Chapter 6: General Assessment of the Study Area

6.1 User Groups and Population at Study Area

User Groups:

The following user groups were distinguished:

1. Students
2. Teachers
3. Administration
4. University personnel
5. Research assistants
6. Private employees (including red busses and guards)

Population[81]:

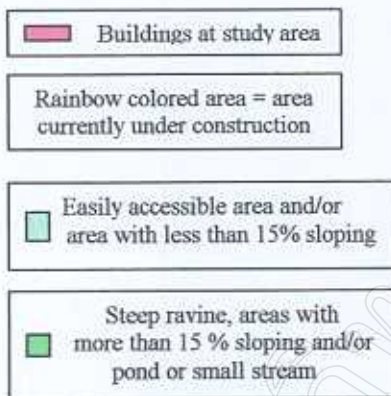| Table 2: Number of heads per user group				
Faculty of Humanities: 2503	2200 students	192 teachers	18 research assistants	50 administrative personnel	43 full-time employees
Faculty of Science: 3064	2562 students	266 teachers	34 research assistants	100 administrative personnel	102 full time employees
Faculty of Social Sciences: 1879	1745 students	75 teachers	7 research assistants	23 administrative personnel	29 full-time employees
Faculty of Economics: 750	709 students	32 teachers	3 research assistants	5 administrative personnel	1 full-time employees
Computer Center: 39	-	-	11 research assistants	19 administrative personnel	9 full-time employees
Library: 182	-	-	49 research assistants	74 administrative personnel	59 full-time employees
Student registration: 49	-	-	21 research assistants	14 administrative personnel	14 full-time employees
Estimated (daily) Commuters and others: 1534	1534	-	-	-	-
Sum:	8750	565	143	285	257
Total:					10.000

6.2 The Study Site And Physical Conditions Relevant for Traffic

General Geography:

The study site is one of the study-centers of the Chiang Mai University campus. Areas not occupied by buildings feature:

1. Untended mixed forest types, mostly in areas with more than 15 % sloping.
2. Tended gardens and park-like greenery, with trees, shrubs and flowers.
3. Open space with lawn cultivation.
4. Clear-cut areas for parking.
5. Walkways connecting buildings.
6. Resting areas.
7. Smaller open air sport-facilities.
8. Some private gardens

Map 1: General Geography

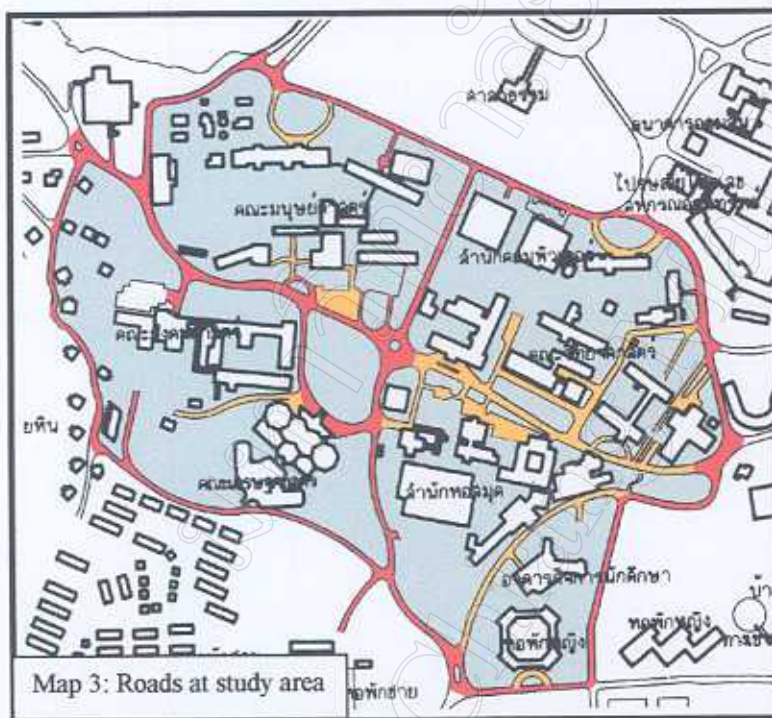|	
▭	Buildings at study area
	Rainbow colored area = area currently under construction
▭	Easily accessible area and/or area with less than 15% sloping
▭	Steep ravine, areas with more than 15 % sloping and/or pond or small stream

Buildings:

1. Department of Computer-science
2. University Computer Center
3. Department of Mathematics
4. Department of Statistics
5. Main Building of the Faculty of Science and Department of Chemistry
6. Department of Biology
7. Department of Geology
8. Exhibition Hall
9. Book Store
10. Main Library
11. Administration and Registration
12. Multi-faculty teaching facilities 1

Map 2: Buildings at the study area
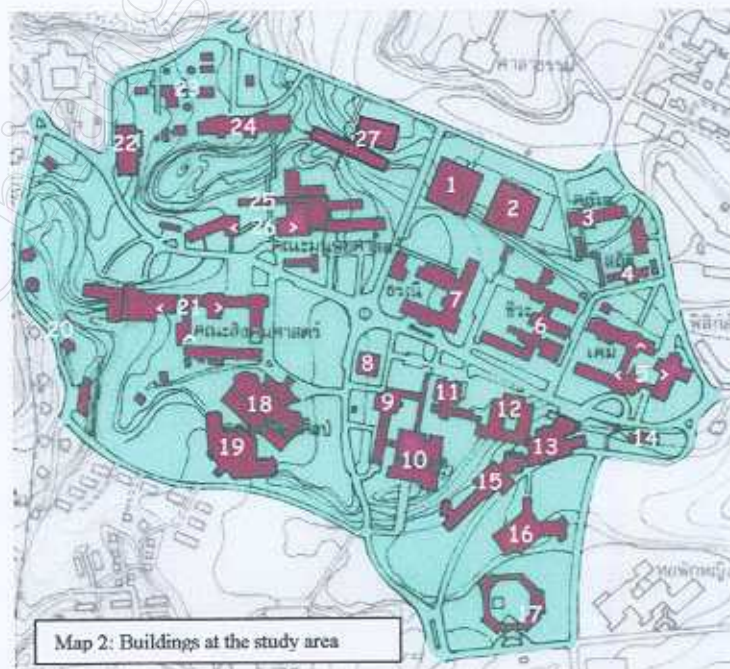
13. Multi-faculty teaching facilities 2
14. Building of the faculty of Physics
15. Multi-faculty teaching facilities 3
16. Canteen and Student Union
17. Women's Dormitory 3
18. Former department for Architecture (now abandoned)
19. Faculty of Economics
20. Between southern and northern intersection of western side of target area: private houses for teachers and smaller institutes
21. Faculty of Social Sciences
22. Canteen of Faculty of Humanities
23. Group of Maintenance Buildings
24. Faculty of Humanities, Foreign Language Department
25. University Radio
26. Faculty of Humanities
27. Faculty of Humanities

Roads:

The road-system used at the study area is based on a two-lane road system and distinguishes between free access and limited access.

Map 3: Roads at study area

Road with free access can be described as follows:
- The traffic lanes have an average width of 2.5 to 3 meters.
- Road-shoulders are partially turned into bicycle lanes.
- At bigger intersections during rush hours traffic is directed by policemen.
- Road-signs are sometimes painted on the road surface.
- No right-of-way system is used to direct traffic flow.
- No one-way roads are installed.

| ■ Roads with free access | ■ Roads with limited or no access |

Roads with limited or no access are used to
- Interdict through-traffic
- Lead to reserved parking lots
- Are used as improvised parking area

Current traffic flow system:

The current traffic flow system provided by the road set up features one central, three major and one minor traffic node.

The central node:

This node is situated in the middle of an area at the study site that forms a triangle, the corners of which are the main library building, the faculty of social sciences building and the faculty of humanities building. Traffic is directed to the node by three main access roads, entering from the North, West and South. A fourth access road from the East is restricted to use by teachers and university personnel and its main purpose is to hinder through-traffic and provide area for parking.

The major nodes A and B:

The nodes A and B can be considered as one, as they are in close proximity to each other and constitute the entrance and exit nodes for almost all traffic from and to the main entrance of the university campus. Between them, to the Southwest of the road is center 1 of non-

Map 4: Current traffic flow system

↔ Two directional Traffic	Center of non-curricular activity and public services	Central traffic node at the faculty of humanities
◎ Major traffic node		

curricular activity and public services, as well as the main access area to the largest open-air recreational facilities of the university to the Northeast of the study area.
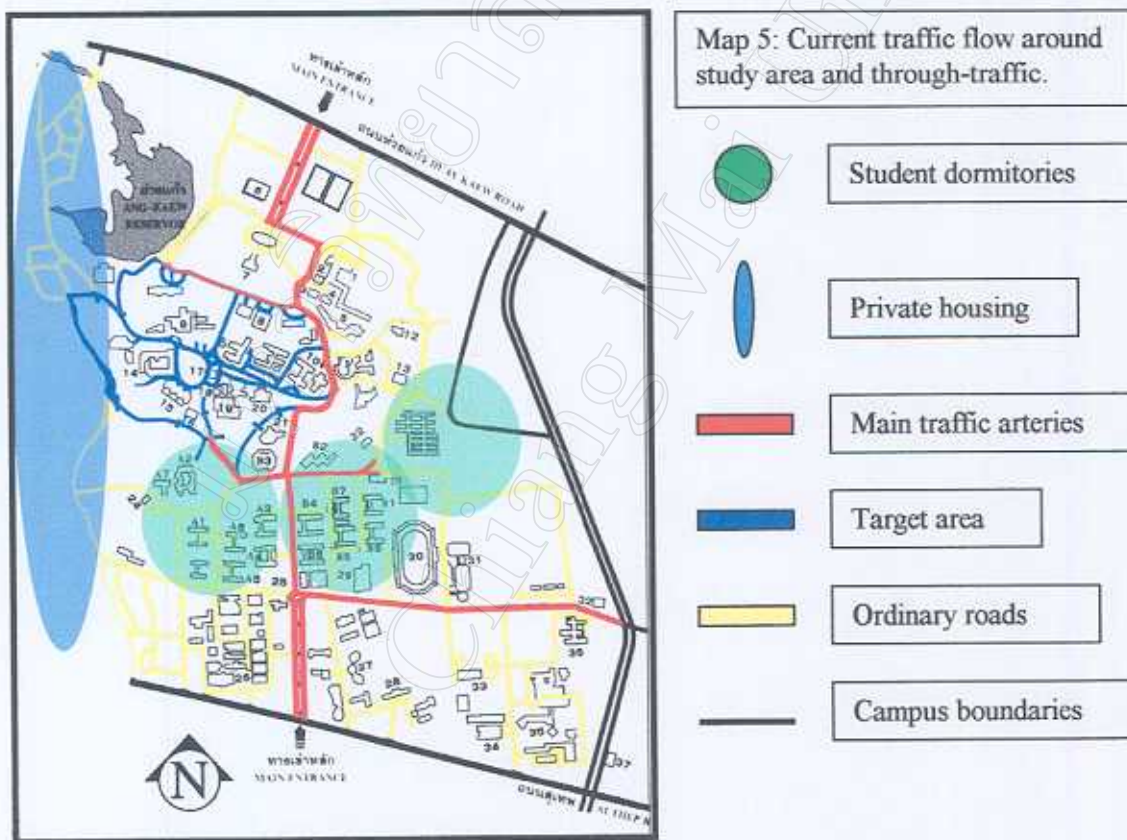
The major node C:
The node C constitutes the main entry and exit node to the study area. From the North it collects traffic from the main entrance that bypasses the study area to the east. From the East and South it collects traffic from the student dormitories and from the South traffic from the main back-entrance
and via a roundabout from the main eastern entrance of the university campus[82]. To the Southeast corner of the node is a large open-air sports facility (center of activity 2).

The minor node D:
This node collects mostly traffic from the student dormitories to the Southwest of the study site and from the private quarters of teachers and other personnel to the West.

Except for the central node at the faculty of humanities, all nodes are outside of the study area, but directly adjacent to it. They are considered here because any change in the traffic flow at the site directly, will immediately have an impact on the amount of vehicles they have to accommodate and the overall traffic flow at campus. Movement through the study area constitutes an alternative route to cross from the northern area of campus to the South and vice versa, especially for all commuters from the dormitories and private quarters to the Southwest and West of the study area.

Map 5: Current traffic flow around study area and through-traffic.

●	Student dormitories
▮	Private housing
▬	Main traffic arteries
▬	Target area
▭	Ordinary roads
—	Campus boundaries

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[82] To the East and South of the campus are the main city areas of private dormitories and apartment buildings for students.

Current areas used for vehicle parking:
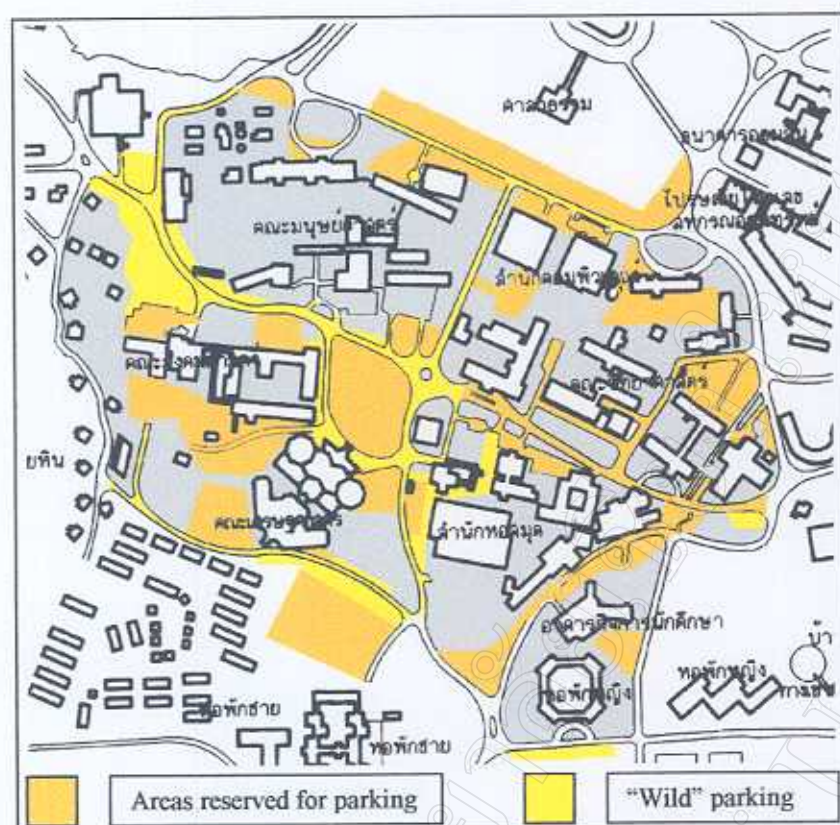
Map 6: Current areas used for parking

There are four types of parking lots:
1. Reserved parking lots.
2. Parking lots separated according to type of vehicle.
3. Mixed parking.
4. "Wild" parking[83]

| | Areas reserved for parking | | "Wild" parking |

Table 3: Number of provided parking lots[84]:

Area	Amount of parking lots provided			Amount of students using the area during lectures
	Cars	Motorbikes	Total	
Library	78	520	598	No information
Faculty of Social Science	233	561	794	1,070
Faculty of Humanities	149	555	704	2,478
Computer Center	32	-	32	No information
Faculty of Computer Science	34	110	144	No information
Faculty of Science	277	555	832	2,248
Multi faculty teaching facilities	55	520	575	2,143
Student activity building	66	300	366	No information
Faculty of Economics	55	130	185	500
sum	979	3,251	4,230	8,439

Teachers and other university personnel use areas for reserved parking. The entrances to these locations are normally guarded and parking takes place in an ordered fashion. Parking lots separated according to type of vehicle are normally designated by the size of the entrance to the lots. Mixed parking uses painted signs on the pavement to indicate types of vehicle. "Wild" parking happens anywhere at the study site.

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[83] Parking in any area that is clearly not designated for the purpose.

[84] Data from Summer 1999

It is sometimes not easy to tell which areas are designated for parking and which is not, as for example the area at the entrance to the canteen of the Faculty of Humanities. It happened to the author repeatedly[85] that he was asked to leave clearly marked motorbike parking lots, because "this area is now used for construction". Generally the following trend can be observed: as soon as more than one motorbike or car is parked in a given area, other vehicles will accumulate around it, independent of whether the area is a spot marked for parking or not.

6.3 Employed Means of Transportation

Users at campus employ a variety of vehicles for transportation. The following different types of motorized and non-motorized commuting can be discerned according to optical presence[86]:

1. Motorcycles
2. Cars
3. Walking
4. Red busses
5. The tram
6. Bicycles

Motorcycles:
Motorcycles represent the largest group of vehicles. Almost all units in this class use low CC engines (between 50 and 125), with the occasional larger engine (150 to 500 CC) that can be observed.

Cars:
According to optical presence, cars and pick-up trucks are the second most important vehicles for commuting. Engine types observed generally range from 1200 CC to 2400 CC.

Walking:
Walking is employed for transition[87], but also extensively for commuting between destination buildings within the land-area of the study site. Pedestrian walkways along roads, if present, are rarely used. Walkways connecting buildings are frequently used where available, especially at the faculty of the Humanities and close to the library. In the absence of walkways, users tend to create their own paths through greenery, especially from commonly used unauthorized areas of "wild" parking to destination buildings.

Red busses:
Red busses are the standard available form of public transportation. They consist of privately owned pick-up trucks with mostly diesel engines modified to allow passenger seating in the back (capacity up to 12 passengers). Fares are between one and two Baht per trip. No bus stops are provided and passengers board by waving the red busses to a stop along the road. Red busses normally cruise at slow speed through campus, as they have to be prepared to pick up passengers anytime, thus, some times being an obstacle for traffic flow.

The tram:
The tram[88] first started running on the 15th of February 2000 with four cars. The engines are running on gasoline and seating capacity is about 40 people, including a maximum number of people standing in the aisle. The tram is run by a private operator and 3 lines have been installed:

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[85] During August through to October 1999

[86] Based on OBEA during December 1999 through to June 2000

[87] User movement to and from parked vehicles to the destination building or movement between adjacent buildings.

[88] Information from the central library and the CMU president's office, 5.4.2000

1. Line one: from the main access roads at the 'sala tham' to the faculties of science, humanities, and social science.
2. Line two: from the dormitories to the faculties of engineering, educational science, agriculture, fine arts and a stopover at the clock tower.
3. Line three: From the western part of the study area to the faculty of engineering, partly outside university and past the men's dormitories

The fare is three Baht. Tickets are also sold in the form of a booklet with 20 or 50 fares, respectively. Distribution price is 30 or 75 Baht, which brings the rate down to 1.50 Baht per trip[89]. The tram was installed based on a step-by-step approach. The first two months were considered a trial run and admission was free. In the second phase, the fares were introduced and if consumer response is positive over the next 120 to 180 days, it is planned to employ a total of 8 and then 12 cars, respectively. Currently the tram employs six cars. So far, the costumer response does not seem to be positive, as the tram is empty most of the time.

Parallel to the tram a vehicle restriction program was enforced by prohibiting BA students of the first 3 years that are resident at university dormitories to use a private vehicle for commuting on campus.

Bicycles:
Bicycles can rarely be seen at CMU campus, although their overall number seems to be increasing during the cold months of the year. Bicycle lanes have been created. However, they hardly qualify as such, as
- they are partly occupying space used as pedestrian walkways[90],
- hardly ever have separated entry or exit ramps,
- they have poor alignment[91] and
- are part of traffic channels with a high grain[92].

Storing racks to park bicycles have been provided, but their placement is so poor that other parking vehicles almost always block access to them. In some instances there are erected in a right angle to each other, which makes it impossible to use them properly[93].

6.4 Organizational Conditions

6.4.a Administrative Organization[94]

General administrative structure:

Although CMU is referred to as one university, it actually consists of 12 different units that function independently with different internal administrative structures and define their common interest in the university parliament.

University rights can be (and are) changed by additional decrees issued by the Thai government. The last such decree was issued in February 2000. The structural set-up of the 12 units can differ considerably and in figure 12 we give three examples, the president's office, the Graduate School and the university faculties[95]:

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[89] In August 2000 a variety of further alternatives were discussed to bring the fee per ride down to levels competitive with individual traffic
[90] See also in the appendixes, A11: land-use and site planning.
[91] Alignment refers to the manner in which channels are laid out within their environment and the site itself.
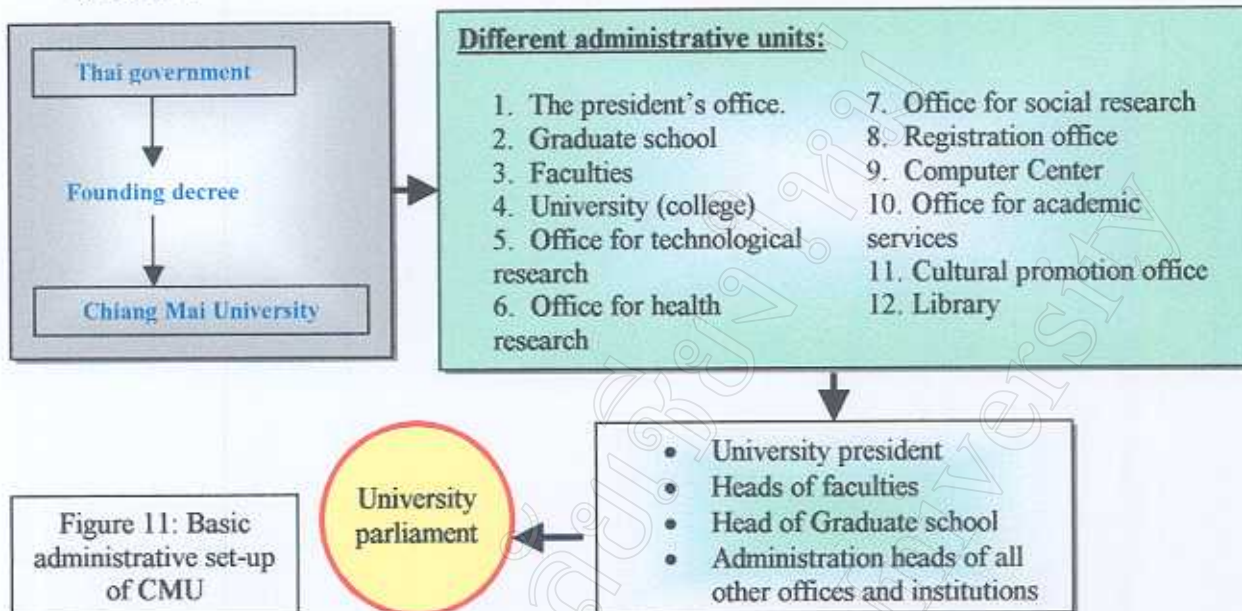[92] The grain describes whether channels are separated according to type of vehicle or mode of transportation.
[93] For example, at the faculty of humanities in front of the building HB6 (July 2000).
[94] Source: Related Thai government decrees between 1986 and 2000
[95] This presentation intends to give a general idea of the applied types of administrative structure, only.

The decision finding process for each of the 12 units takes a different form and time, due to their different internal structure. Although the independence of each unit seems to be the foremost concern and can be considered a strong point in the university's set-up, any implementation process is unduly slow. Especially on overlapping issues, such as traffic, responsibilities are not clearly defined and weak links during implementation are difficult to pinpoint[96].

Figure 11: Basic administrative set-up of CMU

Different administrative units:

1. The president's office.
2. Graduate school
3. Faculties
4. University (college)
5. Office for technological research
6. Office for health research
7. Office for social research
8. Registration office
9. Computer Center
10. Office for academic services
11. Cultural promotion office
12. Library

- University president
- Heads of faculties
- Head of Graduate school
- Administration heads of all other offices and institutions

University parliament

Thai government → Founding decree → Chiang Mai University

Financing and budgeting of Chiang Mai University:

The three main budgets at university are all connected to the president's office in one form or another. This position is therefore of utmost importance and wields a lot of influence, either indirectly through dismissing a budgetary proposal or directly by approving a proposed budget. The influence of other units of the university is guaranteed by having their representatives in the approving bodies or via screening access to some funds.
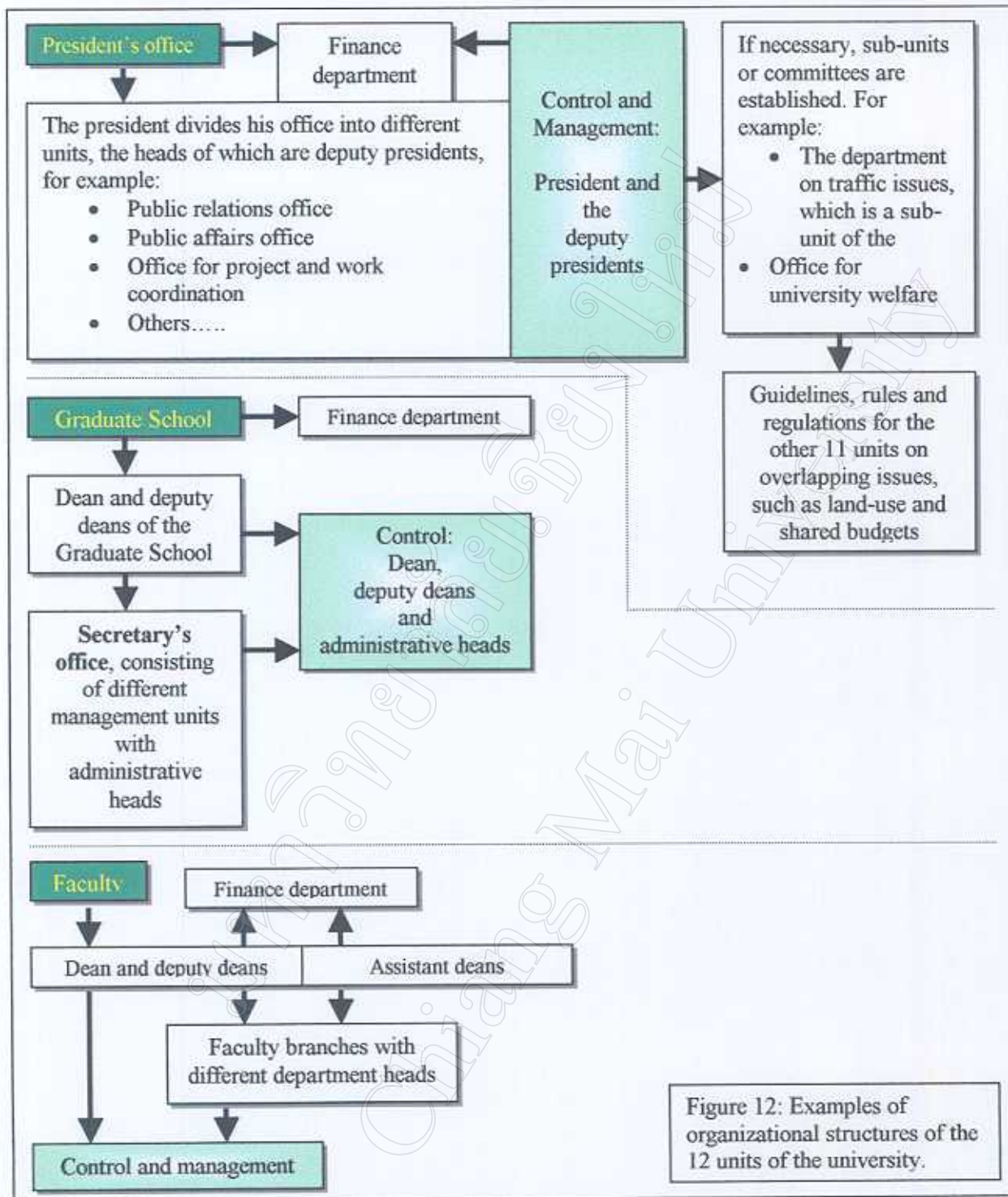
Funding for traffic measures is drawn from a variety of sources, depending whether the project is an initiative of the administration, a research project or directly related to one of the twelve university units or institutions with similar status. For this system of multiple funding sources to be an advantage in traffic management, a clear and executable master plan with defined responsibilities is needed. Currently traffic is handled by a sub-division of the office for university welfare, which in turn is a unit of the president's office. The tram and bicycle lanes are an initiative of this office. Funding for traffic related measures seems to be sufficient. For example, the bicycle lanes were installed with an initial budget proposal of 15 million Baht[97].

6.4.b Traffic Master Plan of the University and Faculties

- Traffic master plans for the university and the faculties are only available in a rudimentary form as general guidelines. A land-use and zoning map for the years 1992 to 1996 exists, which has been published in 1991. More recent, printed material was not available to this study.

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[96] Source: SSI with administrators in May/June 2000
[97] SSI with the faculty of engineering on the 7th of June 2000

President's office → Finance department ← Control and Management: President and the deputy presidents

The president divides his office into different units, the heads of which are deputy presidents, for example:
- Public relations office
- Public affairs office
- Office for project and work coordination
- Others......

If necessary, sub-units or committees are established. For example:
- The department on traffic issues, which is a sub-unit of the
- Office for university welfare

Guidelines, rules and regulations for the other 11 units on overlapping issues, such as land-use and shared budgets

Graduate School → Finance department

Dean and deputy deans of the Graduate School

Control: Dean, deputy deans and administrative heads

Secretary's office, consisting of different management units with administrative heads

Faculty → Finance department

Dean and deputy deans   Assistant deans

Faculty branches with different department heads

Control and management

Figure 12: Examples of organizational structures of the 12 units of the university.

- The guidelines are 4 years old and their implementation is subject to prolonged budget procedures. A copy was not made available to this study. On the search for traffic related material, during one meeting[98] with faculty administrators, the researcher was told that traffic management normally takes the following form: "We paint the lines for parking lots and people park. Maintenance does that."

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[98] At the faculty of Social Science in February 2000.

- The current regulation is that all changes regarding the use of land not occupied by existing faculty buildings have to be approved by the president's office first.
- A committee on university traffic exists but has not convened in almost three years.
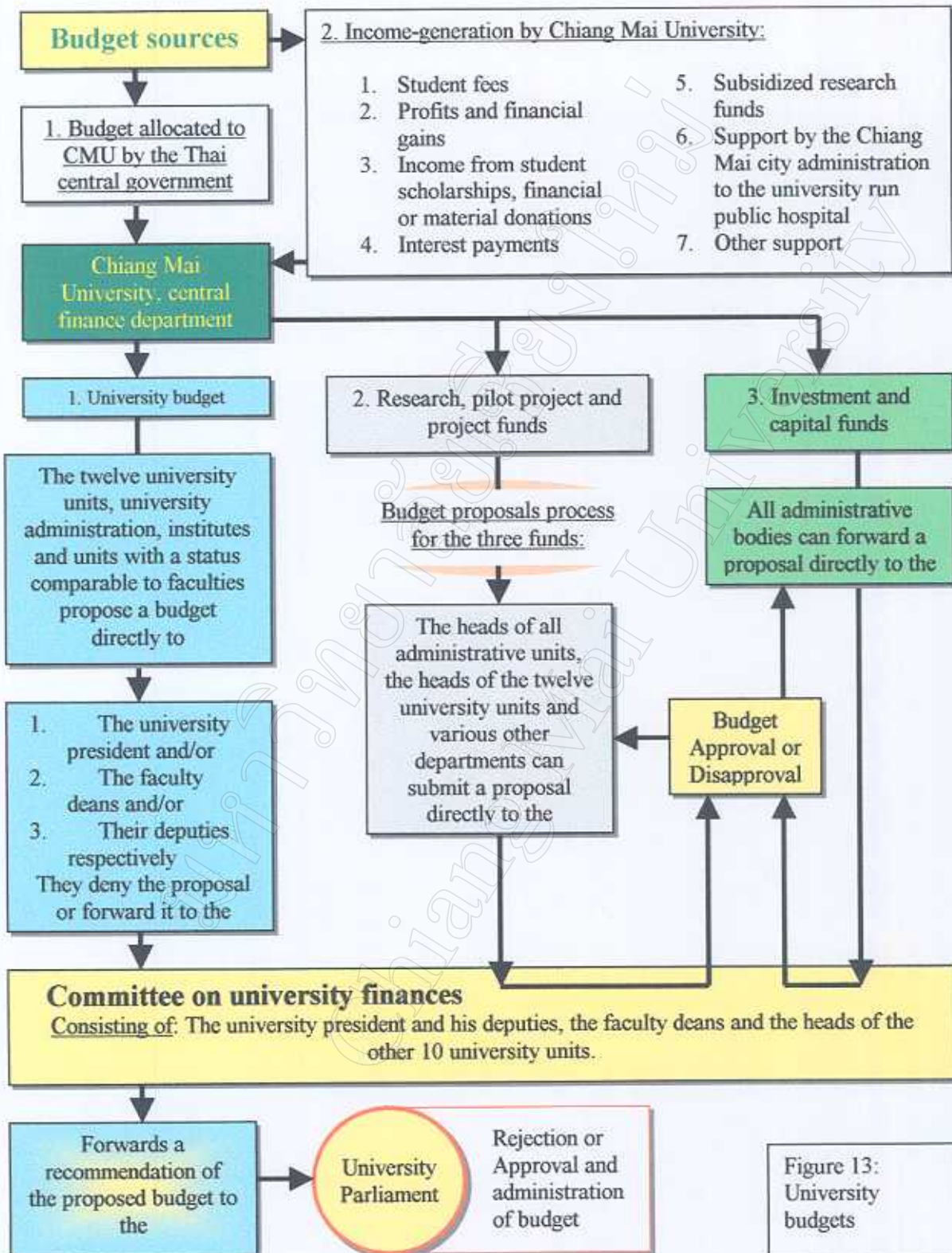
Budget sources

2. Income-generation by Chiang Mai University:

1. Student fees
2. Profits and financial gains
3. Income from student scholarships, financial or material donations
4. Interest payments
5. Subsidized research funds
6. Support by the Chiang Mai city administration to the university run public hospital
7. Other support

1. Budget allocated to CMU by the Thai central government

Chiang Mai University, central finance department

1. University budget

2. Research, pilot project and project funds

3. Investment and capital funds

The twelve university units, university administration, institutes and units with a status comparable to faculties propose a budget directly to

Budget proposals process for the three funds:

All administrative bodies can forward a proposal directly to the

1. The university president and/or
2. The faculty deans and/or
3. Their deputies respectively

They deny the proposal or forward it to the

The heads of all administrative units, the heads of the twelve university units and various other departments can submit a proposal directly to the

Budget Approval or Disapproval

Committee on university finances

Consisting of: The university president and his deputies, the faculty deans and the heads of the other 10 university units.

Forwards a recommendation of the proposed budget to the

University Parliament

Rejection or Approval and administration of budget

Figure 13: University budgets

6.4.c Current Traffic Rules and Regulations

- University traffic follows Thai traffic rules, however, the police as an enforcement agency are not allowed onto campus. Guards from university and/or a private company take on the duty of policemen during critical traffic hours. They are dressed as traffic police, but lack any executive power. (However, throughout the text this study refers to them simply as policemen in accordance with their role in traffic management at campus as opposed to the role of a guard.)
- Currently BA students of the first three years that are resident at university dormitories are officially prohibited from using motorized vehicles. Therefore every campus user has to register his or her vehicle. Permission to use a vehicle is given in the form of a sticker that can be attached to the frame[99]. Guards at the five main entrances to campus control these stickers. Temporary users of vehicles at campus have to deposit their ID-cards or a similar type of identification before permitted entry.
- At the premises of the faculty of science an area has been established that is commonly referred to as 'silent zone'. This description is not correct, however, as it is simply an area of 'No through traffic' between the university registry and buildings of the faculty, with access restricted to university personnel and teachers. (See chapter 8.2, roads.)
- The three major university entries/exits are controlled by guards from a private company. Their role is to control vehicle entry permits in form of stickers attached to the vehicle. Vehicles without sticker have to deposit some form of identification with the guards that is handed back to the owner upon leaving CMU campus at the same control point used for entry. Thus campus through-traffic for non-users of CMU facilities is largely eliminated. However, this system tends to create unnecessary traffic, as such vehicles can only leave the premises at their point of entry.

6.4.d Current Traffic Related Programs

- The University has adopted a policy on traffic management based on concerns about 'wild parking', road safety, traffic jams, air pollution and noise pollution[100]. Proposed measures are:
1. Organize parking at CMU
2. Find ways to reduce the number of motorized vehicles at campus
3. Promote bicycle use
4. Solve the traffic safety problems
5. Introduce an efficient system of public transportation.

- The CMU bicycle club provides a few hundred bicycles that can be rented for 1 Baht per day. Acceptance is somewhat low[101].

6.4.e Personal Management of Commuting by Users

Within the traffic environment established by the current administrative organization, each individual user has created a personal form of adaptation or coping[102] in order to achieve the

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[99] The stickers become property of the vehicle holder, thus many copies made with laser-copy machines are available, as no legal consequences need to be feared. For the guards it is impossible to tell, which sticker is a copy and which one is a genuine. Prices for copied stickers range from 40 to 80 Baht on the 'gray' market (May 2000).

[100] The president's office, April 2000.

[101] Source: OBEA and SSI on June the 7th, 2000.
Bundit Graduate School is currently conducting research on the bicycle club and related issues. For more information contact the Graduate School, branch: Man and Environment Management.

personally most efficient form of commuting based on individual access to resources. This personal management of commuting is an acquired behavior and all individual decisions involved are in sum the actual traffic that one can observe at campus. Describing commuting according to user groups outlines opportunities and restrictions for traffic management measures at the study site. In the questionnaire four questions were asked concerning this topic and the following percent distribution established:

Although 20 % of all participants do not have a vehicle at their disposal, only 10.4 % actually walk from home directly to University or class and only 8.1 % rely on red busses. The discrepancy of 1.5 % suggests that at least some ridesharing is established in one form or another. Once commuters have arrived at campus, a drastic change in choice of vehicle takes place. While 25.4 % use their car to commute to university, only 11.9 % actually use their car while moving within the campus area. The motorcycle provides the main means for commuting off campus with 50 % although a drop of 9.8 % can be observed once on campus. The use of pick-up-trucks, like cars, is also roughly cut in half with a drop to 1.3 % of users from 2.7 %. Interestingly, the use of red busses and trams accounts for only 4.1 % of all internal commuting, down almost half from 8.1 %. The biggest gain can be observed for walking. The number of users commuting by foot within the campus area almost quadruples from 10.4 % for commuting to campus to 38.8 % for commuting on campus.

Ridesharing is an established means of commuting; 35 % never ride alone, 38.3 % mostly share transportation and only 26.7 % normally ride alone. The number of ride-sharers is, thus, exceptionally high and establishes this form of commuting as the most important one.

Regarding personal commuting management, the following general characteristics can be established:
1. The motorbike is the most important vehicle for commuting.
2. Cars and pick-up-trucks are mostly considered vehicles to reach university and their use drops by approximately 50% for commuting on campus.
3. On campus, walking as a form of commuting is practiced intensively by almost 40 % of campus users.
4. Ridesharing is an accepted form of transportation and practiced in one form or another by up to three-fourth of all campus users.
5. Red busses, the tram and bicycles play only a minor role in campus commuting.

Table 4: Personal commuting habits of users	
Number of answers and per cent distribution	**Worded questions and possible answers.**
1.	**What type of vehicle(s) do you have at your daily disposal? (more than one answer was possible)**
138/480 = 28.8%	Car.
262/480 = 54.6%	Motorbike.
31/480 = 6.5%	Bicycle.
26/480 = 5.4%	Pick-up truck.
96/480 = 20.0%	I do not have a vehicle at my daily disposal.

[102] See appendixes chapter A10.

2.	What type of vehicle do you mostly use for your transportation directly from your home to classes/university and from classes/university to your home?
122 = 25.4 %	Car.
241 = 50.2 %	Motorbike.
15 = 3.1 %	Bicycle.
13 = 2.7 %	Pick-up truck.
39 = 8.1 %	Red busses.
50 = 10.4 %	I walk.
480 = 100 %	

3.	What type or types of vehicle do you mostly use for your transportation in between classes and for your way to lunch?
57 = 11.9 %	Car.
197 = 41.0 %	Motorbike.
13 = 2.7 %	Bicycle.
6 = 1.3 %	Pick-up truck.
21 = 4.1 %	Red busses / tram
186 = 38.8 %	I walk.
480 = 100 %	

4.	When you ride a vehicle at campus, do you share it with someone?
168 = 35.0 %	Yes, I always share transportation with someone.
184 = 38.3 %	Yes, I mostly share transportation with someone.
128 = 26.7 %	No, I normally ride alone.
480 = 100 %	

6.4.f Personal Management of Commuting According to User Groups

Considering personal transportation management separated into user groups and their preferences will give valuable indicators for possible conflicts of interest in administrative management measures. The groups considered are:
1. Students
2. Teachers
3. Administration
4. University and private personnel and research assistants

We can find the following general characteristics in personal transportation management according to user groups:

Students:
1. The motorbike is the most important vehicle for commuting.
2. Cars and pick-up trucks are mostly considered vehicles to reach university and their use drops by much more than 50% for commuting on campus.
3. On campus, walking as a form of commuting is practiced intensively by almost 40 % of campus users.
4. Ridesharing is an accepted form of transportation and practiced in one form or another by up to almost 80 % of all students.
5. Red busses, the tram and bicycles play only a minor role in campus commuting.

Teachers:
1. The car is the most important vehicle for commuting on and off campus.

2. Walking as a form of commuting on campus is practiced intensively by almost 40 % of the teachers.
3. Motorbikes and red busses/tram play no role at all in on campus commuting (0.00%)
4. Ridesharing is not an accepted form of transportation and practiced in one form or another by only 28.57 % of all teachers.
5. The bicycle plays only a marginal role in on-campus commuting.

Administration:
1. The car is the most important vehicle for commuting on and off campus (50.00% and 66.67, respectively).
2. Walking is the second most important form of on-campus commuting (25 %).
3. Motorbikes and bicycles play a minor role in on-campus commuting with together 16.67 %.
4. Ridesharing is the normal form of transportation on campus with 83.33%[103].
5. Red busses and the tram play only a marginal role in on campus commuting.

University personnel and research assistants:
1. The car is the most important vehicle for off-campus commuting.
2. Motorbikes and cars are equally important vehicles on campus.
3. Walking for on campus commuting is the most important form of transportation.
4. Ridesharing is practiced by only about half of this user group.
5. The bicycle, the red busses and the tram play only a marginal role in on campus commuting.

Summary:

Based on majority:
The majority of users opt for the motorbike as their main means of transportation on and off campus. The total number used on campus decreases by about 20%. The car is the second most important vehicle, but far behind motorcycles. Bicycles, red busses and the tram play a minor role in on campus commuting. Except for motorbikes, all vehicles on campus are used about 50 % less often than for off campus transportation. Instead, a shift towards walking takes place. Ridesharing plays a very important role in on-campus transportation and is widely practiced.

Based on user groups:
As students are the user majority on campus, it is expected that their on-campus transportation choice differs only slightly from the overall result of the questionnaire. However, considered as a group of their own, their reliance on motorcycles, walking and ridesharing is even more pronounced.
Teachers, the administration, university employees and research personnel rely mostly on cars. This group is clearly led by teachers and the administration, with 50% of both groups using this means of transportation. Teachers almost never practice ridesharing. They never use public transport. The administration, university employees and research personnel employ other forms of transportation to a limited degree.

Based on an environmental perspective:
Walking would be the ideal choice for sustainable transportation at campus. It is widely practiced and could even be more encouraged. Bicycles are not really accepted as a means of transportation.

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[103] This high number is probably due to the fact that many administrators have a personal driver.

Public transportation in the form of red busses or the tram is the environmentally least damaging form of motorized transportation available at campus. However, they are not accepted and used only by a minority of campus users. Some vehicles are not well maintained and pollute unnecessarily.

Although the number of motorbikes at campus is astounding, their relatively small engines and the high percentage of practiced ridesharing make them environmentally the most sound alternative after public transport. Some vehicles are not well maintained.

Cars are the worst choice of transportation in regard to the environment, especially among those user groups, like teachers, that hardly ever practice ridesharing. Some vehicles are not well maintained.

Students:

Table 5: Personal commuting habits of students	
Number of answers and per cent distribution	Worded questions and possible answers.
1.	What type of vehicle(s) do you have at your daily disposal? (more than one answer was possible)
91/411 = 22.14%	Car.
243/411 = 59.12%	Motorbike.
27/411 =6.57%	Bicycle.
15/411 = 3.65%	Pick-up truck.
2.	What type of vehicle do you mostly use for your transportation directly from your home to classes/university and from classes/university to your home?
79 = 19.22 %	Car.
229 = 55.7 %	Motorbike.
12 = 2.92 %	Bicycle.
7 = 1.70 %	Pick-up truck.
37 = 9.00 %	Red busses.
47 = 11.4 %	I walk.
411 = 100 %	
3.	What type or types of vehicle do you mostly use for your transportation in between classes and for your way to lunch?
28 = 6.81 %	Car.
189 = 45.99 %	Motorbike.
9 = 2.19 %	Bicycle.
3 = 0.73 %	Pick-up truck.
19 = 4.62 %	Red busses / tram
163 = 39.66 %	I walk.
411 = 100 %	
4.	When you ride a vehicle at campus, do you share it with someone?
157 = 38.20	Yes, I always share transportation with someone.

%	
161 = 39.17 %	Yes, I mostly share transportation with someone.
93 = 22.63 %	No, I normally ride alone.
411 = 100 %	

Teachers:

Table 6: Personal commuting habits of teachers	
Number of answers and per cent distribution	**Worded questions and possible answers.**
1.	What type of vehicle(s) do you have at your daily disposal? (more than one answer was possible)
23/28 = 82.14%	Car.
4/28 = 14.28%	Motorbike.
1/28 = 3.57%	Bicycle.
2/28 = 7.14%	Pick-up truck.
2.	What type of vehicle do you mostly use for your transportation directly from your home to classes/university and from classes/university to your home?
21 = 75 %	Car.
2 = 7.14 %	Motorbike.
1 = 3.57 %	Bicycle.
2 = 7.14 %	Pick-up truck.
0 = 0.00 %	Red busses.
2 = 7.14 %	I walk.
28 = 100 %	
3.	What type or types of vehicle do you mostly use for your transportation in between classes and for your way to lunch?
14 = 50 %	Car.
0 = 0.00 %	Motorbike.
1 = 3.57 %	Bicycle.
1 = 3.57 %	Pick-up truck.
0 = 0.00 %	Red busses / tram
12 = 42.86 %	I walk.
28 = 100 %	
4.	When you ride a vehicle at campus, do you share it with someone?
1 = 3.57 %	Yes, I always share transportation with someone.
7 = 25.00 %	Yes, I mostly share transportation with someone.
20 = 71.43 %	No, I normally ride alone.
28 = 100 %	

Administration:

Table 7: Personal commuting habits of administrators	
Number of answers and per cent distribution	**Worded questions and possible answers.**
1.	What type of vehicle(s) do you have at your daily disposal? (more than one answer was possible)
9/12 = 75.00%	Car.
3/12 = 25.00%	Motorbike.
1/14 = 8.33%	Bicycle.
3/12 = 25.00%	Pick-up truck.
2.	What type of vehicle do you mostly use for your transportation directly from your home to classes/university and from classes/university to your home?
8 = 66.67 %	Car.
2 = 16.67 %	Motorbike.
1 = 8.33 %	Bicycle.
0 = 0.00 %	Pick-up truck.
1 = 8.33 %	Red busses.
0 = 0.00 %	I walk.
12 = 100 %	
3.	What type or types of vehicle do you mostly use for your transportation in between classes and for your way to lunch?
6 = 50.00 %	Car.
1 = 8.33 %	Motorbike.
1 = 8.33 %	Bicycle.
0 = 0.00 %	Pick-up truck.
1 = 8.33 %	Red busses / tram
3 = 25.00 %	I walk.
12 = 100 %	
4.	When you ride a vehicle at campus, do you share it with someone?
4 = 33.33 %	Yes, I always share transportation with someone.
6 = 50.00 %	Yes, I mostly share transportation with someone.
2 = 16.67 %	No, I normally ride alone.
12 = 100 %	

University personnel and research assistants:

Table 8: Personal commuting habits of university personnel and research assistants	
Number of answers and per cent distribution	**Worded questions and possible answers.**
1.	What type of vehicle(s) do you have at your daily disposal? (more than one answer was possible)

12/25 = 48.00%	Car.
11/25 = 44.00%	Motorbike.
2/25 = 8.00%	Bicycle.
5/25 = 20.00%	Pick-up truck.

2.	What type of vehicle do you mostly use for your transportation directly from your home to classes/university and from classes/university to your home?
11 = 44.00 %	Car.
8 = 32.00 %	Motorbike.
1 = 4.00 %	Bicycle.
3 = 12.00 %	Pick-up truck.
1 = 4.00 %	Red busses.
1 = 4.00 %	I walk.
25 = 100 %	

3.	What type or types of vehicle do you mostly use for your transportation in between classes and for your way to lunch?
7 = 28.00 %	Car.
7 = 28.00 %	Motorbike.
2 = 8.00 %	Bicycle.
1 = 4.00 %	Pick-up truck.
0 = 0.00 %	Red busses / tram
8 = 32.00 %	I walk.
25 = 100 %	

4.	When you ride a vehicle at campus, do you share it with someone?
5 = 20.00 %	Yes, I always share transportation with someone.
9 = 36.00 %	Yes, I mostly share transportation with someone.
11 = 44.00 %	No, I normally ride alone.
25 = 100 %	

6.5 Attitudinal Environment

The overall psychological make-up of a group of people determines their use of resources. This chapter assesses acceptance probability of traffic measures by looking at the attitude and opinion of user groups at the study site concerning traffic related issues. Questions were asked about the following categories:

1. Infrastructure measures
2. Traffic policy
3. Social aspects

Some of the questions presented in the questionnaire were developed from data of one of the preliminary papers. This data is therefore introduced in the first part of this chapter.

6.5.a User Groups' Opinion Regarding Traffic and Traffic Discipline (Based on Preliminary Paper 1)

This part of the assessment describes the attitude and satisfaction of campus users regarding traffic related issues. Data given here is based on the first preliminary paper and divided into the following categories:

> **Vehicles & Traffic control structures**
> **Traffic discipline & personal values**
> **General infrastructure & public transportation**
> **General management principles**
> **Parking**
> **Road infrastructure**
> **Land-use**

Vehicles & Traffic control structures:

- 89% of campus users think that there are many or too many vehicles at campus and 75 % support measures to restrict their numbers.
- 83% of campus users regard the number of vehicles as an obstruction to their movement during at least some hours of the day and 10% regard the number as a permanent and serious obstruction.
- 65% think that the current traffic problems are due to a lack of strict traffic measures.

Traffic discipline & personal values:

- 73% of users think that there is a general lack of respect towards traffic rules and regulations.
- 60% think that values of Thai society prevent people from accepting riding a bicycle or motorbike as a means of transportation.

General infrastructure & public transportation:

- 74% think that buildings and related infrastructure are not appropriate for the number of vehicles at campus.
- 61% think that a lack of choice in transportation forces people to use motorized vehicles.
- 90% would welcome a zone protected from noise pollution.
- 62% think that the campus is degrading.

General management principles:

- 77% of campus users are not satisfied with the general conditions for transportation at CMU.
- 92% think that a central transportation management system is needed to regulate traffic at CMU campus.
- 64% of campus users would agree to an infrastructure fee-system in one form or another.

Parking:

- 74% think that there are not enough parking lots at campus.

Road infrastructure:

- 66% think that the road infrastructure is not appropriate to entice walking.
- 70% think that the university should provide a more convenient infrastructure for cycling or motorbike riding.
- 56% think that there are enough roads at CMU.
- 70% think that the number of bicycle lanes is not sufficient and 74% think that the existing ones are not convenient.
- 59% think that the roads are too narrow.

Land-use:
- 70% think that the current land-use at CMU is not appropriate for the number of vehicles present.
- 77% think that there are not sufficient public chairs, benches and other seating facilities.
- 80% think that there are not sufficient public meeting points and salas.
- 77% think that there are not sufficient public parks and resting areas close to buildings.
- 55% think that there are not sufficient pedestrian walkways along roads.
- 80% think that there are not sufficient public roofed over walkways for weather-protected transition.

Summary:

The attitude and opinion towards traffic at university clearly favors change. Most users are dissatisfied with the current situation and see the reasons in inappropriate management, land-use and zoning that is not up to current needs and little convenience in the traffic solutions offered. However, users are critical and understanding towards these problems as they see part of them rooted in cultural values and personal behavior. A centrally organized management would be welcome, even at the cost of having to pay user fees.

6.5.b User Groups' Opinion Regarding Specific Infrastructure Measures

Participants of the questionnaire have not opted to select their personal mode of transportation to be supported by infrastructure adaptation, but instead opt for public transportation and walking for commuting. However, the currently offered system of red busses and trams receives preferential support from only about one quarter of users, e.g. 27.50% and 25.42%, and instead 56.04% would prefer a system of mini-bus lines. A better adaptation of the campus infrastructure towards walking receives 44.58% of preferential support. 76.9% think that measures are needed to make walking more convenient and 78.5% want the construction of roofed over walkways. 79.79% opt for a silent zone reserved for walking and bicycle riding around the library. Infrastructure adaptation for cars, bicycles and motorbikes is least popular, with only 17.92%, 17.29% and 11.87% respectively preferring adaptation for these types of vehicles. The following questions were asked:

Table 9: User Groups' Opinion Regarding Specific Infrastructure Measures	
Number of answers and per cent distribution	**Worded questions and possible answers.**
1.	**What kind of transportation should receive most support in campus infrastructure lay out?** (Participants were asked to give each type of transportation a number, 1= most support, 7= least support. Results are shown in total accumulated points/the total number of participants)
2132/480 = 4.44	Cars.
1989/480 = 4.14	Red busses.
1354/480 = 2.82	Minibus lines.
1944/480 = 4.05	Tramlines.
2231/480 = 4.65	Motorbikes.
2098/480 = 4.37	Bicycles.
1674/480 = 3.49	Walking.
	The following table shows the percent distribution of answers per type of vehicle/selected grade of support (1= most support, 7= least support). In the left field the combined percentage points of groups 1 & 2, as well as groups 6 & 7 are given.

Cars 86/480 = 17.92% 167/480 = 34.79%	For category 1: 20/480 = 4.17% For category 2: 66/480 = 13.75% For category 3: 60/480 = 12.5% For category 4: 240/480 = 29.17% For category 5: 27/480 = 5.62% For category 6: 64/480 = 13.33% For category 7: 103/480 = 21.46%
Red busses 132/480 = 27.50% 150/480 = 31.25%	For category 1: 35/480 = 7.29% For category 2: 97/480 = 20.20% For category 3: 79/480 = 16.45% For category 4: 36/480 = 7.50% For category 5: 83/480 = 17.29% For category 6: 86/480 = 17.92% For category 7: 64/480 = 13.33%
Minibus lines 269/480 = 56.04% 94/480 = 19.58%	For category 1: 250/480 = 52.08% For category 2: 19/480 = 3.96% For category 3: 31/480 = 6.46% For category 4: 41/480 = 8.54% For category 5: 45/480 = 9.37% For category 6: 74/480 = 15.41% For category 7: 20/480 = 4.17%
Tramlines 122/480 = 25.42% 139/480 = 28.96%	For category 1: 41/480 = 8.54% For category 2: 81/480 = 16.87% For category 3: 99/480 = 20.62% For category 4: 48/480 = 10.00% For category 5: 72/480 = 15.00% For category 6: 81/480 = 16.87% For category 7: 58/480 = 12.08%
Motorbikes 57/480 = 11.87% 169/480 = 35.21%	For category 1: 15/480 = 3.12% For category 2: 42/480 = 8.75% For category 3: 80/480 = 16.67% For category 4: 114/480 = 23.75% For category 5: 60/480 = 12.50% For category 6: 45/480 = 9.37% For category 7: 124/480 = 25.83%
Bicycles 83/480 = 17.29% 123/480 = 25.62%	For category 1: 20/480 = 4.17% For category 2: 63/480 = 13.12% For category 3: 79/480 = 16.45% For category 4: 70/480 = 14.58% For category 5: 125/480 = 26.04% For category 6: 51/480 = 10.62% For category 7: 72/480 = 15.00%
Walking 214/480 = 44.58% 114/480 = 23.75%	For category 1: 101/480 = 21.04% For category 2: 113/480 = 23.54% For category 3: 53/480 = 11.04% For category 4: 30/480 = 6.25% For category 5: 69/480 = 14.37% For category 6: 75/480 = 15.62% For category 7: 39/480 = 8.12%
2.	**Do you think measures are needed to make walking more convenient at campus?**
369 = 76.9%	Yes.

111 = 23.1%	No.
480 = 100%	
3.	Would you agree to a silent zone at a wider area around the library reserved for walking and bicycle riding only?
383 = 79.79%	Yes.
97 = 20.21%	No.
480 = 100%	
4.	Do you think the university should build roofed over walk ways to connect buildings to give protection from weather?
377 = 78.5%	Yes.
103 = 21.5%	No.
480 = 100%	

6.5.c User Groups' Opinion Regarding Traffic Policy

The campus policy of separating parking lots according to user groups, as practiced at the faculty of science, is considered differently by the two main user groups. The student faction is almost split in half, with 48.18% supporting separation and 51.82% rejecting it. In spite of the fact that 80% of all questionnaires were answered by students, the large majority of 72.46% of all other user groups supporting the idea pushes the total number of supporters to 51.70%. On the other hand, the campus policy of restricting the use of certain vehicles according to user groups meets with 83.50% disapproval by all groups, with no significant deviation according to individual user groups.

Concerning the hypothetical use of possible user fees, a similar form of agreement throughout all user groups can be found. A total of 14.80% of all users would welcome the introduction of such a fee system unconditionally, with a slight majority for the students with 14.84% compared to other user groups with 14.49%. A considerable majority of 57.90% of all users welcome a fee system under the condition that generated fees are used for traffic related measures only, with a small percentage deviation of 57.42% for students and 60.87% of all other user groups. Only 27.30% think that a fee system should not be introduced (27.74%/students and 24.64%/all others). These findings confirm the questionnaire of the preliminary paper and its analysis that a majority of about 75% of all users would be willing to sacrifice financial resources, if they could be used to improve the traffic situation.

Concerning traffic violation, again, a large majority of 79.20% thinks that traffic law enforcement should be stricter at campus, with no significant deviation in opinion among the user groups. The introduction of fines for traffic law violation finds a somewhat smaller majority of 59.80% supporters. However there is a slight deviation between user groups, with 58.64%/students and 66.67%/all others. The largest majority for any topic of the questionnaire, with 91.90% of all answers, was found regarding the introduction of measures to improve the relationship between guards and campus users through efforts in awareness raising and knowledge building to make users understand the guards' role in traffic management better.

The last question in this category concerned the introduction of traffic lights. Here, a slight majority of 51.64% prefers traffic police (guards) to help direct traffic, while 33.96% would opt for traffic lights. 14.58% would welcome a combination of both systems. The following questions were asked:

Number of answers and per cent distribution	Worded questions and possible answers.
	Table 10: User Groups' Opinion Regarding Traffic policy
1.	**Do you support the creation of separated parking lots according to user groups like: students, teachers, administration etc...?**
248 = 51.7%	Yes.
232 = 48.3%	No.
480 = 100%	
	Answers according to user groups:
Yes	Students: 198/411 = 48.18% All other groups combined: 50/69 = 72.46%
No	Students: 213/411 = 51.82% All other groups combined: 19/69 = 27.54%
2.	**Do you think that all types of vehicles should be allowed for all groups of users, or do you think some restrictions should be applied? (For example: Do not allow BA students of the first year to use private transportation on campus.)**
401 = 83.5%	All should be allowed to use any vehicle they want.
79 = 16.5%	Some restrictions on vehicle use are appropriate.
480 = 100%	
3.	**In some other countries traffic management systems are based on the collection of user fees. Do you think such a fee system should be applied at Chiang Mai University?**
71 = 14.8%	Yes, a management system should have the right to collect user fees.
278 = 57.9%	Yes, but a management system should have the right to collect user fees only, if the collected fees are used directly for traffic management and related infrastructure, only.
131 = 27.3%	No, such a system should not be used at CMU.
480 = 100%	
	Answers according to user groups:
Yes, a management system should have the right to collect user fees.	Students: 61/411 = 14.84% All other groups combined: 10/69 = 14.49%
Yes, but a management system should have the right to collect user fees only, if the collected fees are used directly for traffic management and related infrastructure, only.	Students: 236/411 = 57.42% All other groups combined: 42/69 = 60.87%
No, such a system should not be used at CMU.	Students: 114/411 = 27.74% All other groups combined: 17/69 = 24.64%
4.	**What do you think? Should traffic law enforcement be stricter at campus?**
380 = 79.2%	Yes, it should be stricter.
100 = 20.8%	No, I do not agree.
5.	**What do you think? Should traffic law enforcement introduce fines for**

	traffic law violation?
287 = 59.8%	Yes, it should be stricter and introduce fines.
193 = 40.2%	No, I do not agree.
480 = 100%	

	Answers according to user groups:
Yes, it should be more introduce fines.	Students: 241/411 = 58.64% All other groups combined: 46/69 = 66.67%
No, I do not agree.	Students: 170/411 = 41.36% All other groups combined: 23/69 = 33.33%

6.	Do you think that university should built a better relationship between guards and campus users and make efforts to raise public awareness and knowledge concerning the guards' role and importance in implementing a traffic management system?
441 = 91.9%	Yes, I agree.
39 = 8.1%	No, I do not agree.
480 = 100%	

7.	Do you think the presence of police at campus to help directing traffic is better or would you prefer traffic lights?
247 = 51.46%	Police presence to direct traffic is better.
163 = 33.96%	Traffic lights to direct traffic are better than policemen.
70 = 14.58%	Both, police and traffic lights should be used to direct traffic.
480 = 100%	

6.5.d Cultural Aspects Regarding Traffic

The first question of this category is based on many similar remarks while conducting the first preliminary paper, which are in essence: 'In Thai society, a person of a higher social standing like for example a teacher, is somewhat expected to drive a car.' When this topic was addressed in the questionnaire, a somewhat different result could be found with only 22.90% agreeing to the statement and the large majority of 77.0% denying it. However, a significant deviation according to user group could be found. Slightly more than half of the non-student groups agreed with the statement, expressing a conflict of opinion that is sometimes reflected in campus traffic policies.

A second question concerned the enforcement probability of traffic regulations by guards, when dealing with violators of a different social status. Here 62.71% of all users thought that equal enforcement of traffic regulations throughout all social classes is not possible due to an inferior social status of guards in Thai society, while 37.29% would not agree to such a statement. There is an interesting deviation in percent distribution regarding especially university employees, research assistants, administrators and private personnel. Here, a total of 78.05% agreed to the statement.

The following questions were asked:

Table 11: Cultural Aspects Regarding traffic	
Number of answers and per cent distribution	Worded questions and possible answers.

1.	What do you think of the following statement? In Thailand a professor is expected by society to drive a car and any other form of transportation is considered not really appropriate for his social position?
110 = 22.9%	Yes, a professor is expected to drive a car.
370 = 77.1%	No, this is not true.
480 = 100%	
	Answers according to user groups:
Yes, a teacher is expected to drive a car.	Students: 110/411 = 18.25% All other groups combined: 35/69 = 50.72%
No, this is not true.	Students: 370/411 = 81.75% All other groups combined: 34/69 = 49.28%

2.	Would you agree to the following statement? In Thai society and on campus, guards have an inferior social position and it is difficult for them to enforce traffic rules with all users of the campus infrastructure equally strict.
301 = 62.7%	Yes, I agree.
179 = 37.3%	No, I do not agree.
480 = 100%	
	Answers according to user groups:
Yes, I agree.	Students: 252/411 = 61.31% Teachers: 17/28 = 60.71% University employees and research assistants: 21/25 = 84.00% Administration: 8/12 = 66.67% Private employees: 3/4 = 75.00%
No, I do not agree.	Students: 159/411 = 38.69% Teachers: 11/28 = 39.29% University employees and research assistants: 4/25 = 16.00% Administration: 4/12 = 33.33% Private employees: 1/4 = 25.00%