

Study of VKT estimation based on odometer

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Abstract: Vehicle Kilometer of Travel (VKT) is one of the most meaningful indicators to represent road transport in a particular area. In the countries that such estimates are available, VKT are often used for setting goals and objectives in transportation planning and used in various important decisions making processes.^[1] In addition, in developing cities, estimation of CO₂ emission based on VKT is only applicable approach. This study was performed to estimate VKT based on odometer in Khon Kaen, Thailand.

1. Introduction

Vehicle kilometer of travel or VKT is most essential data in order to observe vehicle usage and estimate amount of CO₂ emission from road transport. Especially, in developing cities, estimation of CO₂ emission based on VKT is only applicable approach. However, it is not sufficiently available in Thailand.

Therefore, VKTs by vehicle types were measured by applying the method based on records of odometer in Khon Kaen province of Thailand as a case. Also, characteristics of measured VKTs were analysed by comparing with vehicle age, etc.

2. Existing Studies

Energy Policy and Planning Office (EPPO) observed VKTs on the studies of energy consumption in 1997 and 2008 respectively. Limanond T., et al. estimated VKT at Bangkok and Nakhonrachasima based on records of odometer under the ATRANS Research project. Satiennam T., et al. also estimated VKT at Khon kaen and Hetyai by employing similar approach. Those studies found economical factors such as GDP, income level, etc. and land use characteristics such as population density, etc. significantly affected on VKT. However, sampling on Khon kaen study was not proper so that measurement based on appropriate method is required.

3. Survey of VKT in Khon kaen

1) Question items

Based on existing studies, following question items were selected, a) vehicle age, b) records of odometer, c) fuel type, d) a new car or a second hand car, e) private car or commercial car, f) sex, g) age, h) personal income, i) household income, j) occupation k) residential location

2) Targeted vehicle type

Out of classification of vehicle by the department of land transport in Thailand, Sedan (not more than 7 passengers), Van and Pick up and Motorcycle were selected as types to measured VKT because their shears are high. Since we could not get enough samples size for Van and Pick up on this survey, it is not included on this analysis. We plan to conduct survey again on coming October.

3) Conducting interview survey

With cooperation of students of Khon kaen university, we conducted interview survey with drivers who visited two gas stations in Khon kaen city during a week from August to September. One of gas station is located along National highway No.2 and other is located inside of the campus of Khon kaen university.

4) Sampling

Required samples size was decided based on the equation 1 by inputting number of registered vehicle in 2010. Number of registered vehicle, required sample size and acquired sample size are shown in Table 1.

$$n = N/(1 + Ne^2) \quad (1)$$

Table 1 Estimated sample size

No.	Type of Vehicle	Vehicle Register	Sample Size	Acquired
1	Sedan not more than 7 passengers	77335	398	660
2	Van & Pick up	129098	399	269
3	Motorcycle	373116	400	591

4. Data Analysis

1) Sedan (not more than 7 passengers)

Accumulated VKTs for the year in which more than ten data were collected draw as bar chart in Figure 1. Bar chart shows accumulated VKT (dividing accumulated VKTs by number of collected samples). Lng chart shows annual VKTs (dividing accumulated VKTs by vehicle age).

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Logarithmic curves were estimated for accumulated VKTs and annual VKTs. Since correlation coefficients became 0.62 and 0.92. Generally, the VKT is influenced by many factors, such as age of vehicle, socio-economics of vehicle's owner, household characteristics, fuel price, transport infrastructure (Button et al., 1993; Kenworthy and Laube, 1996). Previous research papers, for instance, indicate that the age of vehicle will play roles on the VKT as well, that is, as the vehicle get older, it will be driven less distance, shown as Logarithmic curves of annual VKTs in figure1.

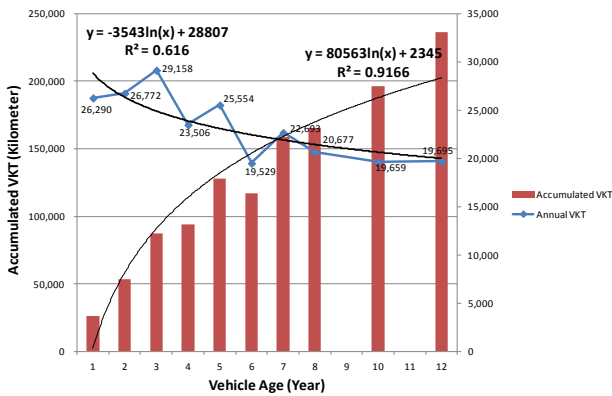


Figure1 Estimated accumulated and annual VKT

Figure 2 shows the frequency distribution of VKT which was classified by every 5000km. The number of vehicles age decrease with increasing VKT.

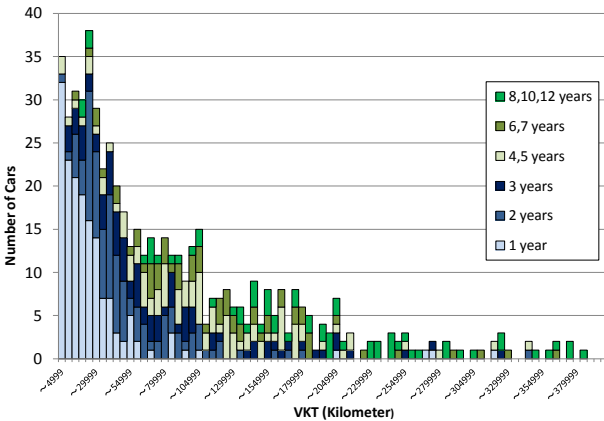


Figure2 VKT and Number of cars

2) Motorcycle

The relevant statistics as well as the estimated coefficients for the models were shown in figure3. Similarly to Sedan not more than 7 passengers, it was found that the annual VKT decreases as the vehicle age increase. Since correlation coefficients became 0.94 and 0.93, goodness of fit of both curves were high. With the same reason stated in 1) we can observe the same trend with motorcycle that as the age of vehicle is increasing, the VKT decreases, as presented in figure 3.

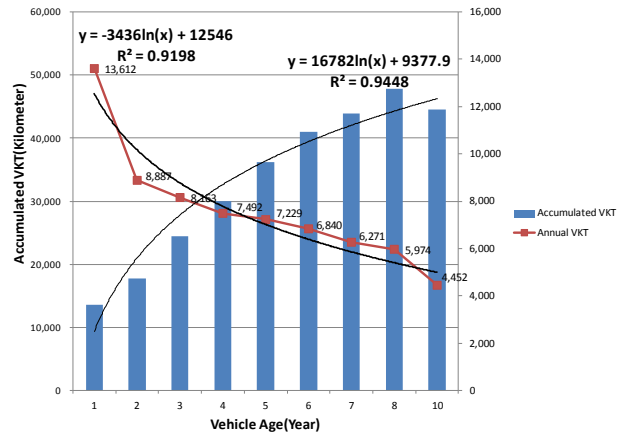


Figure 3 Estimated accumulated and annual VKT

Similarly to Sedan not more than 7 passengers, it was shown that the number of vehicle is decreased with increasing VKT.

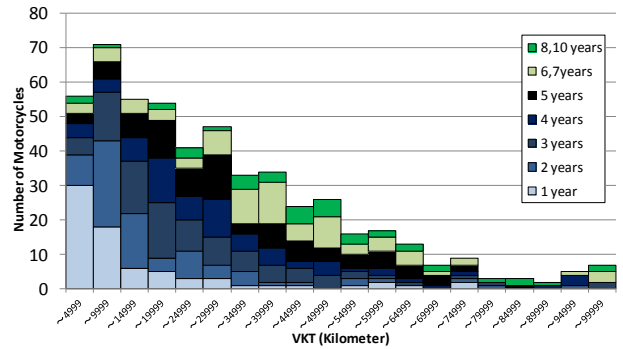


Figure4 VKT and Number of motorcycles

5. Conclusion

As the result, it was found that VKT has a high correlation with vehicle age.

Acknowledgment

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