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Shale oil production value chain economic impact analysis

13 May 2011

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Mr Priit Rohumaa
Viru Keemia Grupp AS
Järveküla tee 14,
30328 Kohtla-Järve
Estonia

13 May 2011

Shale oil production value chain economic impact analysis

Dear Mr Rohumaa,

In accordance with the engagement letter between AS PricewaterhouseCoopers Advisors ("PwC") and Viru Keemia Grupp AS ("VKG"), signed on 21 January 2011, we performed an analysis of the shale oil production value chain positive economic impacts. We calculated a single Petroter-type shale oil plant value chain and the total VKG shale oil production related operations' impacts on the Estonian gross domestic product (GDP), employment, foreign trade balance and the estimated impact on the Estonian state tax revenue.

Inputs for the calculations were obtained from the materials prepared by VKG, interviews conducted with the representatives of VKG, information retrieved from the Eurostat and the Statistics Estonia (Statistikaamet). The accuracy of the results presented in this report is highly dependent on the accuracy and completeness of the information provided by VKG, obtained from the Eurostat and the Statistics Estonia.

We have not carried out anything in the nature of an audit nor have we subjected the financial or other information received from the Company for the purposes of our work to checking or verification procedures. Accordingly, we assume no responsibility and make no representations with respect to the accuracy or completeness of the information in this report, except where otherwise stated. Had we performed additional procedures, other matters might have come to our attention that would have been reported to you.

This report is solely for the purpose stated in the engagement letter referred to above and is not to be used for any other purpose and is subject to distribution limitations to parties other than stated in the engagement letter. This report relates only to the accounts and items specified in the report below and does not extend to any financial statements of VKG or its subsidiaries.

We make no representations or warranties regarding the services or this report and expressly disclaim any contractual or other duty, responsibility or liability to any person or entity other than VKG.

We make no representation regarding the sufficiency of our work either for the purpose for which this report has been requested or for any other purpose. The sufficiency of the work we performed is solely the responsibility of the Company, as are any decisions with respect to the matters described in this report.

If you have any further questions or inquiries please contact Teet Tender or Ülar Kirikal (+372 6 141 800).

Yours faithfully,

Teet Tender
AS PricewaterhouseCoopers Advisors

Contents

This report summarises the economic impacts that constructing the new Petroter shale oil plant and the whole VKG shale oil production value chain would have on the Estonian GDP, tax revenue, foreign trade balance and employment

Executive summary

Introduction

This section summarises the report of VKG shale oil production impact on:

- Estonian GDP;
- state tax revenue;
- employment; and
- foreign trade balance.

For performing our work, we have applied an extended input-output model. This model allows the capture of a macro-perspective of a single company activities.

The results of the analysis have been calculated on three different levels:

- Investment impact: Petroter plant value chain – an impact generated when investing into a Petroter-type shale oil production plant and making corresponding investments into energy generation and oil shale mining.
- Operating impact: Petroter plant value chain – an annual operating impact generated by Petroter plant shale oil production and related activities.
- Operating impact: VKG shale oil production value chain – an annual operating impact generated by the entire VKG shale oil production and related activities.

Please note that the analysis does not include the impacts generated by the use of free operating cash flows. In case these cash flows were used for investment purposes, additional impacts would possibly be induced. In case the cash flows were used for dividend distribution they would possibly have an additional impact on the tax revenue.

As the actual future allocation of cash generated from the operations will depend on the future needs of the business and thus cannot be reliably established , the impact of using cash flows is not covered in this report.

Our approach allows to capture the macro-economic perspective of a single company's investment and operating activities

Business overview

Oil shale are available in a number of countries worldwide. However, according to the latest researches, it is used only in China, Brazil and Estonia to produce shale oil.

Viru Keemia Group (VKG) is one of the largest oil shale processor appreciating this mineral deposit and bringing products made hereof to the consumers.

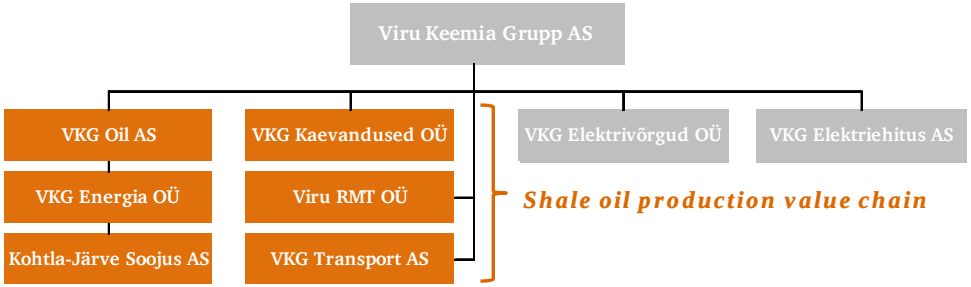
VKG consists of eight companies - the parent company and its 100% owned seven subsidiaries. The group currently employs about 1.6 thousand people. 2009 consolidated turnover was over EUR 100 million , and the 2010 turnover of the year 2010 is estimated to be EUR 130 million. VKG is among the largest investors at both regional and state levels. Investments made into environment protection and development within the last ten years exceed EUR 255 million. It is also one of the most well known local developers who care about its employees and local residents. In 2010 VKG joined the most powerful international initiative for social responsibility - GRI and UN Global Compact.

VKG pays special attention to the protection of environment. The group's main priorities in this field are prevention and minimisation of production impact on the environment. The group aims at employing modern technologies, which would enable to commercially use the potential of shale oil in the best possible way.

over €255m

Environmental investments since 2000

VKG group structure



VKG Oil AS is the largest Estonian commercial producer of shale oil and oil shale chemistry.

VKG Energia OÜ supplies with heat the residents of Järve, the subsidiaries of VKG group and neighbouring industrial enterprises. The total thermal power of the enterprise is 700 MW.

Kohtla-Järve Soojus AS supplies heat energy to Jõhvi and a part of Kohtla-Järve.

VKG Kaevandused OÜ is the owner of Ojamaa mine, which is located in the southern part of the VKG industrial territory and its deposits are estimated to comprise 60 million tonnes of oil shale. VKG holds an extraction permit to mine 75 million tonnes of oil shale , satisfying the VKG requirements for the next 20–25 years.

VKG Elektriehitus AS provides all-round services in the field of constructing power networks to industrial enterprises, electrical companies and network owners.

VKG Transport AS is one of the largest Estonian transport companies which renders car and railway logistics services domestically and worldwide. Its operations are partially unrelated to the shale oil production value chain.

Viru RMT OÜ has significant experience offering repair and assembly services. Its activities include repair and servicing of processing units, production of metal details and constructions and rendering assembly services. Its operations are mostly related to the shale oil production value chain.

VKG Elektrivõrgud OÜ possesses a power distribution network from Narva to Sillamäe. The region with over 100,000 residents is supplied with electricity using the distribution lines of VKG Elektrivõrgud, which total 810 km .

Summary operating impacts – VKG shale oil production value chain

VKG shale oil production value chain				
Operating impact				
Impact	**Direct**	**Indirect**	**Induced**	**Total**
GDP, € in thousands	106,214	18,438	7,742	**132,394**
Employment, # of jobs	1,762	921	459	**3,142**
State tax revenue, € in thousands	20,361	6,378	2,678	**29,417**
Net exports (imports), € in thousands	90,834	(11,327)	(2,323)	**77,184**

Source: VKG information, PwC analysis

The VKG shale oil production value chain has an annual impact of EUR +132.4 million on the Estonian GDP. A large proportion (80.2%) of the impact is direct, i.e. generated inside the group due to the high value added by the operations. The total impact corresponds to 0.9% of the Estonian GDP for 2010. Therefore, the VKG shale oil value chain operations have a significant impact on the Estonian economy.

The operations generate a positive impact to the Estonian state tax revenue amounting to EUR +29.4 million. This impact corresponds to 0.6% of the Estonian state tax revenue of 2010.

The operations generate 1,762 jobs once the Ojamaa mine is fully operational. Additional 1,380 jobs are generated through the demand of goods from the suppliers and the consumption induced impact of employed VKG workers.

Most of the jobs generated are located in North-East Estonia. This region suffered from the highest regional rate of unemployment in Estonia in 2010 of 25.8%. Thus, the operations of VKG shale oil production have a significant impact on the social and economic stability of the region.

The jobs generated in the sector have also a significantly higher value added component (EUR 42.1 thousand per employee) when compared to the Estonian average (EUR 25.4 thousand per employee). Therefore, the jobs generated by VKG have a significant impact on boosting the growth of the Estonian GDP.

The shale oil production has a significant positive impact both on the exports and subsequently the foreign trade balance of Estonia. The positive annual impact of EUR +77.2 million accounts for 0.9% of the Estonian total exports and 14.9% of the Estonian foreign trade balance of 2010.

Summary investment impacts - Petroter shale oil plant value chain

Petroter-type shale oil plant value chain				
Investment impact				
Impact	**Direct**	**Indirect**	**Induced**	**Total**
GDP, € in thousands	25,770	10,933	3,375	**40,078**
Employment, man years	1,625	686	200	**2,511**
State tax revenue, € in thousands	8,915	5,612	1,168	**15,695**
Net export (import), € in thousands	(78,830)	(8,157)	(1,013)	**(88,000)**

Source: VKG information, PwC analysis

The investment impacts represent economic impacts of the investment into a Petroter-type shale oil plant and proportional investments into energy generation and mining, which together comprise an essential part of shale oil production value chain related investments.

The impact of the single Petroter-type shale oil plant value chain investment on the Estonian GDP amounts to EUR +40.1 million.

The impact on the State tax revenue totals to EUR +15.7 million, generating EUR 6.1 million of production and import taxes and EUR 6.0 million of social charges and EUR 3.6 million of other taxes and charges.

The investment generates 2,511 man-year equivalent jobs in the investment phase. Assuming a two year investment timeframe, the impact of +1,256 jobs a year reduces unemployment by 0.2% over the two years. This impact is followed by an operating phase impact, where the temporary jobs are replaced by permanent ones.

There is a negative impact on the foreign trade balance, totalling to EUR -88.0 million, that mostly comes from the imports of machinery needed for setting up the operations. This impact corresponds to 17% of the Estonian foreign trade balance of 2010.

Nevertheless, this negative impact is off-set by the positive impact on the foreign trade balance through net exports of the operations already in the fourth year of production.

Summary operating impacts – Petroter shale oil plant production value chain

Petroter-type shale oil plant value chain				
Operating impact				
Impact	**Direct**	**Indirect**	**Induced**	**Total**
GDP, € in thousands	35,164	6,104	2,536	**43,804**
Employment, # of jobs	583	305	152	**1,040**
State tax revenue, € in thousands	6,741	2,112	887	**9,740**
Net export (impoirt), € in thousands	30,073	(3,750)	(769)	**25,554**

Source: PwC analysis

The Petroter-type shale oil plant value chain has an annual operating impact of EUR +43.8 million on the Estonian GDP. A large proportion (80.2%) of the impact is direct due to the high value added by the operations. The total impact corresponds to 0.3% of the Estonian GDP for 2010. Therefore, the operations have a significant impact on the Estonian economy.

The operations generate a annual positive impact to the Estonian state tax revenue amounting to EUR +9.7 million. This impact corresponds to 0.2% of the Estonian state tax revenue of 2010.

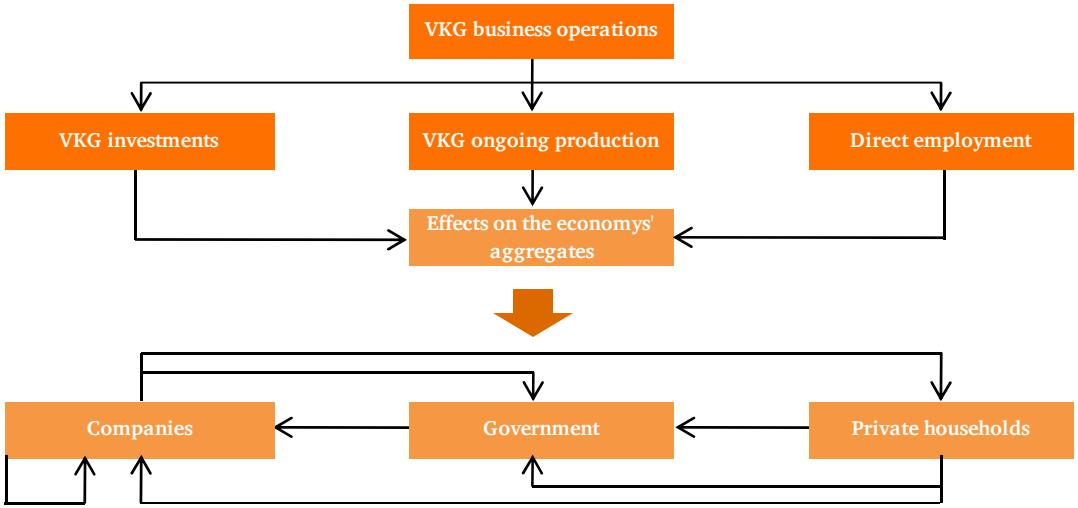
The operations generate 583 jobs inside VKG group. Additional 457 jobs are generated through the demand of goods from the suppliers and the consumption induced impact of employed VKG workers.

The shale oil production has a significant positive impact both on the exports and subsequently the Estonian foreign trade balance. The annual positive impact of EUR +25.6 million accounts for 0.3% of the Estonian total exports and 5.0% of the Estonian foreign trade balance of 2010.

Starting from the fourth year of operations, the positive annual operational impact of EUR +25.6 million to net exports off-sets the negative impact of EUR -88.0 million from the investment phase.

Methodology

Methodology basics



In order to quantify the socio-economic contribution of VKG's business operations to the Estonian economy, we assessed the related economic and fiscal impacts as well as impacts on private households. In particular, we derived indicators for VKG's impacts on GDP, employment, foreign trade balance and tax contribution. The analysis of these impacts allows this study to provide a quantitative and, to a lesser extent, qualitative assessment of VKG's economic contribution to the broader Estonian economy.

To cover all the economic impacts in Estonia, we analysed the direct impacts of VKG's economic activities as well as the indirect and induced impact salong the entire supply chain of oil shale energy investment, production and distribution.

Model approach

Exemplary Input-Output Table									
To / From	Intermediate demand				Final Demand				Total Demand
		Primary Sector	Seconary Sector	Tertiary Sector	Public Consumption	Private Consumption	Exports	Other Final Demand	
Intermediate Inputs	Primary Sector								
	Secondary Sector		Q1				Q2		
	Tertiary Sector								
Intermediate Inputs	Wages & Salaries				Q4				
	Gross operating Surplus		Q3						
	Taxes								
	Imports								
Total Supply									

Q_1 Intermediate usage
Q_2 Final demand
Q_3 Primary inputs to production
Q_4 Primary inputs to final

In order to estimate the economic contribution of VKG to Estonian economy, we developed an extended input-output-model. In principle, an input-output model describes general intra-economy value flows. It reconciles what goes into different sectors of the economy and what goes out. Inter-sector relations in an economy are an important factor in this input-output analysis, demonstrating how the output of one industry flows towards another industry where it serves as an input. Therefore, the model shows economic interdependencies among producers of goods and services, illustrating how one industry depends on another.

The input-output-table itself is static, which means it is formulated with respect to a specific year and has to be updated periodically. Because all sectors of the economy - industry sectors, households, the government and the foreign sector (exports) - are both, buyers and sellers of goods and services, input-output-tables have a square format (number of columns and rows in the intermediate goods quadrant (Q1 see table below) are equal). Rows represent sellers (receipts) and columns represent buyers (expenditures). Three out of the four quadrants in the input-output-table are relevant for this study: Final demand (Q2), Intermediate Usage (Q1) and Primary inputs to production (Q3). For example, private consumption of employees induces production which leads to money transfers between various sectors, which subsequently generates income for households, governments and companies.

Input-output methodology (1 of 2)

Suppose for example, that one output of the Estonian economy is from a secondary (i.e. production) sector. In order to produce this output, this sector requires inputs such as labour, capital and intermediate goods. By examining the country's input-output-table, one can gain a clearer idea of what resources are being used for what purposes. In addition, the difference between the cost of the inputs and the price of the outputs indicates the "value added" associated with this production.

However, there are some shortcomings of the input-output methodology. First of all, studies of that kind are data-intensive and technically demanding. Their correctness is largely dependent on the quality of both, official and corporate data. To account for this potential pitfall, we only used official input-output-tables, data obtained from Statistics Estonia and Eurostat and data provided by VKG.

Another shortcoming is that the methodology only provides a snapshot of Estonia's economic activities. Time-series research or the development of major variables over time can only be carried out with certain restraints. For instance, input-output analyses do not account well for technological change since the tables are only updated from time to time and the latest available input-output-tables for Estonia date from 2005.

Since most industrial sectors are subject to technological change over time, relying on this data potentially involves missing some important developments that affect the impacts such as potential capital-labour substitution, the increase of import shares and technological change.

Input-output methodology (2 of 2)

Despite these main deficits, the great advantage of input-output-modelling is that it yields a macro-perspective of a single firm's activities. It links the related demand to economy wide statistical data.

From an algebraic perspective, the main approach of the model can be described by the following equation. This basic equation includes the methodology to incorporate all domestic impacts along the entire supply chain.

$$(I - A)^{-1} y = x$$

Whereas I is the unity matrix, A is the matrix of the domestic technology coefficients, which for example reflects the input share of sector one in the output of sector two. Y is the scalar of the VKG related demand per sector. The inverse of $(I - A)$ is known as the Leontief Inverse.

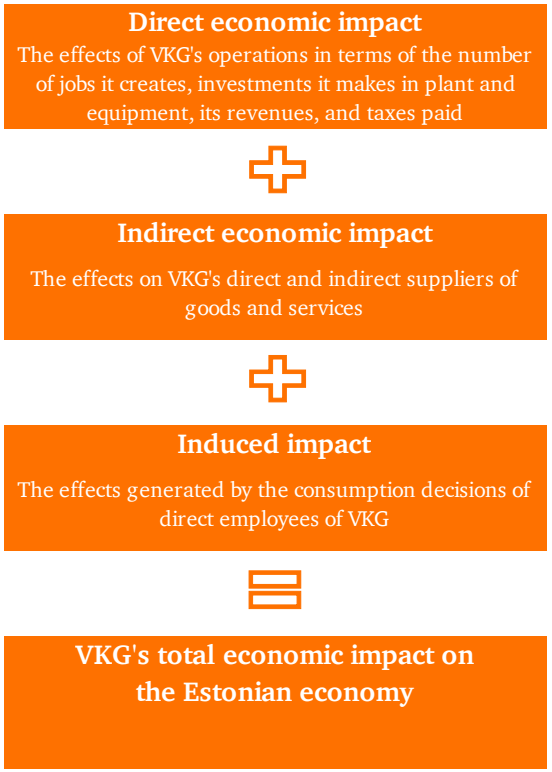
Finally, x is the scalar of the direct and indirect production values per sector. Based on x it is possible to derive the economic indicators as explained above (GDP, tax, employment, imports etc.) as a linear transformation of the production value per sector.

The input-output methodology yields a macro-perspective of a single company activities

Estimating direct, indirect and induced impacts (1 of 3)

Overview

Based on the explained model approach we estimated the direct, indirect and induced impacts of VKG´s socioeconomic contribution. As **direct impacts** we consider all economic impacts within VKG. As VKG extracts oil shale oil, produces shale oil and its' by-products, there is also a demand on VKG's suppliers and so on down the supply chain. This demand is considered as the **indirect impact**. As a result of the direct and indirect impacts, the level of household income throughout the economy is higher, which is the result of direct employment. A proportion of this increased income is re-spent on final goods and services, which is defined as the **induced impact**. The ability to quantify these indirect and induced impacts is important as it allows to analyse VKG activities' total economic impact to the Estonian economy.



For the avoidance of doubt, this report only covers the economic contribution of VKG's production of energy made from oil shale (shale oil, heat and electricity).

Since the substitute of not producing energy from oil shale in Estonia would likely be the import of corresponding energy, the report does not cover the general impacts of distribution and use of energy in Estonia.

Direct economic impacts

To analyse the direct impacts we processed the data provided by VKG. In particular, we requested information on typical oil shale energy generation investments and information regarding the average oil shale energy generation within VKG.

Estimating direct, indirect and induced impacts (2 of 3)

Indirect and induced impacts

To quantify the indirect and subsequently the induced impacts of VKG's economic contribution, we applied our extended economic input-output-model as explained above. Basically, we used the following statistical data:

- Input-Output-Table (2005, Domestic intermediate goods, Statistics Estonia);
- Employment per input-output sector (2005-2010, Statistics Estonia);
- Growth rates for salary per employee/GDP per employee (2005-2010, Eurostat);
- Information on tax payments, social insurance payments, saving rate and import-export statistics (2005-2010, Statistics Estonia).

To estimate the indirect impacts, we analysed VKG's demand for intermediate goods and services. To allow more specific analyses of these impacts, we differentiated between impacts for a typical investment in VKG's production chain as well as VKG's average demand for goods and services during the generation of oil shale energy.

By deriving the VKG goods and services demand scalar (y) we arrived at the basis for the multiplication with the Leontief-Inverse as explained previously. As a result of this multiplication we arrive at the scalar (x). The interrelation between the scalar (x) and the indicators can be derived from the interrelation for the economy wide sector figures within the input-output table.

In addition to the direct and indirect impacts we also estimated the induced impacts. In doing so, one can either account for the consumption impact of the directly employed personnel only (alternative A) or include both, the consumption impact of the directly and indirectly employed personnel (alternative B). In contrast to alternative A, alternative B includes the additional demand for consumption goods and services from the indirect suppliers' employees. Summarising this, alternative B includes a wider range of socio-economic impacts.

Estimating direct, indirect and induced impacts (3 of 3)

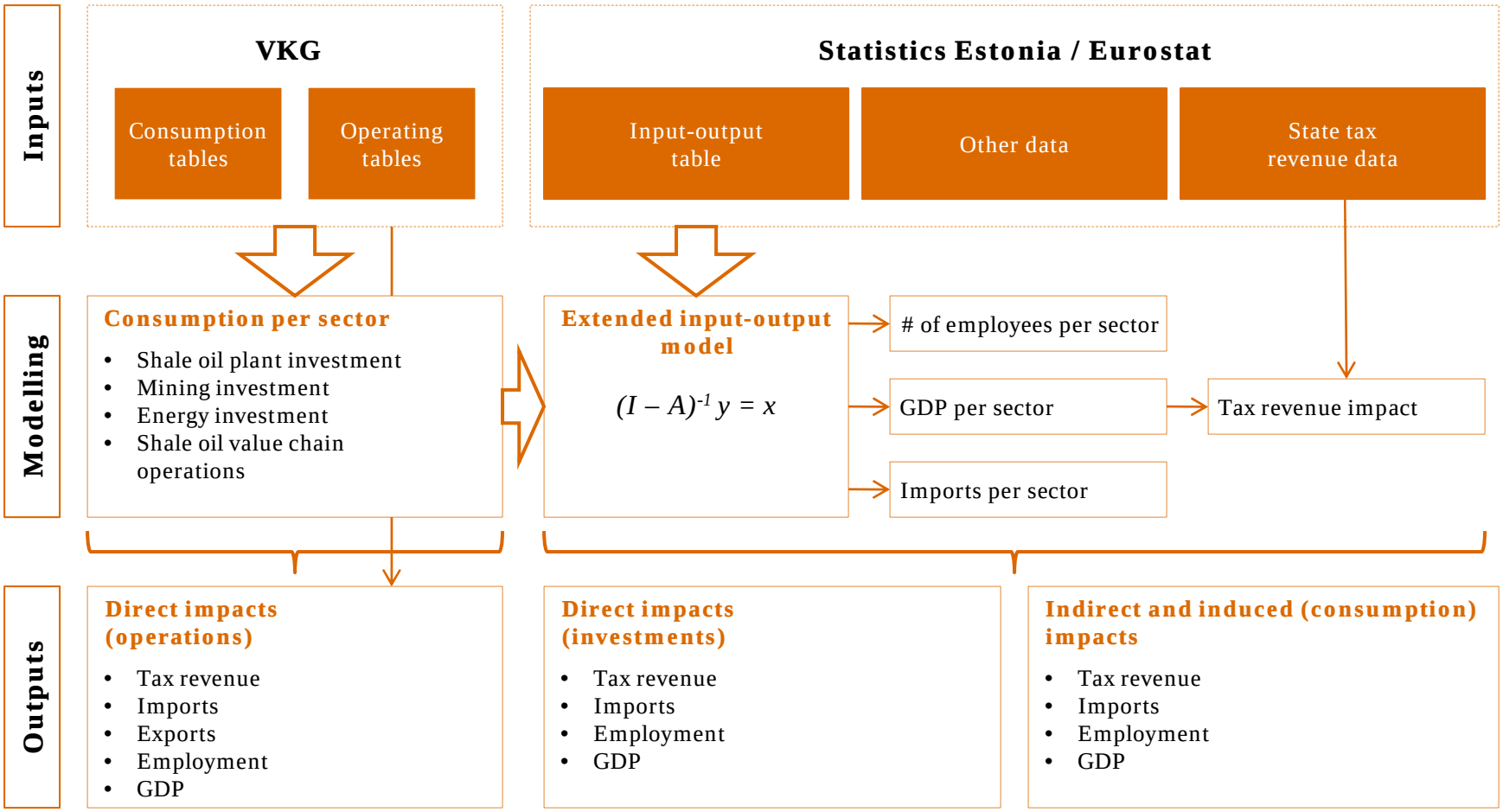
However, to avoid the over-estimation of VKG's socio-economic contribution, we only included the calculation of the direct employees' consumption impacts to derive the scalar.

In this context it is important to note that we stick to the European Commission's (major project) approach which defines "direct employment" as the employment in the assessed company/project itself as well as the employment of the direct (first stage) suppliers during the investment phase.

Therefore, the employment of the direct suppliers in a typical VKG investment is also deemed as a direct employment.

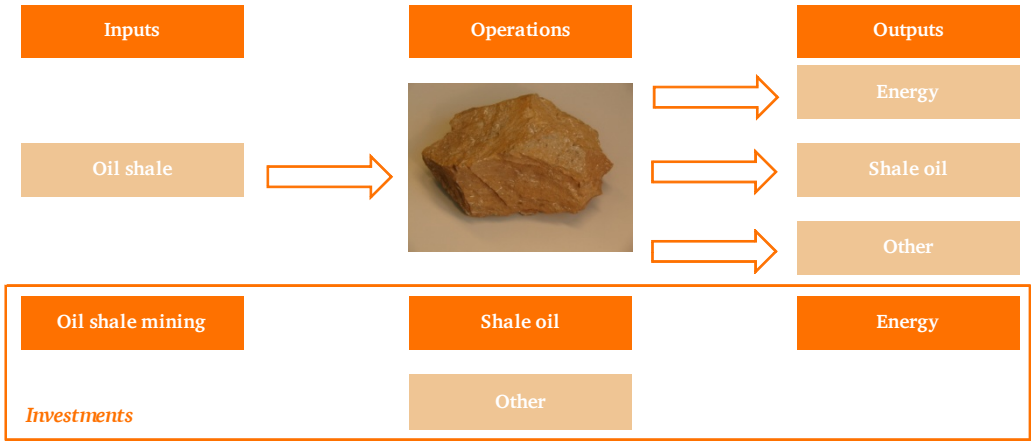
To get the link between the available information from the input-output-table (salary and wages) to the aggregated additional demand for domestic consumption goods we included statistical data and assumptions for social charges, other employment tax payments, domestic saving rates as well as the share of demand for domestic products. To differentiate sector wise the demand for domestic consumption goods, we used the available private household consumption structure from the input-output framework. Based on this approach we derived the scalar for a typical VKG investment as well as an average VKG production year.

VKG economic impact analysis flow-chart



Data

Linking of data



The operating impacts for Total VKG shale oil production value chain are calculated based on the 2011 VKG consolidated budget, from which non-shale oil value chain related operations had been previously eliminated by VKG.

For the purposes of this analysis, the purchase cost of oil shale in the consolidated figures has been replaced with the operating costs of Ojamaa oil shale mine.

Although, currently this mine is not fully operational, inclusion of the costs allows to present the anticipated long-term impact of VKG operations.

Single Petroter-type shale oil plant value chain impacts have been calculated as a proportion of the total VKG shale oil value chain impacts, based on shale oil output (roughly 1/3 of the total output). This derivation follows the assumption of similar revenue and cost structure for single plant value chain to the total, as instructed by VKG.

Individual (mining, shale oil and energy) investment impacts have been interlinked using the proportional shares of inputs (mining: tonnes of oil shale) and outputs (energy: MWh of electricity; shale oil: tonnes of shale oil) to the consolidated operating figures. This allows to present a proportional investment impact of a single Petroter-type plant value chain.

Shale oil plant and energy investment inputs

New shale oil plant

New shale oil plant based on Petroter technology will be located at the VKG production territory. The new production complex will include the following main components: oil shale warehouse, oil shale supply system, thermal process department, condensation department.

Oil shale, which sizes between 0-25 mm and heat value of 8,4 MJ/kg will be used as the raw material.

The oil plant processing capacity at full will be 850 thousand tonnes of oil shale a year, from which arises:

- 104,600 tons of shale oil;
- 27,600 thousand cubic metres of retort gas;
- 6,400 tons of coke; and
- 167,900 MWh steam.

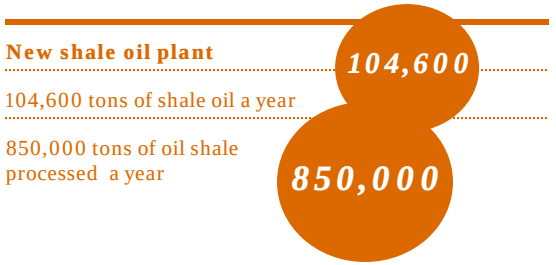
This amount corresponds to app. 1/3 of the total VKG shale oil value chain oil output budgeted for 2011.

Energy generation

VKG Energia thermal power stations are basically part of the oil production process, because the generator gas can be utlised only at station boilers.

VKG Energia is in the process of acquiring a new turbo plant unit which has a turbine electrical power of 29 MW.

This unit allows to process approximately 70% of the generator gas output of a single Petroter-type shale oil plant. Thus, investment into a Petroter-type shale oil plant results to approximately 1.43 times investments into such turbo plant units.



Mining investment inputs

Oil shale mining

Ojamaa mine has a surface area of 1,694 ha and has estimated deposits of 56.68 million tons (as of 1 January 2006). The average depth of the mine is 30 meters.

Oil shale mining consists of the following operations:

- Drilling the auger hole with blasting charge;
- Loading the charge holes and blasting;
- Loading the material onto a conveyor.

Oil shale extracted from Ojamaa mine will be used as a raw material in VKG Oil plants.

The crushing and screening facility, which converts the output into a usable form, is situated near the shaft.

To transport the oil shale from Ojamaa mine to oil plants, located in Kohtla-Järve, a 13 km long band conveyer will be constructed.

The mine is estimated to reach full capacity in 2013. At that time it should be able to produce 2,750 thousand tonnes of oil shale a year. This output is sufficient to provide the oil shale needed for VKG operations in 2011.

Thus, in the analysis the purchase costs of oil shale in the VKG shale oil value chain budget for 2011 have been replaced by the budgeted operating costs of Ojamaa oil shale mine.

Single Petroter-type shale oil plant is able to produce approximately 1/3 of the total VKG shale oil value chain oil output budgeted for 2011. Thus, a single Petroter-type shale oil plant investment is assumed to lead to a mining investment corresponding to 1/3 of the budgeted investment into Ojamaa oil shale mine.

2,750

The planned full annual production capacity (thousand tonnes) at the Ojamaa mine

Results – VKG shale oil production

Operating phase: VKG shale oil production
Impact on GDP

Impact on GDP

The direct impact on GDP in this case represents the impact to the economy through the value added by the activities of VKG shale oil production value chain in one year of operations and corresponds to EUR +106.2 million.

The annual impact on GDP generated through the demand for the goods of suppliers (both direct and indirect) amounts to EUR +18.4 million. Industries which have the largest indirect impact are land transport services, machinery and equipment, coke and refined petroleum products, trade and repair services for motor vehicles and water.

The induced impact represents the economic impact induced through the consumption by workers employed in VKG and amounts to EUR +7.7 million annually.

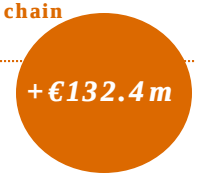
VKG shale oil production value chain	
Operating impact on GDP	
Operating effect, € in thousands	
Direct impact	106,214
Indirect impact	18,438
Induced impact	7,742
Total	**132,394**

Source: VKG information, PwC analysis

The total impact of the total VKG shale oil production value chain operations on GDP is EUR +132.4 million annually. This corresponds to approximately 0,9% of Estonian GDP for 2010.

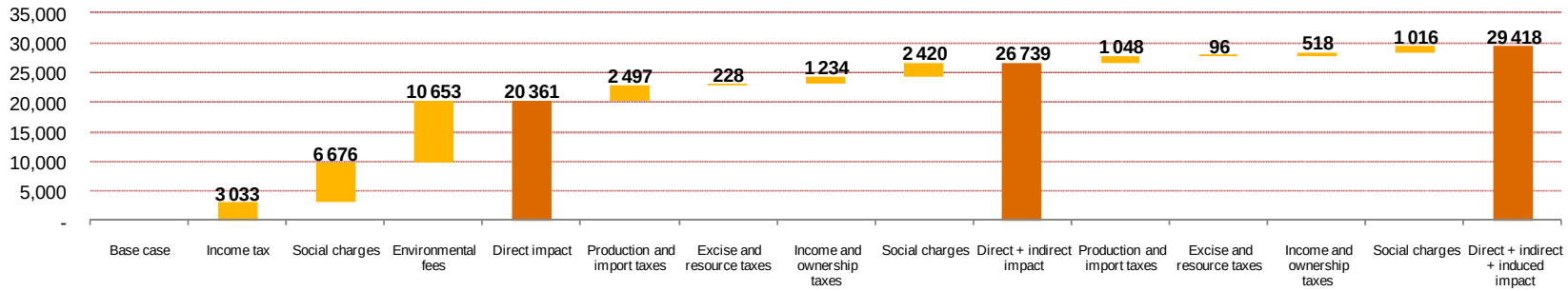
This value is remarkable for a single group of companies. Thus, VKG shale oil production value chain operations have a very significant impact on the Estonian economy.

VKG shale oil production value chain Impact on GDP



Operating phase: VKG shale oil production
Impact on tax revenue

VKG shale oil production value chain tax revenue impact, € in thousands



Source: VKG information, PwC analysis

The annual impact on the Estonian state tax revenue from the operating phase is estimated to be EUR +29.4 million. The direct impact is calculated based on the VKG 2011 shale oil production value chain budget:

- Personal income tax of EUR +3.0 million;
- Social charges of EUR +6.7 million; and
- Environmental fees of EUR +10.7 million.

Please note that the VAT calculation was excluded from the analysis. However, using a high-level estimate, we assess the additional impact of VAT paid on the goods and services supplied to the Estonian consumers to range from EUR +6.7 to +7.1 million.

The indirect and induced impact on tax revenue is following:

- EUR +3.5 million – production and import taxes;
- EUR +0.3 million – excise and resource taxes;
- EUR +1.8 million – income and ownership taxes; and
- EUR +3.4 million – social charges.

The total impact of EUR +29.4 million makes for 0.6% of the total Estonian tax revenue for 2010. This is another significant contribution by a single group of companies.

Operating phase: VKG shale oil production
Impact on employment

The number of directly employed VKG's workers in the shale oil production value chain currently amounts to 1,562. From these 160 are employed for the operations of Ojamaa oil shale mine. Another 210 are expected to be hired by the time the mine becomes fully operational. Following the assumption of the Ojamaa mine being operational applied for these calculations, the total number of 1,762 employees is considered. Additional impacts on employment include:

- Indirect impact of 921 jobs generated through demand from the suppliers; and
- Induced impact of 459 jobs generated through the consumption by employees hired in the VKG shale oil value chain.

The number of jobs generated by indirect and induced impact in different sectors is as follows:

- Primary sector (agriculture, fishing and forestry): 38 jobs;
- Secondary sector (mining and production): 500 jobs; and
- Tertiary sector (services): 842 jobs.

It is also possible to calculate the value added impact of these workers by dividing the total value added (GDP) by the number of employees. These values are calculated for both direct and total impacts as follows:

- Direct: EUR 106.2 million / 1,762 employees = EUR 60.3 thousand per employee.
- Total: EUR 132.4 million / 3,142 employees = EUR 42.1 thousand per employee.

When comparing the figures to the Estonian average of EUR 25.4 thousand per employee, it can be seen that the workers in this sector generate significantly higher GDP than the Estonian average.

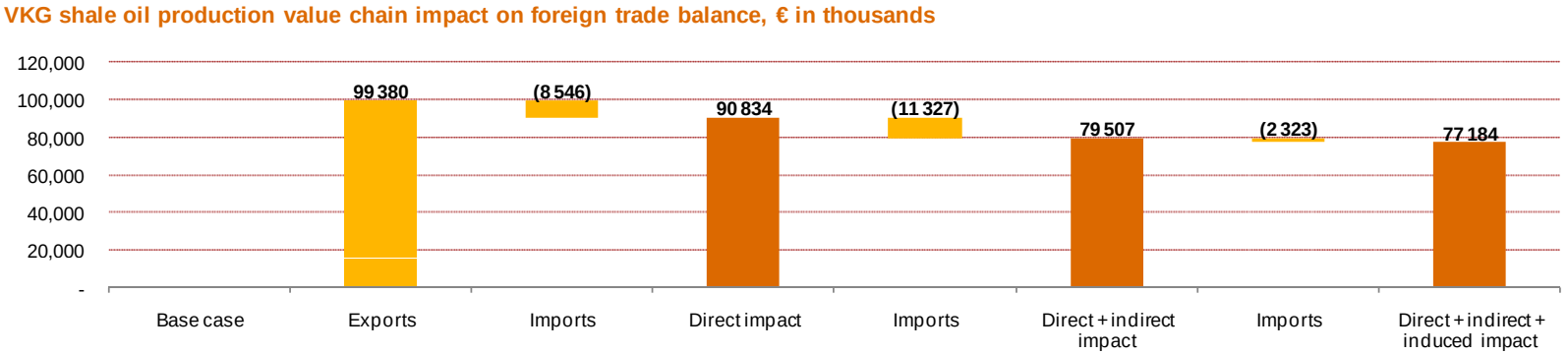
VKG shale oil production value chain	
Operating impact on employment	
Operating impact, number of employees	
Direct impact	1,762
Indirect impact	921
Induced impact	459
Total	**3,142**

Source: VKG information, PwC analysis

Additionally, a significant proportion of jobs are located in the North-East of Estonia. This region had the highest regional unemployment rate in Estonia of 25.8% in 2010. Therefore, the jobs that are both generated and maintained in the region by VKG operations are essential to support the social and economic stability of the region.

VKG shale oil production value chain
Number of employees

Operating phase: VKG shale oil production
Impact on foreign trade balance



Source: VKG information, PwC analysis

The total VKG shale oil production value chain has an annual positive operating impact on the foreign trade balance of EUR +77.2 million. The impact comprises the following:

- Direct exports: EUR +99.4 million– mostly shale oil and coke;
- Direct imports: EUR -8.5 million – mostly imported machinery;
- Indirect imports: EUR -11.3 million – imports by the suppliers;
- Consumption imports: EUR -2.3 million – imports induced by the consumption by the workers employed by VKG in the shale oil production value chain.

The estimated annual positive impact to the foreign trade balance of EUR +77.2 million amounts to 14.9% of the EUR +517 million Estonian foreign trade balance for 2010.

The annual direct exports of EUR +99.4 million accounts for 0.9% of Estonian total export of 8,754 million in 2010.

The total VKG shale oil production value chain imports amount to EUR 22.2 million annually, which accounts for 0.2% of Estonian total imports of EUR 9,242 million in 2010.

In total, the operations have a significant positive impact on both the total exports and the foreign trade balance.

Results – Petroter shale oil plant

Investment phase: Petroter shale oil plant
Impact on GDP

Impact on GDP

The direct impact on GDP in this case represents the impact to the economy through the goods and services provided by the direct suppliers in the investment phase and amounts to EUR +25.8 million.

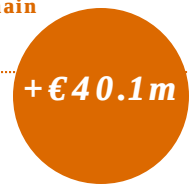
The impact on GDP generated through the demand for goods and services of indirect suppliers amounts to EUR +10.9 million.

The induced (consumption) impact represents the economic impacts generated through the consumption by workers employed by the direct suppliers and amounts to EUR +3.4 million.

Petroter shale oil plant value chain	
Investment impact on GDP	
Investment impact, € in thousands	
Direct impact	25,770
Indirect impact	10,933
Consumption impact	3,375
Total	**40,078**

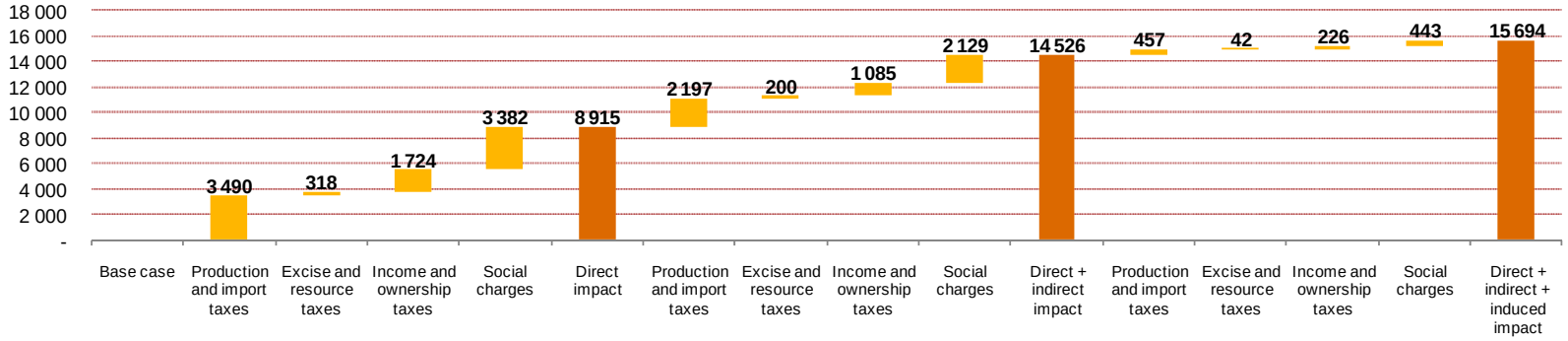
Source: PwC analysis

Petroter shale oil plant value chain investment impact on the Estonian GDP



Investment phase: Petroter shale oil plant
Impact on tax revenue

Investment phase tax revenue impact, € in thousands



Source: PwC analysis

The impact on the Estonian state tax revenue from the investment phase is estimated to be EUR +15.7 million. By Estonian Statistics Office tax income classification, the impact comprises the following:

- EUR +6.1 million – production and import taxes (incl. VAT, customs charges, etc.);
- EUR +0.6 million – excise and resource taxes (incl. various excise taxes, pollution charges, water special usage charge, etc.);
- EUR +3.0 million – income and ownership taxes (incl. income tax, vehicle tax, boat tax, etc.); and
- EUR +6.0 million – social charges (incl. Social taxes and unemployment insurance).

The total tax revenue impact of EUR +15.7 million makes 0,3% of the Estonian state tax revenue in 2010.

Single shale oil plant value chain investment impact on the Estonian state tax revenue

+€15.7m

Investment phase: Petroter shale oil plant
Impact on employment

Impact on employment

The employment impacts calculated for the investment phase are presented in man-years, since the demand generated for these jobs is temporary.

One man-year is an equivalent of one full time job created for the duration of one year.

By assuming an average investment time span of two years, the investment would expectedly generate 1,256 jobs (2,511 man-years / 2 years) over the period of two years.

Therefore, the investment would correspond to a temporary reduction in the unemployment rate of approximately 0,2% as compared to the Estonian unemployment of 2010.

Single shale oil plant value chain	
Investment impact on employment	
Investment impact, in man-years	
Direct impact	1,625
Indirect impact	686
Induced impact	200
Total	**2,511**

Source: PwC analysis

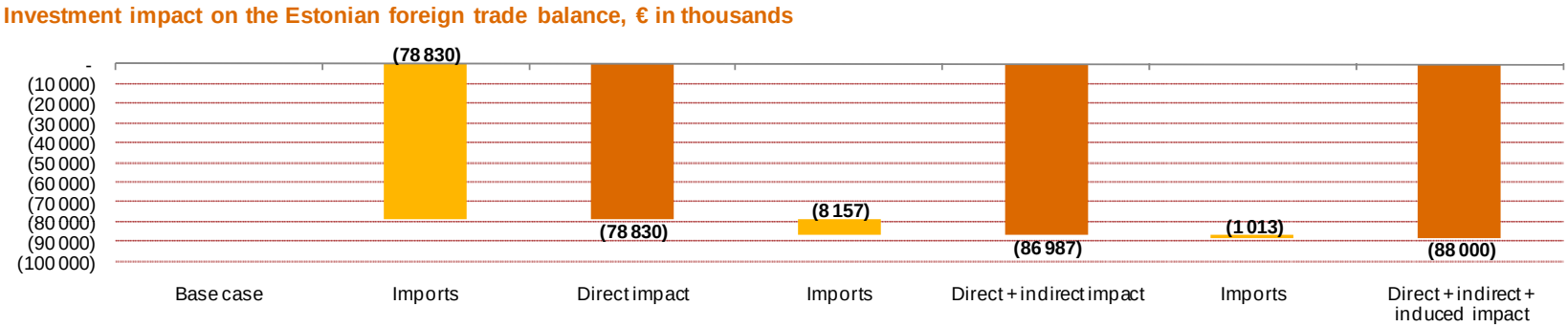
The number of jobs generated in different sectors is as follows:

- Primary sector (agriculture, fishing and forestry): +26 man-years
- Secondary sector (mining and production): +1,328 man-years; and
- Tertiary sector (services): +1,157 man-years.

Petroter shale oil plant impact on the Estonian employment

+2,511 man-years

Investment phase: Petroter shale oil plant
Impact on foreign trade balance



Source: PwC analysis

The Petroter shale oil plant value chain investment has an EUR -88.0 million negative impact on the Estonian foreign trade balance, comprising the following:

- EUR -78.8 million – the direct imports and the imports by direct suppliers;
- EUR -8.2 million – imports by the indirect suppliers; and
- EUR -1.0 million – imports induced by the consumption of the workers employed by the direct suppliers.

The negative impact to the foreign trade balance of EUR -88.0 million amounts to -17.0% of the Estonian foreign trade balance of EUR +517 million for 2010.

The corresponding impact as compared to the Estonian total imports of EUR 9,242 million for 2010 is 1.0%.

Nevertheless, the negative impact of the investment on foreign trade balance is off-set by the positive impacts of net exports during the fourth year of operations.

Operating phase: Petroter shale oil plant
Impact on GDP and tax revenue

Single Petroter-type plant value chain generates approximately 1/3 of the total VKG shale oil value chain operating impacts.

Therefore, the operations of a single plant generate an annual impact of EUR +43.8 million to GDP and EUR +9.7 million to the Estonian state tax revenue.

Petroter-type shale oil plant value chain	
Operating impact on GDP	
Operating impact, € in thousands	
Direct impact	35,164
Indirect impact	6,104
Induced impact	2,563
Total	**43,831**

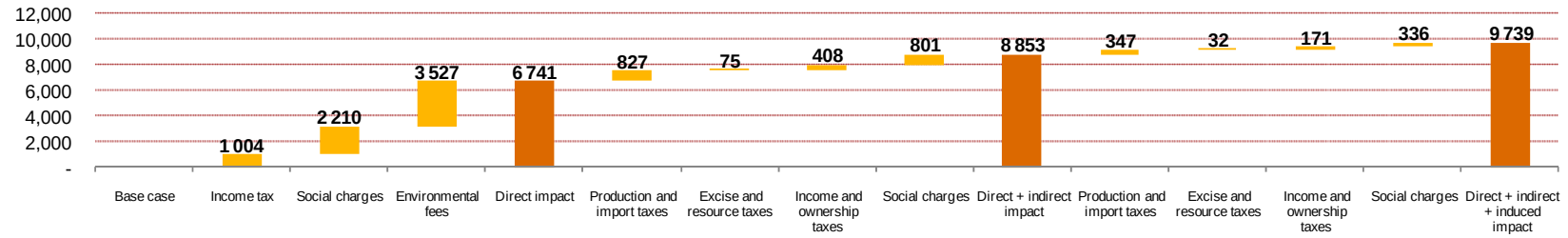
Source: PwC analysis

Petroter shale oil plant value chain

Impact on GDP **+€43.8m**

Impact on the Estonian state tax revenue **+€9.7m**

Petroter shale oil plant value chain tax revenue impact, € in thousands



Source: PwC analysis

Operating phase: Petroter shale oil plant
Impact on employment and foreign trade balance

Petroter-type shale oil plant value chain operations generate 583 jobs in the shale oil production, oil shale mining, heat and energy generation, machinery repairs and transportation. Additional 305 jobs are created through the demand of goods from suppliers and 152 jobs are created through the induced impact of the consumption by the employees of the value chain.

The value chain has an annual positive EUR +25.6 million net impact on the total exports and foreign trade balance of Estonia.

Petroter-type shale oil plant value chain	
Operating impact on employment	
Operating impact, number of employees	
Direct impact	583
Indirect impact	305
Consumption	152
Total	**1,040**

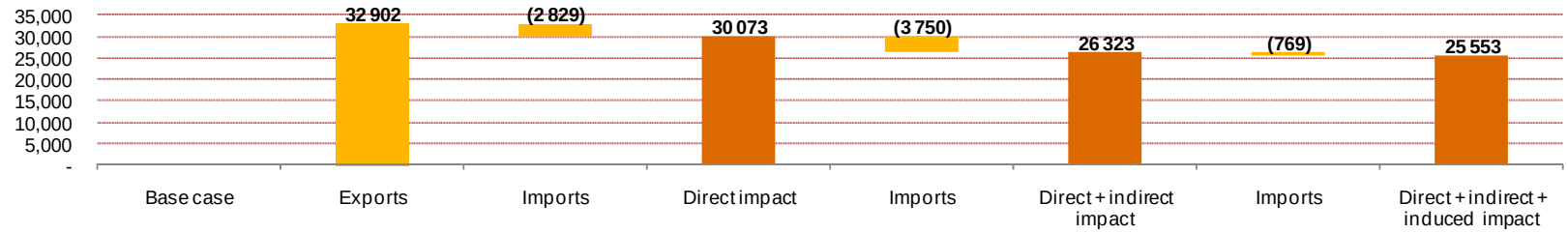
Source: PwC analysis

Petroter shale oil plant value chain

Number of employees **+1,040**

Impact on the foreign trade balance **+€25.6m**

Petroter-type shale oil plant value chain impact on foreign trade balance, € in thousands



Source: PwC analysis

Glossary

Excise and resource taxes	Includes various excise taxes, pollution charge, water special usage charge and other taxes.
Income and ownership taxes	Includes personal income tax, vehicle tax, boat tax and other taxes.
Oil shale energy	Refers to produced shale oil and its by-products (mainly heat, electricity)
Production and import taxes	Includes VAT, customs charges and other taxes.
Social charges	Includes social taxes and unemployment insurance charge.
Petroter-type shale oil plant value chain	A range of operations from the extraction of oil shale, its transportation, production of shale oil and related byproducts to end product transportation corresponding to the output of a single Petroter type shale oil plant operating at full capacity
VKG shale oil production value chain	A range of operations from the extraction of oil shale, its transportation, production of shale oil and related byproducts to end product transportation corresponding to the VKG total shale oil output budgeted for 2011
VKG	Viru Keemia Grupp AS