

Accessibility of Shuttle Bus Stops in KNUST

Kwaku Agyemang Frimpong, MSc;
Participant ID: 202403034

Kwame Nkrumah University of Science and Technology, Transport Research and Education Center Kumasi

ABSTRACT

Public transportation plays a vital role in enhancing accessibility and mobility within urban environments, particularly within university campuses where students and staff rely on shuttle bus services for daily commutes. However, the effectiveness of shuttle bus systems depends not only on their availability but also on their accessibility. This study aims to assess the accessibility of shuttle bus stops at Kwame Nkrumah University of Science and Technology (KNUST), Ghana. Using Geographic Information Systems (GIS) techniques, time isochrones were generated around six shuttle bus stops to delineate areas reachable within 1, 2, 3, 4, and 5-minute walking intervals. The analysis revealed varying levels of accessibility across the campus, with spatial disparities observed based on the proximity to shuttle bus stops and campus features. The findings highlight the importance of incorporating accessibility considerations into transportation planning efforts to enhance campus mobility and promote equitable access to facilities and services. By identifying areas of high and low accessibility, university stakeholders can prioritize investments in shuttle bus services, pedestrian infrastructure, and active transportation initiatives to improve connectivity and create a more inclusive campus environment. This research contributes to the advancement of sustainable transportation practices and informs evidence-based decision-making processes aimed at enhancing the overall student experience at KNUST.

INTRODUCTION

Public transportation plays a crucial role in enhancing accessibility and mobility within urban environments, particularly within university campuses where students and staff rely heavily on shuttle bus services for their daily commutes. However, the effectiveness of shuttle bus systems relies not only on their availability but also on their accessibility.

The problem statement arises from the need to assess the accessibility of shuttle bus stops at KNUST. While the existence of shuttle bus services is known, their effectiveness in providing timely access to key locations across the campus remains understudied.

METHODS AND MATERIALS

The study utilized geospatial data obtained from Kwame Nkrumah University of Science and Technology (KNUST), including the locations of shuttle bus stops and campus road networks. Open route service is used to obtain the road networks within the KNUST campus. Geographic coordinates of the shuttle bus stops were collected using GPS devices, ensuring accuracy in spatial positioning.

Isochrone Generation: Isochrones were generated around each shuttle bus stop to delineate areas accessible within specified time intervals. The QGIS plugin, such as the ORS tools- 'isochrones from point layer', facilitated the creation of isochrone layers based on walking time thresholds.

Visualization: The generated isochrones were visualized using thematic mapping techniques to highlight accessibility patterns across the campus. Colour gradients were utilized to represent varying levels of accessibility, with darker shades indicating areas reachable within shorter time intervals.

RESULTS

Isochrone Visualization: The analysis resulted in the generation of time isochrones around each of the six shuttle bus stops within the KNUST campus. These isochrones visually represent areas accessible from each stop within 1, 2, 3, 4, and 5-minute walking intervals. Figure 1 illustrates the spatial distribution of the isochrones, providing insights into the accessibility patterns across the campus.

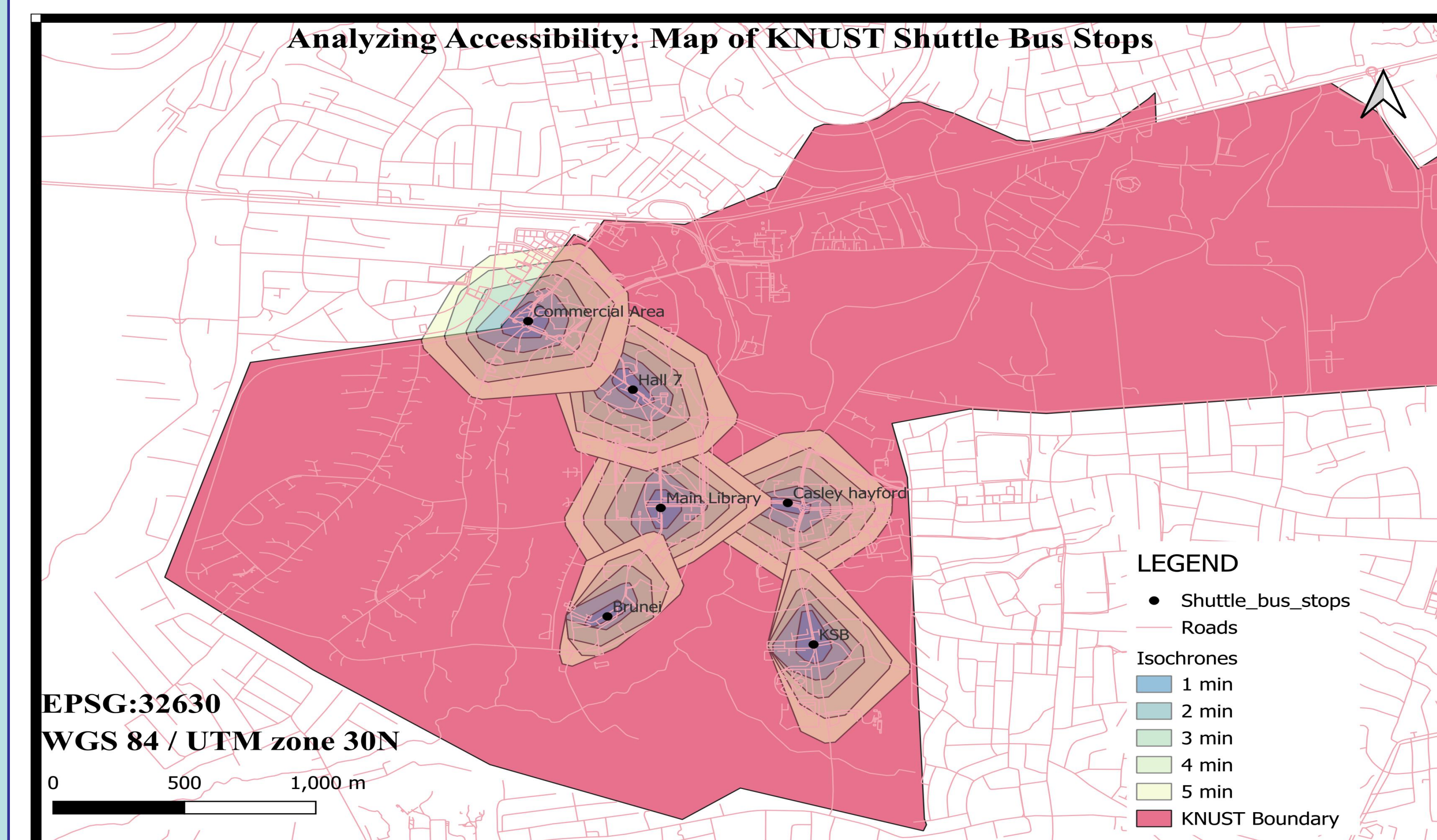


Figure 1: Accessibility map of shuttle bus stops.

Accessibility Patterns: The analysis revealed varying levels of accessibility around the shuttle bus stops, with accessibility diminishing as the walking time threshold increased. Within the 1-minute isochrone, a significant portion of the campus was reachable from each stop, indicating high levels of accessibility within close proximity. As the walking time threshold increased to 2, 3, 4, and 5 minutes, the accessible area decreased, reflecting longer walking distances required to reach distant locations.

Comparison between Stops: Comparative analysis between the six shuttle bus stops revealed differences in accessibility profiles based on their respective locations and surrounding campus features. Stops located in central or densely populated areas of the campus tended to exhibit higher levels of accessibility across all time intervals, reflecting their strategic positioning within the transportation network. Conversely, stops situated on the periphery of the campus demonstrated lower accessibility, indicating potential challenges in reaching distant destinations within short walking distances.

DISCUSSION

Several factors may contribute to variations in accessibility around shuttle bus stops, including the distribution of campus facilities, the layout of pedestrian pathways, and the availability of alternative transportation options. Stops located near academic buildings, residential areas, or administrative offices may experience higher demand and greater accessibility, whereas stops situated in peripheral or less densely populated areas may face challenges in serving remote destinations within short walking distances. Additionally, the presence of physical barriers such as steep terrain or limited pedestrian infrastructure may impact accessibility and hinder pedestrian mobility.

CONCLUSIONS

The accessibility analysis conducted in this study provides valuable insights into the spatial distribution of accessibility around shuttle bus stops within the KNUST campus. The findings underscore the importance of incorporating accessibility considerations into transportation planning and infrastructure development initiatives at KNUST. Targeted interventions, such as improvements to shuttle bus services, pedestrian infrastructure enhancements, and active transportation initiatives, can help address accessibility challenges and promote equitable access to campus facilities and services.

CONTACT

Kwaku Agyemang Frimpong
Regional Transport Research and Education Center Kumasi
Email: kwakufrimpong230@gmail.com
Phone: +233540418089