Evaluating Walkability in Dormitory Areas of Tsukuba University

Hao HOU (Doctoral Program in Geoenvironmental sciences)

1. Motivation

The purpose of this study is to map the walkability of dormitory areas with four factors including walk path condition, facility accessibility, aesthetics and safety. Daytime and nighttime walkability is evaluated separately with different factor selections. The walkability maps can show strength and weaknesses in construction of different dormitory areas for further development in these areas.

2. Introduction

Walkability is a well-known count of how conducive an area is to walking to and from chosen destinations. Calculation of walkability is widely used in evaluating the design of the neighborhood environment (NE) to determine the ease or difficulty of travel by foot in this area. A good NE with high walkability may expect more physical activity and healthier diets among persons living in this area. High walkability also indicates low usage of vehicles which means low Carbon dioxide emissions and good environment.

3. Study Area

Three main dormitory areas in University of Tsukuba (Ichinoya Dormitory Area, Hirasuna Dormitory Area and Oikoshi Dormitory Area) are selected as the research objects. 350 m buffers (areas within 5 min walking distance) of each dormitory are created as study areas.

4. Methodology

Residential density is supposed to be similar in these three areas. As a result, four factors (walk path condition, facility accessibility, aesthetics and safety) are selected for the evaluation.

- Walk path condition: This factor is evaluated by observing the condition of walk path, including the width of sidewalk, the material of road surface, the existence of a separation between sidewalk and driveway and the existence of green belts.
- Facility accessibility: Interviews to residents in study areas are finished to get qualitative evaluations for facility accessibility in neighborhood. Each answer is related to a score and the average scores of separated areas are calculated as one walkability factor.
- Aesthetics: Questionnaires are used to get the evaluation of greenness and landscape of the buffer areas from residents there. Questions include residents' sense of trees, greenness and landscapes in their neighborhoods.
- Safety: Daytime safety and nighttime safety are evaluated separately with different questions. Daytime safety is evaluated with resident's consciousness of traffic condition and crime rate while nighttime safety factor gives more weight to lightness near neighborhood.

Daytime Walkability Score (DWS) is calculated with factors of walk path condition, facility accessibility, aesthetics and daytime safety. Each factor value is normalized and given a weight of 25%. Finally, the score ranges between 0 and 100. Nighttime Walkability Score (NWS) is calculated with the same normalization method while aesthetics and daytime safety are given a weight of 12.5% each and another 25% weight is given to nighttime safety.

5. Results and Discussion

Figure 1 shows the DWS in three main dormitory areas with the road evaluation result. It is clear that during daytime, Oikoshi Area has a higher walkability compared with other two areas. The result mainly comes from a high facility accessibility and a relatively low traffic volume also attributes to the result. On the other hand, Ichinoya Area has the lowest walkability among these three areas because of a very low facility accessibility and few landscapes according to the questionnaires. Hirasuna Area is close to Oikoshi Area and the difference of walkability among them mainly comes from the difference of walk path condition nearby.

Figure 2 is the map of NWS in study areas. The result is similar with DWS map that Ichinoya Area has the lowest walkability. However, there is a difference within dormitories in Ichinoya and the reason is considered to be the difference in lightness.

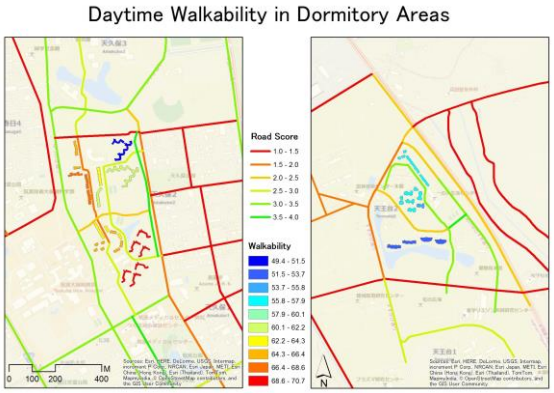

Fig.1 Daytime Walkability Map

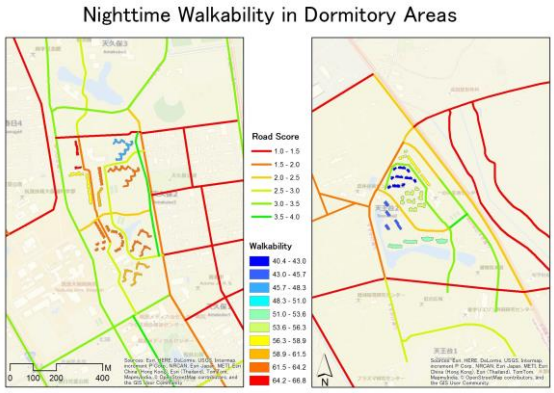

Fig.2 Nighttime Walkability Map