UTM UNIVERSITI TEKNOLOGI MALAYSIA iGES UTM-LOW CARBON ASIA ICLCA 2015

ARE THE NEIGHBORHOOD COMMERCIAL AREAS OF ISKANDAR MALAYSIA CENTRALLY LOCATED FOR LOW CARBON TRAVEL?

M. Rafee Majid[a], Nadhirah Nordin[a], Faeiruz Rosman[b]

[a] UTM-Low Carbon Asia Research Centre, Faculty of Built Environment, Universiti Teknologi Malaysia, 81310 Johor Bahru, Johor, Malaysia.
[b] Dept. of Urban & Regional Planning, Faculty of Built Environment, Universiti Teknologi Malaysia, 81310 Johor Bahru, Johor, Malaysia.

INTRODUCTION

Recent developments in Malaysia show that the amount of CO_2 increases every year which is mainly contributed by transportation sectors (World Bank, 2008). The amount of travel-induced carbon emission can be reduced by minimizing unnecessary extra travel coverage that can result from inefficient location of oft-frequented places such as the commercial centres. Thus, this paper discusses on the centrality assessment of the commercial areas within selected neighborhoods in Iskandar Malaysia. It looks at the distribution of commercial areas within the neighborhoods and evaluating the centrality of street networks in relation to these commercial areas. The selected neighborhoods are representative of existing neighborhoods within Iskandar Malaysia built across five decades from 1970s to 2010s. According to Bevelas (1948), centrality in communication network is basically represented by a point to some extend that the point has the shortest path to the other point that is in the network. Centrality measures indicate that some of the nodes contained in an urban network are more significant especially the nodes that are located at the center of the network rather than the rest (Porta, Crucitti and Latora, 2006).

RESEARCH METHOD

The study area is in Iskandar Malaysia and although fifteen neighborhoods of different ages with mixed land uses have been studied, this paper discusses only the results of the centrality analysis carried out on three neighborhoods which are Taman Tasik, Taman Abad and Taman Kebun Teh. The three are selected for discussion due to the uniqueness in their design and location of commercial areas. Table 1 defines the four centrality measures used in this study. All the parameters (Reach, Betweenness, Straightness, Closeness) were measured using Urban Network Analysis, a network analysis toolbox made for ArcGIS.

Table 1: Definitions of the four measures of centrality assessment

Reach	Betweenness	Straightness	Closeness
The number of buildings that are reachable from i at a shortest path distance of at most network radius r (Sevtsuk, 2010)	Betweenness of a building estimates the number of times i lies on shortest paths between pairs of other reachable buildings that lie within the network radius r (Urban Network Analysis, 2008)	How closely the shortest network distances between i and other buildings that are reachable within radius r resemble Euclidean distance (Urban Network Analysis, 2008)	The inverse of the total distance from i to other buildings that are reachable within radius r along shortest path (Urban Network Analysis, 2008)

RESULTS AND DISCUSSIONS

Figure 1 shows the location of commercial areas and the four measures of centrality for each studied neighborhood. In general, the existing location of commercial areas are situated at the edge of the neighborhoods near the main road which influence the centrality of these commercial areas. It can be seen that most of the commercial areas are located beyond the walking distance (800m radius) from the compact area of the residential zones in the neighborhood. The commercial area also tend to be located near the low density residential area. This situation should not happen as the low density residents are usually occupied by high income owners with little tendency to shop at the commercial area. Vice versa, the people with low income usually have higher tendency to shop at chat area and they should be placed closer to the commercial area.

Multiple Centrality Assessment can become one of the tools to measure centrality of the commercial area and facilities in designing residential areas. By applying these measures, the allocation of commercial areas will be centralized and can reduce motorised travel as well as increase walkability.
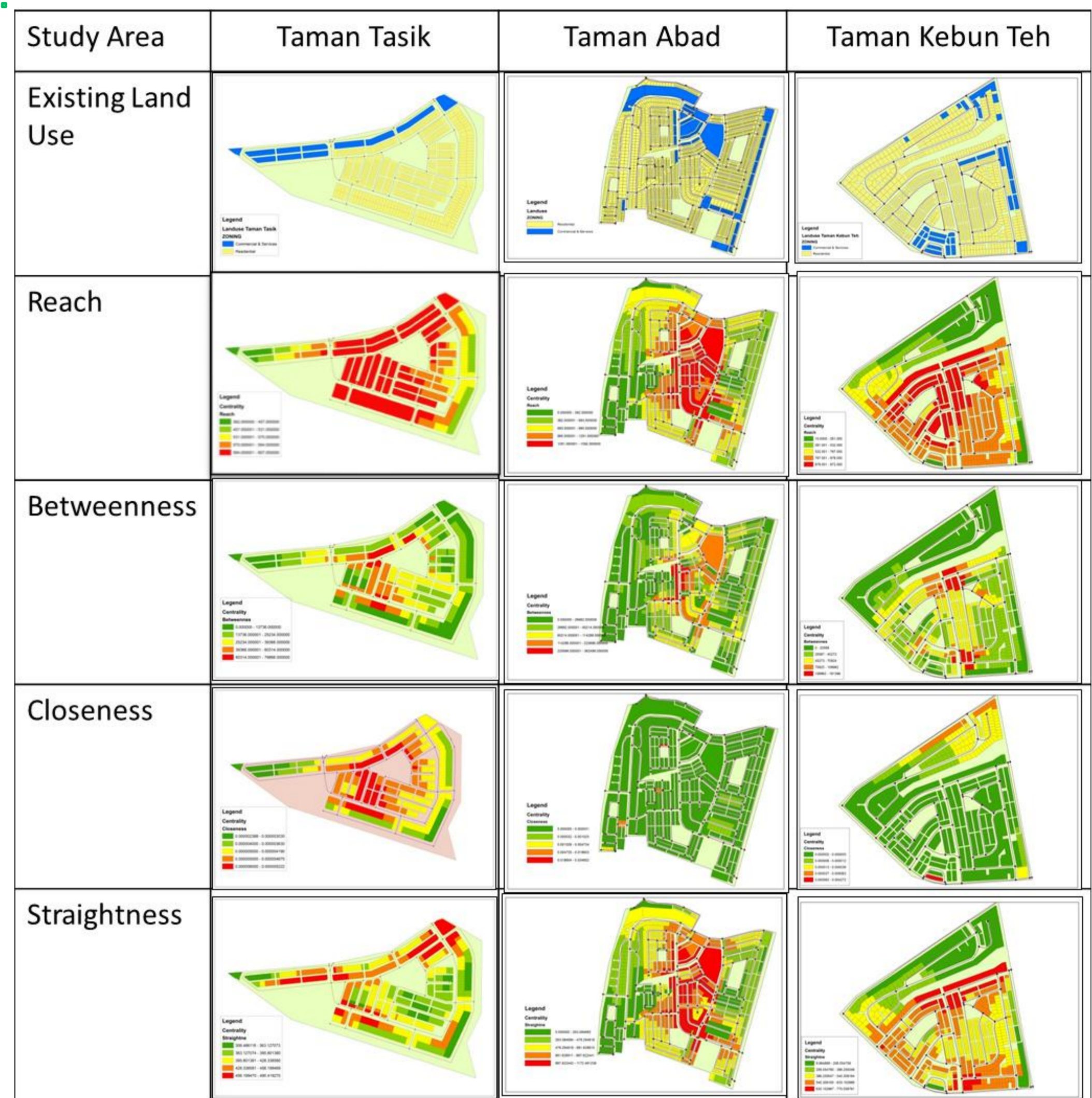

Figure 1: Reach, Betweenness, Closeness and Straightness of three neighborhoods

Assessment of the centrality of the existing commercial areas in neighborhoods of Iskandar Malaysia seems to indicate that these commercial areas were located not guided by the four measures of centrality (reach, betweenness, closeness and straightness) but based on the potential visibility of the areas. Hence the lining up of the commercial units along major roads bordering the neighborhoods. In terms of low carbon, such locations promote unnecessary travels that can increase carbon emissions.

REFERENCES

1. Bavelas A., 1948. A Mathematical Model for Group Structures. *Human Organization,* **7**, 16-30, 1948.
2. Porta S., Strano E., Iacoviello V., Messora R., Latora V., Cardillo A., Wang F. Street Centrality and Densities of Retail and Services In Bologna, Italy. *Environment and Planning B: Planning and Design*, **36**, 450 – 465, 2009.
3. Porta S., Crucitti, P., Latora V. Multiple Centrality Assessment in Parma: A Network Analysis of Paths and Open Spaces. *Urban Design International*, **13**, 41- 50, 2008.
4. Porta S., Latora V., Wang F. Street Centrality and the Location of Economic Activities in Barcelona. *Urban Studies*, **49(7)**, 1471–1488, 2012.
5. Sevtsuk A. Path and Place: A Study of Urban Geometry and Retail Activity in Cambridge and Somerville, MA. *PhD Dissertation, MIT, Department of Urban Studies and Planning, Cambridge*, 2010.
6. Sevtsuk A. & Mekonnen M. Urban Network Analysis: A New Toolbox for ArcGIS. *City Form Lab, MIT,* 2012.
7. The World Bank, CO_2 Emission Per Capita. *The World Bank*, 2008.

ACKNOWLEDGEMENT