Development of Sustainable Campus: Universiti Kebangsaan Malaysia Planning and Strategy

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Abstract.
Malaysia and 178 countries in the world has signed and agreed on acceptance and implementation of sustainable development on the Agenda 21. It was reconfirm again in Johannesburg in 2002. The Malaysian Government commitment can be seen in the Five year development scheme from the sixth up to the ninth Malaysian Plan which from the year 1990 to 2010. Universiti Kebangsaan Malaysia (UKM) as one of government agency will also committed to implement the sustainable development. It started in the year 1994 when the Institute of Environmental and Development known as LESTARI was established. This paper will generally looking at the initiative and strategy taken by University Kebangsaan Malaysia in planning and developing the sustainable campus. Universiti Kebangsaan Malaysia target to achieved the sustainable campus status in year 2020.

Keywords. Sustainable Development, commitment, Environment, Facilities, Strategy

1. Introduction

During the united Nations Earth Summit held by the United Nation Environment Programme (UNEP) in Rio de Janeiro (1992), a sustainable development was defined as “improving the quality of human life while living within the carrying capacity of supporting eco system”. This definition has an impact on the economic, social and environmental development. It was later be formally adopted worldwide. At the 2005 World Green Building Council Congress, the mayors of fifty of the world’s largest cities signed an agreement that all new municipal buildings will be subjected to green building rating systems by 2012. Malaysia and 178 countries in the world has signed and agreement on acceptance and implementation of sustainable development and has accepted to implement the Agenda 21. It was reconfirm in Johannesburg in 2002. The Malaysian Government commitment can be seen in the Five year development scheme from the sixth up to the ninth Malaysian Plan which from the year 1990 to 2010. Universiti Kebangsaan Malaysia (UKM) as one of government agency will also committed to implement the sustainable development. It started in the year 1994 when the Institute of Environmental and Development known as LESTARI was established. The main objective of this Institute is to initiate and oversee the sustainable component is included in the environmental and education development at Universiti Kebangsaan Malaysia.

2. UKM Background.

Universiti Kebangsaan Malaysia was developed on land which cover 20 709.2 acre. Current concentration is on the Northern part of the site where Langat basin as the boundary and Federal road on the eastern site. The campus is connected easily by the North South Highway. Total student population as 2007 are 17 603 where 99.2 % are local and the rest are international. The international students are mainly from South East Asia, Middle East, Europe, China and Africa. There are 5, 614 student as 2007 are doing research for postgraduate studies for master and Phd. To conduct the entire programme at UKM, there are more than 2 000 academic staff and about 3 034 support staff. The student/academic ratio is 1 : 8.8.

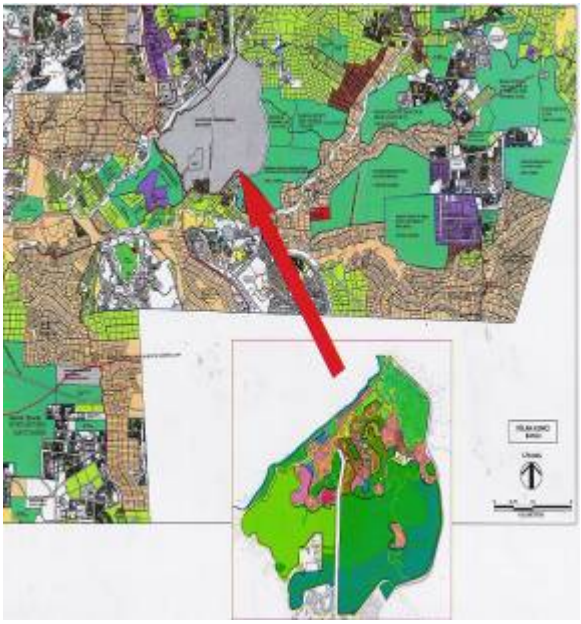
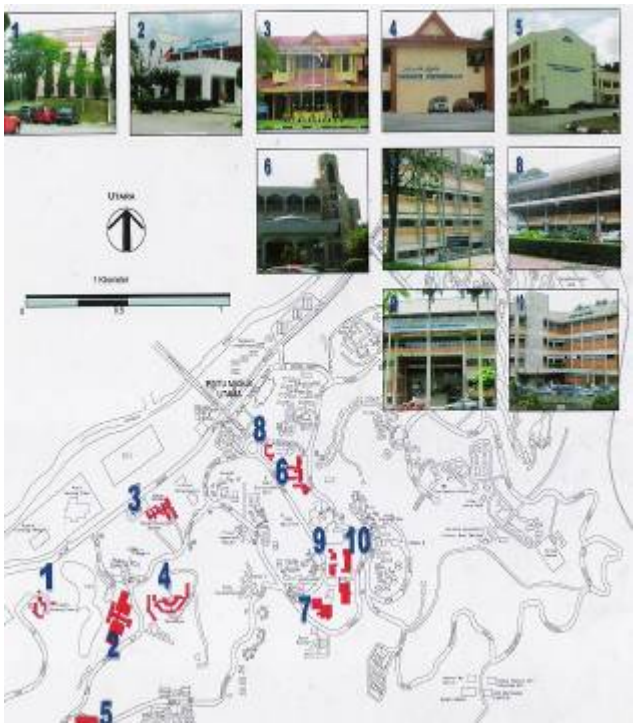


Figure 1. Location Plan of UKM.

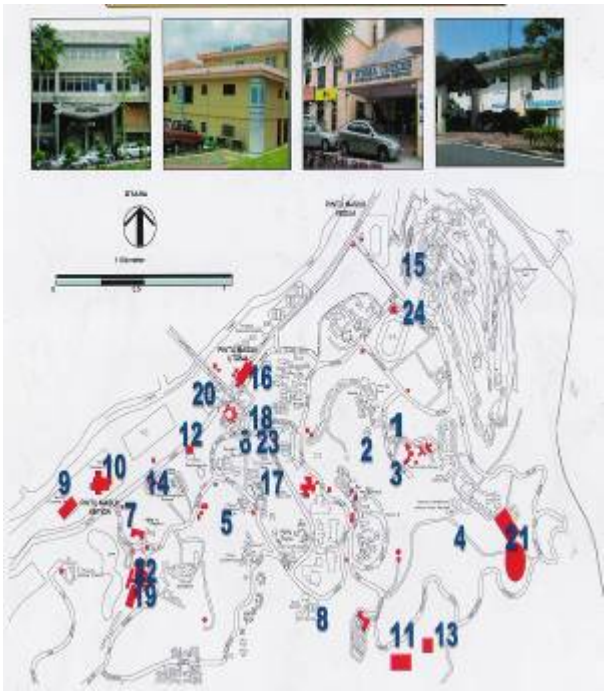
There are 10 faculties and 13 institutes which developed various academic and professional programmes. To facilitate the student, there are currently 11 colleges in the campus which can accommodate about 85% of the students' population. Other facilities provided are as follows:

i. Administration building
ii. Academic/faculties building
iii. Sport and Recreational facilities
iv. Water body and stream
v. Road and transport facilities
vi. Parking facilities
vii. Forest reserve
viii. Others.



Legend:
1. Faculty of Law.
2. Faculty of Engineering
3. Faculty of Language
4. Faculty of Education
5. Faculty Technology and Information
6. Faculty of Social Science
7. Faculty Science and Technology
8. Faculty of Islamic Studies
9. Faculty of Science and Mathematic
10. Faculty of Business and Economic

Figure 2. Location of UKM Academic Facilities



1. Institute of Malaysian and International Studies.
2. Institute of Environment and Development
3. Postgraduate Centre
4. ROTU Centre
5. Student Clinic
6. Library
7. ICT Centre
8. Plant House
9. Malay Ethnology Museum
10. Intelligent Technology Centre
11. Animal House
12. Centre for Geology
13. Gen Tech Analysis Centre
14. Wisma Unikeb
15. Club House
16. DECTAR
17. Student Centre
18. Chancellery
19. Space Science Centre
20. Mosque
21. Staff Quarters
22. IMEN
23. ATMA
24. University Guest House.

Figure 3. Location of other Facilities
Legend

3. UKM Strategic Plan 2000 – 2020

The development of strategy plan is developed to help Universiti Kebangsaan Malaysia to plan and further develop for better optimisation of political eco-system, social, economic technology and education environment. In order to achieve the objectives ten(10) strategies are design. They are:

Strategy 1. To widen and enhance the Malay Language as the medium for knowledge
Strategy 2. To Enhance and encourage research
Strategy 3. To improve the quality of graduates (Under and Post Graduate)
Strategy 4. To Internationalised programme and contribution
Strategy 5. To improve discipline and education excellent
Strategy 6. To be well prepared for ICT.
Strategy 7. Well plan budgeting
Strategy 8. To enhance and developed sustainable physical infrastructure for better educational facilities
Strategy 9. To enhance sustainable human resource.
Strategy 10. To practice authentic working culture.

UKM sustainable master plan is developed base on the above strategies with special considerations on the strategy 2, 6, 8, 9,and 10.

4. Principles of Sustainable Development at Universiti Kebangsaan Malaysia.

The principles at UKM is developed base on the concept being practice globally and being accredited at international level which include the Rio principles 1992, Agenda 21, implementation plan for sustainability Johannesburg 2002 , the framework developed

at the national level in Malaysia such as the vision 2020 and other development principle and strategy. UKM committed to practice and implementation of the sustainable development principles by 2020 . The UKM principles on the Sustainable development are as follows:

- To enhance and encourage sustainability and to collaborate with others that implement and practice sustainable development.
- To improve the productivity and wellness of the community
- To improve the ecosystem health in the campus
- To encourage research related to environmental and development institute to champion the sustainable development.
- To develop tool for responsible decision making, and
- To use the benchmarking to monitor, report and improve the continuous sustainable development.

5. UKM Sustainable Development Objectives.

The objectives is the main criteria that help to develop the sustainable components at UKM. They are ;

i. To maintain and manage the water resources for the quality and sufficient.
ii. To mange energy that are efficient and sustainable.
iii. To implement efficient solid waste management.
iv. To develop identity in the sustainable building design
v. To develop sustainable and identity landscape
vi. To improve public transportation and reachable.
vii. To improve the quality of life in campus
viii. To create awareness for sustainable life among the campus community.

6. UKM Sustainable Components.

There are three main components in the development of sustainable campus at UKM. There are:

i. Equity.
   a. Governances
   b. Human wellness
   c. Curriculum
   d. Ability construction
ii. Economy
   a. Management of water
   b. Management of energy
   c. Management of solid waste
   d. Use of materials

iii. Design
   a. Design and Infrastructure
   b. Landscape and forestry
   c. Transportation.

7. Sustainable Indicator use at UKM

Indicator is the important tool to ensure that the master plan developed could be assess to indentify whether it has achieved the target. UKM indicator and assessment criteria as seen on the table 1.

Table 1, Showing the Assessment and indicator.

Objectives of the Sustainability	Assessment criteria	Indicator
To maintain and manage the water resources for the quality and sufficient	Reduce water usage.	Amount of water Usage
	Water quality enhancement.	Index water Quality
	Enhancement of management of water sources	Amount of water seepage and usage of surface water.

To manage efficient energy	Reduce energy usage Usage of alternative source of energy	Amount of energy Amount of alternative energy
Reduce waste production	Reduction of material usage and sources Reduction of solid waste Encourage recycling of materials	Amount of material usage and sources Amount of solid waste produce Percentage of recycle Percentage of compose
Building Design and UKM Identity	Sensitivity to environment Development of UKM identity	Level of sensitivity Achievement of identity in building design.
Sustainable and identity landscape	Development of landscape of identity and quality.	% of budget for landscape Level of quality
Public transportation and reachable.	Level of public transportation, pedestrian, bicycle and motorcycle usage. Reduce traffic congestion Reduce conflict for road user Reduce of journey duration	% of public bus user % of using bicycle % of Using motorcycle Volume of traffic Amount of parking Rate of Accident in campus Facilities provided
Improvement of Quality of life for campus community	Increase the level of satisfaction Facilities provided for campus community	Campus density Ratio of Open space and Population Recreational and open space
Encourage sustainable life	Improvement of awareness for sustainable life. Ability to influence in decision making	Satisfaction of campus community Level of awareness of campus community on sustainability Level of awareness of decision maker on sustainability.

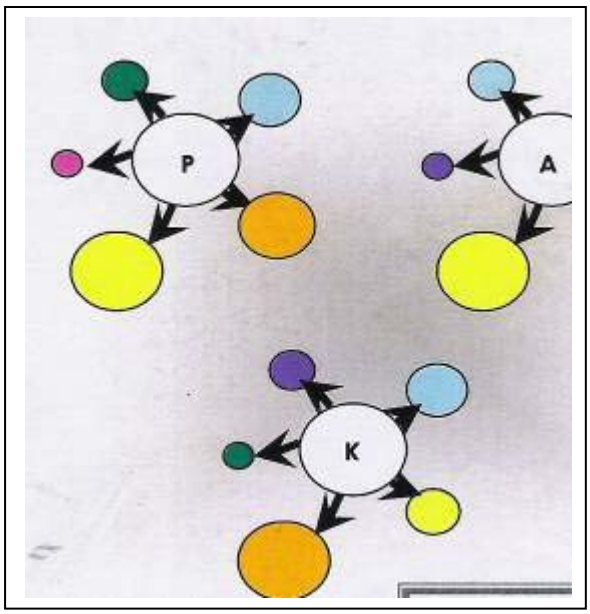
8. Development of Master plan.

Universiti Kebangsaan Malaysia approach in developing the master plan guideline by introducing cluster which was base on the space components within the specified cluster. The cluster designed will take into consideration the relationship between the user and the space provided. The determination of the components through a thorough studies of present and future needs of the user.

Base on the objectives development of sustainable campus the relevant components are identified. The preliminary conceptual planning is developed where the concentration is focusing on the relationship between the users and the spaces provided. The main user are identified as students, academician, non academician staff, visitors and parents.

Among components that are seriously considered are relationship between and the social activities, academic and administration facilities, research activities, sport and recreational and private space.

The space need to be developed as a multifunction space to serve the main purpose of the campus. The component needs to take consideration on the integration between the end user such as students, academicians and supporting staffs. Figure 4 shown the linkage between the activities and the end user.



Legend

Activity Social

Academic Facilities

Administration Facilities

Research Facilities

Sport and Recreation

Private space

P = Students
A = Academic Staff
K = Non Academic staff

Figure 4. The relation of the components and the end user.

9. Development of Cluster

For the development of master plan seven cluster has been established. Base on the component required by the end user the space categories for each cluster has been identified as in the table 2.

Table 2 Cluster and the Space

cluster	space
Cluster 1	Faculty and Institute Facilities
Cluster 2	Faculty, Institute and Accommodation Facilities.
Cluster 3	Institute and Recreational Facilities.
Cluster 4	Research and Innovation Facilities
Cluster 5	Technopreneur Park.
Cluster 6	River Line Development.
Cluster 7	Forest Reserved

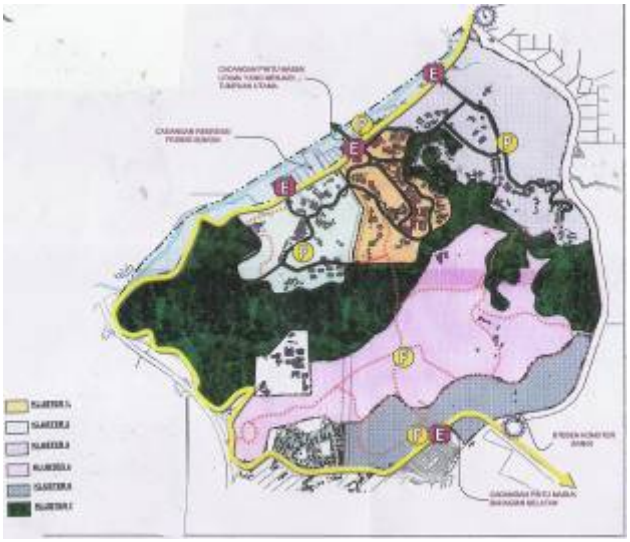


Figure 5. Universiti Kebangsaan Cluster Map.

The topography and the existing spine of road which run through the campus are the main consideration for the cluster development. The space in each cluster is later determine and the component is identified as shown the table 3.1- table3.7.

Table 3 -1. Cluster 1.

Space	Components	Remark
Academic Building	Lecture & Tutorial Room, Laboratories	
Research Centre for Institute	Laboratories & other Research Facilities	Existing Facilities Maintain/upgrading
Open Space	Wetlands	
Private Space	Gazebo, theatre ,landscape & others	

Table 3-2. Cluster 2

Space	Components	Remark
Academic Building	Lecture & Tutorial Room, Laboratories	
Accommodation	Student Hostel, Staff Quarters and Guest Facilities	
Open Space	Stadium and Sport Facilities for Soccer, Tennis, Badminton & Squash	
Private Space	Gazebo, theatre ,landscape & others	

Table 3-3. Cluster 3

Space	Components	Remark
Academic Building	Lecture & Tutorial Room, Laboratories	
Research Centre for Institute	Laboratories & other Research Facilities	Existing Facilities Maintain/upgrading
Accommodation	Student Hostel, Staff Quarters and Guest Facilities	
Private Space	Gazebo, theatre ,landscape & others	
Open Space	Shelter & Gazebo	

Table 3-4. Cluster 4

Space	Components	Remark
Academic Building	Lecture & Tutorial Room, Laboratories	
Research Centre for Institute	Laboratories & other Research Facilities	Existing Facilities Maintain/upgrading
Accommodation	Student Hostel, Staff Quarters and Guest Facilities	
Private Space	Gazebo, theatre ,landscape & others	
Open Space	Shelter & Gazebo	
Public Area	Plaza	

Table 3-5. Cluster 5

Space	Components	Remark
Academic Building	Lecture & Tutorial Room, Laboratories	
Accommodation	Student Hostel, Staff Quarters and Guest Facilities	
Open Space	Stadium and Sport Facilities for Soccer, Tennis, Badminton & Squash	
Private Space	Gazebo, theatre ,landscape & others	

Table 3-6. Cluster 6.

Space	Components	Remark
Academic Building	Lecture & Tutorial Room, Laboratories	

Accommodation	Student Hostel, Staff Quarters and Guest Facilities	
Open Space	Stadium and Sport Facilities for Soccer, Tennis, Badminton & Squash	
Private Space	Gazebo, theatre ,landscape & others	

Table Y-7. Cluster 7.

Space	Components	Remark
Private Space	Forest Reserved	

10. Concept of Cluster

The concept of cluster is to integrate variety of space and to develop individual identity within their own boundary of area. Implementation of the concept base on plinth of building, vehicular access, pedestrian, connection between building and environmental aspect.

For the sustainable development in UKM Each cluster will have their own administration, academic and research, social, sport and recreational facilities, connection between cluster and relationship between public and private space. Each cluster will be surrounded by greenbelt. Pedestrian will be the main consideration within the cluster. The diagrammatic conceptual development as shown in the Figure 6.

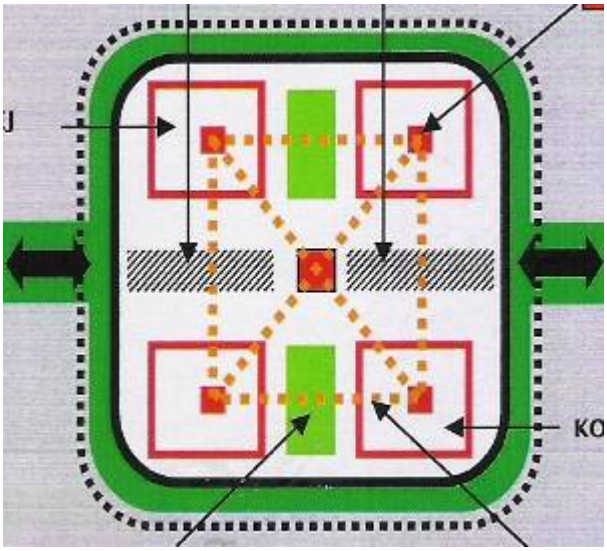


Figure 6. Component and relatiomship of each cluster.

For connection between the cluster public transportation is given priority with the implementation of park and ride concept. Figure 7, illustrate the concept of the connection between cluster.

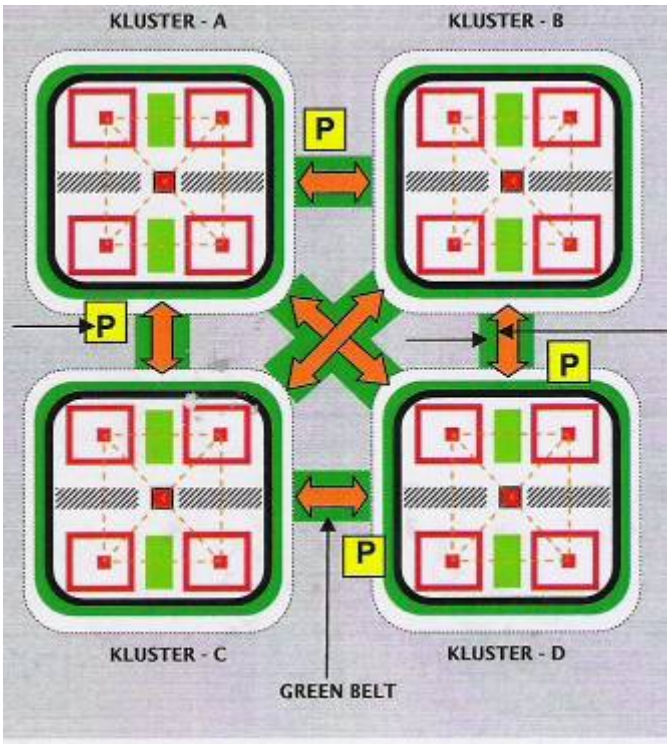


Figure 7. Connection between Cluster.

11. Physical Development for Sustainable Campus at UKM.

The approach take by UKM is to identified and divide it into to main section, Firstly, it will cover the following:

i. Traffic and transportation
ii. Architectural Building design
iii. Open Space and recreational
iv. Infrastructure and utilities
v. Forest reserved management

In this section it will concentrate to ensure that all the facilities and area in the campus is easily reachable within speculated time. Priority will be given to the road system, pedestrian and vehicular route, park and ride system, parking and public transportation. This will reduced the number of vehicles in the campus. This will create more positive effect to the environment where the noise and the carbon monoxide (CO) will be reduced. More park and ride station will be developed in every cluster to improve and provide better reachable facilities.

The sustainable campus design will be responsible to give protection to the environment and ecosystem. The design principle will be base on the integration of the architectural element, engineering principles and technology in construction. It will involved the combination of aesthetic values, environment, social, politic and morale. The deign principle that will be introduced are :

i. Project management
ii. Standard performance
iii. Live design purposes
iv. Design with nature
v. Considerate development
vi. Reduced traffic and vehicular facilities
vii. Healthy ecosystem and environment.

More formal and informal open space to be allocated with a proper landscape that will enhanced the environmental aspect of the space. Selection and preservation of plant which less maintenance will be one of the step taken.

Energy, water resources and solid waste management as well as telecommunication and ICT will be given priority consideration in developing the infrastructure and utilities. Effective usage of energy for heating, ventilation and air conditioning will be the main consideration also not to forget the usage of renewable energy. Solid waste disposal centre will be established for recycle and generation of composting product for other usage.

UKM is the only university in Malaysia who have the biggest forest reserved. The maintenance and rehabilitation program of the forest will be given due consideration to stabilised the ecosystem.

The second section will cover the cluster and the interconnection between them . Each cluster will be functionally individual where most of the cluster will concentrate on academic, research and activities related to academic, sport and recreational. The development of the cluster is realised the UKM intention to become one of the best university in the field of research.

12. Conclusion

Good governances is the main factor that help organisation to achieve their target. Therefore it is important for UKM to develop their implementation agent to achieve the 2020 vision to become sustainable campus. The Main step take is to establish committee as:

i. To establish secretariat for sustainable development
ii. To create new post for expert in sustainable development
iii. Management and budget for sustainable development
iv. To develop guidelines for campus sustainable development
v. Priority given to sustainable development project

vi. To give special consideration on environmentally project
vii. To appoint professional consultant who have experience in sustainable development
viii. To establish good governance in management and administration
ix. To encourage more collaboration on sustainable development with other related establishment
x. To be responsibility and accountability to the environment, and
xi. To be more innovative and efficient in dealing with sustainable development.

With all those steps taken, UKM are very much hope that they will achieve their target to become sustainable campus in 2020.

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