BUILT ENVIRONMENT:
HOUSING, TRANSPORTATION, & STORMWATER MANAGEMENT

As the climate continues to change, in the next 30 years Columbia communities are likely to face vulnerabilities related to…

Housing

MEDIUM-HIGH

Warming temperatures will likely increase demand for air conditioning, which most homes and apartments have, but the increase in energy costs may be difficult for households, especially low-income ones, to bear. Heavier rains may cause more local flooding, which could cause damage and limit mobility for some neighborhoods in more flood-prone areas of the city.

Transportation

LOW-MEDIUM

Flooding is not a significant concern for Columbia now, but more heavy rain events in the future may increase the risk of local flooding, potentially blocking roadways and trails. The high reliance on personal vehicles and limited transit services across the metro area limits residents' options for getting around, especially during times of extreme events.

Stormwater management

MEDIUM

The city's stormwater infrastructure may not be able to handle the amount of runoff that is expected in the future, and considerable resources would be needed to make needed upgrades.

Vulnerability Ranking

LOW | LOW-MEDIUM | MEDIUM | MEDIUM-HIGH | HIGH

Housing

Of the 46,184 occupied housing units in Columbia, 47% are owned by residents and the remaining 53% are rented [1]. In recent years, the number of multi-family housing units in Columbia has been rapidly increasing. This trend is considered to be driven by relatively rapid growth of the Columbia metropolitan area population, which increased by more than 11% between 2010 and 2016 [2]. During that same period, total enrollment at the University of Missouri Columbia increased by approximately 2.5%, accounting for some, but not all, of this change [3]. Also driving this trend may be changing expectations and desires among students for off-campus housing with amenities in close proximity to campus, as well as relatively low permitting costs. Annual population growth in Columbia is anticipated to slow slightly in the future, but will likely maintain a rate that would continue driving the construction of multi-family housing.

The average Columbia resident earning the median annual income for the region spends 26% of their income on housing costs, which is slightly under the national average. Lower-income households whose annual income is 80% of the regional median income—representing about one-third of Columbia's community—spend 32% of their income on housing [4]. The Columbia Housing Authority helps low-income households overcome this cost burden by providing subsidized housing or affordable housing vouchers to over 1,900 households in Columbia and Boone County, representing 9% of the city's rental market [5]. Meanwhile, the City of Columbia has been working to increase investments in historically under-resourced neighborhoods and help low- and moderate-income households build wealth through its first-time home buyer assistance program [6].

Warmer temperatures and more cooling needs

Climate change is expected to increase air temperatures in Columbia, with summertime highs reaching nearly 104°F and nightly lows staying above 80°F by 2080 [7]. Asphalt and other features in the urban environment may make temperatures warmer in the city due to the urban heat island effect. Under these conditions, there will likely be greater demand for homes and apartments with air conditioning (A/C), natural shading, passive cooling design, and other features that provide relief from the heat. Residents may use A/C more often, leading to increased energy use, higher household cooling costs, and greenhouse gas emissions. Larger A/C units with more capacity may be needed to counteract extreme heat, but these units may be less efficient on days when that capacity is not needed. Good insulation in homes and apartment buildings will be needed to maximize efficiency and reduce unnecessary costs; cooler roofs and other strategies can also help. Households with lower annual incomes may be less likely to have air conditioning and may need financial assistance to install and operate air conditioning units and improve insulation in their homes.

Heavier rainfall and flooding

Columbia is also expected to have more frequent heavy rainfall events in the future, which will increase the risk of local flooding to homes and apartment buildings, especially those located in flood zones [7]. Structures that are sufficiently elevated above average flood levels in the current climate may not be high enough for the larger floods that are expected to occur in the future. Thirty residential structures are located in the floodway, but about 300 more are in areas at risk of flooding during bigger events that have historically happened every 100 years [8]. A total of 1,050 residential structures, including five public housing communities, are at risk of being affected by 500-year flood events [8]. Flooding may cause sanitary sewer backups around some residential structures, potentially making them uninhabitable until water recedes and the area is cleaned up. Heavy rain events will also require larger gutters, downspouts, bioswales, and other on-site infrastructure to manage higher volumes of stormwater.

There are five public housing communities located in areas at risk of being affected by floods that have historically occurred every 500 years: Jesse Wrench, Lower Jesse Wrench, Frank Coleman, Oak Towers, and Bear Creek [8]. Lower-income residents may face challenges in recovering from flooding if they do not have insurance or sufficient resources to fix damages to their home or property.

Lynn Street Cottages and the Columbia Community Land Trust

The City of Columbia has been working alongside neighborhood and community members to redevelop the block of Garth, Sexton, Oak, and Lynn with affordable housing and improved infrastructure. The project includes the development of eight affordable owner-occupied homes with near net-zero energy usage design and universal design features. The homes were developed in a cottage housing style arrangement to increase the density of the development. The development also included significant stormwater improvements to benefit the surrounding neighborhood.

The Lynn Cottages development also coincided with the City's creation of the Columbia Community Land Trust (CCLT). The CCLT is a separate 501(c)3 with a governance structure that includes membership from the community at large, neighborhood members, and CCLT homeowners. The CCLT's main purpose is to steward the City's investments in affordable housing, which will be done by maintaining ownership of the land beneath the homes and authorizing its approved use through a 99-year ground lease. The CCLT will ensure the homes remain affordable, owner-occupied, and well-maintained for generations to come. This kind of long-term planning is especially important as we prepare for anticipated climate change impacts.

Transportation

Columbia's residents mostly rely on private vehicles to get around. Over two-thirds (78%) of residents drive alone to work, 9% carpool, 5% walk, and only 1% take public transit [9]. The annual cost of car ownership is over 18% of the average Columbia resident's annual income [4]. Columbia's public transit system is relatively small compared to cities of similar size due to budgetary constraints. Columbia is not alone in this situation—public transportation is poorly funded statewide. Columbia's pedestrian infrastructure includes 555 miles of sidewalks in the metro area, but funding constraints have also left some neighborhoods without any sidewalks, possibly inhibiting mobility and accessibility to transit, and raising potential safety concerns during flooding events.

Under future climate conditions, heavier rain events may pose a higher risk of flooding and damage to transportation infrastructure [7, 10]. Local street flooding may become more widespread if stormwater pipes prove too small to handle heavier rain events. Roads will need to be designed with larger pipes and inlets to efficiently move stormwater off the streets, which could increase costs for construction and ongoing maintenance. Heavier rains are likely to destabilize streambanks and increase erosion, threatening bridges, trails, and other structures along waterways. These impacts will require more labor and equipment to clear rock, mud, and debris and repair damaged infrastructure—all of which increase costs. Flooding also affects walking and biking, especially on trails built in floodplains. Since bike lanes are typically built close to street gutters, they may be unusable if streets are flooded. Roadways are not expected to be significantly impacted from erosion since it is currently a minor issue and mudslides are extremely rare.

Meanwhile, warmer temperatures and extreme heat may weaken pavement and other types of material, lower long-term durability, and require more maintenance. Warmer temperatures may have negative health impacts on people who use active transportation or public transit, making it more difficult for them to get around. On the other hand, warmer winters in the long term may mean fewer instances of freezing and thawing and less demand for some types of maintenance.

Columbia residents who rely on walking or biking, who do not have a personal vehicle, or who cannot drive may be more exposed to extreme heat and poor air quality from smog or airborne allergens. People with respiratory or cardiac conditions, older adults, pregnant women, and children may be especially sensitive to these conditions. Demand for Go COMO fixed bus routes, Para-Transit, and Tiger Line may increase among these community members. During severe rain events, especially when transportation infrastructure is damaged or service is interrupted, people with limited mobility including older adults and people with disabilities may need additional Para-Transit services to get to places of shelter and address basic needs. The sparse nature of the transit system could be a significant liability during such events.

Regional growth and development

Columbia's population grew by nearly 40% between 2000 and 2016 (from 84,531 to 117,165) [2]. The city is projected to continue growing by approximately 1.5% each year to exceed 200,000 by 2050 [14]. With this growth has come inner city redevelopment and increased housing prices, which could push lower-income and minority populations to the fringes of the city where there are fewer resources, transportation options, and walkable or bikeable infrastructure.

Stormwater management

Columbia's existing stormwater infrastructure will likely be challenged by more frequent and higher intensity storms due to the age and condition of structures and pipes, though much of the infrastructure has yet to be visually assessed for its conditions [11]. Extreme events may lead to more flash flooding with higher volumes of water, which will be difficult for undersized pipes to handle. These events may lead to stormwater infrastructure failures, which have occurred in recent years [12]. Since Columbia's sewer infrastructure is separate from its stormwater drainage infrastructure, it is less vulnerable to contamination during heavy rain events compared to St. Louis, Kansas City, and other cities that have combined systems [13]. Still, the City's stormwater infrastructure will need greater capacity to manage the projected heavier flows, and some houses may be affected by sewer backups during heavy rains.

References

[1] U.S. Census Bureau, Table S2502: Demographic Characteristics for Occupied Housing Units, 2016.

[2] U.S. Census Bureau, Total Population, 2000 Census, and Demographic Estimates, 2012-2016 American Community Survey 5-Year Estimates.

[3] Office of Intitutional Research and Quality Improvement, University of Missouri Columbia, Total Enrollment by Student Level, Fall Semesters, 2007-2017, Columbia, MO, 2017.

[4] Housing and Transportation Affordability Index, Center for Neighborhood Technology, 2017 Update. [Online]. Available: https://htaindex.cnt.org/map/. [Accessed March 2018].

[5] Columbia Housing Authority, 2018. [Online]. Available: http://www.columbiaha.com/. [Accessed March 2018].

[6] T. Petras, "City to provide assistance for first-time homebuyers," KMIZ News, 22 December 2015.

[7] C. J. Anderson, J. Gooden, P. E. Guinan, M. Knapp, G. McManus and M. D. Shulski, "Climate in the Heartland: Historical Data and Future Projections for the Heartland Regional Network," Urban Sustainability Directors Network, 2015.

[8] City of Columbia, Geographic Information Systems Department, 2018.

[9] U.S. Census Bureau, Sex of Workers by Means of Transportation to Work, Workers 16 years and over, 2016.

[10] U.S. Environmental Protection Agency, "What Climate Change Means for Missouri," 2016.

[11] City of Columbia, Missouri, "Technical Memorandum 4: Stormwater System Evaluation, Columbia Wastewater and Stormwater Integrated Management Plan," Columbia, Missouri, 2017.

[12] ABC 17 News, "Stormwater pipes fail after heavy rain in Columbia, Video segment," 2 July 2015. [Online]. Available: http://www.abc17news.com/news/stormwater-pipes-fail-after-heavy-rain-in-columbia/54268794. [Accessed 11 May 2018].

[13] City of Columbia Utilities, "Storm Water: Understanding the Issue," [Online]. Available: https://www.como.gov/utilities/stormwater/stormwater-education/understanding-the-issue/. [Accessed March 2018].

[14] Columbia Area Transportation Study Organization (CATSO) Technical Committee, "Memo to Coordinating Committee on population projections adopted for long-range transportation plan update," 13 November 2017. [Online].