global witness

Global Witness Open Model Manual

1. Introduction and purpose of the model

Global Witness has created this model to allow citizens of Uganda, and other oil rich countries, to assess the financial terms of their countries' oil contracts and associated financial terms. The model is available to anyone to download from our website free of charge under the creative commons licence. This is the first open source model of its kind.

The intention is that this model will allow people to make sense of their oil sector and strengthen the argument for contract disclosure. It will also help people predict and track future revenue.

The version available on our website is designed to model the contract terms of two specific Ugandan contracts. However, it can be adapted to allow others to model other contract terms. This manual will show you how to do both. It also sets out the assumptions we have used for the Uganda specific modelling in Section 5 on page 8.

Models are built on assumptions about the future, such as prices and costs, which are unknown and/or uncertain. Project-specific information, such as cost estimates, is difficult to find and is rarely publicly available at a level other than a very general one at best. This model is built on standard assumptions and a stylised oil project. Because of these inherent uncertainties, such fiscal analysis has it limits. Results will never be 100% accurate and should not be treated as such.

Despite this uncertainty, the analysis that a model can provide is still useful. It can allow the user to see how different financial terms will impact on revenues depending on different variables.

Models can provide some comparison across countries and projects, though this comparison is never perfect. It is difficult to compare different projects and say which one is a "good deal" and which one is a "bad deal." Governments have different policy objectives. Different countries may seek different benefits from their resources. Some may desire upfront cash and can afford to take on very little exploration risk, while others may not; some may see an opportunity to create a large domestic oil services industry through local content, while others may not have the resource base to justify such a strategy. Whether or not a fiscal system achieves a country's desired policy goals is probably the most important question, though it is not one that a model alone can answer.

It is hoped that this model demonstrates the importance of analysing fiscal terms as a whole, and not individually. It is easy to take one fiscal term (a royalty rate, for example) and say whether it is seems high or low compared to a global average. But this is both misleading and distracting. Models are needed to get a sense of the whole fiscal picture. This is what this model does.

The model provides estimates of important figures like Net Present Value and rates like 'Government Take' and Internal Rate of Return (IRR).

Users of the model will ideally have a sound knowledge of the fiscal regimes typically applied to petroleum projects, along with intermediate excel skills. This is especially necessary if the user

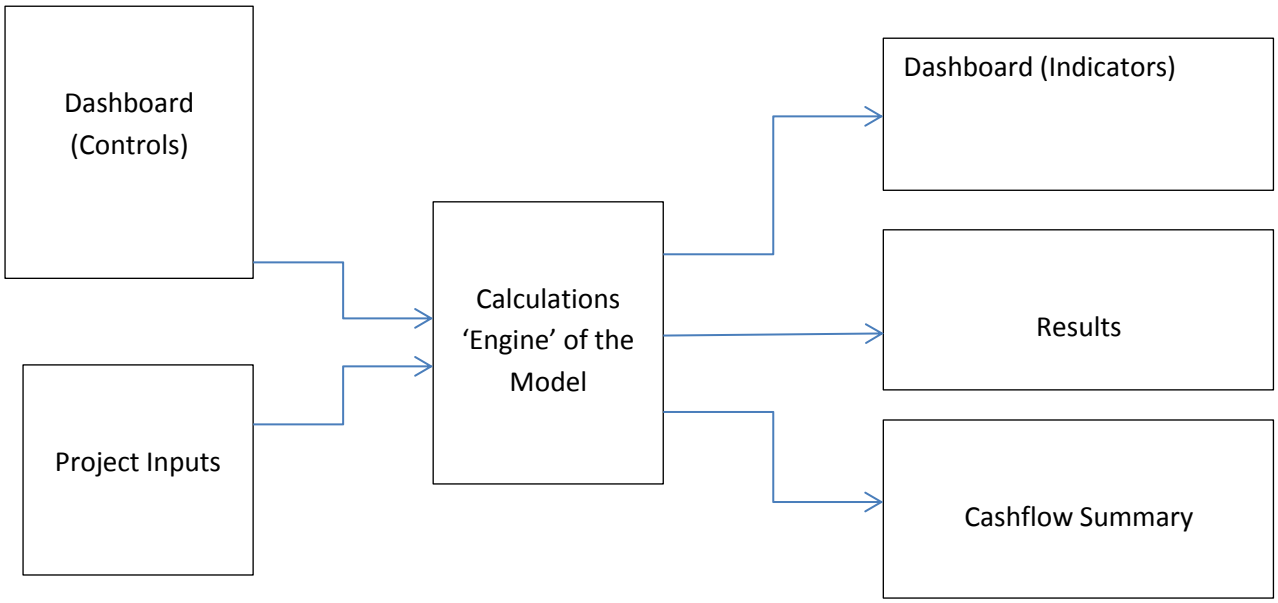
intends to apply the model to new contract terms or projects, and/or modify the coding of the model. You will also need access to primary contract details and local tax information.

However, if you only want to alter some of the major variables for the Uganda context you can simply use the dashboard to see the results. Alternatively you can use our online revenue infographic which uses results generated by the model.

The following sections explain the model's functions and the assumptions and inputs we have used. For a breakdown of the assumptions we have used in the Uganda modelling please see Section 5 below on page

2. **Model Map:**

The model is set up as follows:



3. **Using the Model:**

There are three options for using the model once you have downloaded it.

1. Use the dashboard controls to change basic assumptions related to this Uganda specific project such as oil price, production rate and costs. Some of this can be achieved by using the simpler revenue infographic on our website which uses the results from the model.
2. Update and improve the model by altering the underlying assumptions and/or code in the model in relation this Uganda specific project.
3. Adapt the model to another contract, or set of contracts, all together by altering the underlying assumptions and code.

Dashboard (Controls): Changing Fiscal Terms

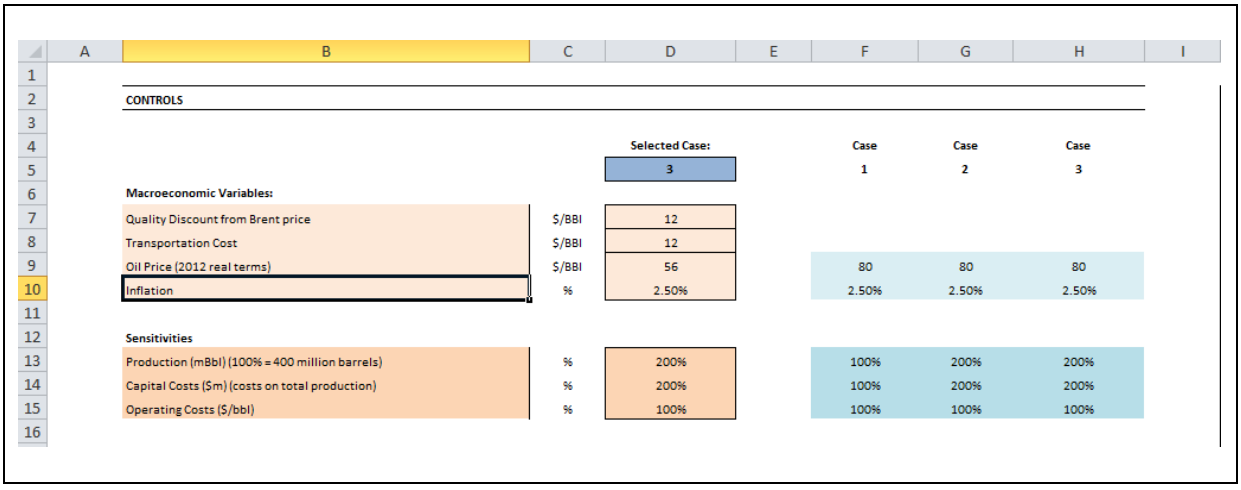
The dashboard provides the easiest way or changing the variables in the model without modifying the coding.

The left-hand side of the 'Dashboard' sheet lists a number of fiscal terms which are used as inputs into the model calculations. The terms are listed in Column B.

These are:

- Macroeconomic Variables
    - Oil price (this figure will increase with inflation during the project)
    - Discount from Brent – most oil sells at a figure less than Brent crude depending on its quality, we have included the option to apply this discount
    - Transportation cost – oil needs to be transported to the point of sale, we have included the option to deduct the cost of transportation from the oil price
    - Inflation (modelled at a standard 2.5% in this instance)
- Sensitivities (allowing for an increase/decrease in cost or production levels)
    - Cost (Capital and Operating Costs)
    - Production - the amount of oil to be produced from a particular project (100% = 400 million barrels of oil)
- Fiscal Terms
    - Royalties (tax collected on revenues before they are split between company and government)
    - Income Tax (tax levied on company revenues)
    - Production Sharing (the division of oil production between company and government)
    - Withholding Taxes (taxes on interest and dividend payments)
    - Resource Rent Tax (Windfall tax or additional profits tax)
    - NOC Carry (state participation in the contract via national oil company)
- Financing Assumptions
    - % of debt (used to finance the project)
    - Repayment period
    - Interest Rate

The model allows for a number of scenarios to be created, and these are set out in Columns F to H. The terms being modelled at any given time are those listed in Column D. In the model on our website they are labelled with the different contract terms to which they relate.



	A	B	C	D	E	F	G	H	I
1									
2		CONTROLS							
3									
4				Selected Case:		Case	Case	Case	
5				3		1	2	3	
6		Macroeconomic Variables:							
7		Quality Discount from Brent price	$/BBl	12					
8		Transportation Cost	$/BBl	12					
9		Oil Price (2012 real terms)	$/BBl	56		80	80	80	
10		Inflation	%	2.50%		2.50%	2.50%	2.50%	
11									
12		Sensitivities							
13		Production (mBbl) (100% = 400 million barrels)	%	200%		100%	200%	200%	
14		Capital Costs ($m) (costs on total production)	%	200%		100%	200%	200%	
15		Operating Costs ($/bbl)	%	100%		100%	100%	100%	
16									

To change the scenario: You will want to change the "Selected Case". Alter the number in Cell D5 to reflect the number of the scenario (or contract in this case). This scenario will then be reflected in the model calculations. This will allow you to see the effect of changing the fiscal regime. Three regimes (Case 1, 2, and 3) are loaded into the model.

To change assumptions: To change the individual fiscal, macroeconomic or financing assumptions reflected in a particular scenario, alter the numbers in columns F to H, depending on the scenario you are working on. This will allow you to see the effect of changing a single parameter.

To carry out sensitivity analysis: The model automatically assumes a 400 Million Barrel project (100%) with a typical production curve and stylized cost estimates. These can be changed using the sensitivities in columns F-H. When changing the field size with these boxes, change only the production and capital cost (capex) percentages, not the operating cost (opex) percentage; it changes automatically with changes in production.

Do not change the cells in column D, other than D5. This could delete the formulas in that column and then no longer provide the pre-calculated results.

Most of the *Fiscal Terms* on the dashboard can be altered including the tax rates. For further information about the assumption and inputs we have used for the Uganda modelling see Section 5.

Inputs: Project Parameters

Project specific parameters are detailed in the 'Inputs' sheet:

- Oil Production Profile: A time series projection of the production rates expected from the oil field being modelled
- Oil Price: Projection of oil price over time, based on the macroeconomic (oil price and inflation) assumptions entered in the Dashboard sheet.
- Capital Costs: Time series projection of the capital expenditure expected for the project
- Operating Costs: Time series projection of the operating costs expected for the project. This is inputted as a dollars per barrel ($/bbl) figure and total variable costs are calculated based on the production rate assumptions.

	A	B	C	D	E	F	G	H	I	J
1		Year		2012	2013	2014	2015	2016	2017	2018
2										
3		PRODUCTION								
4										
5		Oil Production (MBpd)	MBpd	-	-	-	-	7.50	36.60	60.25
6										
7		PRICES								
8										
9		Oil Price	US$/Bbl nominal	-	-	-	-	88.3	90.5	92.8
10		Inflation Index		1.00	1.03	1.05	1.08	1.10	1.13	1.16
11										
12		COSTS								
13										
14	2,000	Capital costs	US$m real	120	400	600	500	200	100	40
15										
16		Variable Operating Costs	US$/bbl					12.0	12.0	12.0
17	4,728	Operating costs	US$m real					32.8	160.3	263.9
18										

Note that the graphs in the inputs page will not change to reflect any changes the user makes to those inputs. They are not linked to the input cells and show only the inputs that are initially in the model.

Dashboard (Indicators): Observing the Results

The right hand side of the 'Dashboard' sheet presents the output of the model, listing some key indicators which a user may be interested in. The model is presented in this way to allow the user to instantly see the impact of changing fiscal parameters of the model on the left-hand side 'Controls' section of the same sheet.

The parameters that are listed are:

- Net Present Value of the cashflow to the different actors, at a range of discount rates
- Associated 'take' or % of cashflows allocated to the different actors under the current project assumptions, at a range discount rates
- Graph to illustrate how the project's cashflows are distributed among the actors over the project life
- Breakdown of Payments to Government by revenue stream (Total, NPV and breakdown over project life)
- Internal rate of return of the Project and to the Investor
- Graph to illustrate the breakdown of government revenues by fiscal stream over the project life.

Note: For simplicity, all figures are in nominal terms.

'Discount rate': investors and governments value money now more than money in the future. They therefore apply a 'discount rate' to projected future revenues in order to calculate the value of those returns to them at the present time. This does not affect the actual revenues received or the actual share of revenues between companies and government, but allows them to predict value as opposed to alternative investments. Essentially, the more in need of immediate capital a government or company is the more it is likely to discount future returns. Investors will also consider risk and alternative investment opportunities when calculating their discount rate. A 10% discount rate is fairly standard for the industry. The discount is applied annually to any cash flow that has not yet been realised.

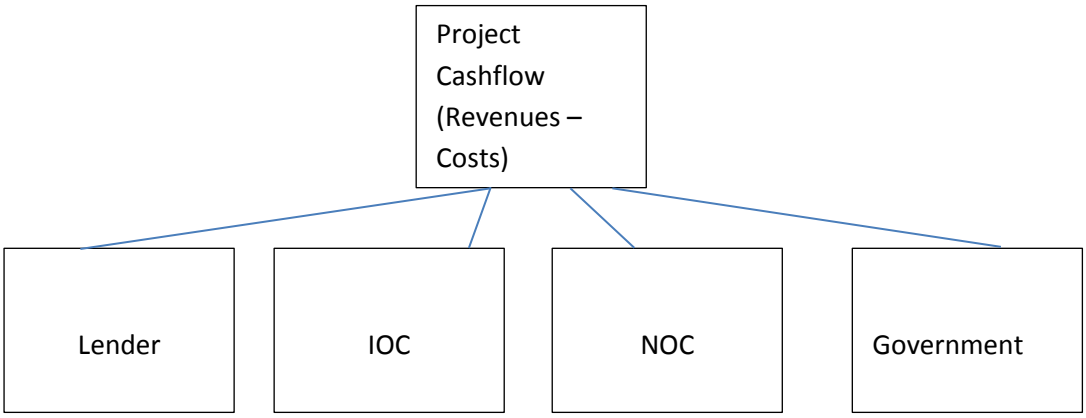
Internal Rate of Return (IRR): IRR is a figure which describes the rate of return for the investor in a project. IRR's show the return on that project (as opposed to equity, for example) and are used to rank projects when companies are making an investment decision. Companies use this calculation to decide whether an investment is worthwhile and to compare it against other potential investments to consider which is most viable. As a rule of thumb oil companies will look for a minimum of a 12% IRR in order to invest, but they will also take other factors into consideration such as political risk and alternative investment opportunities. The higher the IRR for the company, the more attractive the project is to the investor.

Withholding taxes: Our model assumes that both the company and the NOC pay withholding taxes at the full statutory rate of 15%. Some models do not include withholding taxes as it is common for

international oil companies to avoid paying them by using subsidiaries established in tax havens or other jurisdictions that have agreed tax treaties. Withholding taxes push up government take by a couple of percent. (For the Uganda modelling we have used a company IRR threshold of 22% for the tax).

Calculations:

The 'Calculations' sheet is the 'engine' of the model. The calculations sheet works out the Project Cashflow, and how this will be distributed among the stakeholders in the project.



The whole calculation is carried out in nominal terms.

Section	Description
Project Cashflow	The project cashflow is simply the operational cashflows of the project. Total Revenues from oil production (production x price) less Total Capital & Operating Costs. The Total Production is calculated from the Production Rate assuming 365 days of production a year.
Financing	The model assumes a single loan made to cover a % of the capital costs. This % is an input in the Dashboard sheet. The remainder of the capital costs are funded by equity. The length of the repayment period (reflective of third party debt), along with the interest rate are also specified in the Dashboard sheet. Equity and Debt are drawn down until the project cashflows are sufficient to fund the remaining capital costs. This will occur when the capital expenditure profile overlaps with the start of oil production.
Payments to Government	
Royalty 1	The first royalty calculation is a sliding-scale based on daily production. The calculation is made on the revenues from Total Production before the deduction of any costs.
Royalty 2	The second royalty calculation is a sliding-scale based on

	cumulative production. The calculation is made on the revenues from Total Production before the deduction of any costs.
Production Sharing	The production sharing calculation is made on revenue after royalties. The cost recovery calculation is made, first calculating how much of the revenue is available for cost recovery based on the cost recovery limit stated in the Dashboard sheet. Capital, operating and financing costs are assumed to be cost recoverable and are deducted from the revenues which are available for cost recovery. These deductions are the 'Cost Petroleum' for the period. The remainder of the post-royalty revenue, which is the 'Profit Petroleum' are then shared according to the Production Sharing thresholds (based on daily production rate) and associated Government/Contractor shares as inputted into the Dashboard sheet.
Resource Rent Tax	The resource rent tax is calculated on a stylized measure of pre-tax project cashflows. This measure of pre-tax project cashflow is calculated by allowing capital and operating costs to be deducted from revenues, along with royalty and production share payments to government. When this pre-tax project IRR reaches the threshold specified In the Dashboard sheet, the resource rent tax is charged as per the specified rate.
Income tax	Income tax is calculated separately for the IOC and the NOC. Depreciation is calculated on a straight line basis over the number of years entered in the fiscal parameters section of the Dashboard. Since each party will eventually cover its share of the capital costs, the IOC and NOC are allowed a depreciation deduction corresponding to their share of the capital expenditure. Loss carry forward is assumed to be unlimited. Tax is charged according to the rate specified in the Dashboard sheet.
NOC Carry	It is assumed that the NOC's capital costs are carried by the IOC up until the point where production begins. At this point, the NOC is allowed to first pay for its share of operating costs, any capital costs which are being funded from cashflows, as well as its share of the interest expense being incurred by the third party loan financing of the project's capital expenditure. All remaining cost and profit oil must then be used to pay back the carried costs, with an interest charge as specified in the Dashboard sheet.
Withholding Taxes	This calculation assumes that both the IOC and NOC are liable to

on Dividends	pay withholding taxes on their dividends. The rates are applied as per those entered into the Dashboard sheet.
Cashflow Summaries	
Project Cashflow	This section lists all the cash inflows and outflows for each actor in the project: Lender, Government, International Oil Company and National Oil Company, and shows how the Project Cashflow is distributed among these entities in all periods. The check in Line 327 is a verification that the project cashflow is completely accounted for in each period. Care should be taken to ensure that this line always reads 'TRUE'
IOC Cashflow	
NOC Cashflow	

The checks listed in column A are designed to ensure the correctness of the calculations, and to alert a user to potential errors. Errors may occur when adapting the calculations of the model.

Cashflow Sheet: Following the Cashflow Trail

This section lists all the cash inflows and outflows for each actor in the project: Lender, Government, Investor, NOC, and shows that the Project Cashflow is distributed among these actors in all periods.

Results

This sheet is used to calculate the indicators in the Dashboard 'Indicators' Section.

4. What the model does not include:

It should be noted that this model makes a number of simplifications, and there are a number of things which are not reflected in the model, including but not limited to:

- Treatment of Decommissioning Costs
- Lumpsum payments: Signature Bonuses, Social Contributions, Surface Rentals
- Ringfencing by field
- Uncertainty analysis
- Particularities of the fiscal system that are unique to any country/contract such as tax breaks that may have been negotiated

5. **The Uganda assumptions**

Not all information required to accurately model the Uganda PSAs is a) known or b) in the public domain. As such, we have had to use the best available information and assumptions. As more information becomes available, such as actual production rates and sales prices, it will be possible to input these into the model and far more accurately predict the revenues the Government is likely to receive. The following is a breakdown of the inputs and assumptions we used in order to generate our findings:

***Production Sharing Contract*:** the modelling is based on the 2012 Exploration Area 1 PSA (as the Kanywataba area, to which the second 2012 contract relates, has now been relinquished). However, we have also modelled the 2004 Heritage contract terms for EA1 as a basis for comparison.

Taxes and royalties: these are contained in the contracts and public information on Uganda's tax system in briefings from Deloitte and PriceWaterhouseCoopers.[i] Corporate Income tax is modeled at a standard 30%. The model does not include secondary taxes and levies such as surface rentals and rental fees which are likely to have a limited impact on the results. Royalty rates vary according to the contracts as detailed below. The 2012 contracts contain two royalties, one based on daily production, the second on cumulative production. Royalties are collected before cost recovery.

Daily production royalty contained in both the pre-2008 contracts and 2012 contracts.

Gross Total Production (BOPD)[1]		Royalty Rate
1.	Where the production does not exceed 2,500	5%
2.	Where the production is higher than 2,500 but does not exceed 5,000	7.5%
3.	Where the production is higher than 5,000 but does not exceed 7,500	10%
4.	Where the production exceeds 7,500	12.5%

(Royalty payments are tiered, so if daily production was 6,000 barrels then the company would pay, 5% on the first 2,500, 7.5% on the next 2,500 and 10% on the remaining 1,000.)

Cumulative Royalty in 2012 contracts only.

Recovered Cumulative Petroleum (Million Barrels)		Additional Royalty
(i)	Where the recovered cumulative Petroleum does not exceed 50	2.5%
(ii)	Where the recovered cumulative Petroleum is higher than 50 but does not exceed 100	5%
(iii)	Where the recovered cumulative Petroleum is higher than 100 but does not exceed 150	7.5%
(iv)	Where the recovered cumulative Petroleum is higher than 150 but does not exceed 250	10%
(v)	Where the recovered cumulative Petroleum is higher than 250 but does not exceed 350	12.5%

[1] Barrels of Oil Per Day

(vi)	Where the recovered cumulative Petroleum is higher than 350	15%

***Oil Price*:** The model uses a conservative starting oil price of USD$80 per barrel,[2] following the projections of the more conservative case of the United States Energy Information Administration (US EIA) 2013 data.[ii] The price rises by 2.5% each year until 2036 when production would be projected to end. The decision to base our model on this projection is based on the advice of industry insiders and futures analysts.

Where the oil price in the "macroeconomic variables" section on the dashboard is changed the figure used will increase at the same incremental rate (2.5%) per year.

We have assumed a US$12 discount from Brent crude prices.

Transportation cost: Ugandan oil will be transported to the refinery via pipelines, while the remainder will be transported, through a pipeline, to the Kenyan coast where it will be sold on to international markets and shipped to a refinery. The complication is that as Ugandan crude is waxy in nature the pipeline will need to be heated to keep it flowing. When constructed it will be the longest heated pipeline anywhere in the world.

According to the contracts, the parties agree that the tariff to use the pipeline will be set so that the pipeline company's costs of constructing, financing, operating and maintaining the export pipeline should achieve a reasonable return on the project (Section 16).

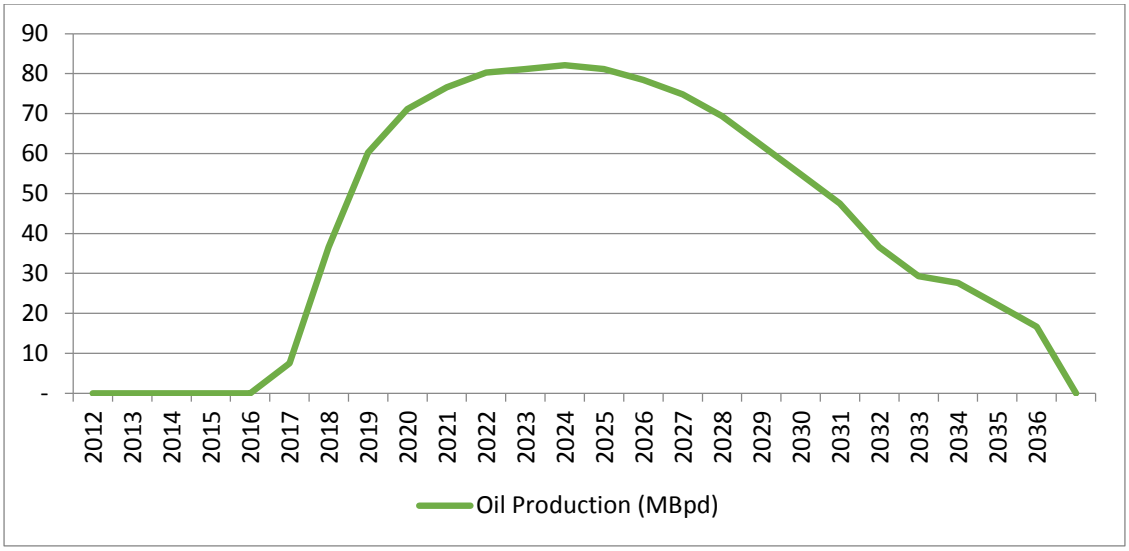
We have assumed a US$12 a barrel transport fee based on industry estimates. As such, the price we have modelled for a barrel of oil is US$56 (after the Brent discount has also been applied).

***Oil Production*:** We do not have accurate figures for oil discoveries in EA-1A which fall under the 2012 contract. For the purpose of this fiscal model, we have created a base of 400m barrels which can be altered by changing the percentage figure in row 13 in the Dashboard. (The 400m barrel figure is the best estimate for EA1).

The estimates for total 'recoverable reserves', e.g. the amount of oil it is possible to get out of the ground and export to market, in Uganda is between 1.2bn and 1.7bn barrels. In reality it is not possible to know how much oil is in the ground and how much will be recovered until a company starts pumping.

The production curve, which charts the likely amount of oil produced each year and varies over the course of the life cycle of the project, is a simplified standard onshore production curve (see below). The Model assumes that production will begin in 2017 as predicted by the Government.[iii] If oil company development plans were available it would be possible to predict production more accurately.

[2] This price is inflated at very standard rate of 2.5% and the prices quoted in the various studies as reference points also use standard inflation methodologies.



Project Costs: Project cost estimates and actual costs are difficult to find at a level of specificity that is useful for generating a fiscal model. For the Uganda modelling, data from Tullow's website and publicly available information was used (see footnote for sources).[iv]

Production sharing and cost recovery: The Uganda contracts we modelled contain a 60% cost recovery threshold which means that companies can use up to 60% of production, after royalties have been taken, to repay their initial investment costs. The remaining 40% or more will be shared between the Government and company according to the percentages dictated in the contract. See details of production sharing from the 2012 EA 1 contract below based on Barrels per day (Bopd): As the quantity of production increases the proportion of government share also increases:

Production BOPD	Government Production Share	Licensee Production Share
(i) Where production does not exceed 5,000	45%	55%
(ii) Where production is higher than 5000 but does not exceed 10,000	47.5%	52.5%
(iii) Where production is higher than 10,000 but does not exceed 20,000	52.5%	47.5%
(iv) Where production is higher than 20,000 but does not exceed 30,000	57.5%	42.5%
(v) Where production is higher than 30,000 but does not exceed 40,000	62.5%	37.5%

(vi)	Where production is higher than 40,000	67.5%	32.5%

This is a fairly standard arrangement. The Government percentage is 1% lower in the 2012 EA 1 PSA at each threshold than the 2004 Heritage contract.

Cost recovery: The Uganda PSAs allow for up to 60% of oil and 70% of gas to be allocated to cost recovery in any given year with the remainder carried forward (Clause 12.2). Companies can carry forward unrecovered costs from one year to the next (Clause 12.3), but costs are "ringfenced" meaning that they can only be recovered from production from the same licence area where they were incurred (Clause 12.1).

State participation: The contract terms used in this modelling allow for a 15% state participation in the production – this is reflected in the NOC inputs in this model.

The contract stipulates that interest is 'carried' by the company, meaning that the IOCs will cover the NOC's share of upfront costs, which will be recouped from cost oil alongside their own. In practice this means that after the royalties and costs have been deducted, the NOC will own a 15% share of the remaining production from which they will profit through the sale of the oil. Global Witness understands that the Government did take up its 15% interest in the Kingfisher field when it granted the production licence to CNOOC in September 2013 and that it intends to do the same in future licences.[v] For the purpose of this model, therefore, we have assumed this and included state participation revenues. In the model it is possible to view the IOC and NOC shares of revenue separately.

---

[i] Deloitte,*The Deloitte Guide to Oil and Gas in East Africa*, 2013[online]. Available from http://www.deloitte.com/assets/Dcom-Kenya/Local%20Assets/Documents/The%20Deloitte%20Guide%20to%20oil%20and%20gas%20in%20East%20Africa.pdf (Accessed: 22 May 2014)
PriceWaterhouseCoopers, *Oil and Tax Guide for Africa 2013*[online]. Available from: http://www.pwc.com/en_GX/gx/oil-gas-energy/publications/pdfs/pwc_oil_and_gas_tax_guide_for_africa_2013.pdf. (Accessed: 22 May 2014)

[ii] See US Energy Information Administration, AEO2014, particularly the excel model embedded on the site of price data plotted on Figure Five. Available from: http://www.eia.gov/forecasts/aeo/er/early_prices.cfm (Accessed 19 September 2013).

[iii] Xinhua, *Uganda issues first ever oil production license to CNOOC*, 25 September 2013 [online]. Available from: http://news.xinhuanet.com/english/business/2013-09/26/c_132750537.htm. (Accessed: 22 May 2014).

[iv] Tullow Oil NAV Model, Uganda tab [online]. Available from: http://studenttheses.cbs.dk/bitstream/handle/10417/3218/Tullow%20Oil%20NAV%20Model.xlsm?sequence=2 (Accessed 18 July 2014).
Jens Petter Wilhelmsen and Mathias Loretzen, *Investment Case: Tullow Plc*, June 2012, Copenhagen Business School [online]. IHS, Available from: http://studenttheses.cbs.dk/bitstream/handle/10417/3218/jens_petter_wilhelmsen_og_mathias_lorentzen.pdf?sequence=1 (Accessed 18 July 2014).

[v] Bloomberg, *CNOOC of China wins Uganda's First Oil production license,* 25 September 2013 [online]. Available at: http://www.bloomberg.com/news/2013-09-25/cnooc-of-china-wins-uganda-s-first-oil-production-license.html. (Accessed 22 May 2014).
Global Witness correspondence with Total, 21 July 2014.