SUSTAINABLE CAMPUS DEVELOPMENT :

Holistic Perspectives

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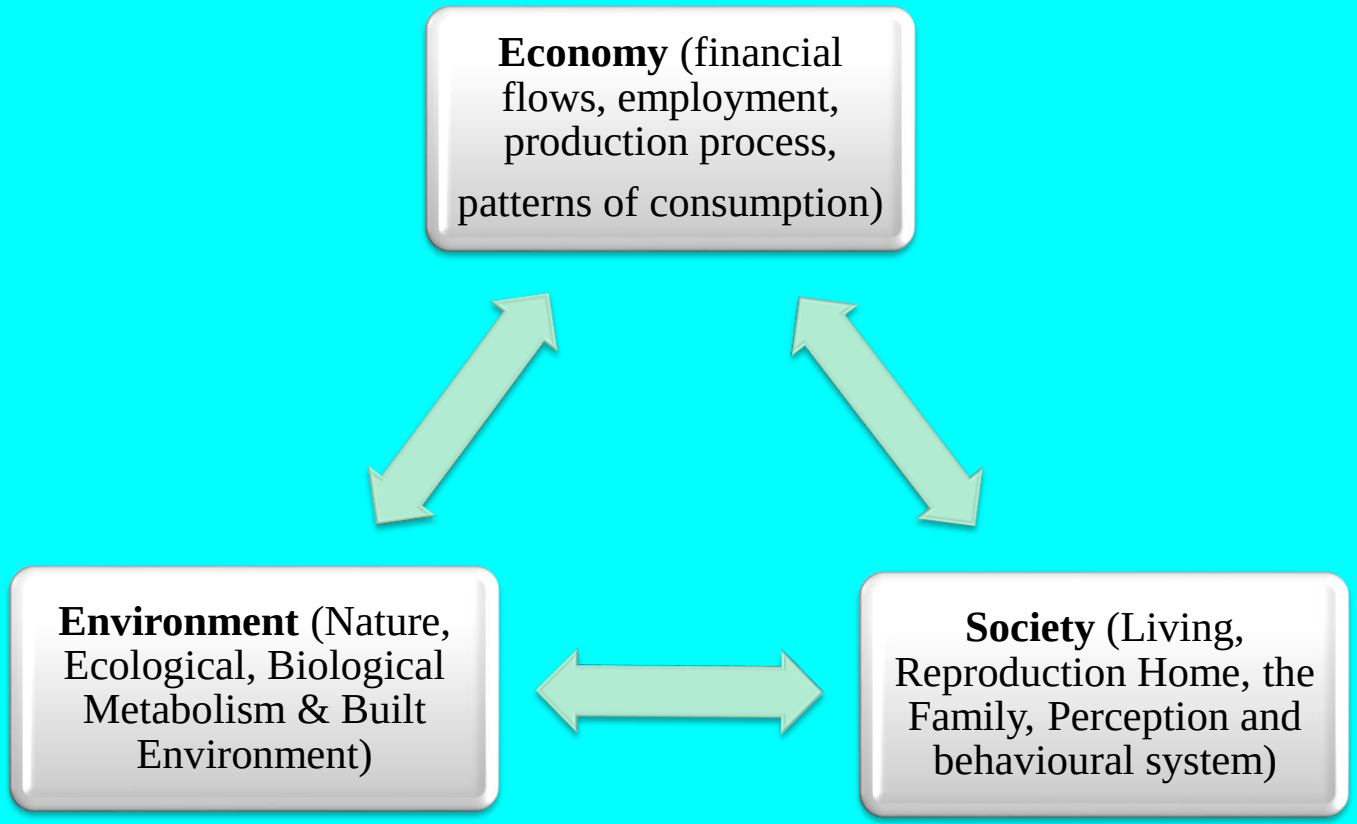
Sustainability

- The concept of sustainability is related to the carrying capacity of the earth resources and the environment. Most human activity depletes rather than replenishes or sustain the earth resources that contain the capacity to carry life.
- Involves renewable resources such as forests, ocean fisheries and use of soil. It is associated with maintaining the earth's carrying capacity through alteration of individual and collective human behaviour.

- Fenke Adriaens et.al (2005) stresses that vision of sustainability is strongly influenced by the dominant culture in which, it is found not just in the object itself but also in the idea behind it. The meanings can be more sustainable than the object itself.

- Thus, planning for a sustainable city is closely related to promoting sustainable communities.

Sustainability – integrated concept



- The concept – a method or plan to bring about a desired future and a way to improve the sustainable performance within a university campus and increase awareness among its population of what sustainable is.
- Sustainable campus community is one that act upon its local and global responsibility to protect and enhance the health and well being of human and ecosystems. Sustainable campus is to protect and improve health and well being of people and ecosystems.

- A better balance between economic, social and environmental goal in terms of policy implementation and long term campus activities.
- Sustainable campus involves:
- 1. a) environmental management : pollution prevention, energy efficiency, resource conservation, waste reduction, recycling etc.
- b) Green campus: green building, green transportation and campus preservation of natural and built resources and heritage.

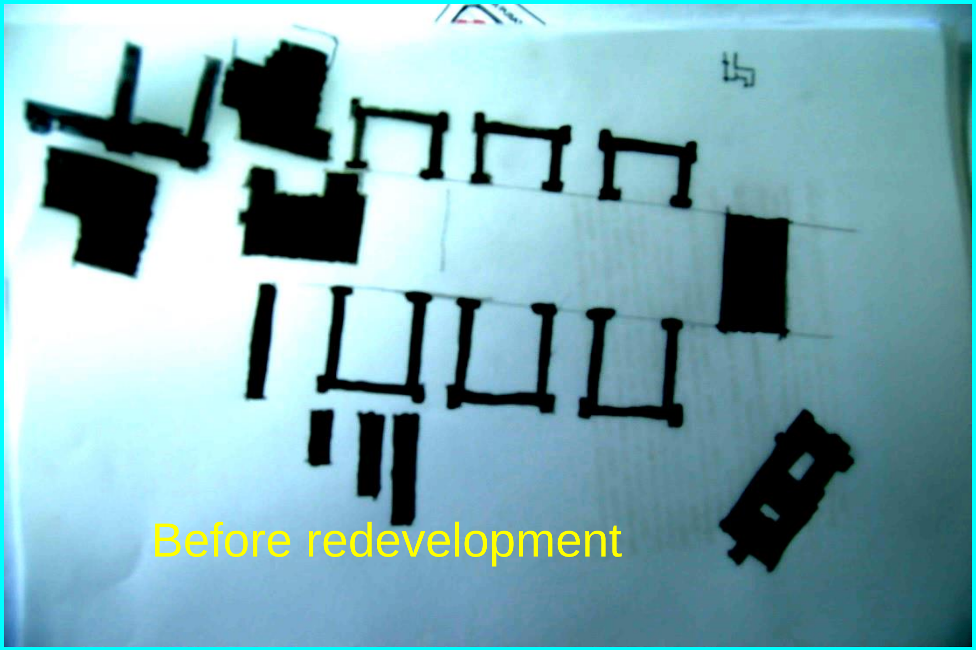
- 2. Public Participation and social responsibility:
- a) public participation of campus community, alumni and partnership,
- b) community services – public lecture and awareness, community projects other services and
- c) social justice, equity, care for handicap.

- 3) Sustainability teaching and research :
- a) conference, seminars, workshops etc.
- b) courses and curriculum – sustainability, health and safety and livable settlements .
- c) Research and Development – renewable energy, environmental protection, climate change etc.

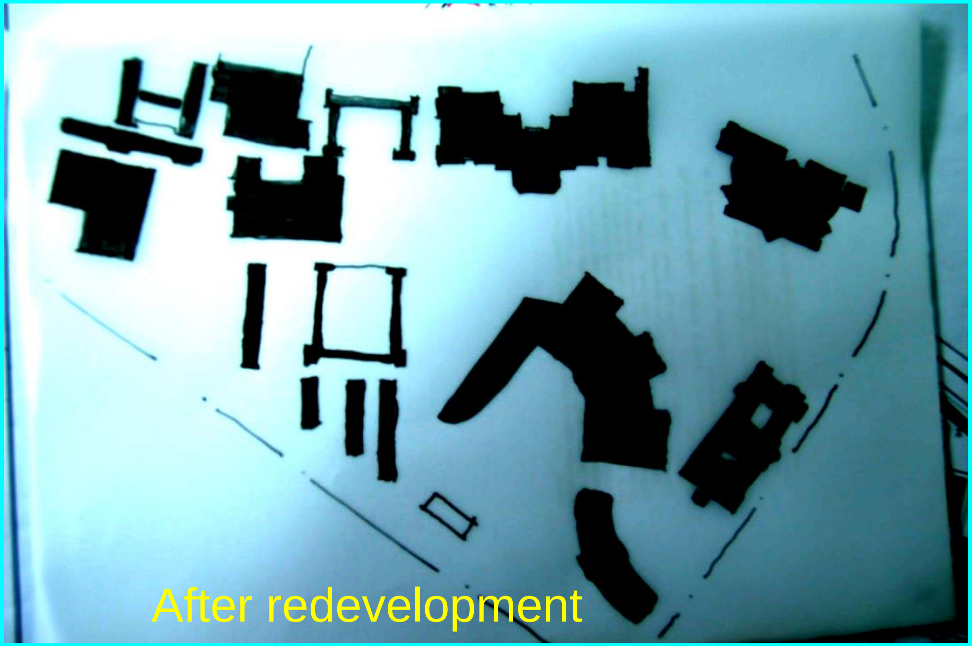
Green Open Spaces in Campus

- Benefits:
- a) ecological – reducing noise, regulating filtering air, ambient temperatures, protect habitats and biodiversity.
- b) Social benefits - provide solace from stressful university life, hasten recovery from illness and foster active and healthy living, social interaction. Facilitate teaching about diversity, natural orders and other ecological science subjects.

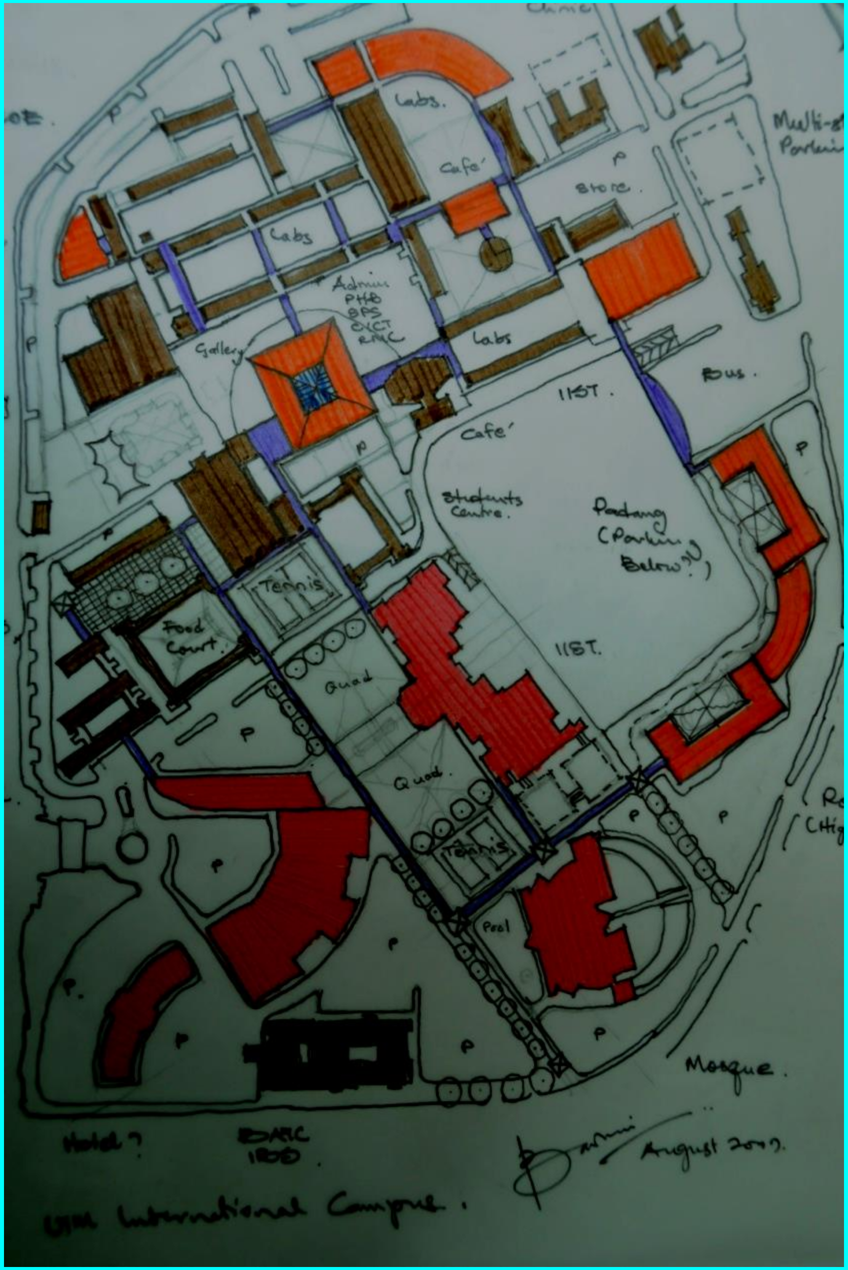
- Economic benefits – promote tourism, reduce pollution through decreased car dependence by providing alternative transportation corridors, lessening environmental impacts and reducing health care expenses, adapting cities to anticipated impacts of climate change : increased flooding, higher temperatures, and increased storminess.



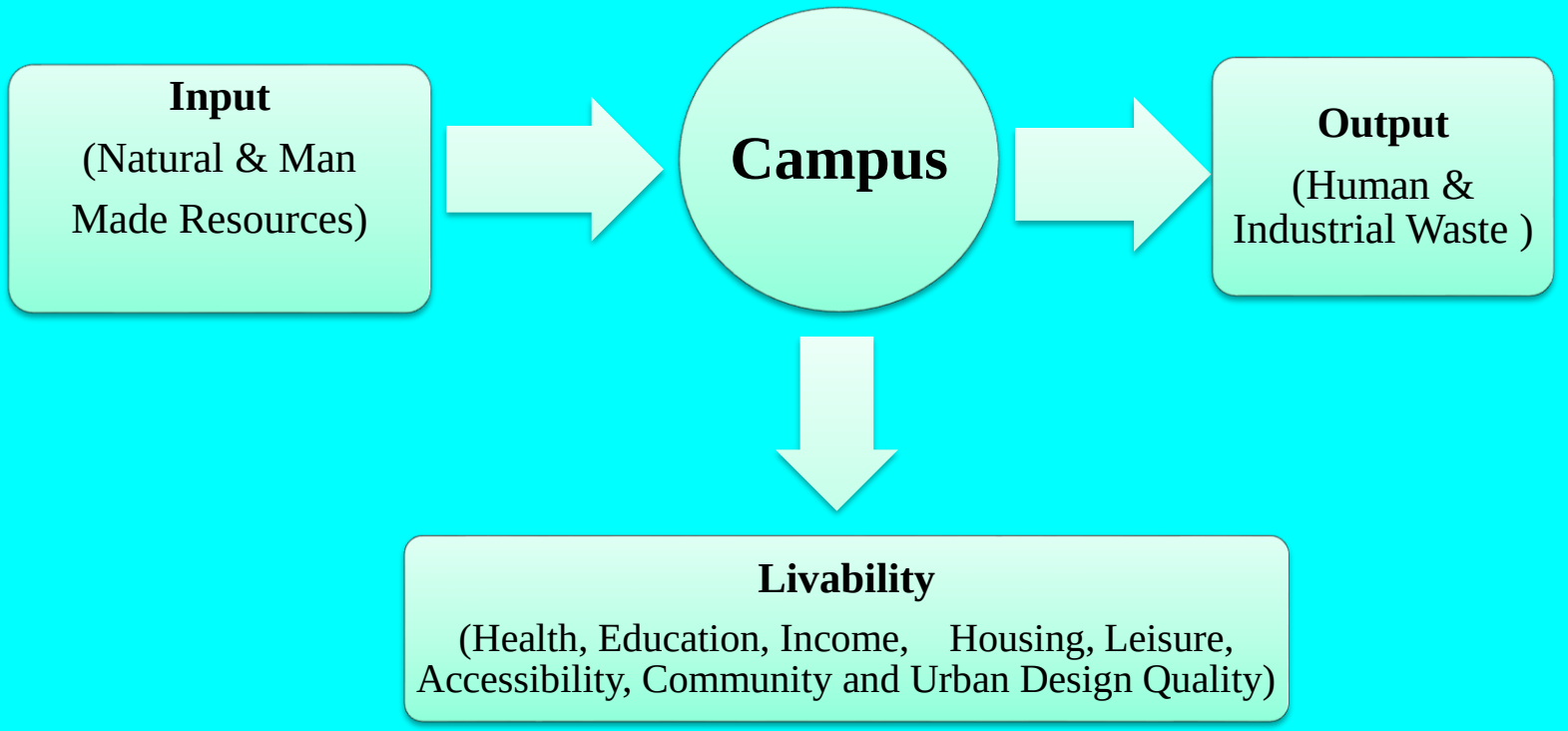
Before redevelopment



After redevelopment



Model of Campus as a Human Settlement



What Affects Campus Sustainability?

- 1. Transportation Priorities - Public or Private, walkable or not.

- 2. Economic Priorities – Build new or Conserve, Greenfield or Brownfield development, Compact or Sprawl

- 3. Cultural Priorities – User's Perception and Behavioural response towards the environment

ISSUES OF CAMPUS DEVELOPMENT IN MALAYSIA

- Rapid development in terms of higher educational establishments increase demand for new campuses.
- Minimum guidelines except for EPU and JKR guidelines for university buildings which does not cover planning and environmental aspects for campuses.
- Universities should provide the most condusive environment for learning considering they are the training grounds for all types of
- Campus environment should be suitable for learning and able to support the academic culture in order to produce human resource that is creative, dynamic, critical and able to live in a community.

- Campus losing green open spaces due to the need to provide more parking spaces.
- Expansion of university buildings often consume green spaces available. Spaces between buildings not well defined to serve as spaces for social interaction, studying, learning and are extremely isolated.
- Not enough green open spaces that are shaded to deal with the tropical climate.

CURRENT ISSUES

- World class universities are concerned about the following planning and urban design aspects:

i) The campus environment must be condusive for living and learning. It should encourage positive social interaction as well as becoming part of tourist attractions.

ii) The planning approach is more comprehensive with the aim of acquiring sense of place and having its own identity as well as being a sustainable development. The campus planning is being done by professionals with expertise in urban design and architecture.

iii) The campus master plan is being done with the views of the students taken into considerations so that it is socially sustainable.

TYPES OF UNIVERSITY

- Oxbridge – a no. of semi autonomous colleges providing residential and catering facilities with small scale teaching space and some central shared facilities jointly administered. Unique to Oxford and Cambridge.

- London - almost independent colleges and self contained universities with some central services, nearly all duplicating college facilities. Unique to London University.

- Provincial – A number of subject department or faculties with various central facilities and element of residential accommodation. The archetype and mostly found all over the world.

FORMS OF DEVELOPMENT

- Molecular – Faculty buildings are widely separated in groups leaving ample space for expansion in between the clusters of buildings.

- Linear – where strips of major buildings containing general, residential and academic use along major routes.

- Radial – where major buildings are focused at the centre and other buildings radiate away from it. Expansion takes place all around.

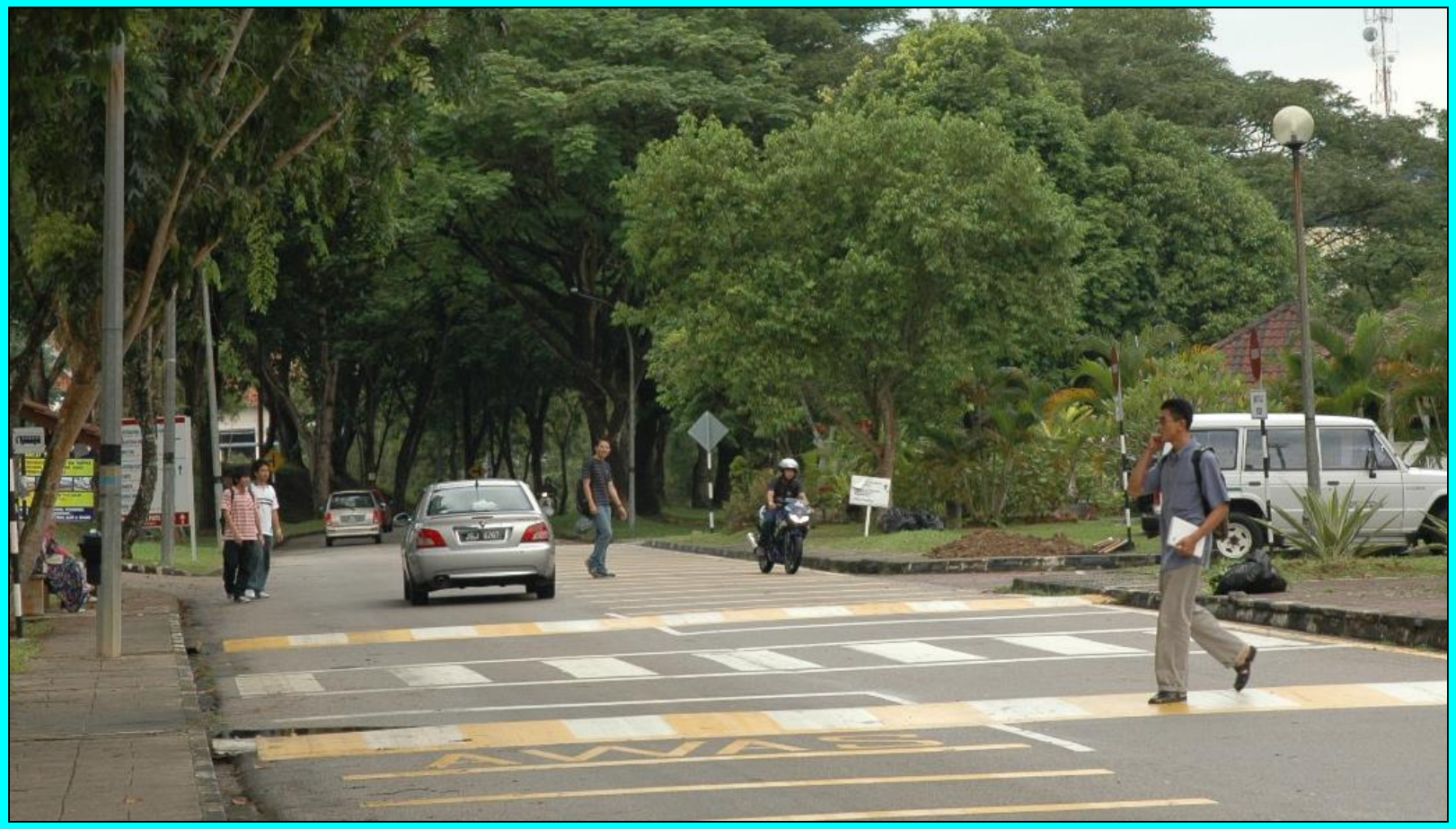
WEAKNESSES OF THE PLANNING AND DESIGN OF CAMPUSES IN MALAYSIA FROM SUSTAINABLE DEVELOPMENT POINT OF VIEW

Findings from research conducted on four government funded universities in Malaysia :

first generation, second generation, third generation university and a university of international status.

Planning

◎ Sporadic planning, no continuity and lacking in contextual considerations. Sprawling low density development increase distance to travel and consumes more energy more transportation.



◎ Conflict between vehicular and pedestrian traffic. Low priority given to pedestrians needs. ◎ Congestion due to priority given to motorised vehicles. ◎ Road and junction design that is not complying to acceptable planning standards.

◎ Inappropriate location of communal facilities and amenities and not strategic enough to facilitate its access by all students.

EG.: Placing the mosque at the hill top will create inconvenience to the users and discourage them from using it.

- The place identity is not clear and the lack of clarity in the signage makes way finding difficult in certain universities.

- The campus structure is weak because of the lack of clarity in the hierarchy of campus spaces and road networks
- Confusing road system and indistinct signboards

Design

- Not permeable with limited entrances for public visitors.
- Not visitor friendly due to closed campus design

The design that is not friendly to disable people. Poor design in terms of continuity and accessibility . Sustainable campus should be inclusive and employs universal design principles.

- Poor consideration of the context
- The design is not responsive to the topography. Unnecessry cut and fill. Building design that is not energy efficient and highly dependent on mechanical ventilation
- Buildings are built in an individualistic and monumental manner.

◎ Wasting of space. The interior and exterior spaces are not created to provide condusive environment for interaction and leisure. Impose cost on maintaninance.

The landscape elements are not designed based on climatic and comfort aspects. Failed to exploit the local ecology and habitat as its identity. Landscape is not fully utilised and designed as places for interaction, mainly for decorative and symbolic purposes.

The campus spaces are not helping to reduce the stress from studying. The campus life is not attractive and does not reflect the academic community. ◎ Social life that is alienated rather than integrated with the surrounding community. Closed instead of 'open campus' is still being practiced.

- Unsafe environment from psychological and physical aspects because of poor lighting quality at night.

PLANNING AND DESIGN CRITERIA FOR SUSTAINABLE CAMPUS ENVIRONMENT

- Findings are based on bench marking study on world class top universities in
  - Australia :University of Melbourne, Australia National University, Monash University, University of New South Wales, University of Queensland and University of Sydney.
  - Japan : University of Tokyo, University of Kyoto, Tokyo Institute of Technology and University of Osaka

Planning

- Zoning – compact, accessible & permeable
- Structure – clear hierarchy of paths and open spaces.
- Pedestrian friendly environment – walkable
- Exploiting natural resources for recreational facilities and leisure

1. Zoning

◎ Distinct campus structure in terms of the zoning , clear space hierarchy, clear visual units, and separation between vehicles and pedestrian road to increase the walkability, accessibility and to create a strong image.

◎ eg : The dominant main pedestrian walkways creates a distinctive campus structure

University of Melbourne, AUSTRALIA

- Campus zoning must be concerned with certain aspects such as location, population, topography, surrounding use and uniqueness of the ecology as well as natural surrounding. Landuse zoning should be concerned with the relationship between the landuse and there should be efforts to share the facilities with the surrounding community to tighten the bond between communities.

Monash University, AUSTRALIA

- Compact planning that respects the topography and considers the frequency of use to determine the location of clustered buillding, avoiding squander space and encourage the use of facilities.
- EG: Multi-storey parking lot to reduce space usage and visual impact of parking lots.

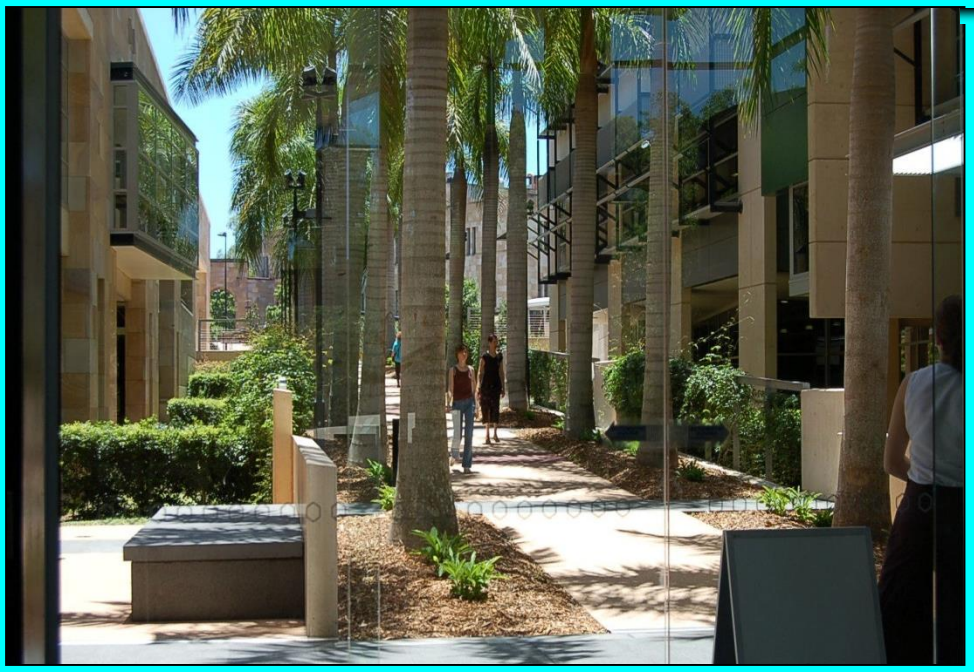
University of Queensland, AUSTRALIA

- **Main campus nodes becomes the campus's pulse, complete with the public facilities like a small town. Small nodes are created in the clustered building area which consist of hostels, faculties, and are linked through pedestrian walkways.**
- **EG : Complete facilities like a small town.**

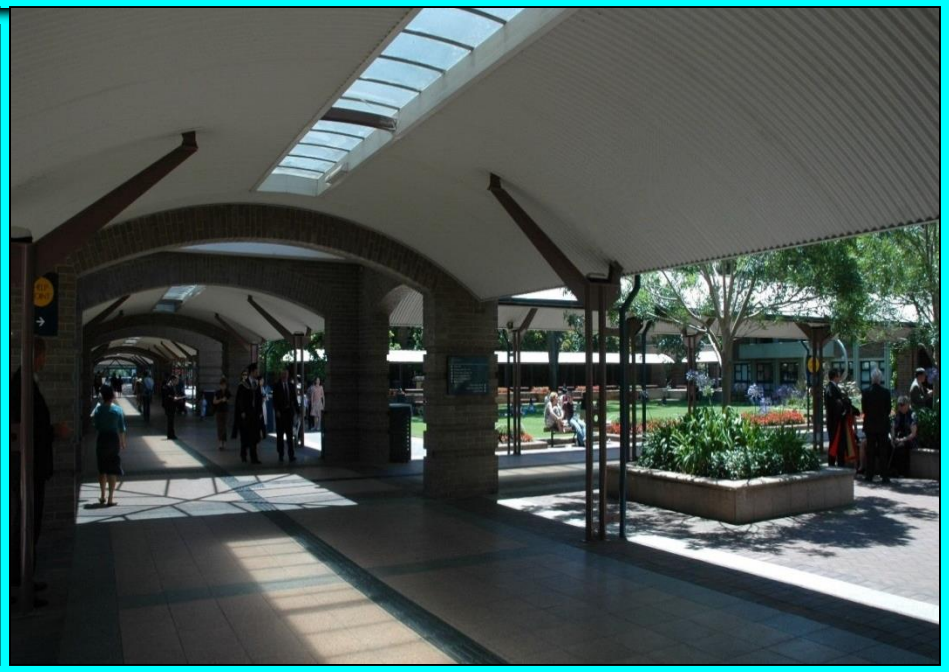
Main open space like a plaza is built as a campus centre for student's assembly or activities

Australian National University, AUSTRALIA

- **Future development and expansion are considered in space zoning and planning as campus development is a dynamic process.**



University of Queensland, AUSTRALIA



University of New South Wales, AUSTRALIA

- Accessibility and safety aspects should be considered in locating the buildings and public facilities.

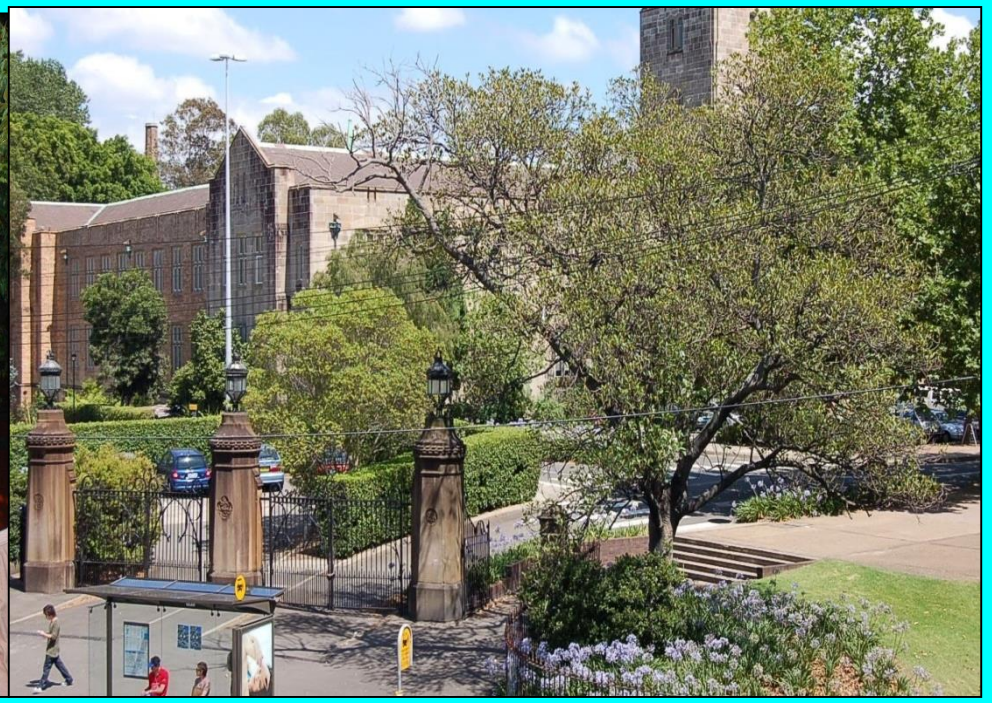
The pedestrian walkways are continuous and responsive to the climate as well as catering for the disable needs.

EG: The walkways are accommodated with roof as shading devices from the sun and rain.

University of Queensland, AUSTRALIA

- Visual quality is considered and should be exploited in the campus planning. Recreational facilities through exploitation of natural resources facilitate social interaction and reduce stress.

University of Tokyo, JAPAN



University, of Sydney, AUSTRALIA

◎ **Main entrance is built with distinct landmark to reflect the campus's identity, visitor friendly, and provides the information about the campus.**

EG : The traditional gate symbolises the identity of the oldest university in Japan.

EG : The uniqueness of the landscape and unmanned gateway at the entrance attracts and welcome the public and visitors into the campus.

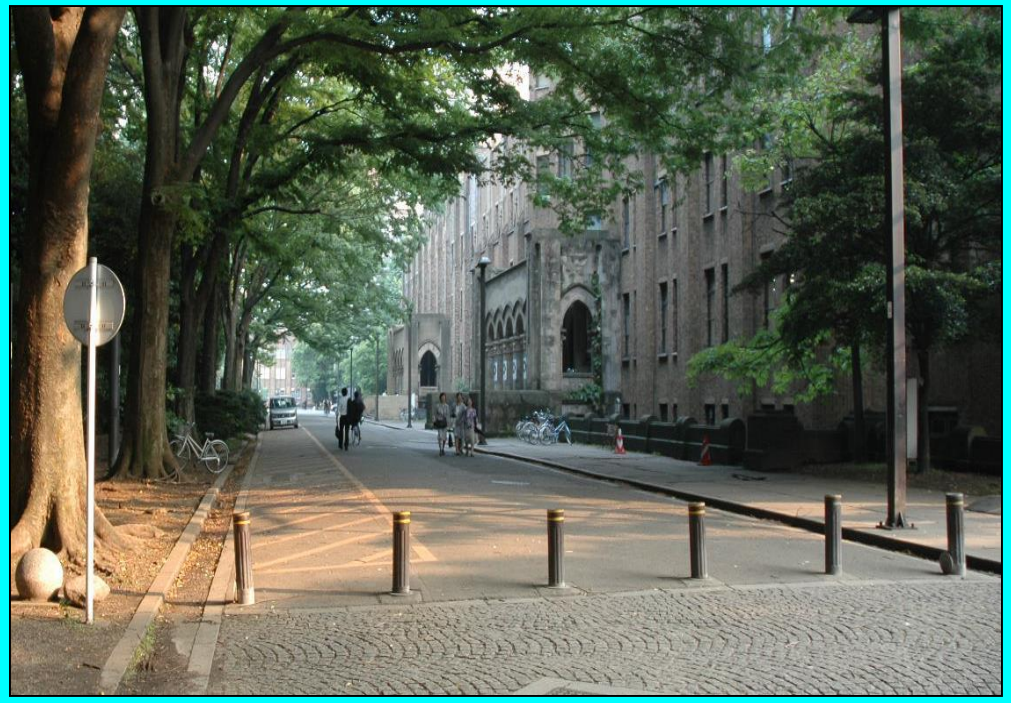
University of Osaka, JEPUN

◎ The pedestrian system in the campus is integrated with the public transport through facilities provided

Australian National University, AUSTRALIA

◎ **The parking areas have positive visual impact and are connected with the pedestrian walways.**

EG : The parking lot is located at the spaces between buildings with minimum impact to the environment through landscaping.



University of Tokyo JAPAN

University of Kyoto, JAPAN

◎ **The pedestrian walkways are used to link the main entrances to building or campus area.**

EG: The pedestrian friendly environment that allows vehicles for access only.

EG : The bicycle parking area is located at the end of the block to ease the users and encourage students to use it.

Design

- Human Scale with activities generated at ground levels.
- Pedestrian friendly environment
- Contextually Responsive
- Clear Hierarchy of Spaces - functional
- Conservation of Heritage Buildings
- Intelligent and Smart building
- Universal Design
- Climatically Responsive

Design

University of Melbourne, AUSTRALIA

Australian National University , Canberra, AUSTRALIA

- **Human scale design.**
- **Distinct hierarchy in the campus space design through the dominant pedestrian walkways in the whole campus.**

University of Tokyo, JAPAN

Institute of Technology Tokyo JAPAN

Pedestrian friendly environment - Dominant pedestrian walkways.

EG : Main pedestrian walkways that connect the main entrance and campus centre. This walkway is located between the main buildings such as library, theater and faculty.

Design

Monash University, AUSTRALIA

- The exterior of the building design reflects the activities inside. Building design that harnest rain water to be used for heating/cooling purposes. Smart building concept that is energy efficient and control access into the buildings using smart card.

Design

University of Melbourne, AUSTRALIA

University of Queensland, AUSTRALIA

- **The building and space design is sensitive to the surrounding and relate to each other in terms of design elements, building material and items to create a sense of unity as a composition**
  - EG : The close relationship between the exterior and interior building's functions.

Institute of Technology Tokyo JAPAN

University, of Sydney, AUSTRALIA

◎ **Sustainable development is emphasized in aspects of durable, energy saving and low maintenance building materials**

EG : Maintenance and renovation/face lift of old buildings instead of demolition and build new

EG : Old buildings are conserved for their heritage value and restored and adapted for new uses.

Design

University of Kyoto, JAPAN

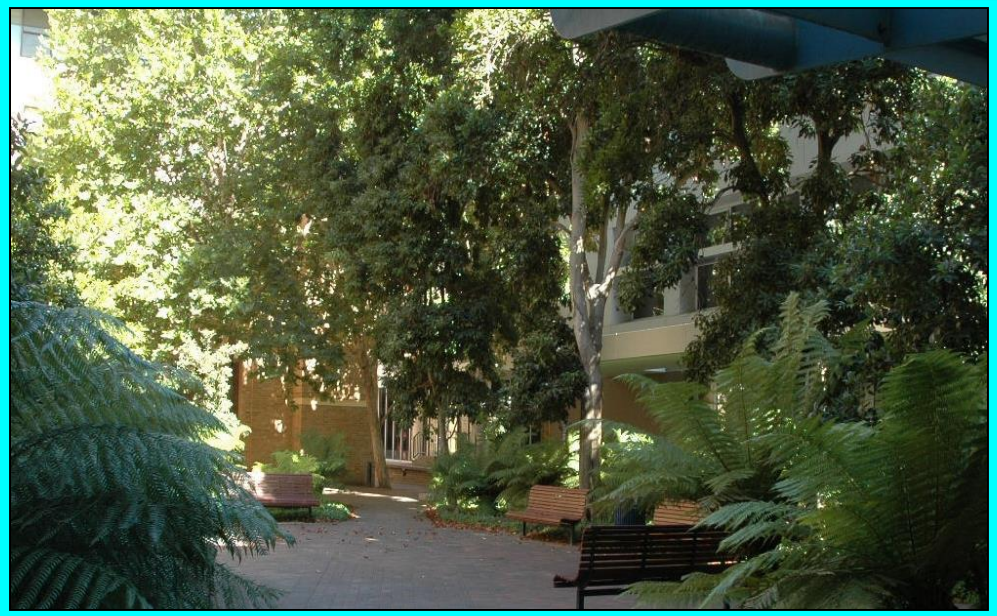
University, of Sydney, AUSTRALIA

◎ The space, entrance and pedestrian design that is sensitive to the needs of the disable.

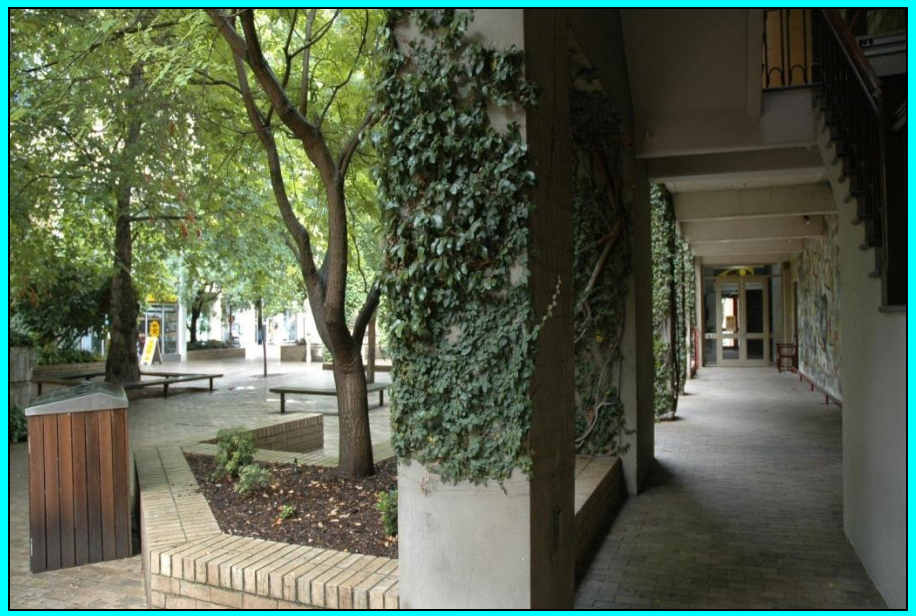
EG : The parking lot and building entrance that facilitates the disable.

EG : *Ramps are provided to facilitate access for the* disable.

Design



University of New South Wales, AUSTRALIA



University of Melbourne, AUSTRALIA

- Spaces between buildings are designed as a connection of the clusters of buildings through the continous pedestrian way that supports the activities. The variety of open spaces is to fulfill the different needs for informal study and for passive and active recreation as well as space for spontaneous interaction.
- Climatic aspect and individual needs for resting as well as public needs for interactions are taken into account in designing the open spaces.

Landscape

- Functional
- Protecting the natural habitat and bio- diversity
- Preserving Heritage Trees
- Durable and Robust Hardscape Materials
- Low maintainance
- Avoid undefined spaces between buildings

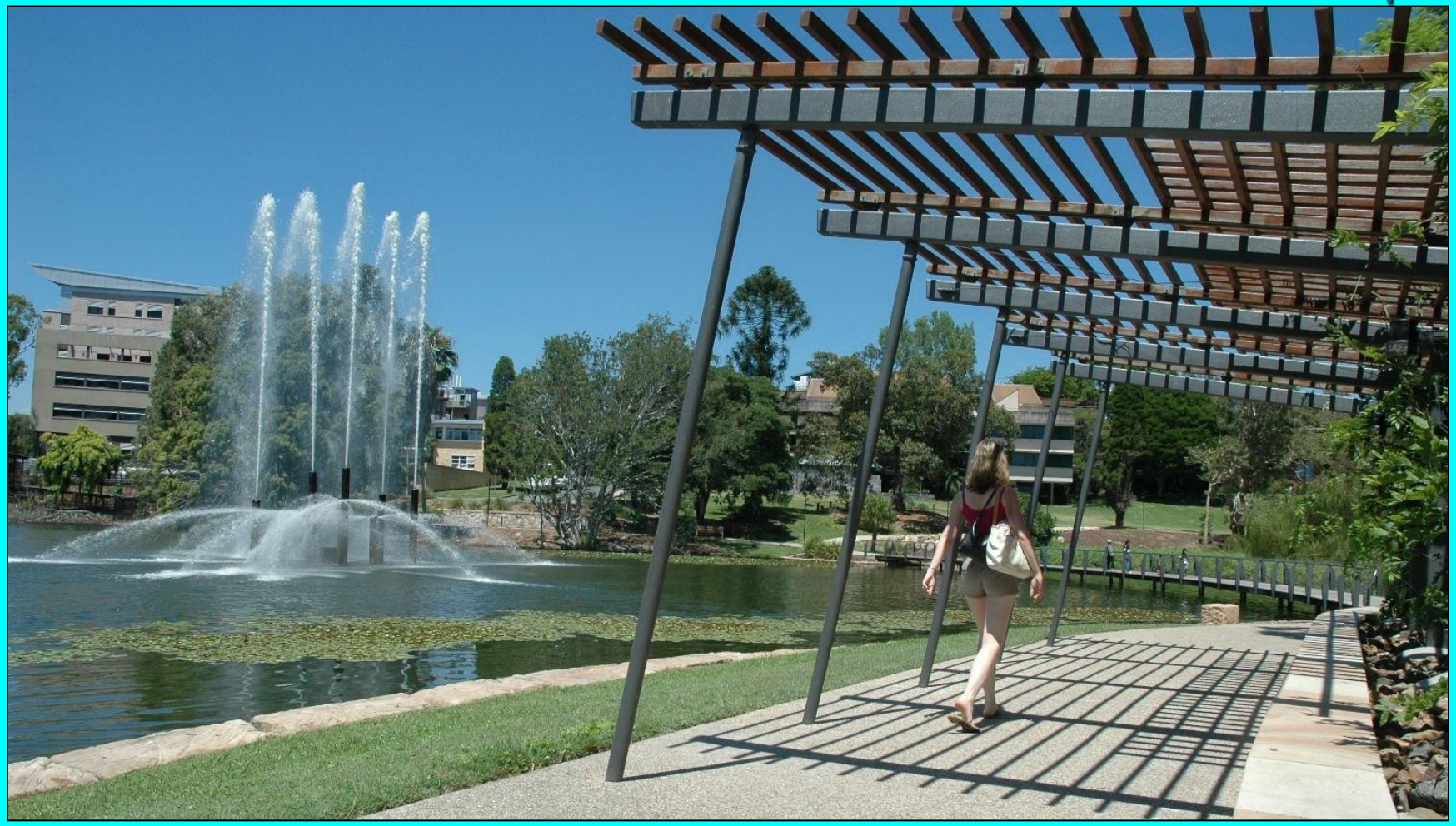
Landscape

University of New South Wales, AUSTRALIA

Australian National University, AUSTRALIA

- Landscape element is used to create an identity in the campus.
- The continous landscaping with the surrounding area as well as responsive connection between old and new buildings.

Landscape



University of Queensland, AUSTRALIA

- **High ecology value and potentials for recreation are the main characteristic of campus landscape. Water bodies should be exploited effectively and used as part of storm water management**

Landscape

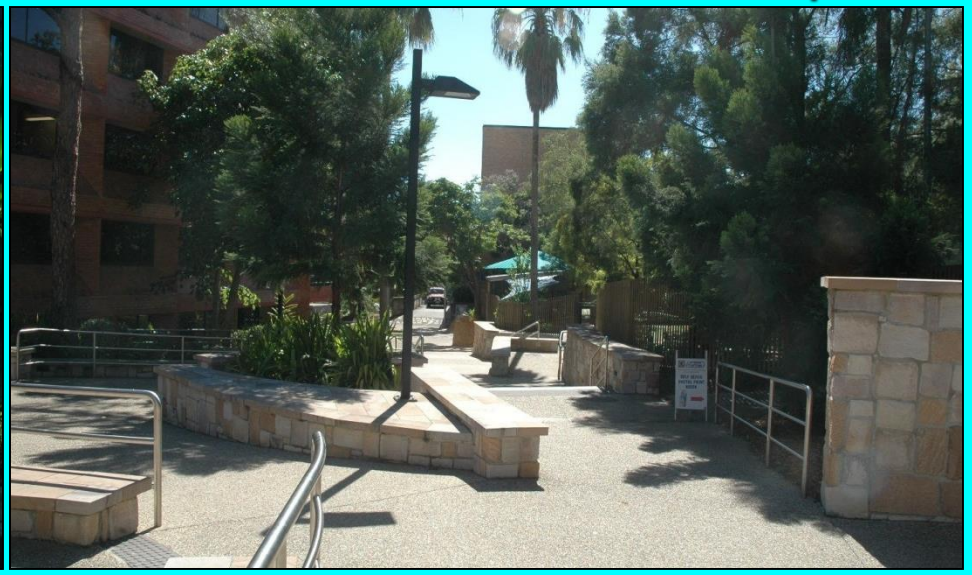
University of Tokyo, JAPAN

University of Tokyo, JAPAN

- **Preservation and conservation of matured trees as part of overall campus planning.**
- **The trees are used to give the spatial impact in determining the main open space, circulation corridor, entrance, visual edges and limit the effects of the micro climate. They also help to strengthen the campus image.**

Landscape

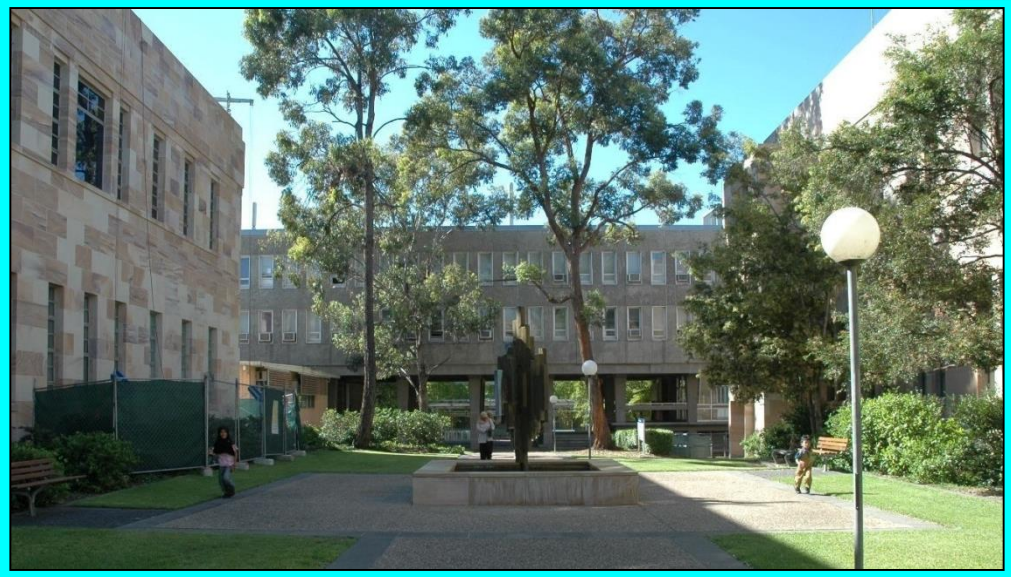
University of Queensland, AUSTRALIA



Tokyo Institute of Technology, JEPUN

◎ Building and landscape planning and design that have a sense of uniformity and intergrated with each other.

Landscape



University of Queensland, AUSTRALIA

University of New South Wales, AUSTRALIA

- The soft and hard landscape are given same emphasis as the surrounding development in terms of scale, size and details.
- Design that allows creative, responsive and easy maintainance.
- The selection of soft and hard landscape material should come from tough and easy-to-maintain material.
- Landscape design that suits the road hierarchy and functions

CONCLUSION

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A university campus should be planned and designed to create an environment that is condusive for learning and living thus more sustainable. This can be achieved by creating an environment that facilitates the pedestrian movement within the campus as well as encouraging interaction. The design should be responsive to the local climate to be energy efficient.

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Students's opinion and local site characteristics must be taken into consideration in planning the campus structure. It is important to understand the behaviour of the campus users so that a sustainable culture can be introduced to suppport the design. The design must be functional and meet the needs of the users as an environment that is inconvenient to the users can be stressful, thus socially unsustainable.

The End