Chapter 9

OIL DEPENDENCE, IMPACT OF OIL PRICE VOLATILITY AND POLICY RESPONSE IN PAPUA NEW GUINEA

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1. Introduction

Energy consumption is an input to the development process (e.g., various forms of fuel used in industries) as well as an output/benefit (a family driving a car or having electricity connected to their house in a village) of economic development.

Papua New Guinea has vast energy resources including oil, gas, hydroelectricity and renewable energy. As much as 30 per cent of PNG’s export revenue came from the oil (petroleum) and gas sub-sector between 1993 and 2001. The country’s current known oil reserves stand at nearly 500 million barrels and about 40 trillion cubic feet of gas. But the country has always been a producer of crude oil and gas solely for export until 2004. All refined petroleum products for use in industries and daily conveniences in the economy have always been imported until then. A new era dawned on PNG when the new Napa Napa oil refinery was completed and in June 2004 the first shipment of crude oil from Kutubu to be refined at the refinery was made. The first sale of domestically refined product occurred in August 2004. The first export of refined petroleum products also occurred in the same quarter. The refinery is producing marine diesel, diesel, gas oil, naphtha and Jet A1 fuel from the primary distillation unit and gasoline from the reformer unit (for conversion of naphtha to gasoline).

2. Development of National Energy Policy

The National Energy Policy in Papua New Guinea has generally been fragmented and remained so since Independence. Perhaps this reflected the fact that there have been more than one agency involved in different aspects of energy provision in PNG and the country had always imported petroleum products for its energy consumption needs. Each agent had a different perspective to the provision of energy. For instance, the then state-owned Electricity Commission (now corporatised to PNG Power) is responsible for supplying fuel-powered electricity, mainly in urban centres, the Consumer Affairs Council (now the Independent Consumer and Competition Commission) is responsible for pricing regulation, the relatively new Petroleum and Energy Department is responsible for the Government’s interest in the development of projects in the energy area and so on and so forth. These various responsibilities are governed by various respective legislations. There was perhaps complacency on the part of authorities to pay attention to policies relating to alternate energy sources and import replacement.

First, the exploration, discovery and exploitation of energy sources such as crude oil, gas and hydropower in addition to the traditional electricity from transformation fuel and second, the fast pace of market-based development, the need to develop a more coherent national energy policy has become apparent. As the then Deputy Prime Minister and the current Minister for Petroleum and Energy, Sir Moi Avei said in his foreword to the Draft National Energy Policy:

"The way in which we produce, supply and consume energy is of vital importance to sustainable development in all facets, as energy has deep relationships with each of its three dimensions - the economy, the social welfare and the environment."
These relationships are developing in a rather fast and complex manner due to increase globalisation, growing market liberalisation and new technologies, as well as by growing concerns about the climate which we live in and about energy supply security which is vital for vibrant economy and depends on adequate and reliable energy supply due to our demand situation. The diversification of supply sources from the traditional sources of high priced imported oil products (even with our own petroleum products development and yet to be fully developed natural gas resources,) is a positive sign of dependence on the country’s own natural resources.

In order for energy to be an integral part of sustainable development, new policies are needed to be developed and such policies must be cohesively balanced among the three dimensions of sustainable development. Energy should be seen as the engine room of any nation and must be placed high in the echelons of government priority.”  (Draft National Energy Policy, 2005, p4)

In 2005, a project team was tasked to examine the different past polices and come up with a National Energy Policy that will bring every aspect of energy planning and delivery for the nation in a coordinated manner and help the government to deliver on its aims and objectives on national development. Under the auspices of the Department of Petroleum and Energy, particularly the Division of Energy, the team was tasked to produce two policy documents - the Rural Electrification Policy and the National Energy Policy and their accompanying plans; the Rural Electrification Plan and the PNG Energy Plan based on which projects can be initiated and implemented.

The National Energy Policy gives authority for the right of Rural Electrification Policy to be considered for further development of rural area for power development. The National Energy Policy addresses the macro energy issues of the energy sector of the PNG economy whilst the Rural Electrification Policy addresses a specific or micro area of energy, and that is, the provision of electricity in the rural areas. The latter is a subset of the former. One of the objectives of the National Energy Policy is “to contribute to the economic and social development of rural PNG through the provision of cost effective and reliable electricity supplies.” Rural electrification projects both here and in other developing economies have shown that with the delivery of electricity to rural communities, there have been some remarkable improvements in the social and economic indicators in these communities. (Rural Electrification Policy, 2005, p18).

The goal for policy and planning in energy development is: “Open and consultative cross-sectoral policy development and integrated planning to achieve sustainable supply and use of energy”.

The policies, as sourced from the PNG Draft National Energy Policy 2005, to work towards this goal are:

1. Ensure energy sector policy and planning addresses the availability and efficient use of affordable, and appropriate sources of energy, taking into account a balance of social, cultural, technological, institutional, environmental, economic, and global market issues.
2. Promote sustainable energy options for electricity generation, transportation, water supply, health care, education, telecommunication, tourism, food supply, and income generation particularly to the rural population that is without access to electricity.
3. Promote the development of appropriate regulatory guidelines to meet the needs of suppliers and consumers.
4. Assess and promote indigenous resource potential and technical capacity for all aspects of energy sector planning and development.

5. Promote efficient use of energy in all sectors of the economy.

6. Promote the involvement of all stakeholders, including non-government organisations, local communities especially youth and women in policy development and integrated planning.

7. All energy service companies and large mining, agricultural and retail companies are mandated to provide energy data in terms of fuel used, energy generated to the National Energy Office or National Statistical Office for the sector to plan efficiently for the country.

8. Promote the development of national energy policy and related policies and PNG Energy Plans and Electricity Plans that address the reduction of fossil fuel imports and greenhouse gas emissions and strive to meet national renewable energy targets.

9. To convene, as required, an inter Departmental consultative committee (the National Energy Advisory Committee) to discuss and provide advice and recommendations to the Energy Division of DPE on major energy sector issues and initiatives, and to ensure effective co ordination of the PNG Energy Plan is approved across departments and ministries.

The goal of rural electrification is:

increase the provision and accessibility of electricity by 15% of the rural population by the year 2025 through an integrated planning approach.

The policies, as stated in the Draft PNG Rural Electrification Policy 2005, to work towards this goal are:

1. Promote increased use of cost-effective and environmentally friendly reliable electricity supplies to rural areas through both grid-connected electrification programs and stand-alone renewable-based power systems.

2. Promote a level playing field approach for the application of renewable technologies and conventional energy sources where feasible in rural areas.

3. Promote a joint approach by all stakeholders for the development and supply of electricity.

4. Mobilise external financing and other resources to develop renewable rural electricity initiatives.

5. Maximise net benefit to meet existing economic and social development needs.

6. Ensure that CDM renewable energy projects approved by NCDMA be collaboratively developed and administered for the recipient community.

### 3. The Energy Sector

The energy sector in PNG comprises all activities revolving around the exploration and development of energy resources and their transportation and retail, to the generation, transmission and distribution of electricity (electrical energy), including the production of energy products. Thus, the sector includes sub-sectors such as petroleum, gas, hydropower, mini-hydropower, thermal electricity (from diesel, gas and biomass generation), wind and solar power generation, as well as mineral extraction. (Draft National Energy Policy, 2005, p18.)
3.1. Supply/Production of Energy in PNG

Papua New Guinea has enormous alternative energy resources, which are grossly under-developed. For example, of hydroelectricity potential of some 15,000 megawatts, only one per cent (1%) has been developed\(^2\). PNG has abundant potential of biomass.

Of the total domestically produced primary energy supply in 2002, crude oil and petroleum products accounted for 84 percent, natural gas 10 percent, the balance consisted of 6 percent including hydro and other fuels. Around 85 percent of the total domestic energy production is exported. Most of gas produced was used for electricity generation for the Porgera Gold Mine while all of the hydro and other fuels were for the generation of domestic electricity.

![PNG Primary Energy Supply by Fuels (2002)](Image)

(Taken from the Draft National Energy Policy Document, Original Source: EDMC, IEEJ, Japan)

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Figure 2
PNG Primary Energy Supply Trend (1980 to 2025)

Source: Token from the Draft National Energy Policy. Original Source - Actual Data APEC & DPE; Forecast - DPE

<table>
<thead>
<tr>
<th>Year</th>
<th>Energy Supply (BAU at 3.05% GDP)</th>
<th>Energy Supply (BAU at 2.5% GDP)</th>
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<tbody>
<tr>
<td>1980</td>
<td>604</td>
<td>604</td>
</tr>
<tr>
<td>1985</td>
<td>700</td>
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</tr>
<tr>
<td>1990</td>
<td>952</td>
<td>952</td>
</tr>
<tr>
<td>1995</td>
<td>731</td>
<td>731</td>
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<td>806</td>
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<tr>
<td>2010</td>
<td>1,488</td>
<td>1,488</td>
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<tr>
<td>2015</td>
<td>1,729</td>
<td>1,729</td>
</tr>
<tr>
<td>2020</td>
<td>2,009</td>
<td>2,009</td>
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<tr>
<td>2025</td>
<td>2,335</td>
<td>2,335</td>
</tr>
</tbody>
</table>

Figure 3
Petroleum Products Supply Trend (1980 - 2025)
3.2. Demand for Energy in PNG

3.2.1. Electricity/Power Sector
3.2.2. Industry Demand

Taken from the Draft National Energy Policy Document, Original Source: APEC & DPE; Forecast - DPE
3.2.3. Agriculture Demand for Energy (Agriculture Sector is Treated Separately from Industry)

![Figure 8: Agriculture Energy Consumption](image)

Taken from the Draft National Energy Policy Document. Original Source: APEC & DPE; Forecast - DPE

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<tbody>
<tr>
<td>Agriculture (BAU)</td>
<td>30</td>
<td>33</td>
<td>81</td>
<td>77</td>
<td>103</td>
<td>110.73</td>
<td>119.03</td>
<td>127.56</td>
<td>137.55</td>
<td>147.87</td>
</tr>
<tr>
<td>Agriculture (3% GDP)</td>
<td>30</td>
<td>33</td>
<td>81</td>
<td>77</td>
<td>103</td>
<td>106.09</td>
<td>109.27</td>
<td>112.65</td>
<td>115.93</td>
<td>119.41</td>
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<tr>
<td>Agriculture (5% GDP)</td>
<td>30</td>
<td>33</td>
<td>81</td>
<td>77</td>
<td>103</td>
<td>108.15</td>
<td>113.56</td>
<td>119.24</td>
<td>125.2</td>
<td>131.46</td>
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3.2.4. Transportation Sector Demand for Energy

![Figure 9: Transport Energy Consumption](image)

Taken from the Draft National Energy Policy Document. Original Source: APEC & DPE; Forecast - DPE
4. Oil Dependency

Papua New Guinea is the second-largest country in the Oceania or the South Pacific region in terms of population and third in terms of land area. It is endowed with a rich natural resource base that includes major gold and copper deposits, large oil and natural gas reserves, and extensive forests and maritime fisheries. Despite these abundant resources, the economy still struggles to achieve sustained economic growth. Real GDP growth has mostly been low to moderate since independence in 1975. Only in the 1990s, particularly in the first half of the decade, did the economy experience high growth of real GDP. This was due to the mineral boom with new mines and the first crude oil production coming into being.

Following the instability of the late 1990s, the PNG economy is now going into its 5th year of macroeconomic stability and economic recovery, supported by sound economic policies and high export commodity prices. "Continued high export commodity prices have significantly strengthened the external position since 2004, which has led to a sharp increase in net foreign assets, while disciplined macroeconomic policies and low interest rates have spurred business confidence, which has led to the increase in private sector credits and net domestic assets since 2005." (IMF's selected issue paper “Liquidity and Inflation in PNG” for IMF Article IV Consultation in 2007).

Energy consumption has increased steadily over the years. Demand for petroleum products increased as total energy demand increased. All the demand for petroleum products were met through imports. It has been the single major form of energy. In 1993, production and export of crude oil commenced, following the successful exploration and subsequent negotiations between the foreign investor, the government and the landowners for the Kutubu oil project in the highlands region to take place. As the output, crude oil, was all exported, the economy’s dependence on imported refined oil product continued. However, as a share of total energy consumption, demand for petroleum products declined slowly as the other forms of energy consumption, hydro for electricity and gas increased their share.

This scenario changed in 2004 when a new era dawned on Papua New Guinea, with the first oil refinery- the Napa Napa oil refinery- outside of Port Moresby began producing refined oil products from crude oil. Some of the refined products are exported while some go towards meeting the demand in the domestic market. Consequently, the overall oil dependency of the economy declined markedly to around 50 percent.

Table 1

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<tbody>
<tr>
<td>1990</td>
<td>450</td>
<td>410</td>
<td>85.0</td>
<td>60</td>
<td>NA</td>
<td>103</td>
<td>103</td>
<td>0.0</td>
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<tr>
<td>1995</td>
<td>502</td>
<td>477</td>
<td>84.0</td>
<td>65</td>
<td>NA</td>
<td>100</td>
<td>103</td>
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<tr>
<td>2000</td>
<td>541</td>
<td>448</td>
<td>81.9</td>
<td>65</td>
<td>NA</td>
<td>100</td>
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<tr>
<td>2005</td>
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<td>475</td>
<td>80.0</td>
<td>60</td>
<td>NA</td>
<td>100</td>
<td>100</td>
<td>5.0</td>
<td>90.0</td>
</tr>
</tbody>
</table>

Notes

1) An estimation is assumed for hydro and gas energy, which is added onto the consumption of petroleum products.
2) The total consumption of petroleum products is obtained by the summation of industries' consumption of oil products.


3) The extent scope of Oceania is defined variably, with interpretations including Australia, New Zealand, New Guinea, and various islands of the Melanesian Archipelago.
5. Price Determination Mechanism of Fuel Products

The project agreement signed in 1997 by the Government and InterOil Ltd for the latter to build and operate an oil refinery in PNG has embedded in it, a provision for the pricing of fuel products from the refinery. The fuel products are to be sold to domestic distributors at Import Parity Price (IPP). This means that the products would be treated as if they were imported. The IPP is the CIF price (in kina) of importing equivalent products from Singapore. It is calculated monthly based on the previous month’s Singapore prices.

Upon becoming operational in mid 2004, the refinery has since supplied all of PNG’s requirements for petrol, diesel and kerosene. The Independent Consumer and Competition Commission (ICCC) regulates and monitors the prices of the fuel products ex-Napa Napa to ensure they are consistent with the IPP. This comes under the Petroleum Pricing Review Final Report issued in August 2004. Under the Report, the calculation of the retail prices for fuel product is based on a framework that is effective until 2009. An indicative retail price is announced on the 8th of each month and is arrived at by adding freight charges, taxes and the retailer’s profit margin to the IPP. Prices may differ across provinces/centres due to differences in freight costs.

\[
\text{IPP + Excise Duty + Freight Charge + Retailer’s Margin + General Sales Tax (10\%)}
\]
\[
= \text{Retail Price of Petrol, Diesel and Kerosene}
\]

There is no government subsidy for prices of petroleum products.

6. Impact of and Policy Responses to Volatile Oil Prices

To look at the impact of the recent/current world oil price increases and the response of macroeconomic policy, in particular monetary policy, it is necessary to look at the key economic fundamentals at the different time periods.

Historically, the first oil crisis of 1974/75 and the second oil crisis of 1980-82 resulted in a deteriorated terms of trade for the Papua New Guinea economy and a rise in inflation. The rise in oil prices caused inflation to increase in PNG’s major trading partner economies such as Australia. This in turn led to increased imported inflation given PNG’s great dependence on imports, yielding inflation rates of 14.3 percent in 1973 and 19.7 percent in 1974. Similarly, in 1980 to 1982, inflation rate averaged 8.1 percent.

On both occasions, the international prices of the major agricultural and mineral export commodities declined. That led to deteriorated balance of payments positions for the economy.

By contrast, the oil price increase of the 2000s is accompanied by high agricultural and mineral commodity prices, induced by China and India’s economic growth. Thus, the terms of trade has not deteriorated. The relatively high export commodity prices led to increased exports, a healthy balance of payments position for the PNG economy and an increase in international reserves to a record level of US$699 million in the fourth quarter of 2004 and by the end of 2006, it was over US$1.0 billion. The high international reserves combined with a relatively weak US dollar and prudent fiscal management led to a relatively stable kina exchange rate. The kina appreciated against the US dollar from the record low of 25 US cents in 2002 to 30 US cents in the fourth quarter of 2003 and stabilised between 30 and 32 cents in
2004 and the end of 2005 and reached 33 US cents by the end of 2006. Against the Australian dollar, the kina has varied between 40 and 45 cents. Relative to the first nine years of the floating exchange rate regime, this represents a short but significant period of a sustained stable kina in the 11 years of the regime. Exchange rate movement is a major determinant of inflation in the PNG economy, as shown by internal Bank of Papua New Guinea research. The feed through of changes in a trade-weighted exchange rate to inflation is 0.5 percent for every percent depreciation of the Kina over four quarters (Sampson, Nindim, Marambini and Yangon, 2006). Given this, the relatively stable Kina has helped PNG to achieve low inflation, as measured by the consumer price index (CPI), of 2 to 5 percent in the 2004 to 2006 period, the lowest since the floating of the Kina in 1994.

Moreover, despite the worldwide oil price increases, inflation rates in PNG’s major trading partners have been low. In particular, Australia’s inflation has been at around 2 percent, driven by the strong Australian dollar and strong economic growth. This translated into low imported inflation for PNG unlike in the first two oil price crises. If there were high inflation in PNG’s major trading partner economies, there could have been higher inflation in PNG under the stable Kina, given the experience of high inflation in the first two periods of oil crisis under the fixed exchange rate system when imported inflation increased.

We do not imply by the above that the current international oil price rises does not impact on PNG. Indeed, the prices of fuel products have risen by some 20 percent or more between 2003 and 2006. The impact on the overall inflation is, however, to a lesser extent than during the first two oil crises. One technical or operational factor for the lesser impact could be that fuel products account for a very low weight (1.51 percent) in the CPI basket of goods. However, the influence of increased fuel prices on other goods and services would be sufficient for the second round effect, as they have high weights in the CPI and fuel is an input for their supply.

The ultimate impact of increased oil prices on the PNG economy, as in many economies, is on inflation and production. The formulation of monetary policy does not account directly for the first round of increased oil prices. It caters for oil price changes indirectly through the forecasts of inflation which has embedded in it oil price changes. It reacts to the second or subsequent rounds of increased inflation, as measured by the CPI. With low inflation in 2003 to 2006, the Bank of Papua New Guinea eased its monetary policy in the second half of 2003 and has maintained that stance through to 2006. During the same period, real gross domestic product (GDP) grew by around 2 to 4 percent, induced by the high export commodity prices, including oil prices, and the stable macroeconomic conditions, following the dismal GDP performance in the late 1990s to 2002.

7. Structural VAR Model Results

This section presents indicative results of the structural VAR analysis, when the VAR method is applied on the PNG economy data for the period 1996.1 to 2005.4.

The Figure 10 below reports the impulse responses of the economy to a shock in oil prices. In response to a 2.0 percent increase in oil price, the domestic currency (Kina) appreciates by around 0.5 percent before stabilising by the 6th quarter (top right panel). The exchange rate appreciates because in the PNGS economy, a rise in oil price means more foreign exchange earnings from the export of oil, which exerts an upward pressure on the exchange rate. Government revenue increases by about 3 percent in the 2nd quarter (middle left panel) and declines by the 4th quarter. It stabilises by the 12th quarter. The increase in Government revenue comes from increased mineral tax that results from increased exports of oil, itself being the response to the oil price increase. Inflation increases by 0.5 percent by
the 2nd quarter (middle right panel) and fluctuates between 0.5 and -0.5 percent over 6 quarters before stabilising in the 8th quarter. Real GDP grows marginally by 0.25 percent then fades away by the 10th quarter. The growth in real GDP is consistent with the growth in export earnings (supply response) although the exchange rates appreciated.

8. Conclusion

The results of the VAR model together with the qualitative analysis has to be understood with a caution that not all factors for the performance of the economy with respect to the oil price increase can be explained in that context only. Our explanation is only within the context of the macroeconomics of the economy and what the model can explain.

The structural VAR model results are consistent with the qualitative analysis provided earlier. The increase in international oil price did not lead to a decline in activity as might be
expected because the higher price actually induced a growth in export of oil, which together with increased production and export of other commodities, also because of higher prices, led to an increase in real GDP. This is contrary to the popular belief that increased oil prices would induce a decline in demand and therefore a decline in activity. The increase in foreign exchange inflows, supported by prudent fiscal management, caused the Kina to appreciate instead of depreciating as one might expect from increased prices of PNG tradable goods. The relative stability in the exchange rate and low imported inflation helped PNG attain low inflation outcomes.

All these are in contrast to the experiences of the first two oil crises, where PNG experienced a deteriorated terms of trade, low growth in exports, high inflation because of high imported inflation and subdued economic activity.

The stability in the exchange rate, low inflation and good fiscal management made it easy for the Central Bank. From the second half of 2003, it eased monetary policy and has maintained that stance throughout most of the 2003 to 2006 period. This is in contrast to the expectation that during the period oil price rise, a central bank would normally adopt a tight monetary policy stance in fear of inflationary pressures. The factors underlying this stance are explained above. The stance and conduct of monetary policy has also assisted the macro environment. The maintenance of an easy (officially called “neutral”) stance has led to a low interest rate environment, which has encouraged growth in credit. The real GDP growth in 2005 and 2006 especially can partially be attributed to that.
References

2. Government of PNG, (2005), Rural Electrification Policy, Department of Petroleum and Energy, Port Moresby.
5. Various Consultations with PNG Power, Independent Consumer and Competition Commission and Interoll Products Ltd.
6. Papers from the two SEACEN Workshops on the Project.