

Street Networks in Phnom Penh

Summary Report on Data of Street Networks

10th April, 2021



Walkable Street Networks, Bikeable Street Networks,
Drivable Street Networks

Foreword



The mobility of people in Phnom Penh city was made by many types of transport modes, i.e., motorized transport, and active transport. In this sense, the motorized transport includes passenger car, motorcycle, Tuk-Tuk, etc., meanwhile the active transport are public transit, cycling, and walking.

Many studies in transportation field were illustrated that usage of the motorized transport have higher pollution to environment if compare to the usage of active transport. Based on this reason, many countries worldwide encourage people to use the active transport mode, i.e., public transit, cycling, and walking. In addition, activate transport also becomes to be an importance research topic in transportation field so far in developed as well as the developing countries.

Active transport mode already existed in Phnom Penh city nowadays, as the public bus was under the operation within 13 bus lines in 2021 that cover nearly the whole area of Phnom Penh city, for instance. Beside this, the walking also made by people who have trip with short distance in Phnom Penh city as well as the cycling.

In order to enhance the usage of the walking in Phnom Penh, this needs to study on many factors that will affect on walkability or the perception from users or characteristic of users. Through a research effort on urban mobility, I have developed a dataset of '**Street Network in Phnom Penh**', which provides to help other research with data of walkable street network, bikeable street networks, and drivable street networks for their study. These datasets, which is available upon request by email, includes shapefiles for walkable, bikeable, and drivable street networks in Phnom Penh. It was created by extracting satellite data.

In addition, this data will be essential for developing of pedestrian street in Phnom Penh city. In urban, the active transport will be a part of contribution for reducing the traffic congestion, pollution from congestion, etc.

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Foreword



Data is almost everything for researchers. However, the researchers from the least developing countries, like Cambodia, always complain about inaccessibility to data and resources. Moreover, the available data and resources are commonly incomplete and poor in quality. On one hand, I have learned that some researchers themselves do not know where to search for the data and resources. On other hand, the data and resources have not been compiled and made available collectively.

Seeing this challenge, the Center for Khmer Studies (CKS) has initiated an urban database project to compile a variety of data – including academic and grey literature, quantitative data, master plans, images, and policies and laws. Many links to popular databases and academic publishers, such as Elsevier, Springer, Wiley, Taylor Francis, Sage, PubMed, MDPI, PlosOne, and Nature, are also available on the CKS's urban database website.

Of course, the CKS urban database may not provide everything you want as its focus is about urban studies but I believe that to some extent this initiative could help the researchers, students, and faculty members in the field of urban studies.

A handwritten signature in black ink, appearing to be in Khmer script, written over a light blue rectangular background.

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Senior Urban Researcher

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Summary

Transport Mode in Phnom Penh

Phnom Penh is the capital city and an economical center of the Kingdom of Cambodia within the total population of about 1.25 million (in 2012). Along with economic development in Phnom Penh, the number of registered vehicles has also grown rapidly. Nowadays, there are many types of transport modes that people have used for their trip from origin to destination. Obviously, there are two groups of transport modes that are the choice for their trip, i.e., motorized transport and active transport. Motorized transport referred to motorcycle, household vehicle (passenger car), tuk-tuk, Bajaj, Remork, etc. Meanwhile, the active transport referred to public transit (i.e., public bus), cycling, and walking.

Conveniences of Active Transport

The usage of active transport, i.e., walking, cycling, and public bus, can contribute on alleviation of CO₂ emission, reduce the traffic congestion, save money for travelling. In other words, walking, and cycling are categorized to be the non-motorized transport that this transport mode can provide the users to travel in short distance for their trip if compare to other modes. Non-motorized transport, i.e., walking and cycling, can also provide users with the health benefit also.

Type of Street Networks

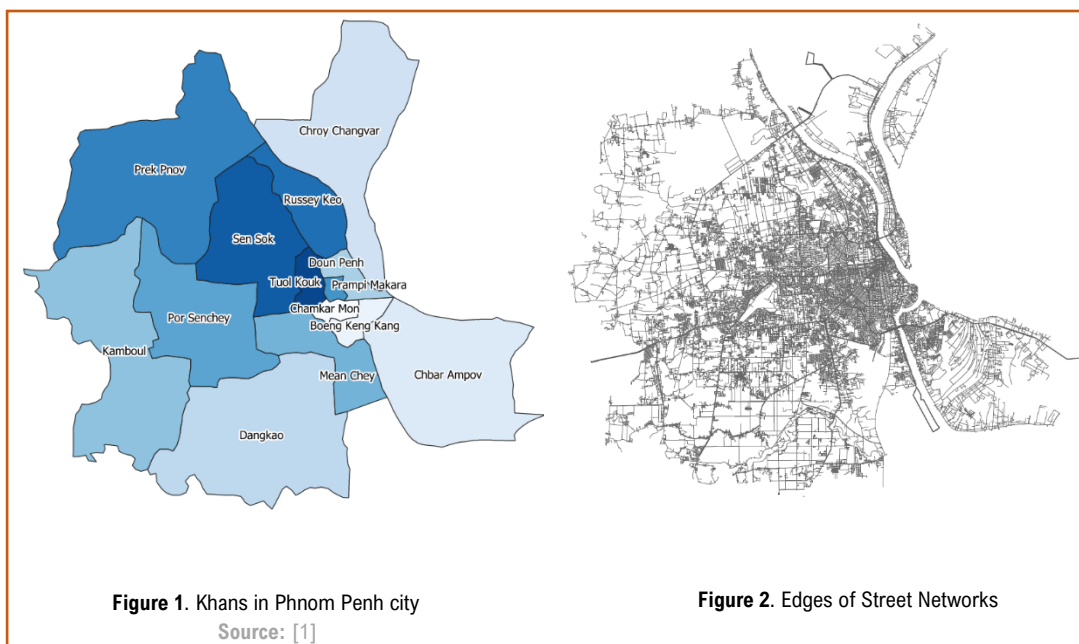
In general, the street network can serve the users in different aspects that the function of those roads can be determined by the physical infrastructure. Some road types can be used for all functions, i.e., driving, walking, and cycling. However, some streets can limit the function of usage, i.e., some roads can provide people to bike, and to walk. Meanwhile, some roads can provide users only for walking, for instance, e.g., road in village that has the small carriageway (road width). According to those reasons, the street network was divided by three types of differences as below,

- Walkable Street Network (Road that possible to walk)
- Bikeable Street Network (Road that possible to bike)
- Drivable Street Network (Road that possible to drive)

These three types of street network are very essential for researchers and developer the street network. The data of street network can be used in many aspects in different purposes of researching or project of urban development. This report is aimed to illustrate these three types of street network and also demonstrated some result from usage of those data in researching field also.

Street Networks in Phnom Penh

Street Networks



Phnom Penh presently has 14 Khans (in 2021), i.e., Chamkar Mon, Daun Penh, Prampi Makara, Tuol Kork, Dangkao, Mean Chey, Russey Keo, Sen Sok, Pou Senchey, Chroy Changvar, Prek Pnov, Chbar Ampov, Boeung Keng Kang, and Kambol. The boundaries of 14 Khans are represented in **Figure 1**. Data of Street Network were combined between (1)-Nodes, and (2)-Edges (See **Figure 2**).

- Edge represents an interface between streets and the adjoining buildings and plots.
- Node represents a point of intersection within a specific network or dead-end of network. (dead-end of networks can be called as **cal-de-sacs**)

Walkable Street Networks

Walkable Streets for pedestrian are the data of all streets and paths that pedestrians can walk (those networks type ignores the one-way directionality by always connecting adjacent nodes with reciprocal directed edges). Walkable Street Network for all of 14 khans were played as nodes and edges (see **Figure 2**, and **Figure 3**).



(a)



(b)

Figure 3. Edges and Nodes of walkable street at (a)-Stueng Mean Chey flyover, (b)- Central Market.

Note: -Yellow point is node (Intersection point or dead-end of network)
-Purple curve represents the edges of network.

Summary Data of Walkable Street Networks

Pedestrian Street Networks in Phnom Penh city have 125804 edges, 62900 streets, 48820 nodes, within 35327 intersections. The total length of street for pedestrian in Phnom Penh city is 5632.38 kilometers. The node density of walkable street is 56.12 node/km² meanwhile intersection density is 40.61 intersection/km². The other detail information from data of street networks is shown in **Table 1**.



Figure 4. Edges of Walkable Street Networks

Table 1- Summary stats data of walkable in Phnom Penh city

Type of Data	Value
number of edges	125804*
number of streets	62900*
number of nodes	48820*
number of intersections	35327*
total street length (km)	5632.38
total edge length (km)	11264.88
node density (node/km ²)	56.12
intersection density (intersection/km ²)	40.61
edge density (km/km ²)	12.95
street density (km/km ²)	6.47
average of edge length (km)	89.54
average street Length (km)	89.55
average circuitry	1.062
average street per node	2.58

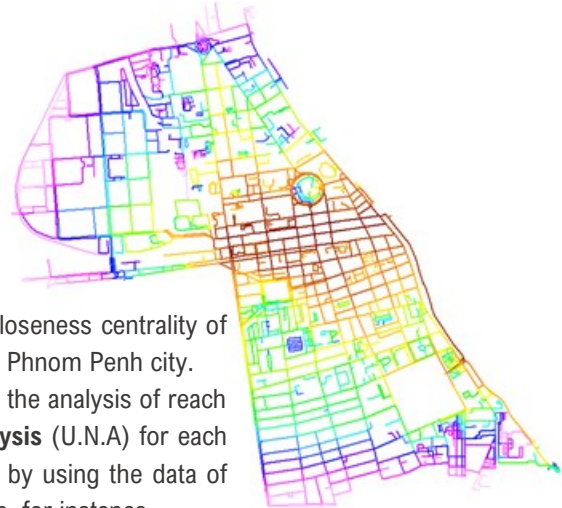
Note: * indicates the value for walkable street, km: Kilometers, km²: Square-kilometer.

Implementation

Analysis on Centrality of Bus Stop by Surrounding Walkable Street

The data of street networks as shown in Figure 3 will be able to use for other analysis as,

- Gravity Centrality.
- Closeness Centrality
- Betweenness Centrality
- Reach Centrality
- Straightness Centrality
- Redundancy Index
- Redundancy Path



The Figure 4 illustrate the analysis of edge closeness centrality of walkable street networks in Daun Peng Khan, Phnom Penh city.

Beside this, in Figure 5 demonstrate the analysis of reach centrality by using the **Urban Networks Analysis (U.N.A)** for each of bus stop and bus shelter in Phnom Penh by using the data of street network for pedestrian around bus stop, for instance.

Figure 4-The edges closeness centrality in DaunPenh districts

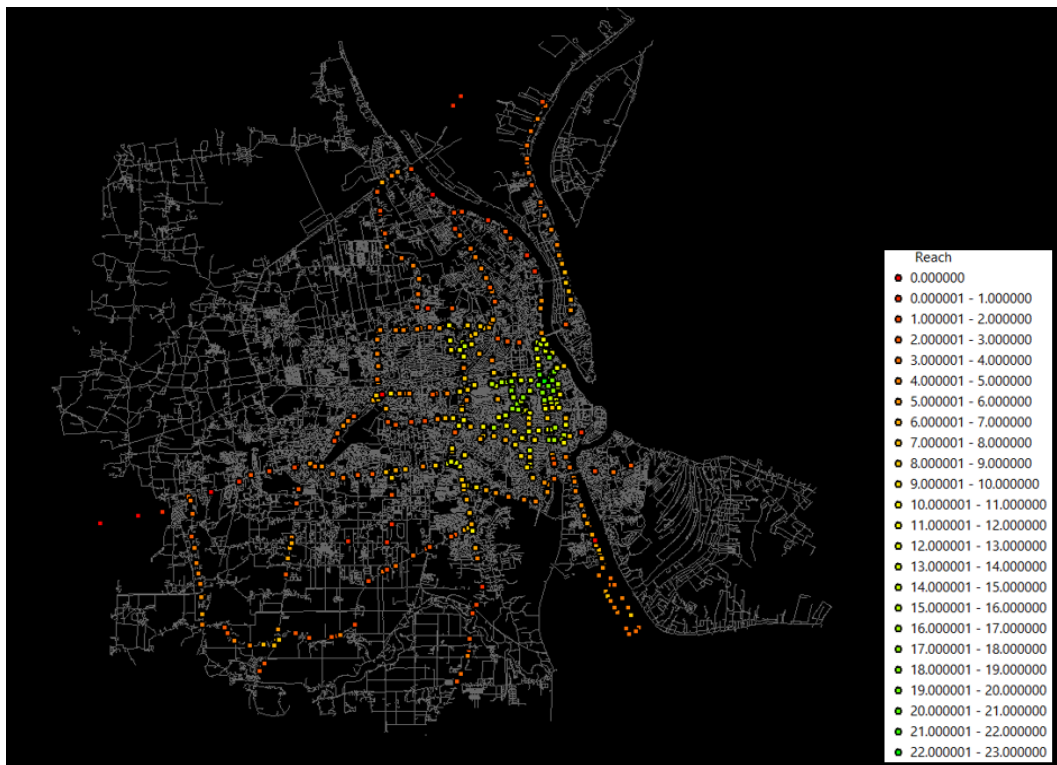


Figure 5. Reach Value of each bus stop in Phnom Penh city within search radius R=1000meter around bus stop.

Street Network in Phnom Penh

For Researcher/Developer of Pedestrian Street

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