

Evaluation of Pedestrian's Profile, Activity, and Environment in the City of Bandar Lampung, Indonesia

Fritz Akhmad Nuzir¹, Haris Murwadi^{1,2}, Bart Dewancker³

¹Lecturer, Bandar Lampung University, Indonesia

²Doctoral Student, the University of Kitakyushu, Japan

³Professor, Department of Architecture, the University of Kitakyushu, Japan

Abstract

The on-going urban development requires massive expansion in transportation infrastructure. Transportation sector is single-handedly responsible for a quarter of CO2 emission worldwide. Therefore it is very clear that to reduce the emission one of the important methods is to promote the use of non-motorized transportation modes. Walking is the very basic form of this zero carbon urban mobility yet often receives less attention in urban development. On previous studies, authors identified key-elements of Pedestrian Profile, Pedestrian Activity, and Pedestrian Environment which are being introduced by authors as its abbreviation, PL.AC.E. Furthermore each key-element will be defined by its common key-attributes. By contextually utilizing the framework of PL.AC.E., authors suggested that an urban area could be evaluated for its existing performances and/or be improved based on its potentials to become a walk-able area. Authors designed a comprehensive questionnaire based on the framework as the tool for data collection and then analyzed it using statistical procedures.

Also on a previous study, authors already utilized this evaluation method for a case study in Kitakyushu, Japan. However the questionnaire was designed to target different kind of respondents and areas so then the result could be representing different scenarios for the validation process. Therefore on this study authors utilized the evaluation method with the case study of the city of Bandar Lampung in Indonesia. The questionnaire was distributed to 189 respondents directly and via online form. The results was then analyzed and compared with the results from the previous case study. Authors concluded that the framework was able to identify the propensity of each key-attribute in order to understand the characteristic of each key-attribute. The framework was also be able to elaborate the relationship between the key-attributes within each key-element in order to find unique phenomena in the case study area.

Keywords: up to 5 words; pedestrian; PL.AC.E.; profile; activity; environment

1. Introduction

The on-going urban development requires massive expansion in transportation infrastructure. Transportation sector is single-handedly responsible for a quarter of CO2 emission worldwide. Therefore it is very clear that to reduce the emission one of the important methods is to promote the use of non-motorized transportation modes. Walking is the very basic form of this zero carbon urban mobility yet often receives less attention in urban development.

By focusing only on improving the walking environment, one often fails to encourage people to walk within the urban setting. Thus one needs also to

elaborate and address the factors of walking. Many studies from various disciplines were already conducted to define those factors. Nuzir and Dewancker, for example, concluded that it is necessary to know the pedestrian's preference so that we would be more effective in improving walking environment [1]. Another finding by Xi categorized the pedestrian into 2 types based on their walking activity, which were Commuters and Visitors [2]. Commuters usually determine daily destination, prioritize travel time, and able to modify routes if required. Meanwhile, Visitors have rather non definitive schedules and routes. Then Cervero and Kockelman proposed that in order to boost the intensity of non-auto transport modes, density, land-use diversity, and pedestrian-oriented designs could be offered in urban planning recommendations [3]. Thus it is very important to have a comprehensive framework consisting common factors of walking as an evaluation parameter.

Contact Author: Fritz Akhmad Nuzir, lecturer, Bandar Lampung University, Address: Jl. Z. A. Pagar Alam No. 26, Labuhan Ratu, Bandar Lampung, Lampung, INDONESIA
Tel: (+62) 721 701463 Fax: (+62) 721 701467
e-mail: fritz@ubl.ac.id

1.1. Previous Studies

On previous studies, authors proposed the framework of Pedestrian PL.AC.E. which stands for the key-elements of Pedestrian Profile, Pedestrian Activity, and Pedestrian Environment. Each key-element will be defined by its key-attributes. By contextually utilizing the framework of PL.AC.E., authors suggested that an urban area could be evaluated for its existing performances and/or be improved based on its potentials to become a walk-able area. Authors designed a comprehensive questionnaire based on the framework as the tool for data collection and then analyzed it using statistical procedures. The tool was able to identify the propensity of each key-attribute in order to understand the characteristic of research subject.

1.2. Problems Statement

However this tool required a designated group of people rather than random sample due to the limitation of sampling. It was based on either the neighborhood (the environment) or the social cultural setting (the activities). Random sampling resulted general reading of which could not assess specific issue on specific area within specific group of people. However in understanding an urban setting, the result is naturally heterogeneous. Thus this study aimed to improve the result of random sampling by multiply the sampling size yet focusing on one key element at a time.

2. Methods

2.1. Data Collection

As mentioned above, authors already utilized this evaluation method for a case study in Kitakyushu, Japan. However the questionnaire was designed to target different kind of respondents and areas so then the result could be representing different scenarios for the validation process. Therefore on this study authors utilized the evaluation method with the case study of the city of Bandar Lampung in Indonesia. On this paper, authors would like only to discuss the Pedestrian Profile as the main focus.

The questionnaire was distributed directly during a public event using an online form. Additionally the online form was also shared on authors' social media to gather more responses. However from 235 initial responses, only 189 responses were considered valid. The period of data collection was from 18th of August 2015 to 23rd November 2015 with the following link: <https://docs.google.com/forms/d/e/1FAIpQLSf3qDuUP92nDLC6JJai3n2YQARHsW4RJQfwBmb9U4SzkSeofA/viewform>

2.2. Results

It was found that the responses mostly were from the regular employees and government officers of which accounted for 58.7% of the employment status,

as seen in Figure 1. As for the respondents' current address, from 20 wards of the city of Bandar Lampung, 15 wards were represented. The missing wards were Teluk Betung Barat, Teluk Betung Timur, Enggal, Kedamaian, and Bumi Waras. Mostly they live currently in Kemiling (18%) and Rajabasa (16.4%). As per year 2015, Kemiling is the 2nd most populated ward in Bandar Lampung with 64,402 people, while Rajabasa is the 13th with 47,125 people. 3 of the missing wards: Teluk Betung Barat, Teluk Betung Timur, and Enggal are amongst the least populated wards. Therefore, in general nearly all wards were proportionally represented. Refer to Figure 2.

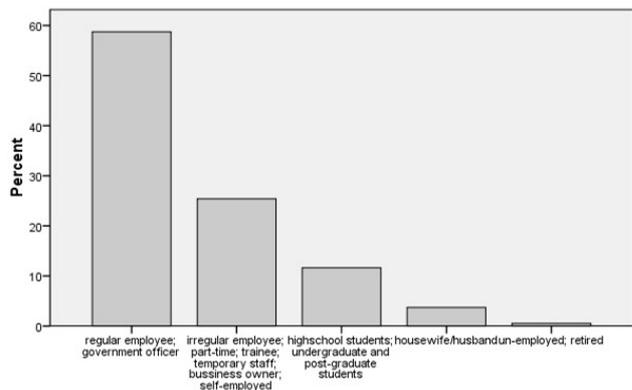


Fig.1. Employment Status.

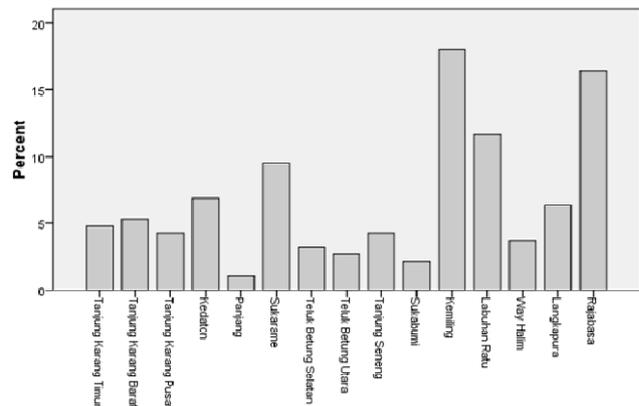


Fig.2. Current Address.

The work places of the respondents were also located mostly inside Bandar Lampung (85.5%). It was also acknowledged that the respondents were divided into single (32.3%) or married (67.7%), as seen in Figure 3. Meanwhile the respondents were mostly between 21 – 40 years old (82%) thus they are still in their productive age. This group of age (20-39) represents 342,583 people or equal with 35.7% of total population in Bandar Lampung (960,695 people) in 2014 [4]. In general they were evenly divided into male respondents (53.4%) and female respondents (46.6%). Lastly it was identified that more than half of the respondents (55%) were originally from Bandar Lampung. Please refer to Figure 4.

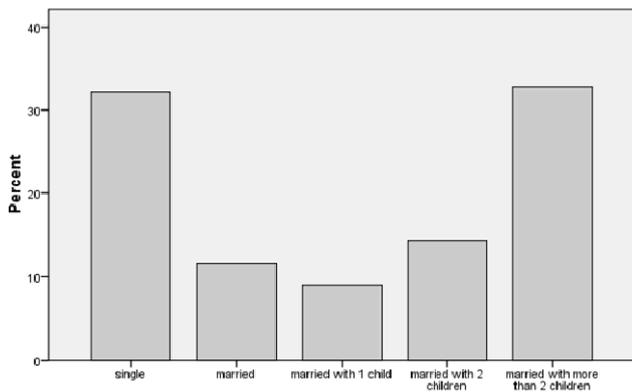


Fig.3. Marriage Status.

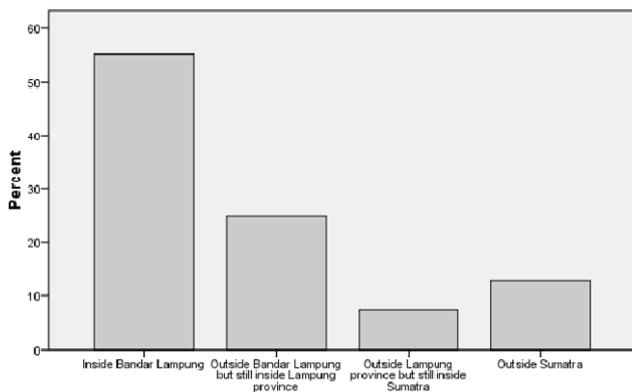


Fig.4. Hometown.

From the responses for the key element of of the Pedestrian Profile firstly it was concluded that the respondents hardly use public transportation. 70.4% of the respondents only use the public transportation occasionally. And even 12.2% of the respondents do not use at all. For the key-attributes of mobility choice, there were 4 scenarios provided in the questionnaire such as: to work; to school/ university; to daily market; to public facility; and for recreation. The results could be seen in Figure 5-8.

From total responses, car/motorcycle was recorded as the main transport mode for all scenarios described as in the following: when going to work 80.8% of the respondents use car/motorcycle; when going to school/university 68.8% use it; when going to daily market 74.6% use it; when going to public facilities 83.6% use it; and when going for recreation 85.7% of the respondents use car/motorcycle.

Interestingly it was acknowledged that walking mode was mentioned in all scenarios and it was never with the lowest percentages, except only for going to public facilities (to work: 6% or 3rd; to school: 10.8% or 2nd; to daily market: 4.2% or 4th; to public facilities: 0.5% or lowest; and for recreation: 1.1% or 4th). The other low carbon urban mobility mode, cycling, was even worse because it was only mentioned with very small percentages when going to work and to daily market and even absence in all other scenarios.

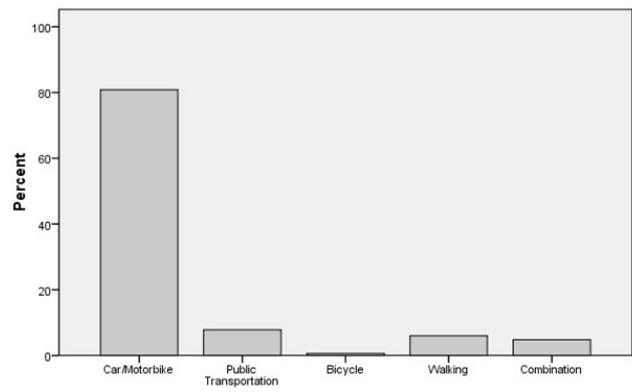


Fig.9. Transport Mode to Work.

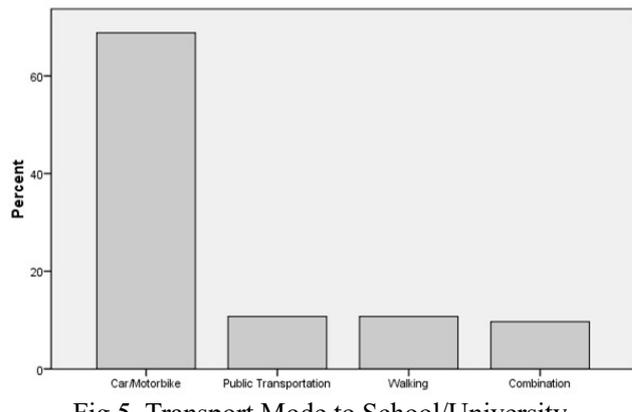


Fig.5. Transport Mode to School/University.

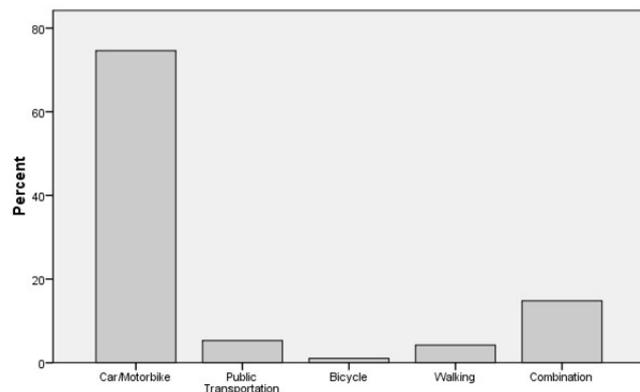


Fig.6. Transport Mode to Daily Market.

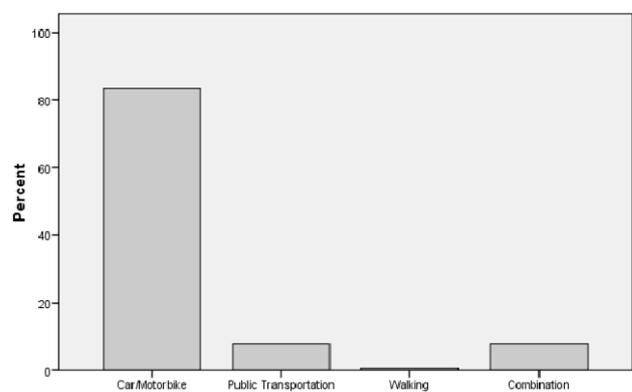


Fig.7. Transport Mode to Public Facilities.

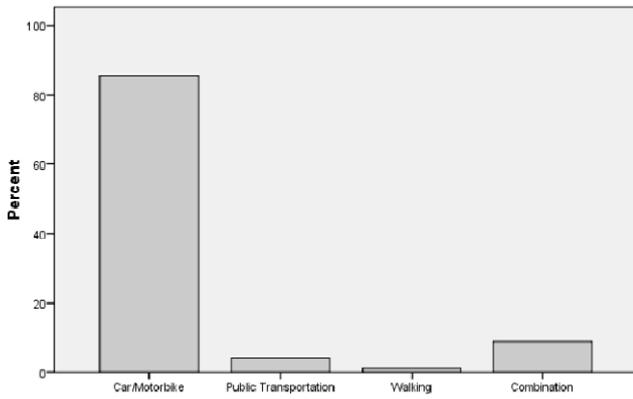


Fig.8. Transport Mode for Recreation.

The next response was about the ownership and usage of motorized vehicles such as car and motorbike. There were 30.7% of the respondents own and use car every day. However on the other hand, motorbike was more popular than car because there were 64.6% of the respondents stating that they own and use motorcycle every day. Please see Figure 9 and 10.

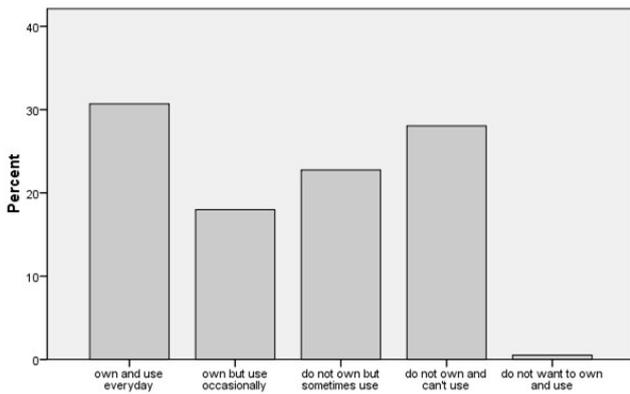


Fig.9. Car Ownership and Usage.

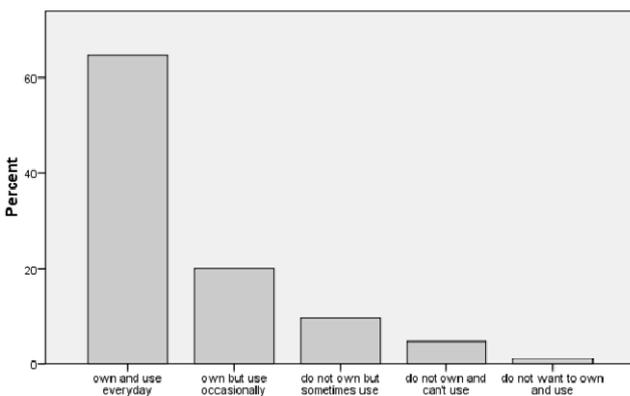


Fig.10. Motorcycle Ownership and Usage.

The respondent's preference toward the mobility choice above was reflected also on their awareness level about several terminologies of environmental issues, such as Climate Change, Greenhouse Gases (GHG) or CO₂ Emission, and Low Carbon Principles or Low Carbon City. The respondents were quite

familiar with the term Climate Change (47.6%) and GHG/CO₂ Emission (48.1%), yet they weren't familiar with Low Carbon terminologies (23.8%), as in Figure 11-13. However for all three terminologies, the responses showed that the interest from the respondents to know more about them was high.

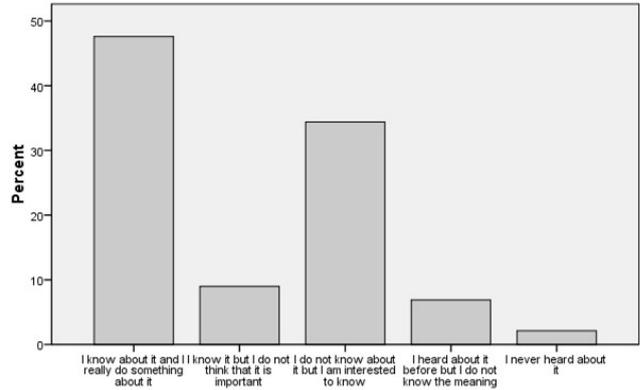


Fig.11. Familiar with the Term "Climate Change".

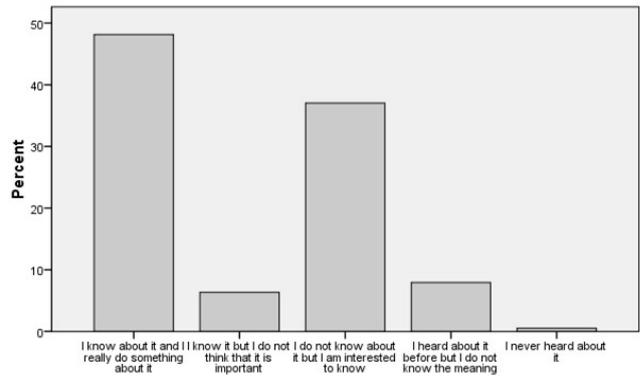


Fig.12. Familiar with the Term "GHG/CO₂ Emission".

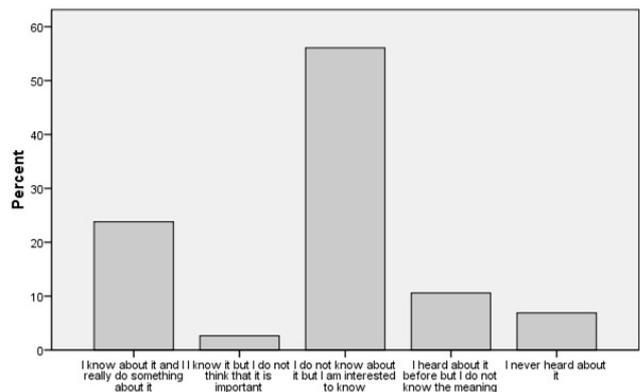


Fig.13. Familiar with the Term "Low Carbon Principles/City".

As for the type of living place, the respondents mostly live in detached houses (85.7%). And walkability (9.5%) was seen as the least reason for choosing the living place, while the other reasons shared the responses quite evenly. Mostly the respondents already live in the current address more

than 2 years and even 47.1% live more than 5 years already. In regard with their physical activity, the responses were mainly often (39.7%) and 1-2 times a week (29.1%). Please refer Figure 14-16.

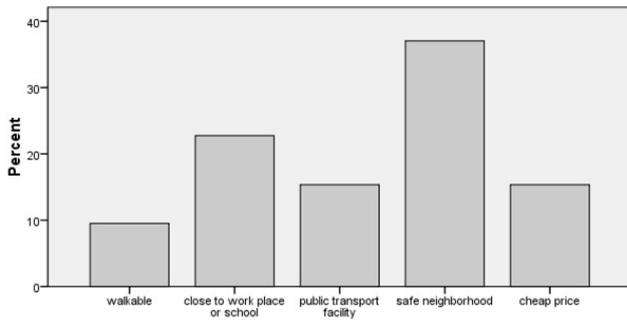


Fig.14. Reason Choosing Living Place.

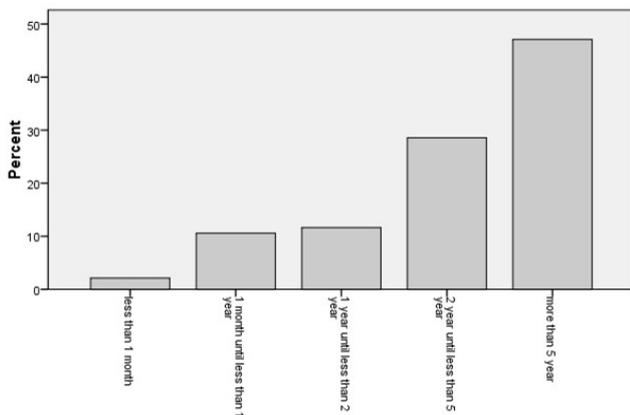


Fig.15. Period of Living.

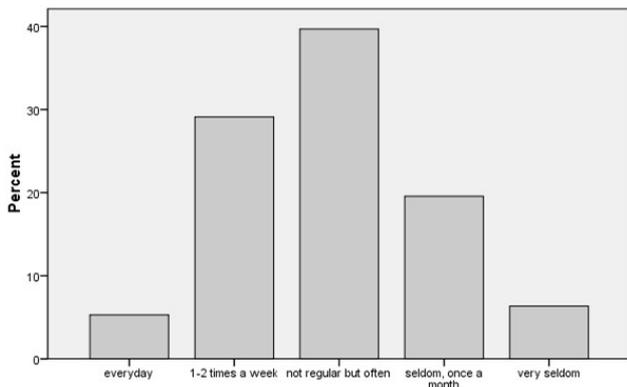


Fig.16. Physical Activity.

3. Discussions

The answers which had the highest percentage for each question in each key attributes were assessed in order to understand the propensities. As mentioned in the above, for the study we would discuss only the responses toward the key-attributes of Pedestrian Profile as follows:

a. Mobility choice

It can be concluded that most of the respondents use private motorized vehicles mainly motorcycle

as the main transport mode for all trip scenarios. And most of them also use car every day yet the level of ownership is lesser than motorcycle. This could be related to the fact that motorcycle is cheaper than car.

Another interesting propensity was that when going to public facilities and for recreation, the respondents were reluctant to walk. This could indicate that the locations of the public facilities are quite far from residential areas and/or the walking area is not walkable. Time limitation would not be main concern of this propensity since the scenarios of going to work and going to school, which require certain limitation of time, showed more tendency of the respondents to walk and even to use bicycle.

b. Public transportation usage

For the public transportation usage, the responses indicated a propensity which was stated that they only use public transportation occasionally which is less than once a week. However it was founded that in general, public transportation is the second most popular mobility choice.

c. Employment and education background

As for the employment status, the profile mostly represented the regular employee or government officers. This could indicate a profile of people with higher level of educational background and also middle to higher level of financial income.

d. Social cultural capital

The respondents represented a profile of people who lives inside Bandar Lampung city and also originally from the city. It represented people who live in the detached house of which is still the typical housing typology of the regional areas in Indonesia. The reasons of choosing living area were rather various yet walkability has the lowest percentage which means that walking is yet to influence people's social and cultural interaction. As for the living period, it represented the long-term residence. Therefore it could indicate that the respondents were already familiar with the environment and unlikely to have limitations or difficulties to wander around either their neighborhood or the whole city area.

e. Financial income

Related with the key attributes of Employment and Education Background, authors also assessed the financial income based on their marriage statuses. The profile represented people with financial stability since they can afford married life with more than 2 children. This could also indicate the reason of their mobility choice since they could afford personal motorized vehicle mainly motorcycle to support their living activity. Although they could save more money if they chose walking and cycling as their transport modes, modern living nowadays demands time efficiency and instant comfort which could not be fulfilled

without the development of proper walking infrastructure.

f. Gender

The profile represented responses from male and female evenly. This could indicate that the results were valid for both genders. Nuzir concluded from his study that key attribute of gender mainly differentiated the activities of the pedestrians [5]. On the next stage of analysis authors would like to investigate again on how gender can define the pedestrian preferences.

g. Age

The profile of the respondents represented the younger people between 21-40 years of age. As previously explained, this group of age accounted for more than one third of the population of the city of Bandar Lampung. This could indicate that this profile would highly influence the behavior of the citizen. A propensity that could be acknowledged would provide highly relevant information which could be used to evaluate and to improve the development of walking in Bandar Lampung.

h. Physical condition

The current status of the physical condition of the profile based on the propensity of their physical activity routine showed that the profile would have medium to high level of physical condition. This could indicate a profile that basically would fit into the non motorized urban mobility development such as walking and cycling. Even more these transport modes could further improve their physical condition since Blanco argued that the increase of public health and the living quality could be achieved by improving walking condition and environment [6].

marriage status, could indicate the reason of their mobility choice since they could afford personal motorized vehicle mainly motorcycle to support their living activity. Although they could save more money if they chose walking and cycling as their transport modes, modern living nowadays demands time efficiency and instant comfort which could not be fulfilled without the development of proper walking infrastructure.

This profile was acknowledged to represent native people therefore the result is most likely contextual. However this would also indicate that walking as a transport mode in urban setting is yet to influence the local social and cultural value. Therefore this key attribute of social and cultural capital, of which authors would refer as non physical factor, needs to be emphasized during future urban development since this could be the key in complementing the improvement on walking physical infrastructure.

Finally authors would also argue that this profile would highly influence the behavior of the citizen based on its proportion within the total population and also its original character of higher productivity compared to the other groups of age. Therefore this profile would provide highly relevant information which could be used to evaluate and to improve and would also be the one who utilize and benefit from the development of walking as a low carbon urban mobility mode in the city of Bandar Lampung.

Furthermore on the next stage, authors would assess the results from the key elements of Pedestrian Activity and Pedestrian Environment as a completion of the framework of PL.AC.E. And at the end again the correlation between the 3 key elements would also be examined to understand unique value might become the key factor for the success of the implementation.

4. Conclusions

From the propensity reading above, it can be concluded that although the profile showed a high dependency to private motorized vehicles in the form of car or motorcycle, this propensity was highly occurred on certain trips such as going to public facilities and for recreation. This could indicate that the locations of the public facilities are quite far from residential areas and/or the walking area is not walkable, or other reasons.

Public transportation was the second most popular mobility choice although the level of usage was still rather low. This could be a result of low quality of service by the local public transportation. However if this could be improved then it is possible to have a better walking environment since walking is often combined with the use of public transportation.

A profile of people with higher level of educational background and also middle to higher level of financial income was acknowledged from the result. This propensity in relation with the result from key attribute of financial income which focusing on the

5. References

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