

Evaluation of Road Pricing in Udon Thani

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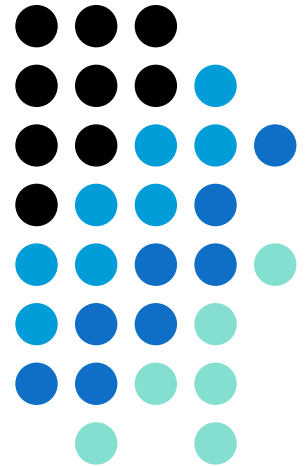
Dr. Tuenjai Fukuda

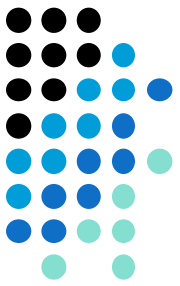
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1. Introduction

- In Thailand, an increasing of the traffic volume is remarkable with rapid economic growth in recent years, and the increase of CO₂ emission from transport sector becomes a problem even in a local city.
- The purpose of this paper is to evaluate the present traffic situation of Udon Thani City and the effect of Road-Pricing scheme (Inflow regulation to the inner city) in the peak of the morning (8:00a.m.–9:00a.m.) in the center of Udon Thani City.
- We calculated the regulating situation by traffic demand analysis software namely “JICA STRADA”.

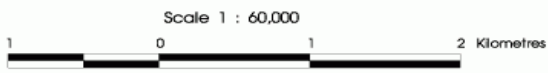
2. Road Network



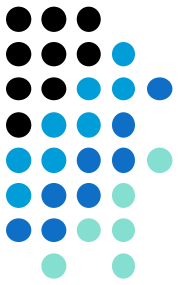
แผนที่ตัวเมืองอุดรธานี UDON THANI CITY MAP

สัญลักษณ์ Legend

- | | | |
|--|-----------------|-------------------------------|
| | ศาลากลางจังหวัด | City Hall |
| | ไปรษณีย์ | Post Office |
| | โรงเรียน | School |
| | สนามบิน | Airport |
| | สถานีขนส่ง | Bus Terminal |
| | สถานีรถไฟ | Railway Station |
| | สำนักงาน ททท. | Tourism Authority of Thailand |
| | ทางหลวง | Highway |
| | แหล่งน้ำ | Stream, Water |
| | ทางรถไฟ | Railway |



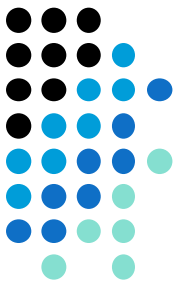
What is “JICA STRADA”?



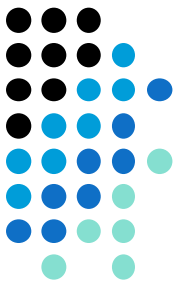
- JICA STRADA is software of traffic demand analysis.
- JICA STRADA based on 4 step model.

3. Analysis of traffic situation

3.1. Methodology



1. Analyze existing traffic condition with JICA STRADA.
2. Develop Origin-Destination (OD) table and set up parameters.
3. The amount of CO₂ emissions are calculated to three cases [(1) without road pricing, (2) with road pricing, (3) with road pricing and improve road pricing].
4. Evaluate effectiveness of road pricing.

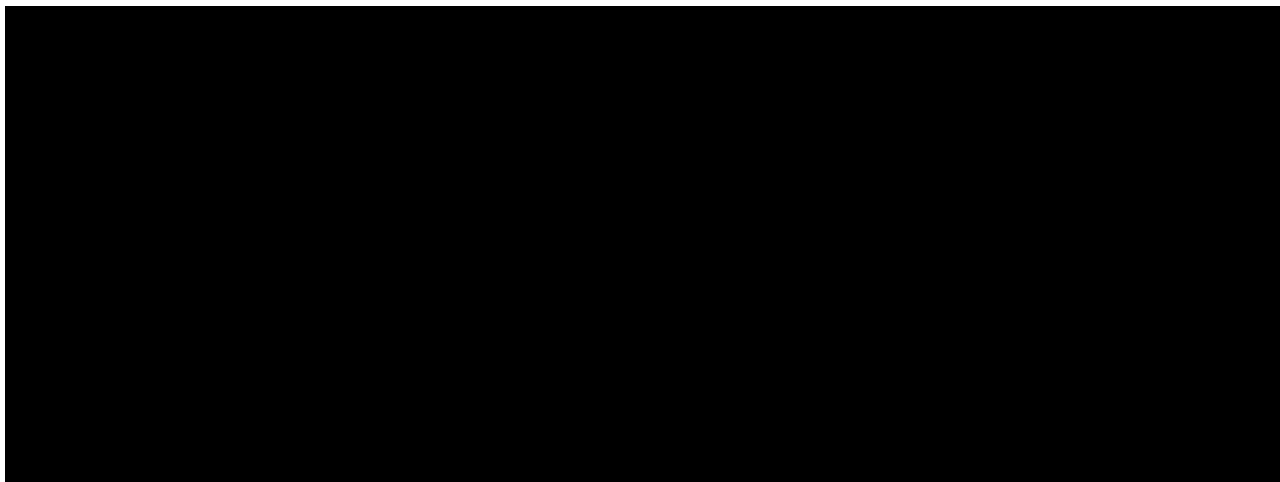


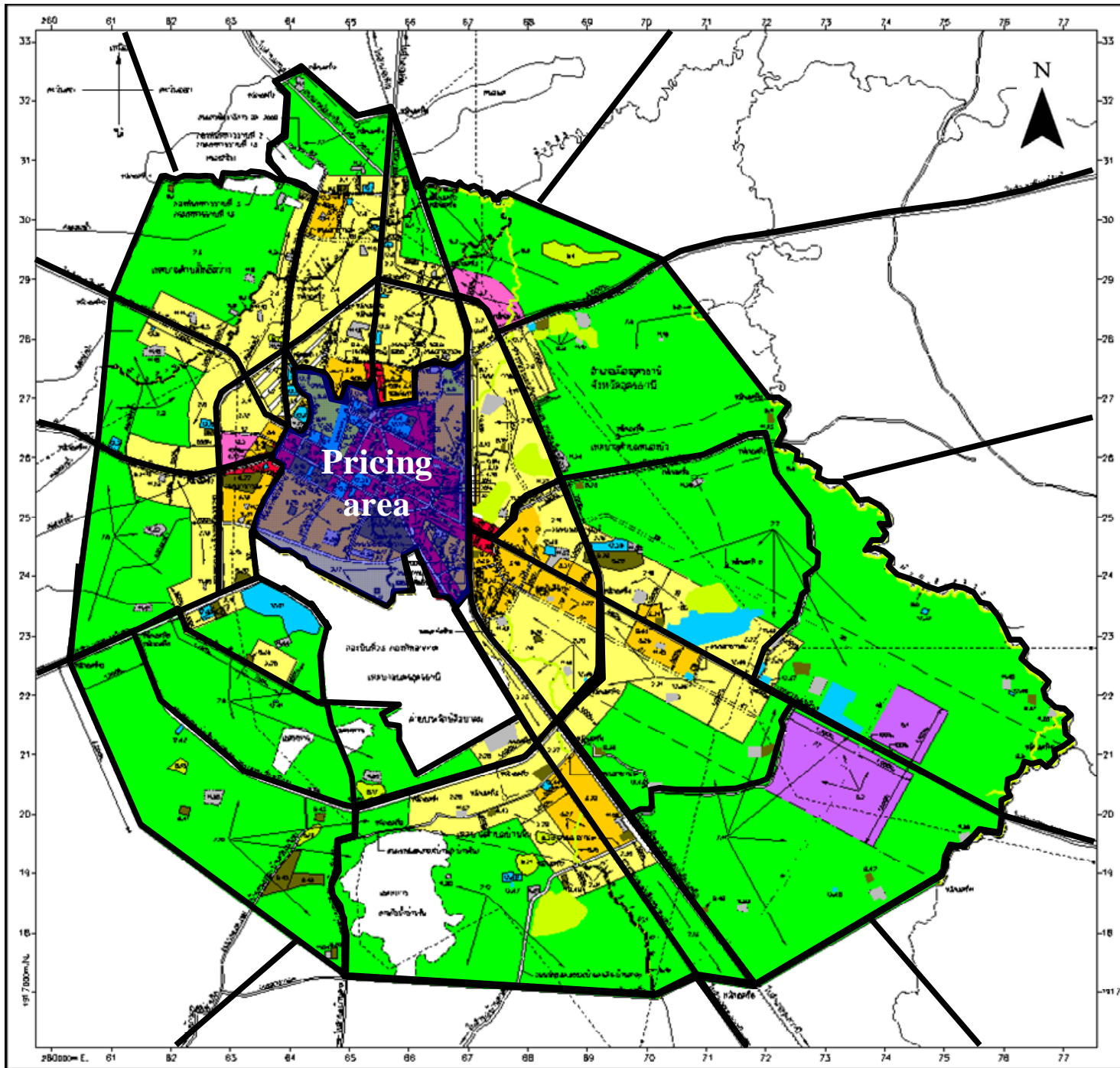
3.2. Preparation of data

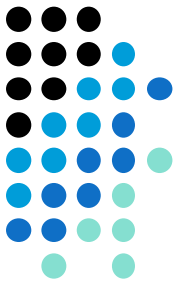
- OD Table

- Time : From 8:00 to 9:00 a.m.
- Transportation modes : Car, Bike, Songteaw
- Zone : 86
- Node : 511
- Link : 272

Link capacity







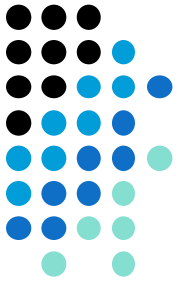
3.3. Way of Road pricing

- Time : 8:00a.m. ~ 9:00a.m.
- Object : Car, Bike (Permit only Songteaw)
- Detail Area :

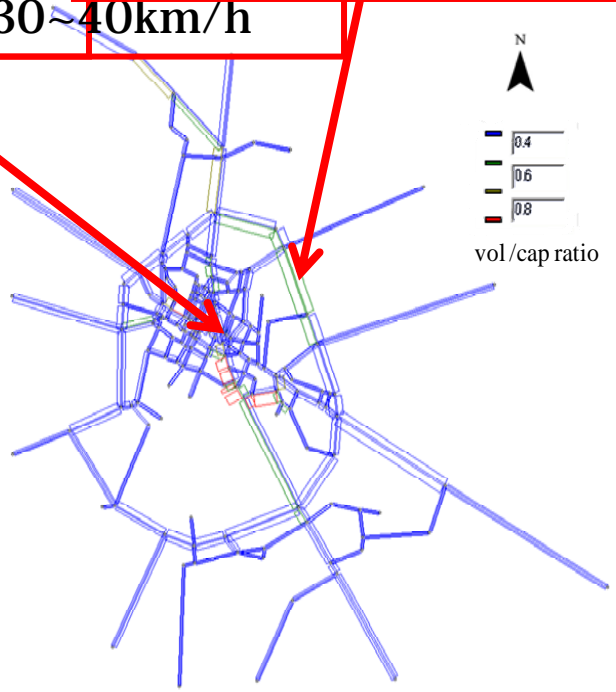
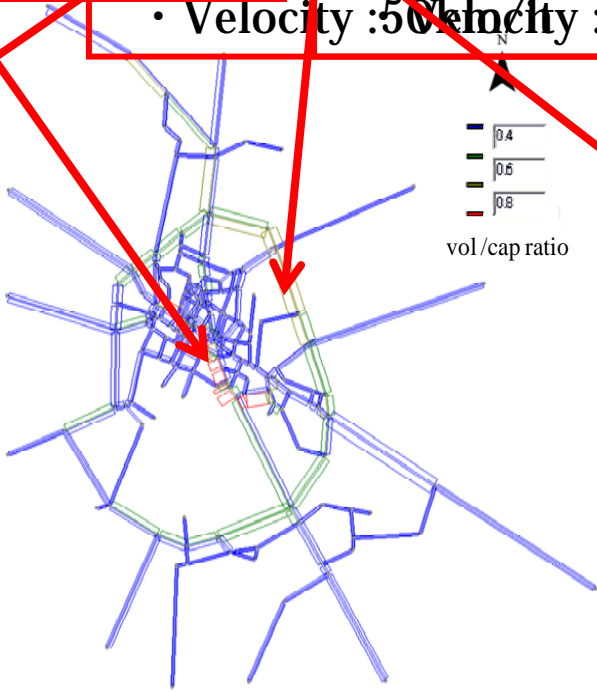
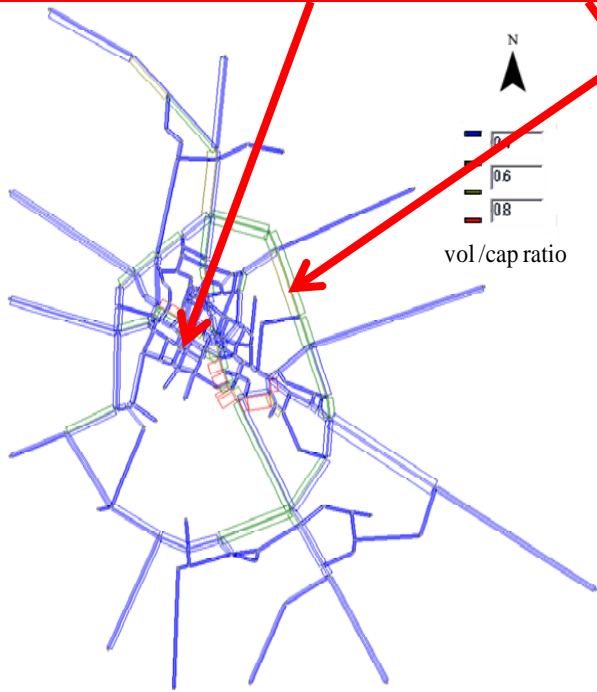


4. Comparative result

4.1. Result of traffic assignment



CBD Area	CBD Area	CBD Area	Ring Road	Ring Road
• V/C : Over 1.0	• V/C : Max 0.92 ; • V/C : Max 1.4	• V/C : Max 1.4	• V/C : Max 0.68 ; • V/C : Max 1.4	• V/C : Max 1.4
• Velocity : Around 30km/h	• Velocity : 20~40km/h	• Velocity : 30~40km/h	• Velocity : 30~40km/h	• Velocity : 40~50km/h
			• Velocity : 50km/h	



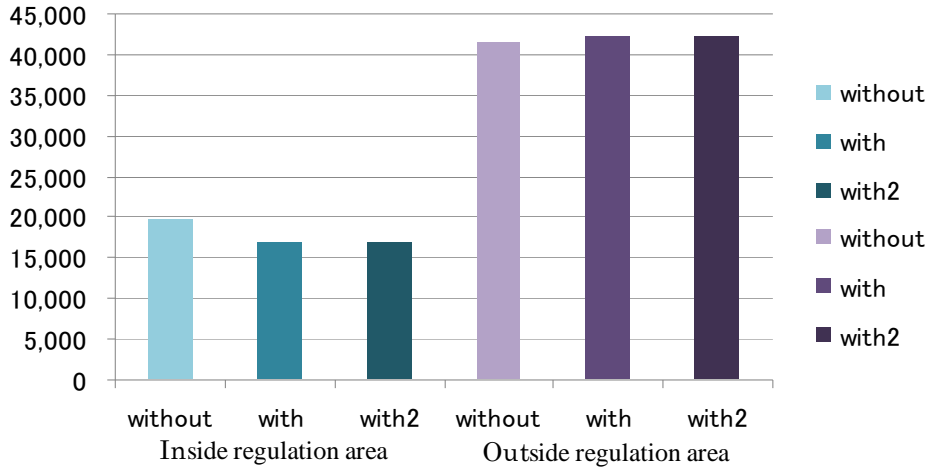
Without road pricing

With-case1

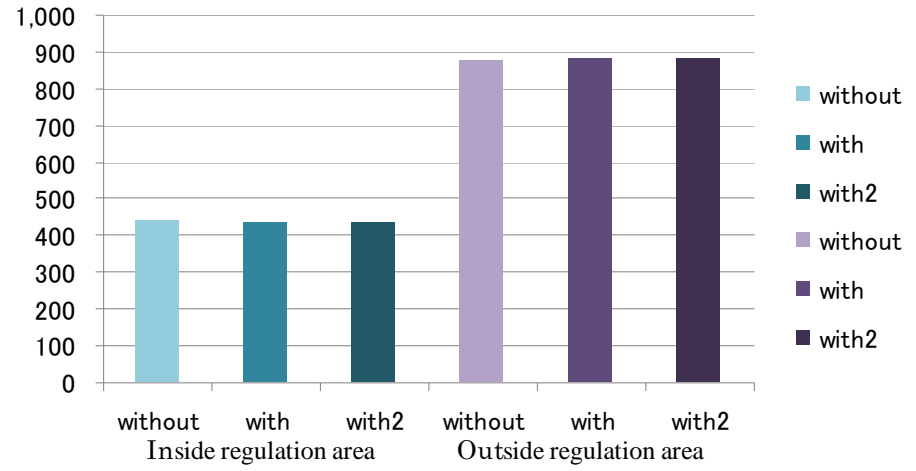
With-case2

Link congestion levels

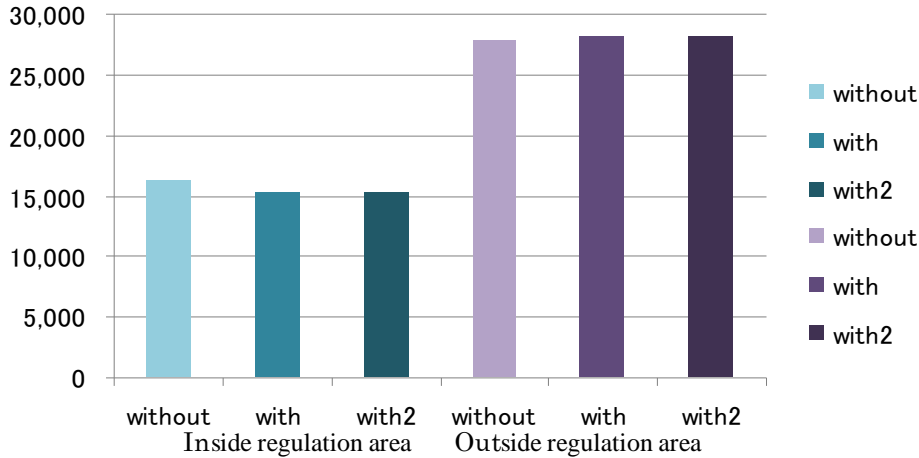
car



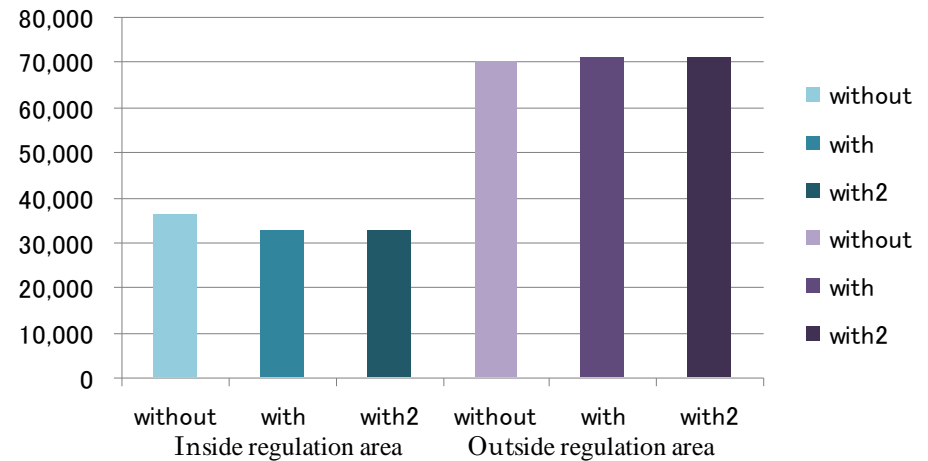
songtaew



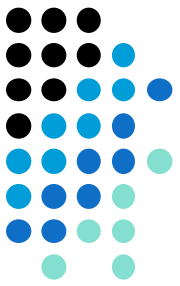
bike



total



Number of Some Vehicles



4.2. Calculation of CO₂ emissions

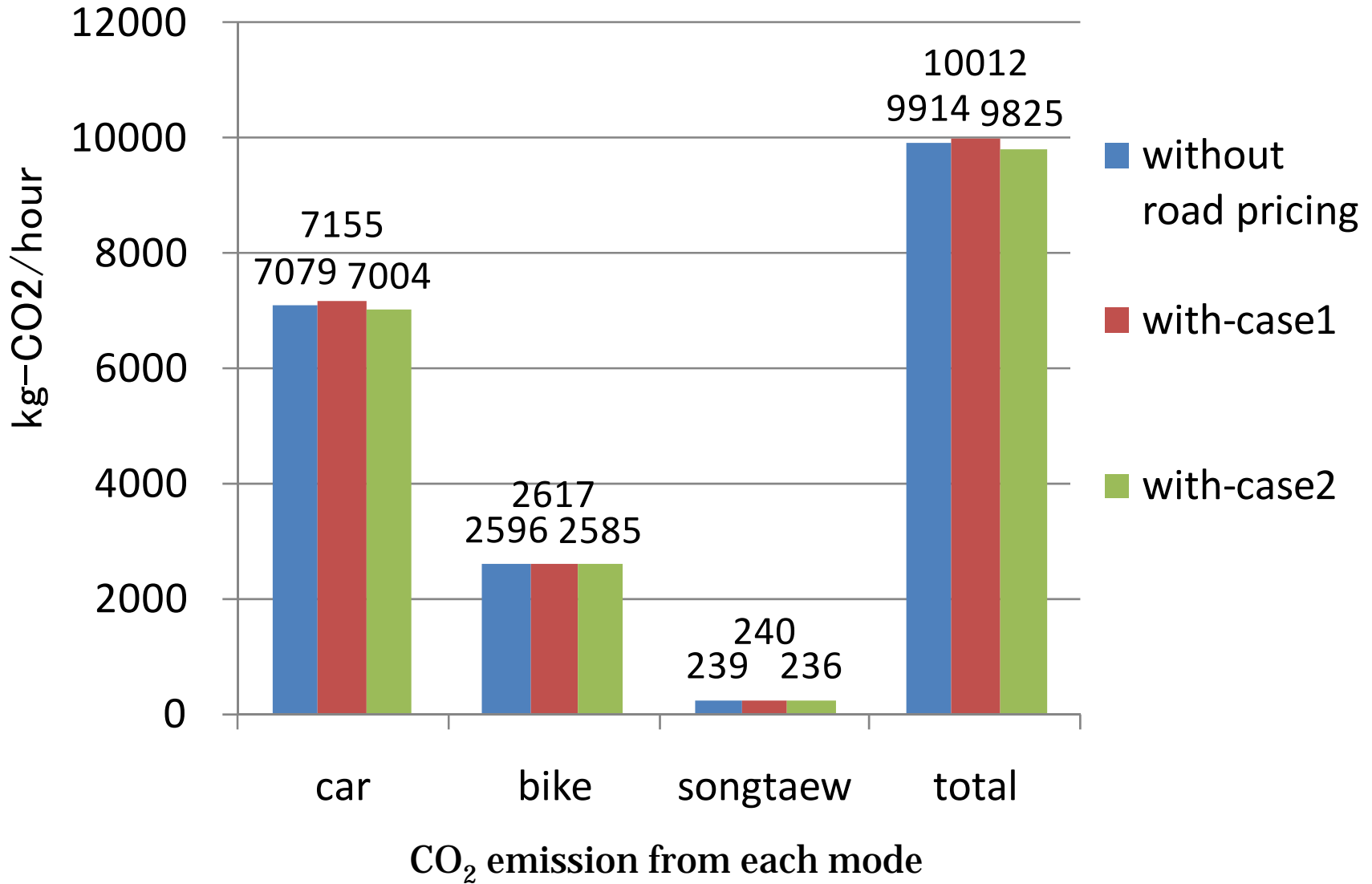
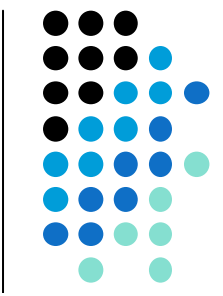
- CO₂ emission volume(g-co₂/hour) =
Length × Emission Factor × Traffic Volume ...(1)
- $EF = aV^2 + bV + c$...(2)
a,b,c : Coefficients (These are shown Table 1)
V : Average vehicle speed

Coefficients of emission factors

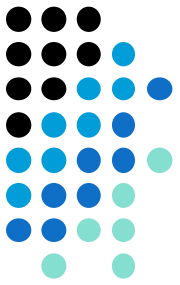
	a	b	c
Passenger car	0.0584	-7.4383	335.90
Motorcycle	0.0308	-3.6385	165.98
Light duty truck	0.0378	-4.2744	178.78

(Source: MLIT, 2004)

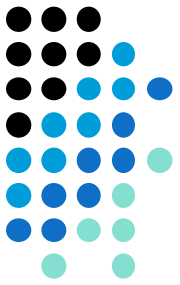
4.3. CO₂ emission



5. Conclusion



- The result of the case study shows that only installing road pricing to CBD is not sufficient.
- Improvement of road capacity on the ring road is one of possibility to cover regulated traffic flow, and the charged fee should use to support expenditures on construction of road improvement.
- Improving public transportation to access CBD will be another option to stimulate the shift to more efficiency transportation mode usage.
- The future issue of our study is to consider feasibility of other transportation strategies for Udon Thani city.



Thank you for your attention.