

A Study of Students' Perception on Sustainability of Campus Design: A Case Study of Four Research Universities Campus in Malaysia

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Abstract: The aim of this research was to examine the effectiveness of campus physical development planning in Malaysia in creating a sustainable living on campus by assessed the problems that exist. The study was conducted in four public university campuses and limited to only the campus physical planning. Selected campuses are the research universities campus. The case studies were conducted on each campus. The methodology used in this study is qualitative and quantitative techniques. Quantitative technique involves collecting data using questionnaires distributed among 100 respondents for each campus. Meanwhile, the qualitative technique involves collecting comments and opinions from the respondents obtained from questionnaires, behavioral observation and visual research. The results were then compared for each campus for an explanation of the problem. The findings revealed that all campuses had a similar problem. However, there are some differences about the extent or severity of the problems based on campus physical development plan that is different. The result showed that there are minimal problems occurs on the campus that planned more compact compare to a wide and dispersed campus. It also indicates that a compact campus tend to create a sustainable life on campus.

Keywords: Campus, physical planning, student perception, sustainable

INTRODUCTION

The issue of sustainability has been around for a long time. However, it has become a hot issue after the Earth Summit taking place in 1992 in Rio de Janeiro and in 2002 in Johannesburg. Conference in 1992 led to the formulation of Agenda 21, an action plan containing broad principles to help governments and other institutions in carrying out the policies and programs for sustainable development in their respective countries. After that, the principles of sustainability began to be adopted by institutions around the world to run their operations. Sustainability is a key issue for all organizations in the 21st century (Rusinko, 2010). As an institution, the university also can't avoid the issue of sustainability. Beringer *et al.* (2008) also recognized that sustainability is an important issue for universities around the world. Thus, there are several universities that have given their commitment in creating a sustainable campus. Among the commitments undertaken by the universities toward the sustainability are through the learning process approach, the campus environment and management (Davis and Wolski, 2009). Out of these three approaches, the implementation of a sustainable campus environment is one of the most effective way possible against other approaches. Alfieri *et al.* (2009) has stated that: "By

living and learning in an environmentally conscious community, students learn to consider the impact of their everyday decisions". In addition, in 1943 Sir Winston Churchill also issued a statement that used to be the principle or belief until this day; "We shape our buildings and then they shape us".

The aim of this research was to examine the effectiveness of campus physical development planning in Malaysia in creating a sustainable living on campus by assessed the problems that exist. Although this statement describes the building, in fact it also means the same thing for the environment. This is because the building and the environment have the same function as place for humans to live and do activities. The statement was supported by Campos (2008) who argue that human behavior can be shaped by the environment. Therefore, it is important to create a campus environment that can offer and encourage the community to lead a sustainable life. Thus, a sustainable campus should be implemented through the campus physical development plan.

MATERIALS AND METHODS

Materials:

Definition: Sustainable development means the development or progress that meets current needs

without compromising needs of future generations (Brundtland, 1987). According to van Weenen (2001), the sustainable development is the mutual dependence of nature. In addition, Sohif *et al.* (2009) interpret sustainable development as development that improve the quality of human life while living within the capacity of ecosystems while supporting the purpose and benefits of focusing on a balance of social, ecological and economic. Sustainability will be achieved when the current requirement is achieved without compromising the ability of future generations to meet their needs. Based on these statements, we can conclude that development of sustainable campus means development of the campus that meet the current needs and improve the quality of life without compromising the future generation needs with focusing on balance in terms of environmental, social and economic (Sohif *et al.*, 2009).

The importance of physical development of sustainable campus: Every year, the number of students who further their studies at universities is increasing. This has been certified by D'Amico and Brooks (1968). After nearly 43 years, this is definitely increasing with population growth and industrial development and technology. Thus, the universities must have a long-term development plans for their campuses (D'Amico and Brooks, 1968). They added that there are important for planning development to meet the crucial needs of today while anticipating the impact on the future development of the campus. This fact has been proved that the awareness of sustainable development has been around for a long time, but was not given serious attention. The statement also coincided with the concept of sustainable development is highlighted by the Bruntland Report (1987) which defines sustainable development as development that meets current needs without compromising the needs of future generations.

The importance of sustainable campus development can be seen when many universities have committed to creating a 'green campus' lately (Isiaka and Ho Chin, 2008). The statement was also supported by Ryan *et al.* (2010) when they state that there are many higher education institutions in the Asia Pacific region, which has been promoting the implementation of 'green campus'. This is because there are many benefits that can be achieved through the development of a sustainable campus. Thus, many universities have made sustainability a priority in planning and designing new projects on the campus (Alfieri *et al.*, 2009).

According to Norton *et al.* (2007), the real benefits of sustainable development can be achieved with the balance of the three aspects of economic, social and environmental. However, there are still many who view the sustainable development from the aspect of environment alone (Isiaka and Ho Chin, 2008; Norton *et al.*, 2007). Therefore, the development of the campus cannot focus on one aspect and ignoring the other aspects because these aspects are mutually dependent and affect each other.

Campus is a centre of knowledge. Campus also known by the local community and society beyond the status and reputation. Thus, the formation of a sustainable campus can provide opportunities for higher education institutions to teach, show the progressive principles and be a model to the larger community (Franklin *et al.*, 2003). Based on these facts, campuses have a strong influence on a community and a great potential for promoting sustainable development. This shows that how important the establishment of a sustainable campus that could be the basis of a broader sustainable development throughout the region.

Compact development as a way to promote sustainability: Widely and disperse planning certainly contrary to the concept of sustainability as it increases the distance between areas, increasing reliance on vehicles, air pollution, accessibility problems, infrastructure and facilities management, energy efficiency, poor social life and others. As emphasized by Neuman and Kliment (2004), three main aspects that need to be addressed in the campus planning are accessibility, safety and community participation. Research on compact planning practices found in the approach can provide a suitable environment to support all three aspects. In addition, this design approach also provides various advantages of campus planning in other aspects such as circulation, transportation, provision of amenities and others. The analysis made by Burton (2000) found that there are seven advantages when implementing the compact development plan, such as:

- Reduce land used
- Reduce vehicle dependency
- Reduce resource consumption and pollution
- Encourage the use of public transport, walking and cycling
- Better accessibility to facilities and service areas
- More efficient provision of infrastructure and utilities
- Redevelop an area

Analysis shows that a compact plan affect all three aspects of sustainability; environmental, social and economic development. Reduction of land use, reduce dependence on motor vehicles and reducing resource use and pollution are among the important effect in ensuring the sustainability of the environment remains protected. From the social aspect, the use of public transport, walking and cycling can improve opportunities for people encounter and interact. Meanwhile, the redevelopment of an area also contributes to social sustainability on campus. This is because it can help to improve the atmosphere in the campus community. In addition, the better accessibility to facilities helped the campus community to get their needs with ease. Indirectly, it could offer a better life without unnecessary obstacles on campus. Finally, the impact of the economic aspects can be viewed from two different angles of the campus community and the developers of the campus. For campus community, it can reduce transportation costs. The movement of pedestrians and cyclists only needs human's energy as a primary source. While public transport services are usually free for college campus. Thus, the campus community can reduce the cost of living. From the point of the university or the developers of the campus, a compact development can facilitate the provision of infrastructure and utilities throughout the campus. In addition, the campus facilities can be shared because the development is carried out in close proximity. In addition to Burton (2000), there are a number of other researchers who also recognize the advantages of compact design, such as Burns (2001), Steffen (2008) and Santana *et al.* (2009).

Research methods: The research involved case studies conducted on selected campuses. To obtain the necessary data and information, both quantitative and qualitative techniques were used. Methods and tools used in this study were questionnaires, behavioral observation and visual research.

The scope of the research: The research was conducted in four public university campuses. The selection of university campuses in this research is based on the status of universities as a research university. First four research universities in Malaysia has been selected namely Universiti Kebangsaan Malaysia (UKM), Universiti Sains Malaysia (USM), Universiti Malaya (UM) and Universiti Putra Malaysia. This research was limited to campus physical planning only. Among the elements in the physical design of the campus examined are the layout of the campus, accessibility, circulation, building design, landscape

and environment, transport and mobility and security and lighting. This research was held around three months from October to December 2011.

Quantitative method: Quantitative method in this research involved questionnaires as instruments. The purpose of this questionnaire to obtained feedback from the respondents about the condition and problems on their campuses. The subjects of the questionnaire are the students who live on campus. This is because Dahle and Neumayer (2001) stated that students are encouraged to criticize campus' activities because they are 'clients' and allowed to demand reform on issues of environment and sustainability. In addition, Shuhana *et al.* (2007b) agreed with Moos (1979) statement that students' perception provided an important perspective for an 'educational settings'. Feedback from target groups is essential to ensure that their needs are taken into account in the planning stage. In the context of the planning process, these elements are known as community participation (Nurwati *et al.*, 2006).

The number of respondents determined based on de Vaus (2002) and Hoinville (1977) statements. On 95% confidence level and 5% of sampling error, de Vaus (2002) stated that the required sample size was 400 sets. Hoinville (1977) also stipulates that the sub-group in the study, the minimum amount needed in each group were set at between 50-100 samples. Thus, a total of 400 students were selected for this study. The amount is divided equally for each campus. This means the number of students who are selected for each campus is 100, which coincides with Hoinville (1977) about the minimum sample size in each sub-group.

The data obtained from the questionnaires were statistically analyzed to show the results for each campus. The results for each campus were then compared with each other. For further clarification on the results, qualitative methods were used.

Qualitative method: Qualitative methods used in this research involved three (3) techniques; questionnaires, behavioral observation and visual research. Through questionnaires, the students can give comments or opinions in the appropriate fields. This approach collected information about students' feelings and emotions of the situation on their campuses.

Behavioral observations are one of the techniques of field studies are often used in social science research (Chua Yan, 2006). Behavioral observations were conducted to record the behavior and reactions of students to the campus environment. Researcher observed and recorded observations using notes and photographs. Researchers not involved in the activities

performed by students. This technique is a complement to studies in which the results of the observations can be compared with findings from other techniques (Sapsford and Jupp, 2006).

Visual study was conducted to evaluate the character of an area. These techniques allow researchers to study the shape, composition and appearance of the city as well as evaluating the assets and liabilities of a city. Through a visual study, researchers can record the physical and social character of the campus that important or prominent in the campus environment and to comment on the weaknesses and problems in planning the physical development of campus (Shuhana *et al.*, 2007).

This qualitative method collected information about the physical condition of the campuses studied and feelings of students on their campuses. This information is very important to complement the findings of qualitative methods. Information obtained from the qualitative methods used to explain the findings derived from quantitative methods.

RESULTS AND DISCUSSION

Research found that there are difference approach has been used to plan the physical development for research campuses. Research also found that every approach taken has its own advantages and disadvantages. Besides, there are also problems that were shared among the campuses.

Structural layout of the campus: The four campuses developed using different planning approaches. Structural layout of the campus affects the pattern of life on campus, especially in terms of accessibility and circulation. Besides, there is a physical development of campus that is less stressed on the relationship between the functional areas or buildings in campus. Figures below show the distribution of areas in planning development and student movement on the research campus.

Structures of the internal layout of the UKM campus are divided into three (3) areas, namely the Range 1, Range 2 and Range 3 (Fig. 1). Range 1 area is planned using the concept of 'core centralized' by putting the academic areas surrounding by the social areas and hostels. The development of the campus in the Range 2 and Range 3 appear to be as simple accretion by placing new buildings in available spaces without assessing the functional relationship of the buildings.

USM main campus is planned in a more compact compared to the other campus (Fig. 2). This may be due to the limited supply of land for the campus since it is

already surrounded by the development areas. Facilities area is located in the central and surrounded by academic areas, while residential areas are located in suburban campus. The position of the buildings, especially in facilities and academic areas are close to each other.

UM campus planning is scattered where there are academic areas located far from the main academic areas (Fig. 3). UM campus layout looked like structure of 'centralized core' which putting the residential area surrounding the social and academic areas. However, the structure of 'centralized core' is quite broad and not well-organized where there is an area in the center of campus that have not been developed. Hilly terrain factors may be barriers to develop that area to create a well-organized structure.

UPM main campus is the largest campus in the study (Fig. 4). The campus planning is divided into two main areas, academic and residential areas. Academic buildings have been grouped in one area, while residential areas are also grouped in the same manner. Other than that, the administration and student facilities are grouped together in the academic areas. There are a residential colleges, field, sports courts and fitness center in the residential areas.

Accessibility: Accessibility is the ability to get goods, services and doing activities (Fig. 5). The feedback obtained from the survey found that the accessibility to academic areas from residential areas is highest for the USM campus, followed by UPM, UM and UKM campus. This may be due to the compact layout of the campus which can reduce the distance between residential areas and academic areas. For the UKM campus, the random placement of students and campus wide growth with simple accretion causes the distance between residential areas in the academic areas increases.

Accessibility to the facilities area is highest at UKM campus and the lowest at UM campus. These results may be influenced by the UKM campus facility located in the center of campus. Other than that, the continuity of covered walkway and the placement of most of the residential colleges around the building complex also affect the results. As for the UM campus, the position of the facilities area is located in the center of campus. However, the distance the building is quite far from residential areas and there is no covered walkway connecting the building to residential areas.

USM and UPM campus recorded the highest results in terms of accessibility to the recreational areas, followed by UM and UKM campus. USM and UPM campus providing recreational areas that are not



Fig. 1: Structure of the campus layout for UKM, Bangi Google Earth. Edited by the author



Fig. 2: Structure of the campus layout for USM, Penang Google earth. Edited by the author

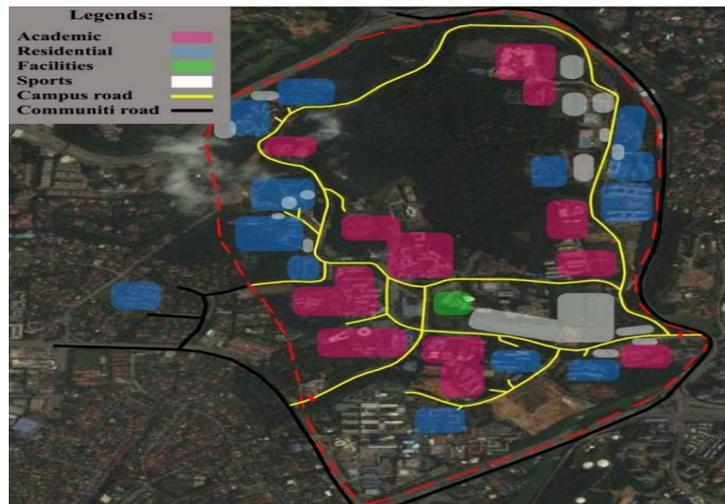


Fig. 3: Structure of the campus layout for UM, Kuala Lumpur Google earth. Edited by the author

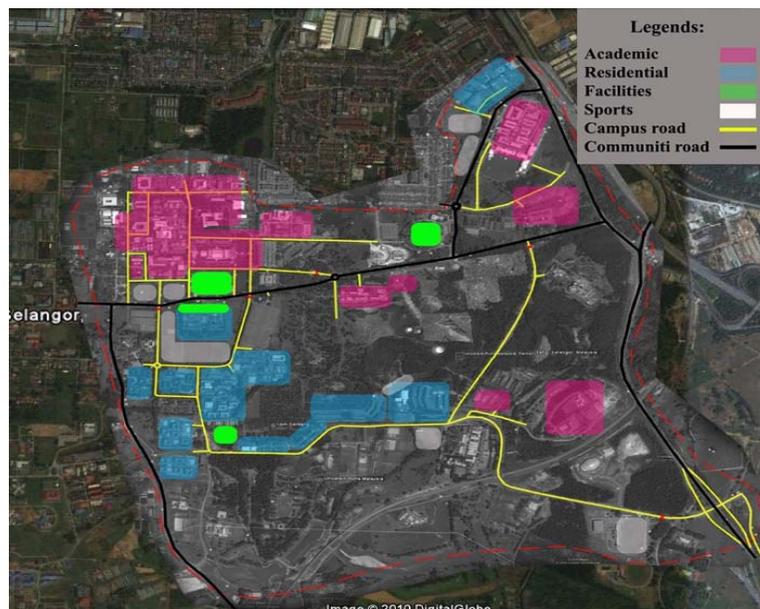


Fig. 4: Structure of the campus layout for UPM, Serdang Google earth. Edited by the author

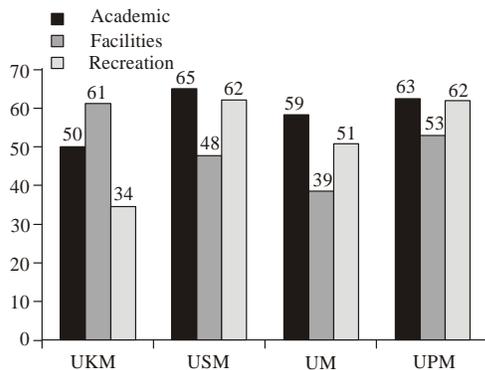


Fig. 5: Students' feedback on accessibility from residential area to another area in campus

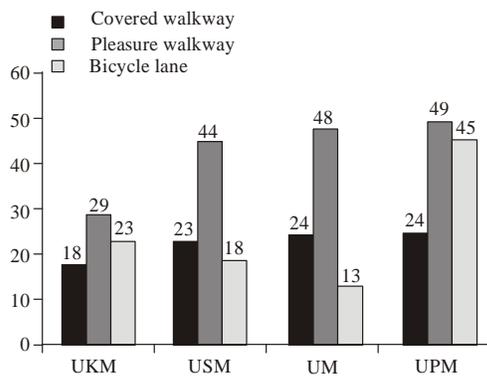


Fig. 6: Students' feedback on accessibility aspect on their campuses

focused on one area only. Although the main recreational area is far from some residential areas, the campus provides a sport field in most of the residential areas. This is easier for the students to exercise. As for the UKM campus, the position of recreation and sports area are far from most of the residential area because it is located on the suburban of the campus. Meanwhile, most of the residential areas do not offer facilities for recreation purpose.

Circulation: The continuity of the network of roads and paths allow easier travel (Litman, 2008). Research found that there were similarities in aspect of circulation on the research campus (Fig. 6). Result shows that majority of respondents said there is no continuity of covered walkways at their campus. Besides, majority of respondents (except UKM's respondents) state walking in campus is comfortable. For bicycle lanes, all the research campuses have shown highest percentage respondents expressed that there is no special lane for bicycles provided on their campus.

The sustainable campus usually promoted students to walk or using bicycles in campus area in order to reduce the usage of engine vehicle. Most of the movements in the campus area are depends on the vehicle usage that contribute to high resource utilization. One way to encourage students to walk or using bicycle is by creating a comfortable end

enjoyable experience for them and also providing high level of security. Malaysia is country that has a hot and humid tropical climate throughout the year. To ensure the comfort of pedestrians, the walkways should be able to protect them from the effects of weather such as rain and sunny day. One of the solutions is by providing covered walkways at campus. Research found that all research campus is less emphasizing on pedestrian's comfort. Pedestrian circulation on campus is not designed well, but only provided a sidewalk alongside the road without covered walkways. Walkways should be designed separately from the vehicle circulation (Sulong, 1983). This way is to ensure pedestrian safety and is covered in order to provide comfort to the users (Aldrin *et al.*, 2006). Pedestrian walkways should become the spine of the campus since it act as liaison to the main areas in campus (University of Victoria Campus Planning Committee, 2005)

Besides walking, bicycle is also an effective ways since it does not pollute the air and also not leave great impact on the environment while helping to improve the health of the cyclist (Drumheller *et al.*, 2001). Research found that special lanes for cyclist are not adequately prepared in the research campus. Bicycle's lanes are usually shared with pedestrian walkways or vehicle's lanes. This situation can be dangerous both to pedestrians and also the cyclist. Same as pedestrian's case, one way to encourage students to use bicycle is by providing a comfort and safe facilities to them. Beatley (2003) states the use of bicycles can be improved by separating the bicycle's lane from vehicle's lane, provide a proper place for parking and also provide own signage.

Building design: Planning should consider the aspect of unity in designing the building, but diversity is necessary to indicate the various disciplinary areas offered activities and cultures that exist on campus (Shuhana *et al.*, 2007). Majority of respondents from USM, UM and UPM campuses state that buildings design of their campus are unique and able to shown its own identity (Fig. 7). On the other hand, majority of UKM respondents believe that building design of their campus is not unique and failed to show its own image.

Visual research conducted found that there is consistency in the design of some building on UKM campus. They are not only uniform, but also have the same design (Fig. 8 and 9). This resulted in difficulty to differentiate one building from another and the building itself failed to project its own image. It also failed to indicate the diversity of disciplinary that existed on the campus.

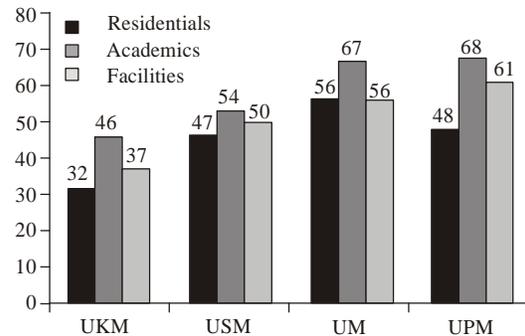


Fig. 7: Students' feedback on the uniqueness of buildings' design on their campuses

Landscape and surrounding: Landscaping is one of the aspects that need to be emphasized in campus design. Instead of beautify and brighten the campus area, landscaping plays multiple roles such as adjustment component of micro-climate campus (Zulkifli, 1999), natural boundaries, defining a space and as a tool to help 'wayfinding' and most importantly, landscape is the complement to the architecture (Walker and McGough, 1962). Therefore, an element of the landscape is one of the important components in creating a comfortable campus environment. This is consistent with the objective of a sustainable campus which emphasize in improving the quality of life (Fig. 10).

Overall, majority of the respondents of all research campus state that landscape that are available at their campus in adequated and created a comfortable campus environment. However, UKM campus has shown a low percentage compared to other campus. Research and visual observation conducted found that eventhough UKM campus is surrounded by a green area, landscape design especially in residential and academic area are less concern. Landscape element that has been applied is not designed based on themes and its own concept. This affects the comfort of the campus environment. For other campus, the landscape design is more structured and well maintained which result in creating a comfortable atmosphere in campus.

Meanwhile, a higher percentage was recorded in USM and UPM campus (compared to UKM and UM campus) over the role of landscape in helping the learning process. USM campus aims to create a 'university in the garden' to emphasize aspects of a comfortable learning environment. Trees on the USM campus cannot easily cut down or thrown away while the matured trees remain as one of the campus heritage assets. This situation can maintain a natural



Fig. 8: Photographs of different residential colleges on UKM campus that have same designs



Fig. 9: Photographs of different buildings on UKM campus faculty that have same designs

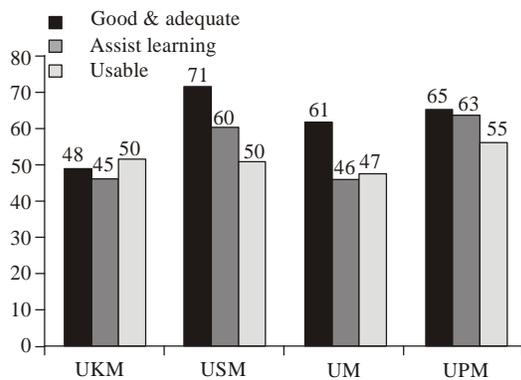


Fig. 10: Students' feedback on landscape and environment aspects in their campuses

environment that provides peace and comfort that will help student in their learning process. For UPM campus, the arrangement of the landscape in each residential area looks neat, well maintained and also has its own concept. Although it is not very attractive, landscape in UPM campus looks neat and well maintained. This situation provides a pleasant visual impact to the campus community especially for students. Therefore, it can help student to get a better and effective environment in their learning process.

Research also found that the landscape elements were manipulated as a tool to increase wayfinding in campus. At USM, landscape elements are used to

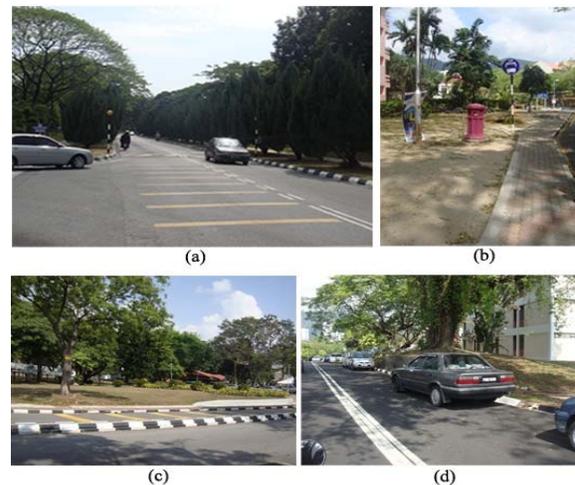


Fig. 11: The difference in the landscape along the main road (a) the current normal ways for in and out, (b, c and d) at the USM campus

define the road hierarchy. Landscape design on the main road and secondary road in USM campus has been differentiate to ease the identification of different ways. In addition, landscape design that used a consistent plant species and in line along the main road (near the campus entrance) provide a sense of welcoming to visitor instead showing the directions (Fig. 11 and 12) as a valuable heritage of the



Fig. 12: Photographs of a matured plant is retained

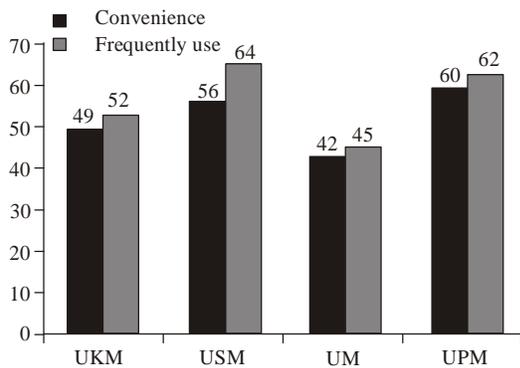


Fig. 13: Students' feedback on public transportation in their campuses

USM campus. In addition, the matured plants are also manipulated as elements of attraction and create beautiful scenery.

However, research campus still lack of hard landscape elements, sculpture and decorations that can be used and make as a landmark. Although majority of respondents of each campus reflect there are availability of these elements, low percentage was recorded. In addition, the decoration such as waterfall is placed at inappropriate location and difficult to use the facilities. There are also elements of hard landscape that left abandoned and poorly maintained. Therefore, it would reduce the desire of campus community to enjoy the campus environment and deny the potential of outdoor space as a medium of effective learning.

Transport and movement: Transport is one of the most important aspect in life because people always moving from one place to another. Similarly, campus community also needs to move and need transportation as a supporting tool to ease the movement. However, impact of students and staffs travel are often ignored (Ryan *et al.*, 2010). The real purpose of movement are to get goods, services and doing activities (Litman and Laube, 2002). Usually there are two types of transportation within the campus; public transport and private transport.

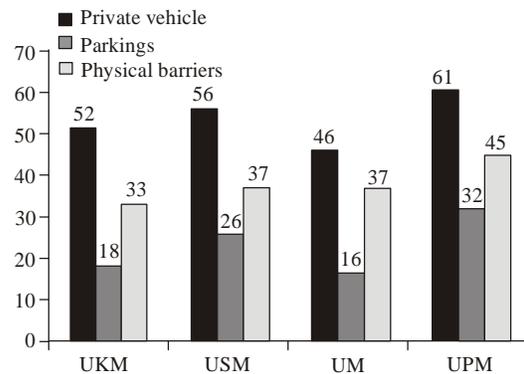


Fig. 14: Students' feedback on the use of private vehicle and physical barriers

From conducted research, result showed that all campus providing bus services in order to ease movement of students (Fig. 13). Average of the respondent state that bus services is comfortable except for UM campus, where the percentage of respondents who expressed bus services is comfortable is having the same percentage of respondents who have opposite opinion. In addition, majority of respondents (except UM campus) state that they usually use public services. There were complaints from UM campus respondents on public services in their campus.

"Public transport is sometimes not on schedule. Driver break time is earlier than their schedule ..."

Respondent 47 from UM campus.

"To ensure bus driver to comply with the rules, drivers is expected to adopt the slogan 'courtesy of our culture' ..." - Respondent 18 from UM campus.

In addition, majority of respondents state that they were comfortable to use private vehicle except for UM campus (Fig. 14). The highest percentage was recorded at UPM campus. This may be due to road condition in UPM campus is more convenient compared to other campus. The separation of the circulation between academic and residential areas smoothen the vehicle movement and improves road safety especially in residential areas. Parking is not a serious problem in UPM campus when comparing to other campus. In addition, only UPM campus highest recorded majority respondents stated that there are physical barriers in their campus. This is probably due to the UPM campus area that widest among the studied campuses and students should use the vehicle to move from one place to another place. Their movement within the campus will be limited when there is no transport.

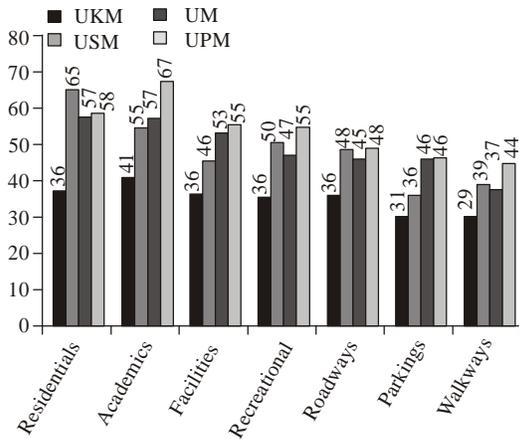


Fig. 15: Students' opinions about the safety aspect on their campuses

Safety and lighting: Academic community should be equipped with a convenient and secure access that connects all facilities to all users Shuhana *et al.* (2007). Safety and lighting are two important elements which depend on each other. To ensure the campus is safe,

lighting aspects also play a big role instead of safe application of design technique and design. The higher the level of lighting on campus, the higher the potential to create a secure environment, especially at night. Instead of ease the vision, good lighting is one of the informal monitoring techniques that can be used to prevent crime. Pedestrian should be given highest priority in campus planning (Nurwati *et al.*, 2006; Strange *et al.*, 2000).

Research found that campus planning that place one building apart from another can raise a safety issues (Fig. 15). Safety issues arise when location of the building is separate and far apart from other building causing increasing in the distance of campus community. For vehicle usage, the longer the distance, the longer the time they will be on the road. At the same time, they are exposed to various risks. In addition, pedestrians also receive the same risk as the distance increase and they also need to pass through high risk areas.

Based on the feedback received from the respondents, there are several locations that claim to be not safe in the research campus. Roads, walkways and parking are among the areas which considered high risk areas. It is closely related to lighting factor when percentage of positive responds in these areas is low compared to other areas. The percentage of respondents stated that the lighting area at that area is good are

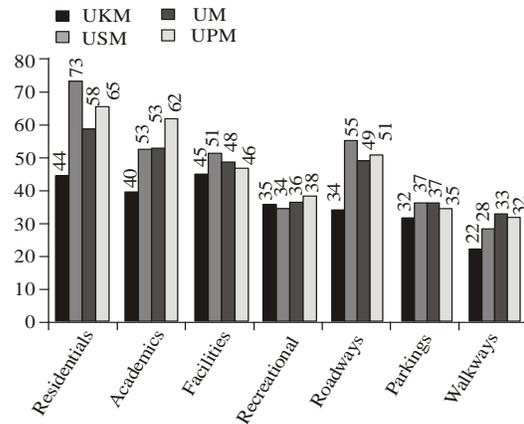


Fig. 16: Students' opinions about the lighting aspect on their campuses Below are the complaints received from the respondents

low. Below are the complaints received from the respondents:

“There are few places outside the residential area is too dark. There are also certain roads on the hill is dark like a haunted house” - Respondents 17 from UM campus.

“Please increase the number of light for a brighter residential area so that residents feel safe.” - Respondents 19 from USM campus.

“To increase number of street lights on Lebu Silicon which is the road to the entrance of UPM.” Respondent 12 from UPM campus.

“Ensure better security and lighting at pusanika and pedestrian walkways at night.” - Respondent 37 from UKM campus.

Research also found that the circulation of road and pedestrians design is less sensitive on security aspect. Dark walkways, no segregation between pedestrian walkways and roads, far distance and also have to go through the risk area make the pedestrians and other road users feel unsafe (Fig. 16). Street lights that has been used is not suitable and also confusing the vision of road users. Moreover, the road condition is poorly maintained increase the risk of accidents.

“Add the lights in the campus, in the dark and lonely areas will make students feel unsafe especially when coming back from night class.” - Respondent 25 from USM campus.

“Change to a brighter light so that it will not confuse the road users.” - Respondent 41 from UKM campus.

“Repair the damaged road for safety reasons.” - Respondent 28 from UPM campus.

Dark and less security aspect of the parking area is also scared the students. The crime incident especially theft of motorcycle that usually happened during end of semester showing lack of informal security in the parking area design. One of the comments received were:

“Provide secure motorcycle parking lot at College Amin. The incident of losing the motor at the end of semester is always happened.” - Respondent 65 from UKM campus.

Complaints and comments received indicate the importance of safety and lighting on campus. Planning and design of the research campus is less emphasizing on both of the aspects. The main cause of this problem is the placement and layout of building which is less suitable. As a result, providing a safe areas and roadways and also optimum lighting is difficult to implement.

CONCLUSION

Results showed that there are some weaknesses in physical development plans of studied campuses. Development plans using a wide area and put the location of the buildings are far apart have a big impact on the campus accessibility and circulatory system. Development of large area is difficult for universities to provide facilities such as covered walkways, bicycle paths, optimum lighting and landscaping in a controlled setting throughout the campus. In addition, the campus plans must ensure unity in the building design and landscaping to establish the identity of the disciplines offered. To ensure the convenience of students, the campus transportation system should be more systematic and timely schedule. In addition, lighting is an important aspect in ensuring the safety of students, especially at night. It can be concluded that the physical development of campus planning certainly play a big role in influencing the sustainability of a campus. Referring to the findings, the USM campus that planned more compact compared to other campuses shows minimum overall problems. This proves that compact campus is more practical for a campus that aims to create a sustainable life. This statement is coincided

with the views of other researchers such as Burton (2000), Burns (2001), Steffen (2008) and Santana *et al.* (2009).

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