Climate change adaptation of major infrastructure projects

Country report for Latvia

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Note for the readers of the printed version: the present country report links to a large number of resources via hyperlinks, which by nature are only active in the electronic version. In order to find the identified resources, an online search will usually deliver the right result; but otherwise it is also possible to make use of Annex II of the main report where all the identified resources and their hyperlinks are presented.

Disclaimer: The identified resources are non-exhaustive and present a snapshot of the readily available and accessible material during 2017. This information was collected through finite web-based desk research, and through questionnaires and interviews aimed at the relevant national competent authorities (ESIF managing authorities, research institutes, ministry officials, etc.). Further resources might be available but not accessible due to privacy restrictions, or a lack of mandate to share related material. Following the publication of the present report, more resources will continue to reach the public domain, including through Climate-ADAPT and the identified national websites.

1. INTRODUCTION

The EU Strategy on Adaptation to Climate Change of 2013 includes actions to enhance the resilience of infrastructure and mainstream climate adaptation into the European regional and cohesion policy. The Common Provisions Regulation (CPR) of 2013 states under article 8 that climate change mitigation and adaptation, and risk prevention shall be taken into consideration for investments made with the support of the European Structural and Investment Funds (ESI Funds). The regulation integrates climate change adaptation considerations into the preparation and approval of major projects[1] or other projects funded by the ESI Funds through the requirement to conduct climate change vulnerability and risk assessments. In coordination with the ESI Funds, and complimentary to them, the LIFE fund in addition assists in the realisation of the climate change adaptation objectives. Climate change analyses (such as vulnerability and risk assessments) are also sporadically found to be undertaken for infrastructure projects that are financed outside the framework of EU funds.

This report for Latvia focuses on the adaptation to climate change of infrastructure projects supporting the requirement to undertake climate change vulnerability and risk assessments by presenting:

- **Legal, policy and institutional framework**: A schematic outline of national and regional policy and legal framework, and organisational structure to deal with adaptation;
- **Resources**: Offering the most important resources supporting the realisation of climate change vulnerability and risk assessments for infrastructure projects. The available resources for data, methodologies, tools, guidance, design standards, system framework and institutional capacity are contextualised and listed in this section;
- **Sector overview**: Identifying the approach, main strengths and weaknesses for each of these sectors: Transport, Broadband, Urban Development, Energy, Water and Waste; and
- **Case studies**: Current practice in adaptation and resilience of infrastructure projects.

Country Overview

Latvia has developed its National Adaptation Strategy, which will be an Official Development Planning Document, approved by the Cabinet of Ministers of Latvia. The National Action Plan is being developed by the Head Climate Adaptation Department with a team representing other ministries and departments. The Ministry of Environmental Protection and Regional Development of the Republic of Latvia (VARAM) is responsible for climate change adaptation. Adaptation strategies are being developed at subnational (regional or local) levels. Three Latvian municipalities have signed up to the Covenant of Mayors for Climate and Energy initiative committing to develop local adaptation strategies or plans.

Various resources are available to support climate adaptation. The Ministry of Environmental Protection and Regional Development provides research reports on risk and vulnerability assessment and identification of adaptation measures in six areas, such as landscape and infrastructure planning. It also provides material related to conference and seminar on climate change adaptation. The Latvian Centre for Environment, Geology

[1] major project: an operation comprising a series of works, activities or services intended in itself to accomplish an indivisible task of a precise economic or technical nature which has clearly identified goals and for which the total eligible cost exceeds EUR 50 000 000 and in the case of operations contributing to the thematic objective under point (7) of the first paragraph of Article 9 of Regulation 1303/2013 where the total eligible cost exceeds EUR 75 000 000

and Meteorology (LEGMC) is responsible for continuous climate change data collection as well as monitoring extreme events, data storage and analyses on long-term observation results. The Central Statistical Database run by the State offers access to a number of data sets including weather patterns at city level. VARAM prepared research reports on risk and vulnerability assessment and identify adaptation measures in different sectors. Latvia started the preparation of climate change adaptation materials in 2008. A guide for climate change adaptation strategy in Latvia has been published with the purpose of offering suggestions for activities to help prepare the national climate change adaptation strategy in Latvia. The Latvian Centre for Environment, Geology and Meteorology has developed climate change scenarios for the country running up to 2100 and has created a climate change analysis tool on their basis. The aim of this tool is to identify and assess past climate change and prepare future scenarios for these changes. EU-level documentation has been taken into account when preparing the NAP, such as the Commission staff working document SWD(2013) 137 on Adapting infrastructure to climate change, the DG CLIMA guidelines on application of economic instruments for adaptation to climate change and the 2011 EcoLogic report on Climate Proofing of key EU policies. There are no specific design standards available relevant to climate change adaptation and policy makers may refer to international resources. For instance the International Organisation for Standardisation has a specific guiding standard for Vulnerability Assessment and the British Standards Institute which is currently drafting one on Adaptation to Climate Change – Principles, Requirements and Guidelines. VARAM has good cooperation with Civil Protection, Ambulance and Ministry of Health, which are dealing with people affected by higher flood occurrences linked with climate change. To foster institutional capacity, VARAM is organising conferences and seminars to build knowledge on climate and environmental issues, including adaptation. The Faculty of Geography and Earth Sciences at the University of Latvia is a leading national and international research structure dealing with climate change studies, working in close cooperation with the Ministry of Environmental Protection and Regional Development and local municipalities.

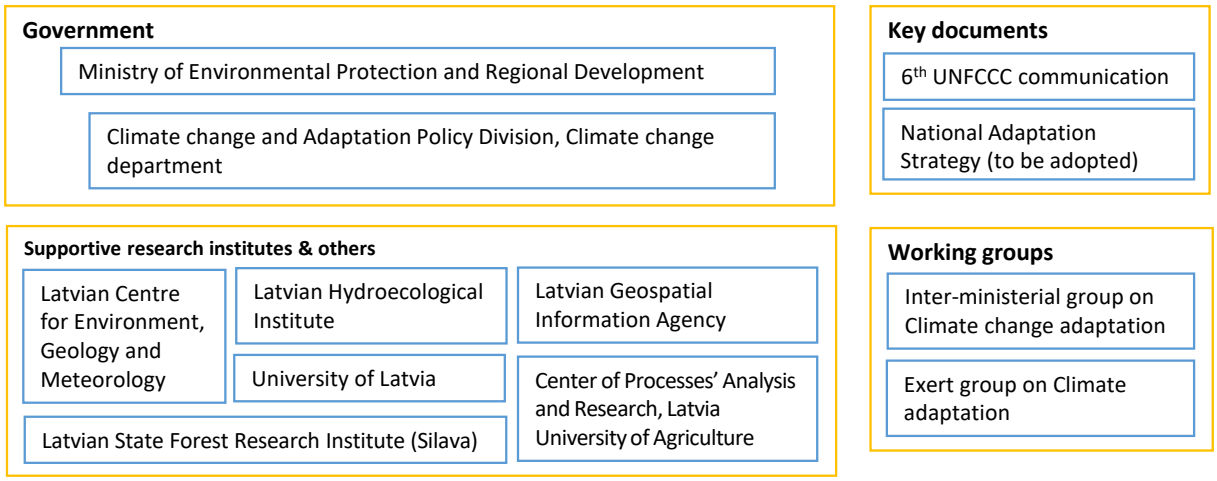
Infrastructure sectors are making use of the above mentioned resources and taking action to adapt to climate change. The report Risk and vulnerability assessment and identification of adaptation measures in the field of construction and infrastructure planning contains an identification of impacts for the transport sector, comprising of road, rail, air, and water transport. It offers a risk analysis, and identifies adaptation measures. Climate change impacts on floods in urban area have also been developed in the context of the LIFE project on the current and potential impact of rain and snow-water waters on the flood of the Riga City area. The Latvian government has issued a summary about potential climate risks, and has developed a report on power supply reliability and quality to estimate the cost of eliminating the consequences of electricity supply due to natural hazards, number of damages and capital expenditures. Flood risk and flood hazard maps are publicly accessible on the LGEC website. Information may also be drawn from projects that have dealt with the evolution of the Latvian river basins, past floods, the evolution of the resources.

One case study has been identified in Latvia for climate adaptation: the electrification of the freight railway transit corridor, SJSC "Latvijas dzelzceļš", which shows that how climate change can be considered for existing infrastructure.

2. LEGAL, POLICY AND INSTITUTIONAL FRAMEWORK

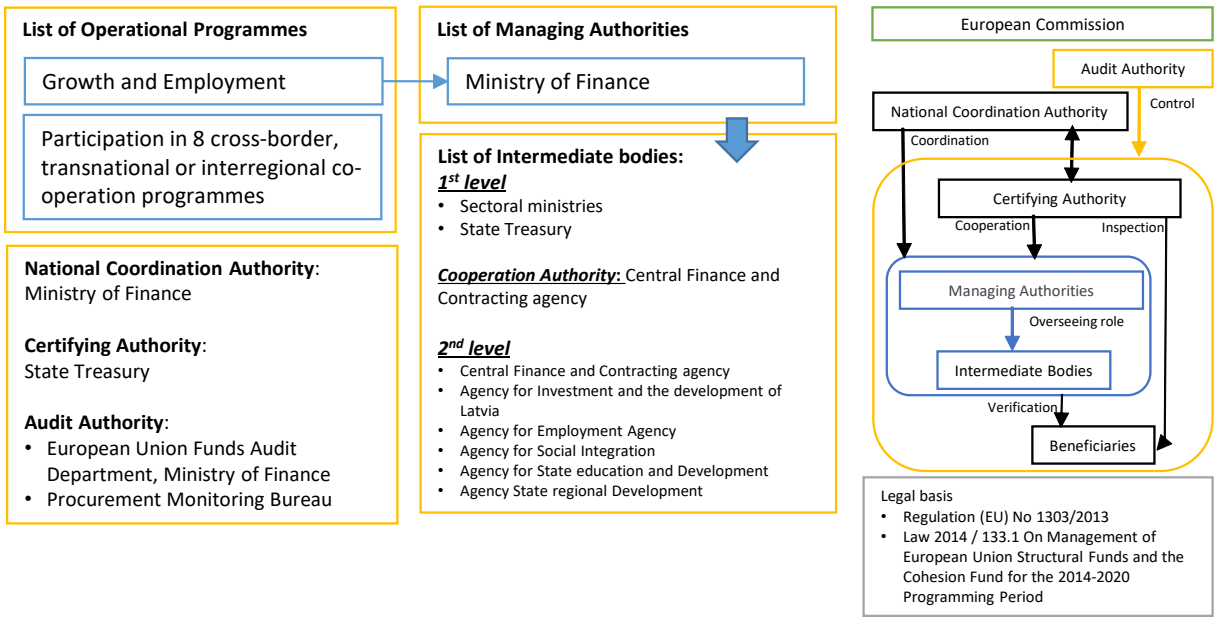
The Ministry of Environmental Protection and Regional Development (MEPRD) is in charge of developing a long-term (up to 2030) National Adaptation Strategy, in continuous consultation with other ministries and two working groups. There are horizontal coordination activities taking place between bodies responsible for relevant sectors. Systematic coordination is established through the involvement of MEPRD per sector. The following sectoral ministries are involved: Ministry of Health, Ministry of the Interior,

Ministry of Economics, Ministry of Transport, Ministry of Agriculture, and Ministry of Culture.



Local authorities (municipalities) have an important role to play, particularly regarding implementation of adaptation action. For example, three Latvian municipalities have signed up to the Covenant of Mayors for Climate and Energy where they commit to developing and implementing adaptation actions. Some municipalities, such as Riga and Ventspils have drawn up their local action plans for minimising the greatest risks (e.g. flood boundaries, flood construction level) and these actions are included in flood risk management plans.

The institutional framework of ESI Funds management in Latvia follows the structure required by Regulation 1303/2013 in order to ensure sound management of EU funds. The system is centred around one key Managing Authority, which is the Ministry of Finance. Additional sectorial ministries are important as Intermediary Bodies, while a number of public agencies are key Cooperation Authorities.



3. RESOURCES

This country report has reviewed the currently available resources in Latvia for adapting to the impacts of climate change across six key infrastructure sectors. Adaptation to climate change is integrated in the legal basis[2] for ESIF-funded projects, through the processes of vulnerability and risk assessments which are, broadly:

1. Vulnerability – evaluating the sensitivity and exposure of infrastructure to climate change
2. Risk – estimating the likelihood and impact of relevant climate hazards
3. Adaptation - consideration of adaptation options and integration into the project planning

The legal requirements for major projects also foresee climate change mitigation. This study however is focused on climate change adaptation and does not cover mitigation aspects.

Information on the requirements for climate change adaptation is available in the 2016 publication Climate Change and Major Projects, and details on the methodology of climate resilience analysis is provided in the 2017 JASPERS publication The Basics of Climate Change Adaptation, Vulnerability and Risk Assessment. Further resources are being identified in the present publication and its references. Effective vulnerability and risk assessments for the adaptation of major projects to climate change require the resources explained in the following table:

Resources	Explanation
Data Availability	The availability, accessibility and applicability of data on climate projections and impacts, on past and historic events, on geophysical parameters, on long-term scenarios, on economic, environmental and social impacts, etc.
Methodologies	The existence of quantitative or qualitative methodologies (a system of processes, a set of principles and rules) for integrating climate change adaptation in the development of infrastructure projects.
Tools	The availability of tools for planning, evaluation, impact estimation (i.e. software, maps, computer simulations, long term climate forecasts etc.) to assist with the adaptation of infrastructure to climate impacts
Guidance	The provision of guidance on how to use methodologies (i.e. for conducting climate change vulnerability and risk assessments) or develop the required infrastructure project documentation relating to climate adaptation.
Design Standards	The availability of published engineering design standards (i.e. by BSI, DIN, ISO) for infrastructure projects that include sections or appropriate provisions to ensure resilience to climate change impacts
System	The institutional and legal framework that the formal authorities work with to deliver their primary responsibilities for climate adaptation, infrastructure, and management of European Structural and Investment Funds
Institutional capacity	The human and technical capacity of institutions to carry out their functions. It depends on being adequately resourced, on having the appropriate expertise, and on collaborating effectively and enforcing

[2] Regulation (EU) No 1303/2013, Commission Delegated Regulation (EU) No 480/2014, Commission Implementing Regulation (EU) No 1011/2014, No 215/2014, 2015/207; and the Directives 2001/42/EC, 2011/92/EU and 2014/52/EU

	laws and regulations

3.1. Data Availability

Quantitative data are essential to understand the relevant risks and the requirements for any corresponding climate change adaptation in key sectors. The Ministry of Environmental Protection and Regional Development (VARAM) of the Republic of Latvia is responsible for the climate change adaptation. VARAM provides research reports on risk and vulnerability assessment and identification of adaptation measures in six areas, such as landscape planning and tourism, biodiversity and ecosystem services, civil protection and emergency assistance, construction and infrastructure planning, health and well-being, agriculture and forestry. It also provides material related to conference and seminar on climate change adaptation.

The Latvian Centre for Environment, Geology and Meteorology (LEGMC) is responsible for continuous climate change data collection as well as monitoring extreme events, data storage and analyses on long-term observation results, adaptation monitoring. LEGMC maintains historical database on surface hydrological information (from 1919), coastal zone hydro meteorological parameters (from 1835) and air and agro-meteorological parameters (from 1945), environmental quality (from 1946), synoptic meteorology (from 1933) and meteorological information (from 1814).

The Central Statistical Bureau (CSB) is the state authority on statistics, maintaining a national database of statistics relating to the economy, society and the environment, including weather patterns at city level. Analysing local government requests from unforeseen events, it can be seen that the natural disasters causing most impact are floods. Resources allocated to flood prevention are twice the amount of the total resources allocated to prevent the consequences of all other natural disasters.

State Fire and Rescue Service of Latvia (SFRS) provide monitoring regarding climate change risks on fire safety and firefighting. Forest fires are identified as Latvia`s priority risks and National Forest Inventory (monitoring) is collecting and analysing data about climatic impacts, growth and yield, species composition, forest types, damage levels.

Baltadapt Climate Info bulletins describe the impact of climate change on the Baltic Sea and each issue reviews the expected impacts on a selected indicator, including: precipitation, wind climate, sea level rise, oxygen content, salinity, water temperature, biodiversity and habitats, biological production, wind waves, river discharge, nutrient loads to the Baltic sea, eutrophication, and sea ice

Research institutes identified that have interest in the area of climate adaptation include the Riga Technical University (RTU), the Latvian State Forest Research Institute ("Silava"), and the Centre of Processes` Analysis and Research. The main scientific institutions engaged in matters of CC impacts and consequences are noted to cover a wide spectrum of related fields, including climate change impacts on aquaculture, surface and ground water, inland and Baltic Sea, coastal erosion, ecosystems` services, biotypes and species, flood modelling, modelling of wind fields, wave and current dynamics, forest ecology, entomology, forest monitoring, and fish resources.

The LEPRD Climate Change Department now is working on the development of a climate change platform, expected to be launched in 2018.

Updates for a wide range of national adaptation actions, can be found in the National adaptation actions deliveries database on EIONET, and on the Climate-ADAPT website.

3.2. Methodologies

Methodologies for integrating climate change adaptation into the development of infrastructure projects rely on the basic rules of risk assessment. VARAM prepared research reports on risk and vulnerability assessment and identify adaptation measures in different sectors, including construction and infrastructure planning. Each sectoral study is based on the following methodological steps:

a) Context analysis - scientific observations, analysis of existing policies, reports and articles
b) Analysis of cause and effect chains – or and how climate change parameters influence concrete sectors and groups
c) Risk assessment - methodology based on "Risk Assessment and Mapping Guidelines for Disaster Management", qualitative methods (risk matrices), quantitative methods (regression analysis and partial correlation), risk mapping (for flood risk zones, sea coastal zones, vulnerable territories regarding tourism and landscape planning, etc.) etc.
d) Vulnerability assessment - assessment is based on risk levels, categories and target groups affected, their adaptive capacity, level of estimated economic losses or gains, and vulnerability level
e) Identification, description and analysis of relevant to risk prevention adaptation measures
f) Cost-benefit and cost-effectiveness assessment for concrete adaptation measures

Latvia started the preparation of climate change adaptation materials in 2008. A guide for climate change adaptation strategy in Latvia has been published with the purpose of offering suggestions for activities to help prepare the national climate change adaptation strategy in Latvia. The suggestions in the guide have been prepared, based on other countries' experience, for example Germany, as well as taking into account the current situation and priorities In Latvia.

3.3. Tools

Tools are highly valuable for facilitating climate adaptation studies and planning for infrastructure. They can be public or private, numerical or descriptive, and be provided in many mediums, such as software, text documents, maps, and so on. Some tools are generic (such in risk assessments) whilst others are specific to a certain set of circumstances.

The Latvian Centre for Environment, Geology and Meteorology has developed climate change scenarios for the country running up to 2100 and has created a climate change analysis tool on their basis. The aim of this tool is to identify and assess past climate change and prepare future scenarios for these changes. The results of this study on past and projected climate change in the form of maps and graphs are depicted in the interactive climate change tool. This tool has a key role to play in society and raising awareness of climate change.

The Floods Directive requires Member states to prepare Flood Hazard Maps and Flood Risk Maps. Latvia has realised such maps, which are updated every 6 years and uploaded to the flood hazard and risk maps deliveries database on EIONET. Flood maps, including temperature and precipitations data are accessible on the website of the National Meteorological Service.

EIONET provides Flood Maps which are publically available, mapping areas of potential significant flood risk. EIONET also contains Flood Risk Management Plans.

For a continual update of available tools, the reader is referred to the European Climate Adaptation Platform Climate-ADAPT, which has a dedicated tools section.

3.4. Guidance

Guidance is an essential requirement to ensure consistency in applying methodologies and tools. Currently, concrete guidance has not yet been developed in Latvia. However, the adoption of the National Adaptation Strategy in 2018 should partly remedy the lack thereof and create momentum.

EU-level documentation has been taken into account when preparing the NAP, such as the Commission staff working document SWD(2013) 137 on Adapting infrastructure to climate change, the DG CLIMA guidelines on application of economic instruments for adaptation to climate change and the 2011 EcoLogic report on Climate Proofing of key EU policies. Guidance originating from the national level has not been identified. Updated guidance for climate change adaptation can be retrieved from the European Climate Adaptation Platform Climate-ADAPT.

3.5. Design Standards

Design standards are critically important for all infrastructure projects to ensure stability and optimal functioning under the strain of natural phenomena. For civil works (including bridges, buildings, masts and towers for the mobile access networks), EN standards are available to address natural forces such as wind and snowfall, e.g. EN1991-1-4 (Eurocode 1) and EN1993 (Eurocode 3) for structures in steel. However, these standards might be outdated and not account for the impacts of climate change.

The standardisation organisation, Latvian Standard Ltd is collaborating with the European Standardization Organizations in the context of the EU Regulation No 1025/2012 on European standardisation. The European Committee for Standardisation (CEN) and Electrotechnical Standardisation (CENELEC) established the Adaptation to Climate Change Coordination Group (ACC-CG) to coordinate standardisation work in the field of adaptation to climate change in support of the implementation of the EU Strategy on Adaptation to Climate Change. More information is available in the section on *Available resources at the EU level* in the Final Report of the present study (European Commission, 2018).

3.6. System

The institutional system for adapting to climate change requires a legal framework (laws and implementing regulations) and strategies and policies (with implementing action plans). The system is usually conflated with disaster management (and its various components, preparedness, reduction etc.) and more generally with resilience.

Institutional and legal framework

Latvia has developed, but not yet approved by Government, its National Adaptation Strategy, which will be an Official Development Planning Document, approved by the Cabinet of Ministers of Latvia. The Strategy offers an analysis on:

1. historical climate impacts from the year 1961 and future scenarios until 2100,

2. risk and vulnerability assessment in the six most vulnerable sectors[3],
3. adaptation measures in sectors and calculations of cost – benefit analysis,
4. adaptation monitoring system, incl. climate and adaptation indicators
5. engagement of stakeholders, determination of their responsibilities and
6. research, education, data collection and provision, information dissemination and public involvement.

A detailed Adaptation Action Plan will be provided, and will include 18 main action directions according to strategic goals and adaptation subjects: people, economy, infrastructure and construction, nature, and horizontal subject – information and knowledge. In total 86 actions, related to concrete climate change risk and vulnerability assessment are included in action plan. For each action the responsible institution, other involved institutions, duration, necessary financing, finance sources, the level of priority, and other information is included in action plan.

Adaptation strategies are being developed at subnational (regional or local) levels. Three Latvian municipalities have signed up to the Covenant of Mayors for Climate and Energy initiative committing to develop local adaptation strategies or plans. The first regional adaptation strategy in the Salacgriva region was developed and adopted in August 2011. Adaptation options have been developed and appraised, and their implementation will be initiated with particular focus on coastal erosion, flooding, agriculture, forestry, infrastructure, public health. However, No specific sectoral adaptation plans have been adopted.

Disaster management of all natural extremes in all sectors and governmental levels is foreseen in the recently adopted Civil Protection and Catastrophe Management Law (2016), which prescribed risk assessments and prevention.

National Risk Assessments have been undertaken in line with thematic ex-ante conditionality 5.1, according to which, national or regional risk assessments for disaster management need to be taking into account climate change adaptation. The Ministry of Environmental Protection and Regional Development, in collaboration with contractors, conducted research on risk and vulnerability assessment and identification of adaptation measures in six areas: landscape planning and tourism, biodiversity and ecosystem services, civil protection and emergency assistance, construction and infrastructure planning, health and welfare, agriculture and forestry.

Responsible authorities

As the Ministry of Environmental Protection and Regional Development of Latvia (MEPRD/ VARAM) is the responsible authority for the climate change policy design, elaboration and implementation, all other relevant sectorial policies (legislative acts, policy planning documents) and appropriate measures (often carried out as projects with financial support of national level or EU financial institutions) are harmonized with the MEPRD/ VARAM.

The NAP is being developed by the Climate Change Department with a team representing other ministries, departments, institutions. The following sectoral ministries are involved: Ministry of Health, Ministry of the Interior, Ministry of Economics, Ministry of Transport,

[3] Biodiversity and ecosystem services; forestry and agriculture; tourisms and landscape planning; health and welfare; building and infrastructure planning; civil protection and emergency planning

Ministry of Agriculture, and Ministry of Culture. Working groups for this project were approved in September 2017 with a view to review the document before its publication.

Management of the ESI Funds

Requirement for climate adaptation are present for major projects funded by the ESI Funds. The absorption of ESI Funds is centred through the Operational Programme Growth and Employment, managed by Ministry of Finance. The OP plans the implementation of four major projects. Latvia is also participating in in 8 cross-border, transnational or interregional co-operation programmes. The 1st level Intermediate bodies are the sectoral ministries and the State Treasury. The 2nd level intermediary bodies are the Central Finance and Contracting agency, the Agency for Investment and the development of Latvia, the Agency for Employment Agency, the Agency for Social Integration, the Agency for State education and Development, and the Agency State regional Development. To ensure the management of the system, the National Coordination Authority rests with the Ministry of Finance, while the Certifying Authority is the State Treasury, and the Audit Authorities are the European Union Funds Audit Department at the Ministry of Finance, and the Procurement Monitoring Bureau.

3.7. Institutional Capacity

The institutional challenge for climate change adaptation is that climate policy is a cross-cutting issue, and requires co-operation across a large number of institutions. To be effective in delivering climate change adaptation a minimum level of capacity is needed on leadership, technical and human resources, effective collaboration, and financial support.

Technical and human resources

In relation to climate adaptation, there is on civil servant of the Ministry of Environmental Protection and Regional Development (VARAM) working on the subject. VARAM has good cooperation with Civil Protection, Ambulance and Ministry of Health, which are dealing with people affected by higher flood occurrences linked with climate change. To foster institutional capacity, VARAM is organising frequent conferences and seminars to build knowledge on climate and environmental issues, including adaptation.

The main scientific institutions engaged in matters of climate change impacts cover a wide spectrum of related fields[4]. For the period 2014-2017, the priorities announced by the Cabinet of Ministers on climate change and adaptation topics are related to the newest climate scenarios development, ecosystems services, and exploration of invasive species. National research programme`s sub-programme "Value of Latvian ecosystem and its dynamics in the influence of climate – EVIDEnT" addresses ten tasks in five projects.

Effective collaboration

Baltadapt developed a transnational climate change adaptation strategy for the Baltic Sea Region, which focuses on the sea and the coastline. The project facilitated a knowledge-brokerage process on climate change adaptation between research and policy, thus contributing to improved institutional capacity.

The Faculty of Geography and Earth Sciences at the University of Latvia is a leading national and international research structure dealing with climate change and

[4]climate change impacts on aquaculture, surface and ground water, inland and Baltic Sea, coastal erosion, ecosystems` services, biotypes and species, flood modelling, modelling of wind fields, wave and current dynamics, forest ecology, entomology, forest monitoring, fish resources, etc.)

environmental studies, working in close cooperation with the Ministry of Environmental Protection and Regional Development and local municipalities. It has participated in EU projects ASTRA, BaltCICA, Baltadapt and several national climate change research projects as well as State research programmes, including an assessment of the impacts of climate change on surface waters of Latvia and the Baltic Sea, and establishment of a scientific basis for adaptation.

Experts from national agencies, scientific institutions, ministries, municipalities, business structures and NGOs have participated in many workshops and conferences regarding climate change scenarios, risk and vulnerability assessment, discussions on indicators and adaptation monitoring system, flood risk warning system, spatial and coastal zone planning.

Financial resources

Latvia uses a broad range of funding sources for climate adaptation. State and municipality funding (funding for adaptation, especially in local regions and municipalities, is earmarked financing named New Policy Initiatives), EU funding (ERDF, ESF, CF, EAFRD, EMFF, Life, Horizon 2020 programme), the European Economic Area (EEA) and the Norwegian Financial mechanism (also for the period 2014-2021), State budget financing through certain funds, e.g. Latvian Environmental Protection Fund (LEPF), Latvian Environmental Investment Fund (LEIF) and Rural Support Service.

The ESI Funds are enabling the development of major projects in the 2014 – 2020 programming period for Latvia. Concerning major projects, by early 2018, there have been 3.2 Million EUR approved for Network Infrastructures in Transport and Energy; 3.2 Million EUR for Low-Carbon Economy; and 3.2 Million EUR in Environment Protection & Resource Efficiency. The dataset will be updated regularly to reflect changes in the programme lists and major project notifications.

According to the ESIF-viewer, Latvia is planning investments of 4.5 Billion EUR. 1172 Million EUR are approved for Network Infrastructures in Transport and Energy (Thematic Objective 7); 212 Million EUR in Environment Protection & Resource Efficiency (Thematic Objective 6); and 173 Million EUR for Information and Communication Technologies (Thematic Objective 2). The shares within these Thematic Objectives that may relate to climate adaptation are unknown.

The EEA and Norway Grants have allocated 73 Million EUR for the period 2009 – 2014, and 102 Million EUR for the period 2014 – 2021. Specifically, the Norwegian Environment Agency has allocated 14 Million EUR for the Climate Change Mitigation, Adaptation and Environment programme in the 2014-2021 period. For the 2009 – 2014 period, the allocated funds specifically for climate change adaptation were 10.4 Million EUR.

4. SECTOR OVERVIEW

4.1. Introduction

Since 2014, the requirements for major projects to obtain ESIF funding[5] demand that project applications integrate climate change considerations[6], such as a vulnerability and risk analysis and adaptation option appraisal. At EU-level, material is available to assist in fulfilling these requirements. Key websites and documents are:

[5] http://ec.europa.eu/regional_policy/archive/projects/major_projects/index_en.cfm

[6] For a compilation of the climate change requirements for major projects in 2014-2020, see: http://www.jaspersnetwork.org/plugins/servlet/documentRepository/displayDocumentDetails?documentId=401

- The Climate-ADAPT website containing many links to data and a map viewer
- EUROPEAN COMMISSION Directorate-General for Regional and Urban policy: The Guide to Cost-benefit analysis of Investment projects (also referred to as the 'CBA guide')
- EUROPEAN COMMISSION DIRECTORATE-GENERAL CLIMATE ACTION: Non-paper of Guidelines for Project Managers: Making vulnerable investments climate resilient
- JASPERS Guidance note: The Basics of Climate Change Adaptation, Vulnerability and Risk Assessment
- JASPERS Guidance note: An overview of the most important sources for integrating climate change in (major) projects

Additional relevant material can be found in the Final Report of the present study (European Commission, 2018) in the section *Available resources at the EU level* and in *Annex I*.[7]

4.2. Transport

Investments in the transport sector are very diverse, covering roads (including bridges and tunnels), inland waterways, rail, ports / airports, and public transport infrastructure. Any disruption caused in this sector can affect many other sectors (economic and societal) directly. Potential threats are sea-level rise and extreme weather events, such as extended heatwaves, flooding, heavy rainfall or storm, and landslides amongst others. Extreme weather events are a potential threat to both infrastructure and operation of the transport system.

Road infrastructure

The report Risk and vulnerability assessment and identification of adaptation measures in the field of construction and infrastructure planning contains an identification of impacts for the transport sector, comprising of read, rail, air, and water transport. It offers a risk analysis, and identifies adaptation measures.

See section 4.1 for more information on other documents that can help in taking climate considerations into account.

Railway infrastructure

The report Risk and vulnerability assessment and identification of adaptation measures in the field of construction and infrastructure planning contains an identification of impacts for the transport sector, comprising of read, rail, air, and water transport. It offers a risk analysis, and identifies adaptation measures.

As part of the Operational Programme Growth and Employment, Latvia is implementing a significant major project to electrify its rail infrastructure. In the context of this project, the European guidelines have been followed for conducting climate vulnerability and risk assessments. The following impacts were considered: high air temperature, low air temperature, intense precipitation (including risk of flooding), strong winds and storms, loss of snow cover, no or less frost, changes in vegetation and lightning. As a result, climate adaptation measures are planned for the construction phase. These include:

[7] European Commission (2018) Climate change adaptation of major infrastructure projects. A stock-taking of available resources to assist the development of climate resilient infrastructure. Final report.

early notifications, recording of time disruptions due to the weather, visual and mechanical inspections and various technical and maintenance means and operation, etc. (See Section 5 Case studies).

See section 4.1 for more information on other documents that can help in taking climate considerations into account.

Airport infrastructure

The report Risk and vulnerability assessment and identification of adaptation measures in the field of construction and infrastructure planning contains an identification of impacts for the transport sector, comprising of read, rail, air, and water transport. It offers a risk analysis, and identifies adaptation measures.

See section 4.1 for more information on other documents that can help in taking climate considerations into account.

4.3. Broadband

The International Telecommunication Union has issued the recommendation L.1502 "Adapting information and communication technology infrastructure to the effects of climate change" for the purpose of identifying climate threats and their impact. L.1502 supports Resilience by design in identified risky areas, and proposes changes to equipment installation standards to ensure protection from more frequent extreme weather phenomena and their impacts. The European broadband sector standardisation bodies have not prepared vulnerability assessment and risk management framework for dealing with climate change in broadband projects.

For the programming period 2014-2020, Latvia is expected to receive €44 Million on broadband investments, including infrastructure investments. There are currently five older projects in the sector and in the context of the Digital Single Market, supported by EU funds, all of which submitted their funding applications in the previous programming period of 2007 – 2013 and as such are exempted from the requirement to conduct vulnerability and risk assessments. The programme Next Generation Network for Rural Areas, which runs from 2015 to 2020, foresees the establishment of fibre backhaul infrastructure for wholesale broadband services in rural areas and the overall costs of rolling out the network are estimated at €119 million, financed by the European Regional Development Fund.

It is a general best practice for operators to use flood mapping information from environmental agencies to safeguard new planned data centres from flooding. For civil works (e.g. masts and towers for the mobile access networks), EN standards are available to address wind and snowfall, e.g. EN1991-1-4 (Eurocode 1) and EN1993 (Eurocode 3) for structures in steel. But these standards don't take climate change into account. CEN-CENELEC is currently working on adapting a number of EN standards to climate change. See Final Report of the present study (European Commission, 2018) for more information in the section on *Available resources at the EU level.*[8]

See section 4.1 for more information on other documents that can help in taking climate considerations into account.

[8] European Commission (2018) Climate change adaptation of major infrastructure projects. A stock-taking of available resources to assist the development of climate resilient infrastructure. Final report.

4.4. Urban Development

Investments in the urban development sector include site developments (industrial and other), urban planning, local infrastructure, building projects (such as hospitals, schools), and much more diverse projects. Cities have a unique position to analyse and respond to local impacts and vulnerabilities, such as heat island effects, which depend on the specific layout of a city, its green spaces, and numerous other factors. Cities can actively support the uptake of climate change adaptation in infrastructure projects through, for instance pilot projects, and can initiate dedicated infrastructure projects to improve their resilience to climate change. General information about climate change impact to Urban Development sector can be found in IPCC 5th assessment reports.

The report Risk and vulnerability assessment and identification of adaptation measures in the field of construction and infrastructure planning highlights that extreme weather events, such as storms and floods, have a strong impact on buildings. It has been recognised that increased climate fluctuations, higher temperatures, precipitation changes and high humidity levels will accelerate the deterioration of stone and metal structures in many cities.

Climate change impacts on floods in urban areas have also been developed in the context of the LIFE project on the current and potential impact of rain and snow-water waters on the flood of the Riga City area.

As part of the Operational Programme Growth and Employment, Latvia is implementing a major project to construct an additional building to the already existing infrastructure of the Stradini Hospital.

See section 4.1 for more information on other documents that can help in taking climate considerations into account.

4.5. Energy

Project investments in the energy sector are related to power generation infrastructure, energy distribution networks and energy storage (e.g. through hydropower). Potential impacts of climate change on energy infrastructure may include increased damage to power generation plants or problems with energy provision, leading to black-outs or other disruptions. Disruptions in the energy sector can have large impacts on different sectors due to the increasing dependency on (electric) power provision for all kind of operational systems such as water supply (pumping installations, …), the food system (transport, cooling, …), transport (electrified vehicles, dynamic traffic information, …), etc.

The Latvian government has issued a summary about potential climate risks, and has developed a report on power supply reliability and quality to estimate the costs of eliminating the consequences of electricity supply due to natural hazards, the number of damages and capital expenditures. Information about climate change impact in the energy sector can be found in IPCC 5th assessment report, including risk measures for the energy sector.

See section 4.1 for more information on other documents that can help in taking climate considerations into account.

4.6. Water

Investments in the water sector are linked to efficient water supply (including reduction of leakage), wastewater treatment and water reuse as well as the implementation of River Basin Management Plans (RBMP) to ensure integrated water management at the river basin scale. Important threats are linked to water quantity (droughts and floods) as well as quality (water pollution). Climate change can have an impact on both water quantity and quality. Following the EU Floods Directive 2007/60/EC, Member States are obligated to perform flood risk assessment and to elaborate flood hazard and risk maps and flood risk management plans. Flood risk maps include the history of floods and climate scenarios. Member States also need to take climate change into consideration when developing RBMP. A Guidance document on adaptation to climate change in water management is available to ensure that the RBMP are climate-proofed. Evaluations of the RBMP and FRMP are also available on the EC website.

As part of the Operational Programme Growth and Employment, Latvia is investing in two types of water-related priorities regarding adaptation to climate change, risk prevention and management: projects to prevent threat of flood and coastal erosion risks in urban areas, and projects to reduce flood risk in rural areas.

Flood risk and flood hazard maps are publicly accessible on the LGEC website. Information may also be drawn from projects that have dealt with the evolution of the Latvian river basins, past floods, the evolution of the resources. As Riga City is the capital and also the largest city of Latvia, a Flood Risk Management Plan has been elaborated for Riga City (2012).

The PESETA II report identified future tendencies for Latvian river basins. The EEA report Climate change, impacts and vulnerability in Europe provides Historical average flood amounts for Latvia.

Other relevant documents include:

- Guidelines on mitigation of Baltic Sea coastal zone erosion consequences (2014)
- Enhancing Society's Understanding about Climate Change Effects on Lakes in Latvia (2015-2016)

See section 4.1 for more information on other documents that can help in taking climate considerations into account.

4.7. Waste

Project investments in the waste sector are related to separate collection infrastructure, re-use and recycling infrastructure, energy recovery facilities. Potential impacts of climate change on waste infrastructure may include increased rates of waste decomposition, odour and dust due to increased temperatures, flooding of landfills and waste treatment facilities, and reduced water availability for wet processes in waste treatment facilities. Also the impact on transport infrastructure should be considered, as transport is a critical component of waste management (collection, transport to and from waste treatment facilities). The impact on transportation is discussed in the section on transport above.

As part of the Operational Programme Growth and Employment, Latvia will implement a project to develop biodegradable waste recycling facilities. These facilities will need to comply with the Directive 2010/75/EU on industrial emissions (IED), which requires as a general principle that necessary measures should be taken to prevent accidents which may have environmental consequences, and to limit those consequences. This requires

that a structured management plan should be available that includes and mitigates hazards such as extreme weather conditions (e.g. flooding, very high winds). In the BAT reference document (BREF) on Waste Treatments Industries, some information is provided on the impact of certain climatic conditions (e.g. the impact of higher temperature on biofilter performance, aerobic decomposition, etc.). Although climate change is not specifically addressed.

For landfills, Directive 1999/31/EC on the landfill of waste requires that landfills are situated and designed in such a way that pollution of the soil, groundwater or surface water is prevented. This requirement is transposed into national design standards for the construction of landfills that include the consideration of temperature, precipitation extremes and flooding where relevant.

See section 4.1 for more information on other documents that can help in taking climate considerations into account.

5. CASE STUDIES

5.1. Case studies of infrastructure projects which have addressed climate change adaptation

Latvian railway network electrification project	
Project description	Aim of the Project. Freight traffic by railway in East-West transport corridor from CIS countries to the ports of Riga, Ventspils and Liepaja is significant for Latvia's economy. In order to increase the transportation efficiency and strengthen the international competitiveness of the Latvian railway transit corridor, SJSC "Latvijas dzelzceļš" plans to electrify the main network with 25 kV AC technology. Currently, freight transportation is serviced only with diesel traction. The full Latvian railway network electrification programme has been divided into several independent stages, which are intended to be implemented sequentially, evaluating technical restrictions, synergies with other parallel projects and availability of financial resources. Project scope. Stage I is planned to be implemented by 2023, during the EU funds programming period of 2014-2020 and stage II is planned to be finished by 2025.According to MCA two preferred alternatives for Stage I have been separated: • Electrification of the Latvian railway in route - Rezekne, Daugavpils – Krustpils – Riga; • Electrification of the Latvian railway in route - Rezekne, Daugavpils – Krustpils – Jelgava – Ventspils.
Photograph	N/A
Budget	Total estimated budget: €519,043,000
Climate Change Vulnerability and	Climate Change related risks were identified in the Feasibility

Risks	study, using data on current (using LDz statistics and expert views) and future climate scenarios for Latvia (Latvian Environment, Geology and Meteorology Centre (LEGMC))[9]. The climate change-induced current and future weather patterns were taken into account, and vulnerability and risk assessment performed. The following guidance and information sources were used for preparing CC vulnerability and risk assessment: • The LEGMC report as a basic guidance on projected climate changes; • EC guidelines "Climate change and Major Projects" [10]; • LDz statistical data on time disruptions; The following climate hazards were assessed under vulnerability assessment: high air temperature, low air temperature, intense precipitation (including risk of flooding), strong winds and storms, loss of snow cover, no or less frost, changes in vegetation and lightning. Risk assessment results are shown in the table below of identified risk levels for climate change factors.

Climate factor	Negative impact description	Impact level	Likelihood	Risk level
High air temperature	Negative impact on ICL – sag of overhead line, risk of de-wirement, power cut	3	2	Moderate
High air temperature	Negative impact on TPS – loss of power	3	2	Moderate
Low air temperature	OCL icing	3	2	Moderate
Low air temperature	Damage to pantograph	3	2	Moderate
Strong winds	Damage to OCL, fallen trees	3	2	Moderate

[9] LVGMC: http://www2.meteo.lv/klimatariks/zinojums.pdf
[10] EC. Climate Change and Major Projects. Outline of the climate change related requirements and guidance for major projects in the 2014-2020 programming period. Available here: https://ec.europa.eu/clima/sites/clima/files/docs/major_projects_en.pdf

<table>
<tr><td>Climate change adaptation measures</td><td>
<table>
<tr><th>Climate factor</th><th>Impact description</th><th>Adaptation measures</th></tr>
<tr><td>High air temperature</td><td>Negative impact on OCL – sag of overhead line, risk of de-wirement, and power cut</td><td>Decrease of train speed. Early notification of event(s). Urgent maintenance according to internal procedures shall be ensured. Regular monitoring 4 of OCL quality.</td></tr>
<tr><td>High air temperature</td><td>Negative impact on TPS – loss of power</td><td>Reserve capacities installed according to technical design. Early notification of event(s). Urgent maintenance. Secondary electricity supply shall be ensured.</td></tr>
<tr><td>Low air temperature</td><td>OCL icing</td><td>OHL shall be designed of appropriate materials to minimise icing and/or provided with closed circuit systems for heating of OHL during unfavourable climate conditions. Early notification of event(s). Urgent maintenance must be ensured. Regular monitoring of OCL quality.</td></tr>
<tr><td>Low air temperature</td><td>Damage to pantograph</td><td>Early notification. Urgent maintenance shall be ensured.</td></tr>
<tr><td>Strong winds</td><td>Damage to OCL, fallen trees</td><td>Early notification. Regular monitoring of OCL quality. Urgent maintenance shall be ensured. Regular maintenance of protection belts - with regular cutting of trees, monitoring their height to avoid risk of falling them to the railway tracks etc.</td></tr>
</table>
</td></tr>
<tr><td>Good practice</td><td>This case studies shows that climate change can also be considered for existing infrastructure, for instance when modifications are planned. Also in a later stage of a project, significant climate adaptation measures can be implemented.</td></tr>
<tr><td>Further information</td><td>/</td></tr>
</table>

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