

„LAST MILE“ SOLUTION IN LITHUANIA

NERINGA CASE

TECHNICAL AND ECONOMICAL VIEW

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Summary

Neringa is the longest town and national park of Lithuania, which is inscribed into UNESCO World Heritage List as a valuable and unique cultural landscape in the Baltic region. Factors, such as geographical disjuncture, ecology, and small amount of residents aggravate natural development of Neringa’s telecommunication infrastructure; development of Neringa’s commercially-founded telecommunication services as well as development of information society is encumbered.

Neringa is located on the Curonian Spit – in the narrow peninsula, which separates Curonian Bay from Baltic Sea. You can access Neringa from Lithuanian Klaipeda seaport by ferry through Curonian Bay.

Historically, Neringa Municipality did not have the same conditions as other regions of Lithuania in terms of telecommunications infrastructure.

Due to the social and geographical conditions - remoteness, isolation, small market - Neringa municipality was the only one in the country where were no multichannel television and fast Internet access until 2005. Not even 3000 residents live in Neringa – the market is too small to attract private investments to IT infrastructure and to give quick investment dividends.

Municipality of Neringa succeeded to receive EU PHARE support for the commercially profitless but an important project for residents “Pilot Project for Promotion of Information Society via Development of Regional Wireless Access (data, voice transmission and other ITT services infrastructure)” which was financed from the budget of 2002.

The project was based on the assumptions that Broadband Wireless Access (BWA) will compensate weaknesses of the Neringa city (remoteness, isolation, small market) and enhance potential business strength of the region. Broadband Wireless Access was found by project initiators to be the best way to info-include Neringa municipality, to help it overcome its geographical isolation and widespread of population.

In 2005 the supply provider JSC Skaidula introduced and installed wireless radio access equipment. In the same year public institution “Vėlingis” was specially established by Municipality of Neringa to be a manager and owner of Neringa BWA system.

JSC “Lietuvos radijo ir televizijos centras” was appointed to be Neringa BWA system operator - <http://neringos.erdves.lt>.

It is affirmed, that established Wireless Broadband Access system secures telecommunication services extension to 95 percent of potential users in Neringa.



1. Background/Conditions

1.1. Geographic

Neringa is the longest town and national park of Lithuania, which is involved in UNESCO World culture and nature worth list. Neringa is located on the Curonian Spit – in the narrow peninsula, which separates Curonian Bay from Baltic Sea. You can access Neringa from Lithuanian Klaipeda seaport by ferry through Curonian Bay.

Neringa was established in 1961, when Lithuanian Curonian Spit parts townships - Juodkrante, Pervalka, Preila, Nida, were connected to one town, which length was almost 50 km. At this time about 3000 residents live in Neringa town.



Neringa municipality is geographically the most western municipality of Lithuania, situated on a Curonian Spit, surrounded by the Curonian Lagoon from the East, the Baltic Sea from the West and the Kaliningrad Region (Russia) from the South. The only connection to the mainland is by ferry.

One of the most important sources for Neringa economical development is tourism. There are many interesting objects for tourists in the region, including unique nature environment elements, great landscapes, nature. Neringa resort is visited by hundred thousands of holiday makers every year. Big part of Baltic Sea coast strip cover beaches. Big possibilities for tourism development in region infuses yacht tourism.

1.2. Situation before the project

Historically, Neringa Municipality did not have the same conditions as other regions of Lithuania in terms of telecommunications infrastructure. There are many technological and physical possibilities in the “mainland” to develop telecom alternatives (radio-relay, other wireless links, optical and other cable networks) and they are in the process of being developed. However, Neringa municipality has no cable networks (not even TV) and there were no other alternative available.

Due to the social and geographical conditions - remoteness, isolation, small market - Neringa municipality was the only one in the country where there were no multichannel television and fast Internet access until 2005.

On June 25, 1998, Neringa municipality adopted its strategy, called “Neringa – international communication centre” (MS – Municipal Strategy). Since then there have been attempts to create adequate communication infrastructure. One of the most realistic possibilities six-seven years ago was to use digital microwave multipoint distribution system (MMDS) stations. However, the private company which got the national licence for MMDS, did not start any activities in Neringa. The mentioned private company did not come to the region because of two reasons: 1) small market in Neringa, which potentially can return such investments only in decades or will not return at all; 2) deep seasonal fluctuations of social life in this resort region (which is a rather destabilising factor for private business)¹. Furthermore, the MMDS bandwidth (2.5 – 2.6 GHz) was planned to be closed altogether by 2008.

There is no and can not be any optical cable link to Neringa, because of the geographical location of the municipality. The only connection to the mainland is by ferry. Therefore, any cable connection to the mainland would have to be installed underwater, which the private sector would regard to be too expensive and which would be risky because of the shallowness of Curonian Lagoon.

¹ Source: Standard Summary Project Fiche. Project No 2002/000.620.04.01.

2. Project description

Factors, such as geographical disjuncture, ecology, and small amount of residents aggravate natural development of Neringa’s telecommunication infrastructure; development of Neringa’s commercially-founded telecommunication services as well as development of information society is encumbered. Not even 3000 residents live in Neringa – the market is too small to attract private investments to IT infrastructure and to give quick investment dividends.

Within the project preparation phase was stated that it is necessary to cover all population of Neringa region with new local telecommunication services infrastructure, which will provide three input elements:

1. Alternative “last mile” solution for competitive local voice communication services (IP telephony), which will lead to decrease of the prices of telephony services.
2. “Last mile” solution for permanent and affordable access to Internet services providing fast data exchange.
3. Wireless access to TV services (regional, national and satellite TV programs).

Therefrom municipality of Neringa succeeded to receive EU PHARE support and with its help to finance commercially profitless but an important project for residents. An application for PHARE support by municipality of Neringa was submitted in 2002. In December, 19 of the same year, contemporary Finance Minister of Lithuania, current European Committee commissar Dalia Grybauskaitė and European Committee deputation in Lithuania leader Michael Graham signed financial memorandum for the 3rd part of National PHARE program of 2002 year, whereby the Pilot Project for Promotion of Information Society via Development of Regional Wireless Access (data, voice transmission and other ITT services infrastructure) was financed.

2.1. Project goals

The goals of the Pilot Project for Promotion of Information Society via Development of Regional Wireless Access (data, voice transmission and other ITT services infrastructure) were:

- To develop organizational and technical infrastructure (broadband wireless telecommunications access system), which will enable fast Internet access, data transmission, voice and video data exchange in Neringa and to enhance development of a new and effective business infrastructure in this peripheral resort region. An increase of the usage of fast Internet access in Neringa will be achieved through installation of municipally-owned technical facilities and start up of various information and telecommunication services and innovative businesses.
- To connect the regional broadband wireless access system to national and international systems, thus helping Neringa municipality and local businesses to exploit eBusiness infrastructure in the interest of better local economic development.

The project was based on the assumptions listed below:

- Broadband Wireless Access (BWA) will compensate weaknesses of the Neringa city (remoteness, isolation, small market);
- BWA will enhance potential business strength of the region (international cooperation, tourism, unique resort possibilities, etc.);
- Digital TV relay network will be installed by Lithuanian radio and TV centre in terms, according their business plan throughout the country;
- Neringa municipality is committed to implementation of program to exploit the potential of BWA.

2.2. Project alternatives

Other alternatives were analysed in a pre-feasibility study before submitting the project application for funding²:

1. To use fixed telephony lines for data transmission:

- The distance from Klaipėda to other end of Neringa would be too long in order to provide high quality data transmission via fixed telephony network.
- Needs rather expensive equipment for data transmission, but still would not provide access for TV services.
- No independence from network owner and, therefore, Internet services would be too expensive in order to catalyze information society development.

2. To cover region with optical fiber network:

Advantages:

- Can provide access to all three crucial services (voice communication, Internet, TV).
- Can provide unlimited speed of data exchange.

Disadvantages:

- At the time needed not less then 6 000 000 EUR investment in order to reach Nida across Curonian Spit and further investment to develop distribution network.
- Do not fit to constraints of National Park (restrictions to dig, etc.).

3. Mixed usage of optical fiber and fixed telephony lines (optical fibre across Curonian Lagoon to Juodkrantė / fixed telephony lines used for data transmission in Juodkrantė and covering the distance from Juodkrantė to preila, Pervalka and Nida):

Relative advantages:

- the distance of used fixed telephony network will be reduced; it will ensure satisfactory quality for services; investment for equipment supply and installation would be less then BWA.

Main disadvantages:

² Source: Summary report on pre-feasibility study. Standard Summary Project Fiche. Project No 2002/000.620.04.01.

- too risky, as far as Curonian Lagoon is rather shallow; on independence from fixed telephony network owner; would not ensure access to cheap Internet services in all region; would not provide access to TV services.
- 4. *Mixed usage of optical fibre and non-broadband radio links* (optical fibre to Juodkrantė / non-broadband radio links from other side of Curonian Lagoon to Preila, Pervalka and Nida / non-broadband radio links for data distribution network inside all four settlements in Neringa).

Main advantages:

- Cheaper solution for Internet services and data transmission, independent from fixed telephony lines owner.
- Enough data transmission speed for SME and household offices.

Main disadvantages:

- Does not create enough competition in the field of telephony services.
- Does not provide access to TV services.

- 5. *Usage of individual and / or collective satellite TV downlinks in addition to 4th option:*

Advantages:

- Provides access to certain packages of satellite (international) TV services.
- In the case of high penetration would not require broadband distribution of TV programs.

Disadvantages:

- Does not fill the gap of access to local, regional and national TV programs and does not support community information system.
- Less international TV programs available than in cable or wireless-cable systems.
- Will not enhance accelerated connectivity of the community into modern telecom network.

2.3. Description of the project technical solution

There was no intensive development of Broadband Wireless Access Systems until the project, because other technologies in “the mainland” were regarded as appropriate and had been developed earlier. However, Broadband Wireless Access was found by project initiators to be the best way to info-include Neringa municipality, to help it overcome its geographical isolation and widespread of population, to provide information infrastructure for local businesses as well as the public sector and help use the potential strength of the region.

Neringa BWA system consists of the Network Operation Centre (NOC), 2 base stations and 6 repeaters.

The system architecture can be divided in four main zones³:

- Nida location architecture

³ Source: Detail Technical Project of Neringa Region BWA System (Terminales del Telecomunicacion Terrestre, S.L.)

- Pervalka location architecture, where theNOC is placed.
- Juodkrante location architecture.
- Preila and Pervalka locations architecture.



Source: <http://neringos.erdves.lt>.

The center of the system architecture is the NOC placed in Pervalka (at Bite GSM Tower). This NOC is connected with the external internet and voice networks via a digital radio link between Nida (where the connection with those networks is located) and the NOC location.

Also, in the NOC, all the carriers and data and video contents are generated and distributed to the other parts of the system architecture.

For distribution of modulated signals from NOC to Nida and Juodkrante AML analog links are used: distant sites of Neringa BWA system are reached using AML point-to-point radio relay links, which are intended to transmit all 45 TV channels plus data and voice. Current AML downstream is 6 DVB-C carriers (~247Mbps) and 1 DOCSIS 1.1 downstream carrier (~30Mbps). AML links are broadband – bandwidth is 110MHz.

For service generation, the selected technology is:

- **DVB-C** for TV. This standard technology utilizes 64 QAM modulation for TV distribution. This permits the transmission of multiple TV channels with a very reduce spectrum usage. In fact for this system, the 6 carriers are required for a minimum of 40 TV channels, which mean 48 MHz.
- **DOCSIS 1.1** for data services. This technology uses 64 QAM for downstream and QPSK or 16 QAM for upstream, but also was competitive in price, as there was a wide offer of vendors for both the headend modem (called CMTS) and the customer modem (cable modem). A single carrier of 6 MHz provides 30 Mbps of downstream throughput which is more than enough for the required services. In the return path, the system offers 4x5 Mbps for a total of around 20 Mbps of upstream throughput.
- **H.323** protocol is used for both the telephony and videoconferencing services.

3. Project results

Broadband Network System (BNS) is intended for provision of digital cable television, telephony, internet and data transfer services. For television 247 Mbps channel is intended, for data transfer 30 Mbps (Down) and 4.5 Mbps (Up). BCS base stations (BS) are equipped in 4 region vicinities: Nida, Preila, Pervalka, Juodkrante.

System generates assumptions for development of informational technologies, expansion of telecommunication networks, creates competition in the sector of regional telecommunication services.

Digital cable television (DCTV) is transmitted with BNS help for residents of Neringa. DCTV is possible to receive everywhere, where the installation of telecommunication networks is difficult or rather expensive. Before the project, only analogical television, which quality can not match digital TV quality, and satellite which has specific defects, were available.

Local and internet network services are extended to every user. Internet speed is about 2 Mbps in Lithuania and abroad.

Extended service package consists of⁴:

- Stable, unlimited internet connection.
- Outer IP address.
- Fast and comfortable information exchange with other users in same network.
- Free e-mail address and WEB hosting service.
- Interactive communications (video conferences).
- Individual services.

It is stated, that established Wireless Broadband Access system secures telecommunication services extension to 95 percent of potential users in Neringa.

⁴ Source: General Service Provider: <http://neringos.erdves.lt>

4. Model of financing

4.1. Investment

The project was funded exclusively by public sector. No private sector financing was used. An application to get PHARE support was submitted in 2002 by Municipality of Neringa. 4,447 million Litas was allocated for the project from the PHARE support (Economic and Social Cohesion program); Neringa municipality co-financed the project with 1,550 million Litas.

Investments were divided mainly into two contracts: supply and service. The full tender documentation, technical specifications and related documentation was prepared in advanced within the PHARE Project Preparation Facility.

The supply part of the project covered acquisition of necessary transmission and data processing equipment by Neringa municipality including installation costs.

The service part of the project involved Technical Assistance to the Municipality of Neringa in relation to the setting up of the management arrangements for the local operation of the BWA infrastructure.

Approximately 80% of the budget was used within the supply contract, that is for the BWA equipment. App. 19% of the budget was used within the service contract, that is for the Technical Assistance to Municipality of Neringa: development of a new local information society development plan, management arrangements for the BWA infrastructure operations, assistance to development of promotional and public awareness campaigns etc. In addition to above mentioned contracts involving PHARE funds, additional works contracts for BWA receiving network further installation was undertaken by Neringa Municipality using local funds. The value of these works was planned to be 20,000 Euros.

4.2. Operational model

In 2005 the supply provider JSC Skaidula introduced and installed wireless radio access equipment. In the same year public institution “Vėlingis” was specially established by Municipality of Neringa to be a manager and owner of Neringa BWA system. Communication Regulatory Authority issued a license for “Vėlingis” to use 28 GHz Local Multipoint Distribution Service (LMDS) frequencies and to provide LMDS services.

“Vėlingis” was also decided to be the main contractor of all leasing contracts concerning antennas mounting as well as indoor equipment placement.

General service provider – Neringa BWA systems operator – provides:

- multichannel subscription cable television services;
- Internet services;
- fixed telephony services;
- other data transmission services.

It was decided that appointed Neringa BWA operator will pay monthly concession fee which will be used to cover costs of leasing contracts maintained by Vėlingis. It is agreed that

General service provider will pay 3000 LT monthly concession fee during the first three years of operations and starting from 4th year will pay 6000 Lt monthly concession fee.

Trying to make concession tender more attractive for possible operators it was also decided that Municipality of Neringa will appoint certain budget for “Vėlingis” so that “Vėlingis” could cover costs of frequency licenses for the first free years of operation.

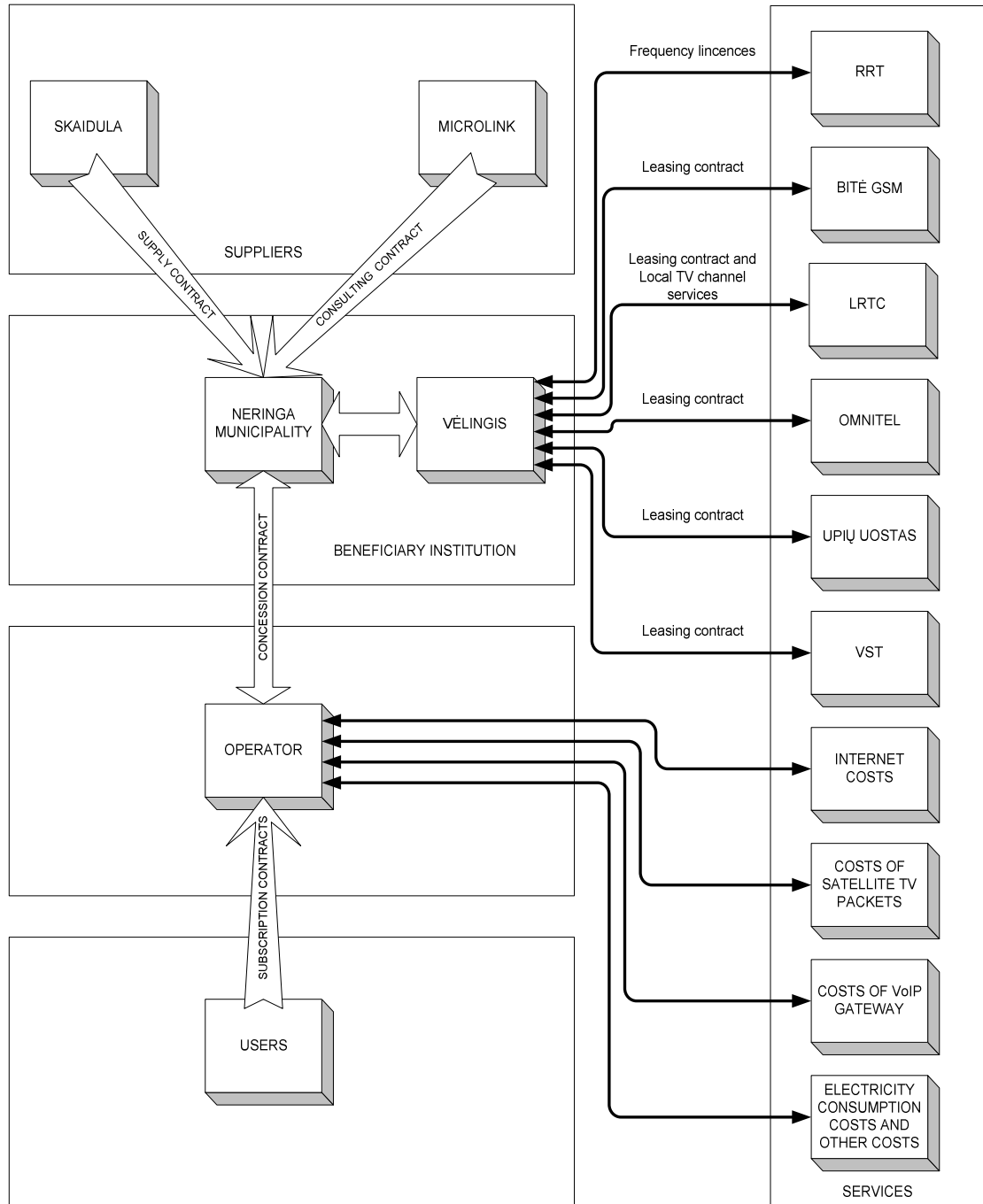
Current frequency licensing costs to the state paid by Vėlingis as provided by Communications regulatory authority of Lithuania does not exceed 60 Lt per month (circa 18 EUR) and is planned even to be decreased.⁵ The fee is lower than was planned at project final report stage (as it can be found in tables below).

Starting from the 4th year of operation the Operator will have to cover frequency licenses costs by itself – that means starting from the 4th year concession monthly fee will be bigger.

JSC “Lietuvos radijo ir televizijos centras” was appointed to be Neringa BWA system operator - <http://neringos.erdves.lt>.

The foreseen operational scheme is provided below.

⁵ <http://www.rtt.lt/index.php?69789744>



Source: FINAL REPORT of “Technical Assistance for Pilot Project for Promotion of Information Society via Development of Regional Wireless Access (data, voice transmission and other ITT services infrastructure)”, October 2005. SIA “Microlink Latvia”.

Planned budget costs of “VĒLINGIS” when submitting project final report were these:

- For the first 3 years of operation:

#	Service provider	Type of service	Price of services per month, LT
1	UAB "Bite GSM"	Possibility to mount antennas on PERVALKA 40m tower	1.000,00 Lt
		Possibility to mount antennas on PREILA 24m mast	200,00 Lt
2	AB LRTC	Possibility to mount antennas on NIDA 60m tower	700,00 Lt
3	UAB "Omnitel"	Possibility to mount antennas on JUODKRANTE 60m tower	845,00 Lt
4	UAB "Kauno tarptautinis upiu uostas"	Possibility to mount antennas on NIDA "Zirgo galva" building	168,00 Lt
5	UAB VST	Possibility to mount antennas on NIDA 24m tower	168,00 Lt
6	AB LRTC	Provision of 5 local TV channel package in digital MPEG-2 format	300,00 Lt
7	Communication Regulation Authority	Frequency regulation services	2.639,52 Lt

Total: 6.020,52 Lt

- Starting from the 4th year of operation:

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5	UAB VST	Possibility to mount antennas on NIDA 24m tower	168,00 Lt
6	AB LRTC	Provision of 5 local TV channel package in digital MPEG-2 format	300,00 Lt
7	Communication Regulation Authority	Frequency regulation services	2.639,52 Lt

Monthly concession fee of 3.000Lt for the first 3 years of operation

Municipality of Neringa will cover this cost for the first 3 years of operation

Monthly concession fee of 6.000Lt

Source: FINAL REPORT of “Technical Assistance for Pilot Project for Promotion of Information Society via Development of Regional Wireless Access (data, voice transmission and other ITT services infrastructure)”, October 2005. SIA “Microlink Latvia”.

4.3. Prices for the end-users

When preparing the concession contract it was agreed that General Service Provider will follow such kind of requirements:

- a. price for general package of services (which will include internet service, cable TV service and fixed telephone subscription service) shall not exceed 6% of Lithuanian average salary provided by Department of Statistics (<http://www.stat.gov.lt>).
- b. requirements for the number of Neringa BWA users to be achieved during first, second and third years of operation.

The mix of these requirements was supposed make an Operator to offer affordable Neringa BWA service prices.

Currently, General Service Provider (<http://neringos.erdves.lt>) offers the following packages:

- ✓ **For the business clients.**

TRYS+

45 TV channels, internet, 2 fixed telephone lines.

TV subscription fee, Lt (excl. VAT)	Internet speed, kb/s	Total subscription fee, Lt (excl. VAT)
16.95	256	118
16.95	512	152
16.95	1024 (1 Mb/s)	316
16.95	2048 (2 Mb/s)	588

INETAS+

Internet, 2 fixed telephone lines.

Internet speed, kb/s	Total subscription fee, Lt (be PVM)
256	114
512	147
1024 (1 Mb/s)	279
2048 (2 Mb/s)	550

TV+

45 TV channels, possibility to subscribe 2 fixed telephone lines.

TV subscription fee, Lt (excl. VAT)	Minimal telephony fee, Lt (excl. VAT)	Total subscription fee, Lt (excl. VAT)
25		25
21	33	54

TELE+

2 fixed telephone lines, internet.

Internet speed, kb/s	Minimal telephony fee, Lt (excl. VAT)	Total subscription fee, Lt (excl. VAT)
128	109	109

Installation costs for the business clients starts at 149 LT (excl. VAT).

✓ **For the private clients.**

TRYS

45 TV programos, internetas, fiksuotoji telefono linija. Free installation.

TV subscription fee, Lt (incl. VAT)	Internet speed, kb/s	Total subscription fee, Lt (incl. VAT)
20	256	69
20	512	79
20	1024 (1 Mb/s)	99
20	2048 (2 Mb/s)	118

INETAS

Internet, fixed telephone line. Free installation.

Internet speed, kb/s	Total subscription fee, Lt (incl. VAT)
512	67
1024 (1 Mb/s)	87
2048 (2 Mb/s)	107

TV

45 TV channels, possibility to subscribe a fixed telephone line.

TV subscription fee, Lt (incl. VAT)	Minimal telephony fee, Lt (incl. VAT)	Total subscription fee, Lt incl. VAT)
29		29
25	19	44

TELE

Fixed telephone line, internet

Internet speed, kb/s	Minimal telephony fee, Lt (incl. VAT)	Total subscription fee, Lt (incl. VAT)
128	64	64

The installation is free for private clients.

5. Recommendations

In terms of technology, the choice of technologies is restricted in Neringa region and furthermore there is no possibility to utilize RAIN fibre optic cable infrastructure. But for other regions in Lithuania is highly recommended to look up to the RAIN project, as state invests more than 200 million Lt into this infrastructure.

Unfortunately there is no possibility to receive funding of EU Structural Funds 2007 – 2013, as all broadband's part is already pre-planned for the RAIN2 project.

Concerning benefits of BWA project:

- ✓ it is clear that the idea is not profitable financially;
- ✓ critics also stress the amount of investments made versus size of population in the region, herewith the quantity of users;
- ✓ anyhow, the project is profitable in terms of social – economic interest, having in mind the extent of tourism development in the region.

Main problems of project implementation are technical:

- ✓ Allocation of AML frequency channels is very complicated and has to be coordinated with Kaliningrad region, moreover it is complicated to align such AML links,
- ✓ Antenna mounting technical problems,
- ✓ no straight line visibility between GSM towers (in Preila),
- ✓ difficulties in getting permissions for tower building,
- ✓ project management problems (low budgets for some works, contracts had to be prolonged, additional equipment was needed),

Recommendations:

- ✓ Use wireless technology only in flat areas, where direct visibility can be reached,
- ✓ Plan much more time for site preparation, technical project preparation,
- ✓ For the first operational years some budget to cover part of the costs are needed from municipality,
- ✓ There is a need for municipality owned legal body to be the owner of the equipment in order to be capable to conduct business activities (to get income).

Keywords

