

Smart Information Services for Building Equitable Active Transportation Culture

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This project aims to develop smart city information systems for enabling and enhancing the equitable and sustainable active transportation culture. The first phase of the project focuses on data acquisition and conflation for addressing multiple impacts of active transportation.

Active transportation, such as walking and cycling, can offer a plethora of advantages to individuals and society. For individuals, walking and cycling are the most prevalent ways to engage in physical activity, which could improve one's health. Active transportation is also the most cost-effective mode of transport, which requires no fuel cost and low maintenance cost, compared with cars. Active transportation also brings significant benefits to environmental sustainability in the long term. Active transportation produces minimal pollution and carbon emissions, contributing to a cleaner environment and potentially reducing the costs associated with pollution-related health issues. Promoting walking and cycling can help alleviate traffic congestion, leading to reduced time and productivity losses associated with traffic jams. Nevertheless, individuals who engage in active transportation are subject to specific types of risks within their daily surroundings, such as traffic crashes, air pollution, traffic noise, and extreme weather. Because of historical, policy, and economic factors, these potential hazards may not be uniformly spread across all neighborhoods and communities within a city. This unequal distribution of risks can result in certain areas facing higher levels of exposure to the challenges associated with active transportation. Underserved communities might face a greater burden of risks associated with active transportation, as they heavily rely on such means due to economic constraints that make car ownership unfeasible for many residents within these areas.

Pedestrian and bicyclist crashes persist as significant challenges in transportation and public health. Based on a nationwide report by the National Highway Traffic Safety Administration (NHTSA), pedestrian fatalities increased 13 percent from 6,565 in 2020 to 7,388 in 2021, while bicyclist fatalities increased 2 percent from 948 in 2020 to 966 in 2021. However, such crashes are not equally distributed for all demographic groups and communities. As outlined in a report by the Governors Highway Safety Association (GHSA) there is a disproportionate occurrence of traffic crash fatalities among individuals of Black, Indigenous, and People of Color (BIPOC) backgrounds in the United States. The total nationwide traffic deaths were recorded at 145.6 and 68.5 per 100,000 population for American Indian/Alaska Native and Black communities, respectively. This was notably higher than the overall rate of 58.1 deaths per 100,000 for the entire population. Regarding pedestrian crashes, a study conducted by NHTSA unveiled distinct differences in fatality rates. In 2018, the pedestrian fatality rate for the white population was recorded at 1.5 per 100,000, whereas the corresponding rate for the Black population was 2.94 per 100,000. This indicates that the pedestrian fatality rate for the Black population was approximately twice that of the white population (Glassbrenner et al., 2022).

Promoting an active transportation culture requires providing information services and policy recommendations, with the overarching goal of ensuring safety and equality for all. However,

there is a significant lack of relevant infrastructure, policies, and data-driven solutions for enhancing and promoting an active transportation culture. As such, this project aims to develop smart city information systems for enabling and enhancing the equitable and sustainable active transportation culture by developing publicly accessible visualization tools and conducting in-depth research on health risks associated with active transportation modes using advanced modeling approaches. In the project's first phase, various data sources capable of quantifying the health burden experienced by active transportation users were identified. This will encompass not only measuring the health burden itself but also identifying potential factors that might contribute to this burden. The project's first phase resulted in a visualization dashboard displaying pedestrian and bicyclist crashes and other related information such as roadway infrastructure, traffic noise, air pollution, pedestrian and bicyclist volumes, and socioeconomic characteristics.

Smart Information System Dashboard:

<https://tamu.maps.arcgis.com/apps/dashboards/49f9e21e68654cda836b41f4bacf0e2e>