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ISLAND SUSTAINABLE ENERGY ACTION PLAN

ISLAND OF SAAREMAA

Date 18.10.2012

Executive summary

Saaremaa - literally Land of Islands - is the second biggest island in the Baltic Sea with an area of 2 668 km². At the same time Saaremaa is the biggest island of the Republic of Estonia. Muhumaa – the third biggest island (206 km²) of Estonia lies between Saaremaa and the mainland. Saaremaa and Muhumaa are connected with a causeway through the strait and constitute the predominant part of Saare county. Additionally some small islands belong under Saare county, but these constitute a very small part of the area (and population) of the county.

Current document is the
ISLAND SUSTAINABLE ENERGY ACTION PLAN (ISEAP) of Saare county.

The most important aim in energy use in Estonia comes from the Renewable Energy Directive (2009/28/EC), the so-called 20-20-20 strategy which requires, by the year 2020, to cover 25% of total energy needs with energy from renewable sources and for the transport sector 10% of energy needs from renewable sources.

Saaremaa has joined the International agreement Called Pact of Islands. The Pact of Islands signatories make a number of significant commitments, among which:

- to go beyond the objectives set by the EU for 2020, reducing the CO2 emissions in their respective territories by at least 20%;
- to submit an Islands Sustainable Energy Action Plan including a Baseline Emission Inventory which outlines how the objectives will be reached.

Thus the main purpose of current action plan is to provide measures to reduce CO2 emissions by at least 20% by the year 2020 compared to the baseline year.

Current sustainable energy action plan sets out to report the following:

- Presents the baseline energy and CO2 inventory for the year 2005;
- Describes the trends in energy sector in Saaremaa and gives the prognosis for the “Business as usual” scenario;
- Proposes and describes the actions needed to exceed the target of reducing CO2 emissions by 20% by the year 2020.

The changes in usage of energy are impacted by several general trends, such as:

- Changes (decrease) in population;
- Changes in macroeconomic environment;
- Increase in consumption of goods and services;
- Increase of car usage;
- Mechanisation and automation of production;
- Development of the tourism sector (and services) in Saaremaa.

In addition the political mechanisms of European Union have a major impact on development of energy use, as well as (raising) prices of heat and electricity.

For the BAU scenario, still an increase in usage of energy is expected in most sectors. Development and implementation of sustainable actions is therefore vital to prevent the increase of CO2 emissions and to turn it into a decline.

The results of the CO2 emission calculations in the plan were as follows:

- Overall CO2 emission for the baseline situation in 2005: 158 692 t CO2.
- Overall CO2 emission for 2020 in case of BAU scenario: 191 108 t CO2
- Overall CO2 emission for 2020 in case of ISEAP scenario: 124 798 t CO2.

The emission balance for the ISEAP scenario shows that after implementing the actions foreseen in the action plan the overall CO2 emissions are reduced by 21,4% compared to the baseline situation in 2005 that exceeds the target set with the Local Sustainable Energy Action Plan.

The biggest challenges in terms of CO2 emissions that remain are:

- The transport sector, where it is difficult to significantly reduce the dependency on fossil motor fuels in such a short period;
- The secondary sector where it is complicated to extensively reduce the amount of fuel oil that is used in industrial processes.

The results of the calculations also show that the most efficient means for reduction of overall CO2 emissions is installation of wind turbines for power production into the national grid. Whereas **the tertiary sector holds the biggest potential for energy savings.** Of course, to achieve the target of reducing CO2 emission by at least 20% all actions in all sectors are needed.

* The ISEAP report is accompanied with ISEAP calculation tables where the detailed numeric data is presented, current report presents the main outcome of the calculations made.

Contents

1. CONTEXT

1.1. Geography and territory

Saaremaa - literally Land of Islands - is the second biggest island in the Baltic Sea with an area of 2668 square km. At the same time Saaremaa is the biggest island of the Republic of Estonia and situated close to the western coast of the mainland of Estonia. Also Muhumaa – the third biggest island of Estonia (206 square km) lies between Saaremaa and the mainland. Saaremaa and Muhumaa are connected with a causeway through the strait. The nearest point on the mainland is the harbour of Virtsu, over 6 km away from Muhumaa. There is a ferry service between Muhumaa and the mainland.

Saaremaa and Muhumaa constitute the predominant part of Saare county. Additionally some small island belong under Saare county but these constitute a very small part of the area (and population) of the county.

The landscape of Saaremaa belongs to the West-Estonian lowland region. The landscape type of the area is limestone and moraine plain, the average elevation being about 15 meters above sea level. The relief in the island is quite flat. Because of that, the coastlines can be identified as an important land feature in the area and have a strong impact on how the landscape is perceived. Traces of maritime processes can be found far inland from the coastline and play a major role in the experience if the landscape. The coastline of Saaremaa is strongly fragmented, especially the northwestern and western coast of the island and the area facing the Gulf of Riga, east of Kuressaare. The largest peninsulas include Sõrve in the southwest, Tagamõisa in the northwestern part of the island, Kübassaare at its southeastern corner, Pammana in the north and Vätta peninsula in the south. The deepest gulfs near Saaremaa, Küdema and Tagalaht, are situated between the peninsulas.

There are about 80 lakes in Saarema (the number is constantly changing as in the course of time new lakes are formed and some of the existing ones grow over and disappear), most of them small – over a half of them do not exceed 10 ha in area. Only Mullutu-Suurlaht and Karujärv are among the largest lakes in Estonia.

Saaremaa is a true botanical Mecca, 80 percent of the plant species found in Estonia are represented here. More than 40 percent of Saaremaa is covered with forest. The forests mostly constitute of mixed forest but in some areas one can also find deciduous forests. There are coastal meadows and dryer alvar meadows on the islands. Once a typical and exclusive landscape element in Saaremaa, the alvars are now in decline. Nature conservation planning for Saaremaa now includes protection of the largest and most rare alvar areas.

The woods of Saaremaa are rich in game, there are great number of wild boars, elks, deer and roe deer. 90% of all known hatching species net or have nested here. The Western Estonian islands lie within East-Atlantic flyway, the waterfowl migratory path. This bird

route connects Northeastern Europe with Arctic regions and each year hundreds of thousands of migratory birds visit Saaremaa in spring and autumn.

The present landuse on the island faces several important environmental challenges according to the overview made in the Saaremaa County Plan. Development is increasing in the coastal areas and other landscapes previously untouched by human settlement, and over-exploitation of these valuable lands is considered a threat. This trend may cause both a decline of habitats, and fragmentation of landuse due to privatisation.

1.2. Demography

In 1923 the population of Estonia was 1.09 million. Between 1923 and 1940 the population remained the same, decreasing by a tenth after World War II. Since the 1950s the population increased until the 1990s, reaching 1.57 million in 1990. In the past two decades (1990-2010) the population has been decreasing. In 2012 the population of Estonia was 1.34 million.

In the years 2008-2010 the population's decrease took a much slower course and by the end of 2011, it could even be regarded as stabilized. According to Eurostat's estimations[1] about the population, this stabilization would not lead to an increase, but the population will be decreasing the whole first half of the century (until 2060). According to the estimations of the Estonian Statistical office, the population of Estonia will be 1.24-1.25 million by 2050.[2].

The changes in population affect different counties differently. Population decrease took off in the south-eastern part of Estonia and in Viljandi county a lot earlier than elsewhere already in the 1970s. In the last decade the only county where the population has been increasing was Harjumaa, in the rest of the counties the population is decreasing. The decrease is somewhat less significant in the counties of Tartu, Rapla and Pärnu. In the rest of the counties the population is decreasing rapidly. An optimist might point out Saare County as one where the decrease is slightly slower.[3].

The population of Saare County is in decline. It has decreased from approximately 40 000 in the year 1993 to 34 800 in 2009 and to 34 500 in 2012, or by 13 percent in a period of 16 years[4]. The drop in population is a general trend occurring throughout Estonia since the country regained its independence in 1991. Three main trends affecting the population

[1] http://statistikaamet.wordpress.com/2011/07/08/eurostat-muutis-eesti-rahvastikuprognoosi-optimistlikumaks/
[2] http://statistikaamet.wordpress.com/tag/rahvaarv/
[3] http://statistikaamet.wordpress.com/tag/rahvaarv/
[4] In 2011 a population survey was carried out in Estonia. According to the preliminary results 31 344 inhabitants lived in Saare county (35 951 in 2000), that is much smaller (ca -10%) compared to data from other sources. However, as the results of the survey are not final yet, the latest official data from Statistics Estonia - ca 34 500 inhabitants - is used.

development are the negative fertility/mortality rate, the negative migration pattern and the aging of the population. The balance between birth and death rates is negative by more than 100 inhabitants per year. The number of children in the age group 0-14 years has dropped by 17 percent in just four years, 2004 - 2008. This is due to low fertility, and the negative net migration of young people and families. This together with negative net migration means that Saare County loses between 100 and 300 inhabitants per year. Although similar population trends are evident for Estonia, the decrease is more rapid in the islands (also in Saaremaa).

The age structure in Estonia and in Saaremaa has also changed. The largest change concerns the age group 0-14 years. In 2004 the share of children aged 0-14 exceeded 17 percent while their share was less than 15 percent in 2008. During the same time period, the age group 15-64 years has increased in percent and in absolute numbers. Also the number of people 65 years and older has increased. In Saare County population structure is different from Estonia as a whole - Saare County has even a larger share of elderly people compared to the average of Estonia.

In perspective, demographists do not foresee a thoroughly positive natural population increase in Estonia. In case the present trends of population continue, the estimated population in the county is around 30,000 by 2020 (based on the data of the county government's vital statistics office).

The following table presents the population of Saaremaa in the years 2002 to 2007, shown by different age groups, based on the development strategy of Saare County.

Table 1. Population and age variation of Saare county 2002 - 2007[5]

	2002	2003	2004	2005	2006	2007
Population	**35 746**	**35 584**	**35 356**	**35 208**	**35 076**	**34 978**[6]
Men	16 744	16 675	16 575	16 531	16 476	16 415
Women	19 002	18 909	18 781	18 677	18 600	18 563
0–14-year old	6894	6541	6181	5824	5505	5311
%	19.29	18.38	17.48	16.54	15.69	15.18
15–64-year old	22 852	23 003	23 088	23 229	23 361	23 322
%	63.93	64.64	65.30	65.98	66.60	66.68
65-year old and elder	5999	6039	6086	6154	6209	6344
%	16.78	16.97	17.21	17.48	17.70	18.14
Change in population	**-126**	**-164**	**-235**	**-155**	**-140**	**-109**

The average population density in the county was 11.9 residents/km^2. Urbanization has been the main trend. The largest settlement on the island Saaremaa is the town of Kuressaare where a more urban type of development is concentrated, presently 41% of the population i.e. 16 500 residents live there. The rest of Saaremaa is more rural and the housing developments are scattered. The settlement structure is spread rather evenly over the island with traditional fishing villages along the coastline and agricultural villages inland. The average village size is small in terms of population. Orissaare is the second settlement in the County with 1073 residents (in 2008), Kärla village has 931 residents,

[5] The source used in the development strategy of Saare County: Statistics Estonia (http://www.stat.ee)
[6] For comparison - as explained above the overall population in 2012 is considered to be 34 500.

Salme 570, Aste 512, Valjala 497, and Kihelkonna 480. The coasts mostly attract summer residents and foreign tourists.

The population of Kuressaare has remained stable and mainly as a result of the migration within Saaremaa we assume that the population of Kuressaare will remain stable until the year 2020.

Out of the 16 local governments of Saare country, two are not in Saaremaa. The island of Muhu has 1,900 residents and the island of Ruhnu has 60 residents.

So, different sources and estimations can transpire core opinions and presumptions used in this project:

- The population of Saaremaa continues to decrease – both as a result of negative natural growth and negative migration. This prognosis will be based on the estimation that the population will be decreasing by 300 persons per year up until the year 2020, when the population will be 32,000 (this prognosis is actually a positive overestimation).
- The population will continue to age.
- Migrating within Saaremaa is significant in case of Kuressaare, where the population will remain stable as a result of migration from other parts of Saaremaa.

Based on the significance of tourism in the region the number of people residing in the area fluctuates seasonally. Many of the houses are also summer houses/cottages, which are actually used and occupied for a shorter period in summer.

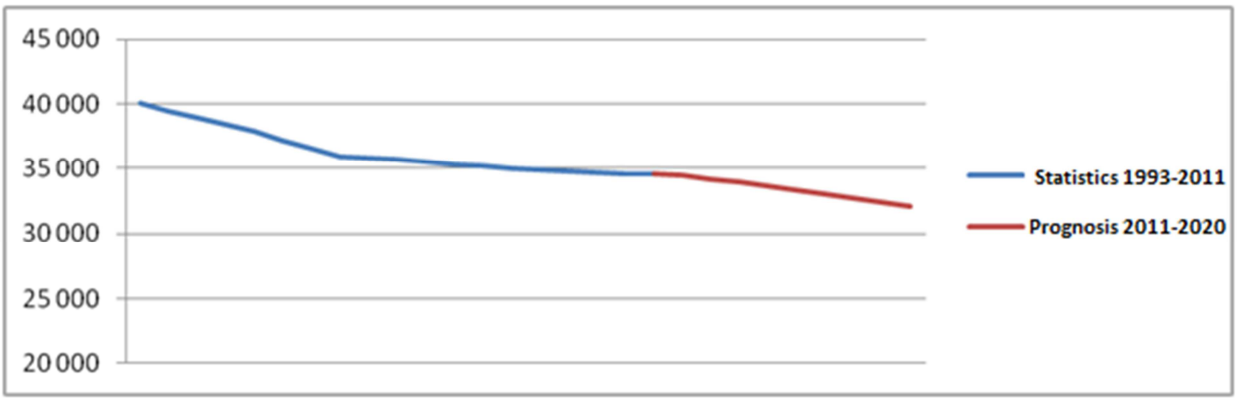

Figure 1. Population dynamics of Saare county 1993-2020[7].

[7] Data: for 2000-2011 – Statistics Estonia (www.stat.ee); for 2012-2020 – prognosis made by Hendrikson&Ko, according to which the population will decrease linearly by 300 inhabitants per year

1.3. Economy

During the past twenty years the Estonian economy has undergone major transformation. The country has completely reoriented its production to new markets in the Nordic countries and the rest of EU. This development has affected the regional economies all over Estonia. Employment has decreased, mainly in the agriculture and manufacturing sectors, while there has been a increase in employment within the service sector. In the country as a whole, employment in agriculture has decreased from twenty to four percent and manufacturing from 38 to 35 percent between 1990 and 2008. The Service sector i.e. tertiary employment increased from 43 to 60 percent during the same period.

The traditional way of life in Saaremaa has been connected to agriculture and coastal fishing, which were dominating in the Saaremaa economy until the late 1980s. Production sectors based on natural resources (agriculture, fishing, forestry) have gradually lost much of their economic importance. After the crisis in the agriculture and fishing sector, employment increased in the service sector and manufacturing sector. In Saare County employment in agriculture was about 40 percent in 1990, and has decreased to about 9 percent in 2008. The employment within the service sector increased from 38 percent to 55 percent during the same period (mainly by tourism). In absolute numbers, employment in the secondary sector increased in Saare County during the period 1990-2008 from 4 600 to 5 500.

The employment rate of Saare County is low for both men and women. In Estonia as a whole, the employment rate for men[8] was 68 percent while the equivalent was only 58 percent in Saare County in 2008, i.e. about ten percentage points below the national average. For women the difference to the national average is only four percentage points. A part of the male labour force is poorly adapted to the quite recent structural changes in the economy. There is a lack of jobs in "traditional" male occupations, such as in agriculture and some branches of industrial manufacturing. Also construction work is more easily available or better paid on the mainland, especially in the Tallinn area.

The change in agriculture is one trend that is affecting the way of life in Saare County. Its importance as a source of employment has decreased. The global development of commercial agriculture goes on, emphasising low market prices, efficient production and economies of scale. On the other hand, many small self-sustaining farms that used to strive on small scale production by one or two, mainly elderly people, have been turned in to part time farming. The part time farms are tended by one to two persons that also have a part time job in another sector (e.g. health care or local commercial/tourist services). Thus we can state that here will likely be polarisation. While entrepreneurial farms will continue to grow in size, there will also be (part-time) small-scale horticulture and animal tending, which is a "green" trend in many countries.

The importance of the primary sector has notably decreased in Saarema and restructuring it is similar to other Estonian counties. Both in agriculture and fishing target markets have been almost completely replaced and, being a member of the European Union, the areas

[8] The employment rate - also called the employment-to-population ratio - is the percentage of working-age people who have jobs.

are heavily regulated (production and fishing quota, fytosanitary regulations, etc). In forestry the main influencing factors were returning private forests to their owners and a large demand for local timber as raw material for paper to be exported. By the time this strategy is compiled, business in the primary sector has stabilised and a notable trend is towards the decrease of the importance of micro- and small enterprises in all areas. Enterprises of medium size prevail in the market as they are able to fulfil the requirements of market regulation.

The present crops include grains, potatoes, but also livestock. Horse and lamb farming is increasingly popular, especially in tourism oriented farms and for the purpose of traditional landscape management (alvars, wooded meadows). Fishing in the area is no longer an important occupation. The average number of fishermen holding fishing rights in the impact area in the years 2006–2008 was about 50 and only a small part of them (10-15) were responsible for the bulk of the catches.

The secondary sector has reached a state of relative stability. Enterprises of Saare County have been able to maintain and update local food industry. An important part of the enterprises in this field are still owned by local capital. Larger reorganisation has been carried out in fish industry, but it has also reached a state of stability and found new target markets.

The production of building materials has been brought up to date and similarly to Estonia as a whole the development was supported by the rapid growth of the building industry and real estate development since the start of the 2000s. Another positive trend is the slight resurgence of timber industry, but is a small-scale event yet. The rapid growth of the building sector has been the force holding up the second sector in the years of rapid growth, also the capacity of the enterprises of the county to operate outside the county.

Saaremaa has an old tradition of boat-building, today both wooden and plastic boats are manufactured. The production of recreational crafts and boats has risen from a traditional industry to an innovative one and almost all of the production is realised in foreign markets. The biggest ship construction facility (Baltic Workboats AS) is in Nasva.

New branches of industry have been cropping up in the county – electronics, rubber and plastics production, clothing industry. First three of them started out as sub-contractors, having by now increased the importance of engineering and technical production and have decreased their dependence on the parent company.

The tertiary sector has been experiencing very rapid growth, a trend that can be regarded as an important asset of business environment of Saare county.

Saare County is an important tourism attraction in Estonia. In the last decade tourism has developed into an independent business sector in the county. The number of accommodation places has doubled itself several times, mainly enterprises owned by local capital have developed a marked of SPA-hotels. The number of tourism farms and bed-and-breakfasts has also increased. The number of guests staying overnight were 144 000 in 2008 and the tourism sector employed 1 500 persons in Saare County.

The Saaremaa brand is well known in Estonia, Finland and Latvia. The slogan of Saaremaa is “Saaremaa – a fascinating place overseas” and its symbols are sweet and sour bread, wind turbines and home-brewed beer. The most important resources of Saarema in the context of recreational industry are its characteristic nature catering for various different needs (both in Estonia and the whole region of the Baltic Sea), as well as numerous monuments of history and culture. Saaremaa is one-of-a-kind also in its location and isolation which has helped it retain the characteristic way of speaking and stunning national costumes.

For decades, creating a permanent transportation link between the island of Muhu and the mainland, which would enliven the economic climate in Saaremaa, but no final decision has been made yet.

The number of sales enterprises targeted at the local consumer and tourists has increased, similarly to the number of service enterprises (restaurants, beauty parlors and hairdressers, recreational enterprises).

Both the new branches of the secondary sector and the rapid growth of the tertiary sector have been acting as an important buffer for the business in Saare county at the times of large-scale rearrangements in industry and land management. The biggest challenge yet is the question of how to retain an attractive business environment also in the remoter outskirts of the country, as it is precisely which is the key to success in the conditions of limited resources in the in the future.

1.4. Political and administrative structures

The territory of Estonia is divided into counties, which are further divided into communes and towns. There are 15 counties in Estonia with 226 units of local governance: 33 towns and 193 communes.
The county governor is the representative of state in a county. Towns and communes are municipal entities based on the principle of common local governance, comprising the first tier of public management. Each municipal unit is also a part of one of the counties.

There are 15 communes and 1 town (Kuressaare) in Saaremaa. 13 of the communes and the town are situated on the island of Saaremaa, Muhu and Ruhnu being two separate islands and communes.-

The manager responsible for the functioning of the main grid of the electrical system in the whole Estonia is Elering AS (a state-owned enterprise), who is the real-time manager of the electrical system in Estonia. Elering is responsible for the functioning the electrical systems and provides quality electricity for the consumer at all times. Elering creates the conditions for the functioning of the electricity market and is constructing cross-border power links to ensure the free moving of electricity between the neighbouring systems and markets. A simplified explanation is that Elering owns the transmission system of 330 kV and 110 kV electricity, that is, the main transmission network.

Electricity reaches the common consumer through the distribution network functioning on various lower voltages (below 110 kV). In Saaremaa and most other parts of Estonia, its manager is the state-owned enterprise of Elektrilevi AS.

The electricity producers of Saaremaa (wind turbines and biogas CHP) transmit electricity to the distribution network and/or use it for their own enterprises.

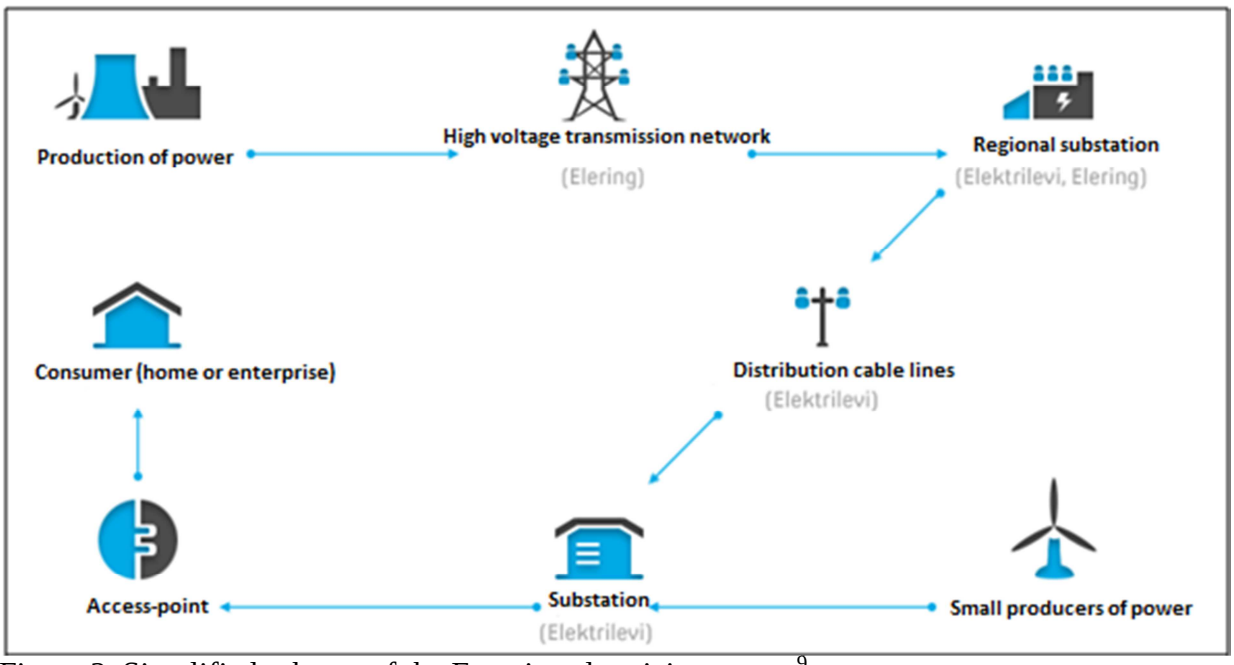

Figure 2. Simplified scheme of the Estonian electricity system[9]

District heating is used in Kuressaare and in a few other larger high-density areas, where boiler plants are owned by enterprises belonging to the local government. Heating providers operate according to the market situation, but regard to the limitations set by the legislation and the role of the local government – the heat prices offered for the end users are committed in cooperation with the State Regulator and local authorities.

Firewood is also widely used and its market operates based on general market regulation, where the prices are set by the buyers and sellers (firewood does not have excise tax).

In the field of liquid fuels (mainly motor fuels), the market operates also based on general regulation and prices are set by buyers and sellers. There are several petrol chains in Saaremaa and market competition takes place.

[9] Source: https://www.elektrilevi.ee

2. OVERALL STRATEGY

2.1. Current framework and vision for the future

Estonia has undergone major changes in the whole society in the last two decades, moving from the Soviet economy to democratic European market economy.

Estonia is characterised by clear west-oriented outlook with the focus on Europe and Scandinavia. Estonia makes great efforts to participate as a constructive and active partner in international cooperation through various organizations and structures. Estonia is, for example, a member of the European Union and its currency is the Euro. Estonia is the member of NATO and participates as actively as possible in local conflict situations handled internationally (Afghanistan, Iraq etc). Also, Estonia is a member of OECD.

Estonia's documents of local strategic development are consistent to the general trends in the area in the European Union and in many issues the country positions itself similarly to the Northern Countries and Germany.

2.2. Objectives, targets and strategic guidelines

The most important aim in energy use in Estonia comes from the Renewable Energy Directive (2009/28/EC), the so-called 20-20-20 strategy which requires, by the year 2020, to cover 25% of total energy needs with energy from renewable sources and for the transport sector 10% of energy needs from renewable sources.

There are several strategic development documents in Estonia relating to the goals set. The following ones are the most relevant:

- State-wide planning (the main plan Estonia 2010 and an update Estonia 2030+).
- National development plan for the energy management of Estonia until the year 2020.
- National long-term development plan for the fuel and energy management of Estonia until 2015 (with the vision for 2030).
- Development Plan of the Estonian Electricity Sector until 2018.
- Estonian renewable energy action plant up to the year 2020.

Saaremaa has joined the International agreement called Pact of Islands. The Pact of Islands signatories make a number of significant commitments, among which:

- to go beyond the objectives set by the EU for 2020, reducing the CO2 emissions in their respective territories by at least 20%;
- to submit an Islands Sustainable Energy Action Plan including a Baseline Emission Inventory which outlines how the objectives will be reached.

Within this framework current Energy Action Plan is drawn up as a part of the ISLE-PACT project. The ISLE-PACT project is committed to developing Local Sustainable Energy Action Plans and a pipeline of bankable projects with the aim of meeting or exceeding the EU sustainability target of reducing CO2 emissions by at least 20% by the year 2020.

In addition to the goals fixed by national and local authorities and the measures taken to fulfil them, it is very important to bring out projects carried out by the key business sector.

In the case of Saaremaa, one very important issue is that of and international electricity transmission line. The system manager of the Estonian and Latvian power grid (Elering in Estonia) has come to the conclusion that another electrical capacity transmission line needs to be build between Estonia and Latvia in addition to the existing ones. Presently there are 3 options considered for the potential future electricity line, one of them being the line passing Saarema.

Without large-scale investment into transmission lines it is not possible to build as many new electrical wind turbines in Saaremaa. A new international transmission line through Saaremaa would increase the economic and technical potential of developing wind energetics immensely.

3. ENERGY BALANCE AND EMISSION INVENTORY

3.1. Baseline situation

The baseline situation of the action plan reflects the state of energy demand and of carbon dioxide emissions (CO2) before the preparation of the plan and constitutes the reference basis for 2020 scenario drafting and setting of objectives and targets.

The baseline year, for the elaboration of energy demand scenarios and for the carbon dioxide emissions, is the year 2005 in order to keep in line with the objectives set for the European Union and with the criteria established in the scope of the Pact of Islands.

To set up the baseline situation for the current document also the data from TRANSPLAN[10] project, which had been previously carried out, has been used. Energy balance in 2005 was drawn up, taking into consideration the final energy demand, energy conversion for heat and electricity production, and primary energy demand. Also the carbon dioxide emission inventory was determined for the year 2005.

However, where possible and relevant, also newer data has been shown in the report to set the context and illustrate the trends.

3.1.1. Final energy demand

Electricity

Development plan of the Estonian electricity sector up to the year 2018, approved by the government of the Republic of Estonia in 2009 bring out the key concepts of the Estonian electricity business. Both in 2007 and in 2012 still, the prevalent basis for the production of electricity is oil shale and the main production area is north-eastern Estonia.

[10] http://www.transplanproject.eu/

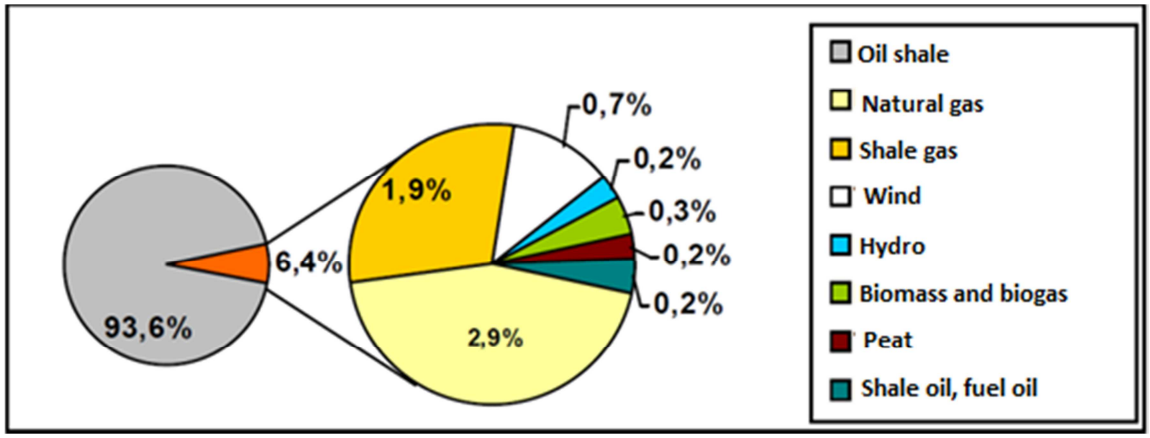

Figure 3. Production of electricity in Estonia by different energy sources, 2007 annual total production 12 188 GWh[11]

In addition to the reconstruction of oil shale stations (to adapt to the environmental regulations), the largest increases in capacity in Estonian energetics have taken place in wind energetics and co-generation stations.

As of the end of 2011, the total capacity of electrical wind turbines in Estonia was 184 MW, with the annual production of 365 GWh (the prognosis for the year 2012 is 540 GWh). Presently, several wind parks are being constructed and started and the figures will rise even more in the upcoming few years.

In 2011, there were about 8 MW of wind turbines installed in Saaremaa and the production contributed to the general power grid with about 20 GWh, while the total production was estimated at 25 GWh, as a part of the production was used for the enterprises' own consumption. In 2005 the electrical wind turbines produced 23 GWh. Presently no construction work is done in the area of electrical wind turbines, but there are several projects still in the development phase (plans etc).

In addition to electrical wind turbines, electricity is produced in Saaremaa in Jööri swinery in a biogas production plant on the base of slurry and bio waste products of pig farming. Electricity has been produced into the grid since 2007. Ltd Kuressaare Vesi has also plans to produce electricity from sewage sludge (starting 2012-2013).

The boiler plant of Ltd Kuressaare Soojus is under reconstruction and a new co-generation unit will probably start producing electricity in 2012.

In the total power consumption, on the Estonian level, growth is expected in the following decades. According to *Development plan of the Estonian electricity sector up to the year 2018*, one of the most strategic documents, however presenting some slightly outdated data, the expected growth rate is around 2% per year. Taking into account the actual changes in electricity consumption and its trend, the growth of power consumption follows the lowest levels suggested in the scenario or is even falling behind.

[11] source: Development plan of the Estonian electricity sector up to the year 2018

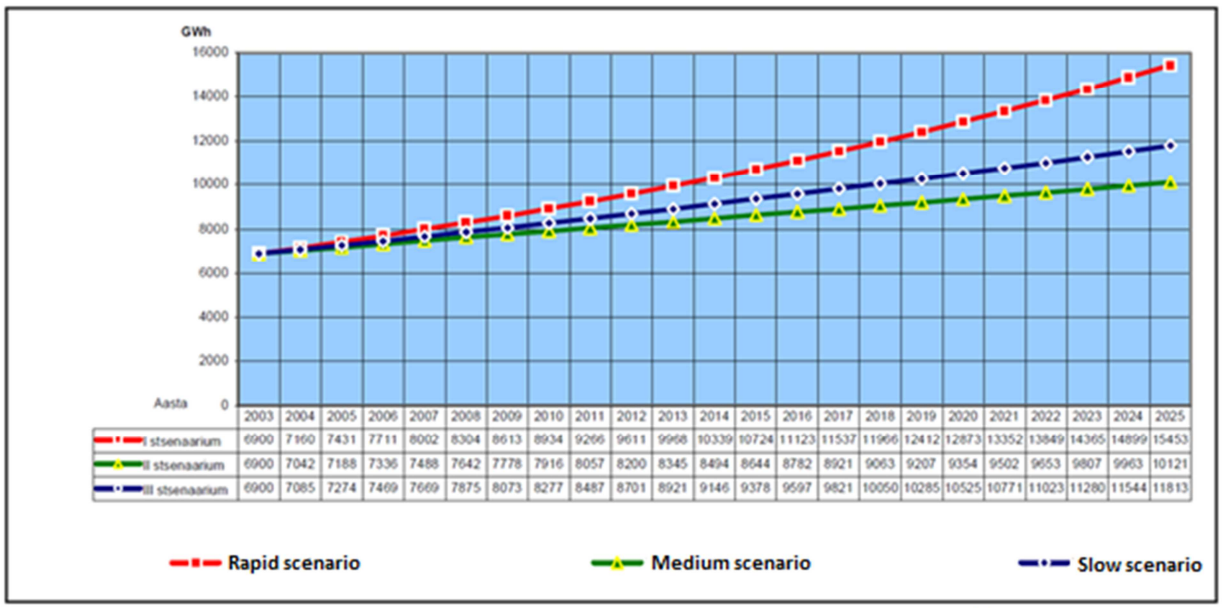

Figure 4. Total electricity consumption and its prognosis until the year 2025[12]

As more accurate data on power consumption in the industrial and service sector contain sensitive business information that is increasingly important in an open electricity market, the information on power consumption is not always available in some areas. This work will be based on the total consumption of 142 GWh per base year in Saaremaa which was used in TRANSPLAN project.

This work will remain at the assumption that the total power consumption in Saaremaa is comprised by 25% of the residential sector, 3% of the primary sector (agriculture and forestry), 38% of industry, 2% of building and construction and 30% of the tertiary sector.

Taking into account the decrease in population, but an increase in electricity consumption per capita, an overall increase in electricity consumption is estimated (see chapter 3.2 for details).

Heating – district heating network and local heating. Industrial consumption.

The baseline situation for heat consumption is also described for the year 2005 (like for other sectors) and the numbers for the heat production and consumption largely come from the TRANSPLAN project. However, newer data and estimations have been included in the description of the baseline situation where available.

The largest district heating network in Saaremaa is situated in Kuressaare, but there are smaller district heating networks in other high-density areas (e.g. Orissaare, Kärla, Pärsama, Salme, Liiva Leisi).

[12] Source: Development plan of the Estonian electricity sector up to the year 2018

In the basic situation, Ltd Kuressaare Soojus operates two boiler plants in Kuressaare, the larger of which is Kalevi boiler plant with the total output capacity of 37 MW, using wood chips, bark, sawdust and oil shale oil as peak fuel. Luha boiler plant has the total capacity of 16 MW and uses oil shale oil as fuel and is usually started when the outside temperature drops below -5º C.

In 2010, the boiler plants owned by Ltd Kuressaare Soojus produced a total of 86,981 MWh of heat, out of which 62,342 (71,7%) was produced from wood fuels and 24,639 (28,3%) from oil shale oil. The flue-gas condenser of wood chip boiler's produced 6,971 MWh of heat in 2010. Heat was sold in the amount of 72,503 MWh to Kuressaare DH consumers in the year 2010.

At Kalevi boiler plant (of Ltd Kuressaare Soojus) a heat and power cogeneration station was built, and it is expected to start producing electricity in 2012.

Ltd Kuressaare Soojus also own two small boiler plants operating on fuel oil outside the town of Kuressaare. The boiler plants are located in Aste and Upa. The small boiler plants produced and sold 1068 MWh of heat in the year 2010.

There is also a district heating network in Orissaare, operated by Ltd Kuressaare Soojus, where the local boiler plant was reconstructed in 2010 so that it uses wood chips, peat and reed as fuel.

The systems of district heating produce heat for all sectors – households, secondary sector and tertiary sector.

In this work the statistics of the TRANSPLAN project are used and it is based on the assumption that households consume 50% of the district heating produced, the secondary sector consumes 10% of the heat produced and the tertiary sector uses 40%.

According to the Development plan of the residential sector of Estonia 2008-2013[13] the average energy consumption in Estonian households is bigger compared to other EU member states – for Estonia it is 250 kWh/m^2 per year. At the same time, this data is probably to some extent out of date and is this report the average energy consumption per square metre in Estonian households is considered to be about 200 kWh/m^2 per year.

According to the somewhat dated data of the Statistical office[14], the total area of living spaces was 18,000 m^2 in the public sector and 1,049,000 m^2 in the private sector.

To check these figures, we carry out calculations based on the fact that the total area of living spaces was 1,1 million m^2 in 2005 and ca 40% of them are mainly summer cottages or other spaces that statistically exist, but are not actually used and are not heated. Given that on average, the annual specific heat consumption is 200 kWh/m^2 and the total area of

[13] Eesti eluasemevaldkonna arengukava 2008–2013 http://www.mkm.ee/public/documents/EMA_ARENGUKAVA_21_01_08kinnitatud.pdf
[14] data enquiry from: http://pub.stat.ee/px-web.2001/Dialog/varval.asp?ma=KVE7&ti=ELURUUMIDE+ARV+JA+PIND+MAAKONNA+J%C4RGI%2C+1%2E+JAANUAR+%281995%2D2002%29&path=../Database/Majandus/09Kinnisvara/01Elamumajandus/&lang=2

living spaces is 660,000 m^2, the annual heat consumption adds up to a total of about ca 132 000 MWh

About 36% of this 132,000 MWh is covered by district heating. The remaining 64% of the households are using individual heating solutions.

So this work will be based on the numerical values provided below:

- The average annual heat consumption of the households of Saaremaa is about 132,000 MWh
- The total amount of heat transmitted to the district heating network by the district heating boiler plants of Saaremaa is about 93,589 MWH per year,
  About 50% of it will be used for household heating (given in the table at 46,795 MWh)
- 85 205 MWh of the households heating energy does not come from district heating network. Household gas is used in the amount of 6,000 MWh. Electrical heating takes up 6000 MWh and the remainder (73 205 MWh) of the energy used for household heating is bio fuel (mostly firewood).
- Coal and fuel oils are of marginal importance in household heating.

- 10% of the overall heat transmitted to the network (that is 93,589 MWh) is used in the industry and 40% is used by the public sector and service sector

- Fuel oil is used in the industry in the amount of 87,820 MWh and 5,410 MWh in the public and the service sector.
- In agriculture and forestry, biomass is used to produce 737 MWh of heat.

Transport fuels

The main uses of diesel fuel and petrol are road transport, forestry and agricultural vehicles.

The diesel fuel used in agriculture and forestry is 18,740 MWh per year, in building and construction the respective figure is 4,034 MWh.

As for road transport, the existing data (158,470 MWh of petrol and 70,0808 MWh of diesel fuel) from TRANSPLAN project has been additionally compared to the data on traffic volumes that is available mainly for state-owned motorways in the year 2011.

When taking the data of the traffic polls of the last years (mainly 2009-2011)[15] (these polls are not carried out annually at all roads) and estimating the average fuel consumption at 10 litres per 100 km (including passenger cars, trucks, buses etc), the average petrol/diesel consumption on the state-owned roads of Saaremaa is about 40,000 litres in 24 hours or about 146 GWh per years. When it is further estimated that about 65% of car traffic takes

[15] Traffic volumes in Saaremaa in 2005 were about the same as in 2009-2011

place on motorways and about 35% on smaller roads and roads in built-up areas, we also arrive to the same conclusion that the average energetic value of fuels used in Saaremaa is about 230,000 MWh per year.

Table 2. Breakdown of fuel consumption by transport modes

	Diesel (MWh)	Gasoline (MWh)
Buses of public transports	60 000	
Trucks, semitrailers and other	40 000	
Small vehicles (public and private)	60 000	70 000
SUM	**160 000**	**70 000**

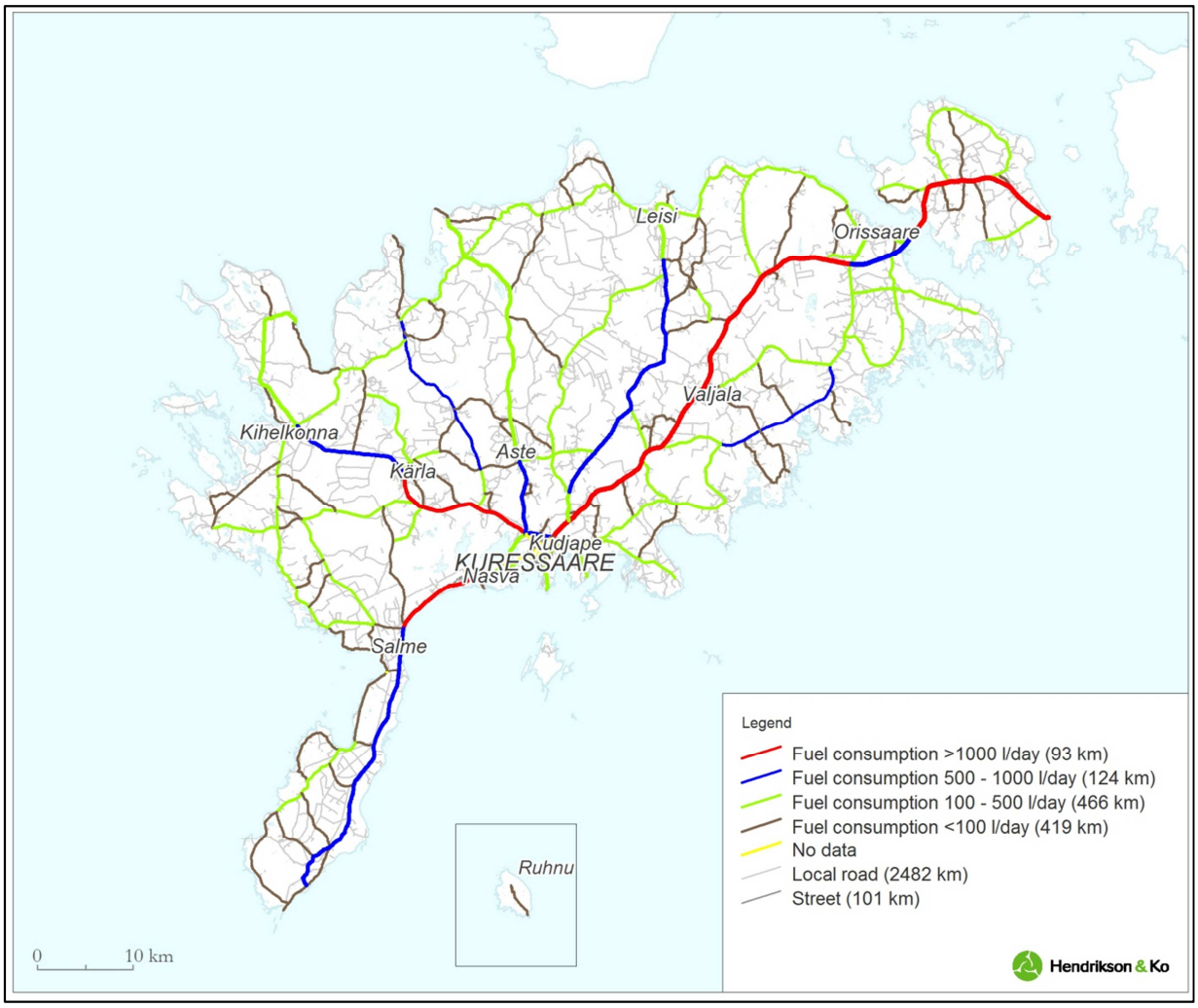

Figure 5. Breakdown of fuel consumption by roads in Saare county (2011)

Summary

The final energy demand, per energy carrier and per sector, in Saaremaa, in 2005, is presented in the following table and figures.

Table 3. Final energy demand in 2005 (MWh)

DEMAND SECTOR	ENERGY FOR FINAL USE										
	Centralized energy services			Fossil fuels					Renewable energy sources		TOTAL
Sector description	Electricity	Heat	Subtotal	Fuel oil	Diesel	Gasoline	LPG	Subtotal	Biomass	Subtotal	
RESIDENTIAL	38 340	46 795	85 135				5 710	5 710	73 205	73 205	164 050
PRIMARY SECTOR	4 260		4 260		18 740			18 740			23 000
SECONDARY SECTOR	56 800	9 359	66 159	87 820	4 034			91 854			158 013
TERTIARY SECTOR	42 600	37 436	80 036	5 410				5 410			85 446
TRANSPORTS					160 000	70 000		230 000			230 000
TOTAL	142 000	93 589	235 589	93 230	182 774	70 000	5 710	351 714	73 205	73 205	660 508

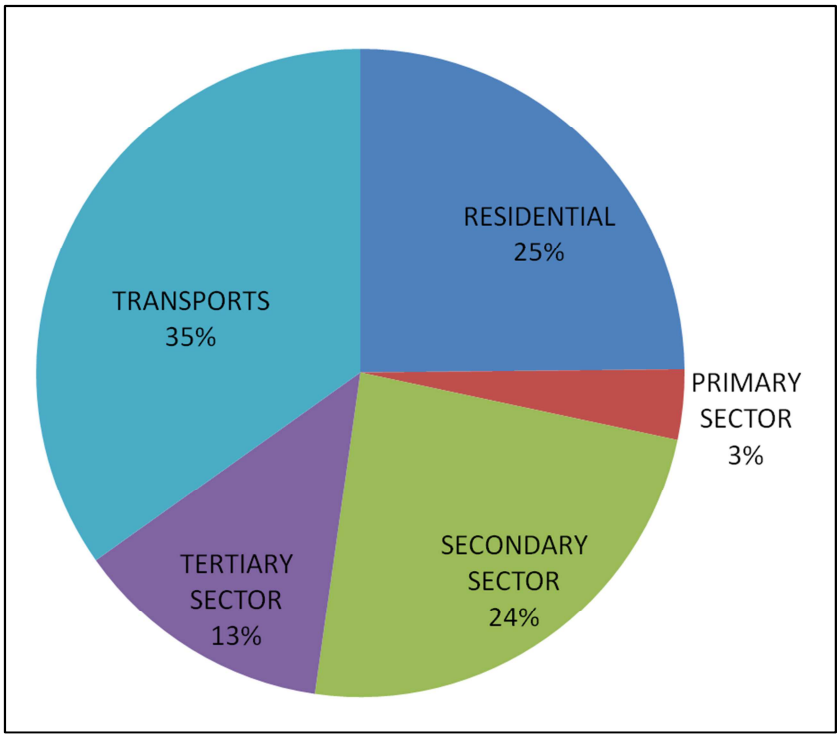

Figure 6. Final energy demand per sector in 2005

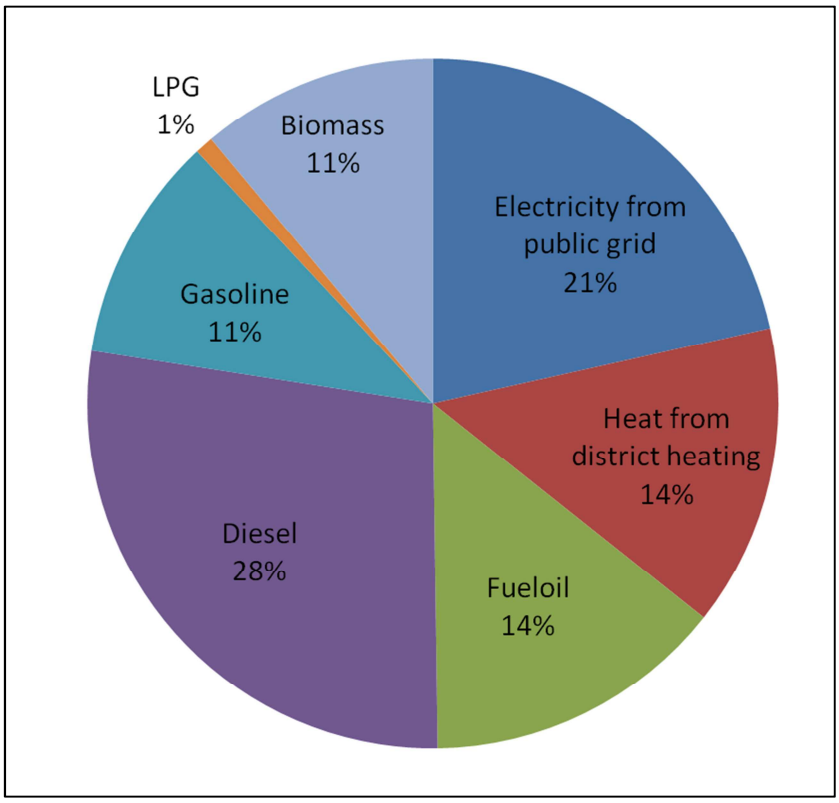

Figure 7. Final energy demand per energy carrier in 2005

3.1.2. Energy conversion

In 2005 there are some wind turbines for production of electricity in Saaremaa, with the production of 23 075 MW per year.

Production of heat is based on both individual heating (for dwelling houses mostly with biomass) and on district heating (mainly woodchip boilers, but also some fuel oil and coal).

Cooling (production of cold) is not common in Estonian climate and can be considered marginal also in Saaremaa. This is not expected to change for the year 2020. Therefore the energy for cooling is not taken into account in this action plan (as irrelevant).

Lately more and more small scale devices are installed for production of secondary energy that work on renewable sources, such as solar collectors and heat pumps. These cases are considered as changes in energy consumption, under all sectors separately. Current chapter only considers the secondary energy that is produced into the grid/network.

Table 4. Energy conversion in 2005 (MWh)

PRODUCTION SECTOR	ENERGY SOURCE							ENERGY FLUXES	TOTAL	Distribution losses and self-consumption
	Fossil fuels			Renewable energy sources			Subtotal	External connection		
Energy product	Fuel oil	Coal	Subtotal	Wind	Biomass	Subtotal		Import to island		
Electricity				23 075		**23 075**	**23 075**	118 925	**142 000**	10 688
Heat	22 776	9 250	**32 026**		84 960	**84 960**	**116 986**		**116 986**	23 397
TOTAL	**22 776**	**9 250**	**32 026**	**23 075**	**84 960**	**108 035**	**140 061**	**118 925**	**258 986**	**34 086**

3.1.3. Primary energy demand

Saaremaa as a whole imports energy. The main carriers of energy that are imported are electricity, motor fuels, liquid fuels, also coal. Local energy sources include biomass (mainly wood) and wind.

Table 5. Primary energy demand in 2005 (MWh)

PRIMARY ENERGY SOURCE										
Fossil fuels						Renewable energy sources			Electricity	TOTAL
Fuel oil	Diesel	Gasoline	LPG	Coal	Subtotal	Wind	Biomass	Subtotal	Imported electricity (cable)	
117 460	182 774	70 000	5 710	10 210	**386 154**	23 075	167 605	190 680	118 925	695 759

3.1.4. Emissions of carbon dioxide

All types of energy usage also emit CO2 – household consumers, the first, second and tertiary sector and transport.

For illustrative purposes the Table 6 below lists all the enterprises in Saaremaa with the permission for outside air pollution, basically all emission sites with a notable output. The statistical amount of the CO2 produced in 2011 is also shown in the table (these calculations do not display the usage of renewable fuels).

Table 6. Establishments with an exhaust emission permit in Saare county in 2011[16]

Company/ administration	Local municipality	Area of activity	Source	CO2 emitted in 2011 (t)
Ltd Kuressaare Soojus	Kuressaare	heat	chimney	2 223
Ltd Kuressaare Soojus	Kuressaare	heat	chimney	1 723
Ltd Kuressaare Soojus	Kuressaare	heat	chimney	959
Ltd Kuressaare Soojus	Kuressaare	heat	chimney	
Ltd Kuressaare Soojus	Kuressaare	heat	chimney	
Ltd Kuressaare Soojus	Kaarma	heat	chimney	212
Orissaare Soojus OÜ	Orissaare	heat	chimney	
Orissaare Soojus OÜ	Orissaare	heat	chimney	3
Leisi Valla Kommunaalamet	Leisi	heat	chimney	
Leisi Valla Kommunaalamet	Leisi	heat	chimney	91
SW Energia OÜ	Kärla	heat	boiler house	711
SW Energia OÜ	Kärla	heat	boiler house	410
SW Energia OÜ	Salme	heat	boiler house	343
Karja OÜ	Leisi	agriculture	dryer	31
Kõljala POÜ	Pihtla	agriculture	chimney	
Kärla Põllumajandusühistu	Kärla	agriculture	wood boiler	
Valjala Söödatehas AS	Valjala	agriculture	chimney	59
Valjala Söödatehas AS	Valjala	agriculture	chimney	120

[16] Source: Estonian Environment Information Centre (EEIC; www.keskkonnainfo.ee) and Hendrikson&Ko

Company/ administration	Local municipality	Area of activity	Source	CO2 emitted in 2011 (t)
Valjala Seakasvatus OÜ	Valjala	agriculture	gas boiler	
Nordecon AS	Kuressaare	construction	HOT MIX30	323
Nordecon AS	Kuressaare	construction	diesel power station	56
Baltic Workboats AS	Kaarma	industry	chimney	77
Duschy AS	Kaarma	industry	chimney	48
Est-Agar AS	Kärla	industry	chimney	1 946
Level AS	Kuressaare	industry	concrete factory	27
Level AS	Kuressaare	industry	chimney	10
Level AS	Kuressaare	industry	asphalt factory	226
Luksusjaht AS	Kuressaare	industry	WOLF	117
Luksusjaht AS	Kuressaare	industry	Vitoplex 300	46
Luksusjaht AS	Kuressaare	industry	Rocca CPA	77
Kasse Paadid OÜ	Orissaare	industry	boiler	
Läätsa Kalatööstus AS	Salme	industry	chimney	80
Muvor OÜ	Kuressaare	industry	chimney	
Novara OÜ	Orissaare	industry	boiler	
Reta Puit OÜ	Kaarma	industry	Boiler house	
Saare Leib OÜ	Kuressaare	industry	chimney	88
Saare Leib OÜ	Kuressaare	industry	chimney	35
Saare Leib OÜ	Kuressaare	industry	chimney	93
Saaremaa Lihatööstus OÜ	Kuressaare	industry	boiler house	1 534
Saaremaa Piimatööstus AS	Kuressaare	industry	chimney	2 353
Saare Economics OÜ	Valjala	industry	generator	
Saare Economics OÜ	Valjala	industry	boiler	
Saare Paat AS	Kaarma	industry	boiler house	
Sarmet OÜ	Kaarma	industry	chimney	75
GoBus AS	Kuressaare	transport	chimney	91
Eesti Energia AS	Ruhnu	energetics	chimney	360
Muhu Valla Kommunaalamet	Muhu	heat	chimney	

The carbon dioxide emissions for current ISEAP action plan were determined according to the IPCC (Intergovernmental Panel on Climate Change) methodology, which considers the carbon content of fuels or non-renewable fractions of energy resources used in the combustion or in electricity production.

For renewable energy sources, the contribution from hydro, wind and solar energy, as well as from waste heat recovery, to carbon dioxide emissions was zero. For biomass, assuming a sustainable exploitation of the resources, a neutral balance of emissions was considered.

Table 7. CO2 emissions from final use in 2005 (t CO2)

DEMAND SECTOR	ENERGY FOR FINAL USE								
	Centralized energy services			Fossil fuels					TOTAL
Sector description	Electricity from public grid	Heat from district heating	Subtotal	Fuel oil	Diesel	Gasoline	LPG	Subtotal	
RESIDENTIAL	14 770	5 187	19 958				1 370	1 370	21 328
PRIMARY SECTOR	1 641		1 641		5 004			5 004	6 645
SECONDARY SECTOR	21 882	1 037	22 920	24 502	1 077			25 579	48 499
TERTIARY SECTOR	16 412	4 150	20 561	1 509				1 509	22 071
TRANSPORTS					42 720	17 430		60 150	60 150
TOTAL FOR INTERNAL MARKET	54 706	10 375	65 080	26 011	48 801	17 430	1 370	93 612	158 692

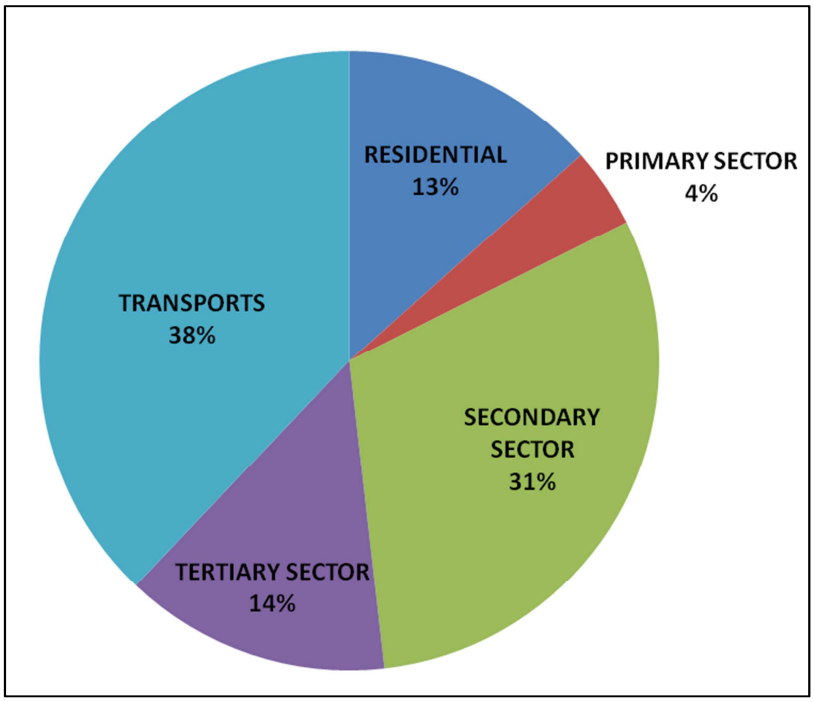

Figure 8. CO2 emissions per sector in 2005

3.2. Projections to 2020 – Business as usual scenario

The business as usual (BAU) scenario corresponds to the evolution of the energy demand and carbon dioxide emissions until 2020, based on the year 2005, considering that the conditions of the baseline situation are maintained and that the actions advocated in this action plan are not implemented.

For the BAU scenario an increase in usage of energy is expected in most sectors (but not in all of the sectors).

The increase in usage of energy is impacted by several general trends, such as:

- Changes (decrease) in population;
- Changes in macroeconomic environment;
- Increase in consumption of goods and services;
- Increase of car usage;
- Mechanisation of production;
- Development of the tourism sector (and services) in Saaremaa.

In addition the political mechanisms of European Union have a major impact on development of energy use, as well as (raising) prices of heat and electricity.

For current action plan the annual growth rates of energy usage in different sectors were assessed. The table below presents growth rates for the BAU scenario more relevant for the action plan.

Table 8. Growth rates of energy consumption for the BAU scenario

SECTOR	Annual increase in consumption for the BAU scenario
RESIDENTIAL	
Domestic uses	
Electricity from public grid	*2,0%*
Heat from district heating	
PRIMARY SECTOR	
Agriculture, forestry and livestock	
Electricity from public grid	*-2,0%*
Diesel	
SECONDARY SECTOR	
Industry and mining	
Electricity from public grid	*2,0%*
Heat from district heating	
Construction	
Electricity from public grid	*2,0%*
TERTIARY SECTOR	

SECTOR	Annual increase in consumption for the BAU scenario
Public sector and services	
Electricity from public grid	*3,0%*
Heat from district heating	
TRANSPORTS	
Buses of public transports	
Diesel	
Trucks, semitrailers and other	
Diesel	
Small vehicles (public and private)	
Diesel	*1,5%*
Gasoline	*1,5%*

3.2.1. Final energy demand

The final energy demand in Saaremaa for the BAU scenario, in 2020, per energy carrier and per sector, is presented in the following table and figures.

Table 9: Final energy demand in 2020 – BAU scenario

DEMAND SECTOR	ENERGY FOR FINAL USE										
	Centralized energy services			Fossil fuels					Renewable energy sources		TOTAL
Sector description	Electricity	Heat	Subtotal	Fuel oil	Diesel	Gasoline	LPG	Subtotal	Biomass	Subtotal	
RESIDENTIAL	51 601	46 795	98 395				5 710	5 710	73 205	73 205	177 310
PRIMARY SECTOR	3 146		3 146		18 740			18 740			21 886
SECONDARY SECTOR	76 445	9 359	85 804	87 820	4 034			91 854			177 658
TERTIARY SECTOR	66 369	37 436	103 805	5 410				5 410			109 215
TRANSPORTS					160 000	70 000		230 000			230 000
TOTAL	197 562	93 589	291 151	93 230	182 774	70 000	5 710	351 714	73 205	73 205	716 070

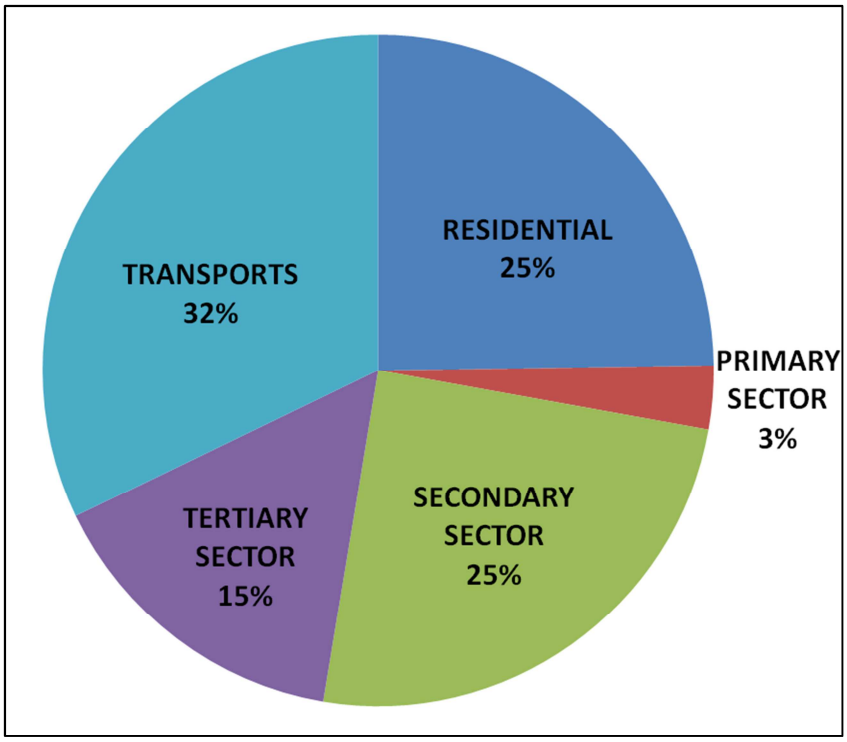

Figure 9. Final energy demand per sector in 2020 – BAU scenario

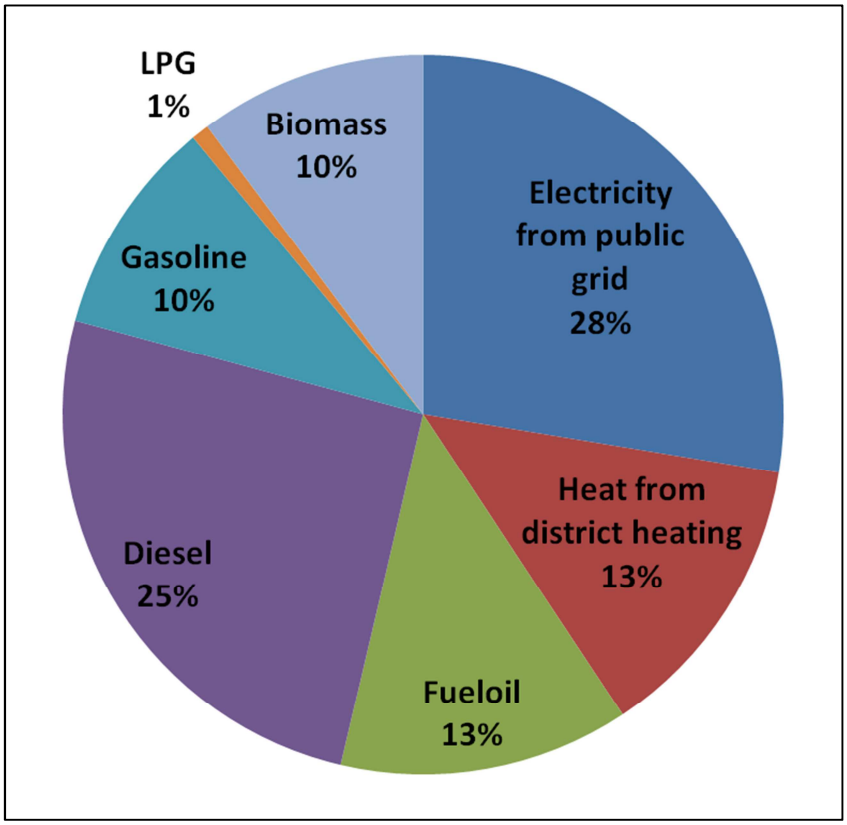

Figure 10. Final energy demand per energy carrier in 2020 – BAU scenario

3.2.2. Energy conversion

For the BAU scenario the overall situation with energy conversion in 2020 is similar to the baseline situation (no new energy production instalments).

Table 10. Energy conversion in 2020 for the BAU scenario (MWh)

PRODUCTION SECTOR	ENERGY SOURCE							ENERGY FLUXES	TOTAL	Distribution losses and self-consumption
	Fossil fuels			Renewable energy sources			Subtotal	External connection		
Energy product	Fuel oil	Coal	Subtotal	Wind	Biomass	Subtotal		Import to island		
Electricity				23 075		**23 075**	**23 075**	189 357	**212 432**	14 870
Heat	19 923	9 250	**29 173**		84 960	**84 960**	**114 133**		**114 133**	20 544
TOTAL	**19 923**	**9 250**	**29 173**	**23 075**	**84 960**	**108 035**	**137 208**	**189 357**	**326 565**	**35 414**

3.2.3. Primary energy demand

Table 11. Primary energy demand in 2020 for the BAU scenario (MWh)

PRIMARY ENERGY SOURCE											
Fossil fuels						Renewable energy sources			Electricity	TOTAL
Fuel oil	Diesel	Gasoline	LPG	Coal	Subtotal	Wind	Biomass	Subtotal	Imported electricity (cable)	
116 668	182 774	70 000	5 710	10 883	386 035	23 075	167 605	190 680	189 357	766 072

3.2.4. Emissions of carbon dioxide

The carbon dioxide emissions are calculated for the year 2020, adopting the same methodology used for the baseline year, from the energy demand projections in the BAU scenario.

As an increase in usage of energy is expected in most sectors, the BAU scenario also results in bigger CO2 emissions compared to the baseline year 2005.

Table 12. CO2 emissions from final use in 2020 for the BAU scenario (t CO2)

DEMAND SECTOR	ENERGY FOR FINAL USE								
	Centralized energy services			Fossil fuels					TOTAL
Sector description	Electricity	Heat	Subtotal	Fuel oil	Diesel	Gasoline	LPG	Subtotal	
RESIDENTIAL	22 751	5 196	27 946				1 370	1 370	29 317
PRIMARY SECTOR	1 387		1 387		5 004			5 004	6 391
SECONDARY SECTOR	33 704	1 039	34 744	24 502	1 077			25 579	60 322
TERTIARY SECTOR	29 262	4 157	33 419	1 509				1 509	34 928
TRANSPORTS					42 720	17 430		60 150	60 150
TOTAL FOR INTERNAL MARKET	87 104	10 392	97 496	26 011	48 801	17 430	1 370	93 612	191 108

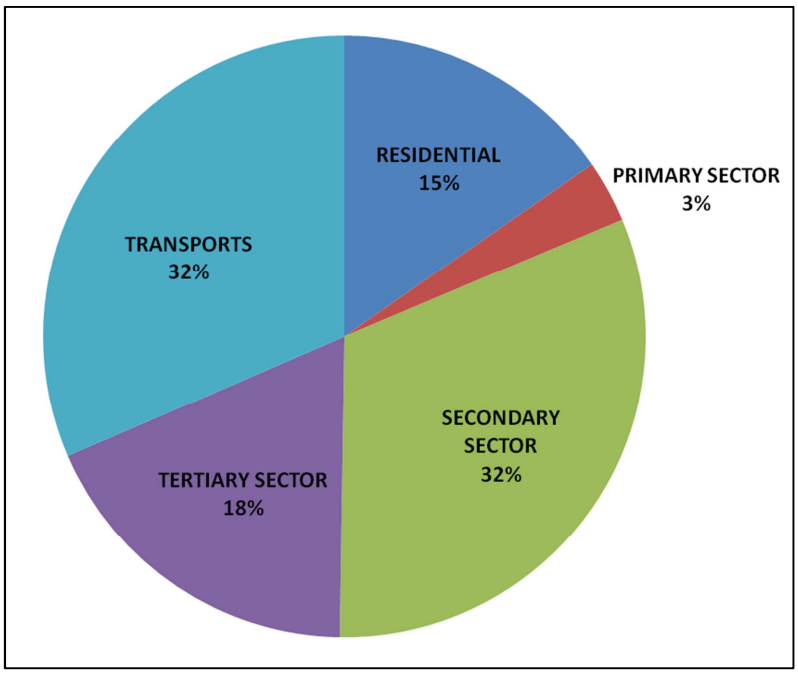

Figure 11. CO2 emissions per sector in 2020 for the BAU scenario

3.3. Projections to 2020 – Action plan scenario

The action plan scenario corresponds to the evolution of the energy demand and carbon dioxide emissions until 2020, based on the year 2005, considering that the actions advocated in the action plan are implemented. The evolution of the energy demand and CO2 emissions, result, cumulatively, from the socio-economic dynamics and external factors considered in the BAU scenario and from the implementation of the action plan.

The actions foreseen in the ISEAP plan are introduced in chapter 4. Current chapter summarises the overall projections for the year 2020 in case the ISEAP actions are implemented.

3.3.1. Final energy demand

The final energy demand in Saaremaa for the ISEAP scenario, in 2020, per energy carrier and per sector, is presented in the following table and figures.

Table 13: Final energy demand in 2020 – ISEAP scenario

DEMAND SECTOR	ENERGY FOR FINAL USE												
	Centralized energy services			Fossil fuels						Renewable energy sources			TOTAL
Sector description	Electricity	Heat	Subtotal	Fuel oil	Diesel	Gasoline	LPG	Natural gas	Subtotal	Wind	Geo-thermal	Biomass	
RESIDEN-TIAL	44 380	40 246	84 626				5 710		5 710			73 205	163 541
PRIMARY SECTOR	2 706		2 706		17 383				17 383				20 089
SECON-DARY SECTOR	66 005	8 681	74 687	79 038	4 034				83 072	4 391	4 391		166 541
TERTIARY SECTOR	44 619	25 607	70 226	5 410					5 410				75 636
TRANS-PORTS	390		390		160 432	75 897		5 130	241 459			11 338	253 187
TOTAL	158 100	74 534	232 634	84 448	181 848	75 897	5 710	5 130	353 034	4 391	4 391	84 543	678 992

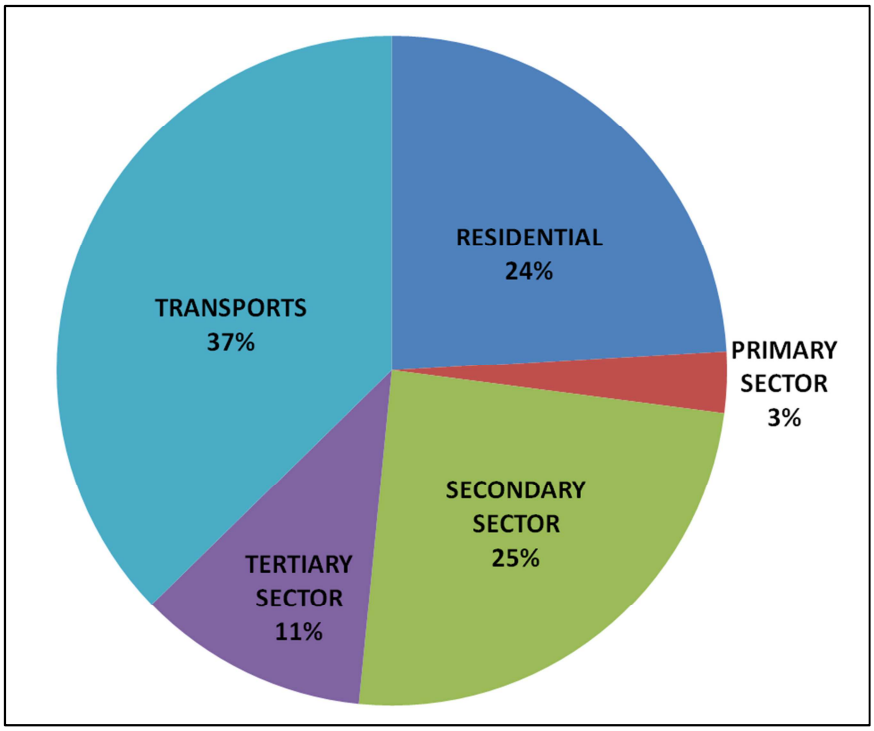

Figure 12. Final energy demand per sector in 2020 – ISEAP scenario

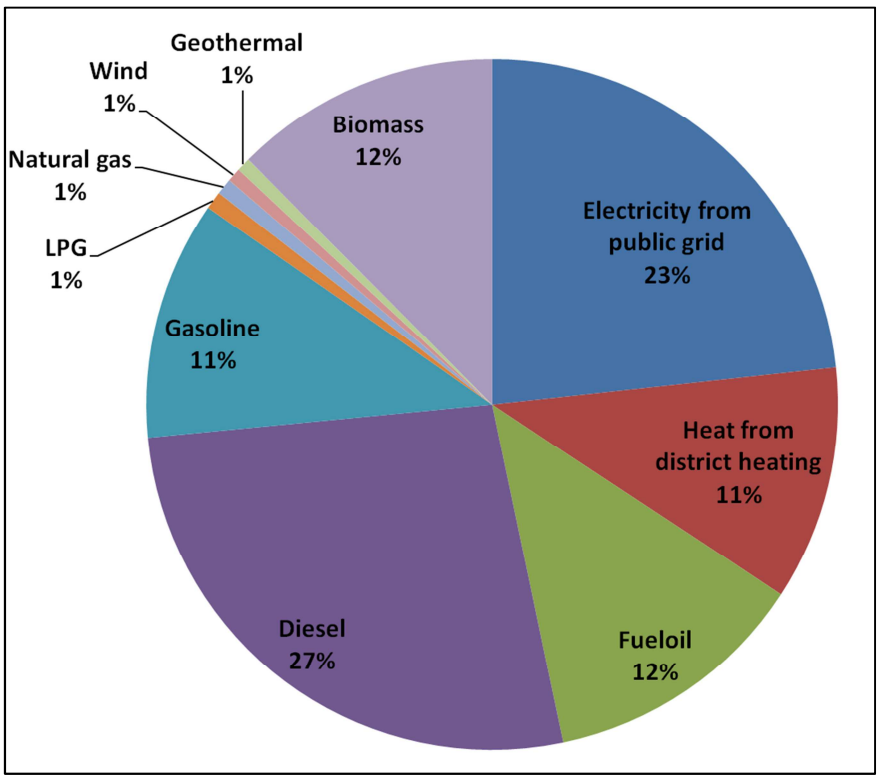

Figure 13. Final energy demand per energy carrier in 2020 – ISEAP scenario

3.3.2. Energy conversion

The action plans foresees several changes in energy conversion (for action see chapter 4.6). Most notable new developments to change the situation are installation of wind turbines and a new CHP power plant for district heating. Also, the usage of coal for production of heat is stopped.

Table 14. Energy conversion in 2020 for the ISEAP scenario (MWh)

PRO-DUCTION SECTOR	ENERGY SOURCE						ENERGY FLUXES	TOTAL	Distribution losses and self-consumption
	Fossil fuels	Renewable energy sources				Subtotal	External connection		
Energy product	Fuel oil	Wind	Biomass	Energy recovery	Subtotal		Import to island		
Electricity		95 575		13 000	**108 575**	**108 575**	61 425	**170 000**	11 900
Heat	5 535		85 360		**85 360**	**90 895**		**90 895**	16 361
TOTAL	**5 535**	**95 575**	**85 360**	**13 000**	**193 935**	**199 470**	**61 425**	**260 895**	**28 261**

3.3.3. Primary energy demand

Table 15. Primary energy demand in 2020 for the ISEAP scenario (MWh)

PRIMARY ENERGY SOURCE												
Fossil fuels							Renewable energy sources				Electricity	TOTAL
Fuel oil	Diesel	Gasoline	LPG	Natural gas	Coal	Subtotal	Wind	Geothermal	Biomass	Subtotal	Imported electricity (cable)	
90 959	181 848	75 897	5 710	5 130	0	359 545	99 966	4 391	179 387	283 744	61 425	704 714

3.3.4. Emissions of carbon dioxide

The carbon dioxide emissions are calculated for the year 2020, adopting the same methodology used for the baseline year and for the BAU scenario, from the energy demand projections in the action plan scenario.

Table 16. CO2 emissions from final use in 2020 for the ISEAP scenario (t CO2)

DEMAND SECTOR	ENERGY FOR FINAL USE									
	Centralized energy services			Fossil fuels						TOTAL
Sector description	Electricity	Heat	Subtotal	Fuel oil	Diesel	Gasoline	LPG	Natural gas	Subtotal	
RESIDENTIAL	7 931	981	8 912				1 370		1 370	10 283
PRIMARY SECTOR	484		484		4 641				4 641	5 125
SECONDARY SECTOR	11 796	212	12 008	22 052	1 077				23 129	35 137
TERTIARY SECTOR	7 974	624	8 599	1 509					1 509	10 108
TRANSPORTS	70		70		42 835	18 898		1 036	62 770	62 840
TOTAL FOR INTERNAL MARKET	28 256	1 817	30 072	23 561	48 554	18 898	1 370	1 036	93 420	123 492

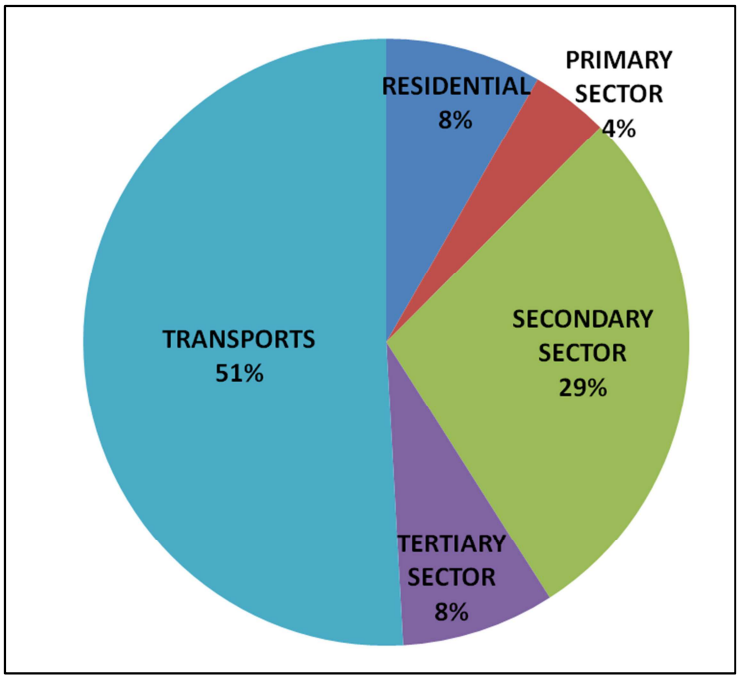

Figure 14. CO2 emissions per sector in 2020 for the ISEAP scenario

Summary of CO2 calculations:

The results of the emission calculations:

- Overall CO2 emission for the baseline situation in 2005: 158 692 t CO2.
- Overall CO2 emission for 2020 in case of BAU scenario: 191 108 t CO2
- Overall CO2 emission for 2020 in case of ISEAP scenario: 123 492 t CO2.

The emission balance for the ISEAP scenario shows that after implementing the actions foreseen in the action plan the overall CO2 emissions in 2020 are reduced by 22,2% compared to the baseline situation in 2005 that exceeds the target set with the Local Sustainable Energy Action Plan.

The biggest challenges in terms of CO2 emissions that remain are:

- The transport sector, where it is difficult to significantly reduce the dependency on fossil motor fuels in such a short period;
- The secondary sector where it is complicated to extensively reduce the amount of fuel oil that is used in industrial processes.

4. ACTIONS

To achieve the target of reducing CO2 emissions measures have been worked out that promote more effective energy use and wider use of renewable energy sources. The measures fall under different sectors and fields of activities, including the production, distribution and consumption of energy, also involving different parties such as local administrations, enterprises and households.

In current chapter the actions are listed that are planned to guide the development in the energy sector in Saaremaa towards sustainability and to achieve the target of the energy action plan - reducing CO2 emissions by at least 20% by the year 2020 compared to the baseline year 2005. Thus, all activities carried out or planned since the baseline year are included in the action plan.

For all the actions the following characteristics have been calculated:

- ESTIMATED ENERGY SAVINGS [MWh/year];
- ESTIMATED RENEWABLE ENERGY INCREASE [MWh/year];
- ESTIMATED CO2 REDUCTION [ton/year].

The detailed calculations are presented in ISEAP tables, added to this action plan report.

The results of the calculations show that the most efficient means for reduction of overall CO2 emissions is installation of wind turbines for the production of energy into the grid. According to the action plan the overall expected renewable energy increase for the year 2020 (compared to the baseline year 2005) is 93 062 MWh, from which installation of new wind turbines gives 72 500 MWh. The total CO2 reduction of all ISEAP activities for the year 2020 is 75 840 tCO2, from which the installation of wind turbines gives 33 350 tCO2.

The tertiary sector holds the biggest potential for energy savings. CO2 reductions of 15 419 tCO2 will be achieved by reducing energy use by as much as 40 195 MWh in the year 2020. Of course, to achieve the target of reducing CO2 emission by at least 20% all actions in all sectors are needed. The total energy saving of all ISEAP activities is 93 420 MWh.

The actions are described below for different sectors.

4.1. Residential

The actions for the residential sector fall under two categories:

- Reduction of heat consumption;
- Reduction of electricity consumption.

Reduction of heat consumption

The main effect here can be achieved with the increase of energy saving measures (thermal insulation, renovation of ventilation and heating systems etc) of new and existing buildings. It is expected that with improvements in thermal insulation energy savings of 1% per year can be achieved.

Reduction of electricity consumption

Reduction of electricity consumption will be achieved through the following main activities:

- Use of energy-efficient and environmentally friendly heating systems and domestic energy production;

In Saaremaa a great amount of people are already heating their homes with biomass (wood), so a significant change towards using more biomass (compared to fossil fuels or electricity) in domestic use is not expected. However, existing electrical heating systems can be made more energy-efficient, using new technologies such as heat pumps, solar water heating, wind micro-turbines etc, especially in villages and summer houses. Even if these solutions consume electricity (like in case of heat pumps), the use of electricity is more effective compared to conventional electric heating. Furthermore, with the increasing prices of electricity flats currently heated using electricity may rejoin the district heating network or the local central heating of a building, this would reduce the consumption of electricity in Saare county.

- Acquisition of energy efficient appliances (incl lightning);
- Adoption of more efficient behaviour.

A shift in habits (both for consumer-behaviour and for domestic behaviour) is achieved by promotional campaigns and awareness-raising as described under chapter 4.9. Also, the rising prices of electricity contribute to this development. Some of the simpler measures include for example installation of LED lamps, light control sensors and temperature regulators.

It is estimated that through these activities the increase electricity consumption is reduced by 1% per year (compared to the BAU scenario that estimated 2% increase).

Table 17. Actions in the residential sector

SECTORS AND FIELDS OF ACTION	ACTIONS	IMPLEMEN-TATION SCHEDULE		EXPECTED ENERGY SAVINGS [MWh/year]	EXPECTED RE-NEWABLE ENERGY INCREASE [MWh/year]	EXPECTED CO2 REDUCTIO N [ton/year]
		Starting year	Ending year			
DOMESTIC USE						
Heat	Reduction of heat loss: * Increase of thermal insulation of new and existing buildings * Renovation of ventilation and heating systems	2005	2020	9 395		2 621
Electricity	* Use of energy-efficient and environmentally friendly heating systems and domestic energy production * Acquisition of energy efficient appliances * Adoption of more efficient behaviour	2005	2020	7 765		3 572

4.2. Primary sector

Energy consumption in primary sector in Saaremaa is not great, however some reductions may still be achieved through the following activities:

- Use of energy-efficient in-house equipment in barns and animal-farms

Continuous modernisation of equipment helps to achieve savings of 1% per year in electricity consumption (compared to the 2% increase in BAU scenario).

- Use of more energy-efficient machinery in fields

These activities include using modern machinery (tractors, harvesters etc) with smaller fuel consumption and efficient agronomy techniques. The goal is to achieve 0,5% reduction in diesel consumption per year.

Table 18. Actions in the primary sector

SECTORS AND FIELDS OF ACTION	ACTIONS	IMPLEMEN-TATION SCHEDULE		EXPECTED ENERGY SAVINGS [MWh/year]	EXPECTED RE-NEWABLE ENERGY INCREASE [MWh/year]	EXPECTED CO2 REDUCTIO N [ton/year]
		Starting year	Ending year			
AGRICULTU RE, FORESTRY AND LIVESTOCK						
Electricity	Use of energy-efficient in-house equipment in barns and animal-farms	2005	2020	473		218
Diesel	Use of more energy-efficient machinery in fields	2005	2020	1 357		362

4.3. Secondary sector

The main activities within the secondary sector fall under three categories:

- Use of renewable energy in energy-intensive industry;
- Reduction of heat consumption;
- Reduction of electricity consumption.

Use of renewable energy in energy-intensive industry

In the baseline situation quite a remarkable amount of fuel oil is used in the secondary sector, mainly in industries. Decrease of the use of fossil fuels as burner fuel is difficult for industries as there are no realistic options for replacing it with natural gas. However, in some cases it is possible to replace oil consumption with electricity consumption while adding renewable energy sources. It is expected for some major industries to follow that formula to reduce their own expenses and promote sustainable energy, for example by installing wind turbines, heat pumps or solar energy devices for their own consumption.

Promoting such activities it is expected to reduce fuel oil consumption in 2020 by 10% compared to the baseline year (2005).

Reduction of heat consumption

Reduction of heat consumption in the secondary sector is mainly achieved by:

- **Implementation on energy saving measures (e.g. increase of thermal insulation, renovation of ventilation and heating systems) of new and existing buildings and installation of more efficient heat storage equipment;**
- **Use of waste heat recovery systems.**

0,5% reduction per year in heat consumption is estimated.

Reduction of electricity consumption

The reduction in electricity consumption can be achieved with the use of more energy-efficient technologies.

Due to increasing mechanisation of the secondary sector (industrial activities, building) more and more processes are carried out with devices that use electricity. Therefore For the BAU scenario electricity consumption is expected to increase 2% per year.

Developments in technology and awareness-raising (as set out under chapter 4.9) help to promote usage of energy-efficient solutions and technologies in industries and building.
Like for the residential sector, some of the simpler measures include for example installation of high efficiency lamps, light control sensors and temperature regulators.

Through these activities it is expected to reduce the increase in electricity consumption (compared to the BAU scenario) by 1% per year in industries and 0,5% per year in building sector.
Also, the rising prices of electricity contribute to this development.

Table 19. Actions in the secondary sector

SECTORS AND FIELDS OF ACTION	ACTIONS	IMPLEMEN-TATION SCHEDULE		EXPECTED ENERGY SAVINGS [MWh/year]	EXPECTED RE-NEWABLE ENERGY INCREASE [MWh/year]	EXPECTED CO2 REDUCTIO N [ton/year]
		Starting year	Ending year			
INDUSTRY						
Renewable energy	Use of renewable energy in energy-intensive industry	2007	2020		8 782	2 450
Heat	* Increase of thermal insulation of new and existing buildings (and renovation of ventilation and heating systems and installation of more efficient heat storage equipment) * Use of waste heat recovery	2005	2020	971		273
Electricity	Use of more energy-efficient technologies in industry	2005	2020	10 927		5 027
CONST-RUCTION						
Electricity	Use of more energy-efficient technologies in construction	2005	2020	297		137

4.4. Tertiary sector

The actions fall under two main categories:

- Reduction of heat consumption;
- Reduction of electricity consumption;
- More efficient public sector arrangement and activities.

Reduction of heat consumption

Just like for the residential sector, the main effect here can be achieved with the increase of thermal insulation of new and existing buildings and renovation of ventilation and heating systems. For big commercial establishments in the tertiary sector (SPA-s, hotels etc) waste heat recovery may also serve as a viable and efficient option to save energy.

In case of the commercial sector the potential to save energy for heating is considered to be bigger than for the residential sector. Also, for the public sector, reduction in heat losses is needed increasingly more doe to Energy Performance In Building Directive II (EPBD directive II). Thus, at least 2% reduction in heat consumption per year is expected.

Reduction of electricity consumption

Reduction of electricity consumption in tertiary sector is achieved through the following activities:

- Use of energy-efficient and environmentally friendly heating systems and renewable energy production.

Like for the residential sector, new technologies such as heat pumps and solar water heating could be used. Main beneficiaries from such solutions could be large SPA-s and hotels, especially active during summers in Saaremaa.

- Acquisition of energy efficient appliances (incl lightning);
- Adoption of more efficient behaviour.

For the BAU scenario an annual increase of 3% in electricity is estimated for the tertiary sector due to active development of the tourism sector (hotels etc). At the same time it means that the saving potential is great. If implementing abovementioned activities and principles, it is expected to reduce that increase by 2% compared to the BAU scenario (resulting in an overall 1% increase).

<u>Efficient street lightning</u>

Additionally, a specific project is being carried out by Kuressaare town to promote sustainable usage of energy. Starting from 2013 a new street lighting system will operate. It includes installation of efficient lamps, luminaries and control sensors for street lighting. The expected reduction in electricity use of street lightning is 40% that equals 756 MWh per year.

More efficient public sector arrangement and activities

Furthermore, additional saving potential lies within the public sector: overall increase in efficiency of public sector can reduce energy consumption and the good examples of sustainable solutions and best practice undertaken by the public sector should be in the forefront of the development of Saare county. This includes energy efficiency programmes, monitoring of consumptions, energy audits, adoption of energy efficiency measures, use of renewable energies and adoption of more efficient behaviour. Therefore, the public sector has a major role in guiding the energy sector of Saarema towards sustainable development.

With successful implementation of the activities and principles described above and with active development towards sustainability by the public sector, 2,5% reduction per year is expected for both heat and electricity consumption in the tertiary sector compared to the BAU scenario.

Table 20. Actions in the tertiary sector

SECTORS AND FIELDS OF ACTION	ACTIONS	IMPLEMEN-TATION SCHEDULE		EXPECTED ENERGY SAVINGS [MWh/year]	EXPECTED RE-NEWABLE ENERGY INCREASE [MWh/year]	EXPECTED CO2 REDUCTION [ton/year]
		Starting year	Ending year			
PUBLIC SECTOR AND SERVICES						
Heat	* Increase of thermal insulation of new and existing buildings (and renovation of ventilation and heating systems) * Use of waste heat recovery * Improving efficiency of public services	2005	2020	16 971		4 735
Electricity	* Use of energy-efficient and environmentally friendly heating systems and domestic energy production * Acquisition of energy efficient appliances * Adoption of more efficient behaviour * Improving efficiency of public services	2005	2020	22 387		10 299
Project	Installation of efficient lamps, luminaries and control sensors for street lighting	2013	2020	837		385

4.5. Transports

For the BAU scenario an 1,5% annual increase of fuel consumption (both, diesel and gasoline) is expected for private cars. For public transport and transport of goods (trucks) the overall fuel consumption is expected to remain the same.

Reductions in used energy and produced CO2 in the transport sector can mainly be achieved through the following main activities:

Use of sustainable modes of transport (public transport, bicycles) and more efficient vehicles

With systematic development of better public transport system and opportunities for light traffic a small modal shift is expected in Saaremaa. To some extent, private car traffic is replaced with public transport, bicycling and walking.

In terms of public transport, the main impact could be achieved with increasing the supply of public transport service in Summer, ensuring a shuttle service connecting main residential and hotel areas, the beach, entertainment areas, city centre, and other main destinations used by tourists.

To promote wider use of bicycles the development of supporting infrastructure (bicycle roads, parking spaces, bicycle hire etc) is needed. In addition it is advisable to promote bicycle use by acquiring bicycles for public servants.

The second measure to reduce fuel consumption (in addition to reducing the usage of cars) is promoting more sustainable and effective cars (with a smaller fuel consumption).

In the action plan a 0,3% reduction in the increase fuel usage of private cars is expected. To compensate that, there should be minor increase in the usage of buses.

However, these changes also depend on the overall economy and fuel prices to a great deal.

In addition to the abovementioned, car mileage and fuel consumption can be reduced by reducing “empty runs” in cargo. But in current action plan it is assumed that this will also take place in case of the business as usual scenario as a means to reduce costs and is therefore not included separately in the activities.

Wider use of biofuels (biodiesel, ethanol)

In the action plan it is expected that by the year 2020 5% of transport fuel sold is biofuel (biodiesel, bioethanol). About 5% of biofuel can be mixed into the motor fuel without having to change the motors of the vehicles.

To achieve this, the public sector has a vital role. The possibilities to guide the development in the right direction involve introduction of “green” public procurements and promotion of the usage of biofuels. Also, it is needed to guarantee that old buses are replaced with new models that comply with EU energy standard.

Wider use of electric cars

In the action plan it is expected that by the year 2020 1% of the cars used in Saaremaa will be electric cars. Also, public sector has a major role in achieving this. Possible activities include using electric cars by public sector officials, promotional campaigns and development of infrastructure (loading points) for electric cars.

However, the usage of electric cars largely depends on technological development and the price of electric cars. At the time of compiling this action plan, unfortunately, electric cars are still rather expensive for private ownership.

Use of gas engines

In the action plan it is expected that by the year 2020 4% of the private cars used in Saaremaa will use Liquefied Petroleum Gas (LPG) or Compressed Natural Gas (CNG) as fuel. The advantage of usage of gas compared to electric cars is that the existing vehicles can be rebuilt by installing a gas device, therefore the investment is much smaller (does not require buying a new car).

Like for biofuels and electric cars, public sector has a major role in increasing the use of gas engines. Development of gas stations to Saaremaa is needed.

Another possible measure to promote usage of LPG and CNG is to use only gas busses in public transport (this can be achieved by definition of such criteria in public procurements).

Table 21. Actions in the transport sector

SECTORS AND FIELDS OF ACTION	ACTIONS	IMPLEMENTATION SCHEDULE		EXPECTED ENERGY SAVINGS [MWh/year]	EXPECTED RENEWABLE ENERGY INCREASE [MWh/year]	EXPECTED CO2 REDUCTION [ton/year]
		Starting year	Ending year			
Passenger road transport	Wider use of biofuels (biodiesel etc)	2005	2020	10	3 000	804
Freight transport	Wider use of biofuels (biodiesel etc)	2005	2020		2 000	534
Private transports	* Wider use of biofuels (bioethanol, biodiesel etc) * Wider use of electric cars * Wider use of gas engines in cars	2005	2020	1 894	6 338	2 317
Overall actions	* Use of sustainable modes of transport (public transport, bicycles) * Smaller fuel consumption of transport vehicles	2005	2020	7 111		1 825

4.6. Secondary energy production and energy fluxes

In the action plan several activities and projects are foreseen to produce secondary energy is from renewable sources. Under current chapter listed are the activities that have already been carried out (since the baseline year 2005) as well as the activities that are planned to be carried out in the future.

Renewal of infrastructures and equipment of electricity transmission and distribution networks also helps to save energy, these effects are already taken into account above under final consumption of heat and electricity.

Use of environment-friendly fuels and shift to CHP technology in district heating boiler houses.

Ltd Kuressaare Soojus (the main DH provider in Saaremaa) is adding a new CHP plant beside the old boiler plants. The CHP plant is planned to start working already in the end of 2012.

The numeric data of the Ltd Kuressaare Soojus development:

- FUEL USED BEFORE CHP - 64 000 MWh of woodchips, 23 000 MWh of fuel oil per year.
- FUEL USED AFTER INSTALLATION OF CHP PLANT – 96 000 MWh of woodchips, 4 600 MWh of fuel oil per year.
- PRODUCTION AFTER INSTALLATION OF CHP PLANT - 13 000 MWh of electricity, 58 000 MWh of heat per year.

Renovation and fuel shift in boiler houses

In the baseline year 2005 10 210 MWh of coal was used for producing heat into the district heating networks. After renovating the two old boiler houses, it is expected that no boiler houses work on coal anymore by the year 2013 and the usage of coal has been turned to 0.

Installation of wind turbines (and wind parks)

Saaremaa's potential for the usage of wind energy is very high. Today, the main obstacle for adding the wind turbines to the power grid is technical – the transmission network is not yet ready to accept the additional wattages. Another obstacle is posed by aspects of nature conservation and the attitudes of the local residence in relation to building wind turbines to specific locations.

In the context of adding the wind turbines to the power grid, one of the most important themes is an international transmission line. The system manager of the Estonian and Latvian power grid (Elering in Estonia) has come to the conclusion that another electrical capacity transmission line needs to be build between Estonia and Latvia in addition to the existing ones. Presently there are 3 options considered for the potential future electricity line, one of them being the line passing Saaremaa. A new transmission line through

Saaremaa would increase the economical and technical potential of wind energy immensely.

Presently, a plan is being compiled for the whole island of Saaremaa to find out the best locations for future wind parks – on total, 2,700 ha of land have been deemed suitable for this, where ca 400 MW could be installed.

Saaremaa could possibly be providing hundreds of megawatts of installed wattage, but in order to realise it, large-scale investments into the transmission lines are necessary – most plausibly done within the new Estonian-Latvian transmission system. Planning and building projects of this scale will take around two years, which is why this work will not count on an extensive realisation of wind energy usage in Saaremaa by 2020.

This work will be based on a rather modest assumption that starting from 2014, ca 3 MW of wattage will be installed in Saaremaa annually, with an added 7,5 GWh to the annual production.

Production of electricity from locally produced biogas

Two such developments are put into practice:

- Production of electricity from agricultural waste in Jööri, Valjala parish.

Pig slurry is turned into biogas, electricity generated on the base of the biogas is sold into the public grid. The project was started in 2007. The monthly production of the facility is 150 MWh of electricity – 1800 MWh electricity per year.

- Production of electricity from sewage sludge in Kuressaare wastewater treatment plant.

Biogas in produced from sewage sludge, biogas turned into electricity. Planned to be started in 2012-2013. Estimated production of electricity into the public grid 400 MWh per year.

Low energy district heating system in Väike-Roomassaare peninsula

Kuressaare Town Government has prepared a pilot project situated in Väike-Roomassaare peninsula in Kuressaare waterfront. Väike-Roomassaare is known of its sporting facilities. As the complex is far from the existing district heating network the municipality has seriously considered the alternative of placing sea collectors in the bay nearby and build a low temperature local district heating network where heat carrier is glycolic.

The objectives of the project are:
1. Seaside quarters are situated far from district heating systems heating plants having problems with the heat loss.
2. The price of the heat though existing central heating network costs 1/3 more than trough low energy district heating network.
3. Ecological conditions in the bays near Kuressaare are quite ideal for placing sea collectors. Muddy sea bed with depth between 1-4 .
4. Sea collectors with low energy district heating network are pollution free inexhaustible infrastructure.

5. Low energy district heating network allows individual houses neighbouring the network to connect their heat pumps with system. After the wood burning era there is not an reasonable alternative for heat pumps in the seaside quarters.

Details of the planned activity are yet to be specified (and therefore the impact of this activity is not quantitatively described in the action plan).

Table 22. Actions in the secondary energy production sector

SECTORS AND FIELDS OF ACTION	ACTIONS	IMPLEMENTATION SCHEDULE		EXPECTED ENERGY SAVINGS [MWh/year]	EXPECTED RENEWABLE ENERGY INCREASE [MWh/year]	EXPECTED CO2 REDUCTION [ton/year]
		Starting year	Ending year			
Heat (non-renewable)	Renovation of boiler houses (and fuel shift)	2005	2013			816
Wind	Installation of wind turbines and wind parks	2011	2020		72 500	33 350
Combined Heat and Power plant	Use of environment-friendly fuels and shift to CHP technology in district heating boiler houses	2013	2020	13 026	444	6 112
Biomass	Production of electricity from locally produced biogas (biogas produced from organic waste)	2007	2020	N/A	N/A	N/A
Ground heat	Installation of sea collectors and a low energy district heating system in Väike-Roomassaare peninsula	2013	2020	N/A	N/A	N/A

4.7. Land use planning

Proper land use planning is needed to implement all possible measures for improve energy efficiency and to achieve effective and sustainable energy use.

The most import land use plan in Saaremaa regarding the energy sector is the thematic plan of wind energetics to be realised already in 2012. The plan, covering the whole island of Saaremaa and aiming to lay out the most suitable locations for will parks has deemed about 2,700 hectares as usable, where an estimated amount of 400 MW could be installed.

In the context of adding the wind turbines to the power grid, one of the most important themes is an international transmission line. The system manager of the Estonian and Latvian power grid (Elering in Estonia) has come to the conclusion that another electrical capacity transmission line needs to be build between Estonia and Latvia in addition to the existing ones. Presently 3 options are considered for the potential location of the future

electricity line, one of them passing Saaremaa. A new transmission line through Saaremaa would increase the economical and technical potential of wind energy in Saaremaa immensely. Presently, the decision regarding the new line has not been made and no planning is being carried out yet.

The main actions in the action plan are as follows:

Table 23. Actions regarding land use planning

SECTORS AND FIELDS OF ACTION	ACTIONS	IMPLEMEN-TATION SCHEDULE	
		Starting year	Ending year
Regional and local strategic planning	* Integration of criteria and norms in land use planning and municipal regulations that encourage the minimization of energy needs in transports and buildings. * Implementation of a sustainable energy action plan for all municipalities.	2005	2020
Transports and mobility planning	* Monitoring of public transport needs and development of effective public transport system.	2005	2020
	* Installation of charging infrastructures for electric vehicles and gas stations for vehicles with gas engines.	2005	2020
Energy infrastructures planning	* Development of Estonian-Latvian electric power connection	2012	2020
Renewable energy land use planning	* County thematic plan of wind farms	2012	2013

4.8. Public procurement of products and services

The public sector has a vital role in guiding the development of the energy sector into right direction. Introduction of “green” public procurements has an important role in achieving the set targets.

Table 24. Actions regarding public procurement of products and services

SECTORS AND FIELDS OF ACTION	ACTIONS	IMPLEMEN-TATION SCHEDULE	
		Starting year	Ending year
Energy efficiency requirements/standards	Definition of standards and criteria for energy efficiency in the specifications of tender documents for procurement of works, acquisition of goods and services.	2012	2020
Renewable energy requirements/standards	Definition of standards and criteria for use of renewable energy in the specifications of tender documents for procurement of works, acquisition of goods and services.	2012	2020

4.9. Citizen and stakeholders

To achieve sustainable development and CO2 reduction active co-operation is needed between all stakeholders. Actions in the action plan include the following:

Table 25. Actions regarding citizen and stakeholders

SECTORS AND FIELDS OF ACTION	ACTIONS	IMPLEMENTATION SCHEDULE	
		Starting year	Ending year
Advisory services	Creation of an Internet-based sustainable energy advisory service for local businesses and residents.	2012	2020
Financial support and grants	Financial support to infrastructures for sustainable energy, including electric cars charging stations and improvement of electric grid to receive renewable energies.	2012	2020
	Applications for infrastructures and sustainable energy projects to national and European support programs.	2012	2020
	Promotion of financing and credit instruments for sustainable energy investments (energy service companies and banks).	2012	2020
	Reduction of public parking fees for electric vehicles.	2012	2020
Awareness raising and networking	Awareness-raising campaigns for adoption of efficient equipment, practices and behaviour.	2012	2020
	Tourist information to promote sustainable energy use during the visit.	2012	2020
	Development of cooperation projects in the energy domain with other regions.	2012	2020
	Promotion of cooperation activities in the energy field between regional and local administration, research institutes, business associations, companies, credit institutions, NGOs and the media.	2012	2020
Training and education	Development of educational material, awareness-raising and information sessions, and other educational activities on sustainable energy and sustainable behaviour.	2012	2020
	Development of energy initiatives involving school programs (guides, games, competitions, etc).	2012	2020
	Introduction of eco-driving habits in training of driving school students and in complementary training of fleet drivers.	2012	2020

5. ORGANIZATIONAL AND FINANCIAL MECHANISMS

In order to implement the action plan, it is necessary to establish a coordination and organizational structure, ensure appropriate technical expertise, mobilise the involvement and commitment of stakeholders and provide financial means for the actions. To ensure that the objectives and targets are achieved, it is also necessary to establish follow-up and monitoring mechanisms.

5.1. Coordination and organizational structures

Saaremaa Local Governments Association is the decision making body that authorizes the action plan.

Saare County Government is responsible for the coordination and organization of the ISEAP action plan.

5.2. Staff capacity

The plan as a whole will be implemented in collaboration with Saare County Government, local town and parish administrations, companies, consultants, operators, designers, constructors etc.

As many of the activities involve Kuressaare, the biggest town of Saaremaa, also Kuressaare Town Government has an important role in implementing the plan.

5.3. Involvement of stakeholders

Public consultations and events will be organized by Saare County Government and Kuressaare Town Government if needed. The goal of these events is to inform the public and stakeholders on the actions and the progress of the plan's implementation, identify existing or possible constraints and analyse measures to optimize the results and correct possible deviations.

To reach a wider public, the media will be used, to date with events, forums and publications, including electronic platforms, to disseminate information on the plan's actions and on the benefits and incentives available, raising awareness to the importance of these actions, in the scope of regional development and the improvement of quality of life and of the environment.

5.4. Budget

The overall investment foreseen to implement the Sustainable Energy Action Plan of Saaremaa is 129,2 million Euros, to be carried out until 2020. The investments are done by private persons, companies, local administrations, state and other institutions. Financial support may be possible from EU structural funds, also some new sources may be possible in relation to CO2 quota trade.

The investments shown below are largely estimated and depend on the specific details of implementation.

Investments needed for all actions separately are given in the ISEAP table, in this report a summary is presented below.

Table 26. Investments foreseen to implement the Sustainable Energy Action Plan of Saaremaa

SECTORS AND FIELDS OF ACTION	ESTIMATED INVESTMENT COSTS [euro]
RESIDENTIAL	
DOMESTIC USE	55 000 000
PRIMARY SECTOR	
AGRICULTURE, FORESTRY AND LIVESTOCK	1 000 000
SECONDARY SECTOR	
INDUSTRY	9 000 000
TERTIARY SECTOR	
PUBLIC SECTOR AND SERVICES	14 177 258
TRANSPORTS	
	4 800 000
SECONDARY ENERGY PRODUCTION AND ENERGY FLUXES	
	44 300 000
LAND USE PLANNING	
	600 000
CITIZENS AND STAKEHOLDERS	
	366 600
TOTAL	129 243 858

5.5. Financing sources and instruments

The action plan covers numerous actions in the underlying projects that will have different possibilities for financing.

For many actions private financing will be essential both on the individual level as well as on company level. Thus, the need for awareness raising, financial assistance and encouragement is especially important, as well as a favourable legislative situation. Also, for several actions financing is needed from state budget and with the help of initiatives by local administrations.

The action plan is a sum of several specific actions over a long period of time, which cannot be financed all together by the same means. Below some guidance is given about some of the resources concerning organisational structures and financing that might come in place for the action plan.

The main financer for improving the energy efficiency of buildings is the owner of the building. However, there are also national support systems (Kredex) for granting loans and covering a part of the expenses related to improving the energy efficiency of buildings.

The development of electrical wind turbines is financed by the developers who also use funding from commercial banks. In a few cases (in 2011 and 2012 form the funds acquired from the international sales of the Estonian CO2 quota) in Estonia, state capital funding has been employed in Estonia.

Electric cars were also bought and a network of quick-charging stations was built in Estonia form the funds acquired from the international sales of the Estonian CO2 quota. Presently (in 2012), the state will cover about 50% of the price of the electrical car to the consumer, also from the funds of CO2 quota sales.

5.6. Monitoring and follow-up

Saare county Government will continuously monitor the implementation of the Sustainable Energy Action Plan of Saaremaa Island and the development towards lower CO2 emissions.

In the case of significant deviation in the implementation of the actions and results obtained, as well as relevant changes in the socio-economic and political context, which may pose a risk for the targets set for 2020, the Saare county Government may propose a revision of the Sustainable Energy Action Plan of Saaremaa Island.

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PACT OF ISLANDS

Authoriser of the plan:

Saaremaa Local Governments Association

Regional authority:

Saare County Government

Elaboration:

Hendrikson & Ko

Financial support:

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Disclaimer: