

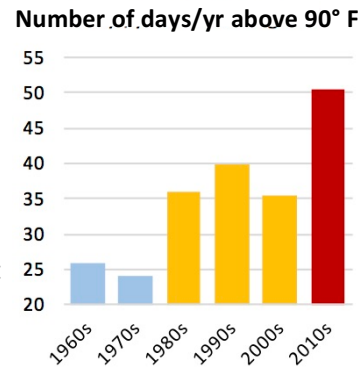
CLIMATE HAZARD IDENTIFICATION

FOR LOUISVILLE METRO REGION



The 2016 **Louisville Metro Hazard Mitigation Plan** is state-of-the-art. The plan provides detailed assessments of the risks associated with 13 major hazards to the Louisville Metro region, its residents, and infrastructure. And yet, one important variable is missing – **climate change**. This document provides an overview of how climate change is expected to exacerbate (or lessen) many of Louisville’s hazards over time.

Extreme Heat – Heat is the number one cause of mortality among all weather-related disasters. Both the frequency and duration of heat waves have increased in Louisville. The number of days above 90° F has increased steadily in Louisville¹ (graph on right). Warm nights (above 75°F) are especially dangerous, and could increase from just a few per year to between 50-75 per year if emissions are not reduced.²



As temperatures rise 5-8°F by mid-century and 7-12°F by late century,³ heat stress and heat stroke will become increasingly common. Researchers have calculated the number of mortalities associated with each additional degree of warming, which can be used to map heat-related impacts throughout the Louisville Metro region.

Climate Risk = Already increasing; highly likely to continue to increase

Severe Winter Storm – Extreme snow, blizzards, and ice storms are all considered severe winter storms. Extreme snowfall has declined more than 20%¹ and is expected to continue to become less common, as are blizzards. Snowfall is projected to decline 77-91% by the 2080s.³ Conditions amenable to ice storms could occur 63-75 fewer days/ yr.³

Climate Risk = Risk is highly likely to decline in coming decades

Flood – Floods are caused by excessive precipitation. Precipitation has been increasing in Louisville, and is expected to continue to increase.¹ Regionally, the amount of precipitation in large storms has increased by 27%, and is expected to continue to increase.² Models indicate that 100-year floods in Louisville are likely to become 2.5-3.5 times more frequent over the next 60 years, if emissions are not reduced.⁴

Climate Risk = Risk already increasing and highly likely to worsen

Air Quality – Higher temperatures associated with climate change lead to the formation of ground-level ozone. As Louisville works to improve air quality and reduce greenhouse gas emissions, the effectiveness of such efforts will be impaired as temperatures rise. Air quality impacts to human health include respiratory and heart disease and are associated with significant medical costs and mortality.

Climate Risk = Already occurring and highly likely to worsen over time

Drought – Even with increasing rainfall, drought stress can increase across a region due to higher temperatures, evaporation and evapotranspiration (water use by plants). Models show the Louisville region will become increasingly drought stressed due to higher temperatures. Drought stress is expected to increase by 47% by the 2050s and 63% by the 2080s.³

Climate Risk = Likely to increase in frequency and intensity



GEOS
INSTITUTE

The 2016 Louisville Metro Hazard Mitigation Plan can be accessed at this link - https://louisvilleky.gov/sites/default/files/emergency_services/pdf_files/lm_hmp_2016_final.pdf



Severe Storm – Severe thunderstorms are a major source of catastrophic loss. Increasing convective potential energy and strong winds associated with climate change indicate that severe thunderstorms are likely to increase.² In the Southeast specifically, the most violent and severe storms could become more common.

Climate Risk = Highly likely to increase in frequency and intensity

Tornado – Tornadoes are spawned by thunderstorms and produced when cool air overrides a layer of warm air, forcing the warm air to rise rapidly. Scientists are unclear about how atmospheric instability and wind shear will respond to climate change.² Tornadoes have been increasing in Kentucky over the last decade. Also, clusters of tornadoes are becoming more common.

Climate Risk = Already occurring and risk is likely to continue to worsen

Hailstorm – Hailstorms are also related to thunderstorms, and occur when storms have strong updrafts that bring water into the cold region of a cloud. Warm and moist conditions promote these updrafts. Hail has been increasing in size in some parts of the U.S. Not a lot of study has been done, however, on the likely response of hailstorms to climate change. Stronger thunderstorms are likely to cause increased hail size.

Climate Risk = Hail sizes increasing, but future risk unknown

Karst/Sinkhole – 55% of Kentucky sits upon karst-prone substrate, which can collapse or cause sinkholes and lead to dam leakage or radon. Due to the link between climate change and larger storms, climate change could worsen karst hazards. One study found that for every global temperature increase of 0.2° F, sinkholes increased by 1-3%.⁵ Precipitation is expected to increase by 9% in Louisville. 100-year storms are expected to occur every 20-30 years.⁴ Both are likely to contribute to increasing karst and sinkhole hazards.

Climate Risk = Increased risk is likely but uncertain

Landslide – Landslides are activated by storms, fires, and human modification of the land. Precipitation has been increasing in recent years - the 3 highest years on record all occurred within the last decade.¹ The number of large storms increased by 58% in the Southeast since 1901.² The likelihood of landslides may increase.

Climate Risk = Increased risk likely. More information needed.

Wildfire – Wildfires can include grass, scrub, or forest fires, and most are human-caused. Weather, climate, topography, wind, drought, surface fuels, and fire behavior all affect wildfire risk. Most attention is focused on surface fuels, but climate and weather have a large role. Studies indicated significant variation across the Southeast in likely future changes in wildfire frequency and intensity.⁶ Spatially explicit model results were not readily available.

Climate Risk = Risk likely to worsen. More information needed.

Dam/levee Failure – Extreme precipitation can lead to dam and levee failure. Precipitation has been increasing in recent years - the three highest years on record all occurred within the last decade.¹ The number of large storms increased by 58% in the Southeast since 1901.² The likelihood of dam and levee failure may increase with continued high greenhouse gas emissions.

Climate Risk = Increased risk likely. More information needed.

Hazardous Materials – Releases of hazardous materials can be deadly, and can occur in conjunction with natural disasters and human caused events. Severe heat can cause train derailments and spills.⁷ Extreme temperatures are expected to increase by 8.3° F by the 2050s and 12.6° F by the 2080s.³ Also, 100-year floods are expected to become 2.5-3.5 times more common over the next 60 years.⁴

Climate Risk = Risk likely to worsen, but more information needed

Earthquake – Not considered a climate-related risk for Louisville

