

INVESTIGATION OF EXISTING ENERGY SITUATION IN LIMBAŽI REGION

LIMBAŽU RAJONA ENERGOAPGĀDES ESOŠĀS SITUĀCIJAS IZPĒTE

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Introduction

It is forecasted that energy consumption in Latvia in the future will increase together with the development of the economy. Accordingly the question about ensuring energy independence and sufficiency of resources is getting more urgent. At the same time additional attention is being paid to energy environmental and social aspects. One of the approaches for handling these issues are integrated energy planning.

Energy planning can be performed on different levels – national, regional, and local level. Each planning level is specific. Energy planning on the regional level is recognized as most appropriate for the promotion of renewable energy sources, insurance of energy independence, and reduction of environmental impacts.

Until now in Latvia, energy plans or similar planning documents have been developed mainly on the national or local planning levels. Only a few attempts to predict and to forecast energy development has been implemented on the regional level, e.g., energy plans have been developed for the municipalities of Dobeles and Saldus regions. However, those attempts did not result in visible changes and did not promote other Latvian municipalities to develop such investigations and to think about sustainable development in future.

This research was performed for Limbaži region in Latvia. The Limbaži region is a typical Latvian rural region. The region's administrative structure consists of territories of five cities and

11 parishes. There is no connection to natural gas grid and for this reason it is possible to highlight the need for use of local fuel and renewable energy sources.

To find appropriate energy planning method, different methods in literature were reviewed and the most suitable methods for the Latvian situation were chosen. The choice of method was limited by the availability of information at the regional and municipal level. Different data sources were used for obtaining the information, e.g., statistical data, questionnaires and interviews with local stakeholders; as well many assumptions were applied.

The aim of the research was to develop a suitable energy planning method for the typical Latvian region, evaluate the region's existing energy situation and to create future development scenarios for the time period until year 2030. Two scenarios were developed – a reference and energy efficiency scenario. Regarding these scenarios, the region's future energy demand and environmental impact in the form of CO₂ were predicted and divided for different consumer sectors.

Evaluation of existing energy situation

Investigation of the existing energy situation showed that wood is mainly used for heat generation. Often the utilization of wood fuel is performed using equipment with very low efficiency. Low efficiency is not the problem only of heat generation system but also for the distribution and demand side. Total amount divided by different type of fuel used in Limbaži region largest heat sources is showed in Fig.1.

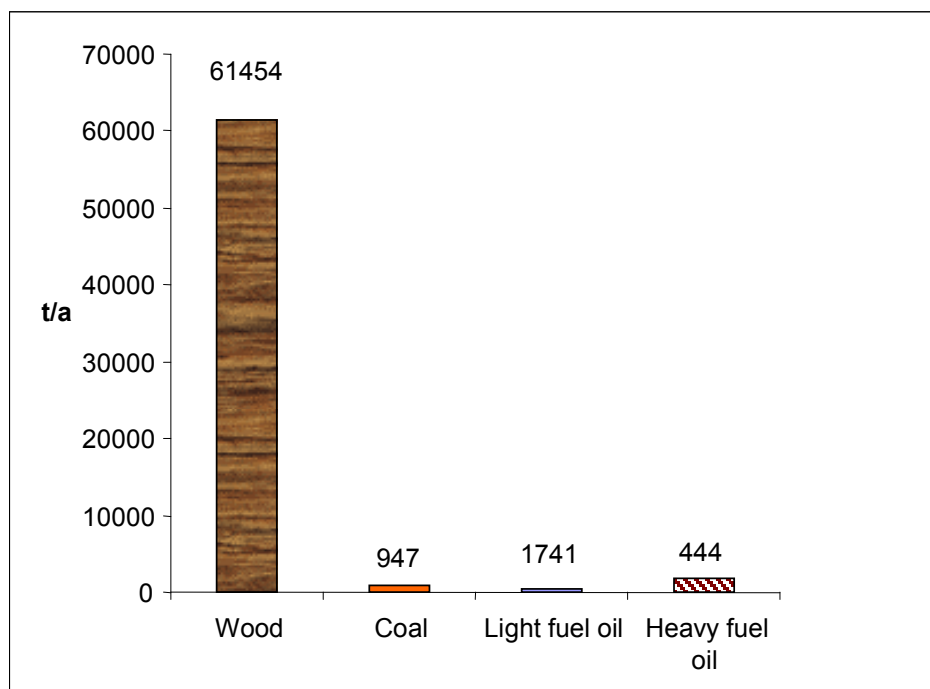


Figure 1. Use of fuel in Limbaži region heat sources, 2005 [1]

Electricity in the region is generated by two small hydro power plants and one wind park. These installed electricity generation capacities are negligible compared to the total region electricity consumption. Therefore almost all of the necessary electricity volume is imported from outside the region. The overview of energy generation sources in Limbaži region is given in Table 1.

Table 1

Electricity generation sources in Limbaži region

Nr.	Location	Name	Installed capacity, MW	Energy type
1.	Skulte parish	Aģe hydro power station	0.05	Hydro energy
2.	Viļķene parish	Viļķene hydro power station	0.035	Hydro energy
3.	Ainaži rural territory	Ainaži Wind power station	1.2	Wind energy
Total installed capacity			1.285	

Based on existing energy supply and demand evaluation, the potential of energy efficiency and renewable energy was defined. The evaluation showed that main energy saving potential is in the housing sector as well heat losses could be reduced in district heating systems – in production sites and distribution networks. The highest renewable energy potential is identified for biomass projects and, compared to other regions in Latvia, Limbaži region has good wind energy potential as well [2].

Future energy development alternative scenarios

According to the evaluation of the existing energy situation, the future development scenarios were created for the time period until year 2030. Two scenarios were developed – a reference and energy efficiency scenario. Regarding these scenarios, the region's future energy demand and environmental impact was predicted and divided for different consumer sectors. Forecasts were performed using Long-range Energy Alternative Planning (LEAP) computer model, which is developed and distributed by the Stockholm Environmental Institute in Sweden [3].

The first reference scenario was developed based on the State development forecasts found in different national planning documents [4;5]. After this, based on reference scenario, the new energy efficiency scenario was created. It was assumed that in 2030 only energy efficient equipment will be used in households and, regarding energy efficiency measures, the energy consumption in industry will decrease by 1% every year. It is assumed that energy consumption will decrease also in the transport and commercial sectors.

The modeling results showed that energy consumption is decreasing every year and after comparing both scenarios it was predicted that implementation of energy efficiency measures can save up to 19% of total energy consumed. The difference in energy consumption between both scenarios is shown in Fig.2.

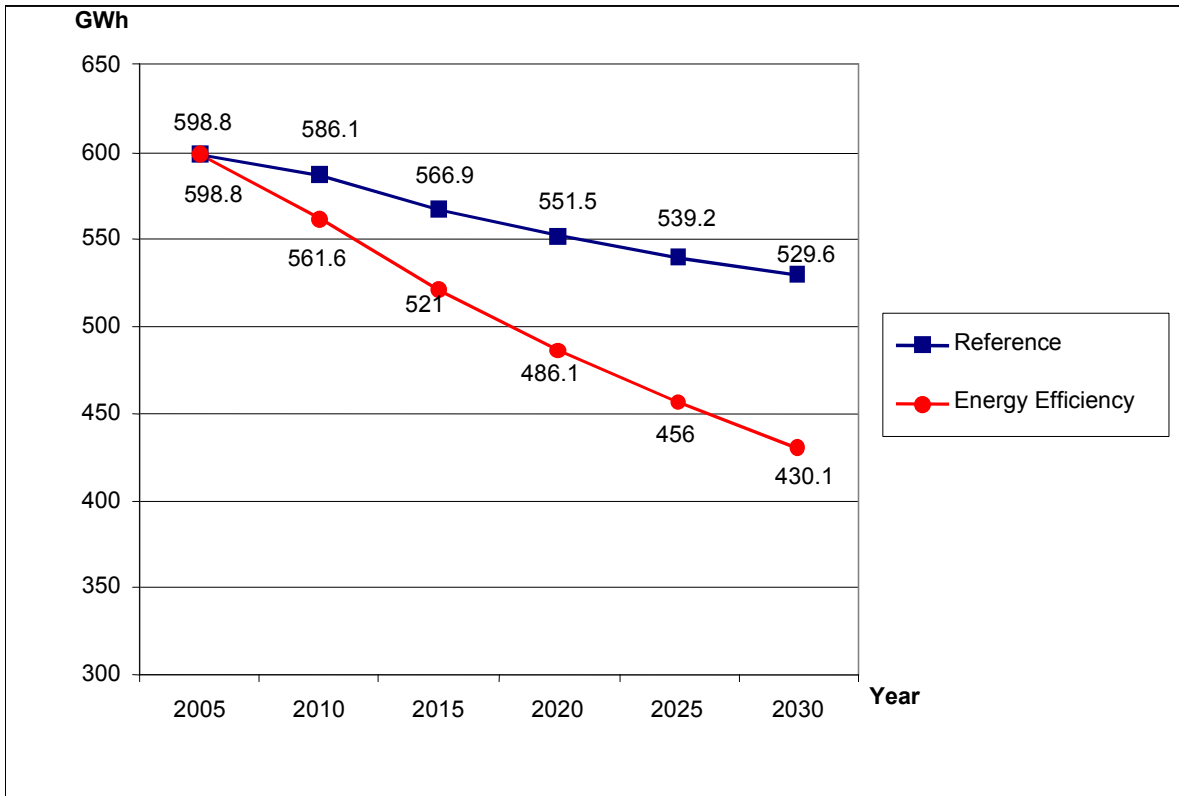


Figure 2. Forecast of total region's energy consumption

In different sectors, e.g., households and industry, energy efficiency measures allow to reduce total energy consumption by up to 22 – 24%. Households are the main energy consumers. The modelling results showed that energy consumption tended to go down and this is mainly due to the forecasted decrease in the population. In other sectors – industry, transports and commercial sector, energy consumption is increasing every year.

To verify the model, modelling results were compared with nationally forecasted development trends. The results were similar and thus it is predicted that modelling results are eligible.

To evaluate the region's development from the environmental point of view, CO₂ emissions were calculated for each scenario. In calculation of CO₂ only fossil fuels were included. Calculation results showed that total emission amounts tend to grow over the years (see Fig.3), which is due to forecasted growth of number of vehicles and increased amount of kilometers driven. Since in heat production mainly wood fuel is used which is not included in CO₂ emission calculations, the main carbon emission source is the transport sector.

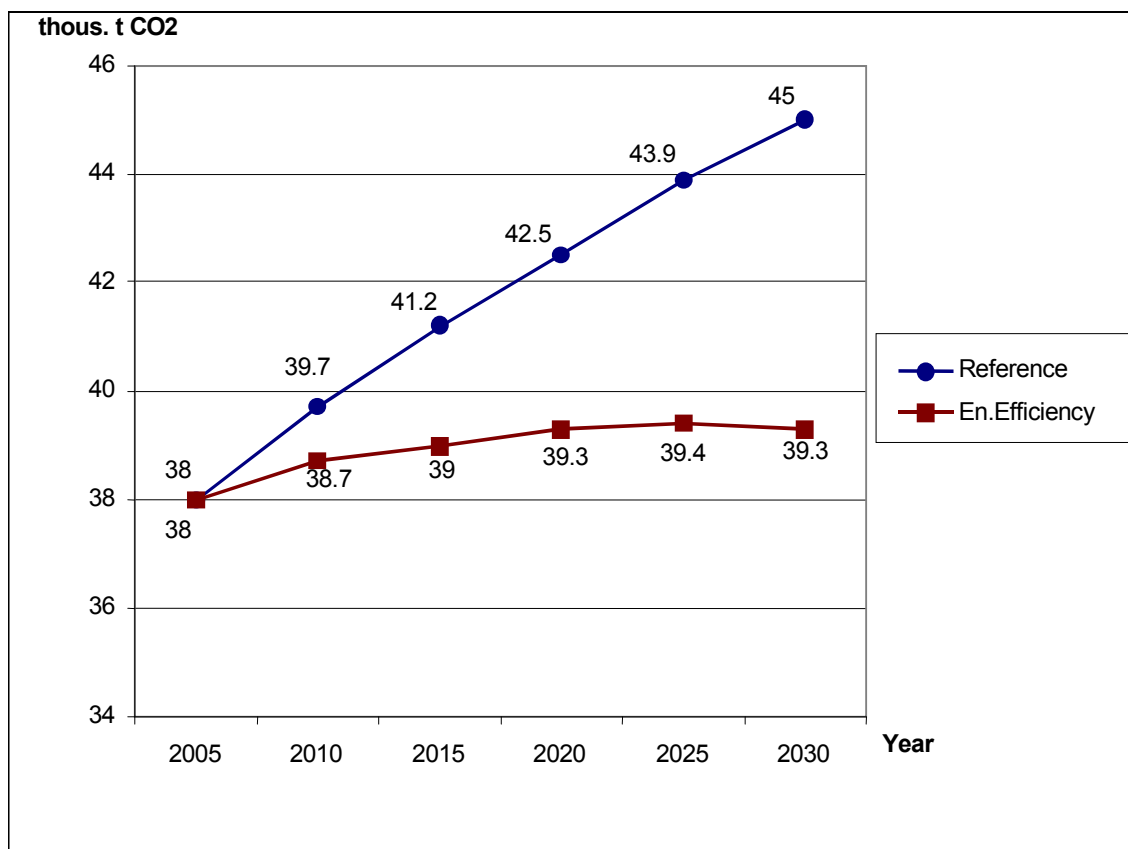


Figure 3. Forecast of total region's CO₂ emissions

The amount of CO₂ emissions is increasing every year both in reference and energy efficiency scenario. Total CO₂ emission in 2030 is forecasted 45 thous.tons in reference scenario and in case of energy savings it could be reduced to 39.3 thous.tons. However, even with the energy efficiency measures it will not be enough to stop increasing amount of CO₂. This is due to the significant share of transport in the total balance of CO₂ emissions and more attention has to be paid to transport related problems, like promotion of biofuel use and development of new low fuel consumption technologies.

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Dzene I., Veidenbergs I., Roša M. Limbažu rajona energoapgādes esošās situācijas izpēte.

Pētījuma ietvaros ir izveidots Limbažu rajona energoplāns, kurā izpēta rajona energoapgādes esošā situācija, kā arī, izmantojot dator modeli LEAP, prognozēta rajona attīstība nākotnē. Informācijas ieguvei tika izmantoti dažādi pieejamie datu avoti – statistikas informācija, anketēšana, intervijas u.c., kā arī izdarīti dažādi pieņēmumi. Iegūtie dati rāda, ka siltumenerģijas ražošanā pārsvarā tiek izmantota koksne, kas bieži tiek dedzināta ar zemu lietderības koeficientu. Zema energoefektivitāte ir ne tikai siltuma ražošanā, bet arī pārvadē un lietošanā. Elektroenerģija rajonā tiek ražota divās mazajās hidroelektrostacijās un Ainažu vēja parkā, bet uzstādītās elektroenerģijas jaudas ir mazas, tādēļ gandrīz visa nepieciešamā elektroenerģija tiek importēta. Balstoties uz esošās situācijas novērtējumu, tika modelēti rajona nākotnes attīstības scenāriji līdz 2030.gadam. Tika izveidoti divi scenāriji – atsaucis un energoefektivitātes -, saskaņā ar kuriem noteikts rajona nākotnes enerģijas patēriņš pa sektoriem. Modelēšanas rezultāti rāda, ka enerģijas patēriņš pakāpeniski samazinās un, salīdzinot abus scenārijus, energoefektivitātes pasākumu rezultātā 2030.gadā ir iespējams ietaupīt līdz 19% enerģijas. Turpretim CO₂ emisijas nākotnē pieaug, kas ir saistīts ar lielo transporta sektora īpatsvaru kopējā emisijas bilancē.

Dzene I., Veidenbergs I., Roša M., Investigation of Existing Energy Situation in Limbaži Region.

The main outcome of the research is energy plan for Limbaži region, which includes the investigation of existing energy supply and forecast of region's future development using computer model LEAP. Different data sources were used for obtaining the information, e.g., statistical data, questionnaires and interviews with local stakeholders as well many assumptions were applied. Investigation of existing energy situation showed that wood is mainly used for heat generation. Often the utilization of wood fuel is performed using equipment with very low efficiency. Low efficiency is not the problem only of heat generation system but also for distribution and demand side. Electricity in the region is generated by two small hydro power plants and one wind park. These installed electricity generation capacities are negligible compared to the total region electricity consumption. Therefore almost all of the necessary electricity volume is imported from outside of the region. According to the evaluation of existing energy situation the future development scenarios were created for the time period until year 2030. Two scenarios were developed – a reference and an energy efficiency scenario. Regarding these scenarios region's future energy demand was predicted and divided for different consumer sectors. The results showed that energy consumption is decreasing every year and after comparing the both scenarios it was predicted that implementation of energy efficiency measures can save up to 19% of total energy consumed. However CO₂ emissions are increasing every year that is due to the significant share of transport in the total balance of CO₂ emissions.

Дзене И., Вейденберге И., Роша М., Исследование существующей ситуации энергоснабжения Лимбажского района.

В рамках исследования разработан энергоплан для Лимбажского района, в котором изучена существующая на данный момент ситуация энергоснабжения, а также, применяя компьютерную модель LEAP, прогнозировано дальнейшее развитие района в дальнейшем. Для получения информации были использованы различные доступные источники данных- статистическая информация, анкетирование, интервью и др., а также сделаны различные допущения. Полученные данные показывают, что в основе производства тепловой энергии используется древесина, которая часто сжигается с низким коэффициентом полезного действия. Низкая энергоэффективность присутствует не только в производстве тепла, но и в передаче и использовании. Производство электроэнергии в районе реализуется на двух гидроэлектростанциях и в Айнажском ветряном парке, но установленные электрические мощности незначительные, поэтому почти вся необходимая электроэнергия импортируется в район. Основываясь на оценке существующей ситуации, были смоделированы сценарии развития района до 2030 года. Были созданы два сценария- маргинальный и энергоэффективный, в связи с которыми было определено дальнейшее потребление энергии района по секторам. Результаты моделирования показали, что потребление энергии постепенно уменьшается и, сравнивая оба сценария в результате мероприятий по энергоэффективности в 2030 году возможно сэкономить до 19% энергии. Напротив эмиссии CO₂ в будущем вырастают, что связано с высоким удельным весом транспортного сектора в общем эмиссионном балансе.