

# Actions of the state in directing the use of oil shale

*Does the state guarantee that oil shale reserves are  
used sustainably?*



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## Summary of audit results

The National Audit Office audited whether the goals set in the National Development Plan for Oil Shale Use – to reduce the environmental impact of oil shale mining and processing and to increase the efficiency of these two processes – have been achieved. Has the research required for the new oil shale development plan been carried out? Does the state receive a fair revenue for oil shale mining and processing?

**Why is this important to taxpayers?**

No other industry in Estonia has a bigger environmental impact than oil shale mining and use. The air pollution caused by the oil shale sector comprises more than 70% of all emissions into the air in Estonia and oil shale waste comprises *ca* 70% of non-hazardous and 82% of hazardous waste. The water pumped from mines and quarries and the cooling water used by Eesti Energia Narva Elektriijaamade AS (power plant) comprises more than 90% of surface water and groundwater used in Estonia. The confluence of oil shale mining and processing has reduced the ground water resources in Ida-Viru County and spoilt the quality of ground and surface water. The contribution of the oil shale sector to Estonian GDP, however, is only 4%.

Irrespective of whether the electricity and oil made from oil shale is consumed in Estonia or exported, the negative impact is felt entirely in Estonia. Use of oil shale for export has increased in recent years and it will continue to increase in the future. 29% of electricity output and 78% of oil output was exported in 2012. The companies plan to multiply their oil production by 2020. The pressure applied by the companies to mine up to 25 million tons of oil shale per year is therefore increasing. The annual limit of oil shale mining established by the state in 2008 was 20 million tons and its objective was to reduce mining to 15 million tons by 2015. Oil shale mining increased by 7% from 2007-2012. However, diminishing oil shale reserves and the consistently significant environmental impact mean that in the new oil shale development plan the state has to decide the reasonable quantities and purposes of future oil shale use.

**What did we find and conclude on the basis of the audit?**

**The state has not achieved the goals set in the National Development Plan for Oil Shale Use, which are to reduce the environmental impact of oil shale mining and use and to increase the efficiency of mining and use. The state has not carried out a comprehensive assessment of the environmental, health or socioeconomic impact of the use of new oil shale reserves in the preparation of the new development plan.**

**Environmental charges have also failed to motivate entrepreneurs to pollute less or use natural resources more sustainably.**

Key observations of the National Audit Office

- **The main goal of national development plans, incl. the oil shale development plan – to guarantee Estonia’s energy independence with oil shale energy – is no longer relevant.** As an open electricity market participant and member of the Nordic electricity exchange, Estonia cannot favour domestic production sources when guaranteeing power supply for its consumers. The profitability of oil means that Eesti Energia will also be using oil shale mainly for oil production in the near future and export most of the output. Even if the oil were not exported, it could not be used as motor fuel without being refined. This means that in the present economic situation, oil shale is no longer a means of ensuring the state’s energy security.
- **The second important goal of the oil shale development plan – to mine and use oil shale more efficiently – has not been achieved.** According to the development plan, reduction of losses is the indicator on the basis of which the efficiency of mining is assessed. Mining losses in quarries and underground mines have not decreased. Mining losses in oil shale quarries increased 11% from 2007-2012, but in underground mines the loss of oil shale remained at the same level as in 2007 (i.e. 28%). Oil shale mining losses total *ca* four million tons per year.

Better technology and equipment must be taken into use to mine oil shale more efficiently. The state has not set forth any specific measures for increasing the efficiency and use of oil shale (i.e. for more efficient electricity and oil production).

- **The third goal of the oil shale development plan – to reduce the environmental impact of oil shale mining and use – has not been achieved.** The negative environmental impact has increased in terms of almost every indicator established for monitoring the environmental impact of oil shale use in the development plan. For example, the oil shale industry generated 12% more oil shale bottom ash, 8% more fly ash and 2% more semi-coke in 2012 than in 2007. The amount of CO<sub>2</sub> emissions and oil shale ash created per unit of oil shale energy and heat production has also increased by 11%. Only the quantity of sulphur dioxide (SO<sub>2</sub>) has decreased, as the EU Directive stipulates that large combustion plants may not generate more SO<sub>2</sub> emissions than permitted. Cleaning equipment has been installed in the chimneys of Narva Elektriijaamad to reduce emissions. However, the development plan does not include SO<sub>2</sub> emissions as an indicator on the basis of which the reduction of environmental impact can be monitored.

The Ministry has not specified a single activity in the development plan which would help to reduce the environmental impact of oil shale mining and use.

**The environmental charges applied to oil shale do not meet their purpose of motivating companies to prevent or reduce potential damage related to the use of natural resources, emission of**

**pollutants into the environment and disposal of waste.** The rates of environmental charges were developed from 1989-1990, when the transition economy was unstable and companies were in a difficult situation. This is why the first charges were very small and have been gradually increased over time. This increase has mostly been arithmetic and the actual environmental impact and its consequences (external costs) have not been considered.

Also, the state still has not carried out any research to ascertain the complete environmental, health and socioeconomic impact of the oil shale sector using the agreed methods and in a manner that would satisfy all parties. It is therefore unknown how much money the reduction of environmental impact and the elimination of damage would take. The ministry has highlighted that the present environmental investments require more money than is received from environmental charges. For example, 112 million euros was invested in the preservation or improvement of the environment in 2008, but the same amount in 2012 was as high as 250 million. However, the share of environmental charges in the investments made was 78% in 2008 and just 32% in 2012: the amount of environmental charges received in the state budget was only 79 million euros.

- **At present, the state does not earn enough from oil shale mining and use.** The state has allowed one of its riches – oil shale – to be used in business. Entrepreneurs earn income at the cost of this resource, which means that the state should demand a fair charge for its use. Not a single tax aimed at earning revenue for the state from oil shale production has so far been established for the Estonian oil shale sector. For example, the state earned *ca* 12 million euros from shale oil production in 2012 as national taxes (environmental charges, labour taxes and excise duties) while the operating profit of oil producers amounted to *ca* 91 million euros. The total amount of national taxes received from the oil shale sector per year is *ca* 90 million (incl. *ca* 34 million as excise duty and labour taxes, and 56 million euros as environmental charges).

The Government of the Republic discussed the establishment of a state revenue (*royalty*) for the use of oil shale in 2013, but making this decision was postponed.

- **The Ministry of the Environment has not prepared the research required for the preparation of the new oil shale development plan to help assess the impact of mining the annual volume of oil shale and the use of new reserves on people, nature and the economy.** The full impact of the existing and closed mines and the industry must thereby be considered. Increasing the annual mining limit and starting to use new oil shale reserves is impermissible without complex research into this impact. The impact of mining on ground and surface water should also be more thoroughly analysed. Especially if it is known that the areas of ground and surface water whose status is bad due to oil shale mining will keep growing in the future.
- **Supervision of the mined quantities of oil shale must be improved, as there is no reassurance that the state has received the correct amount of charges from companies for their**

**extraction rights.** The Environmental Inspectorate, the Environmental Board and the Ministry of the Environment are obliged to supervise mining. The Environmental Board as the inspector of the correctness of environmental charges and the Ministry of the Environment as the issuer of extraction permits have the right to carry out control measurements. The state receives 25 million euros every year for oil shale extraction rights, which is *ca* 80% of the total mineral resource extraction charge in Estonia. However, neither of the authorities has organised any control measurements so far. This means that for decades, the state has trusted the data declared by oil shale extractors.

The audit revealed that in addition to oil shale, the state should also be concerned about the legality of the extraction of other mineral resources, e.g. peat.

### What did we recommend as a result of the audit?

#### Recommendations of the National Audit Office

Before the new National Development Plan for Oil Shale Use (2016-2030) is completed, the Ministry of the Environment has to do some research to ascertain

- what kind of complex (health, environmental and socioeconomic) impact is associated with the use of new oil shale reserves as well as with existing and closed mines. Based on this, it has to assess the complex negative impact of the oil shale sector that society is prepared to tolerate. Only then will it be possible to decide on the permitted annual volume of extracted oil shale;
- how great the actual environmental damage caused by oil shale mining and use is and how much money the state will have to spend to eliminate such damage. Thereafter, to calculate environmental charges that will motivate companies to prevent environmental damage and use natural resources more sustainably.
- Continue analysing the royalty for oil shale use whilst considering the fact that oil production will have increased significantly by 2016. In order to achieve the goals related to oil shale use, it is necessary to clearly determine the principles of oil shale taxation and the bases for amending the taxes in the new Energy Sector Development Plan and Oil Shale Development Plan.
- Ensure that specific actions that will result in more efficient extraction and use of oil shale and a reduction in environmental impact are set forth in the new Oil Shale Development Plan (2016-2030).

#### Responses of the Minister of the Environment, the Minister of Economic Affairs and Communications, the Minister of Social Affairs and the Minister of Finance:

The **Minister of the Environment** agreed with the majority of the recommendations made by the National Audit Office and promised that the opinions and recommendations of the National Audit Office would be considered as much as possible in the National Development Plan of Oil

## Shale Use 2016-2030 and the Energy Sector Development Plan until 2030.

The Minister explained that the environmental impact of the oil shale sector is indeed extremely high and that the main reason why attempts to reduce it have failed is that the implementation of the development plan had to be postponed due to the recent recession. The Minister herself also considers the extensive environmental impact of the oil shale sector a problem, but cannot offer any solutions.

In regard to environmental charges, the Minister confirms that the manner of their implementation and their rates are constantly discussed, and these discussions include the assessment of environmental protection requirements as well as the state's economic and social situation.

The **Minister of Economic Affairs and Communications** agreed with the National Audit Office that oil shale must primarily be used in areas where its economic added value is highest. This is the principle that the Ministry is considering in the preparation of the new Energy Sector Development Plan (until 2030). The future role of electric power generated from oil shale in Estonia will become clear in the course of the preparation of the development plan. The Minister will submit the new Energy Sector Development Plan to the Government of the Republic in November 2014.

The **Minister of Social Affairs** agrees with the recommendations made by the National Audit Office and adds that the Health Board has launched a study of the health impact of the oil shale sector in order to implement them. The results of the study can be used to establish measures for reducing the health impact of extraction in the new oil shale development plan.

The **Minister of Finance** agrees that it is necessary to calculate the environmental damage caused by the oil shale industry in monetary terms. The Minister considers it necessary to ascertain whether the charge payable for oil shale mining and processing covers the cost of the pollution caused by the oil shale industry. The Minister of Finance also proceeds from the assumption that the revenue earned from environmental charges must not equal the cost of environmental damage, but can exceed it. The Minister of Finance also agreed with the recommendation to clarify the principle of the royalty payable for oil shale use and the basis of taxation before 2016.

The Minister of Finance did not agree with the suggestion to consider the separation of Eesti Energia Kaevanduste AS from the Eesti Energia Group. However, he admitted that it is necessary to analyse whether Eesti Energia Kaevandused remaining in the Eesti Energia Group constitutes an infringement on competition and what to do if this is the case.

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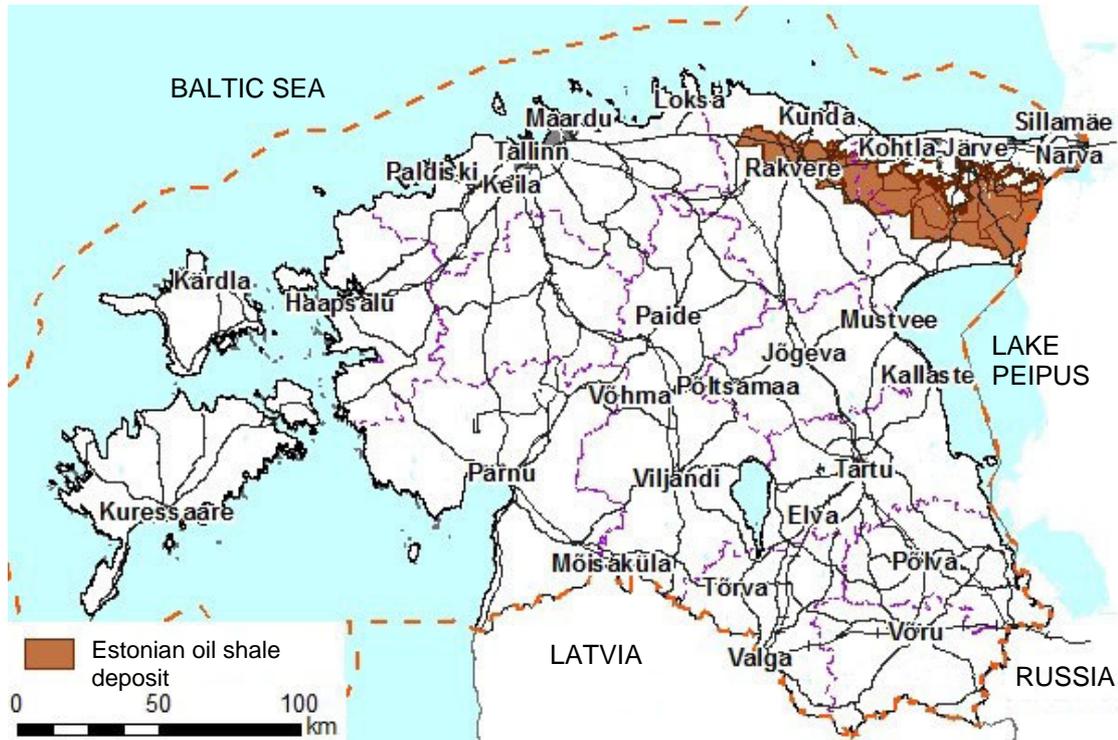
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## Overview

### Oil shale reserves

1. The oil shale deposit of Estonia is mostly located in the territory of Ida-Viru County and partly also in Lääne-Viru County (see Figure 1).

Figure 1. Location of Estonian oil shale deposit



Source: Estonian Land Board

**Active reserves – oil shale reserves** that can be extracted with existing technology and equipment that guarantee the reasonable and economically viable use of the earth's crust and adherence to environmental requirements.

**Passive reserves** – oil shale reserves whose extraction is impossible from the viewpoint of environmental protection or due to a lack of suitable technology. Such reserves may prove to be usable in the future.

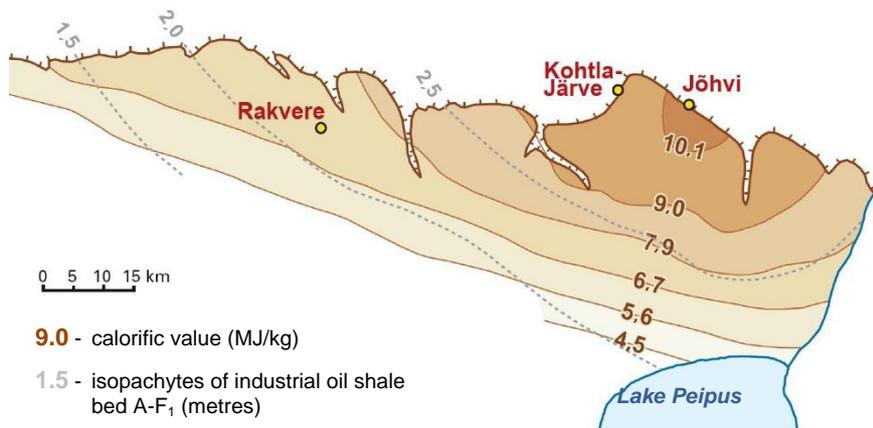
**Calorific value of oil shale** – the indicator used to describe the quality of oil shale and to assess its energy content. The higher the content of organic substances in the oil shale, the more oil can be produced from it and the higher its calorific value.

2. Oil shale reserves total 4.8 billion tons according to the National Environmental Register. **Active reserves**<sup>1</sup> amounted to 1.3 billion tons and **passive reserves** to 3.5 billion tons as at the end of 2012. According to the Ministry of the Environment it is only possible to extract up to 50% of active reserves. The remainder comprises the oil shale loss associated with mining and the reserves under buildings and roads. Considering that 20 million tons of oil shale is extracted every year, active reserves will only last for another 25-30 years.

3. Oil shale of the best quality is located in the northern area of the central and eastern part of the deposit – the quality of the oil shale found there is 9-10.5 MJ/kg (see Figure 2). The reserves in these areas have mostly been exhausted or will be exhausted soon. Unextracted oil shale reserves are located in the western and southern parts of the deposit, but these reserves contain lower levels of organic substances and their **calorific value** is therefore lower. The oil shale found in the north-western part of the deposit has a calorific value of 6.5-7.5 MJ/kg, while the same value of oil shale found in the south is only 5-6 MJ/kg.

<sup>1</sup> The term 'active reserves' used in this report refers to the reserves that can be extracted as defined in § 10 of the Earth's Crust Act.

**Figure 1. Thickness and calorific value of the oil shale seam in the oil shale deposit of Estonia**



Source: H. Bauert; V. Kattai 1997. Kükersite oil shale – Geology and mineral resources of Estonia. Eesti Teaduste Akadeemia Kirjastus, Tallinn

4. In addition to the deteriorating quality of oil shale reserves, mining conditions are also becoming increasingly difficult. The layer of soil covering the northern border of the deposit is 1-10 m thick, but the thickness of soil on the southern border of the deposit is 80-90 m. 25-27 m is considered the maximum depth for open-pit mining. This means that more oil shale will have to be mined underground in the future, which is more expensive and generates bigger losses.

### Oil shale mining

5. Oil shale has been mined in Estonia for *ca* 100 years. More than 870 million tons of oil shale has been extracted from the ground in this time. These are **geological reserves** that do not include **mining losses**. Mining peaked at the end of the 1970s and the beginning of the 1980s, when more than 30 million tons of oil shale was extracted per year. Oil shale mining had dropped to *ca* 10 million tons per year by the end of the 1990s. Mining has been on the rise again since then, reaching *ca* 15 million tons in 2012. Mining losses amounted to 4 million tons in 2012.

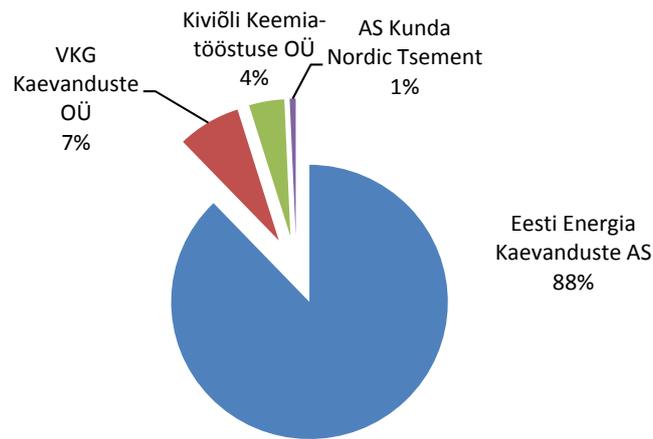
6. There are four oil shale mining companies operating in Estonia (see Figure 3). The biggest is the public undertaking Eesti Energia Kaevanduste AS, which mined 13.1 million tons in 2012 and whose oil shale losses amounted to 3.7 million tons. VKG Kaevanduste OÜ mined 1.1 million tons in 2012 and posted oil shale losses of 0.32 million tons. Kiviõli Keemiatööstuse OÜ mined 0.615 million tons in 2012 and posted mining losses of 0.04 million tons. AS Kunda Nordic Cement mined 0.107 million tons for cement production in 2012 and had no oil shale losses.

**Geological oil shale reserves** means the pure oil shale (without the limestone interlayers) in the ground which are recognised in the balance sheet of mineral reserves.

**Mining loss or oil shale loss** – oil shale that remains in the ground upon mining. This is mainly oil shale that remains in the unmined parts of mines and in the bottom or on the ceiling of the mined section.

Oil shale located in karst areas, dislocation zones and in flooded, burnt and collapsed areas.

Figure 3. Division of oil shale mining between companies in 2012



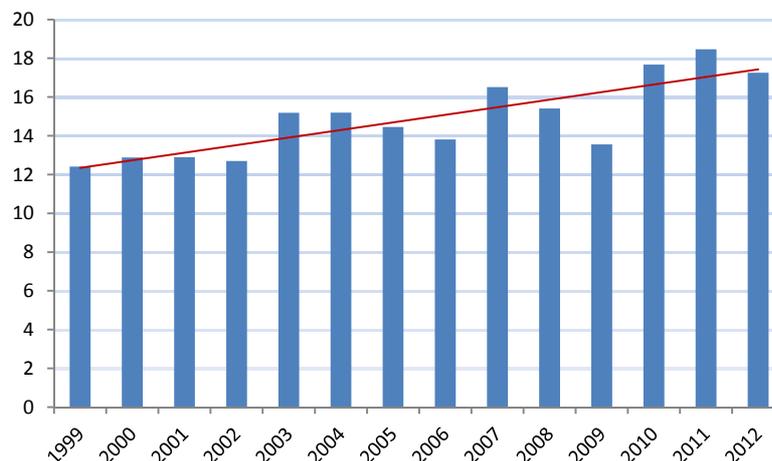
Source: Estonian Land Board

### Oil shale consumption

7. The quantity of oil shale consumed in 2012 according to Statistics Estonia was 17.3 million tons. During Estonia’s independence, oil shale consumption was highest in 2011 at 18.5 million tons – as much as 6 million tons more than in 1999, when consumption was lowest (see Figure 4). The oil shale consumed is **trade oil shale**, which is *ca* 10-20% heavier than the oil shale in the mineral reserves balance sheet (i.e. geological reserves), as oil shale is usually extracted with limestone particles that cannot be fully removed later. Also, trade oil shale has a higher moisture content than the oil shale in the mineral reserves balance sheet.

**Trade oil shale** – oil shale with qualities determined by standards (e.g. calorific value and limestone and moisture content) that is supplied to users.

Figure 4. Oil shale consumption from 1999-2012 (million tons)

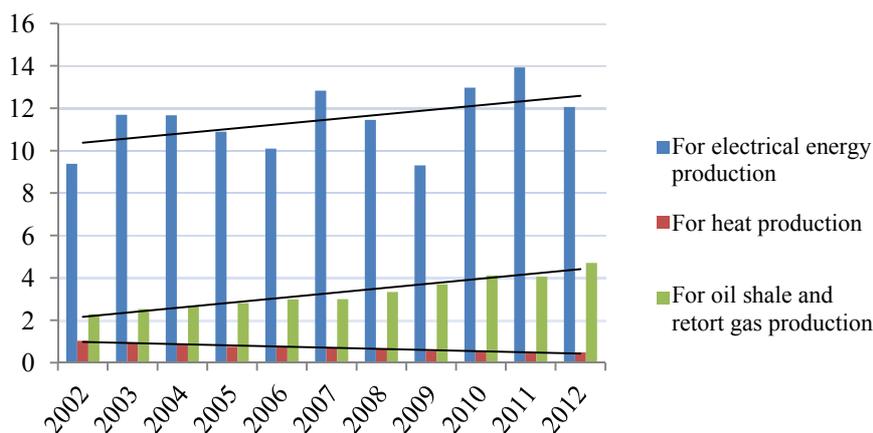


Source: Statistics Estonia

### 70% of oil shale is used for electricity generation

8. Oil shale is used mainly for electricity generation (see Figure 5). 70% of all consumed oil shale was used for this purpose in 2012. The second important area of use is the production of shale oil and retort gas, where 27% of oil shale was consumed in 2012. To a lesser extent, oil shale is also used to produce thermal energy, cement and chemical products. This comprised 3% of consumed oil shale.

**Figure 5. Oil shale consumption by use from 2002-2012 (million tons)**

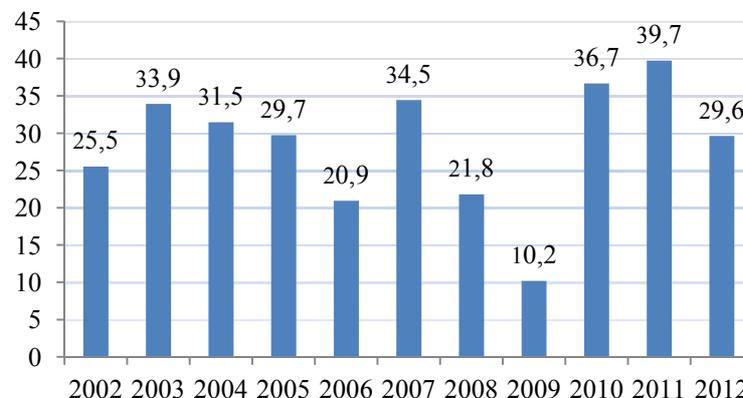


Source: Statistics Estonia

9. The use of oil shale for electrical energy generation has increased from 9.3 million to *ca* 14 million tons in the last decade. The quantity of oil shale used for electrical energy generation in 2012 was somewhat smaller: 12 million tons. In 2012, 71% of **net electricity generation** was consumed in Estonia; 29% was exported. Exports of electricity have ranged from 10-40% in the last ten years (see Figure 6).

**Net electricity generation** – generated electrical energy that does not include the electricity consumed by the power plants themselves.

**Figure 6. Share of exported electric energy in generated electric energy from 2002-2012 (per cent)**



Source: Statistics Estonia

10. The use of oil shale for oil production has increased from *ca* 2.2 million to 4.7 million tons in the last ten years. The biggest shale oil producer is VKG Oil AS, which made 370,000 tons of oil or *ca* 60% of total oil production in 2012. Eesti Energia Õlitööstuse AS produced 211,000 tons of oil in 2012 and Kiviõli Keemiatööstuse OÜ produced 70,000 tons. Up to 78% of shale oil is exported.<sup>2</sup>

**Did you know that...**

in terms of quality, oil shale is similar to crude oil. Oil shale must be processed in order to obtain fuel or other products, e.g. light or heavy fuel oil or diesel.

<sup>2</sup> Based on the annual reports of the companies and the data of Statistics Estonia

**Greenhouse gases** – carbon dioxide (CO<sub>2</sub>), methane (CH<sub>4</sub>), nitrous oxide (N<sub>2</sub>O) and fluorinated gases or F-gases. The quantity of greenhouse gases is expressed as a CO<sub>2</sub> equivalent.

**Oil shale ash** – mineral residue generated by burning oil shale.

**Oil shale mine waste** – limestone and oil shale residue caused by enrichment of oil shale. Limestone is removed from the mix of mined oil shale and limestone during separation.

**Oil shale semi-coke** – solid residue generated in the distillation of oil shale into oil and gas.

### Did you know that...

- 14-18 m<sup>3</sup> of water is pumped out when one ton of oil shale is extracted;
- the sulphate-rich water that is pumped from mines and directed back into the natural environment has had a negative impact on five lakes in the Kurtna lake complex, incl. the Kurtna Nõmmejärv and Kirjakjärv lakes, which are in a Natura nature protection area.

**Sinkhole** – depression caused by collapse of workings in the ground

**Comprehensive impact of oil shale sector** – impact of oil shale mining and use on nature, health and the socioeconomic environment.

## Environmental impact

11. The oil shale industry is the biggest source of air pollution in Estonia. In 2012 the energy sector emitted<sup>3</sup> 17 million tons of **greenhouse gases** in CO<sub>2</sub> equivalents into the ambient air. In 2011 Estonia ranked second in the European Union (EU) in terms of CO<sub>2</sub> emissions per person, at 13.6 tons. The average quantity of CO<sub>2</sub> emissions per person generated in the EU is considerably lower – 7.8 tons.

12. More than 80% of waste in Estonia is generated in the oil shale sector. The quantity of hazardous waste generated in 2012 was *ca* 8 million tons of **oil shale fly** and bottom **ash** and 1 million tons of **semi-coke**. The quantity of **mine waste** (which forms part of non-hazardous waste) generated in 2012 was 9 million tons. In terms of the quantity of hazardous waste per person, Estonia ranks first among EU countries, at 6.7 tons, while the EU average is as low as just under 200 kg.

13. Approximately 227 million/m<sup>3</sup> of water is pumped from mines and quarries per year in order to extract oil shale. Ground water comprises 64% of the water pumped from underground oil shale mines and 24% of the water pumped from quarries.<sup>4</sup> Eesti Energia Narva Elektriijaamade AS used 1306 mln/m<sup>3</sup> of surface water for cooling. Directing mining water to bodies of surface water creates floods in the receiving bodies of water and increases soil erosion. Natural bodies of water have been changed by the ditches and channels built to drain off mine water. For example, the natural headwaters of the Kohtla River have almost dried out.

14. The oil shale industry has the biggest impact on the quality and quantity of ground water. For example, the status of the groundwater body of the Ordovician Ida-Viru oil shale basin is bad due to oil shale mining and use, and experts are of the opinion that restoring its status would be technically and economically unfeasible.<sup>5</sup> Three adjacent bodies of groundwater are also at risk.

15. In addition to groundwater, mining also has other impacts on the environment. Noise, vibration, dust, **sinkholes** and floods have an adverse impact on both people and the ecosystem. The decrease in the value of properties and land, damage caused to landscape and buildings, emigration of people and other such impacts caused by mining also have an impact on the local community. The health impact of oil shale must also be mentioned. All of these aspects have been studied very little or have not been studied at all, which means that it is not clear how the environmental and other damage caused by mines can be compensated. This means that there is no overview of the **comprehensive impact** of oil shale mining and use.

## Environmental charges

16. The state has established environmental charges to prevent or reduce the potential damage associated with the use of natural resources,

<sup>3</sup> Includes the CO<sub>2</sub> of the entire energy sector, incl. the CO<sub>2</sub> emissions generated by burning natural gas and from fuel in the transport sector.

<sup>4</sup> Origin of water pumped from mines and quarries. Geological Survey of Estonia, 2005

<sup>5</sup> Water Management Plan of East-Estonian Basin. Order no. 118 of the Government of the Republic of 1 April 2010.

emission of pollutants into the environment and waste handling. The amount of environmental charges received in Estonia in 2012 was *ca* 79 million euros. 72% or 56 million euros of this was received from the oil shale sector. 45% or 25 million euros of the environmental charges from the oil shale sector were oil shale extraction charges. According to the Ministry of the Environment, the biggest environmental charge in the oil shale sector is paid by Eesti Energia Kaevanduste AS – more than 50% of the total environmental charges received from the sector. Companies in the oil shale sector pay a fee for the special use of water for the consumption of ground and surface water, and a water and ambient air pollution charge for emitting pollutants into the environment. Oil shale companies also pay a waste discharge fee for discharging mining waste, oil shale ash, semi-coke and non-hazardous waste.

### Environmental permits and supervision of permits

17. The Ministry of the Environment issues extraction permits for oil shale mining. The ambient air pollution, special use of water and waste permits issued by the Environmental Board are added to this. The average or maximum annual extraction limit, the area of use and the expiry date of the permit are indicated on the extraction permit. The extraction permit is generally issued for up to 30 years, and if the reserves are not exhausted during the term of the permit it is possible to request the extension of the permit for up to ten years. Approximately 60% (761 million tons) of active reserves (1.3 billion tons) have been distributed among extractors through extraction permits (see Table 1). The first of the extraction permits held by currently operating quarries and mines will expire in 2019. The last permits are valid until 2036.

**Table 1. Quantity of oil shale permitted for extractors to extract and annual extraction limit<sup>6</sup>**

Extraction permit holder	Valid extraction permits as at 1 September 2013	Reserves granted for use with permits as at 31 December 2012 (million tons)	Share of reserves granted for use with permits (%)	Maximum annual extraction limit (million tons)	Share of annual extraction limit (%)
Eesti Energia Kaevanduste AS	14	659	86.6	15.01	75.0
VKG Kaevanduste OÜ	2	78	10.2	2.772	13.9
Kiviõli Keemiatööstuse OÜ	2	21	2.8	1,980	9.9
AS Kunda Nordic Tsement	1	3	0.4	0.238	1.2
Total	19	761	100	20	100

Source: Ministry of the Environment, Estonian Land Board

### Rules of competition must be observed when extraction permits are issued

18. The current organisation of the issuing of extraction permits has caused disputes between extractors, as it obstructs fair competition. The Earth's Crust Act stipulates that when the mineral reserves whose extraction was permitted are about to be exhausted and the extractor

<sup>6</sup> The present extraction rate of 20 million tons will be reviewed when the new oil shale development plan for 2016–2030 is prepared.

applies for a new extraction permit, their application will be processed on a priority basis, i.e. before those who do not hold a permit. This means that the regulation gives an advantage to companies that already hold permits. The competitive situation is also influenced by the fact that the annual extraction limit of 20 million tons is divided between companies for an unspecified term and such a division perpetuates the market share of oil shale extraction companies for a long time.

19. Adherence to environmental permits and environmental legislation is supervised by the Environmental Inspectorate. The performance of the permit's requirements is also monitored by the Environmental Board and the Ministry of the Environment. The Technical Surveillance Authority supervises the performance of the technical and safety requirements of extraction. The correctness of extraction charges is checked by the Environmental Board on the basis of the extraction volume reports submitted by the extractors. These reports are submitted on the basis of the measurements made (or ordered) by the extractors. Both the Ministry of the Environment and the Environmental Board have the right to organise control measurements to check that the extracted quantities are correct.

### **National development plans that regulate the use of oil shale**

20. The extraction and use of oil shale is touched upon in several national and sectoral development plans. The most important of these are:

- National Development Plan for the Use of Oil Shale 2008-2015 (hereinafter the Oil Shale Development Plan);
- National Development Plan of the Energy Sector until 2020 (hereinafter the Energy Sector Development Plan);
- Development Plan of the Estonian Electricity Sector until 2018;
- Action Programme of the Government of the Republic 2011-2015.

21. The Energy Sector Development Plan is the document that combines the different development plans of the field of energy. It contains the conclusions, goals and actions written down in the Oil Shale Development Plan and the Electricity Sector Development Plan. The purpose of the Oil Shale Development Plan is to determine how much oil shale can be extracted and used. The Electricity Sector and Energy Sector Development Plan, however, determine how much oil shale the economy needs. Nevertheless, the state takes the decisive position in determining the quantity to be extracted in the Oil Shale Development Plan. The preparation of the new Energy Sector Development Plan and Oil Shale Development Plan (until 2030) has started and they should be ready by 2015.

22. The Oil Shale Development Plan was prepared as a result of the increasingly strong pressure of extractors to increase extraction volumes and concern about the diminishing oil shale reserves. Permits that allowed the extractors to extract up to 24 million tons per year had been issued to the extractors by the end of 2005. At the same time, new applications for extraction permits for mining 26 million tons had been

**The Energy Sector  
Development Plan combines  
all development plans of the  
sector**

submitted. Approval of the applications would have meant that up to 50 million tons of oil shale per year could have been extracted.

23. One of the most important results of the preparation of the Oil Shale Development Plan was the stipulation of an annual oil shale extraction limit of 20 million tons in the Earth's Crust Act. According to the development plan, the state needs oil shale to supply Estonian consumers with electrical and thermal energy and enhanced oil shale products without disruption. The development plan also states that when oil shale is extracted, both the oil shale and other natural resources must be used as efficiently as possible and any negative environmental and social impact should be as small as possible to ensure that the natural resources last for as long as possible and that the security of the state is guaranteed.

24. A broad circle of specialists was involved in the initial preparation of the Oil Shale Development Plan, and the draft of the development plan and its implementation plan were completed in April 2007. The Riigikogu approved the development plan on 21 October 2008 and its implementation plan on 25 May 2009, i.e. 1.5 and two years later, respectively. Many measures and activities planned for the achievement of the development plan's goals were removed from the plan in the meantime. For example, the plan to amend the Environmental Charges Act in such a manner that the external costs of oil shale mining and use would be given greater consideration was abandoned. Reviewing oil shale pricing principles and introducing a quality-based price scale were also considered unnecessary. The amendments were not coordinated with the members of the development plan preparation committee or the roundtable.

#### External costs of oil shale mining and use

— the damage caused to people, the artificial environment and ecosystems, and the risks that are partly or fully not borne by those who cause them, but by the people living in the territory of their impact or by society as a whole, including future generations.

25. The **National Audit Office** assessed in the course of the audit whether the goals of oil shale mining and use set in the development plan are clear, relevant and set in consideration of significant impacts; whether the actions planned and the requirements established for the achievement of the goals guarantee that the environmental impact will decrease and that the state will receive fair revenue for the use of a natural resource of national importance. The reclamation of oil shale mines was not approached in the audit.

### The intended goals will not be achieved with the Oil Shale Development Plan

26. The oil shale reserves in the earth's crust belong to the state and the state uses development plans to establish how much and what kind of oil shale is extracted, the conditions under which it is extracted and how it is used. The state also establishes restrictions, where necessary.

27. The National Audit Office is of the opinion that the need to use oil shale economically and to preserve the natural environment and natural diversity at the same time was considered when goals were set in the Oil Shale Development Plan. The goals contained in the development plan must be timely and the measures and actions must guarantee that goals are achieved. Measureable and appropriate impact indicators must be set in order to assess actions. Development plans must be regularly reviewed and updated, where necessary.

## Energy security can no longer be guaranteed with oil shale in the present economic environment

### Did you know that...

the price of electricity in the Estonian region of the electricity exchange increased steeply in June 2013: 44% on average compared to May. At the same time, the prices remained relatively stable in the Nordic countries. The increase in Finland at the same time was 3%.

The fact that the generation of oil shale power in Estonia exceeded the consumption of power at the same time did not help prevent the steep price increase, as the generated electricity was sold to the electricity exchange.

## Ensuring Estonia's energy independence with oil shale energy is no longer relevant

28. One of the main goals of the national development plans regarding the mining and use of oil shale is to guarantee continued oil shale energy supply and energy independence for Estonia.

29. The National Audit Office points out that the goal of energy independence set in the development plan does not take account of the significant developments in the energy sector and is therefore no longer relevant. Energy independence means that Estonia generates electricity to the extent of its consumption. As an open electricity market participant, Estonia cannot favour domestic production sources when guaranteeing power supply for its consumers. Neither can energy independence be guaranteed with shale oil, as most electricity consumers use other types of fuel and the majority of the oil is exported.

30. The state cannot tell consumers and producers on the open electricity market which sources the electricity they use must come from or to whom the generated electricity can be sold. Consumers have the right to buy electricity from the producer that offers the best price and producers have the right to sell electricity to buyers who pay the most. Neither can the state establish restrictions on trading in electricity that comes to Estonia via power lines from other countries or in electricity that leaves Estonia. The National Audit Office also approached this topic in the 2012 review 'Alternatives for Electricity Production'.<sup>7</sup>

31. Most European countries with open electricity markets consider the security of electricity supply the guarantee of their energy independence or energy security. Security of supply is guaranteed for consumers via the development of a national electricity network and power lines with other countries, and via opening the energy market. The European Union is seeking to promote transferring to CO<sub>2</sub>-free energy sources (incl. renewable energy), dispersing electricity generation and increasing both energy efficiency and competitiveness in the establishment of national generation capacity. Estonia must proceed from exactly the same principles. The transmission system operator Elering is responsible for guaranteeing security of supply.

32. The national development plans still emphasise that only oil shale left over from electricity generation is used to produce shale oil. Shale oil production is not considered an important goal in any of the development plans. The price of shale oil is related to the price of oil on the world market. In the last ten years, the price of oil has increased from *ca* 30 US dollars to 110 dollars per barrel, i.e. *ca* 300%.<sup>8</sup> The estimated added value of oil production is *ca* three times higher than that of electricity generation. This is why oil shale companies are planning to focus on oil production as early as in the next decade.

<sup>7</sup><http://www.riigikontroll.ee/Riigikontrollipublikatsioonid/Audituaruanded/tabid/206/Audit/2264/Area/4/language/et-EE/Default.aspx>

<sup>8</sup> Data of the International Monetary Fund, [http://www.quandl.com/IMF-International-Monetary-Fund/POILBRE\\_USD-Crude-Oil-petroleum-Price-Dated-Brent](http://www.quandl.com/IMF-International-Monetary-Fund/POILBRE_USD-Crude-Oil-petroleum-Price-Dated-Brent) (as at 28 August 2013)

### Did you know that...

the calorific value of oil shale in the unmined areas of the deposit is 12-25% lower and companies must increase extraction volumes accordingly to produce the same quantities of oil and electricity.

### The quantity that may be mined per year is unclear

**Geological oil shale reserves** means the pure oil shale (without the limestone interlayers) in the ground which are recognised in the balance sheet of mineral reserves.

33. Oil producers are planning to increase oil production *ca* three-fold in the next ten years (see Point 145). They want to use more than half of the extracted oil shale for oil production in the next three to seven years (see Figure 15). If the oil producers build the intended oil plants, the 20 million tons of oil shale they are permitted to extract per year will not be enough to produce the intended quantities of oil and electricity at the same time.

34. The establishment of the annual limit of oil shale extraction – 20 million tons – with the Earth's Crust Act on 23 November 2008 can be considered an achievement of the preparation of the valid development plan. Extraction quantities were not previously limited. The extraction limit determines the quantity mined per year, how long the reserves will last and the scale of the impact associated with the extraction.

35. The reason for the establishment of the annual limit was to prevent an increase in the environmental impact of extraction and to ensure that oil shale reserves last for as long as possible. However, only one environmental impact indicator – the need to reduce SO<sub>2</sub> emissions – was considered when the annual limit was established. The need to reduce waste generation, to increase recycling of waste and to protect surface and ground water does not appear among the reasons for the establishment of the annual limit.

36. The environmental assessment report on the Oil Shale Development Plan (2007) contains the admission that the establishment of the annual extraction limit of 20 million tons in itself will not cause the environmental impact to decrease. According to the author of the assessment report, the environmental impact will only decrease if oil shale users start using technologies that result in the reduction of the quantity of emissions as well as their hazardousness.<sup>9</sup>

37. Although the annual extraction limit was established with the Earth's Crust Act, it did not specify the kind of oil shale reserves that these 20 million tons contain. According to the Ministry of the Environment, the **geological reserves of oil shale** are considered in the case of both extraction permits and the annual extraction limit.<sup>10</sup> Mineral reserves in natural condition are in the earth's crust, i.e. they have not yet been mined. The extracted reserves are always smaller by the amount of mining losses. However, the Ministry has proceeded from extracted oil shale reserves in the case of the annual limit in the reports of the implementation plan of the development plan implementation. For example, 15.9 million tons was extracted in 2011, with a mining loss of 4.7 million tons.<sup>11</sup> This means that the Ministry's explanations contradict the reports of the implementation plan of the development plan implementation.

38. Extractors consider the extracted quantities in the case of the permitted annual extraction limit, i.e. the mining loss is not considered.

<sup>9</sup> Valdur Lahtvee 2007. Strategic Assessment of the Environmental Impact of the National Development Plan for the Use of Oil Shale 2007-2015. Stockholm Environment Institute

<sup>10</sup> Response of the Deputy Secretary General of the Ministry of the Environment of 30 August 2013

<sup>11</sup> 2011 Report on the Implementation of the National Development Plan for Oil Shale Use 2008-2015. Ministry of the Environment, Tallinn 2012

The average mining loss in the last ten years has been 3.7 million tons per year or 21% of the quantity of geological oil shale.

**39. The National Audit Office is of the opinion** that the main goal of the Development Plan – to guarantee energy security with oil shale energy – is no longer relevant. This means that it is now clear to the state how much oil shale should be used and under which conditions. Due to the changes on the electricity market, it is impossible for Estonia to guarantee that Estonian consumers are supplied with electricity generated from oil shale. Neither can energy independence be guaranteed with shale oil, as most of it is exported and unrefined oil cannot be used as motor fuel. Security of supply can be guaranteed with the help of competitive production capacities of low carbon content, adequate electricity connections with other countries and a reliable national electricity grid system. Since the use of oil shale for oil production is increasing, the state's primary obligation is to determine how much of the resource may be used and the conditions under which it may be used.

**40.** The National Audit Office is of the opinion that the annual rate of oil shale extraction must be determined in a manner that is clearly understandable to all parties. This excludes a situation where the quantities of extracted oil shale are larger than intended by the state.

**41. Recommendation of the National Audit Office to the Minister of the Environment:** specify § 25<sup>1</sup> and Subsection 26 (3) of the Earth's Crust Act in such a manner that it is clearly understandable to all parties whether the permitted annual limit of 20 million tons is the quantity of geological oil shale with or without mining loss.

**Response of the Minister of the Environment:** the wording of said provisions is being specified in the codified text of the Draft Earth's Crust Act that is currently being developed, although there are no disputes at present, as the annual oil shale extraction limit means the maximum quantity of oil shale permitted to be extracted on the basis of all permits in a calendar year.

**42. Recommendations of the National Audit Office to the Minister of the Environment and the Minister of Economic Affairs and Communications:**

- abandon the goal of guaranteeing the energy supply of Estonian consumers with electricity generated from oil shale in the Energy Sector Development Plan and the Oil Shale Development Plan that are currently being prepared. There is no reason to prefer electricity generation to other uses when oil shale reserves are used.
- If the state still considers the generation of oil shale electricity important, it should develop measures that guarantee the quantity of oil shale required for electricity generation. The relevant goals and actions must be included in both the Oil Shale Development Plan and the Energy Sector Development Plan.

**Response of the Minister of the Environment:** this issue is analysed in the National Development Plan for Oil Shale Use (hereinafter the Oil Shale Development Plan) and the uses of oil shale will also be determined. In electricity generation, it is important to guarantee the

smallest possible cost/price for both the consumer and the environment. We consider the increased valorisation of oil shale important in the use of this mineral resource.

These issues will be analysed in the new Oil Shale Development Plan and the relevant mechanisms will be developed. Since the Oil Shale Development Plan and the Energy Sector Development Plan until 2030 (hereinafter the ESDP) are being prepared at the same time, then this issue will be given attention in both development plans.

**Response of the Minister of Economic Affairs and Communications:** we agree with the opinion of the National Audit Office that the use of oil shale should be based on the goal to use oil shale primarily in the areas where the economic added value created by the use of oil shale is highest. This is the principle that we are considering in the preparation of the new Energy Sector Development Plan until 2030. However, this does not mean that the generation of electricity from oil shale will no longer play an important role in guaranteeing the state's energy supply and energy security in the future. We would like to point out that the generation of electricity and production of oil from oil shale are not mutually exclusive – quite the opposite. Based on economic practicality as well as the aim to valorise oil shale to the maximum, the use of the by-products of shale oil production – retort gas and high-temperature waste heat – for electricity generation already makes sense. This is already done today. The nature and scope of the role of energy generated from oil shale in the energy portfolio of Estonia will become clear when the various future scenarios given in the new Energy Economy Development Plan until 2030 are analysed.

The Ministry of Economic Affairs and Communications will submit the new Energy Sector Development Plan until 2030 to the Government of the Republic in November 2014.

### **The efficiency of oil shale extraction and use has not increased**

43. The efficiency of oil shale extraction and use will increase when better extraction and processing technology is implemented.

44. According to the Oil Shale Development Plan, the **efficiency of extraction** must be assessed on the basis of whether mining losses have decreased in comparison to 2007, when losses were 8% in quarries and 28% in underground mines. This calculation is based on geological oil shale reserves. The development plan does not prescribe the extent to which mining losses should be reduced. Neither does the development plan contain any specific actions for reducing mining losses.

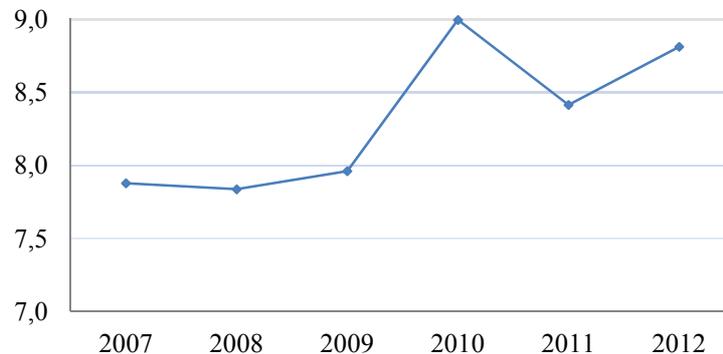
45. There were plans to establish impact indicators for both oil production and electricity generation in order to measure the **efficiency of oil shale use**. No such indicators have been developed so far. The Ministry of the Environment has promised to present indicators on the efficiency of oil shale use in the 2012 report on the fulfilment of the implementation plan of the development plan, which will be completed by spring 2014.

46. The average quantity of mining losses in quarries and underground mines from 2007-2012 was 4 million tons. The mining losses in quarries

**No specific actions for increasing the efficiency of oil shale extraction and use have been planned.**

had not decreased by the end of 2012 compared to 2007; instead they had increased 11% (see Figure 7).

**Figure 7. Oil shale mining losses in quarries from 2007-2012 (%)**



National Audit Office on the basis of the data of the Estonian Land Board and the Ministry of the Environment

**Pillar** – mineral resource not extracted from the earth’s crust for technological, economic or environmental reasons, e.g. for supporting the ceiling of the mine and maintaining the roads and buildings above the mine.

47. Mining losses in underground mines in 2012 were the same as in 2007, i.e. 28%. The Ministry of the Environment has admitted in the reports on the fulfilment of the implementation plan of the development plan that losses in underground mines may amount to 35% of extracted oil shale quantities due to pillar. Since pillars must be left in underground mines to prevent them from collapsing, then large losses are inevitable in some sense. For example, scientists from the Department of Mining of Tallinn University of Technology have admitted that losses will increase to up to 40% in the future when oil shale is extracted from depths greater than 60 m.

**Did you know that...**

the following research by Tallinn University of Technology has been financed by EU funds:

- Reduction of CO<sub>2</sub> emissions by making combustion air richer in oxygen in a fluidised bed reactor – 0.7 million euros;
- Oil shale mining without losses and in an environmentally sustainable manner – 0.6 million euros;
- Fundamentals of the maximum valorisation of oil shale – 0.5 million euros; and
- Fundamentals of new uses of solid waste associated with oil shale burning – 0.5 million euros.

48. The **National Audit Office is of the opinion** that losses can already be reduced in both quarries and underground mines by using the best available technology and equipment for extraction. For example, rock can be mechanically crushed and removed from the massif in both quarries and underground mines instead of drilling and blasting. Yet the development plan contains no measures or actions to force extractors to implement the best available technology and equipment. Charging more for oil shale extraction rights would also make extractors treat oil shale more economically (see Points 136-140).

49. However, any significant reduction in losses in underground mining (e.g. by refilling underground workings) requires both scientific and applied research. The Ministry prescribes research and development activities and a variety of research in the development plan. For example, five million euros was obtained from EU funds for research and development from 2009-2012, which comprises 95% of all money allocated to the implementation of the development plan.

50. It is important that oil shale companies and universities cooperate when research and development projects are carried out. However, many researchers interviewed by the National Audit Office pointed out that companies are generally not interested in cooperating with universities. Companies are not taking part in many relevant research projects.

## 51. Recommendations of the National Audit Office to the Minister of the Environment:

- ensure that specific actions that will result in the more efficient extraction and use of oil shale are set forth in the new Oil Shale Development Plan.
- Use research to identify technology and equipment that allow for extraction in underground mines in a manner that harms the environment as little as possible and results in the smallest possible mining losses, and to determine actions for the implementation of such technology and equipment in the development plan.

**Response of the Minister of the Environment:** The experience of oil shale mining in Estonia is long. There is no doubt that the implementation of such new technologies is necessary. Current attempts at refilling workings, i.e. filling the workings left by oil shale extraction with rock material and ash, can be given as an example. This helps prevent (or minimise) the destruction of landscapes and land becoming unusable. It also reduces the need to leave pillars in the earth's crust, meaning that more of the oil shale reserves can be used. The second of these is a method already long since used, of which a technically updated version will soon be tested. This is winning the oil shale reserves by underground mining using a mining machine. Once the oil shale has been won, large areas will be sunken to minimise damage to the landscape.

Some examples of making oil shale extraction more efficient were described in the previous response. Actions for making oil shale use more efficient (e.g. the development and implementation of the best available technology in energy generation and oil production, rational use of extracted resources and lengthening the value chain) are planned in the Oil Shale Development Plan.

## The environmental impact of oil shale extraction and use has not decreased

52. The environmental impact of oil shale extraction and use must decrease, and this is also prescribed in the Oil Shale Development Plan. However, the development plan does not determine the extent to which environmental impact must decrease in order to consider it successful from the viewpoint of the implementation of the development plan. A couple of indicators have been established for monitoring the decrease in environmental impact. The development plan contains no actions that would lead to a decrease in the environmental impact of oil shale extraction and use.

53. Another drawback of the development plan is that the environmental impacts of extraction and processing (electricity generation and oil production) have been dealt with together, not separately. This is why anyone who reads the plan may assume in error that environmental impact as a whole is discussed in the plan. For example, monitoring the quantity of mine waste is the only indicator established for the assessment of the environmental impact of extraction.

**Only a few indicators have been established for assessing the decrease in environmental impact**

### Did you know that...

the most significant environmental impact of **oil shale extraction** includes reduction of groundwater resources, deterioration of the status of surface water and groundwater, reduction of biological diversity, generation and depositing of mine waste, noise and vibration, damage to the landscape and air pollution.

the most significant environmental impact of **oil shale processing** includes air pollution, generation and depositing of hazardous waste and the use of large quantities of water for cooling equipment in the generation of oil shale electricity.

54. Neither does the development plan establish indicators for assessing the impact of the oil shale sector on groundwater and surface water, despite the fact that the oil shale sector is the biggest user of water in Estonia and the status of the groundwater body of the Ordovician Ida-Viru oil shale basin is bad due to oil shale extraction and industry. The development plan does mention the need to develop indicators for assessing the impact that oil shale extraction and use has on people's health, but nothing has been done so far.

**The quantities of oil shale ash are increasing**

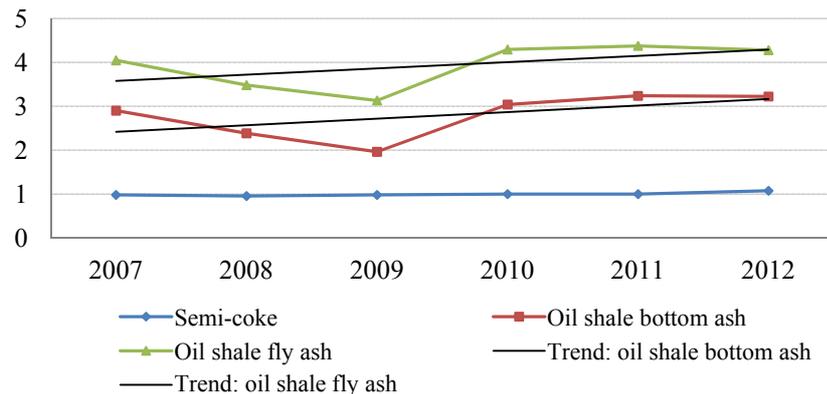
55. According to the development plan, the environmental impact of oil shale **processing** will be reduced when less waste (bottom ash, fly ash and semi-coke) is generated than in 2007 and the quantity of CO<sub>2</sub> emissions decreases. The environmental impact of oil shale **extraction** will decrease when less mine waste is generated than in 2007.

56. The audit revealed that the quantity of bottom ash, fly ash and semi-coke increased by 12%, 8% and 2%, respectively, from 2007-2012 (see Figure 8). The quantities of oil shale bottom ash and fly ash were only smaller during the years of recession, when less oil shale was extracted and less electricity was generated.

**Did you know that...**

oil shale ash is the waste created instead of semi-coke in new oil production plants. This means that the quantity of ash will increase and the quantity of semi-coke will decrease in the future. Little research has been done to ascertain whether this is better or worse for the environment.

**Figure 8. Quantity of oil shale bottom ash, fly ash and semi-coke created in electricity and heat generation from 2007-2012 (million tons)**

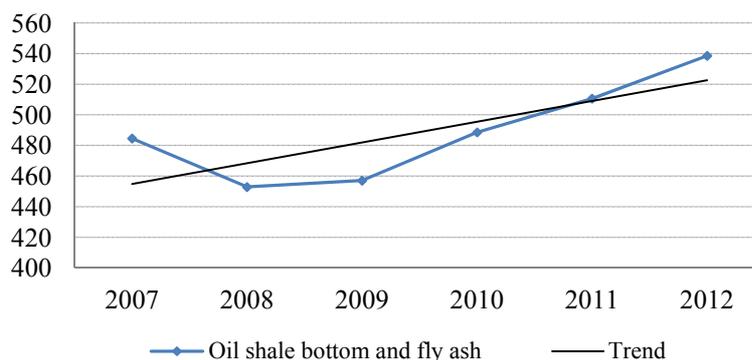


Source: Environment Agency

57. The increase in the oil shale bottom and fly ash<sup>12</sup> per unit of energy (GWh) of generated electricity and heat also indicates an increase in the environmental impact of oil shale processing (see Figure 9). The Ministry of the Environment was unable to explain why the generation of electricity and heat from oil shale created more ash.

<sup>12</sup> The quantity of oil shale ash only contains the ash created by electricity and heat generation.

**Figure 9. Quantity of oil shale bottom and fly ash created in electricity and heat generation from 2007-2012 (tons/GWh)**



Source: National Audit Office on the basis of data from Statistics Estonia and the Environment Agency

**The quantity of CO<sub>2</sub> emissions per GWh of electricity and heat generation increased by 11% from 2007-2012.**

**Greenhouse gases** – carbon dioxide (CO<sub>2</sub>), methane (CH<sub>4</sub>), nitrous oxide (N<sub>2</sub>O) and fluorinated gases or F-gases. The quantity of greenhouse gases is expressed as a CO<sub>2</sub> equivalent.

The Ministry of the Environment found the **efficiency** of oil shale energy generation by dividing the electricity and heat output by the energy content of the oil shale used to generate it.

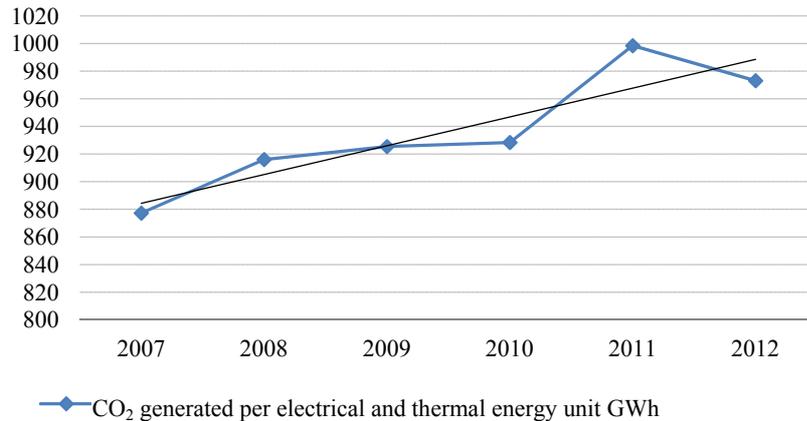
58. The goal set in the development plan is to reduce the air pollution caused by energy generation, which is measured with the quantity of **greenhouse gases** in carbon dioxide equivalents (CDE). 18 million tons CDE of greenhouse gases were created in the energy sector in 2007, while the quantity in 2012 was 17 million tons.<sup>13</sup> Since this indicator contains the emissions of the entire energy sector, incl. transport, the Ministry of the Environment has also admitted that the incorrect indicator was selected for recognising the quantity of CO<sub>2</sub> emissions of the oil shale sector when the Oil Shale Development Plan was prepared.

59. The burning of oil shale for the generation of electricity and heat alone generated 11 million tons of CO<sub>2</sub> emissions in 2007 and 10.2 million tons in 2012.<sup>14</sup> The quantity of CO<sub>2</sub> emissions therefore decreased by 8% from 2007-2012. However, the quantity of CO<sub>2</sub> emissions per unit of oil shale electrical and thermal energy GWh had increased by 11% by 2012 in comparison to 2007 (see Figure 10). According to the Ministry of the Environment the **efficiency** of the electrical and thermal energy generated from oil shale has decreased, which is why more CO<sub>2</sub> emissions were created per generated unit of energy GWh in 2011 and 2012.

<sup>13</sup> Greenhouse gas emissions in Estonia 1990–2012. National inventory report under the UNFCCC and the Kyoto Protocol. 2014

<sup>14</sup> Greenhouse gas emissions in Estonia 1990-2012. National inventory report under the UNFCCC and the Kyoto Protocol. 2014

**Figure 10. CO<sub>2</sub> emissions created by the generation of electrical and thermal energy from oil shale from 2007-2012 (tons per GWh)**



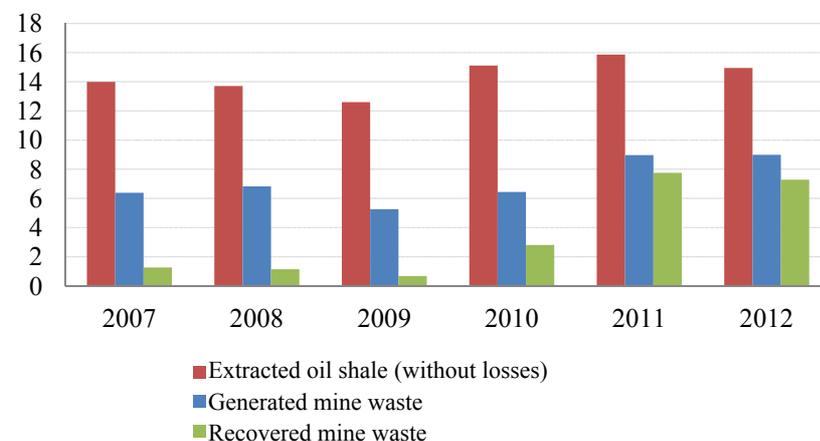
Source: National Audit Office on the basis of data from the Ministry of the Environment and Statistics Estonia

60. A positive that can be pointed out is that sulphur dioxide (SO<sub>2</sub>) emissions in energy generation decreased by more than 50% from 2007-2012 (from 84,000 tons to 37,000 tons). SO<sub>2</sub> emissions had to be reduced in order to adhere to EU air pollution requirements. Desulphurisation equipment was therefore installed in the chimneys of Eesti Energia Narva Elektriijaamade AS by the end of 2012. However, the development plan does not include SO<sub>2</sub> emissions as an indicator on the basis of which the environmental impact of oil shale energy generation is to be monitored.

**Quantities of mine waste are increasing**

61. The environmental impact of oil shale **extraction** has not decreased either. The quantity of mine waste generated in extraction should be smaller than in 2007 according to the development plan (see Figure 11). However, waste statistics indicate that it had increased by 41% by the end of 2012. According to the Ministry of the Environment, the reason for this is the extraction of oil shale of increasingly lower quality. According to Eesti Energia Kaevanduste AS, the mine waste created in the Narva quarries was not recognised in waste reporting before 2011. This suggests that the quantity of mine waste has partly increased due to changes in accounting principles and procedures.

**Figure 11. Quantity of extracted oil shale and recovered mine waste from 2007-2012 (million tons)**



Source: Estonian Land Board

**There is no reassurance that the quantity of recovered mine waste is correct**

**Did you know that...**

although a general definition of recovery was absent in EU law until EU Directive 2008/98 entered into force, it was defined as follows in several EU court rulings: when waste is used for the same purpose instead of a pure, specially produced material.

62. Although the quantity of recovered mine waste has increased considerably, there is no reassurance that the activities companies have recognised as recovery can actually be considered recovery. For example, the waste reports of Eesti Energia Kaevanduste AS indicate that the quantity of recovered mine waste has increased by 18.5 times in comparison to 2007, i.e. from 0.2 million to 3.7 million tons (see Table 2). The company declared redesigning a part of the oil shale mine waste deposit area as a motor racing hill as recovery. VKG Kaevanduste OÜ also planned to recognise designing the mine waste deposit area as a so-called pyramid hill as recovery. Recognising this waste as recovered is legally questionable, as the Waste Act stipulates that waste has been recovered when it has been used as a replacement for materials that would otherwise have been used for this purpose. It is clear that the motor racing hill and pyramid would not have been established from another material.

**Table 2. Generation and recovery of oil shale mine waste from 2007-2012 (million tons)**

	2007	2008	2009	2010	2011	2012
Generated mine waste	6.4	6.8	5.3	6.4	9.0	9.0
Total recovery	1.3	1.1	0.7	2.8	7.8	7.3
incl. creation of Estonia motor racing hill	0.2	0.1	0.0	2.1	4.9	3.7
incl. other recovery (mostly for maintenance quarries)	1.1	1.0	0.7	0.7	2.9	3.6

Source: Environment Agency

63. According to the Waste Department of the Ministry of the Environment, the Environmental Board has not made sure that waste is recovered in the manner set forth by law. The National Audit Office is of the opinion that in such a case, the state has lost 8.1 million euros due to a different interpretation of the term 'recovery' which Eesti Energia Kaevanduste AS should have paid to deposit mine waste over three years.

**Continued oil shale extraction increases the area in which groundwater is not drinkable**

**Did you know that...**

oil shale extraction has the biggest impact on groundwater: the wells of local people dry up or the water in the wells does not meet the requirements for drinking water.

64. The Oil Shale Development Plan does not establish a single action for the protection of the reserves and status of groundwater, although experts find that the area in which groundwater is contaminated keeps increasing. For example, the status of the groundwater body of the Ordovician Ida-Viru oil shale basin is bad and it will not become good by 2015. However, this is required by the EU Water Framework Directive. Experts are of the opinion that improving the status of this groundwater body is impossible, but an action plan needs to be prepared to prevent further deterioration of the situation and to protect adjoining groundwater bodies. Although the respective proposal was made in the Water Management Plan of the East-Estonian Basin, the Ministry of the Environment keeps postponing the preparation of the plan.

65. According to the Water Department of the Ministry, the action plan for the protection of the groundwater body of the Ordovician Ida-Viru oil shale basin will not be prepared before the period of the next water management plan (2016-2027). The Water Framework Directive offers the option to request an extension for the achievement of the good status of this groundwater body from the European Commission. According to the Water Department of the Ministry, the plan is to postpone the goal

until 2027. The goal that will then be set is smaller, i.e. a bad status, as it is obvious that achieving a good status is impossible. At the same time, the state has to justify the postponement of the goal. The reason the Ministry intends to give is the need to generate electricity, i.e. the socioeconomic reason, in order to guarantee energy security (see also Points 28-31).

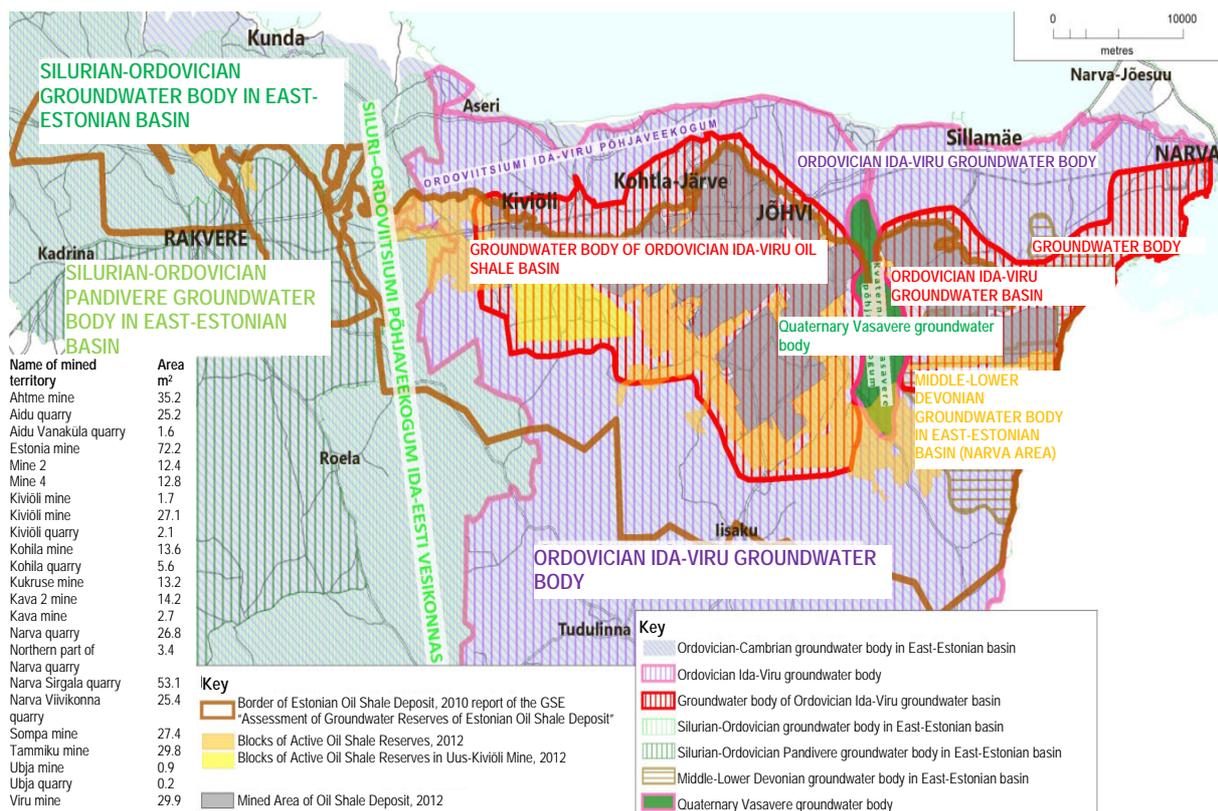
**Risk to groundwater** – a groundwater body is at risk when there are suspicions that its good status and compliance with established environmental goals cannot be achieved without the implementation of measures.

**Did you know that...**

the sulphate content in as many as 36 of the 61 drill wells that use water from the groundwater body of the Ordovician Ida-Viru oil shale basin is higher than permitted and water from these wells is therefore not drinkable.

66. In addition to the groundwater body of the Ordovician Ida-Viru oil shale basin, the three water bodies adjacent to it and located in the area of the oil shale deposit as well are also considered to be **at risk** (see Figure 12). According to the Ministry of the Environment, the new assessment of the status of groundwater bodies will be prepared by the end of March 2014, but the research<sup>15</sup> commissioned by the Ministry already indicated that the status of another groundwater body, the Ordovician Ida-Viru groundwater body, will probably also deteriorate when the next new mine (Uus-Kiviõli) is opened.

**Figure 12. Groundwater bodies at risk due to oil shale extraction: Ordovician Ida-Viru groundwater body, Quaternary-Vasavere groundwater body, Ordovician-Cambrian groundwater body in the East-Estonian basin and the groundwater body of the Ordovician Ida-Viru oil shale basin whose status is already bad.**



Source: AS Maves

<sup>15</sup> Groundwater bodies at risk, additional description of groundwater bodies at risk, pollutants that endanger the status of groundwater bodies at risk and thresholds of these pollutants. Transboundary aquifers, additional description of transboundary aquifers and possible negative transboundary impact on groundwater caused by human activity. AS Maves, 2010

### Did you know that...

- five lakes in the Kurtna lake complex have been changed, incl. Kurtna Nõmmejärv in the Natura area, by directing mining water through them,
- the Vasavere groundwater body, which is the source of drinking water for ca 50,000 people in Ida-Viru County, is located in the area of the Kurtna lake complex,
- the extractor established an infiltration barrier in Narva quarry to protect the Kurtna lake complex, because there is a real threat that the quarry may start drying out the lakes,
- according to the Ministry of the Environment, it is still not clear whether the impact of water collection and extraction in the region of the Kurtna lake complex has actually been prevented and mitigated.

### It may take years for the environmental impact of mining water to become evident

67. Although the ‘Assessment of the Groundwater Reserves of the Estonian Oil Shale Deposit’ study was commissioned in 2010 within the scope of the Oil Shale Development Plan, the Ministry has not started to implement the recommendations made therein. For example, one of the recommendations made in the study was to assess whether extraction damages the quality of groundwater layers in unmined areas and the surface water regime. It is also unclear whether the Ordovician Ida-Viru groundwater body (the Lasnamäe-Kunda water layer) will be able to be used as a source of drinking water after the mines are closed. Only mined areas have been studied so far.

68. The survey carried out by the National Audit Office among local authorities<sup>16</sup> revealed that the impact of mining is biggest on groundwater and it results in the disappearance of water from wells or in the water becoming undrinkable. According to the local authorities, some drinking water wells have dried up in 70% of all local authorities due to current oil shale extraction. 43% of local authorities with oil shale deposits said that the quality of drinking water in some wells is poor. Drying out of wells or the quality of drinking water is a problem in 55% of the local authorities where mining has been suspended or mines have been closed.

69. Neither do the Oil Shale Development Plan and its implementation plan contain any actions aimed at the protection of the flowing bodies of water affected by mining or improvement of their status. Directing mining water into water bodies significantly changes the water regime of water bodies in areas where mining has taken or will take place, and this results in floods and increasing soil erosion. Mining water also increases the content of suspended solids, sulphate, magnesium and calcium in water bodies. According to the Water Management Plan of the East-Estonian Basin, extraction has had a negative impact on the Rannapungerja, Purtse, Ojamaa, Kohtla, Erra, Mustajõgi and Pühajõgi rivers.<sup>17</sup> The sulphate content of these water bodies is ca 200–600 mg/l, exceeding the ordinary sulphate content of surface water many times.

70. Closure or suspension of the mines would not solve the problem either, because the water level in mines that have already been closed must be kept under control to avoid flooding or polluting the groundwater. Previous experience has shown that the problems caused by mining water may also become evident years later and the consequences of this may have a direct impact on the local community. For example, when a number of mines south of Jõhvi were flooded, this also caused excess water problems in Jõhvi town. After the Tammiku mine was flooded, the mining water flowed into the forest through the sinkhole that appeared at the intersection of the mine passages and only then was it decided to establish a functioning drainage system.

71. These examples prove that the focus tends to be on dealing with consequences rather than prevention. This is partly the result of inadequate studies. For example, there have been no broad studies of the

<sup>16</sup> Mäetaguse, Illuka, Sõmeru, Vaivara, Sonda, Jõhvi, Maidla, Kohtla Nõmme and Kohtla municipality and Kiviõli and Kohtla-Järve town

<sup>17</sup> Water Management Plan of the East-Estonian Basin, Order no. 118 of the Government of the Republic of 1 April 2010

impact of mining water on bodies of surface water and ecosystems. It is necessary to study in detail the impact that the changes in water regime associated with mining have on plant communities (incl. on nature conservation sites and on protected species outside of conservation areas).

72. Since oil shale extraction, the opening of new mines, the closure of existing mines and pumping water out of them will continue in the coming decades, the impact of mining on surface water will also increase.<sup>18</sup>

73. The **National Audit Office is of the opinion** that the rise in the negative environmental impact of the oil shale sector is currently associated with both the scale of extraction and the further use of oil shale. The environmental impact will not decrease until the best available technology and equipment are used in oil shale extraction and processing. The Ministry of the Environment has not planned a single specific activity in the development plan which would help reduce the environmental impact of oil shale mining and use. No actions have been planned for reducing the quantity of bottom and fly ash, mine waste and CO<sub>2</sub> emissions, although the relevant impact indicators have been set. Neither does the development plan contain any activities that would result in increased waste recovery and reduce the quantities of other air pollutants in addition to CO<sub>2</sub>.

#### Did you know that...

although the Ministry of the Environment has set itself the obligation to assess the impact of the development plan's implementation on the environment once a year, it has not done so yet.

In order to assess the impact, the Ministry had to summarise the results of the environmental monitoring required according to the environmental permits in the oil shale sector.

According to the Ministry, they regard the annual report on the fulfilment of the implementation plan as impact assessment, but the National Audit Office is of the opinion that this report is an overview that does not contain any assessment.

74. The National Audit Office also points out that the state agrees with the deterioration in the quality of groundwater and the decrease in reserves as a result of continued oil shale extraction and use. This is illustrated by the almost non-existent addressing of the problems of groundwater protection in the Oil Shale Development Plan. The Ministry of the Environment has been aware of the bad status of the groundwater body of the Ordovician Ida-Viru oil shale basin for a long time and it also knows that a good status must be achieved by 2015 pursuant to the EU Water Framework Directive. Although proposals on how to prevent the further deterioration of the status of this groundwater body have been made, the Ministry has postponed their implementation until the new 2016-2027 period of the Water Management Plan. The National Audit Office is of the opinion that using the need to guarantee energy security with oil shale electricity to justify this postponement to the European Commission is not correct. Namely, as an open electricity market participant, Estonia cannot favour domestic production sources when guaranteeing power supply to its consumers. Also, oil shale will predominantly be used for oil production in the future, and this oil will be exported.

75. Nor has the Ministry of the Environment planned any actions for the protection of surface water, although it is clear that either the state or local authorities will have to solve the problems caused by mining for many decades to come. Planning the protection of surface water is also complicated by the fact that the overall impact of oil shale mining water on bodies of surface water and their ecosystems has not been studied at all. Since there are other factors that affect the status of water bodies in addition to mines (agriculture, wastewater and dams), it is necessary to

<sup>18</sup> Water Management Plan of the East-Estonian Basin, Order no. 118 of the Government of the Republic of 1 April 2010

carry out detailed analyses of the specific factors that have led to deterioration in the status of bodies of water.

**76. Recommendation of the National Audit Office to the Minister of the Environment:**

- in order to clearly distinguish between the environmental impact of oil shale extraction and use, establish separate actions that reduce the environmental impact of extraction and use as well as the indicators that make it possible to assess them (e.g. spoiling surface water and groundwater and reducing waste generation).
- Develop measures with groundwater experts that would help mitigate the impact of oil shale extraction on groundwater bodies.
- Before 2015, prepare an action plan on how to prevent further deterioration in the status of the groundwater body of the Ordovician Ida-Viru oil shale basin and thereby also prevent deterioration in the status of adjoining groundwater bodies.
- Assess the impact of oil shale extraction and the closure of mines on the quality of the groundwater body of the Ordovician Ida-Viru oil shale basin and the adjoining groundwater bodies.
- Assess the impact of oil shale extraction and the closure of mines on surface water and related ecosystems and communities (incl. conservation areas and protected species).

**Response of the Minister of the Environment:** I agree that separate actions and indicators that make it possible to assess the actions must be indicated in the Oil Shale Development Plan to reduce the negative environmental impact of oil shale extraction and use. This is how the topic has been handled in the new Oil Shale Development Plan. Separate subchapters about the impact of oil shale extraction and its use have been used in the structure of its draft to describe environmental impact. The problems of the specific area are highlighted at the end of each subchapter and the development plan offers measures and actions for the solution of these problems as well as indicators that can be used to assess the extent to which goals are achieved. The environmental impact of oil shale extraction and use is analysed both separately and in combination in the Strategic Environmental Impact Assessment (SEA) Report prepared during the development of the Oil Shale Development Plan.

The Ministry of the Environment plans to define measures for the mitigation of the negative environmental impact caused by oil shale extraction in cooperation with researchers and entrepreneurs. For example, one such measure is to redirect the water pumped out of mines and quarries back into the environment in a manner that affects the overall water balance and circulation of the region as little as possible.

[Protection of the groundwater body of the Ordovician Ida-Viru oil shale basin] The action plan will be prepared in 2014, but will presumably be presented to the Government of the Republic with the water management plan for the next period (2015-2021).

The impact of oil shale extraction on the quality of the groundwater body of the Ordovician Ida-Viru oil shale basin and surrounding groundwater bodies is assessed within the scope of the assessment of the status of groundwater bodies. This forms part of the assessment of the status of groundwater bodies, preparation of a surveillance network and development of measures for maintaining or improving the status of groundwater bodies under the water management plan.

The environmental impact of the closure of oil shale mines is different in each mine and quarry. The impact factors, the affected ecosystems and the scope of the impact are all different. This is why the negative impact of the closure of mines is assessed with the scope of the environmental impact assessment of the specific closure project. The measures for mitigating the environmental impact of the closure of mines are also developed on the basis of the environmental impact assessment report.

## **Non-existent studies make better planning of oil shale extraction and use in the new development plan impossible**

77. The Ministry of the Environment has started preparing the new Oil Shale Development Plan, which plans oil shale extraction until 2030. The most important topics discussed in the development plan are reduction of the environmental impact of oil shale extraction and use, more economical use of oil shale and establishing a maximum annual extraction limit.

78. The exhaustion of oil shale reserves and the pressure applied by companies to continue mining mean that new oil shale reserves must be taken into use. Before declaring new reserves active, the state must assess the **comprehensive impact** of oil shale extraction and use, incl. health and socioeconomic impact. Reserves must be used on the principle that the reserves that cause the smallest negative environmental, health and socioeconomic impact are taken into use first of all.

### **Many important studies have not been carried out**

79. When oil shale extraction and use are planned and when new reserves are taken into use, it is important to know what impact this will have. This helps avoid the generation of negative impact that is impermissibly large on groundwater or surface water, people's health and the socioeconomic environment. Identifying impact also helps plan actions for mitigating the negative impact already caused.

80. The new Oil Shale Development Plan until 2030 does not make it possible to plan the sector much better than the present one, because the studies needed to identify the socioeconomic, health and environmental impact of oil shale extraction and use have not been carried out. Commissioning several studies was planned in the present Oil Shale Development Plan (until 2015), but many of them have not been carried out to the planned extent or not at all (see Annex A).

**Comprehensive impact of oil shale sector** - impact of oil shale mining and use on nature, health and the socioeconomic environment.

## The health impact of the oil shale sector has not been analysed

### Did you know that...

the present Oil Shale Development Plan states that the health impact of the oil shale industry must be identified and measures must be developed for the mitigation of this impact.

The Health Board started working on the study in early 2013; it will presumably be completed in 2016.

## The socioeconomic impact of the oil shale sector must be more thoroughly studied

Impact on the living environment is regarded as the **socioeconomic impact of the oil shale sector** in this report: the impact on local development, economic subsistence (employment and income), infrastructure and property, and demographic development.

81. Although oil shale has been extracted for decades, health experts and local authorities feel that the state has failed to ascertain the factors of oil shale that pose a risk to people's health or analysed and assessed the health impact of these factors. This does not allow the state to take steps for the protection of people's health. At present, the state has no overview of the kind of pollutants generated by the oil shale sector that people come into contact with and of the quantities in which they are generated. For example, air surveillance is carried out, but the collected data are not analysed. There are also too few air pollution measurement stations, and measurements are taken over short periods of time.

82. The state could already have launched several actions, as the sources of pollution have been operating for decades and enough data has been collected about the impact over the years. For example, the National Institute for Health Development and Statistics Estonia have collected data about people's health and social subsistence (incl. the national census). Data about air pollution can be obtained from the two surveillance stations operating in Kohtla-Järve, one of which belongs to AS Viru Keemia Grupp and the other to the state. Data about water quality can be obtained from the Environment Agency, the Environmental Research Centre and the Health Board.

83. According to the Ministry of Social Affairs, the cost cuts caused by the recession were the reason why health research was left out of the implementation plan of the Public Health Development Plan. Lack of money is also a reason why the necessary staff (who could work on the preparation of research, assessment of health risks etc.) have not been hired. For example, there is just one person working in the Risk Assessment Bureau of the Health Board, who simply is not able to deal with all of the necessary tasks (assessment of the risks of single companies as well as whole sectors).

84. The **socioeconomic impact** of the oil shale sector has not been thoroughly studied either. The first study that directly focussed on the socioeconomic impact of oil shale extraction and use was carried out by the Praxis Centre for Policy Studies in 2013. According to them, the study makes it possible to assess the trends (positive and negative) and extent of single impact factors, but not to give a comprehensive final assessment of the socioeconomic impact of the oil shale sector. The study points out that since the oil shale sector is important in terms of employment in the region, the possible impact on employment and income must be assessed when decisions affecting the sector are made.

The authors of the study are of the opinion that their study is not a substitute for the fundamental research required for the preparation of the Oil Shale Development Plan. For example, experts advised the state to define areas with active oil shale reserves where extraction will take place in the future and the impact on other economic activities is considered. Areas with passive reserves, where economic activities and residential development will be less restricted, should also be defined. Another recommendation was to study the impact of the activities carried out by the oil shale industry in the past.

**The problems related to ground stability in mined areas must be clarified**

85. One of the aspects of the socioeconomic impact of oil shale mining that needs to be more thoroughly studied is the stability of the ground in mined areas. Supporting pillars are left in underground mines to support the ground. The ground can sink by up to 1.7 m when mine ceilings collapse. This changes the water regime in the ground and the area may turn into a swamp. The strength of supporting pillars decreases over time. No research has been done to find out how well pillars last in flooded mines and how likely it is that they may collapse. Only light buildings that have a stronger structure (e.g. slab foundations) can be built in areas of underground mines where the ground is supported by pillars. However, this makes construction more difficult and expensive, and reduces interest in building in these regions.

86. The Ministry of the Environment justified the failure to carry out the necessary research and delays in starting the research with the budget cuts made as a result of the recession.

**Lack of studies is an obstacle to planning the use of oil shale reserves**

87. A lack of research is why the state has not made several important decisions, such as which mining fields in the oil shale deposit will be mined first, where and when mining will start next and in which mining fields it is necessary to postpone mining for as long as possible. The order in which reserves are taken into use should depend on the impact mining will have – the mining fields where the impact is smallest should be mined first. At present, almost all active reserves have been declared equal in terms of their impact. The extractors actually choose the mining fields where they start mining when they submit their extraction permit requests to the Ministry of the Environment.

**The local authorities in oil field deposit areas are not sufficiently involved in decision-making.**

88. This means that the present procedure for using oil shale deposit puts local authorities in a difficult position, as it is not known when extraction will start in certain areas. For example, the only buildings that may be built in the oil shale deposit are temporary residential buildings and industrial buildings to maintain access to the mineral reserves. However, temporary permits create uncertainty about the future among new residents and companies, and they choose a different region or local authority in which to live and operate. Sale of state-owned agricultural land in the deposit is also out of the question.

**Did you know that ...**

there are ten local authorities in Ida-Viru and Lääne Viru Counties where 25% or more of the territory is comprised of oil shale deposit. In six local authorities, deposits cover at least 60% of the territory. The percentage of the territory covered by the deposit is ca 90% in Illuka municipality and ca 80% in Rägavere municipality.

89. To date, the involvement of local authorities in the oil shale deposit in deciding on the use of oil shale reserves has been irregular and rare. For example, the local government association represents local authorities in many issues. A survey of local government leaders indicated that local authorities want to be directly involved in decision-making. Local government leaders want to participate more actively in the development of the National Development Plan for Oil Shale Use, in the establishment of the conditions of extraction permits and environmental impact assessment, in the development of the rates of environmental charges and in the revaluation of reserves.

**The comprehensive impact of mining is not considered in the revaluation of oil shale reserves**

90. Before the adoption of the new Oil Shale Development Plan the Ministry of the Environment intends to qualify a large quantity of oil shale reserves as active whose mining was previously considered

**The state wants to start using large quantities of new oil shale reserves**

### Oil shale reserves can be reassessed in two ways:

- by declaring that an oil shale reserve whose extraction was previously prohibited is active, e.g. by also permitting the extraction of oil shale of lower energy content in the future;
- by declaring that a reserve whose extraction had been permitted is negative, i.e. a new conservation area is formed and extraction is prohibited.

### The comprehensive impact of mining is not assessed when reserves are declared active

**Groundwater feeding area** – area with a thin surface where water from melted snow and rain flows into surface cracks and replenishes groundwater reserves.

There is no permanent water network on the arch of the Pandivere Uplands. The water absorbed into the ground on the arch of the uplands exits in the numerous springs on the edge, which form the start of many rivers that are rich in water (Pärnu, Põltsamaa, Pedja, Jägala et al.).

unfeasible due to its low calorific value. **Oil shale reserves are revalued** on the basis of just two criteria: the reserve must contain enough energy; and it must not be located in a nature conservation area. The National Audit Office is of the opinion that the state does not have a clear understanding of what the comprehensive impact of taking the reserve into use would be.

91. An oil shale reserve may be declared active if economical use of the reserve is guaranteed upon extraction and the complex impact associated with the extraction is acceptable to society. However, this means that the state must assess the negative impact of the oil shale sector as a whole: socioeconomic, health and environmental impacts.

92. This means that whilst reserves whose energy content is 35 GJ/m<sup>2</sup> have been considered active to date, then in the future it will also be possible to extract oil shale whose energy content is at least 30 GJ/m<sup>2</sup> (see Annex B). The reason given for the change is that using oil shale of lower energy content has become economically feasible for companies.

93. According to a study carried out by the Department of Mining of Tallinn University of Technology, *ca* 2.1 billion tons of oil shale reserves can be qualified as active.<sup>19</sup> The reserve under nature conservation areas (areas where the surface is more than 30 m thick) was also considered in this opinion. The precondition to declaring a reserve active is the existence of suitable extraction technology which does not have a negative impact on protected sites. Economic activities in conservation areas are currently prohibited by the Nature Conservation Act. This means that the Ministry of the Environment cannot automatically declare the oil shale reserves given in the study as active. The National Audit Office is of the opinion that if the reserves under nature conservation sites are left passive, then *ca* 1.3 billion tons of oil shale reserves can be declared active. Since the oil shale reserves whose extraction is currently permitted also amount to 1.3 billion tons, then the Ministry's intention is to double the quantity of oil shale whose extraction is permitted to 2.6 billion tons.

94. However, the comprehensive impact of extraction, incl. environmental impact, is not assessed when oil shale reserves are revalued. Environmental impact is only assessed when the extractor has applied for a permit to mine in a certain area of land. The current practice of granting extraction permits and environmental impact assessment confirms that permits have not been refused for environmental considerations.

95. The Pandivere Uplands and adjoining areas form one of the areas where oil shale can be extracted as a result of the revaluation of reserves. However, the Pandivere Uplands are an important **groundwater feeding area**, where extraction will have a negative impact on the groundwater regime and quality, and will affect numerous bodies of surface water. Experts insist that an oil shale mine should never be established in or near

<sup>19</sup> Determination of Oil Shale Uses and Assessment of Reserves Based on New Criteria to Guarantee Sustainability of Oil Shale Use. Department of Mining of Tallinn University of Technology, 2010

a water protection area.<sup>20</sup> The Pandivere nitrate-sensitive area has been formed, but it only focuses on protecting surface water near the ground and on reducing the nitrate content of water and does not prohibit mining.

96. Unfortunately, *ca* 20% of the reserves of the Estonian oil shale deposit are located in the territory of the uplands. For example, two companies have already applied for permits to extract in the Sonda research field, which is located near the Pandivere Uplands. The National Audit Office is of the opinion that declaring oil shale reserves active without any impact assessment is impermissible.

97. The **National Audit Office is of the opinion** that such a superficial attitude towards the impact of oil shale assessment means that the decisions made about the extraction and use of oil shale will not be better or more thought through than before. Several aspects of environmental impact as well as health and socioeconomic impact have not been identified in depth. Establishing a new annual extraction limit and making decisions on the revaluation of oil shale reserves before assessing the comprehensive impact of oil shale extraction and use is impermissible.

**98. Recommendations of the National Audit Office to the Minister of the Environment:**

- organise an assessment of the comprehensive impact of oil shale extraction before the preparation of the new development plan. In addition to the recommendation in Point 76 of the report, the following research should be carried out:
  - identify the stability of the ground above underground mines and the related impact, and a map of known collapses for further overviews;
  - develop measures for protecting the Pandivere groundwater body. One option is to create a Pandivere water protection area.
- Based on comprehensive impact assessment, assess the complex negative impact of oil shale extraction that society is prepared to tolerate. A new annual extraction limit should therefore be established with the Earth's Crust Act.
- Based on comprehensive impact assessment, identify the areas where the impact of extraction is smaller and areas where impact as a whole is larger. Take account of the assessment results when mining areas are selected and update the actions and measures in the Oil Shale Development Plan on this basis.
- Take account of the comprehensive impact assessment of oil shale mining when oil shale reserves are revalued and new reserves are declared active, permitting extraction only in areas where the expected impact is smaller. Give special attention to protecting groundwater in the Pandivere Uplands and surrounding areas.

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<sup>20</sup> Pandivere National Water Protection Area. AS Maves, 1993

- Increase the participation of local authorities more and via direct representatives in making decisions about the use of oil shale. For example, local authorities should be involved in declaring oil shale reserves active, granting extraction permits, incl. the process of environmental impact assessment and the preparation of the Oil Shale Development Plan. Organise information events in local authorities of oil shale deposit during the preparation of the development plan. Local authorities must be included in preparing and carrying out research related to oil shale.

**Response of the Minister of the Environment:** strategic assessment of the environmental impact of the Oil Shale Development Plan will be carried out during the preparation of the plan and a relevant report will be prepared. The data for this can also be obtained from the results of the applied research carried out for the determination of extraction sensitivity, the first stage of which was completed in 2010 and the second stage of which is expected to start this year.

The ‘Digitalisation of the Plotting Boards of Oil Shale Mined Areas and Stability Assessment’ research of Tallinn University of Technology is also about to be launched and should be completed in 2015.

The groundwater bodies whose status will be maintained or improved within the scope of water management plans have already been determined in the area of the Pandivere Uplands. The status of each groundwater body will be assessed for this purpose at the beginning of the six-year period of the water management plan, and the pressure factors of each groundwater body will also be determined. This will be followed by defining measures for mitigating the impact of pressure factors and monitoring the status of the groundwater body to assess the impact of the measures and the changes taking place therein. The status of groundwater bodies will be assessed again at the end of the six-year period of the water management plans to plan actions for the new period of water management plans. A nitrate-sensitive area has also been formed in the region to protect groundwater from the pollution generated by agriculture.

I agree that establishing the permitted annual limit of oil shale extraction and use on the basis of the SEA makes sense. The necessity of a new annual limit is doubtful, because current knowledge suggests that tolerating impact even larger than it is at present is not acceptable.

I agree with the recommendation [to identify areas of larger and smaller mining impact on the basis of a comprehensive impact assessment], which can be done using the results of the mining sensitivity research and the results of the SEA.

I agree that the results of comprehensive impact assessment (in this case the mining sensitivity research and SEA) must be taken into account when oil shale reserves are revalued and declared active. We will give special attention to groundwater – as a source of both drinking water and water necessary for ecosystems.

Local authorities must be included in making any decisions concerning the earth’s crust. Until now, local authorities have constantly been included in processing applications for geological research permits and

mineral resource extraction permits, environmental assessment and preparation of development plans regarding mineral resources (as required under the provisions of the Earth's Crust Act). They will soon be included in the preparation of the Oil Shale Development Plan: as soon as the primary version of the development plan is ready to be presented. The Estonian Mineral Resources Committee (EMRC), which reviews the drafts of all decisions and strategic documents concerning the earth's crust, has been an excellent cooperative body. There are also representatives of several local government associations among the members of the EMRC.

**99. Recommendations of the National Audit Office to the Minister of Social Affairs and the Minister of the Environment:**

- The following should be done before the preparation of the new Oil Shale Development Plan:
  - collect the monitoring data of sources of pollution in the oil shale sector and analyse them. Identify the total quantity of pollutants generated by all sources of pollution and how dangerous these pollutants are;
  - collect the health data and surveys of the residents of Ida-Viru County and analyse them; and
  - on the basis of the pollutant monitoring data and the health surveys of Ida-Viru County residents, plan measures for assessing and mitigating the health impact of oil shale extraction and agree on sources of financing before the new Oil Shale Development Plan (2016-2030) and its implementation plan are adopted.
  - Add mitigating measures in addition to the aforementioned ones to the new Oil Shale Development Plan, its implementation plan and Public Health Development Plan on the basis of the health impact research to be completed in 2016.

**Response of the Minister of Social Affairs:** we agree that the given recommendations will help to prepare a new and better Oil Shale Development Plan, which takes account of the comprehensive impact of oil shale extraction and use on the environment and health.

Research to identify the impact of oil shale extraction and use on people's health has been launched to implement the recommendations given in the draft audit report. The Health Board applied for support for a 'Study of Health Impact of Oil Shale Sector' from the Environmental Investment Centre to identify the impact that oil shale extraction and use have on people's health. The Environmental Investment Centre decided to support this project with 163,955 euros on 19 June 2013. The first stages of the project will include identifying sources of pollution in the oil shale sector as well as collecting and analysing monitoring data and the data of scientific research carried out in the past. An analysis of illness and the mortality rate of the population will then be carried out. It will compare the incidence of tumours, illnesses of the respiratory tract and respiratory organs (incl. asthma) and cardiovascular diseases in areas affected and not affected by oil shale extraction. A cross-sectional survey will also be carried out among the residents of Ida-Viru County in the later, clinical

research stage of the project to create better connections. The first part of the survey will focus on adults and the second part on children. A random sample of adults (2500 people) will be found and questionnaires about health complaints, living environment and socioeconomic indicators will be posted to them. The health complaints reported by the respondents themselves will then be connected with objective environmental indicators and health data. The project has not yet been launched, as the clinical research permit from the human studies ethics committee is pending. The expected launch date of the project is 1 December 2013. The deadline of the project is March 2015.

An overview of the health impact of the oil shale sector in Estonia will be completed as a result of the project and the results will help plan measures for mitigating the negative health impact in the new Oil Shale Development Plan. Both the Ministry of Social Affairs and the Health Board are involved in the preparation of the National Development Plan for Oil Shale Use 2016-2030.

**Response of the Minister of the Environment:** the Health Board is currently working on the ‘Study of Health Impact of Oil Shale Sector’, which was financed by the Environmental Investment Centre. It should be possible to use the first data collected in the course of the study in the preparation of the Oil Shale Development Plan after the first quarter of 2014 (interim report). The following is known at the moment: underground mining of oil shale has a smaller impact on ambient air than mining above ground, where fine particles and gases created by blasting end up in the air. A significant share of ambient air pollution in Estonia comes from the oil shale industry and the most important pollutants are fine particles, which consist of many components and among others contain organic pollutants, incl. persistent organic substances and metals, and may be carcinogenic. The finer the particles, the more damage they cause to a person’s health if they end up in the respiratory tract. The heavy metals that are emitted into the ambient air accumulate in soil, plants and the food chain, and their harmful impact on organisms may take a long time to become evident. In terms of groundwater, there is no negative impact on people’s health coming from the oil shale sector. Instead, the impact manifests itself in the spoilage of sources of drinking water, which means that new wells or even catchments need to be established for people.

I agree [that health impact assessment and finding money for this purpose must be agreed before the adoption of the new development plan], which will be agreed during the preparation of the Oil Shale Development Plan and the implementation plan.

The aforementioned ‘Study of Health Impact of Oil Shale Sector’ will be completed in 2015. The results can be used in the preparation of various strategic documents and their implementation plans by the end of the first quarter and thereafter.

## Regulation and supervision of mining is inadequate

100. The environmental impact of oil shale mining is complex, which is why it makes sense for the state to regulate mining with one permit. The efficiency of oil shale extraction increases and its negative impact on the environment decreases when the state sets the use of best available technologies as a condition in the environmental permit (currently extraction permit).

101. It is necessary to exercise supervision in order to know how much oil shale is extracted and whether the state is receiving a fair charge for extraction rights. For example, 76% of the charge for mineral resource extraction rights is paid for the extraction of oil shale. The oil shale extraction charge received in 2012 was 25 million euros. This means that adherence to the conditions established in the extraction permit is important in terms of both the correct use of oil shale reserves and the reduction of environmental impact.

### Several different environmental permits would not resolve comprehensive environmental problems

Issuing several environmental permits to extractors diffuses responsibility

102. The state regulates mining and its environmental impact with four different permits. Regulating the sector in this manner creates unnecessary workload and expenses for both the state and mining companies, diffuses responsibility at the level of the state, duplicates the conditions given in the permits and is an obstacle to obtaining a comprehensive overview of the impact of mining.

103. An extraction permit, waste permit, permit for special use of water and ambient air pollution permit are issued to oil shale extractors. On top of that, different agencies grant the permits, monitor adherence to conditions and check reports. Extraction permits are issued by the Ministry of the Environment and the remaining permits are issued by the relevant regions of the Environmental Board.

104. Separate specialists deal with each type of impact in the Environmental Board: a water specialist with water issues, an air specialist with air issues and a waste specialist with waste issues. Environmental impact assessment is organised separately by environmental management specialists. This basically means that each specialist is responsible for their own narrow field. For example, the water specialist issues permits for special use of water, establishes conditions in the permits and monitors their performance. Such fragmentation makes obtaining a comprehensive overview of the environmental impact of mining difficult and also diffuses responsibility.

105. For example, the permit for special use of water issued to the Narva quarries mainly reflects the use of water, but not the broader impact mining has on the aquatic environment. The impact on a body of water as well as the adjoining terrestrial ecosystem, the decrease in groundwater reserves and the deterioration in the quality of groundwater usually stretch further than the region covered by the permit for special use of water, but they are not mentioned in the permit.

106. This is also confirmed by the fact that the Ministry of the Environment initiated the assessment of the environmental impact of the extraction permit in the Narva quarries just five months after the Environmental Board had approved the environmental impact assessment report of the permit for special use of water, the ambient air pollution permit and the waste permit. According to the Ministry, it initiated the assessment because, to their knowledge, no relevant environmental impact assessments had been carried out before. The National Audit Office finds the reason given by the Ministry to be appropriate, as the assessment report approved by the Environmental Board did not touch upon the impact of mining on the nearby Kurtna landscape protection area and Puhatu nature conservation area. However, organising several environmental impact assessments creates bureaucracy and costs for both the extractors and the state.

107. An analysis of environmental permits revealed that many conditions are duplicated in the permits. For example, both the extraction permit and permit for special use of water of Eesti Energia Kaevanduste AS include the requirement to clean and reconstruct the sludge settling ponds in Väike-Pungerja village.

108. The fact that in recent years conditions have been added to extraction permits on the basis of environmental assessment reports is a positive example. For instance, the extraction permit of the Estonia mine includes the requirement to study the possible impact of redirecting mining water past the Kurtna lakes, measure the ground oscillations associated with blasting and establish drinking water wells for the residents. However, these are not actions that reduce direct negative environmental impact.

109. At the same time, the Ministry of the Environment has so far failed to use the opportunity to establish conditions for the use of technology in the extraction permits despite the development plan stating that the introduction of best available technology will enable the efficiency of mining to be increased. The best technology is usually more expensive than existing technology and reduces the profitability of mining. This means that companies will not start using them unless they are forced to do so by the state. However, the Ministry of the Environment explained to the National Audit Office that companies are already using the best available technology and the topic requires no further attention.

110. For example, rock can be mechanically crushed and removed from the massif in both quarries and underground mines instead of drilling and blasting. This would make it possible to prevent the ground oscillations caused by blasting, noise, dust and exhaust gases emitted into the air, and water pollution. Oil shale loss would also decrease. However, drilling and blasting are still used in Estonian underground mines today.

111. Mechanical rock-cutting technology (surface miner) is used by AS Kunda Nordic Tsement in the Ubja oil shale quarry and by Kiviõli Keemiatööstuse OÜ in Põhja-Kiviõli quarries. No mining loss is generated in the Ubja quarry, as the company is interested in mining as economically as possible. Eesti Energia Kaevanduste AS, however, is using drilling and blasting technology in the Narva quarries and the mining loss is 11% of the extracted quantity.

### The extraction permits contain no requirements regarding the technology that must be used

#### Did you know that...

technology for refilling the workings left by mining is currently being researched to reduce oil shale loss in underground mining and reduce environmental impact. According to this, mining chambers are filled with a filler made of oil shale ash and crushed mining waste, which forms an artificial supporting pillar when it hardens.

Lack of money for applied research is an obstacle to the development of the technology. Scientists say that extractors consider applied research too expensive and are not interested in financing it. For example, one artificial pillar used in the research costs *ca* 100,000 euros.

Also, the possible environmental impact of the working-refilling technology must also be thoroughly studied before it can be taken into use.

**The quantity of extracted oil shale is basically not checked**

**Did you know that...**

in its 2009 audit 'Organisation of Extraction of Mineral Resources Used in Construction by the State', the National Audit Office also concluded that the inspection of extraction volumes is inadequate.

**State supervision over the quantities of extracted oil shale is inadequate**

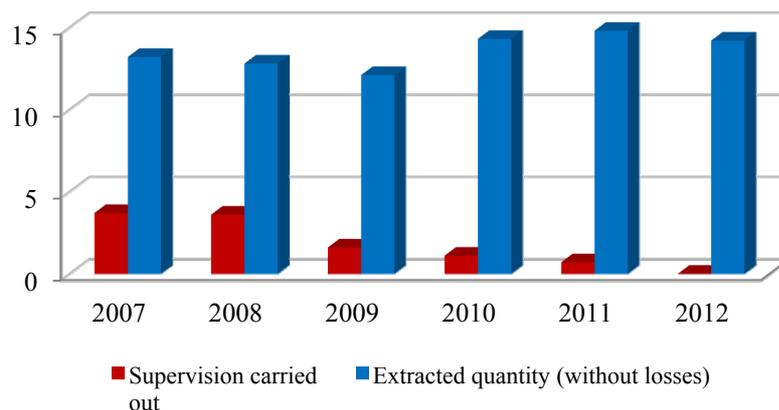
112. The state cannot be certain that the data about the quantities of extracted oil shale and the extraction charges paid on these quantities are correct. The data submitted by the extractors was taken at face value during the audited period and they were not checked.

113. The Environmental Board, the Ministry of the Environment and the Environmental Inspectorate are obliged to supervise mining. The Environmental Board as the inspector of the correctness of environmental charges and the Ministry of the Environment as the issuer of extraction permits have the right to order control measurements. However, neither of the authorities has organised any control measurements so far.

114. According to the Environmental Board, it was responsible for the correct calculation of the extraction fees imposed on companies until 1 April 2011. Companies themselves are responsible for these calculations after this date and the Environmental Board only carries out follow-up inspections. In its explanation to the National Audit Office, the Environmental Board stated that they have not checked the correctness of the environmental charges declared by oil shale extractors since 1 April 2011 because they found no signs of the risk of fraud by oil shale extractors in the course of risk analysis.<sup>21</sup>

115. The Environmental Inspectorate has inspected the performance of the conditions of extraction permits from 2007-2011, but mainly in quarries and mines where mining volumes are small (see Figure 13). The Environmental Inspectorate did not inspect the performance of the conditions of extraction permits in the Estonia mine and Narva quarries from 2007-2012, although the oil shale extracted in these mines comprises ca 70% of the total annual extraction quantity.

**Figure 13. Annual quantity of oil shale extraction (million tons) and supervision of extraction permits by the Environmental Inspectorate from 2007-2012**



Source: National Audit Office on the basis of data of the Estonian Land Board and the Environmental Inspectorate

116. According to the Environmental Inspectorate they have inspected extracted quantities on the basis of the mine surveying measurements of companies and with GPS devices in smaller quarries, but the data obtained in this manner are rather vague and not as reliable as control measurements.

<sup>21</sup> Minutes of interview with employees of the Environmental Board, 23 April 2013

The actual extracted quantity can be ascertained with control measurements in underground mines and with inspection flights in quarries.

117. Although supervision of mining is not a duty of the Land Board, they organised inspection flights in oil shale quarries in 2009 and 2012 using money received from the Environmental Investment Centre. Several problems were highlighted in the flight reports (see Table 3) and information about them was sent to the Ministry of the Environment and the Environmental Inspectorate in April 2013.

**Did you know that...**

the peat in the state mineral resources register may be extracted if an extraction permit has been issued. Also, an extraction charge must be paid on the peat.

However, Eesti Energia Kaevanduste AS does not have a permit for extracting peat and it has not paid the extraction charge.

**Table 3. Results of inspection carried out by Land Board in 2012**

Name and number of extraction permit	Results of inspection flights
Vanaküla quarry fields (Eesti Energia Kaevanduste AS) KMIN-017	Heaps and body of water outside service land, KMIN-036 permit expired, not reconditioned.
Narva quarry (Eesti Energia Kaevanduste AS) KMIN-073	554,400 tons of peat entered in the mineral resources register was extracted during the extraction of oil shale from the overburden and the establishment of a new sludge settling pond from 2009-2012.
Sirgala quarry (Eesti Energia Kaevanduste AS) KMIN-074	From 2009-2012, ca 26,200 tons of passive proven reserves, which are not among the extracted reserves on the permit, were extracted from the block (barrier pillar) and 232,400 tons of peat entered in the mineral resources register was extracted from the overburden and outside the permitted service land during the establishment of a new sludge settling pond.
Sirgala oil shale quarry II (Eesti Energia Kaevanduste AS) KMIN-087	125,800 tons of peat entered in the mineral resources register was extracted during the extraction of oil shale from the overburden from 2009-2012.

Source: Estonian Land Board

118. According to the Environmental Inspectorate, misdemeanour proceedings have been launched on the basis of Subsection 48 (8) of the Earth's Crust Act due to the failure to recondition the Vanaküla quarries. The supervision procedure of the Narva quarry (including the Sirgala quarries) is still ongoing.

119. Eesti Energia Kaevanduste AS has extracted more than 900,000 tons of peat from the Narva quarries without a permit. According to the mineral resources balance sheet, 831,000 tons of peat on average was mined on the basis of permits from 2009-2012. The means that Eesti Energia Kaevanduste AS has extracted more peat than the average annual quantity extracted by all other peat extractors. Since the extraction charge must also be paid for extracting mineral resources entered in the environmental register, this means that the state lost ca 1-1.3 million euros on the extraction of peat.

120. The **National Audit Office is of the opinion** that obtaining an adequate overview of the impact of extraction is difficult because mining is currently regulated via several environmental permits. There have been situations where the same condition is stated in several permits whilst there are other conditions (e.g. the use of technology) that have not been set at all. At the same time, it is repeatedly emphasised in both the Oil Shale Development Plan and its environmental assessment that increasing the efficiency of oil shale extraction and use and decreasing their environmental impact requires the use of better technology.

121. It is also impermissible that the state has failed to organise control measurements of the extracted oil shale quantities for decades. It is therefore impossible to be certain that the state has received correct amounts of extraction charges. The Ministry of the Environment has declared the first procurement for making control measurements in oil shale mines. The state must also be concerned about the illegal extraction of other mineral resources, such as peat, and the extraction charges it has therefore missed out on.

**122. Recommendations of the National Audit Office to the Minister of the Environment:**

- prepare legal amendments for regulating the operations of extractors with one environmental permit in the future;
- establish conditions regarding the technology used in mining in mineral resource extraction permits; and
- initiate the amendment of the Earth's Crust Act in such a manner that the data of extracted mineral resource quantities submitted by the extractors must be regularly checked and that money for this purpose is allocated from the state budget. Consider the development of an amendment that gives the data of quarries collected by the Land Board in the course of inspection flights the power of proof both in the supervision and follow-up inspection of environmental charges carried out by the Environmental Inspectorate.

**Response of the Minister of the Environment:** with regard to this issue [– prepare legal amendments –] the Ministry of the Environment is still forming an opinion.

We are considering the establishment of conditions that would bring about a need to update technology. This presumes that the efficiency and environmental sustainability of the new technology is proven. The results of inspection flights have so far formed important input for risk analysis and for assessing the reliability of the measurements carried out by companies.

Giving aerial inspection the power of proof could be considered, but this carries significant risks in terms of environmental charges, as the results determined by this method are only accurate and reliable enough in regard to the calculation of environmental charges in certain cases. The data obtained by aerial inspection are indicative and highlight the need to inspect the extractor. The supervision carried out by the Environmental Inspectorate (EI) or the follow-up inspection of environmental charges cannot rely on them. The data must be specified with measurements on land.

The frequency of control measurements has increased in recent years. It is done on a random basis, relying on risk analyses, and the focus is on quarries where there is a reason to presume or suspect the submission of inaccurate data or where presumed violations have been detected on the basis of aerial controls carried out by the Land Board. We therefore find that the present risk-based approach is reasonable.

## The state is not paid enough for the use of a mineral resource of national importance

123. Oil shale must be used by valorising it to the maximum extent, and as economically and efficiently as possible in such a manner that all of the related negative impact (incl. on nature, the economic environment and health) is reduced to a minimum. The money received from environmental charges must be used for the maintenance of the environment, the reproduction of mineral resources and remedying environmental damage. The other taxes established by the state, such as labour taxes and excise duties as well as taxes on corporate profits, must guarantee the state a fair revenue for the use of a mineral resources of national importance.

**Environmental charges** are natural resource charges and pollution charges.

**External costs** – the damage caused to people, the artificial environment and ecosystems, and the risks that are partly or fully not borne by those who cause them, but by the people living in the area of their impact or by society as a whole, including future generations.

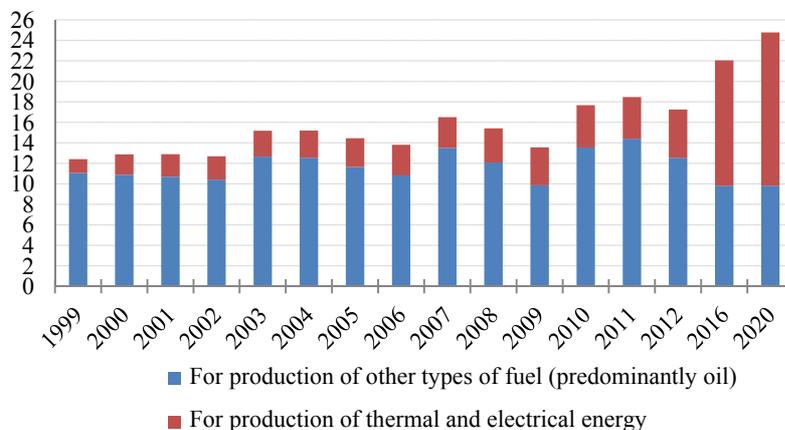
124. The purpose of **environmental charges** is to motivate companies to prevent or reduce potential damage related to the use of natural resources, emission of pollutants into the environment and disposal of waste. Environmental charges are also a tool via which the possible damage associated with extraction and production, i.e. **external costs**, must be included in the production price. The situation, place of use, quality and deficiency of the reserves of natural resources, the environmental hazards of the manner of use and the need to protect other natural resources are taken into account upon establishing charge rates. The sensitivity to pollution of the emission site, the hazardousness of the pollutant and the use of best available technology must also be taken into account.

**Exporting the electricity and oil produced from oil shale does not bring the state a fair revenue**

### Oil shale is increasingly extracted for export purposes

125. Although it is emphasised in the Oil Shale Development Plan that oil shale must be used by valorising it as much as possible, this is not the case at present. Oil shale is still predominantly used for electricity generation, but oil production has also been growing strong in recent years (see Figure 14). Oil shale consumption has increased, and the main reason for this is exports of electricity and oil, not an increase in domestic consumption. The electricity generated in 2012 exceeded domestic consumption by 29%. Electricity exports have increased *ca* seven-fold in the last 14 years.

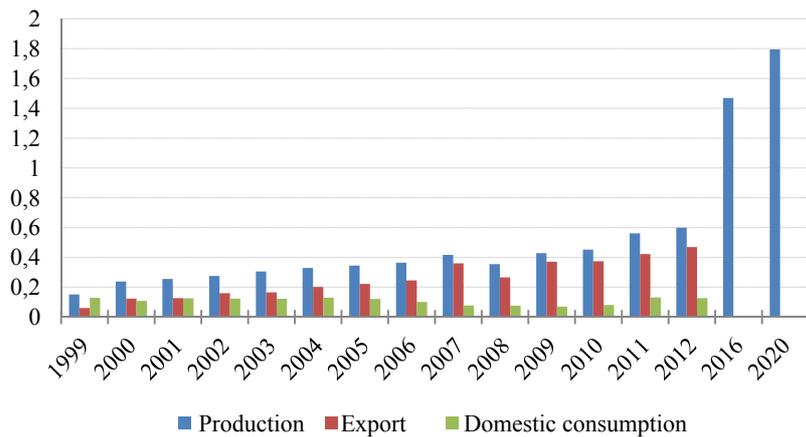
Figure 14. Oil shale consumption from 1999-2012 and forecast for 2016-2020 (million tons)



Source: National Audit Office on the basis of data from Statistics Estonia and the Ministry of Finance

126. Shale oil production grew consistently from 1999-2012 due to high oil prices and guaranteed high profits for producers. This has encouraged oil producers to make plans to multiply their oil production (see Figure 15). 78% of the shale oil produced in Estonia was exported in 2012. Shale oil exports have increased *ca* eight-fold in 14 years.

**Figure 15. Shale oil production, consumption and exports from 2005-2012 and forecast for 2016-2020 (million tons)**



Source: National Audit Office on the basis of forecasts prepared by Statistics Estonia and entrepreneurs

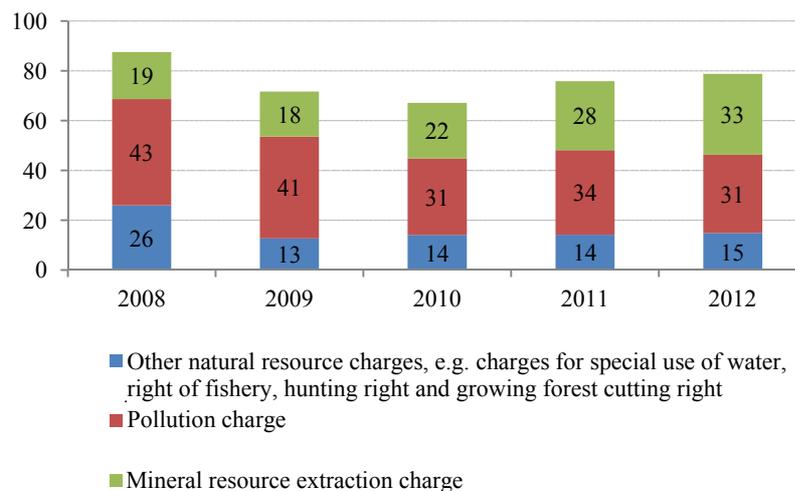
### The environmental charges of oil shale do not meet the goal established for them

**Environmental charge rates have been increased on the basis of agreements rather than anything else, which means that they do not reflect the actual status of the environment**

127. Estonia has not established a single tax aimed at earning revenue for the state from oil shale production. Until now the state has only considered it necessary to demand environmental charges for the extraction and processing of oil shale in order to influence entrepreneurs to use natural resources sustainably and to remedy the damage caused to the environment.

128. The amount of environmental charges received in the budget of the state and local authorities in 2012 was 79 million euros. 56 million euros or 72% of this was received from the oil shale sector. The amount of the mineral resource extraction charge received in the budget of the state and local authorities amounted to 33 million euros. 25 million euros or 76% of this was received from the oil shale sector (see also Figure 16).

**Figure 16. Receipt of environmental charges in the budgets of the state and local authorities from 2008-2012 (million euros)**



Source: Ministry of the Environment

### Did you know that...

the **external costs** of oil shale extraction are caused by the following circumstances:

- air, water and ground pollution;
- creation of waste;
- excessive use of natural resources;
- noise and vibration;
- decrease in biological diversity;
- restriction of land use caused by ground subsidence;
- decrease in the value of property;
- restriction on the use of land areas with oil shale reserves;
- migration of people caused by mining;
- deterioration in people's health; and
- other damage to infrastructure or deterioration in quality et al.

**129.** The quantities of pollutants generated by production and the environmental impact related to the use of mineral resources have not decreased as a result of the environmental charge system (see Points 52-75). The environmental charge rates are estimates according to the explanatory memoranda to the drafts of the Environmental Charges Act and agreed in the course of negotiations. The first environmental charge rates were developed from 1989-1990, when the transition economy was unstable and companies were in a difficult situation. This is why the first fees were initially very small; they have gradually increased over time. The increases have been arithmetic and the actual **external costs** have not been taken into account.

**130.** The conclusion reached in many earlier analyses is that the environmental charges have not motivated companies sufficiently to reduce pollution and do not include all of the external costs. The National Audit Office has repeatedly arrived at the same conclusion in its audits.<sup>22</sup> For example, Praxis recommended a review of the Estonian environmental charge system in its Environmental Charge Analysis of 2012 to make the tax burden comply with the environmental impact of pollution and use of resources and make sure it does not promote activities that are harmful to the environment.

**131.** The Ministry of the Environment is also of the opinion that the increased extraction quantities and burden on the environment prove that all of the external costs associated with mining are not included in the environmental charges.<sup>23</sup> For example, mining losses have not decreased and waste is not being recovered any more than before. The Ministry of

<sup>22</sup> 'Impact of Pollution Charges on Reduction of Environmental Pollution', 2009 and 'Alternatives for Electricity Production', 2012

<sup>23</sup> Response number 12-11/13/4166-2 of the Ministry of the Environment to the Estonian Association of Mining Companies, the Association of Construction Material Producers of Estonia, the Estonian Peat Association and the Federation of Estonian Chemical Industries, 28 June 2013

the Environment feels that the actual need to compensate external costs or reduce impact will become evident on the basis of environmental investments, and the share of the environmental charges in these is becoming constantly smaller. For example, 112 million euros was invested in the environment in 2008, but the same amount in 2012 was as high as 250 million. However, the share of environmental charges in the investments made was 78% in 2008 and just 32% in 2012.<sup>24</sup>

**The use of environmental charges to finance other state budget expenditure is increasing.**

132. The impact of the environmental changes on the improvement of environmental status is reduced further by the government's decision in 2010 to use some of the collected environmental charges to cover general state budget expenditure. According to this decision, only environmental charges equalling the rates effective in 2009 are now received in the budget of the Environmental Investment Centre. This means that more money from environmental charges is received for covering general state budget expenditure every year, as the charges increase over time. For example, 47 million euros or 21% of environmental charges received by the Environmental Investment Centre was used to cover other expenditure of the state from 2010-2012 (see Table 4).

**Table 4. Environmental charges received from 2009-2012 (million euros)**

<b>Environmental charges received</b>	<b>2009</b>	<b>2010</b>	<b>2011</b>	<b>2012</b>
<b>Total environmental charges received</b>	<b>72</b>	<b>67</b>	<b>76</b>	<b>79</b>
▪ incl. money for specific purposes received by the Environmental Investment Centre	54	40	41	36
▪ incl. money received for covering general state budget expenditure on the account of annual increase	0	8	16	23
▪ incl. environmental charges received by local authorities*	18	19	19	20
<b>Excise duty on electricity to state budget (former CO<sub>2</sub> pollution charge)</b>	<b>22</b>	<b>29</b>	<b>32</b>	<b>33</b>

\* The specific purpose for which the environmental charges received by local authorities should be used has not been determined either.

Source: National Audit Office based on data of the Ministry of the Environment and the Ministry of Finance

**Did you know that...**

- the excise duty on electricity is paid by the consumer, not the producer;
- the excise duty on electricity is not added to exported electricity.

133. The amount of money received for environmental purposes is also decreasing because electricity producers have not been required to pay the CO<sub>2</sub> pollution charge since 2008. This charge was replaced with the excise duty on electricity, which is paid by consumers. This was justified with the need to avoid double taxation, as producers will have to start buying CO<sub>2</sub>quotas from the market pursuant to the rules of the CO<sub>2</sub>-trade. The amount of the former CO<sub>2</sub>pollution charge or excise duty on electricity received from 2009-2012 was therefore as high as ca 116 million euros.

<sup>24</sup> Response number 12-11/13/4166-2 of the Ministry of the Environment to the Estonian Association of Mining Companies, the Association of Construction Material Producers of Estonia, the Estonian Peat Association and the Federation of Estonian Chemical Industries, 28 June 2013

**The rate of the oil shale extraction charge is not based on the quality of oil shale or the purpose for which it is used**

134. Also, oil shale as a resource is not valued on the basis of its quality or purpose of use, although this is required by law. At the same time, it is known that oil shale of lower quality that cannot be used for oil production is suitable for electricity generation. For example, oil shale is currently the only extracted mineral resource<sup>25</sup> for which a uniform resource charge (1.46 euros/ton<sup>26</sup>) has been established, although lower and upper limits of the charges have been established for all mineral resources. For oil shale, they are 0.92 and 6.39 euros per ton, respectively. For example, the resource charge payable for sand depends on the purpose of use: fill-up sand, technological sand and construction sand. The charge rates of dolomite, crushed rock, clay, limestone and peat are also differentiated on the basis of quality or purpose of use.

**The state gives the oil shale away too cheaply and does not earn enough from its use**

**Did you know that...**

in addition to taxes, the state has withdrawn ca 90 million euros per year on average in dividends from the Eesti Energia Group in recent years.

However, in 2012, for example, Eesti Energia Group was given 150 million euros from the state budget to increase its share capital.

135. In order to assess whether the state receives fair revenue from companies engaged in oil shale extraction and processing for the right to use a natural resource of national importance, the National Audit Office analysed the tax burden of the oil shale sector as a whole instead of just the environmental charges.

136. The state receives ca 80-90 million euros per year from the oil shale sector as environmental charges, labour taxes and excise duties. The environmental charges of the oil shale sector comprise ca 70% of this.

**A mining company is considerably less profitable than other oil shale companies**

137. The National Audit Office reviewed the distribution of the tax burden by oil shale production type. It was found that the tax burden of the largest oil shale extractor, Eesti Energia Kaevanduste AS, is considerably larger than that of oil and electricity producers (Table 5). For example, the share of national taxes in the sales revenue of oil producers is five times smaller than in the sales revenue of the mining company and 1.5 times smaller than that of Narva Elektriijaamad. In 2012, the amount of labour taxes and environmental charges paid by Eesti Energia Kaevanduste AS to the state was 43 million euros.

**Table 5. Share of taxes paid by oil shale sector in sales revenue in 2011**

Share of taxes (%)	Eesti Energia Kaevanduste AS	Eesti Energia Õlitööstuse AS, VKG Oil AS	Eesti Energia Narva Elektriijaamade AS
Share of environmental charges in sales revenue	13.1	1.3	4.5
Share of labour taxes in sales revenue	7.0	1.7	1.5
Total share of national taxes in sales revenue	20	4	6

Source: National Audit Office on the basis of the annual reports of the companies

138. This shows that taxation of the oil shale sector is characterised by the fact that the least profitable branch of the sector has the biggest tax burden. The ‘Analysis of the Competitive Situation in the Oil Share

<sup>25</sup> Uniform extraction charges have also been established on phosphorite and crystalline building stone, but these are not extracted at present.

<sup>26</sup> Effective as of 1 January 2014. Regulation No 172 of the Government of the Republic, *Riigi Teataja* No 1, 2009, p 366

Sector' prepared by the Estonian Competition Authority in 2013 indicates that the profitability of oil shale mining companies is 13%, the estimated profitability of electricity generation on the open market 33% and the profitability of oil production 83%. The Estonian Competition Authority feels that since Eesti Energia Kaevanduste AS extracts and sells a finite mineral resource of national importance, the profitability of the company should be in favour of the mine instead.

139. In principle, the state could earn considerably more than before from the sale of oil shale alone. For example, Eesti Energia Kaevanduste AS sold oil shale for 10-18 euros per ton in 2011 (see Table 6). The Estonian Competition Authority is of the opinion that both electricity and oil producers are able to pay more for oil shale: oil producers up to 28 euros/ton and electricity producers up to 18 euros/ton. If the mining company had sold oil shale for the aforementioned prices, the sales revenue it would have earned in 2011 would have been over 160 million euros or 35% more than it actually did.

**Table 6. Oil shale sale price of Eesti Energia Kaevanduste AS in 2011**

Company name	Euros/ton
to Eesti Energia Narva Elektriijaamade AS	10.58
to Eesti Energia Õlitööstuse AS and Kohtla-Järve Soojuse AS	10.55
to VKG Oil AS	15.23
to AS Kunda Nordic Tsement	16.99
to Kiviõli Keemiatööstuse OÜ	18.17

Source: 2011 Annual Report of Eesti Energia Kaevanduste AS

140. In light of the oil producers' plans to multiply oil production in the coming years (see Figure 15), Eesti Energia Kaevanduste AS would earn at least 29 million euros more every year if it sold oil shale for 28 euros/ton. If the 2016 oil production plan is a success, it will earn as much as 153 million euros more than it currently earns. Since Eesti Energia AS is a group where the oil shale extractor, electricity producer and oil producer are all parts of the same group, it is not very likely that such prices will be established within the group. Splitting Eesti Energia AS into separate companies is an option that would help achieve fairer competition and a fairer oil shale sale price and make the extraction company more profitable.

141. As the oil shale industry uses a mineral resource of national importance similar to the oil industry, the National Audit Office analysed taxation practice in countries that produce oil. Unlike Estonia, other countries tax the use of natural resources of national importance at higher rates than those imposed on ordinary business. States usually demand additional **royalties** from entrepreneurs for the use of natural resources. The following options are generally used:

- corporate income tax, but at a higher rate than applied to companies in other areas;
- another special tax, e.g. resource rent, is added to corporate income tax;

### Did you know that...

11 companies belong to the **Eesti Energia AS group**, incl.

- Eesti Energia Õlitööstus;
- Eesti Energia Kaevandused; and
- Eesti Energia Narva Elektriijaamad.

### Other countries charge more for the use of mineral resources

**Royalty** is a certain percentage of tax established by the state on the company's output that may be related to the quantity of the output sold or sales revenue;

- export customs duty added to corporate income tax.

142. For example, oil companies in Norway must pay resource (i.e. oil) rent in addition to the ordinary corporate income tax (28% of net profit) which amounts to 50% of net profit. Other companies in Bahrain are exempt from corporate income tax, but oil companies must pay income tax of 46%. The income tax imposed on companies that deal with oil and other mineral resources in Ireland is 25% whilst other companies pay 12.5%. Irish oil companies also pay a tax of 5-15% based on the profitability of the oil field and the investments made for it. In Russia oil companies pay 11 euros per ton of oil (called a royalty) plus 20% corporate income tax and 35-60% export customs duty, which depends on the oil price.

143. Estonia can earn more revenue on the use of oil shale, e.g. by imposing a tax on shale oil. In 2012 the state earned *ca* 12 million euros as national taxes (environmental charges, labour taxes and excise duties) from oil production alone whilst the profit of oil producers amounted to *ca* 91 million euros.

144. Considering the plans of oil producers to produce *ca* 1.8 million tons of oil in 2020<sup>27</sup>, their operating profit would increase to 288 million euros. For example, if the state imposed a 25% income tax on oil producers, the amount of additional revenue received in the state budget in 2020 would be 72 million euros based on even the most modest calculations. It is important to note that while the state can withdraw revenue from public undertakings as dividends, it cannot do so in the case of private companies.

**The establishment of a royalty on the use of oil shale has been discussed by the Government of the Republic, but making a decision has so far been postponed.**

145. The Government of the Republic has also discussed the receipt of fair revenue from oil shale mining and processing. The goal to discuss the possible establishment of oil shale royalties was set in the Government's action programme. The Ministry of Finance completed the analysis of oil shale taxation by spring 2013 and presented it to the Government of the Republic. Unfortunately, taxation of the revenue earned on the sale of shale oil was immediately precluded in the analysis, as it allegedly does not comply with the principles of the Estonian tax system. Also, the Government decided to suspend discussions on the topic until 2016, because the environmental charges were unexpectedly increased at the end of 2012. At the end of 2013, however, the Supreme Court annulled the decision to increase the environmental charges that was made in 2012. Postponing the decision on royalties from oil shale use is therefore no longer justified.

146. The situation in Estonia is special, because oil shale is mainly used for two purposes: electricity generation and oil production. Although oil production is considerably more profitable, the oil shale resource charge does not depend on what is produced, but is the same for everyone. If the state wanted to tax shale oil production at a higher rate than electricity generation, this could be viewed as prohibited state aid. Such taxation is therefore permissible if the European Commission confirms that it cannot be viewed as **state aid** or if the European Commission approves the state aid.

**State aid** – any aid granted by a Member State to its companies which damages or threatens to damage competition in the European Union by favouring certain companies or the production of certain goods.

<sup>27</sup> 14 million tons of oil shale per year would be used in this case.

147. The **National Audit Office is of the opinion** that using the environmental charges to cover general state budget expenditure does not comply with the Environmental Charges Act. Environmental impact continues to increase and experts feel that the environmental charges already include only a part of external costs, yet the money received as environmental charges is used to cover other state budget expenditure.

148. The reason given earlier to justify the need to tolerate the environmental damage associated with the oil shale power industry was guaranteeing cheaper electricity for Estonian consumers, but this can no longer be a valid point in conditions where the market is open and both electricity and oil are exported. As the majority of oil shale electricity and shale oil will be exported in the future, but the negative environmental impact will remain in Estonia, our future generations will have to deal with the environmental impact of the oil shale sector if the present system of environmental charges is not changed.

149. The National Audit Office finds that the environmental and labour taxes, excise duties and dividend revenue for oil shale as a mineral resource of national importance received annually from the oil shale sector do not provide fair revenue for the state. A mineral resource of national importance is given away too cheaply despite the fact that finding sources of money for the state is becoming more difficult every year.

150. An agreement about the taxation of oil shale use must be made before 2015, as without this it will be impossible to set clear additional goals or actions for the development of the oil shale sector in the Energy Sector Development Plan or in the Oil Shale Development Plan. However, the situation where taxes are hastily increased and without thorough analysis to increase state budget revenue, which has occurred many times before, must be prevented. Oil shale companies that plan to invest a lot of money in production also need clarity and certainty about taxation.

**151. Recommendation of the National Audit Office to the Minister of Finance and the Minister of the Environment:** before the Energy Sector Development Plan and Oil Shale Development Plan is adopted in 2015,

- carry out studies to ascertain the actual environmental damage caused by oil shale mining and use, and how much money the state will have to spend to eliminate such damage must also be assessed before the completion of the new development plan. Based on this, assess whether the environmental charge rates established for oil shale extraction and use are justified;
- on the basis of research, assess the share of environmental charges that should be used for specific purposes – maintenance of the environment, restoration of natural resources and compensation of environmental damage – and the amount of the remaining environmental charges that could justifiably be used to cover the general expenditure of the state. When the amount required by the state to remedy environmental damage is decided, it must be kept in mind that investments in the environment are presently made with the

support of EU structural funds, but Estonia will not receive this money in the same amounts after 2020.

**Response of the Minister of the Environment:** I agree that this must be kept in mind when the Oil Shale Development Plan is prepared. Subsection 4 (3) of the Environmental Charges Act (hereinafter the ECA) stipulates that the state budget revenue obtained from environmental charges is used for the purposes of maintaining the state of the environment, restoration of natural resources and remedying environmental damage. This principle determines the use of the environmental charges. We find that an analysis of the projects that reduce or remedy environmental impact and are aimed at regions and areas related to the oil shale industry and the support distributed to these projects enables the funds required by the state for investing in the reduction and remedying of environmental impact to be assessed.

In addition to the remedying of environmental damage highlighted by the National Audit Office, the implementation of environmental charges is also aimed at reducing the environmental impact of the activities of environment users and motivating them to reduce the generation of pollutants or waste by reducing the environmental charge payable by the user when they use the environment efficiently. This function must also be taken into account in addition to the money needed for remedying environmental damage when charges are established. However, we would also like to point out that the activities of environment users are also steered with other environment policy instruments in addition to the environmental charges, such as the requirements and thresholds stipulated in environmental permits. This means that the combined impact of all of the instruments applied to the oil shale industry on the prevention or reduction of potential damage must be assessed when the rates of environmental charges are justified, and the need to remedy the environmental damage caused by the oil shale industry must be taken into account.

I agree that it is necessary to analyse and assess the size of the environmental charges allocated for a specific purpose also after 2015 and the scope of environmental impact that can be remedied with the help of the state budget, e.g. for compensation of health and social impact.

**Response of the Minister of Finance:** we agree that it is necessary to calculate the actual environmental damage caused by the oil shale industry in money.

However, we proceed from the assumption that the revenue from environmental charges must not equal the cost of environmental damage, but can exceed it. We distinguish between the different purposes and ideas of extraction charges and pollution charges. We consider it necessary to find out whether the pollution charges associated with oil shale extraction and use cover the expense of the pollution associated with the oil shale industry. However, tying the environmental damage caused by the oil shale industry one-on-one to all environmental charges may not be reasonable due to the lack of reliable methodology.

The need to change the bases of distributing the money received as environmental charges is constantly assessed. Also, environmental protection requirements and the state's economic and social situation are

taken into account in the assessment pursuant to § 2 of the Environmental Charges Act.

**152. Recommendations of the National Audit Office to the Minister of Finance:**

- Continue analysing the royalty for oil shale use whilst considering the fact that oil production will have increased significantly by 2016. All taxation variants must be analysed. Not a single variant should be left unanalysed for political reasons. In order to achieve the goals related to oil shale use, it is necessary to clearly determine the principles of oil shale taxation and the bases for amending the taxes in the new Energy Sector Development Plan and Oil Shale Development Plan. This is why answers must be found to the following questions:
  - a) How much revenue does the state want to receive for oil shale use? How big is the royalty the state is presently missing out on?
  - b) What kind of revenue can be requested from companies, considering the present situation?
  - c) What kind of a tax system would guarantee the state's receipt of the necessary revenue and the well-being of companies?
- Consider separating Eesti Energia Kaevanduste AS from the Eesti Energia group to guarantee fair competition.

**Response of the Minister of Finance:** we agree with the recommendation to clarify the principle of the oil shale royalty and the basis of taxation before 2016.

The companies in the Eesti Energia group form a value chain that provides the best synergy in cooperation between different areas. Should risks materialise, the companies may no longer be sustainable and their competitive position could be damaged. This is why we are not in favour of separating them. It is also impossible to conclude on the basis of the National Audit Office's audit that separating Eesti Energia Kaevandused AS from Eesti Energia AS would be the best way of changing the competitive situation. It would also be necessary to analyse whether there is any infringement of competition, the extent of any possible infringement and what the alternatives are for mitigating market imperfections.

/digitally signed/

Tarmo Olgo  
 Director of Audit, Performance Audit Department

## Recommendations made by National Audit Office and responses of ministers

The National Audit Office made various recommendations to the Ministry of the Environment, the Ministry of Finance, the Ministry of Economic Affairs and Communications and the Ministry of Social Affairs. The ministers sent their responses to the recommendations made by the National Audit Office from 19 November to 13 December 2013.

### General comments of ministers on audit report

**Minister of the Environment:** In 2012 and 2013, the National Audit Office audited whether the state has guaranteed that oil shale reserves are sustainably and efficiently planned and mined, that the environmental impact of this is reduced and that the state earns enough for the use of a mineral resource of national importance. The National Audit Office has done an admirable amount of work within the scope of this audit.

The National Development Plan for Oil Shale Use 2016-2030 (hereinafter the Oil Shale Development Plan) and the Energy Sector Development Plan until 2030 (hereinafter the ESDP) are currently being prepared. The opinions and recommendations of the National Audit Office can be taken into account in these development plans as much as possible.

**Below, I give my comments on the audit report in general and more specifically on some points made in the report.**

You write that when the state established 20 million tons as the permitted annual extraction limit in 2008, it failed to specify whether this meant the quantity of oil shale with or without mining loss.

I would like to explain that the objective of establishing this limit was to minimise 1) the negative environmental impact of oil shale use, and 2) the quantity of oil shale won from the earth's crust that can be used in power plants, oil plants and elsewhere, thereby guaranteeing the sustainable use of oil shale. As far as we know, there is no single oil shale mining company that has not understood this limit. However, the wording of the relevant provision will be specified in the codified text of the draft of the Earth's Crust Act that is currently being prepared (see response to the recommendation made by the National Audit Office in Point 41).

The environmental impact of the oil shale industry really is very large. This is also one of the reasons why the Government of the Republic decided in 2006 that the National Development Plan for Oil Use 2008-2015 should be prepared. Two implementation plans have been prepared and approved regarding this plan: for 2009-2012 and 2013-2015. A report is prepared on the achievement of the goals established in these implementation plans. As we all know, some years were very difficult both economically and financially, which forces us to review the schedule of the actions. This is why the implementation of the second stage of the extraction sensitivity of oil shale has only just started, which means that the goal of reducing the environmental impact of oil shale extraction and processing and guaranteeing higher efficiency of oil shale extraction and use set in the National Development Plan for Oil Shale Use 2008-2015 has not been achieved. This does not apply to health research in the oil shale sector, as its deadline pursuant to the implementation plan is 2015.

It is written in the audit report that the main objective of the National Development Plan for Oil Shale Use – to guarantee Estonia's energy independence with oil shale energy – is outdated and as an open electricity market participant and a member of the Nordic Electricity Exchange, Estonian cannot favour domestic production sources in guaranteeing power supply to its consumers. I emphasise that we are currently preparing the new Oil Shale Development Plan in which different options for electricity generation are discussed.

You write that the second goal of the National Development Plan for Oil Shale Use 2008-2015 – to make oil shale extraction and use more efficient – has not been achieved. The reason: the best available technology is not used in extraction. This is why mining losses have not decreased: mining losses in oil shale quarries increased by 11% from 2007-2012, but in underground mines the loss of oil shale remained at the same level as in 2007 (i.e. 28%). No target loss level has been determined. I would like to explain that the oil shale layers in currently operating quarries are thinner than in previous years, but the layers of limestone separated to mine waste are thicker. Also, the importance of underground mining increased during the period under review and tests for refilling extraction workings have not yet been completed. It would have been possible to considerably reduce the size of the pillars left in the earth's crust if these tests had been successful.

It is written in the audit report that the third goal of the National Development Plan for Oil Shale Use 2008-2015 – to reduce the impact of oil shale extraction on the environment – could also not be achieved and the example given is that huge quantities of groundwater are pumped out because of oil shale extraction and directed into bodies of water, causing the groundwater reserves to decrease and making drinking water unusable. The water circulation in bodies of water is changed and they become polluted. Also, the landscape and the ecosystem are spoilt and there is air pollution, noise, vibration etc. The Ministry of the Environment also considers this a problem. The problem of deteriorating groundwater quality will hopefully soon be resolved when companies start implementing the measure aimed at ensuring that directing the groundwater pumped out from mines and quarries back into the environment on the overall water balance and circulation is as small as possible.

The audit report states that supervision of the quantity of extracted oil shale is inadequate – I would like to point out that the duty of the Environmental Board is to check that environmental charges are correctly declared, which is what the Board does on the basis of a risk analysis. If there are suspicions that the requirements in the extraction permit have been breached, the case is processed by the Environmental Inspectorate. There have been only a couple of such cases in the oil shale sector, but the number of breaches in the extraction of other mineral resources has been higher. The Environmental Inspectorate also constantly checks the activities of extractors as planned.

In regard to environmental charges, I would like to add that the manner of implementation and the rates of environmental charges are constantly discussed, and these discussions include the assessment of 1) environmental protection requirements; and 2) the state's economic and social situation. An annual increase of 10-30% (with some exceptions) has been established on the pollutant charge rates until 2015 in order to continue taking account of the environmental impact of the oil shale industry, and the levels of these rates are based on hazardousness and environmental impact. The rates of oil shale extraction charges and the charges for the water pumped out of mines and quarries and cooling water were reviewed in 2012 in relation to the

improvement in economic conditions and a continuing increase of 20% per year, which allows the state to demand a fair price so as to value the use of mineral resources more highly than before.

The audit report claims that the state has failed to assess the comprehensive impact of oil shale extraction and use. This was actually done within the scope of the preparation of the National Development for Oil Shale Use 2008-2015 by carrying out a strategic environmental impact assessment (SEA) and the same is also being done during the preparation of the new Oil Shale Development Plan (see response to recommendation 99 of the National Audit Office).

**Below are my separate comments on several points made in the audit report.**

Point 4 of the report. I would like to add that although underground mining is more expensive and mining losses are higher, it does not change the living conditions of local people in such a drastic manner, as the surface of the ground remains untouched if refilling of mining workings is used.

Point 5 of the report. Regarding the marginal note to this point, I would like to specify that oil shale does not remain unextracted, because oil shale in karst areas and tectonic fault belts is often inactive or entirely absent. The reserves registered in karst areas and tectonic fault belts is deleted from the list of deposit in the environmental register with a resolution of the Minister of the Environment based on the recommendation of the Estonian Mineral Reserves Committee.

Point 33 of the report. The plans of oil producers must take account of the sufficiency of oil shale reserves and all of the restrictions established on the basis of environmental conservation.

Point 35 of the report. The permitted annual limit of 20 million tons was not set in the National Development Plan for Oil Use 2008-2015 in consideration of the need to cut down CO<sub>2</sub> emissions alone. Many circumstances were considered when it was set, incl. other emissions into the ambient air (primarily SO<sub>2</sub>) as well as the industry's actual need for raw materials (oil shale resource).

Point 37 of the report. It is true that mineral resource extraction permits have been granted on the basis of the natural or geological reserves of oil shale. The mineral reserves registered in the deposit list of the environmental register (incl. oil shale reserves) are also geological reserves. The same manner of accounting has been used for mineral reserves in the consolidated balance sheets of the mineral reserves of the Republic of Estonia that are prepared every year. The same manner of accounting has been used for oil shale reserves in the reports on the implementation plan of the National Development Plan for Oil Shale Use 2008-2015: the quantities of natural mineral reserves removed from the earth's crust, not the quantities (trade oil shale) sent to the power stations of oil plants.

Point 54 of the report. The Health Board is currently working on the 'Research of Health Impact of Oil Shale Sector' study.

Point 55 of the report. The 2009-2012 implementation plan of the National Development Plan for Oil Shale Use 2008-2015 does not contain an indicator of the quantity of mine waste; the indicator noted in the 2013-2015 implementation plan is 'quantity of mine waste generated in oil shale processing: base level 6.775 million (2007)', but there is no target level. The indicator is set in order to compare the mine waste won in different years and monitor its use. The use of mine waste can be increased, but the quantity of the mine waste won during extraction is dictated by the geological structure of the quarry or mine, because the layers of limestone between the layers of oil shale have to be won with the oil shale.

Points 61-63 of the report. It is true that recovered quantities of mine waste have increased significantly. The quantity of the mine waste generated by oil shale extraction that is used per year is given as an indicator in the National Development Plan for Use of Mineral Resources Used in Construction 2011-2020, and at least 40% of the mine waste must be used by 2020. 2011 was an exception, as ca 90% of the generated mine waste was used according to the Environmental Information Centre (presently the Environment Agency). This was achieved due to the work done on three major sites: the construction of the Estonia motor racing hill; and the reconditioning works in the Aidu and Narva quarries. As you write in the audit report, recognising this waste as recovered is legally questionable, as the Waste Act stipulates that waste has been recovered when it has been used as a replacement for materials that would otherwise have been used for this purpose. Your opinion is that the motor racing hill and pyramid would not have been established from another material. However, local authorities have accepted the construction of such facilities, probably reckoning that this will help them develop tourism and expand sporting opportunities in Ida-Viru County. The rowing canal to be established in the area of the Aidu oil shale quarry, which is soon to be closed, also indicates that local authorities in Ida-Viru County have started to actively develop local life.

**National Audit Office:** The National Audit Office is of the opinion that the local authorities' approval of the motor racing hill and pyramids established by recovering mine waste does not prove whether or not the Environmental Board made sure that the recovery was legal before granting the permits.

**Minister of the Environment:** Point 65 of the report. The action plan will be prepared in 2014 and submitted to the Government of the Republic with the water management plan for the next period (2015-2021).

Points 81-83 of the report. The Health Board takes account of the earlier studies, and data in databases are considered during the preparation of the study of the health impact of the oil shale sector. This includes the environmental monitoring databases of the National Institute for Health Development and Statistics Estonia (data of the permanent monitoring station at Kohtla-Järve and the monitoring station on the territory of Viru Keemia Grupp AS). The data of water quality available in the Environment Agency, the Environmental Investment Centre and elsewhere are also used.

Points 84-85 of the report. Socioeconomic research should probably also continue within the scope of the new Oil Shale Development Plan. Speaking of the recommendation made by the Praxis Centre for Policy Studies to the state, i.e. to determine areas of active oil shale where extraction is to occur in the future and impact on other economic activities is considered, then this is rather easy to do – there are only a few such areas left. The reason is simple: extraction permits have already been issued regarding the majority of areas containing active oil shale reserves. The majority of inactive oil shale reserves are under conservation areas and permitting 'free economic activities and residential construction' there is impossible. The oil shale reserves in the southern and western parts of the Estonian oil shale deposit are passive due to the low energy intensity (below 35 GJ/m<sup>2</sup>). Based on the study of the Department of Mining of Tallinn University of Technology, part of this passive oil shale reserve could be re-qualified as active reserve.

Point 86 of the report. The planned start date of the study of ground stability in mined areas is 2014.

Point 88 of the report. Such recommendations have been made in the National Development Plan for Oil Shale Use 2008-2015,

which was approved by the Riigikogu. Such recommendations will also be made in the new Oil Shale Development Plan. The areas of oil shale deposit most suitable for mining are clarified as a result of a study of mining sensitivity, and the current ratio of active and passive reserves is changed by the possible reassessment of oil shale reserves on the basis of energy intensity or another indicator (e.g. oil intensity), which is planned to be done in the Oil Shale Development Plan.

**National Audit Office:** The National Audit Office disagrees with the claim of the Minister of the Environment that the development plan contains recommendations on which mining fields should be mined first and where mining should be postponed for as long as possible. The Oil Shale Development Plan contains no opinions of the mining sensitivity of mining fields. In Point 88 of the report, the National Audit Office emphasises that there is no research that would make it possible to assess the mining sensitivity of the entire oil shale deposit. If the Minister of the Environment refers to Annex 7 to the Oil Shale Development Plan when speaking of a recommendation, then the opinions given there are not based on thorough research.

**Minister of the Environment:** Points 92 and 95 of the report. Assessing a mineral reserve as active does not mean granting an extraction permit for extracting all of the mineral reserves within the boundaries of the deposit. Entering a mineral reserve in the environmental register as an active reserve makes it possible for the developer to apply for an extraction permit. An assessment of the environmental impact of the intended activities is initiated where necessary, which will also be used to ascertain whether and which part of the researched reserve is usable without significant negative environmental impact. The extraction permit is not granted if it is found that extracting the mineral resource without significant negative environmental impact is impossible.

There is no reason to initiate an environmental impact assessment when the category of a mineral reserve is re-qualified, because it is possible to assess the impact of a specific activity and the reassessment of a reserve (changing data in the environmental register) has no impact.

**National Audit Office:** the national audit office has pointed out in the report that the actual situation in assessing the environmental impact of mining and granting extraction permits indicates that the Ministry of the Environment has not yet refused to grant a permit due to environmental considerations. In practice, this means that extraction is also permitted when a mineral reserve is assessed as active. The National Audit Office notes that the Ministry of the Environment must identify the comprehensive impact of mining before mineral reserves are declared active, and any reassessment decisions should be made after this.

The laws of the state do not stipulate that when the category of a mineral reserve is re-qualified or re-assessed, the impact must only be assessed on the basis of the Environmental Impact Assessment Act. It is not prohibited for ministries to commission an analysis or study from experts that investigate the health impact of mining, as has been done in a couple of cases, e.g. to study groundwater spoilage.

**Minister of the Environment:** Point 115 of the report. I would like to point out that data of instrumental measurements was requested and received from extractors also prior to 2011. Based on these and analysing the aerial inspection data of the Land Board, we found that the declaration of extracted quantities and extraction charges has generally been reliable.

Point 117 of the report. The risk analysis mentioned by the employee of the Environmental Board during the interview was based on the aerial inspection data of 2009 and 2012. Flights were organised above 13 oil shale quarries in 2009 (11 of them belonging to Eesti Energia Kaevanduste AS, one to Kiviõli Keemiatööstuse OÜ and one to Kunda Nordic Cement) and no differences with regard to the declarations were found. This was also confirmed by the aerial inspection report of 2012, where flights were organised above another 13 quarries, 12 of which overlapped with the quarries inspected in 2009; the new one was the quarry of VKG Kaevanduste AS.

As it is impossible to find anything in mines by aerial inspection, the data submitted by the companies themselves have been relied on to date. The Ministry of the Environment has taken an important step towards inspecting the accuracy of the extracted quantities declared by underground mines by carrying out mine survey operations. Once the results are received, it will be possible to analyse whether the data declared to date have been correct and whether heightened attention in the form of follow-up inspection is necessary.

Point 135 of the report. The situation where only oil shale of higher quality was suitable for oil production according to companies and oil shale of poorer quality could be used for electricity generation is a thing of the past. The new oil production technology used today means that oil shale of lower quality is also suitable for oil production. Establishing different rates for the extraction charges payable for oil shale of different quality has been the topic of many discussions. However, there is almost no need for this in the present day when the quality of the oil shale is no longer of primary importance in terms of its use.

I would also like to note that oil shale is not the only extractable mineral resource on which a uniform extraction charge has been established – uniform rates are also applied to clay and crushed rock. The charge rates on peat are established on an accrual basis, not on the basis of quality.

Finally, I would like to point out that the audit report needs editing in terms of the names of some of the interviewees as well as inaccuracies in terminology.

**National Audit Office:** we would like to point out that oil shale is the only extractable mineral resource on which a uniform extraction charge rate has been established, i.e. there is no distinguishing based on use or quality. Fill-up soil, crushed rock and construction aggregate are distinguished in the case of crushed rock, and ceramic and keramzit clay, refractory clay and cement clay are distinguished in the case of clay. The fact that the Ministry also applies a uniform charge rate to these mineral resources is not a reason why the charge payable for oil shale use could not be differentiated by quality and use.

**Minister of Social Affairs:** the Ministry of Social Affairs has analysed the observations, opinions and recommendations given in the draft audit report. The recommendations made to the Minister of Social Affairs and Minister of the Environment include the recommendation to jointly study the pollution sources of the oil shale sector before the preparation of the new Oil Shale Development Plan to identify the quantity of pollutants and their compliance with monitoring data and toxicity. The draft also includes recommendations to plan measures for reducing the negative health impact of mining in the Oil Shale Development Plan; to agree on the content of the activities concerning the health impact assessment to be included in the Oil Shale Development Plan and the implementation plan of the development plan and possible sources of funding; and to add additional mitigating measures to the Oil Shale Development Plan and the Public Health Development Plan on the basis of the thorough health impact assessment that will be completed in 2015.

Recommendations of National Audit Office	Responses of Ministers
<p><b>Specification of the annual extraction rate</b></p> <p>41. Recommendation to the Minister of the Environment: specify § 25<sup>1</sup> and Subsection 26 (3) of the Earth's Crust Act in such a manner that it is clearly understandable to all parties whether the permitted annual limit of 20 million tons is the quantity of geological oil shale with or without mining loss. (Points 34–38, 40)</p>	<p><b>Response of the Minister of the Environment:</b> the wording of said provisions is being specified in the codified text of the Draft Earth's Crust Act that is currently being developed, although there are no disputes at present, as the annual oil shale extraction limit means the maximum quantity of oil shale permitted to be extracted on the basis of all permits in a calendar year.</p>
<p><b>Guaranteeing energy independence</b></p> <p>42. Recommendations of the National Audit Office to the Minister of the Environment, the Minister of Economic Affairs and Communications and the Minister of Agriculture:</p> <ul style="list-style-type: none"> <li>■ abandon the goal of guaranteeing the energy supply of Estonian consumers with electricity generated from oil shale in the Energy Sector Development Plan and the Oil Shale Development Plan that are currently being prepared. There is no reason to prefer electricity generation to other uses when oil shale reserves are used.</li> <li>■ If the state still considers the generation of oil shale electricity important, it should develop measures that guarantee the quantity of oil shale required for electricity generation. The relevant goals and actions must be included in both the Oil Shale Development Plan and the Energy Sector Development Plan.</li> </ul> <p>(Points 28–33, 39)</p>	<p><b>Response of the Minister of the Environment:</b> this issue is analysed in the National Development Plan for Oil Shale Use (hereinafter the Oil Shale Development Plan), and the uses of oil shale will also be determined. In electricity generation it is important to guarantee the smallest possible cost/price for both consumers and the environment. We consider the increased valorisation of oil shale important in the use of this mineral resource.</p> <p>These issues will be analysed in the new Oil Shale Development Plan and the relevant mechanisms will be developed. Since the Oil Shale Development Plan and the Energy Sector Development Plan until 2030 (hereinafter the ESDP) are being prepared at the same time, then this issue will be given attention in both development plans.</p> <p><b>Response of the Minister of Economic Affairs and Communications:</b> we agree with the opinion of the National Audit Office that the use of oil shale should be based on the goal to use oil shale primarily in areas where the economic added value created by the use of oil shale is highest. This is the principle that we are considering in the preparation of the new Energy Sector Development Plan until 2030. However, this does not mean that the generation of electricity from oil shale will no longer play an important role in guaranteeing the state's energy supply and energy security in the future. We would like to point out that generation of electricity and production of oil from oil shale are not mutually exclusive – quite the opposite. Based on economic practicality as well as the aim to valorise oil shale to the maximum, the use of the by-products of shale oil production – retort gas and high-temperature waste heat – for electricity generation makes sense. This is already being done today. The nature and scope of the role of energy generated from oil shale in the energy portfolio of Estonia will become clear when the various future scenarios given in the new Energy Economy Development Plan until 2030 are analysed.</p> <p>The Ministry of Economic Affairs and Communications will submit the new Energy Sector Development Plan until 2030 to the Government of the Republic in November 2014.</p>
<p><b>The efficiency of oil shale extraction and use</b></p> <p>51. Recommendations to the Minister of the Environment:</p> <ul style="list-style-type: none"> <li>■ ensure that specific actions that will result in more efficient extraction and use of oil shale are set forth in the new Oil Shale Development Plan.</li> <li>■ Use research to identify technology and equipment that allow for extraction in underground mines in a manner that harms the environment as little as possible and results in the smallest possible mining losses, and to determine actions for the implementation of such technology and equipment in the development plan.</li> </ul> <p>(Points 43–50)</p>	<p><b>Response of the Minister of the Environment:</b> The experience of oil shale mining in Estonia is long. There is no doubt that the implementation of such new technology is necessary. Current attempts are refilling workings, i.e. filling the workings left by oil shale extraction with rock material and ash, can be given as an example. This helps prevent (or minimise) the destruction of landscapes and land becoming unusable. It also reduces the need to leave pillars in the earth's crust, meaning that more of the oil shale reserves can be used. The second of these is a method already in use for a long time and its technically updated version will soon be tested. This is winning the oil shale reserves by underground mining with a mining machine. Once the oil shale has been won, large areas will be sunken to minimise damage to the landscape.</p> <p>Some examples of making oil shale extraction more efficient have been described in the previous response. Actions for making oil shale use more efficient (e.g. the development and implementation of the best available technology in energy generation and oil production, rational use of extracted resources and lengthening the value chain) are planned in the Oil Shale Development Plan.</p>
<p><b>The environmental impact of oil shale extraction and use</b></p> <p>76. Recommendations to the Minister of the</p>	<p><b>Response of the Minister of the Environment:</b> I agree that separate actions and indicators that make it possible to assess the actions must be indicated in the Oil Shale Development Plan to reduce the negative environmental impact of oil shale extraction and use. This is how the topic has been handled in the new Oil Shale Development Plan. Separate</p>

Recommendations of National Audit Office	Responses of Ministers
<p>Environment:</p> <ul style="list-style-type: none"> <li>▪ in order to clearly distinguish between the environmental impact of oil shale extraction and use, establish separate actions that reduce the environmental impact of extraction and use as well as the indicators that make it possible to assess them (e.g. spoiling surface water and groundwater and reducing waste generation).</li> <li>▪ Develop measures with groundwater experts that help mitigate the impact of oil shale extraction on groundwater bodies.</li> <li>▪ Before 2015, prepare an action plan on how to prevent the further deterioration of the status of the groundwater body of the Ordovician Ida-Viru oil shale basin and thereby also prevent deterioration in the status of adjoining groundwater bodies.</li> <li>▪ Assess the impact of oil shale extraction and the closure of mines on the quality of the groundwater body of the Ordovician Ida-Viru oil shale basin and the adjoining groundwater bodies.</li> <li>▪ Assess the impact of oil shale extraction and the closure of mines on surface water and related ecosystems and communities (incl. conservation areas and protected species).</li> </ul> <p>(Points 52-75)</p>	<p>subchapters about the impact of oil shale extraction and its use have been used in the structure of its draft to describe environmental impact. The problems of the specific area are highlighted at the end of each subchapter and the development plan offers measures and actions for the solution of these problems as well as indicators that can be used to assess the extent to which goals are achieved. The environmental impact of oil shale extraction and use is analysed both separately and in combination in the Strategic Environmental Impact Assessment (SEA) Report prepared during the development of the Oil Shale Development Plan.</p> <p>The Ministry of the Environment plans to define measures for mitigation of the negative environmental impact caused by oil shale extraction in cooperation with researchers and entrepreneurs. For example, one such measure is to redirect the water pumped out of mines and quarries back into the environment in a manner that affects the overall water balance and circulation of the region as little as possible.</p> <p>[[Protection of the <a href="#">groundwater body of the Ordovician Ida-Viru oil shale basin</a>] The action plan will be prepared in 2014, but will presumably be presented to the Government of the Republic with the water management plan for the next period (2015-2021).</p> <p>The impact of oil shale extraction on the quality of the groundwater body of the Ordovician Ida-Viru oil shale basin and surrounding groundwater bodies is assessed within the scope of the assessment of the status of groundwater bodies. This forms part of the assessment of the status of groundwater bodies, preparation of a surveillance network and development of measures for maintaining or improving the status of groundwater bodies under the water management plan.</p> <p>The environmental impact of the closure of oil shale mines is different in each mine and quarry. The impact factors, the affected ecosystems and the scope of the impact are all different. This is why the negative impact of the closure of mines is assessed with the scope of the environmental impact assessment of the specific closure project. The measures for mitigating the environmental impact of the closure of mines are also developed on the basis of the environmental impact assessment report.</p>
<p><b>Research required for preparation of Oil Shale Development Plan</b></p> <p>99. Recommendations to the Minister of the Environment:</p> <ul style="list-style-type: none"> <li>▪ organise an assessment of the comprehensive impact of oil shale extraction before the preparation of the new development plan. In addition to the recommendation in Point 76 of the report, the following research should be carried out:</li> <li>▪ identify the stability of the ground above underground mines and the related impact, and map known collapses for further overviews;</li> <li>▪ develop measures for protecting the Pandivere groundwater body. One option is to create a Pandivere water protection area.</li> <li>▪ Based on comprehensive impact assessment, assess the complex negative impact of oil shale extraction that society is prepared to tolerate. A new annual extraction limit should therefore be established with the Earth's Crust Act.</li> <li>▪ Based on comprehensive impact assessment, identify the areas where the impact of extraction is smaller and areas where impact as a whole is larger. Take account of the assessment results when mining areas are selected and update the actions and measures in the Oil Shale</li> </ul>	<p><b>Response of the Minister of the Environment:</b> strategic assessment of the environmental impact of the Oil Shale Development Plan will be carried out during the preparation of the plan and a relevant report will be prepared. The data for this can also be obtained from the results of the applied research carried out for the determination of extraction sensitivity, the first stage of which was completed in 2010 and the second stage of which is expected to start this year.</p> <p>The 'Digitalisation of the Plotting Boards of Oil Shale Mined Areas and Stability Assessment' research of Tallinn University of Technology is also about to be launched and should be completed in 2015.</p> <p>The groundwater bodies whose status will be maintained or improved within the scope of water management plans have already been determined in the area of the Pandivere Uplands. The status of each groundwater body will be assessed for this purpose at the beginning of the six-year period of the water management plan, and the pressure factors of each groundwater body will also be determined. This will be followed by defining measures for mitigating the impact of pressure factors and monitoring the status of the groundwater body to assess the impact of the measures and the changes taking place therein. The status of groundwater bodies will be assessed again at the end of the six-year period of the water management plans to plan actions for the new period of water management plans. A nitrate-sensitive area has also been formed in the region to protect groundwater from the pollution generated by agriculture.</p> <p>I agree that establishing the permitted annual limit of oil shale extraction and use on the basis of the SEA makes sense. The necessity of a new annual limit is doubtful, because current knowledge suggests that tolerating impact even larger than it is at present is not acceptable.</p> <p>I agree with the recommendation [to identify areas of larger and smaller mining impact on the basis of a comprehensive impact assessment], which can be done using the results of the mining sensitivity research and the results of the SEA.</p> <p>I agree that the results of comprehensive impact assessment (in this case the</p>

Recommendations of National Audit Office	Responses of Ministers
<p>Development Plan on the basis of this.</p> <ul style="list-style-type: none"> <li>■ Take account of the comprehensive impact assessment of oil shale mining when oil shale reserves are revalued and new reserves are declared active, permitting extraction only in areas where the expected impact is smaller. Give special attention to protecting groundwater in the Pandivere Uplands and surrounding areas.</li> <li>■ Increase the participation of local authorities more and via direct representatives in making decisions about the use of oil shale. For example, local authorities should be involved in declaring oil shale reserves active, granting extraction permits, incl. the process of environmental impact assessment and the preparation of the Oil Shale Development Plan. Organise information events in local authorities of oil shale deposit during the preparation of the development plan. Local authorities must be included in preparing and carrying out research related to oil shale.</li> </ul> <p>(Points 77–78, 84–98)</p>	<p>mining sensitivity research and SEA) must be taken into account when oil shale reserves are revalued and declared active. We will give special attention to groundwater – groundwater as a source of drinking water and groundwater as a source of water necessary for ecosystems.</p> <p>Local authorities must be included in making any decisions concerning the earth's crust. To date, local authorities have constantly been included in processing applications for geological research permits and mineral resource extraction permits, environmental assessment and preparation of development plans about mineral resources (as required under the provisions of the Earth's Crust Act). They will soon be included in the preparation of the Oil Shale Development Plan: as soon as the primary version of the development plan is ready to be presented. The Estonian Mineral Resources Committee (EMRC), which reviews the drafts of all decisions and strategic documents concerning the earth's crust, has been an excellent cooperative body. There are also representatives of several local government associations among the members of the EMRC.</p>
<p><b>Health research required for preparation of Oil Shale Development Plan</b></p> <p>100. Recommendations of the National Audit Office to the Minister of Social Affairs and the Minister of the Environment:</p> <ul style="list-style-type: none"> <li>■ The following should be done before the preparation of the new Oil Shale Development Plan: <ul style="list-style-type: none"> <li>• collect the monitoring data of sources of pollution in the oil shale sector and analyse them. Identify the total quantity of pollutants generated by all sources of pollution and how dangerous these pollutants are;</li> <li>• collect the health data and surveys of the residents of Ida-Viru County and analyse them;</li> <li>• on the basis of pollutant monitoring data and health surveys of Ida-Viru County residents, plan measures for assessing and mitigating the health impact of extraction and agree on possible sources of financing before the new Oil Shale Development Plan (2016-2030) and its implementation plan are adopted.</li> </ul> </li> <li>■ Add mitigating measures in addition to the aforementioned ones to the new Oil Shale Development Plan, its implementation plan and Public Health Development Plan on the basis of the health impact research to be completed in 2016.</li> </ul> <p>(Points 81–83, 98)</p>	<p><b>Response of the Minister of Social Affairs:</b> we agree that the given recommendations will help to prepare a new and better Oil Shale Development Plan, which takes account of the comprehensive impact of oil shale extraction and use on the environment and health.</p> <p>Research to identify the impact of oil shale extraction and use on people's health has been launched to implement the recommendations given in the draft audit report. The Health Board applied for support for the 'Study of Health Impact of Oil Shale Sector' from the Environmental Investment Centre to identify the impact that oil shale extraction and use have on people's health. The Environmental Investment Centre decided to support this project with 163,955 euros on 19 June 2013. The first stages of the project will include identifying the sources of pollution in the oil shale sector as well as collecting and analysing monitoring data and the data of scientific research carried out in the past. An analysis of illness and the mortality rate of the population will then be carried out. It will compare the incidence of tumours, illnesses of the respiratory tract and respiratory organs (incl. asthma) and cardiovascular diseases in areas affected and not affected by oil shale extraction. A cross-sectional survey will also be carried out among the residents of Ida-Viru County in the later, clinical research stage of the project to create better connections. The first part of the survey will focus on adults and the second part on children. A random sample of adults (2500 people) will be found and questionnaires about various health complaints, living environment and socioeconomic indicators will be posted to them. The health complaints reported by the respondents themselves will then be connected with objective environmental indicators and health data. The project has not yet been launched, as the clinical research permit from the human studies ethics committee is pending. The expected launch date of the project is 1 December 2013. The deadline of the project is March 2015.</p> <p>An overview of the health impact of the oil shale sector in Estonia will be completed as a result of the project and the results will help plan measures for mitigating the negative health impact in the new Oil Shale Development Plan. Both the Ministry of Social Affairs and the Health Board are involved in the preparation of the National Development Plan for Oil Shale Use 2016-2030.</p> <p><b>Response of the Minister of the Environment:</b> the Health Board is currently working on the 'Study of Health Impact of Oil Shale Sector', which was financed by the Environmental Investment Centre. It should be possible to use the first data collected in the course of the study in the preparation of the Oil Shale Development Plan after the first quarter of 2014 (interim report). The following is known at the moment: underground mining of oil shale has a smaller impact on ambient air than mining above ground, where fine particles</p>

Recommendations of National Audit Office	Responses of Ministers
	<p>and the gases created by blasting end up in the air. A significant share of ambient air pollution in Estonia comes from the oil shale industry and the most important pollutants are fine particles, which consist of many components and among others contain organic pollutants, incl. persistent organic substances and metals, and may be carcinogenic. The finer the particles, the more damage they cause to a person's health if they end up in the respiratory tract. The heavy metals that are emitted into the ambient air accumulate in soil, plants and the food chain, and their harmful impact on organisms may take a long time to become evident. In terms of groundwater, there is no negative impact on people's health coming from the oil shale sector. Instead, the impact manifests itself in the spoilage of sources of drinking water, which means that new wells or even catchments need to be established for people.</p> <p>I agree [that health impact assessment and finding money for this purpose must be agreed before the adoption of the new development plan], which will be agreed during the preparation of the Oil Shale Development Plan and the implementation plan.</p> <p>The aforementioned 'Study of Health Impact of Oil Shale Sector' will be completed in 2015. The obtained results can be used in the preparation of various strategic documents and their implementation plans by the end of the first quarter and thereafter.</p>
<p><b>Regulation and supervision of oil shale extraction</b></p> <p>123. Recommendations to the Minister of the Environment:</p> <ul style="list-style-type: none"> <li>▪ prepare legal amendments for regulating the operations of extractors with one environmental permit in the future.</li> <li>▪ Establish conditions regarding the technology used in mining in mineral resource extraction permits.</li> <li>▪ Initiate an amendment to the Earth's Crust Act in such a manner that the data of extracted mineral resource quantities submitted by the extractors must be regularly checked and that money for this purpose is allocated from the state budget. Consider the development of an amendment that gives the data of quarries collected by the Land Board in the course of inspection flights the power of proof in both the supervision and follow-up inspection of environmental charges carried out by the Environmental Inspectorate.</li> </ul> <p>(Points 101-122)</p>	<p><b>Response of the Minister of the Environment:</b> the Ministry of the Environment is still forming an opinion on this issue.</p> <p>We are considering the establishment of conditions that would bring about a need to update technology. This presumes that the efficiency and environmental sustainability of the new technology is proven. The results of inspection flights have so far formed important input for risk analysis and for assessing the reliability of the measurements carried out by companies.</p> <p>Giving aerial inspection the power of proof could be considered, but this carries significant risks in terms of environmental charges, as the results determined by this method are only accurate and reliable enough in regard to the calculation of environmental charges in certain cases. The data obtained by aerial inspection are indicative and highlight the need to inspect the extractor. The supervision carried out by the Environmental Inspectorate (EI) and the follow-up inspection of environmental charges cannot rely on them. The data must be specified with measurements on land.</p> <p>The frequency of control measurements has increased in recent years. It is done on a random basis, relying on risk analyses, and the focus is on quarries where there is reason to presume or suspect the submission of inaccurate data or where presumed violations have been detected on the basis of the aerial control carried out by the Land Board. We therefore find that the present risk-based approach is reasonable.</p>
<p><b>Environmental charges on oil shale extraction</b></p> <p>152. Recommendation to the Minister of Finance and the Minister of the Environment: before the Energy Sector and Oil Shale Development Plan is adopted in 2015,</p> <ul style="list-style-type: none"> <li>▪ the actual environmental damage caused by oil shale mining and use and how much money the state will have to spend to eliminate such damage must also be assessed before the completion of the new development plan. Based on this, assess whether the environmental charge rates established for oil shale extraction and use are justified;</li> <li>▪ on the basis of research, assess the share of environmental charges that should be used for specific purposes – maintenance of the environment, restoration of natural resources and compensation of environmental damage</li> </ul>	<p><b>Response of the Minister of the Environment:</b> I agree that this must be kept in mind when the Oil Shale Development Plan is prepared. Subsection 4 (3) of the Environmental Charges Act stipulates that "the state budget revenue obtained from environmental charges is used for the purposes of maintaining the state of the environment, restoration of natural resources and remedying environmental damage". This principle determines the use of the environmental charges. We feel that an analysis of projects that reduce or remedy environmental impact and are aimed at regions and areas related to the oil shale industry and the support distributed to these projects enables the funds required by the state in order to invest in the reduction and remedying of environmental impact to be assessed.</p> <p>In addition to the remedying of environmental damage highlighted by the National Audit Office, the implementation of environmental charges is also aimed at reducing the environmental impact of the activities of environment users and motivating them to reduce the generation of pollutants or waste by reducing the environmental charge payable by the user when they use the environment efficiently. This function must also be taken into account in addition to the money needed to remedy environmental damage when charges are established. However, we would also like to point out that the activities of environment users are also steered with other environment policy</p>

Recommendations of National Audit Office	Responses of Ministers
<p>– and the amount of the remaining environmental charges that could justifiably be used to cover the general expenditure of the state. When the amount required by the state to remedy environmental damage is decided, it must be kept in mind that investments in the environment are presently made with the support of EU structural funds, but Estonia will not receive this money in the same amounts after 2020.</p> <p>(Points 124-135, 148-151)</p>	<p>instruments in addition to the environmental charges, such as the requirements and thresholds stipulated in environmental permits. This means that the combined impact of all of the instruments applied to the oil shale industry on the prevention or reduction of potential damage must be assessed when the rates of environmental charges are justified, and the need to remedy the environmental damage caused by the oil shale industry must be taken into account.</p> <p>I agree that it is also necessary to analyse and assess the size of the environmental charges allocated for a specific purpose after 2015 and the scope of environmental impact that can be remedied with the help of the state budget, e.g. for compensation of health and social impact.</p> <p><b>Response of the Minister of Finance:</b> we agree that it is necessary to calculate the actual environmental damage caused by the oil shale industry in monetary terms.</p> <p>However, we proceed from the assumption that the revenue from environmental charges should not equal the cost of environmental damage, but could exceed it. We distinguish between the different purposes and ideas of extraction charges and pollution charges. We consider it necessary to determine whether the pollution charges associated with oil shale extraction and use cover the expense of the pollution associated with the oil shale industry. However, tying the environmental damage caused by the oil shale industry one-on-one to all environmental charges may not be reasonable due to the lack of reliable methodology.</p> <p>The need to change the bases of distributing the money received as environmental charges is constantly assessed. Also, environmental protection requirements and the state's economic and social situation are taken into account in assessment pursuant to § 2 of the Environmental Charges Act.</p>
<p><b>Analysis of royalty for oil shale use and separation of Eesti Energia Kaevanduste AS from group</b></p> <p>153. Recommendations to the Minister of Finance:</p> <ul style="list-style-type: none"> <li>▪ Continue analysing the royalty for oil shale use whilst considering the fact that oil production will have increased significantly by 2016. All taxation variants must be analysed. Not a single variant should be left unanalysed for political reasons. In order to achieve the goals related to oil shale use, it is necessary to clearly determine the principles of oil shale taxation and the bases for amending the taxes in the new Energy Sector Development Plan and Oil Shale Development Plan. This is why answers must be found to the following questions: <ul style="list-style-type: none"> <li>a) How much royalty does the state want to receive for oil shale use? How big is the royalty the state is presently missing out on?</li> <li>b) What kind of royalty can be requested from companies, considering the present situation?</li> <li>c) What kind of a tax system would guarantee the state's receipt of the necessary royalty and the well-being of companies?</li> </ul> </li> <li>▪ Consider separating Eesti Energia Kaevanduste AS from the Eesti Energia group to guarantee fair competition.</li> </ul> <p>(Points 136-151)</p>	<p><b>Response of the Minister of Finance:</b> we agree with the recommendation to clarify the principle of the oil shale royalty and the basis of taxation before 2016.</p> <p>The companies in the Eesti Energia group form a value chain that provides the best synergy in cooperation between different areas. Should risks materialise, the companies may no longer be sustainable and their competitive position could be damaged. This is why we are not in favour of separating them. It is also impossible to conclude on the basis of the National Audit Office's audit that separating Eesti Energia Kaevandused AS from Eesti Energia AS would be the best way of changing the competitive situation. It would also be necessary to analyse whether there is any infringement of competition, the extent of any possible infringement and what the alternatives are for mitigating market imperfections.</p>

## Characteristics of audit

### Purpose of audit

The purpose of the audit was to assess whether the state guarantees the sustainable planning and economical extraction of oil shale and a fair revenue for the use of a mineral resource of national importance.

### Assessment criteria

The general opinion is given on the basis of the following criteria:

1. The state has established clear, measurable and relevant objectives for oil shale extraction.
2. The state is aware of the total volume of oil shale reserves, the volume of active reserves, the quality of the reserves and how long the reserves will last.
3. The objectives of oil shale use guarantee the greatest possible benefits from such use.
4. The annual oil shale extraction limit is expressly and clearly understandable.
5. The state assesses and considers environmental, health and socioeconomic impact when planning oil shale extraction.
6. Local authorities are involved in planning the use of oil shale reserves.
7. Money, responsible persons and completion deadlines are planned for the activities determined in development plans and other documents.
8. The activities determined in development plans and other documents make it possible to achieve the established goals; the activities will be carried out and their impact will be assessed.
9. Conditions for reducing environmental impact, not damaging the surrounding environment (infrastructure and housing) and requirements for the technology to be used are set in environmental permits.
10. Those who issue environmental permits inspect the performance of the requirements set out in the permits.
11. Negative environmental impact has decreased as a result of the performance of environmental requirements and the implementation of environmental charges
12. Differentiation of oil shale resource charges or taxation of shale guarantee that the state receives a fair royalty for oil shale use.

### Scope and focus of audit

The audited agencies were the Ministry of the Environment, the Environmental Board, the Land Board and the Environmental Inspectorate.

The audited period was predominantly from 2007 to 2012.

The audit focused on two main issues:

1. Are the state's goals in the extraction and use of oil shale reserves clear and relevant, and do they take account of significant impact?

2. Do the actions and requirements established by the state for the achievement of the goals lead to the reduction of negative environmental impact and guarantee the state a fair royalty for the use of oil shale?

In order to answer these questions, the following important activities were performed:

**Review and analysis of documents**

- legislation, analysis of the stenographic records of the Riigikogu and strategic planning documents, their explanatory memoranda and annexes;
- National Development Plan for Oil Shale Use, implementation plan (related research, analyses etc.);
- environmental permits (extraction permits, permits for special use of water, waste permits, ambient air pollution permits, materials of applications for permits, environmental memoranda and environmental impact assessment reports);
- consolidated mineral reserve balance sheets of the Land Board, mineral resource reassessment certificates;
- combinability of the monitoring data of groundwater and surface water monitoring by the state and by companies, water management plan of the Ida-Viru County basin;
- supervision reports of the Land Board, Environmental Inspectorate and Technical Surveillance Authority;
- annual reports of companies;
- report on the competitive situation in the oil shale sector prepared by the Estonian Competition Authority.

**Database searches and queries**

- database of the structural funds (SFOS), database of environmental permits and environmental charges (KLIS), annual reports of water use (VEKA);
- queries to the Environmental Information Centre (Environment Agency), the Environmental Board, the Ministry of the Environment, the Environmental Investment Centre, the Health Board and Statistics Estonia.

**The following persons were interviewed and asked to provide explanations:**

Person and agency	
1.	Ado Lõhmus, Deputy Secretary General, Ministry of the Environment
2.	Tarmo All, Head of Land & Soil Department, Ministry of the Environment
3.	Maris Saarsalu, Head of Land & Soil Department, Ministry of the Environment
4.	Rein Raudsepp, Environmental Management Adviser, Ministry of the Environment
5.	Janne Tamm, Chief Specialist, Land & Soil Department, Ministry of the Environment
6.	Ergo Pärn, Adviser, Environmental Department, Ministry of the Environment
7.	Peeter Eek, Head of Waste Department, Ministry of the Environment
8.	Jaak Jürgenson, Head of Viru Region of the Environmental Board
9.	Emma Krikova, Leading Environmental Use Specialist, Viru Region of the Environmental Board

10.	Olga Kuvatova, Head of the Environmental Charges Bureau, Environmental Department, Environmental Board
11.	Reet Roosalu, Head of Geology Department, Estonian Land Board (ex officio)
12.	Timo Tatar, Head of Energy Department, Ministry of Economic Affairs and Communications
13.	Aive Telling, Head of Environmental Health and Chemical Safety, Department of Public Health, Ministry of Social Affairs
14.	Anneken Metsoja, Analyst, Department of Surveillance & Evaluation, National Institute for Health Development
15.	Valdur Lahtvee, Stockholm Environment Institute
16.	Kaja Peterson, Stockholm Environment Institute
17.	Igno Valgma, Department of Mining, Tallinn University of Technology
18.	Jüri-Rivaldo Pastarus, Department of Mining, Tallinn University of Technology
19.	Priit Rohumaa, CEO, Viru Keemia Grupp AS
20.	Jaanus Purga, R&D Manager, Viru Keemia Grupp AS
21.	Heiki Luts, Mayor of Vaivara Municipality
22.	Veikko Luhalaid, Chairman of Vaivara Municipal Council
23.	Etti Kagarov, Mayor of Kohtla Municipality
24.	Margit Juuse, Environmental Specialist, Kohtla Municipal Government
25.	Arno Rossman, Chairman of Kohtla Municipal Council
26.	Hardi Murula, Mayor of Maidla Municipality
27.	Enno Vinni, Chairman of Maidla Municipal Council
28.	Märt Ots, Director General, Estonian Competition Authority
29.	Juhan Põldroos, Head of Supervisory Department, Estonian Competition Authority
30.	Martin Kaljuste, Steiger Engineering LLC
31.	Erki Niitlaan, Steiger Engineering LLC
32.	Arvi Toomik, Steiger Engineering LLC
33.	Indrek Tamm, AS Maves
34.	Andres Siirde, Department of Thermal Engineering, Tallinn University of Technology
35.	Rein Talumaa, Engineer, Energy Specialist
36.	Peeter-Jass Pikk, OÜ Baltic Energy Partners
37.	Jüri Soone, Lilleküla Society
38.	Peep Vassiljev, Mayor of Sõmeru Municipality
39.	Väina Puura, Department of Geology, University of Tartu
40.	Rein Perens, OÜ Eesti Geoloogiakeskus
41.	Merle Truu, OÜ Eesti Geoloogiakeskus
42.	Mati Rammo, OÜ Eesti Geoloogiakeskus
43.	Veljo Aleksandrov, CEO, Eesti Energia Kaevandused AS
44.	Erik Väli, Production Director & Member of Management Board, Eesti Energia Kaevandused AS
45.	Toomas Põld, Logistics Director & Member of Management Board, Eesti Energia Kaevandused AS
46.	Kalmer Sokman, Mineral Resources Environmental Manager, Environment Services, Eesti Energia AS
47.	Mai Luuk, social scientist, former lecturer at Tallinn University

## Survey

The leaders of local authorities located in the territory of the Estonian oil shale deposit in Ida-Viru and Lääne-Viru Counties were asked to take an online survey. The objective of the survey was to determine what local authorities think about the state's activities in planning the use of oil shale and involvement of local authorities as well as the negative and positive impact generated for local authorities by oil shale extraction and use, and the impact of the restrictions established on the use of oil shale deposit on the development of local authorities. The questionnaire was sent to 18 local authorities, all 18 of whom responded.

## Completion date of audit:

The audit was carried out from August 2012 to September 2013.

## Audit team:

The members of the audit team were Audit Manager Airi Andresson, Senior Auditor Krista Jansen and Auditor Alar Jürgenson.

## Contact information

Further information on the audit is available from the Communication Service of the National Audit Office:

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An electronic copy of the audit report (pdf) is available online at [www.riigikontroll.ee](http://www.riigikontroll.ee).

A summary of the audit report is also available in English.

The number of the audit report in the internal records system of the National Audit Office is 2-1.7/14/70060/12.

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## **Earlier audits of the National Audit Office in the area of mineral resources, energy and environmental charges**

**6 October 2008 – Impact of Pollution Charges on Reducing Environmental Pollution**

**14 May 2009 – National Arrangement of Mining Mineral Resources Used in Construction**

**26 November 2009 – State's Efforts of Reducing Greenhouse Gas Emissions**

**18 September 2012 – Alternatives for Electricity Production**

All reports are available on the website of the National Audit Office at [www.riigikontroll.ee](http://www.riigikontroll.ee)

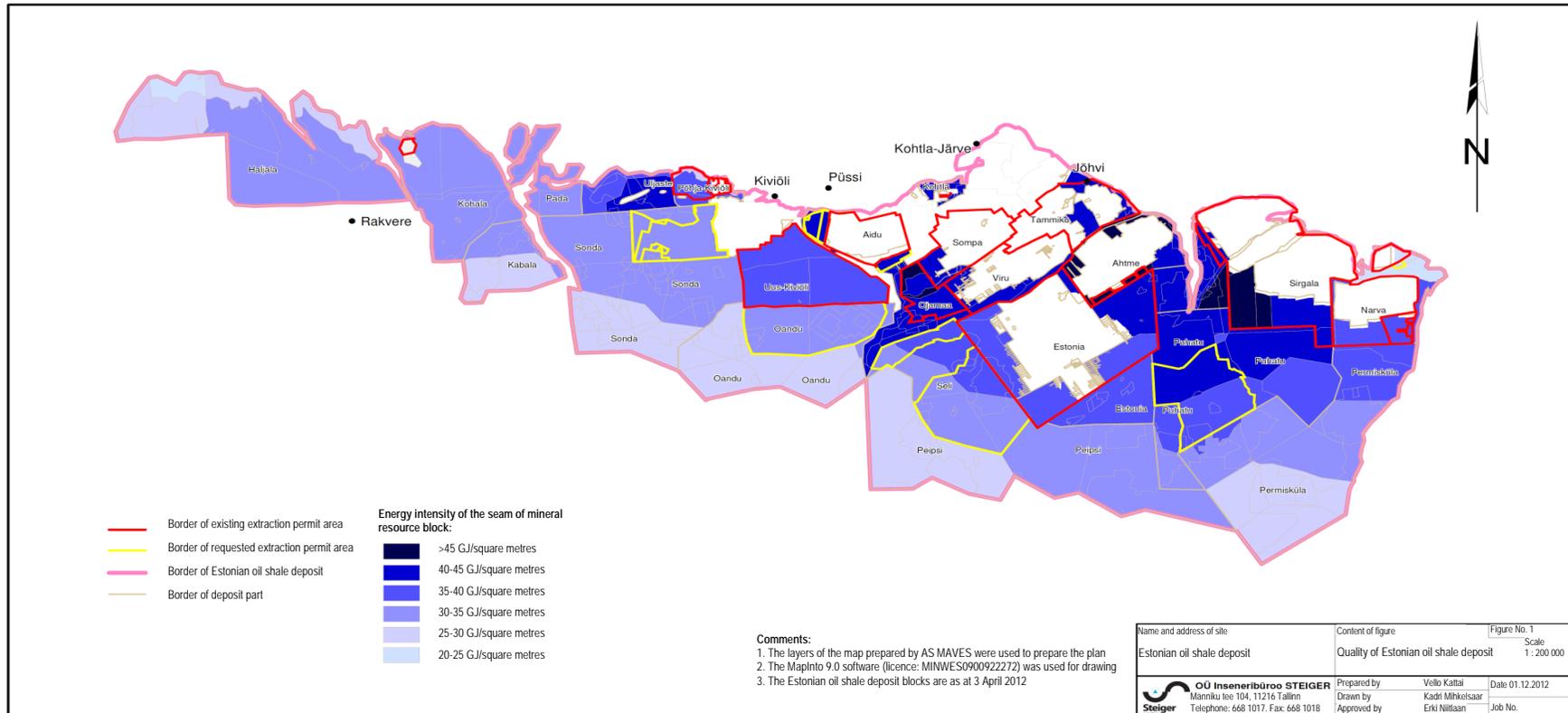
## Annex A. Studies required with the Oil Shale Development Plan and their implementation

Study required in the Oil Shale Development Plan	Reports on the performance of the implementation plan of the development plan
<p>Studies for determining the uses of oil shale:</p> <ul style="list-style-type: none"> <li>▪ Stage I – development of criteria for assessment of oil shale reserves by quality</li> <li>▪ Stage II – assessment of oil shale reserves by quality according to new criteria</li> </ul>	<p>According to the Ministry, the following paper, completed in 2005 by the Department of Mining of Tallinn University of Technology, will be considered as the stage I study: Creation of Oil Shale Reserve Assessment for Uses and Assessment of Quantity According to Developing Fuel and Energy Sector, Long-Term Resource Planning.</p> <p>The stage II study was completed by the Department of Mining of Tallinn University of Technology in 2010: Determination of Oil Shale Uses and Assessment of Reserves Based on New Criteria to Guarantee Sustainability of Oil Shale Use.</p> <p>According to the Ministry, the purpose of the papers is to consider changing the minimum activity of oil shale reserves and replacing the present energy intensity of 35 GJ/m<sup>2</sup> with 30 GJ/m<sup>2</sup>, which makes it possible to reassess the oil shale reserve in the list of deposit according to an energy intensity of 30 GJ/m<sup>2</sup>.</p>
<p>Commissioning applied research for the preparation of the next Development Plan for Oil Shale Use, incl.</p> <ul style="list-style-type: none"> <li>▪ complex research for determining the optimal annual extraction volume of oil shale for 2016-2030 considering the gradual decrease in the share of oil shale energy and specification of the state's interests in relation thereto;</li> <li>▪ research for the establishment of the priorities of oil shale use for 2016-2030 proceeding from economic criteria and the best available technology.</li> </ul>	<p>The research was supposed to be carried out in 2010.</p> <p>The research has been postponed year after year due to budget cuts. The 'Analysis of the Data Required for Preparation of the National Development Plan for Oil Shale Use 2016-2030' was completed in April 2013. It was prepared by Steiger Engineering LLC, the Stockholm Environment Institute, AS Maves and OÜ Baltic Energy Partners.</p> <p>The study recommends increasing the existing extraction rate, as companies are using more environmentally friendly technology, the oil industry is expanding strongly, the electricity market is open and the requirements of the European Union have become less strict.</p>
<p>Studies in the area of oil research and development</p>	<p>The Energy Technology Programme was created to finance research and development in the area of oil shale. Research into a variety of oil shale processing technology, incl. research into sustainable oil shale extraction.</p>
<p>Applied research to objectively take account of the external costs of oil shale use in the establishment of environmental charge rates in such a manner that the efficiency of oil shale use and valorisation of oil shale products increases, before which assessing the impact of changes in environmental charges on the electricity price and business.</p>	<p>Pursuant to the implementation plan, the research had to be carried out from 2009-2010.</p> <p>The Ministry of the Environment has demonstrated the following works as completion of the research:</p> <ul style="list-style-type: none"> <li>▪ Study organised by the Ministry of Economic Affairs and Communications: Mitigating the Negative Impact of Climate Package and Emissions Trading, 2011. The research indicated that the implementation of the climate package in the electricity generation sector is associated with a significant increase in direct and indirect expenses and a major threat of carbon leakage.</li> <li>▪ The Analysis of Environmental Expenditure commissioned by the Ministry of the Environment, 2012, prepared by the Praxis Centre for Policy Studies. The paper gives an overview of the receipt of environmental charges and analyses the use of money and changes from 2005-2010.</li> <li>▪ Analysis of the Impact of Environmental Charges commissioned by the Ministry of the Environment, 2013, prepared by the Stockholm Environment Institute Tallinn and the Centre for Applied Social Sciences (CASS) of the University of Tartu. The paper focuses on the impact of different types of environmental charges, incl. the impact of resource charges on business and the environment, and on the efficiency of charge rates. The analysis forms the basis for the establishment of environmental charges for 2016-2020.</li> </ul> <p><b>Comment of the National Audit Office:</b> the external costs of oil shale are not actually analysed in any of the aforementioned papers.</p>
<p>Identification of the environmental and health impact</p>	<p>This research should be carried out from 2012-2015.</p>

<p>of oil shale extraction and use and suggesting measures for reducing impact</p>	<p>The Environmental Investment Centre made the decision to fund the research in June 2013. The research will be carried out by the Health Board and should be completed in spring 2015.</p>
<p>The research that can be used to assess the status of groundwater in oil shale deposit and to give an overview of groundwater reserves and its movement in planned mining regions; specify hydrological models that make it possible to determine the extent of the cone of depression and the quantity of pumped-out water.</p>	<p>The Assessment of Groundwater Reserves in Estonian Oil Shale Deposit was completed in 2010. It was prepared by Eesti Geoloogiakeskus OÜ.</p> <p>This research gave a thorough account of the current status of groundwater reserves in the oil shale deposit. The impact of extraction on the changes in the groundwater level and quantities was modelled with the research.</p> <p><b>Comment of the National Audit Office:</b> However, the impact on the water quality of the groundwater bodies in the unmined areas adjacent to the groundwater body of the Ida-Viru County oil shale basin was not discussed in the study.</p>
<p>Applied research on the basis of which the extraction of oil shale and the recovery of mined areas can be stipulated in the Earth's Crust Act and its derivative acts as fast as possible.</p>	<p>Pursuant to the implementation plan, this research had to be carried out from 2009-2011.</p> <p>The research has not been commissioned. The 2010 report on the implementation of the development plan states that improving and specifying landscape reconditioning requirements in the Earth's Crust Act will help implement the measure.</p>
<p>Applied research on the basis of whose results the mining sensitivity of an area can be proceeded from when applications for extraction permits are processed or decisions on taking a mining field into use are made.</p>	<p>Pursuant to the implementation plan, this research had to be carried out from 2009-2011.</p> <p>AS Maves completed the Applied Research for Determination of Categories of Mining Sensitivity and Using the Oil Shale Deposit Proceeding from Mining Sensitivity.</p> <p>Follow-up research was initially planned to be carried out in 2011, then in 2012, but it did not commence in 2013 either. The research has since been added to the 2013-2015 Implementation Plan of the Development Plan.</p> <p><b>Comment of the National Audit Office:</b> only the mining sensitivity of nature conservation areas was assessed in the research. The mining sensitivity of the remaining area of the deposit was not assessed.</p>
<p>Applied research on the basis of which the Earth's Crust Act can be updated with a list of cases where the extraction permits can be amended and annulled.</p>	<p>Pursuant to the implementation plan, this research had to be carried out from 2010-2011.</p> <p>The research has not been commissioned. The 2010 report on the implementation of the development plan states that specifying the provisions of amending and annulling mineral resource extraction permits will help implement the measure.</p>

Source: National Development Plan for Oil Shale Use 2008-2015 and Implementation Plan 2009-2012, and reports on the performance of the implementation plan 2009-2011

## Annex B. Energy intensity of mineral resource seam of Estonian oil shale deposit



Source: Steiger Engineering LLC