LIFE LOCAL ADAPT | Integration of climate change adaptation into the work of local authorities

Valka Municipality Strategy for Climate Change Adaptation

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1 Introduction

Several cycles of climate change occurred throughout our planet's history. They could be attributed to orbit change or amount of solar energy received unlike current warming trend, which is indisputably associated with human activity and emissions linked to ever-increasing energy use. However, in similar fashion, it can be limited and counteracted with targeted action. Although negative impact of climate change is a global issue, solutions must be sought at all levels. Nature protection and sensible urbanization planning must be implemented on local and regional scale.

Development and implementation of ambitious projects can pose a significant challenge for smaller municipalities due to the lack of knowledge, tools or financial means. Nevertheless, even minor changes and actions can add up to a significant cumulative effect. Preserving a single great-tree or preventing a marsh from draining in some cases can amount to saving a unique ecosystem. Additionally, green initiatives are often part of existing regional planning goals to ensure safety and wellbeing of inhabitants and can be easily incorporated into objectives for climate change adaptation.

2 Current situation

2.1 Environmental characteristics

Valka County is located in the northeast of Latvia. It includes five parish territories and the city of Valka. The administrative centre is the city of Valka, located in the hillocks of Ergeme, in the Sakala Highlands. The valley slope stretching through cities is crossed by Pedele River. In the western part of city in the hillocks of Burgas, the highest points can be found elevating up to 90 m a.s.l.

In the beginning of 2015, the population of Valka County was 9670 (incl. 5590 in Valka), but in recent years it has decreased at the rate of approximately one hundred per year. The average population density in the county is 10.7 inhabitants /km^2.

Valka County's vision is a favourable, clean and tidy forest-rich environment with quality infrastructure for living and conducting business in Northern Vidzeme.

There are no meteorological observation stations available in Valka County. Therefore, it's relatively difficult to identify climate change.

While writing this section, several documents developed by the Valka County Council have been used to obtain more detailed information on different areas and the environmental situation in general.

- Environmental Review (2016), Valka County Council
- Valka County Regional Planning 2016-2017, Valka Dome (2015)

2.1.1 Air temperature

The average annual air temperature in the Valka County ranges from + 4.6 °C in the southern part of the region to 5.0 °C in the northwest of the region. In the course of the year, the coldest month is January with an average air temperature from -7.0 in the southeast to -6.6 °C in the northwest and an average minimum air temperature from -9.5 °C to -10 °C. The warmest is July with a monthly average temperature of +16.1 to + 16.5 °C and an average maximum of +21.2 to + 21.9 °C. To this day, the absolute minimum air temperature recorded was -40 to -42 °C, the absolute maximum air temperature recorded was +33 to + 34 °C.

Compared to other regions of Latvia, Valka region has a relatively short vegetation period. In the summer of 2015, the temperature exceeded +30 degrees for several days, but already in the third week of August the temperature was only slightly above 0 °C, and frosts were observed in some areas.

2.1.2 Precipitation

On average, precipitation can occur every other day. The annual rainfall is 670 to 710 mm. The highest precipitation is observed in July and August (monthly precipitation is 85 to 95 mm), the least - in February and March (monthly precipitation level is 25 to 35 mm). Generally, the prevalent are winds from the south, southwest, and west directions. The highest wind speed is in November-January (with monthly average of 3 to 5 m/s), the lowest - in July-August (monthly average of 2-3 m/s).

2.1.3 Water bodies

Valka county is located more than 100 km from the sea coast.

Surface waters in Valka County occupy an area of 5278.8 ha. Based on the hydrographic breakdown, the watercourses and water bodies in the territory of Valka are located in the Gauja River, Salaca and Emajogi river drainage basins.

The main part of the hydrographic network in the Valka area is the rivers that represent the 3 river mouth areas - Gauja, Salaca and Emajogi (flowing through Estonia to the Gulf of Finland). There are 46 rivers located or spanning the county, of which 18 exceed 10 km length. The largest is Gauja (about 80 km flowing through in the county). Vija, Seda, Pedele and Omulupe are from 25 to 100 km long.

The Gauja drainage basin (including its tributaries and their basins) occupy mainly the depression of Vidusgauja, Aumeistar valley and part of Vidzeme highlands. Gauja has the largest left tributary Vija, while others are considerably smaller. The upper reaches of the tributary basins on the left bank of the Gauja are located in the northeastern part of the Vidzeme upland. River downslopes are relatively small. For the largest rivers in the upper reaches they usually exceed 4 m/km, for lower reaches they are smaller- 1-2 m/km. For some of the smaller rivers in the upper reaches drop can range from 8-11 m/km to less.

The northern part of the county is located in the **Salaca drainage basin**, whose rivers are primarily characterized as the tributaries of the Burtnieks (Seda etc.). These river basins are mainly in the North Vidzeme lowland, with the lower part of the central part forming Lake Burtnieks. The river downslopes are not particularly steep (0.1 - 0.2 m / km), which complicates the drainage and contributes to marsh formation. The marsh proportion of basin of the Sedas River is 10% (in Latvia, on average - 9.9%). River network density – 0.4 km/km^2.

In the very northeastern part of the region, the rivers - Omulupe and Pedele are part of **Emajogi drainage basin** (Estonia).

Rivers of Valka region belong to the lowland water flows. During summer groundwater is the main source for the rivers, while in other seasons, melting snow and rainwater are primary sources.

From all the rivers found in the Valka County, only the Gauja is included in the public river list.

2.2 Characterization of different areas

This chapter will describe the areas that were previously included in the climate change studies.

2.2.1 Biodiversity and ecosystem services

The biodiversity of the Valka county area is linked to a number of protected areas.

The following specially protected nature territories are located in Valka county:

- North Vidzeme Biosphere Reserve;
- Protected Landscape Area North Gauja - NATURA 2000 Territory;
- Nature Reserve "Kārķu Swamp" - NATURA 2000 territory of 292.5 ha;
- Nature Reserve "Bednes Swamp" - NATURA 2000 territory of 22 ha;
- Nature Reserve "Vadaiņu Swamp" - NATURA 2000 territory of 221.4 ha;
- Nature Reserve "Sedas Swamp" - NATURA 2000 territory 330.1 ha;
- Nature Reserve "Burgas Meadows" - NATURA 2000 territory of 183.3 ha;
- nature reserve "Lapinu lake" - NATURA 2000 territory of 0.8 ha;
- Nature Reserve "Taurīšu lake" - NATURA 2000 territory of 1.6 ha;
- 85 Micro nature reserves.

266 protected trees or Great-trees (according to the criteria set by the Cabinet of Ministers) grow in the Valka region and are listed in the Annex 3 to the Explanatory Memorandum of the Valka County Spatial Planning.

The Great-/Heritage trees play an important role in maintaining overall biodiversity, as the diversity of their habitat is an important environmental quality characteristic. The Great tree is perceived as an independent ecosystem, a living space for many rare and endangered species of mammals, birds, insects, mushrooms and other organisms. The most important regulation defining the status of the Great-tree and its management is the Law "On Specially Protected Nature Territories" (LV, 5, 25.03.1993), issued on 2nd of March, 1993, and

Cabinet of Ministers Regulations No. 264 (16.03.2010) "General rules for the protection and use of specially protected nature territories".

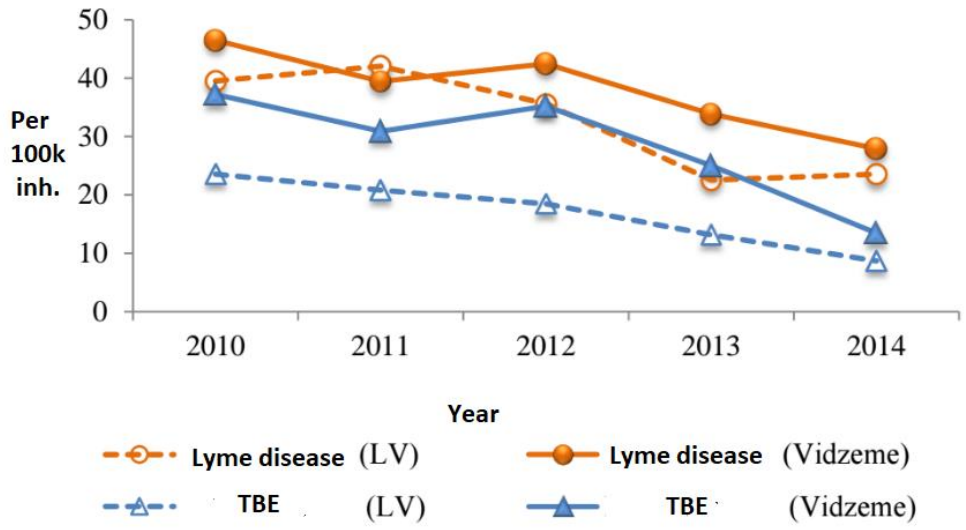
2.2.2 Health and Welfare area

There are 8 family doctors available in the Valka county (7 in Valka, 1 in Karki). Emergency medical care can be received at the Emergency Medical Care Center, where the assistance is provided by a doctor and a nurse or „Vidzeme Hospital", Ltd. In Valka there is one emergency care paramedic team on duty [(1)].

Health and welfare data is available for the whole Vidzeme region, including Valka county information [(2)]. In the Vidzeme region, similar to Latvia as a whole, the most common causes of death are: cardiovascular diseases (60% of all deceased in 2014 aged younger then 64 - 35% of all deceased), malignant tumors (21% in 2014 aged younger then 64 - 27% of all diseased) and external causes of death (5.8% in 2014 aged younger then 64 - 18% of all deceased). Compared to the average national level, Vidzeme region exceeded the average mortality rate related to cardio-vascular diseases (CVD) by 14% (2014), furthermore, dinamic rate is rising since year 2012. Also standardizing by age groups, Vidzeme level is higher by 9% compared to national average.

According to experts, the frequency of vector-borne diseases is directly linked to the prolonged metrological summer and autumn. Shorter winter time can increase incidence of vector-borne infectious diseases. Although rate of tick-borne encephalitis (TBE) infections varies annually, overall there is a decrease in the incidence of TBE disease, while the incidence of Lyme disease is increasing.

Figure 1: Incidence of Lyme disease and tick-borne encephalitis (TBE) in year 2010-2014, per 100 000 inhabitants [(2)]



2.2.3 Landscape planning and Tourism

Several local architectural, cultural and heritage objects of significance are located in the Valka area.

Valka County has a specially protected landscape area of national significance "Northern Gauja". Its territory includes Valka, Vijciems and Zvartavas parishes. The North Gauja Valley has a mosaic landscape with a great diversity of habitats and species.

Vijciems parish is a meadow-rich territory with elements of agricultural activity dating to various periods of history: plantations (groups of trees) around courtyards, old alleys, masonry buildings, crooked rural roads, manor houses. The most valuable landscape of the countryside is the North Gauja Protected Landscape Area.

The most valuable landscapes of the Karki parish include the road section from the „Naglas" to the „Vēveri", the surroundings of Lake Veckarki, the surroundings of Lake Cepsi, the surroundings of Lake Bezdibeņa, the High (White) Mountain, the Spalu alleys, the old tree line along the road before Karki center border, arriving from direction of Rujiena.

The contrasting landscape of Zvartava parish is formed by the distribution of tree species and the aeolian dunes. Visually appealing forest landscapes can be admired along Valka - Viresu road. 4915 ha of Zvartava parish territories (28.9% of all parish territories) are included in the protected landscape area "North Gauja". The wide view of the Gauja valley landscape opens in Zvartavs parish near the Valka - Viresu road, in the Cirgala forest.

Landscaping would be desirable in several places. Park-like meadows in Valka and Zvartava parishes, inland dune array in the vicinity of Cirgala, and Gauja coastline can be included in the list of significant landscape elements. Particularly attractive is an opportunity to observe landscape changes of North Gauja area resulting from transformations of the Gauja riverbed.

In Ergeme parish, the structure of the landscape is determined by the detailed mountainous terrain of Ergeme hillsides. The aesthetically and historically significant elements of the landscape - oak alleys, manor and old-town buildings and parks, masonry buildings and their ruins, farmhouse greenery - are all typical for North Vidzeme. Great landscape value is attributed to un-straightened, unregulated small rivers.

There are seven guest houses, four country houses, one farmhouse, one recreation center and two youth hostels involved in tourism industry in the county. As an additional service, accommodation providers offer tent and caravan sites.

2.2.4 Agriculture and Forestry

Overall 58.57% of the area is covered by forests. They are considered to be the largest treasure of the region. Forest area in Valka is expected to increase, due to natural over-growing of non-agricultural land as well as artificial afforestation.

2.2.5 Civil protection

In accordance with Article 17 of the "Civil Protection Law", objects of increased danger were identified in the Valka region.

List of high-risk industrial accident objects of potential national significance includes:

- "Tīne", Ltd., (Valka, Tālavas 35a) - petrol station (Cabinet Regulation No. 532 of 19.07.2005 "Regulations on the Procedure for the Evaluation of Industrial Accident Risk and Risk Reduction Measures").

High-risk fire-hazard areas of potential national significance include:

- Seda peat bog,
- Forests located along the railway between the Valmiera and Smiltene roads up to the Gauja River.

Prospective flood areas of national significance:

- Valka town - the dam on Pedele River, Zāģezera and Sēlijas Street. In the event of an emergency, bordering areas are flooded.
- Gauja River overflowing during spring floods will cause flooding in:
  - Valka parish area houses: "Vekši", "Krastiņi", "Marsi", "Mezaparks" and wood-working company "Ievinas".
  - Zvārtava parish area houses: "Jauntillikas", "Rāmnieki", "Pedraudzes" un "Klajumi".

In the event of overflow of these high risk areas, access roads, production facilities and public housing will be damaged.

County level significance territories and objects:

- Former Siberian Plague Cemeteries: Valka Parish "Vēverzemnieki".
- Explosive objects:
  - gas filling station in Valka;
  - the largest petrol stations in the territory of Valka.
- Fire hazard sites and areas:
  - petrol stations;
  - gas filling stations (Valka);
  - wood processing companies;
  - peat bog; meadows on peat layers;
  - forest area;
  - former municipal waste dumps.
- Among the potentially most dangerous motorways in the Valka county following are identified:
  - National Highway A3;
  - Railway Riga - Tallinn and St. Petersburg.

2.2.6 Construction and Infrastructure

Valka county occupies territory of 906.8 km², including the county center - the city of Valka and territories of 5 parish administrations. Population number reached 9670 on 1st of January, 2015. The region is crossed by main road A3 / E264 Riga - Tartu, and the Riga - Tallinn railway, running via Valka and Valka parish.

Valka County territory is crossed by 110 kV and 330 kV overhead power lines. Electricity transmission network substation "Valka" is located in Valka, Raina Street 90. "Latvijas propana gāze", Ltd., Valkas Liquefied Gas Supply Station is providing gas for Valka region. Resi-dents use liquefied central gas systems and gas cylinders. Telecommunications in the coun-try are ensured by fixed and mobile network infrastructure. „ Lattelecom", Ltd., is the main fixed phone network provider. The company owns 91% of shares in the communications market. The rest of the market is occupied by alternative operators. Most areas, including the largest populated areas, have mobile coverage. The Internet is available in almost all requions of Valka county. In all parishes, it is provided via radio waves.

Valka Town, Valka Parish Village, Karki Parish Village, Ergeme Parish Village, Zvartava Parish, Vijciems Parish Village People use centralized water supply system. In Valka Town, Valka Parish Village, Karki Parish Village, Ergeme Parish Village, Vijciema Parish Village, centralized sewage systems are installed.

The heat production in the Valka region is organized in three ways:

- Central Heating Systems: in Valka city and Ergeme (Ergeme parish), which provides centralized supply of heating and hot water to the population;
- Local heating systems: each customer (building or building complex) has a separate heat energy production facility for providing hot water and heating (for example, a pellet boiler in Valka kindergarten "Pumpuriņš", wood heating in Seli village, etc.);
- Individual heat supply: the inhabitants have installed a hot water and heating supply system in their apartments, in isome cases individual heating system is installed in the municipal buildings (for example, a school building in Kārķu parish, a multi-apartment building in Zvārtava parish, etc.).

2.3 Climate change risks

Since 2017 Valka County is participating in European Member State Project LIFE LocAL ADAPT for Integration of climate change adaptation into the work of local authorities No. LIFE15 CCA/DE/000133. This project was focused on identifying main risks and vulnerabilities caused by climate change, as well as determining possible adaptation measures. These documents are based on similar research conducted on national scale, and further adapted to Valka county situation.

It must be taken into account that Valka County occupies relatively small territory in context of climate change. It was considered when assessing both the risks and adaptation measures. Therefore, although there were total of 30 risks identified at national level, with number of adaptation activities for each, only selected risks and related adaptation measures were highlighted as relevant to Valka County situation.

In order to discuss and evaluate the risks and preventive measures for Valka situation specifically a group of local specialists were gathered in Valka City Council to attend a meeting on

8th of September 2017. Representatives from various fields were invited – health and welfare, construction, tourism, civil protection and work safety, county planning and development, as well as management.

Participants were involved in open discussion and share their opinion on what are the main risks of climate change, and what should be the focus of the project going forward. Following risks were highlighted:

1.2 Generalist species replacing specialist species.

Experts pointed out a Heracleum (hogweed) invasion as one of the main concerns. Mapped spread of Heracleum genus species in Valka County in attached to the report in Annex A.

Suggestions: Herd grazing in Heracleum spread territories, mowing, chemical control (herbicides).

2.2 Chronic diseases flare (CVD, diabetes etc.) and increase in mortality rate.

Including acute viral infection outbreaks in organized groups.

Suggestions: Informative seminars, raising awareness of and educating medical personnel and social workers.

2.3 Increased incidence of diseases and/or endemic occurrence of insect-born infections.

Particular emphasis was placed on the increased tick distribution area and prevalence of tick-borne diseases. It must be determined, if Valka County is an endemic region, and if publicly-funded vaccination scheme is available.

Suggestions: Informative seminars, raising awareness of and educating medical personnel and social workers. Increase public awareness.

3.2 Flood risk (rising water levels in rivers and lakes), 5.5 Road damage caused by rainfalls and 6.2 Flood risk caused by heavy rainfalls Biodiversity and ecosystem services

Flood affected areas were identified; risk area map was added to the report.

Suggestions: Improve pumping station operation. The problem of capacity has been identified, as in the case of heavy rainfall, it's not sufficient to pump large volumes of water; an increase in capacity is required.

Develop a technical guidance project to optimize rainwater drainage systems.

Inspection of canal locks on river Pedele (Selija Street) to assess its operational state.

5.1 Storm caused rooftop damage. 5.6. Electric distribution network disruptions due to wind gusts.

During storm in 2016, rooftop of Mierkalna folk house was displaced, and trees fell in surrounding territories.

Suggestions: Tree removal around power lines to prevent wind-caused disruptions. Exploring alternative energy sources.

In addition to identifying possible risks, participants filled in a survey, assessing the likelihood of occurence of those risks and the ability to mitigate or prevent them at Valka county level, assigning a score 1-5, 1 indicating the lowest probability, and 5 – very high probability. This method was used to evaluate all 30 risks.

Obtained results yielded average rating of 2,9 points for risk probability, and 1,9 points for impact mitigation probability. Risk probability average rating was exceeded in case of 17 possible risks, and 15 risks were rated higher than average for impact mitigation probability. Out of these, 9 risks were assigned above average rating for both risk probability and mitigation possibility.

Table 1: Assessment of likelihood of risk occurrence and viability of mitigation measures

		Likelihood of occurence	Ability to affect	Discussed
	Identified Risks	AVERAGE		
1. Biodiversity and ecosystem service area				
1.1	Water body contamination/eutrophication	**3,33**	**2,33**	
1.2	Ecologically plastic species (generalist species) drive out eco-logically sensitive (specialist species)	2,44	1,67	
1.3	Infection diseases uncharacteristic for Latvia	2,57	2,29	
1.4	Entrance and increase of viability of new species	2,67	1,89	
1.5	Increase in pest and pathogen spread and viability	**3,33**	1,44	
1.6	Flood risk (storm surge at sea coast)	1,75	0,75	
2. Health and welfare				
2.1	Risk of increase in acute intestinal infection diseases, disease flare	**3,44**	**2,33**	
2.2	Chronic diseases flare (CVD, diabetes etc.) and increase in death rate	**3,22**	**2,33**	✓
2.3	Acquired endemic state and/or increase in diseases caused by insect-born infections	**3,33**	**2,33**	✓
2.4	Increase in incidence and mortality from respiratory diseases, especially within particular risk groups	2,89	**2,44**	
2.5	Increase in heat stroke frequency	2,44	**2,44**	
2.6	Internal and external migration	1,89	**2,00**	
3. Tourism and landscape planning				
3.1	Change in winter tourism season length and characteristics	**3,56**	1,44	
3.2	Flood risk (water raising in rivers and lakes)	**3,33**	1,44	
3.3	Flooding and erosion of the Baltic Sea and Rīgas Bay coastal areas	1,80	0,80	
3.4	Change in summer tourism season length and characteristics	**3,67**	1,78	
4. Agriculture and forestry				
4.1	Spread of tree diseases and insect pest populations	**3,22**	1,78	
4.2	Damage caused by spring frosts	**3,44**	1,33	
4.3	Storm risk	**3,67**	1,67	

5. Construction and landscape planning				
5.1	Increased storm-caused rooftop damage	**3,78**	**2,33**	✓
5.2	Building damage risk due to rainfall caused flooding	**3,22**	2,00	
5.3	Snow caused overload increase on rooftops	2,67	**2,33**	
5.4	An increase in indoor overheating	2,22	**2,67**	
5.5	Road damage risk due to rainfall caused flooding	**3,11**	**2,44**	(✓)
5.6	Electrical transmission network damage due to wind gusts	**3,67**	**2,78**	✓
5.7	Increased demand for electricity during summer	2,67	**2,11**	
6. Civil protection and emergency assistance				
6.1	Flood and ice drift	2,44	1,78	
6.2	Flood risk caused by heavy rainfalls	**3,44**	**2,00**	✓
6.3	Storm and storm surge risk	1,00	0,67	
6.4	Forest and peat fire risk	**3,33**	**2,22**	

2.4 Prioritized risks

Main risks were determined based on discussion and survey results. These risks, mitigation and prevention measures were further analysed.

3 factors were taken into account when selecting the risks:

- Was the risk considered a priority during the discussion;
- Does the risk probability rating exceed average rating determined by the survey;
- Does the ability to affect/mitigate risk at Valka County level exceed average rating determined by the survey;

Table 2: Risks identified as a main priority

2.2	Chronic diseases flare (CVD, diabetes etc.) and increase in death rate	**3,22**	**2,33**	✓
2.3	Acquired endemic state and/or increase in diseases caused by insect-born infections	**3,33**	**2,33**	✓
5.1	Increase storm-caused rooftop damage	**3,78**	**2,33**	✓
5.5	Road damage risk due to rainfall caused flooding	**3,11**	**2,44**	✓
5.6	Electrical transmission network damage due to wind gusts	**3,67**	**2,78**	✓
6.2	Flood risk caused by heavy rainfalls	**3,44**	**2,00**	✓

During the meeting it was established that risks no.5.5 and 6.2 are often grouped together as flood risk, with road damage as a main concern. In national expert studies above mentioned risks were determined from two separate areas - Construction and landscape planning and Civil protection and emergency assistance. Therefore, this is the same risk considered from two different perspectives. In context of Valka county, road damage was assessed to have the main impact.

As a result, following risks were prioritized:

1. Chronic diseases flare (CVD, diabetes etc.) and increase in death rate

2. Acquired endemic state and/or increase in diseases caused by insect-born infections
3. Increase storm-caused rooftop damage
4. Electrical transmission network damage due to wind gusts
5. Road damage risk due to rainfall caused flooding

3 Political goals

Environmental protection and regional development ministry guidelines for year 2014 – 2020 can be found on their homepage. Two goals are determined in the document section "Climate change":

- To ensure Latvia's contribution in reduction of global climate change, considering countries environment, social and economic interests;
- Promote Latvia's readiness to adapt to climate change and associated impact

Valka county climate policy is closely related to Valka's development strategy. The development strategy of the Valka region has been based on the vision of 'Valka region - as favourable, clean and tidy forest-rich environment with a quality infrastructure for living and conducting business in Northern Vidzeme. Adaptation to climate change is in line with Valka's development goals.

- Development of human resources;
- Well organized infrastructure and services;
- Entrepreneurship development;
- Assessed natural assets and preserved cultural and historical heritage.

Other planning documents of Valka county have been used to develop this strategy.

4 Action plan

Guidelines and an action plan for the implementation of the climate policy objectives have been developed also at national level. All activities are divided into five sub-sections. The first (1) and third (3) sections relate to the GHG emissions system management. The remaining sections refer to the activities required to mitigate the negative effects of climate change:

1) GHG reduction and CO2 capture
2) Adaptation to climate change
3) GHG emissions inventory and forecasting
4) Research on climate change, climate change mitigation and adaptation to climate change
5) Informing and educating the public

Considering previously described risk analysis and the identification of the adaptation activities, table 3 indicates how these measures can be applied to Valka county.

Table 3: Valka County climate change adaptation measures in context of national climate policies

Latvia's Climate Policies	Valka county climate change adaptation measures
Analyzing risk and impact and identifying measures to adapt to climate change	A project that includes activities to identify and analyze the risk of climate change and adaptation activities in Valka County is conducted since 2017 under the LIFE program
Development of climate change monitoring system	The measure is to be implemented at the national level. Some parameters (mapping of invasive species distribution and flooding areas, mortality rate and causes, etc.) will continue to be monitored at the local level
Improvement of the National System for preparedness and response to the consequences of climate change	Does not apply to Valka county - the measure is to be implemented at the national level
Providing infrastructure to prevent flood risk caused by climate change	- Mapping of potential flood and wind-caused flooding areas. - Check and, if necessary, improve the operation of the pumping station - Inspect and, if necessary, improve the rainwater drainage system - Inspect and, if necessary, improve the locks on the Pedele river (Selija street)
Implementation of coastal erosion risk reduction measures to protect significant public infrastructure	Does not apply to Valka County - the measure is to be implemented at the national level
Integrating climate change issues into various sectoral policies and local government activities, incl. development of regional strategies / plans	Does not apply to Valka County - the measure is to be implemented at the national level
Implementation of research on climate change, mitigation and adaptation of various areas to climate change	A project that includes activities to identify and analyze the risk of climate change and adaptation activities in Valka County is conducted since 2017 under the LIFE program. During this project, in addition to the above-mentioned adaptation measures, further steps have been identified: - Mapping of Heracleum (hogweed) invasion - Assessment and limitation of the invasion of Heracleum genus species - Tree trimming and maintenance of energy supply networks to prevent and limit their damage in the event of storms - Explore possibility of introduction and exploitation of alternative energy sources
Informing and educating the public	- Informing and educating medical staff, social workers and other officials working with people belonging to a particular risk group

	- Education of healthcare workers, social workers and other officials working with organized groups. - Informing the public

Altogether 10 events have been identified, with implementation stages at different levels.

Measures that have already been implemented or are currently being implemented:

1. The identification, analysis and development of adaptation measures for climate change are taking place within the framework of the LIFE LocAL ADAPT project of European Community for environment and climate action LIFE 2015 programme;
2. Mapping of potential flood and wind caused flooding territories - cartographic material available at the Valka County Council;
3. Mapping of the Heracleum (hogweed) invasion - cartographic material available at the Valka County Council;
4. Informing and educating health professionals, social workers and other officials working with the people belonging to a particular risk group - In December 2017, an informative seminar on tick-borne diseases and viral infections was organized in the framework of the EPICURO project.

Although initial steps have been taken, it is important to continue these activities - for example, to update cartographic material, continue training and education, follow up and participate in activities that are implemented on a national scale.

Measures not yet implemented due to additional funding requirements:

1. Inspect and, if necessary, improve the operation of the pumping station;
2. Inspect and, if necessary, improve the rainwater drainage system;
3. Inspect and, if necessary, improve effectiveness of the locks on the Pedele river (Selija street);
4. Assessment and limitation of the invasion of Heracleum genus species (hogweed);
5. Tree trimming and maintenance of energy supply networks to prevent and limit their damage in the event of storms;
6. Explore possibility of introduction and exploitation of alternative energy sources.

5 Monitoring mechanism

Although manifestation of climate change is easily observed, due to the complexity and dynamic nature of the issue, there is still significant uncertainty about the rate of change. However, development of new methods and technologies, as well as increasing public awareness and support, drive the progress in the field leading to a better understanding, mitigation and monitoring of climate changes.

Multiple projects are implemented at international and national levels. Goverment agencies and organizations avail of state of the art technology and satellite measurements to gather information about the climate variables [(3)]. This data can further be used to assess extent of

adverse changes and their impact, to develop future forecasts and strategy, and adjust infrastructure planning accordingly.

Considering a high cost of monitoring system installation, operation and maintenance, individual municipalieties are limited in measurements and observations that can be made at a local level. Likewise, Valka county heavily relies on the data obtained by national monitoring systems and studies carried out by regional meteorological centres.

Following steps can be employed as a checklist to monitor adaptation measure implementation progress:

- Cooperating with local institutions to gather and analyse relevant data;
- Participating in national and regional climate change adaptation and monitoring initiatives, reviewing obtained data and assessing its relevance to local situation;
- Recording number of informative sessions on health related topics in context of climate change, as well as number of attendees;
- Recording number of inspections, current condition and improvements made to flood prevention systems (drainage systems, water pumping stations, locks on rivers);
- Mapping of potential flood and wind caused flooding territories;
- Mapping distribution area of invasive species (Heracleum genus) at various points of adaptation measure implementation;
- Performing and recording regular tree trimming around electricity transmission and distribution lines to prevent power outages.

Based on analysys of obtained data, action plan can be corrected and adjusted accordingly.

Assessment of the effectiveness of each mitigation measure can be obtained by analysing relevant data prior and post measure implementation. For example, comparison of the distribution area of invasive species before and after targeted infestation limitation activities can indicate action effectiveness in reducing spread of generalist species.

However, challenges can arise during analysis of correlations in results obtained. Identified connection can be misleading: increase in diagnosed Lyme disease cases can appear to be a result of better public awareness and education of medical personell (adaptation activity), but it could also be attributed to prolonged metereological summer, thus increasing overall infection incidence and number of diagnosed cases, even if detection percentage remains the same. Therefore sucess of each adaptation measure has to be assessed in context of other contributing factors.

6 Summary

Valka County is a northeast municipality of Latvia, occupying territory of 906.8 km², including the county center - the city of Valka, and territories of 5 parish administrations.

The area is rich in appealing landscapes, formed by scenic meadows, rivers and forests - the main treasure of the area, covering more than half of the territory.

County's vision is a favourable, clean and tidy forest-rich environment with quality infrastructure for living and conducting business in Northern Vidzeme.

A number of high risk objects and areas are located in the county, posing fire-hazard and flooding risk. In the event of spring floods or river dam damage, access to roads, production facilities and public housing can be adversely affected.

Valka county occupies a relatively small territory in context of climate change. Due to restricted financial and human resources, there is a limited scope of assessment, implementation and evaluation of mitigation measures that can be accomplished.

Specialists from various fields were invited to Valka City Council to participate in discussions to identify risks and evaluate preventive measures applicable to local situation. Out of 30 risks identified at the national level, only those with the highest probability rating and viability of mitigation measures were highlighted as relevant:

1. Chronic diseases flare (CVD, diabetes etc.) and increase in death rate
2. Acquired endemic state and/or increase in diseases caused by insect-born infections
3. Increase storm-caused rooftop damage
4. Electrical transmission network damage due to wind gusts
5. Road damage risk due to rainfall caused flooding

Mitigation measures were evaluated and action plan designed to limit adverse effect of identified risks, focusing on education sessions for health professionals, inspection and improvement of flood prevention systems; mapping of potential flood areas and distribution of invasive Haracleum species, and trea trimming to prevent power outages during storms.

Complex nature of the risks associated with climate change and lack of historical data make it a challenging task to determine the impact of each separate adaptation event. However, it’s clear that failure to implement identified actions will result in significant adverse effects for regional development.

Monitoring and evaluating adaptation mechanisms is a relatively novel area, therefore data and experience exchange is of paramount importance. Due to a dynamic nature of the issue, action plan should be regularly reviewed and adapted in light of new information and emerging methods for efficient mitigation of climate change.

7 Literature

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8 Annex A: Distribution of invasive Heracleum genus species in Valka county