Chapter 7: Summative, Critical Analysis Based on Triangulation

The process of triangulation can be described as 'cross-checking from different perspectives[104]'. Data employed for the analysis is therefore based on at least three independent sources from altogether six different data groups utilized, which are:

1. Quantitative data from the university registration and administration
2. The questionnaire of the preliminary paper 1[105]
3. The results of the preliminary paper 2[106]
4. The first questionnaire of this study.
5. Data based on OBEA
6. Data collected by SSI[107]

7.1 Physical Conditions Relevant for Traffic

General:

The hilly terrain and the campus location on the slopes of Doi Suthep with its particular climate restrict traffic measures in two respects:

1. Not all vehicles or modes of transportation are equally appropriate for mass commuting, and
2. Unrestricted growth of motorized traffic is critical due to exhaust emission build-up under certain weather conditions.

These restrictions pose a problem for campus traffic development in general. The promotion of non-motorized transportation such as cycling and walking could be an alternative to motorized traffic and stop environmental pollution and emission build-up. On the other hand, not all users are physically equally able to use cycling or walking as their standard form of commuting. These special geophysical characteristics of the campus call for the implementation of an efficient system of mass transportation based on environmentally friendly engines.

The predominantly warm, subtropical climate in combination with the hilly terrain of the campus constitute an environmental opportunity. The recreational green-space of the university can support a large variety of different vegetation. Properly landscaped the campus could become an outstanding botanical treasure unique in Thailand, which would help to ease the problems of:

1. Noise-pollution, where lush vegetation could serve as sound barrier,
2. Air pollution, where dense, well tended vegetation could absorb a high percentage of motorized traffic emissions,
3. Visual pollution, where vehicles would not dominate the landscape optically. It would furthermore
4. Decrease overall average temperatures at campus wherever the greenery provides shade, and
5. Improve CMU's water balance sheet, as dense vegetation helps to slow evaporation of ground-moisture during the hot season.

Buildings:

The amount of buildings at the study site, with new construction at the library and the faculty of humanities under way, has reached a limit. If planning and construction continues unabated, the study site will soon have an appearance similar to the faculty of science.

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[104] Patton, Michael Quinn: 'Qualitative Evaluation Methods', Sage, Newbury Park, 1990

[105] "Proposal for a Land-Use Plan and Concept for One of the Study Centers of Chiang Mai University Campus"

[106] "Vehicle Parking at Chiang Mai University Campus"

[107] Summative trans-scripts of the SSI sessions can be found in the appendixes, chapter A4.

Densely built and populated with limited open space, this faculty was forced to restrict traffic on its premises in order to stop city-like noise levels due to traffic and commuting. The so-called 'silent-zone' between its buildings is actually a misnomer, as it only restricts traffic according to social position, e.g., teachers and personnel are allowed to use the premises' traffic infrastructure, while motorbike riding students are denied entry. The result is not only opposed by an overwhelming majority of all user groups, which are against this form of management, but also increase the demand in traffic space for the surrounding faculties, as no alternative parking is offered.

Buildings at other than the faculty of science are placed within appropriate distance to each other and in accordance with site-planning theories offer transition areas not wider than fifty meters. Their close proximity would also be ideal to support a loop or green belt that would promote walking as means of short distance commuting.

Roads:

Some of the roads at the study site are in bad condition, but all in all, they are sufficient in number and extent to accommodate the current traffic volume. Traffic jams during the university's rush hour mostly occur at the major traffic node C and the minor node D. Part of this problem is due to the building layout of the women's dormitory B3, where the main road practically forms its transition area. Thus, entering and exiting students are forced to regularly delay traffic by crossing the road to the (wild) motorbike parking area across, or by boarding red busses, which have no road-shoulder to temporarily stop their vehicles other than on the main lane.

Another road that poses some problems for traffic flow is opposite the main library. Here the traffic grain is extremely high, as the road is narrow and only allows for one traffic channel. Thus, commuters from the adjoining faculties and the car park create East-West/West-East traffic movement on foot that has to cross a South-East/East-South motorized traffic axis. To aggravate the problem, an entry/exit to the main car-parking area to the West of the library has been opened, bringing additional cross-movement to this particular stretch of road. The newly constructed bicycle lanes lead bicycle traffic into that narrow strip by using part of the pedestrian walkways. The area is the main part of the central node and offers the services of a few smaller shops, public telephones and an ATM booth. However, this is a problem of planning, e.g., designation and layout; The road itself would be sufficient with a proper layout of the surrounding area.

Parking:

Parking at the study site is in a serious condition of mismanagement. The number of parking lots offered to users is much less than 50 % of what would be needed to accommodate all vehicles properly. The result is widespread 'wild' parking, which is one of the main reasons for environmental destruction through traffic encroaching on human and green space. There is a variety of reasons for this phenomenon, some of which are:

1. Mostly poor and inconvenient layout of existing lots, which supports the process of gradual encroaching on other land.
2. A general lack of traffic discipline.
3. A (cultural?) tendency of the users to park wherever it is not expressly prohibited[108].
4. A lack of alternatives.
5. A lack of traffic law enforcement and others.

This study considers parking and its degrading effect on the campus environment[109] as the currently most pressing traffic problem at CMU. However, parking is an integral part of traffic, and thus, parking problems can only be solved through proper traffic management principles and user education (see following chapters). Improving the physical parking lot

[108] During one of the SSI, the researcher was told by an interview partner: "Unfortunately we [the Thais] do not park, we just stop our cars"

[109] Suggestions for an improved, general layout of parking lots can be found in the appendix, chapter A6.

will only increase the efficiency of the act of parking itself, but can hardly solve environmental problems created by it.

7.2 Employed Means of Transportation

Motorcycles:

Motorcycles are the most common form of transportation at the study site and there is a variety of reasons that contribute to their widespread use:

- They are economically affordable for almost everyone.
  Most of the users at the site are students with limited financial resources. But the ability to move freely and individually is very important at campus. For example, without individual transportation it is very often impossible to change classes within the 10-15 minute break provided for that purpose. With individual transportation time related planning becomes more flexible, as classes can be chosen to attend that would otherwise have to be taken in another semester[110].
- Expenses for maintenance are low.
  Repair and expenses for petrol are within the personal budget of most students. However , an enquiry at the CMU petrol station with the attendants revealed that almost none of the motorbikes taking petrol there fill their tank completely. Besides social reasons like friendship and companionship, the need to save money might be a major reason why ridesharing is so common among students.
- Riding a motorbike for commuting requires only a few skills.
  Contrary to driving a car, the most commonly used bikes employ a two-stroke or four-stroke engine with automatic gearshift that can be handled by children (as can often be seen on roads in Thailand).
- Motorbikes are highly maneuverable and relatively flexible.
- Motorbikes require only a small amount of traffic space in form of roads.
- Required space for parking is small.
  Despite the limited amount of parking lots at campus, finding a place to park the bike is relatively easy. Parked bikes in areas not designated for parking, like a footpath or along the road, are more easily accepted as they represent less of an obstruction as would a car in the same place.
- Motorbikes are an efficient solution to the lack of a comparable transportation alternative on and off campus.
  The transportation alternatives offered at Chiang Mai University, the tram lines and the red busses, are not sufficient in number and frequency of rides to induce users to switch their mode of transportation. Public transportation is slow, not convenient, not well organized and, even at 1.50 to 3 Baht a ride, it is not cost-effective. On average, an ordinary motorbike will get about 180 kilometers out of 80 Baht of petrol. If we assume the average commuting distance per trip with 1.5 kilometers, which is about the distance from the front entrance of CMU to the back entrance, one ride will cost 0.66 Baht. If we calculate alternate use of bikes from alternate owners through ridesharing, one trip will cost as little as 0.33 Baht per user. The maintenance cost for the average bike is about 250 Baht per 5000 kilometers[111], or 0.05 Baht/kilometer. Added to the cost per trip, one ride alone will cost about 0.71 Baht and with ridesharing about 0.38 Baht. The cost will go down for shorter trips, while available public transportation will cost the same.

Motorbike disadvantages are:

- They are not convenient for all weather conditions.

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[110] Having no individual transportation often represents someone with almost no financial resources, while motorbike-ownership represents a user with limited resources. Thus the motorbike is a vehicle chosen out of necessity and hardly ever is it the vehicle of choice.

[111] Source: Honda retailer Niti-Motor Company Limited, Huay Kaeuw Road, Chiang Mai

Especially during very hot or rainy weather, motorbikes provide little protection. This might be one of the reasons that ridesharing for student car-owners is very high, as they can provide dry and cool rides to their fellow students.

- They are less safe than walking or transportation on four wheels.
- Not properly maintained, their combustion engines create high levels of air pollution.
  The toxins emitted by badly maintained engines include NOXs, COXs, sulphur, benzene and dioxins, all extremely harmful for organisms and carcinogenic.
  Although emission regulations exist in Thailand, motorbike emissions are never checked. As regular engine inspection increases maintenance costs, many motorbike owners only enter a service station when it is unavoidable.

Although the use of motorbike drops from 55.72% for students for off-campus commuting to 45.99% for on-campus commuting, it is still the main form of transportation. In combination with the high percentage of ridesharing practiced by students (38.20% always and 39.17% most of the time), it becomes clear that this type of vehicle is responsible for most of the mass transportation at campus.
This however is quite different, if we look at other than the student user group. Here only 11.59% of all on-campus commuting is achieved by motorbike. This discrepancy in used mode of transportation between the students and the working population at campus is an expression of their different needs and the probable source of conflicting views on how traffic management should be done. Policies in the past and current policies have not and do not support the motorbike as the No 1 means of mass commuting at campus, contrary to practiced traffic management reality.
If we look at the facts of everyday mass commuting, we can understand the motorbikes importance better. An estimated 4500 students (including commuters) rely on the motorbike. If we consider ridesharing, this number can go up to 7200 students daily! If we estimate that only one third of this number has to change classrooms that cannot be reached on foot within 15 or twenty minutes, it becomes clear that the currently 240 seats offered by the tram are in no way adequate for the needs of the majority of the campus population. Even if we include twenty red busses it would only increase the seating capacity of the public transportation to about 480 seats at a time. This is only a little more than 10% of what would be needed to actually substitute bikes, not considering ridesharing. With ridesharing the number drops to about 6%. Probably due to this lack of capacity, among other reasons, only 4.62% of all students use red busses regularly.

The current regulation of not allowing resident BA degree students of the first three years (six semesters) to drive individual vehicles on campus is therefore a policy that is not approved by most users (see chapter on attitudinal environment) and probably worsens the traffic situation more than it easies it. According to the SSI, although the number of motorbikes present on campus has slightly decreased, the number of cars seems to have increased. About 45% of the student car users always practice ridesharing. Although a car can transport four to five people at a time and can take those along that are not allowed to use motorbikes, the actual need in traffic space has increased. It is possible to park 6 motorbikes that transport 12 people (and sometimes more) on the space required to park one car that transports a maximum of 5 people. The result can be seen at campus, where efforts to create car parks have increased visibly after the enforcement of the no-individual-transportation-policy. Based on OBEA during the last 8 months at campus, we can state that more green area has been eroded and prepared for car parks than would be needed to park all motorbikes currently used at campus. The total number of 979 provided parking lots for cars as of summer 1999 (not including improvised areas paved with gravel), could accommodate roughly 5500 motorbikes (six bikes/car), while the provided 3251 motorbike parking lots would only accommodate about 550 cars. Interpreting these numbers focusing on the actual space used up, we can state that that twice as much green area is currently sealed over to park cars than is to park motorbikes. At the same time, the space provided for cars can only transport 40% of the people that motorbikes parked on the same area could.

A reason for this harmful traffic policy might be that the very policy decision-making process and its implementation does involve students only marginally (see chapter on organizational environment) and puts interests of the minority of car-dependent commuters at an advantage.

Cars:

Cars are the second most common form of motorized transportation at campus. Compared to other vehicles they have advantages, which are:

- They constitute a relatively safe form of transportation.
- They offer all weather protection.

  Contrary to almost all other forms of transportation, cars can generate their own air-conditioned climate. Thus, commuting in a car is convenient.
- They have a relatively high seating capacity, when compared with motorbikes or bicycles.

  An average of four to five people can be seated in an ordinary car, if ride sharing is practiced. Regarding only the energy-balance and not the used up traffic space, an HOV car can move people almost as efficiently as motorbikes do. However, if used as an SOV, their energy consumption and pollution generation is very high in comparison.

There is a range of disadvantages to a car that very often outnumbers its advantages:

- A car requires much more traffic space in form of roads and parking lots than do bicycles or motorbikes.

  Accordingly, the infrastructure created for cars tends to encroach on human space more. This encroachment is most of the time un-orderly and destructive, especially when the provided infrastructure is too small. Also, during a phase of rapid economic development the increase in number of cars normally outgrows the expansion of related infrastructure. The current situation at CMU campus is an example of how a vehicle increase beyond infrastructure capacity can lead to degradation in human space through pollution and land destruction[112].
- It is difficult to always run a car as an HOV.

  But with a low or single occupancy, a car's petrol consumption and generated environmental pollution is relatively high per transported person.
- Cars are expensive.

  It is not possible for each user at university to ride a car. Even if the infrastructure would allow for such a scenario, the price for a car is simply too high for the majority of people at CMU.
- The cost to build and maintain the infrastructure needed for a transportation system based on individual cars is very high.
- Like with all vehicles using combustion engines, regular maintenance is needed to keep pollution in form of exhaust emission low.

  Toxins emitted by badly maintained engines include NOXs, COXs, sulphur, benzene and dioxins, which are extremely harmful for organisms and carcinogenic. Especially cheaper diesel engines emit toxic soot, which can often be seen at campus. However, a diesel engine is a more efficient combustion system than a four-stroke engine due to its high mileage yield and long life expectancy of the engine, if it is regularly maintained. Most diesel engines at campus are pick-up trucks or red busses, while the majority of ordinary passenger cars use four-stroke engines. Thailand has exhaust emission laws for cars, which are never enforced at university.

The car plays a variety of roles for all user groups:

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[112] In this case by pushing the smaller, 'weaker' vehicle to the fringes of the provided infrastructure, forcing them to find new space to substitute for the one taken by the bigger and physically and socially 'stronger' cars.

Although almost 23% of all students have access to a car for personal transportation, only about 19% use a car for their commuting to campus, e.g., 16% of student car owners choose a different form of transportation. This trend is much stronger for on- campus transportation. Here, less than 7% of all students rely on a car, or only 35% of all student car owners. This indicates that many cars are used by this group for ridesharing to class, carrying along other student car owners and those BA students that are not allowed to drive individual vehicles on campus.

Other user groups, notably teachers, administrators and administration personnel, reduce their use of cars for on-campus commuting by only about 30% and at the same time practice almost no ridesharing. If we relate to the numbers concerning people transported and space used by cars in the transportation environment, as introduced in the last chapter, we can state the following:
Of the 1300 non-students at the study site (including commuters) about 900 keep using their cars for on-campus transportation and 50% of those drive always alone and 33% drive sometimes and 17% always in company. If we estimate this ridesharing with an optimistic average of two people for each tour of those that practice ridesharing in some form or other, we come to a total of 1350 (900:2=450 / 450x1+450x2=1350) people transported with 900 car rides. At the same time, of 8700 students 7% use about 600 cars for on-campus commuting. Of those 600 cars 45% always and 34 % sometimes practice ridesharing, while 21% always drive alone. If we estimate that 79% (45%+34%) always ride with two people per car and 21% with one person, the total number transported in 600 rides is about 1100 people and car users of all groups together transport 2450 people. At the same time the motorbike transports about 7200 people (including ridesharing), while using only about half the space for parking than what is needed to accommodate the cars used for on-campus commuting.

The current policy of indirect promotion of car use through the 'no-individual-vehicle-for-BA-1-2-3-students' policy must lead to a dead-end and further degradation of traffic and the environment at campus, if no viable alternative in traffic management is introduced.

Walking:
Walking is the most important form of on-campus commuter movement after motorbike use and before car use. Walking has only two disadvantages, which are a lack of weather protection and small flexibility for longer distances, but many advantages, which are:

- Walking is a very environmentally friendly form of transportation.
- If not practiced in heavily polluted atmosphere, it increases health and lowers social costs through healthier people.
- It requires only transition areas and no space for vehicle parking.
- Walking creates no air-pollution
- Walking creates hardly any noise pollution.
- Walking needs no individual financial investment.
- Walking needs no skills.
- Walking is the most energy efficient form of transportation (besides cycling).
- Walking saves national resources.
- Walking needs only a small transportation environment to take place...and others.

Walking is for all people a necessity. Transition between destination building and parked vehicle and vice versa happens on foot. Looking at the existing walking infrastructure, there are only two areas where walking as a form of commuting is part of the human environment design and designation at campus:

1. At the faculty of humanities and
2. to the East of the library.

In all other areas at campus walking is only a means to get to a parked vehicle. Where sidewalks are provided,

- they are either used as bicycle lanes, or
- hard to access, or
- blocked by parked vehicles, or
- difficult to reach, e.g., by crossing motorized traffic axis', or
- interrupted by drive ins and exits to parking areas, or
- too high above the pavement, or
- not protected from weather, or
- in bad general condition.

In spite of these infrastructure flaws, walking is practiced by almost 40 % of users as a regular form of commuting and must be practiced in some form or other by everyone at campus to cross transition areas. Almost 77% think that the university should take measures to improve walking and almost 79% that roofed over walkways between buildings should be constructed. Almost 80 % think that university should introduce a silent zone for non-motorized traffic, only.

The traffic policy of Chiang Mai University does not seem to consider walking as being part of its traffic management. For example, improvised parking areas paved with gravel provide no channel for transition by walking, and thus create a high grain of different channels of transportation, increasing the risk of accidents and resulting in a situation where different forms of traffic constantly obstruct each other.

The opportunity to create a loop for walking that might induce some users to stop using their vehicle on their own account and thus reduce traffic at the source is not realized. As walking, and equally parking are not treated as an integer part of traffic, their traffic-easing potential in design, designation and layout improvement of the infrastructure are not realized:

- The loop

Non-motorized traffic infrastructure has the ability to unify the human environment with the natural environment due to its relatively low impact on the ecology during construction and utilization. This is an advantage that can be taken into consideration while designing the green-space or transition area between access roads and destination buildings. The closer one brings motorized traffic infrastructures to buildings, the more distance is put between the human space and the natural space or environment. By keeping such structures at a relative distance of 50 meters from the destination buildings, the human space is surrounded by a miniature green belt. By connecting individual greenbelts through a series of walkways and bike-lanes, it is possible to create a non-motorized alternative for transition and short distance commuting, e.g., walking. Such an alternative is called 'the loop'.

- Parking

Space reserved for parking can be used more efficiently if there is a conceptual link in its design to the loop. Clearly separated traffic channels can be created, as the means of transition to buildings is walking, independent of the type of vehicle used to reach from a point of origin to the parking lot. Creating a clear, visual borderline between the space of the loop and parking space, and by creating distinct channels for transition, encroaching of traffic space onto human space can be much reduced or stopped.

The current trend at CMU is to give way to traffic encroachment at the expense of walking. This process normally starts with wild parking, which is parking in any area that is clearly not designated for the purpose. As such areas are not prepared to take the repeated impact of heavy vehicles and the accompanying pollution, or many human individual transitions, vegetation and topsoil quickly deteriorate. Greenery is replaced by bare wasteland, which chokes the neighboring vegetation with dust, thus aggravating the process. Optically one might describe it as a form of 'traffic cancer', with the final result being the topsoil

completely removed and the natural self-healing process permanently interrupted. Two examples from many at CMU are in front of the main library and opposite the canteen of the faculty of humanities. In both areas, surviving trees are surrounded by a dusty wasteland that is exclusively used for parking. Normal policy of traffic management at campus is to accept the erosion and supply a surface of gravel, turning the wild parking area into an authorized, improvised parking lot. In some instances measures are taken to stop further encroaching by blocking access to lawns with old tree logs, like for example at the main library. In front of the women's dormitory B3 the wasteland created by parking is currently being replanted and attempts are made to return this stretch of greenery to its designated purpose. However, unless physical barriers are erected, this study doubts the long-term effects of this measure. To solve those types of problems, walking and parking have to become an integrated part of the traffic concept as expressed in planning and design.

Red busses:
Red busses are the traditional means of mass commuting and privately owned and operated. By means of SSI, the study has learned that about twenty years ago, red busses were very efficient and always available. With the arrival of individual transportation, red busses had to wait longer and longer to collect enough passengers for a ride, thus decreasing the convenience of the system and increasing the trend towards individual motorization. Currently red busses hardly ever wait in front of buildings for customers, but instead cruise the area along the roads to find customers. Thus the main 'bus stops' have been relocated away from the buildings onto the roads, creating additional strain on the traffic flow.

There are two red bus 'depots' in areas chosen by the drivers and not designated for the purpose. They are at the main centers of non-curricular activity 1 and 2 (proximity of the post-office and opposite the student parliament). At times they obstruct traffic considerably. The fact that the drivers have no depot provided for the purpose of breaks and maintenance reflects a lack of support from the CMU traffic management for this once very efficient form of public transport. As competition among the busses is tough and customers are scarce (only 4.74% of users rely on this form of transportation), maintenance of cars is very often bad and the red busses are among the worst air-polluters at university. However, for some commuters, the red busses still provide the only viable form of mass commuting and link into Chiang Mai town off campus.

One of the advantages of the red busses is that they are cost-free for CMU, as they are privately owned. However, the university does not impose any pollution control measures for this type of public transport. To enforce the national law on vehicle emissions on campus would be quite sufficient. As the red busses very often continue their rounds into the city, such measures would also benefit Chiang Mai as a whole and it might be possible to find cooperation from the local police authorities.

The tram:
Like the red busses, the tram is privately owned. The policy leading to their introduction is an attempt to introduce an efficient form of public transportation. Looking at the results of various SSI sessions, one has to ask why? The red busses can provide an efficient form of transportation, if they can operate under conditions with less stress on individual transportation. To enhance this form of public transport, it would therefore be necessary to create those favorable conditions, also for the tram. As it is, currently the tram is simply competing with the red busses for the few customers that rely on any form of public transportation. No new demand is created by an accompanying traffic policy.

The number of available tramcars, lines and their frequency is not sufficient at all. During CMU rush hour about 8000 students have to commute within the study area. The tram provides at most 240 seats at a time for all cars combined. According to the introductory letter of the university president, an expansion of the system depends on acceptance by the

customers and at most an introduction of 6 more cars is planned within the next six to eight months (counting from February). An additional 6 cars would increase seating capacity to 480, about 7% of what is needed to substitute for individual transportation during rush hour. During the SSI with students this study recorded two interesting comments:

1. "...During the trial phase, while the rides on the tram were still free, people [students] took their girl friends on free rides over campus. That is why the tram was mostly half filled. But hardly anyone used them to go to class. Now that we have to pay a fee for the rides...well, see for your self, they are empty."
2. "...I wish the administration would stop 'trying' things and instead 'do' things... [Question researcher: "What do you mean?"]...When university has a new traffic idea, they always have a trial-phase on a small scale first, but students need solutions that work on a big scale. So if you try, do it right and try on a big scale. How can students change when they are offered 6 cars and three lines?"

As a matter of fact, looking at principles on how a trial phase is properly conducted, it is important to create the same conditions during the trial period that will exist after the expansion of the program. Which means:

- No free rides during the initial phase, or one will collect data that is not relevant for the implementation of the full program.
- Besides selecting a vehicle like the tram and a target group for trial, it is equally imperative to select a pilot project group. In this case, for example, only the students of one or two dormitories and no other students. Using this approach,
  - ⇒ Seating capacity would be appropriate,
  - ⇒ Relevant opinion polls for adaptation could be conducted,
  - ⇒ People participation could give valuable insights in line development and
  - ⇒ Needed frequency of runs could be established.

No other users should be allowed to use the trams during the trial period. This would ensure that gathered information could be extrapolated to relevance for the whole program. If the trial program is successful, it would probably have attitudinal impact on other students outside of the trial group that observe the convenience of the offered alternative. Not being allowed to use the tram, they would by themselves ask when they are provided with this alternative and be more willing to switch means of transportation when they are finally offered the opportunity to use the tram.

This study predicts that because of the way the trial phase of the tram was initiated and with a promised development potential of only 12 cars for the target group,

- There will be hardly any or no students switching to the tram permanently,
- No relevant data will be gathered for alternative traffic measures,
- The target group will learn to permanently view a tram system as insufficient,
- There will be a permanent negative response to the 'no-individual-vehicle-for-BA-1-2-3-students' policy as no real alternative is introduced simultaneously, and
- There might be negative expectations by the target group of more restrictive measures at their cost.

Currently, the tram takes away more space from the traffic environment than it can possibly create. For example, it shares the vehicle depots with the red busses in areas that are prone to traffic jam in the first place, especially at the women's dormitory 3 B. Because of their size, the tramcars are contrary to the individual traffic management chosen by users, which is mostly based on small and fast motorbikes. When the tram is not well frequented and, thus, does not really reduces the number of vehicles on the roads, it only represent an additional traffic obstacle for other vehicles to overtake.

The cost of 1.5 Baht and 3 Baht, respectively, is no alternative for the target group students, with an average cost per trip of about 0.5 Baht. Would it not be possible for university to fix the cost at 1 Baht per trip and extend the right to place advertisement on a tramcar to the private tram operator?

Bicycles:
Traffic policy at CMU tries to promote the bicycle for commuting. It has done so with some effort and financial investment to build bike-lanes. However, those bike-lanes are in no way adequate to ensure a convenient and safe ride. According to the first preliminary paper, 70% think that the university should provide a more convenient infrastructure for cycling or motorbike riding, 70% think that the number of bicycle lanes is not sufficient and 74% think that the existing ones are not convenient.

The lack of convenience is due to the very poor layout of the lanes:

- They share traffic channels with motorized traffic, which makes them unsafe.
- They partly occupy space designated for walking.
- They are hard to access due to a lack of ramps.
- They are partly constructed off the access roads (for example opposite the computer service center) with no transition to any building in the vicinity.
- They are partly obstructed, for example opposite the building HB6 by a tree that grows right into the path and is impossible to circumnavigate without getting off the bike.
- They are partly constructed on road-shoulders in areas traditionally and still used for motorized vehicle parking.

The way the lanes are designed, bicycles are a form of inferior traffic, because they only run parallel to the infrastructure for motorized traffic without protection from then. They thus automatically become the 'weaker' traffic component. In no area is one advantage of the bike realized, its ability to use shortcuts through areas that are restricted for other vehicles. Bicycles can be faster than cars, because they can go off road! Although the CMU bicycle club offers reasonable bikes for rent at 1 Baht a day, many students view this not as an option during traffic hours and according to the SSI with the club, most bikes are used for fun rides in the evening hours. Another drawback seems to be that some students are afraid to rent a bike that is left in disrepair by the previous user and just breaks down while they are using it, making them responsible for the then needed repairs.

7.3 Organizational Conditions

7.3.a Administrative Organization

General administrative structure[113]:
The major weak point in the administrative set-up is that responsibility and authority are separated. For example:
The department for traffic is a subunit of the office for student welfare, which in turn is a unit of the president's office. The department for student welfare is headed by a deputy president, who appoints some of his staff to work in the department for traffic. This staff can work simultaneously in a number of departments, as the deputy president is responsible for a variety of other departments that are subunits of the office of student welfare. The department for traffic appoints an assistant manager (Phu Chuai) who heads a work-unit on university safety, which is among other things responsible for the implementation of measures or policies decided on traffic. The advisory traffic committee, which consists of representatives of university professors from the faculties and other units and work on an honorary basis, are

[113] The data on the administrative structure collected via SSI was very often contradictory, especially regarding rights in decision-making. The presentation in this chapter is an approximate summary of all SSI concerning this subject.

consulted when traffic issues are discussed in a board and the voices of the students and the head of the traffic work-unit are heard. The board decides on a traffic master plan, which after approval by the central government is implemented at the premises. The extent of the actual implementation depends on the president's office. For example, the 'no individual transportation for BA 1-2-3-year students' is in effect since 1998[114], but has only been fully implemented since the 2nd semester 1999.

The central government has the authority to allow or deny certain policies or rights of the university; however, they are not responsible for the impact of their denial. For example, according to SSI sources university personnel does not have the right to enforce Thai traffic law, which creates a law vacuum at campus[115] to the considerable disadvantage of traffic management. The authority to decide on individual measures of an approved master plan rests with the office for student affairs. The responsibility for their implementation rests with the personnel for traffic management, which has no authority on traffic management decisions…and so on.

The effect of this structure is that personnel with the hands-on experience have no authority and thus no or only minor influence over the traffic master plan and those with the authority lack on-hand experience. Thus the system creates a situation where intellectual resources are wasted. Another handicap of this set-up is that although there are attempts to centralize traffic management, those with authority and those responsible for implementation have parallel duties to fulfill. The traffic committee for example has not fully convened in three years, due to the fact that it is not possible "to find a date that suits all members equally well".

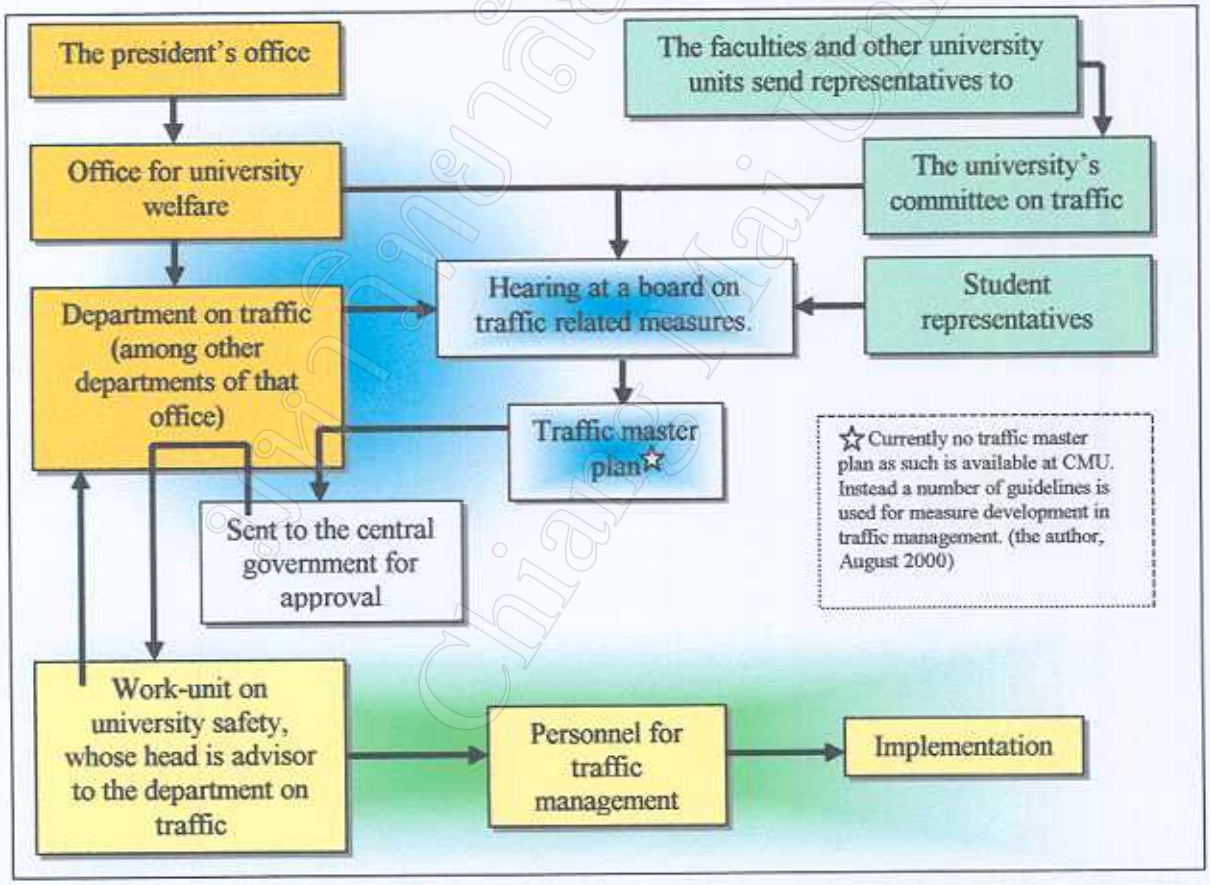

Figure 14: Administrative structure concerning traffic

[114] Data collected via SSI contradictory, ranging from 1997 to 1999. Some sources say the policy is currently only implemented for BA students of the first year, some claim otherwise.

[115] Other SSI sources claim that the president's office can decree such a right, if it wished to.

The fact that master plans for traffic have to be approved by Bangkok makes a fast and efficient adaptation to current needs almost impossible. According to one SSI source, the plan guidelines implemented currently were drawn up in the year 1996.

Financing and budgeting of Chiang Mai University:
The structure applied at university stresses democracy in as far as it is based on elections and independence of the administrative units at university. This, however, creates smaller independent budgets that are allocated to each unit. Thus, sometimes funds have to be drawn from different sources for one overall purpose like traffic management. Traffic exists in three different environments simultaneously, the physical, organizational and attitudinal environments. Whenever administrators want to initiate a project or measures to improve the traffic situation including all of the three environments, they have to apply for funding from a variety of sources. This slows down any implementation process or even renders it impossible.

The elective system for the office of president opens opportunities for politics and lobbying. In theory, everybody can become president of the university through being proposed by one of the eligible voters and then elected by a majority. However, the structure of administration gives also relative independence to the university's budgeting and a major role to the president and thus the support of a candidate might very well depend on his or her influence with the various units at university. In almost all of the SSI conducted, the topic of financial kickbacks and/or bribes within the administration was addressed, although proof or names were never forwarded. One example on how money can be siphoned off was given as follows:
A newly erected building needs air-conditioning, which is provided by the free market through a contract. The winner of the contract does not only have to install air-condition to the building, but also, for example, pave its access roads. Thus an officially granted budget for infrastructure measures is freed and can either be put to other uses or disappear into private pockets. It is not the aim of this study to follow up on such allegations or even to judge them and detailed quantitative data on this subject was not available to the study. Thus the analysis does not assume that the current administrative structure is based on corruption as part of politics and lobbying. However, it keeps the user concern in mind that the administration puts personal benefit higher than public welfare and development.

In order to avoid unnecessary problems in the process of fund allocation, the study suggests creating a main office for traffic management and an independent source of finances through applying PPP/UPP. In combination with an open book form of spending control, rumors regarding kickbacks and bribes could be stopped in their tracks and user confidence in the administration restored.

7.3.b Traffic Master Plan of the University and Faculties

The observed traffic measures are defined by goal and not by underlying objective and are not part of a whole that would indicate a master plan for land-use designation and design according to density. Without proper guidelines for the development of the 3Ds in traffic management, no traffic measure can solve problems at the roots[116].

7.3.c Traffic Rules and Regulations and Current Traffic Related Programs

Although national traffic rules are applicable at university, there is no responsible enforcement agency, resulting in a 'no rules situation' at campus, a fact acknowledged by

[116] See chapters A8, A9 and A11 in the appendixes.

almost all users. Over 90% wish for a campaign to relate to the guards and learn more about their role and importance in traffic management.
This lack of exercised responsibility is one of the basic faults of campus traffic management as a whole. It does not only have impact on the implementation of all current and future measures, but also results in a lack of authority.
For example, the current head of the student parliament has written an official letter to the traffic unit of the student welfare department, concerning the way traffic is split into separate lanes for cars and motorbikes at the entries/exits of university. Students have complained of near-accidents when the two channels are forced to cross whenever they turn into different directions. The parliament requested an end to this possible accident hazard[117]. In the answer, the students were told that as of yet no accidents have occurred and it needs to be seen, whether this policy would have to be changed. In other words: Let's wait until the first accident really happens and then we can talk about doing something.
This answer might be a symptom of a management structure where executing and decision-making responsibilities are separated: The traffic unit is responsible for the implementation of a policy that has not been determined by it, or where the final implementation is surrendered to a third party, which is the private company running the guards at university exits/entries. Talking to the third party about this problem does not produce results, as it is responsible to the university administration and not to the students. The final result of the matter is that nothing happens until there is an accident. Then, responsibilities have to be sorted out, which might not be easy, because those who have the authority do not carry the responsibility and those who carry the responsibility do not have the authority. (See chapter on the organizational environment.)

The current campus regulation of 'no-individual-vehicle-for-BA-1-2-3-students' without a viable alternative in transportation indirectly promotes an increased use of cars by students for ridesharing. It is a measure that solves the problem at the wrong end. Students are probably the user group that needs flexibility in transportation most, as they are the user group that has to change location most often. Prohibiting some members of this group from using motorbikes, does not reduce traffic, but leads it into new channels. The form of transportation they have found to be most effective and convenient in almost all respects is the motorbike. Thus, this regulation ignores their basic needs without offering a viable alternative.

Currently the university undertakes large efforts to increase the amount of parking lots, mostly for cars, for example adjacent to the men's dormitories A4 and A5. The implementation of such a policy is contrary to the individual-vehicle-restriction policy, which tries to reduce the number of vehicles at campus. The message sent to the user is:

- If you are a student and live at campus, you must not have individual transportation on campus.
- If you are a student and live at campus and have a car, exceptions might be made[118].
- If you have a car, university provides an increased number of parking lots for you.
- So, stop using your motorbike and try to get or use a car.

According to SSI, the number of motorbikes has slightly decreased, while the number of cars has actually increased. This might be due to the fact that many students living on campus now get a lift from those who have access to a car, as ridesharing is a common behavior among students. The policy of restricting the individual choice of students, but not the individual choice of all users who live at campus, expresses the dictum that 'some people are more equal than others'. The University has to make a choice. If it employs traffic measures according to social strata, results will be most unsatisfactory in terms of achieved problem solution. On the

[117] The researcher himself uses a motorbike for on- and off-campus commuting and has encountered near accidents due to this situation repeatedly. The risk here is clearly with the weaker traffic members, which are motorbikes and bicycles.
[118] The researcher knows personally at least four students, who should not be allowed to have a vehicle at campus. However, they have cars and use them without any restrictions. One of many possible reasons might be that guards tend to enforce a policy less with some users due to their higher social class, which is expressed in their vehicle. (See Assessment, cultural aspects regarding traffic.)

other hand, if it employs 'democratic' measures, the results will be satisfactory for traffic, but not for the next up-coming administrative election. With a dilemma like this might it not be better to find an approach that is not based on restrictions at all, but on standards instead[119]?

The faculty of science has established an area that is commonly referred to as 'silent zone'. According to OBEA over a few days and on different occasions[120] and conversations with the guards, the policy implemented is that cars with stickers are allowed inside the area without questions and cars without stickers need to have a reason. Thus, the silent zone is a car zone only. The quiet of the area is achieved by stopping through-traffic. While being effective in this respect, this policy also enhances the preference cars are receiving in management measures.

The current traffic related programs are based on the following goals:

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.

All measures initiated accordingly fall short of their objective. (See the above chapters on Parking, motorbikes, bicycles, roads and red-busses/trams.) This is due to the absence of effective guidelines and assumptions in measure development and underlying objectives.

Guidelines and assumptions observed are:

- The motorbike is responsible for the traffic problems and therefore their number at campus has to be reduced.
- The car is not responsible or less responsible for traffic problems.
- Students are more flexible than other user groups and freshmen staying at dormitories (compulsory) do need individual transportation during their first semesters less than other students.
- Private operators should organize offered public transportation.
- Areas of wild parking have to be integrated in the traffic infrastructure.

The guiding principles involved do not reflect traffic reality at campus, which according to the collected data of this study is:

- The motorbike is the most efficient of available transportation choices in regard to passenger capacity and needed traffic space.
- The car is the worst choice, transporting only about 30% of all passengers, while using about 66% of all provided traffic space.
- Due to their tight timetables and restricted financial means, students are probably one of the least flexible groups of users at campus. Especially first semester students, who do not as yet know campus well, are at a disadvantage in building personal transportation alternatives quickly.
- Private operators depend on quick commercial success and are limited in their development by the potential market available to them. They are caught in a negative development loop, with their potential customers being too few to allow investment that could build a viable transportation alternative.
- Restricting the number of vehicles at campus and simultaneously increasing the official parking lots, sends a contradictory message to campus users.

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[119] Standards could also help to improve some of the logic behind the current policy. The researcher was told that measures to restrict especially motorbikes were taken due to the large number of motorbike accidents. If motorbikes constitute for (about) 80% of all vehicles used at campus, it is normal that statistically 80% of all accidents should also involve motorbikes, assuming the same accident probability for all types of vehicles. However, according to the department of traffic engineering at CMU, in traffic reality the accident probability for motorbike riders is actually about four times higher than for other vehicles, which proves that this kind of logic is not a valid basis for traffic management decisions.

[120] Between January and February, and June 2000

There are no underlying objectives that can be observed from the applied measures on a university-wide scale. However, the faculty of humanities and the library have to some extend utilized the following objectives in the development of their premises:

- Create a user friendly and convenient infrastructure.
- Incorporate as much greenery as possible into that infrastructure.
- Respect environmental concerns in the development process.

The positive results of using underlying objectives can easily be experienced at both premises. The faculty of humanities has a green and quiet core with traversing roofed-over walkways connecting buildings. The library offers a relatively quiet spot for reading and meetings of users between the main building, the registration office and the multi-faculty utility building. The extension of the library is constructed with as little damage to existing green as possible.

7.3.d Personal Management of Commuting by Users and User Groups

The personal management of commuting shows distinctive differences according to user groups. In the past there have been no restrictions on campus in regard to personal vehicle choice, which allowed each user group to develop personal transportation in accordance with

- Their personal convenience, based on
- Their needs,
- Their financial and social resources, and at least to some degree
- Their personal preference.

Starting from mainly reliance on red busses about twenty-five years ago, the result of this uninhibited development of personal mode of commuting lead to two different major types of traffic, one based on cars and one based on motorcycles.

The change was gradual and depended on the affluence of Thailand's society. With higher income of some users, the extent of individual transportation increased. Only when a certain critical point was reached in regard to the number of customers still relying on the red-busses, did the trend to individual transportation turn into a wave and changed traffic at campus quickly and thoroughly. Red busses were not convenient anymore due to slower average numbers of trips per car and longer waiting periods for customers. At the time no measures were taken to reverse, stop, or at least guide this development and it is thus that we arrive at the current traffic situation at campus. But mass-commuting relying on individual transportation has a price, which for the university is:

- Increased noise levels
- Increased air pollution
- Loss in green space in order to accommodate individual vehicles (parking) and increased road construction,
- University 'sprawl' (as in urban sprawl), due to planning focusing on individual transportation and the vehicle with the largest demand in traffic space, and
- Loss in flexibility and mobility due to traffic jam during rush hour.

To reverse this process and go back to public transportation from individual transportation is rather difficult and will take time. The individual choice of vehicle has resulted in distinct commuting modes and behavioral patterns. The current traffic reflects an acquired user behavior based on the available transportation environment in balance with user group needs, resources and preference, resulting in an accepted convenience for the individual. Thus, in order to gradually change back, traffic measures must first of all respect this convenience as much as possible, which a restricting-vehicles-policy does not.

Instead, the reversal should focus on traffic environment and space. As the increase in available traffic space enabled a rapid development of individual transportation in the first place, now a decrease in available traffic space must slowly lower the convenience of

acquired traffic behavior. However, the red busses (and the tram in its current form) are no longer able to make up for a loss of convenience due to their reliance on market mechanisms. As CMU has invested in road and traffic infrastructure development in the past, it now needs to invest in an effective public transportation system, the costs of which can at least be partly recovered by charging user fees at a rate that is competitive with those of individual transportation. Furthermore, the use of the infrastructure at campus by individual vehicles should be subject to a fee, too, because it creates as much cost for the university as does a public transportation system.

The space freed from traffic can be made available to those who do not use individual transportation in form of a silent zone open for a variety of curricular and non-curricular activities. It will help to change the currently predominant attitude towards land-use for traffic into a focus on non-motorized commuting. It is also important that all user groups are allowed to continue their chosen main form of transportation in the initial phase of change, as alternative traffic behavior must originate in the user himself in order to be most effective and lasting.

However, attempts should be made to gradually separate the current main types of traffic, which are:

1. Motorbike traffic
2. Walking, and
3. Car traffic.

By creating separated traffic channels as much as possible, management according to type of traffic becomes easier and more effective. The designation of land-use can be more specific and open up land-areas for improved site design. The resulting relative loss in flexibility is made up by a gradual increase in public transportation efficiency. Users are, thus, able to modify their traffic behavior without loss of convenience in motorized commuting and rewarded by an increase in convenience for non-motorized commuting. Once the process of personal change has started, follow-up measures can increase desired change and stop undesired developments. To keep focused on the convenience for the user, it is, however, very important to include user participation in the development and implementation of new measures.

7.4 Attitudinal Environment

7.4.a Regarding Traffic and Traffic Discipline

Traffic discipline:

Traffic discipline at university is simply not enforced. Showing no discipline, like for example expressed in wild parking, is always rewarded with success. The users choice to behave anti-social reflects absence of impact awareness and the presence of a strong egocentric-type of personal decision-making. Users as a whole do not seem to realize the summative effect of many individual anti-social decisions.

On the other hand, the large number of users who admit to their own lack of traffic discipline and wish for more knowledge regarding the guards and their role at campus clearly indicate that users themselves wish for a change.

The problem is connected to missing leadership, as was often expressed in SSI sessions. Traffic education is also lacking.

Another reason for the widespread misconduct in personal traffic behavior might be found in the ambiguity of the current traffic measures. While prohibiting some use of individual vehicles, an increased number in car parks is being built. The message for the majority of motorbike riding users conveyed is that their personal convenience and needs are neglected by those who control traffic management. Many students do not feel inclined to behave

properly only to make way for car-users, representing a social class which many might never be able to join. It does not seem to occur to most users, that their own behavior is a form of traffic control.
During the SSI, on the researchers question why users do not speak with those who can change things, most answers were of the following type:

- I just don't have the time for that.
- This is difficult in Thailand.
- It won't change a thing, anyway.
- They do not listen to students, anyway.

Thus the lack of traffic discipline seems at least to some degree based on resignation regarding organizational matters and the personally perceived significance in the whole of society.

For the study, the problems in traffic discipline represent one of the largest obstacles in proper traffic management. It is imperative that users can be motivated to take part in traffic management and regard their personal action as a significant part of the whole. Discussion, education and training must thus be part of any successful management program.

General infrastructure & public transportation:
Although the general infrastructure is seen as sufficient regarding roads, other means of commuting are not supported well. They are considered half-hearted and not up to the needs of the users. Especially students would be willing to switch to public transportation if it only were efficient. The tram, for example, is seen as yet another example of how traffic alternatives should not be approached by the administration: "...They make a trial phase for public transportation and if it is accepted they will introduce the real thing. But unless the real thing is there to begin with, people will just not switch their form of transportation, because the alternative offered is just not adequate. So the whole thing is abandoned after a while until someone comes up with a new idea that starts with just another trial phase. I am so bored of it! ...". This kind of sentiment is supported by the fact that a large majority (of all user groups) would be willing to pay a user fee to improve transportation infrastructure, if the collected money is not used for something else.

Most of the participants in SSI stated that they have never tried the tram even once, for mainly two reasons:

- The tramcars do not look safe.
- "I will not use it anyway, so why should I take a ride?"

General management principles:
The current campus policy of 'no-individual-vehicle-for-BA-1-2-3-students' without a viable alternative in transportation in combination with an increase in available car parks forms counterproductive traffic behavior by forcing BA students to adapt their planning to include car sharing instead of bicycle sharing. Cars are a much less efficient mover of masses of people at campus. It also indirectly teaches that a car is the higher valued vehicle of transportation. Regarding the limited financial means of most students, this leads to frustration and dissatisfaction with the current traffic management.
According to the questionnaires and SSI,

- Most users do not actually see any form of traffic management taking place, but
- Consider measures as orders without regard to their needs.
- They feel that they are not in touch with the guards and their role is too little known to them.
- Many of the users regard parking lot separation according to status as not appropriate.

Regarding specific infrastructure measures:
Only one infrastructure measure was specifically addressed during the SSI: the increasing loss of green space to an increasing number of parking lots. Even when trees were planted, like for example at the student parliament, the space in between was sealed over with concrete bricks. This desire to see more green at campus is in accordance with the questionnaire of the preliminary paper 1, where a majority thought that the infrastructure is sufficiently developed and no more traffic space is needed.

7.5 Possible Indicators Provided By the Analysis and Preliminary Papers

Looking at the attitudinal environment regarding traffic, a variety of physical and organizational changes that would represent a development for the better for most users can be pointed out:

1. An increase in the number of tramcars, or the efficient presence of any other forms of public transportation, like for example a system of minibuses.
2. An increase in human space and space for commuting on foot.
3. Improved management of parking.
4. Increased traffic law enforcement.
5. Public relation efforts concerning traffic.
6. Increased participation in traffic organization.
7. An increase in green space.