Accounting for Depletion of Oil and Gas Resources in Malaysia[*, #]

By

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Abstract

This paper provides an assessment of the changes in the availability of oil and gas resources in Malaysia. The physical and monetary balance sheets for crude oil and natural gas for the period 2000- 2007 was constructed. The net present value of expected future incomes to reflect the value of resource change was calculated based on a physical extraction and a resource rent scenario. Resource rent is gross operating surplus less the estimated user cost of produced capital in the crude oil and natural gas extraction industry. We obtained the gross operating surplus by subtracting the value of consumption of employees and net taxes on production cost from the value added of petroleum domestic products. Our findings noted serious reduction of oil reserves from 2001 – 2005, due to changes in crude oil prices, and thereafter the depletion rate decreased. Malaysia has depleted her natural gas reserves mainly in 2004 and 2005. Changes in reserves values were attributable more to price changes and new discoveries. Further, our study shows that the royalty rate paid by the state oil company, Petronas was far less than the estimated resource rent.

JEL Codes: Q56 - Sustainability; Environmental Accounts and Accounting

Topics: Environmental Economics and Policy; Resource / Energy Economics & Policy

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Introduction

Subsoil assets account for a large proportion of the natural assets of certain regions in Malaysia. Subsoil assets in Malaysia are predominantly composed of crude oil and natural gas reserves by virtue of economic value. There also exists a small fraction of coal reserves and other subsoil assets but their monetary value is relatively small.

Subsoil minerals particularly oil and natural gas have played a crucial role in the Malaysian economy over the past four decades. The National oil and gas company (Petronas) to date remains the most important contributor of federal government's income, contributing some 40% to the federal budget annually.

The Gross Domestic Product (GDP) captures well the benefits of mineral extraction and products from their flows in the economy. However, changes in the stocks of subsoil assets are clearly omitted from the GDP. Therefore, national income accounts of resource-rich economies that fail to include mineral assets may seriously misrepresent true progress in national income and wealth generation over time. Furthermore, energy resources extraction and consumption are strongly attributable to many serious local and global environmental problems such as air pollution and global warming, directly or indirectly from the combustion of fossil fuel. This study, however, gives special focus on the valuation of reserves and depletion of crude oil and gas resources in Malaysia.

As of 2010, Malaysia held proven reserves of some 4 billion barrels, which stands for the third highest oil reserves in Asia pacific region after China and India (EIA). Malaysia is the world's eighth largest owner of natural gas reserves with 83 trillion cubic feet (Tcf) of proven reserves.

Malaysia's total oil production in 2009 was 693,000 barrels per day (bbl/d). Production has been declining since its peak of 862,000 bbl/d in 2004 due to the maturing of most of her offshore fields. Malaysia consumes most of her production where exports in 2009 were 157,000 bbl/d (EIA). The government is currently enhancing output from existing fields and developing new fields in deepwater areas. Natural gas production has been rising gradually, reaching 2.1 Tcf in 2009. However, domestic natural gas consumption has also been increasing steadily, reaching 1.0 Tcf in 2009. Based on current extraction rates, Malaysia's crude oil and natural gas reserves are expected to last for 20 years and 34 years, respectively.

The need for the compilation of physical and monetary balance sheets for subsoil assets stems from the idea that non-renewable assets have a finite capacity to supply input materials. Taking into account the depletion of subsoil assets into GDP accounts will show a clear link between resource changes and economic growth. We will be able to ascertain if resource rents are re-invested adequately to generate capital assets to enable future productive capacity of economic

systems. Such analyses will demonstrate a clear path and guide towards improved policy formulation in light of sustainable development quest in Malaysia.

Classification of Oil and Gas Reserves

In Malaysia, the integrated resources classification system for oil and gas uses two categories of resources - discovered and undiscovered (CCOP, 1999). Discovered resources encompass ultimate recovery and potential recovery based on commerciality, producibility and uncertainty. Reserves refer to remaining commercial quantity of oil and gas after deduction of cumulative production from the ultimate recovery and consist of proved, probable and possible. Potential recovery includes the proved, probable, and possible as well. The undiscovered resources (speculative recovery) are classified further into low, expected, and high values.

Compilation of Physical Balance Sheets

Physical asset accounts depict the physical terms of the stocks and the change in stocks over a period of time. It shows the statistics on initial stocks, additional exploitable reserves, depletion, and end period stock. The main objectives of a stock account are to measure the absolute level of natural resources at a point in time as an indication of the country's wealth, and to show any change in its stock levels over a certain period of time.

The compilation of physical balance sheet each year starts with an opening stock, which is equal to the closing stock of the previous year. During the year, the opening stock is affected by three sources of flows, viz: 1) reappraisal of existing reserves due to new information, new technology and price changes, 2) new discoveries, and 3) extractions. Based on a number of published sources, the physical balance sheets of oil and gas reserves for Malaysia were compiled for the period 2001 -2007 (Table1 and Table 2).

Table1: Physical Balance Sheet of Crude Oil (billion barrels)

Years	2001	2002	2003	2004	2005	2006	2007	Source
Opening stock								
Remainder of proven reserves 1st January	3.9	3	3	3	3	3	3	EIA
Remainder of probable reserves 1st January	.59	1.24	1.544	1.841	2.288	2.252	2.357	Total Reserve - Proven Reserve
Remainder of reserves 1st January	4.49	4.24	4.544	4.841	5.288	5.252	5.357	PETRONAS
Opening stock:	4.49	4.24	4.544	4.841	5.288	5.252	5.357	PETRONAS
Reappraisal (gross) (+)	-0.25	0.304	0.297	0.447	-0.036	0.105	-	Closing Stock - Opening Stock
New discoveries and Re-evaluation of discovered resources (+)	-0.0094	0.5589	0.5663	0.7227	0.1943	0.3286	-0.0094	Calculated
Production/extraction (-)	0.2406	0.2549	0.2693	0.2757	0.2303	0.2236	0.2147	EIA
Other adjustment (= reminder)	-	-	-	-	-	-	-	-
Net closing stock (balanced via other adjustment)	4.24	4.544	4.841	5.288	5.252	5.357	NA	PETRONAS

Table2: Physical Balance Sheet of Gas Reserves (billion cubic feet)

Resource stock of oil	2001	2002	2003	2004	2005	2006	2007	Source
Opening stock								
Remainder of proven reserves 1st January	81700	75000	75000	75000	75000	75000	75000	EIA
Remainder of probable reserves 1st January	550	12490	14026.1	12028	10203.9	12958	13928.9	Total reserve - Proven Reserve
Remainder of reserves1st January	82520	87490	89026.1	87028	85203.9	87958	88928.9	PETRONAS
Opening stock	82520	87490	89026.1	87028	85203.9	87958	88928.9	
Reappraisal (gross) (+)	4970	1536.1	-1998.1	-1824.1	2754.1	970.9	-	Closing Stock - Opening Stock
New discoveries and Re-evaluation of discovered resource (+)	6627.7	3248.9	7.8	380.6	4996.6	3160.4	6627.7	Calculated
Production/extraction (-)	1657.7	1712.8	2005.9	2204.7	2242.5	2189.5	2277.8	EIA
Other adjustment (= reminder)	-	-	-	-	-	-	-	-
Net closing stock (balanced via other adjustment)	87490	89026.1	87028	85203.9	87958	88928.9	NA	PETRONAS

Compilation of Monetary Balance Sheets

To construct the monetary balance sheet, this paper uses the Net Present Value (NPV) approach with assumptions made on future physical extractions and social discount rates to estimate the unit resource rent. Such monetary accounts will allow the aggregation of various asset classes and hence comparison can be made in terms of their respective contributions to the nation's wealth.

The NPV method is based on assets theory, which calculates the present value (market value) as the sum of discounted expected future resource rents. How much we have, how much we have used and how long will it last are key questions at the time of valuing the asset. In this study, the present value of the future resource rents was based on a social discount rate of 10 percent. Theoretically, the net present value under certain conditions - such as no taxes will be equal to the market value of the resource. The NPV method is recommended by the Handbook on Measuring Capital (OECD), the System of National Accounts (SNA) and SEEA 2003.

Definition of Resource Rent

Resource rent (RR) refers to the net income from resource extraction. It is defined as total revenue from sales less all costs incurred in the extraction process including user cost of produced capital. This means the resource rent represents the returns from the resource only. In this study, the resource rent was calculated by subtracting the user cost of produced capital from the gross operating surplus (economic rent) of the industry (extraction of both crude oil and natural gas). Since the data on operating surplus is not available, it was proxied by subtracting the value of intermediate consumption, consumption of employees and net taxes on production cost from the value of output. The results are shown in Table 3.

Given the definition of resource rent, the return to fixed capital (user cost of capital) is deducted from the net operating surplus each year. The appropriate rate of returns relates to the choice between the application of the default rate of 8% (as proposed by the Eurostat Task Force on Subsoil Assets), or the application of a rate of 8% *plus* an indicator of general prices changes. This paper considers a default rate of 8% adjusted for inflation. For the general indicator of price level, the deflator of Gross Domestic Product (GDP) at market prices was used. It can be shown that the use of an inflation-adjusted rate of return to capital can significantly affect the results for the 'net resource rent'. This is by the combination of the level of inflation itself and the capital stock/operating surplus ratio. The larger the capital stock, relative to operating surplus and the larger the GDP-deflator, the larger the effect of accounting for inflation on the resource rent.

Table 3: Gross Operating Surplus (crude oil and natural gas) in Malaysia (RM thousand)

	2001	2002	2003	2004	2005	2006	2007	Source
Gross domestic product	33365000	33524000	40492000	42,001,000	41,853,000	41,405,000	42,196,000	National Product at expenditure Accounts,
Compensation of Employee	831270	925814	1023355	894318	1040067	1391422	1828305	Petroleum and Natural Gas Statistic (Various Years)
Salaries and wages paid	773115	883695	953632	789507	955571	1258548	1667965	Petroleum and Natural Gas Statistic (Various Years)
Employers contribution	58155	42119	69723	104811	84496	132874	160340	Petroleum and Natural Gas Statistic (Various Years)
Taxes on production	19395000	22509000	21875000	23347000	27051000	25058000	25772000	Ministry of Finance
Taxes on products	19395000	22509000	21875000	23347000	27051000	25058000	25772000	
Other taxes on production	-	-	-	-	-	-	-	
Subsidies on production	-	-	-	-	-	-	-	Distribution of National Capital account (2005) Mentioned that there was no subsidies on petroleum extraction
Subsidies on production	-	-	-	-	-	-	-	
Other subsidies on production	-	-	-	-	-	-	-	
Gross operating surplus	13138730	10089186	17593645	17759682	13761933	14955578	14595695	Authors' Calculation
Consumption of fixed capital	2035887	2506170	2705474	2701750	2988389	4026365	4753193	Petroleum and Natural Gas Statistic (Various Years)
Net operating surplus	11102843	7583016	14888171	15057932	10773544	10929213	9842502	Authors' Calculation

Table 4: Calculation of Resource Rent (RM thousand)

Year	Operating surplus (net)[1]	Capital stock (net)[2]	Return to fixed capital stock (r=8%)[3]	Return to fixed capital stock R + inflation)[4]	Resource rent (r=8)[5]	GDP – deflator (changes in %)[6]	Resource rent (r = 8 + inflation)[7]	Effect of inflation adjustment on RR (in %)[8]
2001	11102843	11868570	949485.6	761962.19	10153357	-1.58	10340881	1.84691
2002	7583016	14029697	1122375.76	1561505.3	6460640	3.13	6021511	-6.797
2003	14888171	15895423	1271633.84	1796182.8	13616537	3.3	13091988	-3.85229
2004	15057932	26815592	2145247.36	3756864.4	12912685	6.01	11301068	-12.4809
2005	10773544	26482209	2118576.72	3344703	8654967	4.63	7428841	-14.1667
2006	10929213	31304405	2504352.4	3700180.7	8424861	3.82	7229032	-14.194
2007	9842502	43733572	3498685.76	5772831.5	6343816	5.2	4069670	-35.8482

Sources:
1. Calculated by authors
2. Petroleum and Natural Gas Statistic (Different Years)
3. Literature Review for r=8% and SEEA
4, 5, 7, 8. Calculated by authors
6. World Bank

The compilation of individual balance sheets for oil and natural gas requires the calculation of a separate resource rent for oil and for natural gas. It was not possible at this point to make a clear distinction between the production costs of oil and gas. Therefore, we presumed that the ratio between the two resource rents is equal to the ratio between the production values of oil and gas. Thus, we used the production values as weights to apportion the resource rent for oil and gas (Table 5). Table 6 shows the estimated resource rent per standard cubic feet (scf) of natural gas and barrel of oil equivalent.

Table 5: Calculation of Resource Rent for Crude Oil and Natural Gas

Year	2001	2002	2003	2004	2005	2006	2007	Source
Petroleum production (RM Million)	36,363	37,968	40,310	42,001	41,854	41,405	42,196	Year Book statistic (different years)
Crude oil production (RM Million)	20687	21349	22275	22529	20634	19999	20824	Year Book statistic (different years
Natural gas production (RM Million)	15,676	16,619	18,035	19,472	21,220	21,406	21,372	Year Book statistic (different years
Crude oil production share	0.5689	0.56229	0.55259	0.53639	0.493	0.48301	0.49351	Calculated by Authors
Natural gas production share	0.4311	0.43771	0.44741	0.46361	0.507	0.51699	0.50649	Calculated by Authors
Resource rent in crude oil production (r = 8) (RM Thousand)	5776269.7	3632749	7524395	6926261	4266894	4069286	3130714	Calculated by Authors
Resource rent in natural gas production (r = 8) (RM Thousand)	4377087.3	2827891	6092142	5986424	4388073	4355575	3213102	Calculated by Authors
Resource rent in crude oil production (r = 8 + inflation)	5882952.6	3385831	7234533	6061802	3662415	3491690	2008409	Calculated by Authors
Resource rent in natural gas production (r = 8 + inflation) (RM Thousand)	4457928.4	2635680	5857455	5239266	3766426	3737342	2061261	Calculated by Authors

We used a fixed extraction rate of 610 barrel per day and 2280 billion cubic feet for natural gas per year. Annual future or expected unit resource rent was based on assumption of future price developments. Future price scenarios for oil and gas are often very unreliable, and plagued with uncertainties.

Table 6: Calculation of Unit Resource Rent

Year	Production of crude oil (thousands barrel)[1]	Production of natural gas (billion cubic feet)[2]	Resource rent per barrel (r = 8):RM	Resource rent per billion cubic feet (r=8):Cent	Resource rent per barrel (r = 8+ inflation: RM	Resource rent per billion cubic (r = 8 + inflation):Cent
2001	240612	1657.7	24.006	0.26	24.449	0.27
2002	254938	1712.8	14.249	0.17	13.281	0.15
2003	269319	2005.9	27.938	0.30	26.862	0.29
2004	275703	2204.7	25.122	0.27	21.986	0.24
2005	230341	2242.5	18.524	0.20	15.899	0.17
2006	223599	2189.5	18.199	0.20	15.615	0.17
2007	214700	2277.8	14.581	0.14	9.354	0.09

Source: 1, 2: EIA

Because oil and gas prices fluctuate very heavily, we decided to use a 3-year moving average basis to estimate the expected unit resource rent. By taking an average of the last three years prices, the estimated monetary values of oil and gas reserves became less sensitive to yearly fluctuations of oil and gas prices.

Table7: Expected Unit Resource Rent

Years	Resource rent per barrel (r = 8) (RM)	Resource rent per billion cubic feet (r = 8) (Cent)	Resource rent per barrel (r = 8 + inflation (RM)	Resource rent per billion cubic (r = 8 + inflation) (Cent)
2008	17.10	0.18	13.62	0.14
2009	16.63	0.17	12.86	0.13
2010	16.10	0.16	11.95	0.12
2011	16.61	0.17	12.81	0.13
2012	16.45	0.17	12.54	0.13
2013	16.39	0.17	12.43	0.12
2014	16.48	0.17	12.60	0.13
2015	16.44	0.17	12.52	0.13
2016	16.44	0.17	12.52	0.13
2017	16.45	0.17	12.55	0.13
2018	16.44	0.17	12.53	0.13
2019	16.44	0.17	12.53	0.13
2020	16.44	0.17	12.53	0.13

Source: Authors' calculation

In compiling the monetary balance sheet, the difference between the opening and closing stock values in year *t* is split into four components: (1) a revaluation due to price changes; (2) a revaluation due to time passing; (3) the monetary value of the yearly extraction; (4) a residual that accounts for other changes affecting asset levels and values, including discoveries, reappraisals and adjustments of mineral resources and differences between realized and projected physical extraction. The revaluation due to price changes is associated with an increase or a decrease of the unit resource rent.

The aggregates of first, second and last component are shown in the monetary balance sheet for natural gas. The adjusted inflation resource rent and a 5% discount rate as a baseline was chosen to reflect the monetary balance sheet of natural gas and crude oil reserves (Table 8 and Table 9).

Table 8: Monetary Balance Sheets for Natural Gas Reserves in Malaysia (Billion RM)

Monetary valuation of gas reserves	2001	2002	2003	2004	2005	2006	2007
Opening Stocks	55.744	55.092	56.661	56.487	52.995	49.174	49.358
Revaluation due to price change and revaluation due to time passing and other adjustments (+)	3.805	4.204	5.683	1.747	-0.054	3.921	0.656
Extraction value (-)	4.457	2.635	5.857	5.239	3.766	3.737	2.061
Closing Stocks	55.092	56.661	56.487	52.995	49.174	49.358	47.954

Source: Authors' Calculation

In the period under investigation, the monetary value of gas reserves varies between RM55.7 and RM49.35 billions. Moreover, due to price changes, the economic value of oil and gas reserves has increased, whereas the physical amount of the reserves has decreased. This finding points especially, among others, the importance of appraising both the physical balance sheets and the monetary balance sheets simultaneously. By the end of 2007, the remaining gas reserves in the Malaysia had a monetary value of RM47.95 billions.

Table 9: Monetary Balance Sheets for Crude Oil Reserves in Malaysia (RM Million)

Monetary valuation of oil reserves	2001	2002	2003	2004	2005	2006	2007
Opening Stocks (RM Million)	45064.3162	45852.499	42823.36	40307.87	39268.02	38334.901	38048.0086
Revaluation due to price change and revaluation due to time passing and other changes (+)	6671.093	356.441	4718.42	5022.85	2729.291	3205.728	1902.401
Extraction value (-)	5882.91	3385.58	7233.91	6062.70	3662.41	3492.62	2007.45
Closing Stocks (RM Million)	45852.499	42823.36	40307.87	39268.02	38334.901	38048.0086	37942.96

Source: Authors' calculation

For the period of study, the economic value of oil reserves (Table 9) declined by RM6920 million. Remaining oil reserves in 2007 were estimated at RM37,942 million.

Tables 10 and 11 show the contribution of God given asset to the production of both sectors has fallen pronouncedly from 28 percent in 2003 to 10 percent in 2007.

Table 10: Contribution of Non-Produced Capital (Natural Resource) in Value Added of Crude oil Production (%)

	2001	2002	2003	2004	2005	2006	2007
Extraction(RM Million)	5882.91	3385.58	7233.91	6062.70	3662.41	3492.62	2007.45
Value added (RM Million)	20687	21349	22275	22529	20634	19999	20824
Contribution of natural resources (%)	0.28	0.16	0.32	0.27	0.18	0.17	0.10

Source: Authors' Calculation

Table 11: Contribution of Non Produced Capital (Natural Resource) in Value Added of Natural Gas Production (%)

	2001	2002	2003	2004	2005	2006	2007
Extraction (RM Million)	4457.928	2635.68	5857.455	5239.266	3766.426	3737.342	2061.261
Value added (RM million)	15,676	16,619	18,035	19,472	21,220	21,406	21,372
Contribution of natural resources (%)	0.28	0.16	0.32	0.27	0.18	0.17	0.10

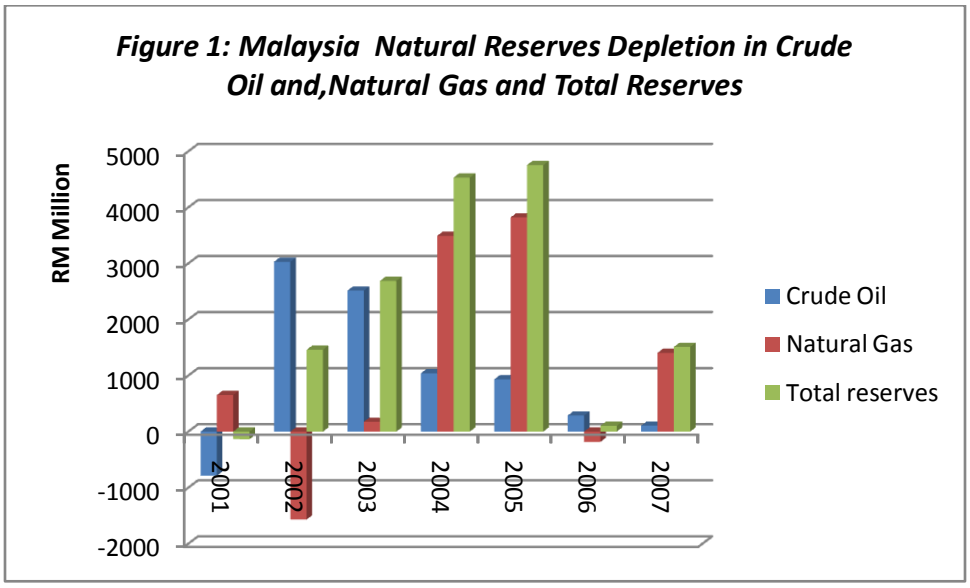
Source: Authors' Calculation

Table12: Depletion in Oil and Gas Reserves from 2001 to 2007 (RM Million)

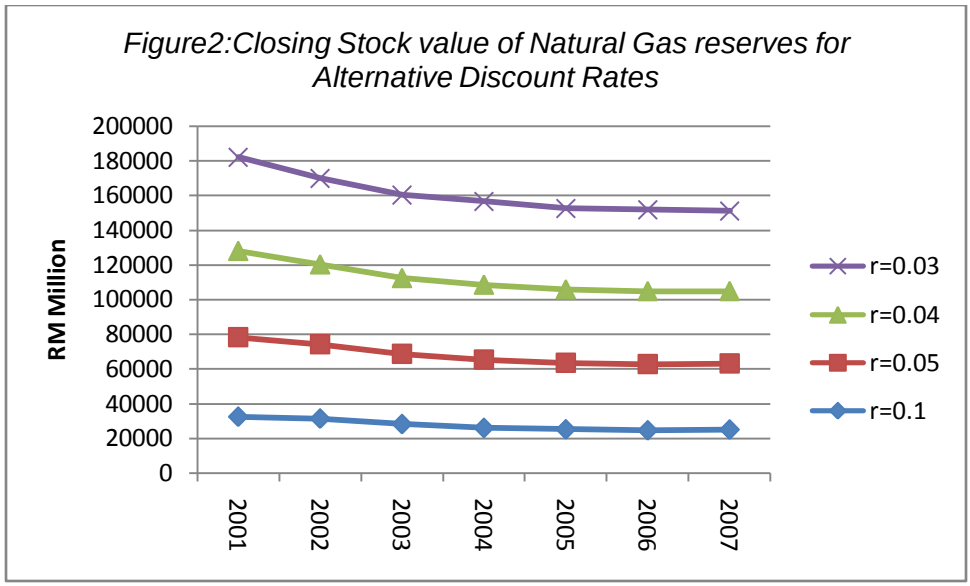
	2001	2002	2003	2004	2005	2006	2007
Crude oil	-788.183	3029.139	2515.49	1039.85	933.119	286.8924	105.0486
Natural Gas	652.25	-1568.91	174.31	3491.78	3821.22	-184.41	1404.33
Total reserves depletion	-135.933	1460.229	2689.8	4531.63	4754.339	102.4824	1509.379

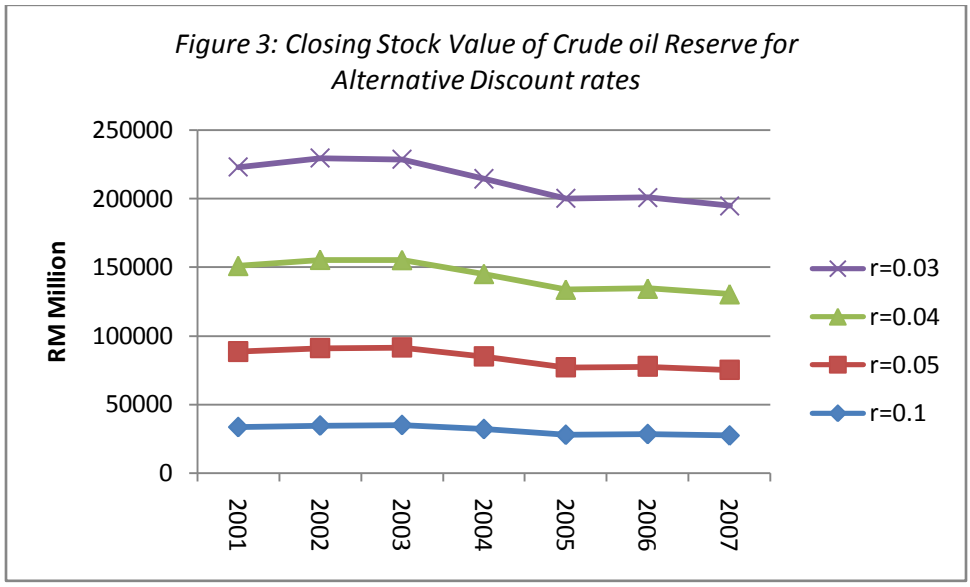
Source: Authors' Calculation

The depletion of crude oil reserves was declining since its peak in 2002 while the reserves value of natural gas has fluctuated due to discoveries of new gas fields.



The sensitivity of the baseline model to the different discount rate was investigated. The results are presented in the Appendix**.** It shows that different discount rate has notable effect on the net present value of future incomes (different discount rate refers to differences in attitudes toward risk and time preferences).The higher the discount rate the lower the weight to future resource, thereby, the monetary value of petroleum reserves is lower for higher discount rate and vice versa (Figure 1 and Figure 2)





Resource Rent and Royalty Payments

Oil and gas extraction in Malaysia is under the control of Petronas, the national oil company. Other companies act under Production Sharing Contracts (PSCs) with Petronas. Under the **PSC**s, the oil companies bear the risk of any oil exploring initiatives and develop the field. The revenue streams of oil and gas produced under the PSCs are split into cost oil, profit oil, and the royalty. Royalties are based on the volume or value of petroleum extracted.

Petronas announced that a total of RM 25.9 billion has been paid to the Federal Government and oil resource states for the financial years 2004 to 2007.The royalty rate of 7.8 percent paid by

Petronas was calculated by dividing the total amount of Royalty paid by total gross value of oil output (332.37 RM in Billion). On the other hand, average contribution of non-produced capital for the same financial year was estimated at 18 percent. This study estimates the minimum royalty rate that oil companies are supposed to pay. Total value of production is;

$$VP = CO + P + R$$

Where VP, CO, P, R denote gross value of product, cost oil, profit before tax, and royalty, respectively.

Considering that the royalty rate is defined as $(r = \frac{R}{VP})$ and given prior knowledge that under PSCs, maximum allowed cost for contractors is 60 percent of Gross Value of Product (CO = 0.6VP). Applying the equation for royalty rate and minimum allowed cost into the main equation ($VP = CO + P + R$) results in the following equation;

Minimum $r = 0.4$ - profit rate
Here, the $profit\ rate = \frac{P}{VP}$

The above discussion shows the minimum royalty rate that companies under the PSCs have to pay, given no knowledge of the value of non produced capital. The royalty rate would increase as cost oil decreases. For example, when cost oil is 50 percent of gross value of production, the minimum royalty rate that contractors' ought to pay is $r = 0.5$ - profit rate

Conclusion

This paper has presented an illustration of the valuation of oil and gas capital depletion in Malaysia over the period 2001 - 2007. Given the operating surplus, pricing and discount rate scenarios, our calculations suggest serious depletion rate of oil reserves from 2001 – 2005. Malaysia has depleted her natural gas reserves mainly in 2004 and 2005 while crude oil in 2002 and 2003. Greater changes in reserves values were attributable to price changes, new discoveries, and time passing rather than extraction rate. Natural resource accounting points clearly to the dependence of the Malaysian economy on natural resource extractions in the early years of our investigation where its contribution to value added was higher. After 2005, Malaysia showed less dependency on oil and gas extraction where contribution of the said resources fell below 20 percent of product value added. A number of policy issues emanate from our findings. The estimated resource rents were more than double in comparison with that of oil royalties. This suggests there is scope for increases in royalty payments to the federal and state coffers. More importantly, since oil and gas is a non-renewable resource, it will be important to identify the extent of Genuine Savings within the sector. This will critically reflect the degree of sustainability in the management of such resources. These issues warrant further investigation in future studies.

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Appendix

Table A1: Monetary Balance Sheets for Natural Gas Reserves in Malaysia (Billion RM) (r=0.10)

Monetary valuation of gas reserves	2001	2002	2003	2004	2005	2006	2007
Opening stocks	34.17259	33.29521	34.35361	34.78036	31.878	27.74176	28.25228
Revaluation due to price change and revaluation due to time passing and other adjustments (+)	3.59841	3.6276	6.24386	2.38892	-0.32399	4.23267	1.00299
Extraction value (-)	4.47579	2.5692	5.81711	5.29128	3.81225	3.72215	2.05002
Closing Stocks	33.29521	34.35361	34.78036	31.878	27.74176	28.25228	27.20525

Source: Authors' Calculation

Table A2: Monetary Balance Sheets for Crude Oil Reserves in Malaysia (RM Million) (r=0.10)

Monetary valuation of oil reserves	2001	2002	2003	2004	2005	2006	2007
Opening stocks(RM million)	33067.896	32317.136	31264.665	28139.75	25944.76	25131.149	24577.8517
Revaluation due to price change and revaluation due to time passing and other changes (+)	5132.15	2333.109	4108.995	3867.71	2848.799	2939.323	2457.788
Extraction value (-)	5882.91	3385.58	7233.91	6062.70	3662.41	3492.62	2007.45
Closing Stocks (RM million)	32317.136	31264.665	28139.75	25944.76	25131.149	24577.8517	25028.19

Source: Authors' calculation

TableA3: Depletion in Oil and Gas Reserves from 2001 to 2007 (RM Million) (r=0.1)

	2001	2002	2003	2004	2005	2006	2007
Crude oil	750.76	1052.471	3124.915	2194.99	813.611	553.2973	-450.338
Natural Gas	877.38	-1058.4	-426.75	2902.36	4136.24	-510.52	1047.03
Total reserves depletion	1628.14	-5.929	2698.165	5097.35	4949.851	42.7773	596.692

Source: Authors' Calculation

Table A4: Monetary Balance Sheets for Natural Gas Reserves in Malaysia (Billion RM) (r=0.04)

Monetary valuation of gas reserves	2001	2002	2003	2004	2005	2006	2007
Opening Stock	63.1264	62.65934	64.47712	64.04946	60.32928	56.83613	56.85876
Revaluation due to price change and revaluation due to time passing and other adjustments	4.00873	4.38698	5.38945	1.5711	0.3191	3.74478	0.45211
Extraction value (-)	4.47579	2.5692	5.81711	5.29128	3.81225	3.72215	2.05002
Closing Stocks	62.65934	64.47712	64.04946	60.32928	56.83613	56.85876	55.26085

Source: Authors' Calculation

Table A5: Monetary Balance Sheets for Crude Oil Reserves in Malaysia (RM Million) (r=0.4)

Monetary valuation of oil reserves	2001	2002	2003	2004	2005	2006	2007
Opening Stock (RM Million)	48393.197	49744.807	46084.655	43837.38	43260.76	42289.677	42107.2769
Revaluation due to price change and revaluation due to time passing and other adjustments	7234.52	-274.572	4986.635	5486.08	2691.327	3310.22	1684.293
Extraction value (-)	5882.91	3385.58	7233.91	6062.70	3662.41	3492.62	2007.45
Closing Stocks (RM Million)	49744.807	46084.655	43837.38	43260.76	42289.677	42107.2769	41784.12

Source: Authors' calculation

Table A6: Depletion in Oil and Gas Reserves from 2001 to 2007 (RM Million) (r=0.04)

	2001	2002	2003	2004	2005	2006	2007
Crude Oil	-1351.61	3660.152	2247.275	576.62	971.083	182.4001	323.1569
Natural Gas	467.06	-1817.78	427.66	3720.46	3493.28	-22.87	1597.91
Total reserves depletion	-884.55	1842.372	2674.935	4297.08	4464.363	159.5301	1921.067

Source: Authors' Calculation

Table A7: Monetary Balance Sheets for Natural Gas Reserves in Malaysia (Billion RM) (r=0.03)

Monetary valuation of gas reserves	2001	2002	2003	2004	2005	2006	2007
Opening Stocks	72.26837	72.0923	74.268	73.49027	69.46227	66.49881	66.2922
Revaluation due to price change and	4.29972	4.7449	5.03938	1.26328	0.84879	3.51554	0.16653
Extraction value (-)	4.47579	2.5692	5.81711	5.29128	3.81225	3.72215	2.05002
Closing Stocks	72.0923	74.268	73.49027	69.46227	66.49881	66.2922	64.40871

Source: Authors' Calculation

Table A8: Monetary Balance Sheets for Crude Oil Reserves in Malaysia (RM Million) (r=0.03)

Monetary valuation of oil reserves	2001	2002	2003	2004	2005	2006	2007
Opening stocks(RM million)	52153.156	54201.376	49791.016	47891.96	47908.68	46891.747	46843.0022
Revaluation due to price change and revaluation due to time passing and other changes (+)	7931.13	-1024.78	5334.854	6079.42	2645.477	3443.875	1405.288
Extraction value (-)	5882.91	3385.58	7233.91	6062.70	3662.41	3492.62	2007.45
Closing Stocks (RM million)	54201.376	49791.016	47891.96	47908.68	46891.747	46843.0022	46240.84

Source: Authors' calculation

Table A9: Depletion in Oil and Gas Reserves from 2001 to 2007 (RM Million) (r=0.03)

	2001	2002	2003	2004	2005	2006	2007
Crude oil	-2048.22	4410.36	1899.056	-16.72	1016.933	48.7448	602.1622
Natural Gas	176.07	-2175.7	777.73	4028	2963.46	206.61	1883.49
Total reserves depletion	-1872.15	2234.66	2676.786	4011.28	3980.393	255.3548	2485.652

Source: Authors' Calculation