

Trend of final energy intensity changes in Lao PDR

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Abstract:

While being developed, Lao society and economy have gradually shifted from agricultural-based to service-industrial oriented one. As a result, final energy consumptions are also rapidly changing. The paper studied a trend of changes in final energy intensity by looking at sector-wide energy demand and contribution shares in Gross Domestic Products. It was found that intensity of total final energy consumption in Lao PDR gradually decreased during about the last decade, which was considered as a good trend. This was resulted of fast stable economic growth and comparatively slow growth in energy demand. Furthermore, Lao economy still relays mainly on less-energy intensive economic sectors, such as services and traditional agriculture. Although Energy intensity of the Industry, transportation and services sectors has decreasing trend, but slowed down in recent years. Moreover, energy intensity of agricultural sector has increasing trend. All these facts give a ground for thinking that in the future, when socio-economic development of the country will reach higher level, there will be more energy consuming activities, then energy demand will increase while economic growth will slow down, and therefore, energy intensity is to increase. Knowledge on trend of energy consumption changes would be useful for predicting energy demand and securing energy supply in the future.

Keywords: Energy Intensity; final energy demand

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1. Introduction

This study is to find out the root causes and trend of the changes in final energy consumption in Lao PDR, by looking at sector-wide energy demand behavior and its connection to economic growth for a period of 2000-2012.

Government of Lao PDR had set a Millennium Goal to shift country out of a status of the Least Developed Countries by 2020. Country's modernization and industrialization, and rural electrification as well have been considered among the most important agendas in development programs of Lao government.

Above mentioned policies of government will lead to significant changes in term of energy supply and demand by the main economic sectors. Therefore, knowledge on sector-wide energy demand behavior is crucial in term of reliable energy forecasting and planning.

Socio-economic development of Lao PDR has significantly increased since its opening up in late 1980s, turning from centrally planned economy to free market mechanism oriented. As a result of socio-economic development, energy consumption of the country has also continuously increased, particularly since late 1990s. Total final energy demand of Lao PDR reached 2.5 Million tons of Oil Equivalent (MTOE) in 2012, with an annual growth of 3-4% in parallel with stable and rapid economic growth (JICA, 2012).

As observed from the sector-wide demand for Lao final energy for a period 2000-2012, residential sector accounted for the largest share and had decreasing trend (62% in 2000 to 54% in 2012) (Table 1). The second largest consumption was by transportation sector, increased share from 20% to 23% for the same period. Final energy consumption share by industrial sector for that period was almost doubled (5% to 8%). Moreover, agriculture sector shared smallest final energy consumption, but it had the highest growth: grew from 0.23% in 2000 to 1.13% in 2012 (or increased almost 5 times). The share of Commercial sector in total energy consumption remains nearly unchanged for

the above mentioned period and accounts for about 15% of country's total final energy consumption.

Table 1 Sector-wide share of final energy demand and Gross Domestic products (GDP)

Sectors	Final energy Consumption shares		Gross Domestic Products (GDP) shares	
	2000	2012	2000	2012
Industry	4.5%	8.2%	17%	33%
Transport	19.5%	22.8%	5.9%	5.8%
Services	13.6%	14.3%	24%	27%
Agriculture	0.2%	1.1%	54%	35%
Residential	62.1%	53.6%		

(LSB, 2014; UNESCAP, 2014)

Lao Gross Domestic Products (GDP) stably grew at a rate of 7-8% per annum (constant price 2002), especially since late 90s. GDP per capita at current market price increased almost triple for period 2005-2012, from 511 to 1396 US\$ (LSB, 2014).

In 2012, agriculture sector contributed the largest share to GDP and had decreasing trend (54% to 35% for 2000 and 2012 respectively) (Table 1). The second largest share in total GDP in 2012 contributed by industry and almost doubled of share in 2000. The third largest contribution was shared by service sector, slightly increased from share in 2000. Contribution by transportation remained nearly unchanged.

2. Results and discussion

Energy intensity (EI) of total final energy consumption of main activities gradually decreased from 449 TOE/(million 2005 PPP \$) in 2000 to 138 in 2012 (Fig. 1), or decreased at a rate of -9% per annum (Table 2). This is, probably as a result of relatively fast economic growth (7-8%) versus low growth in final energy demand (3-4%). Furthermore, for the mentioned period, the Lao economy had been relying on less energy-intensive sectors, such as traditional agriculture and industry, which contributed the highest share in GDP in 2012(35% and 33% respectively) but consumed just 1.1% and 8.8% of total final energy demand of the country (Table 1).

Obviously, total and by-sector FEI have had decreasing trend for 2000-2012, except for agriculture sector, where FEI grew at a rate of 8% (Table 2). Due to the fact that agriculture sector contributes rather small share in total energy consumption, total and sector wide FEI will continue decreasing but at lower rate in coming years.

During 2000-2012, transportation sector accounted for the highest final energy intensity (FEI, 1,483 TOE/million US\$(PPP2005 in 2000), probably due to the fact that there was dominance of vehicle for personal use and furthermore, old vehicles were still widely used. Transportation FEI quickly decreased to 538 in 2012 (about -8% per annum), despite of rapid increase of vehicle population (18% increasing rate for 2001-2011, [JICA, October 2012]), but perhaps, more productive use and increased new vehicle import. Moreover, demand on final energy by transportation sector grew at a rate of 6% per year for period 2000-2012, while GDP contribution by the sector grew faster, at 12%, and as a result, the sector energy intensity is expected to continue decreasing. JICA study projected final energy demand share of transportation sector to increase to 29% by 2025 (Business As Usual, BAU) (JICA, 2012).

Industrial and service sectors accounted for the highest decrease of final energy intensity during period 2000-2012, with annual average -10% (Table 2). In the coming 10-15 years, these sectors are

expected to grow intensively, in particular due to booming mining and construction industries, as well as rapid growing commercial centers. According to recent projection by JICA, the industrial sector in Laos is assumed to have high real GDP growth and energy demand by the sector will rapidly increase (annual average 15%) and expending its share from 9% (2010) to 31% (in 2025), the highest shares, comparing to commercial (29.2%) and residential (29.3%) (JICA, 2012).

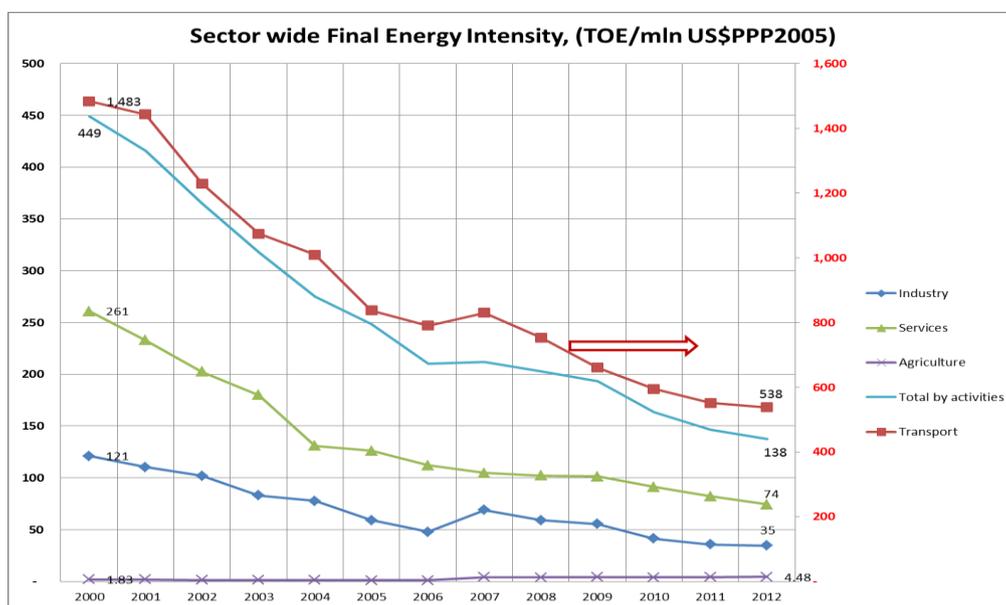


Fig. 1 Sector-wide Energy intensity changes (LSB, 2014; UNESCAP, 2014).

Table 2 Trend of changes of energy consumption and GDP for a period 2000-2012

Sectors	Final energy		GDP		Changes of Energy Intensity(EI)
	Demand Growth	By sector Share growth	By sector Growth	By sector Share growth	
Industry	9%	5.1%	22%	5.8%	-10%
Transport	5%	1.3%	15%	-0.1%	-8%
Services	5%	0.4%	16%	1.0%	-10%
Agriculture	19%	14.6%	11%	-3.6%	8%
Residential	3%	-1.2%			
Total	4%		15%	-4%	-9%

(LSB, 2014; UNESCAP, 2014)

Energy demand by residential sector in Lao PDR had smallest annual growth (3%) and its share decreased -1.2% for a period of 2000-2012 and such trend will sustain up to 2025. JICA study predicted that in the future, energy demand of residential sector shall continue growing, but its share will decrease to 29% by 2025 (JICA, 2012).

While being developed, Lao society is moving from backward agrarian format toward modern service and industrial oriented one. This can be seen from the changes in GDP contribution shares, where traditional agriculture share decreased, while shares of industrial-service sectors together increased (46% in 2000 to 75% in 2012 (Table 1)). This also implies increase of both energy consumption and GDP of the country. According JICA study's projection, energy demand of Lao PDR will grow 6.7% annually for 2010-2025 period, compared to 4% for 2010-2010, while GDP growth rate will be 10.4% versus 6.7% for respective periods (at constant 2002 price) (JICA, 2012).

3. Conclusion

Lao energy demand rapidly grew in parallel with stable economic growth, while moving toward modern society. Final energy intensity has been continuously decreasing since more than decade, but to growth in the next decade, when the social-economic development will reach higher level, where will be more energy intensive activities.

Knowledge on real energy demand changes behavior is essential for proper energy planning process and securing future sustainable energy supply. It is recommended that a careful study is necessary to find out the correlation between this energy intensity behavior and economic growth.

4. References

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