

People's Preferences of Urban Design Qualities for Walking on a Commercial Street

J Ernawati¹, Surjono², and B S Sudarmo¹

¹ Human Settlement and Urban Design Laboratory, Department of Architecture, Faculty of Engineering, The University of Brawijaya, Jl. MT.Haryono 167 Malang-65145, Indonesia

² Department of Urban and Regional Planning, Faculty of Engineering, The University of Brawijaya, Jl. MT.Haryono 167 Malang-65145, Indonesia

Email: jenny_ernawati@ub.ac.id; jny23ern@gmail.com

Abstract. This research aims to explore people's preferences of urban design qualities for walking on a commercial street, with Kawi Street located in a commercial neighborhood in the town of Malang Indonesia as the case study. Based on a literature review, this study used eight urban design qualities, i.e., enclosure, legibility, human scale, transparency, complexity, coherence, linkage, and imageability. This study applied a survey research method using a self-administered paper-pencil questionnaire applying two measurement techniques: Likert scale was used to explore people's evaluations of urban design qualities of the street, while multiple-rating scales were used to measure people's preference for walking on the street. One hundred and ten people randomly selected as respondents. Regression analysis was employed to explore the influence of urban design qualities on people preference for walking. Results indicated four urban design qualities that affect people's choice for walking on a commercial street, i.e., transparency, coherence, linkage, and imageability. Implications of the findings will be discussed in the paper.

1. Introduction

This article presents some of the research results that are intended to support the concept of a walkable city. A pedestrian-friendly city is not only beneficial to public health, but it can also support a sustainable city concept as walking is a pollution-free mode of transportation.

The essential urban element for the community's physical activity, such as walking, is a street. A street is a kind of public spaces that are most accessible to the public. They are the city's most widely used open spaces.

The street is an urban design element that serves as a means of traveling to work, shopping, dining, and other daily activities. It is functioning as an infrastructure for moving people and vehicles, and also serves as a social space (Jacobs [1]). In this case, the design of a street can affect the formation of user's social life, primarily if the physical design of the road can attract people for walking down the street (Appleyard [2]). The results of previous studies have shown a connection between the physical environment and walking activities (Owen et al. [3]; Ernawati [4]). Therefore, the design of a street that provides physical space for pedestrian activities may affect people preference for walking on the



street. People often walk on certain streets for hours without feeling tired. The feeling is probably due to the quality of urban design of the road that is conducive and exciting to walk.

Further studies show that the literature on urban development and planning in recent decades suggest a mixed-use environment. The mixed land use pattern in a situation is the preferred pattern of physical environment development. People like this pattern because the mixed land use that accommodates various activities can provide a more vital, vibrant, attractive, safe and sustainable urban lifestyle (Bentley et al. [5]; Jacobs [1]; Mehta [6]). Previous studies also have shown that one of the essential characteristics people seek in a mixed-use land area is the life and diversity of the dominant areas, the commercial streets (Brower [7]). Therefore, this study examines the quality of urban design in a commercial area.

This study emphasizes the importance of the role of perception as a mediator of the relationship between the physical environment and people walking behavior. People's evaluations in the context of this research meant to link between objective measurements and subjective reactions.

The physical characteristics of the environment can be measured objectively. It considered as an environmental fact. Although observers or users can gauge the quality of urban design by an objective measure, the measurement of the quality implies a variation of (though relatively small) judgment between one person and another. Observation of the physical environment alone cannot measure the quality of the observed environment. Since the characteristics of the real environment affect individual reactions, the quality of the physical environment should be regulated individually.

In sum, the characteristics of the physical environment, the quality of urban design and the individual reactions will together determine people's preferences in walking on the street. It implies what one feels about the street as a place for walking. By examining people's choices concerning the quality of urban designs, it is expected to provide an understanding of what and how the quality of urban design can influence people's walking behavior. Therefore, people's preference becomes one of the crucial keys to environmental design. The town design, in turn, can contribute significantly to public health and sustainable development.

Preference itself refers to something preferred or something to be liked. In the context of this study, the preference meant the tendency of choice based on a liking of a street for walking. This selection covers many objectives, whether walking activity as a mode of transportation, for sport, for day-to-day operations, or for their leisure time activities.

Previous studies on the preference of urban environments based on aims in assessing preferences. Nevertheless, the study of preferences on urban environments carried out mostly still mixes between the choice of physical environmental attributes and the perceptual quality of the city environment. For example, Herzog [8] found that urban space that is well-structured, unified, has sufficient complexity with relatively new elements, most favored by society. The research conducted by Nasar [9] found that the quality of urban landscape is considered harmful by the community due to the presence of motor vehicles, and considered right when it comes to well-maintained areas. The study also found that inner-city sights with an open view felt more secure than landscapes with a closed view (Nasar et al. [10]). Past studies, furthermore, have emphasized the importance of security to the community's preferences for active engagement within the city (Harrison et al. [11]). Even high insecurity against crime in specific environments causes the elderly to decrease their desire to walk in those areas, and some people also reportedly avoided streets with heavy traffic due to feeling unsafety (Michael et al. [12]).

The impression of open and closed spaces, feeling of danger due to particular physical environmental conditions and so on is directly related to the perceptual quality of urban design. A literature review in the field of urban design indicates that spatial qualities can influence people's preferences to actively travel and actively spend their free time in public spaces (Ewing et al. [13]). The quality of such physical area refers to the perceptual quality of the urban environment, the urban design quality. This perceptual quality of the environment, which based on the perception of the user community, plays an important role to build a connection between the physical elements of the

environment and walking behavior. These qualities are believed to link the physical characteristics of the environment with people's preferences for walking activities.

The literature review further reveals that the study of visual aspects of the environment continues to grow in the field of urban design, architecture, landscape architecture, garden planning, environmental psychology and others. From literature studies, the authors look for the most discussed design qualities and which has empirically proven to be an outstanding quality for urban space users. From the literature review conducted, Ewing et al. [13] and Ewing & Clemente [14] found eight essential urban design qualities related walking activities that the most discussed and empirically proven. The eight town design qualities are imageability, enclosure, human scale, transparency, complexity, coherence, legibility, and linkage (Ewing et al. [13]; Ewing & Clemente [14]; Ewing & Handy [15]). The quality of urban design studied in this research concerning people's preference in walking activities based on those eight urban design qualities. The understanding of each of the urban design qualities used in this study will be discussed as follows (based on Ernawati et al. [16]; Ewing et al. [13]; Ewing & Clemente [14]; Ewing & Handy [15]).

The first quality to discuss is imageability. It is the quality of a place that makes the site distinct, recognizable and memorable. A place is said to have a high imageability if the area has a particular physical element and the arrangement attracts attention, evokes certain feelings and creates a deep impression. It may not be just a single attribute that causes an imageable street, but because of a combination of various elements.

The second quality to study is the enclosure. An enclosure is the level of 'closure' space where streets and other public spaces are visually constrained by buildings, walls, trees, and other vertical elements. A sense of enclosure is formed when the view is limited in such a way that the open space feels like a 'closed' space. In a road corridor, a row of buildings can be like a wall that limits the outer area, while the street and pedestrian paths become like floors and when the altitude of the building is almost the same, the sky becomes like a ceiling. Enclosures can also be formed by elements other than buildings, such as rows of trees with a certain height.

The third crucial urban design quality to study is human scale. Human scale refers to the size, texture, articulation of physical attributes that match the size and proportion of people. In the context of pedestrian ways or sidewalk, those qualities should accord to the speed of pedestrians. To gain a right human scale, the width of the building must be proportional to the height of the building, or the width of the road is comparable to the height of the row of buildings. The trees on the street side can also function to reduce the scale of tall buildings and wide roads. If the existence of tall buildings and street width make the human level disappear for pedestrians, then trees with low branches and leaves that form canopy can simultaneously give the impression of relatively small space in relatively large containers (Arnold [17]).

The fourth quality to mention is transparency. Transparency refers to the conditions under which people can see or feel what is outside the boundaries of a road or other public space. Space transparency is a condition of a building with a material that is translucent to light or air, like a glass wall for example. An example of space transparency is a commercial street corridor with storefronts or display windows that invite passersby to view and enter the store. In contrast, massively enclosed free walls and buildings with reflective glass are examples of design elements that have low transparency qualities.

Complexity is also an essential walkable street design quality. It relates to the amount of diversity that can be seen clearly by observers (Rapoport [18]). It refers to the visual richness of a place (Ernawati et al. [16]). Pedestrians need a higher level of environmental complexity to feel interested in walking in the neighborhood. In essence, complexity refers to the order of physical elements beyond the boundary of the street, i.e., from the sidewalk to the arcade then to the yard and the building; The old variety of structures; Diversity of social activities; And the variety of space usage in a single day.

The sixth quality to discuss is coherence. Coherence refers to a sense of visual regularity. The level of integration is influenced by its consistency and completeness in scale, character, layout, landscape, street furniture, pedestrian path materials and other physical elements. According to Jacobs [19], the

coherence in architecture achieved when buildings on the street get along one another. They look different, but they express respect each other in term of their height and their appearance.

The seventh design quality to study is legibility. Legibility refers to the conditions under which the spatial structure of a place can be understood and can guide travel quickly. The clarity of an area determined by a street network system that facilitates the user by providing clear environmental and location orientations. It also arranges the physical elements of the environment as clear orientation points. In other words, legibility is the clarity of the appearance of a city setting in such a way that each part can be known quickly and can be arranged in a unified pattern (Lynch [20]).

The last quality to study is linkage. A linkage is a physical and visual connection from building to the street, building to building, space to space, side of the road to another side of the road which tends to separate each other becomes combining into one. Rows of trees, rows of buildings and zebra cross are examples of elements that create linkage. The linkage can be understood as environmental features that indicate the existence of connectedness between different places and which can provide convenient access to them. The link may occur longitudinally along the street or laterally across the street.

Those eight qualities of urban design mentioned were evaluated by local people in this study. The perceived quality of an area (such as a street corridor) depends on the evaluation of the inhabitants or users of the place (Ernawati & Moore [21]). However, the importance of people's point of view in the design quality of a street corridor has not been a focus of previous researchers. Therefore, this study meant to fill this gap.

2. Methods

This study employed a quantitative approach. It applied a survey research method using a self-administered paper-pencil questionnaire applying two measurement techniques: Likert scale and multiple-rating scales. Likert scale was used to explore people's evaluations of urban design qualities of the street, while multiple-rating scales were used to measure people's preference for walking on the street.

2.1. The case study site

Kawi Street, as the case study site of this research, is one of the leading commercial streets in the town of Malang, Indonesia. Kawi Street has developed as a densely commercial neighborhood. Commercial buildings such as retail stores, shops, and restaurants dominate the area. One of the biggest shopping malls in the town of Malang is located on this street too. However, there are only a few numbers of people who walk on this road corridor. It seems people prefer to park their cars or motor vehicles just right in front of their destination buildings.

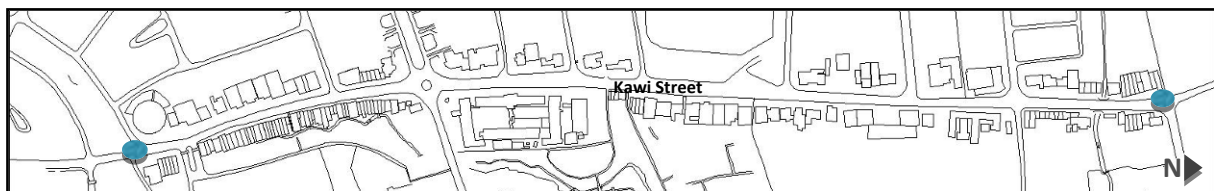


Figure 1. The case study site: Kawi Street



Figure 2. The Appearance of Kawi Street

2.2. Population and samples

Pedestrians on Kawi Street were chosen randomly as respondents. One hundred and ten people were selected to participate in the study. Following samples selection technique by Ernawati et al. [16], the researchers went to Kawi Street at a variety random times, and the five pedestrians met were chosen as respondents. All of the analysis used the data from 110 respondents.

2.3. Instruments and Variables

The primary tool used in this study was a self-administered paper-pencil questionnaire. The questionnaire consists of three parts to record socio-demographic data, people's evaluation of urban design qualities, and people's preferences of walking down the Kawi Street. Respondents evaluated the urban design quality using a five-scale measurement of Likert scale, ranging from strongly disagree (value '1') to strongly agree (value '5'). The urban design quality being studied based on eight perceptual qualities found from the previous studies that already discussed in the previous section. Those qualities include the enclosure, legibility, human scale, transparency, complexity, coherence, linkage, and imageability (Ewing et al. [13]; Ewing & Clemente [14]; Purciel & Marrone [22]). People filled up the questionnaire of urban design quality using photographs of the street representing those qualities as stimuli. These pictures meant to guide respondents in evaluating the urban design qualities of the street. Meanwhile, seven-scale multiple-rating scales ranging from least preferred (value '1') to most preferred (value '7') used to measure people's preferences for walking on the street.

2.4. Data analysis

This research applied descriptive statistics to identify urban design quality of the street and people's choice for walking on the road. Furthermore, this study also employed multiple simple regression analysis to reveal the influence of urban design qualities on people's choice for walking. In this case, urban design qualities treated as independent variables while people's preference as the dependent variable. All of the data analysis used the SPSS software.

3. Results and discussions

The Participants consist of 60.91% man and 39.09% woman. Nearly 90% of respondents are 35 years old and below, which means that almost all pedestrian respondents in Kawi Street corridors are relatively young and in productive age. The majority of respondents (81.82%) are Javanese with middle-low socioeconomic condition (about 76.36%). The majority of participants (63.64%) have settled in Malang for more than 15 years. Most of them (61.82%) walked on the street in the afternoon, while the rest walked in the morning until noon (around 10:00-14:00) and most of them (92.73%) walked in there not more than 30 minutes.

Results show that people's preferences for walking on Kawi Street are small (Mean score < 4.00 out of seven scales). This result indicates that people are not interested in walking on the Kawi Street. It seems the community walk down the commercial street because of their need to shop or visit the restaurant in the area. Many factors might influence people in walking activities on commercial streets.

Furthermore, this research found that the pedestrians on Kawi Street assessed the quality of urban design (rated on five-scales of Likert Scale) as relatively has poor conditions. Five of eight perceptual qualities of the urban design in the area assessed as having the qualities with Mean score only around "3" out of five scales. They are the enclosure, legibility, human scale, transparency, and imageability, while the coherence and linkage qualities even rated lower by society (Mean score < 3). This result shows that in overall urban design quality of Kawi Street evaluated as not right by people. This situation means the community walks on Kawi Street might because of the need, and not because of the quality of the street design as a commercial area.

Those results of urban design quality in the area have an implication. Previous studies have shown that urban design quality is an important aspect that can attract people to walk on a downtown street. Therefore, knowing the quality of urban design that affects people's preference for walking on a street corridor is crucial. To find out which variables of urban design quality that influence people's choice to walk on a commercial street, this study conducted regression analysis between preference as the dependent variable and urban design quality as independent variables. To be freer to see the influence for each urban design qualities, then the data analysis performed simple regression analysis for each variable of urban design qualities.

Results found four urban design qualities that do not influence people's preference to walk on the commercial street. They are Enclosure quality, Legibility, Human Scale, and Complexity ($p > 0.05$). These findings show that the community of Kawi Street users do not consider those qualities of urban design as a priority for them to attract people for walking. It seems the local people think that other urban design qualities are more of a priority for the attraction of the area for them to walk.

This fact demonstrated by further findings from this study, which shows that Coherence quality of the street has a significant influence on people's preference for walking ($p < 0.05$), as can be seen in Table 1. It is understandable that visual and spatial regularity and unity provide comfort for the community in walking in the area.

Table 1. ANOVA^a between people's preference and coherence of the street

| Model | | Sum of Squares | df | Mean Square | F | Sig. |
|-------|------------|----------------|-----|-------------|-------|-------------------|
| 1 | Regression | 2,607 | 1 | 2,607 | 5,746 | ,018 ^b |
| | Residual | 48,993 | 108 | ,454 | | |
| | Total | 51,600 | 109 | | | |

a. Dependent Variable: Preference

b. Predictors: (Constant), Coherence

The results also indicated that the quality of Linkage has a significant effect on people's preference for walking ($p < 0.01$). Table 2 shows the product of the regression analysis of the two variables. This finding indicates that the community needs a good connectivity, both visually or spatially, to walk on the one side of the street as well as to move from one side of the street to the other sidewalk.

Table 2. ANOVA^a between people's preference and linkage quality of the street

| Model | | Sum of Squares | df | Mean Square | F | Sig. |
|-------|--|----------------|----|-------------|---|------|
|-------|--|----------------|----|-------------|---|------|

| | | | | | | |
|---|------------|--------|-----|-------|--------|-------------------|
| 1 | Regression | 6,930 | 1 | 6,930 | 16,754 | ,000 ^b |
| | Residual | 44,670 | 108 | ,414 | | |
| | Total | 51,600 | 109 | | | |

a. Dependent Variable: Preference

b. Predictors: (Constant), Linkage

Further analysis can be seen in Table 3, which shows that Imageability also has a significant influence on people's preference on walking in commercial areas ($p < 0.05$). Imageability makes people easy to remember and keep a picture of the place and gives them a deep impression of the area.

Table 3. ANOVA^a between people's preference and imageability quality of the street

| Model | Sum of Squares | df | Mean Square | F | Sig. |
|--------------|----------------|-----|-------------|-------|-------------------|
| 1 Regression | 2,317 | 1 | 2,317 | 5,076 | ,026 ^b |
| Residual | 49,283 | 108 | ,456 | | |
| Total | 51,600 | 109 | | | |

a. Dependent Variable: Preference

b. Predictors: (Constant), Imageability

Furthermore, Table 4 shows that the quality of space and building transparency was also found to have a significant effect on people's preference for walking in the commercial area of Kawi Street ($p < 0.01$). This result is in line with the research results of previous studies which show that the transparency of space or buildings is a characteristic that creates attraction to the commercial area. Pedestrians can enjoy window shopping during their walk on the sidewalk.

Table 4. ANOVA^a between people's preference and transparency quality of the street

| Model | Sum of Squares | df | Mean Square | F | Sig. |
|--------------|----------------|-----|-------------|--------|-------------------|
| 1 Regression | 9,497 | 1 | 9,497 | 24,360 | ,000 ^b |
| Residual | 42,103 | 108 | ,390 | | |
| Total | 51,600 | 109 | | | |

a. Dependent Variable: Preference

b. Predictors: (Constant), Transparency

It can be concluded that the findings of the study indicate four urban design qualities that influence people's preference to walk on a commercial street (with the case study of Kawi Street, Malang Indonesia). Those qualities are Coherence ($p < 0.05$), Linkage ($p < 0.01$), Imageability ($p < 0.05$), and Transparency ($p < 0.01$). The research findings are in line with previous studies from Ernawati et al. [16]. On their previous study on a commercial street in the downtown area of Malang Indonesia, they found four urban design qualities that affect people's preference on walking. Those are Legibility ($p < 0.01$), Coherence ($p < 0.01$), Linkage ($p < 0.01$) and Imageability ($p < 0.01$). Those previous findings compare to the results of this current study, shows three urban design qualities are stable in influencing people's preference for walking, i.e., Coherence ($p < 0.05$), Linkage ($p < 0.01$), and Imageability ($p < 0.05$). This condition means those three qualities of urban design found as having a

consistency as significant factors that influence people's preference for walking. This situation means the findings may be generalized to other commercial streets.

The results show that the quality of urban design that affects people's preference in walking emphasizes the visual and spatial quality of the area that makes people comfortable to walk. However, in the previous study (see Ernawati et al. [16]) the aesthetic quality such as transparency is considered does not influence people's preference on walking. This finding indicates a priority level for the community in their choice. Since the commercial street in Malang is still considered relatively have a low quality of urban design, the local people emphasize the importance of spatial quality and regularity in visual quality that provides convenience for people to conduct their activities in the area. If the spatial conditions are well met, then the public might see the aesthetic aspect as an important factor in influencing their preference for walking on the commercial street.

In sum, the two studies conducted by the authors on different commercial streets found three urban design qualities, i.e., Coherence ($p < 0.05$), Linkage ($p < 0.01$), and Imageability ($p < 0.05$), that steadily affected the public preference for walking on commercial streets. These results of the studies show that people prefer to walk on a commercial street when the street corridor has coherence quality, which refers to visual regularity. This integration quality means the street should have consistency and completeness in the physical elements such as character, scale, landscape, layout pattern, street furniture, sidewalk materials and so on. Beside of the coherence quality, people's preference for walking on the street also influenced by linkage quality of the road. This condition means pedestrians prefer to walk on a street that has a high quality of physical and visual connections between its elements. This quality covers the connectedness not only along the road but also across the street. The further result shows that the quality of imageability also influences people's choice to walk on a commercial street. The place that is memorable and has a distinctive quality can create deep impressions, which in turn might make people love to come again and experience the area. However, to ensure the most influential variables of urban design quality, it needs to conduct this kind of studies elsewhere. The urban design qualities that affect people's preferences might vary depending on the culture of the community. Therefore, cross-cultural research, in this case, is also needed to see the similarities and differences of each different culture, which provides an opportunity for the adjustment of urban design in the commercial area by local wisdom in the region.

As a whole, results of this study make a valuable contribution to the concept of people-based planning and design. It supports the street redesign that can meet the needs of residents and users.

4. Conclusions and recommendations

This study found four urban design qualities that do not influence People's preference for walking on a commercial street, i.e., Enclosure, Legibility, Human Scale, dan Complexity ($p > 0.05$). The study also found four urban design qualities that have significant influence on People's preference for walking on the the commercial street, i.e. Coherence ($p < 0.05$), Linkage ($p < 0.01$), Imageability ($p < 0.05$), and Transparency ($p < 0.01$). However, compared to the findings of the previous research, it can be concluded that there are only three urban design qualities that are consistency as influence factors of people's preference for walking on a commercial street. They are Coherence ($p < 0.05$), Linkage ($p < 0.01$), and Imageability ($p < 0.05$). Therefore, since people's preference is a subjective response, more studies of this kind of research should be conducted elsewhere to test the consistency of the findings. A further multicultural research is also required to reveal the role of local urban design in people's preference for walking.

Acknowledgments

This research was funded by The Ministry of Research, Technology and Higher Education of The Republic of Indonesia, which is gratefully acknowledged.

References

- [1] Jacobs J 1961 *The death and life of great American cities* New York: Vintage Books

- [2] Appleyard D 1981 *Livable streets* Berkeley: Univ. of California Press
- [3] Owen N et al. 2004 Understanding environmental influences on walking: Review and research agenda *American Journal of Preventive Medicine* **27** (1) pp 67-76
- [4] Ernawati J 2016 Dimensions underlying local people's preference of street characteristics for walking. *Procedia - Social and Behavioral Sciences* **234** pp 461-469
- [5] Bentley I et al. 1985 *Responsive environments: A manual for designers* London: Architectural Press
- [6] Mehta V 2007 Lively streets: determining environmental characteristics to support social behavior *Journal of Planning Education and Research* **27** pp 165-187
- [7] Brower S 1996 *Good neighbourhoods: A study of in-town and suburban residential environments* NY: Praeger Publisher
- [8] Herzog T R 1992 A cognitive analysis of preference for urban spaces *Journal of Environmental Psychology* **12** pp 237-248
- [9] Nasar J L 1987 Environmental correlates of evaluative appraisals of central business district scenes *Landscape and Urban Planning* **14** pp 117-130
- [10] Nasar J L et al. 1983 The emotional quality of scenes and observation points: A look at prospect and refuge *Landscape and Planning* **10** pp 355-361
- [11] Harrison R et al. 2007 The population effect of crime and neighbourhood on physical activity: an analysis of 15,461 adults *Journal of Epidemiology & Community Health* **61** pp 34-39
- [12] Michael Y L et al. 2006 Neighbourhood design and active aging *Health and Place* **12** pp 734-740
- [13] Ewing R et al. 2006 Identifying and measuring urban design qualities related to walkability *Journal of Physical Activity and Health* **3** 1 pp 223-240
- [14] Ewing R and Clemente O 2013 *Measuring urban design: metrics for livable places* Washington: Island Press
- [15] Ewing R and Handy S 2009 Measuring the unmeasurable: urban design qualities related to walkability *Journal of Urban Design* **14** 1 pp 65-84
- [16] Ernawati J et al. 2016 Urban design qualities related walkability in a commercial neighbourhood *E-BPJ* **1** 4 pp 242-250
- [17] Arnold H 1993 *Trees in urban design* New York: Van Nostrand Reinhold
- [18] Rapoport A 1990 *History and precedent in environmental design* New York: Plenum
- [19] Jacobs J 1961 *The death and life of great American cities* New York: Vintage Books
- [20] Lynch K 1960 *The image of the city* Cambridge MA: Joint Center for Urban Studies
- [21] Ernawati J and Morre G 2014 Tourists' and residents' impression of a heritage tourism site: the case of Kampong Taman Sari, Indonesia *Archnet-IJAR* **8** 3 pp181-194
- [22] Purciel M and Marrone E 2006 *Observational validation of urban design measures for New York City: field manual* Active Living Research Program: Robert Wood Johnson Foundation