



# Climate change adaptation of major infrastructure projects

Country report for Estonia

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Country report for Estonia

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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<sup>1</sup> 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 Estonia 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 Estonian [National Climate Change Adaptation Development Plan](#) was approved in 2017. The [Ministry of Environment](#) is responsible for the implementation of the adaptation strategy and shall annually present to the Government of the Republic an overview about the execution of the NAS and the achievement of its objectives. Partial responsibility has been given to the Ministry of Rural Affairs, Ministry of Economic Affairs and Communications, Ministry of the Interior, Ministry of Finance, Ministry of Education and Research and other ministries. A Steering Committee was formed to support the development of the NAS. The Steering Committee was led by the Estonian Environmental Research Centre, and included representatives of concerned government authorities, associations and organizations. The climate change adaptation [Development Plan](#)'s main objective is to increase readiness and capacity of the state, and of regional and local levels to adapt to climate change.

Estonia is a member of the [EU Strategy for the Baltic Sea Region](#) and the [Strategy for the Baltic Sea Region Action Plan](#) sets the framework for implementation. The Strategy and

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<sup>1</sup> 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

Plan are both complete, with the Plan's [web portal](#) providing a comprehensive list of projects undertaken in Estonia. A report by the [Baltic Environmental Forum](#) describes strategies adopted by Estonia for climate change adaptation since 2008, and gives the list of national institutions involved in the process and their assigned responsibilities. Other active institutes include the Estonian Environmental Research Centre and the University of Tartu.

Various resources are available to support climate adaptation. The official web portal, "[Keskkonnaministeerium](#)", contains all Climate Change Adaptation data. Regarding the value at risk (VAR) from climate change, a study commissioned by the Ministry of the Environment of Estonia "[Adapting to climate change in the fields of economy and society](#)" analyses the social and economic impacts of climate change adaptation on Estonia. The [Estonian Environmental Research Centre](#) provides relevant and up-to-date information on climate change adaptation and strategies for each sector for citizens, municipalities and businesses. The [State Weather Service](#) also surveys meteorological and hydrological parameters throughout the country. Information about the [sea level status, trends, projections and water temperatures in different coastal](#) regions of Estonia is held by the Marine Systems Institute at Tallinn University of Technology. There also exists an advanced [tool for scenarios of the Baltic Sea ECOSystem to SUPPORT decision making](#) (ECO SUPPORT). The Baltadapt project has created the a [Vulnerability Assessment Concept](#), a tool for the prioritisation of the most relevant issues for macro-regional cooperation, and a methodology for the [conceptualisation of vulnerability and review of assessments around the Baltic Sea region](#). National guidance exists in the form of the Climate Change Adaptation Strategy until 2030 ([NAS](#)) and National Action Plan ([NAP](#)). Baltadapt created [Guidelines on System Vulnerability](#), an analysis of the Baltic Sea region vulnerability to the impact of climate change. 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](#). Design standards have been amended for climate change adaptation, for instance a rule by the Haapsalu City Government following flooding in 2005. In the areas of planning, health and rescue capabilities, the University of Tartu conducted research on the project "[WHAT: Assessing the Impact of Climate Change and Developing Adaptation Measures in Planning, Land Use, Human Health and Rescue Capacity](#)".

Estonia has prepared resources for some of its sectors to adapt to climate change. The [Estonian transportation sector](#)<sup>2</sup> is well adapted to the seasonal changes and climate extremes in general - transport infrastructure is built in line with the climatic conditions of latitude. In the areas of energy and infrastructure, the Stockholm Centre for the Environment [conducted the](#) project "[ENFRA: Estonian Infrastructure and Energy Sector Climate Change Adaptation Strategy](#)". The broadband sector is not addressed in the Estonia climate change adaptation [Development Plan](#). For urban development, the [Development Plan](#) prioritises Land Use and Planning, and Infrastructure and Buildings to alleviate the risk of flooding and erosion through effective urban planning. In the energy sector, the objective of the [Estonian climate adaptation strategy for infrastructure and energy](#) has been to analyse the climate change impacts and suggest adaptation measures for the adaptation strategy. For the water sector, there is information available on sea level trends and projections for different coastal region. [Flood risk management plans](#) and [flood risk maps](#) are available following the requirements of the EU Floods directive. The [WEAP](#) software tool that takes an integrated approach to water resources planning to evaluate climate adaptation options under different climate, economic, agricultural and energy scenarios. For the waste sector, reducing the environmental risk from waste is a part of the [National Waste Management Plan 2014–2020](#). Taking into consideration that the forecasts predict an increase in the occurrence of extreme weather

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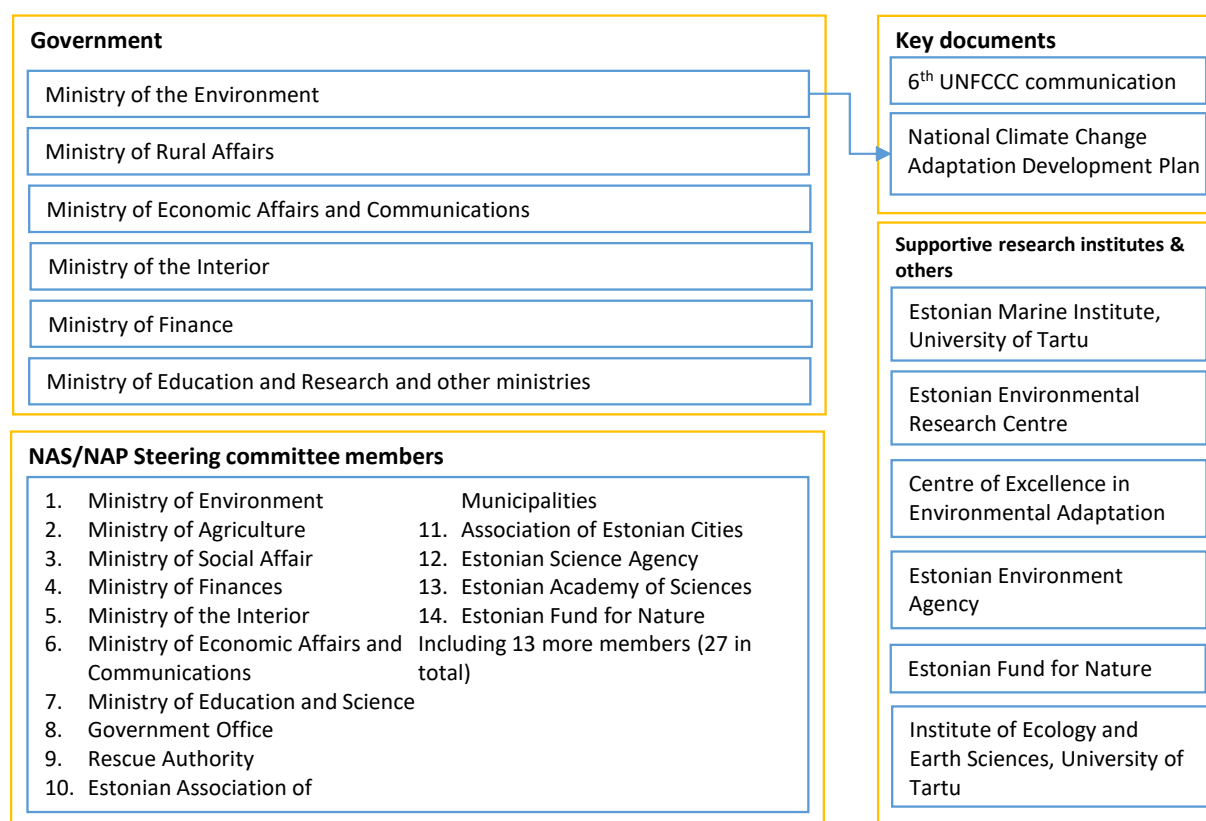
<sup>2</sup> Lahtvee, V. Allik, A., Annuk, A., Heinap, J., Jüssi, M., Kallaste, T., Kirsimaa, K., Klein, K., Kuldna, P., Nõmmann, T., Oisalu, S., Rimmelgas, L., Uiga, J., Piirsalu, E., Poltimäe, H., Tuhkanen, H., (2015), Eesti taristu ja energiaspektori kliimamuutustega kohanemise strateegia – lõpparuanne. SEI Tallinn, Eesti Maaülikool, Balti Keskkonnafoorum, Fridjof Nanseni Instituut. Tallinn-Tartu, 724 lk. [https://www.envir.ee/sites/default/files/enfra\\_lopparuanne.pdf](https://www.envir.ee/sites/default/files/enfra_lopparuanne.pdf)

conditions, the [arrangement of landfills and mining waste storages](#) is also a measure which helps to adapt to climate change.

The present study examines five case studies for climate adaptation projects and infrastructure projects in Estonia, with more information provided in the respective country report. The selected case studies the [climate adaptation strategy for infrastructure and energy](#), [integrated marine and inland water management](#), the development of a [system modelling and decision support tool](#), a [Cloud-based Flood Prevention and Monitoring System](#), and the promotion of [cross-border sustainable urban drainage systems](#).

## 2. LEGAL, POLICY AND INSTITUTIONAL FRAMEWORK

The task of the [Ministry of the Environment](#) is to create such circumstances and conditions which ensure that the existing and future generations have access to diverse nature and healthy social environment as well as the sustainable use of natural resources. The [Ministry of the Environment](#) has a broad remit, including administering and funding the following organisations: [The Environmental Board](#), [The Environmental Inspectorate](#), [Estonian Land Board](#), [State Forest Management Centre \(RMK\)](#), the [Foundation Private Forest Centre \(PFC\)](#), [Estonian Environmental Research Centre](#), [Geological Survey of Estonia](#), [AS Ökosil](#), [Estonian Environment Agency \(KAUR\)](#), [Estonian Museum of Natural History](#) and [Information Technology Centre of the Ministry of the Environment \(KEMIT\)](#). No sub-national or regional adaptation strategies have been adopted yet, though in county-regions risk assessments and crisis management plans are required to be in place and be updated regularly. The City of Tallinn is currently preparing the adaptations strategy for the capital.



Climate change research has been conducted by many Estonian universities and research centres. For example, the NAS baseline studies made by experts and scientists working groups from the University of Tartu, Estonian University of Life Sciences, Stockholm Environment Institute Tallinn Centre, Estonian Fund for Nature, Baltic Environment



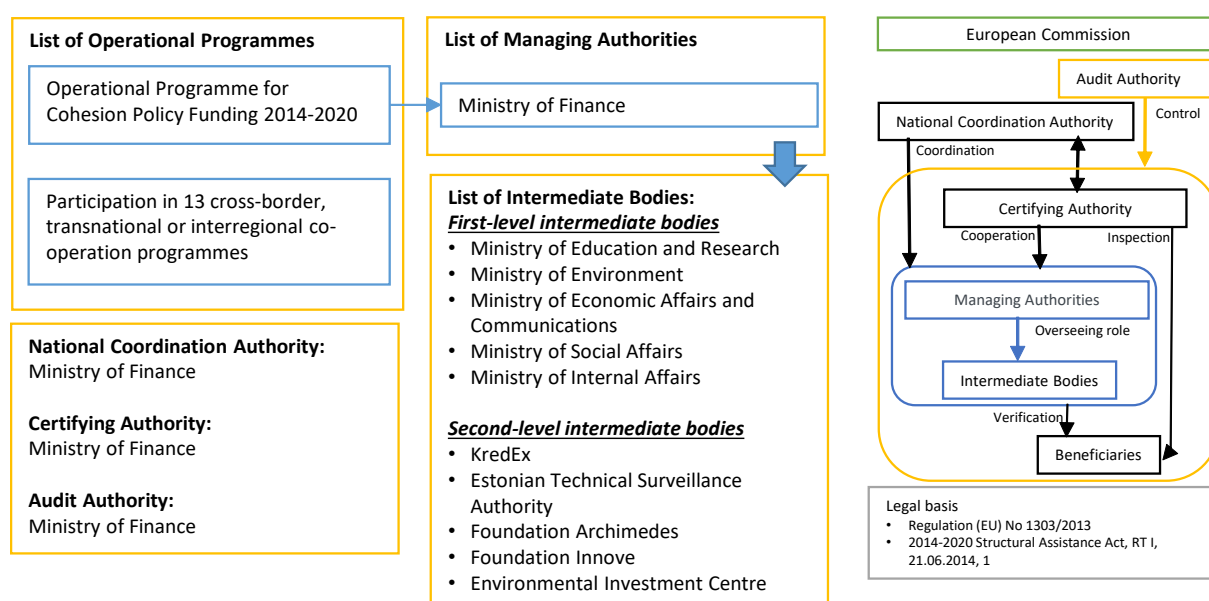
Forum, Estonian Academy of Security Sciences, Estonian Environmental Research Centre and others.

[ENVIRON](#), the Centre of Excellence in Environmental Adaptation, was established as a project-based institution in 2011. Researchers from the centre study the adaptation of plants and ecosystems to the environment and biotic stress in order to understand the response of ecosystems in the temperate zone to global climate change.

A Steering Committee has been formed for development of the National Adaptation Strategy. The Steering Committee is led by the Estonian Environmental Research Centre, and included representatives of concerned government authorities, associations and organizations, including: Ministry of Environment, Ministry of Rural Affairs, Ministry of Social Affairs, Ministry of Finance, Ministry of the Interior, Ministry of Economic Affairs and Communications, Ministry of Education and Science, Government Office, Rescue Authority, Estonian Association of Municipalities, Association of Estonian Cities, Estonian Science Agency, Estonian Academy of Sciences and Estonian Fund for Nature.

All ministries are responsible for coordinating the development of these activities that fall under the responsibility of each respective ministry in the action plan. The Ministry of Environment will however organise the annual reporting on the implementation of the NAP and coordinate adaptation related ministerial communication. By 1st March every year, from the year 2018 onwards, the Ministry of Environment will report to the government on the implementation of the Strategy and its goals.

In Estonia, ERDF is mainly absorbed through the Operational Programme for Cohesion Policy Funding 2014-2020. The [Ministry of Finance](#) (MoF) is the Managing Authority and is also fulfilling the tasks of the Certifying Authority and the Audit Authority.



### 3. RESOURCES

This country report has reviewed the currently available resources in Estonia for adapting to the impacts of climate change across six key infrastructure sectors. Adaptation to climate change is integrated in the legal basis<sup>3</sup> for ESIF-funded projects, through the processes of vulnerability and risk assessments which are, broadly:

<sup>3</sup> Regulation (EU) No 1303/2013, Commission Delegated Regulation (EU) No 480/2014, Commission

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
<b>Data Availability</b>	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.
<b>Methodologies</b>	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.
<b>Tools</b>	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
<b>Guidance</b>	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.
<b>Design Standards</b>	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
<b>System</b>	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
<b>Institutional Capacity</b>	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

### **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 official web portal for climate change adaptation sits within the Ministry of the Environment; "[Keskkonnaministeerium](#)". This website contains a link to the Estonia climate change adaptation [Development Plan](#) until 2030.

The Ministry of the Environment produced the [Development Plan](#) with the aim to organise and direct the field of adaptation to the impact of climate change, with a focus on eight priority sectors (see "Legal, Policy and Institutional Framework"). This report provides an overview of the value at risk from climate change:

- Economic impacts: The economy in Estonia has not been significantly impacted by climate change so far. Global climate change has increased the likelihood and extent of extreme weather conditions, and given rise to several risks, which could significantly influence the insurance sector. The insurance sector has not been engaged effectively in climate risk spreading to date; and
- Social impacts: The hazards accompanying extreme weather conditions vary locally (e.g. floods in coastal or lowland areas) and by specific sections of society (e.g. the elderly are more vulnerable to extreme cold and heat). Estonia has risk analyses for dealing with emergencies resulting from extreme weather conditions and the [National Action Plans](#) for dealing with such situations. The need for cooperation between rescue service authorities, organisations and individuals also increases.

[Statistics Estonia](#) is the national statistics authority and maintains a database of statistics relating to the economy, society and environment. The exact content of this database was not examined in the context of the present study.

Estonia's [Sixth National Communication](#) to the United Nations Framework Convention on Climate Change (UNFCCC) also provides long-term climate change assessments across a range of sectors, with scenarios on risk and vulnerability assessments by sector.

Estonia's current [National Adaptation Strategy \(NAS\)](#) considers vulnerability to climate change, climate impacts and adaptation measures. These are provided on a regional basis and for a range of sectors (including Energy, Water, and Urban).

Vulnerability and risk assessments are currently being carried out at a local level, for instance by the [Tallinn City Government](#).

The Ministry of the Environment, the [Environmental Board](#) and [Estonian Environment Agency \(KAUR\)](#) provide relevant and up-to-date information on climate change adaptation and strategies for each sector for citizens, municipalities and businesses. Information on ambient air quality can be found on Estonian ambient air quality monitoring [database](#), whilst information about flood risk areas can be found from Estonian Land Board's [flood application](#) and Wildfire [statistics](#).

[Estonian future climate scenarios until 2100](#), conducted by the [Environment Agency](#); provides additional information on meteorological and hydrological indicators. Its subdivision, the [State Weather Service](#), surveys meteorological and hydrological parameters (e.g., air temperature, seawater temperature, storms and hydrological data).

There are a number of research institutions in Estonia that carry out research related to climate adaptation, including the [Estonian University of Life Sciences](#) and the [Estonian Environmental Research Institute](#).

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.

Baltadapt has created a methodology for the [conceptualization of vulnerability and review of assessments around the Baltic Sea region](#).

The adaptation options and measures in NAS are based on the analysis of existing scientific literature, (national) policies and legislation and information from different databases, as well as expert knowledge also gathered in the expert groups for the baseline studies. The selection of priority adaptation options is based on multi-criteria analyses, stakeholder and consultations, and the opinion of the interministerial committee.

The Stockholm Environment Institute in Tallinn has developed the [WEAP](#) software methodology that takes an integrated approach to water resources planning to evaluate climate adaptation options under different climate, economic, agricultural and energy scenarios.

The climate change adaptation [Development Plan](#) lists out objectives, measures and a guide to help adapt to climate change. The main objective of the Plan is to increase the readiness and capacity of the state, and of the regional and local level to adapt to the effects of climate change. The Development Plan's baseline studies are as follows:

- Climate change adaptation strategy and measures for thematic fields of natural environment and bio-economy ([BIOCLIM](#));
- Estonian Climate Adaptation Strategy for Infrastructure and Energy ([ENFRA](#));
- Assessment of climate change impacts elaboration of adaptations measures: planning, land use, health and rescue management ([KATI](#)); and
- Climate change impact assessment and elaboration of suitable adaptation measures in the fields of the economy and society ([RAKE](#)).
- The cost of the mentioned measures was assessed during the preparation of the climate change adaptation [Development Plan](#).

### **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.

The [Estonian Weather Service](#), which publishes data and climatological information on weather observations and scenarios, weather events and climate change science. Information about the [sea level status, trends, projections and water temperatures in different coastal](#) regions of Estonia is also held by the Marine Systems Institute at Tallinn University of Technology. The website of [Estonian Rescue Board](#) publishes practical emergency instructions, including extreme weather conditions. Lastly, there exists an advanced [tool for scenarios of the Baltic Sea ECOSystem to SUPPORT decision making](#) (ECO SUPPORT).

The on-line Sea Level Information System run by the Marine Systems Institute at Tallinn University of Technology provides information about the sea level status, trends, projections and water temperatures in different coastal regions of Estonia.

The Estonian Rescue Board website publishes practical emergency instructions, including in extreme weather conditions (like storms, thunderstorms, extremely cold weather conditions, floods).

The Baltadapt project has created the A [Vulnerability Assessment Concept](#), a tool for the prioritization of the most relevant issues for macro-regional cooperation. EIONET provides [Flood Maps](#) which are publically available, mapping areas of potential significant flood risk. EIONET also contains Flood Risk Management Plans.

The Stockholm Environment Institute in Tallinn uses the [WEAP](#) software tool that takes an integrated approach to water resources planning to evaluate climate adaptation options under different climate, economic, agricultural and energy scenarios.

For a continual update of available tools, the reader is referred to the European Climate Adaptation Platform [Climate-ADAPT](#), which lists the tools which are established or being developed in Estonia.

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. National guidance exists in the form of the [Climate Change Adaptation Strategy until 2030](#) (NAS) and [National Action Plan](#) (NAP) - approved by the Government of Estonia on March 2, 2017.

Some adaptation measures have been included in sectoral development plans, action plans and laws (e.g. [The Estonian Forestry Development Plan until 2020](#), [The Nature Conservation Development Plan until 2020](#), [the Water Act](#), [the Emergency Act](#), [The Estonian Rural Development Plan for 2014–2020](#) and “[The National Security Concept of Estonia](#)”). The existing development and action plans are mostly drawn up to the year 2020.

Within the [Development Plan](#), a framework is presented based on which vulnerabilities Estonia faces with regard to climate change adaptation, and how these can be reduced. The [Development Plan](#) was drawn up based on thorough studies, in the course of which the measures for adaptation to climate change to be implemented in the short-term perspective (up to 2030) as well as in the long-term perspective (up to 2050 and 2100) were determined. Achievement of the goals of the [Development Plan](#) is supported by a respective implementation plan. The European Commission's [Guidelines on developing](#)

[adaptation strategies](#) is a document consisting of current adaptation policies in place as well as general guidelines for EU members to follow (not a requirement).

Estonia has actively dealt with ensuring preparedness for [emergencies and crisis management](#) at the national level. The crisis management field is a horizontal field where each ministry is responsible for the implementation of the activities related to crisis management in their field of governance, with the Ministry of the Interior as the coordinator. Baltadapt has created [Guidelines on System Vulnerability](#), which is an analysis of the Baltic Sea region vulnerability to the impact of climate change.

The [BaltCICA](#) project of the Baltic Sea Region Programme (BSR III) was the immediate successor to the project 'Developing Policies & Adaptation Strategies to Climate Change in the Baltic Sea Region (ASTRA)' which was successfully completed in 2007. The work focussed on the impact of the rise in sea level accompanying climate change in coastal regions. As regards Estonia, the object of research was the west coast, from Häädemeeste to Haapsalu.

### **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 [Estonian Centre for Standardisation](#), the national standards authority, 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).

A [report](#) for the [ASTRA project](#), funded by the European Regional Development Fund (ERDF), showed an estimate of the damage of the storm and high flood in January 2005 on the islands and west coast of Estonia (including two largest coastal cities – Pärnu and Haapsalu) as €48 million. Design standards have been amended for climate change adaptation, for instance a rule by the Haapsalu City Government following flooding in 2005 that a building permit will not be granted to a building whose floor height is less than 2.2m above sea level.

### **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 [National Climate Change Adaptation Development Plan](#) was approved in 2017 and has eight priority sectors: 1) Health and rescue capability, 2) Land use and planning, 3)



Natural environment, 4) Bioeconomy, 5) Economy, 6) Society, awareness and cooperation, 7) Infrastructure and buildings, and 8) Energy and security of supply.

The "[Elaboration of Estonia's Draft National Climate Change Adaptation Strategy and Action Plan](#)" was a project that ran between 2014 and 2016 supported by the European Economic Area (EEA) Financial Mechanism 2009-2014. The predefined project promoter was the Estonian Environmental Research Centre (EERC) and project partners were the Estonian Environment Agency and the Norwegian Directorate for Civil Protection and Emergency Planning. The development of the NAS/NAP was the responsibility of the Ministry of the Environment (MoE).

[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.

Estonia is a member 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 in Estonia.

A report by the [Baltic Environmental Forum](#) (BEE) describes strategies adopted by Estonia for climate change adaptation since 2008, and gives the list of national institutions involved in the process and their assigned responsibilities, as well as the projects they are involved in. BEE has been involved in the [Estonian National Climate Adaptation Strategy for Infrastructure and Energy](#), along with the Estonian University of Life Sciences, the Fridtjof Nansen Institute, and the Stockholm Environment Institute in Tallinn.

### **Responsible authorities**

The [Ministry of Environment](#) is responsible for the implementation of the adaptation strategy. Partial responsibility has been given to the Ministry of Rural Affairs, Ministry of Economic Affairs and Communications, Ministry of the Interior, Ministry of Finance, Ministry of Education and Research and other ministries.

Recently, the [Ministry of Environment](#) commissioned four major [studies](#) in climate change adaptation from scientists from various universities in Estonia and experts from environmental non-profit organisations. The same interest groups were also actively involved in the preparation and coordination of the [National Climate Change Adaptation Development Plan](#).

The local governments that are the most active are those which are most vulnerable to climate change, i.e. coastal cities like Tallinn, Haapsalu and Pärnu and Tartu, which is situated at the large inland waterway called [Emajõgi](#). In 2017, the city of Tallinn began to prepare an individual climate change adaptation [plan](#), instigated through their 2015 initiation into [Mayors Adapt](#).

Other active institutes include the Estonian Environmental Research Centre and the University of Tartu (Institute of Ecology and Earth Sciences and the Estonian Marine Institute) and the Estonian Fund for Nature.

### **Management of the ESI Funds**

The [Ministry of Finance](#) (MoF) is the Managing Authority of the [Operational Programme for Cohesion Policy Funding 2014-2020](#). It is also fulfilling the tasks of the National Coordination Authority, the Certifying Authority and the Audit Authority. Intermediary bodies for the management of ESI Funds are split in two levels, where the first one is

comprised of the ministries of Education and Research; of Environment; of Economic Affairs and Communications; of Social Affairs; and of Internal Affairs. The second level of intermediary bodies is comprised of KredEx, the Estonian Technical Surveillance Authority, the Foundation Archimedes, the Foundation Innove, and the Environmental Investment Centre.

### **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, analytical capabilities, and financial support.

#### **Technical and human resources**

[The Research Centre](#) at the University of Tartu has various ongoing projects focused on climate change adaptation strategies, including the following:

- A completed project "[Assessment of climate change impacts and elaboration of adaptation instruments in the field of planning, land use, health and rescue management](#)"; and
- Ongoing projects in the [water supply and waste sectors](#), such as technology used in water treatment plantations.

Other projects conducted by universities include the [SmartEnCity Project](#) (University of Tartu, Department of Geography) on smart city solutions (urban development) and [BioClim](#) (Estonia University of Life Sciences); a project on "*Climate change adaptation strategy and measures for thematic fields of natural environment and bio-economy*".

#### **Effective collaboration**

During the process of the NAS/NAP preparation, coordinated by the Estonian Environmental Research Centre (EERC), a steering committee was set up to assist and coordinate the development of the NAS/NAP. The steering committee covers representatives of all concerned government authorities, associations and organizations (27 members in total) including: Ministry of Environment, Ministry of Agriculture, Ministry of Social Affairs, Ministry of Finance, Ministry of the Interior, Ministry of Economic Affairs and Communications, Ministry of Education and Science, Government Office, Rescue Authority, Estonian Association of Municipalities, Association of Estonian Cities, Estonian Science Agency, Estonian Academy of Sciences, Estonian Fund for Nature. In the process of developing adaptation policy in Estonia, stakeholders from national governmental bodies as well as the scientific research communities were consulted. Some information was collected from regional level governmental stakeholders. The overall responsibility for developing and implementing the adaptation strategy and action plan relies on the Ministry of the Environment (MoE).

#### **Financial resources**

The European Economic Area (EEA) Financial Mechanism 2009-2014 supported the project [Elaboration of Estonia's Draft National Climate Change Adaptation Strategy and Action Plan](#). As a result of the predefined and open call projects, awareness of the adaptation to the climate change increased.

Concerning major projects, by early 2018, there have been no funds allocated for major projects in Estonia for the 2014 - 2020 programming period according to the datasets of



the European Commission. However, the [data set will be updated regularly](#) to reflect changes in the programme lists and major project notifications.

According to the [ESIF-viewer](#), Estonia is planning investments of 3.5 Billion EUR. 484 Million EUR are approved for Network Infrastructures in Transport and Energy (Thematic Objective 7); 207 Million EUR in Environment Protection & Resource Efficiency (Thematic Objective 6); and 85 Million EUR for Information and Communication Technologies (Thematic Objective 2). Projects under the Thematic Objective 5 on promoting climate change adaptation, risk prevention and management are not available.

In the relevant website [struktuurifondid](#) of the Ministry of Finance visitors can find information about projects which have been supported by European Union Structural Funds. Indicatively, as of June 30 2016, 1,572 projects were registered within Estonia for the 2014-2020 period, of which 896 were ongoing and 144 completed. The total budget of the structural funds projects for the 2014-2020 period was €3,336 million, of which €447 million was applied to transport, €80 million to broadband, €232 million to energy, €185 million to water, €107 million to environment, €66 million to urban development and the remainder to other sectors.

## 4. SECTOR OVERVIEW

Since 2014, the requirements for major projects to obtain ESIF funding<sup>4</sup> demand that project applications integrate climate change considerations<sup>5</sup>, 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](#)

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*.<sup>6</sup>

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<sup>4</sup> [http://ec.europa.eu/regional\\_policy/archive/projects/major\\_projects/index\\_en.cfm](http://ec.europa.eu/regional_policy/archive/projects/major_projects/index_en.cfm)

<sup>5</sup> 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>

<sup>6</sup> 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.

#### **4.1. 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.

Within the list of the Estonian Emergency Act, eight out of the 19 vital services are directly transport-related, including the operation of airports, air navigation, public railway infrastructure management, rail transport (including public passenger transport), ice-breaking works, ports, vessel traffic management system, and the functioning of the state main- and support highways.

##### **Road infrastructure**

Despite the vulnerabilities related to climate factors, the [Estonian transportation sector](#)<sup>7</sup> is well adapted to the seasonal changes and climate extremes in general - transport infrastructure is built in line with the climatic conditions of latitude and the transport organisation takes into account the climatic conditions of our location. A project team produced a [comprehensive overview of expected climate change impacts in Estonia](#), led by The Estonian Climate Adaptation Strategy for Infrastructure and Energy (ENFRA). The project stated that permanent impacts, as a result of the rise in precipitation and average winter temperatures, will be evident from 2030 and 2050 onwards.

In 2015, three Estonian research teams cooperated with partners from Norway and Iceland to analyse climate change adaptation options with regards to [preparing Estonia for heat waves and icy road](#). The findings served as a basis for the national climate change adaptation strategy for Estonia.

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

##### **Railway infrastructure**

No specific measures or documents on climate adaptation of railway infrastructure were found in the current study, but the findings as described for road infrastructure in the section above, are also relevant for railway infrastructure.

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

##### **Airport infrastructure**

In the current study, no specific strategy on making Estonian 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.

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<sup>7</sup> Lahtvee, V. Allik, A., Annuk, A., Heinap, J., Jüssi, M., Kallaste, T., Kirsimaa, K., Klein, K., Kuldna, P., Nõmmann, T., Oisalu, S., Rimmelgas, L., Uiga, J., Piirsalu, E., Poltimäe, H., Tuhkanen, H., (2015), Eesti taristu ja energiasektori kliimamuutustega kohanemise strateegia – lõpparuanne. SEI Tallinn, Eesti Maaülikool, Balti Keskkonnafoorum, Fridjof Nanseni Instituut. Tallinn-Tartu, 724 lk. [https://www.envir.ee/sites/default/files/enfra\\_lopparuanne.pdf](https://www.envir.ee/sites/default/files/enfra_lopparuanne.pdf)

## **4.2. 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.

The broadband sector is not addressed in the Estonia climate change adaptation [Development Plan](#). With regard to EU funding of Estonia’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 Estonia is approximately €43 Million.

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*.<sup>8</sup>

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

## **4.3. 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

Each year in Estonia, extreme weather events cause damage to buildings. In addition to extreme weather events, great damage has been caused also by heavy snow which has resulted in the collapsing of roofs, as well as heavy rainfall which leads to moisture damage in buildings. The main adaptation actions taken in the past, as well as those being implemented now, is designing and building in accordance with the requirements set to comply with the climate conditions, and ensuring the quality assurance of the buildings.

The establishment of a constructed environment is very expensive and the life of buildings very long, so solutions must take into consideration the risks of future floods, storms and heat waves which may occur, according to the results of a strategic environmental assessment and risk analysis. Building exclusion zones and flood areas

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<sup>8</sup> 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.

should be taken into account more seriously when preparing and establishing the plans. Therefore, when amending legal acts on planning, the adequacy of the current norms should be observed. In the future, the monitoring and assessment systems of climate risks must be specified, including the mapping of risk areas of the heat island effect in towns and the floods caused by heavy showers, as well as the socio-economic sensitivity of city districts and regions. This should be done in order to create an understanding of climate and weather sensitive systems and to develop spatial means of analysis for considering the local conditions of towns when [adapting to the effects of climate change](#).

The [Development Plan](#) prioritises 8 sectors, two of which are Land Use and Planning, and Infrastructure and Buildings. The general aim of Land Use and Planning is to alleviate the risk of flooding, erosion, storms and the heat-island affect by using effective irrigation, drainage and urban planning. Resources from the Internal Security Development Plan 2020 and the Estonia Rural Development Plan for 2014-2020 have funded this action.

The Estonian Climate Adaptation Strategy for Infrastructure and Energy (ENFRA) project, led by [SEI Tallinn](#), aimed to supplement knowledge gaps on climate change impacts, adaptation needs and options. The goal was to help society to better cope with any negative impacts that may arise as a result of climate change and extreme weather events. In particular, the project targeted the infrastructure and energy sectors, with a focus on how to mainstream adaptation into daily activities and ensure that adaptation in Estonia occurs in a coordinated manner. The project team produced a [comprehensive overview of expected climate change impacts in Estonia](#), and a list of suitable and cost-efficient adaptation measures.

The University of Tartu research focuses on [construction](#), including a [project](#) led by Antti Roose, who hopes to continue the cooperation with their partners in the Norwegian Institute for Urban and Regional Research (NIBR) to develop flood scenarios for the coastal towns in Estonia using similar models that have already been done in.

The Estonian climate adaptation strategy for infrastructure and energy [project](#) was developed to increase awareness on climate change adaptation among the public administration and other participants through dedicated guidance and a planned strategy within these sectors (see Case Study section for further information).

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

#### **4.4. 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, ...) and transport (electrified vehicles, dynamic traffic information, ...).

In terms of energy supply and security of the electricity provision, the most vulnerable sector is the electricity transmission network, particularly to weather events such as large storm winds. The main measures<sup>9</sup> implemented today in order to ensure energy independence, energy security and safety, is the diversification of fuels and fuel suppliers, construction of new foreign connections, proper maintenance provision in case

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<sup>9</sup> Estonian Ministry of Environment (2016), Kliimamuutustega kohanemise arengukava aastani 2030, 52 lk. [http://www.envir.ee/sites/default/files/kliimamuutustega\\_kohanemise\\_arengukava\\_aastani\\_2030\\_1.pdf](http://www.envir.ee/sites/default/files/kliimamuutustega_kohanemise_arengukava_aastani_2030_1.pdf)

of trees fallen on power lines and replacement of overhead lines with underground lines. It was found that the changing climate will have positive as well as negative influences on the Estonian energy resources during the evaluation period until 2100.

In the context of a project financed by the EEA Grants Environmental Program, [an infographic offers the main relevance of climate adaptation for the energy sector](#). The main impacts of climate change, and the corresponding adaptation activities include: Blackouts due to storms and glaze frost, and the option of replacing aerial cables with underground cables; the increase in average annual wind speed and higher water levels might increase the revenue from (domestic) renewable energy resources, and legislation and standards for energy production should therefore be complemented in accordance with the research done on the impact of the climate change.

The issues and measures addressed in the [ENFRA document](#) regarding climate change in Estonia focus on the cost-efficient adaptation measures. The objective of the [Estonian climate adaptation strategy for infrastructure and energy](#) has been to analyse the climate change impact and work out measures for the Estonian national climate change adaptation strategy in infrastructure and energy sectors (see Case Study section for further information).

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

#### **4.5. 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 [Development Plan](#) includes information on the risk of flooding in Estonia, including the increase in precipitation, especially in winter, which is increasing the number of floods and need for maintenance (such as establishing adequate drainage ditches). Subsequently, it is necessary to be prepared for accidents and emergencies related to flooding in densely populated areas. The [RESCUE website](#) provides information on major accidents and emergencies in Estonia.

Information on sea level status, trends, projections and water temperatures in different coastal regions of Estonia is held by the Marine Systems Institute at Tallinn University of Technology. They also hold data on real-time sea level information on the [sea level in Estonia](#). Freshwater sites form a considerable part of the land area in Estonia, and any changes in climate parameters may cause significant shifts in these ecosystems. The changed climate conditions of the Baltic Sea, including decreasing of the extent and thickness of sea ice, increase in water temperature, have an impact on all living organisms and their mutual relationships. Increasing sea water temperatures facilitate survival of introduced species in the Baltic Sea, which may thereby completely reorganise the functioning of the local ecosystem<sup>9</sup>. Additionally, rising sea levels produce increased coastal erosion, resulting in a need for more adequate infrastructure and buildings as well as better drainage systems, discussed in the [Development Plan](#).

The [BaltCICA](#) project of the Baltic Sea Region Programme (BSR III) was the immediate successor to the project 'Developing Policies & Adaptation Strategies to Climate Change in the Baltic Sea Region (ASTRA)' which was successfully completed in 2007. The work focussed on the impact of the rise in sea level accompanying climate change in coastal regions. As regards Estonia, the object of research was the west coast, from Häädemeeste to Haapsalu.

The Stockholm Environment Institute in Tallinn uses the [WEAP](#) software tool that takes an integrated approach to water resources planning to evaluate climate adaptation options under different climate, economic, agricultural and energy scenarios.

The Integrated marine and inland water management [project](#) developed systems for information exchange on climate change adaptation, as well as strategies and measures for adapting to a changing climate (see Case Study section for further information).

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

#### **4.6. 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.

Reducing the environmental risk from waste is a part of the [National Waste Management Plan 2014–2020](#). Taking into consideration that the forecasts predict an increase in the occurrence of extreme weather conditions, the [arrangement of landfills and mining waste storages](#) is also a measure which helps to adapt to climate change. The University of Tartu conducts a variety of research projects on [water supply and waste management](#), including research on the disposal of waste water sediment and bio-waste.

Large waste treatment plant are subject to [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.

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

Estonian climate adaptation strategy for infrastructure and energy	
Project description	The objective of this project was to ensure the functioning of the above mentioned sectors in case of any climatic events, so that the vital services dependent on infrastructure will be available to people.
Photograph	n/a
Budget	Initial project cost: € 314,862  Final project costs: € 300,725
Climate Change Vulnerability and Risks	The national strategy lists the problems posed by climate change on the functioning of society and the economy and sets out a plan of measures for resolving the most important problems.
Climate change adaptation measures	The result of this study is a thorough and comprehensive overview of the impacts of climate change and necessary adaptation measures; and appropriate measures in priority fields such as infrastructure, buildings, transport and energy sector in the form specified in the Estonian national climate change adaptation strategy and action plan.
Good practice	The project has increased awareness of and practical competence about climate change adaptation among the public administration and other participants through dedicated guidance and a planned strategy within these sectors.
Further information	<a href="https://eeagrants.org/project-portal/project/EE02-0014">https://eeagrants.org/project-portal/project/EE02-0014</a>

Integrated marine and inland water management	
Project Description	Improving the current status of Estonian marine and inland waters is a priority. Around 74% of Estonian rivers, 50% of lakes, and only two coastal water areas out of 16 can be defined as having good environmental status. The aim of the programme is to assist Estonia in achieving good environmental status in its marine and inland waters. This is in line with Estonia's obligations deriving from EU marine and inland water legislation, the EU Strategy for the Baltic Sea Region and the Helsinki Commission (HELCOM) Baltic Sea Action Plan 2021.
Photograph	n/a
Budget	€6.9 million
Climate Change Vulnerability and Risks	Objectives of the project included: <ul style="list-style-type: none"> <li>- Increased capacity to assess vulnerability to climate change</li> </ul>

	<ul style="list-style-type: none"> <li>- Increased awareness of and education in climate change adaptation</li> </ul>
Climate Change Adaptation Measures	<p>Results of the project included:</p> <ul style="list-style-type: none"> <li>- Establishment of systems for information exchange on climate change adaptation.</li> <li>- Implementation of strategies and measures for adapting to a changing climate.</li> </ul>
Good Practice	Climate change is considered here in a project that aims for improving the good environmental status of marine environment and inland waters.
Further Information	<a href="https://eeagrants.org/What-we-do/Programme-areas/Climate-change-and-renewable-energy/Adaptation-to-climate-change">https://eeagrants.org/What-we-do/Programme-areas/Climate-change-and-renewable-energy/Adaptation-to-climate-change</a>

#### Development of data-modelling system and decision support tool

Project description	The objective of the project is to develop data-modelling system and the decision support tool for the integrated marine and inland water management for use of institutions related to water management in Estonia.
Photograph	n/a
Budget	<p>Initial project cost: € 2,044,000</p> <p>From EEA Grants: € 1,852,068</p>
Climate Change Vulnerability and Risks	The project is necessary to strengthen capability of management of inland waters and coastal waters.
Climate change adaptation measures	The outcome of the project is a decision support tool for water policy planning and implementing and more specifically main output is a modelling system for inland water and coastal water management.
Good practice	The project involves partnership of different key stakeholders, including Estonian Environmental Agency (national and international reporting), the Environmental Inspectorate (monitoring), the Agricultural Board, the Health Board, Estonian Environmental Research Centre, local governments and water enterprises. This will ensure better understanding of the use of an integrated model in adapting to climate change.
Further information	<a href="https://eeagrants.org/project-portal/project/EE02-0003">https://eeagrants.org/project-portal/project/EE02-0003</a>

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

### Smart City Project: Cloud-based Flood Prevention and Monitoring System



Project description	The “ <a href="#">Floud</a> ” technology is based on the employment of ultra-low-cost environmental monitoring devices designed to enable, through a cloud-based data collection mechanism, extensive and real-time monitoring of the status of floods in urban areas, towards increasing the understanding of these phenomena, as well as providing an effective tool for issuing early warnings to the population and improve existing prediction models.
Photograph	<a href="http://www.flydogmarine.com/products/submersed-profiler-salla/">http://www.flydogmarine.com/products/submersed-profiler-salla/</a>
Budget	n/a
Climate Change Vulnerability and Risks	Current tools for measuring the impact of the consequences of floods do not allow for a good understanding of its implications and indirect costs. Leaders in the market of urban sewage development and management agree that a slow improvement of the design and construction techniques is mainly due to the lack of proper data to provide estimations of the impact of such potentially dangerous pollution events.
Climate change adaptation measures	The introduction of the technology would result in a new data-collection and analysis mechanism, which could disrupt existing practices (and research field) of flood management in urban areas. The proposed early detection solution is aimed at creating a shift from just dealing with the consequences of a flood towards increasing the time to prepare for a flood and thus reducing the consequential indirect costs.
Good practice	This could result in saved lives and decreased damage to land and property, but also introduce a novel tool for Insurance and Risk Assessment, improved best practices for flood protection equipment providers and rescue services.
Further information	<a href="http://www.flydogmarine.com/products/smart-city/">http://www.flydogmarine.com/products/smart-city/</a>

#### Promoting sustainable urban drainage systems in Estonia - Latvia cross-border area to improve the environment for active and sustainable communities

Project description	The project explores the best ways to develop sustainable urban drainage systems in Estonia and Latvia. Joint feasibility studies in Baldone (LV), Tartu (EE), Rīga (LV) and Pärnu (EE) will look for the most efficient ways to drain surface waters back into the environment in ecological ways without expensive piping works. The local community groups will be actively involved and educated about these issues.
Photograph	n/a
Budget	€115 million
Climate Change Vulnerability and Risks	Not specifically carried out

Climate change adaptation measures	General and detailed principles on planning, designing, implementing and maintaining Sustainable Urban Drainage System (SUDS) solutions.
Good practice	Introduces SUDS which is a relatively low-cost adaptation with co-benefits
Further information	<a href="http://drainforlife.eu/index.php/en/about-project">http://drainforlife.eu/index.php/en/about-project</a>



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