TWO OCEANS STRATEGY

EMPLOYMENT AND ECONOMIC POTENTIAL ASSESSMENT

EXAMPLE MINING PROJECT

UNLOCKING RESPONSIBLE ENERGY AND NATURAL RESOURCE INVESTMENT

We are a risk, research and sustainability consultancy supporting responsible investment in energy, natural resources and infrastructure in Asia.

We provide research and strategic consultancy to investors wanting to take advantage of the substantial growth potential of emerging markets, especially Asia. We use rigorous proprietary evaluation tools, methodology and networks to provide expertise across three pillars:

- **IMPACT EVALUATION**
- **RISK IDENTIFICATION**
- **SCENARIO ANALYSIS**

This report has been generated based by Two Oceans Strategy ’s web-based tool to quantify potential employment and economic benefit of natural resources and energy projects.

The tool is intended for investors, project developers, communities and governments to quantify the total, year by year and multiplier effects of potential economic benefit from natural resources projects. Our tool combines rigorous economic modelling, a proprietary database of geographic indicators and project level financial information. It allows comparison of total economic uplift and multiples between projects.

The tool is aimed as a guide to support the following:

- Sustainability / ESG reporting
- Negotiations between stakeholder groups
- Engagement with host governments and communities
- The fostering of a partnership ethos between the stakeholder groups
- Investment assessment

An Overview of Our Methodology

Total Project Expenditure → **Total In-Country Expenditure** → **Wages to Employees + Payment to Suppliers**

Leakages: Expenditure on Importing Labour or Materials

Total Potential Economic Impact

Direct Economic Impact

Output:	Production from local suppliers to the project
Income:	Wages for project employees and payments to suppliers
Gross value Add:	Value-addition by the project
Emploment:	Workers employed on project
Fiscal:	Taxes paid by project

Indirect Economic Impact

Output:	Production by subcontractors
Income:	Wages for project contractors staff and earning made by suppliers to contractors
Gross value Add:	Value-addition by the suppliers
Emploment:	Local suppliers increases employment to produce output required
Fiscal:	Taxes paid by suppliers & workers

Induced Economic Impact

Output:	Increased production resulting from increased demand for goods
Income:	In-country business income (and employee income) resulting from increased spendind by project workers
Gross value Add:	Value-addition by firms as a results of extra output arising through extra consumption
Emploment:	Jobs resulting from increased speanding by project workers
Fiscal:	Texas paid by suppliers and workers as a result of extra consumption

PART 1: EMPLOYMENT POTENTIAL

PART 2: ECONOMIC POTENTIAL

PART 3: METHODOLOGY

EMPLOYMENT POTENT

The Example Mining Project will generate paid work from within South Africa from:

- Direct Employment: the number of individuals the project directly employs
- Indirect Employment: the number of individuals employed by the suppliers and subcontractors of the project
- Induced Employment: the number of individuals employed due to increased personal expenditure on goods and services by workers, either directly or indirectly employed by the project

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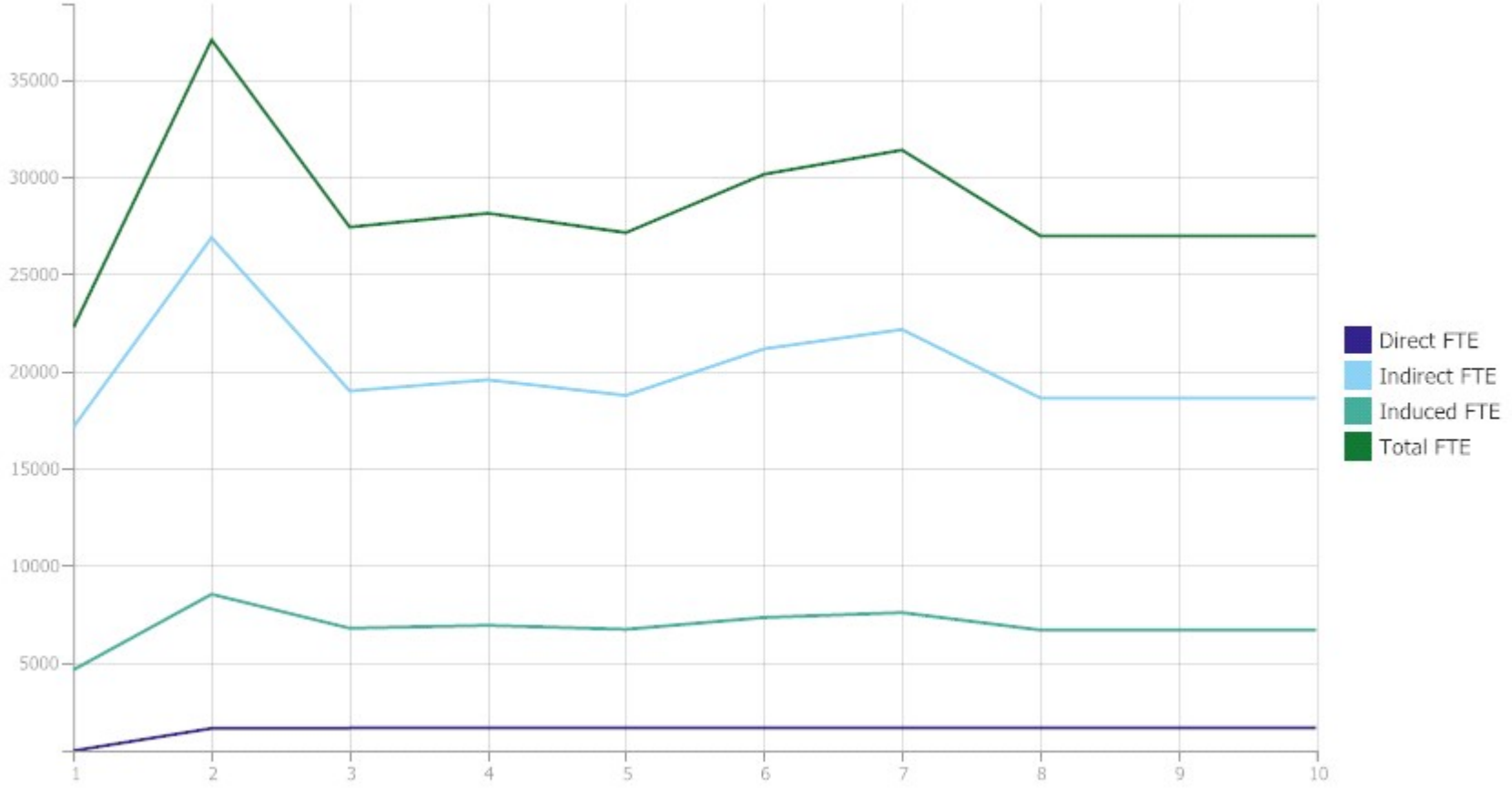
Total Direct, Indirect and Induced Full Time Equivalent Jobs by Project Year



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Labour Forecasting

	Peak Labour	Jobs Created (total jobs divided by project duration)
Direct	1,646	1,528
Indirect	26,886	20,055
Induced	8,532	6,863
Total		**28,446**

Percentage year on increase in direct employees from project location including in modelling: 0 %

Employment Multiples

The employment multiple relates to the proportion of employees directly employed by the project and the total number of full jobs generated by the project. Employment multiples are highly variable dependent on the proportion of outsourcing that a company engages in. A higher degree of outsourcing will result in a higher multiple due to the lower amount of direct employment.

Type 1 Employment Multiple: Direct + Indirect / Direct 14.12

Type 2 Employment Multiple: Direct + Indirect + Induced / Direct 18.62

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ECONOMIC POTENTIAL

Economic Impact Potential

There are various approaches to measuring the economic impact of a project:

Income

This relates to the measure of all income earned by households and profits earned by businesses as a result of the additional economic activity due to the project.

Output

This is the broadest measure of economic activity, the total gross value of goods and services produced by a company or industry measured by the price paid to the producer. However, it can be a misleading measure of economic development benefit, since it does not distinguish between a high value-added activity (generating substantial local profit and income) and low value-added activity (generating relatively little local profit or income from the same level of sales).

Gross Value Added (GVA)

This refers to the additional value of a good or service over the cost of inputs used to produce it from the previous stage of production. It is the net output: the difference between revenues and expenses on intermediate inputs.

Fiscal

Fiscal benefits arise through taxes paid from the project itself (such as Corporate income tax on profits, plus royalties and any other project-level taxes) and an increase in the taxes paid by workers and suppliers.

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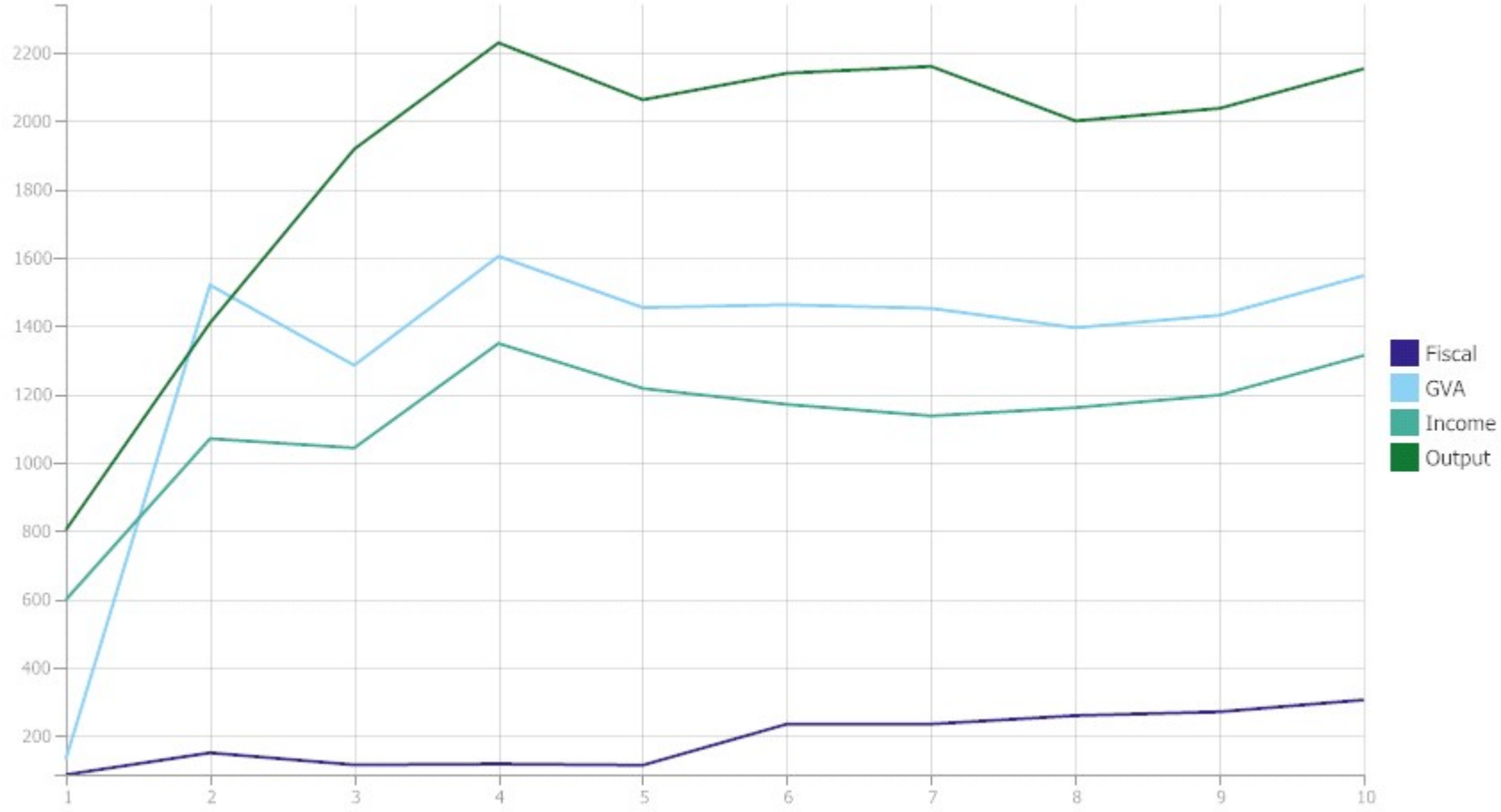
POTENTIAL ECONOMIC IMPACT BY YEAR



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TOTAL AGGREGATED ECONOMIC IMPACT POTENTIAL

Impact Indicator	Rand (millions)	Type 1 Multiple (Direct + Indirect / Direct)	Type 2 Multiple (Direct +Indirect + Induced)
Income	11,257.53	3.18	4.10
Output	7,177.89	1.82	2.10
Gross Value Add	5,012.77	4.68	4.83
Fiscal	651.77	2.36	2.67

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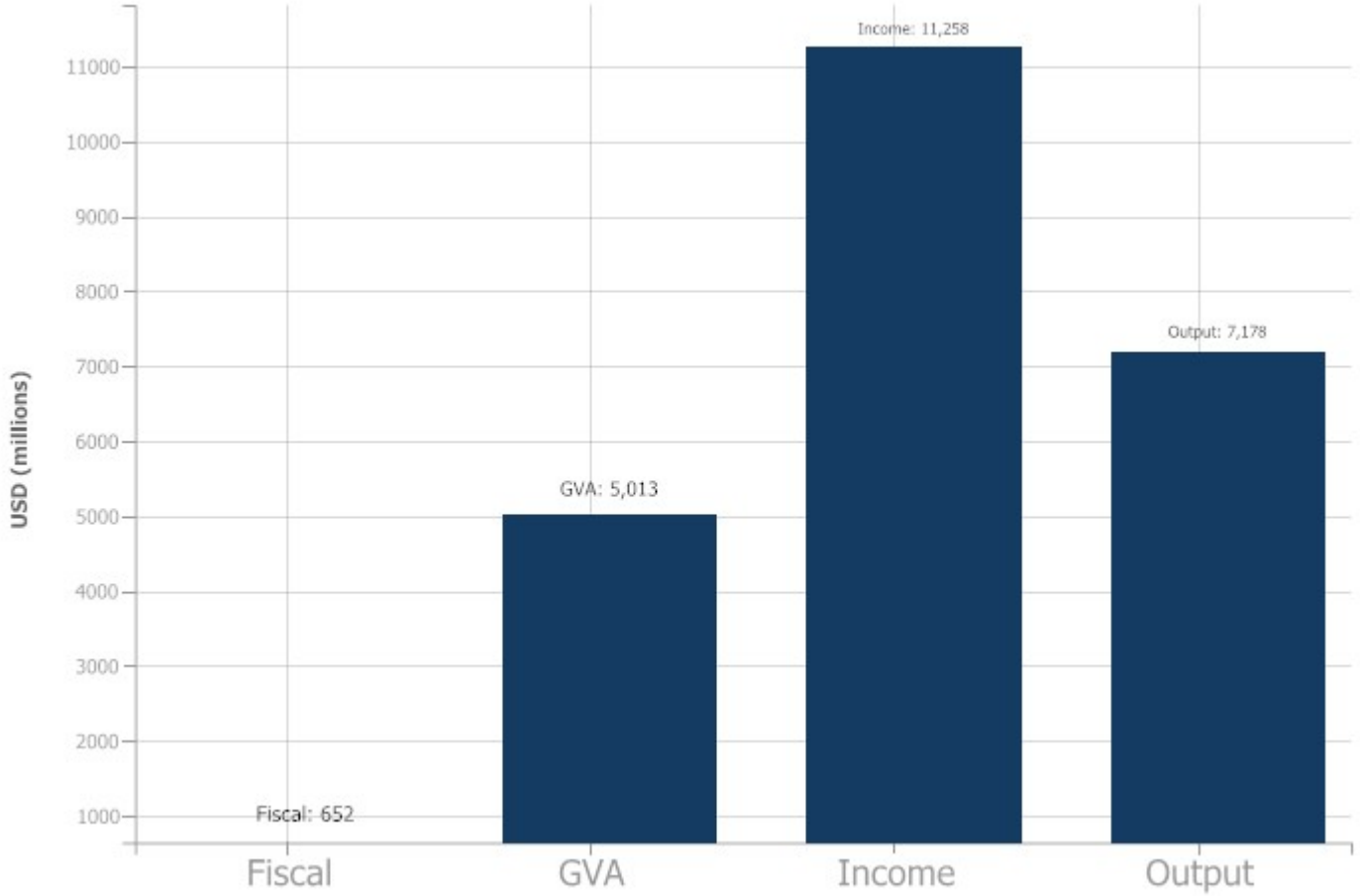
NET PRESENT VALUE OF ECONOMIC IMPACT



Discount Rate: 20 %

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METHODOLOGY

Approach

The model focuses on local expenditure as the key driver of economic impact. Our approach combines self-inputted data on expenditure and our country-specific assumptions. Having the investor or project owner input the expenditure data ensures greater precision and reliability than applying a multiplier developed using national statistics to the wrong figure.

The model can quantify the economic impact at the national or subnational level, depending on where the project location is set.

We draw on the investor, the most informed regarding the data, to provide information on expenditure from their financial modelling of the project.

The Constituent Parts of Economic Impact

The model aims to quantify the total potential economic impact of a mining, renewable or conventional energy project.

Economic impact is comprised of:

- Direct Impacts: Expenditures associated with constructing, operating and closing a project, such as labour, materials, supplies and capital.
- Indirect Impacts: Expenditures from the suppliers of the project purchasing goods and services and hiring workers to meet demand, and the stimulus effect this will have throughout the economy of such procurement from local supplier to local supplier.
- Induced Impacts: Employees of the project purchasing goods and services at a household level, such as increases in purchases in the local shops and the requirement for additional workers in establishments servicing the increase in expenditure for these employees.

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STEP 1: QUANTIFYING DIRECT ECONOMIC IMPACT

The economic impacts from a project stem from project expenditure, the model starts with estimating project expenditure and categorising local and international expenditure.

Localising Expenditure

Since the economic impacts from a project stem from project expenditure, the model starts with estimating project expenditure. A vital assumption in determining the broader economic impact results from the use of local procurement and local employment in project costs.

The total direct expenditure on local workers and suppliers constitutes the direct impact for income and output (suppliers only), just as the total number employed in the project constitutes the direct impact on employment. Our model relies on an estimation of national against imported, international labour.

In order to calculate the direct economic impact (and to help the calculation of the later indirect and induced impact), we must estimate the use of local content. This includes for labour, where a breakdown between expatriate and local employment is required. For all non-labour costs, a breakdown between imported and locally procured is required. The model thus expects users to insert % locally procured and employed, in order to get a value for local procurement and wages.

STEP 2: QUANTIFYING INDIRECT ECONOMIC IMPACT

The direct expenditures will all have indirect economic impacts, in addition to the direct impacts. The indirect impact results from suppliers to the project hiring more workers and increasing procurement from their own suppliers (as inputs into the production of inputs to the project). This then leads to such suppliers to suppliers increasing their own procurement and labour, in several rounds of indirect impact.

- Indirect impact income: Earnings from suppliers to the subcontractor (i.e. local farmer) plus additional wages to employees of the supplier
- Indirect impact on output: Increased output from suppliers to the subcontractor (i.e. agricultural production)
- Indirect impact on Employment: Increased employment from the subcontractor in order to produce additional output
- Indirect impact on taxes: Increased taxes paid by a subcontractor to the government (both turnover taxes plus profits taxes).
- Indirect impact on gross-value added: The added value arises from the subcontractor's use of their own inputs to create outputs and is represented by profit margin.

Country	Profit Margin	Average Effective Tax Rate	Labour Share
South Africa	16.88%	29.10%	56.86%

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Indirect Impact assumptions in the model

Profit Margins for suppliers

The assumed gross margin for suppliers arises from the Penn World Table's (PWT) Internal Rate of Return assumptions. From the guide accompanying PWT:

The return on capital plays an important role in the economics literature, in particular, the Lucas (1990) paradox of why capital is not flowing towards low-income countries. In PWT 9.1 we introduce a new variable, the real internal rate of return on capital (IRR), which allows us to track the development of the return on capital over time and compare levels across countries. We apply the method by Jorgenson and Nishimizu (1978), which is a more accurate measure of the return to capital than the often-used Marginal Product of Capital (MPK) because it accounts for differences in the composition of the capital stock. The required rate of return on capital is chosen to exhaust the income left after subtracting labour income from GDP. This gives an IRR on capital which sets 'pure profits' to zero and is thus consistent with the maintained assumption of perfect competition. An important drawback, in a global context, is that in some countries the rents from extracting natural resources like oil and gas is a sizeable fraction of GDP (Lange, Wodon and Carey, 2018). For those countries, computing the IRR based on the income that does not flow to labour would substantially overestimate the required rate of return on assets. So instead, we determine the income flowing to capital as nominal GDP, minus labour income and minus natural resource rents. The greater the internal rate of return to capital, the greater would be the margins companies are making on individual sales.

Effective Tax rates for suppliers

Having assumed post-tax profit margin from a transaction, we need to make an assumption about the tax paid on the transaction. A component of the WB Doing business relates to 'Paying Taxes', which uses an indicator of total tax and contribution as a % of the profit. Country scores for this indicator have been downloaded and applied to profits (recorded as gross margin above).

Having subtracted profit margin and taxes paid by suppliers, we come to the cost of output. This difference between the sales value and costs incurred by the producer is also gross value added.

Production costs distribution between wages and procurement

All output results from labour augmented by non-labour inputs. For example, output for a consultancy will result from the work of the consultants plus the laptop they use and their offices etc. Output from a construction firm will result from the work of labourers plus the machinery employed to support such workers.

The cost of producing such output thus requires payment of wages to employees used, plus purchasing or renting of non-labour inputs which 'augment' the use of labour in the production process. Such non-labour inputs support the productivity of labour, which is how technology leads to productivity improvements.

For this model, we want to understand how much an additional unit of output from a supplier to a project results in payment of wages to employees relative to the procurement of further supplies/inputs, from a range of local or foreign suppliers.

The approach we use is to use data on the labour share of national income, from the PWT. This % labour share is then applied to the cost of sales to estimate the additional expenditure from labour resulting from a certain increase in output. The residual (after profits, tax and use of labour) is procurement. We then need to identify how much procurement is local, for which we estimate import penetration.

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Country	Import Penetration Ration	Average Pay Per Worker
South Africa	22.36%	20,943.37

Import Penetration

For this, we have used the World Bank's World Development Reports. The WB reports show imports as a % of GDP. We have estimated the % of expenditure in the economy which goes on imports by subtracting exports (also from WB reports) from GDP and adding imports to estimate total domestic consumption and have used imports as a % of total domestic consumption as our figure for import penetration.

Employment Assumptions

In order to assume a likely impact on employment, we have had to consider how employment relates to output i.e. how much extra employment is caused by extra output. For the extra output generated, we have applied the labour share (from PWT) to indicate how much of the extra output would be spent on wages. We have then divided this aggregate figure by the GDP per worker (again available through PWT) in order to estimate the quantitative impact on employment.

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Indirect impacts on variables

Indirect impact on income

It is easiest to start with calculating the impact on income. The direct impact on income has been calculated by examining project expenditures on labour and domestic procurement. The indirect impact on income stems from the payment by project suppliers in the form of wages and additional local procurement. This depends on the size of the assumed expenditure by suppliers on local wages and procurement.

Having estimated the impact on income from the first round (i.e. expenditure by suppliers to the project), the model proceeds to estimate the impact on income from the second round (i.e. suppliers to suppliers) and the third round (suppliers to the suppliers to the suppliers) etc. This is done by applying the ratio of the indirect income impact from the first round to the direct income impact, to the first-round indirect income impact, to get the second-round income impact.

The model only goes to five rounds as that is enough to illustrate the impact even with exceptionally high local procurement. Eventually, the impact on the economy peters out due to leakages. The total indirect impact is calculated by adding together the impact from the first five rounds. The Type I multiplier can then be estimated (direct + indirect impact divided by direct impact).

Indirect Impact on output

The Output is the total value of production (i.e. business sales revenue). The direct output is the value of local sales to the mine, petroleum or energy project. Such suppliers have their own suppliers, which also increase output, which is an indirect impact. Likewise, such suppliers have their own suppliers and vice versa. The first round of indirect impact on output stems from increased local procurement by suppliers to the project. We use the same technique as for the indirect impact on income for later rounds.

Indirect impact on gross value added

The gross valued added is the difference between the value of output and the cost of producing such output for the suppliers who benefit from the indirect impact on output.

For the direct impact, this results from the user-inputted sales revenue minus capital and operating costs. For the indirect impact, it is the revenue received by suppliers for their inputs to the projects minus the proportion of such revenue which is accounted for by the cost of production (both procurement of inputs and employment).

Indirect Impact on employment

With employment, the quantitative indicator is different (i.e. the number of jobs, rather than any financial value). Thus, we must establish a relationship between jobs and output i.e. how many additional workers will subcontractors to the project employ in order to meet required additional output.

The labour share of income shows us how much of the income generated by the project is spent on labour costs (as opposed to procurement). To understand the impact in terms of employed workers, we need to apply this proportion of income spent on labour by the average wage to get the number of employed workers.

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STEP 3: QUANTIFYING INDUCED IMPACT

The final step in the analysis is to compute 'induced impact'. Induced impact results from increased personal expenditure on goods and service by workers, either directly employed by the project or indirectly employed by a supplier to the project. An example of induced employment would be an additional waiter/waitress employed at a local restaurant that caters to mine workers.

Overview of Induced impact

As with the income received by suppliers, there are a limited number of uses for the additional income received by direct and indirect employees. These are:

- Consumption of locally produced goods
- Consumption of imported goods
- Savings (or paying down debt)
- Additional Taxes

Mathematically, the additional income must be entirely covered by the above uses. Out of the above uses, consumption of imported goods and savings can be considered leakages, whilst consumption of locally produced goods and payment of additional taxes have a clear economic impact in the country, such as:

- Induced impact on income: Local business income (and employee income) resulting from increased spending by employees of the project and suppliers (i.e. local restaurant earnings),
- Induced impact on output: increased production resulting from increased demand for goods (i.e. meals) from employees of project and contractors.
- Induced impact on Employment: Increased employment resulting from increased spending by both employees of the project and suppliers (i.e. restaurant etc)
- Induced impact on taxes: Taxes paid by the business on income resulting from increased sales to directly and indirectly employed workers.
- Induced impact on gross-value added: the value-added from the additional output generated through domestic consumer demand.

Thus, we need to identify the proportion of additional income which is consumed locally in the domestic economy.

There are three steps to getting to this:

1. Apply taxes to get actual disposable income
2. Identify the proportion of additional/marginal income which is consumed
3. Identity proportion of consumption on imports

For taxes, the model allows users to impose assumed taxes paid on personal incomes by country in order to reach disposable income. Having identified disposable income, we then establish the proportion, which is consumed, rather than saved (i.e. the propensity to consume).

Having subtracted tax and consumption, the remainder (residual) is savings.

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For Uruguay for example, the breakdown is as following:

% of Individual income paid in tax	21.43%
% of individual income going to consumption	63.38%
% of individual income saved (inc. debt repaying) - residual	15.18%

Out of additional consumption, we must establish the proportion which is spent on the domestic economy (not imported). For this, we subtract the propensity to import in order to calculate the % which is consumed locally.

For Uruguay for example, the figures are as followed:

Import Penetration	15.98%
% locally sourced or consumed	84.02%

Induced Impact calculation
There are three steps to getting to this:

1. Apply taxes to get actual disposable income
2. Identify the proportion of additional/marginal income which is consumed
3. Identity proportion of consumption on imports

Country	Personal Tax	Average Propensity to Consume
South Africa	12.72%	78.78%

Chart: New Policy Scenario, IEA 2015

Effective tax rates for personal incomes

For effective tax rates for personal incomes, we have used as our source a database compiled by the International Centre for Tax and Development. This gives a breakdown on revenue collection by country by different sources.

For our purposes, we want to establish effective tax rates for personal incomes. This should include personal income tax and social contributions. However, there is a good argument for including taxes paid on goods and service (i.e. sales taxes, VAT and excise duties), since these are effectively paid by the consumer and they reduce 'real' income.

Based on how the ICT database was set out, the simplest approach was to subtract from revenue collection revenues from natural resources, corporate income tax, property, exports and grants. This left remaining personal income tax and social security contributions, taxes on goods and service and import taxes, all of which are paid directly or indirectly by the individual.

Propensity to Consume

Having applied taxes on personal incomes, we now must consider how much of disposable income is consumed. Again, we have used World Bank World Development Reports for our source, using estimates for households and NPISH final consumption as a % of GDP.

Household final consumption expenditure (formerly private consumption) is the market value of all goods and services including durable products (such as cars, washing machines, and home computers), purchased by households. It excludes purchases of dwellings but includes imputed rent for owner-occupied dwellings. It also includes payments and fees to governments to obtain permits and licenses. Here, household consumption expenditure includes the expenditures of nonprofit institutions servin households, even when reported separately by the country. This item also includes any statistical discrepancy in the use of resources relative to the supply of resources.

Again, we apply the import penetration assumption to consumption (since some consumption will be of imports).

The residual (after subtracting taxes paid and consumption) is savings. This is leakage – as savings increase, the size of the induced impact decreases (and multiplier reduces).

Propensity to Import

To estimate the propensity to import, we have used WB Development Reports, which provide imports and exports as % of GDP. Since GDP comprises the result of consumption, government expenditure, investment and net exports, we have estimated the amount of domestic expenditure which is accounted for by imports by subtracting net exports from GDP and then adding imports as a % of GDP.

For example, for Albania, we know that imports are 46.6%, whilst exports are 31.5% of GDP. To estimate total domestic consumption, we have completed the following:

- GDP= Government Expenditure + Investment + Domestic Consumption + (exports-imports) = 100%
- GDP= Government Expenditure + Investment + Domestic Consumption – 15% = 100%
- GDP = 115%-15% =100%

Total expenditure = 115% + 46.6% = 161.6%

Thus, imports as a % of expenditure is 46.6% out 161.6%, which equals 28.8%.

Step 4: Aggregation and multiplier calculation

Having calculated the direct, indirect and induced impacts for output, income, GVA, employment and fiscal measures, we can aggregate the total economic impact and calculate multipliers (both type 1 and 2).

Finally, the model applies different discount rates to show the net present values of such benefits under different discount rates.

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