Greensettle
GREEN CITIES AND SETTLEMENTS

UNIVERSITY of OULU
OULUN YLIOPISTO

Sustainable Spatial Development Scenario and Backcasting

For Kostomuksha Urban District and Kalevala National District

NorTech Oulu

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Report for WP3: Roadmap for sustainable spatial development

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FOREWORD

This report is carried out as part of the "Green cities and settlements" (GREENSETTLE) ENPI CBC project. GREENSETTLE is financed from the Karelia ENPI CBC programme (co-funded by the European Union, the Russian Federation and the Republic of Finland). The project aims mainly to encourage the development of green cities and settlements in remote cross border areas of Finland and Russia.

The general idea of the project is to produce recommendations, which, when put in use, can provide sustainable solutions for long-term spatial development. Two areas in Republic of Karelia, Russia, have been selected as of pilot territories, which are targeted in this project. These recommendations have been made by taking into account the local circumstances, resources and infrastructures. The purpose has been to provide a roadmap, which should further balanced and sustainable social and economic development of the districts.

The well-being of the population living in the pilot territories has been the primary target of the project. The ways to improvement the living conditions, increase the attractiveness of pilot territories and to improve the self-sufficiency of these areas have been studied in the project. The people of Kostomuksha and Kalevala are the main beneficiary of the project, together with the public infrastructure sector at large.

The following tasks and objectives have been included in the GREENSETTLE project plan:

- apply resource efficiency principle on local resources: i.e. efficient land use (via spatial potential utilization), efficient material use (via non-waste or low-waste technologies), efficient waste utilization (via recycling, reuse, waste-to-energy technologies), efficient energy use (via energy saving and energy efficient technologies) and efficient recreational potential use (via utilization of cultural and natural heritage and tourism development);
- improve functionality and competitive capacity of Kostomuksha urban district and Kalevala national district;
- facilitate functioning of the pilot territories in harmony with nature;
- reduce ecological footprint and overall contribution to climate change;
- apply environment friendly technologies suitable for northern territories;
- use Finnish experience regarding technologies, which have been applied in similar climate conditions;
- arrange effective cross-border exchange of best practices in public facilities and services;
- improve public and transport infrastructure;
- enhance the role of local small and medium size enterprise (SME) via training, consulting and support;
- build awareness and share information on potentials and possibilities of sustainable spatial development.

The project is divided into several work packages, and these on the other hand to activities. This report is produced as part of Activity 11, which aims to visualize the possible future of the pilot territories. We know how the territories look like in 2013, but what about in 2050? This vision covers different aspects of climate-neutral economy: i.e. efficient and clean resource use, aesthetics, respecting cultural and natural heritage, and maximizing the well-being and prosperity of people of the pilot territories. The main goal is to build a roadmap to the future for Kalevala and Kostomuksha and to demonstrate, which different scenarios and turns this might take.

INTRODUCTION

This paper presents an overview of the methodology and related theoretical background applied in the Activity 11 of the "Green cities and settlements" (GREENSETTLE) project. It also illustrates the present conditions and level of development of the Kostomuksha city and the Kalevala municipal district. Besides this, the report includes also the various steps, which lead towards the following goals: i.e. improvement of the living conditions, attractiveness, stability and self-sufficiency of the Kostomuksha city and the Kalevala municipal district.

The main idea is to improve the local circumstances in Kostomuskha and Kalevala by applying appropriate technologies, most of which have been tested and in implemented successfully in Finland or in EU countries in the northern areas. These technologies, methods and other features can benefit the local economy and environment in Kostomuksha and in Kalevala, and also further environmental and educational change on social level.

This report is meant to be advisory only. The main objective is to provide the involved parties (in particular, local people, municipal officials and other stakeholders) with recommendations about the development of the municipalities. The envisioned future with all the goals mentioned above is based on the concept of sustainability. The major outcome of the proposed way of development is to improve the functionality of the Kostomuksha city and the Kalevala municipal district, increase their attractiveness on the regional, national and international level. The purpose is to further the development of the municipalities into resource and energy self-sufficient eco-municipalities.

1 THEORETICAL PART

To meet all the goals of the Activity 11, it is important to understand the theoretical background of eco-municipalities and other factors contributing to this. This has been mainly discussed in previous reports of the GREENSETTLE project, so only the most important concepts are shortly presented here.

1.1 UNDERSTANDING THE GLOBAL PROBLEM, TAKING LOCAL ACTIONS

The world population at the present time is more than 7 080 000 000 people (**UNSD, 2012**), which is ten times higher than it was in 1700. (**WPB, 2013**). The population growth has led to an obvious rise in the use of resources (**NS, 2013**), but as population has increased, the resources are diminishing. The latter is known as the Natural Step Funnel, described in Figure 1 (**Chamilos, 2011**).

It is a generally accepted fact that if population continues to increase at current rate, the planet can't meet the resource needs of the people, not even the most crucial ones, such as food, water, etc. As a consequence, we can expect that there will be more and more different kind of crises in the future. An unemployment crisis, a food crisis, a global financial crisis, an economic crisis and a global ecological crisis are just bound to happen, UNLESS something is done to change the current trends (CR, 2013).

When we have agreed about the existence of this global problem, the next step is to try to prevent it from happening. Corrective measures have to be taken, but how can an entire planet be saved, is a more problematic task. Thus, the best possible way to move forward is to act locally. Every small deed counts, when

all the people start to look after their own immediate environment. The latter can be put in the following phrase: think globally, act locally.

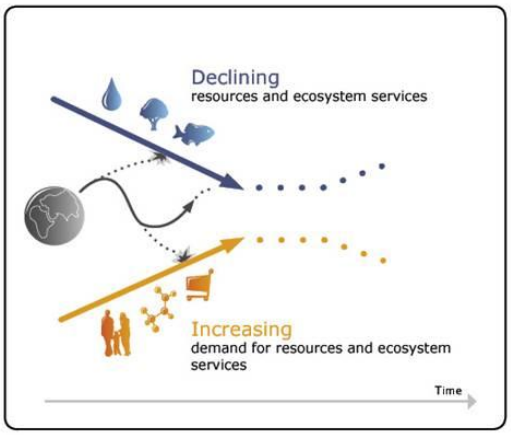

FIGURE 1. THE NATURAL STEP FUNNEL (SOURCE: CHAMILOS)

1.2 SUSTAINABLE DEVELOPMENT AND SUSTAINABILITY

One of the key concepts of Environmental Science is sustainable development. The original definition was included in the Report of the World Commission on Environment and Development (WCED), which was published in 1987. In this report sustainable development was defined as a "*development that can meet the needs of the present generation without compromising the ability of future generations to meet their own needs*" (WCED, 1987). In this concept the three fundamental components are considered: i.e. social, economic and environmental development. They are illustrated in Figure 2.

FIGURE 2. THE THREE MAIN COMPONENTS OF SUSTAINABLE DEVELOPMENT CONCEPT

It is also important to define, what is included in each of these components of sustainable development. Social development includes provision of housing, education, jobs, healthcare and welfare, community services, social aspirations support, recreational facilities, etc. The main feature of economic development is productivity in harmony with nature (i.e. efficient use of resources, investments in eco-ideas and related technological development, local skills network arrangement, etc.). The environmental development includes institutional change along with the preservation and enhancement of local natural ecosystems, natural resources included. All these three areas are crucial, interconnected, and should be developed sustainably and coexist in balance and in harmony with natural ecosystems (**Chamilos, 2011**).

Sustainable development in itself has to be defined too. Sustainability is, in general, "things that can keep going, can sustain themselves, can continue into the future and go on forever". This refers mainly to the Earth and humanity. If we develop our civilization sustainably, the planet can function as it was supposed to do. This means that the planet can sustain a good quality of life for its current and future inhabitants and provide us with crucial resources (i.e. fresh air, clean water, food, etc.) (**NS Video, 2013**).

1.3 SUSTAINABILITY CONDITIONS

In order to live in a sustainable way, certain conditions of sustainability have to be met (see also Figure 3). All these four sustainability conditions, which are below, are discussed in detail in the report of Activity 1 of the project (Chamilos, 2011).

1. "Nature is NOT subject to systematically increasing concentrations of substances extracted from the Earth's crust";
2. "Nature is NOT subject to systematically increasing concentrations of substances produced by the society";
3. "Nature is NOT subject to systematically increasing degradation by physical means";
4. "People are NOT subject to conditions that systematically undermine their capacity to meet their needs (NS System, 2013)".

FIGURE 3. THE FOUR SYSTEM CONDITIONS OF A SUSTAINABLE SOCIETY (SOURCE: NATURAL STEP)

1.4. THE ABCD METHOD

The four sustainability conditions are also included in the ABCD method, which is used in strategic planning. ABCD method is a process, which allows organizational changes to be made and can be used as a platform for decision-making. The general scheme is presented in Figure 4. In this report the ABCD method is used to create a strategy for sustainable development of the pilot territories.

The structure consists of four basic steps, which are listed below:

1. Step A – *Awareness and visioning*. This step includes observation of the current situtation and creation of common understanding about the theoretical background (i.e. sustainability, sustainable development, ecocity, etc.). It is important that all the involved parties – municipal officials and

decision makers, community citizens, stakeholders, practitioners – understand the basics of the method. The current situation with problems and unsustainable practices are to be studied and based on these the potentials and opportunities are to be explored. A vision is to be developed, how to proceed and make a sustainable and prosperous community (based on the sustainability conditions and related experience). An action plan is made to move towards this vision, which has been generated;

2. Step B – *Baseline mapping*. This step is about presenting the current state of the pilot territories. Many spheres are analyzed in order to acknowledge the existing assets of the communities: i.e. resources and resource efficiency, energy demand, dependency on fossil fuels, waste generation, environmental impact, basic needs for the territories, services, utility networks, transport infrastructure, demographic situation, economic situation, industry, housing, etc. The latter are essential for future opportunities;
3. Step C – *Creative solutions*. After the present situation (i.e. baseline) is known, a detailed description of desirable future vision (i.e. sustainable community, waste management organized, less or no negative environmental impact, resource efficient utilization, energy efficiency, etc.) will be drawn. All the solutions and scenarios of sustainable development of the pilot territories are developed at this stage. The intermediate targets (or steps) towards the desired future are described;
4. Step D – *Decide on priorities*. The summary of the Step C solutions and scenarios is described. The priorities are set on the most crucial scenarios and actions. The actions involving investments should pay off well. The systematic step-by-step process towards sustainability is chosen (**Chamilos, 2011**).

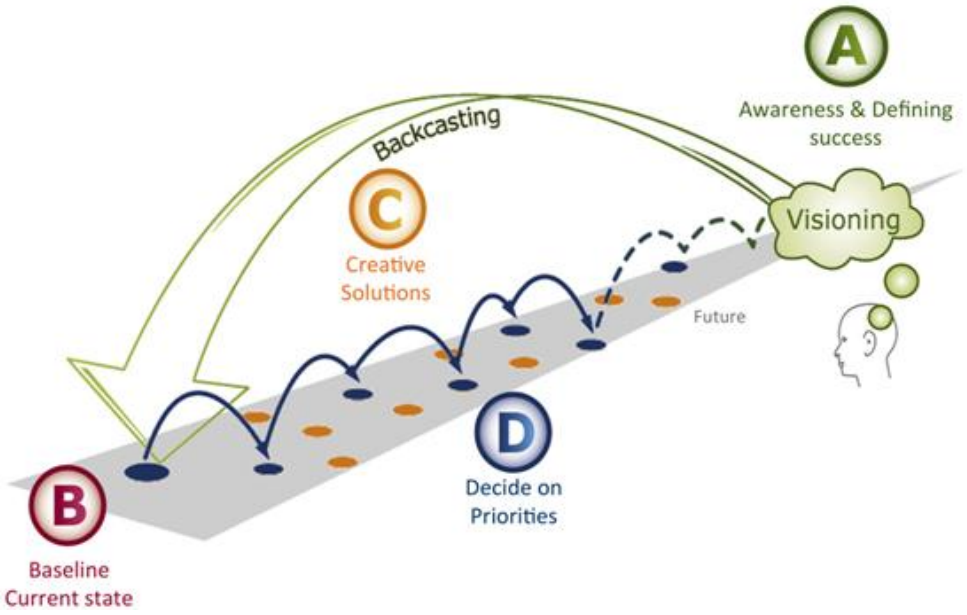

FIGURE 4. THE ABCD METHOD (SOURCE: NATURAL STEP)

1.5 BACKCASTING APPROACH

The central approach that is used in this work and, in particular, in the ABCD method, is called backcasting. It is basically a process of describing desirable future. We envision in detail how the future (i.e. in 10, 50, 100 or in any chosen time period) will look like. Then we consider the steps, which are needed to be taken to reach this future.

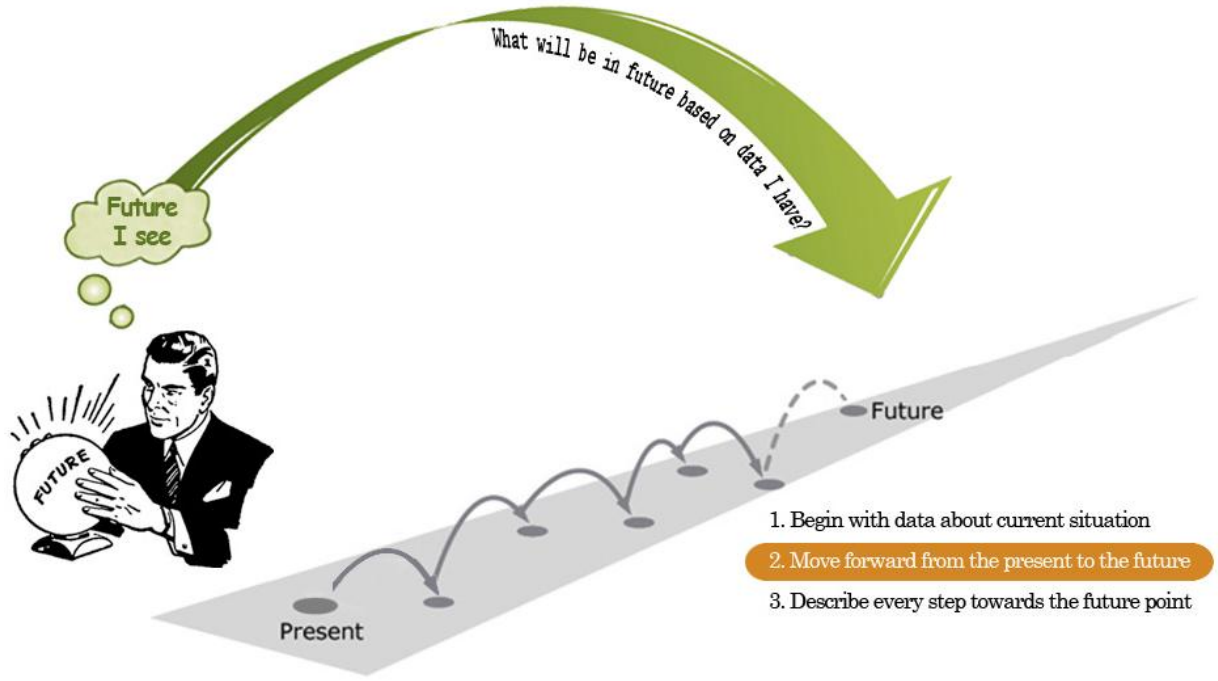

FIGURE 5. FORECASTING ILLUSTRATION (SOURCE: MODIFIED PICTURE FROM NATURAL STEP)

The difference between forecasting is the following:

- *Forecasting*. Forecasting scheme is pictured in Figure 5. The process is based on information about current situation. Then we predict what future might be in certain period of time. Thus, on the timeline we go from the present to the future. In other words, we imagine how things will develop further on if we start to forecast taking into account the situation in the beginning as baseline. To illustrate, weather forecasting works exactly in this way. Meteorologists predict the weather based on climate data they have. They convert current information about climate into future weather forecasts;

- *Backcasting*. Backcasting is illustrated in Figure 6. In this case the baseline is set on the other part of the timeline. We put desirable future as our point of destination. Here we also move from the present to the future. But the future is the one we want to have. Thus, it works in different way compared to forecasting. Firstly, we agree about the desired point in the future, describing how it will look like in detail. Then we determine the way we can get there, including intermediate targets. In other words, we consider the steps we need to take to achieve what we want at certain point. The future point depends on us. It can be in 5, 10, 20, 50, 100 years or something else. This approach is especially useful in environmental and socio-economic studies (**Chamilos, 2011**).

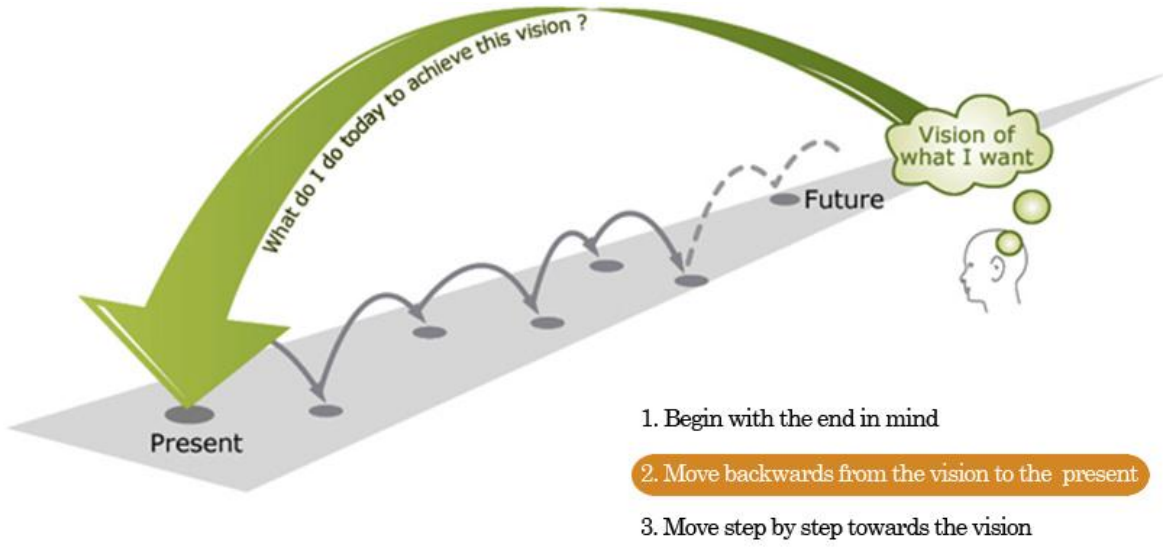

FIGURE 6. BACKCASTING ILLUSTRATION (SOURCE: NATURAL STEP)

2 BASELINE

The pilot territories are located in the Republic of Karelia. The general scheme of the location of the Kostomuksha city and the Kalevala urban-type community is illustrated in Figure 7.

FIGURE 7. THE GENERAL LOCATION OF THE KALEVALA URBAN-TYPE COMMUNITY AND THE KOSTOMUKSHA CITY (SOURCE: MODIFIED PICTURE FROM ENPI CBC)

2.1 KOSTOMUKSHA URBAN DISTRICT

2.1.1 OVERVIEW

Kostomuksha is a Russian municipality established as an industrial city 30 years ago. As can be seen on Figure 8, it is located in the western part of the Republic of Karelia and the city center is only about 30 km from the Finnish-Russian border. It is dynamically developing industrial and cultural centre of the Republic of Karelia, which is located at 64.638 of northern latitude and 30.705 of east longitude. The Kostomuksha city is situated near Lake Kontokki on the West-Karelian elevation and it is about 390 m above the sea level. There are three lake and river systems: i.e. northern, south-western and southern. Kostomuksha has continental climate and the annual average temperature of +0.5 ^{0}C. In the summer there is a period of midnight sun, in the winter a polar night period.

FIGURE 8. THE LOCATION OF THE KOSTOMUKSHA URBAN DISTRICT IN THE ROK(SOURCE: MODIFIED PICTURE FROM LAUSALA T.)

Kostomuksha is the youngest human settlement in the Republic of Karelia. It was established in connection to the opening of iron ore extraction and processing enterprise (Chamilos, 2011). The demographic situation of the city is quite stable. There is a slight out-migration trend. The population is relatively young and there is natural growth of population. Most of the population is employed by industry. The main enterprises are major providers of social and other services to their employees and the city population, for instance they support the construction and running of sport facilities construction. The salary level in the city is high and even attracts workforce from Petrozavodsk to Kostomuksha (KRC, 2012).

The city has reached a high socio-economic developmental level. The economy is growing (advance index of more than 100%) and both the income of the population (average salary of 720 euro/month in 2010) and its purchase power is high. The retail trade sector is expanding and the closeness to the border of Finland has

contributed to this and to the business climate in general. There are many enterprises with Finnish partners and co-owners, and most of these companies provide services and goods for Finnish (or EU) partners and markets. The closeness of the Finnish retail market has led to a higher spending in Finland than in the internal republican market. The local market has improved significantly recently, but cannot still compete with the high level of quality provided by the Finnish markets.

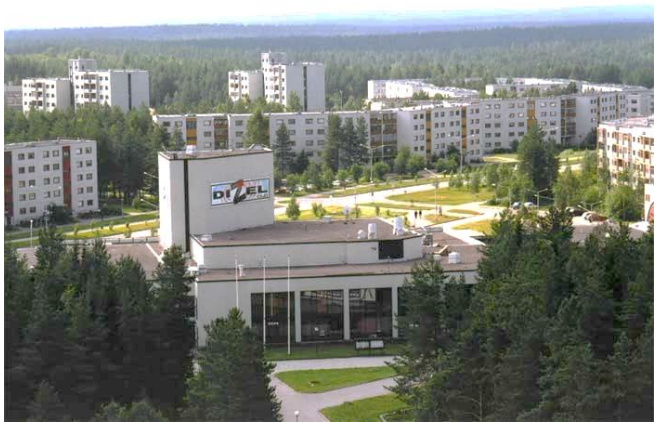

PHOTO 1. KOSTOMUKSHA VIEWS (PHOTOS BY LEBED V.)

The Kostomuksha city, images of which can be seen on Photo 1, is a part of the Kostomuksha urban district. The territory of the Kostomuksha urban district is 4046 sq km (2.2% of the Republic of Karelia) and includes also villages of Voknavolok (Vuokkiniemi), Ladvozero (Latvajärvi), Ponygaguba, Sudnozero (Venehjärvi) and

Tolloreka. The population of the urban district is around 29 000 people (4% of the Republic of Karelia population) and the population density is 7.4 people per sq km **(FSSS, 2012).** The urban district is situated close to the Finnish border in the West of the Republic of Karelia. It shares a border with the Kalevala national district in the north and with the Muezerskiy municipal district in the east and south. Compared to the constituent villages, the Kostomuksha city is well-developed and can be regarded as a local hub. There is potential to establish connections with neighbouring districts that can result in intersectorial technological and other links. Besides, the city has favourable position as it is located between the North-West of Russia and Scandinavia. According to the experts of the Karelian Research Centre, the advantageous geographical position of the city is well utilized. For instance many international projects have been realized **(KRC, 2012; Kostomuksha, 2013; KRC RAS, 2011)**.

Kostomuksha has minerals, water and forests, but also recreational and cultural resources. However, Kostomuksha can be regarded as a monocity, since city's economy is very dependent on one company and one economic activity: ore extraction and its processing. Therefore, the ups and downs of the global iron ore markets and their final products keep the city on its toes. It has been estimated, that there is still enough iron ore for 30-35 years, but something else has to be found out, if the city is to prosper and maintain its vitality after all the ore has been extracted. The economy has to be diversified, which could be accompanied with solving problems of resource efficiency and environmental protection. Another positive point about diversification and emergence of new business sectors is that this will increase the knowledge base of the city.

The local environmental problems are mainly related to the ore extraction and processing enterprise: 99.9% of the waste is generated by the company. According to environmental monitoring, air pollution level is increasing in the Kostomuksha city. The emissions in Kostomuksha constitute almost 53% of all the emissions in the Republic of Karelia. Kostomuksha gnererates also about 10% of the wastewater discharges in the Republic of Karelia. The industrial wastewater from the enterprise does not penetrate to the three lake and river systems mentioned above **(KRC, 2012)**.

2.1.2 NATURAL RESOURCES

Even though Kostomuksha relies heavily on iron ore deposits, it does have other mining resources. The forest sector can also be developed.

Ore mineral resources. The area is a part of the Karelian geological block of the Baltic crystal shield. There is iron ore (as the main resource), gabbro-diabase, granite, dolomite, talc-chlorite, basalt, sand-gravel, clay, underground water, peat, gold, diamonds, molybdenum, nickel, chrome, cupper and rare metals. There are two ore deposits in the district with about 1.5 billion tons of capacity: i.e. Kostomuksha and Korpanga. The Kostomuksha deposit is the largest in the North-West Russia. The ore extraction is estimated to continue at current level for 30-35 years.

Non-metallic mineral resources. Crushed stone is produced (for the internal needs) for the enterprise (870 thousand m^3/year) and city (30 thousand m^3/year); as well as concrete; talc-peach stone; construction powders, pastes, tile, bricks, silicate cotton; ground and cover enamel; dark green and semi-white bottles and jars; and sanitary ware items.

Land resources. The total amount of available land is 404 600 ha.

Forest resources. The total area of forest resources in the Kostomuksha urban district is estimated to be 345 thousand ha. The actual forest area is 215 thousand ha (mostly represented by coniferous forest). The timber stand reserve capacity is about 320 million m^3 whereas wood of coniferous trees and deciduous wood reserve are estimated to be 136 m^3/ha and 100 m^3/ha respectively. Since 2006 about 75 thousand ha of forest area have been assigned to the Kalevala national nature reserve. There are plans to expand forestry in the area, i.e. tree-planting activities. Apart from wood, there is non-wood resources in the forests. There are plenty of mushrooms, berries and plants available for food industry and pharmaceutics.

Fish resource. There are more than 20 fish species in the local water bodies (**Kostomuksha, 2013; KRC RAS, 2011**).

2.1.3 INDUSTRY

Kostomuksha has highly developed and advanced mineral resource industry (production index of more than 100%) and geological prospecting. The town itself was formed around the iron ore extraction and processing, which is carried out by a company named "Karelsky okatysh". The enterprise, which is part of one of the world's leading vertically integrated steel and steel related mining companies. SEVERSTAL group, with approximately 63,000 employees, has assets besides Russia, in the USA, in the Europe (Ukraine, Latvia, Poland and Italy) in Africa (Liberia), but also investments in South America (Brazil). Severstal is listed on MICEX/RTS, GDRs are traded on the LSE. The head office is located in Moscow (Figure 9, logos of the SEVERSTAL group and Karelsky Okatysh). The main consumer of Karelsky Okatysh products is Severstal Russian Steel (Cherepovets, Russia), but other main customers include Tata Corus (Netherlands, Great Britain), Lucchini (Italy), Rautaruukki (Finland).

FIGURE 9. SEVERSTAL AND KARELSKIY OKATYSH LOGOS (SOURCE: SEVERSTAL)

Besides mining, there are other significant industrial sectors in the city. These include construction, woodworking (215 thousand m3/year); trout industry (1600 t/year), electronics assembly and supply; heat and power engineering; food industry (e.g. bakery, berries and mushrooms processing, juice production); production of components for explosives; and some others on smaller scale. The main industrial representative in the city – the ore extracting and processing enterprise "Karelsky okatysh" has achieved several international certificates, for instance ISO-9001 (Quality Management Systems), ISO-14001 (Environmental Management System), and ISO-18001 (Occupational Health & Safety Management System). The Kostomuksha industrial sector contributes significantly to the economy of the Republic of Karelia and provides annually around 35% of the GDP of the Republic. It is also the biggest employer of the Kostomuksha population.

There is also several other international companies operating in Kostomuksha. Wiring harness ("AEK" LLC) and electronics ("Electrokos" LLC) factories are part of Finnish company PKC Group Ltd, which has had production in Kostomuksha for over ten years. Other important industries include timber and furniture making. A wood processing complex is being developed by Swedwood (an industrial group within IKEA),

which includes a sawmill, chip-board and furniture factory. In total there are 1274 registered entrepreneurs and 294 commercial companies in the Kostomuksha urban district **(Kostomuksha, 2013; KRC RAS, 2011).**

2.1.4 HOUSING

The housing sector is in decent conditions and there is no need for mass reconstruction. Most of the buildings were built by the Russian and Finnish construction companies in the late 1970's and early 1980's. The public services are at an adequate level and meet the local needs. There is centralized water supply and sanitation as well as solid waste management system.

On the other hand, there is a shortage of housing. The people in Kostomuksha live more densely in terms of housing space per inhabitant. In 2010 the average index of accommodation supply in the Republic of Karelia was 24 sq m per person whereas in the Kostomuksha city it was 19.9 sq m per person. In connection with the latter, the Kostomuksha city housing sector is going to be extended. A building program is currently underway in the city, according to which 400 new low-rise buildings (or 1000 flats) should be built from 2014 onwards. Other measures are also taken to ease the lack of suitable houses for the growing population. There are also urban development plans, which guide the urban sprawl in Kostomuksha. The city itself has not been built very tightly, but the buildings are spread out to a large area.

Another issue, which is slowing down construction activities in Kostomuksha, especially concerning individual house building, is the land issue. All the decisions regarding land use in the border territories are centralized to Moscow and taken on federal level. This process is very time consuming.

As mentioned earlier, the city provides numerous services to its inhabitants. There are several schools from kindergardens to a vocational and training school and also two offices of higher education institutions. The city runs also hobby centres, a vocational centre, centre of education development, social service centres, orphanage and a job centre. Cultural needs of the inhabitants are met by a public library, a culture and museum centre, a cinema and a waterpark. Municipal hospital and medical centre look after the health of the inhabitants, and one hundred ninety shops and forty objects of public catering care for other needs.

Some obsolete buildings are planned to be demolished. There are also plans to reconstruct and modernize housing sector to meet European standards.

The following priorities have been set to the development of the city and its services:

- increase of transport infrastructure potential;
- development and modernization of communal utilities;
- improvement of reliability and quality of communal services;
- provision of safety and comfort conditions of living;
- involvement of private investments in communal infrastructure development **(Kostomuksha, 2013).**

2.1.5 ENERGY

The housing sector of the city is heated by state-owned district heating. Hot water is provided by the ore extraction and processing enterprise, which produces hot water by a petroleum-fired boiler. The main fuel oil is M-40 (or M-100). The boiler was installed in 1979 and repaired in 2010. The hot water cost is dependent on oil price and on the general instability of the petroleum market. The householders are given a 20% discount per unit of received heating.

The electricity is generated via hydropower station that is 200 km out of the city. A transmission system provides a continued and uninterrupted supply of electricity. The transmission lines are 220 kV.

The electricity grid and supply is public owned. According to "The report of head of administration related to the results of his work and work of the Kostomuksha urban district administration, 2012" a combined heat and power (CHP) plant is planned. The work is planned to be done by 2017. The capacity of the CHP unit is to be 50-70 MW. This plant will be fuelled by biofuel: i.e. peat, raw waste lumber (wood chips, sawdust, crust) (**Kostomuksha 2013; BIOKostomuksha, 2013)**.

The energy consumption of the ore extraction and processing enterprise is 1509 million kW. In contrast, the energy consumption of the Kostomuksha city is 3770 thousand kW.

In 2010 Kostomuksha city was rated as an energy-deficient area of the Republic of Karelia, which suffers from a power deficit problem. A new electrical line needs to be built in order to cover the growing demand. On the other hand, there is more and more pressure to introduce heat management devices in the households.

There are some other energy resources available besides fuel oil, which is used currently. Natural gas could be used in the energy production by the enterprise. There are also huge deposits of peat in the Kostomuksha urban district, which could be used as a energy source both by the enterprise and the municipality. (**Zavarkina E., 2012**).

2.1.6 TRAFFIC AND TRANSPORTATION INFRASTRUCTURE

The road conditions are satisfactory and in better shape in comparison with the road network in the Kalevala national district. There is plenty of traffic and even congestion on times. This is due to the relatively large population (for a town in northern areas of the Republic), presence of the ore extraction and processing enterprise (the largest in the Republic of Karelia) and the location on the road leading to the border crossing between Finland and Russia. The federal "Kochkoma-Tiksha-Ledmozero-Kostomuksha-state border" cross through Kostomuksha for 85 km. The roads in Kostomuksha Urban districts, which total 252.3 km, are divided into the following road types: 129.7 km of gravel and macadam surface roads, 74.8 km of roads with asphalt surface and 48.7 km of dirt roads. The length of motor roads (of local significance) towards the villages of the Kostomuksha urban district is 72.95 km. All the roads belong to lower categories IV (117.8 km of road surface) and V (135.4 km of road surface) and the road network was built in 1978-1984. The motor road map from 1999 is shown on Figure 10. Many parts of the motor roads are in need of repair or larger reconstruction. Apart from the federal road, there is another significant road: i.e. "Kostomuksha-Voknavolok-Voinitsa", which connects Kostomuksha urban district to the Kalevala national district. The condition of this road is gradually improving because of ongoing road repair works. The official programs regarding road reconstruction or repair in the Kostomuksha urban district are presented in section 2.1.14 ("The programs of development of the urban district").

Private companies are in charge of providing public transportation in the city. The frequency of the public transportation is rather insufficient. Hence, citizens usually resort to their own cars or taxis instead. The private car fleet is estimated to be about 17 000 units (555 cars per 1000 people). There is public transportation towards the outskirts and peripheral areas.

In Kostomuksha there is also a modest bike road network, which is not utilized, as cycling culture has not developed yet. Bicycles are normally used only by children or youth in Russia. There are also those young

people, who ride sport bicycles in their free time as a hobby, but do not use them for getting from one place to another. The number of those people, who use bicycles regularly as a means of transportation, is very low. The people still prefer cars or taxis to move around the city rather than cycle. Apart from that, the bicycle roads conditions are not satisfactory. The problematic points are illumination of the roads, maintenance during winter time, lack of services for bikers in public places and workplaces (i.e. showers, dryers, etc.) and parking areas for bicycles (Posudnevsky A., et al. 2012; Kostomuksha 2013).

FIGURE 10. THE MAP OF MOTOR ROAD INFRASTRUCTURE OF THE REPUBLIC OF KARELIA (SOURCE: MODIFIED FROM LAUSALA T.)

What is also essential to mention is that during Spring season (i.e. April-May) there are many constraints for heavy load vehicles (more than 4 tons) due to the poor state of the roads. Melting snow decreases the road carrying capacity, but these constraints do not apply to international goods transportation and bus passenger

traffic. This measure is taken in the old roads in order to preserve them and prolong their life time. A weighing control point is planned to be built in order to catch those truck drivers, who do not follow these regulations.

There are not either enough rest areas by the roads, which affects road safety as well. Many traffic and direction signs are also missing, which contributes negatively to road safety as well. Other issues affecting the road conditions and road safety are:

- a great number of abnormal curves on the road plan and longitudinal slopes;
- timber carrying trucks (i.e. timber-hauling transport) do not use special logging roads but normal motor roads. These damage the roads and shorten their lifetime more significantly than regular vehicles;
- the road Voinitsa-Voknavolok-Kostomuksha is a private road and belongs to "Swedwood Karelia". Apart from this non-state road, there are some roads that do not belong to nobody

As for the water infrastructure, this type of transportation is absent in the district (**Posudnevsky A., et al. 2012).**

2.1.7 INTERURBAN TRANSPORT CONNECTION

Since 1982 the Kostomuksha city has had railway connection with Kochkoma. Kochkoma is a settlement, which is located in the eastern part of the Republic of Karelia 25 km away from Kostomuksha, It is possible to reach bigger cities in northern and southern directions through Kochkoma. The distance are the following: Murmansk (690 km) in the north and Petrozavodsk (270 km), St. Petersburg (680 km) or Moscow (1300 km) respectively in the south. Thus, the city has railway connections with industrial centres of North-West Russia (Cherepovets, St. Petersburg) and Moscow. There is a railway between Kostomuksha-Ledmozero-New Yushkozero. It is possible to get from the Kostomuksha urban district to the Kalevala national district by train. The latter can be seen on Figure 11 below.

Opening of rail services between Finland and Republic of Karelia have been discussed and two routes have been planned: Petrozavodsk–Sortavala–Joensuu and Petrozavodsk–Kostomuksha–Kajaani–Oulu. At this stage the feasibility studies are going on. The establishment of the Petrozavodsk-Kostomuksha-Kajaani-Oulu railway can be beneficial for both of the GREENSETTLE pilot territories: i.e. the Kostomuksha urban district and the Kalevala national district. This route would make travel between Petrozavodsk and these districts, but also to Finland. In return, the districts can become more accessible for tourists coming there from European Union countries and rest of the world. Thus, the railway can further economic development in both Kostomuksha and Kalevala. For the Kalevala national district this has more significance due to its current socio-economic state **(Press-service GRK, 2012).**

Kostomuksha can be reached using different means of public transportation There is a train from Petrozavodsk (tree times per week) and from St. Petersburg (twice per week) and a bus from Petrozavodsk via Segezha (daily connection). There is also airport in Kostomuksha, which can handle small airplanes (up to 17 persons) and helicopters. The airport is mostly used currently by the enterprise, but it is going to be modernised by 2014 **(KRC RAS SWOT, 2012; KUDA, 2011).**In order to reach Voknavolok (Vuokkiniemi) village, there is a bus from Kostomuksha city (four times per week).

There are proposals to create a transportation logistics centre in the Kostomuksha urban district. This would be a multifunctional terminal and logistic complex, which would improve the quality and efficiency of transports in delivery of freight from producer to the consumer (Kostomuksha, 2013; KUD STR, 2008).

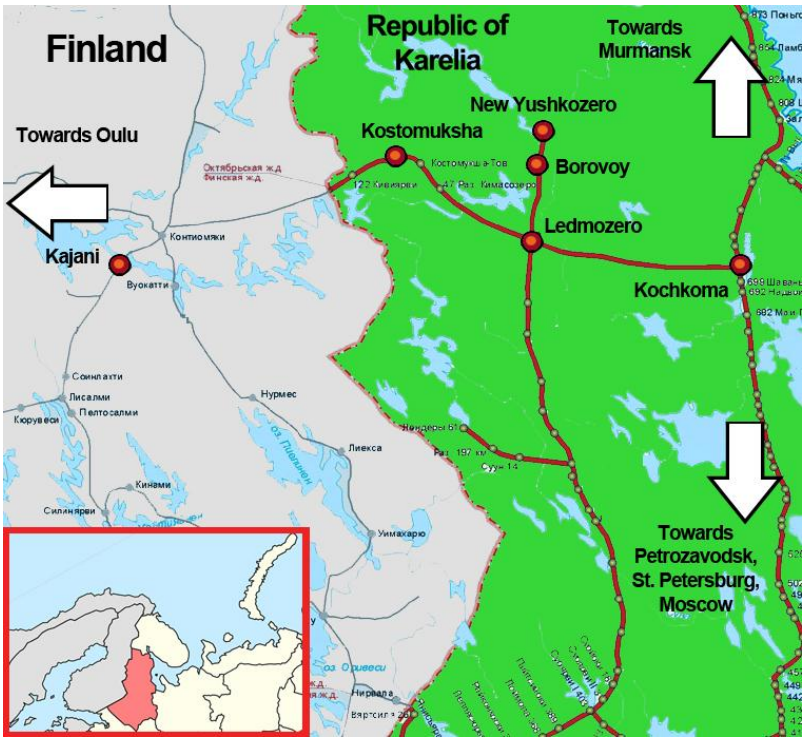

FIGURE 11. THE RAILWAY CONNECTION OF THE DISTRICT

2.1.8 WATER AND SANITATION

More than 20% of the Kostomuksha urban district is covered by water bodies. The water supply quality in Kostomuksha city is good and meets the case. The water supply and sanitation system is 100% centralized in Kostomuksha, unlike in other settlements (e.g Voknavolok). The pipeline network is in satisfactory conditions, but some critical parts of the network are to be replaced. The current wastewater treatment system cannot purify the water to meet the standards and has to be modernized. Critical parts of the network need to be replaced. The water intake was built in 1972 in Lake Kamennoe in the Kostomuksha nature reserve (i.e. 17 400 m^3/day). Water purification station was constructed in 1972.

Before the water is supplied to the consumers, it is treated by coagulation, chlorination and alkalization. The length of water-distributing system is 118.1 km. 87.4 km of the water network utilizes iron pipes (74%), 12.7 km plastic (11%) and 18.0 km steel pipes (15%). 15% of the water-distributing network was constructed in 1970s, 35% in 1980s and 20% in 2000s. The percentage of its tear and wear is 75% due to the network's age (30 years old). The existing pipeline needs to be reconstructed in order to meet the requirements of new buildings in the city. 6 km of the water network needs urgent replacement.

The length of sewerage network is 106.9 km. 43.3 km of the network is ceramic (40.5%), 51.4 km plastic and 12.2 km concrete (11.4%). 15% of the sewerage network was constructed in 1970s, 34% in 1980s, 20% in 1990s and 31% in 2000s. 5km of the pipeline needs to be replaced.

There is a wastewater treatment plant in the city with 24 thousand m^3/day capacity (16 thousand m^3/day of capacity is utilized). The wastewater is subject to mechanical and biological treatment.

The water is screened twice (to remove the largest fractions) before a third screen takes place at the wastewater treatment plant. Then a mechanical treatment process takes places: wastewater goes through sedimentation tanks (suspended solids are precipitated), aeration tanks (biological-floccules are formed via small air bubbles involvement), and retention tanks. Afterwards stabilization of organic matter takes place. The last step is disposal of (mechanically) dewatered sludge. The latter is partly delivered to the city landfill and used as cover material.

After the treatment the purified water is directed to Lake Trovyanoe, 25 km away from the water intake. Part of industrial sewage goes to a tailing dump, part is recycled.

There is a water monitoring system.

Water-distribution and disposal suffers from following problems:

- wastewater treatment consumes plenty of energy and heat (higher than in other Russian cities: i.e. northern territory peculiarity);
- wastewater does not meet the standards;
- tear and wear of the water networks.

Some measures have been planned according to the "Environmental protection action plan of the Kostomuksha urban district sustainable development for 2008-2012":

- improvement of the water supply and sanitation reliability;
- modernization of water supply along with the city growth and development;
- reconstruction and maintenance of water network;
- water supply for population in those areas, where water supply is not centralized.

The whole water network belongs to the state (**Chamilos, 2011; KRIMEL et al., 2012**).

2.1.9 MUNICIPAL WASTE MANAGEMENT

Kostomuksha city is the biggest waste producer in the Republic of Karelia. The iron ore extraction and processing enterprise can be blamed for this, as it produces 99.9 % of all the waste produced in the municipality. This waste includes huge amounts of side products of the mining industry, which are classified as waste.

The municipal waste collection is centralized and collected once per day by collection trucks. Citizens of five-storey buildings bring waste by themselves to the collection trucks, whereas inhabitants of higher buildings can use the rubbish chutes, which have been built into these buildings. After all the waste arrives to the bottom of the pipe, yardmen take it to the trucks.

There is no separation of waste at source. There is also no industrial and hazardous waste disposal. The sites with containers are situated only by the railway station and at downtown. During summer time, containers are set up in the city. In general, there are NO metallic waste containers in the city or on its streets. The

authorities' opinion is that there is no need for them because the waste management works well. In other settlements (e.g. Voknavolok) there are sites with containers around the municipality.

The 17 ha municipal landfill was built in 1983 and is located 5.3 km from the Kostomuksha city. 11.000 tons of waste is utilized annually. 5 ha of the landfill capacity have been used already. There is no geological or ecological monitoring. The landfill is divided to several parts: e.g. for solid waste fraction, for medical waste, for animal burial place, etc. There is no fence around the landfill. During summer separation of waste is organized at the landfill. Hence, there are separate places for metal, glass, paper and plastics. In dry weather spontaneous combustion can happen. The tailing dump, which was founded in 1983, is filled up to a critical point. It pollutes the environment.

The forest industries have on storage on their premises about15 thousand tons of sawdust and 3 thousand tons of ash. Some of the wood waste is sold to Finland, some is packed into briquettes. Some ash is sold to people as fertilizer.

The recycled waste fraction is mainly paper due to the pulp and paper industries in the area.

Studies to collect and recycle plastic bottles and carton have been made. Transportation expenses are the main issue, which prevents further development of carton recycling. Plastic bottles are stored in case recycling is to start. Funds are needed to develop plastic bottle recycling.

Light bulbs and tires are not utilized. There is no recipient facility nearby to utilize these fractions.

Part of medical waste is disinfected and then delivered to the landfill. The other part (i.e. biological) is burnt in the Kostomuksha hospital crematorium. The crematorium is also used for organic waste incineration.

The industrial waste from the ore extraction and processing enterprise is 92 million tons. The main fraction (i.e. 99% of all waste) is sedimentary sand and mineral by-products. Part of the sand is utilized in construction of roads. The huge rites of geological transport vehicles are stored on the territory of the enterprise. Due to its enormous size they are hard to transport to recycling plant that is 1000 km from the Kostomuksha city. The tires have high calorific (heating) power (i.e. comparable with coal) and are a potential energy source. However, the tires need to be cut smaller, to the size of 5 cm^2. The industrial accumulators and oily wastes are sent to St. Petersburg for utilization. The municipal accumulators and oily wastes are not sent to the landfill.

Some activities have been planned according to the "Environmental protection action plan of the Kostomuksha urban district sustainable development for 2008-2012":

- improvement of the system of waste (industrial and domestic) collection, transportation, disposal and utilization;
- eliminations of non-sanitary landfills;
- waste reuse and recycling increase;
- involve the people, green movement.

A mercury lamp recycling factory (1000 lamps/day) will open soon. The factory is supposed to be operating both on Kostomuksha and the Republic of Karelia level.

Non-sanitary landfills are a problem in the city and in the district. This normally takes place close to the garage cooperation and lawn-and-garden cooperation (**KUD, 2008**).

2.1.10 THE FREE TIME ACTIVITIES AND ENTERTAINMENT ORGANIZED IN THE CITY

The city of Kostomuksha hosts several annual events. Among the activities are international ethno music festival, international chamber music festival, Republic ballad song festival, rock festival, national and international folk festivals and others. These numerous events have earned the city the distinction of being the city of festivals or the cultural centre of the Republic of Karelia. The city has also a culture and museum centre, cinema, waterpark, etc. There is also several restaurant establishments and cafes, which cater for the locals and tourists. A shopping mall is also being built.

2.1.11 TOURISM IN THE KOSTOMUKSHA URBAN DISTRICT

The City of Kostomuksha offers culture, natural beauty and health services for tourists. A holiday camp outside of the Kostomuksha by Lake Kontokki serves both domestic and international tourists. There is a museum of heated metal boilers (i.e. samovars) close to the village Tolloreka and there are good possibilities for fishing (i.e. 22 species of fish) and hunting, plenty of berry spots, virgin taiga forests, etc. There are more than 92 objects of cultural heritage in the urban district. To illustrate, in the Sudnozero (Venehjärvi) village there are buildings constructed in XVI century. Besides, Kostomuksha nature reserve situated 25 km to the south-west from the Kostomuksha city and other areas of the urban district offer good hiking opportunities (i.e. different touristic paths, etc). In the whole, 43% of the Kostomuksha urban district belongs to nature reserves land, which is a very high number internationally (**KUD, 2008**).

PHOTO 2. RADON HYDROPATHIC ESTABLISHMENT BATH EXAMPLE (PHOTO BY KRIVOY ROG LIFE)

There is also a unique radon hydropathic establishment that is the only one in the Republic of Karelia. Radon water helps to treat diseases of locomotive system, nervous system, cardiovascular system, skin burns, etc. The Kostomuksha radon hydropathic establishment, shown on Photo 2, is based at the Kostomuksha hospital (**Institute of Urbanistics, 2010**; **KMH, 2013**). Being the only one in the Republic of Karelia, it attracts tourists to Kostomuksha both from rest of the Russia and from Finland (**Mir Karpat, 2012**; **Aqua Expert 2011**; **Serba, 2011**; **GSE, 1990**).

Despite the above mentioned cases, there is still plenty of unused tourism potential in the region. There is not enough qualified staff and large scope tourism projects are not implemented, which would utilize the recreational potential of the pilot territory **(KRC, 2012)**. The hotel business is quite well-established and can offer 350 vacant places. There are touristic websites (i.e. http://kostravel.ru and http://kostamus.ticrk.ru), one of which also provides information to visitors in in English and Finnish.

The road connections are good. There are three motor roads leading to Kostomuksha city: i.e. Kostomuksha-Voknavolok, Kostomuksha- Lyttä, Kostomuksha-Kimasozero. Thus, the Kostomuksha city has advantageous geographical location (transit position): i.e. perspective international transport corridors. Western tourists can reach the city easily due to its closeness to Finland, but from Kostomuksha they can proceed to other destinations:

a. through Kostomuksha city to Kem and the Cultural and Historic Ensemble of the Solovetsky Islands (UNESCO World Heritage List);
b. through Kostomuksha city to Petrozavodsk and the Kizhi Pogost (UNESCO World Heritage List);
c. through Kostomuksha city to the home of the world famous Karelian and Finnish epos (i.e. about great deeds and adventures of heroes of the Kalevala) called “Kalevala” in the Kalevala urban-type community;
d. through Kostomuksha city to the Kostomuksha and Kalevala nature reserves;
e. to the “Kola” motor road to Murmansk in the northern direction and to St. Petersburg in the southern direction;
f. to other cities of North-West Russia.

Russian tourists can also travel via Kostomuksha to Finland and through Finland to other European countries (**KRC RAS SWOT, 2012; KUDA, 2011**).

PHOTO 3. VOKNAVOLOK VILLAGE VIEWS (PHOTO BY LEBED V.)

As mentioned before, there are several villages in the Kostomuksha urban district. Three of those, in particular, Voknavolok (Vuokkiniemi), Ladvozero (Latvajärvi), Sudnozero (Venehjärvi) are important in terms of ethnography, culture and history. These villages and some of the Kalevala municipal district are regarded as the cradle of Karelian and Finnish culture. They could be used as good recreational resource to attract tourists in the region. Some views of the Voknavolok villages are illustrated on Photo 3. It is important to mention that tourism is still low-developed. According to some estimates only 10% of its true potential is utilized now.

In the Activity 6 of the GREENSETTLE project, the following advantages of the both pilot territories (i.e. the Kostomuksha urban district and the Kalevala national district) were mentioned. They are given below, as listed:

1. Natural and recreation factors:
   a. Favourable ecological state of the region;
   b. Presence of interesting natural objects and monuments;
   c. Geological structure of the territories and its peculiarities;
   d. Presence of rare species of fauna and flaura;
   e. Fishing and hunting availability;
   f. Special features of hydrological regime in the region;
   g. Presence of nature reserves;
2. Cultural and historical factors:
   a. Presence of architectural and archaeological monuments;
   b. Presence of places of famous historical events;
   c. Organization of famous cultural events;
   d. Organization of music and folk festivals;
   e. Museums availability;
   f. Presence and preservation of traditional folk trades and traditional Karelian human settlements;
   g. Presence of folk monuments and organization of traditional and cultural holidays;
3. Organizational and economic factors:
   a. Presence of touristic infrastructure objects;

b. Availability of sufficient amount and range of touristic products;
c. Availability of organizational opportunities for development of different types of tourism;
d. Availability of organizational and economic opportunities for tourism services;
e. Opportunities for tourists accommodation;

4. Social and psychological factors:
   a. Availability of sufficient amount of touristic products with different social features: i.e. interests, age, social position, gender, etc.;
   b. Presence of specific national and cultural basis and goodwill of local population;
   c. Presence of safety guarantees and comfort for tourists **(Kostomuksha, 2013; KRC, 2012)**.

There are some activities according to the "Environmental protection action plan of the Kostomuksha urban district sustainable development for 2008-2012":

a. control of the nature reserve regulations maintenance;
b. Kalevala nature reserve infrastructure development;
c. green movement organization: i.e. ecological education, etc;
d. improvement of ecological, rural and ethic and cultural tourism, including development of international communication;
e. preservation of cultural and natural heritage.

It is also worth mentioning that the Kostomuksha nature reserve, along with the Kalevala nature reserve, belong to the world's first International Nature Park "Friendship" (i.e. the nature park of Russian and Finland). This can be used to promote tourism into the region **(Kostomuksha, 2013; KRC, 2012)**.

2.1.12 ATTITUDE AND WILLINGNESS FOR CHANGES OF THE PEOPLE

The city is often named as a city of miners due to the fact that most of the people are employed by industry. Significant part of the Kostomuksha labouring population (whereas, the overall able-bodied citizens share is 74%) works in the ore extraction and processing enterprise. The unemployment rate in 2013 is 1.3%. The municipality is being developed, there are plans for constructing a football stadium, hockey skating-rink, skiing and biathlon complex, other sport objects, housing, and other facilities. Some of them have already received financial support. Besides, Kostomuksha has airline connection to Petrozavodsk. The prices are on the same level as railway ticket (about 40 euros).

From the newspapers articles and other mass media sources it is possible to conclude that the Russian-Finnish collaboration has a significant role in the Kostomuksha urban district. People know about Finland and about Finns, largely due to the role of Finns in building of the Kostomuksha city. The citizens are geographically close to Europe through Finland, they travel to Finland and to other European countries. Besides, because of these lively connections with Finland, the people have higher requirements regarding life in general and to the work of authorities compared to other municipalities in the Republic of Karelia and Russia in whole. Moreover, taking into account the size of the city and facts underlined from mass media, people are open-minded, united and ready to manage changes together to improve their life. And last but not least, the ore extraction and processing company endorses good social politics. To illustrate this, they facilitate building of sport objects (e.g. swimming pool, etc.). People appreciate this and feel attached to the city. This is one of the factors that explain why out-migration trend is small compared to the Kalevala national district.

2.1.13 THE ATTITUDE AND WILLINGNESS OF AUTHORITIES TOWARDS CHANGES

In 2012 the main objectives were to provide social and economic stability in the Kostomuksha urban district as well as to design and perform construction of the engineering networks to meet the needs of civil engineering in building of houses. The more exact priorities were the following ones: converting of a school building into a kindergarten, construction of international biathlon and ski centre (by 2013), realization of set of activities within the long-term program of "The development of housing building in the Kostomuksha urban district", reformation of system of housing and communal services and implementation of energy efficient technologies (with annual energy consumption decrease of 3% for municipal organizations), and installation of devices of heat management in households (**KRIMEL et al., 2012; KRC RAS SWOT, 2012; KUDA, 2011**).

"The Kostomuksha choice" paper was published in 2012, which was based on several strategies and plans. These were "The Doctrine North-West Russia Development", "The strategy of social and economic development of the Republic of Karelia up to 2020", "The concept of social and economic development of the Republic of Karelia", "The strategic plan of the socio-economic development of Kostomuksha up to 2020" and "The Kainuu region's Business Strategy in Russia". Information from the website of the Minister for Economic Development of the Republic of Karelia was also used, as was the strategy of the Kostomuksha city from the "Republic of Karelia for investment" report. This defines the objectives of Kostomuksha as following:

a. seize a place in international integration processes, international labour share, world economy globalization process, and in the system of quality products supply to customers on external and domestic markets;
b. create the necessary prerequisites for transformation from raw material province to innovative economy, organization of international communication center on the EU-Russia border, organization of business center and tourism center of the North-west of the Republic of Karelia, and social and economic processes management;
c. improve the growth of humanitarian, social, cultural, legal, public development and quality of life in the Kostomuksha urban district. Growth is to be achieved by sustainable balanced development of economy, maintenance of competitive ability of the city and ability to dynamic self-development, provision of the conciliation of the interests and meaningful dialog between business and authorities.

The tasks of Kostomuksha are illustrated below, as follows:

a. continuation of work for improvement of city image and competitive ability growth;
b. participation in organization of Euro-Asian latitudinal transport corridor "Northern axis", creation of transport and distributive and transit-terminal centres with the system of logistics of loads treatment in all directions and for all vehicles;
c. provision of sustainable development of society and creation of healthy environment;
d. Kostomuksha is the territory of investments, a city where everybody has a choice;
e. capitalize on the advantageous location close to the border and active participation in international and interregional cooperation;
f. training of personnel for new technologies;
g. back to the roots – historical and cultural heritage, tourism, care of nature;
h. implementation of market relations in housing and communal services;
i. creation of model of northern territories exploitation in harmony with nature;
j. growth of territories capitalization;

k. stability, predictability, sustainability, efficiency, justice, safety;
l. creation of urban environment with new quality;
m. readiness to respond adequately for challenges of time (**KUDA Choice, 2012; KUD STR, 2008**).

There is also a list of perspective directions for implementation in the Kostomuksha urban district. Part of these are taken into account and presented later (i.e. section 3 Envisioned Future).

Regarding the road conditions, the local authorities of the Kostomuksha urban district do have some funding for their maintenance and reconstruction. Part of it is provided by industrial sector of the urban district, part from "Karelsky okatysh" enterprise's socio-economic collaboration. With this financial support the roads can be maintained in regulations meeting conditions. Besides, the district is considered important on the regional and federal level. Thus, one can forecast that the road network of the urban district will be developed taking the strategic perspectives into account. There are also intentions to unite the Kostomuksha nature reserve and the Kalevala nature reserve (**KUD, 2008**).The Republic of Karelia Road Fund, which was established in 2012, has also directed some funds to the both pilot territories. The aim of the fund is to improve the state of motor roads in the Republic.

The main primary and secondary resources, which are underutilized in the city, are mainly round-wood, aluminum, paper sacks, newsprints, cellulose, ferrous metals, residues and sawmill by-products (i.e. saw dust, logging residues and bark) **(Kostomuksha, 2013)**.

2.1.14 THE PROGRAMS OF DEVELOPMENT OF THE URBAN DISTRICT

The "Environmental protection action plan of the Kostomuksha urban district sustainable development for 2008-2012" raised the following environmental problems/priority tasks: decrease of domestic and industrial waste contamination of territories; improvement of reliability and quality of potable water supply; growth of resource efficiency; cultural and natural heritage conservation. According to this plan, the main controlled indicators were, in particular, the amount of unsanitary landfills (incl. those eliminated), share of losses of household water use (%), morbidity level of population from acute intestinal infections and hepatitis A (people per 100 thousand people), amount of visitors of the national nature reserves of the Kostomuksha urban district (people per year), and participation in international programs of cultural and environmental heritage preservation. The expected results were improvement of quality of life and environmental situation, natural resource efficiency, and investment attractiveness of the Kostomuksha urban district. Evaluation about the performance of the action plan was carried out on meeting in April, 2013 (**KUD, 2008**).

A Strategic plan of socio-economic development of the Kostomuksha urban district up to 2020 has also been compiled (**KUD STR, 2008**). In addition, there is a municipal program called "The development of housing construction in the Kostomuksha urban district up to 2020"

The "Complex innovative modernization plan of the Kostomuksha city up to 2020" defined the medium-term and long-term projects to be carried out. These include. combined heat and power (CHP) plant based on biofuels (by 2017), provision of housing construction sites with communal and transport infrastructure, ski and biathlon center construction, the enterprise modernization, the airport modernization, and small and medium size enterprise (SME) projects. By the 2020 the amount of new constant jobs is projected to be 1265 and the level of unemployment 1%.

"The development of low-rise housing construction of the Kostomuksha urban district for 2011-2020" program is at designing stage. Beginning of the infrastructure construction has been planned for the first three years with the starting of a massive building programme in 2014. The program is financed by local, republic and federal budgets as well as via involving investors. The task is to provide at least 700 families with accommodation **(KRC, 2012; Kostomuksha 2013)**.

There are some ongoing activities, which aim to improve the road conditions. A Karelia ENPI CBC funded project "Improving the gravel road Kostomuksha-Kalevala" aims to repair the 150 km long gravelroad Kostomuksha-Kalevala, which is illustrated on Figure 12. Calcium chloride salt is to be added to the gravel roads to eliminate dust formation. The main partners are the Ministry of Construction of the Republic Karelia, City of Kostomuksha, Kalevala national district, Swedwood Karelia, DRSU Kostomuksha (Ministry of Construction) from Russian side and Finnmap Infra Oy from the Finnish side. The project leader is Municipality of Suomussalmi. The project is ongoing and to be finished by the end of 2013 (**Gruntovaja, 2011**). According to the target program "Road Development in the Republic of Karelia up to 2015" existing wooden bridges will be replaced with capital bridge structures in 2013.

The Republic of Karelia government regulation (№121r-P of 24.02.2012) updated the road reconstruction needs of the previously published "Road Development in the Republic of Karelia up to 2015" programme. In 2012 the 89th km of the road Kostomuksha-Voknavolok-Voinitsa (from the Kostomuksha urban district to the Kalevala national district) was repaired. In 2012 construction of the road Kochkoma-Tiksha-Ledmozero-Kostomuksha-state border (from the 44th to 64th km) was also carried out. In 2015 work will continue on the part of the road from the 35th to 44th km. In 2012 a weighting control post was built on the road Kochkoma-Tiksha-Ledmozero-Kostomuksha-state border. Also a railway and motor road intersection of the same road at the 126th km was reconstructed. In 2014 a reconstruction of the Kochkoma-Tiksha-Ledmozero-Kostomuksh road will take place (from the 244th to 246th km) (RKGR, 2012).

The road fund of the Republic of Karelia, which was created for maintenance, repairs and reconstruction of road networks, should facilitate gradual improvement of the motor roads, especially those of regional significance. The repairing work was to be started in 2012. The fund aims to target the roads in the Republic of Karelia, which do not meet the existing road condition regulations. This should be met by 2015, after which the funding will be directed into construction of motor roads in new directions.

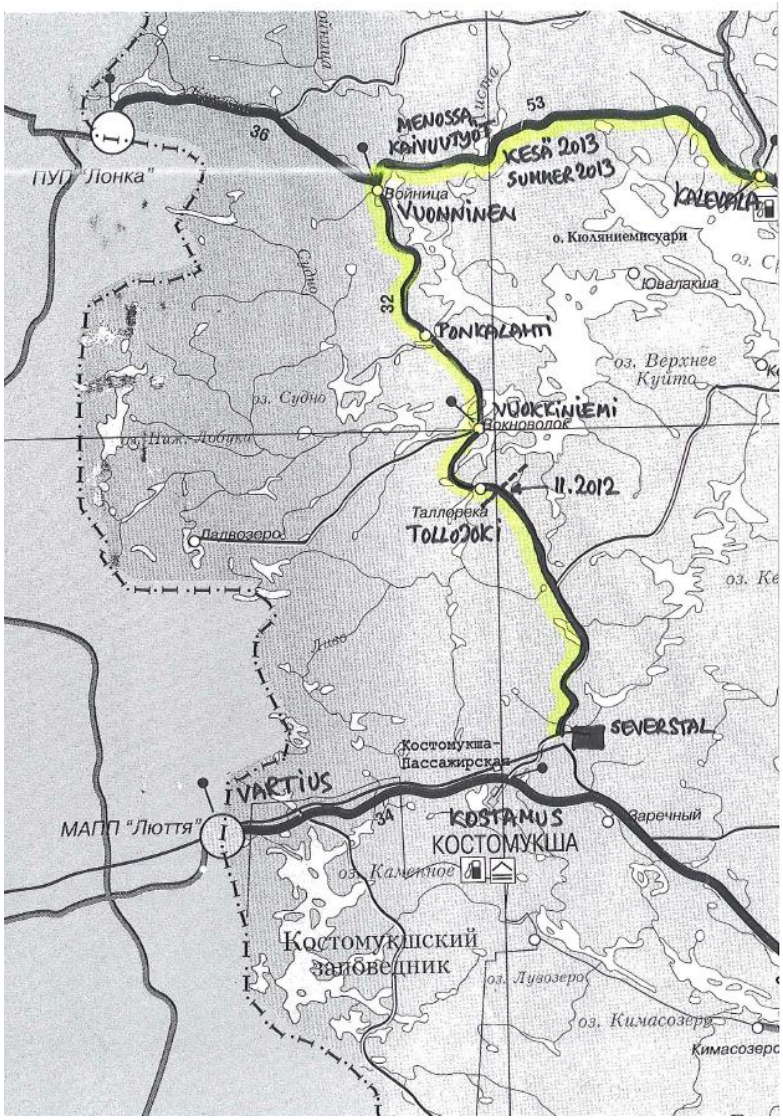

FIGURE 12. THE GRAVEL ROAD RECONSTRUCTON (SOURCE: GRUNTOVAJA)

An EISP PGS "Karelia" project targets the repair of the common roads of regional (Republic of Karelia) significance, in particular, Kostomuksha-Voknavolok-Voinitsa road in 2011–2013. Some parts of the road will be reconstructed, and the selection is made based on the condition of the road. New modern materials are applied (i.e. geotextile) to improve the road surfaces. The partners include representatives of the Republic of Karelia, Ministry of construction of the Republic of Karelia, Swedwood Karelia, the Kostomuksha urban district administration and Finnish municipality of Suomussalmi (**Posudnevsky A., et al., 2012**).

In addition, the ore extraction and processing enterprise "Karelsky Okatysh" subsidies directly the Kostomuksha city development, including road maintenance and reconstruction works. part of the roads Kostomuksha city were repaired and some road maintenance work was done in 2011 and 2012.

In a TACIS project "North Way", which was implemented in 2006, targeted the problems related to lack of adequate traffic and direction signs. The locations for informative traffic signs, guideboards and lay-by places

on the Kochkoma-tiksha-Ledmozero-Kostomuksha-state border road were proposed. The implementation of the project is yet to come.

Several federal and regional programmes are can also be utilised. The "Sustainable rural development for the years 2014–2017 and for the period up to 2020" federal target programme offers support on a competition basis to regions of Russia. The aim is to facilitate sustainable development of rural areas. The main condition to receive founding via the program is to have a territorial planning program. "Small to medium-sized enterprise (SME) development in the Republic of Karelia in the period until 2014" is a regional programme whereas "Development of physical culture and sport in the Russian Federation during 2006–2015" is federal.

An energy efficiency and energy saving program in the Republic of Karelia for 2010–2015 is also being implemented. Within this project the peat gasification is going to be piloted at the ore extraction and processing enterprise by 2013. The efficiency is going to be increased to 15% (modernization of boiler room) (**Official Kalevala, 2013**).

There is also a municipal target program called "Tourism development in the Kostomuksha urban district during 2013-2017". Within the scope of this program a Coordination Tourism Board is created, several international touristic projects are implemented, a touristic map of Kostomuksha is issued, etc. The Kostomuksha city is seen as an international meeting point, which can host workshops, business meetings and conferences.

There are several social municipal target programs: i.e. "Holidays: vacation, health, development" that is related to places of summer vacation for children. "Social protection of population" provides support for people when needed, etc.

In addition, according to the Russian Federation legislation there is a provision of investment preference for those implementing projects on the territory of the Republic of Karelia. These projects receive certain benefits, when they are importing goods to Russia (customs, loans and VAT issues) and investment projects can receive state guarantees for realization.

There are also constructing and reconstructing activities going on in other settlements of Kostomuksha (i.e. Voknavolok, etc.), (**Kostomuksha 2013)**.

2.1.15 SWOT ANALYSIS OF THE SPATIAL POTENTIAL

The SWOT analysis of the spatial development of the Kostomuksha urban district is mostly based on the results of Activity 3 of the GREENSETTLE project and the reports of the Kostomuksha urban district administration. The strengths, weaknesses, opportunities and threats are represented in Table 1 and Table 2 below.

TABLE 1: SWOT ANALYSIS OF THE KOSTOMUKSHA URBAN DISTRICT

Internal factors of the Kostomuksha urban district development	
Strengths	**Weaknesses**
1. Stable economic situation, good city image and favourable investment climate, active participation of the ore extraction and processing company in social life and tax	1. Inefficient utilization of the spatial potential, monostructured economy; 2. Lack of budget funds, high capital

Internal factors of the Kostomuksha urban district development	
revenue; 2. Modern city with natural population growth and quite young population; 3. Developed public utilities network and infrastructure; 4. A city strategic development plan by 2020; 5. Large economic development potential; 6. Easy transport, accessibility for western and Russian tourists; 7. Recreational potential (especially in Kostomuksha nature reserve) and availability of natural resources; 8. Unique radon hydropathic establishment; 9. Hydropower potential; 10. Closeness to the border of Finland, an international car border point, established foreign economic ties with EU-partners, many realized international projects	investments and long pay back periods; 3. Legal issues (i.e. land use restrictions in forest and waterside protection land, in the frontier zone, complicated visa regime for European tourists); 4. Low positioning of the town in the economic relationship system, lack of famous trademarks on external markets; 5. Lack of qualified specialists; 6. Declining population in the district villages due to aging; 7. Lack of transport communication, poor state of road infrastructure, low level of logistics development; 8. Lack of famous places interests for tourists that are worth visiting; 9. Low reliability of electricity supply

TABLE 2: SWOT ANALYSIS OF THE KOSTOMUKSHA URBAN DISTRICT (CONTINUATION OF THE TABLE)

External factor of the Kostomuksha urban district development	
Opportunities	**Threats**
1. Multiple tourism development to support the vitality of vanishing communities; 2. Design and implementation of the city spatial potential; 3. Utilization of hydropower and other energy resources (i.e. timber waste, etc.) potential; 4. Establishment of eco- and ethno-communities in abandoned or vanishing settlements; 5. Transport corridors service organization: i.e. logistics arrangement; 6. Establishment of new companies providing outsourcing services for large European companies; 7. Entry of Russia into WTO and its impact on	1. More restrictions on economic activities; 2. Intensification of out-migration; 3. Partial withdrawal by the "Severstal" holding from the Kostomuksha city, and restructuring of "Karelsky Okatysh" (**Metalinfo, 2013**); 4. Intensification of international and interregional competition; 5. Unstable institutional environment, centralization of budget and tax policy; 6. Intensification of social problems, social differentiation, poverty; 7. Lack of young specialists and out-migration of youth (in case of housing problem

External factor of the Kostomuksha urban district development	
border trade 8. Increase of contract function of border and transborder collaboration.	intensification); 8. outsourcing with outdated technologies coming from highly-developed Europe; 9. Intensification of environmental problems.

SWOT-analysis has shown that the Kostomuksha city has considerable potential for spatial development of the city along with sustainable development of the Kostomuksha urban district.

Among the main problems to solve are, as presented:

- Monostructured economy. There is a need for state and private investment programs;
- Lack of transport communication, poor state of road infrastructure, low level of logistics development. There is a need for reconstruction of existing airport and roads;
- Threat of intensification of housing problem;
- Lack of the social and complex infrastructure.

As contrasted to the problems, the strengths will facilitate the development of the district including economic use of idle land (i.e. the land of abandoned or sparsely populated settlements). New kinds and spheres of economic activity can be developed, which produce new sources of income. The utilization of the strengths can secure viability and self-supply of the settlements (**KRC RAS SWOT, 2012; KUDA, 2011**).

2.2 KALEVALA NATIONAL DISTRICT

FIGURE 13. THE LOCATION OF THE KALEVALA NATIONAL DISTRICT (SOURCE: MODIFIED PICTURE FROM LAUSALA T.)

2.2.1 OVERVIEW

Kalevala national district is a Russian municipal district with 7855 inhabitants (about 1% of the Republic of Karelia population). The population density is 0.8 people per sq km: i.e. the territory is sparsely populated. The district was officially formed in 1927. The current name was given in 1935. The national (or municipal) district consists of four settlements, in particular:

1. Kalevala municipal settlement (i.e. Kalevala urban-type community (the administrative center) and Kuusiniemi settlement);
2. Borovoy rural settlement (i.e. Borovoy settlement);

3. Yushkozero rural settlement (i.e. Yushkozero village (the administrative center), Novoe Yushkozero settlement, and Kepa settlement);
4. Luusalmi rural settlement (i.e. Luusalmi settlement (theadministrative center), Voinitsa settlement, and Tihtozero settlement).

The settlements of the district are sparsely located. There were more villages earlier, but in 1965 a state executive order named "No promise" was given to eliminate villages. As a result, many of villages in the national district have disappeared.

The territory of the district is about 13 300 sq km (around 7.4% of the Republic of Karelia). 30% of the territory consists of wetlands (i.e. peat swamp). The district has the biggest swamp of the Republic of Karelia (i.e. Yupyauzhshuo, lower reach of the Kem river). There is plenty of hills and elevations and also numerous water bodies with the great Lake Kuitto. The water bodies constitute about 15% of the territory's area. There are 50 lakes and 13 rivers.

The administrative center of the Kalevala municipal district is the Kalevala urban-type community, as shown on Figure 13. The industrial sector is underdeveloped and the community is almost total dependant on raw material use. Some of the Kalevala urban-type community illustrations are presented on Photo 4.

PHOTO 4. KALEVALA URBAN-TYPE COMMUNITY VIEWS (PHOTO BY FLUIDR)

Transport infrastructure, energy infrastructure, and public utilities are not highly developed in the Kalevala national district infrastructure. In fact, all of these are in a poor state.

The district is located in the North-West of the Republic of Karelia close to the Finnish border. Apart from the western border with Finland, the Kalevala national district has 5 borders: i.e. northern border with the Loukhskiy district, south-western border with the Kostomuksha urban district, southern border with Muezerskiy district, eastern border with Kem district and Byelomorskiy district. The geographical location of Kalevala is 65.120 of northern latitude and 31.100 of east longitude. The Kalevala urban-type community has continental climate with annual average temperature of +1.1 ^{0}C. In the summer there is a period of midnight sun, in the winter a polar night period.

The population structure is mostly represented by the Russians (more than 45%) and the Karelians (more than 35%) with smaller part of the Byelorussians (about 10%), the Ukrainians (around 3%) and others.

According to official statistics, the demographic trend of the district is negative. The common feature is out-migration, especially that of young people. The main reason for this is unemployment due to the shut down of the main industry, forestry The population is relatively old and declining (i.e. mortality rate is more than birth rate in 1.7 times). Big part of the population is unemployed due to a small industrial sector. The unemployment rate is 4.8%. The level of professional training and qualification is also low. It is difficult to find qualified staff for the district, whether it is a case of doctors and teachers, or other specialists for the development of new business activities in the district. **(KRC, 2012)**. On the other hand, unofficial statistics show a different side of things. There is also some seasonal fluctuation, especially in summer and during winter holidays, when people return to the district for holidays. There is also part time dwellers, who own a house, but use it only some part of the year. It is important to underline that VIP tourism is currently well-developed in the Kalevala national district. Tourists from Russia (mostly Moscow and Saint Peterburg) and Europe take fishing/hunting and rafting tours in Karelia and stay in private luxurious holiday camps, which are not listed on the net officially.

The environmental load is low in the district. According to the environmental monitoring, the air pollution level is a bit more than 3% of emissions in the Republic of Karelia. Regarding the wastewater generation, it is less than 1% of the Republic of Karelia discharges **(KRC, 2012)**.

The most important resources are forest, water, energy (i.e. huge peat reserves), mineral, recreational and cultural. The recreational resources include the favourable environment for self-recovering and emotional regeneration.

The socio-economic level of the district is low. The economy is declining. The district has budget debt of 895 000 euro. The income of the population (with 2010 salary of 480 euro/month) along with its buying power is lower than in Kostomuksha urban district. The main income of population is income obtained via farming (i.e. fishing, hunting, picking up berries and mushrooms, etc.). Tele- and radiocommunication is low developed (there are only two TV channels working, no radio present). Cellular communications has only recently expanded to the district (**RMJ, 2012; FSSS, 2013; Official Karelia, 2013; Official Kalevala, 2013; Karelia guide, 2013; KRC RAS, 2011; KND, 2006**).

2.2.2 NATURAL RESOURCES

The district has access to similar resources as the city of Kostomuksha. The most potential sectors for economic development are mining and forestry.

Ore mineral resources. The area is a part of the Karelian geological block of the Baltic crystal shield. Among the minerals and natural resources are granite, gneiss, diabase, molybdenum, quartzite and cupper.

Non-metallic mineral resources. There is a lot of peat.

Land resources. The total amount of available land is 1 325 990 ha. 2964 ha is agricultural lands (i.e. 1183 ha of tillage and 1781 ha of pasture and hayland).

Forest resources. Forest is main resource. 59.7 million m^3 of the forest resources are mostly represented by coniferous forest (85%). 60% of the forest is more than 100 years old and the forest area is among the biggest in Europe. "Kalevala national nature park" has trees of more than 450-500 years old. Besides trees there are mushrooms, berries and plants available for food industry and pharmaceutics. In addition, there is a great reserve of peat available: i.e. 8500 ha.

Fish resource. There are around 12 fish species in the local lakes (**Official Karelia, 2013; Official Kalevala, 2013; Karelia guide, 2013**).

2.2.3 INDUSTRY

The main industry of the Kalevala national district is wood harvesting and woodworking industry. Apart from that, the industrial sector is almost absent. Among the examples of industrial activity developed in the district are, in particular, food industry (i.e. bakery, though declining production), fish industry and agriculture on small scale. According to the statistics, there are 305 registered small and medium size enterprises and entrepreneurs in the Kalevala national district. Those supply locals with jobs: i.e. there is positive dynamics.

The future of forestry in the district is not promising, despite the huge forest resources. Several major companies are shutting down their operations. Kalevala national district used to produce also galipot, cooperage, boats and pulpchips, but this has gradually ended. **(KRC RAS, 2011; Official Kalevala, 2010)**.

2.2.4 HOUSING

As was the case with Kostomuksha urban district, also in Kalevala the housing sector is under the supervision of the Republic of Karelia. There are 1736 houses in Kalevala. Most of the houses have furnace heating, the second common is central heating, an on the third place is electric heating. The length of heating season is 251 days. The district provides public services for the inhabitants, but they are in a bad state. There are no devices to monitor consumption of electricity, heat energy and water at the households. However, municipal organizations have those devices (**Zavarkina E., 2012**).

Water supply and sanitation is not well developed. Not all the houses are within centralized water and wastewater, as is the case with solid waste management.

The municipality runs three kindergartens and three kindergartens and five schools. There is also a vocational centre (different workshops), banks, telegraph offices, post offices, medical institutions, music school, sport school, hobby centre, job centre, public library, ethnic and cultural centre, municipal hospital. 96 shops, 14

restaurants and several hotels address the needs of locals and tourists. There is also an Orthodox and a Lutheran church. A hotel and a shop are illustrated on Photo 5.

PHOTO 5. EXAMPLES OF THE KALEVALA SHOPS (ON THE LEFT) AND HOTEL (ON THE RIGHT) (PHOTO BY FLUIDR)

The housing and communal services as well as buildings require reconstruction and modernization. From 2006 to 2010 some medical institutions and 18 houses (Kalevala urban-type district, Borovoy rural settlement) were constructed. In 2011 some medical buildings were renovated. (**Zavarkina E., 2012).**

2.2.5 ENERGY

There is a state owned district heating in the city (i.e. 9 boilers). The share of heating methods is the following:

1. Firewood heating;
2. Central heating;
3. Electrical heating.

In the Kalevala national district the heat comes partly (i.e. 40%) from burning of fossil fuel (coal, diesel). The fossil fuels normally are delivered from other regions by rail and motor roads. The use of fossil fuel is obligatory in the area in order to use the total capacity of the three coal furnaces (2700 t/year) and diesel incinerator (400 t/year). These are used to produce heat for the municipality. The remaining 60% of heat is provided via incineration of wood chips and firewood (**Zavarkina E., 2012; BIOKalevala, 2013**).In the Kalevala urban-type community 89% of energy is produced from fossil fuels.

The electricity is generated by Yushkozero hydropower station (18 MW installed capacity). The annual average power production is 80.5 million kWh. A transmission system lines of 220 kV connect the district to this power source. both the The electricity grid and the company running the hydropower plant are public.

There are some other energy resources available besides the fuel oil, which is used currently. Natural gas could be used in the energy production by the enterprise. There are also huge deposits of peat in the area of the The Kalevala national district possesses the second biggest peat reserve in the Republic of Karelia. There are huge deposits of peat in the area of the Kostomuksha urban district (**Zavarkina E., 2012**). Thus, the Kalevala national district has good opportunities to use renewable energy only and become energy self-sufficient. This is a good premise, since the energy consumption is growing and is about 12 000 thousand kWh/year. Due to building of more houses with centralized heating, the heat consumption is going also up. A

further challenge is the monitoring of energy use. As was mentioned in the section 2.2.5, there are no devices at the households, which measure the usage of electricity, heat energy and water. There is also no commercial control for energy consumption (**Zavarkina E., 2012**).

Among the existing problems is the wood supply of the Borovoy rural settlement, the New Yushkozero settlement and the Yushkozero village. The existing boiler house in the Borovoy village is also inefficient and there are large energy losses due to length of this network.

There has been some emphasis to improve the energy supply in the district. During 2006–2010 (Program of socio-economic development) reparations were carried out and one boiler was repaired in the Kalevala urban-type community. One boiler is also designed to be built, but in general, the energy infrastructure is low-developed. This power shortage is a significant obstacle for developing new businesses in the district.

2.2.6 TRAFFIC AND TRANSPORTATION INFRASTRUCTURE

The condition of the roads in the urban district can be characterized as worse than on average in the Republic of Karelia. The latter creates an obstacle for the development of goods transportation and passenger traffic. The transportation network is limited in the whole territory. The motor roads are mostly of local significance, but there roads of national significance: Kem – Kalevala – Lonka and Kepa – Borovoy roads.

Traffic congestion does not happen in Kalevala national district since the population is low and industrial sector is not very developed. The passenger traffic is limited. The main obstacle of this is the long distances between settlements, which lead to high transportation costs. Thus, locals prefer to use their own cars (i.e. 870 cars registered). The state of the motor roads within the municipalities (i.e. Kalevala urban-type settlement, Borovoy, Luusalmi and Yushkozero rural settlements) is worse than on average in the republic and there is little transit transportation in the the district.

The total length of roads in the Kalevala urban district is 442 km, of which 330.3 km is gravel and macadam surface roads, 86.7 km of roads with asphalt surface and 25 km of unpaved roads. As in the case of the Kostomuksha urban district, all the roads belong to the lower categories IV (127.5 km of road surface) and V (289.7 km of road surface). Most of the roads are of the lowest V category (**Posudnevsky A., et al., 2012; KRC RAS, 2011**). Section 2.2.14 ("The programs of development of the national district") includes the official programs related to road reconstruction or repair in the Kalevala national district. Biking is not seen as a serious means of transport and in this respect Kalevala does not differ from Kostomuksha (see the section 2.1.6).

The car owners have to cope with the bad roads, which have negative impacts on the environment too, especially on the territories adjacent to the roads. The drivers have to adapt their driving to the prevailing circumstances and conditions of the road. An ideal road surface is even, which makes it possible to maintain constant speed. Uneven surfaces lead to increased acceleration and braking, and because of this the fuel consumption is higher than in constant steady driving. This increases also air pollution and emission of greenhouse gasses.

There are also other issues related to roads, which are worth noting:

1. great number of abnormal curves on the road plan and longitudinal slopes;

2. roads with gravel surface have practically no dressing at all. Hence, plenty of dust is formed by the cars using the roads;
3. heavy timber transporting trucks damage the roads;
4. constraints for heavy load vehicles (more than 4 tons) during Spring season (i.e. April-May). This is issued because of the melting snow and frost damages, which decrease the carrying capacity of the roads. The constraints are not applicable for international goods transportation and bus passenger traffic. This measure is done to preserve the old roads and to prolong their life time. There has been some violations of this order, which has led to plans to construct a weighting control point.
5. lack of traffic and direction signs in the district.
6. no parking areas along the motor roads aimed for drivers and passengers to have rest. The latter decreases road safety and comfortability of travel.

2.2.7 INTERURBAN TRANSPORT CONNECTION

Since 1964 the Kalevala national district has had a railroad connection with bigger municipalities of Russia (e.g. Segezha that is close to Kochkoma settlement) through the Yushkozero village station. Through Segezha it is possible to reach cities in northern and southern directions (Murmansk 690 km in the north, Petrozavodsk 270 km, St. Petersburg 680 km and Moscow 1300 km in the south. There is a rail connection between New Yushkozero-Ledmozero-Kostomuksha. Thus, it is possible to get from the Kalevala national district to the Kostomuksha urban district by train. The latter can be seen on Figure 14 below.

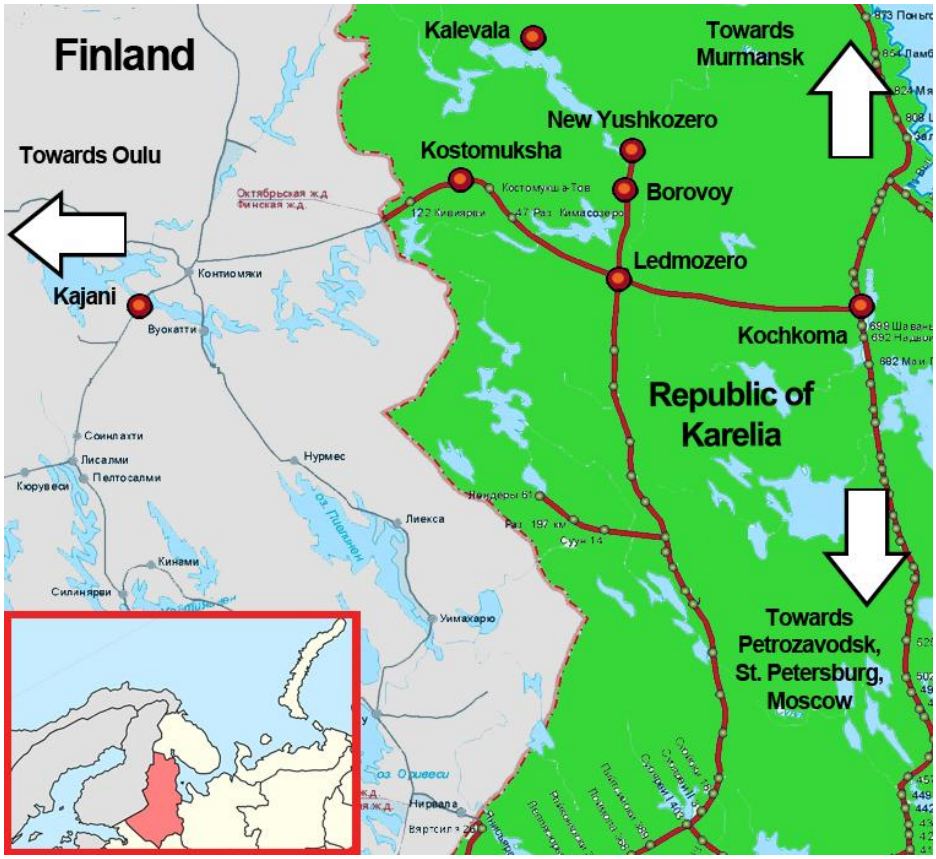

FIGURE 14. THE RAILWAY CONNECTION OF THE DISTRICT

As mentioned earlier, there are discussions about opening the Petrozavodsk–Sortavala–Joensuu and Petrozavodsk–Kostomuksha–Kajaani–Oulu railroads for passenger traffic. This could offer new opportunities for economic development in both districts, but it would be more essential .for the Kalevala national district due to its current socio-economic state (**Press-service GRK, 2012**).

There is no railway connection to the Kalevala urban-type community, but Borovoy settlement and Yushkozero village (i.e. New Yushkozero station) can be reached by train. The New Yushkozero railway station is the terminal station and situated 115 km from the Kalevala urban-type community. Technically, Kalevala urban-type community can be reached in following ways:

1. A train to Kem city, a bus then to Kalevala;
2. A train to New Yushkozero railway station and a bus from there to Kalevala. The bus takes 2.5 hours and runs on every other day;
3. The third option is to take a train to Kostomuksha city from Petrozavodsk or a plane. A bus to Kalevala from Kostomuksha, which runs twice per week;
4. A private car to Kalevala through Kostomuksha(from West) or through New Yushkozero (from South) ;
5. A bus from Petrozavodsk to Kalevala. Trip takes 9.5 hours, operates daily. (**Official Karelia, 2013; Official Kalevala, 2013; Official Kalevala, 2010**).

2.2.8 WATER AND SANITATION

More than 15% of the Kalevala national district is covered by water bodies. The district has a low coverage of water and sanitation system and wastewaters are not treated at all: sewage is directed straight to water bodies or soil. The latter causes certain negative environmental impact. In addition, there is no water quality monitoring system arranged about the water that population is supplied with.

The water-supply pipeline network is 24 km long and 8 km of it needs to be reconstructed. The sewerage network is about 20 km. 17 km of it needs new pipes. The heat network is around 21 km. About 7 km should be repaired. The water intake was built in 1972 and comes from Lake Middle Kuito. The facility was repaired in 1990.

In the Kalevala urban-type community the water supply and sanitation system is only partly centralized. Only 28% of population is covered by water supply and 23% by sanitation). Water purification plant (slot filter and sand filter bed with further chlorination) was constructed in 1990 and has a capacity of 600 m^3/day, but only 230 m^3/day is utilized on average. The equipment is depreciated and the efficient level of purification is lower than the initial capacity of this plant.

The length of water-distributing system is 4.8 km. 2.3 km of this is steel pipes, 2.2. km of plastic pipes and 0.3 km of iron pipes. 26% of the network was built in the 1970s, 19% in the 1990s and 55% in the 2000s. The pipelines constructed in the 1970s needs to be replaced.

There is no wastewater treatment plant in the Kalevala urban-type community. Sewage is collected to double-level precipitation tank, from which it is discharged to Lake Middle Kuito, 200 m away from the water intake. The sewerage system is 2.3 km long. 1.6 km was built in the 1970s, 0.4 km in the 1980s and 0.3 km in the 1990s. The pipes are made of iron. There is no water and wastewater quality monitoring due to lack of funding.

The problems of the Kalevala urban-type community regarding water supply and wastewater disposal system are the following ones:

1. low level of centralized water supply and wastewater disposal;
2. water purification is underutilized;
3. old water intake and water purification systems;
4. low potable water quality;
5. lack of wastewater treatment;
6. bad location of wastewater disposal (close to the water intake);
7. lack of water intake quality and wastewater quality monitoring;
8. lack of funding for modernization of water supply and wastewater disposal system.

In the other settlements of the Kalevala national district - Borovoy and New Yushkozero rural settlements - 70% of population has centralized water supply and 17% of population have access to centralized water sanitation. There is no wastewater treatment system. The whole water network was built in 1970s. The pipelines, which are from iron, are in critical condition. Lack of funding prevents water and wastewater quality monitoring here too.

The problems of the Borovoy and New Yushkovero rural settlements regarding water supply are the following:

1. lack of water purification;
2. water intake network is depreciated (i.e. 75-80%);
3. high energy expenses to supply water;
4. the level of centralized water network is low;
5. absence of wastewater treatment;
6. the existing water disposal pipeline system is in critical state;
7. lack of funding for modernization of water supply and disposal system;

The whole water network of the Kalevala national district belongs to the state. There are some discussions about construction of the water distributing system in the district as well as reconstruction of water intake (**KRIMEL et al., 2012**).

2.2.9 MUNICIPAL WASTE MANAGEMENT

The amount of waste generated is 2.12 thousand tons (1.64 from households, 0.48 from organizations). The data about morphological composition is not available.

The households collect their waste to containers, and then it is transported to landfill. The landfill, which was opened in 1978, is 22.3 thousand sq m. There is no information about the amount of waste in the landfill or about the expected closure date.

The level of centralized municipal waste collection is low. There is no separation of waste at the source or disposal of industrial and hazardous waste. As mentioned earlier, there are plans to open a mercury lamp recycling factory (1000 lamps/day) in the Kostomuksha city. This factory could serve also Kalevala district (**KRIMEL et al., 2012**).

2.2.10 FREE TIME ACTIVITIES AND ENTERTAINMENT

The district offers limited spare time activities. There is the Kalevala traditional theatre (with performances in Finnish and Russian), a local history museum, museum of rune singers, Ortjo Stepanov's country estate, school for different hobbies and a sport school. Traditional summer street festivities and holidays are organised: e.g. Holiday of Ukhta Karelians, Luusalmi public merrymaking, Voinitsa village holiday, Kalevala Day, Literature holiday in the Haikolya village, International dog team race, Hockey tournament, sport fishing, etc. Once a year also the Kalevala ski ultramarathon (100 km) is organized (**Official Karelia, 2013; Official Kalevala, 2013**).

2.2.11 TOURISM IN THE KALEVALA NATIONAL DISTRICT

Some 10% of the tourism potential of the district has been developed. This recreational sector has economic value and is definitely one of the main priorities in the district. There is plenty of potential on this field because this region is related to the world famous Karelian and Finnish epos of "Kalevala". There are many epic and historical places, including the following places:

- sites, where famous rune authors and singers were born;
- the original monument of the Pine Tree of Elias Lönnrot is shown on Photo 6. Nearby this pine tree the rune singers performed their songs hand in hand with Elias Lönnrot, who was the main Karelian rune collector and the author of "Kalevala" epos. The latter is treasure of the area (**Pankratov S., et al., 2009**). There are also sights related to the "Kalevala" epos in the Kalevala urban-type district. Some "Kalevala" extracts on posters are illustrated on Photo 7;

PHOTO 6. PINE TREE OF ELIAS LONNROT (PHOTO BY PANKRATOV S.)

PHOTO 7. "KALEVALA" EPOS CITATIONS (PHOTO BY FLUIDR)

- old-style houses, storehouses, Russian bathhouses, houses of narrator of folk tales, other buildings, suspended bridges, etc.;
- historical sites of warfare, divisional graveyard, war monuments, etc.

The most interesting settlements for tourists are Kalevala urban-type community, Kuusiniemi settlement, Yushkozero village, Kepa settlement, Luusalmi settlement, Voinitsa settlement and Lake Kis-Kis. Besides, there is a lot of archaeological monuments of different ages. In addition, ancient sites of human activity exist on these territories.

There are also plenty of water bodies (i.e. lakes, rivers) in the district suitable for fishing and specific forest fishing/hunting houses for these purposes. There are 12 species of fish in the local lakes (e.g. salmon, pollan, etc.). The rivers are turbulent and full of rapids, which makes them suitable for rafting. For the time being, there are two rafting routes in operation. There is also a lot of waterfalls (the highest is 14m), as well as large forest areas. In the "Kalevala national nature park" there are trees of more than 450-500 years of age. Together with the Kostomuksha nature reserve they belong to the first-world International Nature Park "Friendship" (i.e. the nature park of Russian and Finland)(Official Karelia, 2013; Official Kalevala, 2013; Official Kalevala, 2010). Several touristic hiking paths are organized. Hunting and berry picking is also possible. In addition, there is motor boat, snowmobile, all-terrain vehicle trips and also dog team races are available. The latest kind of tourist entertainment has become popular among professional sportsmen and amateurs. Husky tours are organized by "VelT" in Kalevala district. Some of the touristic activities are shown on Photo 8. Different fairs are also organized annually in the district.

There is plenty of tourism potential, but lack of qualified staff and large scope tourism projects limit the utilization of the recreational potential (KRC, 2012). There are established hotel services, which can accommodate 230 guests. One of the most famous tourism companies is "Velt" that offers various activities and services. The company is very popular among Moscow tourists and tourists coming from Europe (e.g. France). There is also a website (i.e. http://www.visitkalevala.ru) for the Kalevala national district, which has information also in English and in Finnish. The website of the Kalevala national park (i.e. http://www.kalevalsky-park.ru/) and the one providing information about touristic activities in the district (i.e. http://kalevala.com.ru/) are in Russian language only. It is also essential to underline that there is already VIP tourism for people with higher income. Quite often they use helicopters or SUV's to reach certain remote places in the area.

As mentioned before, some of the settlements in the Kalevala national district have ethnographical, cultural and historical all-Russian importance. These settlements are cradle of Karelian and Finnish culture. They could be used as good recreational resource to attract tourists in the region (Kostomuksha, 2013).

Apparently, there is plenty of choice in terms of touristic places of interest. One of main obstacles for tourism is the bad state of the roads. The motor roads of Kem-Kalevala, Kostomuksha-Kalevala, and Loukhi-Tungozero-Kalevala are not in good enough shape to encourage tourists to head to the area by their cars.

PHOTO 8. EXAMPLES OF THE KALEVALA TOURISTIC ACTIVITIES (PHOTOS BY FLUIDR)

There are numerous activities currently underway to develop tourism in the district. These include:

- project about establishing an ethnic and cultural centre in the Kalevala urban-type community;
- preservation of rune singers' villages;
- implementation of "Transboundary tourism development in the Kalevala national district" project, "Grey-haired" runes" project and "Traveling in Elias Lönnrot's paths". Projects utilize the Karelian and Finnish epos "Kalevala";
- construction of "Belt Maailma" tourist complex nearby Lake Kuito
- improvement of border crossings (i.e. both ways) on the "Karttimo-Voinitsa" frontier check-point;
- creation of regional information touristic centre in the Kalevala urban-type community;

- development of fishing, hunting, water and sport tourism..

In the Kalevala urban-type community there are three quite developed tourist offices, two hotels (70 places) and a tourist center (30 places). The annual tourist turnover is about 3000 people. Besides, there is also unknown number of private holiday camps and private hotel cabins. For other activities to be taken to improve tourism in the Kalevala national district, see the section 2.1.12 of the report (i.e. Tourism in the Kostomuksha urban district).

2.2.12 ATTITUDE AND WILLINGNESS FOR CHANGES OF THE PEOPLE

The district has one developed industry, forestry, which is a lifeline for the community. However, this has been on the decline and also the unemployment rate is quite high, 4.8 % in 2012. Based on the newspapers articles and other mass media sources, it would appear that the people would like to broaden the industrial sectors of the district. The Russian-Finnish collaboration is valued high in the Kalevala national district as in the Kostomuksha urban district. People know about Finland and Finns in Kalevala, which is further reinforced by the fact that and many of them have a Karelian ethnic background.

2.2.13 ATTITUDE AND WILLINGNESS FOR CHANGES OF THE AUTHORITIES

As mentioned before, the road conditions are bad in the district. However, these have not captured the attention of the authorities of the Republic of Karelia authorities, since roads in the Kalevala national district have not been included in the development of strategic road network. Hence, funding (for road maintenance and reconstruction) is not provided in that degree that it could improve the road situation in the district (**Posudnevsky A., et al., 2012**).

The Republic of Karelia Road Fund, which was created in 2012, has directed some funds to the improvement of the road conditions in Kalevala district. There is some intermunicipal/international collaboration, which targets also partly roads in Kalevala. These include:

- development of transport infrastructure and improvement of transport accessibility of the district (with the Kostomuksha urban district and the Kem municipal district, Republic of Karelia);
- development of frontier trade and production (with sister municipalities of Finland);
- development of sport and eco-tourism (with other regions of Russia);
- development of ethnic and cultural issues;
- development of folk trades of the Karelian and the Finno-Ugric communities (with the territories where they live);
- development of small scale hydropower production (with the Kem municipal district, Republic of Karelia);
- development of traditional activities (i.e. wood harvesting, fishing, hunting, etc.) of the northern part of the Republic of Karelia (with the Loukhi district, the Kem district and the Kostomuksha urban district);
- development of education (i.e. professional training and occupational retraining) (with educational institution of the Kostomuksha city, the Kem city and municipalities of Finland) (**KRC RAS, 2011**).

In addition, there are projects both in regional, republic and international level, which also apply to the Kalevala National district. These include the following projects: “The Doctrine North-West Russia Development”, “The strategy of social and economic development of the Republic of Karelia up to 2020”, “The concept of social and economic development of the Republic of Karelia” and “The Kainuu’s region Business

Strategy in Russia". Minister for Economic Development of the Republic of Karelia implements also a project called "Republic of Karelia for investment", which aims to improve investment environment in the region. "Program of socio-economic development of the Kalevala national district during 2006-2010" targeted following issues:

1. solution for high unemployment;
2. creation of favourable business environment for entrepreneurship;
3. creation of favourable social environment;
4. tourism development;
5. forestry development;
6. transport infrastructure development;
7. communication infrastructure development;
8. provision of continuous work of housing and communal services;
9. preservation and development of the national colour of the district, its culture and language, folk trades;
10. development of border and interregional communication (**Official Kalevala, 2013**).

There is a need of outer investment involvement. The list of problems where the help of the Republic of Karelia government is needed:

1. Financial support to decrease the budget organization's housing and communal services debt (895 000 euro);
2. Wood supply for boilers in some settlements (i.e. Borovoy rural settlement, New Yushkozero settlement and Yushkozero village);
3. Construction of engineering networks for ethnic and cultural centre;
4. Need for construction of kindergarten in the Kalevala urban-type community and reconstruction of kindergarten in the Borovoy rural settlement;
5. Drainage pumping station maintenance in the Kalevala urban-type community;
6. Motor road condition in the district (**Official Kalevala, 2013**).

The local administration is open for cooperation. All collaborative projects are welcome.

2.2.14 DEVELOPMENT PROGRAMMES OF THE NATIONAL DISTRICT

There are also efforts and programmes to improve the conditions in the district level. These include for instance the municipal target programme for development of agricultural development, which was finished in finished in 2010. There is also a programme for socio-economic development of the Kalevala national district for 2011-2015. The main objective is to create a favourable investment and entrepreneurship environment in the area and increase the economic growth in the district. The authorities have committed themselves to increase investments, consolidate lawfulness and law and order, facilitate business activity development and eliminate of unemployment. Energy efficiency is to be promoted through the republic level programme implemented in 2010 – 2015 (**Official Kalevala, 2013**) and there is a district level programme called "The Kalevala national district strategy of tourism development up to 2015" (**KRC RAS, 2011**).

Measures are taken to improve the road connections. There is an international project "Improving the gravel road Kostomuksha-Kalevala", which was mentioned earlier. The 150 km long gravel road Kostomuksha-

Kalevala, shown on Figure 12 (in the section 2.1.14), is to be repaired by the end of 2013 (**Karelia ENPI CBC, 2011**). Also the repair of the common roads of regional (Republic of Karelia) significance, in particular, Kem – Lonka via Kalevala will be done, which was described in section 2.1.14. In addition, conduit pipes are constructed. In 2011 there were 10 of those installed. 10 more conduit pipes are to be replaced, as planned. In 2012 sections of the Kalevala-Voinitsa and Pongaguba-Voinitsa motor roads were repaired. (**Posudnevsky A., et al., 2012**). The wooden bridges are planned to be replaced by capital ones in 2013 in the framework of the "Road Development in the Republic of Karelia up to 2015" programme.

Reconstruction of the Kem-Lonka road via Kalevala is planned according to the Republic of Karelia government regulation (№121r-P of 24.02.2012), which made some changes in the target program "Road Development in the Republic of Karelia up to 2015". In 2011 the road was repaired from the 75th to 86th km, and in 2015 the road is planned to be repaired from the 86th km to 105th km. In 2013 bridges will be replaced(from wooden to capital structure) on the 54th km and 59th km of the Tungozero-Kalevala motor road. The railway and motor roads intersection on the 2nd km of motor road Kem-Lonka via Kalevala will be reconstructed in 2014. In 2012 the conduit pipes on the 34th and 570th km of the motor road Kepa-Yushkozero-Borovoy were replaced. In 2013 the same work was done on the 25th and 900th km of motor road Tungozero-Kalevala (**RKGR, 2012**).

The roads in the Kalevala district, which do not meet the regulations, are also subject to the actions by the Fund of the Republic of Karelia, which has been mentioned earlier. This fund aims to have the problematic roads of the republic repaired by 2015, after which funding would be directed to construction of new roads.

There is programmes on the district ("Development and municipal support of small and medium size enterprise in the Kalevala national district for 2009-2014") (**Official Kalevala, 2013**) and on the regional level ("Small to medium-sized enterprise (SME) development in the Republic of Karelia in the period until 2014"), which offer support to SME's in the district. There is also an international project, "Small size enterprise in the Republic of Karelia and Murmansk region rural settlements", in this sector. These provide subsidies and financial support, but organise also workshops and seminars for entrepreneurs. Business plans are also compiled (**Kostomuksha, 2013**).

Quality of life and sustainability issues are also on agenda in some projects and programmes. "Improvement of quality of life and environment based on modern rural settlement development" targets the water and waste water issues in the Kalevala national district. A water supply and sanitation model is to be designed and a new eco-friendly model of decentralized local water supply and sanitation system is to be created. The federal target programme for "Sustainable rural development for the years 2014-2017 and for the period up to 2020" is also being implemented, as is the federal target program "Development of physical culture and sport in the Russian Federation during 2006-2015". Activities regarding "The concept of demographical politics" are carried out in the district, and there is an educational program for preschool institutions up to 2014 and a municipal target program "Employment of the Kalevala national district during 2012-2015". There is also a federal target program dealing with housing, "Housing provision for young families during 2011-2015".

One project of the EISP PGS "Karelia" programme aims to develop sheep breeding (**Posudnevsky A., et al., 2012**), whereas development of small and medium size enterprise and folk trades is the target of "Cultural tourism as an economic activity" project. Local civil society is strengthened through the "Creation of public and cultural centres for socio-economic development of local society" programme, which encourages local

participation in the development of the district. "Corporation of the Republic of Karelia development" has carried out a one significant project in Kalevala called "Complex reconstruction of the Kalevala national district and other district of the Republic of Karelia heating system"(**Official Kalevala, 2013**).

2.2.15 SWOT ANALYSIS

The SWOT analysis of the spatial development of the Kalevala national district is mostly based on the results of Activity 3 of the GREENSETTLE project and the reports of the Kalevala national district administration. The strengths, weaknesses, opportunities and threats are represented in Table 3 and Table 4 below.

TABLE 3: SWOT OF THE KALEVALA NATIONAL DISTRICT

Internal factors of the Kalevala national district development	
Strengths	**Weaknesses**
1. Sights related to the Karelian and Finnish epos "Kalevala" are located in the district; 2. Access to the Kalevala nature reserve; 3. Recreational potential and availability of natural resources. Successful experience already in VIP tourism; 4. Established contacts with EU-partners, international projects with them; 5. Connected to industrial centres of North-West Russia and Moscow by rail; 6. Large territories with potential for economic activity; 7. Hydropower potential; 8. The district has a strategy to develop tourism and road infrastructure; 9. Closeness to border; 10. Number of international projects realized.	1. Inefficient utilization of the spatial potential; 2. Poor socio-economic situation in the district, decline of production, economic decline; 3. Legal issues (i.e. land use restrictions in forest and waterside protection land, in the frontier zone); 4. Lack of budget funds, financial debt; 5. Poor development of public utilities and energy infrastructure; 6. Lack of transport communication, poor state of road infrastructure, low level of logistics development; 7. Not enough places of interests, which would attract tourists; 8. Almost total dependency on raw material use; 9. Unemployment; 10. Declining population, out migration trend, dominance of middle aged population.

TABLE 4: SWOT OF THE KALEVALA NATIONAL DISTRICT (CONTINUATION OF THE TABLE)

External factor of the Kalevala national district development	
Opportunities	**Threats**
1. Tourism development to support the vitality	1. More restrictions on economic activities;

External factor of the Kalevala national district development	
of vanishing communities; 2. Design and implementation of the spatial potential; 3. Good possibilities to increase border and transborder collaboration; 4. Utilization of hydropower and other energy resources (i.e. timber waste, etc.) potential; 5. Communication improvement, setting up communication facilities, improvement of computer literacy; 6. Establishment of eco- and ethno-communities in abandoned or vanishing settlements.	2. Intensification of international and interregional competition; 3. Unstable institutional environment along with budget and tax policy; 4. Intensification of social problems, social differentiation, poverty; 5. Lack of young specialists and out-migration of youth.

SWOT-analysis points out that the Kalevala national district has potential for spatial development. However, both the starting point and possibilities differ from those of the Kostomuksha urban district.

The main problems, which have to be solved are the following ones:

- Lack of transport communication, poor state of road infrastructure, low level of logistics development. Existing roads need to be reconstructed;
- Population decline due to out-migration and aging. Need to improve the economy of the district in order to attract youth to the district and to keep them from moving away;
- Aging and lack of the social and other infrastructure.

As contrasted to the problems, the strengths will facilitate the development of the district, including economic use of idle land (i.e. the land of abandoned or sparsely populated settlements). New activities can be developed, which will provide jobs and incomes to the district. The utilization of the strengths will improve viability and self-sufficiency of the settlements (**KRC RAS SWOT, 2012; Official Kalevala, 2013).**

3 ENVISIONED FUTURE

What will the future look like for Kostomuksha and Kalevala in 2050? This chapter presents one picture, how things could have developed in the pilot territories by 2050. The envisioned scenarios deal mostly about the Kostomuksha city and the Kalevala national district (in whole). When comparing these two pilot territories, Kostomuksha city is seen as more as an example of urban area development whereas the Kalevala urban-type district is considered as more rural area with its appropriate way of development. The scenarios can be separated as hi-tech and low-tech paths of development respectively.

3.1 THE DEVELOPMENT SCENARIO FOR KOSTOMUKSHA URBAN DISTRICT

In this chapter most of the attention is given to the Kostomuksha city. The villages of the Kostomuksha district (i.e. Voknavolok (Vuokkiniemi), Ladvozero (Latvajärvi), Ponygaguba, Sudnozero (Venehjärvi) and Tolloreka) are considered mostly as places of interest for tourism, where cultural heritage is well-preserved. The socio-economic development of the villages is tied up with the growth of the tourism business sector. At the same time, along with the development of the Kostomuksha city, the situation in the whole urban district is to develop favourably. The Kostomuksha city of the future is envisioned as a hi-tech eco-city, which has low negative environmental impacts and high quality of life. The various spheres of life, considered in this paper, are described below.

3.1.1 LAND USE

The land use has developed in a following way by the year 2050:

a. The Kostomuksha eco-municipality exists and is one of the best examples of green cities in Russia;
b. The urban development of the Kostomuksha city is implemented in harmony with the natural environment;
c. There have been significant improvements in the city plan: parkland is free and available for public. There are green corridors connecting different parts of the city, which provide access for people and platform for biodiversity. The park areas have plural sidewalks, court games, nature conservation areas with vegetation, shaded seating/picnic areas and resting points. Waste bin system and illumination have been developed and implemented. The parkland provides important social/play/casual sports/recreation experiences for the local area;
d. Bicycle lanes have been designed and built so that the people use bicycle on everyday basis;
e. The city is also pedestrian-friendly, the city centre is at walkable scale;
f. The infrastructure of the city has been developed and modernized (i.e. communal infrastructure is in good condition; resource efficient technologies, renewable energy sources and energy saving activities are utilized);
g. City provides a comfortable environment for its inhabitants (i.e. high level of infrastructure development; high quality of available housing);
h. City has an attractive image. The most important objects are located in accessible distance;
i. The economic basis of the city has been diversified; it does not depend on one enterprise only. This includes transport (logistics), industry (other than metallurgy), municipal services, tourism and telecommunications. Small and medium size enterprises are developed and the economy is innovative;
j. The Kostomuksha nature reserve is popular among tourists and often visited;
k. The vegetation and biodiversity is preserved in the city as well as in the district's nature reservation;
l. The environment in Kostomuksha district is in good condition;

m. The recreational potential of the territory is fully realized. Tourism infrastructure has been developed, tourism services are of high quality, there are famous places of interest worth visiting and a city brand has been created. These sights are used in promotion and advertisement of the city on international market too: There is qualified staff working in the tourism sector, the territory is well-known, accessible and attractive both for Russian and European tourists;
n. Spatial potential is utilized efficiently; the idle land of the settlements of the Kostomuksha urban district is used economically. All the favourable factors (i.e. transit position, small mountain rivers hydropower potential) are utilized **(KRC, 2012)**;
o. Service infrastructure for eco-tourism in the nature reserves is created;
p. Medical tourism is organized;
q. Extreme tourism is organized;
r. Tourism to the islands of Lake Kuitto is organized;
s. Downhill skiing facility and ski and biathlon centre have been built;
t. Cosmetic and SPA-salons are developed;
u. Ethno-cultural historical centre is constructed;
v. "Fregat" motel is extended (200 places), hotel in the city centre is constructed (58 places), more accommodation facilities are organized and available (close to the city centre);
w. Municipal inbuilt buildings are utilized (**KUDA Choice, 2012**).

3.1.2 INFRASTRUCTURE

The infrastructure has developed in a following way by the year 2050:

- Main and local motor road network (including bridges) of the district is rearranged/reconstructed. These are used extensively by both Russian and European tourists;
- Separate logging road system for timber-hauling transport is developed and implemented;
- Additional information signs and guideboards for drivers in two languages (Russian and English) is installed;
- Rest areas on motor roads are arranged;
- International and interregional railway connections are developed;
- Public transportation is well-coordinated and works well in local, regional and international levels;
- Public parking areas with smart solutions are created. Some examples are illustrated on Photo 9

PHOTO 9. SMART PARKING SOLUTIONS (PHOTO BY SMARTPARKING)

Parking solutions already in use in Russia are shown on Photo 10 and parking electric pillars to be used in winter time are shown on Photo 11;

PHOTO 10. VERTICAL PARKING SOLUTION IN RUSSIA (PHOTO BY PARKOFFKA)

PHOTO 11. PARKING ELECTRIC PILLARS (PHOTO BY PRWEB)

- Logistics centre is established and operational in Kostomuksha, trade turnover with Finland (European Union) is developed (**KUD STR, 2008**);
- Local industrial enterprises have undergone a technological modernization, all the standards are met;
- City landscape is improved (i.e. sidewalks, parks, recreation centres, bicycle paths have been set up);
- Airport is reconstructed (**KUDA Choice, 2012**);
- Transit terminals for transportation of goods from railway to motor transport is organized;
- Railway transit terminal organized;
- Sidewalks are illuminated;
- Motor road from the "Fregat" motel to wastewater treatment plant is illuminated;
- Railway station at Kivijarvi is reconstructed;
- International car gate at Lyttya state border is modernized;
- Car camping at the village of Voknavolok (Vuokkiniemi) is constructed (**KUDA Choice, 2012**);
- ICT is applied on information points for live travel information;

3.1.3 WASTE AND RESOURCE MANAGEMENT

The local resource potential is fully utilized and resource efficient technologies are applied by the year 2050. The Kostomuksha urban district is self-sufficient. The situation is seen as illustrated below:

1. Housing:
   a. Eco-friendly technologies and energy efficient building design are applied, new houses are constructed from wood and glued laminated timber;
   b. Wooden complex-houses are produced locally (**KRC RAS, 2012**);
   c. Remote access and smart technologies are implemented: real time pricing, real time information, smart management system, etc.;
2. Water resources:
   a. Water bodies are well-preserved;
   b. Storm water management is arranged for irrigation supply (after pretreatment);
   c. Water consumption is reduced by 15%;
3. Forest resources:
   a. Berry picking and processing is organized, finished products are sent to Russia and Finland;
   b. Juice and jam production is organized;
   c. Pellets production from raw waste lumber is organized;
   d. Industrial production of construction panels is expanded;
   e. Sawing and woodworking centre and souvenir production are organized;
   f. Production of wood chips and lumber is expanded;
   g. Furniture factory is constructed (**KUDA Choice, 2012**);
4. Fish resources:
   a. Trout industry on the Livo river and Lake Verhneje Kuito (Ylä-Kuittijärvi) is extended;
   b. Fish processing department on the Nogeus river is constructed (**KUDA Choice, 2012**);
5. Recreational resources:
   a. Plenty of touristic activities are offered: i.e. fishing, hunting, hiking, rafting;
   b. Health tourism (i.e. sanatoriums, etc.), extreme tourism, cultural (or heritage) tourism, ecotourism is available (**KRC, 2012**);
6. Non-metallic mineral resources:
   a. Some deposits (i.e. gneissic granite, gabbro-diabase, talc-chlorite) are developed;
7. Mineral resources:

a. Burned lime production at the ore extraction and processing enterprise opened;
b. High-strength crushed stone production is opened;

8. Other issues:
   a. Confectionary plant is constructed (**KUDA Choice, 2012**);
   b. Real time resource (water, energy, etc.) monitoring is implemented;
9. Waste:
   a. Waste ending up in the landfill is reduced by 50-75% due to recycling and reuse;
   b. Food waste fraction is separated and sent for utilization (composting and digestion on wastewater treatment plant);
   c. Energy waste faction is utilized;
   d. Plastic bottles are recycled;
   e. Aluminum cans are recycled;
   f. Tires are recycled;
   g. Hazardous waste is not sent to appropriate facilities;
   h. Central waste recycling facilities are established to serve several cities, for example Kostomuksha, Kem, Belomorsk, and Segezha. The population of the cities is illustrated on Figure 15.

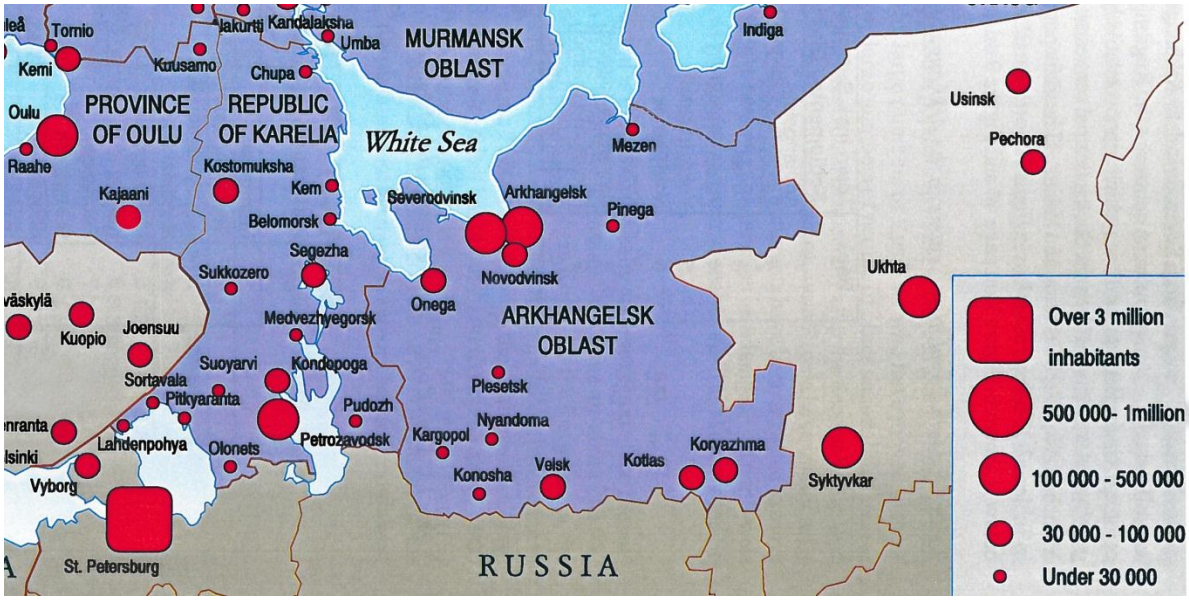

FIGURE 15. THE POPULATION OF THE REPUBLIC OF KARELIA (SOURCE: MODIFIED PICTURE FROM LAUSALA T.)

10. Air emissions:
    a. The industrial sector has low environmental load;
    b. Greenhouse gas emissions have been drastically reduced;
    c. Low carbon footprint is achieved;
11. Wastewater discharges:
    a. Wastewater from domestic and industrial sources is treated according to the latest standards;
    b. The environmental impact is kept minimal.

3.1.4 ENERGY

The energy sector by the year 2050 is seen as described below:

1. Heat supply:
   a. Heat system of the Kostomuksha urban district meets the demands of the whole district;
   b. New heat networks increase the radius of centralized heating;
   c. Energy efficient and saving technologies are implemented;
   d. Efficient heat production and transportation is organized;
   e. Housing sector uses local energy sources (i.e. boilers based on natural gas and heat pumps);
   f. Heat pump is installed on main municipal sewage collector;
   g. Closed system of heat supply is used;
   h. Heat insulation is improved;
   i. Use of fossil fuels for energy production has decreased.
2. Energy supply:
   a. Energy supply in the Kostomuksha urban district is developed;
   b. Renewable energy sources are used (waste-to-energy, hydropower, energy wood);
   c. Electric grid is constructed;
   d. Reliability of energy supply is improved (i.e. there is enough electric substations and electric power transmission lines for the needs of the district);
   e. Energy is produced and transported efficiently;
   f. Electric lines are built underground in dwelling zones (not in air);
   g. Overall electricity demand is reduced by 15-30%;
3. Housing:
   a. Modern energy efficient houses are built, old houses are refurbished;
   b. Autonomic systems are used;
   c. Devices to control water, electricity and heat energy are applied (**KRC RAS, 2012**).

All the development spheres and utilization of local resources can be illustrated as shown on Figure 16.

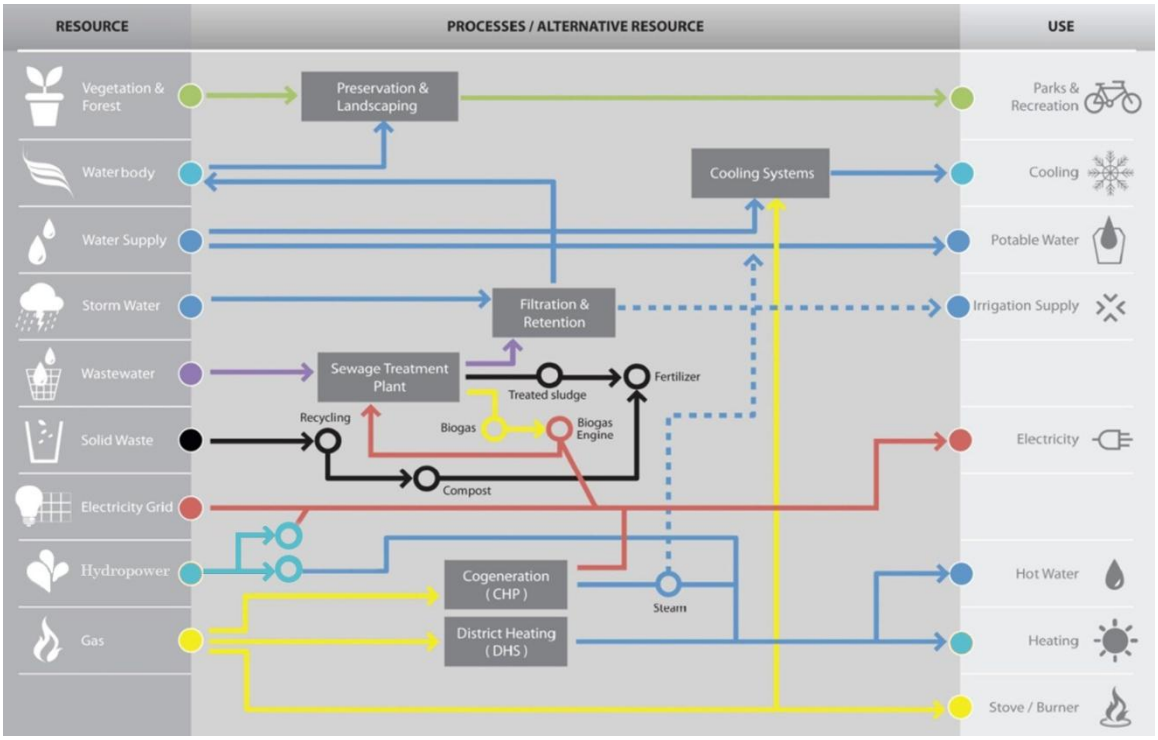

FIGURE 16. PRESENTATION OF AN INTEGRATED RESOURCES MANAGEMENT OPTION IN THE KOSTOMUKSHA CITY (SOURCE: MODIFIED PICTURE FROM TIDA)

3.1.5 INDIVIDUAL AND COMMUNITY WELL-BEING

The individual and community well-being by the year 2050 is seen as described below:

- Population of the Kostomuksha urban-district is around 40 000 people;
- The city has a balanced age structure;
- Quality of life is high. Better infrastructure, waste management and other public utilities increase the well-being of community. The life is more comfortable. The place has become more welcoming;
- People play important role in the development of the district: Active participation in social issues, decision-making and planning;
- There is qualified, professional staff available in the city and the district. A knowledge-based technology center or "Science Park" is built, where education and research is carried out. This educational and scientific action is based on the industrial know-how of the city to develop ore dressing and processing. Experiments and training are arranged in former, unused factory buildings;
- There are sufficient leisure activities. In addition to sports and arts, the public spaces invite people to spend time around the city. There is this kind of places also in shopping complexes. One example is from Dubna, Moscow region, Russia. The illustration of the shopping centre is given on Figure 17;

FIGURE 17. SHOPPING CENTRE IN DUBNA (SOURCE: DUBNA-MAYAK)

- The city appeals to the young people; the city centre has become inviting and youth-friendly. Young people meet there and enjoy the city;
- Private (individual) houses and apartment buildings are constructed;
- Glued laminated timber and private (individual) houses are built;
- Up-to-date car services are available;
- New shopping capacities are available. Finnish network retail (e.g. food, clothing, etc.) is developed in Russia;
- Many new clusters of economic activities are created;
- There is plenty of employment opportunities for the inhabitants, jobs are well-paid;
- There is higher and professional education in the city. Kostomuksha city collaborates with Finnish and Russian universities;
- Community facilities function in a reliable way;

- ICT is applied at information points in the city;
- People have good quality of life (i.e. well-being, health, public utility network, security, emergency management, etc.), they are proud of their city;
- Bicycle culture has progressed. Kostomuksha has become a bicycle friendly city. Rental bicycle services are available;
- Ski and biathlon complex is in operation (**KUDA Choice, 2012**);
- The public transport functions reliably and is used by people;
- European tourists visiting the city are satisfied with the level of security, health and services;
- To attract tourists both from Russia and Europe, there is an up-to-date Science Museum of regional importance. Some existing examples of successful stories are Science Museum "Tietomaa" in Oulu (Finland), Science Museum "Planetarium" in Tromso (Norway), Norwegian Museum of Science and Technology in Oslo (Norway), Science Museum "Klimahaus" in Bremerhaven (Germany), "Corpus" Museum of Human body in Oegstgeest (Holland), etc (**Tietomaa, 2013; Vitensenter, 2013; Tekniskmuseum, 2013; Klimahaus_A, 2013; TURJ, 2013**). This kind of museums are rare in Russia, most famous one is Science Museum "Experimentarium" in Moscow (**Experimentarium, 2013**). The Science Museum in Kostomuksha is very beneficial for the development of the city. Science Museum "Klimahaus" in Bremerhaven, Germany, is shown in photo 12;

PHOTO 12. SCIENCE MUSEUM "KLIMAHAUS" IN BREMERHAVEN, GERMANY (PHOTO BY KLIMAHAUS)

- Many participatory approaches (i.e. public hearings, town meetings, surveys, voting and panels) are organized to strengthen local governance and the role of the local people in making the city more sustainable;
- Corruption is greatly diminished or eliminated (**KUD STR, 2008**; **Official Karelia, 2013**).

The visual summary of all the spheres and the envisioned future of the Kostomuksha city can be represented by the following picture, shown on Figure 18.

FIGURE 18. ENVISIONED FUTURE OF THE KOSTOMUKSHA CITY (SOURCE: MODIFIED PICTURE FROM TIDA AND TRANSNOVA)

3.2 THE DEVELOPMENT SCENARIO OF KALEVALA NATIONAL DISTRICT

The development scenario of Kalevala national district is different from the Kostomuksha urban district. The latter is explained by the difference in baseline of the pilot territories. Hence, the visioning of the Kalevala national district future by 2050 is also represented by taking into account the level of its current development. In contrast with the case of the Kostomuksha city, the attention is given to the whole Kalevala national district. Thus, all the settlements of the Kalevala national district (i.e. Kalevala municipal settlement, Borovoy rural settlement, Yushkozero rural settlement, and Luusalmi rural settlement) are considered. The socio-economic development of the district depends on the growth of tourism. The cultural heritage along with traditions and lifestyle are well-preserved. The future of the Kalevala national district is seen as a low-tech eco-community with the lowest possible environmental impact, old-village-style housing sector, bioeconomy, rural way of living. Despite these, the district has access to good public utilities. What is important to mention, is that there is already now some examples of eco-settlements in the Republic of Karelia (**Ecovil, 2013**). Thus, eco-village concept has good possibilities to be realized. Besides, eco-village may also be used to attract tourists. The following spheres of life considered in this paper are described below.

3.2.1 LAND USE

The land use by the year 2050 has developed in a flowing way:

a. The Kalevala eco-community exists and is one of the best examples of eco-villages in Russia;
b. The Kalevala nature reserve is popular among tourists, it is well maintained;
c. The recreational potential of the territory is fully realized, tourism infrastructure developed, multiple tourism spheres are developed, touristic centre is created. Tourism services have high standards, interesting places worth visiting are developed and implemented, promotion and advertisement os carried out, qualified specialists are available, the territory is well-known, accessible and attractive both for Russian and European tourists;
d. Spatial potential is utilized efficiently, the idle land of the settlements of the Kalevala national district is used economically, all the favourable factors (i.e. transit position, small mountain rivers hydropower potential) are utilized **(KRC, 2012)**;
e. A visit centre in the Kalevala national nature reserve is constructed (**KUDA Choice, 2012**);
f. Kalevalsky national park is utilized in a wide range of leisure activities, especially in hiking;

3.2.2 INFRASTRUCTURE

The infrastructure by the year 2050 is seen as described below:

- Main and local motor road network (including bridges) of the district is rearranged/reconstructed, is in operation and is highly used both by Russian and European tourists;
- Separate logging road system for timber-hauling transport is developed and implemented;
- Additional information signs and guideboards for drivers in two languages (Russian and English) are installed;
- Rest areas on motor roads are arranged;
- Interurban and international bus public traffic is developed;
- Public transportation is coordinated and function well;
- Regular public parking areas are created for tourists;
- ICT is applied on information points for live travel information for tourists;

3.2.3 WASTE AND RESOURCE MANAGEMENT

The local resource potential is fully utilized and resource efficient technologies are applied by the year 2050. The Kalevala national district is self-sufficient. The situation is as described below:

1. Housing:
   a. Eco-friendly and energy efficient technologies are applied, new houses are constructed from wood and glued laminated timber;
   b. Wooden complex-houses are produced locally (**KRC RAS, 2012**);
2. Water resources:
   d. Water bodies are well-preserved;
   e. Storm water management is arranged for irrigation supply (after pretreatment);
3. Forest resources:
   a. Berry picking and processing is organized, products are exported to Russia and Finland, this seasonal work attracts enough manpower;
   b. A brand or trademark for products made in the district ("Kalevala") is established
   c. Local forestry is developed;
4. Fish resources:
   a. Fish farming is arranged;
   b. Smoked fish is produced locally and other local products are sold to tourists aswell;
5. Other issues:
   a. Organic farming is organized. It also attracts tourists;
   b. Substrates from peat are used for agricultural purposes;
6. Recreational resources:
   a. Plenty of touristic activities offered: i.e. fishing, hunting, hiking, rafting. Due to the specific village-style of the area, tourists can take a trip back in time to see how people used to live before;
   b. Health tourism (i.e. sanatoriums, etc), extreme tourism, cultural (or heritage) tourism, ecotourism is available (**KRC, 2012; Official Kalevala, 2010**);
7. Waste management:
   a. New landfill site along with organization of waste management system is organized (**Zavarkina E., 2012**);
   b. Waste going to landfill is reduced by up to 50-75% due to recycling and reuse;
   c. Food waste fraction is separated and sent for utilization (composting). Then it is used in farming;
   d. Energy waste faction is utilized;

e. Plastic bottles are recycled;
f. Aluminum cans are recycled;
g. Tires are recycled;
h. Hazardous waste is sent to appropriate facilities;
i. Waste recycling facilities are concentrated out of the district. The location is chosen so that they can serve a larger area, for instance Kostomuksha, Kem, Belomorsk, and Segezha. The Kalevala national district can send their separated fractions to Kostomuksha city for further utilization;

8. Air emissions:
   a. The industrial sector has minimal environmental load;
9. Wastewater discharges:
   a. Wastewater is treated via Living Machine technology or reed bed water treatment (**Living Machines, 2013; CIWEM, 2012**);
   b. The environmental impact is kept minimal.

3.2.4 ENERGY

The energy sector by the year 2050 is seen as illustrated below:

1. Heat supply:
   a. Heat systems in the district has sufficient capacity for the purposes of the district;
   b. New heat networks have increased the radius of centralized heating;
   c. Energy efficient and saving technologies are implemented;
   d. Efficient heat production and transportation is organized;
   e. Local energy sources are used in housing sector (i.e. boilers based on natural gas and heat pumps);
   f. Closed system of heat supply is used;
   g. Heat insulation is improved (**Zavarkina E., 2012**)
2. Energy supply:
   a. Energy supply is developed;
   b. Renewable energy sources are used instead of fossil fuels (waste-to-energy, hydropower, energy wood);
   c. Electric grid is constructed;
   d. Energy supply reliability is improved (i.e. there is enough electric substations and electric power transmission lines for the needs of the district);
   e. Energy is produced and transported efficiently;
   f. Electric lines are built underground in dwelling zones.
3. Housing:
   a. Old style housing sector is preserved attract tourists interested about the traditional way of living. However, Finnish experience on building of new energy efficient and eco-friendly houses is used;
   b. Autonomic systems are introduced;
   c. Devices for control of water, electricity and heat energy are applied (**Zavarkina E., 2012**; **KRC RAS, 2012**).

3.2.5 INDIVIDUAL AND COMMUNITY WELL-BEING

- Local identity is maintained;
- Good tarmac roads from Kalevala to the nearest cities are built. Kalevala is more accessible;
- The population has grown. Young people, in particular, qualified tourism specialists are available. Other people of working age also stay in the district. There is enough capacity in housing sector;
- Basic education is available. Distant education programs are developed in collaboration with Russian and Finish universities;

- Wide leisure activity possibilities are offered. Special attention is drawn to traditional and cultural activities. Sport and other multiple activities are present, which provide hobbies for youth on their free time;
- Karelian language is maintained and still spoken in the district. The latter is actively used in tourism business with Finnish visitors;
- Karelian folklore and culture are preserved and utilized in tourism;
- Many inviting and attractive tourist sites and activities are developed and implemented. Tourist flows come to the district from Russia, Finland, Sweden and Norway;
- Karelian heritage and the Kalevala (epos) are utilized in tourism as cultural resources;
- Finns and Russians can freely move across the border. Visas are much easier and cheaper to get. The tourist flow from Finland to the Republic of Karelia has grown significantly;
- The language barrier in the Kalevala district is absent. There are enough specialists to handle the tourist flow. Besides, more Finns speak Russian due to increased cooperation between the countries;
- Eco-community concept keeps the vitality of the district. Organic and fish farming is developed. Some smart eco-technologies suitable for rural conditions are applied;
- Local people's opinion is taken into consideration. Population is involved in participatory planning and decision-making (**KUD STR, 2008**; **Official Karelia, 2013**);
- Services (i.e. police, medicine, tourism, communication, etc.) are well-developed;
- There is no big companies in the district, which has not spoiled the environment;
- Small and medium enterprises (SMEs) are widely present.

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