LATVIA

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1. OVERVIEW OF THE REGION

Characteristics of the Region
The Kuldiga region is a municipality of the Kurzeme District in the western part of Latvia. The region was formed in 2009 according to administrative territorial criteria merging 13 parishes (see *Figure 1*).

Figure 1 – Kuldiga region at the map of Latvia (http://www.kuldigasilt.lv)

The Kuldiga region has an area of 17,567 km^2, and a population 24,539 (2013). The population density is 14 people per km^2. 13,335 people live in the main town of Kuldiga (see *Figure.2*)

The region is governed by the Regional council (Dome), which is elected once every four years. There are 17 deputies in the Regional council. The Region is responsible for all governance functions within its territory. The administration centre is situated in Kuldiga town. A small part of the functions are centralised in Kurzeme district, for example passenger transport between regions of the district.

GDP in per capital is €6,802 in 2010 compared to Latvia which is at €8,674. The employment rate was 88.9% at 2013 compared to the whole of Latvia 89.2%. Most of the economically active population (90%) work in agriculture and forestry related industries.

Energy demand and supply of the Region
The most significant local energy resources are fossil fuel, gas, wood and hydro energy obtained from hydropower plants situated at river Daugava (Daugava HPP cascade). Solid fuels, oil products and electricity are imported from several countries, whilst Russia is the only supplier of natural gas. The split of energy flow shows the relatively high dependence from energy import – only 33% of total energy consumption is covered by local energy sources.

In 2012 total energy consumption for heat and electricity in Latvia was 13,068 GWh - that is 1.7% more than in 2008 and 8.9% more in comparison with 2011. The ratio between heat and electricity demand is about 1:1 ± 9%. Shortages of electricity or sales of electricity surplus are managed using interconnections between regions and suppliers. Variable hydro resources influence the amount of electricity produced by Daugava HPP cascade. In 2011 the total consumption of electricity was 7,340 GWh, which was 23.9% higher than the total consumption in 2000. Such significant growth in energy consumption can be explained by a steady development of industry and energy consumption before 2008, now halted due to the current economic crisis.

The diagram in *Figure 2* shows the total energy consumption for the sectors domestic, commercial, industry, and transport as well as the total energy production and the primary energy consumption flows in Latvia 2011. (Ministry of Economics, 2013).

Information specific to the Kuldiga region is not available. Taking in account the energy consumption in Latvia 55,708 GWh (polsis.mk.gov.lv/LoadAtt/file7092.doc) and accordance per capita in Latvia as 27 MWh

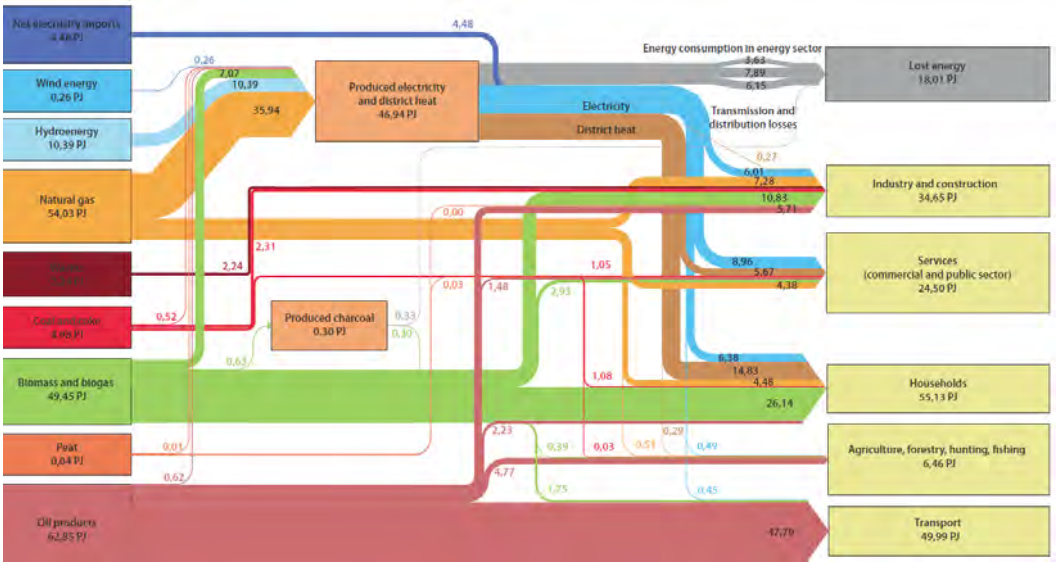

Figure 2 – Primary energy production and consumption flows in Latvia 2011

per year, the energy consumption of Kuldiga region can be estimated at around 696.35 GWh per year in 2010 and 2011. The total amount of GHG emissions in Latvia is shown in *Table 1* (Cabinet of Ministers Decree No. 348). This data is relevant to all Latvia. Information for Kuldiga or for other regions is not available.

	1990	2004	2008	2010
TOTAL	25.894	10.746	11.95	11.43

Table 1 – Total amount of GHG emissions in Latvia, $MtCO_2e$

The total amount of GHG emissions in Latvia is shown at Table 2.

	2015	2020
TOTAL, $MtCO_2e$	12.54	13.32

Table 2 – Total amount of GHG emissions in Latvia

2. CURRENT SITUATION: TARGETS RELATED TO ENERGY POLICY

The Kuldiga region did not create its own strategic planning documents, but follows the National Strategy for Sustainable Development of Latvia (Strategy, 2002), which aims to define the direction for the country's sustainable development.

Consumption of energy in Latvia is influenced by:

1. New technologies in industry and insulation of building, that will reduce consumption of energy;
2. Development of the economy, with new companies and factories in Latvia, that require additional energy.

As results the consumption of energy will increase to 16.5% in 2020 in comparison with 2010.

The document setting the policy objectives related to energy and climate change focuses on the following aspects:

- ensure the contribution of Latvia to the prevention of global climate change in such a manner that does not hinder the economic development of the country;
- promote the development of the energy industry in accordance with a balanced and sustainable economic development;

- decrease air pollutants emanating from energy facilities;
- decrease air pollution caused by transport;
- increase the use of renewable (local) energy resources;
- switch to more environmentally friendly fuels;
- increase the use of CHP;
- increase the security of the energy supply;
- ensure heating energy conservation in buildings;
- use highly efficient technologies for electrical appliances;
- implement a system to analyse and check the energy consumption.

Other Regional targets, barriers and drivers
The municipality of Kuldiga region has identified the following priorities for its budget in 2013:

- reconstruct streets and engineering communications;
- take care of the welfare of the people including new social measures;
- improve the learning and working environment in schools and kindergartens;
- develop cultural, sports and tourism infrastructure and activities;
- support initiatives for citizens and businesses for usefulness of their own region.

The infrastructure and economic development of Kuldiga region in 2013 is planned to implement European Union funded projects. The pre-financing of the projects is envisaged by loan. According to the Latvian National Development Plan 2014 - 2020 (NDP 2014-2020) one of the main priorities is "Energy efficiency and energy production". The NDP goal is "To ensure the sustainable use of energy resources by promoting access to markets, sectorial energy intensity and emissions intensity reduction, local renewable energy consumption an increasing share of the total volume, focusing on competitive energy prices."

Unfortunately, the main barrier in the implementation of these programs is insufficient funding by the Latvian state. According to the European Union's statistical office "Eurostat", data year 2012 Latvian Gross Domestic Product (GDP) per capita was the third lowest in the European Union (EU) countries, only 62% of the average.

A new wood chip powered biomass co-generation plant was built in Kuldiga in 2012, (Kuldiga Heat, 2012). Its thermal energy production is: Q = 3.06 MW and its electricity production is: P = 0.727 MW. The new plant will supply consumers in Kuldiga with full heat capacity during the coldest winter months, as well as supplying new connections.

In 2012 Latvenergo AS, the biggest state owned power supplier, Smart Technology (2012) concluded an agreement with RL Ministry of Environmental Protection and Regional Development and Environmental Investment Fund regarding the implementation of the project "Promoting Energy Efficiency in Households Using Smart Technologies". As part of the project, smart electricity meters have been purchased and installed in 500 households. A data readout system will be introduced and each household will be able to view detailed information regarding its electricity consumption using the *www.e-latvenergo.lv* customer self-service portal, as well as receiving advice on the necessary energy efficiency measures.

The project entails evaluation of the potential of smart metering systems and therefore for changing the habits of consumers and improving the energy efficiency, providing households participating in the project with information about their actual electricity consumption, consumption times. The project should promote reduction of CO_2 emissions, and promote involvement in energy efficiency and environmental protection activities. It is expected that a 10% reduction in CO_2 emissions will be achieved as a result of the project.

Kurzeme Ring project
Kurzeme Ring (KR) ("Kurzemes Loks", 2012) is an energy infrastructure project, which is planned to construct a 330 kV high-voltage, 800 MW, and 340 km power lines in the western part of Latvia in order to protect against failures and crashes. Kurzeme electricity consumption is likely to be increasing due to development of region.

KR is part of a larger project, the NordBalt, of which Estonia, Latvia and Sweden are

involved which is attempting to improve pan Baltic energy security. This international energy infrastructure project will be developed as a result the Baltic electricity market, providing electricity purchase, sale and transit opportunities with other countries of the European Union. An existing 110 kV electricity transmission network in KR cannot provide sufficient electricity supply to the Kurzeme region and therefore requires reconstruction. KR will reduce the possibility of accidents due to weather extremes, and will reduce the time of accident prevention. The project will enhance the electric power reliability in the Kurzeme district and will encourage new users connecting.

In the Kuldiga region the installation of wind power stations, and the use of geothermal energy will decrease the emission of CO_2 through the efficient use of natural resources. Some of these projects will be supported by the European Regional Development Fund program.

3. CASE STUDY: A SINGLE COMPUTERISED KULDIGA REGION UTILITIES MANAGEMENT AND CONTROL SYSTEM

In 2009 Latvia implemented an administrative reform aimed to move from a two level local public government system (1st level - 26 regions and 6 cities comprised, and the 2nd level - approximately 400 parish councils) to a one level structure (110 new regions and 9 cities). Before the administrative reform, public district heating (DH) and water supply management had been operating in each parish, town or city substantively, but due to reform, the water infrastructure DH ownership and maintenance has been shifted from the parish level to regional ownership. Therefore, the new established regions have faced an important problem, on how to organise DH and water supply services throughout the region area.

Before the reform, each parish administration operated public infrastructure all alone, in rare cases getting contributions and resources from the regional budget. The majority of parishes did not have sufficient competence and enough of resources to maintain adequate infrastructure that was partially built with the support of EU funds. Therefore, the majority of regional governments recognised the necessity to create a single system for providing utility services across the territory.

A study carried out by the authors covering three regions in the Kurzeme district: Kuldiga (see *Figure 3* and *4*), Aizpute and Ventspils, revealed common problems (Zabašta, 2010). Each parish independently performed public water and DH services, maintained accounting and obtained payments from customers. Therefore, the regional administrations did not have correct information concerning the overall situation on its territory. Since each parish maintained its own customer billing and property accounting system, the regional administration was not able to provide a common policy related to clients and debtors, due to a lack of timely information. A significant part of the regional property was not equipped with water and heat meters at the entrance to the building, thus water consumption in many cases was determined by local consumption standards, for example, per person and sometimes by the number of animals owned by property owner. Different water tariffs were applied, which were not determined based on actual costs. Because of privatisation formerly public DH, water supply and sewerage infrastructure, in many parishes it ended up in private hands and the new owners charged.

Figure 3 – Kuldiga town centre – a library building

Objectives and methods
This case study is based on research of public utilities and public services, provided after the Kuldiga region had been created during administrative territorial reform in Latvia in 2009. The case study includes Kuldiga Heat and Kuldiga Water.

Figure 4 – The view of Kuldiga town

According to Information Society and Media Directorate General, at least 20% of water is wasted during distribution because of leaks. 20 – 30% additional charge is included in client bills to cover losses in water distribution systems in Latvian municipalities. Therefore reducing waste water will decrease electrical energy consumption for drinking water and sewage water pumping.

The objective of the research in the Kuldiga region related to the issues of district heating, water supply and public facilities services and included:
- identifying the regional public water management, DH and public facilities companies' technical support, human resources, financial resources and maintenance organisation;
- providing recommendations on how to optimise the public utilities organisation and management by offering the necessary action plan for single computerised water and DH networks management and control framework.

In order to offer a computerised model for optimising water supply and DH management in the regions under consideration, the following steps were taken:
- development of a description of the technical solution;
- preparation of a description of the technical equipment and technical documentation;
- preparation of an indicative cost estimate and recommendation about implementation steps.

The outcomes of the study are related to the following fields: Social, Economic, Environmental, and Technical. These research outcomes are intended to be used for further development and modernisation of the regional utility companies and public facilities. Furthermore, the outcomes provide new guidance for the industry to strive towards technological solutions required by municipalities and public utilities.
The following methods have been used: stakeholder's interviews (the heads and the specialists of utility companies; Regional Council key personnel); statistics investigations; innovative projects experience research related to ICT technology accommodation for local needs. The working group responsible for the research included representatives of utility companies, Regional council and parishes representatives, and Ventspils High Technology Park researchers.

Long term focus
The case study aims to demonstrate the development of a computerised system for public utilities including district heating and water distribution networks. For example in 2010 – 2012 the project "E-Water", financed by ERAB, was implemented in four Latvian and one Lithuanian region. The project "Smart Metering", devoted to technology development and accommodation on behalf of water and heat suppliers in municipalities, was implemented in Ventspils region (Kurzeme) in cooperation with researchers of Ventspils University College, Kaunas Technical University, Latvian Internet Association and Ventspils Water Company in 2012 - 2013.

Three Regional councils declared the intention to create a single utility service in the region in order to ensure effective use of human and

technical resources. Therefore, in order to fulfil this goal, the introduction of ICT solution will become one of the long term regional development priorities.

Results

Kuldiga Heat Ltd

Kuldiga Heat provides heating to the city inhabitants and businesses. In the winter of 2009-2010 the heat for most of Kuldiga was produced by the new woodchip plant in Lapeglu Street, built in 2009 with the support of the European Union, which also produces electricity together with heat. The city has another 7 plants with less power using wood, woodchips and diesel.

Modernisation of heating mains and woodchip boiler construction helped to optimise the plant – nine small boilers were closed. By spring 2010 a cogeneration plant was constructed on the former boiler house site, to produce heat together with electricity. The cogeneration plant will store hot water in the summer, so at the end of the heating season it will not be necessary to operate the woodchip plant. 21 heat plants operate in the parishes of the region, predominantly using wood as fuel. In 2009 all the regional plants supplied 21,490 MWh of heating energy. Approximately 94% was supplied to Kuldiga city. Clients received bills on for €1,425,337, but clients' debt was about 9.5%.

Kuldiga Water Ltd

Kuldiga Water supplies residents with drinking water, as well as dealing with wastewater collection and treatment.

Water extraction in the city is based on 5 existing artesian wells. All wells are in good condition. Wells are operated automatically, depending on the water level in the two underground reservoirs. The city operates a modern iron removal plant. The purified water is in full compliance with EU requirements. In 2009-2010, it was planned to implement the European Union Cohesion Fund project "Development of water in Kuldiga municipality" for a value of €13.1 million. The project aimed to improve service quality, water supply and drainage system efficiency, separate rainwater from sewage, and increase service coverage and connection to the sewage system.

The main project benefit is a complete improvement to the drinking water supply in urban areas on the left bank of the river Venta. The project planned to reconstruct drainage system to provide a complete waste collection and transport in order to minimise groundwater infiltration and to prevent direct rainwater penetration into the fecal sewage system. According to Mercè Griera i Fisa, about 3% of electricity consumption is used by water pumping. The biggest electricity bill in many municipalities is the sewage treatment. Therefore decreasing the volume of drinking water, sewage and rainwater treatment will significantly reduce energy needs.

Kuldiga Water maintains 33.1 km of Water Distribution Networks (WDN) and about 60 km of sewerage network; however, it is only 32% of the total WDN. Other 70 km of WDN is operated by each parish separately. Tariffs per 1 m^3 vary significantly among parishes, but some of them do not charge per m3, due to the lack of water flow meters. In 2009 clients received bills were for €891,303 . Clients' debt was about 13.3%, which did not differ from other regions.

Kuldiga Heat Ltd issues and opportunities

Issues:

One of the main problems is that cash flow is seasonal, therefore the main income occurs during the heating season. During summer, revenues are only from advanced payments for heating in apartment buildings and from hot water sales. The company has only three lines of revenue, which implies a financial risk if any of the the systems fails to perform according to plan.

Outside the heating season, employees have insufficient load if additional works for 'external customers' are not carried out. Hot water production during the summer months ensures a loss because of the low water consumption. Loss from the heating mains is greater than 50%.

Increasing the number of water consumers in apartment buildings requires large investment, because the internal supply system in houses

was limited by cutting the hot water pipes between floors. Substations regulators, pumps, heat exchange devices are physically deteriorated, therefore capital investment are necessary, since the substations were constructed in 1995. Substation equipment is generally outdated and in most cases, it is not possible to connect remote data reading and controlling equipment. Company experts admit the heat loss due to leaks and the lack of effective measurement of consumption on clients' site is about 10-15%.

Opportunities:
In order to improve effectiveness of the company, it is recommended to continue to expand construction of the heating mains in Kuldiga city, thus making it possible to increase the number of customers, while providing employees with workload in between the heating seasons. There is also a need to connect the counties district heating system, while expanding its customer base and creating the opportunity for professional and perhaps more effectively management of the existing system. It is recommended that community scale plants are installed within municipal properties such as schools.

When plant reconstruction takes place, it is possible to replace equipment in order to perform remote data reading. Providing plumbing services for Kuldiga Service Utility buildings, could ensure additional workload. The company should also specialise in small-size, local plant construction and renovation services.

Parishes issues and opportunities
Issues:
The most typical issue is that there are a small number of heat consumers with centralised heating systems (mainly houses with 12-24 flats each). The other problem is a lack of qualified staff for heating services. The volume of produced thermal energy often is not calculated and existing boilers cannot be controlled remotely, because of outdated equipment.

Nowadays district heating is subsidised from the municipal budget. Except for Pelchu parish, blocks of flats are not equipped with substations, therefore it not possible to run boilers at optimal mode which are fired only according to the outside temperature – if the temperature is higher, the boiler temperature output will be reduced. It is not possible to regulate heat consumption on clients' premises. Also, due to very low income, residents have a limited ability to pay.

Opportunities:
The maintenance of district heating should be handed over to Kuldiga Heat. In cooperation with housing services providers this could resolve building management issues, allow installation of heat substations and monitoring systems in the houses. It could be possible to choose alternative forms of heating to district heating such as installing wood pellets, woodchip or corn boilers in each block, or maybe for two blocks. An automated system could be used remotely to read and control it.

Kuldiga Water Ltd issues and opportunities
Issues:
Worn and damaged pipes make up a large part of the water supply and sewerage networks in Kuldiga. There is a large drinking water loss due to leaks and unauthorised water extraction, estimated about 25 - 35% of the total supplied amount. The proportion of rain and groundwater in sewer water quantity as a result of weather fluctuations creates require additional power usage, thus increasing the company expenses.

A large part of the company equipment is physically worn and needs a specialised vehicle fleet renewal. Since the economic crisis hit construction business, its output declined sharply so there is a lack of new water and sewer construction requirements. Issues of sewage sludge disposal is not resolved, with options available being resource intensive and financially costly.

Opportunities:
Implementation of the project "Water Development Project in Kuldiga municipality" will enable to connect around 600 households to the centralised water supply and sewerage services. The project will drastically reduce potable water network losses and the proportion of rain/ groundwater in the sewerage system.

A reduction in construction costs enabled the construction of the water and sewage networks in Parventa Kuldiga and ensured compliance with the EU "Water Directive" by the year 2015. Thanks to Regional reform, the newly established Kuldiga Region enables to take over parishes' water network in municipalities. It helps to implement a new policy related to water supply and sanitation, as well as centralised management, including customer database management and billing for services rendered.

Recommended solutions for services and functions sharing between Kuldiga Heat, and parishes and villages
It has been identified that the optimal governance model during the transition period could be one where the responsibility for heat production and supply is by "Kuldiga Heat" in Kuldiga town, while in rural areas public building heating would be the responsbility of each parish administration. The authors propose to nominate the company "Kuldiga Heat" as a knowledgeable authority for all matters related to the boiler houses and DH network reconstruction related issues. The local authorities and businesses can help to solve reconstruction issues with "Kuldiga Heat" in order to carry forward the harmonisation of district heating in the region.

Along with the plants and DH network reconstruction, it is recommend to install remote monitoring and control capabilities. When a plant or a heating unit is equipped with remote monitoring and control equipment, it is possible to review the situation and possibly pass that object under "Kuldiga Heat" responsibility and maintenance.

A model for district heating staff establishment plan and management structure
There are no plans, in the near future to reorganise the structure and the service of district heating. If in the future a separate parish heat system was transferred to "Kuldiga Heat", the functions and responsibilities of the parish would be reviewed.

It is proposed that a model for a single district heating service company should be created through the following steps:

- introduction of remote monitoring and control system;
- creation of a unified emergency service for all utilities in the region;
- harmonisation of overlapping function among municipality-owned utilities;
- creation of housing management department;
- development of a uniform accounting system in municipality owned utilities in order to ensure that the data are comparable.

Possible solutions for services and functions sharing between Kuldiga Water, and parishes and villages
It was recognised that the optimal governance model for the near future could be one where the responsibility of of water distribution networks in Kuldiga town is of "Kuldiga Water". It is proposed that in rural areas parishes should start to hand over their water distribution networks to "Kuldiga Water" and the authors propose to declare the company "Kuldiga Water" as knowledgeable authority within the water distribution networks, including all matters related to the network construction, and reconstruction related issues.

Model for region water management staff establishment plan and management structure
Parishes should keep at their disposal a competent supervisor, who is familiar with urban infrastructure, including water management and who can perform any operational activity before Kuldiga Water experts' arrival. The parish staff for effective management of water resources management should supplement Kuldiga Water workforce. It was found that the functions that overlap should be combined and operated on the principles of mutual cooperation, such as for water emergency service. In the near future, changes for Kuldiga Water budget are not planned.

A model for a single region water supply services company should be created through the following steps:

- introduction of remote monitoring and control system;
- creation of a single emergency service for all utilities in the region;
- elaboration of unified customer database and payment tracking system;

- single tariff list;
- water consumption metering.

Technical solution for a single computerised Kuldiga region utilities management and control system
Available technology research shows that water and heating management could be significantly enhanced through automated metering information extraction and treatment system. "Kuldiga Heat" and "Kuldiga Water" experts recognise that computerised DH and water distribution network management and control system will help detect cold and hot water leaks faster and more precisely. Talsi Water company experience showed water losses decreasing by 30-40%. In 2009, the largest Latvian municipality-owned heat utility, Riga Heat, implemented a pilot project, installing remote automated metering devices in 30 substations, which proved a way of energy saving due to faster detecting of leaks and illegal connections.

A suitable framework of general functional and technical description is given in this section of the document. Implementation of recommended system would ensure end consumers received the best quality of water and heat service delivery, including a reasonable cost of services, as well as efficiency and transparency in tariffs.
In practice there are different automated meters data reading and transmission solutions (AMR) options, including "wire system", "part wireless system" and "wireless remote reading system". Taking into account pluses and minuses, wireless remote reading system is recommended.

Utilities management and control system conceptual model
A recommended conceptual model of control system for water supply and district heating services should comprise such elements.

Data readers
The water meter with pulse output according to the specification requirements of the minimum and nominal consumption should be installed. Customer with installed software and devices will be able to read remotely water consumption data for all the set points at the rate of at least once per hour.

General Packet Radio Service (GPRS) usage
Technical solutions for GPRS offer many different options, the implementation of which does not require a long development times and high costs. For example, it can be telemetry services that often used to communicate with remote objects (stationary or moving). The amount of data to be transferred is not great, but much more important is a continuous communications option with this object, saving the need for the physical presence at the object in case of an accident or checking.

Since modern Global System for Mobile (GSM) networks cover all Latvian territory, it can be concluded that the GPRS service is advantageous to use, if there is no Wi-Fi or ZigBee network. Mobile network operators offer advantageous rates. Given that the Kurzeme District covers three regions, it can be expected that the GPRS usage prices justify use of this solution.

Technical solution alignment with existing IT systems
A unified automated water management and control system must be compatible with existing information systems used for accounting and billing to customers in Kurzeme region. To this end, software will be developed to ensure the exchange of data between the existing systems and the central server of new information systems.

At the moment the Kuldiga region utilities use WinNAMS and Horizon Information System: WinNAMS system is the most popular program used by housing service providers and other utility companies. It provides the broadest functionality in the market, it is easily adaptable to different requirements and it has a convenient and intuitive user interface. The system has several WinNAMS modules, such as billing module, web access module and management cost accounting module.

The HORIZON program is used for enterprise management, finance management and accounting purposes. The program is maintained to ensure its functionality changes according to Latvian laws and regulations and for companies operating processes development. For client billing a special

HORIZON program module is used, which is specifically designed for water-supply and sewage disposal services providers.

Reference model
Considering the previously mentioned technical solutions for water distribution and DH network management and control system of the conceptual model was chosen (see *Figure 4*). This system mainly uses a GPRS network to connect and transfer data between the gateways - concentrators and the main data centre. The system also uses Radio Frequency (RF) transmitters working to transmit data between measurement points and gateways – concentrators. This technical solution will provide customers technical services, and a number of benefits, which are summarised in Table 2 opposite.

Two options for data centre development have been considered:
- first option: data centre for Kuldiga region only;
- second option: data centre is developed for the whole Kurzeme District. This option will be more cost effective particularly if the data centre serves at least two regions.

Water and heat networks management and control system development have been considered in two stages:
- first stage: the system comprehends all planned objects excluding metering equipment installed in client apartments;
- second stage: client apartments will also be equipped with metering equipment.

Summary and conclusions
First option: a data centre is developed only for the Kuldiga region. First stage investment exceeds €359,000. At the second stage, when client individual apartments will be equipped with metering equipment, an additional €306,700 will be needed. Total: €665,700.

Second option: a data centre is developed for all Kurzeme district needs. First stage investment exceeds €389,129. At the second stage, when client individual apartments buildings will be equipped with metering equipment, additional €306,744 will be needed. Total: €695,873.

In the case where a water and heat network management and control system is set up in Kuldiga Aizputes and Ventspils regions, the 2nd option, which involves a data centre for the whole Kurzeme district, would be a more cost effective solution when considering both investment and maintenance cost. Cost savings arise as each data centre requires additional security measures, including fire protection, a power supply from at least from two independent sources and local power backup. The main cost saving during operation arises as fewer staff are required in one centre. Recruiting and retaining qualified IT staff is a difficult for municipal councils.

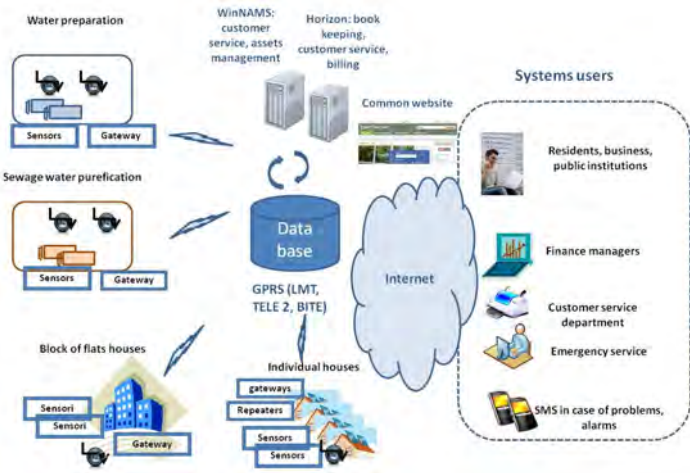

Figure 4 – Utilities management and control system conceptual reference model

Functions	Customers
Accurate, consolidated, timely information on the elevated, subordinates, and the consumption of water and heat energy volume. Ability to make analysis: consumption by time, by clients, etc., to identify outstanding, or discharge water volumes and potential leaks. Opportunity to rationalise and transform the emergency and dispatching services.	Kuldiga Water ltd, Kuldiga Heat ltd and Kuldiga Utilities Services ltd management
Information on water treatment plant operation: which of the pumps works, but which does not, in what working regime. Regular information on the raised and supplied into the network of water volumes. Information about sewage purification stations and pumped drainage water volumes: the pumps are working, or not, and in what working mode. Warnings about unusual water consumption (an accident or fraud). Data on the pump in the boiler house operations. Staff to be on duty at home can receive SMS alerts on the issues.	Kuldiga Water ltd, Kuldiga Heat ltd and Kuldiga Utilities Services ltd technical staff
Data about supplied water volumes to apartment blocks, individual homes, public institutions and companies. Information on the amount of heat consumed by substations. Information on consumption of hot water and heat energy volumes by apartments. Automatic transfer of data from the System database to existing IT systems. The possibilities of customer invoices publish on the Internet and send e-mail (to withdraw from bills sending by post). Refuse data collection on the phone or with subscriber book assistance. No need to carry water meter measuring inventory on client sites.	Kuldiga Water ltd, Kuldiga Heat ltd and Kuldiga Utilities Services ltd Customer Services and Finance department.
Data of apartment blocks water volumes consumption. Data about supplied on cold and warm water volumes apartment house apartments.	Kuldiga Utilities Services ltd management and technical staff
Technicians in counties will be able to make connections to the system using internet. Thus metering data will be available on line.	Parishes staff
Ability to receive bills on website or via e-mail and get bill information via SMS.	Clients: residents and companies

Table 2 – Technical solution advantages and services for users

Outcomes
The research has revealed that the public services, provided by community utilities, are decentralised, fragmented and inefficient. The introduction of a single computerised utility management and control system in the Kuldiga region would improve social, economic, environmental and technical situation of the region. The development of the single utility management and control system was supported by all involved utilities and region council members. The main barriers include:
- lack of financial resources;
- fears related to increasing of tariffs;
- the lack of technical competencies;
- the necessity to adjust legislation.

4. CONCLUSIONS

Research provided for three Kurzeme regions, has revealed common problems:
- fragmentation in the providers of public water and DH services;
- lack of single accounting and billing system for clients in parishes and towns;
- lack of correct information concerning the services provision and consumption.

A significant part of municipal property was not equipped with water and heat meters at the entrance of the buildings and in clients' premises, thus water and thermal energy consumption in many cases are determined by local consumption standards. Cold and hot water leaks in distribution networks are not detected, because of the lack of appropriate data about the state of the networks.

In order to improve efficiency of public services it is suggested to reorganise municipality owned utilities and equip them with Information and communication technology tools. This case study provides information on how to improve efficiency of district heating and water distribution networks, which would encourage savings of heat energy and natural resourses. A study carried out in a frame of the project LV0076 "Development of community facilities system model in the Kurzeme region" revealed similar problems in Ventspils and Aizpute regions where the research team offered similar solutions including to merge fragmented local municipal companiesand to provide a model of computerised control system for district heating and water supply services.

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This publication is a section of the book
"Smart Energy Regions"
Published by The Welsh School of
Architecture, Cardiff University,
Bute Building, King Edward VII Avenue,
CARDIFF, CF10 3NB, UK.
Publication date: May, 2014; ISBN: 978-1-899895-14-4.

The COST Action TU1104 Smart Energy Regions brings together over 70 researchers from European institutions to investigate the drivers and barriers that may impact on the large scale implementation of low carbon technologies in the built environment. The book "Smart Energy Regions" is the outcome of the Working Group 1 of the Action and collects analysis and case studies from 26 European countries. For more information about the Action and COST please visit www.smart-er.eu and www.cost.eu.

ESF Provides the COST Office through an EC contract

COST is supported by the EU

RTD Framework Programme

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COST funds pan-European, bottom-up networks of scientists and researchers across all science and technology fields. These networks, called 'COST Actions', promote international coordination of nationally-funded research.

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- building capacity by connecting high quality scientific communities throughout Europe and worldwide;
- providing networking opportunities for early career investigators;
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Through its inclusiveness, COST supports the integration of research communities, leverages national research investments and addresses issues of global relevance.

Every year thousands of European scientists benefit from being involved in COST Actions, allowing the pooling of national research funding to achieve common goals.

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This publication is supported by COST.