Additional Information to the Proposed Methodology: "Transportation energy efficiency activities by installing digital tachograph systems"

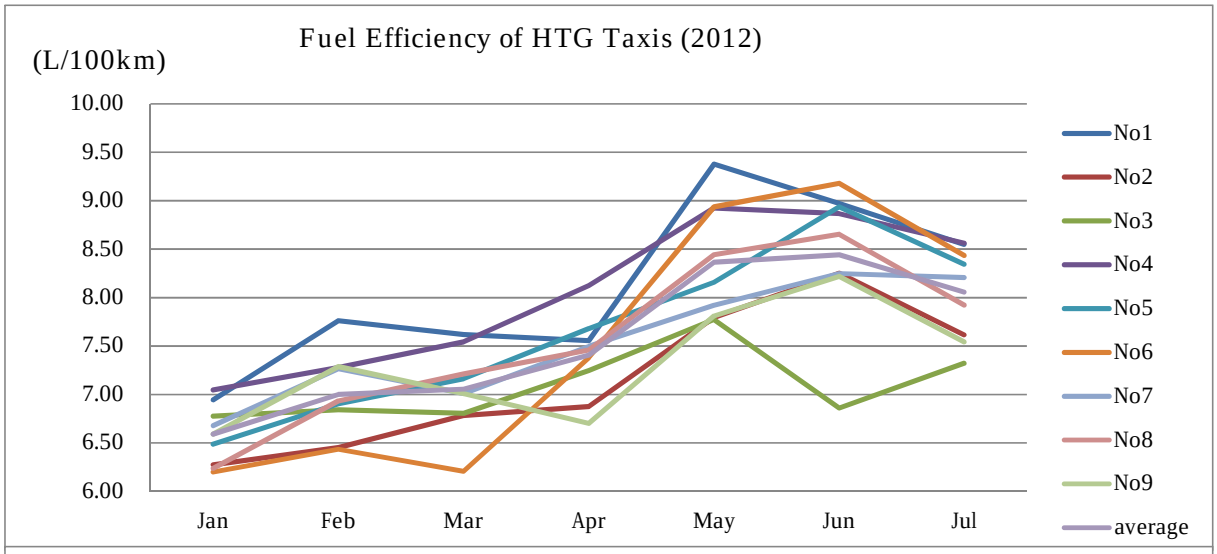
1. Relationship between fuel efficiency of vehicle and temperature
2. Monthly mean temperatures of major 3 cities
3. Justification to apply travel distance to calculate fuel consumption of freight vehicle

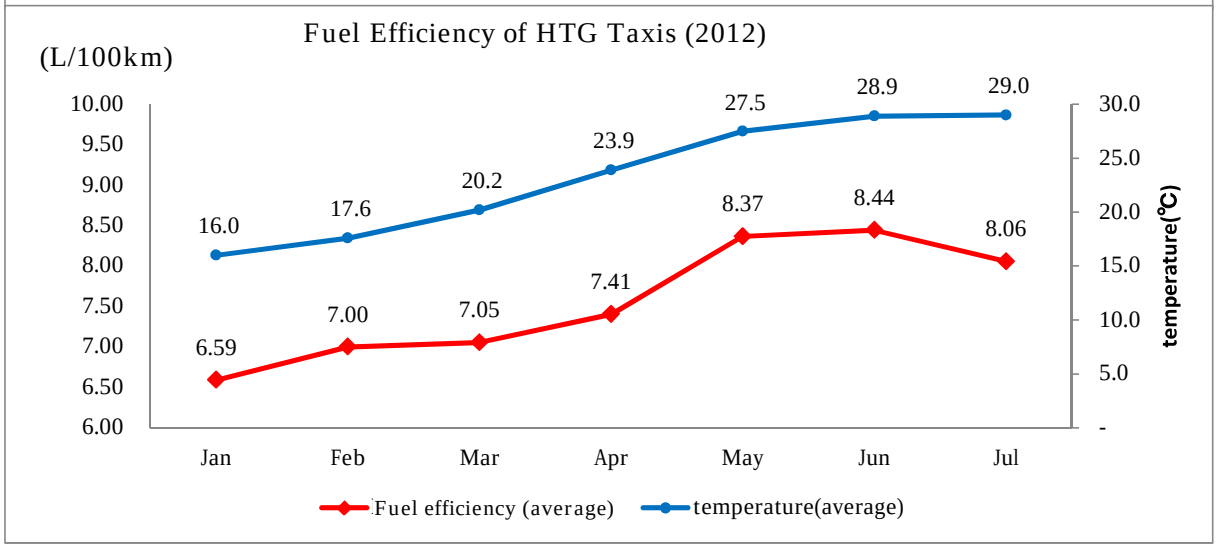
1. Relationship between fuel efficiency of vehicle and temperature

The following table shows monthly average fuel efficiency of taxis in Hanoi, Vietnam.
It is observed that the fuel efficiency of vehicle tends to be higher (less efficient) as the temperature goes higher. That is because air conditioners are working during warmer periods of the year.

unit: L/100km

Taxi No.	Jan	Feb	Mar	Apr	May	Jun	Jul	average
No1	6.94	7.76	7.62	7.55	9.38	8.97	8.55	8.04
No2	6.27	6.45	6.78	6.88	7.80	8.25	7.62	7.09
No3	6.78	6.84	6.81	7.25	7.77	6.86	7.32	7.07
No4	7.05	7.28	7.54	8.12	8.92	8.87	8.56	7.97
No5	6.49	6.90	7.16	7.68	8.16	8.94	8.34	7.55
No6	6.20	6.43	6.21	7.38	8.94	9.18	8.43	7.42
No7	6.68	7.26	7.01	7.50	7.92	8.25	8.21	7.47
No8	6.24	6.93	7.21	7.46	8.44	8.65	7.92	7.46
No9	6.59	7.29	7.01	6.70	7.81	8.22	7.54	7.26
average	6.59	7.00	7.05	7.41	8.37	8.44	8.06	7.49





(source)
2012 Feasibility /Demonstration Studies for New Mechanisms Project /Activities,
Global Environment Centre Foundation

2. Monthly mean temperatures of major 3 cities

Unit (degree Celsius)

	Maximum temperature			Minimum temperature			Average temperature		
Area	Hanoi	Da Nang	HCMC	Hanoi	Da Nang	HCMC	Hanoi	Da Nang	HCMC
January	20	25	32	15	20	22	17.5	22.5	27
February	21	26	33	16	20	23	18.5	23	28
March	23	28	34	19	22	25	21	25	29.5
April	28	31	35	22	24	26	25	27.5	30.5
May	32	33	34	25	25	26	28.5	29	30
June	33	34	33	27	26	25	30	30	29
July	33	34	32	27	26	25	30	30	28.5
August	33	34	32	26	26	25	29.5	30	28.5
September	32	32	32	26	25	25	29	28.5	28.5
October	29	29	31	23	24	24	26	26.5	27.5
November	26	27	32	20	22	23	23	24.5	27.5
December	22	25	31	16	20	22	19	22.5	26.5

Hatched item: Bottom 6 months in order of monthly mean temperature

*8 months are hatched in HCMC because of the same mean temperatures from July to September.

Source)

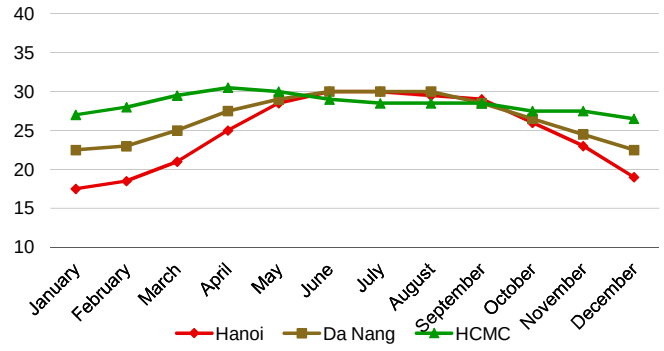
MSN Weather Forecast (http://weather.jp.msn.com/)

Data provided by FORECA

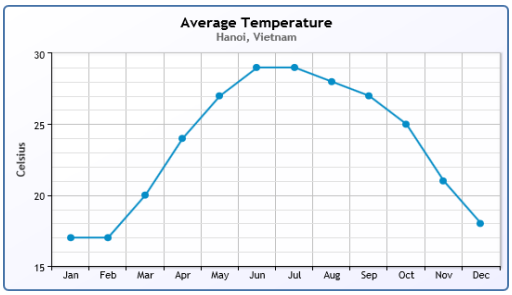
Ave.	24.8	26.6	28.4
From	November	October	July
To	April	March	February

Transition of monthly mean temperature of major 3 cities in Vietnam

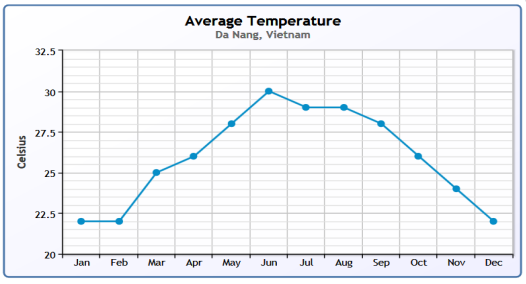
Degree Celsius



Reference: Transition of monthly mean temperature from the different sources (Weatherbase: http://www.weatherbase.com)



Years on Record: 90



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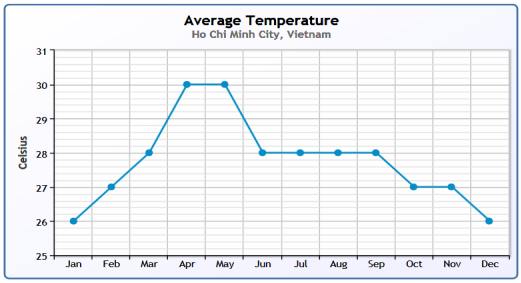


Years on Record: 19

3. Justification to apply travel distance to calculate fuel consumption of freight vehicle

In this methodology, reference emissions are calculated for each freight vehicle by multiplying reference fuel efficiency of freight vehicle set from actual data of fuel consumption and travel distance in the past, project distance travelled by freight vehicle, net calorific value and CO2 emission factor of fuel used by freight vehicles. Therefore, accuracy of calculation depends on reproducibility of actual fuel consumption by reference fuel efficiency of freight vehicle.

Considering the availability of relevant data on travelling of freight vehicle, fuel efficiency can be calculated based on travel distance or freight ton-km. Analysis has been conducted to justify the application of travel distance to calculate fuel consumption of freight vehicle. Statistical data published by Ministry of Land, Infrastructure, Transport and Tourism, Japan, has been used for analysis.

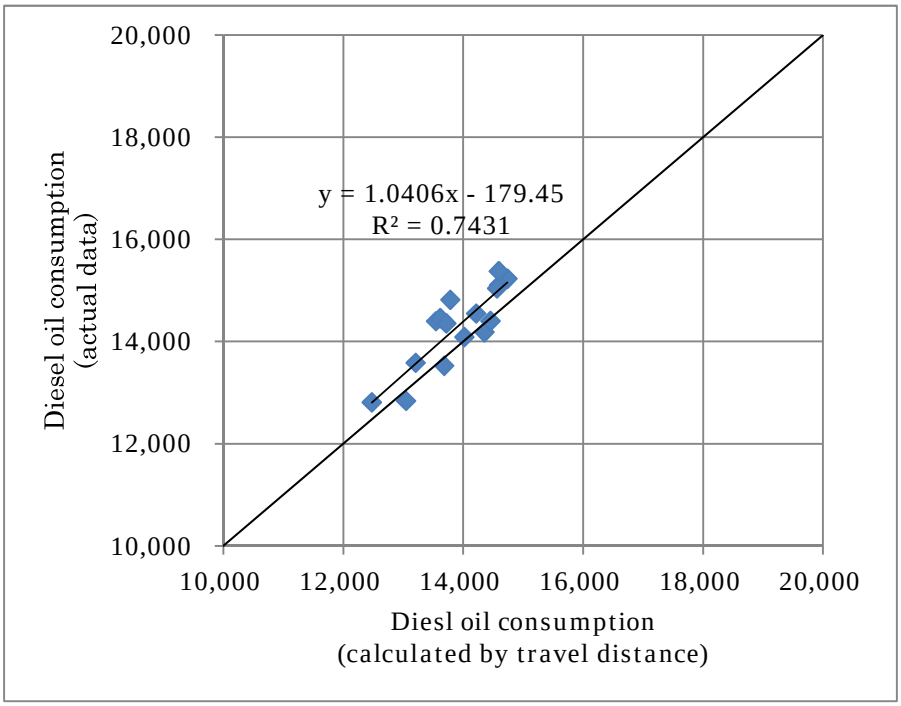
1) Correlation between actual and estimated fuel consumption

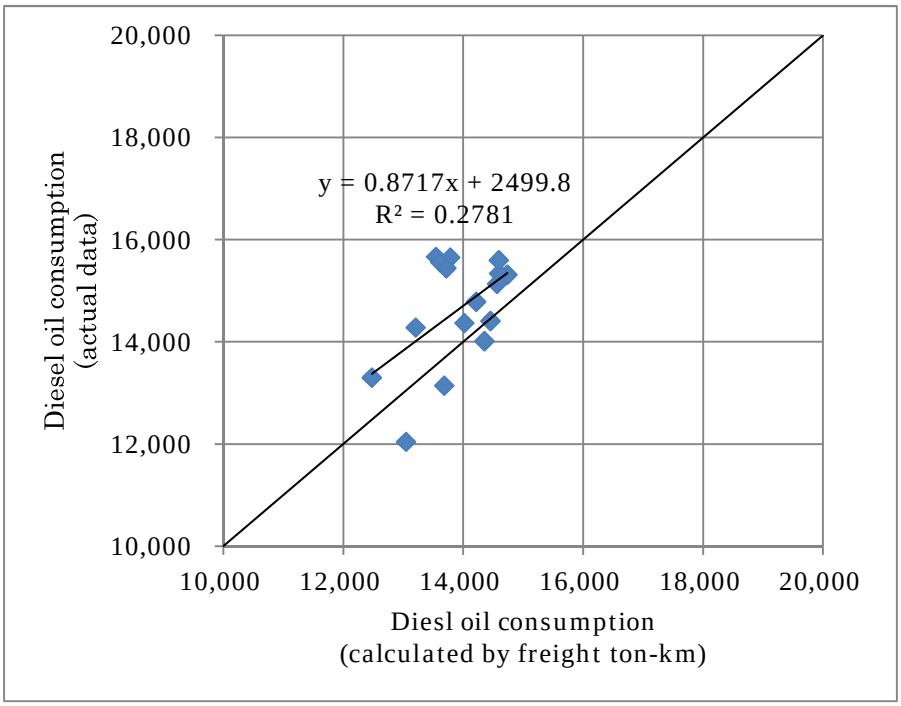
Correlation analysis has been conducted between actual fuel consumption of freight vehicles and fuel consumption estimated by each year's total travel distance or freight ton-km.

As for estimation by travel distance, diesel oil consumptions per travel distance unit of 5 previous years are averaged, and then fuel consumption for each year is estimated by multiplying that year's total travel distance by the averaged unit. Same method is also applied for estimation by freight ton-km.

The following graphs and tables show the results of correlation analysis for both travel distance and freight ton-km.

The coefficients of determination, denoted R^2, are 0.7431 for travel distance and 0.2781 for freight ton-km. Travel distance has a relatively stronger correlation with fuel consumption compared with freight ton-km. It indicates that actual fuel consumption can be numerically reproduced by travel distance.





2) Conclusion

Freight ton-km is used to estimate fuel consumption in CDM methodology. Considering the correlation analysis results, it can be said that fuel consumption of freight vehicle can be estimated by travel distance.

Data on travelling of freight vehicles

year	freight ton-km	travel distance	diesel oil consumption	diesel oil consumption per freight ton-km unit	average of previou 5 years	diesel oil consumption per travel distance unit	average of previou 5 years	estimation of diesel oil consumption (freight ton-km)	estimation of diesel oil consumption (travel distance)
	thousand ton-km	thousand km	10*3kL	l/ton-km	l/ton-km	l/km	l/km	10*3kL	10*3kL
1989	166,101,248	37,788,744	10,286	0.061928	-	0.272207	-	-	-
1990	172,834,111	39,732,101	10,891	0.063014	-	0.274110	-	-	-
1991	178,483,908	43,131,074	11,958	0.067000	-	0.277258	-	-	-
1992	178,291,846	44,265,717	12,345	0.069243	-	0.278894	-	-	-
1993	177,249,387	44,544,043	12,555	0.070835	-	0.281865	-	-	-
1994	181,364,596	46,372,890	13,048	0.071941	0.066404	0.281362	0.276867	12,043	12,839
1995	192,152,656	48,538,375	13,684	0.071214	0.068407	0.281920	0.278698	13,145	13,528
1996	200,089,008	50,614,305	14,353	0.071735	0.070047	0.283583	0.280260	14,016	14,185
1997	202,958,407	51,162,075	14,455	0.071223	0.070993	0.282538	0.281525	14,409	14,403
1998	201,266,019	49,917,046	14,021	0.069662	0.071389	0.280877	0.282254	14,368	14,089
1999	207,773,383	51,588,499	14,216	0.068422	0.071155	0.275571	0.282056	14,784	14,551
2000	217,398,125	54,226,378	14,738	0.067791	0.070451	0.271781	0.280898	15,316	15,232
2001	219,860,277	54,162,746	14,596	0.066390	0.069767	0.269493	0.278870	15,339	15,104
2002	220,346,109	54,485,295	14,565	0.066100	0.068698	0.267317	0.276052	15,137	15,041
2003	230,484,930	56,328,878	14,594	0.063318	0.067673	0.259082	0.273008	15,598	15,378
2004	235,700,119	55,159,919	13,785	0.058486	0.066404	0.249914	0.268649	15,651	14,819
2005	243,192,857	54,644,511	13,546	0.055702	0.064417	0.247898	0.263517	15,666	14,400
2006	250,963,378	55,879,308	13,616	0.054257	0.061999	0.243676	0.258741	15,560	14,458
2007	259,225,501	56,618,368	13,719	0.052923	0.059572	0.242307	0.253577	15,443	14,357
2008	250,812,202	54,653,167	13,208	0.052662	0.056937	0.241672	0.248575	14,281	13,585
2009	242,658,399	52,265,327	12,477	0.051417	0.054806	0.238722	0.245093	13,299	12,810

(source: Statistical Report on Motor Vehicle Transport, Ministry of Land Infrastructure Transport and Tourisum Japan)