Estonian oil shale mining and oil production: macroeconomic impacts study

23 May 2014

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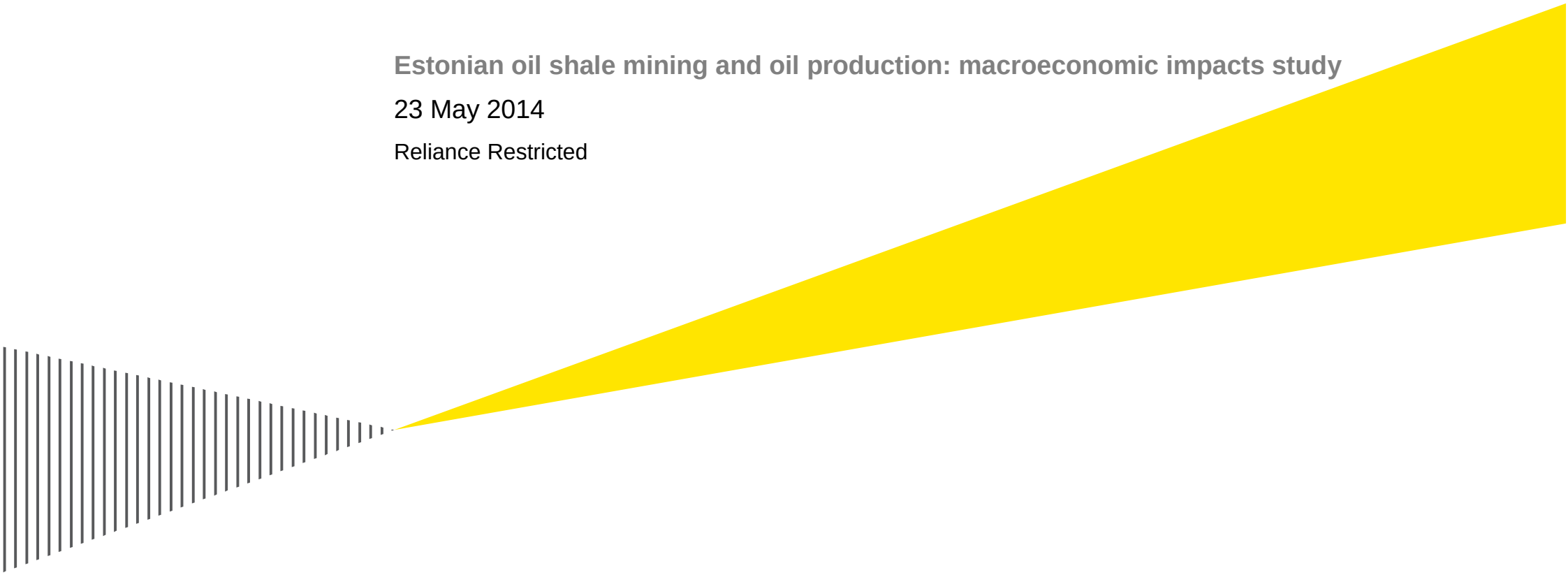

EY

Building a better working world

Ernst & Young Baltic AS
Rävala 4
10143 Tallinn
Estonia

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23 May 2014

Mr Mihkel Härm
World Energy Council Estonian National Committee
Harju 11
Tallinn, 10146

Dear Mr. Härm

In accordance with our engagement letter no TAS244/01-14 (the "Engagement Letter") signed between Ernst & Young Baltic AS ("we" or "EY") and World Energy Council („WEC" or „You" or the "Client"), we have performed an analysis of potential impacts of Estonian oil shale mining industry to the general economy and to the government's budget under various taxation, oil price and EU climate policy scenarios.

The Engagement Letter contains important information which should be read for a proper understanding of our work and the results in the Report.

Our Report

The enclosed report (the "Report") presents the results of our work.

The Report was prepared on the specific instructions of the directors of the Client solely for the purpose of providing input into the political decision-making process with respect to local environmental fees and resource taxes levels, and the Report should not be used or relied upon for any other purpose.

We accept no responsibility or liability to any person other than to our Client, or to such party that we have agreed in writing to accept a duty of care in respect of this Report, and accordingly if such other persons choose to rely upon any of the contents of this Report they do so at their own risk.

Limiting conditions

The information we have received during our work is the responsibility of the Client. We have not sought to establish the reliability of the information given to us, except as specifically stated in the Report. Consequently, we give no assurance on such information.

Subject to our obligation to conduct our work with reasonable skill and care, we shall have no liability for any loss or damage, of whatsoever nature, arising from information material to our work being withheld or concealed from us or misrepresented to us by the directors, employees, or agents of the Client or any other person of whom we make enquiries except to the extent that such loss or damage arises as a result of our bad faith or wilful default or where the withholding, concealment or misrepresentation should have been apparent to us without further enquiry from the information provided to us and required to be considered by us under the terms of our assignment.

Our Report may include prospective financial information for the company included in the analysis. We would like to emphasize that there are usually differences between the estimated and actual results, because the events and circumstances frequently do not occur as expected, and those differences may be material. We take no responsibility for the achievement of the projected results.

Other clauses

The contents of our Report have been reviewed by the representatives of the Client and the Companies. We have obtained a representation letter from them, which confirms the accuracy of the facts presented in this Report.

Our role is to provide you with advice and recommendations for your consideration. We will not perform any management functions or make any management decisions.

Yours faithfully,

Guntars Krols

Partner

Yours faithfully,

Lili Kirikal

Senior manager

Ernst & Young Baltic AS

Abbreviations

#	Number
bbl	Barrel
CAPEX	Capital expenditure
CIT	Corporate income tax
EE	Eesti Energia AS
EU	European Union
EY or We	Ernst & Young Baltic AS
FCF	Free cash flow
GDP	Gross domestic product
GVA	Gross value added
KKT	Kiviõli Keemiatööstus OÜ
m	Million
OPEX	Operational expenditure
t	ton
The Companies	Eesti Energia AS, Kiviõli Keemiatööstuse OÜ, Viru Keemia Grupp AS
VKG	Viru Keemia Grupp AS

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Analüüsitulemuste kokkuvõte

Analüüsi eesmärk

Käesoleva analüüsi eesmärgiks on anda sisendeid poliitilistele otsustajatele, aitamaks neil langetada põhjendatud ja optimaalseid otsuseid kohaliku ressursi- ja keskkonnatasude regulatsiooni kohta.

Sellest eesmärgist lähtudes tellis World Energy Council Estonia EY-lt uuringu, milles analüüsitakse kolme peamise Eesti põlevkivisektorit mõjutava teguri – siseriiklike keskkonnatasude, maailma naftahindade ja CO2 hindade – mõju Eesti põlevkivitööstuse jätkusuutlikkusele ning põlevkivitööstuse laiemat mõju riigi tuludele, tööhõivele ja Eesti majanduse lisandväärtusele.

Kolmest tegurist kaks – CO2 ja nafta hind – on Eestist sõltumatud. Kolmas tegur – keskkonnatasude määr – on aga peamine hoob, mille kaudu Eesti valitsusel on võimalik kõige rohkem selle tööstusharu ellu jäämise ja investeeritavana püsimise aega mõjutada.

Nimelt saab riik keskkonnatasude abil ise määrata, kui palju riigitulusid ta põlevkivitööstusest teenib ning kui palju seetõttu luuakse Eestis majandusele lisandväärtust ja töökohti.

Siinjuures on oluline meeles pidada, et riigitulude teenimise eelduseks on ettevõtete poolt tehtavad investeeringud, mille eelduseks on aga mõistliku tulususe saavutamine. Nõutavat tulusust mõjutab omakorda äritegevuse riskantsus, mille juures on väga oluliseks teguriks maksukeskkonna stabiilsus. Eesti kontekstis peab välja tooma selle, et viimase aja arengute tulemusel on hüppeliselt tõusnud tööstusharu poliitilise ja õigusliku keskkonnaga seotud ebakindlus ja ennustamatus. Selline ebakindlus vähendab investeeringuid ja äritegevuse mahtusid ning nendest tulenevalt ka riigitulusid – seda eriti pikaajalises perspektiivis.

Seega – nii nagu ettevõtete jaoks, on ka riigi jaoks oluline, et tänased maksuotsused oleksid tehtud nii, et riigitulud ja muud mõjud majandusele oleksid pikaajalises vaates maksimaalsed ning stabiilsed.

Analüüsitulemuste kokkuvõte

Peamised mõjutegurid

Käesolevas analüüsis kõrvutasime omavahel:

- 2009. aastal kokkulepitud **keskkonnatasusid** SEI 2013. aasta aruandes ”Keskkonnatasude mõjuanalüüs” toodud tasudega,
- **nafta hinna** tasemeid 90 ja 110 USD/bbl ning
- **CO2 hinna** tõusu 100 EUR/t-ni aastaks 2030 ja 20 EUR/t-ni aastaks 2020.

Selle tulemusel moodustus kaheksa erinevat stsenaariumi, mille kohta EY kogus Eesti Energialt (EE), Viru Keemia Grupilt (VKG) ja Kiviõli Keemiatööstuselt (KKT; koos – Ettevõtted) 20-aastased prognoosid perioodi 2015-2035 kohta. Nendest analüüsiti täpsemalt kolme, kus sarnaste tingimuste korral olid Ettevõtete jätkusuutlikkus ja ärilised otsused piisavalt sarnased – kiire väljasuremine, pikaajaline hääbumine ja jätkusuutlik.

Lisaks eeltoodud kolmele peamisele mõjutegurile kaaluti analüüsi ülesande püstitamisel ka **muid olulisi riske**, mida otsustati töö lihtsustamise nimel mitte kaasata stsenaariumite analüüsi, kuid mida tuleb kindlasti kaaluda analüüsi tulemuste kasutamisel ja tõlgendamisel:

- Ressursi kättesaadavuse tagamine – eeldati, et põlevkivi kasutajatel on ligipääs põlevkivile. Välja jäeti stsenaariumid, kus peale kaevandamislubade tähtaja lõppemist luba olemasoleva kaevevälja raames ei pikendata, kus lõpeb uute kaevelubade andmine või kus uue tehase käitamiseks ei ole võimalik saada põlevkivi seni kuni järgitakse üldist kaevemahu piirangut 20 mln tonni aastas.
- Muud potentsiaalselt karmistuvad keskkonnanõuded, mis ei ole veel teada kuid millega kaasneb investeerimiskohustus ja kapitalikulude kasv. Teadaolevatest nõuetest tulenevad investeeringud on analüüsis juba arvesse võetud.
- Tasuta allokeeritud CO2 kvootide maht – käesolevas analüüsis on lähtutud eeldusest, et olulisi muutuseid praeguses süsteemis ei tule.
- USA dollari vahetuskurss.
- “Crack spread” ehk erinevus raske ja kerge kütteõli hinna vahel.

Aruandes analüüsitud peamiste tegurite mõju põlevkivitööstusele

Allikas: EY

CO2 hind	Nafta hind	Keskkonnatasud	
		Agressiivne (SEI 16%)	**2009 baas**
100 EUR/t	**90 USD/bbl**	**(1) Kiire väljasuremine**	*(5) Tundlik nafta ja CO2 hinna suhtes*
	110 USD/bbl	*(2) Tundlik CO2 hinna ja keskkonnatasude suhtes*	*(6) Tundlik CO2 hinna suhtes*
20 EUR/t	**90 USD/bbl**	**(3) Pikaajaline hääbumine**	*(7) Tundlik nafta hinna suhtes*
	110 USD/bbl	*(4) Tundlik keskkonnatasude suhtes*	**(8) Jätkusuutlik**

- Stsenaariumid on värvitud vastavalt Ettevõtete võimekusele vastavate tingimuste juures äritegevust jätkata.
- Stsenaariumide peamine värv peegeldab EE olukorda ja väiksem osa värvist KKT ja VKG olukorda.
- Rafineerimistehaste ehitus leiab aset roheliseks värvitud stsenaariumites (4, 7, 8) ning ühes kollaseks värvitud stsenaariumis kus nafta hind on 110 USD/barrel (stsenaarium 6). Ülejäänud stsenaariumites ei ole õlikogus piisavalt suur, et õigustada rafineerimistehase ehitust.

- Euroopa Liidu laevakütuse direktiiv (Directive on the sulphur content in marine fuels – Directive 1999/32/EC), mille tulemusel kahjustub põlevkivi kui laevakütuse konkurentsipositsioon Euroopa Liidus alates jaanuarist 2015, kuid mille mõju ulatus on raskesti määratav.

Analüüsitulemuste kokkuvõte

Peamised järeldused

- Analüüsi tulemused näitavad, et ainult tööstusharu poolt otseselt makstud keskkonnatasusid kõrvutades võib jõuda ennatliku järelduseni nagu tööstusharu pikaajaline hääbumine oleks valitsuse seisukohalt eelistatum kui jätkusuutlik tegutsemine. **Kui lisaks keskkonnatasudele arvestatakse muude majanduslike mõjude ja maksudega, näitavad kõik analüüsi tulemused üheselt, et nii riigituludele, tööhõivele kui ka kogu majandusele tervikuna tooks tööstusharu jätkusuutlik tegutsemine kaasa oluliselt paremad tagajärjed kui pikaajalise hääbumise korral, kus keskkonnatasud on kõrgemad.** Näiteks kaotaks riik ca 43% diskonteeritud kogutuludest, kui jätkusuutliku stsenaariumi asemel rakenduks pikaajalise hääbumise stsenaarium, hoolimata suuremast kogutud keskkonnatasude summast. Seega saab riik põlevkivist kui madala kalorsusega ja väheväärtusliku toorme kasutuselevõtust kasu eelkõige pika väärtusahela väljaarendamise kaudu, mis omakorda lisab majandusse kõrgepalgalist tööhõivet terves tarneahelas.
- Keskkonnatasude määrad mõjutavad oluliselt põlevkivi sektori panust Eesti SKP-sse. Keskkonnatasude määrast võib sõltuda, kas põlevkivisektor moodustab Eesti majandusest 2035. aastal 0%, 3% või 7%. Lühiajalisest kasust ajendatud otsused võivad pikas perspektiivis tähendada oluliselt väiksemat majanduskasvu.
- Samas on tööstusharu jätkusuutlikkus üldiselt suure küsimärgi all – selleks on vaja vähemalt kahe faktori (CO_2, nafta hind ja/või keskkonnatasud) positiivset kombinatsiooni. Näiteks võib jätkusuutliku olukorra saavutamine olla võimatu olukorras, kus CO_2 hind on kõrge, sest 110 USD/bbl nafta hind ei vasta kõige levinumatele prognoosidele tööstusharus.
  - Soodsate välistegurite korral sõltub keskkonnatasude määrast, kas ja kui kauaks jääb põlevkivi tööstusharu investoritele atraktiivseks ning ettevõtjatel võimalus innovatsiooniks ja laienemiseks kõrgema lisandväärtusega tootmisesse (näiteks energiajulgeoleku seisukohast olulistesse rafineerimistehastesse).
  - Põlevkivitööstuse pikaajaline ellujäämine, rääkimata suurema tööhõive, maksutulu või SKP saavutamisest, on oluliselt tõenäolisem, kui keskkonnatasud jäävad 2009. aasta baastasemele, mitte tõstes neid agressiivselt (SEI 16%).

Kõiki neid aspekte tuleb hoolikalt kaaluda jätkusuutliku kohaliku maksupoliitika kujundamisel.

Analüüsitulemuste kokkuvõte

Peamised eeldused

IRR

Ettevõtete prognooside koostamise kriteeriumiks oli, et investeerimisotsused langetatakse **15% või 20% IRR**-i teenimise võimaluse olemasolul, vastavalt sellele kas tegu on **olemasoleva või uue tehnoloogiaga** (uue tehnoloogia kasutamine on seotud suurema riskiga).

- Eeltoodud IRR-i määrad põhinevad Ettevõtete kogemusel turutingimustel finantseerimise saamisel nii pankadelt kui investoritelt. IRR-i määrad vastavad ka rahvusvahelistes kaevandussektori uuringutes kasutatavatele määradele (näiteks EY Poola poolt koostatud uuringus ”*Shale gas taxation in Poland*”), arvestades ka Eesti majanduskeskkonna eripära ja riske.
- **Siinkohal tuleb rõhutada ka seda, et ei ole õige võrrelda põlevkivi sektorit õli, nafta või gaasi sektoriga, sest põlevkivi ei ole maailmaturu kaup oma madala küttevääртuse ja suure ballasti pärast**. Põlevkivi väärtuse vabastamiseks tuleb teha märkimisväärselt suuremaid investeeringuid õli tonni kohta kui konventsionaalsete fossiilsete kütuste puhul. Kokkuvõttes on põlevkivist energia saamine märksa väiksema tootlikkusega äritegevus, mis ei suuda taluda samaväärseid maksutasemeid ning on ühtlasi märksa tundlikum kulutasemete kõikumiste ja muude välismõjude suhtes.
- Oluline on arvestada, et värskelt kehtestatud Tööstusheitmete direktiiv (European commission Directive on industrial emissions 2010/75/EU (IED)) ja teised keskkonnaregulatsioonid on pannud ettevõtetele suured investeerimiskohustused, mille tõttu äritegevuse tulusus langeb ja langeb ka võimekus soovitud IRR-i saavutada.

Ratsionaalse investori printsiip

Eeldati, et kõikide ettevõtete omanike (sh EE) näol on tegemist ratsionaalsete investoritega, kes leiavad vajalikud omakapitali vahendid investeeringute teostamiseks. Seetõttu ei ole analüüsitud tulevastest finantseerimisotsustest ega ka käesoleva hetke kapitalistruktuurist tulenevaid mõjusid.

Juhime tähelepanu sellele, et kui investeeringute teostamiseks vajalikku täiendavat omakapitali mahus, mis oleks tarvilik lisaks võlakapitalile, ei ole võimalik kaasata, lükkuksid investeerimisprojektid ja ka nendest saadavad majanduslikud kasud (sh riigitulud) ajaliselt edasi või jääksid teostamata.

Analüüsitulemuste kokkuvõte

Kokkuvõte stsenaariumitest

Väljavalitud stsenaariumid

Käesolevas analüüsis on keskendutud kolmele stsenaariumile, mis esindavad selgelt eristatavaid ärilisi otsuseid (ärilisi otsuseid illustreerivad kõrvaltoodud põlevkivi kaevandamismahtude ja investeeringute graafikud):

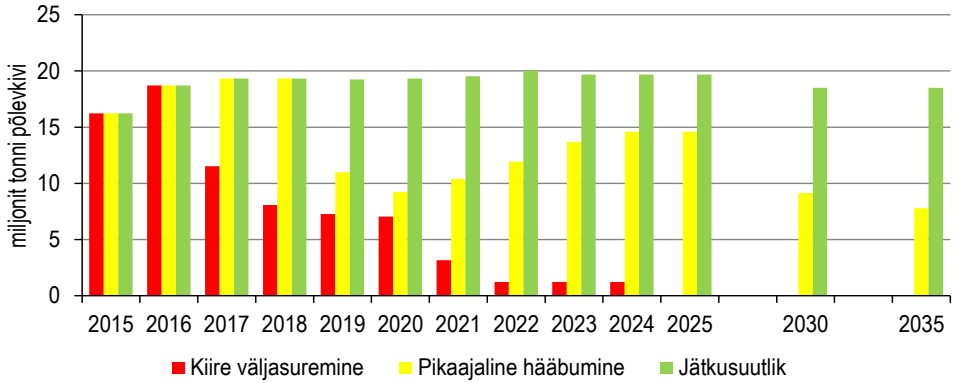
- "**Kiire väljasuremine**" – kiirelt kasvavad keskkonnatasud ja CO2 hind viivad olukorrani, kus 90 USD/bbl naftahinna juures on juba 2021. aastal tööstusharu praktiliselt välja surnud. Kirjeldatud tingimuste realiseerumine on arvestatava tõenäosusega ning nende realiseerumist ja tagajärgi ei tohiks alahinnata.
- "**Pikaajaline hääbumine**" – sama kiirelt kasvavate keskkonnatasude ja sama naftahinna korral aitaks CO2 hinna mõnevõrra väiksem tõus tööstusharul küll pikemalt vastu pidada tänu lähiajal ehitatavatele õlitehastele, kuid viib ikkagi põlevkivi otsepõletamise järsu languseni aastal 2019 ning tööstusharu järk-järgulise hääbumiseni alates 2025. aastast, sest peale seda enam uusi investeeringuid ei tehta. Perioodi õlikogused ja madal nafta hind ei õigusta ka rafineerimistehase ehitust.
- "**Jätkusuutlik**" – ainult 2009. aastal kokkulepitud maksubaasi, 110 USD/bbl naftahinna ja CO2 hinna mõõduka tõusu puhul on kõik kolm analüüsi kaasatud ettevõtet jätkusuutlikud. Aastased kaevandamismahud on maksimaalse 20 mln tonni juures ning tööstusharu lisandväärtust tõstab ka rafineerimistehaste ehitamine. Juhime siiski tähelepanu sellele, et **sektori pikaajalised prognoosid näitavad enamasti naftahinna stabiliseerumist 90 USD/bbl barreli juures. Seega peab seda stsenaariumi käsitlema suure ettevaatlikkusega**.

Investeeringud

- Jätkusuutliku stsenaariumi korral ulatuvad sektori **investeeringud 4,9 miljardi euroni juba esimese 10 aasta jooksul**. Sealt edasi on investeeringud piiratud kuna maksimaalne kaevandamismaht on saavutatud.

Geoloogilise põlevkivi kaevandamismahtude prognoos

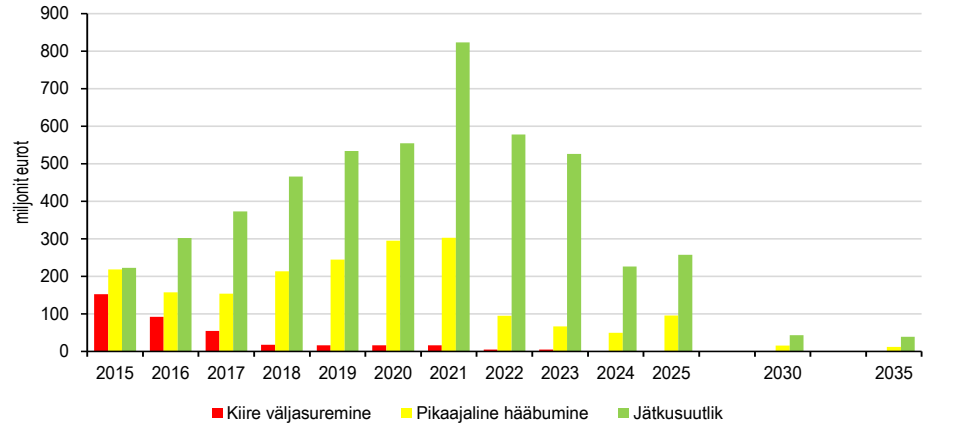
Allikas: EY, EE, VKG, KKT



- Jätkusuutlikus stsenaariumis kaevandatakse maksimaalse lubatud kaevandusmismahu ulatuses (20 mln tonni). Aastast 2030 ja edasi oleks ruumi veel ühe väiksema õlitehase jaoks, aga kaevandusloa omaniku teisied planeeritud tehased on suuremad kui maksimaalse ja tegeliku kaevemahu vahe, mistõttu seda pole prognoosi lisatud.
- Kiire väljasuremise ja pikaajalise hääbumise stsenaariumites lõpetatakse elektri tootmine otsepõletamisega vastavalt aastatel 2017 ja 2019.

Investeeringute prognoos

Allikas: EY, EE, VKG, KKT



- Jätkusuutlikus stsenaariumis oleks majanduslikult mõttekas investeerida veelgi rohkem, kuid kaevandusmahu piirangu tõttu pole see võimalik. Samuti oleksid riigi maksutulud kõrgemad, kui kaevemahud oleksid suuremad.
- Pikaajalise hääbumise stsenaariumis ei tehta peale 2021. aastat enam suuremaid asendusinvesteeringuid, sest see pole tasuv.

Analüüsitulemuste kokkuvõte

Majanduslikud mõjud

Eeltoodud stsenaariumite lõikes oleme analüüsinud põlevkivi kaevandamise sektori majanduslikke mõjusid:

- riigi tuludele (sh keskkonnatasud, tööjõu maksud, ettevõtte tulumaks, CO2 kvootide müügitulu);
- riigi tulude puhasnüüdisväärtusele;
- tööhõivele;
- Eesti SKT-le.

Selleks, et lisaks otsestele majanduslikele mõjudele võtta arvesse kaudseid ja kaasnevaid mõjusid, mis tekivad läbi tarneahela efekti ja töötajate kulutuste, oleme rakendanud makromajanduslikke kordajaid. Kordajate arvutus põhineb Eesti majanduse sisend-väljund tabelitel.

CO2 kvootide müügitulu – mõju riigi tuludele

Käesolevas analüüsis on CO2 mõjusid käsitletud lihtsustatult. Nimelt ei ole spetsiifiliselt analüüsitud EL-i kliimapoliitika tulevastest põhimõtetest ning Ettevõtete CO2 emissioonide iga-aastasest muutusest tulenevat mõju riigitulule. Analüüsis on riigitulude arvestuses toodud eraldiseisvana välja ettevõtete iga-aastane CO2 kulu, mis näitab põlevkivisektori panust riigi CO2 tuludesse. Samas ei tähenda see seda, et kogu riigitulud muutuvad iga-aastaselt, kuigi põlevkivisektori CO2 emissioonidel on suure tõenäosusega siiski teatava viivitusega kaudne mõju riigituludele.

Hetkel kehtiva põhimõtte kohaselt muudetakse EL-is igale riigile allokeeritavaid CO2 kvoote ainult programmiperioodide kaupa, mistõttu järgmist muudatust ei ole ette näha enne 2021. aastat, isegi kui Eestis peaks CO2 kvootide emissioon vahepeal oluliselt muutuma. Järgmisel programmiperioodil tehtavad muutused ei ole veel kindlad ning võimalikuks peetakse vägagi erinevaid stsenaariumeid alates kogu kvootide summa mittemuutmisest (kuigi eeldatakse suuremat iga-aastast kvootide vähenemise koefitsienti) kuni kvootide oluliselt sagedasema ülevaatuseni ja isegi kvoodisüsteemi kaotamiseni.

Sellise analüüsi koostamine ja erinevate stsenaariumite tõenäosuste kaalumine ei olnud käesoleva analüüsi fookuseks ning ei kuulunud meie töömahu hulka.

Mõjud riigi tulude puhasnüüdisväärtusele

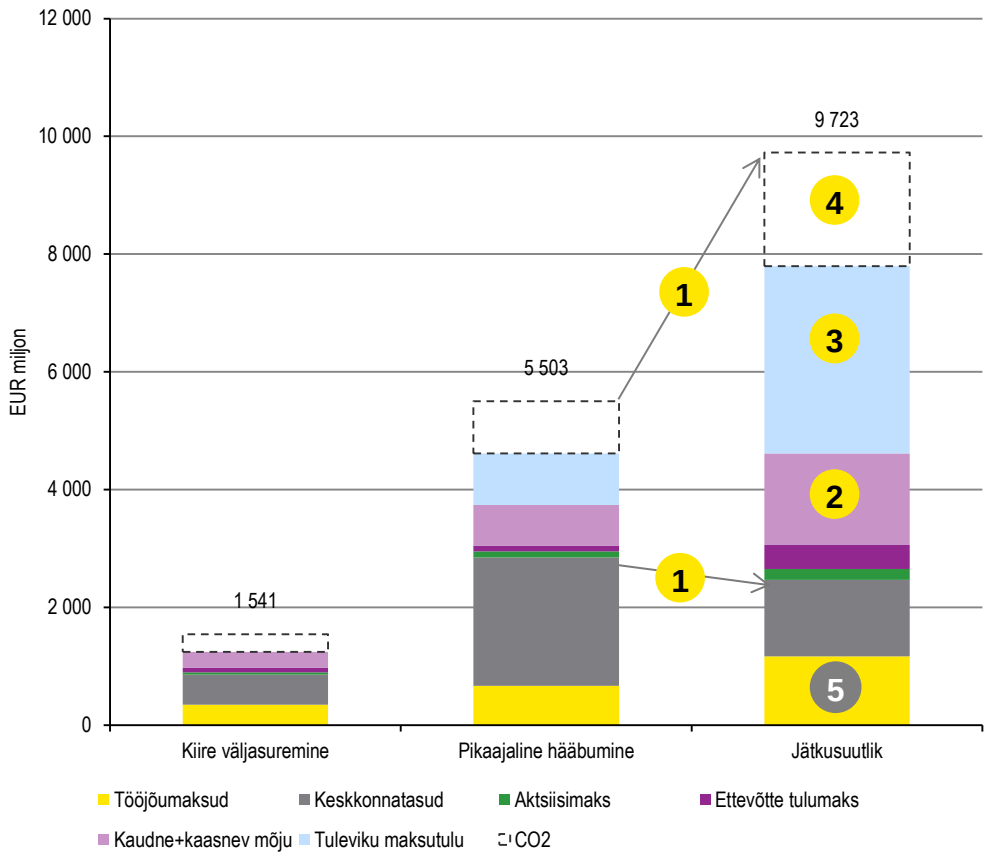
Järgnevas graafikus ja selle kommentaarides on toodud meie analüüsi olulisemad tähelepanekud.

1 Analüüsi kõige olulisemaks tulemuseks on tähelepanek, et keskendudes ainult potentsiaalsete keskkonnatasude laekumisele, ei maksimeeri riik oma tulusid**. Riik kaotaks ca 43% diskonteeritud kogutuludest, kui jätkusuutliku stsenaariumi asemel rakenduks pikaajalise hääbumise stsenaarium,** hoolimata sellest, et keskkonntasudest kogutakse 1.7 korda rohkem diskonteeritud tulusid. Lisaks jääks riik tööstusharu hääbumise korral pikas perspektiivis ilma igasugustest maksutuludest, mis tänu põlevkivi tööstusharu tegutsemisele laekuvad. Seega oleks äärmiselt ohtlik keskenduda ainult keskkonnatasudele, arvestamata teiste majanduslike mõjude ja riigituludega.

2 Jätkusuutlikus stsenaariumis oleks kaudsed ja kaasnevad mõjud 2,3 korda kõrgemad kui pikaajalises hääbumises.

Riigitulude puhasnüüdisväärtus

Allikas: EY analüüs, Ettevõtete informatsioon



- Puhasnüüdisväärtuse leidmisel rakendati 17.5% nominaalset diskontomäära ettevõtte tulumaksule (vastavalt IRR-ile) ning 6% diskontomäära muudele riigi tuludele (vastavalt riigi raamatupidamiseeskirjadele)
- Lõppväärtuse leidmisel rakendati jätkusuutlikus ja pikaajalise hääbumise stsenaariumis vastavalt -2% ja -10% kasvumäärasid.
- Lähtuvalt meie analüüsi metodoloogiast ei ole EE investeeringuid ega dividende kaasatud riigi tulude hulka, vaid erasektori investeeringute ja dividendide hulka.
- CO2 tulud esindavad Ettevõtete kulusid, mitte kogu Eesti riigi CO2 tulu.

3 Kuigi meie analüüs keskendub perioodile kuni 2035, näitab indikatiivne lõppväärtuse arvutus, et diskonteeritud riigitulud, mis tulenevad äritegevuse jätkumisest peale 2035. aastat, oleksid **jätkusuutlikus stsenaariumis 3 korda suuremad kui pikaajalise hääbumise stsenaariumis.** Järelikult omaks tööstusharu eluspüsimine riigituludele olulist mõju ka peale analüüsiperioodi lõppu.

4 Jätkusuutliku stsenaariumi korral ületaks tööstusharu panus riigi CO2 kvootide müügitulusse pikaajalise hääbumise stsenaariumit üle kahe korra, kuigi tööstusharu CO2 intensiivsus tegelikult langeb.

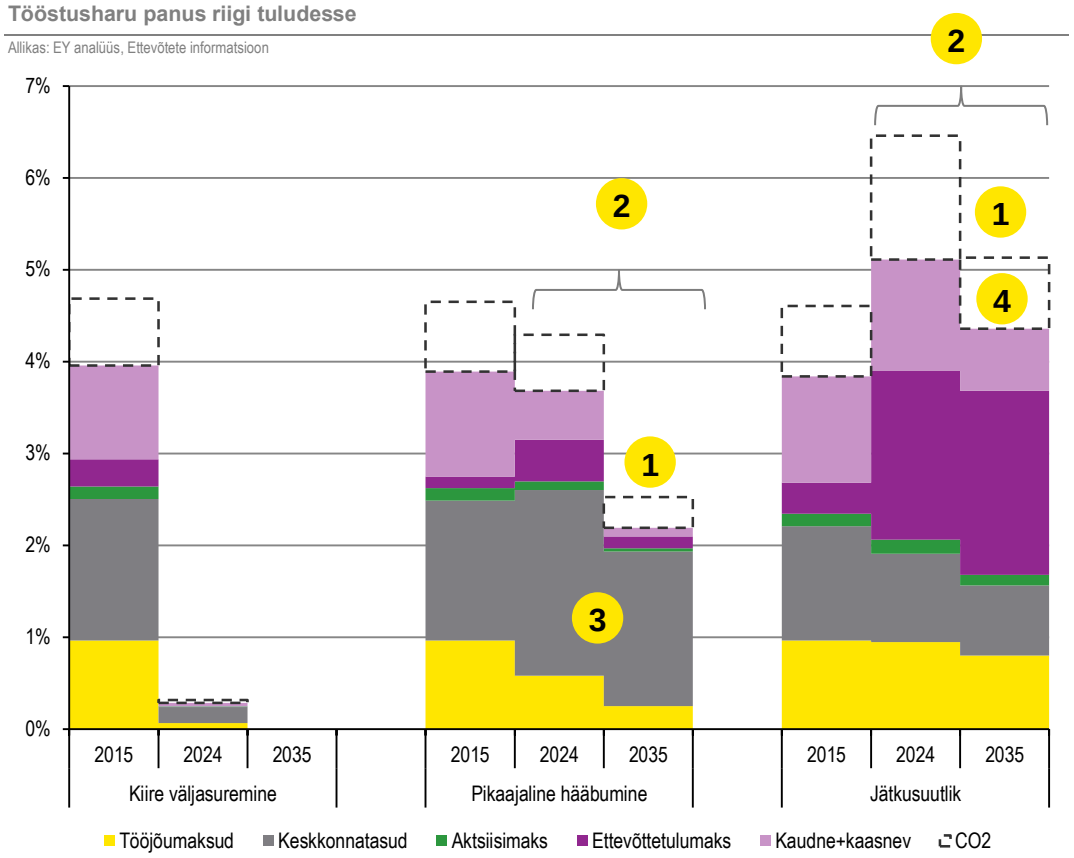
5 Jätkusuutlikus stsenaariumis oleks tööjõumaksude mõju 76% kõrgem kui pikaajalise hääbumise stsenaariumis. Põhjuseks on oluliselt suurem hõivatute arv jätkusuutlikkus stsenaariumis.

Mõjud riigi tuludele, %-na kogu riigieelarvest

Järgnevas graafikus on võrreldud aastaid 2015, 2024 ja 2035. 2024. aasta valiti seetõttu, et see on viimane aasta kui kiire hääbumise stsenaariumis toimus veel mõningane äritegevus. Iga-aastase analüüsi tulemused on toodud Aruandes detailsete tulemuste analüüsi sektsioonis.

1 Pikaajalises perspektiivis (aastal 2035) panustaks põlevkivi tööstusharu **jätkusuutlikus stsenaariumis** riigi kogutuludesse **5,1**%, samal ajal kui **pikaajalise hääbumise** korral jääks vastav näitaja **2,5%** juurde ja väheneks tulevikus veelgi**.**

2 Jätkusuutliku stsenaariumi panus riigituludesse eristuks pikaajalise hääbumise stsenaariumist alates 2024. aastast, kui suurte investeeringute periood on lõppenud. Investeeringute lõppedes hakkavad ettevõtted teenima tulu, mida jaotatakse omanikele dividendidena ja mille pealt makstakse riigile ettevõtte tulumaksu.



3 Pikaajalise hääbumise korral oleks kogutud **keskkonnatasud suuremad** kui jätkusuutlikus stsenaariumis, **kuid see ei ole jätkusuutlik**, sest tööstusharu on hääbumas ja tootmine väheneb märgatavalt.

Graafikult on näha, et samal ajal on oluliselt vähenenud tööjõumaksudega seotud riigitulud, mis **viitab olulisele langusele tööhõives**.

4 Tööstusharu CO2-intensiivsus langeks jätkusuutlikus stsenaariumis, kuna elektri toomine otsepõletamise teel, mis on CO2 intensiivsem kui õli tootmine, kahaneks. Samal ajal suureneks õli tootmine, mille kõrvalproduktiks on elektritootmine.

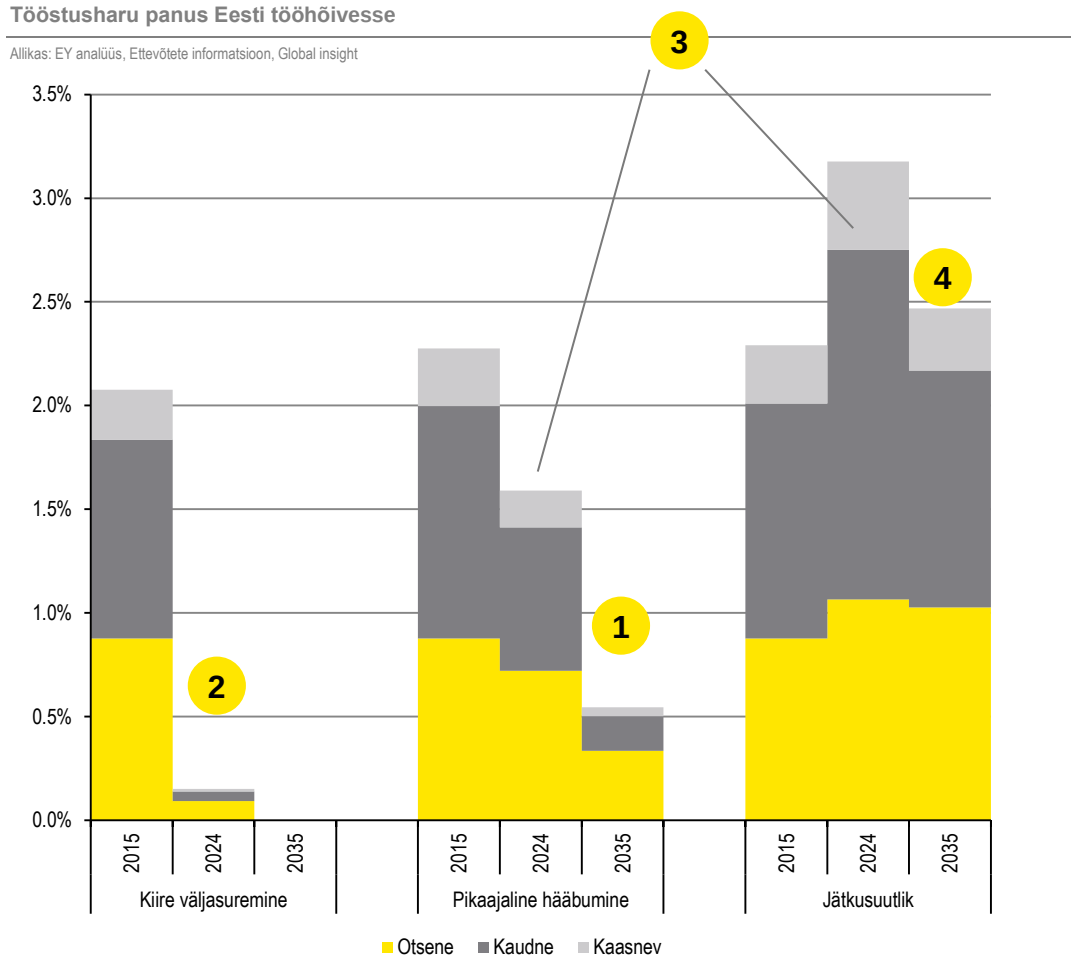
* Tuletame siinkohal meelde üht analüüsi põhieeldust – kõikide ettevõtete (sh EE) investorid on ratsionaalsed ja leiavad kasulike investeeringute tegemiseks vajalikud omakapitali vahendid. Lähtuvalt töös kasutatud metodoloogiast on EE käsitletud erasektori ettevõttena.

* Tuletame meelde ka seda, et CO2 tulud esindavad Ettevõtete kulusid, mitte kogu Eesti riigi CO2 tulu.

Mõjud tööhõivele, %-na kogu Eesti tööhõivest

1 **Pikaajalise hääbumise** stsenaariumis **väheneks tööhõive ca 19 000 inimeselt 4000 inimesele** aastatel 2015-2035. Sellest vähenemisest ligikaudu 5000 töökohta kaoks põlevkivi tööstusharust ja ülejäänud ca 10 000 töökohta teistest tööstusharudest.

2 **Kiire hääbumise** stsenaarium juhib tähelepanu potentsiaalsele probleemile, mis kaasneb põlevkivi tööstusharu väljasuremisega – mil moel rakendatakse **potentsiaalselt 17 500 töötuks jäävat inimest** ühiskonnas peale põlevkivi tööstusharu väljasuremist?



3 **Jätkusuutlikus** stsenaariumis oleks panus tööhõivesse ligi kaks korda kõrgem juba 2024. aastaks võrreldes pikaajalise hääbumise stsenaariumiga – luues ca **12 500 lisatöökohta**.

4 Võrreldes tänase 2,3% panusega kogu Eesti tööhõivesse suureneks jätkusuutlikus stsenaariumis pikaajaline mõju tööhõivele 2,5%-ni. Ajutiselt ületaks tööhõive mõju ka 3,2% - see juhtub siis, kui tööstusharus tehakse märkimisväärseid investeeringuid, mis annab tööd peamiselt ehitussektorile.

Lisandväärtus, %-na Eesti SKT-st

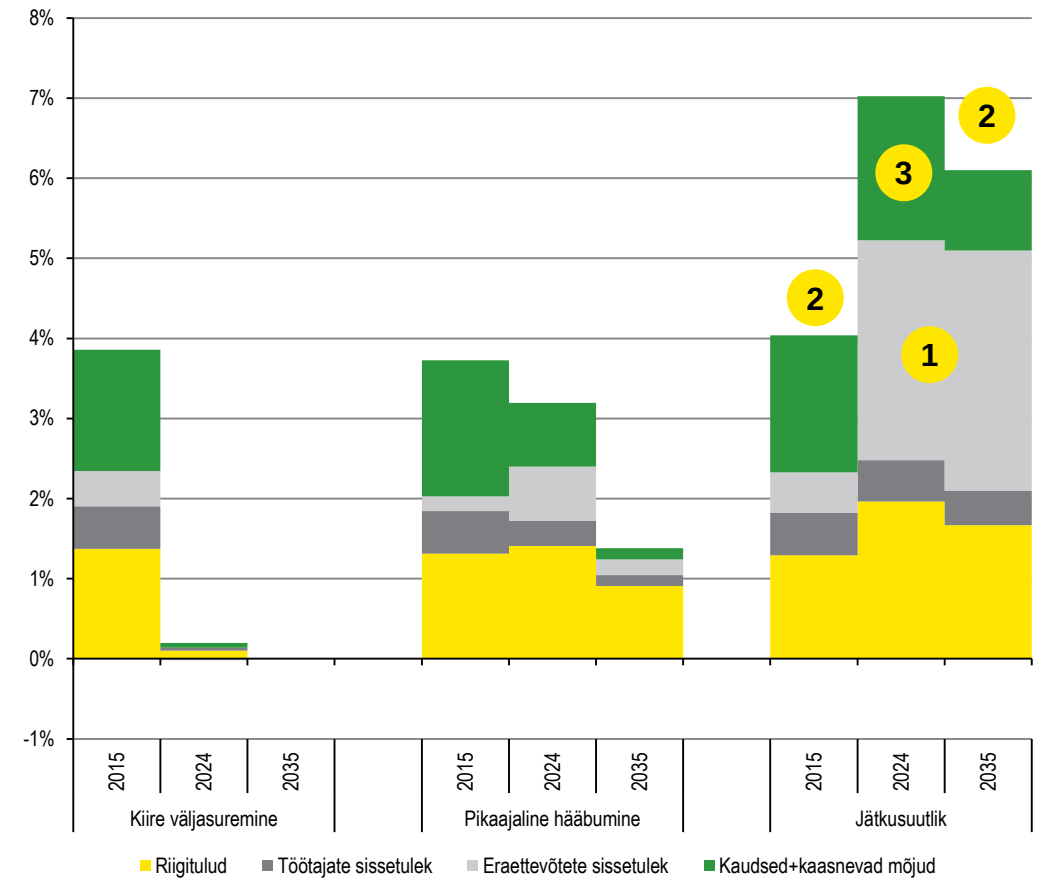
1 **Eraettevõtted võtavad investeerimisega suuri riske, sest nende tulud on positiivsed alles peale 10-aastase investeerimis-perioodi lõppu**. Seega saaks suuri investeeringuid teha ainult siis, kui regulatiivne keskkond on stabiilne ja tulevikuväljavaated läbipaistvad.

2 Põlevkivi tööstusharu tõttu loodud lisandväärtus moodustaks 2015. aastal ligikaudu **4%** kogu Eesti lisandväärtusest. Osatähtsus kogu Eesti lisandväärtusest **tõuseks jätkusuutlikus stsenaariumis ligi 6%-ni** pikaajalises vaates.

3 Paljude teiste tööstusharude puhul oleksid kaudsed ja kaasnevad mõjud märksa suuremad võrreldes otseste mõjudega, aga põlevkivi tööstusharu otsesed mõjud on väga suured peamiselt tänu suurele maksukoormusele.

Tööstusharu panus Eesti majanduse lisandväärtusesse

Allikas: EY analüüs, Ettevõtete informatsioon, Global insight



- Lisandväärtus = riigitulud + ettevõtete tulud + töötajate tulud
- Ettevõtete tulu on võrdsustatud ettevõtete äritegevuse rahavooga peale investeeringuid (sh EE)
- Riigitulude tulp võrdub eelnevalt eraldi analüüsis näidatud kogu riigituludega.

Juuresolevalt graafikult ei paista välja fakt, et intensiivsete investeeringute perioodil (2015-2024) oleks otsesed majanduslikud mõjud tihti väga väiksed (kuigi mitte lausa negatiivsed) kuna eraettevõtete sissetulek on negatiivne (rahavood on negatiivsed). Seda näeb Aruandes detailsete tulemuste analüüsi sektsioonis.

Siinkohal on oluline märkida, et ettevõtted võtavad investeeringute teostamisel olulisi riske ning seetõttu on suurema pikaajalise lisandväärtuse saavutamise jaoks vajalik mitte ainult soodsa maksumäära tänane valik, vaid ka kindlus tuleviku osas. Vastasel juhul ei pruugi ka 15 või 20% IRR olla piisav, motiveerimaks Ettevõtteid investeeringuid teostama.

Teiseks on oluline märkida, et suure osa investeeringutest peaks teostama ka riigiettevõte EE, mille finantseerimine on otseselt Eesti riigi kontrolli all. Seetõttu on osaliselt riigi kontrolli all ka tööstusharust saadavate majanduslike mõjude, riigitulude ja tööhõive ajastatus – juhul kui EE peab finantseerimis-otsuste tõttu investeeringud edasi lükkama, lükkuvad edasi ka nendest tulenevad majanduslikud mõjud.

Background of the analysis

1. Our engagement
2. Sector overview

Our engagement

Our work

This report (the "Report") has been prepared according to the terms agreed between Ernst & Young Baltic AS ("EY" or "we") and World Energy Council Estonian National Committee ("you" or "Client" or "WEC") in the engagement letter dated 30 January 2014 in relation to the analysis of potential economic impacts of Estonian oil shale mining industry under various scenarios.

Background

Oil shale is one of the national resources in Estonia, which is currently mainly used for electricity production, and increasingly more for oil production. The extensive use of oil shale for electricity production has enabled Estonia to be energy-independent. However, it is recognised that oil production is economically more value adding than electricity production, when energy independence aspects are left aside. Estonia is one of the very few countries where oil shale is in commercial use.

Estonian oil shale mining companies are subjects to several market and political risks, which can have substantial impacts on the sustainability of the industry. One of the most important factors that can be influenced by local political decisions are the environmental fees, which have recently been under the elevated attention of many politicians, ministries and market participants. Below we have outlined some of the factors that are relevant for the current analysis.

- The government announced a sudden and sharp increase in resource fees in September 2012, whereas first changes were effective starting from April 2013. However, this was followed by annulment by the Chancellor of Justice in December 2014.
- Meanwhile, the Ministry of Economics has been working on the designing of the environmental fees starting from 2016. As an input to this work, the Government Office has ordered the "Environmental fees impacts analysis" report prepared by SEI Tallinn and Tartu University RAKE in 2013, which recommends a sharp increase in environmental fees.
- In March 2014 the Estonian government changed and the new coalition agreement states that among other goals, the government's focus will be on increasing the environmental fees. Furthermore, the new coalition proposed analysing the possibility of separating the mining activities from the government-

Our engagement

owned oil shale mining and processing company, and moving to the auction system for selling oil shale.

These developments demonstrate that the political and legislative environment has recently been unstable and unpredictable. This has resulted in a substantially increased uncertainty about the future of this industry, which poses a major concern for the investors who are investing in the industry.

Objective

The purpose of our work is to provide input to political decision-makers in order to enable them make informed decisions about local resource and environmental fees policies, and enable the Client to contribute to the ongoing discussions.

Scope of work

Our work consisted of analysing the likely future investment and operational decisions during a 20-year period (2015-2035) of the following companies operating in the Estonian oil shale mining industry (hereinafter the Companies):

- Eesti Energia (EE), the state-owned oil shale company
- Viru Keemia Grupp (VKG)
- Kiviõli Keemiatööstus (KKT)

The forecasts of the Companies have been prepared by combining three main factors influencing the oil shale industry:

- Global oil prices
- Local resource and environmental fees
- EU climate policy impacts on CO2 price

Our engagement

As a result of our work, we quantify and compare the potential economic impacts of Estonian oil shale mining industry to:

- the general economy (GDP of Estonia)
- employment

government's budget (consisting of environmental fees; labour and corporate taxes; income from sales of CO2 quotas, which for simplification purposes is equalised to the Companies' costs)

In addition to summarizing the annual impacts during the 20-year period, we have calculated the net present value (NPV) of government income, in order to demonstrate the time value differences under various scenarios.

The total economic impacts to GDP, employment and government budget were calculated using the appropriate economic multipliers derived from the input-output tables for Estonia. Total economic impact consists of three parts:

- Direct impacts – value added, people employed, and taxes and fees paid to the government **directly by the Companies**
- Indirect impacts – value added, people employed, and taxes and fees paid to the government by the **companies who constitute the supply chain of the Companies**.
- Induced impacts – value added, people employed, and taxes and fees paid to the government by the **companies who provide goods and services to the people who are employed by the supply chain of the Companies and who are spending their salaries**.

Our engagement

Limitations

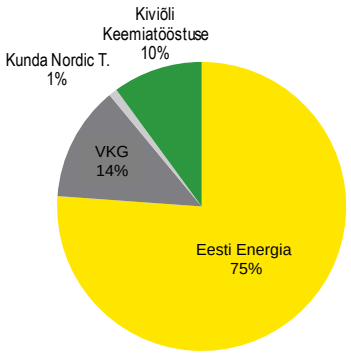
In accordance with our engagement letter and the accompanying transmittal letter, our analysis is subject to the limiting conditions outlined in the Report, including its appendices. This Report, the conclusions disclosed herein, and the associated exhibits and appendices should not be read or utilized in any way without the consideration of these limiting conditions.

- The forecasts of all Companies assume that their **owners (investors) act rationally and it is always possible to raise both equity and debt financing for projects which are economically viable**. Therefore, this analysis does not consider any restrictions arising from the current financing structure and indebtedness of the Companies. Only operational and investment cash flows are considered in the analysis – financial cash flows are excluded. As a result, some operational and investment decisions reflected in this analysis may differ from the decisions which could be made if the owners do not act rationally and/or face financing constraints. For example, such situation might be applicable for the state-owned company EE where the government may not make all decisions from a purely rational market investor's point of view.
- The scope of our work did not include an analysis of the potential EU climate policy changes. In relation to this, our analysis does not cover the impact of CO2 sales revenues on the level of the Estonian state. Instead, the analysis simply indicates the CO2 cost of the Companies when analysing the industry's contribution to the Government's income.
- The accuracy of the results presented in this report is highly dependent on the accuracy and completeness of the information provided by the Companies and the information obtained from the Eurostat and the Statistics Estonia databases.
- We do not express our independent opinion on the assumptions made by the Companies for the purpose of preparing the forecasts presented to us.
- EY has not, except to the extent as requested by the Client and agreed in writing by EY, sought to verify the accuracy of the data, information and explanations provided by the Client or the Companies, and the Client is solely responsible for the respective data, information and explanations. We do not express an opinion or offer any form of assurance regarding the accuracy or completeness of such data, information and explanations. No audit, not even limited, has been carried out. We have considered the information to be reliable and accurate. Therefore, we will accept no responsibility for any error or omission in the Report arising from inaccurate or incomplete information presented to us by the Client or the Companies.
- The application of the input-output methodology in our work is somewhat limited by the following considerations:
  - In our analysis, we have not taken into account direct import taxes related to the imported OPEX and CAPEX of the Companies because of the complexity of such analysis (import taxes vary depending on the type of specific imported product). While it is likely that this exclusion would not materially impact the results of the analysis, given the overall level of preciseness of inputs, the direct and total tax impacts are likely to be somewhat underestimated.
- We have not considered the macroeconomic effects for the country if energy (power, oil) will have to be imported as substitute from other countries.
- The economic multipliers used for the input-output methodology are likely to change over time if the structure of the economic sectoral composition in Estonia changes. This is likely to happen in the scenarios where the oil shale industry fades out. However, it is only possible to use historical multipliers for the analysis.
- Our scope of work does not cover the indirect and induced economic impacts arising from the government spending. Similarly to the Companies expenditures, Government expenditures create a supply chain effect as well. Therefore, the economic impacts of our work are underestimated by the supply chain effect arising from Government expenditures.

Sector overview

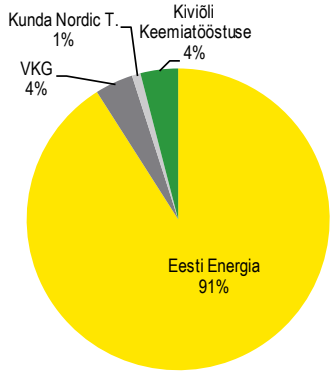
Maximum annual mining limit, 31.12.2011

Source: National development plan for the utilization of oil shale 2008-2015



Amount of extracted oil shale, 2011

Source: National development plan for the utilization of oil shale 2008-2015



Sector overview

Eesti Energia, Viru Keemia Grupp and Kiviõli Keemiatööstus represent the oil shale industry in our analysis. Together, EE, VKG and KKT hold the rights for the extraction of 99% of oil shale allowed for mining per year in Estonia.

Due to the facts that the oil shale industry is not widely spread in the world, transport expenses make it unfeasible to locate oil or electricity production factories far from oil shale mines, and additional licenses for oil shale mining are not available in Estonia, there is no market for the direct product of mining – oil shale. All three companies operating in Estonia are vertically integrated and very little trading occurs between the Companies. There are also no examples of oil shale market existing in other countries where oil shale is mined (such as Brazil, China and the USA). Consequently, the oil shale market only exists at the level of the final product, which also differs a lot for different companies – EE produces mainly electricity but also some oil, VKG produces oil and KKT produces also chemicals. As it can be seen, the industry is not homogeneous and has a very long value chain.

The oil shale industry has a very long value chain

Although oil shale is a direct mining product neither Estonia nor other countries where oil shale is mined have an oil shale market where its market price could be determined through supply and demand. Oil shale transactions are usually conducted between related parties and the only real market is that for the final products – mainly oil and electricity.

It is for this reason that the analysis covers the entire value chain from extraction to the sale of the final product.

Forecasts on carve-out basis

Our analysis covers the whole oil shale industry value chain from the mining of oil shale until the final product of the respective company, including also the byproducts:

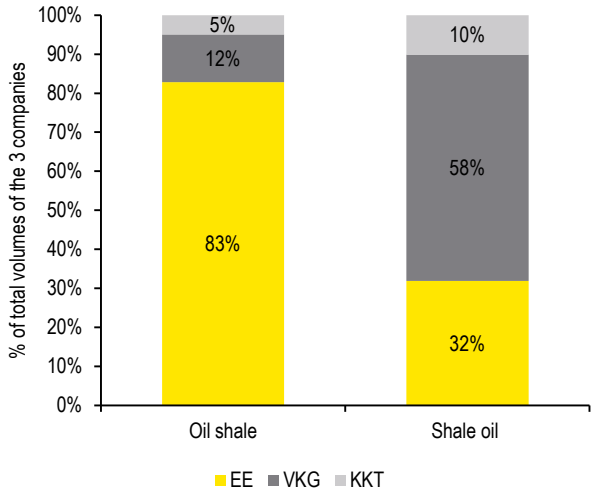
- All support services, such as reparation of respective technology and administration, are included in the value chain if they mainly support the oil shale business.
- Additionally, the processing and selling of the side products of mining and oil production are included in the forecasts. This includes heat and electricity production, chemicals, oil shale gas, other production that uses shale oil production side products, and leftovers.
- However, operations that are not directly related to oil shale mining and shale oil production are excluded from the Companies forecasts.

Both EE and VKG are large groups of companies engaged in various activities in addition to oil shale mining and processing. Given that our analysis is only focused on oil shale related activities, both EE and VKG have prepared forecasts on carve-out basis for this analysis. The carve-out financials exclude activities that are not related to oil shale, such as electricity distribution, renewable energy, foreign projects, electricity trading, etc.

Sector overview

Proportions of total production of the 3 companies (2013 data)

Source: VKG, EE and KKT data



- As a result, EE's carve-out forecasts include the value chain until selling the electricity to the electricity bourse. Oil business is fully included in the forecasts. The inter-sector sales of oil shale are indicated separately and eliminated by EY in the sector consolidation process.
- VKG's carve-out financials include mining, oil production and heating companies.
- KKT is included in the forecasts with 100% of its operations.

Overview of risks in the oil shale sector

The oil shale industry is exposed to several risks – market risks and political risks. There are possibilities to mitigate exposure to market risks to a certain extent (i.e. via hedging), however the Companies remain vulnerable to EU and domestic political decisions.

EE performance dominates the analysis

Given that EE is a substantially larger company than VKG and KKT, it needs to be kept in mind that the results of our analysis mainly reflect the operations of EE. In particular, EE's results in the nearest future mainly reflect direct burning of oil shale for electricity production, although EE gradually moves to oil production where electricity is a by-product.

Nevertheless, it should not be forgotten in the political decision-making process that the ultimate risk bearer in the oil shale industry is the state as the owner of the oil shale resource. Namely, in case the market and political conditions are so restrictive that the Companies will not be able to finance their investments and earn necessary returns, the resource will remain unutilized. This could result in zero value added to the state as the owner of the resource. Clearly, such situation cannot maximise the value for the state.

In addition to three previously outlined main factors, several other important risks were considered when formulating the purpose of the analysis. These were not incorporated into the scenario analysis for pertaining simplicity, however they should be kept in mind while reading the results of our analysis.

In order to focus the analysis on the most important risks impacting the oil shale industry, we have considered together with the Client and the Companies a list of the main risks in the oil shale sector, although the list is not exhaustive (please see the table). As it can be seen, only some of the risks can be influenced by local political decision. Therefore, in order to maximise the value from the local oil shale industry, these decisions need to be constantly reviewed in the light of the other developments which can not be locally influenced.

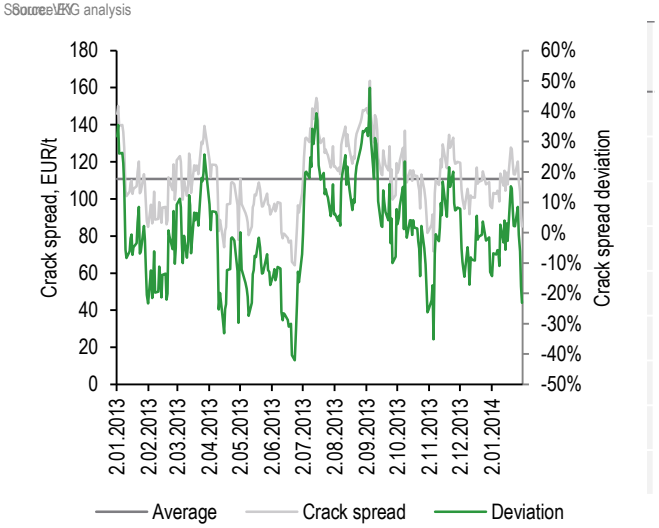
Estonian state is the ultimate risk-bearer

Given that the state is the owner of the oil shale resource, it will ultimately suffer from the same market risks that determine the Companies' performance and investment decisions. However, the state can control local political risks and should aim to make decisions which maximize the value for the state and the whole economy.

Sector overview

Historical crack spread volatility, Jan 13 - Jan 14

Source: VKG analysis



- List is not definite and reflects the primary issues stated by the Companies.

Together with the Companies we have tried to indicatively quantify the potential impacts of the main risks (please see the graph below). The analysis is based on 2035 forecasts, 110 USD/bbl oil price, 20 EUR/t CO2 price and the level of environmental fees agreed in 2009 (this is defined as the Sustainable scenario later in our analysis).

1 **Oil price**: Oil price is one of the key market risks determining the viability of the oil shale industry. If the oil price was 90 USD/bbl instead of 110 USD/bbl, the Companies could lose **20%** of their free cash flows per ton of oil.

2 **Local environmental fees:** In addition to other taxes collected from general business activities, oil shale mining and processing is subject to environmental fees, which constitutes remarkable part of the Companies' cost structure. If the environmental fees were on the level suggested by the SEI analysis instead of the levels agreed in 2009, the Companies' free cash flow per ton of oil could be **30%** lower. **This risk is one of the key focus areas of our analysis because it can be locally politically influenced while most of the other risks can not**.

3 **CO2 price:** Given that the oil shale industry is in CO2 deficit, CO2 expense constitutes a considerable part of the Companies' cost structure. CO2 prices are influenced by the EU regulatory decisions which are indirectly related to demand and supply of the CO2 quotas in the market. If CO2 prices would rise to 100 EUR/ton instead of rising to 20 EUR/ton (in real terms), the Companies' free cash flow per ton of oil could be ca **30%** lower.

4 **Freely allocated CO2 quotas**: In addition to CO2 price risk, there is an uncertainty regarding the continuance of the current system of allocating free CO2 quotas to the oil shale companies. In the base case scenario, EE has assumed that they will not be eligible for any free CO2 quotas after the quotas for Auvere plant are used up. At the same time VKG and KKT expect to receive the same amount of free CO2 quotas as today until 2020 and 2.2% less in every year following this. If EE would get 50% free quotas for the oil production in 2020, which would be reduced by 2.2% every year, their free cash flows per ton of oil could be about **4%** higher in 2035. This impact is effectively included in CO2 price impact (i.e. if EE would receive more free quotas, CO2 impact could be reduced by this amount).

5 **Dollar exchange rate**: In addition to global oil prices, Estonian shale oil producing companies are dependent on dollar/euro exchange rate due to exporting majority of the production based on USD but having the cost base in EUR. 10% fluctuation in exchange rate could result in **8%** change in the free cash flow per ton.

6 **Crack spread (price difference between Brent oil and fuel oil):** The forecasts have been complied by assuming a fixed crack spread based on future prices as of February 2014. Changing the crack spread by 10% (which is 1.2%% of the oil price) the free cash flow per ton changes about **2%.**

7 **EU Fuel directive:** Authorities of EU are planning the new fuel directive, as a result selling the shale oil might become more complicated or impossible, especially in Estonia. The Companies were not able to fairly

Sector overview

The industry is extremely sensitive to the risks

By summing up the impacts from the quantified risks to the free cash flow per barrel of oil, we arrive at a level of **93% of cash flow** per ton of oil (without considering the interdependencies). This indicates that if by 2035 all the risks have realised, the Companies could lose almost all of the free cash flows. **This clearly demonstrates how fragile the industry is**.

accurately forecast the potential impacts from reduced sales price, increased transport price and/or increased investment needs because it is not yet clear how extensive the new legislation could be.

8 **Availability of the resource and resource nationalism**. Global EY researches in mining industry have listed nationalism as one of the largest threats to the mining industry globally. In Estonia this includes, for example, the potential consequences of the substantial resource allocation policy change arising from the recent coalition agreement, the impacts of which can not be easily predicted.

Furthermore, it should be kept in mind that it can be quite likely that further environmental restrictions and investment requirements are introduced in the future, which could also negatively impact the oil shale industry's viability via increased investment requirements and cost levels.

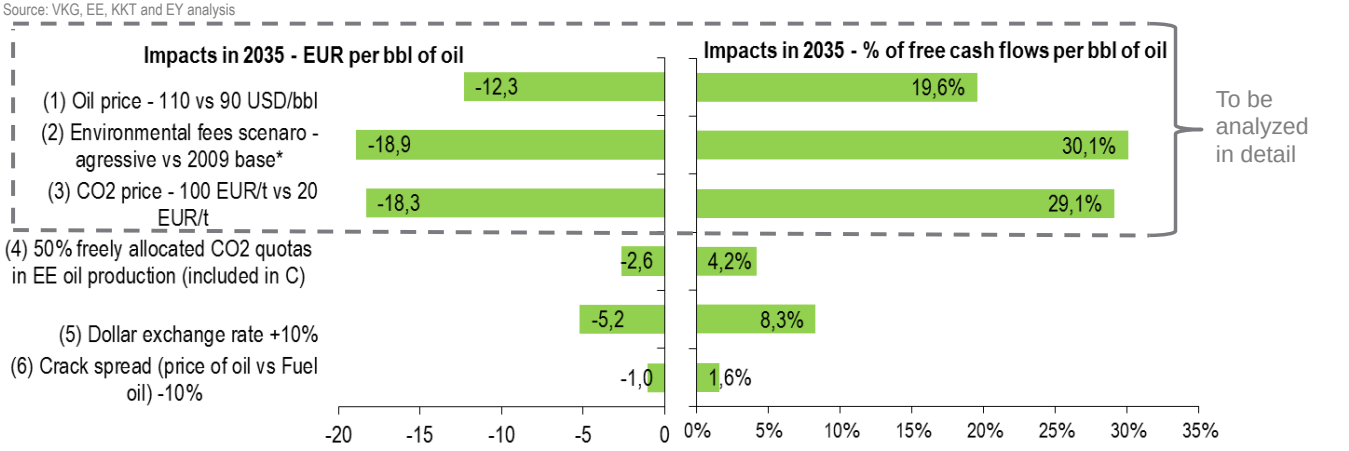
The factors with the highest impact on the Companies' profitability are analysed in detail in the Report:

- oil price,
- CO2 price and
- environmental taxes.

As it can be seen from the table below, these factors can have ca 80% impact on the total cash flow of the Companies in 2035, under the Sustainable scenario.

Measurable oil shale sector-specific risks and their potential impacts based on year 2035 of Sustainable scenario.

Source: VKG, EE, KKT and EY analysis



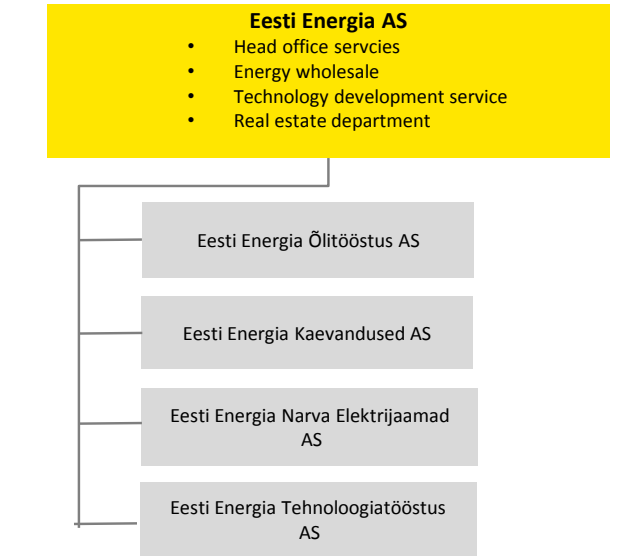
Eesti Energia

EE is a state-owned oil shale mining, oil shale oil production, electricity production and electricity distribution company founded in 1939.

- EE is the largest producer of electricity in Estonia. In addition to electricity production, EE is producing increasingly more oil shale oil every year, reaching approximately 214 thousand tons in 2013. Almost all of shale oil is exported. EE is mining ca 13-14 mln tons of geological oil shale per year, making it the largest oil shale processing company in the world.

EE oil shale value chain structure

Source& EE



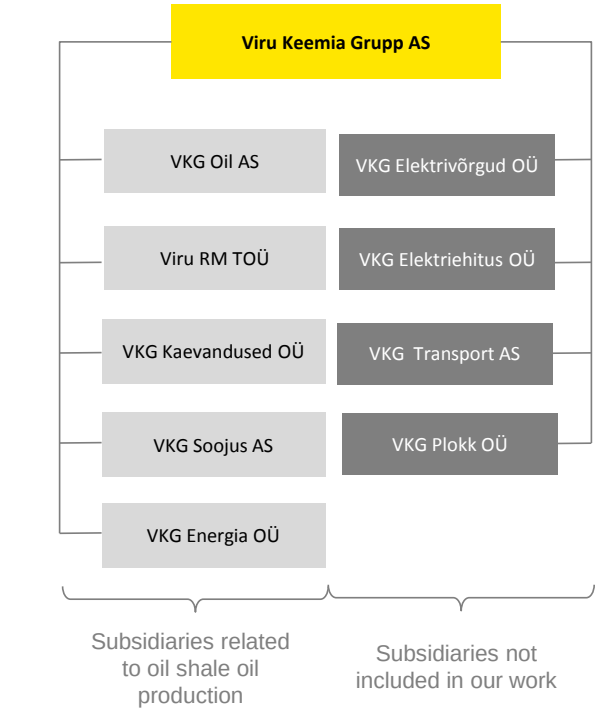
Viru Keemia Grupp

VKG is owned by Estonian private individuals and has been processing oil shale since 1924.

- VKG is the largest oil shale oil production company in Estonia, processing 2.5 million tons of oil shale in 2013. The market share of VKG in oil shale oil production in Estonia is 58%.
- VKG opened in 2012 its own underground oil shale mine, having previously bought oil shale from EE.
- VKG opened in 2013 a new oil manufacturing plant and is currently building two additional ones.

VKG oil shale value chain structure

Source& VKG



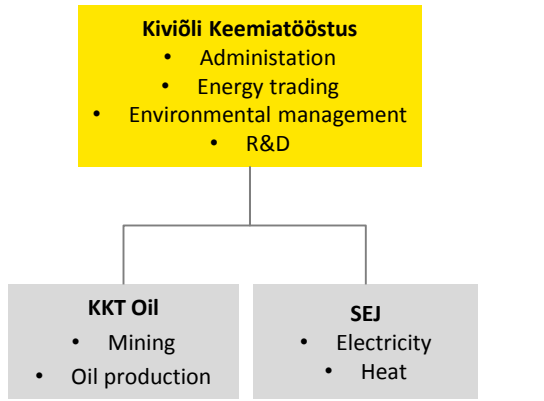
Kiviõli Keemiatööstus

KKT is a subsidiary of Alexela Energia, member of Alexela Group owned by private individuals. KKT has been processing oil shale since 1922.

- The oil shale in KKT is mined in open casts. The Company has the ability to mine two million tons of oil shale per year.
- The production of the KKT's Oil Shale Processing Plant develops in two directions: oil shale retorting to produce shale oil, oil shale-based chemicals and to produce power and heat from retort gas.
- KKT oil shale mining volumes constitutes about 5% of total volumes extracted in Estonia. Oil production constitutes about 10% of total shale oil produced in Estonia.

KKT oil shale value chain structure

Source& KKT



Methodology

1. Methodology

Methodology

Overview of methodology

Economic impacts

The total economic impacts to GDP, employment and government budget were calculated using the appropriate economic multipliers, derived from input-output tables for Estonia. Total economic impact consists of three parts:

- Direct impacts – value added, people employed, and taxes and fees paid to the government **directly by the Companies**
- Indirect impacts – value added, people employed, and taxes and fees paid to the government by the **companies who constitute the supply chain of the Companies.**
- Induced impacts – value added, people employed, and taxes and fees paid to the government by the **companies who provide goods and services to the people who are employed by the supply chain of the Companies and who are spending their salaries.**

Direct, indirect and induced impacts calculation – summary

Variable	GVA	Employment	Government's income
Direct impact	Payments made by the Companies: Employees' income (net salaries) + private sector's income (cash flow after investments) + government's income (taxes, CO2, dividends)	# of people employed by the Companies	Environmental fees (including CO2), labour taxes, corporate taxes and VAT* payments made by the Companies to the government
Indirect impact	Domestic purchases (OPEX + CAPEX) x blended indirect GVA multiplier (by split of industries)	Domestic purchases (OPEX + CAPEX) / blended revenue-per-employee ratio (by split of industries) x blended indirect employment multiplier (by split of industries)	Indirect GVA impact x Estonian economy's tax-to-GDP rate
Induced impact	Domestic purchases (OPEX + CAPEX) x blended induced GVA multiplier (by split of industries)	Domestic purchases (OPEX + CAPEX) x blended induced GVA multiplier (by split of industries)	Induced GVA impact x Estonian economy's tax-to-GDP rate

* VAT in the supply chain of exporting industries is zero; therefore, VAT is not considered in this analysis

Input-output methodology

We use input-output tables for the Estonian economy published by Eurostat on 13 March 2014 to calculate a set of indirect and induced macroeconomic multipliers on a sectoral basis. These multipliers capture economic interdependencies within the oil shale mining and shale oil production supply chain and the wider economy, and thus enable an estimation of the indirect and induced impact on GDP.

Input-output tables are national accounting tools that capture the flow of goods and services between industries within an economy as well as the contribution of labour to economic activities. Input-output tables can therefore be used to map an industry's supply chain through the calculation of input coefficients. Such coefficients capture what share of the value of production in each industry is accounted for by inputs acquired from other industries.

Using such coefficients, output multipliers can be calculated. These capture the additional demand generated in each industry in the economy if the production is increased by one unit of currency in a specific industry. The mathematical process through which multipliers are obtained is known as the Leontief Inverse Matrix.

The table above sets out a high level overview of the methodology which has been used to estimate the direct, indirect and induced economic impacts within the model. We then go on to describe these calculation steps in detail.

For simplicity purposes, all direct, indirect and induced impacts are assumed to take place during the same year. In reality, however, there may be a time difference between the investment and the eventual impact on the economy. In a steady state there would be no difference but if substantial changes are happening from year-to-year, this may have an impact.

Today's prices (i.e. prices in real terms) have been used in all calculations.

Methodology

Overview of methodology

Direct impact

In order to quantify the direct impact of the oil shale value chain, we have used information provided by the Companies on the investments, maintenance expenses, ongoing operating expenditure, revenues, employment and taxes.

The direct impact arises from the ongoing activities in oil shale value chain as well as from the activities that are related to construction of the mines, beneficiation and production facilities and the related infrastructure.

GDP

The direct impact to Estonia's GDP is calculated according to the income approach. According to this approach, the GDP impact is equal to the GVA generated in oil shale value chain and it consists of three components:

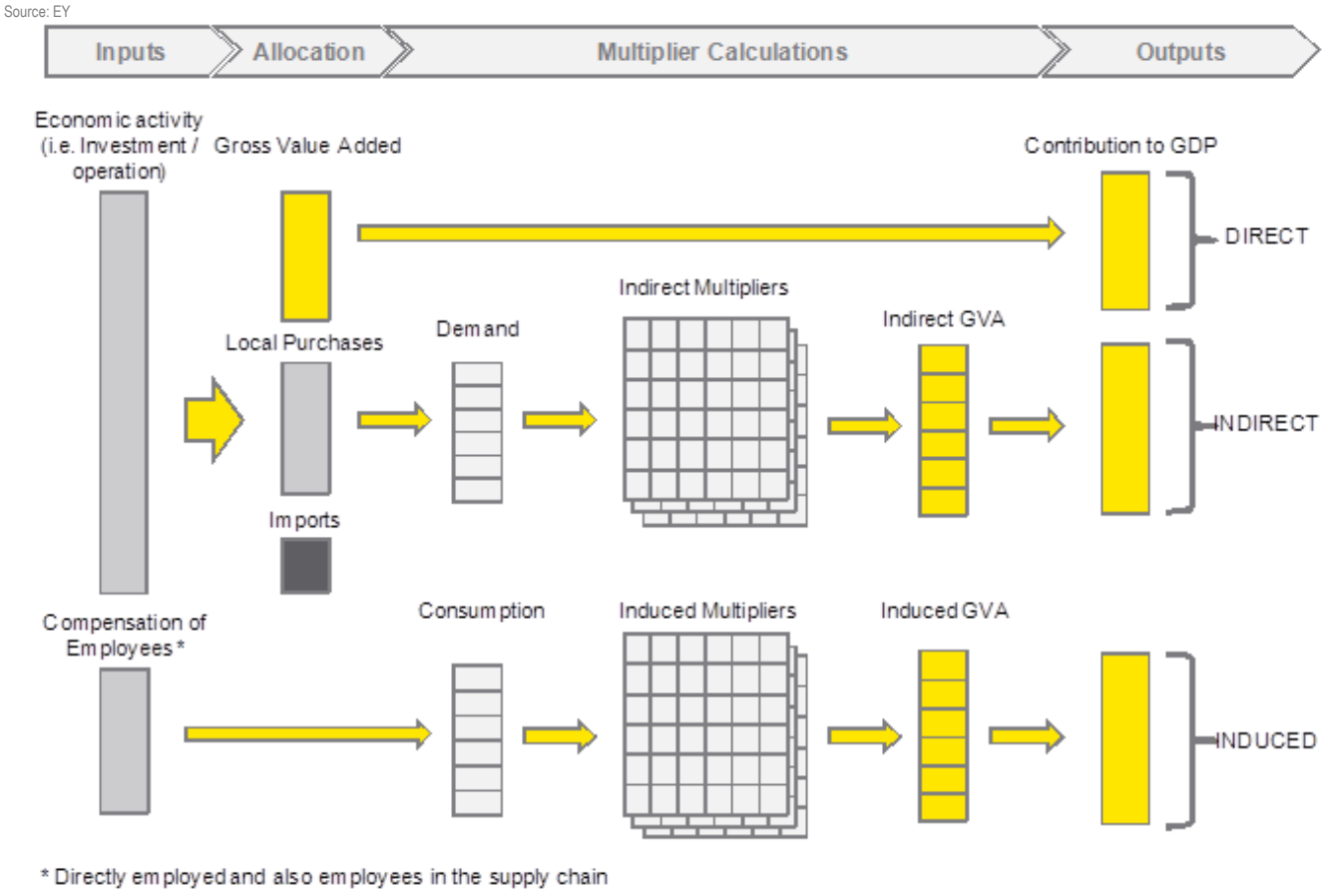
- Government's income from taxes, CO2 quotas sales
- Salaries paid to the employees (without taxes)
- FCF of the Companies (after tax, but before financing cash flows because financing items represent income for debt investors which is similar to dividend income for equity investors and represents direct GDP impact)

Employment

Direct employment is equal to the number of people employed by the Companies.

Methodology used to estimate direct, indirect and induced economic impacts

Source: EY



Methodology

Overview of methodology

Government income

The direct impacts include:

- Employment taxes paid by the Companies. Employment taxes include personal income tax, social security tax and unemployment insurance tax (paid by the employee and employer).
- Environmental taxes incurred due to the mining and shale oil production process – this includes, among others, mining resource fee, fee for water usage and pollution, and taxes particular to rock handling and shale oil production processes.
- Excise taxes on purchases of the Companies. The excise taxes, which are directly paid by the Companies, affect the Government budget, because the oil shale sector contributes to Government budget by domestic consumption of the taxed goods.
- Corporate income tax ("CIT") paid on dividends. Our analysis represents only the theoretical impact of the taxes, because the direct CIT is calculated assuming that all free cash flows would be paid out as dividends.

Direct impact represents the direct contributions made by the Companies. According to the income method, direct GDP impact equals to the sum of:

Employees' income (salaries);

Companies' income (cash flows);

Government income (taxes and other).

Input-output table and GVA calculation methods

Source: EY

			Production (inputs)								Consumption			
			Agriculture	Mining	Construction	Production	Trade	Transport	Services	Other	Consumer spending	Domestic investment	Government spending	Net exports
			1	2	3	4	5	6	7	8				
Value added	Agriculture	1	Intermediate consumption											
	Mining	2												
	Construction	3												
	Production	4												
	Trade	5												
	Transport	6												
	Services	7												
	Other	8												
Demand (output)	Employees		Employee salaries								Gross Domestic Product – GDP (by industries – Gross Value Added – GVA)			
	Private sector		Corporate profit											
	Government sector		Taxes, fees, other											

- Red circle points out the income approach of GVA calculation

The actual free cash flow for dividend distribution can differ from the theoretical amount because the Companies will reinvest some of it into new projects. Nevertheless, this only means that there may be a timing difference in the dividend payment date because eventually the investors need to receive dividends to get compensated for their investments. Furthermore, the future dividends need to be higher than the amount that potentially could have been paid out as dividends today, in order to justify the postponement of dividends.

Methodology

Overview of methodology

- Income from sales of CO2 quotas. For simplification purposes, the CO2 income is equalised to the Companies' CO2 costs. Please see further discussion under the CO2 quota impact section below. In general - although the Government faces certain restrictions when spending the income from CO2 quotas, they still represent cash income to the Government.
- The direct impact on Government income does not include the following taxes and other income:
- Excise taxes paid by the clients of the Companies. There are two main reasons for this. Firstly, the largest share of the production output is shale oil, which is mainly exported and exports are not subject to excise tax. Secondly, the domestically sold goods that are subject to excise tax, would probably anyway be consumed by the local consumers even if the domestic industry would not exist. For example, if EE would not produce electricity, the domestic consumers would still consume it and pay the excise tax.
- VAT – because the net VAT impact in the supply chain of an exporting industry is zero. This rationale also applies in indirect and induced tax impact calculations (i.e. VAT impacts are excluded).
- FCF from state-owned company EE (dividend and investments) – although EE is a government-owned company, in our analysis it has been included in the private sector. This is because:
- Our analysis is based on the assumption that the forecasts are based on rational investor's decisions, but the Government may have other interests, which result in substantially different business decisions.
- The purpose of this Report is to analyse the impact of different taxation and other market conditions impact to the economy and government's budget in general. It was not the purpose of our work to analyse the government's investment decisions (i.e. willingness or wish to invest into EE and, as a result, receive dividends).

CO2 quota impact – limitations

- The scope of our work did not include an analysis of the potential EU climate policy changes. In relation to this, our analysis does not cover the impact of CO2 sales revenues on the level of the Estonian state. Instead, the analysis simply indicates the CO2 cost of the Companies when analysing the industry's contribution to the Government's income.
- According to the currently applied policies in the EU, the member states receive the country-level quotas based on the programming periods. The current period is 2013-2020, which means that before 2021 there should be no change in the Government's income from CO2 (except for the annual reduction of 1.74%), irrespectively of whether Estonia's total emissions change.
- Nevertheless, there is great uncertainty about the potential future developments and the principles that will be applied from 2021 onwards. The potential scenarios range from the assumption that the system remains exactly the same, to the assumption that the system will be completely abandoned.
- Given this uncertainty and the complexity of the potential future scenarios, it was not the focus of our analysis to model this area in great detail, and was not included in our scope of work.
- We wish to point out that this treatment of CO2 is somewhat similar to the methodology with respect to employment taxes and employees' income – namely, if the industry disappears, it does not necessarily mean that the employment taxes and employees' income disappears, although it is likely to change and also to bring substantial negative consequences with respect to unemployment benefit costs, retraining, reallocation, lower future salaries, etc, which also have not been considered in our analysis.

Methodology

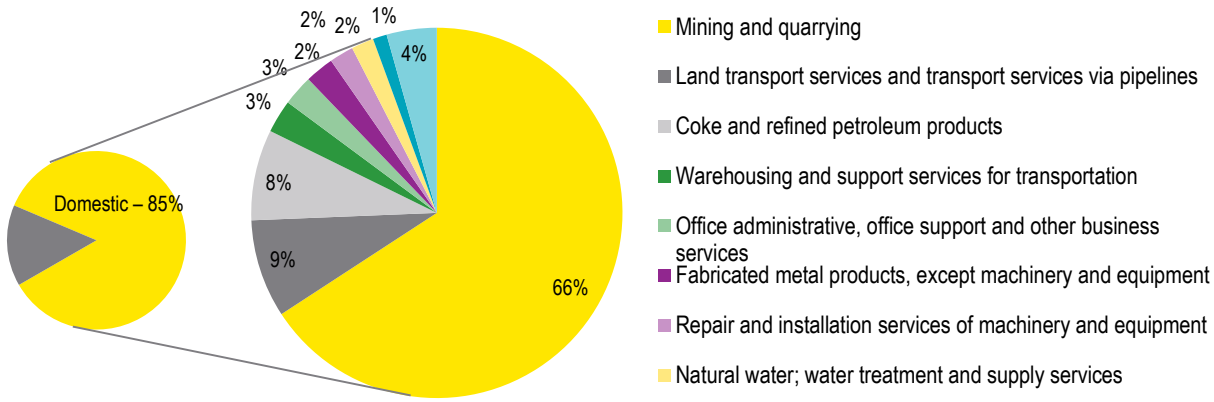
Overview of methodology

Indirect impact

- The investments and operations of the Companies enable also the direct suppliers and their supply chain to operate, invest, employ people, pay taxes and earn profits. There is a multiplier effect on GDP, employment and Government income due to the supply chain effect.
- The indirect impact arises from the oil shale industry's demand for domestically produced goods and services in the supply chain related to the Companies' operations. This is a consequence of the operations and investments of the oil shale industry.
- Expenditures on imported goods and services do not have an impact on domestic economy. Therefore, only domestic expenditures are considered – these represent the revenues (output) of the direct domestic suppliers.
- The domestic CAPEX and OPEX is split into industries because the indirect GVA and employment multipliers are calculated for each industry separately through the application of the Leontiev inverse transformation to the coefficient matrix. The industry splits were based on VKG's analysis of VKG's purchases across industries and domestic share of these sectors. These portions were confirmed by the other two companies.

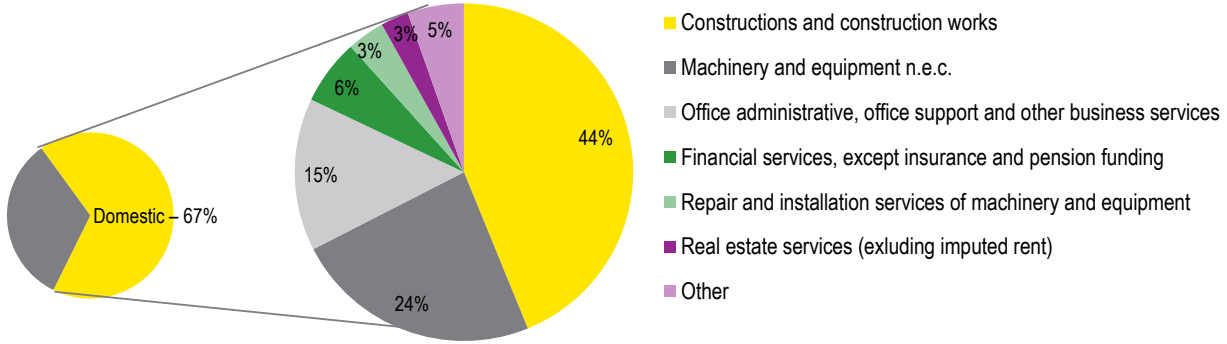
Industry split of domestic OPEX

Source: Data from the Companies



Industry split of domestic CAPEX

Source: Data from the Companies



Methodology

Overview of methodology

Impact on GDP

The oil shale sector's indirect impact on GDP refers to the additional value added which is contributed by the supply chain of the Companies.

The overall impact on GVA has been calculated through the application of sector specific GVA multipliers to the output (revenues) of each sector in Estonian economy, which is included among the direct suppliers of domestic CAPEX and OPEX of the Companies.

GVA multipliers have been calculated from the 2010 Estonian Input-Output tables produced by Eurostat, which was the most recent available information.

Impact on employment

The indirect contribution to employment is equal to the number of employees that are employed by the Companies' supply chain.

This impact is found by applying the sector specific employment-to-output ratios to the domestic CAPEX and OPEX (which represents the output of the first round of domestic direct suppliers) in order to arrive at the number of employees of the first round of domestic direct suppliers.

Apparent productivity of labour has been calculated from Eurostat's Structural Business Statistics database.

The number of employees of the first round of domestic direct suppliers is then multiplied by the indirect employment multiplier, in order to arrive at the number of employees in the whole domestic supply chain of the Companies.

Impact on Government income

The overall indirect impact on Government income has been calculated through the application of the Estonian economy's tax burden-to-GDP ratio. Wider measures of Government income would not have resulted in substantially higher ratios to GDP and were not used because other items of Government income are not assumed to be equally applicable for all industries.

The ratio of tax receipts is based on data from Statistics Estonia database.

Indirect contribution of the mining sector to GVA, employment and taxes arises through the supply chain effect (i.e. the salaries, profits and taxes of the supply chain companies). This effect is related to domestic purchases of OPEX and CAPEX. There is no impact in case of imports.

Methodology

Overview of methodology

Induced impact

The induced impact of the oil shale value chain arises from the economic activity that is generated in Estonia as a consequence of the consumption of goods and services by people who are employed by the companies in the supply chain.

As employment increases, so does the total amount of salaries and wages paid out to employees within the economy. This will increase households' disposable income, and thus boost consumption, via households' marginal propensity to consume (i.e. depending on households' savings rate).

Such an increase in economic activity can be calculated at a sector level by applying induced multipliers similarly to the application of the indirect multipliers – GVA multiplier is applied to the domestic CAPEX and OPEX of the Companies, employment multiplier to the number of employees of the first round of domestic direct suppliers, and tax-to-GDP ratio is applied to induced GDP.

Induced multipliers are again calculated at industry level through the application of the Leontiev Inverse transformation to the coefficient matrix of the Input Output Tables, but it is augmented to include households as an additional sector within the economy that provides labour services, receives salaries and wages in exchange, and consumes goods and services.

Using data from Eurostat, average propensity to consume indices have been calculated at the industry level. This has been applied to the total direct and indirect salaries and wages, to calculate the effect on household consumption at the industry level.

Induced contribution of the mining sector to GVA, employment and taxes arises through the companies (and their supply chain) who provide goods and services to the people who are employed by the supply chain of the Companies and who are spending their salaries.

Limitations of the input-output methodology

The following limitations should be noted to our analysis:

- In our analysis, we have not taken into account direct import taxes related to the imported OPEX and CAPEX of the Companies because of the complexity of such analysis (import taxes vary depending on the type of specific imported product). While it is likely that this exclusion would not materially impact the results of the analysis, given the overall level of preciseness of inputs, the direct and total tax impacts are likely to be somewhat underestimated.
- We have not considered the macroeconomic effects for the country if energy (power, oil) will have to be imported as substitute from other countries.
- The economic multipliers used for the input-output methodology are likely to change over time if the structure of the economic sectoral composition in Estonia changes. This is likely to happen in the scenarios where the oil shale industry fades out. However, it is only possible to use historical multipliers for the analysis.
- Our scope of work does not cover the indirect and induced economic impacts arising from Government spending. Similarly to the Companies expenditures, Government expenditures create a supply chain effect as well. Therefore, the economic impacts of our work are underestimated by the supply chain effect arising from the government expenditures

Methodology

Overview of methodology

Present value of Government's income

We have calculated the present value (PV) of the oil shale industry's contribution to Government income.

The PV of direct Government income calculation includes the same income components (taxes, CO2 quotas sales and state company's FCFs) that are included under the direct impacts in the macroeconomic impacts methodology.

The PV of indirect and induced taxes is also added to the PV of direct Government income.

Furthermore, we applied the Gordon Growth Model for indicating the potential terminal value of Government income after the year 2035:

$$TV = \frac{CF_n(1+g)}{(r-g)},$$

Where

TV – Terminal value.

CF_n – Expected cash flow in the period n;

r – required rate of return on invested capital;

g – long-term growth rate

This calculation only serves as an illustration because our work did not include an analysis of the cash flow structure after 2035. Therefore, high-level indicative assumptions were applied in this calculation and the results should be treated with care.

Terminal year adjustments

In the sustainable scenario we have adjusted the 2035 cash flows for the terminal period calculation so that CAPEX level would equal to depreciation. Namely, in 2035 currently the forecasts only included minimal maintenance CAPEX, which is not representative of business cycle average CAPEX.

Such issue is not relevant for the long-term fade-out scenario where large CAPEX projects are not expected and the growth rate is substantially negative.

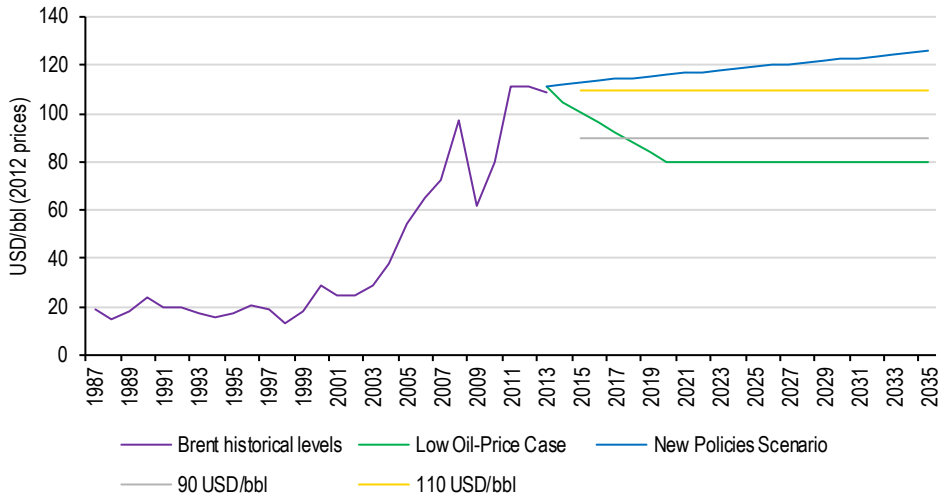
Scenarios overview

1. Key assumptions
2. Scenarios
3. Investments
4. Production volumes
5. Data and forecasting assumptions

Key assumptions

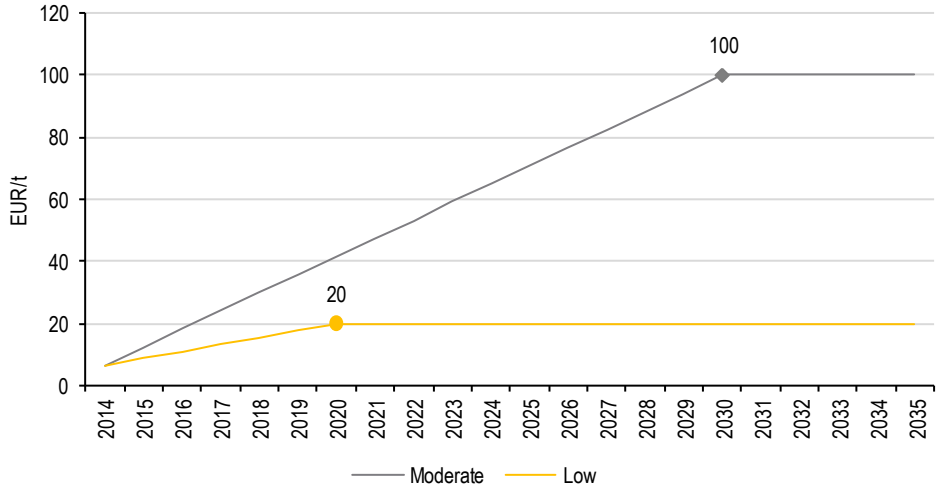
Historic levels of Brent oil price and possible future scenarios

Source: World Energy Outlook 2013



CO2 price scenarios

Source:The Companies



Key assumptions

Main variables

Our analysis is based on the forecasts compiled by the Companies based on the combinations of different environmental fees, CO2 and oil price scenarios. The scenarios were determined together with the Companies in the beginning of our work, based on the premise that they should give an understanding about the consequences of different tax policies under the most likely combinations of oil and CO2 prices.

- Oil price:
  - **90 USD/barrel** – Different oil price scenarios are forecasted by different energy companies, associations, International Energy Agency, the World Bank etc. 90 USD/barrel was selected because it seems to **represent the dominant view** of energy sector companies when planning their investments.
  - **110 USD/barrel** – In the very recent years, oil price has exceeded 90 USD/barrel. Although it does not seem to represent the current dominant view of oil price developments in the future, it is analysed as one possibility. Nevertheless, it means that the **scenarios with 110 USD/barrel should be treated cautiously because they may be too optimistic**.
- EU climate policy impacts:
  - Moderate CO2 price – linear growth from today's prices (~6-7 EUR/t in February 2014 to **100 EUR/t by 2030** (in real prices).
  - Low CO2 price – linear growth from today's prices to **20 EUR/t by 2020** (in real prices).

    Currently there is substantial uncertainty about the future of the EU climate policy and the resulting CO2 prices. Therefore, there is no reliable source on which to base the price estimates. The EU Energy Roadmap 2050 was considered when selecting the CO2 prices. Namely, in the EU Energy Roadmap 2050 the price of CO2 varies between 18 EUR/t in 2020 to 310 EUR/t in 2050 (in 2008 prices). The "low" price of 20 EUR/t was based on the level of CO2 price before the last economic crisis. Given that it represents the lowest end of the range, **scenarios with 20 EUR/t CO2 price should be treated with care because they may be too optimistic**. The "moderate"

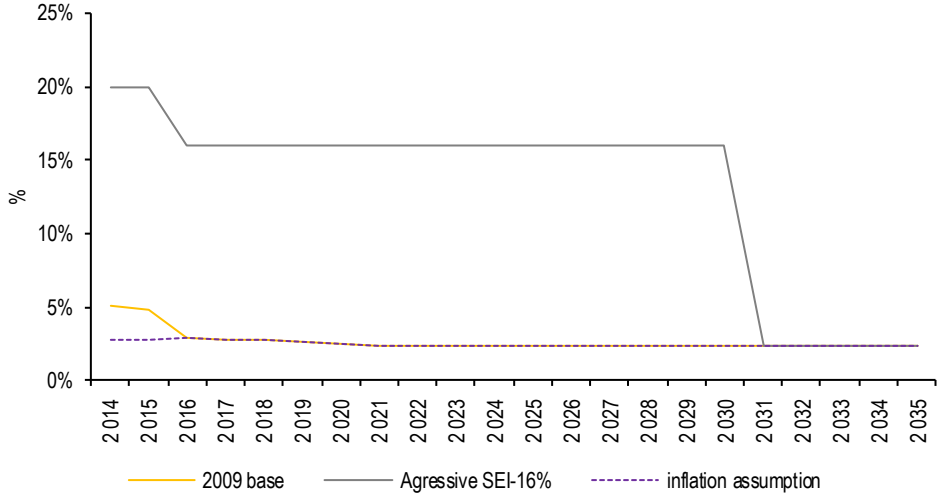
Key assumptions

price of 100 EUR/t is not as high as the highest scenario would indicate because it was subjectively reduced to more realistic levels.

- Estonian resource taxes and environmental fees:
  - **Aggressive (SEI 16%)** – as described by SEI Tallinn and Tartu Ülikool RAKE 2013 analysis "Keskkonnatasude mõjuanalüüs". In this study, a 16% nominal price increase annually during 2016-2030 is recommended for oil shale resource taxes, starting from the level of taxes in 2015, as announced by the government in September 2012. The growth rates of other environmental fees (such as water usage fees, production related pollution fees including fees for sulphur and nitrogen and waste deposits, etc.) were also based on the SEI study. After 2030, it is assumed that all fees grow with inflation (i.e. remain the same in real terms).
  - **2009 base** – as stated in the environmental fees decree from 12.11.2009. The decree sets out the growth rates until 2015. After 2015 it is assumed that all fees grow with inflation (i.e. remain the same in real terms).

Oil shale resource taxes growth rates

Source: SEI, environmental fees decree from 12.11.2009, Global Insight



Key assumptions

IRR for future investment decisions

The main criterion for preparing the forecasts was that future investment decisions are made when it is possible to earn sufficient IRR on them. For the replacement CAPEX and **proven technology** the nominal IRR was set at **15%** while for investment into **new technologies** (such as Enefit280 oil plants or oil upgrading units – refineries) which do not yet have a commercially proven track record for implementation in Estonia, the required IRR was set at ca **20%**.

Such IRR rates are based on the Companies experience in obtaining financing at market conditions both from banks and investors. The IRR rates also correspond to the rates used in international studies on mining sector (such as EY Poland study "Shale gas taxation in Poland"), when also considering the specifics and risks of Estonian economic environment.

The IRR used for investment decisions (15-20%) assumes that the tax environment is stable and fairly predictable and there are no other unpredictable significant political risks (such as a failure to bind the mining permits with useful lifetimes of oil plants, sudden restrictions to the agreed mining volumes, etc). Moreover, the investments are made only if the accessibility to resource is guaranteed. The Government should consider whether setting the limits to the maximum mining volume overweigh the lost and postponed economic values (tax income, employment and economic growth) that could otherwise be gained if there were no cap on total mining volumes.

It is required for the development of the industry that both – the owner of the resource and the user of the resource – have a motivation to develop the industry. What is more, it is possible to reduce the investors' required returns if the Government shares the business risks as and owner of the resource. An additional analysis, which would provide a comparison of different kind of environmental tax systems (profit-based, revenue-based, etc) is needed for this purpose.

Key assumptions

Operational decisions

Operational decisions in the forecasts are simply made based on the comparison of total costs and total revenues – if the market prices are not high enough to cover the production costs per unit, the company needs to close down (a part of) its ongoing operations.

The closing costs include also the costs for closing the mines and making redundancy payments to employees.

Financing decisions and rational investor perspective

The forecasts of all Companies assume that their **owners (investors) act rationally and it is always possible to raise both equity and debt financing for projects which are economically viable**.

Nevertheless, our analysis stops at the level of free cash flows before financing decisions, which means that any drawdowns and/or repayments of debt, as well as the associated costs of capital (interest) are not considered in our analysis.

This also implies that our analysis does not take into consideration the existing capital structure and indebtedness of the Companies. Namely, if is irrelevant if some existing debt covenants are breached because it is assumed that the owners are always able to raise sufficient capital to restore the desired capital structure and debt balance.

Furthermore, it should be pointed out that in some scenarios the Companies may not have sufficient operational cash flows to cover existing financing costs and it might not be rational for owners to inject additional equity. If such event happens, the lending parties (usually banks) may eventually take over the assets of the Companies and sell them. Nevertheless, we consider that under such event the bank will still be interested in keeping the business alive even if the owner of the business changes because, as long as its revenues are still higher than costs, the bank will get at least some return in addition to the ultimate liquidation value. Liquidation does not result in any economic benefits, except for the redundancy payments to employees and mine closure costs, which have already been included in the Companies' forecasts.

As a result of these assumptions, some operational and investment decisions reflected in this analysis may differ from the decisions which could be made if the owners do not act rationally and/or face financing constraints. For example, such situation might be applicable for the state-owned company EE where the government may not make all decisions from a purely rational market investor’s point of view.

Scenarios

Scenarios

As a result of combining the assumptions about taxes, CO2 price and oil price, the Companies prepared eight different scenarios, as presented in the table below. Nevertheless, our analysis is focused only on three scenarios because it was possible to group the scenarios based on the similarity of operational and investment decisions of the Companies. We have categorized three types of forecasts:

- **Red – quick fade-out**. The conditions are soon so unfavourable that the Companies will cease operations before the existing assets are exhausted, simply because revenues do not cover the costs anymore.
- **Yellow – long-term fade-out**. Only the investments that are planned for the nearest future are carried out, but after that no new investments are made and the industry will fade out after the current asset base has arrived at the end of its useful life.
- **Green – sustainable**. In this environment, it is feasible to invest in large capital-intensive projects on a long-term basis.

As it was explained in the Sector overview section, the oil shale industry in Estonia is not homogeneous and there are differences between the Companies. As a result, different companies may make different decisions in the same scenario (i.e. under the same set of assumptions about taxes, oil price and CO2 price).Therefore, the colour coding in the table mainly reflects the operational decisions of EE as the largest company in the industry. If other companies made different decisions, this is indicated with the small rectangle in the right-hand side of the cell. Furthermore, even if the colour coding in the table is the same, it does not mean that the Companies close their operations at the same time or are able to earn the same IRRs under the same set of assumptions.

Scenarios division between fade-out and sustainable

Source:EY analysis

CO2 price	Oil price	Environmental fees	
		Aggressive (SEI 16%)	**2009 base**
100 EUR/t	**90 USD/bbl**	**(1) Quick fade-out**	*(5)Sensitive to oil and CO2 price*
	110 USD/bbl	*(2)Sensitive to CO2 price and environmental fees*	*(6) Sensitive to CO2 price*
20 EUR/t	**90 USD/bbl**	**(3) Long-term fade-out**	*(7) Sensitive to oil price*
	110 USD/bbl	*(4) Sensitive to environmental fees*	**(8) Sustainable**

- The double-coloured cells refer to differences between the Companies in these scenarios

Scenarios

Selected scenarios

As it can be seen from the table, three scenarios were relatively homogenous across the Companies with respect to the operational and investment decisions. Since these scenarios also represent different types of behaviours according to the abovementioned colour coding, they were selected as the key scenarios to be analysed in this report. These scenarios are:

- **Scenario 1: "Quick fade-out"** scenario represents the situation where the oil price is 90 USD/barrel, CO2 prices reach 100 EUR/t in 2030 and environmental taxes grow aggressively.

  Under this scenario, the Companies will cease their operations within ten years – i.e. by the end of 2024 (some companies already earlier). This need comes from the rise in resource fees, as well as the sharp rise in CO2 price while oil prices remain at 90 USD/barrel.

- **Scenario 3: "Long term fade-out"** scenario represents the situation where the oil price is 90 USD/barrel, CO2 prices reach 20 EUR/t in 2020 and environmental taxes grow aggressively.

  Under this scenario there is a slow decline in the industry's activities. In the first years of forecasted operations, new investments are planned to build new capacities in shale oil production, although the oil volumes and oil prices are not sufficient to justify investments in refineries.

- After 2028 the profit margins of the sector start declining noticeably and by 2035 they are approximately at the same levels as the quick fade-out scenario in the final years before ceasing operations. This is a clear indication that fade-out can be expected in some years after 2035, when the existing assets have reached the end of their useful lifetime. **Scenario 8: "Sustainable"** scenario represents the situation where the oil price is 110 USD/barrel, CO2 prices reach 20 EUR/t in 2020 and environmental taxes grow as agreed in 2009 (starting from 2015 with inflation).

  Under this scenario the business environment is sufficiently favourable and oil shale mining will reach its maximum level of 20 million tonnes per year. The value chain also includes refineries. Nevertheless, it should be mentioned that even though this scenario appears sustainable until the end of 2035 and presumably even further, the margins of the sector will probably still decrease in the long run (i.e. after the analysed period) because it gets more expensive to extract oil shale for various reasons – resource is more difficult to access.

The sensitivity analyses which cover the other five scenarios are presented in the appendices of this report.

Scenarios analysed in the report

Source:EY analysis

CO2 price	Oil price	Environmental fees	
		Aggressive (SEI 16%)	**2009 base**
100 EUR/t	**90 USD/bbl**	**(1) Quick fade-out**	*(5)Sensitive to oil and CO2 price*
	110 USD/bbl	*(2)Sensitive to CO2 price and environmental fees*	*(6) Sensitive to CO2 price*
20 EUR/t	**90 USD/bbl**	**(3) Long-term fade-out**	*(7) Sensitive to oil price*
	110 USD/bbl	*(4) Sensitive to environmental fees*	**(8) Sustainable**

Our analysis is focused on three scenarios, which represent similar operational and investment decisions of the Companies:

- Quick fade-out
- Long-term fade-out
- Sustainable

Investments

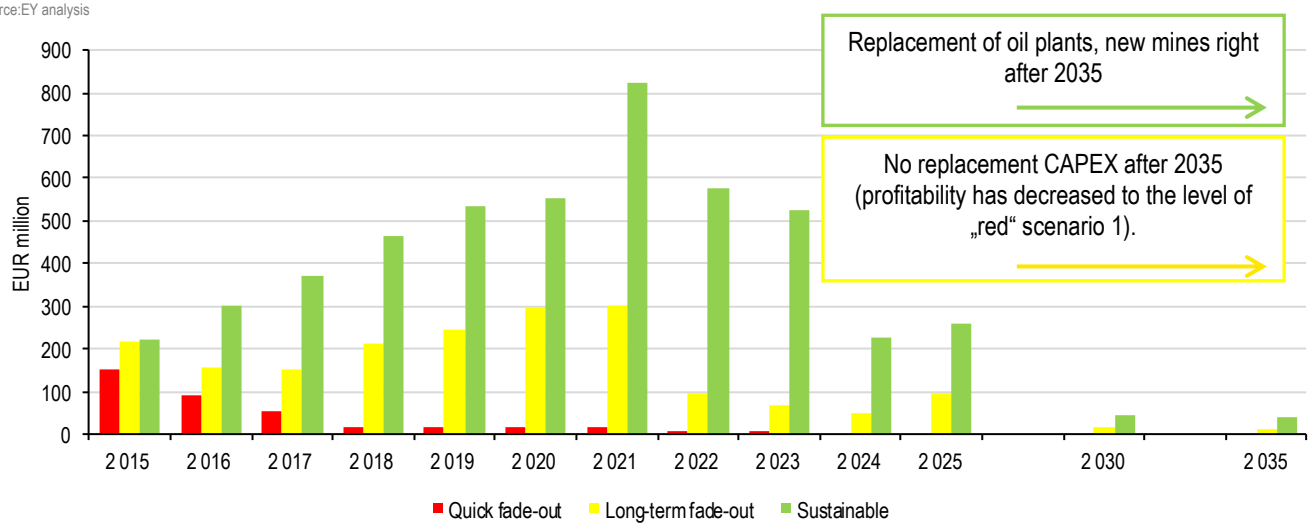
Larger investment projects and additional production volumes

Source:EY analysis

production volumes, th tons	2 015	2 016	2 017	2 018	2 019	2 020	2 021	2 022	2 023	2 024	2 025	2 030	2035	Total
Mines														
Oil plants	+95	+37		+290		+360	+315	+890		+265				+2 252
	+95	+37		+265		+265	+530							+1 192
	+95	+37												+132
Refinery					+750			+750		+750		+750		+3 000

Investment forecast

Source:EY analysis



Investments

Quick fade-out scenario

In the quick fade-out scenario there will be no investments into new large capacities. The ongoing investments represent the minimum possible levels which enable operating until 2024.

Long-term fade-out scenario

In case of long-term fade-out scenario, the Companies are making investments into new capacities only until 2021. These include new oil plants with additional production volume of 1 192 thousand tons. After 2021 the expected IRR no longer justifies investments into new facilities, except that one new mine is opened in 2025 after the exhaustion of one current mine.

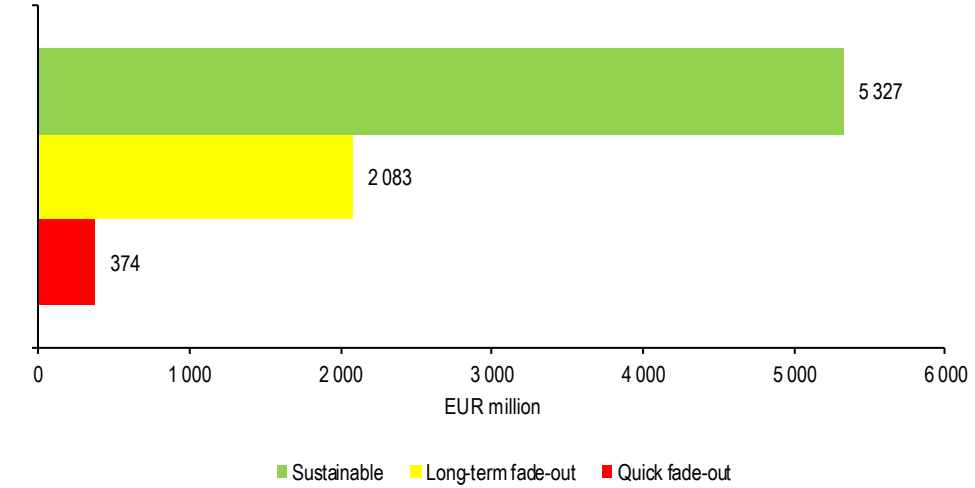
Sustainable scenario

In the sustainable scenario the Companies could make EUR 5.3 billion investments during the 20-year period. The investments include new oil plants with additional production volume of 2 252 thousand tons, which is almost two times higher than the amount planned in the long-term fade-out scenario. Additionally, several new mines would be opened to cover the demand for oil shale.

Furthermore, the sector can invest into new technologies – refineries – which include higher risk but in favourable business environment will extend the oil shale value chain even further. The capacity of the refineries could reach 3 million tons.

Sector CAPEX during 2015-2035

Source:EY analysis



The final years in the forecast show a decline in the investment levels – this happens because the sector is operating at (or near) the maximum mining limit of 20 million tons and there is no room for additional investments. Nevertheless, it can be assumed that after 2035 the investment levels rise again because of the need to replace the facilities that reach the end of their useful lifetimes.

From the financial feasibility perspective the Companies would invest even more, but due to the cap on the maximum mining volumes it is not possible. In terms of tax income, the Government would benefit even more if the mining limit were higher or non-existent.

In business environment that allows sustainable operations for the oil shale industry the **investments amount to EUR 5.3 billion** in the next 20 years, which is **2.6 times higher** than in long-term fade-out scenario.

Production volumes

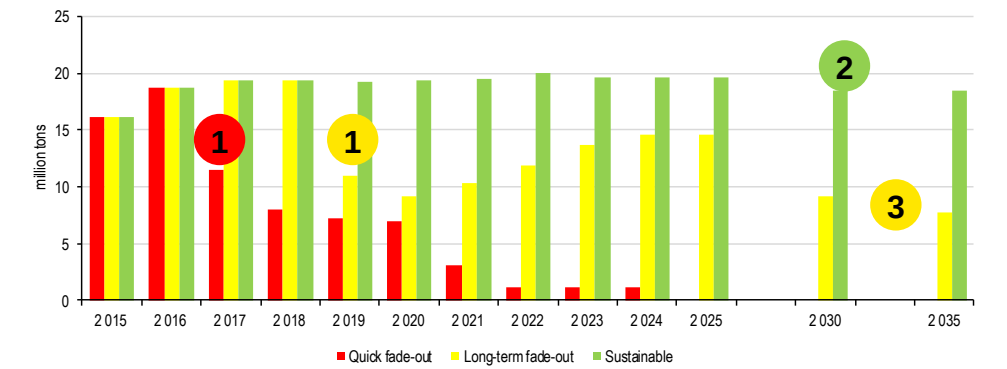
As a result of different investment and operational decisions, the dynamics of oil shale mining and shale oil production volumes varies greatly between the scenarios. It can be observed from the tables below that production levels decrease sharply in fade-out scenarios while the sustainable scenario uses resources near the national limit of 20 million tons per year. Below we have briefly commented the main reasons for these trends.

1 In the quick and long-term fade-out scenarios the sharp reductions in mining volumes in 2017 and 2019 relate to the closure of electricity generation by direct combustion, which becomes unprofitable.
In the sustainable scenario the direct combustion is gradually replaced with electricity generation as a byproduct of oil production.

2 Under the sustainable scenario, the industry constantly operates at or near the maximum oil shale mining limit (20 million tons per year). There is some room for opening another smaller oil plant after 2025, but it is not included in the forecasts becase the planned oil plants have higher volumes than this difference between maximum and projected mining volumes.

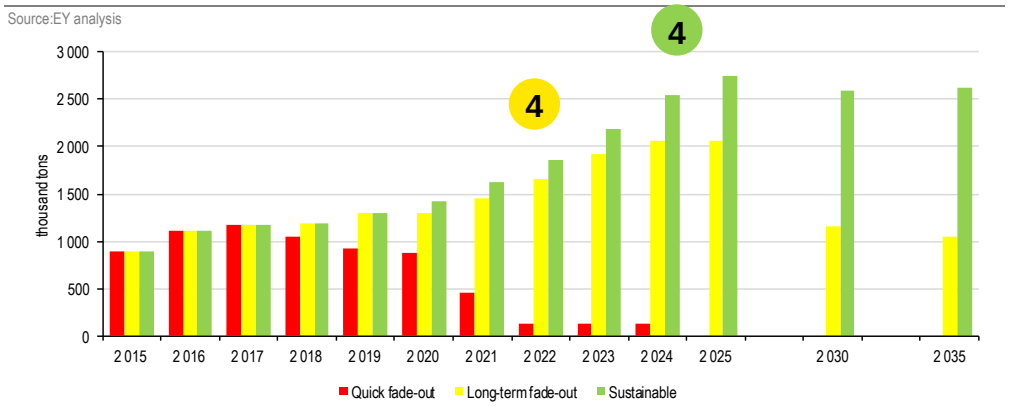
Oil shale mining volumes (mln tons)

Source:EY analysis



Shale oil production volumes (thousand tons)

Source:EY analysis



3 In the long-term fade-out scenario the mining volumes increase after the drop in 2019 because of the opening of new oil plants. However, gradual decrease of activities can be observed arter 2025 (until the end of the currently existing production facilities).

4 The development of shale oil production volumes somewhat lags behind the investment years for new shale oil capacities because it takes a few years until the plants are operating at full capacity.

Data and forecasting assumptions

Data

The forecasts prepared by the Companies included, among other indicators:

- Operating and investment cash flows
- Production and mining volumes
- Number of employees

Aggregation

The aggregated forecasts of the oil shale sector were compiled by summing the Companies' data and eliminating purchases and sales between the Companies. For example, if a refinery is built, the sales of the respective amount of shale oil were eliminated.

Free allocation of CO2 quotas

It was assumed that until 2020 VKG and KKT will receive the currently agreed amount of free quotas. After 2020 (i.e. during Phase IV of the EU Emission Trading Scheme), the allocated quotas for oil production are assumed to decrease linearly by 2.2% every year.

Differently from VKG and KKT, EE assumed that they would not receive any freely allocated quotas for oil production after the currently allocated quotas for Auvere plant are finished. As a result EE's operational decisions and scenarios differ somewhat from those of VKG and KKT, but this difference is not the only difference between the Companies and also not the largest difference.

Differently from oil production, as of 2020 no free quotas for electricity production were assumed – this is similar for all three Companies.

Crack spread

Crack spread between crude oil and fuel oil was agreed at EUR 122 per ton based on the forward price for 2014. The same assumption is applied for both oil price scenarios.

Growth rates

The following growth rates were applied for the purpose of calculating the potential terminal value after 2035.

- Quick fade-out scenario: there is no oil shale industry by 2035.
- Long-term fade-out scenario: -10%, because the oil shale industry is expected to fade quite quickly after 2035.
- Sustainable scenario: -2%, because oil shale mining becomes more expensive over time both due to labour intensity and more difficult accessibility of the resource. As a result, the industry will eventually fade out.

Discount rates

We have applied two different discount rates, depending on the type of cash flow that the Government is expected to receive.

- Namely, the Government shares the business risks in case of profit-based cash flows, such as CIT paid on FCFs. As a result, these cash flows bear the same risks and should be discounted with the same discount rate as the Companies' FCF.
- For other types of taxes and fees the risks for the Government are smaller because they are dependent on the general operating decisions but not on profitability. Therefore, lower discount rate should be applied for them.

For CIT paid on FCFs we applied 17.5% nominal discount rate (ca 15% real rate, given Estonian long-term inflation of 2.3%) as representing a required return of a knowledgeable private investor on the market. This represents the average of 15% and 20% IRRs of the Companies.

For other cash flows we have selected 6% nominal discount rate (3.6% real rate, given Estonian long-term inflation of 2.3%). This is taken from Estonian public sector accounting principles where 6% nominal rate is used for discounting long-term receivables.

We have considered that most probably it could be adequate to apply somewhat higher discount rate than 6%, given that the tax cash flows do not represent known receivables. However, the premium could have been very subjective and small increases in the discount rate would not have changed the conclusions of this analysis. Therefore, it was decided not to subjectively adjust the discount rate.

Macroeconomic impact analysis

1. Present value of government income
2. Impact on government income
3. Impact on employment
4. Impact on GVA

Net present value of government's income

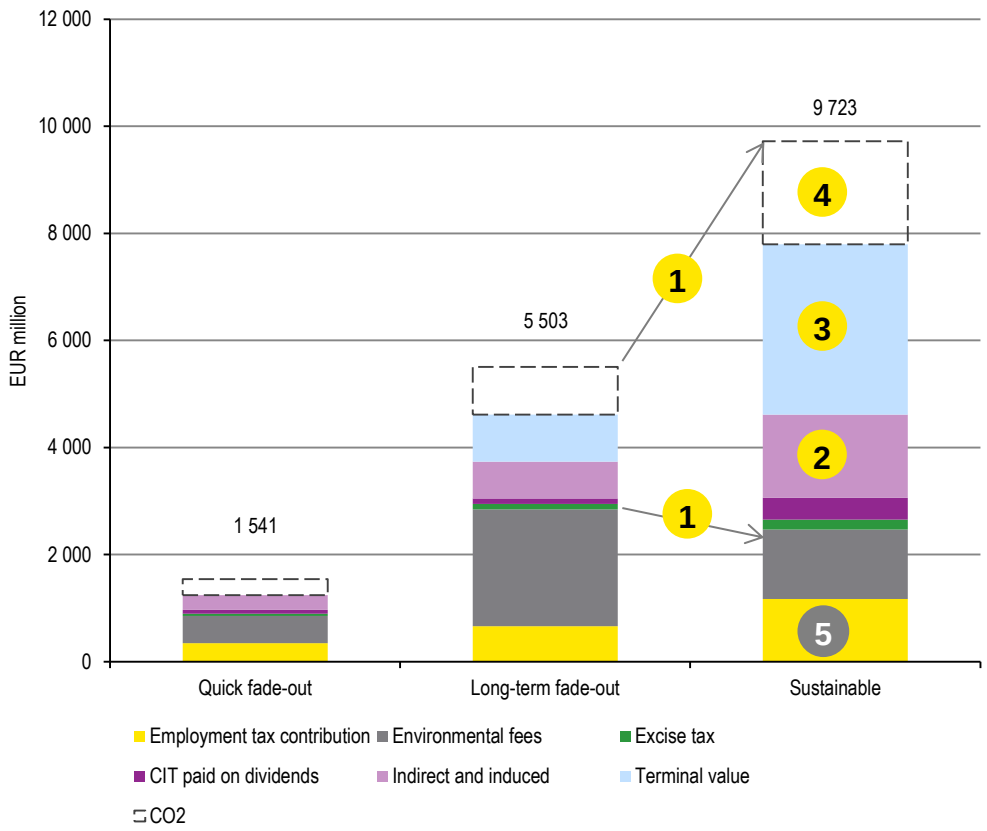
We have outlined the key conclusions of our analysis in the comments to the graph below.

1 The most important observation is that the Government does not maximize its income when it focuses only at the environmental fees. **The Government could lose ca 43% of the total NPV of Government's income if the long-term fade-out scenario were applied** instead of the sustainable scenario, even though the NPV from environmental fees could be 1.7 times higher. Furthermore, in case of fade-out, in long term perspective the Government would not be earning any tax income that arises due to the oil shale industry's operations. Therefore, it could be very dangerous to focus only on the environmental fees and not consider all the other impacts to the economy and Government's income.

2 The NPV of indirect and induced taxes could be 2.3 times higher in the sustainable scenario, compared to the long-term fade-out scenario.

Net present value of government's income

Source: EY analysis, Management's information



- In order to determine the net present value of government income,17.5% nominal discount rate was applied to CIT (according to average IRR between 15 and 20%) and 6% discount rate (according to state accounting policies) was applied to other components of government income.
- We have applied -2% nominal growth rate in sustainable scenario and -10% growth rate in long term fade.out scenario for terminal value calculation.
- According to our methodology, EE's cash flows are not considered as a part of government income but as private sector income in the GDP components.
- For simplification purposes, CO2 income represents the Companies' CO2 expense, not the total CO2 income of the government.

3 Although our analysis is focused on the period until 2035, the indicative analysis of terminal value shows that the **NPV of Government's income after 2035 in the sustainable scenario could be 3.6 times higher** than in the long-term fade-out scenario. This illustrates the importance of the industry's sustainability to the Government's income.

4 In the sustainable scenario the NPV from the industry's contribution to the CO2 revenues could be 2.2 times higher compared to the long-term fade-out scenario, although the CO2 intensity of the industry actually decreases.

5 Employment taxes have 76% higher impact in the sustainable scenario compared to the long-term fade-out. This can be attributed to the higher number of people employed.

Total impact on Government income

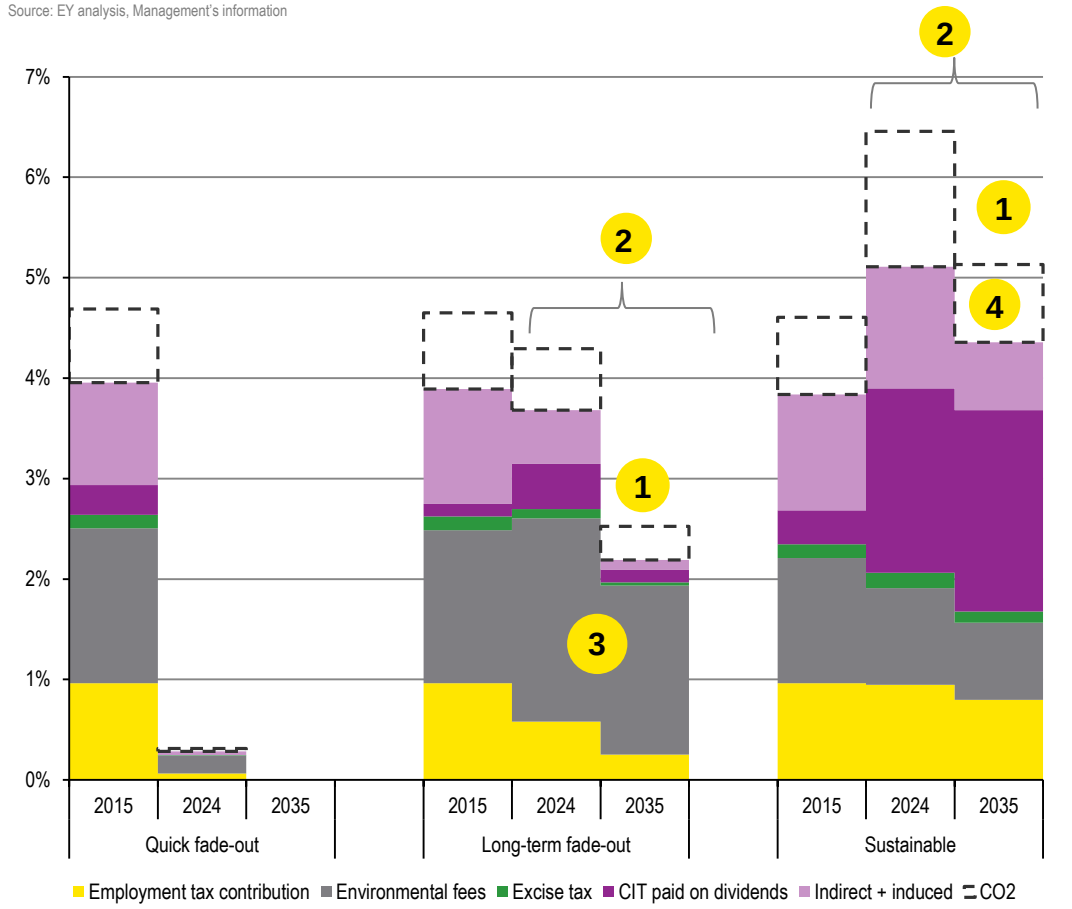
In the table below we compare years 2015, 2024 and 2035. 2024 was selected because it is the last year with any economic activity in the quick fade-out scenario. Annual results are presented on the next page.

1 In the **sustainable scenario** the long-term contribution of the oil shale industry could be **5.1%** of total government income compared to **2.5%** in the **long-term fade-out** scenario in 2035. The latter contribution will decrease even more after 2035.

2 Starting from 2024, after the end of the intensive investment period, the industry's contribution to Government's income in sustainable scenario is substantially higher than in the long-term fade-out scenario. This is because the Companies will finally start generating postive cash flows and, therefore, paying the CIT on dividends.
If the mining limit was higher than 20 million tons, the Government could earn even greater tax income in sustainable scenario. However, in long term fade-out scenario it would not be possible, as the operations are constrained by environmental taxes, not mining limit.

Industry's contribution to government income, as % of total government budget

Source: EY analysis, Management's information



* We would like to remind one of the main assumptions of the analysis – investors of all the Companies are rational (incl EE) and find the necessary equity funding for the investments. According to the methodology used in our work, EE is classified as a privately owned company.

* We would also like to remind that, for simplification purposes, CO2 income represents the Companies' CO2 expense, not the total CO2 income of the government.

3 Collected **environmental fees are higher** in long-term fade-out scenario compared to the sustainable scenario, but **this is not sustainable**, because the industry is fading.

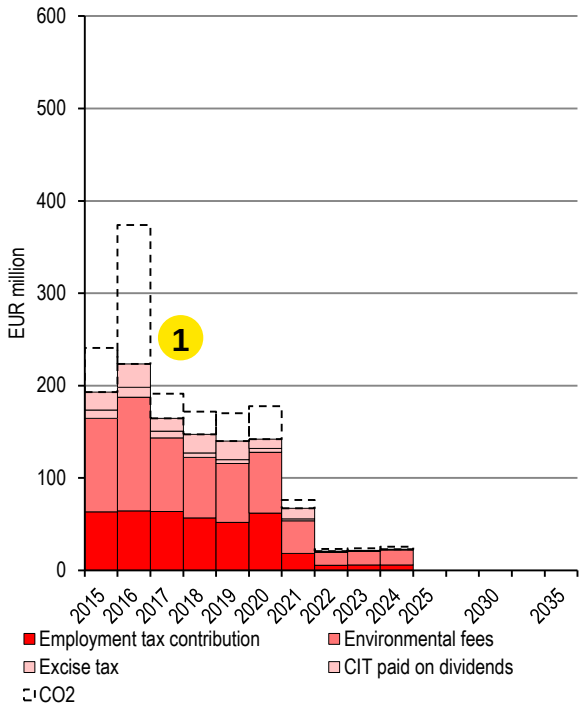
As seen from the graph, at the same time the Government income from employement taxes has decreased, which **implies that there is substantial reduction in employment.**

4 CO2 intensity of the industry decreases because of decreasing electricity production in direct combustion, which is more CO2 intensive compared to oil production. At the same time, electricity will be increasingly produced as the by-product of oil production.

Impact on Government income: direct impact

Quick fade-out scenario

Source: EY analysis, Management's information

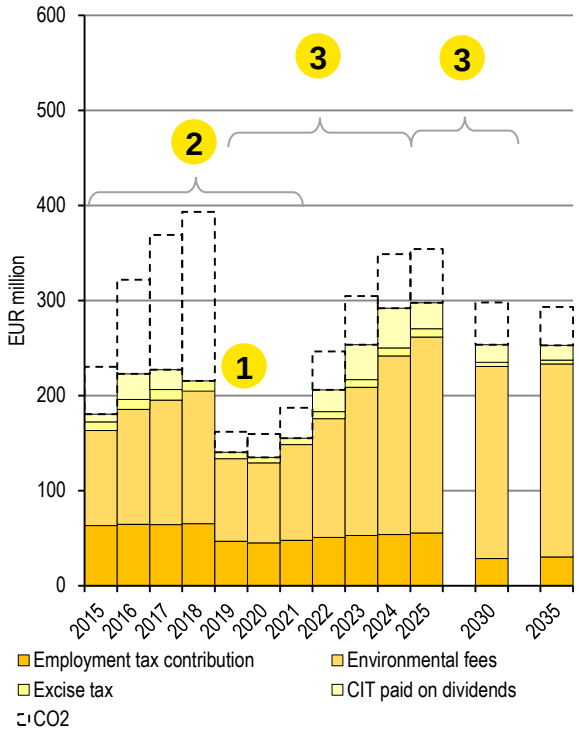


1 Close down of electricity production by direct combustion has a remarkable negative impact to Government income in the nearest future (2017 and 2019) in the quick and long-term fade-out scenarios.

2 As explained in the previous page, the Companies have very limited possibilities for paying dividends and CIT during the heavy investment period.

Long-term fade-out scenario

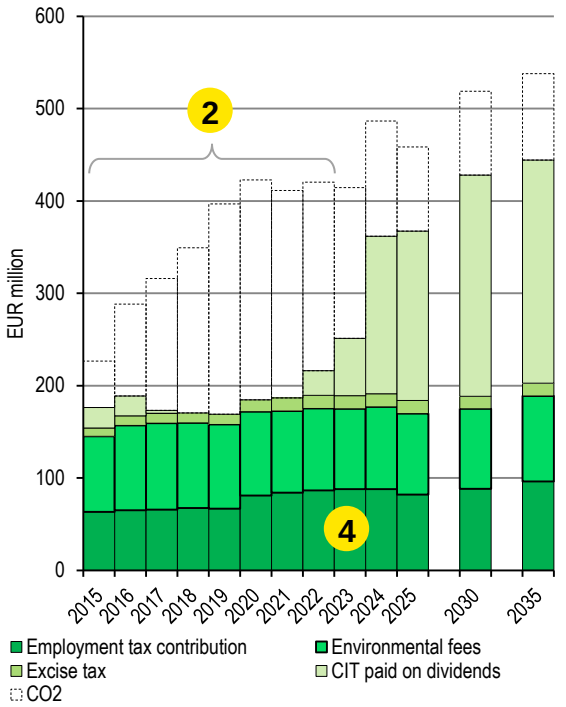
Source: EY analysis, Management's information



3 In long-term fade-out scenario the oil production increases until 2024 despite of the increasing CO2 and environmental tax rates. However, after 2024 the Companies start reducing production volumes and start closing the existing oil plants because of the high CO2 and environmental fee levels.

Sustainable scenario

Source: EY analysis, Management's information

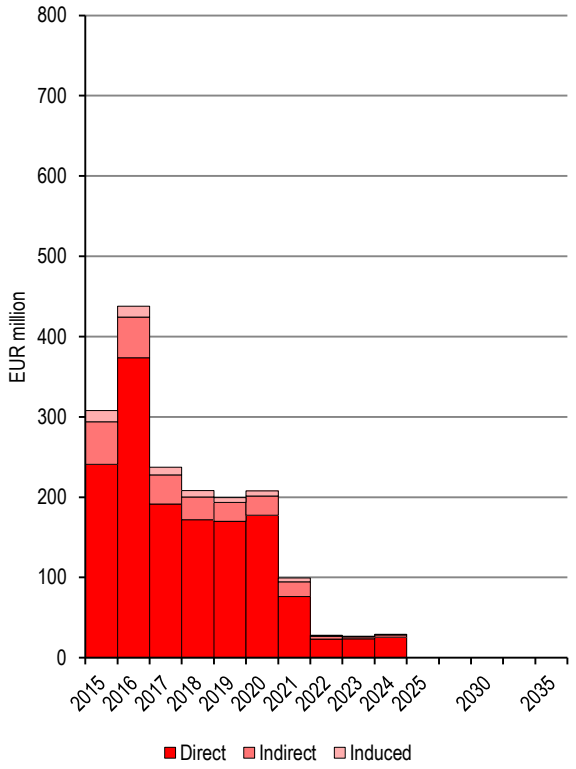


4 Employment tax contribution will be 52% higher in 2035 compared to 2015. This is due to increased salaries and number of employees occupied.

Impact on Ggovernment income: total impact

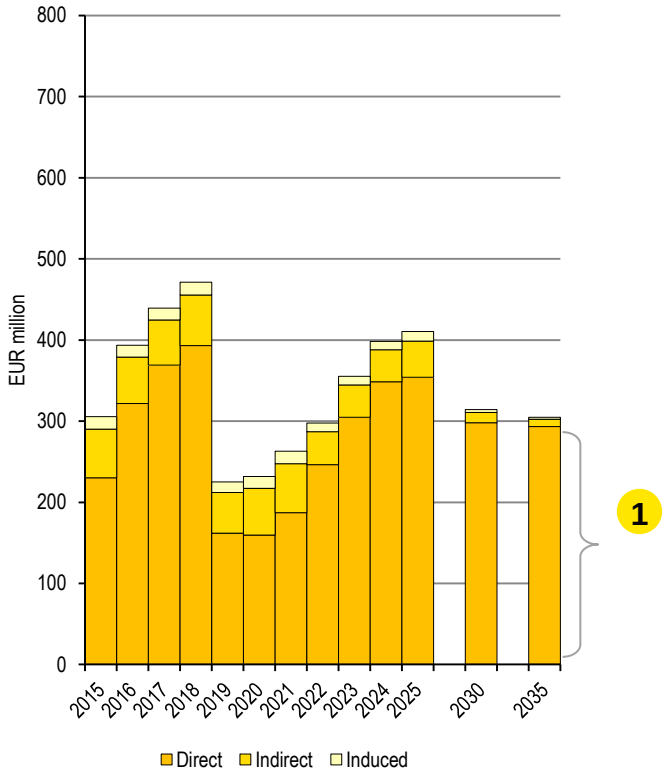
Quick fade-out scenario

Source: EY analysis, Management's information



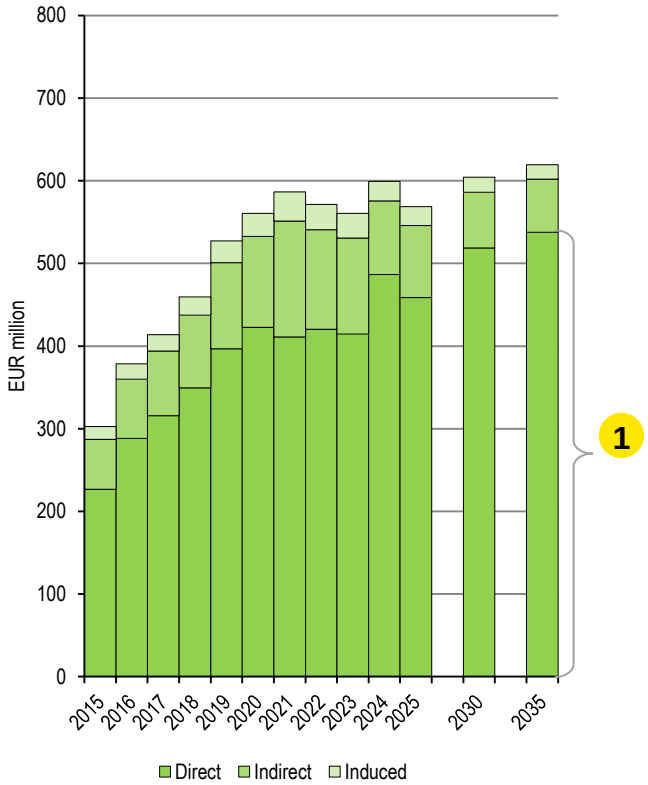
Long-term fade-out scenario

Source: EY analysis, Management's information



Sustainable scenario

Source: EY analysis, Management's information



1 Based on our professional experience, it is not typical that the direct impacts to the government income are significantly higher compared to the sum of indirect and induced impacts.

This indicates that the industry has heavy tax burden compared to other industries.

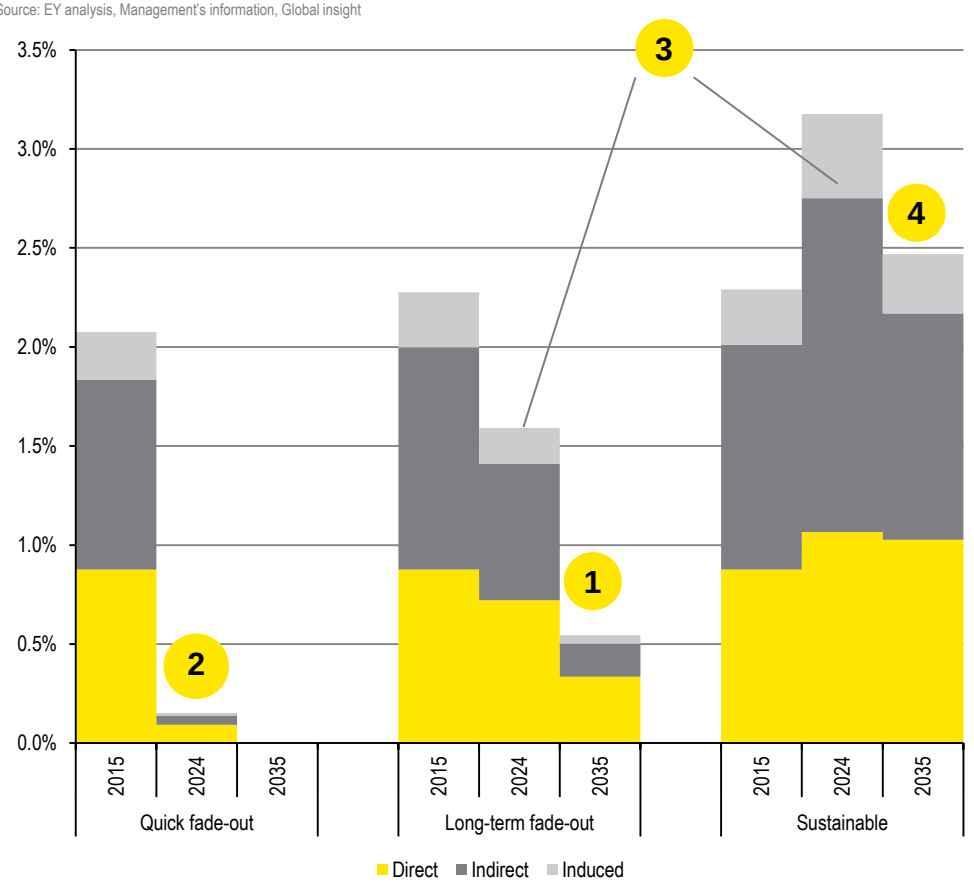
Impact on employment

1 **In the long term fade-out** scenario **employment decreases from ca 19,000 people in 2015 to ca 4,000 people in 2035**, out of which about 5,000 jobs are in the oil shale industry and about 10,000 jobs in other industries.

2 **Quick fade-out** scenario leads attention to the potentially very significant issue that arises from the fade-out of the industry – how would the ca **17,500 people** whose work currently contributes to the oil shale industry be utilized in the rest of the economy after the oil shale industry fades out?

Employment contribution of the industry, as % of total Estonian employment

Source: EY analysis, Management's information, Global insight



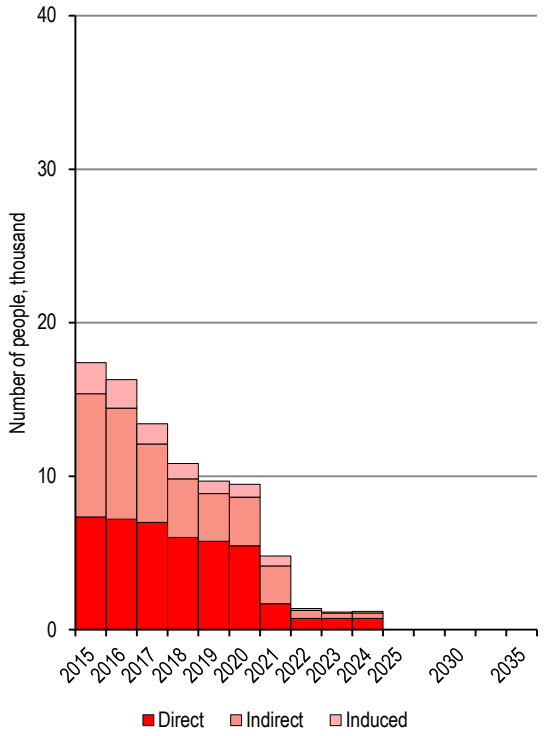
3 Employment contribution in the **sustainable** scenario is twice as high as in the long-term fade-out scenario already in 2024, contributing **additional ca 12,500 jobs** to the economy.

4 In sustainable scenario the long term impact on employment could increase to 2.5% compared to the current 2.3%. For a temporary period the impact exceeds 3.2% - this happens when large investments are made in the industry, which create jobs mainly in the construction sector.

Impact on employment

Quick fade-out scenario

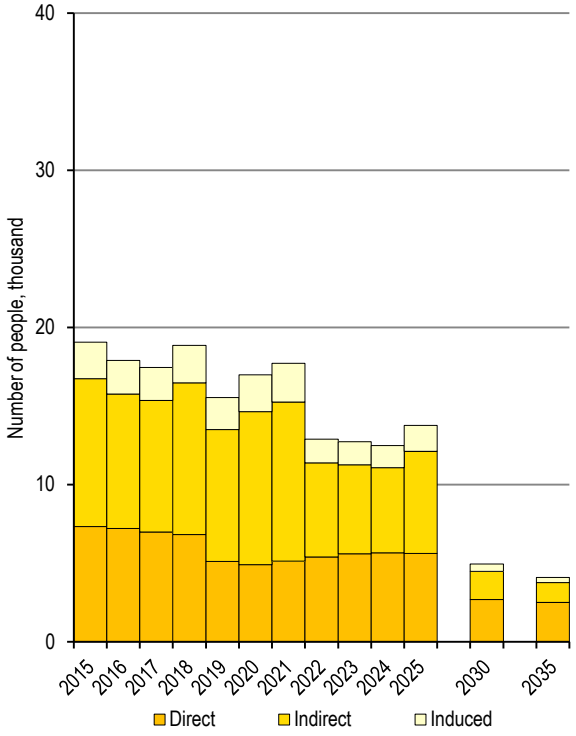
Source:EY analysis, Managements' information



1 More than half of the employment impact comes from the supply chain of the oil shale sector. This is a substantial amount, which clearly demonstrates the magnitude of wider the impact of the industry.

Long-term fade-out scenario

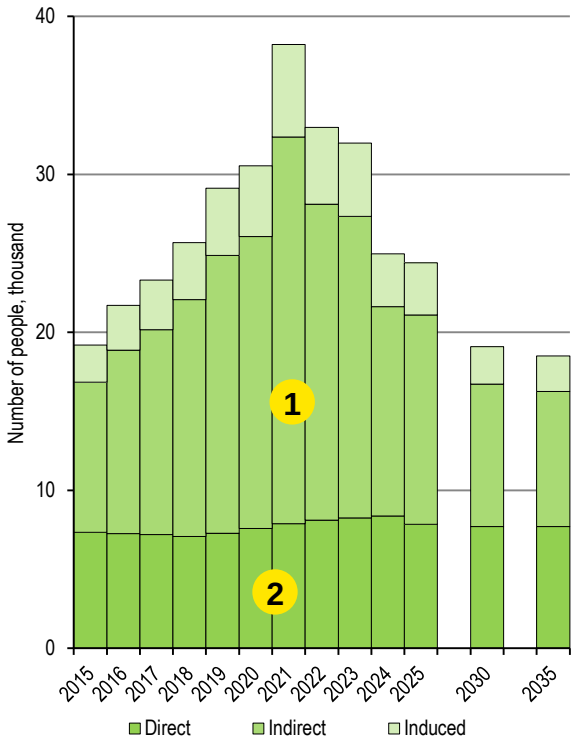
Source:EY analysis, Managements' information



2 Number of permanent employees in the oil shale sector is stable throughout the period.

Sustainable scenario

Source:EY analysis, Managements' information

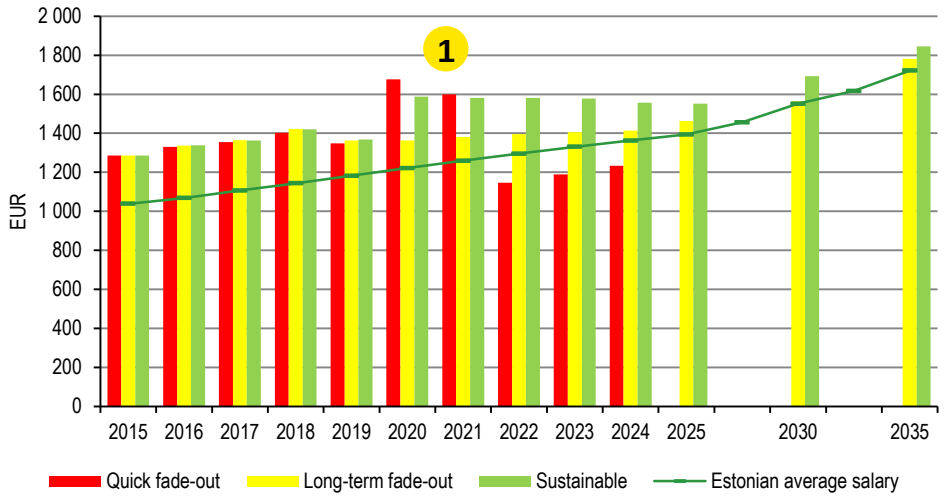


Average salaries

1 The average salaries in the oil shale industry are higher than Estonian average salaries. The higher salary level has an effect on GVA, which means that the oil shale sector contributes to the economy relatively more than other sectors with Estonian average salaries (on ceteris paribus conditions).

Comparison of the oil shale industry's average salaries with Estonian average

Source: EY analysis, Management's information, stat.ee, Global insight, Central Bank of Estonia



Notes to chart

1. Salaries are presented on real terms
2. Average salary of the industry is weighted with number of employees in the Companies.

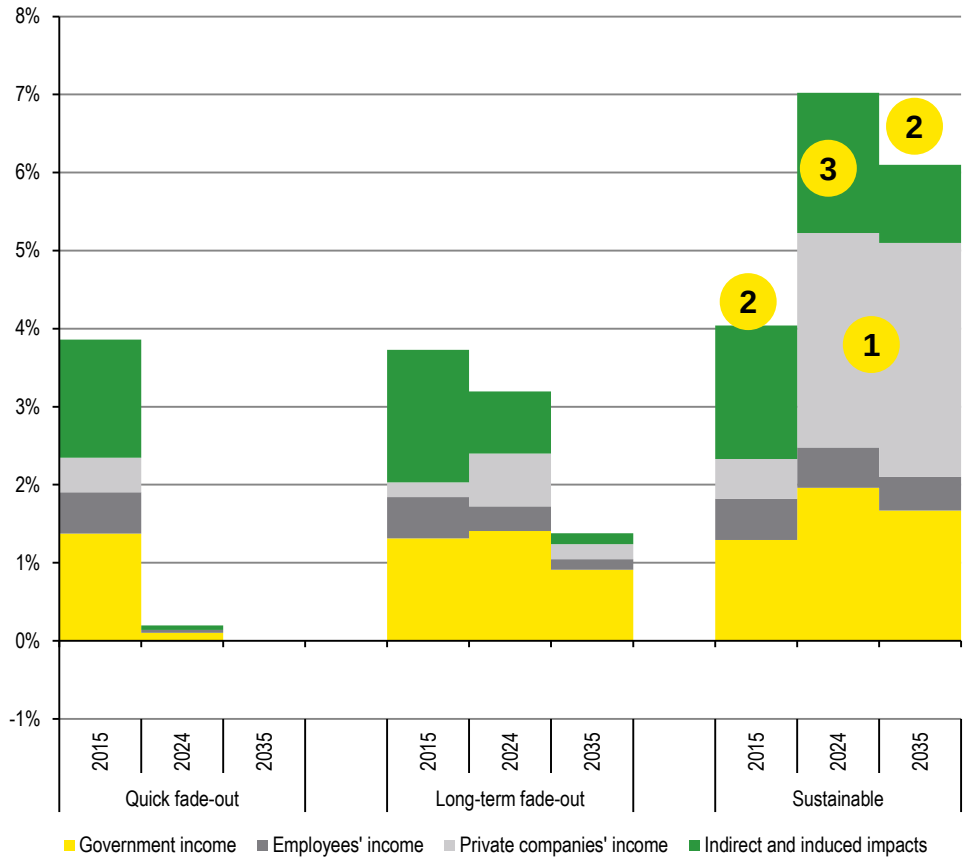
Impact on GVA

1 **Private companies take high risks during the investment period, because their cash flows will not be positive before the end of the 10-year investment period**. Therefore, the investments are made only when the regulatory environment is stable and future prospects transparent.

It is important to notice that large amount of investments has to be made by the state-owned EE, the financing decisions of which are under the direct control of the Government. As a result, the Government also indirectly controls a part of the timing of economic impacts, employment and Government income from the oil shale industry. Namely, if EE should postpone its investment decisions, the respective economic impacts are also postponed

The oil shale industry's GVA, as % of Estonian GDP

Source: EY analysis, Managements'' information, Global insight



1. Gross value added = government income + private companies' income + employees' income
2. Private companies' income includes EE.
3. Private companies' income is equal to free cash flows from operating activities after investments.
4. Government income bar is equal to the previously shown total government income

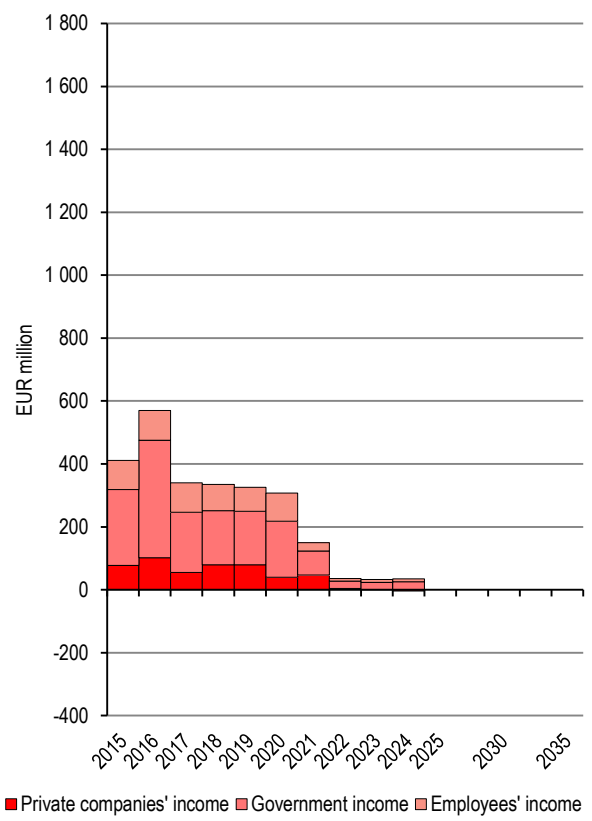
2 The GVA generated by the oil shale industry constitutes about **4%** of the total Estonian GDP in 2015. In a long term perspective **the impact to Estonian GDP increases to 6% in the sustainable scenario.**

3 In many other industries, the indirect and induced impacts would be substantially higher compared to the direct impacts. The high proportion of direct impacts in the oil shale industry is attributable to the high tax burden.

Impact on GVA: direct impact

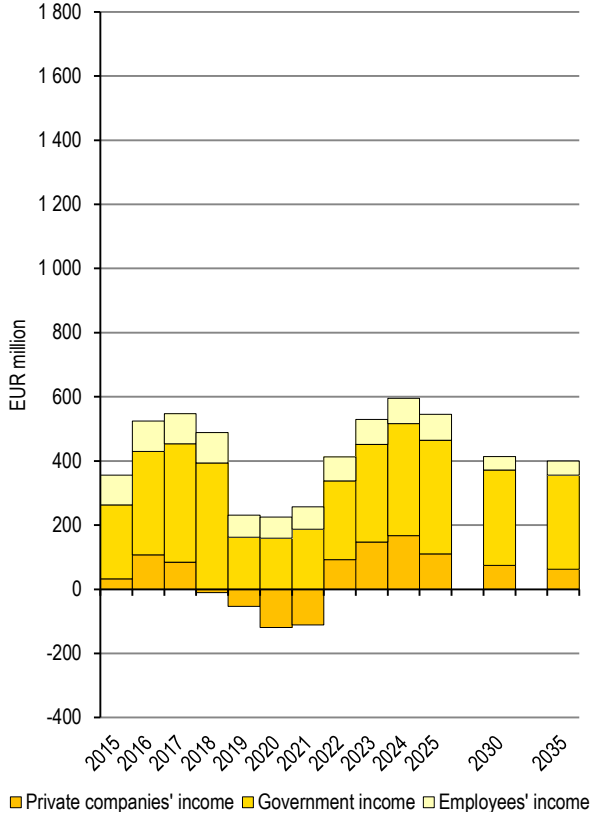
Quick fade-out scenario

Source: EY analysis, Management's information



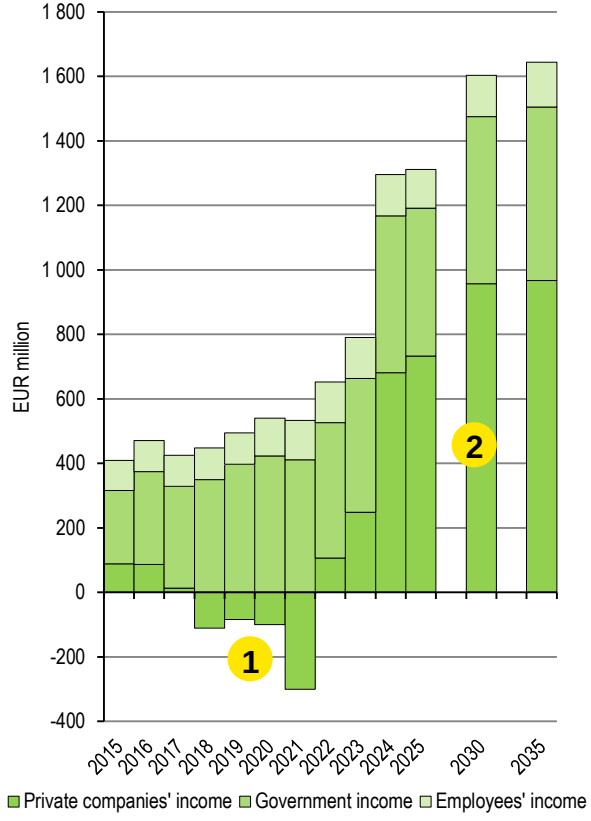
Long-term fade-out scenario

Source: EY analysis, Management's information



Sustainable scenario

Source: EY analysis, Management's information



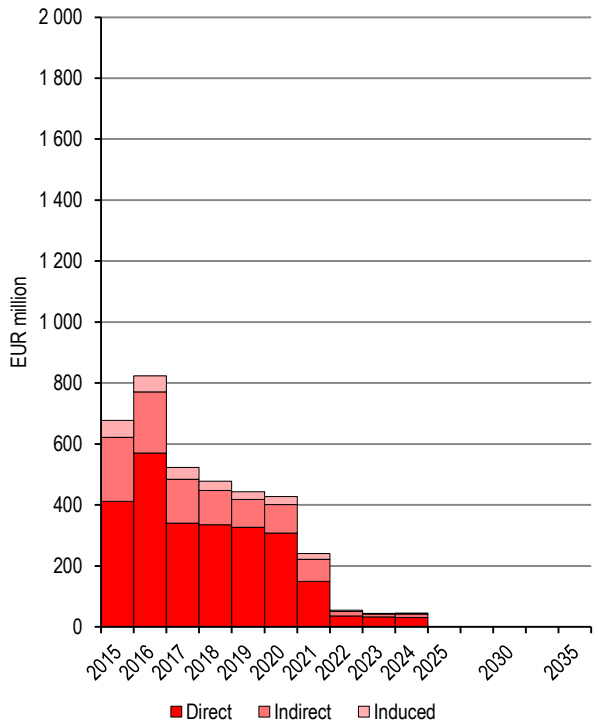
1 Private companies' income is negative due to large CAPEX made in those periods. The investments made will generate substantial positive impact to economy in the future periods.

2 The proportion of government income in total GVA is remarkably larger than sum of employees' and private companies' income. This situation is untypical and indicates that the oil shale sector is heavily taxed, even in the case of the low environmental taxes (sustainable scenario).

Impact on GVA: total impact

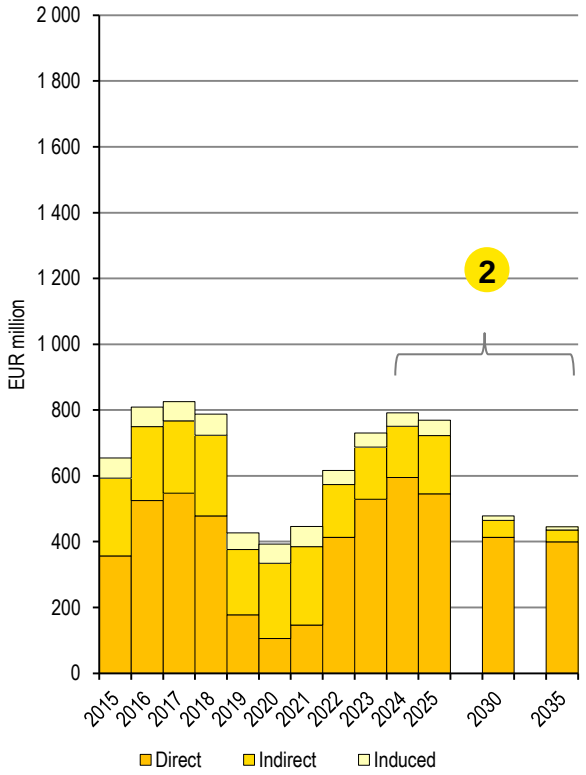
Quick fade-out scenario

Source: EY analysis, Management's information



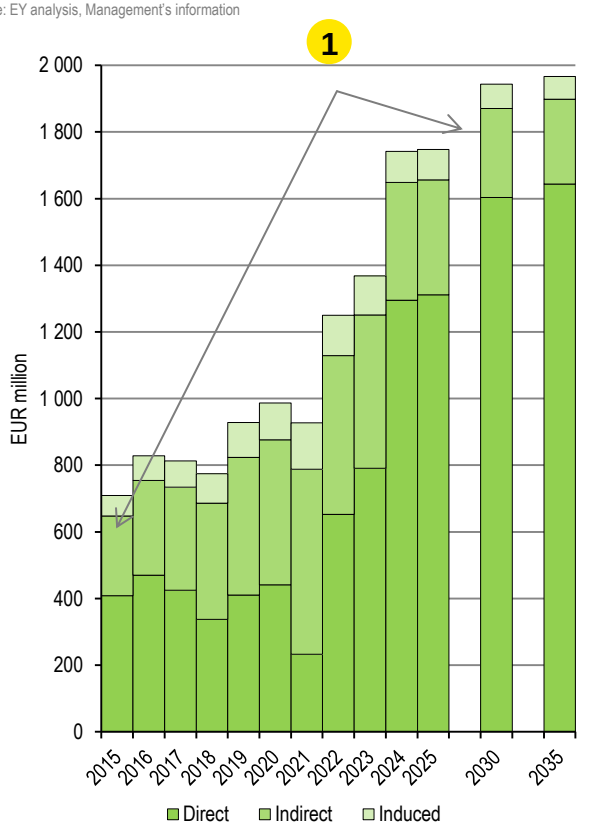
Long-term fade-out scenario

Source: EY analysis, Management's information



Sustainable scenario

Source: EY analysis, Management's information



1 By 2030 the total annual GVA impact in the sustainable scenario is already **4.1 times higher** than in 2015.

2 Starting from 2025 (arter the preceding investments period) the total annual GVA decreases gradually in the long-term fade-out scenario. An important contribution to fade-out comes from increasing labor costs, which results from increasing salaries in the industry.

Appendices

1. Appendix: Sensitivities to environmental tax levels

Sensitivities to environmental tax levels

Sensitivity analysis

Sensitivity analysis provides an overview of all combinations of the key variables analysed in this report.

We have compared the scenarios where CO2 price and oil price are equal and the scenarios differ from each other only by the environmental tax levels – i.e. we compare scenario 1 with scenario 5, scenario 2 with scenario 6, etc.

		Environmental fees	
CO2 price	Oil price	**Aggressive (SEI 16%)**	**2009 base**
100 EUR/t	**90 USD/bbl**	**(1) Quick fade-out**	*(5)Sensitive to CO2 price*
	110 USD/bbl	*(2)Sensitive to CO2 price and environmental fees*	*(6) Sensitive to CO2 price*
20 EUR/t	**90 USD/bbl**	**(3) Long-term fade-out**	*(7) Sensitive to oil price*
	110 USD/bbl	*(4) Sensitive to environmental fees*	**(8) Sustainable**

Key insight

The key finding of the sensitivity analysis is that **it is not sufficient to only analyse the impacts of Government income – the impacts on employment and GVA should be considered as well**. Namely, in scenario 4 the NPV of Government income exceeds that of scenario 8, but both employment and GVA are higher in scenario 8. Therefore, **from the perspective of total Estonian economy and employment, scenario 8 (where environmental fees are low) should be preferred to scenario 4 (where environmental fees are high).**

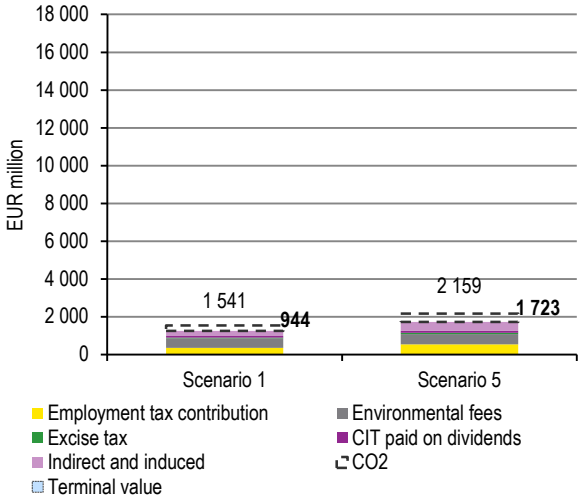
In all other comparisons it is clear that the **scenarios where environmental fees are low (2009 base) always result in higher Government income, GVA and employment** compared to the situation where, ceteris paribus, environmental fees are high.

Higher GVA impacts are achieved only due to higher investments. Given that investments represent a long-term risk to the Companies, **it is essential that the Companies would have certainty about the future environmental fee levels**. If not then it is likely that the investments indicated in this report may not be made under the 15 or 20% IRR conditions which is one of the main preconditions of our analysis.

Sensitivity: impact to discounted Government income

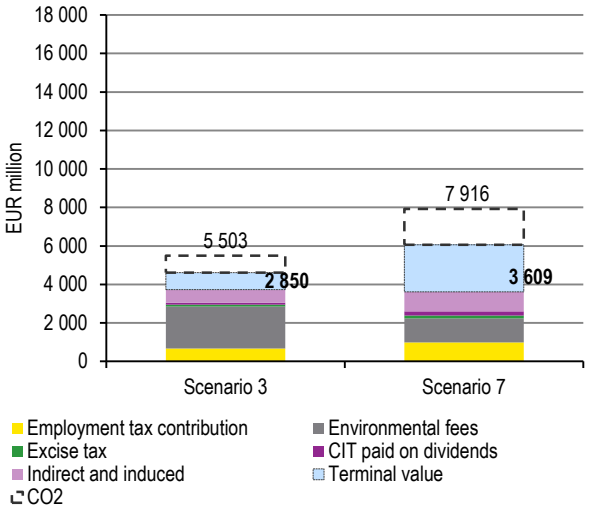
Scenario 1 and Scenario 5

Source: EY analysis, Managements' information



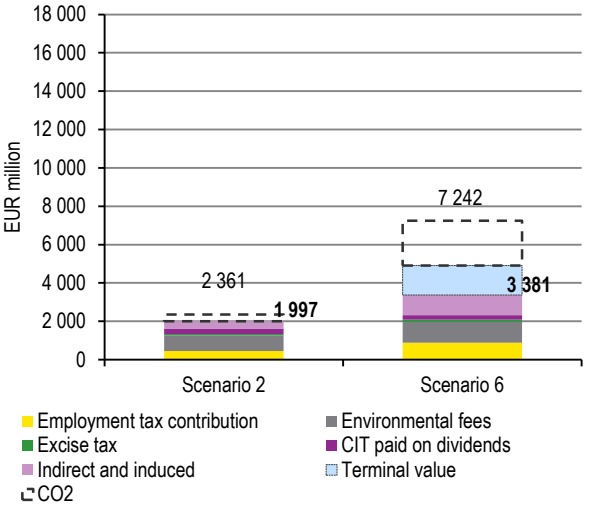
Scenario 3 and Scenario 7

Source: EY analysis, Managements' information



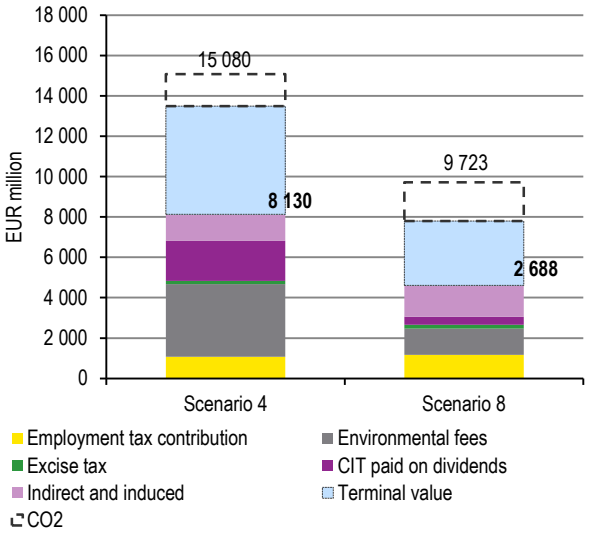
Scenario 2 and Scenario 6

Source: EY analysis, Managements' information



Scenario 4 and Scenario 8

Source: EY analysis, Managements' information



		Environmental fees	
CO2 price	Oil price	**Aggressive (SEI 16%)**	**2009 base**
100 EUR/t	**90 USD/bbl**	**(1) Quick fade-out**	*(5)Sensitive to CO2 price*
	110 USD/bbl	*(2)Sensitive to CO2 price and environmental fees*	*(6) Sensitive to CO2 price*
20 EUR/t	**90 USD/bbl**	**(3) Long-term fade-out**	*(7) Sensitive to oil price*
	110 USD/bbl	*(4) Sensitive to environmental fees*	**(8) Sustainable**

Key insight

Discounted Government income is almost always higher in the scenarios where, ceteris paribus, environmental fees are at the 2009 base level.

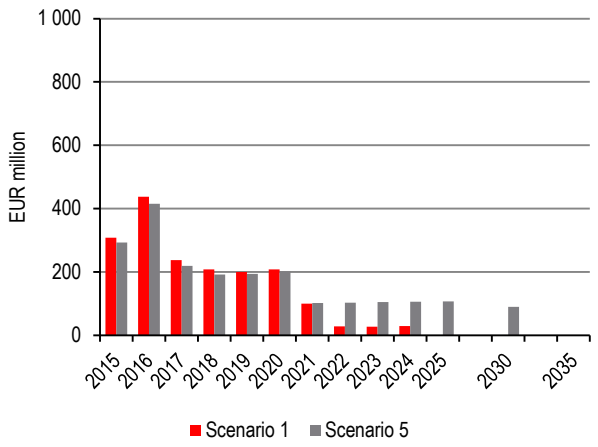
As an exception, when comparing scenarios 4 and 8 where economic conditions are very favourable (oil prices are high at 110 USD/barrel and CO2 prices low at 20 EUR/t), higher environmental fees result in higher NPV of Government income. This is due to fact that, under so favourable economic conditions, the Companies still make less investments when taxes are high but this negative impact does not overweigh the impact from substantially higher tax rates,

Nevertheless, we lead your attention to the analysis of employment and GVA, which is presented in the next sections and which show opposite results – i.e. impacts under scenario 4 are higher.

Sensitivity: total impact on Government income

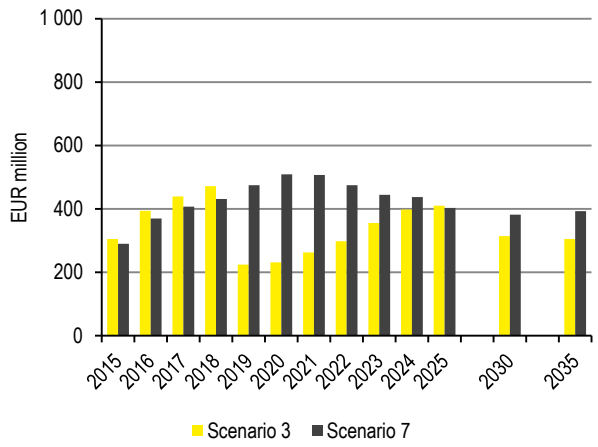
Scenario 1 and Scenario 5

Source: EY analysis, Managements' information



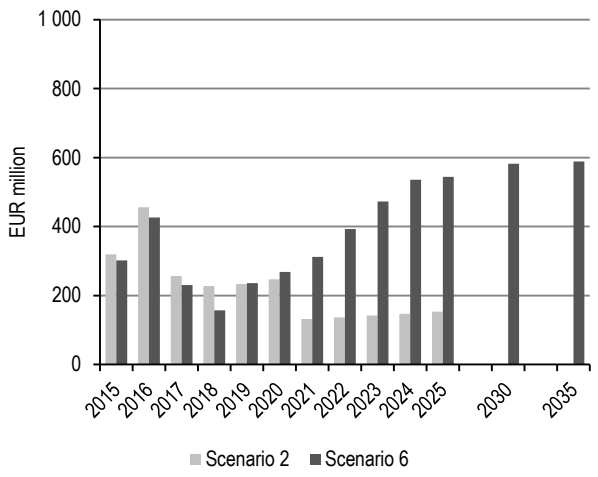
Scenario 3 and Scenario 7

Source: EY analysis, Managements' information



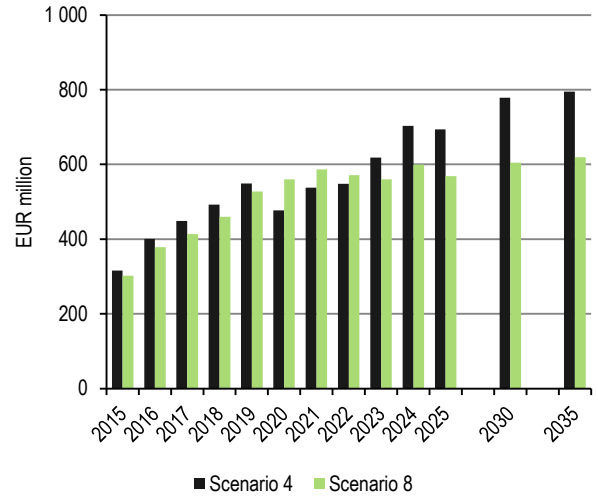
Scenario 2 and Scenario 6

Source: EY analysis, Managements' information



Scenario 4 and Scenario 8

Source: EY analysis, Managements' information



		Environmental fees	
CO2 price	Oil price	**Aggressive (SEI 16%)**	**2009 base**
100 EUR/t	**90 USD/bbl**	**(1) Quick fade-out**	*(5)Sensitive to CO2 price*
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20 EUR/t	**90 USD/bbl**	**(3) Long-term fade-out**	*(7) Sensitive to oil price*
	110 USD/bbl	*(4) Sensitive to environmental fees*	**(8) Sustainable**

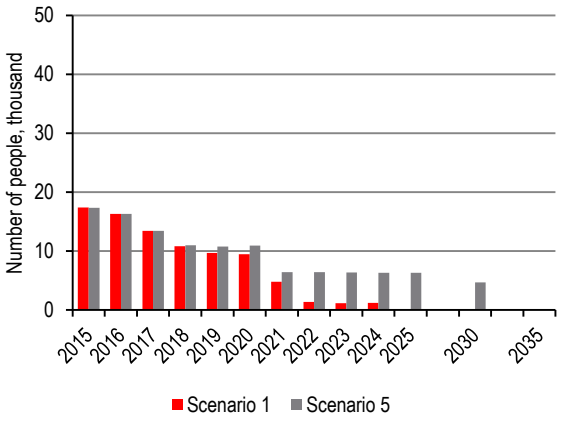
Key insight

Annual analysis of Government income adds some additional insight into the dynamics between years and scenarios. Namely, in majority of the years and particularly in long-term perspective the Government income in low tax (2009 base) scenarios is higher than in the aggressive tax scenarios. The only exception is scenario 4, but again we lead attention to the employment and GVA impacts comparison, which is presented in the next sections

Sensitivity: total impact on employment

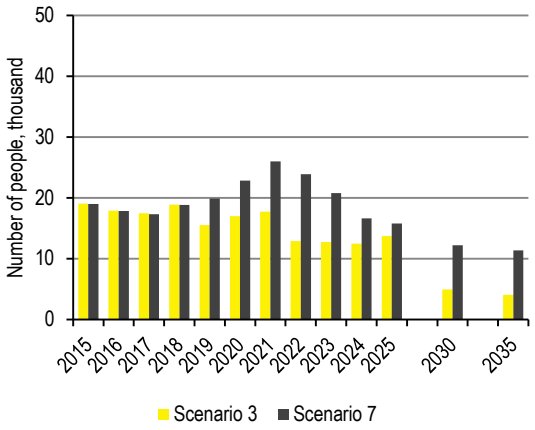
Scenario 1 and Scenario 5

Source: EY analysis, Managements' information



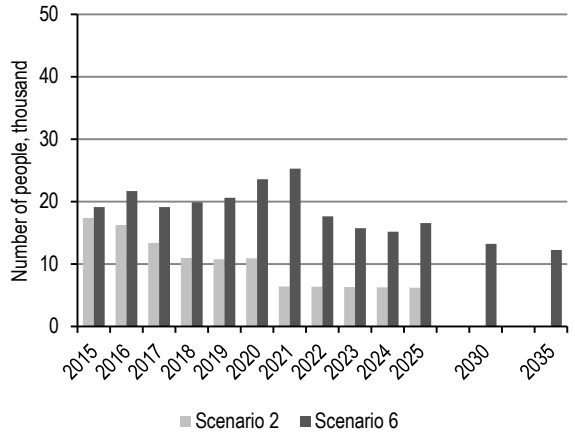
Scenario 3 and Scenario 7

Source: EY analysis, Managements' information



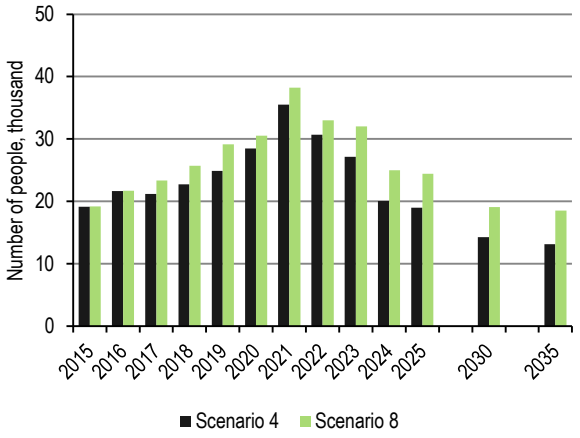
Scenario 2 and Scenario 6

Source: EY analysis, Managements' information



Scenario 4 and Scenario 8

Source: EY analysis, Managements' information



		Environmental fees	
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	110 USD/bbl	*(4) Sensitive to environmental fees*	**(8) Sustainable**

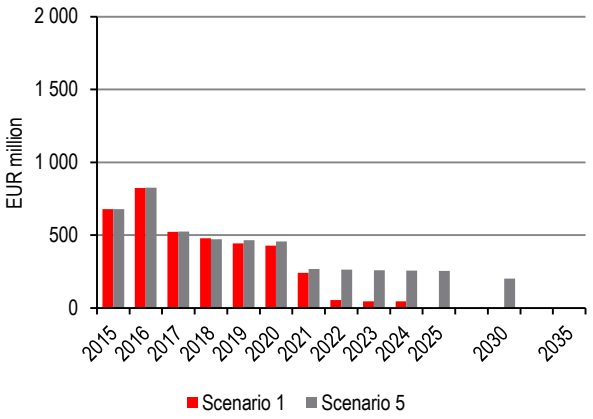
Key insight

Employment impact is always higher in low environmental fees scenarios (with a few exceptions in the first two years). **This illustrates that the decisions about environmental fees rates should not be made not only relying on total government income, but also qualitative aspects such as impact on employment.**

Sensitivity: total impact on GVA

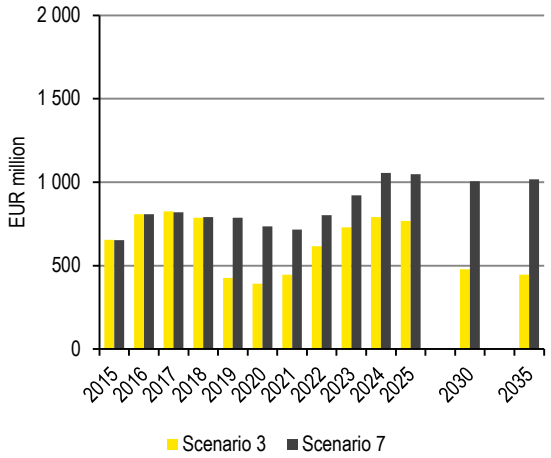
Scenario 1 and Scenario 5

Source: EY analysis, Managements' information



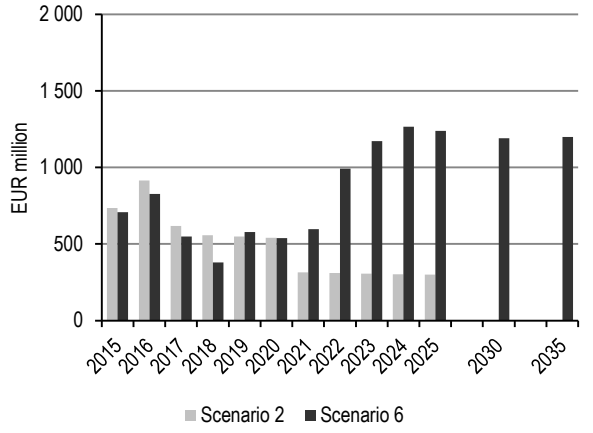
Scenario 3 and Scenario 7

Source: EY analysis, Managements' information



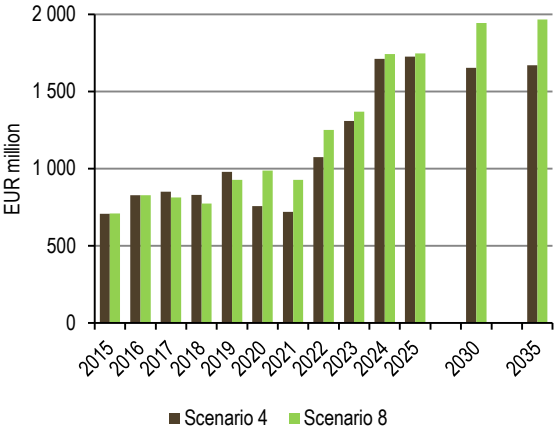
Scenario 2 and Scenario 6

Source: EY analysis, Managements' information



Scenario 4 and Scenario 8

Source: EY analysis, Managements' information



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Key insight

- The differences in GVA under two different environmental fees levels can be opposite in different years. GVA impact tends to be higher for high environmental tax scenarios in the first half of the forecast period. This is mainly a result of the high investments in the low environmental taxes scenarios that reduce the FCF earned by the Companies and negatively (but temporarily) impact GVA. The higher environmental fees often result in modest investment decisions compared to scenarios with low environmental fee levels.
- **In a long term perspective low environmental fees always result in a higher GVA impact than high environmental fees scenarios**.
- The main difference comes from investment decisions, which means that the Companies are taking large risks. Therefore, it is necessary that in addition to reasonable environmental fee levels the Companies would have certainty about the future regarding environmental fee levels. Otherwise, the investments indicated here would require even higher IRRs and would probably not be made under 15 or 20% IRR conditions.

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