



Climate change adaptation of major infrastructure projects

Country report for Lithuania

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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 projects¹ 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 Lithuania 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;
- **Case studies:** Current practice in adaptation and resilience of infrastructure projects.

Country Overview

The [National Strategy for Climate Change Management Policy](#) 2013-2050 adopted in November 2012 is an integrated strategy which covers both adaptation and mitigation issues, and includes implementation considerations. There are no known plans to develop a separate Climate Change Adaptation Strategy. An [Interinstitutional Action Plan](#) on the implementation of the goals and objectives of the Strategy of National Climate Change Management Policy 2013-2020, was adopted in April 2013. The Lithuanian Ministry of Environment is the main coordinating institution responsible for development all of climate change mitigation and adaptation policy. The National Climate Change Committee has been established for advisory purposes on the development of the Lithuanian climate change policy and coordination of its implementation. Municipalities, are responsible for the implementation of the [Action Plan on the implementation of the goals and objectives of the Strategy of National Climate Change Management Policy 2013-2020](#).

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

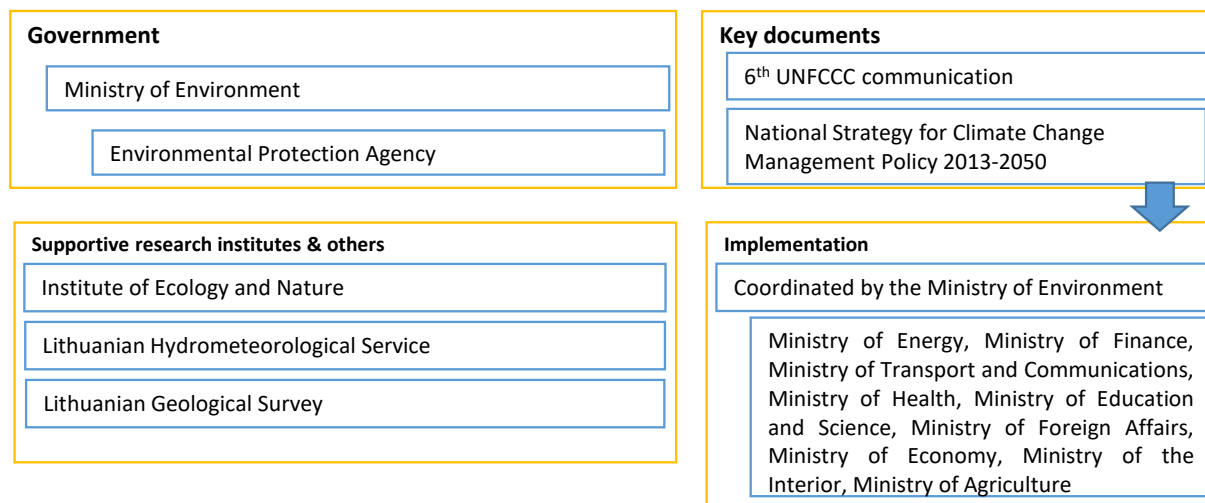
A variety of climate adaptation resources are available. The creation of a central climate adaptation portal for Lithuania is underway (expected completion in 2018), with the purpose of simplifying the exchange of information on climate change adaptation and aid cooperation. The [Lithuanian Hydrometeorological Service](#) provides [data on the evolution of climate](#) over the past few decades. At sector level, the [Ministry of Transport and Communications](#) includes the National Programme for Development of Transport for 2014–2020. The [Environmental Protection Agency](#) (EPA) provides a risk assessment on flooding, as well as flood mapping and flood management plans. Within academia, the Department of Hydrology and Climatology at Vilnius University specialises in researching climate change and meteorology. The [Ministry of Environment](#), in 2015, published a [Study Identifying Vulnerability to Climate Change of Individual Sectors, Risk Assessment and Opportunities to Adapt to Climate Change](#), which identified individual sectors assessed risks, proposed measures that could be implemented. Several publicly available documents provide a methodological framework to integrate the impacts of climate change in different sectors (mainly agriculture). For the scope of this study, the most relevant of these documents is the 2007 [Adaptation to the Impacts of Climate Change at the Lithuanian Seaside](#). A [flood map](#) is available to assess the risk posed to the environment, infrastructure, the economy and cultural heritage. This tool, available online, is to be renewed every six years based on updated projections. The Lithuanian Hydrometeorological Services provide useful monitoring [tools](#) to assess the day-to-day climate impacts of precipitation, wind and temperature. This also includes [climatic models with scenarios](#) for changing rainfall based on variations in global temperature. There are also visual aids (maps) presenting rainfall change in Lithuania. EU resources are in use, such as the [Guide to Cost-Benefit Analysis of Investment Projects](#), the publication on [Climate Change and Major Projects](#) and the non-paper [Guidelines for Project Managers](#). An order from the Ministry of Environment stipulates the [requirements for new infrastructure project design](#), and that natural aspects or other possible natural effects have to be taken into account, for example, how these effects could damage the construction phase. Within national academic institutes, Kaunas University of Technology, Vilnius University and Vytautas Magnus University are some of the bodies involved within various environmental programmes and research projects.

Infrastructure sectors are undertaking steps towards climate adaptation, with most emphasis identified in the water sector. Lithuania's [Sixth National Communication](#) states that rising sea level caused by a warming climate will have serious consequences on the transport sector. The broadband sector is not involved in the federal or regional authority climate change adaptation plans or initiatives organised by governmental bodies. For urban developments, the [Research Institute of Territorial Planning](#) at Vilnius Gediminas Technical University focuses on Geographic Information System (GIS) solution, spatial planning and sustainable urban development. In the energy sector, [the Kaunas hydroelectric power station](#) not only efficiently manages the electricity supply to the surrounding areas, but also enables the man-made reservoirs to hold the volume of the Nemunas River runoff, thus reducing the damage associated with the increased risk of flooding in the area. For the water sector, an [Assessment of Flood Hazard and Flood Risk Maps](#) was published in 2014, indicating a lack of up-to-date information. This was subsequently followed by a report published in the Journal of Water and Land Management ("[Methodology for Flood Risk Appraisal in Lithuania](#)", 2015), which highlighted the crucial risk areas of Lithuania (Western and Central). The waste sector lacks national initiatives but it is complying with the EU [Directive 1999/31/EC on the landfill of waste](#) that requires Member States to safeguard against pollution of the soil, groundwater or surface water.

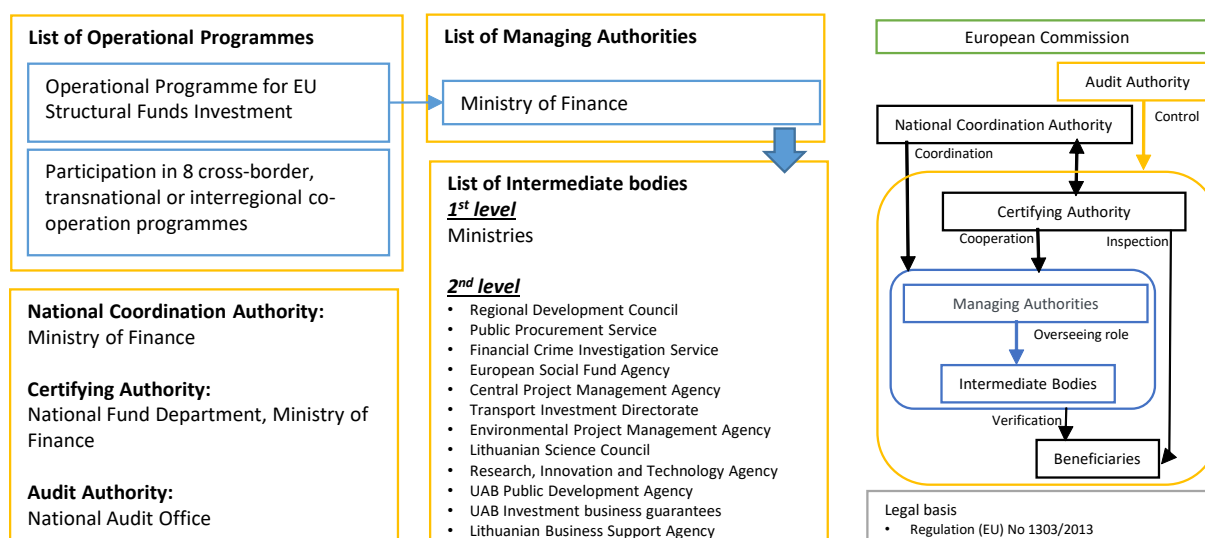
An excellent case study of transboundary climate change adaptation has been identified in Lithuania: [BaltADAPT](#), which is an integrated project with other countries bordering Lithuania to increase the capacity to assess vulnerability to climate change, and whose actions range from protecting the natural ecosystems through disseminating good practice ideas to the general public.

2. LEGAL, POLICY AND INSTITUTIONAL FRAMEWORK

The [National Strategy for Climate Change Management Policy for 2013-2050](#), is developed by the Ministry of Environment. National Action Plan on the implementation of goal and objective of the Strategy of National Climate Change Management Policy 2013-2020, was adopted in April 2013 and contains measures for the year 2013-2016. The action plan is prepared for three year period and is updated annually by adding one more year. In 2016, an updated Action Plan with measures for 2017-2019 was adopted by the Resolution No. 846 of the Government of the Republic of Lithuania.



Governmental and municipal institutions responsible for the implementation of the concrete measures are identified in the Action Plan. The implementation of the Strategy is carried out by the Ministry of Environment, Ministry of Energy, Ministry of Finance, Ministry of Transport and Communications, Ministry of Health, Ministry of Education and Science, Ministry of Foreign Affairs, Ministry of Economy, Ministry of the Interior, Ministry of Agriculture and municipal and other institutions within their remit. The implementation of the Strategy is coordinated by the Ministry of Environment. At a sub-national level, Municipalities, together with relevant national level ministries, are responsible for the implementation of the Action Plan. Apskritis (counties) and municipalities are the effective level of governance for the implementation of climate adaptation policy in Lithuania. No county-level strategies have been adopted yet.



ERDF is mainly absorbed through the Operational Programme for EU Structural Funds Investment, managed by the Ministry of Finance.

3. RESOURCES

This country report has reviewed the currently available resources in Lithuania for adapting to the impacts of climate change across six key infrastructure sectors. Adaptation to climate change is integrated in the legal basis² 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 laws and regulations

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

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 creation of a central climate adaptation portal for Lithuania is underway (expected completion in 2018), with the purpose of simplifying the exchange of information on climate change adaptation and aid cooperation. There were several procurements related to the portal creation made by the [Ministry of Environment](#) and are publicly available on their website (in Lithuanian).

Climate-related information is available on the website of the Ministry of Environment and websites of other sectorial ministries, e. g. the Ministry of Energy, the Ministry of Agriculture, the Ministry of Transport and Communications, etc. The website of the Ministry of Environment provides information on the national strategy, studies and teaching material on primarily mitigation and GHG related issues and some information on adaptation.

The [Lithuanian Hydrometeorological Service](#) (LHMS) provides [data on the evolution of climate](#) over the past few decades. This includes air temperature, precipitation levels, wind load, and sunshine duration. There are a number of qualitative assessments of climate change adaptation impacts for Lithuania, including:

- The [National Strategy for Climate Change Management Policy \(2012\)](#), features a broad set of environmental facts and figures that cover the climate risks associated with Lithuania and outlines key issues regarding the country's climate vulnerability. This document provides detailed and localised analyses on how much the local environment, economy and infrastructure are expected to shift as a result of climate change. The Strategy sets targets and objectives of adaptation to climate change in the most vulnerable sectors agriculture, forestry and biodiversity, water resources, energy, transportation, industry, and public health ;
- The brochure [Lithuanian Climate Change Management Policy and its Implementation](#) summarises the NAS,; and
- A [National Risk Assessment](#), performed in 2013 and coordinated by The [Fire and Rescue Department](#) under the Ministry of Interior. This assessment comprises the evaluation of all threats in Lithuania, including also the threats caused by climate change. An [updated Risk Assessment](#) was carried out in 2015.

The [Ministry of Environment](#) submitted Lithuania's Sixth National Communication to the United Nations Framework Convention on Climate Change ([UNFCCC](#))(November 2012). This report identifies the adaptation of sectors to the environmental changes induced by climate change, with eco-innovative technologies installed and increased efficiency of energy production and consumption by 2050.

At sector level, the [Ministry of Transport and Communications](#) includes the National Programme for Development of Transport for 2014–2020. The [Environmental Protection Agency](#) (EPA) provides a risk assessment on flooding, as well as flood mapping and flood management plans.

Statistics Lithuania is the state authority coordinating official statistics in the country and provides the [Official Statistics Portal](#) with information relating to society, the economy and the environment. The exact content of this database was not examined in the context of the present study.

Within academia, Vilnius University, has over 240 years of observations of air temperature, providing insight into natural and anthropogenic causes of climate variability. The [Department of Hydrology and Climatology](#) at Vilnius University specialises in researching climate change and meteorology. The Institute of Ecology of Vilnius University carried out the study "The study of climate change impact to the land ecosystems, biodiversity, water resources, agriculture and forestry and human health

and the strategic plan for the mitigation of consequences". This study is still one of the most important studies, which comprehensively investigates the impact of climate change on ecosystems, biodiversity, water resources, agriculture and forestry and human health in Lithuania.

Most of the 11 research institutes in Lithuania carry out studies relating particular categories of research of climate change, such as climate change, factors, impact of and sensitivity to climate change, climate change adaptation and mitigation. The main research centres in the area of the adaptation to climate change are the Centre of the Marine Research of the Ministry of Environment of the Republic of Lithuania, the Institute of Ecology of Nature Research Centre, the Lithuanian Geological Survey, Vilnius and Klaipeda Universities. Other institutions related to research development in the area of the adaptation to climate change in Lithuania are the Environmental Protection Agency, the National Lithuanian Research Centre for Agriculture and Forestry (NLRCAF), Nature research centre and others.

The [Baltadapt Climate Info](#) bulletins describe the impact of climate change on the Baltic Sea and each issue reviews the expected impacts on one selected indicator, namely: [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](#).

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. Several publicly available documents provide a methodological framework to integrate the impacts of climate change in different sectors (mainly agriculture). For the scope of this study, the most relevant of these documents is the 2007 [Adaptation to the Impacts of Climate Change at the Lithuanian Seaside](#).

Flooding risk has been assessed through the transposition of the [EU Flood Directive](#) (see "Tools" section for EIONET Flood Maps), during which the national implementation of three stages resulted in:

- A [Risk Assessment](#) on Flooding (Preliminary Flood Assessment report in Lithuanian);
- Maps of Floods Hazards and Risks; and
- Plans of Floods Risk Management.

The full study is not yet publically available, but can be requested from the EPA (only in the Lithuanian language). A [short description](#) of all three implemented phases is provided on the EPA website.

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 as in risk assessments) whilst others are specific to a certain set of circumstances.

A [flood map](#) is available to assess the risk posed to the environment, infrastructure, the economy and cultural heritage. This tool, available online, is to be renewed every six years based on updated projections. The Lithuanian Hydrometeorological Services provide useful monitoring [tools](#) to assess the day-to-day climate impacts of precipitation, wind and temperature. This also includes [climatic models with scenarios](#) for changing rainfall based on variations in global temperature. There are also visual aids (maps) presenting rainfall change in Lithuania.

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. The [Ministry of Environment](#) is the primary coordinating institution responsible for the development of national climate change policy. The Ministry has produced regulations on preparing [Environmental Impact Assessments](#) (EIA), which requires evaluating aspects of climate change adaptation when carrying out certain aspects of an infrastructure project, for example, when selecting the location of an infrastructure project.

The National Climate Change Policy Management Strategy provides some goals and objectives related to assessing impacts, for example 162.1: Ensuring that the engineering infrastructure is developed taking into account the projected impact of climate change.

The JASPERS network has published [a guide for the evaluation of major project applications](#), (including an [evaluation checklist](#)) for the Lithuanian authorities. They constitute a checklist and a guidance tool indicating the type of information suitable for each section of the Major Project Application Form. Although originally developed for use in the Lithuania Transport Sector, they may be of wider interest to beneficiaries and management authorities in other countries and sectors.

In October 2017 Guidance for the Lithuania's municipalities on mitigation and adaptation to climate change *was developed in cooperation with the Norwegian local and regional authorities association*.

A "[Law on protected areas of the Republic of Lithuania](#)" was published in November 1993. Specific amendments of the law were made based on conclusions and assessments made after research of Flood Risk Assessments (e.g. EU Flood Directive). A [Preliminary Flood Risk Assessment](#) report was approved by legal act on 11th January, 2012. There were approximately 16 amendments of the law.

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 national standards authority for Lithuania ([ILNAS](#)), 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).

An order from the Ministry of Environment stipulates the [requirements for new infrastructure project design](#), and that natural aspects or other possible natural effects have to be taken into account, for example, how these effects could damage the construction phase.

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

The Lithuanian Parliament, by the Decree No XI-2375 of 6 November 2012, adopted the [National Strategy for Climate Change Management Policy for 2013 – 2050](#), which outlines the vision, targets and objectives of Lithuania's attempts to address change adaptation up to 2050. The purpose of the Strategy is to formulate and implement the [policy](#) through identifying short-term (by 2020), indicative medium-term (by 2040) and long-term (by 2050) goals and targets in the field of climate change mitigation and adaptation.

An [Interinstitutional Action Plan](#) has been set in place for the implementation of the goals and objectives of the Strategy for the National Climate Change Management Policy. It was approved by the Government of the Republic of Lithuania on 23 April 2013 and contains measures for the year 2013-2016. Following the Strategic planning methodology approved by the Government, the plan is prepared for the three years period and is updated annually by adding one more year. In the updated 2016 Action Plan with measures for 2017-2019 was adopted by the [Resolution No 846](#) of the Government of the Republic of Lithuania. It contains goals and objectives as set by the Strategy and establishes measures ensuring the implementation of these goals and objectives. The Action Plan indicates what financial resources are dedicated for the implementation of the measures and defines the implementing institutions. Assessment criteria and values are also established in the Action Plan.

The goals and objectives of the Climate Adaptation Strategy are implemented by cross-sectorial policies, such as the National Progress Programme for 2014-2020, the National Sustainable Development Program and specific economic sectors development programmes or short-term planning documents. Legal acts, reports and other information related to the climate change topic are available on the internet portals of the [Ministry of Environment](#) of the Republic of Lithuania, the [Environmental Protection Agency](#), the [Lithuanian Hydrometeorological Service](#) and the [Lithuanian Environment Investment Fund](#). All legal acts are placed in the [intranet of the Parliament of the Republic of Lithuania](#).

The Directive 2014/52 on environmental impact assessment (EIA) has been transposed in Lithuania with the [Order No D1-885](#).

The [Ministry of Environment](#), in 2015, published a [Study Identifying Vulnerability to Climate Change of Individual Sectors, Risk Assessment and Opportunities to Adapt to Climate Change](#), which identified individual sectors assessed risks, proposed measures that could be implemented. The results were based on a qualitative assessment. A presentation is available on [Adaptation measures to Climate Change in Lithuania](#), which provides information on the EU policies on adaptation to climate change, such as developing EU white papers and building a common platform for information sharing between member states.

Lithuania's climate change adaptation practice also includes various studies and individual projects that are not purely Lithuanian, but involve the whole Baltic region. They are members of the [EU Strategy for the Baltic Sea Region](#) and the [Strategy for the Baltic Sea Region Action Plan](#), which targets [implementation](#) strategies. The Action Plan identifies to "promote and support the implementation of the BSR (Baltic Sea Region) Climate Change Adaptation strategy". The Strategy and Plan are both complete, with the Plan's [web portal](#) providing a comprehensive list of projects undertaken.

Responsible authorities

The Lithuanian Ministry of Environment is the main coordinating institution responsible for development all of climate change mitigation and adaptation policy and its implementation, transposing the EU climate policy legislation and advising for other institutions on integrating climate policy objectives and concerns into sectors which are not under the responsibilities of the Ministry of Environment.

The [National Strategy for Climate Change Management Policy for 2013 – 2050](#) was developed by the Ministry of Environment. The implementation of *the Strategy* is carried out by the Ministry of Environment, Ministry of Energy, Ministry of Finance, Ministry of Transport and Communications, Ministry of Health, Ministry of Education and Science, Ministry of Foreign Affairs, Ministry of Economy, Ministry of the Interior, Ministry of Agriculture and municipal and other institutions within their remit. The implementation of *the Strategy* is coordinated by the Ministry of Environment. Other Ministries, municipal and other institutions within their remit are responsible for the mainstreaming of climate goals and objectives into sectorial strategies and programmes and implementing related activities in Lithuania.

The National Climate Change Committee has been established for advisory purposes on the development of the Lithuanian climate change policy and coordination of its implementation. The Committee includes 21 representatives of ministries, municipal authorities, research and study, industrial and non-governmental organisations. The Committee also has a role on promotion of the implementation of the provisions of the UNFCCC and coordinates compliance with the requirements of the Kyoto Protocol and the EU legal acts related to the UNFCCC.

Management of the ESI Funds

Lithuania has one Operational programme for EU structural Funds Investment, which is managed by the Ministry of Finance. It is also participating in 8 cross-border, transnational or interregional co-operation programmes. Its intermediary Authorities comprise of the respective ministries, and of the Regional Development Council, the Public Procurement Service, the Financial Crime Investigation Service, the European Social Fund Agency, the Central Project Management Agency, the Transport Investment Directorate, the Environmental Project Management Agency, the Lithuanian Science Council, the Research, Innovation and Technology Agency, the UAB Public Development Agency, the UAB Investment business guarantees, and the Lithuanian Business Support Agency. The National Coordination Authority is the Ministry of Finance, the Certifying Authority is the National Fund Department at the Ministry of Finance, and the Audit Authority is the National Audit Office.

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.

The [Baltic Environmental Forum](#) describes strategies adopted by Lithuania for climate change adaptation since 2008, and gives the list of national institutions involved in the process and their assigned responsibilities. The report lists the main challenges in the development of [National Strategy for Climate Change Management Policy of Lithuania](#), one of which is effective coordination and ensuring all responsible stakeholders assume their responsibilities. The Strategy states that *"the determination of the impact of climate change is hampered by evidently insufficient research of effects on ecosystems and biodiversity carried out in Lithuania"*.

[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.

Technical and human resources

Within national academic institutes, Kaunas University of Technology is involved in various environmental programmes and research projects. They are active members of [EU Water 2020](#) (Waste Water Treatment) and the Multidisciplinary journal, [Environmental Research, Engineering and Management \(EREM\)](#), publishing articles such as "Optimisation of waste stabilisation pond performance for piggery waste treatment using response surface methodology". More universities in Lithuania are conducting research projects into areas of climate change adaptation, including:

- Vilnius University; researching Ecosystems of Lithuania ([Climate Change and impact on persons](#)) and [air temperature observations](#);
- Vilnius Gediminas Technical University is actively involved in [Construction21](#) - a Green Building Exchange supported by the Department of Urban Design;
- The [Research Institute of Environmental Protection](#) (Vilnius Gediminas Technical University) focuses on waste management, technologies and impacts; and
- Vytautas Magnus University funds research into [various environmental infrastructure projects](#).

Effective collaboration

The approaches applied for the implementation of the Strategy and its Action Plan ensure the horizontal as well as vertical coordination - Governmental and municipal institutions responsible for the implementation of the concrete measures are identified in the Action Plan.

Horizontal and vertical coordination of the implementation of adaptation policy is ensured through the work of the National Climate Change Committee. The Committee consists of experts from government, municipal, science and non-governmental organizations (NGOs) and has an advisory role.

The transboundary cooperation is invoked responding to the needs to address common challenges with relevant countries. Lithuanian non-governmental and academic institutions are also quite active in various regional projects being implemented in the

area of adaptation to climate change. Lithuania has taken part in several transboundary projects, including Astra, Baltadapt, Baltica, BalticClimate, Baltclim, RADOST. Lithuania has been active within the Baltic Sea Region Climate Change Adaptation Strategy and Action Plan. In these projects the adaptation options to be applied at local level are analyzed and elaborated.

There are no specific institutions or departments dedicated to ensuring the coordination between science and policy-makers. However, there are some examples of scientific institutions working closely with policy-makers on certain elements of climate adaptation policy, and the Ministry of Environment recognizes that there is a significant margin for improvement in this area.

Financial resources

The [ESI Funds are enabling the development of major projects](#) in the 2014 – 2020 programming period for Lithuania. Concerning major projects, by early 2018, there have been 12.9 Million EUR approved for Network Infrastructures in Transport and Energy; 4.3 Million EUR for Low-Carbon Economy; and 4.3 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](#), Lithuania is planning investments of 6.79 Billion EUR. Projects under the Thematic Objective 7 for Network Infrastructures in Transport and Energy will be receiving 1159 Million EUR, with an additional 28 Million EUR approved for in Environment Protection & Resource Efficiency (Thematic Objective 6); and 244 Million EUR for Information and Communication Technologies (Thematic Objective 2).

4. SECTOR OVERVIEW

4.1. Introduction

Since 2014, the requirements for major projects to obtain ESIF funding³ demand that project applications integrate climate change considerations⁴, 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:

- 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](#)

³ http://ec.europa.eu/regional_policy/archive/projects/major_projects/index_en.cfm

⁴ 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>

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*.⁵

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 heat waves, 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

Lithuania's [Sixth National Communication](#) states that rising sea level caused by a warming climate will have serious consequences on the transport sector. Routes will be flooded during cold periods of year, leading to the inaccessibility of some locations. The [Ministry of Transport and Communications](#) however does not include climate adaptation in its [National Programme for the Development of Transport for 2014-2022](#). Under the Operational programmes funded by the EU Structural Funds Investments, the following major project is planned for 2014 – 2020: Trans-European network link - Vilnius city western bypass. Stage III.

The JASPERS network has published [a guide for the evaluation of major project applications](#), (including an [evaluation checklist](#)) for the Lithuanian authorities. They constitute a checklist and a guidance tool indicating the type of information suitable for each section of the Major Project Application Form. Although originally developed for use in the Lithuania Transport Sector, they may be of wider interest to beneficiaries and management authorities in other countries and sectors.

The [Research Institute of Territorial Planning](#) at Vilnius Gediminas Technical University focuses on transport functionality analysis, publishing an article titled "*The Influence of Transport Infrastructure Development on Sustainable Living Environment in Lithuania*" in the *Procedia Engineering*, vol. 134 (2016). The [Department of Transport Engineering](#) at Kaunas University of Technology comprises work such as "Development and application of innovative research methods and solutions for transportation constructions, transportation means and their flows".

A [Test Road of Experimental Pavement Structures](#) (REPS) has been developed. REPS is a "living lab" (real operated road instrumented with various sensors to monitor different pavements resilience to traffic loads and changing climate conditions), which is 710 m in length and consists of 27 short sections, constructed of different pavement structures. The results of the tests are used to develop new pavement structure solutions that are adapted to for instance increasing traffic loads, higher temperature fluctuations and increased numbers of frost-thaw cycles. A number of national standards have been modified based on REPS findings.

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

Railway infrastructure

⁵ 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.

See section above on Road infrastructure. No railway specific guides or documents on climate adaptation have been retrieved from desk study or interviews.

Airport infrastructure

Lithuania has three international airports located in Vilnius, Kaunas and Palanga. In the current study, no specific strategy on making Lithuanian airports climate resilient was retrieved from desk study or interviews. But more general materials are available which apply to all types of projects, including airport infrastructure. See section 4.1 for more information.

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

Limited resources were identified relating to formal authorities and institutions for broadband in the Lithuania. An [Assessment of Trends and Prospects of the Public IT Infrastructure](#) was conducted, funded by the EU Structural and Cohesion Funds for the 2014–2020 programming period, with the aim of creating an architecture model for a national information resources infrastructure, transition scenarios and an action plan for the optimisation of the management and development of the public IT infrastructure. There is however little mentioning of climate change adaptation strategies in the assessment.

It is however 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*.⁶ See section 4.1 for more information on other documents that can help in taking climate considerations into account.

With regard to EU funding of Lithuania's broadband infrastructure, there is comprehensive guidance provided in '[European Funding for Broadband 2014 – 2020](#)'. This report states that European Structural and Investment Funds are the largest EU public funding source that supports broadband investment. The report also states that the 2014 - 2020 total budget for broadband deployment in Lithuania is approximately €47 Million.

⁶ 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.

The [Sixth National Communication to the UNFCCC](#) specifically comments on how Lithuania's beaches, protective sand-hill and coastal dunes (as well as the lowest parts of Klaipeda and the port), ecosystems, Curonian Lagoon and the Nemunas Delta are the urban areas most vulnerable to climate change.

The [Research Institute of Territorial Planning](#) at Vilnius Gediminas Technical University focuses on Geographic Information System (GIS) solution, spatial planning and sustainable development. The department participates in various EU conferences as experts in the field of spatial planning. The University is also involved in [Construction21](#) - a Green Building Exchange supported by the Department of Urban Design.

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, ...).

Lithuania's [Sixth National Communication](#) reports on a warming climate which is reducing demand for heating, but may increase demand for cooling. Nevertheless, an increasing frequency of extreme events (the increasing water level, more frequent hurricanes and storms) may have a negative impact on the infrastructure, especially on overhead electricity lines in coastal zone.

[The Kaunas hydroelectric power station](#) not only efficiently manages the electricity supply to the surrounding areas, but also enables the man-made reservoirs to hold the volume of the Nemunas River runoff, thus reducing the damage associated with the increased risk of flooding in the area.

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), waste-water 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 scenario's. 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.

The approved Water field development program for 2017–2023 includes upgraded basin areas management plans for the rivers Nemunas, Venta, Lielupė and Dauguva. The Action plan for the implementation of the Water field development program for 2017–2023 also contains adaptation to climate change measures or measures reducing the impact of climate change, including the Baltic Sea, Curonian lagoon and river flood hazard and flood risk maps, as well as flood risk management plans.

In Lithuania, climate change is making rivers and the water supply more vulnerable to several risks; rivers will flood in the spring and autumn while the water quality will decrease during summer. Hence, the water supply has to be monitored and improved. Appropriate measures need to be taken into account to avoid droughts and floods and have a constant fresh water supply. In Vilnius for instance, it is planned to [fix the rain drainage](#) system as the current one is unable to cope when heavy seasonal rain starts. This call for tenders was closed recently. However, tenderers were not required to perform an environmental impact assessment (as mentioned in the Užsakovo reikalavimai (III sk.)), and adaptation as such is not mentioned.

An [Assessment of Flood Hazard and Flood Risk Maps](#) was published in 2014, indicating a lack of up-to-date information. This was subsequently followed by a report published in the Journal of Water and Land Management ("[Methodology for Flood Risk Appraisal in Lithuania](#)", 2015), which highlighted the crucial risk areas of Lithuania (Western and Central) and the need for the following measures:

- Flood hazard estimations,
- Flood damage functions,
- Multi-criteria techniques for aggregation for the results.

The full study is not yet publically available, but can be requested from the EPA (only in Lithuanian language). A [short description](#) of all three implemented phases is provided on the EPA website.

The Kaunas University of Technology is an active member of [EU Water 2020](#), a strategy to tackle current challenges with regards to waste water treatment. The [Department of Environmental Protection and Water Planning](#) at Vilnius Gediminas Technical University helps with environmental legislation projects and Environmental Impact Reports (EIA).

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 and closure of landfills. 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.

In Vilnius, [UAB Vilniaus Kogeneracine Jegaune is planning the construction of a waste power plant](#). The plant will be connected to Vilnius electricity and heating networks and it is planned to help to reduce waste management and heating costs in Vilnius. The [environmental impact assessment](#) does take account of climate change, but the focus is mainly on its contribution to mitigation. Section 5 does briefly mention adaptation with regards to how the sector is adapting to changes in sources of radiation and the reduction of radiation shifts. Nevertheless, the plant will need to meet the requirements of the [Directive 2010/75/EU on industrial emissions](#) (IED), just like other large waste treatment plants in Lithuania. The IED 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.

[Directive 1999/31/EC on the landfill of waste](#) requires that landfills are situated and designed in such a way that safeguard against pollution of the soil, groundwater or surface water. This requirement is translated 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 climate adaptation projects

BaltADAPT	
Project description	<p>Baltadapt (2010 – 2013) was a flagship project under the EU Strategy for the Baltic Sea Region, developing a Baltic Sea Region-wide climate change adaptation strategy.</p> <p>The overriding goal of the Baltadapt Action Plan was to promote the implementation of the Baltic Sea Region Strategy for Adaptation to Climate Change, and to specify priority activities for the macro-region in the field of adaptation to climate change impacts.</p>
Photograph	N/A
Budget	€ 2.9 million
Climate Change Vulnerability and Risks	<p>Macro-regional cooperation within the Baltic Sea Region (BSR), regarding adaptation to climate change, is essential as:</p> <ul style="list-style-type: none"> • There is a need for solidarity to ensure that the most

	<p>exposed and vulnerable regions, sectors, environments and individuals increase their adaptive capacity;</p> <ul style="list-style-type: none"> • There is a need to coordinate actions within sectors integrated through EU policies and the EU single market; and <p>There is a need for a "Common BSR voice" in international contexts to ensure that the specific vulnerability to climate change of the Baltic Sea and its river basin is acknowledged in EU and international policies.</p>
Climate change adaptation measures	<p>In the course of implementation, the need to monitor and evaluate adaptation measures on their effectiveness increases. One way to do this is with the help of indicators. Eleven goals of the proposal for a BSR-wide Strategy for Adaptation to Climate Change, including visions for 2020 and links to the EU Strategy for Climate Adaptation and corresponding chapters in the Baltadapt:</p> <ul style="list-style-type: none"> • Raised awareness concerning the need for action at all governance levels; • Shared macro-regional knowledge bases; • Research cooperation in order to identify and address knowledge gaps; • Facilitated science-policy-business dialogues at and between all governance levels through the provision of web-based as well as "real life" meeting places; • Cooperation on disaster risk management to cope with increased risks due to climate change; • Reviewed and mainstreamed policies in light of climate change adaptation concerns; • Baltic Sea Region cooperation with non-EU member states where it has been defined to be of mutual benefit; • Cooperation between states on the development of national strategies and action plans; • Macro-regional cooperation within business sectors; • Macro-regional cooperation in order to ensure solidarity and funding of adaptation measures; and <p>The Baltic Sea Region as a model region for macro-regional cooperation on climate change adaptation.</p>
Good practice	<p>The focus of the indicators will depend strongly on the desired purpose of the evaluation, which can be:</p> <ul style="list-style-type: none"> • to evaluate the success of adaptation policies and inform future policy development, • to evaluate the impact of adaptation supported across the region and within Member States to account for funding and inform programme planning, and • to evaluate the standard of adaptation across the region and within Member States to justify funding and programme decisions.
Further information	<p>http://www.baltadapt.eu/</p>

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