International Journal of Energy Economics and Policy
Vol. 2, No. 3, 2012, pp.123-133
ISSN: 2146-4553
www.econjournals.com

Modelling Non-Renewable Energy in Mauritius: In Quest for Sustainable Policies towards a Greener Economy

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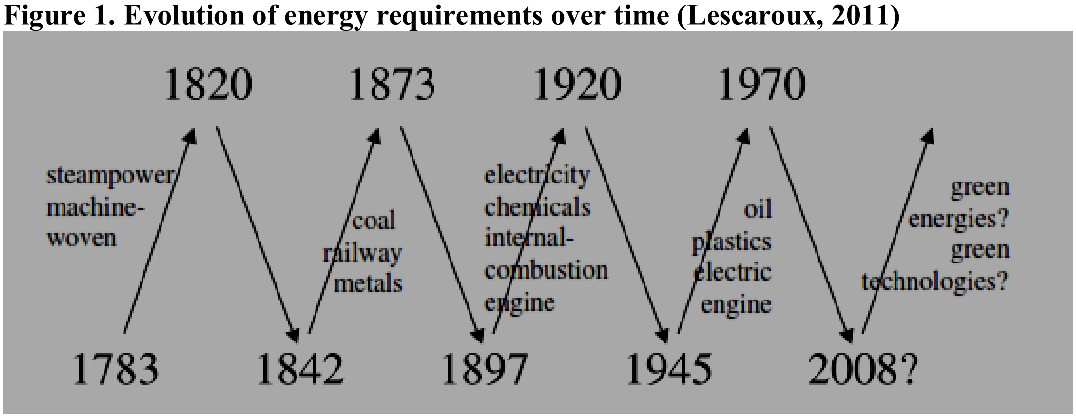
ABSTARCT: This paper sheds light on the interaction between energy consumption and energy production in an upper-income developing country. Results show that Industrial consumption of energy in Mauritius is driven mainly by Fuel source while Commercial use is accommodated by a mixture of Coal and Fuel sources. Bagasse and Hydro energy generations undermine the use of Coal and Fuel, all demonstrating an inherent greening phenomenon embedded in the energy process. However, their size effects are low. Findings further confirm sustainability in energy generation and absorption based on a slightly above one long-term elasticity coefficient between energy production and consumption. Overall, results suggest that Mauritius has to implement vigorous measures in view of greening its energy processes. Policy wise, this could signify the urgent need of both Commercial and Industrial usage taxes to stimulate a greener economy.

Keywords: VAR; Mauritius; Sustainable/Green Policies; Variance Decomposition; Impulse Response; Energy Policies
JEL Classifications: Q4

1. Introduction and Background

Energy use in developing countries has been increasing throughout decades to promote higher growth. As per IEA (2006), energy share consumption of developing countries has undergone a major increase, from 16 % in 1971 to 50% in 2004. Going ahead in the coming years, this number is anticipated to undergo further increases (Pesaran et al., 1998). However, the international community has now stressed on the need to have cleaner energy sources to ensure sustainable development, all aligned towards the Millennium Development Goals of most economies in the world. The reason is that higher energy consumption is expected to unleash correspondingly higher CO^2 emissions. Above all, energy security has now become an issue of major concern with APEC (2006) stating that Indonesia is likely to become a net energy importer as its resources fade away. In essence, there is now widespread consensus among policy-makers to be equipped with modelling tools to assist in taking policies to stimulate a cleaner world. This can best been captured by the figure below.

Figure 1. Evolution of energy requirements over time (Lescaroux, 2011)



2. Mauritius and Energy

Found in the Indian Ocean, Mauritius is an energy-dependent economy with all economic players having access to grid electricity. However, as at date, no major studies have been envisaged in view of having enriching knowledge with respect to the interactions between energy demand and energy supply. Above all, with the onset of the crisis, pressures have already been exerted on the government's purse and this is where the need to reduce import costs happens to be particularly strategic by scaling down the use of non-renewable energy in favour of renewable ones. However, without proper econometric modelling, it will not be possible to end up with sound policies to be eventually adopted. Another major need for such a study is the concerted efforts by the Mauritian government in view of promoting energy conservation, energy efficiency and use of renewable energy, all captured under the Maurice Ile Durable philosophy. The purpose of Maurice Ile Durable is to encourage the use of better technologies, energy sources and policies in view of having a greener Mauritius.

Compared to previous studies done, the current study adopts an utterly different perspective in that the aim is to link different types of energy generation (Coal, Fuel, Hydro, Bagasse and Kerosene) to the distinct types of energy uses or consumption (Domestic, Commercial and Industrial). It can be argued that total energy demand (use/consumption) equals to total energy supply so that the analysis is not warranted. However, it is vital to note that the distinct components of energy consumption can vary much from energy production so that an analysis of each of the distinct types of demand/supply component is justified, chiefly for policy-making. Such an approach is particularly interesting for policy viewpoint in the case that the government envisages to promote greener energy. The justification is that by knowing well which consumption pattern is directly linked to non-renewable energy production, this would signify possible consumption tax charges aligned to production of non-renewable energy sources so that the money obtained would then be unleashed to further promote the development of greener energy sources. Alternatively, such tax would be lowered as the users of non-renewable energy themselves develop greener energy potential like eco-friendly buildings.

Another major contribution of this paper relates to the modelling the cyclical components of each of the different types of energy generation sources and energy uses in Mauritius. Interestingly, the findings remain unchanged and add robustness to the results. This paper is structured as follows. Section 3 discusses the theoretical framework of the paper. Section 4 discusses the data and methodological issues while section 5 deals with energy scenarios that prevail in Mauritius. Section 6 presents and interprets the empirical results. Finally, Section 7 summarises and concludes.

3. Theoretical Framework

Basically, the demand for energy is a derived demand (Bohi, 1981) whereby the demand is not directly demanded but demanded for the services that it generates. For instance, households demand energy to operate their home appliances like TV, Computers, and Washing machines, in order to avail of a higher standard of living. Similarly, companies use energy to operate huge machineries and equipment so that production can take place to produce goods. In that respect, many studies have been done in view of modelling energy. Energy modelling has been widely researched by both practitioners and academics in spite of the fact that models do vary from country to country, let alone the degree of sophistication used in the modelling process.

Beenstock et al., (1999) and Kamerschen and Porter (2004) apply Johansen methodology to estimate own and cross-price elasticities with their findings showing substitutability effect between electricity and natural gas in the industrial sector. Bose and Shukla (1999) adopt a different perspective in their modelling approach by analysing the relationship between industrial electricity consumption and its main determinants (income, price and diesel) for India. They end up with income elastic electricity consumption for large industries but income inelastic electricity consumption for small and medium industries.

Recently, some studies have reviewed the literature pertaining to modelling of energy in developing countries (Jebaraj and Iniyan, 2006; Bhattacharya and Timilsina, 2009). Bhattacharya and Timilsina (2009) note that four methods used to forecast energy demand in developing countries, namely energy intensity, consumption, growth rate and elasticity. They also find different types of models being used such as trend models, econometric models, hybrid models, input-output models and neural networks. Asaduzzaman and Billah (2008) econometrically model the consumption of natural gas in Bangladesh for four major sectors.

However, the energy modelling process has not been without major shortcomings. For instance, deficiency in terms of data availability or poor data does impede on the modelling. For instance, Freund and Wallich (1997), Lampietti and Meyer (2003) and Dodonov et al. (2004) analyse energy consumption in transition countries by having recourse towards survey data. Survey data sometimes suffer from response bias and tend to camouflage the real relationships among variables.

The aim of this paper is to examine the interactions that prevail between energy generation sources and energy users in Mauritius and on the basis of the findings, important policy implications will be drawn in view of fostering a greener Mauritian economy chiefly in the front of having a potential restructuring of the energy taxation. To the author's best knowledge, this is the first very paper that addresses the energy modelling problem for Mauritius.

4. Energy Scenario in Mauritius

A sectoral examination, as depicted in Figure 2, shows that transport sector constitutes the lion's share in terms of energy consumption, having nearly 50 % of the total energy consumed for the year 2010. Just trailing behind transport sector, the manufacturing sector emerges with a consumption accounting around 28 % of total energy consumed while Households lag well behind. This signifies that the transport and manufacturing sectors constitute the main sectors that require significant re-engineering in view of ensuring stable and sustainable growth.

As stressed in the Maurice Ile Durable agenda, the chief aim is to stimulate the use renewable energy by relying less on fossil energy which also has the added benefit of improving the current account deficit. In fact, year in and year out, the imports for fuel have maintained its gradual upward trend. Moreover, fuel imports hover most than 15 % of total imports as shown in figure 3.

Figure 2. Sector energy consumption in Mauritius

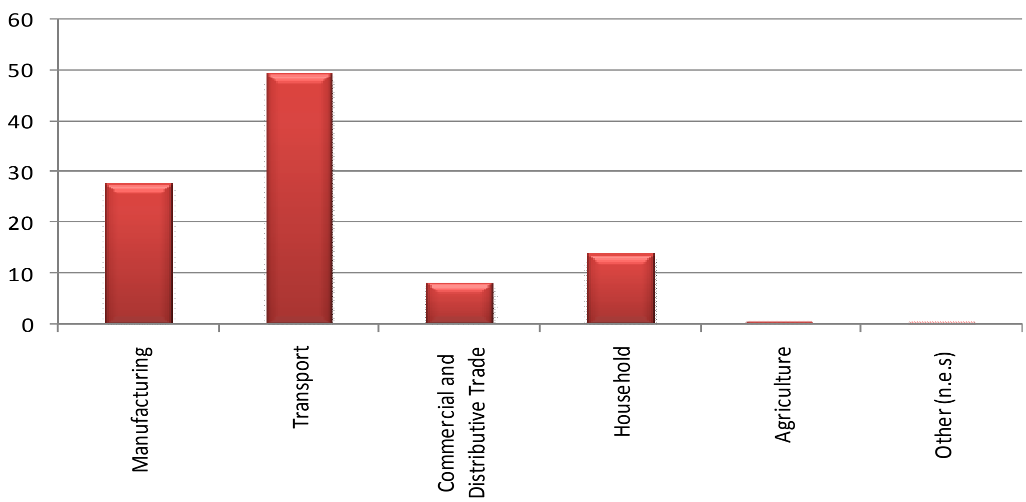


Figure 3. Import bill of energy sources as a percentage of total import bills

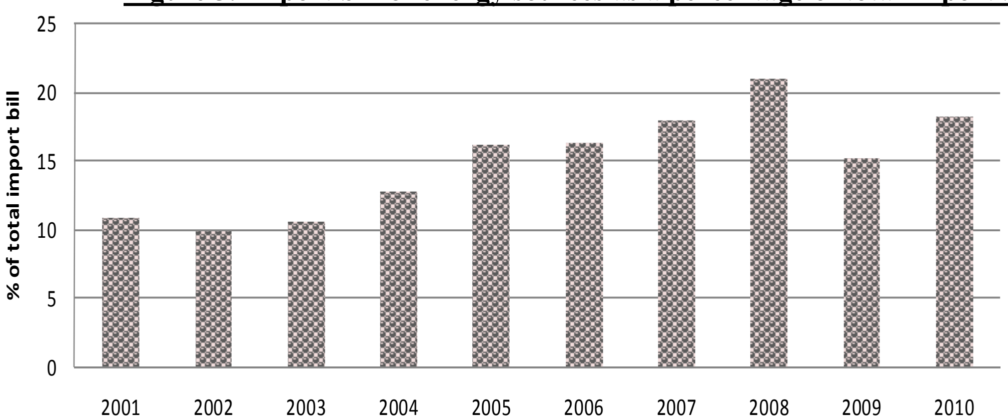


Figure 4. Composition of energy uses/consumption in Mauritius

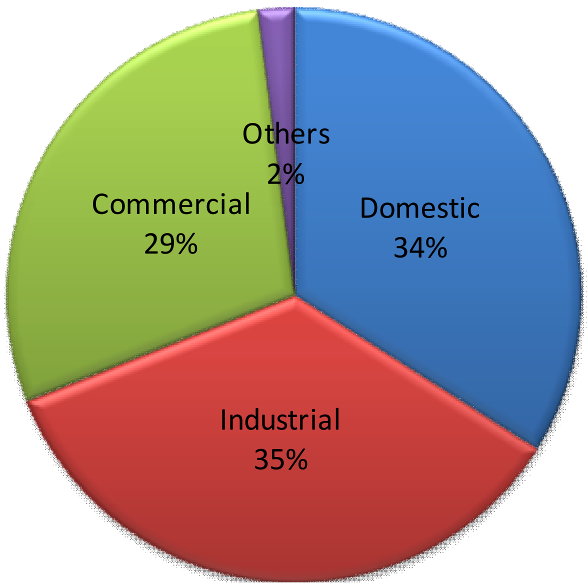
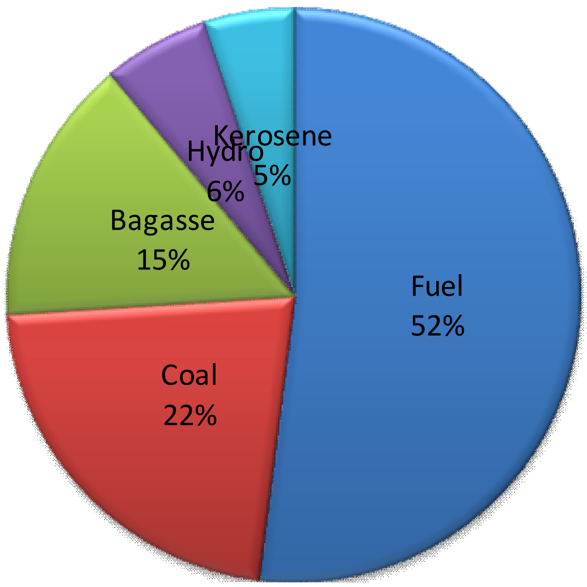


Figure 5. Composition of energy generation in Mauritius



A priori, based on the fact that Fuel and Coal predominate in case of energy us, they are expected to play a critical role in the modelling process. On average, over these fifteen years, Domestic, Commercial and Industrial energy demand constitute 34 %, 29 % and 35 % of total energy consumption in Mauritius while Others represents the rest 2 %[1]. In a parallel manner, on average, over these fifteen years, Hydro, Fuel, Kerosene, Coal and Bagasse energy demand constitute 6 %, 52 %, 5 %, 22 % and 15 % of total energy consumption in Mauritius. Such a finding plainly shows that Mauritius has still a long way to move ahead in the greening process since Fuel and Coal, together represents around 74 % of total energy generation in Mauritius, which systematically projects Mauritius as a hardcore non-green economy in terms of energy use.

Trend analysis based on Hodrick-Prescott filter reveals sustained upward demand for energy consumption, irrespective of whether they emanate from Domestic, Industrial or Commercial sources.

[1] The study will focus on the main users of energy in Mauritius so that ''Others'' will be overlooked.

A conspicuous and worthwhile to note finding is that, as from 2008, Commercial energy consumption rose to new high as to even exceed that of Domestic or Industrial energy consumption. In terms of energy production, Kerosene witnesses a sustained downward trend throughout the years of analysis with two troughs manifesting between 2001-02 and another one in 2007. While Hydro and Fuel energy production seems to be more or less stable, that of Coal witnessed continued increases. Overall, the graphical plots suggests an ongoing rise in energy demand in the forthcoming years and that based on stabilised energy production coming from Hydro and Fuel, further rises in Coal energy production is highly susceptible to manifest.

5. Analytical Framework- Dynamic Estimation based on VAR

To probe into the long-run relationship between energy production (Supply) and energy consumption (Demand), recourse is made towards VAR and if cointegration does prevail, VECM will be used as the econometric model. VAR/VECM approach is used since traditional OLS estimation approach will be biased and susceptible to generate unreliable results. The underlying rationale is that there is high propensity that distinct energy generation sources interact amongst themselves as to trail behind significant endogeneity effects. Above all, in case cointegration manifests, then, the added benefit is its ability to sieve out the short-term effects from the long-term equilibrium. The current paper resorts towards the Johansen and Juselius technique (1990). The Johansen and Juselius approach is based on the following VAR specification.

$$X_t = A_0 + A_1X_{t-1} + A_2X_{t-2} + A_3X_{t-3} + A_4X_{t-4} + ... + A_pX_{t-p} + \varepsilon_t \qquad (1)$$

X is defined as the non-renewable energy demand components under the usual (n x 1) vector (X_{1t}, X_{2t}.,...,X_{nt})’, A depicts the (nxn) coefficients matrix of the lag term of X_t and shows the identically distributed and independent (n x1) vector having zero mean and variance matrix. The endogenous components of VAR comprise of the energy generation sources with energy uses entering the process as exogenous components.

As shown by the unit root tests, not all the variables are integrated of the same order since some variables are already stationary in levels so that VECM application becomes subdued but not VAR. Nonetheless, VAR is still powerful enough as to capture interactions among the variables. The data used in this study comes from the Central Statistics Office, Mauritius based on monthly data that spans over a period of 15 years, from 1995 to 2010. Prior to using the data, they have all been transformed using natural logarithm. In terms of modelling, the variables that represent energy generation sources will, in principle, be considered in the VAR system while the energy demand variables are modelled as exogenous forces. Moreover, the approach taken in this study is robust since recourse is made towards a second analysis by using the cyclical components of each variable, generated from the Hodrick-Prescott filter.

6. Results

Prior to embarking on Vector Autoregressive Regression estimation, it is imperative to effect out unit root tests to ensure stationarity of the distinct variables being modelled. In that respect, recourse is made towards robust unit root investigation based on employment of Augmented-Dickey Fuller test, Phillips-Perron test and KPSS test. All variables have been denoted in GWh, and then transformed using natural logarithm.

Table 1. Unit Root Test Results

	Industrial		Commercial		Domestic		Kerosene	
ADF	-2.341329	-5.343306*	-2.768355	-12.63909*	-3.046893**	-11.7509*	-3.866346*	-9.563602*
PP	-2.914703**	-38.55308*	-1.562209	-12.65273*	-2.244054	-43.45634*	-5.598731*	-47.46584*
KPSS	1.649211*	0.259361	1.812618*	0.009884	1.757767*	0.08763	1.245672*	0.254858
	Fuel Oil		**Hydro**		**Coal**		**Bagasse**	
ADF	-3.210423**	-4.27919*	-6.568026*	-9.264944*	-1.325348	-9.429459*	-2.014487	-14.2561*
PP	-4.717272*	-26.63314*	-5.957292*	-27.80917*	-2.200967	-13.6022*	-5.516904*	-12.13024*
KPSS	0.686933**	0.143135	0.089642	0.196208	1.495165*	0.062209	0.044971	0.028848

KPSS assumes stationary as its null hypothesis test

, denotes statistical significance at the one and five per cent level, respectively.*

In Table 1, the first column under each heading pertains to level, while the second column refers first difference. ADF and PP assume non-stationarity under their null hypothesis while KPSS considers stationarity under its null hypothesis. Results show that Fuel, Hydro, Kerosene and Bagasse are already stationary in level while the rest of the variables considered are non-stationary in levels but stationary when first differenced. The criterion used is to have at least two unit root tests converging towards same results. For instance, in the case of Fuel, ADF and PP confirms stationarity while KPSS rejects same so that Fuel is deemed to be stationary (two out of three).

A priori, a preliminary investigation is required to draw the proper demarcation line between endogenous and exogenous factors. In essence, the forces that drive demand for electricity consumption in Mauritius are categorically considered as exogenous elements in the model. The underlying rationale is that demand for energy consumption is a derived demand which is altogether independent of the level of energy generated. Subsequently, domestic, industrial and commercial energy consumption are systematically inserted as exogenous variables.

However, some energy sources are also exogenous. Hydro element is considered to be exogenous since it is driven by the force of nature. Similarly, Bagasse is deemed to be exogenous as it is driven mainly by the sugar cane production. This leaves Coal, Fuel and Kerosene to be considered as endogenous forces in that one source of energy production may also impact on another energy production source in viewing of sustaining total energy demand. However, when considering Coal, Fuel and Kerosene under VAR, it transpires that exogeneity tests show that Kerosene should be treated as exogenous variable to the plain effect that the final VAR model comprises only of Coal and Fuel as its system. Such a finding bodes well with figure 5 whereby Coal and Fuel constitute the lion's share of total energy generation in Mauritius. Optimal lag selection shows the use of 11 lags and exogeneity tests do confirm interactions between Coal and Fuel with all the rest of the variables considered as exogenous.

Results show that domestic energy consumption does not really influence Coal or Fuel energy production. Industrial energy consumption positively influences Fuel energy production systematically depicting that Fuel constitutes the main type of energy used by Industries with an effect of 0.18% which manifests at the 11 % level. In a parallel manner, Commercial energy usage exerts a positive effect on Fuel energy production with an impact hovering around 0.40 %. However, Commercial energy usage also positively influences Coal with a more pronounced effect of 1.04 % relative to Fuel. Kerosene unleashes a positive effect of 0.01 % on Fuel usage.

The most interesting part of the findings is that Hydro and Bagasse energy production categorically triggers negative effects on both Coal and Fuel energy usage. Despite the economic size effects being low, nonetheless, Bagasse seems to be at least working for reducing the need of Coal energy usage while Hydro works mainly for Fuel energy. However, despite the beneficial effects on renewable energy sources in scaling down non-renewable energy sources, their respective economic size effects are practically low. This signifies that renewable energy sources are not robust enough as to deter the use of non-renewable energy sources so that the government needs to come up with re-engineered and strong policy measures to ensure that Mauritius does move further towards its greening process. In a nutshell, these findings show that Mauritius is endowed with poor level of renewable energy sources and much effort have to be undertaken in that dimension to really move towards Maurice Ile Durable initiative. Kerosene, which initially proved via erogeneity tests to be exogenous, appears to be a complementary energy source to the use of Fuel energy. This signifies that to reduce Kerosene use, Fuel energy use has to be scaled down accordingly.

Post estimation diagnostic tests show successful exogeneity tests, let alone the fact that there is no autocorrelation problem based on the optimal level of lags used. Impulse response functions do not show any systematic trends with respect to the interactions that subsist between Coal and Fuel energy uses (See figures 7 to 9 in appendix). However, interesting findings are noted in the case of the Variance Decomposition analysis which shows that a shock in Coal trails a higher variance effect on Fuel relative to the impact of a shock on the latter to the former's variance.

Table 2. Results under VAR

	Original			Cyclical under HP	
	D(COAL)	**FUEL_OIL**		**CC_COAL**	**CC_FUEL**
D(COAL(-1))	-0.086239 [-1.02460]	-0.051811 [-2.55606] **	CC_COAL(-1)	0.722802 [9.92166]*	-0.046246 [-2.69766] *
D(COAL(-2))	-0.302703 [-3.68403] *	-0.050184 [-2.53613] **	CC_COAL(-2)	-0.201354 [-2.36922] **	0.005371 [0.26857]
D(COAL(-3))	-0.216424 [-2.53764] **	-0.048955 [-2.38355] **	CC_COAL(-3)	0.010846 [0.13256]	-0.000951 [-0.04938]
D(COAL(-4))	-0.261785 [-3.17382] *	-0.020020 [-1.00783]	CC_COAL(-4)	-0.008951 [-0.11171]	0.021758 [1.15402]
D(COAL(-5))	-0.249167 [-3.29482] *	-0.050524 [-2.77422] *	CC_COAL(-5)	-0.104572 [-1.33959]	-0.023841 [-1.29787]
D(COAL(-6))	-0.152159 [-2.01541] **	-0.032146 [-1.76805] ***	CC_COAL(-6)	0.075218 [0.98416]	0.012484 [0.69412]
D(COAL(-7))	-0.350406 [-5.06282] *	-0.043868 [-2.63188] *	CC_COAL(-7)	-0.193515 [-3.03490] *	-0.017956 [-1.19672]
D(COAL(-8))	-0.220678 [-3.04125] *	-0.046727 [-2.67400] *			
D(COAL(-9))	-0.163116 [-2.16355] **	-0.050726 [-2.79382] *			
D(COAL(-10))	-0.126008 [-1.83086] ***	-0.024404 [-1.47235]			
D(COAL(-11))	-0.140925 [-2.02931] **	-0.011095 [-0.66341]			
FUEL_OIL(-1)	-0.156557 [-0.48398]	0.579550 [7.43950] *	CC_FUEL(-1)	-0.137773 [-0.49358]	0.410111 [6.24372] *
FUEL_OIL(-2)	0.553232 [1.56129]	0.115404 [1.35238]	CC_FUEL(-2)	0.354670 [1.17608]	0.090217 [1.27130]
FUEL_OIL(-3)	-0.025755 [-0.07362]	0.012252 [0.14542]	CC_FUEL(-3)	0.100233 [0.33302]	-0.036932 [-0.52145]
FUEL_OIL(-4)	-0.586285 [-1.71729] ***	-0.104817 [-1.27487]	CC_FUEL(-4)	-0.701719 [-2.36425] **	-0.086888 [-1.24404]
FUEL_OIL(-5)	-0.026905 [-0.07873]	0.152012 [1.84703] ***	CC_FUEL(-5)	-0.054946 [-0.18506]	0.105388 [1.50835]
FUEL_OIL(-6)	0.412237 [1.20175]	-0.123170 [-1.49097]	CC_FUEL(-6)	0.758588 [2.54189] **	-0.132478 [-1.88643] ***
FUEL_OIL(-7)	-0.284528 [-0.81850]	0.207804 [2.48226] **	CC_FUEL(-7)	-0.308683 [-1.11914]	0.095972 [1.47863]
FUEL_OIL(-8)	0.662018 [1.84539] ***	-0.167563 [-1.93952] ***	CC_FUEL(-8)		
FUEL_OIL(-9)	-0.390506 [-1.08423]	0.053628 [0.61828]	CC_FUEL(-9)		
FUEL_OIL(-10)	-0.135130 [-0.38745]	0.076013 [0.90499]	CC_FUEL(-10)		
FUEL_OIL(-11)	0.529910 [1.79356] ***	0.134976 [1.89701] ***	CC_FUEL(-11)		
C	-2.134632 [-1.75680] ***	0.369959 [1.26431]	C	-0.014178 [-0.51010]	-0.001266 [-0.19350]
HYDRO	-0.073551 [-1.38534]	-0.040474 [-3.16550] *	CC_BAG	-0.022075 [-1.31222]	-0.008848 [-2.23512] **
BAGASSE	-0.027383 [-1.64942] ***	-0.009720 [-2.43113] **	CC_COM	2.012035 [3.99182] *	0.470039 [3.96292] *
KEROSENE	0.015615 [1.22979]	0.011851 [3.87561] *	CC_DOM	-0.498298 [-0.98305]	-0.101894 [-0.85424]
D(COMMERCIAL)	1.039923 [2.16334] **	0.402832 [3.47973] *	CC_HYDRO	-0.077173 [-1.45821]	-0.043402 [-3.48507] *
D(INDUSTRIAL)	-0.288579 [-0.62268]	0.177751 [1.59261]	CC_INDUS	-0.189893 [-0.36801]	0.340080 [2.80076] *

D(DOMESTIC)	-0.207009 [-0.54056]	-0.065883 [-0.71437]	CC_KERO	-0.035664 [-2.10585] **	0.020744 [5.20527] *
Adj. R-squared	0.396800	0.757797	Adj. R-squared	0.709660	0.730722
F-statistic	5.181889	20.89007	F-statistic	23.36481	25.82981
Log likelihood	105.7703		Log likelihood	127.5199	

A second estimation has also been envisaged in the study in view of sieving out more robust results by using Hodrick-Prescott filter to disentangle the cyclic forces of all the variables. The advantage of using cyclical components of the distinct variables is that they are all already stationary and do not require differencing. Nonetheless, this would constitute the best way to substantiate previous findings. Results are practically the same in the case of variance decomposition and impulse response analyses. In a parallel manner, likewise previous results obtained, no effects are identified as to domestic energy use affecting either Coal or Fuel energy consumption. Commercial energy use again affects both Coal and Fuel, despite that now; the effects are stronger, 0.47 % and 2.01 %, respectively. And finally, Industrial energy consumption is again found to positively influence Fuel energy generation though the impact is relative much higher under the cyclical analysis counterpart. In the case of Hydro energy use, similar findings are noted-negative effect on Fuel energy and no effect on Coal. Again, Bagasse affects Fuel but not on Coal likewise Kerosene which again positively impacts on Fuel but now also engenders a negative effect on Coal. Overall, the cyclical version of the analysis corroborates the previous findings, adding strength to the findings and their ensuing implications.

To know whether energy generation and consumption is sustainable in Mauritius, a stationarity test is applied on the difference between energy production and energy consumption. Findings show that the difference is indeed stationary even at the one per significance level, endorsing the fact that Mauritius is unlikely to face problems in terms of accommodating for an increasing demand in its energy consumption. A more rigorous analysis reveals that total energy generated and total energy used are cointegrated under optimal lags of 12 months, with the long-run coefficient hovering slightly above one, meaning that higher energy demand unleashes slightly more production. Technically, the value one is interesting as it shows that Mauritius does have an efficient energy production process, which may be coined as ‘‘Just-In-Time Energy Production’’.However, such sustainability assessment is biased towards energy requirements with no focus on quality of energy, chiefly vital towards greening the Mauritius economy.

7. Conclusion

This paper constitutes the very first study for Mauritius that explores the relationship between energy generation and energy use/consumption using each of their different components. Basically, there are five types of energy generation, namely Fuel, Coal, Kerosene, Bagasse and Hydro and three types of energy consumption, Domestic, Industrial and Commercial. At the outset, VAR model is used to gauge on the interactions among the distinct energy generation sources and it transpires that Coal and Fuel successfully fulfilled the exogeneity tests while Kerosene, Bagasse, Hydro and the three energy consumption types are fitted in as exogenous variables in the system.

Results show that Fuel usage in Mauritius is predominantly influenced by Industrial demand while Commercial demand affects both Fuel and Coal requirements. Above all, renewable energy sources such as Bagasse and Hydro do exert downward pressures on non-renewable energy sources. But, their economic size effects are low. Cyclical component analysis of the same data tends to show similar findings. Above all, there is strong evidence that Mauritius is an energy sustainable economy since the difference between total energy generated and total energy consumed has been found to be stationary, let alone evidence of a long-run elasticity coefficient slightly above one between total energy generated and total energy used.

Based on the low economic impact on renewable energy sources on non-renewable energy sources, this signifies an urgent need to further develop renewable energy in Mauritius. Indeed, since Mauritius tends to be more or less a flat country, the opportunities for having more hydro power plants are really low. In the same vein, the scope for Bagasse is limited as it merely constitutes a by-product of the sugar cane industry. In that respect, other forms of renewable energy should be fostered. For instance, the ethanol production should be given a real impetus to further promote sustainable development, despite the fact that it emanates from the sugar cane segment. Above all, there still prevails a larger scope to further enhance the solar energy in Mauritius. Recently, MCB, one of the major two domestic banks, sent a strong image to the nation by building the first eco-friendly building which sources its energy from solar energy with anticipated savings of around thirty-five % in energy savings. This signifies that large upfront costs constitute the main hurdle for new companies to adopt the same building strategy and hence the government should play a preponderant role in inducing green financing. Ironically, with the onset of the crisis, it becomes vital to curtail costs and the best way forward would be to radically shift towards solar energy for all buildings to scale down import costs of energy. Nonetheless, at the microcredit level, the government has already given the proper signal via financing incentives provided to households willing to use solar energy.

Recently, the government is reviewing the price of electricity. As per the findings obtained, it would be apt to apply an energy tax on both Commercial and Industrial energy uses to deter the use of non-renewable energy. However, for the CEOs or managers of these Commercial and Industrial institutions to realise the implications of the tax, they should be informed of the long-term benefits in shifting towards solar energy, otherwise the tax would be mere distortionary and acting on the bottom line of the companies in lieu of inducing them to shift towards greener companies. In a parallel manner, more strenuous campaigns should be made to sensitise local citizens about energy efficiency. I believe that mind is the greatest power in this world and no policy can be adopted if the mindset of people is the same. It is only by changing the way things have been done in the past that improvements can be brought forward to ensure proper use of energy.

Overall, commendable efforts have already been made by the government like putting higher taxes on cars that generate higher CO^2 emissions, putting forth a mass transport system to curtail high energy use, encourage car polling, decentralising tertiary education systems and encouraging companies to use company buses for staff travel from their residences to their place of work. However, these policies do not directly tackle the intensive use of non-renewable energy sources so that the tax system, used judiciously, would be really helpful to induce a radical shift in energy use in Mauritius.

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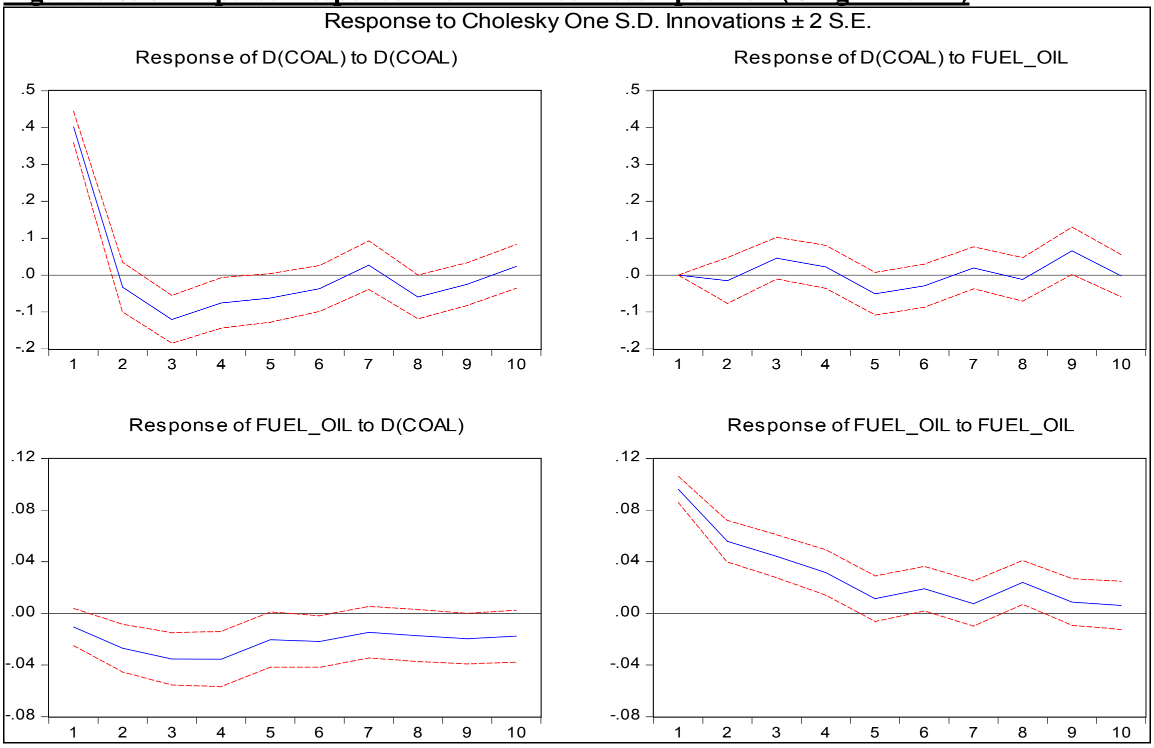
Appendix

Figure 6 & 7: Impulse Response and Variance Decomposition (Original data)



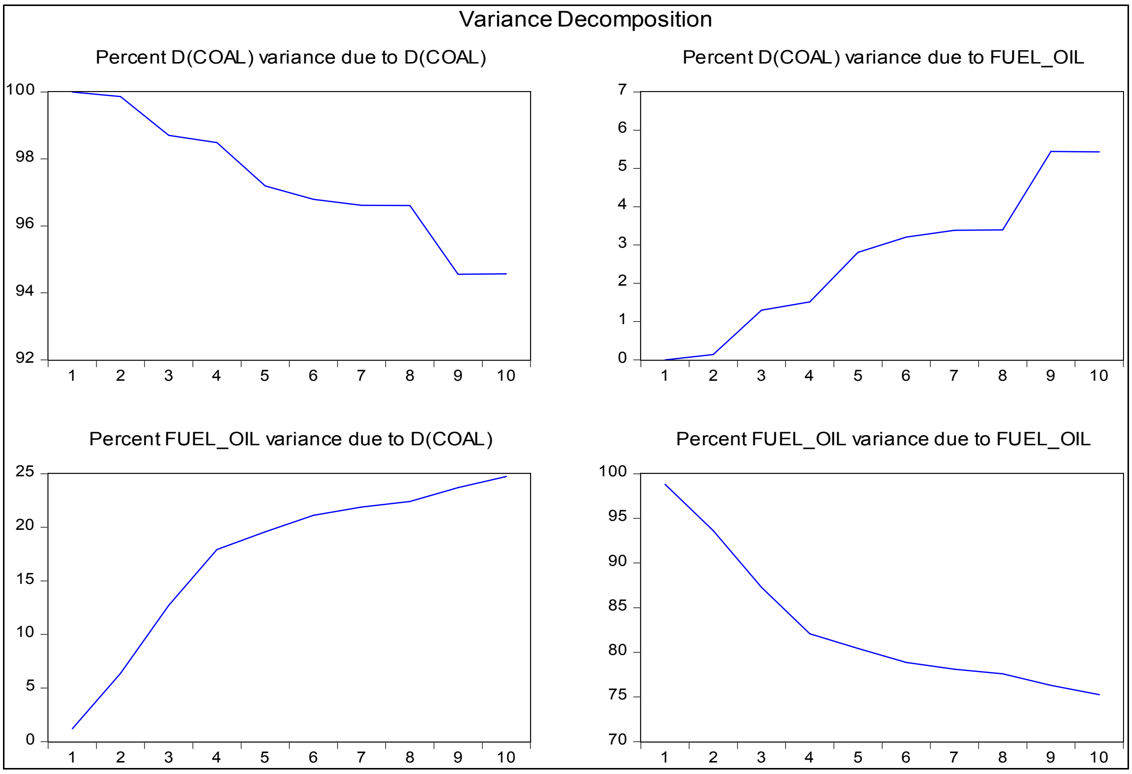


Figure 8 & 9: Impulse Response and Variance Decomposition (Cyclical data)