I, Domingo Abreu Vilomar, hereby submit this original work as part of the requirements for the degree of Master of Community Planning in Community Planning.

It is entitled:
Sustainable Planning Practices in Maha Sarakham University: A Green Campus for a Learning Community

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Sustainable Planning Practices in Maha Sarakham University:

A Green Campus for a Learning Community

Thesis Submitted

In partial fulfillment of the requirements for the Master of Community Planning

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I. Thesis Abstract

The mission of a university is the production of knowledge and distribution of education. This is its main goal and fulfilling it should be the university’s commitment with the society that hosts it. Education is a source of critical thinking and a self-evaluation tool as well, by which society should acquire a broad point of view of the world’s actual condition, its success or failings in terms of social justice, and encourage the attainment of a greater level of awareness and understanding; a mean for discovering new concepts, and the creation of new instruments of improvement.

If the major duty of universities is the creation and sharing of knowledge, and the most urgent need of our times is finding the way of achieving that new way of developing and living, then the universities play a key role in conquering the aforementioned Sustainable Development. Furthermore, these higher studies institutions should be the most active and visible references of sustainability, becoming the flagship in this battle in which the humankind future is on stake.

This thesis aims to analyze the efforts of Maha Sarakham University (MSU) regarding the “green” planning practices of their new campus in Kantarawichai District in northeast Thailand, and how thriving are these “greening” practices compared to the efforts and success of other universities in terms of sustainability achievements.

In the first part of this research we take a look at the commitment of universities with the sustainability concept, analyzing the actions undertaken by some universities towards sustainable practices, and paying especial attention to the
practices related to transportation planning as a way of nurturing a campus life more according to the sustainability requirements of our present times.

In further chapters we address the Maha Sarakham University (MSU) case study, analyzing its impact on the local communities, especially on their socioeconomic dynamics and environmental issues. Based on several documents and sustainability promoting institutions, we also develop a set of campus sustainability indicators, which we will use to determine how effective are MSU actions towards accomplishing its sustainability goals.

Although it is not part of our main focus, since the concept of Sustainable Development is equally based on Environmental, Economical and Equity aspects, besides the research questions regarding to sustainable transportation practices, we raise some questions regarding the social scope of the ongoing sustainability practices of the previously analyzed case study units. As expected, these questions shape our recommendations.

The last part of this thesis is a proposal for the improvement of the MSU greening efforts, specifically towards the enhancing their transportation program.
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1 Introduction

The mission of a university is the production of knowledge and distribution of education. This is its main goal, and universities should be committed to fulfilling this goal for the betterment of society. According to UNESCO, the purpose of education is “to make people wiser, more knowledgeable, better informed, ethical, responsible, critical and capable of continuing to learn”. Achieving this purpose does not mean an instantaneous solution for world’s problems, but it would definitely provide equal opportunities for humankind to develop the skills and means to accomplish this ultimate goal. Education is both a source of critical thinking and a self-evaluation tool. Society should utilize it to acquire a broad point of view of the world’s actual condition, its success or failings in terms of social justice, and encourage the attainment of a greater level of awareness and understanding; a mean for discovering new concepts, and the creation of new instruments of improvement. Education is also the means of propagation of the created knowledge and talents that have been developed, a means to catalyze the shift in the principles, conducts, and standards of living we want to see in our society, and for seeking public awareness and “support for the continuing and fundamental changes that will be required if humanity is to alter its course, leaving the familiar path that is leading towards growing difficulties and possible catastrophe, and starting the uphill climb towards sustainability. Education, in short, is humanity’s best hope and most effective means in the quest to achieve Sustainable Development” (UNESCO, 1997. Van Weenen, 2000).
If the major duty of universities is the creation and sharing of knowledge, and the most urgent need of our times is finding the way of achieving that new way of developing and living, then the universities play a key role in achieving the aforementioned Sustainable Development. Furthermore, these higher studies institutions should be the most active and visible references of sustainability, becoming the flagship in this battle in which the future of humankind is at stake.

This thesis aims to analyze the efforts of Maha Sarakham University regarding the “green” planning practices of their new campus in Kantarawichai District in northeast Thailand, and how thriving these “greening” practices are compared to the efforts and success of other universities in terms of sustainability achievements.

The first part of this research takes a look at universities’ commitments towards the sustainability concept, analyses the actions undertaken by some universities towards sustainable practices, and pays special attention to the practices related to transportation planning as a way of nurturing a campus life more according to the sustainability requirements of our present times.

Further chapters address the Maha Sarakham University (MSU) case study, specifically analyzing its impact on the local communities, especially on their socioeconomic dynamics and environmental issues. Based on several documents and sustainability promoting institutions, a set of campus sustainability indicators is developed, which is used to determine how effective MSU actions are at accomplishing its sustainability goals. Then according to the proposed methodology “(Type 2) Single-Case (Embedded),” the findings of the studied reference units with the actual actions observed in situ at the Maha Sarakham
University are compared, as well as with the results of surveys performed in MSU campus and its surroundings.

Although it is not part of the main focus, since the concept of Sustainable Development is equally based on environmental, economic and equity aspects, besides the research questions regarding sustainable transportation practices, some questions are raised regarding the social scope of the ongoing sustainability practices of the previously analyzed case study units. As expected, these questions shape the recommendations.

The last part of this thesis is a proposal for the improvement of the MSU greening efforts, specifically towards the enhancement of their transportation program.

1.1 Sustainable Campus. General Concepts

1.1.1 Education, Universities and Sustainability

Education as a way of transferring knowledge and skills to improve the quality of life of humankind is the goal of every learning institution. As UNESCO (United Nations Educational, Scientific and Cultural Organization) defines the goals of education, it is meant to improve people’s wisdom and knowledge in order to build a more ethical, responsible and critical society, which will take on world’s problems. Education should also aim to be society’s mirror image as to critique on the world’s flaws and inequalities, and encourage awareness towards fighting the aforementioned imperfections. Education is expected to be foresighted and to discover new ideas, tools and procedures. (UNESCO, 1997)
The role of universities in terms of education goes beyond being a mere source of distribution of information. Universities are intended to be incubators of new concepts and initiatives; constantly producing new knowledge while challenging and putting to prove existing facts. When it comes to Sustainability, the role of universities’ is not only about instruction, but also about setting an example of sustainable performance; as highlighted in the Literature Review of Chapter 2, academic institutions are called “to play a significant role in the search for a more sustainable future.” As the McMillin and Dyball article discusses in the Literature Review, instead of addressing it in a comprehensive way, most universities are undertaking sustainability issues in a compartmentalized manner, restricting sustainability education to specific classes. In order to keep up with the aforementioned role, the academic community faces the need of improving its duty as catalyst of changes towards sustainable development, embracing a holistic line of attack concerning sustainability. As highlighted by several authors cited in our sources, this approach articulates instructive, logistical, investigative, and outreach actions, specially involving students as an essential part of the matter. (McMillin, J. & Dyball, R., 2009)

Ultimately, higher education is humankind’s greatest chance and most valuable resource in pursuit to accomplish sustainable development. (UNESCO, 1997)

1.1.2 Campus Planning as an Approach to Sustainability

Their physical scale, population size and educational commitment make university campuses the ideal environments for sustainability practices. Either
hosting or mobilizing a population of 40,000 people, these figures represent a substantial impact in terms of GHG emissions, energy consumption, solid waste and wastewater production and treatment.

Actions implemented on a campus level such as transportation programs, community outreach strategies, water and energy management, recycling programs and waste reduction, and as other resources planning, can be replicated with a larger impact; extrapolating to a city or even a regional scale, those initiatives that have been proven to be successful as a campus experience. Also, as referenced in the research, these actions may have a direct impact on the quality of life of the campuses’ surrounding neighborhoods. Directly proportional to smaller schemes, when planning sustainable strategies, “thinking about bigger systems as an alternative of individual mechanisms might unfold much more opportunities.” (Sharp, 2009)

On the other hand, as Leith Sharp also asserts, the campus population is a great source of human capital and, since campus sustainability requires an extensive, inclusive and continuous improvement, academic organizations must become learning communities where the people commit to a permanent quest for life quality, working for better collective outcomes. (Sharp, 2009)

1.1.3 Indicators of Campus Sustainability Initiatives

After evaluating different theoretical frameworks, research and analysis, as well as campuses’ sustainable initiatives, with special attention to the principles outlined in the Sustainable Campus Charter of the International Sustainable
Campus Network, concepts which have been assembled in alliance with the Global Universities Leaders Forum (ISCN-GULF), the following environmental and socioeconomic goals have been identified as checkpoints to develop the indicators of campus sustainability:


- **Community Outreach Programs.** Inclusion, Participation, Educational Opportunities, Positive Externalities, Local Business Incubators.

- **Energy Efficiency Programs.** Consumption Reduction Policies, Awareness Campaigns, and Alternative Energy Sources.


- **Environmental Education and Research.** Environmentally Oriented Curriculum, Research Programs, *Living Laboratories for Sustainability*.

- **Natural Resources Management Programs.** Waters Classification, Harvesting and Treatment, Soils Management, Green Areas, Solid Waste Recycling Program.

- **Transportation Systems.** TDM Strategies, Clean Hybrid Buses, Unlimited-Access Transit, Parking Restrictions, Inclusive Transportation.
1.1.4 Questioning the Social Scope of Campus Sustainability

As stated in the Brundtland Report and subsequently in the Earth Summit Rio 92, the Sustainable Development theory is based on three equally important concepts: ecology, economy and equity (as in social responsibility).

All of the abovementioned concepts are highlighted in *Agenda 21*, the action plan implemented by the United Nations as a guidelines to achieve *Sustainability*, and all of which are to be addressed with the same level of commitment and support if a real sustainable model is to be accomplished. However, throughout the research process, and most of all in the Literature Review, it has been made evident that most of the efforts launched by the universities, are substantially committed to environmental or economic endeavors, but with only minor or no social responsibility whatsoever. In the best cases, as in the UF Case Study, social equity is only addressed as a consequence of positive externalities.

Among all the documents and articles reviewed for this thesis, the *Sustainability* social aspects are specifically mentioned only in the Principle no. 2 of the ISCN-GULF Implementation Guidelines. (ISCN, 2010) When addressed in several of the analyzed campus planning actions, social *Sustainability* is only referring to the academic community and never intended to have a direct impact on the local community where the university is inserted and on which it has a considerable social impact. Although it is not part of our main focus, since MSU scale and its initiatives are proven to have a substantial impact on the local communities, this issue is of concern, and we will suggest several actions regarding the social scope of campus sustainability practices.
1.2 Case Study of Maha Sarakham Province, Thailand

1.2.1 Location, Geography and Population

Bordered by the Mekong River, which divides it from Laos to the east and runs down to Cambodia in the south, the Isan (northeastern) region of Thailand is characterized by its flat land and rice crops. However, is also notorious for its several dinosaur troves, achieving the name of Thailand’s Paleontological Region. Ironically, this distinction is practically unknown by the massive Thai tourism industry. (DaGrossa, P. 2003)

Due to its location, today's Isan has a long cultural, religious and political history traced back to the fourth century, but mostly related to the political conflicts between Khmer, Siamese and Lao kingdoms, and particularly the last two of them in the fourteenth century. Maha Sarakham was initially a dependency of the Roi Et Province. It was founded in 1865 when the governor of Roi Et sent 9,000 people along with his cousin appointed as governor to inhabit the new town. Although that region’s ethnicity was traditionally related to Lao, their political identification was associated with the local cities and their aristocracy. (DaGrossa, P. 2003)

With tropical climate conditions (average temperatures as low as 70.3°F and as high as 89.8°F), and located in the center of the Isan Region at nearly 230 meters above sea level, Maha Sarakham province is surrounded by Kelasin, Roi Et, Surin Buriram, and Khon Kaen Provinces. According to 2011 data, Maha Sarakham has a population of 939,736 inhabitants; out of which over 150,000 (the great
majority of it is student population) live in Mueang Maha Sarakham, the province’s capital city. (city’s web, 2012)

1.2.2 From a Farmland Town to Regional Educational Center

The province of Maha Sarakham has been traditionally known for the richness of its natural resources; however, for some time it was ranked as one of the poorest cities in the Isan region. Following the rice crops, the main economic activities of the territory have been habitually related to farming and handcrafts such as silk and other natural fabric production.

Given that it is the home of six colleges, two vocational schools, and two important universities (Maha Sarakham University and Maha Sarakham Rajabhat University), this province had also been appointed as Thailand’s Regional Educational Center, and has received several national and international awards. It is expected that much of its future development will revolve around this role. Because of the fast growing student population, shifts have been detected in the economic dynamics; they are more perceptible in the campus surroundings and in the downtown area of the city. (DaGrossa, P. 2003)

Since 1993, the Mueang Maha Sarakham’s populations has increased 64.25%, most of which occurred from 2003 through 2011 (8 years), when the population registered an increase of 58.98% escalating from 96,408 up to 153,274 inhabitants; out of which, MSU alone has a population of 46,694 students and 879 academic staff. This, of course, has a substantial impact upon the town’s environment and the economic and social dynamics, but also in the traffic
pattern of a city that has not been planned for such dramatic growth. (MSU, 2011)

Back in 1988, when it was already surpassing its own expectations, Maha Sarakham University moved to Khamriang Campus, a new compound within the Tha Khon Yang and Kham Riang Sub-Districts of Kantarawichai District, which also encouraged the housing and commercial development along the road that connect the two towns, and within the sub-districts as well. Although the Kantarawichai District registered a considerable population loss, and even if the Tha Khon Yang and Kham Riang Sub-Districts haven’t registered the same population growth as Mueang Maha Sarakham, there has been a substantial increase through the last eighteen years as well.

Towards ASEAN 2015, a multinational educational agreement subscribed to by the Southeast Asian countries (similar to the Erasmus Program in Europe), MSU has developed the ASEAN Studies Center, which will draw more attention from around all Southeast Asia to the province. This will lead to an even larger academic community living in the downtown area and MSU surrounding districts, and therefore the movement of people from the surrounding rural areas to provide services to the aforementioned academic community.

This population change imposes a high socioeconomic impact on the local community, which has already turned from a farming community into a service society. However, the most impactful change is an increase in traffic levels from Mueang Maha Sarakham.
1.2.3 Indicators of Sustainability [or Un-Sustainability] in Maha Sarakham University

Based on the indicators checklist previously developed in the first part of this thesis, and contrasted with the empirical evidence gathered during the on-site research at Maha Sarakham University in the summer of 2012, we now proceed to evaluate if MSU's *greening* initiative actually fulfills the expectations around the sustainability standards outlined by the *Sustainable Campus Charter* of ISCN-GULF, and supported by the different opinions of the authors cited in our Literature Review.

- **Campus Layout**

  According to the MSU authorities interviewed in the research stage, the Khamriang campus layout was the result of several feasibility studies and planning processes. Therefore, it was designed to satisfy the projected academic and administrative needs.

  Following a circular site plan, the Schools and administrative offices are distributed in a Greek cross geometric distribution with ample lawns and hard pavement public spaces. Housing projects are allocated outside the circle, and concentrated in Faculty Condos to the northeastern border of campus, and student Dorms to the northwestern outskirts. Due to its walking distance (fair in general terms, but not according to Thai preferences), this distribution does not encourage one to walk to campus.

  Campus’ Landscaping is observed to be designed for embellishing purposes, and is based on local species. However, its configuration hardly encourages pedestrian flow and outdoor activities. Furthermore, the
employment of hard pavement increases the existing high temperatures, reducing the usage of these areas.

Little or no accessibility criteria were identified on campus. Maybe due to the low criminal rates, there are no significant safety or illumination efforts.

Khamriang Campus’ circulation is mainly vehicle oriented. Motorcycles are usually found bursting into the pedestrian flow and public spaces. Heavy traffic (mainly motorcycles) on and off campus is constantly present during school hours. Bicycle oriented infrastructure is based on scattered bicycle racks around campus, and no special circulation is provided.

Public spaces are abundant, but because of the aforementioned climate conditions, these are mainly used after sunset. The same usage patterns were identified with the sport facilities, which are conveniently allocated near the students’ dorms.

- **Community Outreach Programs.**

  Although it was mentioned in several meetings and interviews, the MSU outreach program was not made available for this research. Therefore, this research will assume that this indicator’s requirement is not satisfied. None of the educational, participation, inclusion or business incubator parameters were met. However, it is important to mention that the food service industry within Khamriang Campus, as well as many other informal commercial activities, is entirely provided by members of the
local community. These activities should be counted as positive externalities.

- **Energy Efficiency Programs.**

  It was common to see energy efficiency awareness campaigns inside the buildings, but in terms of specific energy consumption reduction policies, no considerable efforts were identified. In consequence with the usually high temperatures, many of the academic and all of the administrative facilities are artificially acclimatized. These are operated under regular standards. The research found that the subject of solar power is present in academic papers, and even some scattered solar panels installed, but no substantial alternative energy sources whatsoever are used.

- **Environmental Design of Buildings.**

  Aside from some tropical architectural considerations, no bioclimatic or relevant environmental design was identified on campus; no green roofs or green walls either.

- **Environmental Education and Research.**

  MSU offers a very strong environmental curriculum. The university's Faculty of Environment and Resources Studies offers six undergraduate and three graduate programs, as well as a PhD program in environment related disciplines and research. However, no *Living Laboratories for sustainability* or any similar initiatives were identified.
• **Natural Resources Management Programs.**

As an answer to the flooding history of the region, MSU Khamriang Campus has a very strong flood control system based on several channels and large-scale ponds surrounding the campus area. Nevertheless, these ponds have no water classification or harvesting purposes. Further than a traditional water treatment plant, no water classification or water recycling efforts were identified. No solid waste classification or recycling program was identified. On the other hand, it is evident that there is a significant presence of solid waste on campus, to the point of high concern.

• **Transportation Systems.**

MSU offers a very basic transportation system to its academic community. This is a “Tram,” which is actually an oil-fueled shuttle bus, that travels a continuous lap around campus. This shuttle bus has no windows or any protection against the weather elements, and offers very low comfort standards. No TDM strategies, clean hybrid buses, Unlimited-Access Transit, parking restrictions, or inclusive transportation whatsoever are apparent. Instead, the university encourages the use of Songthaews, a local rudimentary transportation system based on a pickup truck adapted for people’s transportation purposes. It is important to mention that due to its economic impact in the local community, this transportation system should be considered a positive externality.
1.3 Problem Statement

On the one hand, MSU faculty, staff, students and the host districts are presumed to be a learning community; however, the current dynamic is far from that assumption.

On the other hand, after developing the “New Campus” in Kantarawichai Sub-Districts, MSU has brought a considerable amount of people to this rural area. MSU campus’ surroundings are not planned to host its nearly 50,000 students; therefore, most of them have to live and commute from Mueang Maha Sarakham (4.35 Miles) using private transportation means (nearly 60% of students commute by motorbike). This threatens the environment and social health of a rural area not planned for such impact and campus life.

It is expected that the aforementioned population will increase as a consequence of the implementation of ASEAN 2015, which will draw a larger Southeast Asian visiting population.

The purpose of this research is to determine the role of MSU in terms of building a Learning Community within the region, and to analyze how successful the planning policies are towards the “Green Campus” goal MSU’s Khamriang Campus is currently undertaking. In order to understand these approaches we are analyzing the MSU’s Khamriang Campus actual policies towards the host community, and also analyzing the current campus’ “green planning”, especially the transportation plans.
1.4 Research Questions

There are six major research questions this study seeks to answer. They are:

2. Are there previous and/or current MSU policies for community outreach within the campus area?
3. If they exist, how successful have these policies been?
4. How has MSU’s transportation planning improved the transportation dynamics in the study area?
5. Has the MSU’s transportation planning process been successful?
6. How can these transportation and “greening” plans be improved?
7. Can MSU Khamriang Campus be considered a Sustainable Campus?
2 Literature Review

2.1 The Responsibility of Universities towards Sustainability

Not only to teach about it, but also to set an example of sustainable practice, universities and academic institutions are called “to play a significant role in the search for a more sustainable future.” In their article Developing a Whole-of-University Approach to Educating for Sustainability Linking Curriculum, Research and Sustainable Campus Operations for the Journal of Education for Sustainable Development, Jennifer McMillin and Rob Dyball claim that, “Most universities are tackling sustainability issues in a compartmentalized manner, sustainability education is confined to specific courses, education is often isolated from research, and neither is likely to be linked to sustainable campus operations.”

The academic community should optimize their responsibility as catalyst of changes concerning Sustainable Development, by embracing “a ‘whole-of-university’ approach to sustainability.” The authors also claim that this approach clearly articulates instructive, logistical, investigative, and outreach actions, while committing students in apiece. The article also asserts the importance of creating collaborative environments inside the program for students, as well as academic and administrative community, to have a significant impact on university's accomplishments regarding to sustainability. All of this should reflect on a set of positive externalities as a result, “including raising the profile of university's sustainability initiatives; providing solutions to sustainability problems; building trust among students, managers and academics; and providing meaningful learning experiences for students.” (McMillin, J. & Dyball, R; 2009)
In the years after the Brundtland Report coined the concept of Sustainable Development in 1987, while teaching about sustainability and its different aspects, universities frequently faced the ambiguity of incurring non-sustainable practices. In her Higher Education: the quest for the sustainable campus, an article for the e-journal Sustainability: Science, Practice, & Policy, Leith Sharp states she “was confronted with a profound dilemma as an undergraduate engineering student at the University of New South Wales in Australia in 1992. I had been taught that our planetary life-support systems were in a state of alarming decline by an institution that operated as if what the faculty was teaching was irrelevant”. The author recalls the unsustainable but back then common practice of leaving lights on in “empty overcooled classrooms,” an inexistent recycling infrastructure, pesticides/herbicides-base maintained lawns, while “diesel trucks spewed fumes as they passed on their way to drop off chlorine-bleached virgin paper.” (Sharp, L. 2009)

Questioning how it could be possible to make extensive institutional transformations to come across “the demands of environmental sustainability” at a time in which “it was not even being done in the very university sector where these ideas were being promulgated”, Sharp argued that it would be impossible for their population to change their unsustainable patterns, if universities were not subjects to change, stressing that “to a growing number of people, the idea of teaching sustainability without demonstrating it is highly problematic.” It is commonly understood that the capability of the academic community to improve its own performance is a significant indicator of our
civilization’s aptitude to tackle the “global environmental imperative across all sectors of society.” (Sharp, L. 2009)

According to Sharp, it was back in the early 1990s when the “campus sustainability movement” emerged, undertaking two evolutionary phases since then. While in the first stage, the focus was on “envisioning and articulating the need for campuses to incorporate all sorts of innovations to reduce overall environmental impacts," among other countless expectations, the environmental advocates dreamed about “campuses filled with green buildings, renewable energy systems, local organic food, organic landscaping, enriched native biodiversity, low-pollution transportation systems, bicycle paths, on-site rainwater-storage tanks, grey and black water-treatment systems, socially invested endowments, green chemistry practices, zero solid waste laboratories, green cleaning products, and low greenhouse gas (GHG) emitting campus utilities." During that whole decade and near the beginning of the new millennium, many universities around the world were exploring several “green campus projects," creating examples of nearly “everything on the green campus wish list." In spite of this, the author recalls how “along the way some of us started to notice that while universities were amassing project successes in a piecemeal fashion, they were not achieving the kind of deep organizational transformation many of us now see as fundamentally necessary” (Sharp, 2002).

For instance, as we learned in this article, it was a common practice for an institution to build “a showcase green building project one year only to revert to conventional building design in later projects." Opposed to what was expected, the sole accomplishment did not in fact improve the design/construction
processes inside the institution. “Some universities would publicize specific energy conservation projects such as lighting retrofits one year while adding air conditioning to those same buildings the following year.” While attaining project achievements, these universities failed to institutionalize energy-efficiency requirements to maximize their energy consumption per square foot. “Other universities placed grandiose and expensive recycling bins in public places while allowing waste generation to escalate, creating an isolated success with no comprehensive waste-reduction plan.” (Sharp, 2009)

Nearly a decade after, “sometime around 2003–2004 the movement entered its second wave” as the author recalls, trying to go beyond the showcase-project achievements, advocates pushed for broader public commitments, “dedicated staffing investments, and some kind of specific sustainability governance structure,” now addressing the socioeconomically oriented aspects concerning the academic community. It is when Sharp noticed that the institution's efforts meant to move “beyond the little victories of single projects, toward sustained progress aimed at reaching larger environmental goals, supported by a professional capacity that could ensure ongoing progress.” (Sharp, 2009)

Addressing the tasks of a Sustainability Change-Management Team, Sharp highlights its central role, claiming that it “must be as a resource and catalyst to ignite people right across the university” showing leadership in every green-oriented planning process, such as “building design and operations, renewable energy, environmental purchasing, recycling and waste reduction, green cleaning, alternative fuels, green office practices, green laboratory practices,
organic landscaping, and GHG reduction.” Transforming a complex system as a university needs not only a very proactive squad, but also a population willing to undertake the upcoming changes. It is very interesting how the author argues the popular belief of people being unreceptive to modify their ways, asserting, “People are not resistant to change, they are opposed to instability, and they simply assume that change equals instability. When people experience stable processes of change they generally thrive on the experience and will readily embrace more change.” According to her experiences, she defends that by experiencing adequate positive changes, the people frequently undergo transformations on a personal level, “shifting from being passive participants to becoming leading agents of ongoing innovation and continuous improvement in the organization.” (Sharp, 2009)

The campus population is our greatest capital and, since campus sustainability compels such broad, comprehensive and constant innovation, as well as permanent improvement, academic organizations ought to evolve into learning communities where the most of the people “work in a state of public engagement and life-long learning. Most organizations have a long way to go before their community has evolved to this point.” As Sharp also states, “One of the most effective ways to foster engagement and learning across our institutions is through the use of peer-to-peer forums.” In addition to that she mentions her experiences at Harvard, where her team “experimented with dozens of different peer-to-peer models, working with building operations staff, kitchen personnel, residential students, facility managers, executive level managers, laboratory users, administrative staff, and more.” Their findings indicate that articulating
peers with common social or professional interests to “engage with one another in a shared process of discovery, competition, teaching, and learning was extremely effective in tapping unprecedented effort and stimulating real learning.” Apparently, *peer-to-peer models of engagement* demand more resources to coordinate; however, this methodology seems to generate savings in terms of preventing excessive investments, “and they far out-perform the common approach of having the expert or authority simply tell people what to do.” (Sharp, 2009)

Thinking about bigger systems as an alternative of individual mechanisms might unfold many more opportunities. As an example, the author cites “universities could switch to 100% post-consumer recycled paper at no added cost if they simultaneously adopted double-siding practices for all printers, copiers, and publications.” Another cited example is how “dining facilities could increase local, fair trade, and organic options at no added cost if students would agree to reduce the diversity of meal offerings and eliminate food waste.” (Sharp, 2009)

To finish her article, Sharp claims “we now need to usher in the third wave of the campus sustainability movement, an era focused upon addressing the irrational and unconscious aspects of our institutions to foster a new organizational capacity for innovation and transformation,” stressing task that needs to be addressed and “led with authority and influence, exerted by presidents and executives, middle managers, and grassroots champions.” (Sharp, 2009)
2.2 Implementation Guidelines to the ISCN-GULF Sustainable Campus Charter

Among its principles (specifically in Principle No. 2) and outlined in the Sustainable Campus Charter, the International Sustainable Campus Network in alliance with the Global Universities Leaders Forum (ISCN-GULF) claims that in order to guarantee lasting sustainable campus progress, “campus-wide master planning and target-setting should include environmental and social goals. Sustainable campus development needs to rely on forward-looking planning processes that consider the campus as whole, and not just individual buildings.”

The aforementioned practice should consist of a comprehensive master plan, aiming to achieve a strong impact management policy, responsible ground operations, and a community integration strategy; all of this being translated into land (as well as other natural resources) and ecosystems protection, green transportation systems, resourcefully managed urban flows, guaranteed user diversity, public spaces devoted to social interaction and collective learning (both indoor and outdoor), and inclusive access to all of the above. (ISCN, 2010)

The abovementioned comprehensive plan “can profit from including users and neighbors, and can be strengthened by organization-wide target setting (for example greenhouse gas emission goals).” Commonly known green lifestyles such as low-carbon practices, prioritized pedestrians-oriented circulation, water classification and recycling operations, as well as moderate resources’ usage and minimized waste generation, “need to be identified, expanded and disseminated widely.” (ISCN, 2010)

Outlined in its Principle No. 3, and in order to “align the organization's core mission with sustainable development,” ISCN asserts that campus' training,
research, recreational and administrative facilities “should be linked to create a Living Laboratory for sustainability.” (ISCN, 2010)

Also in this section, ISCN states that while researching, teaching, and learning, the campus users (meaning students, faculty, and staff) are constantly interacting with environmental, social, and economic issues. Hence, the campus sustainability agenda should have concrete goals in order to “bring together campus residents with external partners, such as industry, government, or organized civil society” achieving the best possible synergy. Furthermore, rather than studying a broad-spectrum sustainable future, these programs must tackle “issues pertinent to research and higher education (such as environmental impacts of research facilities, participatory teaching, or research that transcends disciplines).” (ISCN, 2010)

2.3 International Journal of Sustainability in Higher Education. Towards a Vision of a Sustainable University

Widely argued already, and, in our opinion, extremely late for an academic response to such an imperative matter, in its publication Towards a vision of a sustainable university, Hans Van Weenen refers to Sustainable Development as “one of the biggest challenges of the twenty-first century,” highlighting as well that “Several universities have begun the debate about the content of this concept and the ways in which to integrate it into their university policy, organization and activities.” (Van Weenen, 2000)

According to this journal, the Association of University Leaders for a Sustainable Future recently published the existence of several “ways in which universities
can be involved in sustainable development, e.g., management, planning, development, education, research, operations, community service, purchasing, transportation, design, new construction, renovation and retrofit.” (ULSF, 1999). Hence, when addressing this subject, universities should devote specific resources, academic programs “or even a holistic mission.” (Van Weenen, 2000)

In general terms, education is considered the main purpose of university activities. As a way to stress his point, the author recalls the role of education and its service to society, quoting UNESCO when five years after the Earth Summit, the entity claimed:

*The goal of education is to make people wiser, more knowledgeable, better informed, ethical, responsible, critical and capable of continuing to learn. Were all people to possess such abilities and qualities, the world's problems would not be automatically solved, but the means and will to address them would be at hand. Education also serves society by providing critical reflection on the world, especially its failings and injustices, and by promoting greater consciousness and awareness, exploring new visions and concepts, and inventing new techniques and tools. Education is also the means for disseminating knowledge and developing skills, for bringing about desired changes in behaviours, values and lifestyles, and for promoting public support for the continuing and fundamental changes that will be required if humanity is to alter its course, leaving the familiar path that is leading towards growing difficulties and possible catastrophe, and starting the uphill*
climb towards sustainability. Education, in short, is humanity’s best hope and most effective means in the quest to achieve sustainable development (UNESCO, 1997).

Van Weenen considers the University of Florida as a paradigm of commitment to campus sustainability, as the university “has signed a declaration promising to make environmental education and research a central goal of the institution.” For instance, the university’s Center for Construction and Environment is in charge of articulating the actions towards “greening the curriculum, operations and research agenda.” This methodology of greening the campus consist in organizing meetings with actors and stakeholders, conducting environmental inspections, evaluating the classes’ environmental content, and designing educational awareness. The author also asserts that the university’s objective is to “embed environmental literacy into virtually every curriculum and every segment of campus operations.” (Van Weenen, 2000)

Revisiting the University of Hertfordshire’s approach to sustainability, Van Weenen indicates that back in 1995 the university already recognized its responsibilities to this initiative with the launching of a Sustainable Development Policy, which assessed the environmental issues in context within an economic and social perspective. “According to this policy, the University of Hertfordshire is committed to integrate sustainable management principles into the university’s housekeeping practices. It encourages students to recognize the environmental impacts of their studies, aims to encourage collaborative interdisciplinary research on sustainable development themes, and initiates staff development programmes.” Ultimately, the author claims that the university
encouraged the improvement of its outreach agenda in relation to sustainable development within the local community, building partnerships with the people to promote sustainable practices. (Van Weenen, 2000)

Looking at the University of Waterloo, Canada, the author finds that “a vision for a Sustainable University of Waterloo has been articulated. It states that by embodying a set of desired characteristics, the university can lead the greater community in becoming a model for sustainability.” He also quotes five vital principles as central to their mental picture of a Sustainable University of Waterloo, “Awareness, efficiency, equality, co-operation, and natural systems.”

As expected, the university’s idea of sustainability takes into account social, economic, ecological and political issues with equal importance acknowledging how inextricably linked these aspects are in people’s everyday lives. Van Weenen states, “They look at changes to the University of Waterloo political environment where the decision-making process is the result of a multi-disciplinary body, and they consider social aspects of the campus and community links with the campus of the future. It is interesting to see how they visualize this ideal campus, “One result is that the campus of the future will look very different. All lawns are being replaced by natural landscaping, native plant species are being used to encourage wildlife to live in the university grounds and the number of new buildings will be limited.” This image is complemented with the university’s vision of giving priority to “a basic ecological education for all students, faculty and staff.” (Van Weenen, 2000)
As the article goes on, the author keeps highlighting the inclusion of sustainable development programs in the curricula of several universities. The last one to be mentioned is Appalachian State University in North Carolina, USA, where a program of summer internships was being implemented for students in the sustainable development program. As acknowledged in the piece, “Placements include: agriculture, micro enterprise development, the development of a permaculture and appropriate technology training centre outside Asheville.” As part of the program, “Several students have internships in Honduras and Guatemala. Students expressed their support of the sustainable development programme through student government, passing a resolution calling upon Appalachian State to reinstate the agro-ecology programme and to expand the sustainable development curricula offerings at undergraduate and graduate levels.”. As a response to that, the inclusion of environmental protection as an important part of its mission was subsequently amended in the university's mission statement. Back in 1996, the sustainable development program went through a period of collaborative planning and community outreach set of courses, launching conferences and lecture series, and increasing student internships. Van Weenen indicates that, “A full-time, one-year “Sustainable Communities Co-ordinator” was appointed to create a rural/urban model of participatory planning and action around sustainable development projects on land-use planning, sustainable agriculture and micro-enterprise development”. On the other hand, the appointed coordinator would also “help to expand the model in western North Carolina and link the communities to the international sustainable communities movement.” (Van Weenen, 2000)
2.4 Sustainable Campus Transportation through Transit Partnership and Transportation Demand Management: A Case Study from the University of Florida

The Berkeley Planning Journal published in 2006 a case study about the University of Florida, in which it is indicated that the university “has established a long-term, sustainable partnership with the local transit system in Gainesville, Florida.” According to Alex Bond and Ruth Steiner, “this partnership provides over $5.2 million of annual funding to enhance transit services used by students at the university.” The article highlights how the system usage has grown by 284% in eight years. The authors claim, “These ridership gains were made possible through a comprehensive campus Transportation Demand Management (TDM) system, which seeks to reduce automobile use in favor of more sustainable modes.” Among other strategies, the campus’ TDM scheme includes parking restrictions and pricing, transit service improvements, and unlimited-access transit, a joint venture between the municipality and the university.

The Transportation Demand Management (TDM) system is an enclosed concept that incorporates an assortment of planning strategies that encourages a more resourceful use of existing transportation means. TDM lines of attack seek to alleviate the harmful aspects of vehicle travel including transportation inequity, traffic jamming, and the no less important air quality. As part of its scope, the authors state that TDM strategies encourage to “build upon positive aspects of a balanced transportation system to foster economic development, expanded
housing choices, and a reduction in capital expenditure on transportation infrastructure.” TDM plan implementation should be a priority for universities with the aspiration of people shifting from “single occupant automobiles to more efficient modes of commuting to campus.” (Bond & Steiner, 2006)

TDM policies can be broken into three open categories: positive, mixed, and negative. Positive TDM policies increase transportation alternatives and access for all users incorporating among others, transit service enhancements, flexible schedule working hours, and carpooling programs. Mixed TDM policies increase alternatives and access for one portion of the population only, but do not have a negative impact on those out of that group scope. As cited by the authors, “examples of mixed TDM strategies include: high-occupancy vehicle lanes, unlimited-access or fare-free transit programs, and traffic calming.” On the other hand, negative TDM policies reduce alternatives or boost expenses, and include: parking pricing, fuel tax raises, and car-free sectors. (Bond & Steiner, 2006)

Different than combined strategies, individual TDM policies have a moderate influence on the transportation system. However, when coordinated strategies are put into practice, this can produce a considerable impact. Hence, when coordinated strategies are implemented, the negative externalities on individual users are lessened. Making a reference to previous studies, the authors indicate “Experience with high level of service transit may influence future behavior, since psychologically the experience was a positive one. Therefore, exposing students to alternative modes could have lasting impacts on the nation’s transportation system.” Hence, generating a sustainable and multimodal transportation system on campus “could make lasting impacts on the travel
behavior of graduates.” (Bond & Steiner, 2006)

2.5 About Parking Pricing and Restriction

Due to its economic externalities, restrictions and pricing are indicated as two of the main powerful TDM impacts on parking policies, which also are often implemented in dense sectors like cities’ central business districts, as well as in university campuses. In their research, Bond & Steiner found “a strong inverse correlation between the available proportion of parking spaces and transit’s share of peak-hour commuters. In areas like central business districts with fewer available parking spaces, transit use was high. In areas with an excess of parking spaces, transit use was low.” (Bond & Steiner, 2006)

Using a formula commonly known in economics, the authors claim “Universities usually have fewer parking spaces (supply) than the number of commuters who wish to park on campus (demand). Therefore, universities can be expected to behave similarly to central business districts.” Recalling another microeconomic approach, this case study raises the example of for-profit landowners including the cost of “free parking” in the total costs of the developed project, prorating the aforementioned cost of the “free parking” within clients or occupants. (Bond & Steiner, 2006) Nevertheless, universities are considered non-profit institutions, hence are not expected to generate a product whose price could be increased to cover the costs of parking infrastructure. That is why “universities must charge students and faculty who use parking spaces to recover at least a portion of the costs associated with facility construction and maintenance.” This procedure identified as “parking pricing” aims to accomplish a triple goal: “to raise funds, discourage commuters from parking on campus, and to encourage commuters to
use alternative modes.” According to a 2003 research study cited in this case project, the rate of parking permits on campuses “ranged from $14 to $300 per semester, with a mean of $83.43.” The authors stress that yet at institutions with more high-priced parking, “universities are not pricing parking to recover 100 percent of its costs.” The parking expenses of a university contain wages for the infrastructure workforce, administration, building costs, and loss of land availability, meaning that at some point in the future could necessitate the purchase of campus annexes.” (Bond & Steiner, 2006)

Rising mass transportation usage is not exclusively coupled to fare price. In order to attract users, the service ought to be enhanced as well. This study indicates, “The most important service characteristics for non-users of transit are increased frequency and direct routes from home to work.” According to another cited source, the service frequency resulted two times more important to users than fare price. “The wait time for a bus is a substantial component of total travel time. By reducing the total wait time — and thus the total travel time — transit begins to become competitive with the private automobile in terms of convenience. As also cited by the authors “frequency elasticity for transit ridership is 0.5 — for every 10 percent increase in frequency, ridership goes up by 5 percent.” (Bond & Steiner, 2006)

2.6 About Unlimited-Access Transit

University campuses have been the playgrounds of the Fare-Free Transit or Unlimited-Access Transit concept since the late 1970s. According to this Ccse study, back in 1998, an assessment found that 35 of the most important campuses have available some way of unlimited access transit. There is a
misconception that unlimited-access transit is a free service, when actually it is just a different payment system for the aforementioned service. As indicated by Bond & Steiner, “a third party pre-pays the transit provider to carry members of a constituent group without charging them a fare. The transit provider usually receives an annual lump sum payment from the university.” It is a similar scheme to the one implemented in collective health insurance. Tariffs are considerably reduced because of the amount of purchased fares. However, only a small amount of beneficiaries really benefit themselves with the settlement. “Transit passes are distributed or third-party identification cards double as passes,” state the authors; “unlimited access is not limited to institutions of higher learning. Third-party prepayment can also be offered by large employers or municipal governments”. (Bond & Steiner, 2006)

While looking at the Simpson-Curtin rule (Curtin 1968), Bond & Steiner found that “free transit should theoretically increase ridership by a third, since ridership goes up by 3 percent when fares are decreased by 10 percent.” But in reality, the agencies that totally remove fees are more likely to experience an increment of 50% in ridership, possibly because of the implementation of TDM strategies. According to the authors’ sources, “small and medium transit systems benefit the most from an unlimited access or fare-free policy.” Bond and Steiner also found that around 129 Sustainable Campus Transportation systems “have a limited number of activity centers to serve, lower vehicle costs, and lower incidence of vagrancy and vandalism.” (Bond & Steiner, 2006)

Nationwide statistics from 2001 indicate that passengers occupied only 27% of available seats on buses. Such an amount of vacant seats increases the operating subsidies. Hence, “Transit systems want riders to fill those seats, and universities
want to discourage automobile commuters to campus. Through university payments to transit systems, new riders can be brought to the transit system while at the same time relieving the parking demand on campus.” (Bond & Steiner, 2006)

2.7 The University of Florida Case Study

Located in Gainesville, in northern Florida about 90 miles south of the state limits of Georgia, the University of Florida is a familiar example of a college town. Gainesville is an intermediate-sized city with a city population of 108,856 and 218,000 in the metropolitan area, according to 2002 data from this case study, which also highlights that “the transit system serves only the City of Gainesville and adjacent areas of the unincorporated Alachua County.”

Out of its 47,373 students (total enrollment in the 2003–2004 academic year), 28% on graduate or professional levels and 72% on undergraduate, a considerable amount of this student population has moved to Gainesville for their academic lives; however, comparatively few students are actually innate from Alachua County. Besides the students, there are over 4,000 faculty and about 8,000 staff members. The University of Florida was founded in 1905, and its original site, which is the oldest area of the campus, is a compact and dense section better to transit on foot or bicycle. The central part of campus is essentially a pedestrian-only zone throughout daylight hours, with very few parking means. As this case study indicates, “The core part of the campus occupies roughly 600 acres, with the other 1,050 acres devoted to less dense uses such as agricultural research and conservation. Accommodating the needs of more than 58,000 regular commuters to the core of campus requires
balancing the needs of diverse groups and maintaining a comprehensive transportation demand management plan that promotes transit use over private automobile use.” (Bond & Steiner, 2006)

2.8 About the Regional Transit System and Unlimited Access Policy

The Regional Transit System (RTS), a division of the Public Works Department of the City of Gainesville, provides the bus transit in the City of Gainesville, being the only bus transportation service in, out, and around the campus.

A very important fact in this research is that, “the growth in bus ridership on the Regional Transit System has outpaced ridership growth nationwide. Nationwide bus ridership has grown 15 percent to 5.27 trillion over the period 1995 to 2003 (NTST 2003). The disparity between ridership growth in Gainesville and the nationwide total can be attributed to the growth on routes related to the University of Florida.” (Bond & Steiner, 2006)

Back in the 1998–1999 academic year, the University of Florida began a strategy to subsidize the transit service to benefit the student population, resulting in significant service progress, with the creation of an unlimited access policy one of their most successful policies. According to this research, “RTS experienced the largest increases during the two years when university subsidy of transit services began. Since 1999–2000, ridership has been steadily increasing at more modest rates, although it is far out-distancing transit growth nationwide.” (Bond & Steiner, 2006)

Back in 1998, when due to the increasingly amount of private vehicles on campus, the University of Florida was facing a parking/transit crisis. However, instead of undertaking the construction of a massive parking infrastructure
project, the university made a very important choice, and signed a *contractual service agreement* to provide an enhanced transit service to campus. As stated by Bond and Steiner, “the City of Gainesville made an ongoing commitment to fund the ‘baseline’ levels of service found on routes in 1997. Newly established routes would be city-funded to provide a level of service consistent with routes operating in 1997, which operated with one or two buses on 30- to 60-minute headways. Additional funds to provide higher frequency, unlimited-access transit would come from the university.”

As part of the same strategy, the *Transportation and Parking Services Division* and the *Campus Facilities Planning and Construction Office* became the second source of financial support for the city's transit system, providing over $1.5 million to RTS each year. These funds are obtained from parking system transactions, as well as parking fine revenues. The researchers highlighted that “the administration's payment is the part that actually pays for unlimited access. However, administration funds do not pay for any service improvements.” (Bond & Steiner, 2006)

### 2.9 Toward a Sustainable Campus: Comparison of the Physical Development Planning of Research University Campuses in Malaysia

Beginning with the Earth Summit in Rio in 1992 and then in Johannesburg in 2002, the matter of sustainability has been a critical subject of debate. Due to the fact that they are a *center of knowledge*, universities from all over the world have become progressively more concerned with the aforementioned matter. Hence, numerous universities have started to support strategies towards producing
sustainable campuses undertaking design and education as their flagship actions. This research claims that although only a small number of universities are actually taking action towards creating sustainable campuses, several universities in Malaysia have stated their commitment to put into operation sustainable practices. However, as also claimed in this research, “there are several weak aspects in campus physical development planning that have resulted in the failure to create an environment that offers a conducive environment for learning and living." Another important issue is that besides not satisfying the needs of their student population, physical planning on the campuses of Malaysia is less susceptible to change. (Mohd Zulhanif & Nur Akmal 2011)

According to Mohd Zulhanif and Nur Akmal, “the establishment of sustainable practices on campus and the demonstration of better management of practices that comply with sustainability rules, give higher education institutions the opportunity to use their campuses to educate the community at large about progressive models of development.” As a matter of fact, a sustainable campus is expected to have available an environment capable of enhancing academic performance with the aesthetic and practical approach of sustainable design. This research claims that “campus planning affects the entire campus in terms of environmental, social and economic development and thus should focus on the university's mission and its implications when planning and building the physical characteristics of a campus, especially in terms of land allocation and incorporation, locations of academic and residential areas and provision of commercial facilities.” From an urban design perspective, a campus can be seen
as a city configured by its consistently interdependent elements. From the same perspective, Mohd Zulhanif & Nur Akmal state that "there are three main parts of a campus, which include the buildings, outdoors spaces and support elements such as utilities and circulation systems." The researchers also cited that "utility and circulation systems are necessary elements that support the activities of the institution. Hence, a campus most be aware of this interdependency while planning, which means that no system can be planned independently from its surroundings." (Mohd Zulhanif & Nur Akmal 2011)

This research quotes D'Amico and Brooks, who in 1968 stated that the expansion of the majority of campuses has been undertaken by mere buildup, which is regularly attained by “placing new buildings in empty spaces without evaluating the surrounding functional relationships. In addition, various adverse effects could be created, such as barriers to students’ movement, congested network circulation, and issues with parking spaces.” This strategy proved to have an impact on further events, in spite of whether this impact turns into positive externalities or not. A policy that continuously challenges Sustainable Development practices is to develop buildings inside the vacant campus area, but separately from new green areas. Several authors paraphrased in this research have proposed infill development, referring to the developments that take place within the current campus area, and stating, “This concept will minimize the use of vehicles and services. However, people can use the existing facilities and avoid expansion into new areas.” Other findings point at how better it is to encourage an infill strategy, rather than developing new areas, as a way to reduce new burdens on the transportation structure. Mohd Zulhanif & Nur Akmal claim that
“the distance between destinations will become shorter and driving needs will be reduced.” This paper refers to several assessments that have demonstrated that *compact development planning* is “able to encourage sustainability.” The authors claim that besides its environmental advantages, this kind of development planning also encourage “the creation of a healthy social life and reduces economic problems.” (Mohd Zulhanif & Nur Akmal 2011)

The research cites seven advantages of compact development:

i. *Reduced land usage*;

ii. *Reduced vehicle dependency*;

iii. *Reduced usage of resource and emission of pollution*;

iv. *Encouragement of public transportation, walking and cycling*;

v. *Better access to facilities and services*;

vi. *Efficient provision of infrastructure and utilities*; and

vii. *Redevelopment of existing areas*.

### 2.10 About the Structural Layout of the Campus

About the campuses analyzed in Malaysia, this study found that the four universities planned their campuses under different criteria, stressing how “the structural layout of the campus affects the pattern of life on campus, especially in terms of accessibility and circulation. Additionally, it appears that the physical development of these campuses is only minimally concerned with the relationship between the functional areas and buildings on campus.” (Mohd Zulhanif & Nur Akmal 2011)

For instance, the buildings’ configuration within the inner campus layout of University Kebangsaan Malaysia (UKM) is divided into three areas identified in
the study as Range 1, Range 2 and Range 3. The Range 1 area is designed using the concept of 'core centralization', placing the academic buildings in the center and encircled by the common areas and lodgings. Further campus development in Range 2 and Range 3, seems to be achieved by plain addition; new buildings are inserted in vacant spaces without analyzing the purposeful interaction between them. (Mohd Zulhanif & Nur Akmal 2011)

On the other hand, if compared to the other four campuses, the University Sains Malaysia (USM) main campus apparently has been planned following a more compact design, where the services section is located in the center and bordered by the academic buildings, while the housing development was located out in the suburban campus. This study also indicates that the possible driver for this strategy “may be due to the limited supply of land for the campus because it is already surrounded by developed areas.” (Mohd Zulhanif & Nur Akmal 2011)

In the case of the University of Malaya (UM), the campus layout is scattered; where for instance, several academic buildings are located out of the main academic section. According to this study, “the UM campus layout resembles a 'centralized core' structure, with the residential area surrounding the social and academic areas. However, the 'centralized core' is quite broad and not well organized, and there is an area in the center of campus that has not been developed. Hilly terrain factors may be barriers to developing that area and creating a well-organized structure.” Nevertheless, the main campus of University Putra Malaysia (UPM), the largest campus analyzed in this study, was planned dividing it into two focal areas: academic and housing areas. This layout gathered the academic buildings within one area, while the housing developments (including houses, sport fields and courts, and fitness centers) are
clustered in the same way, but in another area, and administrative and student facilities are grouped in the academic section. (Mohd Zulhanif & Nur Akmal 2011)

2.11 About Accessibility

Understanding Accessibility as the capability to achieve 'goods and access to services and activities,' the research team of this study performed a survey on the different campuses, and the results obtained from it found “that the accessibility to academic areas from residential areas is highest for the USM campus (65%), followed by the UPM (63%), UM (59%) and UKM (50%) campuses.” The team suggests that the possible reasons for that result is “the compact layout of the campus, which reduced the distance between residential areas and academic areas;” while in the case of the UKM campus, such results are indicated to be due to “the random placement of students and campus-wide growth using simple accretion” increasing the distance between the housing and the academic areas. However, in terms of accessibility to the facilities area, the UKM campus achieves the highest percentage with (61%), opposed to the UM campus, which achieved the lowest (39%). According to the researchers, “these results may be influenced by the centralized location of the facilities on the UKM campus. The continuity of covered walkways and the placement of most of the residential colleges around the building complex also influenced the results. As for the UM campus, the position of the facilities area is located in the center of campus. However, the distance of the buildings is quite far from residential areas, and there is no covered walkway connecting the buildings to residential areas. “This last fact is very important to
take into account due to the cultural context, and the campus geographic location because Southeast Asian people will try to reduce any possibilities of sun exposure. (Mohd Zulhanif & Nur Akmal 2011)

In terms of accessibility to campus recreation areas, the USM and UPM campuses attained the highest outcome (62%), followed by the UM and UKM campuses with (51%) and (34%) respectively. Although the central recreation facility is far from most of the housing buildings, both the USM and UPM campuses have scattered recreational areas available, providing most of the residential areas with a sports field. Hence, all of the students have access to exercise. On the other hand, since it is located in the suburban area of the university, the recreation and sports facilities of the UKM campus are distant from most of the housing areas. In addition to that, only a few of the residential sections have sport or recreation facilities available. (Mohd Zulhanif & Nur Akmal 2011)

When possible, a well-interconnected road and path network can improve existing circulation. According to this research, there were several similarities in campus circulation patterns. When surveyed about it, the greater part of the respondents mentioned the lack of consistency in covered walkways on their respective campuses. However, if contrasted with UKM answers, most of the students from the other universities (29%) answered that walking on campus is relatively comfortable.” The two main concerns among the respondents of the campuses research stated frustration with the lack of bike lanes and pedestrian-oriented circulation on campus. As stated in this research, “Pedestrian networks should be the backbone of the campus because they act as a liaison to the main areas on campus.” However, the pedestrian circulation on these campuses is indicated to be poorly designed. In order to guarantee proper pedestrian
protection, walkways should be designed independently from vehicle flow, as well as shaded to bestow more comfort to its users. (Mohd Zulhanif & Nur Akmal 2011)

As a counterpoint to the pedestrian networks and due to their minimal carbon footprint and the contributions to the health of its users, the authors point out bicycles as a sustainable transportation means to be incorporated into an alternative transportation system. This research indicates the lack of adequate bicycle lanes, which are usually shared with pedestrian flow or the regular motorized stream. Another important claim is that “This situation can be dangerous both to pedestrians and cyclists. Similar to the case of pedestrians, a way to encourage students to use bicycles is by providing comfortable and safe facilities to support their use.” Along with proper and individual circulation, a bicycle circuit should be provided with parking space and racks, and specific signage. (Mohd Zulhanif & Nur Akmal 2011)

2.12 About Building Design

This study also addresses the architectural scale and design criteria, stating that planning must contemplate the campus visual and operative consistency aspects, while nurturing diversity and supporting the interdisciplinary areas and campus existing subcultures. When questioned about building design aspects, most of the USM, UM and UPM surveyed students indicated how unique and self-defining the different building designs were on their campuses. However, the majority of UKM respondents indicated that their campus building design lacks distinctiveness, failing to project its own image. A visual study carried out at UKM established this overload of design homogeneity of their buildings. “Not only are these
buildings uniform, they in fact share identical designs” claim the researchers, indicating how the resemblances “made it difficult to differentiate one building from another, with each building failing to project a unique image. The buildings also failed to indicate the diversity of the disciplinary areas that exist on campus.” (Mohd Zulhanif & Nur Akmal 2011)

2.13 About the Landscape and Surroundings

This study emphasizes the importance of landscaping as one of the main aspects to be taken into account in campus planning, indicating that “rather than simply beautifying and brightening the campus area, landscaping plays multiple roles.” Landscaping is responsible for adjusting the microclimatic components of campus, setting psychological boundaries that would help define a space and indicate ‘wayfinding’ and, most significantly, articulate the campus architecture. Hence, the landscape elements are among the most significant components in generating a comfortable campus environment; a statement quite coherent with sustainable campus objectives, by emphasizing the improvement of the students quality of life. (Mohd Zulhanif & Nur Akmal 2011)

In general terms, from all four analyzed campuses, most of the surveyed students stressed how “the landscapes on their campuses are adequate and create a comfortable campus environment.” Nevertheless, if compared to the other universities, the UKM campus showed the lowest proportion (48%). As both the research and the visual observation indicate, although a considerable green area surrounds the UKM campus, the housing and academic clusters seem to be a less significant concern in terms of landscape design. According to some findings, “the landscaping elements that have been applied are not designed based on
themes or a unique concept. This affects the comfort of the campus environment. For other campuses, the landscape design is more structured and well maintained, which creates a comfortable atmosphere on campus.” (Mohd Zulhanif & Nur Akmal 2011)

Regarding the learning process, a considerable percentage (a 60% and a 63% on the USM and UPM campuses, contrasted to a 45% and a 46% on the UKM and UM campuses, respectively) of students agreeing that landscape contributed to their educational development. However, research results claim “campuses still lack complex landscape elements” that could contribute as wayfinding and landmarks to increase the identity of the campus. Although most of the answers reveal that some of these elements are present in the analyzed campuses, still a few positive remarks were recorded. The authors highlight that “these more complex landscaping elements, when present, are often in hard to reach locations and left in disrepair. This inattention may reduce the campus community's enjoyment of the campus environment and reduce the potential of the outdoor space as a medium for effective learning.” (Mohd Zulhanif & Nur Akmal 2011)

2.14 About Transport and Movement

The outcome of the conducted research shows that all of the four campuses provide bus services to alleviate the student commute. In general terms and except for service on the UM campus (42%), the respondents confirmed that the provided bus services are comfortable. However, the results are equally divided among endorsement and dissatisfaction. Furthermore, most of the surveyed students (except a 45% from the UM campus) stated that they usually use the public transportation services. Nevertheless, the study indicates that “there were
complaints from the UM respondents about the public transportation services on their campus.” (Mohd Zulhanif & Nur Akmal 2011)

Some of the claims recorded in the investigations, and specifically regarding the flaws in the transportation system of the UM campus, are: "The public transportation is sometimes not on schedule. The drivers take breaks earlier than their schedules indicate” and ”To ensure that the bus driver complies with the rules, the drivers are expected to adopt the slogan 'courtesy of our culture'...”

What I believe is a significant statement in this research is that “the majority of respondents state that they were comfortable using a private vehicle,” indicating that up to 61% of the surveyed UPM students use private vehicles. According to the researchers, “this may be due to superior road conditions on the UPM campus compared to other campuses. The separation of the circulation between academic and residential areas assists vehicle motion patterns and improves road safety, especially in residential areas. Furthermore, parking is not a serious problem on the UPM campus compared to other campuses”

2.15 About Safety and Lighting

As we mentioned before, Southeast Asians tend to avoid exposure to sunlight, hence, the outdoors and sport activities are more likely to happen after sunset. Nevertheless, according to the feedback received from the respondents, the study indicates, ”there are several locations that appear to be unsafe on the research campuses. Roads, walkways and parking are among the areas that are considered to be the most risky. It was observed that lighting levels were lower in areas with less satisfaction with safety.” The study also recorded several complaints. For instance:
"There are few places outside the residential area where it is too dark. There are also certain roads on the hill where it is dark like a haunted house. Please increase the number of lights so that the residential area is brighter residential area and the residents feel safe. To increase number of street lights on Lebuh Silicon, which is the road to the entrance of UPM. Ensure better security and lighting at pusanika and pedestrian walkways at night."

Some other significant results also indicated that either for vehicles or pedestrians, circulation design is less responsive to safety requirements. The study stresses that “Dark walkways with no segregation between pedestrian sidewalks and roads exist for long stretches. This far distance must be travelled at high risk, and the pedestrians and other road users feel unsafe. Street light usage is unsatisfactory and obscures the vision of drivers.” Furthermore, the research indentified that road conditions are poorly maintained, increasing the probabilities of car accidents. The students are commonly scared of dark and unsafe parking facilities; and the frequency of crime, especially related motorcycle stealing, reveal the relaxed security atmosphere in parking section design. One of the comments received was the following: "Provide secure motorcycle parking lot at College Amin. Motorcycles are always stolen at the end of the semester."

To finish this topic, the researchers claim “Complaints and comments received indicate the importance of safety and lighting on campus. Both of these aspects
are less emphasized during the planning and design of research campuses. The main cause of this problem is the placement and layout of buildings. As a result, the provision of secure areas, clearly lit roadways and optimum lighting are difficult to obtain.”

2.16 Literature Review Conclusions

Since its public commencement in 1987, the Sustainable Development theory has been gaining popularity and importance in an exponential manner. Merely argued among the scientific community in its early stage, this concept has turned into a more “trendy” topic in more recent times, evolving from being an academic subject until becoming the main public discourse of entertainment stars and Nobel-winning high profile politicians.

What in essence has not change is the fact that, like back in the times when the Brundlandt Commission coined it, its backbone is the synergy between ecology, economy and equity (as in social fairness), with all three concepts treated with equal importance.

However, as the available and relevant literature for this research was being revised, the vast majority of it was focused either on environmentally or economically oriented approaches, or a combination of both. This Literature Review demonstrates that when it comes to tackle this matter in general, and especially when taken up from the Higher Education standpoint, the sustainability concept keeps being addressed almost exclusively from the economic and environmental perspectives.

The referenced literature constantly takes on green building, renewable energy, water and other natural resources management, landscaping, biodiversity, and
microeconomics. However, when addressing them, the social aspects of sustainability are barely mentioned. For instance, out of twelve references, only four of them express particular interest in the social impact of sustainable practices:

- Leith Sharp recognizes the *campus population* as “our greatest capital,” but barely extends this idea up to the academic community and university staff level, and not to the local people of campus surroundings.
- The ISCN guidelines take into account “community integration strategy” and “social goals” as part of its principles.
- In his article, Hans Van Weenen mentions “community service,” “staff development programme,” and “community outreach” as ways in which “universities can be involved in sustainable development.”
- In the UF Study Case, the social outcome of its transportation strategies is indicated only as having positive externalities, with the only public impact being improving the quality of local transportation.

All of which, despite the impact that the academic activities brought to their local host population, instead of including the surrounding community members in it, their sustainable strategies are almost exclusively directed to benefit the students, teachers and university staff.

Since we did not have the expertise and enough hard data as to address it from a sociological perspective, but in order to avoid neglecting such an important issue, we will address the MSU *social sustainability* aspects not as an attempt to solve the problem, but to point it out in our recommendations. Our transportation proposal will be explicitly influenced towards nurturing the best possible interaction between the academic and the local populations: which
characterize our definition of a Learning Community.

3.0 Methodology

Following the criteria of the Robert K. Yin’s case study design methods, we have chosen the (Type 3) Multiple-Case (Holistic) Method. The selected method is based in the analysis of different cases within one context; in our case, the context selected was the University Campus. Since the climatic parameters and geographic conditions of the analyzed site were very unique, the aforementioned method was modified for analysis purposes and to meet the most similar characteristics. The different cases were selected taking into account the aforementioned conditions. Consequently, the chosen cases were:

A Case Study about the University of Florida (UF) published by the Berkeley Planning Journal, a comparative analysis between the University Kebangsaan Malaysia (UKM), the University Sains Malaysia (USM), the University of Malaya (UM), and the University Putra Malaysia (UPM), all of which occur under fairly similar climatic conditions, and with the same planning approach: transportation and campus sustainability.

That process was contrasted with the analysis of the aforementioned dimensions of planning in the context of Khamriang Campus of Maha Sarakham University, and how these were related to the campus-planning framework. Through one month of field research along with another two research peers and a leading University of Cincinnati faculty member, and after participating in several academic experiences and presenting the results to MSU students and faculty members, a preliminary analysis was developed. These results were analyzed for another month.
During the research stage, all possible efforts to gather hard data were undertaken. However, due to the highly bureaucratic and hermetic Thai information systems, the community outreach, as well as the transportation and energy plans, were not obtained; therefore, most of the research data is based on empirical processes. Consequently, several background interviews were conducted with the university’s authorities. Also, revising the results of a survey designed for academic analysis purposes by Arch. Mai Supathida, a MSU faculty member, which was administered to MSU students, staff and local community members, we intended to determine how successful both approaches have been so far. According to the aforementioned survey, participants were randomly chosen, however, the survey team made sure to include a proportional participation of the aforementioned population.

Once the available literature was compared with the results of the field research, the following steps were taken:

1. Indicators of *Sustainability* were developed based on environmental, economic and equity (as in social responsibility) aspects, and with revised international *Sustainable Campus* guidelines as a framework. These guidelines helped defining the analysis units.

2. Indicators were developed of successful campus transportation practices.

3. The identified indicators were applied to the studied case.

4. A table of Indicators was built to determine whether each decision criterion within each indicator was met or not.
5. The existing campus transportation system was analyzed in comparison to the survey results to determine the people’s choices and trends.

Seven indicators were developed and applied to the MSU Khamriang Campus. Each of the indicators with equal weight was evaluated under the criteria of several items (with equal weight as well) to determine its level of fulfillment.
4 Survey Results

Out of the 110 participants surveyed on the MSU Khamriang Campus, 57 of them were females, and 53 were males. The great majority were younger than 30 years old; 47 of them were less than 18 years old, 39 were between 18 and 30 years old, 21 were between 30 and 55, and 3 were above 55 years old.

The results revealed that 83 of them were students, 11 were MSU teachers or staff, and 16 were none of the above, meaning that they were local people who were service providers. In order to understand where they commuted from, they were asked their place of residence; 23 of them live in the MSU housing projects, 17 and 13 of them live in the Tha Khon Yang and Kham Riang Sub-Districts respectively, while 31 live in independent housing projects near campus, 8 around Chi River, 15 in Mueang Maha Sarakham, and 3 in other sub-districts. Only 18 of them don't own any type of vehicle. Opposed to that 10 of them own a car, 75 own a motorcycle and 6 own a bicycle, totaling 92 vehicle owners.

When asked about their means of traveling around the campus, 4 of them answered that they use their own cars, 71 ride around on their motorcycles and 3 on bicycles, while 4 of them use the Songthaews (pickup trucks), 15 the shuttle bus, and 13 walk around campus. On the other hand, when it comes to commuting from their residences to school, 10 use their own cars, all 75 use their motorcycles, but only 3 and 8 ride their bicycles or walk respectively, while 6 use the shuttle bus and 8 the Songthaews. That, of course, reveals their preferences for privately owned vehicles.
Regarding their willingness to walk within campus, only 23 answered yes, opposed to 87 that would rather not. Among the positive answers, 8 of them liked the exercise, 7 looked for the opportunity for social interaction, 5 just because “it is nice” to walk around campus, and 3 for “other” reasons. However, the reasons for the negative answers were mostly because of a rejection of sunlight or hot weather (72), 7 for the lack of walkways, and the other 8 because they just don’t like to walk. Nevertheless, in terms of shuttle bus rides for the current semester, 83 didn’t ride it at all, 11 rarely used it, and other 5 rode from 1 to 3 times a week, while 11 used it on an everyday basis.

86 of the surveyed are in favor of “greening” policies for MSU, none of them disagree and the rest, 14 in total, don’t care about such policies. Surprisingly, in opposition to the previously revealed preferences for private means of transportation, 97 of the surveyed agreed with promoting the use of bicycles, the shuttle or even walking on campus, 2 disagreed with the idea, and 11 didn’t care. Those surveyed responded similarly about giving people the abovementioned bicycling, walking or shuttle options.

When given the choice of selecting how to improve the shuttle bus service, nobody was against the idea, 4 didn’t care about it, while 106 responded positively; out of which 104 suggested having air conditioned buses, 105 recommended improving the routes, 106 respondents agreed with increasing the route options and requested having shaded bus stops, 103 requested increasing the number of units, and 8 of them suggested adding room for bicycles inside them.
If given the choice of an improved shuttle service, 58 of the surveyed would be willing to use the service instead of their own vehicles; the remaining 52 were not willing to do so.

About parking measures, when it comes to paying for that service if it was provided by MSU, only 18 would be willing to pay for it, while 92 disagreed with the option. Furthermore, if compelled to pay for parking, only 24 would continue to pay for it to keep using their cars, while 86 would rather ride the shuttle (68), bike (13) or walk (5) to campus.

When questioned about including local people in a hypothetical bus service provided by MSU, 88 agreed with the idea, 22 didn’t care about it, and nobody was opposed to such a possibility. On the other hand, 16 people were interested in having more bicycle racks, nobody rejected the idea, but 94 didn’t care about the initiative.

5 Survey Conclusions

• People are generally in agreement with greening initiatives. However, they are not willing to voluntarily give up their own comfort levels.

• If given better conditions, people are subject to change their mobility preferences and behavior, but the chances increase when the comfort options are less cost effective.

• If they have to pay for the other choices, the vast majority of the people would opt for sustainable collective transportation.
• Sustainable transportation should be approached with a comprehensive strategy; a combination of policies instead of a single option.
6 General Conclusions

Both the academic community and the local people whose territory is subject to changes due to these academic activities compose a learning community. As a direct response to social equity, community outreach is a substantial component of a comprehensive approach to sustainability. Therefore, it should be taken into account as seriously as the environmental and economic aspects are usually approached. This thesis’ findings indicate that MSU is making little or almost no effort towards improving the quality of life of the Maha Sarakham citizens. Their actual benefits are due to positive externalities and should be contrasted with the potential negative externalities of the university activities and their impacts. Therefore, if existing, these policies have not been fully effective.

Given the magnitude of the student population, their preferences towards the private transportation options, and the resulting heavy traffic patterns, this analysis concludes that MSU’s transportation planning efforts have not improved the transportation dynamics of Khamriang and the surrounding sub-districts. In addition, the fact that the university promotes the usage of such rudimentary and unsafe means of transportation as the Songthaews indicates the poor outcomes of such strategy.

In order to improve the existing conditions and to be considered a really effective “greening” initiative, a comprehensive transportation plan is needed. A successful Sustainable Transportation Program should be the result of a combined strategy to implement on-campus parking restrictions, the creation of a more inclusive, clean-powered and broader scope transportation structure, along with a pedestrian oriented campus policy.
The results of the applied indicators, as well as the outlines, principles and multiple recommendations of the referenced literature, lead to the conclusion that under existing conditions, the MSU Khamriang Campus cannot be considered a Sustainable Campus.
7 General Recommendations

The following recommendations aim to tackle the weaknesses as well as nurture the potentialities identified throughout the development and application of the Sustainability Indicators. These recommendations are not proposed as the only solutions for the identified MSU Sustainability issues, but as a nonbinding checklist of possible strategies to be further developed following a deeper socioeconomic and environmental assessment.

7.1 Campus Layout Recommendations

- Further housing development should be allocated at the four ends of the campus;
- Landscaping design should be reoriented to encourage pedestrian flow and outdoor activities;
- Hard pavements should be increased, as should shaded public spaces;
- Barriers for people with special needs (accessibility for disabled population) should be eradicated;
- Illumination on walkways and at sports facilities should be improved;
- Vehicle circulation across campus should be limited;
- Bicycle racks should be increased, bike paths included, and showers and lockers facilities installed in academic and administrative buildings, and
- New sports facilities in central campus should be built.
7.2 Community Outreach Programs

- A comprehensive community outreach program based on multilateral commitment should be developed;
- A technical career curriculum for people with different interests, aptitudes and skills should be developed;
- A business incubator program should be developed, and
- Incentives for community participation and integration should be created.

7.3 Energy Efficiency Programs

- A comprehensive and cohesive energy efficiency campaign should be designed;
- An energy consumption reduction policy should be created;
- Artificial acclimatization standards should be revised and enforced;
- Alternative energy research should be encouraged, and
- Alternative energy sources should be incorporated.

7.4 Environmental Design of Buildings

- A gradual environmentally oriented redesign of existing buildings should be planned and
- An Environmental Design code for new buildings should be created.
7.5 Environmental Education and Research

- Existing programs should be evaluated and improved and
- A Living Laboratories for Sustainability program should be started.

7.6 Natural Resources Management Programs

- The existing flood control system (for planting to harvesting) should be evaluated and enhanced;
- A water management (harvesting, classification, and recycling) system should be designed;
- A solid waste classification and recycling program should be created, and
- A comprehensive solid waste management campaign should be designed.

7.7 Transportation Systems

- An exhaustive feasibility and socioeconomic assessment should be carried out;
- A unified and extended route of a clean-powered minibus system should be designed;
- Shaded bus stops should be incorporated;
- A TDM strategy should be implemented;
- This system should be articulated with the business incubator program,
• An in-camps transit pattern to limit the private means of transportation should be designed.

7.8 Transportation Program Proposal

Among the several recommendations, the one with the ability to articulate the social, environmental and economic aspects of sustainability is the transportation system. It should be availed as an educational and a social interaction opportunity, as well as a constant research subject as a chapter of the Living laboratories for Sustainability program.

From the Social point of view, it is conceived to provide service for that Learning Community composed of students, faculty, staff and local community members, and based on each other’s commitment and support.

The Environmental approach will be based on implementing a clean energy system to power the vehicles, while at the same time employing it as an environmental education unit that will provide useful information to the riders.

In terms of the Economic perspective, this program should be planned not only to help the overall Learning Community saving money, but also to produce positive externalities within the local community, as it will be part of it through the business incubator program.

7.9 The Operation

This new transportation system should replace both the shuttle bus and the Songthaews services; therefore, it should be a joint venture (public/private)
initiative that articulates the efforts of the university, municipality, and the local community, already organized as a cooperative through the business incubator program.

As stated in the General Recommendations, it is mandatory to carry out a deeper assessment process to determine the number of units that will satisfy this first stage of operations, the specific expected amount of economic resources to be contributed by each partner, as well as the socioeconomic impact of this program. In a second stage, this initiative should also articulate with the other universities present in the Maha Sarakham province.

Based on their participation in the university Community Outreach programs, the community members will have Unlimited Access to this new transportation system.

7.10 The Financing

Based on the aforementioned assessment, the economic resources should be proportionally provided by the different partners. As referenced in the Literature Review, the TDM strategy allocates resources generated by the municipality and the university. In this case, it is imperative that the local community partners not only contribute the workforce as capital, but also a predetermined proportion of their profits, so they feel compelled to make thoughtful use of this system.
A considerable amount of funding is generated from the revenues of the TDM parking restriction and pricing policies, from both parking fees and policy violation fines.

7.11 The Units

As observed in the University of Cincinnati shuttle service, medium capacity units with a higher frequency of service rate is a more effective system than larger capacity units at a lower frequency rate. Also, as a way of replicating and formalizing the existing Songthaew's very practical passenger capacity, we propose a 24 passengers, air conditioned unit.

These units are to be adequately branded and maintained, as well as equipped with audiovisual panels that will provide both route and environmental information to passengers.

As stated in the General Recommendations, these units are to be powered by a clean energy combined source, developed by and subject to continuous investigations through MSU research programs.

7.12 The Route

As a combination of the existing routes described by the MSU shuttle bus and the Songthaews services, the newly designed routes should cover the two MSU campuses, existing and new housing developments, sport facilities, as well as Mueang Mahasarakham and surrounding Sub-Districts.
The frequency is to be determined by the recommended feasibility and socioeconomic assessment.

7.13 Final Considerations

This combined strategy should have as results: a less dense traffic flow in and out of MSU, a substantial reduction of CO2 emissions and noise pollution, a more cohesive campus life, and business opportunities for the community.

The strategy implementation should be assessed and its positive results replicated on a larger scale so it can have a broader impact in Thai transportation culture.
8 References


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Printed.


Keywords: Sustainability; Higher education institutions; Sustainability model