Program Outline

Tuesday 29th November 2016 at the Palm Resort Salaya

17.00 -20.00 Early Bird Reception

Wednesday 30th November 2016 at Salaya Campus RMUTR

08.00 - 09.00 Registration of participants and coffee and sandwich

09.00 - 09.45 Inauguration

- Video presentation "Royal Duties of His Majesty King Bhumibol Adulyadej"
- Mourn for His Majesty King Bhumibol Adulyadej
- Royal Anthem: pay our respects to His Majesty King Bhumibol Adulyadej
- To give a briefing of the conference by
  Assistant Professor Chulalak Paiboonfoongfueng, Vice President for International Affairs of Rajamangala University of Technology Rattanakosin, Thailand
- The Opening Speech by Dr. Pornchai Thiraveja
  Deputy Director General of The Fiscal Policy Office
- To give the Plate for Sponsors
- Group Photo
- Welcome Speech by Assistant Professor Siwa Wasuntarapiwat
  President of Rajamangala University of Technology Rattanakosin
- Welcome Speech by Professor Dr. Aihie Osarenkhoe
  Director of Research, University of Gävle Sweden

09.45 - 10.15 Keynote speaker: Professor Dr. Arne Fagerström, University of Gävle Sweden
Topic *"A new theory Sustainable Enterprise Theory SET"*

10.15 - 10.45 Keynote speaker: Associate Professor Dr. Kitikorn Charmondusit, Vice President for Environment and Sustainable Development, Mahidol University Thailand
Topic *"Sustainability in Thai Higher Education"*

10.45 - 11.00 Coffee break

11.00 - 12.30 Parallel session A Paper presentations *(see separate program)*

12.30 - 13.30 Lunch

13.30 - 15.00 Parallel session B Paper presentations *(see separate program)*

15.00 - 15.30 Coffee break

15.30 - 16.00 Keynote speaker: Assistant Professor Dr. Agneta Sundström, University of Gävle Sweden
Topic *"Corporate Social Responsibility CSR from a Swedish Perspective"*

16.00 – 16.30 Keynote speaker: Professor Dr. Aihie Osarenkhoe, University of Gävle Sweden
Topic *"The Research Platform Sustainable Business Relations at University of Gävle"*

18.00 Dinner at A313 Room, Salaya Campus RMUTR

Thursday 1st December 2016 at Salaya Campus RMUTR

08.00 - 09.00	Morning coffee and sandwich
09.00 - 10.30	Parallel session C Paper presentations *(see separate program)*
10.30 - 11.00	Coffee break
11.00 - 12.00	Keynote speaker: Professor Emeritus Dr. Gary Cunningham, University of Gävle Sweden Topic *"Corporate governance the case of Stora Enso"*
12.00 - 13.30	Lunch
13.30 -14.00	Announce and Reward the "Best Presentation Award for ASEAN Papers"
14.30	Buses to Rajamangala Chom Kluen, Hua Hin
18.00 approx.	On arrival: Dinner at Rajamangala Chom Kluen, Hua Hin

Friday 2nd December 2016 at Rajamangala Chom Kluen, Hua Hin

08.00 - 09.00	Morning coffee and sandwich
09.00 - 09.45	Presentation of University of Gävle Sweden
09.45 - 10.15	Keynote speaker: Professor Dr. Lars Hassel, Gävle and Umeå University Sweden Topic *"Is it a good business to invest in sustainable firms?"*
10.15 - 10.30	Coffee break
10.30 – 11.00	Keynote speaker: Professor Dr. Wanlop Surakampontorn, Rajamangala University of Technology Rattanakosin, Thailand Topic *"Middle Income Trap and the Roles of Technology University"*
11.00 – 12.00	Discussion on Topic *"A Multidisciplinary View on Sustainable Life and Business"* Keynote speakers 1. Professor Dr. Lars Hassel, Gävle and Umeå University Sweden 2. Professor Dr. Arne Fagerström, University of Gävle Sweden 3. Professor Dr. Wanlop Surakampontorn, Rajamangala University of Technology Rattanakosin, Thailand
12.00 - 13.30	Lunch
13.30 - 14.30	Plenum discussion, Concluding remarks and Future cooperation
14.30 - 15.00	Coffee break

Closing of the workshop

15.15	Buses back to Salaya Campus RMUTR

Parallel Session – Paper Presentation

30 November 2016 Session A 11.00 -12.30

(Each paper 15 minutes presentation and 15 minutes Discussion)

30 November 2016 Session A 11.00 -12.30 Room A413		
Chairman: Assistant Professor Dr. Supaporn Pinyochatjinda Rajamangala University of Technology Rattanakosin		
Co-chairman: Ms.Jutamas Wongkantarakorn Rajamangala University of Technology Rattanakosin		
11.00 - 11.30	A1	Allocation Human Resource in Mobile Dental Unit Via Computer Simulation
		Kanon Sujaree
11.30 – 12.00	A2	Isolation and resistance characteristics of cadmium-resistant microbial consortia in polluted agricultural area, Mae Tao District, Tak Province
		Ladda Seang-On
12.00 - 12.30	A3	The Production of Photobook: The Culture of Phatthalung
		Akera Ratchavieng

30 November 2016 Session A 11.00 -12.30 Room A414		
Chairman: Associate Professor Dr. Mikael Björling, University of Gavle		
Co-chairman: Assistant Professor Dr. Korbkul Jantarakolika Rajamangala University of Technology Rattanakosin		
11.00 - 11.30	A4	Network Perspective on Establishment Process in Transition Economies
		Aihie Osarenkhoe, Daniella Fjellström
11.30 – 12.00	A5	SELF-FINANCIAL EXCLUSION FOR BORDER TRADE OF THAI-MALAYSIA
		Chamnan Ngerndee
12.00 - 12.30	A6	Accounting for sustainability Indicators SIA
		Arne Fagerström, Fredrick Hartwig, Gary Cunningham

30 November 2016 Session A 11.00 -12.30 Room A417		
Chairman: Assistant Professor Dr. Agneta Sundstörm ,University of Gavle		
Co-chairman: Dr. Ekasit Nugoolcharoenlap Rajamangala University of Technology Rattanakosin		
11.00 - 11.30	A7	The possibility of using wood-plastic composites for a traditional Thai house
		Krichkanok Sudasna
11.30 – 12.00	A8	Mathematics Education Program Among the State Universities And Colleges in Ilocos Sur
		Tirso Paje Tactay
12.00-12.30	A9	Board effectiveness, audit quality and financial reporting quality of listed companies in Stocks Exchange of Thailand during Seasoned Equity Offerings
		Malai Kamolsakulchai

30 November 2016 Session B 13.30 -15.00

(Each paper 15 minutes presentation and 15 minutes Discussion)

30 November 2016 Session B 13.30 -15.00 Room A413		
Chairman: Assistant Professor Dr.Daniella Fjellström , University of Gavle		
Co-chairman: Assistant Professor Zahra Ahmadi, University of Gavle		
13.30 - 14.00	B1	The Use of The Level of Traffic Stress Method to Develop Chainat Bicycle Friendly City
		Terdpong Boonpan
14.00 – 14.30	B2	Decision to Choose In-House or Outsource Delivery Services
		Napolpong Sorsomboon
14.30 - 15.00	B3	EMPLOYEE ENGAGEMENT OF COMMERCIAL BANKS IN THE LOWER NORTHERN PART OF THAILAND
		Picha Wisitpanit

30 November 2016 Session B 13.30 -15.00 Room A414		
Chairman: Assistant Professor Dr. Shwn Meei Lee , Hsiuping University of Science and Technology		
Co-chairman: Assistant Professor Dr. Supaporn Pinyochatjinda, Rajamangala University of Technology Rattanakosin		
13.30 - 14.00	B4	Sustainable Science Policy – In Whom Shall We Trust?
		Mikael Björling
14.00 – 14.30	B5	Accounting Ethics, Whistleblowing, and Corporate Governance at Stora Enso – Case Study
		Gary Cunningham
14.30 - 15.00	B6	Reducing agency problem using signaling approach on dividend policy
		Dararat Sukkaew

30 November 2016 Session B 13.30 -15.00 Room A417		
Chairman: Assistant Professor Dr. Korbkul Jantarakolika Rajamangala University of Technology Rattanakosin		
Co-chairman: Ms. Jutamas Wongkantarakorn Rajamangala University of Technology Rattanakosin		
13.30 - 14.00	B7	Systematic CSR implementation in the global supply chain – challenges and implications
		Agneta Sundström
14.00 – 14.30	B8	Earnings Management: Opportunistic or Beneficial in Thailand under International Financial Reporting Standards (IFRSs)
		Wasukarn Ngamchom
14.30 - 15.00	B9	Factors affecting the development of organization sustainability leaders: A case study of visual impairment in the community
		Narit Kerdvimaluang

1 December 2016 Session C 9.00 -10.30

(Each paper 15 minutes presentation and 15 minutes Discussion)

1 December 2016 Session C 9.00 -10.30 Room A413		
Chairman: Assistant Professor Dr. Shwn Meei Lee Hsiuping University of Science and Technology		
Co-chairman: Assistant Professor Dr. Supaporn Pinyochatjinda Rajamangala University of Technology Rattanakosin		
9.00 - 9.30	C1	Knowledge Management Model on Local Wisdom for Community-based Tourism Development in Prachuabkirikhan province, Thailand
		Danai Winairat
9.30 – 10.00	C2	Network Participation Model of Ecotourism Management Based on Sufficiency Economic in Pranburi River Basin, Thailand
		Nipharat Saiprasert
10.00 - 10.30	C3	Retro Market and Nostalgia Tourism in Thailand In the Central of Thailand
		Chakkiat Methanai

1 December 2016 Session C 9.00 -10.30 Room A414		
Chairman: Professor Dr. Arne Fagerstörm, University of Gavle		
Co-chairman: Professor Emeritus Dr. Gary Cunningham, University of Gavle		
9.00 - 9.30	C4	ESG Engagements by Nordic Institutional Investors – Drivers and Outcomes
		Lars G. Hassel
9.30 – 10.00	C5	Business Practices of the Vendors at Vigan Public Market
		Generoso Gudelio G. Pajarillo
10.00 - 10.30	C6	Strategies in declining housing markets: A comparison of public and private housing companies
		Zahra Ahmadi

1 December 2016 Session C 9.00 -10.30 Room A417		
Chairman: Assistant Professor Dr. Korbkul Jantarakolika Rajamangala University of Technology Rattanakosin		
Co-chairman: Ms. Jutamas Wongkantarakorn Rajamangala University of Technology Rattanakosin		
9.00 - 9.30	C7	LEADERSHIP AFFECTING THE OPERATIONS OF BANK IN THE FIRST NORTHERN REGION
		Pattarraporn Rinsri
9.30 – 10.00	C8	Devil in Disguise? Corporate Social Responsibility as Ideology Production
		Lars Ekstrand and Monika Wallmon
10.00 - 10.30	C9	Factors influence the decision to purchase cosmetics via Video online of working woman In Bangkok Metropolis
		Tarnthip Kanarbsak

THE USE OF THE LEVEL OF TRAFFIC STRESS METHOD TO DEVELOP CHAINAT BICYCLE FRIENDLY CITY

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ABSTRACT

The level of Traffic Stress (LTS) is the method to measure the low stress connectivity and classifies streets and intersections from LTS 1 (suitable for children) through LTS 4 (suitable for riders who can share roads with other automobiles traveling at 35 mph or more, comfortably) where low-stress street rates are at LTS 1 or 2. The study aimed at experiment LTS method to develop the bicycle-friendly city in Thailand. After review, the literature of LTS method and Chainat city, the alternative guideline of increasing the rate of LTS for being more bicycle-friendly cities was approved by the public hearing. Then the questionnaire survey was prepared to ensure more samples within five participant groups. The findings indicated, especially the opinion of the bicycle users and representatives from government agencies, agree this bicycle friendly city development base on LTS method is efficient in the high level. If this development is suitable for the physical description of Chinat city, the city planner can adapt this development to other cities in Thailand to encourage people to use bicycles for everyday life.

Keywords: Bicycle-friendly city; The level of traffic stress (LTS); Public Participation

INTRODUCTION

Many cities in Thailand today are facing many issues such as traffic congestion, fuel price, and environmental problems, all of which are related to the use of personal vehicles powered by engines. A bicycle is a vehicle that does not create pollution yet alleviates traffic problems, saving both time and fuel costs. These reasons make bicycles a good choice for a sustainable city. Cycling is suitable for both short and long distance traveling. Furthermore, it is in accordance with national policies in the field of energy conservation and reduces pollution in urban environments,

The most sustainable management of the city is to promote cycling in everyday life, focusing on transportation purpose more than leisure purpose. To develop the cycling as everyday life transportation needs a serious improvement on the routes and infrastructure to be more safe and convenient. However, the use of bicycles has raised key questions on both safety and convenience; hence, it is not easy for cyclists to pedal their bicycles in many places, one of which is Chainat town. Though the campaigns of the sustainable city to encourage the people to use the bike have been launched since 2015, the people have not been using the bicycle as much as it should.

Chainat the city of bicycle

Chainat town, located on the east bank of the Chao Phraya River, features a diversity of natural, historical, and cultural attractions. The physical characteristics of Chainat are very suitable for cycling because the entire city is not too big the radius of the city is not more than 2 km. conforming to the compact city theory. However, most people choose engine-powered vehicles as their main transportation, causing a traffic problem.

The encouragement the use of the bicycle in Chainat began with creating the bike route and setup the bike symbol on that route. Furthermore, there was discussion to make the strategic plan and the process to motivate this mission because this is to change the behavior or the people and community. That is reaching to "Chainat bicycle friendly master plan" for serving the possibility of the cyclist in Chainat referring to Bike for Mom event in 16th September 2015. There were 7,412 cyclists participating the event and 8,761cyclist registering to join. So this mass can be convinced to use the bike in everyday life and the existing 2,362 cyclists joined in any bike clubs in Chainat.

Chainat town transportation situation

Road

The observation to the road and footpath use in the Chainat town founded that sometimes there are cars driving in opposite direction but there is no traffic but also there is no strict traffic control. the most important problem is there are a lot of cars driving and parking along the road during in and out rush hour especially on **Prom Prasert Road** from Chainat Elementary School to Paseesong Market and **Kong Thum Road**.

Footpath and crosswalk

The shophouses owner putting their belonging on a footpath causes to be the obstacle for the pedestrian using a footpath. And the number of the crosswalk is not enough for the requirement of the user in somewhere such as schools, markets, government offices, ETC.

Intersection

The number of traffic light is no enough comparing to the number of dense intersection. The traffic police officer comes to control the instead of the traffic light system. So in the common time the transportation is not safe and convenient enough.

The improvement of safety, convenience to the road and Bike facilities can encourage the people to use the bicycle within the city. The development this province to be bicycle-friendly city need to prepare a good plan and methodology.

Level of traffic Stress for Bicycling and Network Connectivity

The level of Traffic Stress (LTS) methodology has been used in many cities; for example, Fort Collins and Mineta of USA, to improve their cities to be bicycle-friendly. They used this methodology to measure the low-stress connectivity, defined as the ability of a network to connect the origins and destinations of cyclists without subjecting them to unacceptably stressful links. The safety and convenience of the

route are the majority to mention for this methodology to measure and categorize the route for the analysis and planning of bicycling development.

Roger Geller, the bicycle friendly City of Portland development, classified the population by tolerance for traffic stress founded that the most of the population using the road have the tolerance for traffic stress in low level.

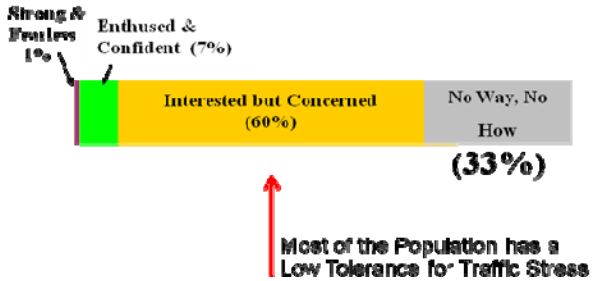


Figure 1.01 Classified population by tolerance for traffic stress

(Source : http://transweb.sjsu.edu/PDFs/research/1005-low-stress-bicycling-network-connectivity.pdf, 2016.)

This method classifies streets and intersections from LTS 1; suitable for children through LTS 4; suitable for riders who can share roads with other automobiles traveling at 35 mph or more, comfortably where **low-stress street rates are at LTS 1 or 2**.

Table 1.01 the meaning of each LTS levels

LTS 1	Presenting little traffic stress and demanding little attention from cyclists, and attractive for a relaxing bike ride. Suitable for almost all cyclists, including children trained to safely cross intersections, On road sections, cyclists are either physically separated from traffic or are in an exclusive bicycling zone next to a slow traffic stream with no more than one lane per direction, or are in mixed traffic with a low speed differential and demanding only occasional interactional with motor vehicles. Next to a parking lane, cyclists have ample operating space outside the zone into which car doors are opened. Intersections are easy to approach and cross.
LTS 2	Presenting little traffic stress but demanding more attention than might be expected from children. On road sections, cyclists are either physically separated from traffic or are in an exclusive bicycling zone next to a well-confined traffic stream with adequate clearance from a parking lane, or are on a shared road where they interact with only occasional motor vehicles with a low speed differential. Where a bike lane lies between a through lane and a right-turn lane, it is configured to give cyclists unambiguous priority where cars cross the bike lane and to keep car speed in the right-turn lane comparable to bicycling speeds. Crossings are not difficult for most adults.
LTS 3	Offering cyclists an exclusive cycling zone (e.g., bike lane) requiring little negotiation with motor traffic, but in close proximity to moderately high speed traffic; or mixed traffic requiring regular negotiation with traffic with a low speed differential. Crossings may be stressful, but are still considered acceptably safe to most adult pedestrians.
LTS 4	Requiring riding in close proximity to high speed traffic, or regularly negotiating with moderately high speed traffic, or making dangerous crossings.

(Source : http://transweb.sjsu.edu/PDFs/research/1005-low-stress-bicycling-network-connectivity.pdf, 2016.)

Criteria for Level of Traffic Stress and Data Needs to Support the Analysis

This section is all of the criteria for any routes at which need to be measured the level of traffic stress.

Criteria for Segment

Table 1.02 Segment Type

Segment Type	Level of Traffic Stress
Stand-alone paths	LTS = 1
Segregated paths (sidepaths, cycle tracks)	LTS = 1
Bike lanes	LTS can vary from 1 to 4
Mixed traffic	LTS can vary from 1 to 4

Criteria for Bike Lanes

Bike lanes are space on the roadway designated by markings for exclusive use by bicycles, unallowable for a motor vehicle to access. There are criteria along four dimensions:

Street width (i.e., number of lanes),
Bicycle operating space,
Speed limit or prevailing speed, and
Bike lane blockage

Criterias are for 2 kinds of location of bike lane; bike lanes alongside parking lanes and bike lanes not alongside a parking lane.

- **Bike Lanes Alongside a Parking Lane**

Table 1.03 Bike Lanes Alongside a Parking Lane

	LTS ≥ 1	LTS ≥ 2	LTS ≥ 3	LTS ≥ 4
Street width (thru lanes per direction)	1	(n.a.)	2 or more	(n.a.)
Sum of bike lane and parking lane width	4.5 m or more	4.2 or 4.35 m[a]	4.05 m or less	(n.a.)
Speed limit or prevailing speed	40 kmph or less	50 kmph	55 kmph	65 kmph or more
Bike lane blockage	rare	(n.a.)	frequent	(n.a.)

n.a. = no effect

- **Bike Lanes not Alongside a Parking Lane**

Table 1.04 Bike Lanes Not Alongside a Parking Lane

	LTS ≥ 1	LTS ≥ 2	LTS ≥ 3	LTS ≥ 4
Street width (thru lanes per direction)	1	2, if directions are separated by a raised median	more than 2, or 2 without a separating median	(n.a.)
Bike lane width	1.8 m or more	1.65 m or less	(n.a.)	(n.a.)
Speed limit or prevailing speed	50 kmph or less	(n.a.)	55 kmph	65 kmph or more
Bike lane blockage	rare	(n.a.)	frequent	(n.a.)

Mixed Traffic

Cyclists can share the road with motor traffic. This level of stress when riding in mixed traffic depends on the prevailing traffic speed and street width (number of lanes.)

Table 1.05 Mixed Traffic

Speed Limit	**Street Width**		
	2-3 lanes	4-5 lanes	6+ lanes
Up to 40 kmph	LTS 1 [a] or 2 [a]	LTS 3	LTS 4
50 kmph	LTS 2 [a] or 3 [a]	LTS 4	LTS 4
55+ kmph	LTS 4	LTS 4	LTS 4
	Use lower value for streets without marked centerlines or classified as residential and with fewer than 3 lanes; use higher value otherwise.		

Detour Criterion

- Low-stress route should not be more than 25% longer than the shortest route
- Short trips is not 0.55 km longer than the shortest route

All of these criteria are used to analysis the level of safety and convenience in Chainat town.

Study Aims

So this study is figuring out whether the level of Traffic Stress (LTS) methodology measuring the low stress connectivity is suitable for Chainat town to develop the bicycle-friendly city. So the streets in 15 communities of the east of Chao Praya river in Muang Chainat municipality is the focused area.

MATERIAL AND METHODS

1. **Collecting Information:** The study began with researching for information on the level of traffic stress (LTS) and information related to bicycle-friendly cities. Then, site surveying was coming for getting **primary onsite information** of the use of bicycles in everyday life in Muang Chainat municipality area.
2. **Analysis:** Level of Traffic Stress (LTS) methodology was used to analysis the Chainat town to know it safety and convenience situation.
3. **Illustration:** The pilot routes had been selected. Then, that (those) route need to be improved the existing infrastructure to increase the level Traffic Stress (LTS) for more safety and convenience.
4. **Testing:** The satisfaction of participants to the development based of LTS methodology can ensure the workable of this methodology, the questionnaire survey was ready to check the agreement and opinion of the people whether this methodology is work to use in Thailand context especially in Chainat town.

Sampling and Data Collection

The questionnaire paper was handed to 331 people from 5 groups relating to bicycle use development. They are

1) The bicycle users
2) Stakeholders, including those who live in the bike path. Shop owners, etc.
3) Students and teachers or some representatives from the school
4) Professionals
5) Representatives from government agencies, such as the provincial administration or the municipal office, department of public works and town and country planning and police officer

Instrument selection

The five-point, reverse-coded scale indicates the extent to which respondents agreed or disagreed with statements about levels of satisfaction. Coded survey used the number 5 to indicate a value for the term "completely agree," 4 for "strongly agree," 3 for "agree," 2 for "disagree," and 1 for "strongly disagree." High scores represent a high level of satisfaction. Score transformation: This study used a symmetric distribution 5 points Likert scale as a tool to determine levels of satisfaction. So that Inter-Quartile Range and Semi Inter-Quartile Range was used to setting the range for date transformation

Mean Score	Level of Satisfaction
1.00 – 1.50	Very Low
1.51 – 2.50	Low
2.51 – 3.50	Moderate
3.51 – 4.50	High
4.51 – 5.00	Very High

Data analysis procedures

Results from the survey were imported into the Statistical Package for Social Sciences (SPSS) software and coded for analysis.

Mean and standard deviation were used to determine the level of bicycle friendly city development based on LTS methodology satisfaction of the people relating to bicycle use development in Chinat town.

RESULTS

The use of Level of traffic Stress

The analysis of the safety and convenience bicycle route is based on the Low Traffic Stress (LTS) methodology to measure the level of friendliness for bicycle use. The appropriate bicycle route should be safe for the user in low street stress level and not farther than 25% or 0.55 km. of the shortest existing route. The graphic shows the level of traffic stress of all routes in Chinat town.

Figure 1.02 Level of traffic Stress in Chainat Town

The result of the LTS analysis can show the appropriate routes. Then all of them need to be classified by the frequency of trips to be 4 levels.

1. More than 100 trips
2. 50-100 trips
3. 30-49 trips
4. Less than 30 trips

Frequency of the trips can be use to select the route for develop the bicycle routes for more safe and convenient. In this case the route having the Frequency of uses more than 30 trip are chosen to consider. There are 5 routes can be mention.

1. **Wong to road** has distance 0.68 km
2. **Prom Prasert Road reaching to Chinat Pre-Elementary School** has distance 1.38 km.
3. **Look Sia 2 road** has distance 1.26 km.
4. **Paholyotin road** has distance 2.71 km.
5. **Prom Prasert Road reaching to Pasisong Market** has distance 0.60 km.

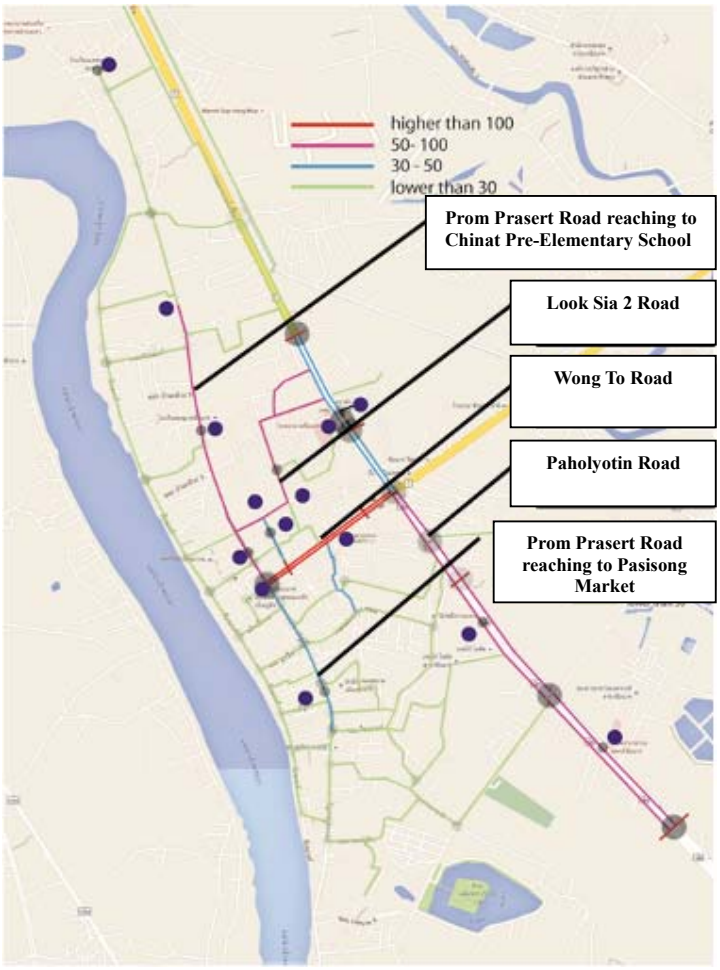


Figure 1.03 5 possible routes

Selecting the bicycle pilot route

The first public hearing was established on 26 December 2015 at Chainat town to by which the participants and contributor can share the information, understanding, and opinion to this development. The participant was from many sectors of Chainat town i.e. bicycle users, representative of Chainat bike club, Province Chamber of Commerce Chainat, representative of government offices, ETC.

Table 1.06 Possibility of each road

Routes	Possibility			Remarked
	Low	Fair	High	
1. Wong to road	/			Footpaths on this street are hard to be allowed to use for the bicycle because of the shops along this road who trespass for their belonging.
2. Prom Prasert Road reaching to Chinat Pre-Elementary School			/	This road and footpath are wide. But there is food card selling on there.
3. Look Sia 2 road		/		There is many cars and public vans parking here all day long and there is food card selling on there.
4. Paholyotin road	/			This road is not in the authority of local administration office so it is not easy to get cooperation.
5. Prom Prasert Road reaching to Pasisong Market			/	This road and footpath are wide. But there is the shops along this road who trespass for their belonging.

So there are 2 routes in high potential for being the bicycle pilot routes. They are **Prom Prasert Road reaching to Chinat Pre-Elementary School and reaching to Pasisong Market**

The pilot routes had been selected. There are many descriptions and problem needed to get agreement for the participants. So, the public hearing was needed to help. The second public hearing was on 23 June 2016 at Mueang Chainat municipality office. The 118 participants were in this public hearing.

The result of the 2nd public hearing is shown by the table.

Table 1.07 The way to solve the problem

The way to solve the problem		
Prom Prasert Road	**Road surface**	**Footpath**
Provincial Waterworks Authority office phase	The driving and parking cars need to be managed especially in front of Chai-Nat Pre-elementary School during the rush hour.	The Painted bicycle pavement on the footpath is wide at lease 2 meters for sharing between bicycle and pedestrian use conveniently and safely. In addition, the obstructions on the footpath need to be managed such as food cards and public telephone booth. It can increase

		safety and convenience for bicycle users and pedestrians. Moreover, the bicycle parking shelter and separate trash category can be prepared for the better use of bicycle and pedestrians.
Pasisong Market phase	The driving and parking cars need to be managed especially in front of the shophouses not to park for long time. The trucks transporting goods can park only the available area which is easy for deliver the goods to shops and not to disturb the other users on road.	The pavements need to be expanded to be not less than 2 meters or up to 1.5 meters in the narrowest footpath. More than that, the obstructions on the footpath need to be managed such as food cards and public telephone booth. It can increase safety and convenience for bicycle users and pedestrians

The agreed bicycle pilot route description: Prom Prasert Road starting from **Provincial Waterworks Authority office** to **Pasisong Market** distance 1.80 km

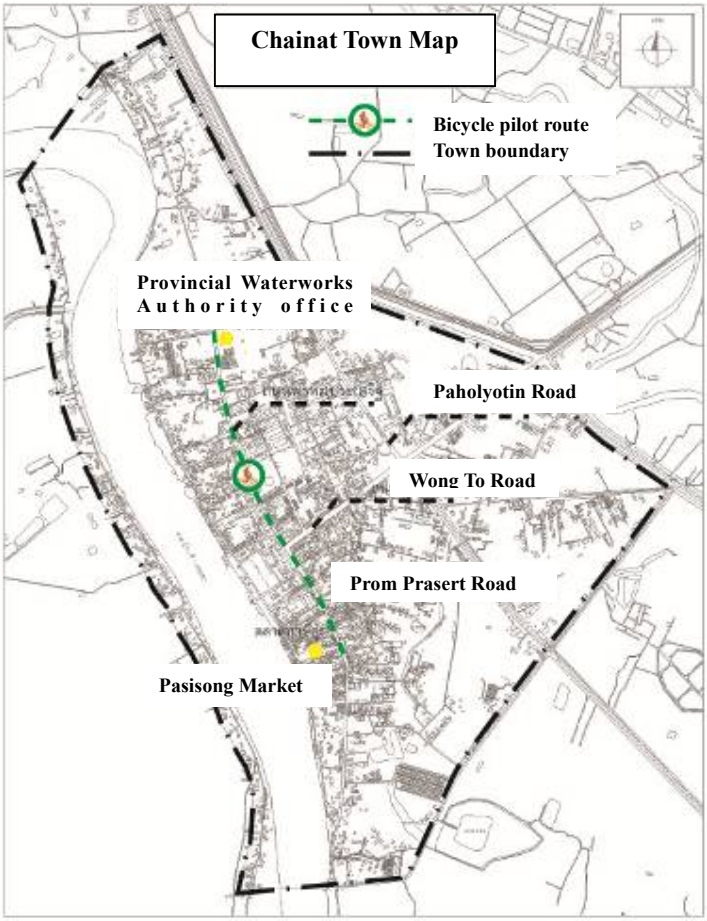


Figure 1.04 Bicycle pilot route description: Prom Prasert Road map

Recent Scenery

Provincial Waterworks Authority office

Police housing to Pasisong market

Chainat pre-elementary school

Tops Charean optical shop

Government officers housing

Accessibility from main road

Figure 1.05 Recent scenery of Prom Prasert Road

Pathway improvement

This improvement following the LTS methodology concerned how to gain more safe and convenient in 2 type of bicycling. Those are **ridding direct way of bicycling** and **Turning and crossing the junction of bicycling.**

1.1. Ridding direct way of bicycling

- The existing footbath area can divide to be shared path, between bicycle and pedestrian, for 2 m. wide.
- The obstructions on the footpath need to be managed such as electricity post, signage and public telephone booth.
- Boundary line and bicycle symbol are prepare for shared path.
- The footpath's edge need to reconstruct to be ramp for bicycling and wheelchair using.
- Shared path signage is set
- Include the landscape design

Figure 1.06 Bicycle pilot route development

Section

Unsharpened edge
Plant box

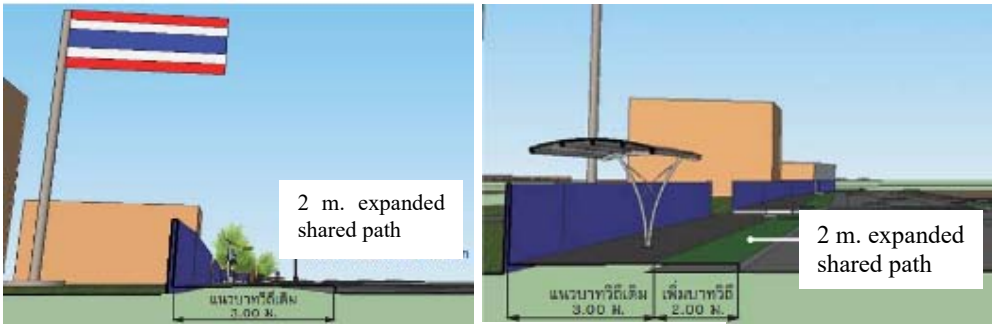
Boundary line and bicycle symbol
are prepare for shared path

Figure 1.06 Bicycle pilot route development Section

Figure 1.07 The obstructions on the footpath need to be managed

- The existing footpath can expand for 2 m. by the same material for more convenient use.

Figure 1.08 Expanded footpath



Existing footpath 3 m.

Existing footpath 3 m.

Figure 1.09 Expanded footpath section

- The landscape design

Figure 1.10 The landscape design

- The existing footbath area is too narrow to make a shared path so it needs to be expanded to be 2 m. wide shared path, between bicycle and pedestrian.

1.7 m. Existing footpath

Expanded existing footpath to be 2 m. shared path

1.4 m. Existing footpath

Expanded existing
footpath to be 1.5 m. shared path

Figure 1.11 Expanded existing footpath to be 2 m. shared path

1.2. Turning and crossing the junction of bicycling

- **The intersection of main road and soi**

Approaching: Road surface need to be lifted same as footpath level and connect by a ramp. It decreases the speed of car before drive through a Soi.

Inside a Soi: Soi surface needs to be clarify not to be crack or broken and paint the bicycle symbol on it. A manhole cover is in the same level of Soi surface. And The Shared way between cars and bicycle is set.

Figure 1.12 The intersection of main road and soi

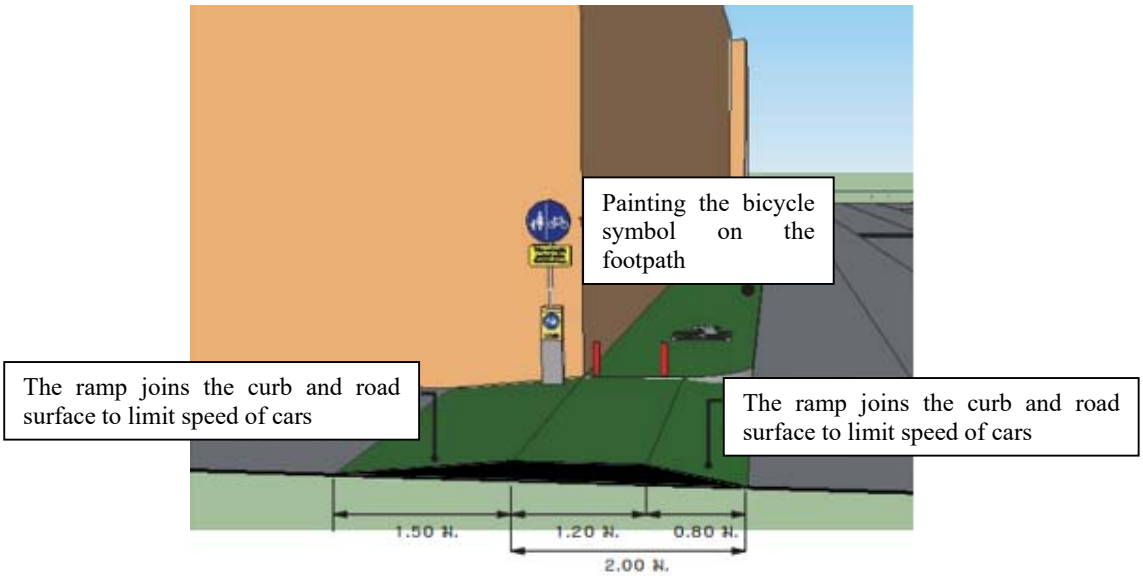


Figure 1.13 Section of Soi approaching

- **Crosswalk for bicycle users and pedestrians**

The proper crosswalk makes the bicycle users and pedestrians can get more safety and convenience of their trip when there are ridding across any intersections.

Figure 1.14 Crosswalk at Pasisong market

Figure 1.15 Crosswalk at Wong To juction (cont.)

Comparing the Level of Traffic Stress (LTS) of before and after development

If the bicycle pilot route will have been constructed and been ready to use. It will change the level of LTS from level 3 to be level 2 and more safe and convenient for the bicycle use and pedestrians using this route. And it can encourage others people to use a bicycle for everyday life within this compact city.

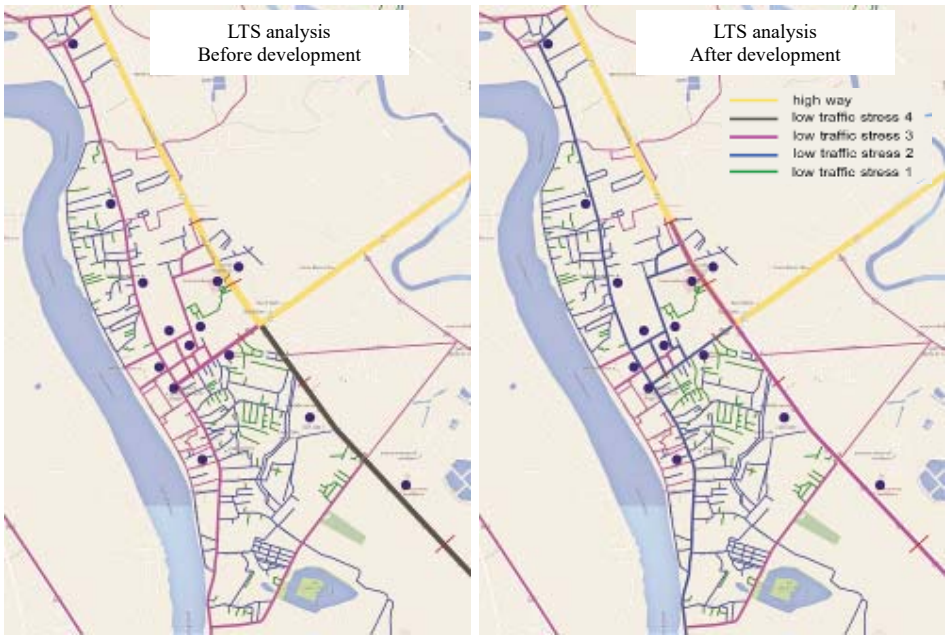


Figure 1.16 The comparison between before and after development

To ensure the workable of this methodology, the questionnaire survey was ready to check the agreement and opinion of the people whether this methodology is work to use in Thailand context especially in ChainaChainat town.

The satisfaction of the bicycle friendly development

The questionnaire will be used to determine the degree of bicycle friendly city development based on LTS methodology satisfaction of the people living in Chainat town. The questionnaire paper was handed to **331 people** from 5 groups relating to bicycle use development. They are

1) The bicycle users
2) Stakeholders, including those who live in the bike path. Shop owners, etc.
3) Students and teachers or some representatives from the school
4) Professionals
5) Representatives from government agencies, such as the provincial administration or the municipal office, department of public works and town and country planning and police officer

Each respondent answered the **opinion of developing the bicycle route** separated to be 3 section of question set. Those are

Section 1: To solved problem that occurs to bicycle user
Section 2: Suitability
Section 3: The Utilization

All of the question in this section was to determine levels of bicycle friendly city development based on LTS methodology satisfaction of the people living in Chainat town.

Respondents identification

A total of 331 respondents were in this study. All of them indentified themselves to each group representatives as shown in the table.

Table 1.08 number of repondent by group representative

group representative	Frequency	Percent
1) The bicycle users	105	31.7
2) Stakeholders, including those who live in the bike path. Shop owners, etc.	90	27.2
3) Students and teachers or some representatives from the school	77	23.3
4) Professionals	15	4.5
5) Representatives from government agencies	44	13.3
Total	331	100.0

The most of respondents (105) identified themselves as **the bicycle user** following by **Stakeholders** (90), **Students and teachers** (77), Representatives from government agencies (44). The least group was 15 people identifying themselves to be Professionals.

The levels of bicycle friendly city development based on LTS methodology satisfaction of the people living in Chainat town

The overall mean score of 3.7456 for the bicycle friendly city development based on LTS methodology satisfaction seemed to indicate that overall, all group representative was **highly satisfied** with this development based on LTS methodology.

Table 1.09 Overall satisfaction

	N	Minimum	Maximum	Mean	Std. Deviation
Satisfaction	331	3.7039	3.7801	3.7456	.81815

The result of averaged a satisfaction level depending on group representative descending shown Representatives from government (3.9208), the bicycle users (3.8875), Professionals (3.7401), Students and teachers or some representatives from the school (3.6222), and Stakeholders (3.6008).

Table 1.10 Satisfaction by each group representative

Group representative	N	Minimum	Maximum	Mean	Std. Deviation
1) The bicycle users	105	3.8714	3.9067	3.8875	.83285
2) Stakeholders, including those who live in the bike path. Shop owners, etc.	90	3.5759	3.6286	3.6008	.85620
3) Students and teachers or some representatives from the school	77	3.4870	3.7247	3.6222	.70412
4) Professionals	15	3.6381	3.8267	3.7401	.77486
5) Representatives from government agencies	44	3.9026	3.9318	3.9208	.84765

The result of averaged a satisfaction level depending on each sections of question descending shown Section 3: The Utilization (3.7801), Section 1: To solve problem that occur to bicycle user (3.7527), and Section 2: Suitability (3.7039).

Table 1.11 Satisfaction by each sections

	N	Minimum	Maximum	Mean	Std. Deviation
Section 1: To solve problem that occur to bicycle user	331	3.6888	3.8157	3.7527	.88892
Section 2: Suitability	331	3.6616	3.8278	3.7039	.85347
Section 3: The Utilization	331	3.7372	3.8308	3.7801	.87744

CONCLUSION

The changing of the level of traffic stress after the bicycle pilot route will have been constructed and been ready to use implied the bicycle user and pedestrians can use the route more safe and convenient for. And it can encourage others people to use a bicycle for everyday life within this compact city. Although this is the first time to apply this LTS methodology to use in Thailand context, it works well as shown in the satisfaction of the bicycle friendly development survey.

The satisfaction of the bicycle friendly development survey is from **331 people** from 5 groups relating to bicycle use development. They are

1) The bicycle users
2) Stakeholders, including those who live in the bike path. Shop owners, etc.
3) Students and teachers or some representatives from the school
4) Professionals
5) Representatives from government agencies, such as the provincial administration or the municipal office, department of public works and town and country planning and police officer

All group representative was **highly satisfied** the bicycle friendly city development based on LTS methodology, especially Representatives from government and the bicycle users. They highly agreed that, firstly, this development based on LTS methodology can **solve a problem that occurs to bicycle user** by **increasing the safety and convenience** of the use of a bicycle to go straight and to cross the junction and also reducing the stress of accidents because of the speed of cars and motorcycles.

Secondary, this development based on LTS methodology is **suitable to use in Chainat town** because of a physical description of Chinat town, Chinat people lifestyle, Chinat's bicycle users. It encourages the people, themselves and one in their families, to use a bicycle instead of cars or motorcycles. And it can make Chinat municipality become bicycle friendly town

Finally, this LTS methodology can be applied to use other cities. Because it supports the use of bicycle in everydaylife safely and convenient also in Chainat town and other cities in Thailand.

REFERENCE

- Creighton, James L., 1992, Involving Citizens in Community Decision-Making, 2nd ed. Washington, D.C. National Civic League.
- Information and communication department, chainat general information, education, 2013, provincial office
- J. Pucher , and R. Buehler . 2008. Cycling for Everyone: Lessons from Europe. Transportation Research Record 2074:58–65.
- Likert, Rensis A. (1961). New Patterns of Management. New York: McGraw-Hill Book Company Inc.
- Maaza C. Mekuria, Ph.D., Levels of Traffic Stress, Low-Stress Bicycling and Network Connectivity, MTI Report 11-19, 2012.
- Peter G. Furth, Network Connectivity for Low-Stress, TRB Annual Meeting Compendium of Papers, 2013
- Provincial strategy for development, Chainat provincial office, The draft bicycle city master plan
- R. Ewing , and R. Cervero . 2001. Travel and the Built Environment: A Synthesis. Transportation Research Record 1780:87–114.
- Bikes Belong, 2012, http://svbcoalition.org [Online], Available: http://svbcoalition.org/bike-education/why-bicycling-is-important/ [9 MARCH 2015].
- Chainat Provincial Federation of Industry. Chainat, Geography. [Online], Available: http://www.ftiprovince.or.th/province/province.aspx?id=10. [9 JANUALY 2016]
- Chainat the treasury department office. Socioeconomic. Chainat General Information. [Online], Available: http://www.treasury.go.th/pv_chainat/ewt_news.php?nid=673&filename=Chainat. [30 JUNE 2015]
- Chainat, Thailand Travelling [Online], Available: http://www.painaidii.com/city/ชัยนาท/lang/th/ [9 JANUALY 2016]
- Government information, Chainat General Information. [Online], Available: https://bie.moph.go.th/bie/region3/contents/download/69. [30 JUNE 2015]
- Mineta Transportation Institute [Online], Available: http://transweb.sjsu.edu/project/1005.html. [9 JANUALY 2016]
- Pimchanok, 2014, thaihealth [Online], Available: http://www.thaihealth.or.th/Content/26386-สสส.%20ชวนคนไทยใช้จักรยานเพิ่ม.html [15 MARCH 2015].
- Tourism Authority of Thailand [Online], Available: http://www.tourismthailand.org/About-Thailand/Destination/Chainat [9 JANUALY 2016]
- Web Site Administrator, 2003-2015, About-Bicycles.com [Online], Available: http://www.about-bicycles.com/Bike-Articles/common-bike-types.html#.VRU87_ysWE4 [9 March 2015]
- Wikipedia [Online], Available: http://en.wikipedia.org/wiki/Bicycle-friendly [10 March 2015].
- Wikipedia [Online], Available: http://en.wikipedia.org/wiki/Bicycle_transportation_engineering#Parking [9 MARCH 2015]
- Wikivoyage [Online], Available: https://en.wikivoyage.org/wiki/Chai_Nat.[30 JUNE 2015]