

Chapter 9: Synthesis

The land-use plan proposed in this chapter only concerns the physical aspects of the traffic environment. Issues of public transportation, as well as the organizational and attitudinal environment are considered separately as part of the suggested pilot project.

As a first step of the synthesis the result of the preceding analysis provides underlying objectives and guidelines for traffic management. Its aim is to suggest a master land-use plan that can help to implement long-term objectives in traffic management, so that the sum of all individual measures contributes to the whole. The second step of the synthesis is the pilot project, suggesting how to start the actual transformation of traffic management. It should be possible to implement the basic changes suggested in the master plan within a period of 3 semesters. However, the physical adaptation of the main traffic arteries suggested here should take longer and be subject to a revision after the implementation of the pilot project.

Some particulars of the master land-use plan proposed here should be adapted if necessary, as the response to the first part of its implementation, e.g., the pilot project, might suggest necessary changes. As the physical environment offered to users also has influence on their environmental perception, new opportunities or restrictions in traffic management might be a direct result of each implementation step. Guidelines and factors that need consideration in the beginning of the project might become obsolete or wrong later on.

As successful traffic management depends to a very high degree on people participation, it has to develop parallel to and in accordance with user response from the very beginning of the project. Underlying objectives and guiding principles for the traffic environments are therefore suggested on a short-term basis together with the pilot project.

Underlying objectives:

From the analysis, the following underlying objectives for traffic management can be derived:

1. Provide an increase in human space over traffic space.
2. Provide a traffic environment that has less air-, noise-, and visual pollution.
3. Decrease the number of vehicles at campus.
4. Promote walking as the general form of short distance commuting.
5. Implement PPP/UPP.

Guiding principles:

The following guiding principles for traffic management can be derived:

1. Unless it creates direct contradiction to or conflicts with the underlying objectives, always put the user convenience within the traffic environment first.
2. Traffic measures should consider all user groups equally.
3. Traffic measures should give all user groups sufficient time to prepare for their impact.
4. Utilize people participation as much as possible.
5. Traffic measures should always have an educational effect.
6. Always promote the environmentally more efficient form of transportation.

Accordingly, the land-use master plan is based on the following approach:

1. Create a physical environment that acknowledges current user needs, but allows subsequent step-by-step implementation of the underlying objectives with as little disturbance to user convenience as possible.
2. Acknowledge the vehicle of choice of user groups in accordance with the guidelines, but simultaneously create conditions for an environmentally sounder alternative in transportation.
3. Conceptually separate the three main forms of traffic (motorbike, car and walking) in order to achieve a higher flexibility and effectiveness in subsequent traffic measures.

4. Provide conditions that allow future growth of the university and an increase in users without compromising the results of applied traffic measures.

The land-use plan uses the following means:

1. Restrict access to some areas, but do not initially restrict the use of any particular vehicle.
2. Create a silent zone to promote non-motorized commuting.
3. Utilize all currently available space for parking, but separate them according to type of vehicle.
4. Build roofed-over walkways as a first alternative for commuting.

9.1 The Physical Environment: General Concept and Traffic Arteries¹²¹

Any change in the current system of land-use at any point at campus always has a direct influence on traffic flow patterns of the whole system, as can easily be seen when construction is going on. It is therefore necessary to start any proposal for change with a basic concept of how to direct traffic flow in order to keep impact at a minimum and if possible to solve some of the traffic problems as outlined by the answers to the questionnaire.

Here in particular the fact that 83% of the participants think that traffic problems mostly occur during certain hours. This rush hour or peak-hour phenomenon has various reasons, two of which are

- a limited carrying capacity of roads and the infrastructure in general and
- simultaneous commuter movement during certain hours due to administrative planning.

9.1.a. Road Carrying Capacity

According to the questionnaire of the preliminary paper, the physical conditions and characteristics of the roads are one reason for traffic obstruction. Besides needed repairs, a traffic flow system should try

- to avoid intersections
- erect clearly understandable traffic signs in sufficient numbers
- straighten roads to avoid unnecessary bends, and last but not least, widen roads, especially at critical traffic nodes as described in the assessment.

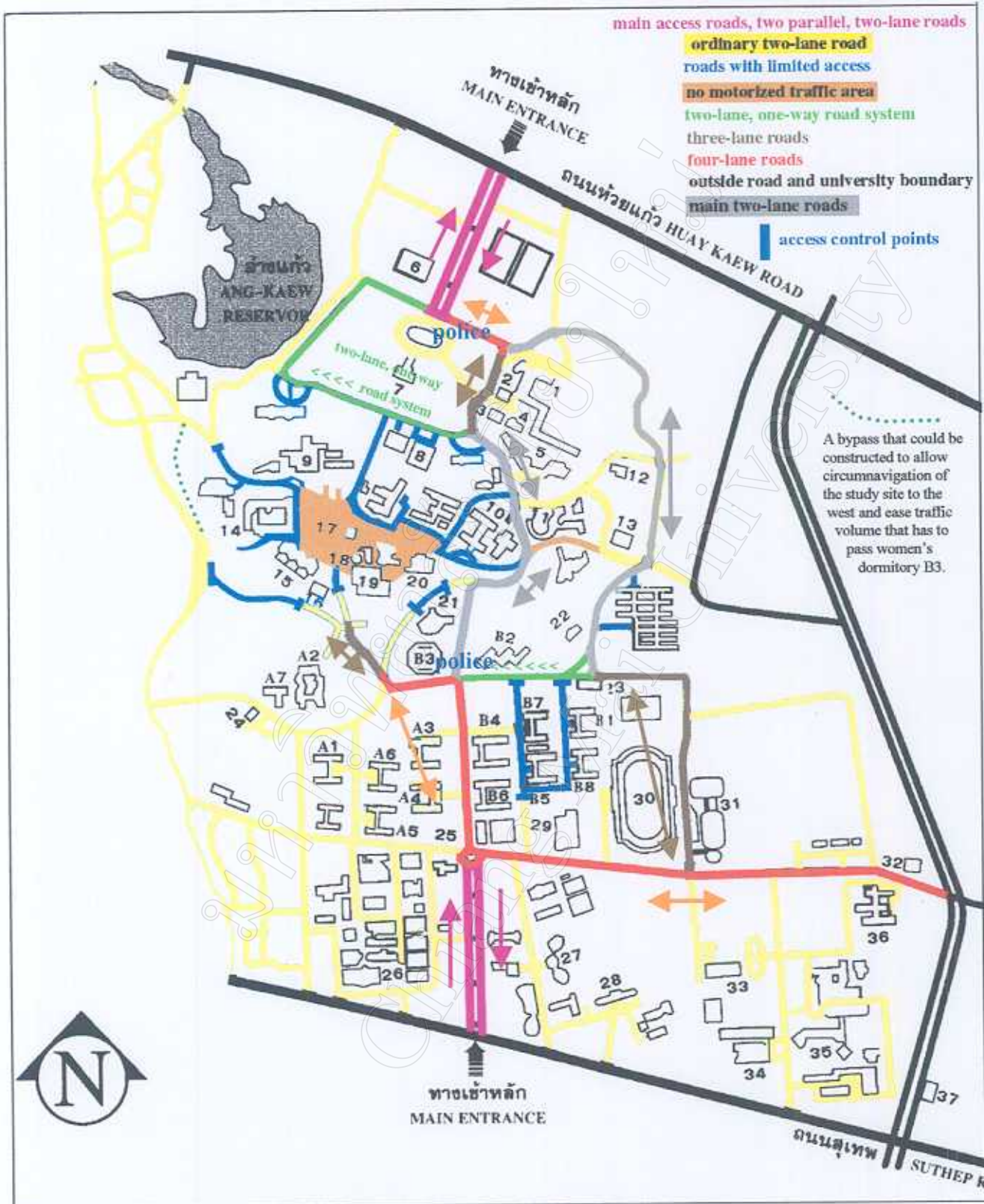
This paper will not recommend the installation of traffic lights, in accordance with results from the questionnaire and due to the costs they impose on the university and due to the presence of traffic police at critical hours to help direct traffic. The presence of police is important, especially considering the fact that 73% think that traffic problems also occur because of a lack of respect for traffic rules. Currently the police are directing traffic at the intersection next to the women's dormitory B3. According to the traffic flow system proposed here, police presence should be increased by also covering the end of the main entrance lanes (see map 7).

Road and traffic signs should be erected above the roads with clearly marked arrows giving directions concerning the area being approached and areas the roads are leading to.

Concerning the straightening and widening of roads, this paper proposes some changes as shown in map 7.

¹²¹ The campus currently experiences a period of constant change. Some areas shown in the maps regarding the land-use master plan might have changed in character during the last six months while this study was conducted. Whenever possible, the maps were kept up to date. However, minor inaccuracies that might be found in some colored areas within the maps have no influence on the basic concept introduced.

Map 7: Main traffic arteries



- The three lane roads proposed for the stretch between the women's dormitory 3 and the library and for the stretch running past the stadium operate on a time related basis. Two lanes to bring traffic into parking areas in the morning hours and after 13.30 hours two lanes to lead traffic out of parking areas.

- The three lane road proposed for the stretch parallel to the main administration and the post-office / bank service area has a permanent two lanes going north to south, one lane of which only feeds traffic into the one-way road system to the north of the target area.

This paper proposes the introduction of more four-lane roads (see map 7). At densely populated areas road bumpers or turtles should be installed to slow down traffic, so that the increased carrying capacity of the roads does not result in faster driving, thus raising the noise pollution level.

The adaptation of traffic arteries and road carrying capacity is needed to at least some extent in order to provide traffic channels that are adequate for the expected change in traffic flow after a silent zone has been fully introduced to campus (see chapter 9.1.c).

9.1.b Simultaneous Commuter Movement

Classes generally start between 8 and 9 o'clock in the morning and last for 1.5 to 3 hours. After that students and teachers very often have to change location to other classes and lessons. Adapting administrative course planning to avoid unnecessary change of location can solve this problem. However, considering the size of the university, this might not be easily achieved or at least take some time to implement through training and communication improvements between the university departments.

An easier way might be to consider the different groups of students, e.g. have all Master and doctoral student classes start at 8 o'clock with 1.5 to 3 hours teaching periods following. The bachelor degree students would start at 9 o'clock with following normal teaching periods. The effect desired is to extend the period of "peak traffic" and have less commuters enter the roads at the same time. The number of Master and doctoral students is relatively small, accounting for about 17% of the student population at the target area. However, 17% less traffic during the main peak-hours would represent a significant improvement compared to the current situation.

9.1.c Silent Zone – A Zone Free of Motorized Traffic

The questionnaire of preliminary paper 1 indicates that campus users would welcome an increase in human space available for recreational and relaxation purposes, as well as the introduction of a noise and air pollution free zone. The proposed establishment of a silent zone in the questionnaire of this study was approved by 79.8% of participants in the following location:

- **The location**

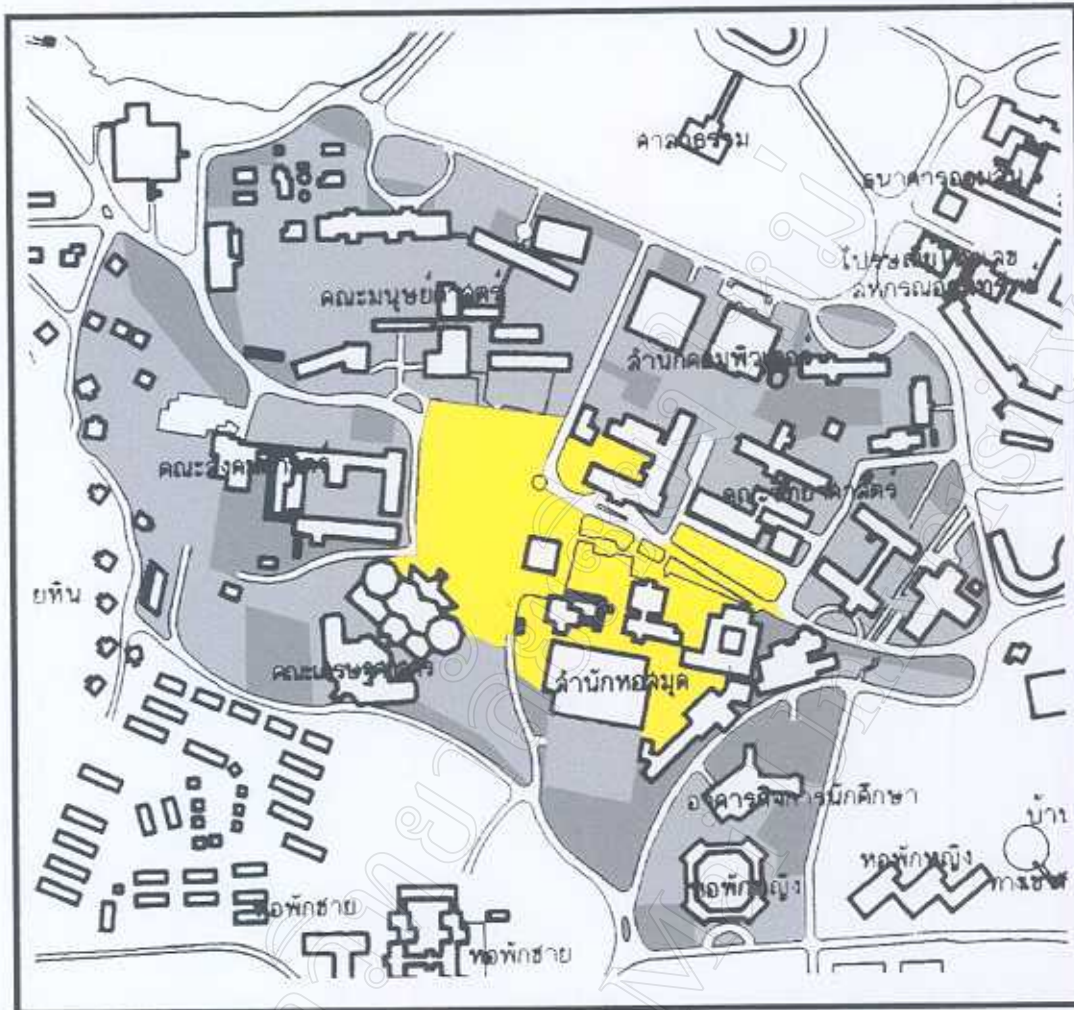
The current center of the study site is in its layout conceived as a square adjoined by buildings of faculties, the library, the exhibition hall and, a little off to the West, the student registration offices. The land area in front of these offices is already free of through-traffic as it is part of the traffic calming area of the Faculty of Science. Besides those areas, the silent zone would include the transition zone directly West, North and East of the main library and the open yard of the department of geology (see map 8).


- **Traffic rules at the silent zone**

No traffic and parking would be allowed within the area, with the exceptions of:

- Bicycles
- Maintenance
- Emergency vehicles
- A small area to the east for parking
- Pedestrians have right of way

Map 8: the silent zone



 Area for the suggested silent zone

• General concept and appearance

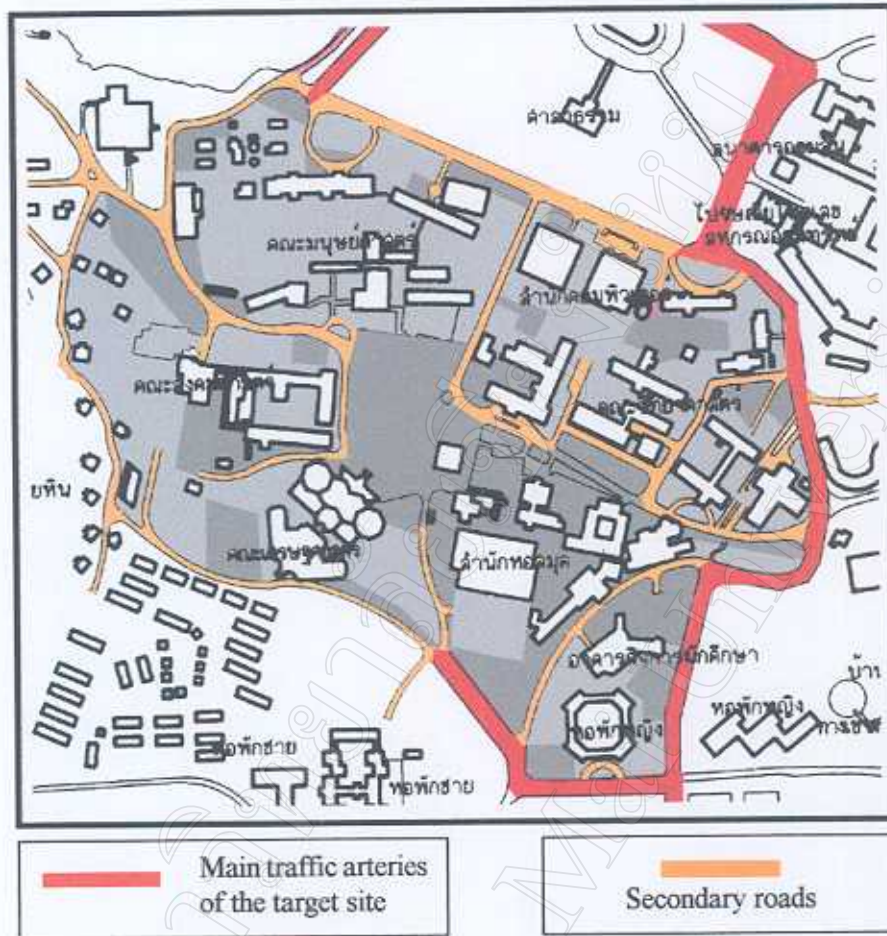
After removal of the current parking lots, trees and greenery are integrated into an area that should be marked by the same surface material and is designed as a meeting spot. It offers sufficient open space for all kinds of activities, as well as benches, chairs, and salas. The silent zone is surrounded by roads with limited access, thus keeping surrounding traffic to a minimum. The now vacant building of the department of architecture (to the South-West of the plaza) could be integrated into the concept as a multi-purpose building.

9.1.d Roads

Introducing a silent zone to the study site will effectively cut all through traffic at the premises. The wider dark red roads of map 9 represent existing roads that are used as main traffic arteries to direct traffic from and to the area. The smaller roads in a lighter red are secondary roads that will be used to direct traffic to parking lots. Those secondary roads that are within the target area or directly adjacent will feature limited access. Limited access should be in effect between 6 a.m. and 6 p.m. only, as some classes are held in the later evening hours, students gather at the faculty student rooms and frequent the library. To park

closer to destination buildings during these hours will increase safety for commuters, as walking distances to the parked vehicle are shorter.

Map 9: Proposed Roads at the study site



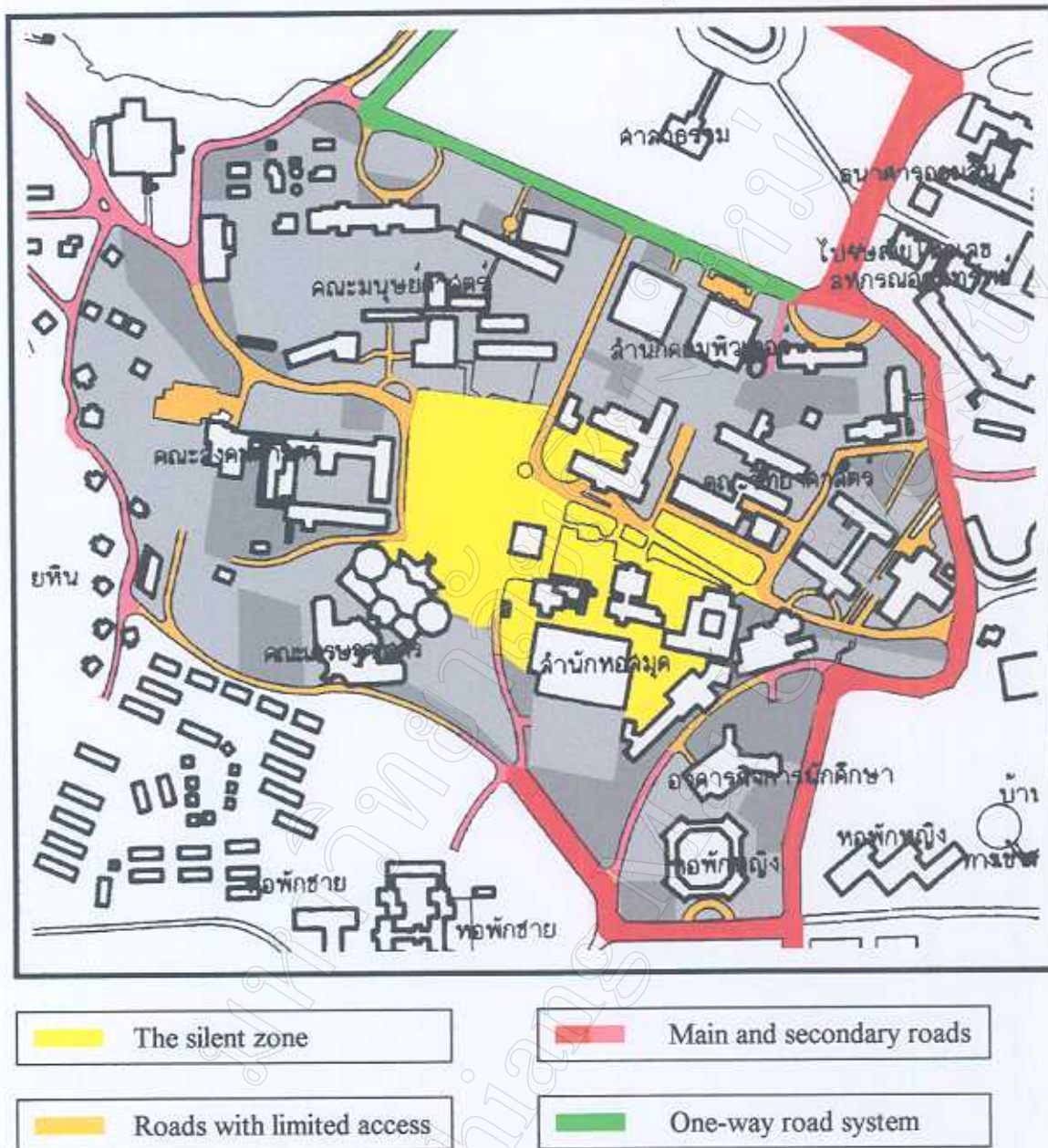
9.1.e Roads With Limited Access

The central silent zone can be approached directly only by roads with limited access. Right of use is reserved for:

- Teachers
- Administrative personnel
- Maintenance personnel
- Emergency vehicles
- Disabled people (with special permission)

The purpose of all roads shown in map 10 is to lead traffic to designated parking areas, except for the main road to the West, which will also be used for through traffic to other areas at campus.

Map 10: Roads with limited access



9.1.f Proposed Traffic Flow System

As indicated by the pointed arrows, all roads can be used in two directions, with the exception of the one-way system to the North (see map 11).

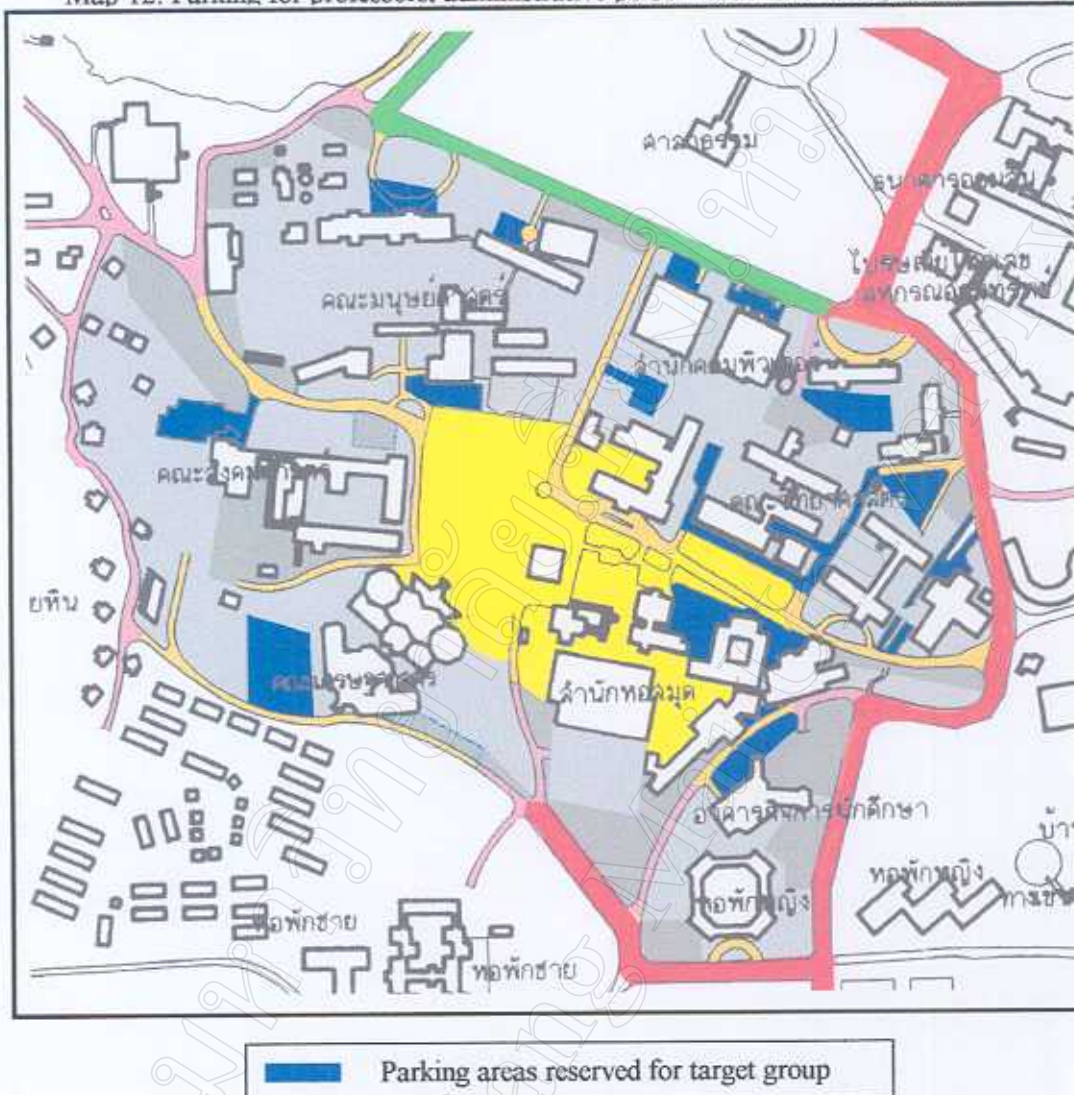
This system leads into an open traffic loop back to the target site around the "sala tham" or to the main university entrance/exit.

The limited access road to the South-West in front of the faculty of economics will effectively stop ordinary through-traffic to the western (open access) secondary road. This is a necessary measure to protect private housing along this road from an increase in traffic, as access to the

9.1.g Proposed Parking Areas

- Professors, administrative personnel and disabled people

Map 12: Parking for professors, administrative personnel and disabled people



All parking areas designated for this group of users already exist at the premises, but are currently mostly open to any user. They consist of properly constructed parking lots or areas allocated for road shoulder parking. These areas should be reserved for professors, administrative personnel and disabled people.

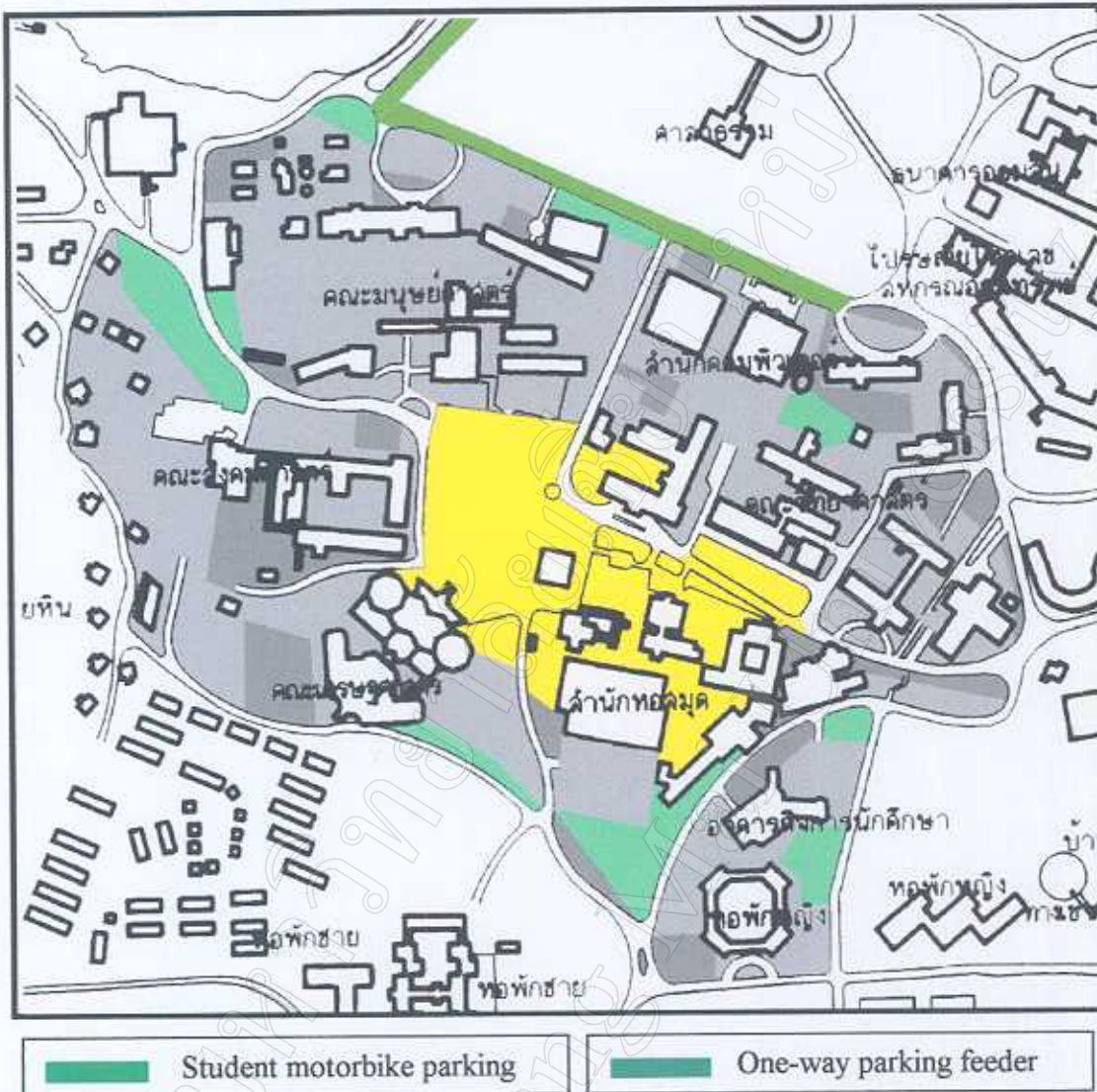
To increase effectiveness of the traffic handling capabilities of a concept built around a silent zone (central plaza), it is important that users find a parking lot quickly and without unnecessary movement of vehicle. Each user of this target group should therefore be allocated his personal parking lot, which stays vacant if not used by its registered user.

- Students' motorbike parking

As the motorbike is the by far most popular mode of transportation at campus and has the largest number of vehicles, the area designated for parking must allow for this fact.

South to the main library is a major motorbike parking area, as it needs to allow for visitors to the library and the administration buildings.

Map 13: Student motorbike parking



All of the area designated is already used for parking. However, in many instances this means “wild” parking on land that is originally intended for other, mostly recreational purposes in form of greenery and park-like plantings.

Those areas can be transformed into proper motorbike parking lots with only minor or no damage to trees and shrubs, giving shade to the parked vehicles and the target site.

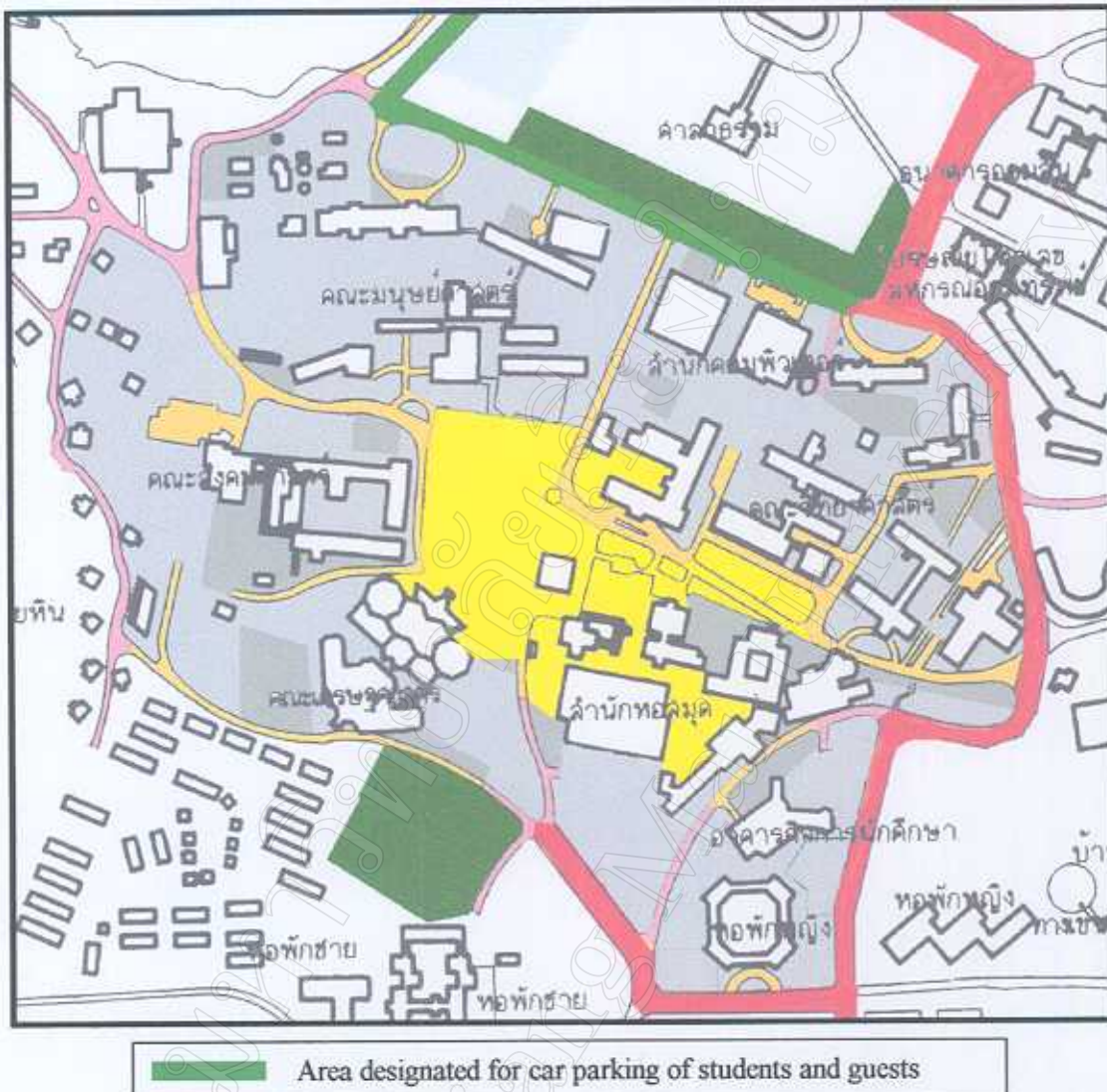
- Students and visitor/guest¹²²-car parking

Almost all of the area designated is already used for parking. However, in many instances this means “wild” parking on land that is originally intended for other, mostly recreational purposes in form of greenery and park-like plantings.

¹²² For guests of the university, like for examples lecturers, please see ‘university and faculty reserved parking’.

Those areas can be transformed into proper car parking lots with only minor or no damage to trees and shrubs, giving shade to the parked vehicles and the target site.

Map 14: Student and visitor-car parking



A future car-park extension might be the area directly underneath the dam of the university water reservoir, which is as yet not utilized for parking, as there are no access roads. An estimated 300 – 400 cars can be parked there.

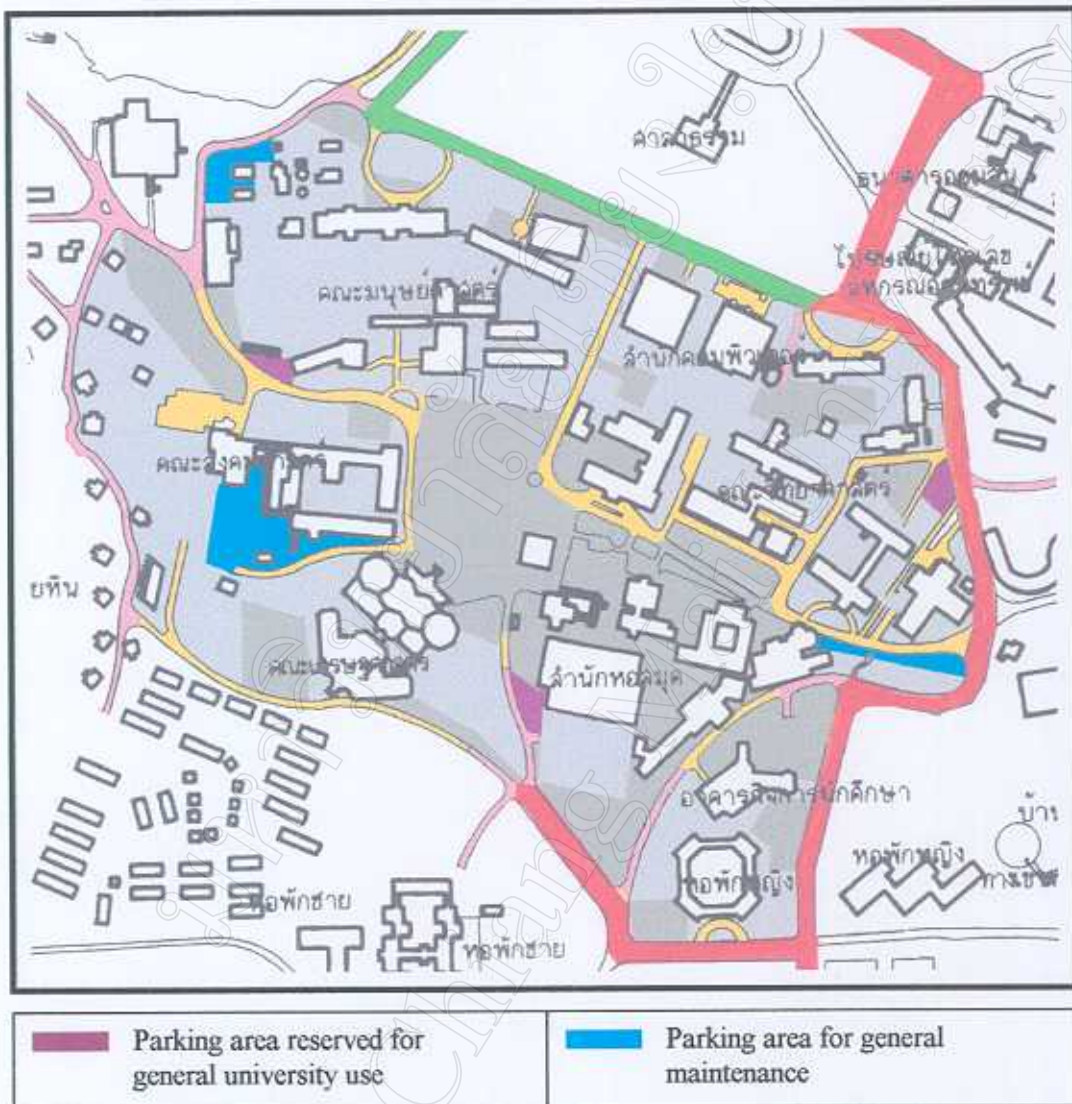
Changes to the current landscape can be kept minor. Investment costs depend on drainage needs and more detailed research is needed here. Although the suggestion of adding parking lots to the campus is contrary to the result of the questionnaire, an alternative area close to the target site might have to be allocated in the future to allow further growth of the university.

- **University and faculty reserved parking, maintenance**

Maintenance plays an important part in the up-keep of the campus. The designated area is already used for this purpose, although in some places not especially reserved. By keeping the currently used lots for maintenance, disruption of the work routine is kept as small as possible.

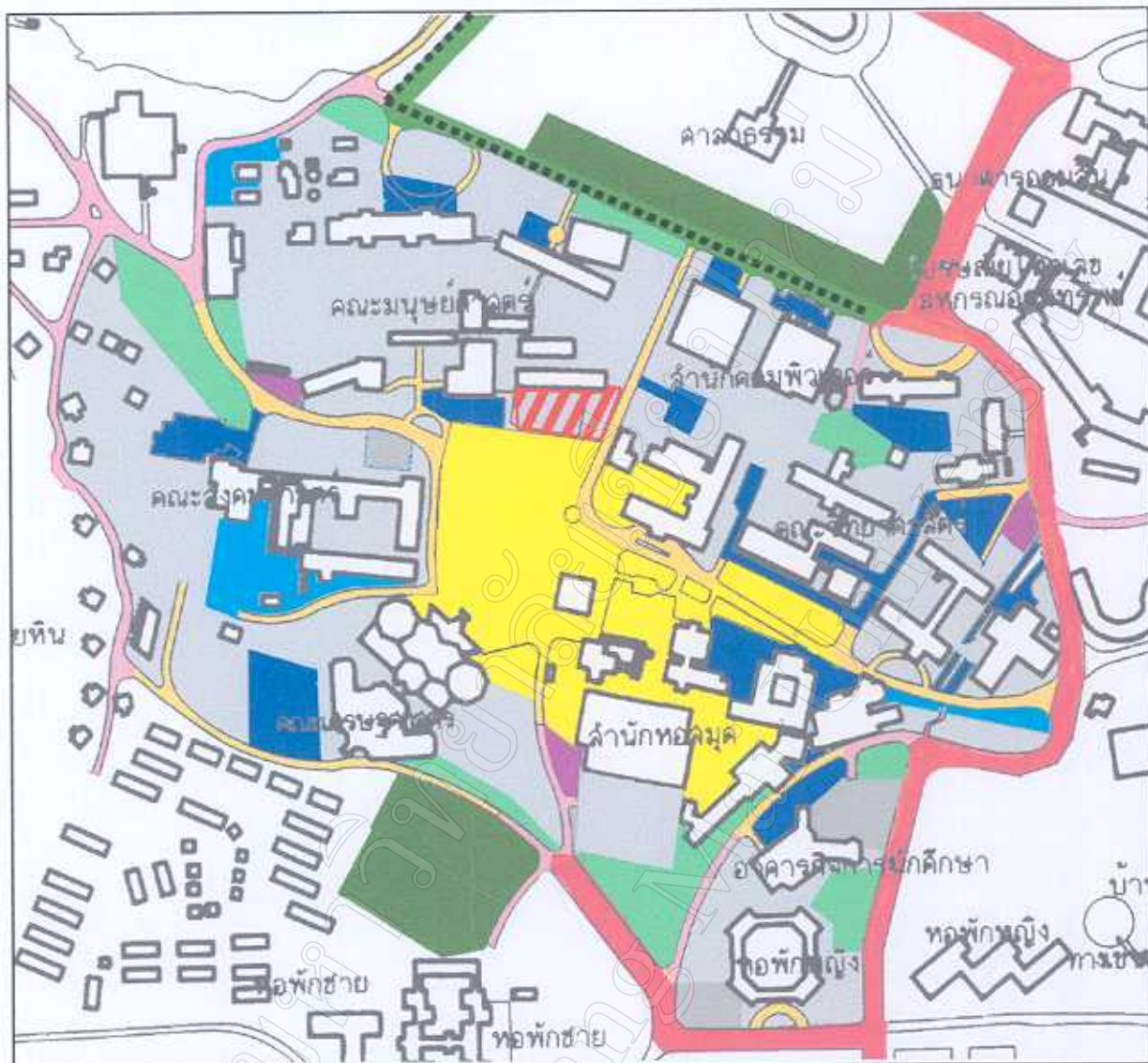
Three smaller areas are proposed for university related activities of the administration and faculties. As all other parking lots in limited access areas are registered with their users, it is important to keep some areas available for commuting university personnel or special guests like lecturers, who sometimes have to carry equipment and need a more convenient parking location closer to buildings. The area here is merely acknowledges the fact of this kind of visitor, the actual area chosen should be decided by the faculties and could well be part of teachers parking.











Map 15: University and faculty reserved parking, maintenance



- All parking areas around plaza

Map 16: Summary map of all parking areas



- | | | | |
|---|---|---|---|
|  | The central plaza |  | Main and secondary roads |
|  | Roads with limited access |  | One-way road system |
|  | Parking area reserved for general university use |  | Parking area for general maintenance |
|  | Area designated for car-parking of students and guests | | |
|  | Parking areas reserved for teachers, administration and disabled people | | |
|  | Student motorbike parking |  | Planned to be utilized for teachers and personnel |

9.2 The Pilot Project - PPP/UPP at Campus

Before discussing detailed measures for a pilot project and accompanying changes to the traffic environments, it is important to define the three Ps of PPP/UPP in the context of university traffic management and how they are applied.

Who is the Polluter?

Every user of the campus traffic infrastructure is equally considered a polluter. This definition is based on ecological principles as discussed in chapter 3.2.f and does not consider non-motorized commuting a form of pollution free transportation.

What type of pollution is considered?

There are, however, two types of pollution:

- Naturally occurring pollution, e.g., all forms of transportation that have the user itself as sole energy source, like walking and bicycle riding. Pollution that occurs during the production of transportation accessories and tools, like shoes and bicycles, are not considered in this frame for PPP/UPP.
- Artificially occurring, man-made pollution, e.g., all forms of transportation that utilize a secondary energy source, like motorbikes, cars, etc. and again pollution occurring during the production of transportation tools are not considered.

What form of pollution is considered?

There are three forms of pollution:

- Minimal pollution, e.g., the pollution that has to occur while a transportation environment is installed, like roofed over walkways, parking areas and roads, and the pollution that has to occur while using the offered transportation environment in an ecologically most efficient way.
- Excessive pollution, e.g., pollution that is in excess of the amount of natural, artificial and minimal pollution that actually need to occur in order to achieve efficient transportation.
- Residual pollution, e.g., is a particular form of excess pollution and occurs in spite of minimal pollution achieved, for example, a user who damages greenery while using a bike or walking.

Who pays?

The Polluter is defined in accordance with the OECD recommendations: ‘...any person who directly or indirectly causes deterioration of the environment or establishes conditions leading to its deterioration, is considered polluter.’ Regarding traffic management, this would include commuters on foot and bicycle, as waste, e.g. pollution, is created during any act of transportation.

How do polluters pay?

According to the suggested forms of pollution to be considered, the study suggests two types of fees for economic internalization of the traffic environment (external tools):

- A basic fee to cover natural and minimal pollution, and
- A Pigouvian taxation fee that covers artificial, excess and residual pollution.

The basic fee:

The basic fee aims at creating an independent and reliable budget for environmental measures to:

- Repair environmental damages that have occurred in the past.
- Transform the current transportation environment in accordance with definitions of sustainable transportation and development.

- Increase traffic efficiency through improved design, designation and concepts of density.
- Integrate People Participation and educational measures as a standard feature of the attitudinal traffic environment.
- Sustain an independent body on traffic issues at Chiang Mai University.

The Pigouvian taxation fee:

Based on the 'AREA' design criteria of PPP/UPP, the Pigouvian taxation fee aims at modifying consumer behavior through introducing market forces to an internalized consumption of resources of "The Commons". With a successful implementation, the budget created by this fee should become smaller over time.

Ambient standards applied for the Pigouvian taxation fee:

The ambient standards applied in PPP/UPP implementation are aiming to

- Achieve sustainable transportation,
- Achieve sustainable development,
- Acknowledge user convenience as expressed in the personal management of transportation by the majority of users at campus,
- Implement the underlying objectives of the land-use master plan, and
- Implement technical vehicle standards.

What internal PPP tools are considered?

Besides the fee system as external tools, a variety of internal, managerial tools are applied:

⇒ **Least-cost End-use analysis**

This tool is applied to find a form of PPP/UPP measures that offer an optimum in economic internalization by considering the net-costs conditions created by the end-use of proposed measures.

⇒ **Systems Based Management**

This form of management works and functions from within the management system applied, e.g., responsibility equals authority and vice versa. Through this tool personnel/people with the most hands-on experience in traffic management have a decisive role and voice to be heard in all units concerning the actual implementation of management decisions.

⇒ **Learning Organization**

The learning organization requires an open-end system of management. Through PPP and PRA end-user experience can influence management decisions regarding traffic directly.

⇒ **Scenario Planning**

Scenario Planning requires each traffic management decision to be part of a whole in all three traffic environments simultaneously, the physical, organizational and attitudinal environment.

⇒ **Design for the Environment**

As the product managed and designed here is the resource land, any change to that resource or its distribution has to be in accordance with the 3 D's of site-planning: Density, Design and Designation.

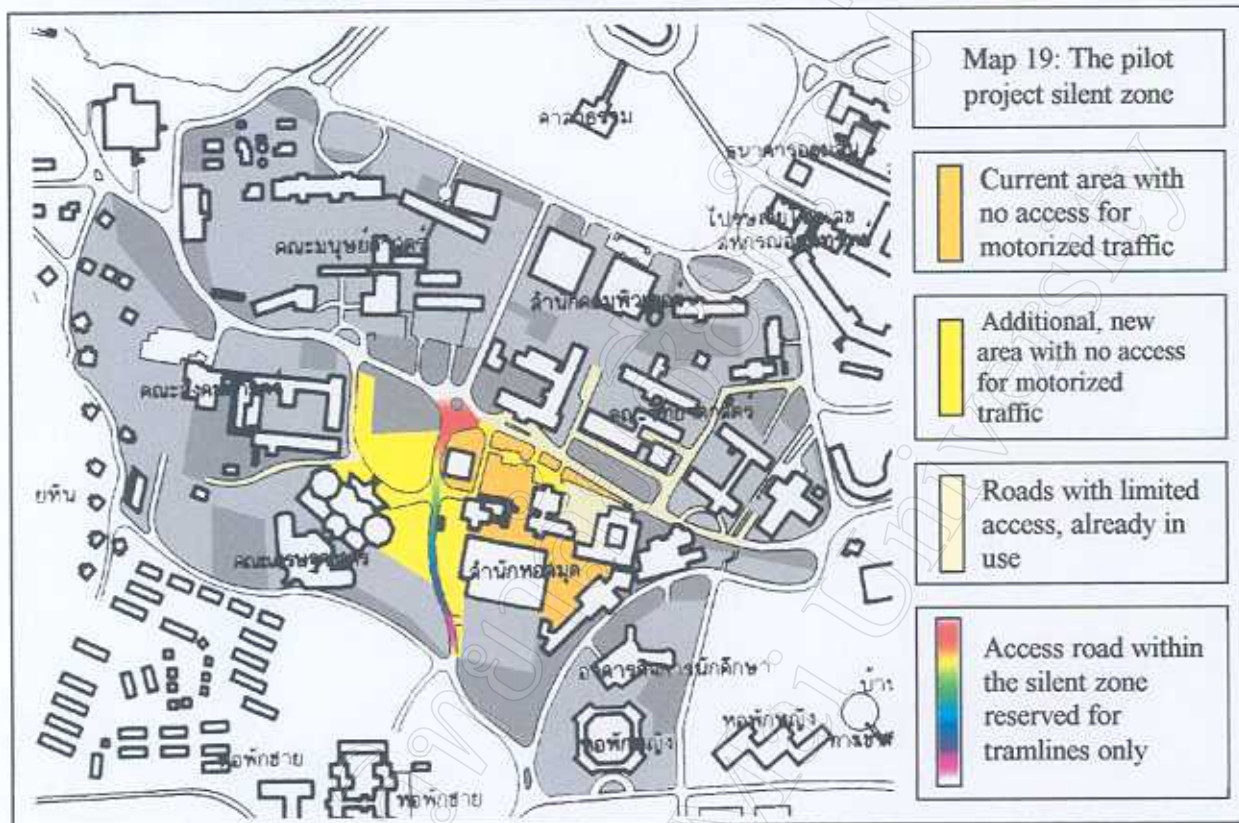
The following forms of transportation are considered for the pilot project:

1. Motorbikes
2. Cars
3. Walking and bicycles (as a form of non-motorized traffic)
4. The tram
5. Red busses

9.2.a The Physical Environment

• Phase 1: The Silent Zone

The suggested silent zone will displace a considerable amount of traffic. To avoid possible negative side effects, such as wild parking, the initial silent zone of the pilot project is smaller than the one outlined in the master plan. The aim is to reserve about as much space for non-motorized traffic as is possible without having to create additional parking areas:



• Walkways

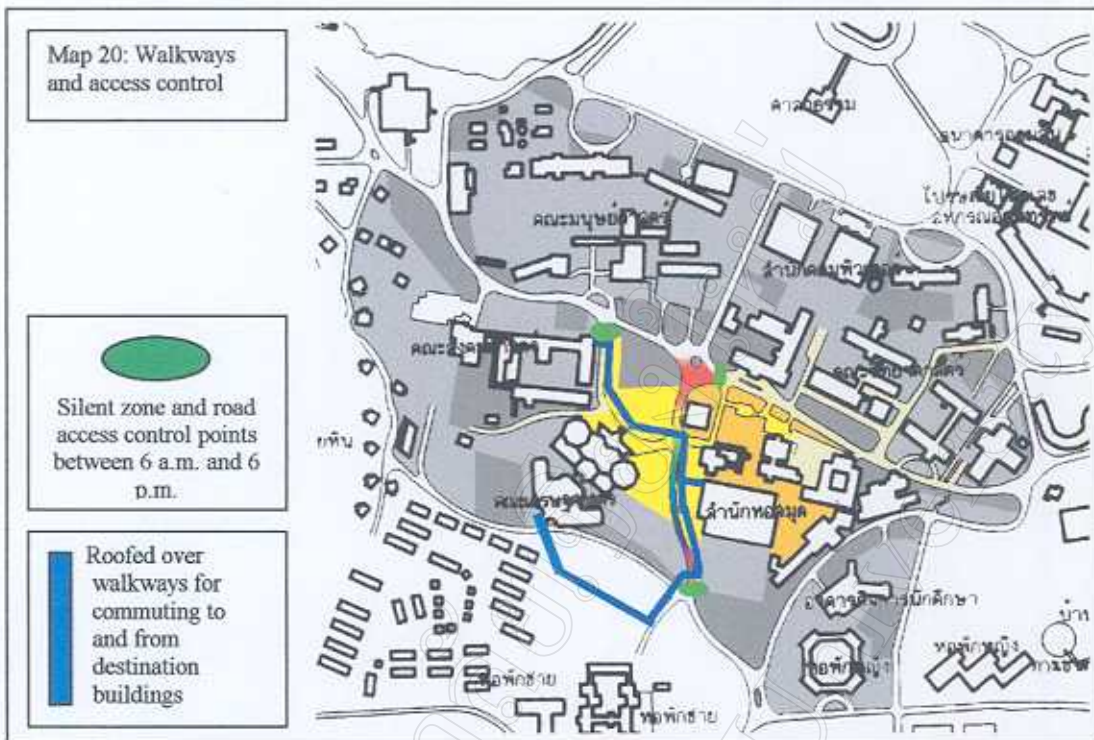
According to traffic management guidelines, user convenience must be a foremost consideration of applied traffic measures. While the creation of an initial silent zone achieves underlying objectives, this measure will force users to park their vehicles in areas slightly further removed from destination buildings, especially the library and to some extent the faculty of social science. To offset for that loss in convenience, walkways should be constructed that are roofed over and wide enough to accommodate a regular flow of walking commuters. In some parts, staircases will have to be constructed, as the south-north approach to the library leads up a considerable slope of 15% and more. To save construction costs, natural and national resources the small concrete blocks now used in the square to provide a surface for parking vehicles can be removed and re-used for the walkway construction. To ensure that the silent zone is only used by pedestrians, bicycles and the tram (opposite the library), control points at roads with limited access have to be established between 6 a.m. and 6 p.m.

• Overall appearance of the area subject to changes due to the pilot project

Starting simultaneously with phase 1, new guidelines in the design of the various transition areas should be applied:

1. Areas not used for motorized traffic related purposes should be transformed into human space by erecting salas, meeting points and individual seating for walking commuters.

- Boundaries between human and traffic space should be clearly marked by newly planted shrubs and plants or other visual barriers that enhance the visual quality of the human space.



- Parking lots should be designated to their purpose by providing an entrance only suitable for the type of vehicle that is supposed to use them.
- Clearly visible and understandable signs in Thai and English should be erected well within the line of vision of all types of traffic.
- Tram stops must be erected.

- The former building for architecture of the fine arts department

Directly adjacent and south of the central square is an empty building that until recently was occupied by the architectural department of the fine arts faculty. Complaints regarding the building range from leaking roofs to very hot conditions during the day.

Currently the building is empty and rapidly degrading. The pilot project suggests transforming the building into an activity center for students and other interested parties. Many student sport activities could be housed here, enhanced by the opportunity to move outside into the silent zone when needed. Also, for example, the bicycle club could build a bicycle depot here for students to rent bikes for one Baht a day. Currently this club is housed at the student parliament, where conditions are rather cramped. The faculty of agriculture might be interested to sell



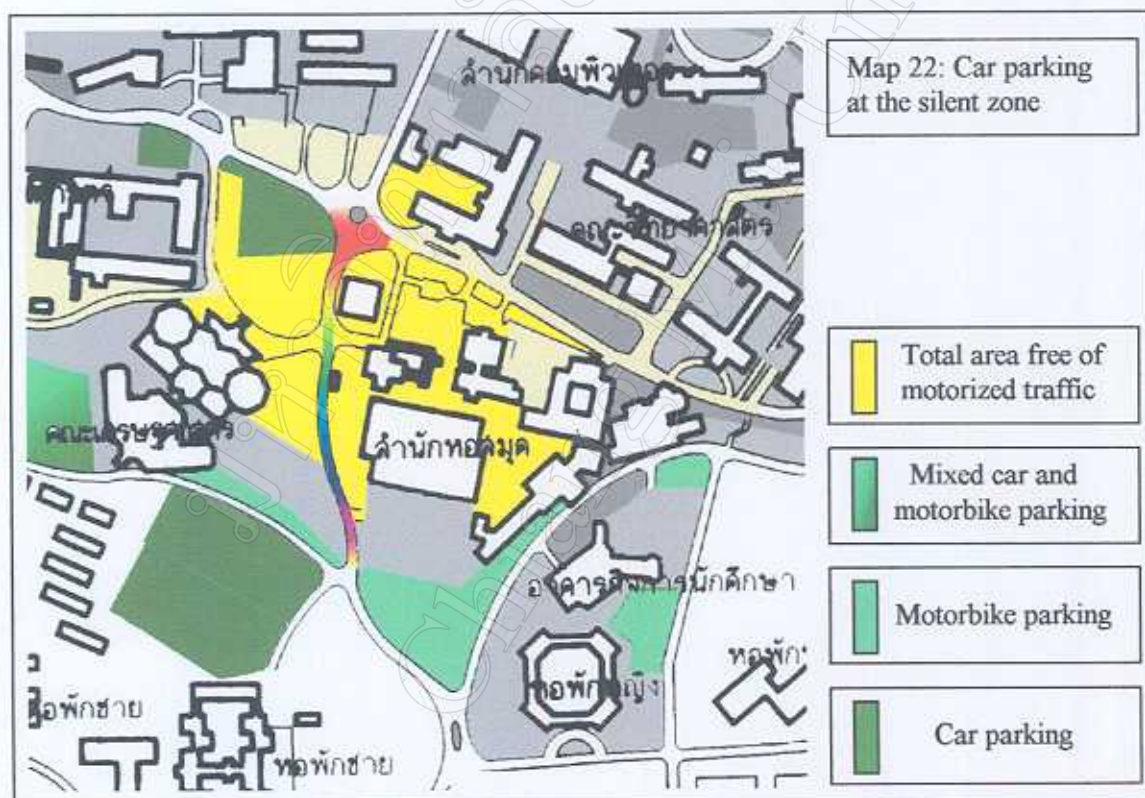
its fresh milk there that is normally offered along the Suthep Road. Having a center of activity right next to the silent zone would enhance the process of creating more human space.

- **The tramline**

As observed in the analysis, the current 3 tramlines offer no advantage over the use of individual transportation. Operating with two cars per line, they are organized in large loops that take about 10-20 minutes per round trip. The pilot project suggests utilizing all six cars to install one line, only, supported by two depots at the end of the line. These depots are removed from ordinary traffic so as not to constitute a traffic obstacle while the cars are being parked. The round-trip distance suggested is about 2 kilometers; tram stops placed about 200 meters apart. A tramcar should be able to finish a one-way trip in about 4 minutes¹²³, including stops. The fare should be one Baht per trip (see organizational environment of this chapter). The line would be able to serve the men's dormitories A1, A2, A5, A6, A7, and the women's dormitory B3. Destinations access includes the faculty of economics, the library, the faculty of social science, the faculty of humanities and the faculty of science.

Restricting the areas served, provide the tram with a sample group that generates useful data for further evaluation of development potential for this form of mass transport. Increasing effectiveness of runs and services will increase the number of students actually using the tram. People participation of the sample group will ensure that other traffic measures parallel to the tram are in line with user needs.

- **Parking**



All areas suggested for parking are already prepared and ready for vehicle parking (from left to right, counter clockwise):

1. The parking lot to the west of the faculty of economics is suggested for combined motorbike/car parking. Regarding its layout and design, it is one of the best parking

¹²³ Times were calculated by using a motorbike at a top speed of 50 km/h plus 20 seconds for each proposed stop added.

- lots provided at CMU. During the learning week it is hardly ever full and roughly one third of its capacity is permanently unused.
2. The parking lot to the South of the faculty of economics is never more than 20% full, although it can easily provide parking for 200 cars. This lot is to be the main substitute for the loss of car parks at the silent zone and is therefore connected to the destination buildings with a roofed over walkway, one arm leading to the faculty of economics and another one past the library directly to the faculty of social science (see map 20).
 3. The small parking strip to the South East of and directly adjacent to the faculty of economics can accommodate up to two times as many motorbikes as are now regularly parked in front of the faculty of social science.
 4. This area between women's dormitory B3 and the new extension building of the library (currently still under construction) is used for motorbike parking but hardly ever filled to its real capacity. It is suggested as the main motorbike parking, substituting for space lost due to the creation of the silent zone in front of and around the library, and offers exactly the same transition distance, as soon as the new building is finished.
 5. The motorbike parking in front of the student parliament and the multi faculty buildings have sufficient capacity to accept more long-time motorbike parking. This might happen, as the silent zone and its system of roads with limited access could induce more bike-users to walk to buildings close-by.
 6. The northern part of the central square should be kept open for car parking for a limited period of time to allow users to adapt to the silent zone more easily. Exit/entry of parking traffic only through one channel at the northern side of the area.
 7. The mixed parking to the north of the faculty of social science should be restricted to car users only, thus avoiding motorbike users that would try to find parking there as a substitute for the abolished bicycle parking in front of the faculty, which is now a part of the silent zone.

- **Tramline 2: Phase 2 of the pilot project**

After the first line is operational, traffic has been partly removed from the very center to its fringes and people participation applied to adapt the system better to user needs. Another underlying objective of the master plan can now be approached: reduce the number of vehicles at campus. This phase is initiated by the following measures:

1. Arrange for permission to park university vehicles at Gad Cheung Doi
2. Install the second tramline with 12 cars and 11 stops.
3. Install 2 central red bus depots
4. Initiate direct measures through rules and regulations to reduce the number of vehicles at campus. (See organizational environment of this chapter.)
5. Continue with the construction of roofed over walkways.

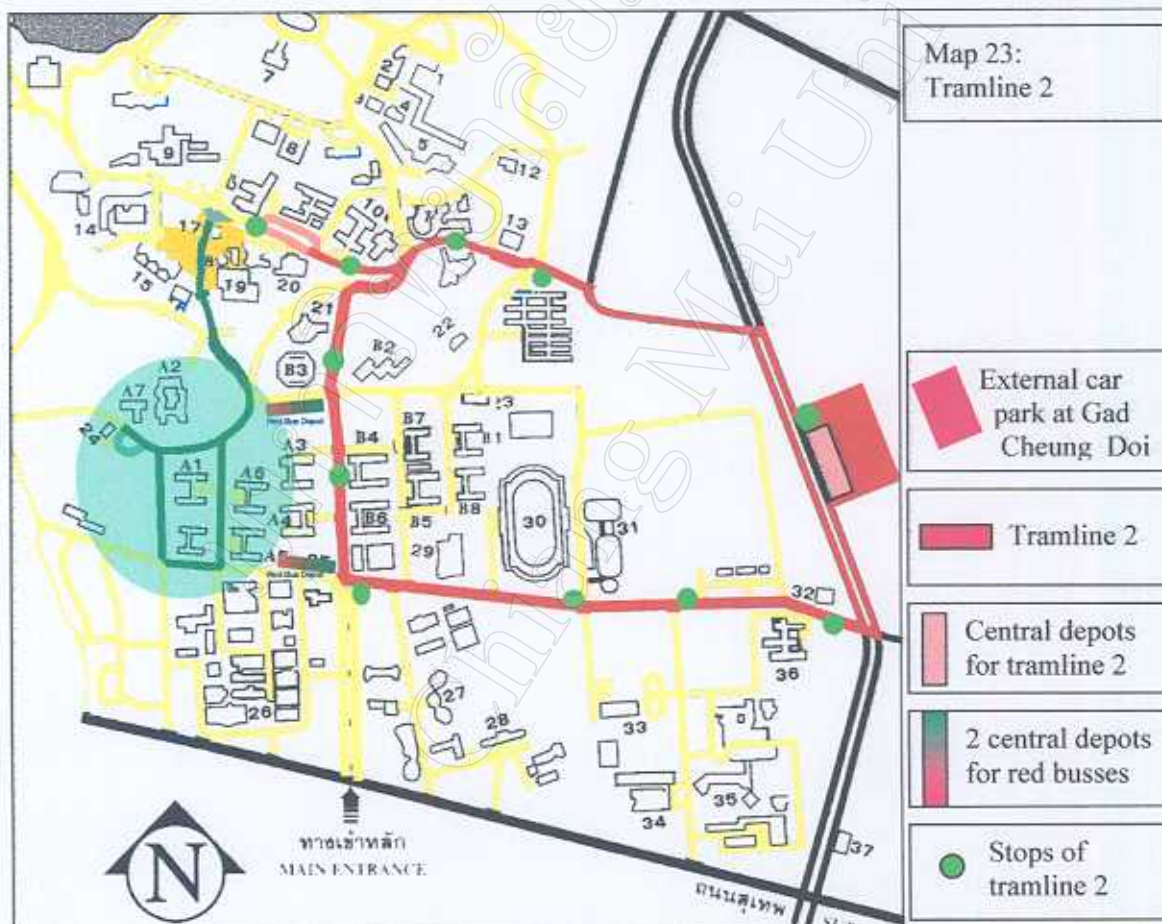
The huge, empty space of Gad Cheung Doi along the Rimkhlongcholprathan Road is used about one to three times a year for various fairs that regularly fail to attract customers. This market was a designated alternative to be used by street vendors after the roadside adjacent to the university of Suthep Road was closed down for this kind of business. However, customer reaction led to an increase of stalls on the other side of the street and the substitute market failed to reach one of its main objectives. The almost completely vacant lot is separated into parking lots that wait to be used.

To induce users to leave their vehicle in front of university requires the well-organized service of tram line two. With twelve cars and partly using roads on campus now blocked to stop through-traffic, one roundtrip would take about 12 minutes, including stops. The fare onto university should be 2 Baht, the fair for cars boarded within the campus area 1 Baht to keep in line with the policy that transportation on campus is 1 Baht per trip. Both line 1 and 2 pass newly reserved depots 1 and 2 (see map 23) for red busses. Here, commuters getting off

the lines can continue their journey by using the more flexible routing of this alternative form of public transport.

An alternative area for parking would be available opposite the Ton Payom market along the Rimkhlongcholprathan Road. This study recommends considering this area for alternative parking outside of campus only if an agreement with the owner of Gad Cheung Doi cannot be negotiated. There are a variety of reasons for this recommendation:

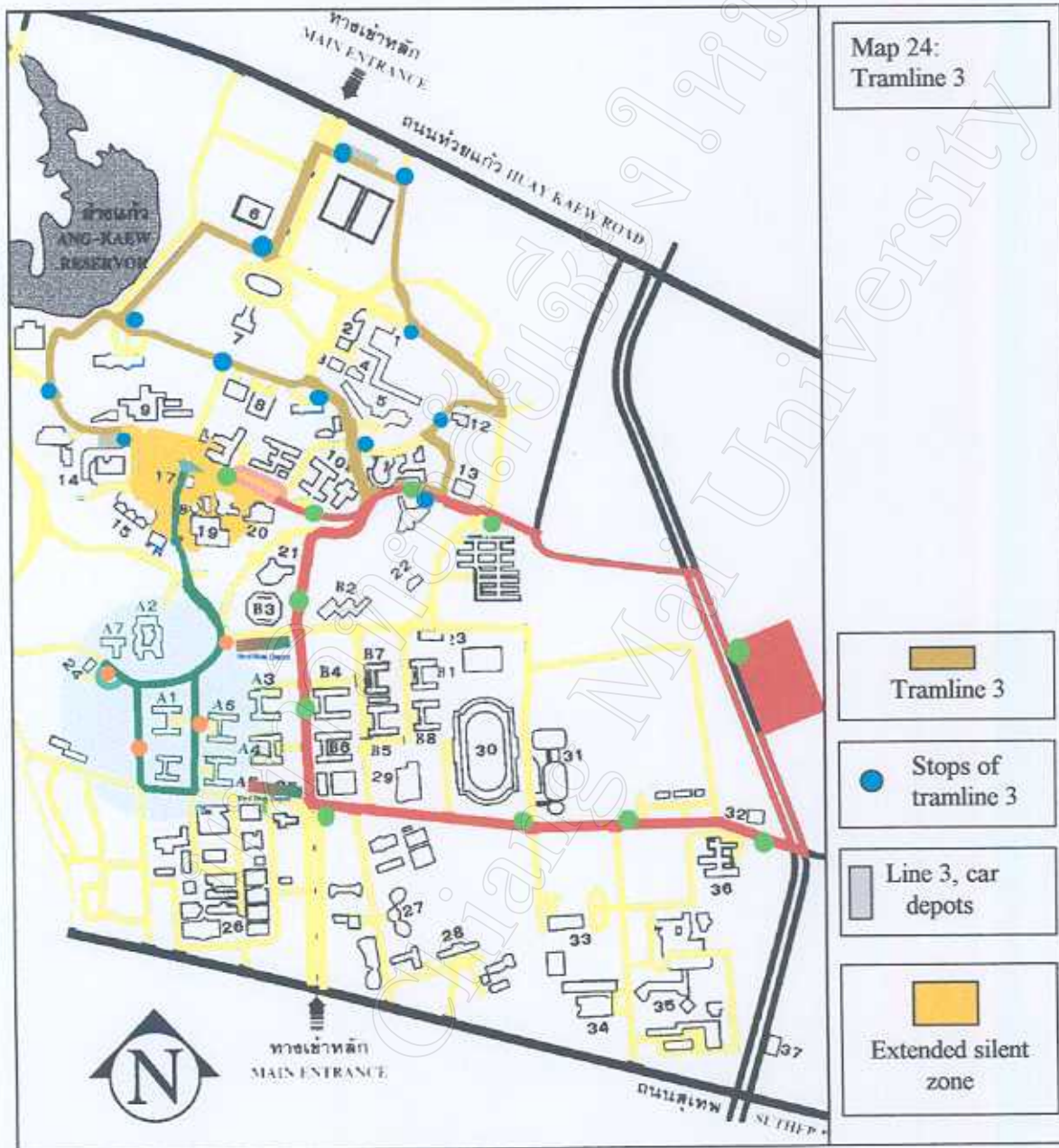
1. Gad Cheung Doi is ready to be used any time.
2. There are at least three access roads to the back of the Gad Cheung Doi property, leading to Thanon Huaey Kaeuw and Thanon Nimanhemin, which greatly increases the efficiency of the area in collecting traffic without creating traffic jams at Thanon Rimkhlongcholprathan.
3. The building of new parking lots on university property would mean the destruction of green-space without substitution.
4. Finances needed to construct new parking lots could be spent to maybe acquiring Gad Cheung Doi over a period of time, instead.
5. The lower campus of CMU with its medical and dormitory facilities is in need of traffic measures, as the area is very crowded with buildings. In the future, the university property at Rimkhlongcholprathan might be used for traffic or site-planning measures due to its very convenient location towards lower campus.



• **Tramline 3: Phase 3 of the pilot project**

With the introduction of the third line, the silent zone can be extended to its planned dimensions as proposed in the land-use master plan. It connects the northern area of campus with the silent zone and has a direct connection with line 2, so that users can easily access parking areas at Gad Cheung Doi. Line 3 features 12 stops, operates with the same number of

cars and should need 9 minutes to complete one round-trip, including stops. Partly utilizing secondary roads it can avoid two major traffic nodes and circumnavigate center 1 of non-curricular activity. By avoiding the at times heavy traffic in the area, the line increases overall speed by simultaneously extending the serviced area. Two depots off traffic lanes will keep it separated from individual traffic as much as possible. The first depot is at the western end of the silent zone, the second one at the main entrance. A range of measures are needed to install its services:



1. The car parking area next to the northern side of the faculty of social science opposite the newly constructed building of the faculty of humanities has to be changed in a tramcar depot.
2. The area at the second depot at the main entrance has to be properly prepared to accommodate parking vehicles. This area is already used for tolerated wild parking, so that no new user habits would have to be established.

3. If necessary, the area underneath the water reservoir can be prepared for additional parking.
4. Continue with the construction of roofed over walkways.

All three lines can be boarded at the silent zone. Combined they have the capacity to carry a maximum of 1200 passengers simultaneously in their 30 cars. During a peak traffic hour of 45 minutes they can carry a maximum of 6840 passengers:

- Line 1: With 4 minutes per round-trip = 11 trips x 6 cars x 40 passengers max. = 2640 passengers.
- Line 2: With 12 minutes per round-trip = 3.75 trips x 12 cars x 40 passengers max. = 1800 passengers.
- Line 3: With 9 minutes per round-trip = 5 trips x 12 cars x 40 passengers max. = 2400 passengers.

With all 3 lines installed, more extensive measures can be taken to reduce the number of vehicles, increase human space and promote walking:

- The network of walkways should be completed as quickly as possible. (Suggestion for such a network: see master land-use plan in this chapter.)
- The restriction of individual vehicles at campus can be increased.
- Reserved parking areas should be firmly established.
- Start initiating the construction of a loop, by
 - Removing unnecessary concrete cover wherever possible.
 - Unify the space of the silent zone visually by giving it a homogenous surface.
 - Increase efforts to separate the silent zone visually from other areas through hedges, shrubs and trees.
 - Renew and improve bicycle lanes.
 - Organize appropriate bicycle parking at the three main entrances/exits of university campus.

- **Tramline 4: Phase 4 of the pilot project**

The southern part of campus has so far been considered little because it is the area with the lowest traffic density at campus. The fourth line, as proposed here, would represent a change from the pilot project to a more extended form of traffic management based on non-individual transportation and focusing on forms of non-motorized commuting. The silent zone can be extended to include an even wider area and parking for dormitories can be centralized.

The fourth line would run with 14 stops and an equal number of cars. One roundtrip would take 15 minutes, extending the system's seating capacity during a 45-minute peak rush hour to 8250 passengers (1680 + 6820). The number of tramline cars would reach a total of 44 cars.

Other centralized parking areas might be constructed closer to the university entrances/exits in order to give users as many opportunities as possible to use campus without their individual transportation. It might be possible to organize parking in front of university at Suthep Road. This area is already used for parking, but in an un-orderly fashion and parallel to the road, which wastes a lot of space. Suthep Road itself is wide enough and can easily accommodate a row of permanently constructed car parks.

Adaptation of the campus road-structure according to the master plan might be another step after the completion of the pilot project. People participation should be constantly practiced to find the most convenient form of a compromise between environmental and user needs.



9.2.b The Organizational Environment in Traffic Management Based on PPP/UPP.

Administrative organization:

To avoid problems apparent in the current structure applied in traffic management as described in chapters 7 and 8, the pilot project should be set up as an independent entity. This independence should cover the following three main aspects:

1. Independence from all other administrative bodies at university.

To achieve this end, as the very first step of pilot project implementation, the university should by decree inaugurate a 'Traffic Management Unit'¹²⁴, which is responsible for traffic policy, related budgets, personnel and traffic measures. This unit should be split into two

¹²⁴ The study will further refer to this unit as TMU

branches, the legislative control agency and the executive branch. The control agency is responsible for book keeping and monitoring of traffic measure implementation. The executive branch is in turn responsible for the implementation of traffic measures. As both branches are represented in the TMU, they share authority and responsibility.

2. The TMU acts as external enforcement agency

As external PPP/UPP measures require an external enforcement agency regarding policies, standards and measures, no other body at university should have the right to overrule traffic related decisions taken by the TMU. Through including representatives of all user groups, policy decisions should reflect a compromise between all groups of interest and thus increase the probability of success.

3. Independence from all other university budgets.

The budget created through PPP/UPP implementation must be allowed to be used on traffic related issues, only. No other unit at university should have claims to the budget of the TMU.

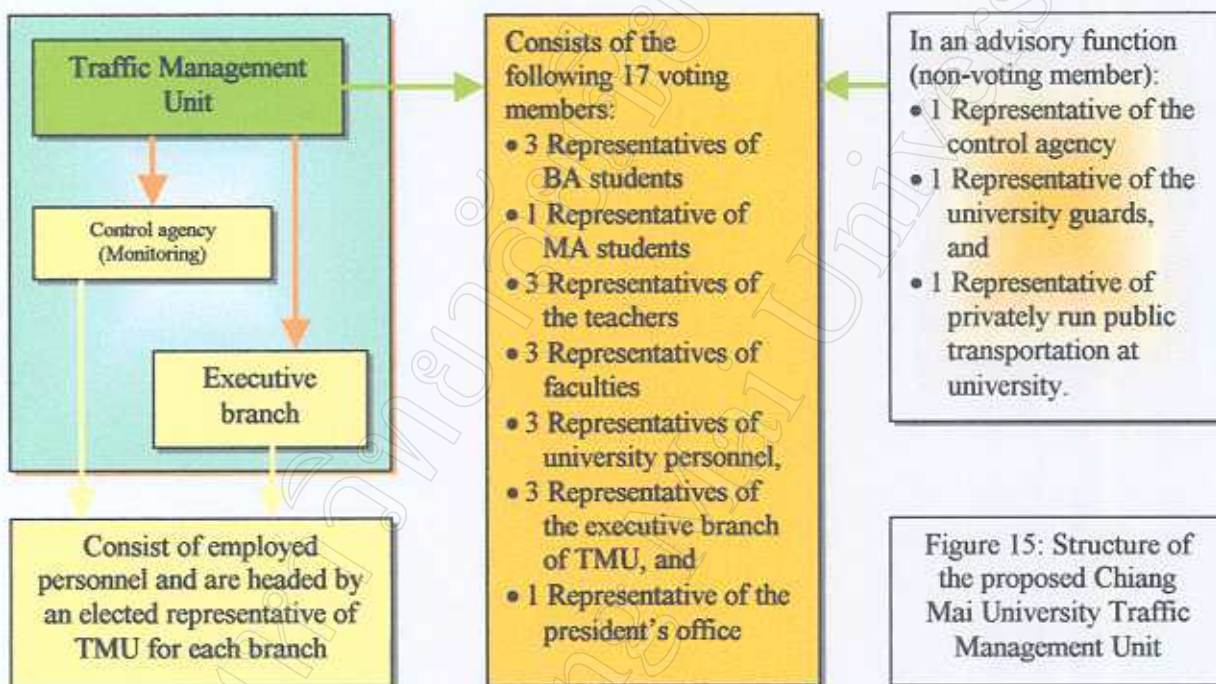


Figure 15: Structure of the proposed Chiang Mai University Traffic Management Unit

- The number of voting members in the TMU is 17 to avoid hanging votes.
- Representatives should be elected for a two-year term taking the limited stay of, for example, students at university into account.
- All voting and non-voting members should receive an appropriate representative's compensation. This compensation should be substantial enough to compensate for a members loss in time and additional responsibility. It should also entice members to regard their presence at the TMU as work with all ensuing responsibilities.
- No member, with the exception of the representative from the executive branch, should be allowed to stay on for more than two consecutive terms.
- Meetings should be held monthly.
- Attendance to the meetings should be compulsory.
- Secret ballots should be the main form of voting in order to avoid intimidation of members due to the Thai social system of peer-ship.

The executive branch:

The structure of the executive branch should reflect the structure of the traffic environment at university. There are three main aspects, the physical, organizational and attitudinal environment. Accordingly, sub-units should be established with different tasks:

1. Unit on implementing physical changes to the transportation environment.
2. Unit on implementing traffic control measures and coordination of traffic related work between the independent units of the university.
3. Unit on user education, People Participation and traffic related PR activities.

The work of those three units is controlled and coordinated by the executive branch' main unit, which is directly responsible to the TMU.

Legal set-up:

To avoid legal problems with external bodies like the central government and internal bodies like the twelve independent university units, the pilot project should become an official traffic and research project of Chiang Mai University.

- According to the Thai government decree from December the 23rd, 1999, under article 11.4, collected income or benefits of the university from other than government sources do not need to be forwarded to the finance ministry when used for administrative measures, care-taking of university property and/or maintenance measures.
- If PPP/UPP fees are collected as ordinary student fees, they automatically become part of the university budget and can be legally requested for allocation by any of the twelve independent university units. To ensure financial independence of the TMU, it is imperative that all fees are collected with the express purpose to implement the traffic and research project of the university.
- As one of the objectives of the project is environment management, further legal support might be drawn from the establishing Charta of the Thai Pollution Control Department, whose relevant principles all support PPP/UPP implementation and measures suggested in this study. These principles¹²⁵ are:
 - '**...POLLUTER PAYS PRINCIPLE.** The owner or possessor of the pollution source is held responsible for all costs of construction and operation of their treatment facilities or paying service fees...'
 - '**...STRICT LIABILITY.** The owner or possessor of the pollution source must be responsible for all costs or damage due to the pollution resulting from their operation...'
 - '**...LOSS OR DAMAGE TO NATIONAL RESOURCES.** Those individuals who commit an unlaw[ful] act or omission by whatever means resulting in the destruction, loss or damage of natural resources owned by the state shall be liable to make compensation to the state, representing the total value of natural resource so destroyed, lost or damaged by such an unlawful act or omission.'
 - '**...EMISSION AND AFFLUENT STANDARDS.** The emission and affluent standards are to be established for pollution control from [...] sources in order to meet the ambient environmental quality standards. The standards in accordance with this act are the national minimum standards.'
 - '**...POLLUTION CONTROL AREA.** Any locality that is affected by pollution and has potential health or economic damages, the National Environment Board shall designate such a locality as a pollution control area in order to receive priority in the budgeting process and in remedial action plans.'
 - '**...DECENTRALIZATION.** Local officials are to be authorized as the pollution control officials according to this Act. The local authorities are the ones who are prepared and are responsible for taking action on their own [...] environmental management plans through the annual budgeting process.'

¹²⁵ June the 4th, 1992 under the Royal Decree on the Organizational Division of Pollution Control Department, Ministry of Science, Technology and Environment B.E. 2535 (1992), as a result of the *Enhancement and Conservation of The National Environment Quality Act B.E. 2535 (1992)*.

Financing:

- The budget of the TMU is provided for through all collected PPP/UPP user fees on a yearly basis.
- The TMU approves budget allocations for work of the executive branch.
- Budget proposals can be made by any member of any the user groups at Chiang Mai University, which are students, teachers, university personnel, the administration and the twelve independent units of Chiang Mai University.

User fees and ambient standards:**1. Basic fee**

The basic fee is collected on a yearly basis from all users of campus, including private employees, but excluding visitors. The fee can be paid any time of the year and the amount collected is 1 Baht per day and person or 365 Baht per person/year.

This fee is in accordance with the principles of the Pollution Control Department and in line with the PPP/UPP definition on campus traffic management.

According to the university census of summer 1999 CMU had 21,413 registered students and approximately 10,000 employees. For all of university this would create a yearly basic TMU budget of approximately (31.000x365) 11.315 million Baht. However, we might consider that roughly one third of these users, or about 10.000 heads, are living, working and learning at the Suan Dok Campus of university, which would not benefit from the pilot project. Although many of those students and personnel at times use the upper campus facilities this study suggests to not include them during the initial phase of the pilot project. The remaining 21.000 users of the upper campus would create a yearly basic TMU budget of 7.655 million Baht. It is important to make all users at the upper campus understand, that even though traffic measure implementation starts at the central study area around the library, that the fully introduced system will also benefit faculties located at the fringes of the upper campus within three semesters of the Pilot Project start.

2. The ambient standard for the basic fee

The ambient standard for the basic fee is defined as follows:

- ⇒ Polluter: Every user of the upper campus of CMU is considered a polluter under the PPP/UPP dictum that consumption equals pollution. This standard therefore allows for no exemption for neither social status nor user status, e.g., residents, visitor, employee, etc., as every user is considered source of at least either natural, minimal or residual pollution.
- ⇒ Objective: The objective of this standard is to achieve a system of sustainable transportation and development under the guidelines of economic internalization.

3. The Pigouvian taxation fee and its ambient standard

According to the purpose of this fee a variety of standards are introduced based on the following definitions:

- ⇒ Polluter: Every user of the upper campus of CMU that uses any energy source for transportation other than him/herself is considered a polluter. With no exemptions every user of a secondary energy source for commuting is considered a source of artificial or excess pollution.
- ⇒ Objective: The objective of this standard is to achieve a system of sustainable transportation and development under the guidelines of economic internalization.
- ⇒ Implementation principle: AREA design criteria.

Types of standard:

Standard A: Walking or bike-riding commuter with no motorized vehicle registered = no fee

Standard B: Motorized vehicle using liquefied gas or electricity = no fee

As motorbikes are the choice of transportation mode for the majority of campus users and also the environmentally friendliest alternative of motorized individual transportation, they are assigned the lowest P.T.-Fees in 4 categories with a progressive increase according to size of engine:

- Standard M1: Motorcycle with an engine of up to 50 cc = 0.50 Baht/cc/year
- Standard M2: Motorcycle with an engine of 51 to 100 cc = 1 Baht/cc/year
- Standard M3: Motorcycle with an engine of 101 to 150 cc = 1.50 Baht/cc/year
- Standard M4: Motorcycle with an engine of 151 cc up = 2 Baht/cc/year

Cars in their currently used form are the environmentally worst form of individual transportation. They are therefore assigned a higher P.T.-Fee in 5 categories with a progressive increase according to size of engine:

- Standard C1: Car or truck with an engine of up to 1000 cc = 1 Baht/cc/year
- Standard C2: Car or truck with an engine of 1001 to 1400 cc = 2 Baht/cc/year
- Standard C3: Car or truck with an engine of 1401 to 1800 cc = 3 Baht/cc/year
- Standard C4: Car or truck with an engine of 1801 to 2200 cc = 4 Baht/cc/year
- Standard C5: Car or truck with an engine of 2201 cc up = 5 Baht/cc/year

Technical standards employed with the ambient P.T. standard:

1. The technical standards for motorbikes are based on the national emission regulations.
2. The technical standards for cars are based on the national emission regulations.

The fee payable increases with the amount of air pollution produced by the engine; the larger the engine, the larger the amount of petrol burned, resulting in more exhaust emissions. However, size of the engine is not the only source of pollution. Maintenance is an important factor regarding air and noise-pollution. A motorized vehicle that has passed emission tests (see next chapter: 'control measures') should be entitled to a 50% fee reduction. The budget created by this fee will get smaller over time, as users will try to avoid the financial expense and switch to the much cheaper alternative of public transportation.

This fee is in accordance with the principles of the Pollution Control Department and in line with the PPP/UPP definition on campus traffic management.

4. Visitor's fee:

Visitors to university that use a motorized vehicle must pay an entrance fee or otherwise the PPP/UPP system is not executable and everyday users would enter the university campus as 'visitors'. We suggest the following standards:

- Standard VA: SOV (single occupancy vehicle) motorbike: 5 Baht
- Standard VB: HOV (high occupancy vehicle) motorbike: 3 Baht
- Standard VC: SOV car or truck: 25 Baht
- Standard VD: HOV car or truck: 15 Baht

Payment of the fee should entitle the visitor to use his vehicle on campus for 24-hours.

5. Red busses and private business:

Concerning this user group we suggest the following policy:

- Red busses can enter university freely after purchase of a license and are not subject to any other fee. They can purchase a six-months license (see next chapter: 'control measures') for 200 Baht upon passing a vehicle emission test.

The competition for public transportation at campus is strong. The study therefore recommends keeping fees for the red busses relatively low, so as not to unnecessarily increase competition between the tram and the red busses, which provide a vital link of campus users into Chiang Mai town.

- Private business can purchase an entry certificate based on the standard of the Pigouvian taxation fee on a monthly basis.

6. University guests:

Guest of the university, like for example lecturers, should receive a free pass onto campus in advance and for the duration of their visit. Payments should be made by the responsible faculty to the TMU, instead. If that is not possible, they should be able to reimburse their receipt for any paid entry fee. The study suggests this policy due to the Thai tradition of honoring guests by not creating expenses for them.

7. University owned cars:

Cars owned by one of the twelve university units should be charged as ordinary cars and their fees due paid by the owning unit directly to the TMU budget.

Based on an estimate of the number of vehicles during an SSI with the administration and data from the questionnaire, at least 10,000 motorbikes and 2,000 cars should be subject to Pigouvian fees, not counting visitors, red busses and private business. Based on OBEA on average the standards M2 should be applicable for motorbikes and C3 for cars. It is difficult to estimate the exact amount of fees generated without exact data, however, a rough estimate is between 8 and 10 million Baht/year.

All fees combined should therefore provide an initial budget of about 14 Million Baht. However, it is expected that this figure will drop quickly with the extension and increased efficiency of public transportation, which is in accordance with the AREA design criteria for PPP/UPP measures.

Control measures:

A variety of control measures are suggested to accompany the PPP/UPP implementation:

1. Registration plates:

Every registered vehicle should receive a registration plate to be attached to the frame of the vehicle. The plates should be made of metal, as they are more difficult to copy than paper certificates and would successfully hinder the emergence of a gray market in permits.

2. Temporary visitors certificate:

Visitors should be handed a paper receipt upon paying the visitors fee according to the suggested standards. Date and time should be noted on the receipt. Upon exit from campus the receipt is collected and if the permitted 24 hours are exceeded, back-payments are collected according to vehicle type, occupancy and number of exceeded 24 hour periods.

3. Entry/exit control:

Guards should control all entries/exits. Traffic should be directed into two channels, one channel only for vehicles with a registration plate and one channel for those vehicles without one or a temporary permit. Thus long control queues that hinder traffic are avoided.

Services of the private sector as part of control measures on campus:

1. Registration plates:

After PPP/UPP fees have been paid, the user should receive a receipt about his payment. That receipt entitles him to a registration plate, which is provided by a private company on the CMU premises and is rented to the user for the amount of 50 Baht per year. Thus the plate remains property of the private company and any attempt to falsify or duplicate it can be legally pursued.

2. Emission test:

Private companies on campus should offer emission tests. A motorbike emission test should cost 10 Baht and a car or truck emission test 50 Baht. If the test is passed successfully, the vehicle owner is entitled to a 50% reduction to his P.T.-Fees.

3. Entry/exit control:

The currently used service of private guards at the main entrances should be extended to all entrances.

4. Tow-truck service:

CMU might consider employing the permanent presence of a private tow-truck service. Called by the university guards, such a service could remove any vehicle that violates traffic rules and thus damages university property. Costs for the service are with the owner of the removed vehicle.

Traffic control

Traffic control on university should be enforced by university guards. Their presence in directing traffic should be visibly increased.

Enforcement of Thai traffic law is legally difficult, as university guards do not have the legal right to book offenders. The study suggests the following alternative, which is in line with the principles of the Pollution Control Department:

Most traffic offenses happen in connection with wild parking, e.g., parking in areas that are not designated for the purpose. However, wild parking is not only a traffic law violation, but also and always a destruction of land and thus university property. Wild parkers should therefore be officially charged with destruction of university property, which is a criminal offense and punishable by criminal law code. Guards at university have the right to arrest those offenders and confiscate the tools used in the destruction of property, e.g., the vehicles until the matter is passed on to the police.

Additionally, the study suggests equipping all private and university guards with megaphones and whistles. Whenever users are seen in unlawful parking or other traffic behavior, guards can give a loud and clear warning to the offender, audible to everyone in the vicinity. This proposal is based on a cultural trait of Thai society, which is called 'glua na taeg'.

All private and university guards that have traffic duty should be equipped with radios to allow instant communication in situations of conflict.

Organizational structure of the tram:

Based on an estimate that a tram system of four lines and 44 cars with full acceptance by the public and based on the proposed fees will attract 15,000 rides per day, the tram will be able to generate a daily turn-over of not more than 20,000 Baht/day. An average of 30 days/month will thus create a budget of 600,000 Baht.

According to SSI, the cost for 1 car is approximately 200,000 Baht and monthly maintenance needs 80,000 Baht for 6 cars. Thus the monthly cost for a fleet of 44 cars would be $(44:6 \times 80,000)$ about 587,000 Baht. However, due to the summer semester and an expected low occupancy during that time, the turn-over generated on a yearly basis would about just cover the costs. Renting advertisement space on the tram cars themselves might generate additional income.

Assuming that this calculation is accurate, the prospect of having the tram lines run by a private investor are rather slim as the total investment cost of $(38 \times 200,000)$ 7.6 million Baht for the fleet is unlikely to ever be recovered. This leaves two options for the organization of the tram:

1. The tram is owned and run by university and the gradual extension of the car fleet and the daily services are financed through the PPP/UPP generated funds.
2. The tram is operated privately and the university subsidizes each ride with a fixed amount of money.

Both systems have their advantages and disadvantages, respectively. A detailed market analysis would be needed to recommend either of the two approaches.

9.2.c The Attitudinal Environment and Related Measures Based on PPP/UPP.

Training, awareness and education:

Every new campus user of all user groups should go through a compulsory traffic training of at least two days, which should cover the following topics:

1. Traffic law
2. Role, duty and authority of traffic guards
3. Introduction to the implemented traffic environment at campus.
4. Commuting options at campus
5. Environmental impact of traffic
6. The basics of PPP/UPP and economic internalization
7. Role, duty and responsibilities of users.

To address current users at campus, university should initiate and create an activity forum for traffic and the environment, in form of a yearly 'traffic week', during which the same topics of the new-user training are addressed, discussions of traffic related issues are encouraged and traffic related activities of user groups are presented to the public.

People Participation:

People Participation should take the form of a regularly held traffic forum during which interested users can

1. Acquire information in which they are interested.
2. Have an opportunity to exchange opinion with other user groups.
3. Can in cooperation suggest traffic measures and traffic environment adaptations to the TMU.
4. Address their observations and concerns regarding traffic.

Traffic PR:

The suggestions forwarded here are based on one of the conclusions of chapter 3.2.f of this study: 'In order to sustain a continued sustainable development of a changed human environment, we need to take measures to...sustain a back-flow of financial capital... to the area [of PPP/UPP implementation]'. This back-flow can take various forms, but should all serve the same objective: make traffic and proper traffic behavior and the environment everyone's concern.

One of the findings of the study is that a large majority of users would like to see an improvement in traffic management at campus. However, most user do not seem to realize, that their personal behavior constitutes the best control and guarantee for such an improvement. To make people realize that they are part of the traffic whole, public relation measures should try to popularize attempts in traffic management and highlight advantages to the user gained by the concept of the pilot project. The study suggests to reserve 25% of the basic user fees, or about 1.9 million Baht, to be returned to the users in various forms of PR and People Participation.

Many users of all groups have expressed disappointment at the lack of administrative leadership concerning traffic related issues. Games and fun activities with laughter and competition could improve this image considerably. Currently, for many users traffic at university is a nuisance. PR-activities should make it an issue and a popular topic.

All financial matters in connection with traffic PR should be decided upon by the TMU, only.

1. The Doi Suthep Bicycle Circuit¹²⁶.

Many campus users do use the bicycle on a regular basis, many, however, only during evening hours. An implementation of the physical environment suggested by the pilot project would increase the traffic space available for bicycles. Its popularity should further be increased by an annual bicycle race for on and/or off road bikes.

The course suggested for the on-road race covers 92 kilometers on good to excellent roads and runs from campus along the Canal Road round the Doi Suthep Range via Sameung, Queen Sirikit Botanical Garden and Mae Rim back to campus. The race would be demanding on a bike rider and cover all degrees of difficulty of on-road biking. The race could be public and have the following categories:

- a. Gender
- b. Age
- c. Campus users (faculties, teachers, administrators, university personnel)
- d. All contestants

The prize money should be considerable, so as to initiate a race noted nationwide. The study suggests:

- First prize among all contestants, one for each gender: 60.000 Baht
- Second prize among all contestants, one for each gender: 30.000 Baht
- Third prize among all contestants, one for each gender: 15.000 Baht

- First prize among all contesting campus users, one for each gender: 30.000 Baht
- Second prize among all contesting campus users, one for each gender: 20.000 Baht
- Third prize among all contesting campus users, one for each gender: 10.000 Baht

- First prize among all contestants 35 years and older, one for each gender: 20.000 Baht
- Second prize among all contestants 35 years and older, one for each gender: 10.000 Baht
- Third prize among all contestants 35 years and older, one for each gender: 5.000 Baht

The total prize money for all contestants in on-road biking would come to 400.000 Baht. This amount is high, but its purpose is to advertise and promote the universities policy towards non-motorized commuting. The study considers it important that prejudice towards the administration concerning their measures being halfhearted is changed to the better. Prize money of this category would demonstrate support and respect towards user groups. It would also greatly unite all campus users in the new traffic policy by giving everyone an opportunity to cheer friends, faculty and colleagues. Students with limited financial resources could better their situation through participation in a non-motorized competition event.

Off-road biking can be introduced in a form similar to the on-road event or even in combination

2. X-Sports on campus

Recently Thailand has had very remarkable international success in sports, like for example, skating (skate-board), roller-skating and x-biking. Public training facilities could be erected in the silent zone and the quality of road surfaces improved to allow for the use of these types of vehicle. Their impact on actual commuting might be small, but they would refocus attention especially of younger campus users away from motorized vehicles towards non-motorized vehicles. Competitions should be held on campus every semester for participants from the user groups on campus and once a year public competitions.

¹²⁶ Prizes for the competitions suggested in this chapter are based on interviews with users: the top prizes should be high enough to allow for a student to finance himself on a low budget for about one year.

University competitions:

- First prize among all contestants for each type of x-sport: 20.000 Baht
- Second prize among all contestants for each type of x-sport: 10.000 Baht
- Third prize among all contestants for each type of x-sport: 5.000 Baht

Public competition(nationwide):

- First prize among all contestants for each type of x-sport: 40.000 Baht
- Second prize among all contestants for each type of x-sport: 20.000 Baht
- Third prize among all contestants for each type of x-sport: 10.000 Baht

The total prize money for all competitions and contestants would come to 420.000 Baht.

This kind of sports activity would attract not only visitors to Chiang Mai and increase the benefit university has on city development, but also focus public attention on the new traffic policy and return some of the fees directly to the user.

3. Traffic related group activities of campus users:

The university should encourage group activities of user groups that help to improve traffic at campus. Such activities could be:

- a. Traffic related research
- b. Traffic related activities in the physical or educational traffic environment.
- c. The physical appearance of transition areas of faculties and other university units.

Support to such activities could be given in form of awards and funding for research and prizes for activities and best appearance.

4. The E-Party:

The E(nvironment)-Party should be a yearly event and held in the cooler season at the end of the second semester, immediately before or after the various sports competitions. The purpose of the party is very simple: give users an opportunity to celebrate their participation in environmental protection through their increased awareness, improved traffic behavior and their willingness to personally sacrifice by paying fees.

The e-party could give people an opportunity to develop a sense of belonging to university under the same, shared environmental awareness and make them proud of being students of CMU. It introduces fun and laughter to the behavioral adaptation required of them, an aspect that, according to SSI, is important in Thai society.