



# Climate change adaptation of major infrastructure projects

Country report for Slovenia

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Country report for Slovenia

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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 Slovenia 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 organizational 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:** Good practice in adaptation and resilience of infrastructure projects.

### **Country Overview**

The [Strategic Framework for Climate Change Adaptation](#) was adopted in 2016. The Strategy will be followed by an Action Plan of adaptation measures, which will be prepared taking into account the national risk assessments and a comprehensive national climate change vulnerability assessment. The Ministry of Environment and Spatial Planning is responsible for the implementation of climate change adaptation policies, and an Inter-Ministerial Climate Change Adaptation Working Group is responsible for the monitoring of the overall implementation of guidelines. Additional formal authorities include the Ministry of Infrastructure ([MZI](#)), the Administration for Civil Protection and Disaster Relief ([ACPDR](#)) and the Slovenian Environment Agency ([ARSO](#)).

The [Ministry of Environment and Spatial Planning](#) (MOP), the [Ministry of Agriculture, Forestry and Food](#), the [Slovenian Environment Agency](#) (ARSO) and the [Slovenian Water Agency](#) (DRSV), are the main organizations providing information on climate change. A new portal providing climate data is expected to come online in 2018 and will be managed by the MOP. Also [environmental data](#) for the Municipality of Ljubljana (e.g.

<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

hydraulic modelling, designing of the flood protection measures and information on water infrastructure) are publicly available. The online portals [National Meteorological Service of Slovenia](#) and [Environmental Information](#) provide climate-related information on different sectors. These portals provide limited climate data though were identified as key sources of information on climate change adaptation. The TURAS University has developed [a methodology for assessing direct and indirect flood based economic losses to allow prioritisation and evaluation of adaptation measures](#).

The [Institute for Water of the Republic of Slovenia](#) is part of the project [Danube Sediment Management](#) whose goal is a set of guidelines for sediment management in the Danube River. This will assist in the implementation of the measures stated in [Slovenia's Water Management Plan for the period 2016-2021](#). The project on the [Integral flood Protection Measures of the Vipava River Basin](#) is to prepare guidelines for the integrated flood protection measures in areas of significant impacts of floods on the River Basin scale and a pilot project of implementation of these guidelines in the Vipava River Basin. 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](#). There are no tools designed specifically for climate change adaptation, although there are several tools available from different institutions that are used throughout the planning and construction phases of major infrastructure projects, including the ARSO [online portal](#). The [Slovenian Institute for Standardization \(SIST\)](#) is collaborating with the [European Standardisation Organisations](#) in the [Adaptation to Climate Change Coordination Group \(ACC-CG\)](#) for standardisation work in the field of adaptation. The Inter-Ministerial Climate Change Adaptation Working Group is becoming operationalised and the Slovenian authorities are taking into consideration the EU requirements to make vulnerable investments climate resilient through the EIA process and through the requirements of ESI Funds.

The [Draženci – Gruškovje](#) project is cited as an example of good practice within transport, given the detail of the climate assessment carried out. The broadband sector is not involved in the federal or regional authority climate change adaptation plans or initiatives organised by governmental bodies. Spatial planning in general is important in Slovenia, but because there are only two cities (Ljubljana as a capital is considered medium size and Maribor a small city), urban heat island and other climate change impacts are less significant than with major urban centres. The [Climate Change Adaptation by Spatial Planning in the Alpine Region](#) (CLISP) project makes reference to the energy sector, but there are no specific methodologies to increase the climate change resilience of existing infrastructure in the sector. The water sector has the most resources available for climate adaptation. Flood prevention is the responsibility of national government and the Municipality of Ljubljana is active in implementing protection when natural disasters occur. Currently, the Municipality has prepared a Flood Protection Plan; and a Water Retention Project (at Brdnikova) which is being built in response to flooding of the Glinščica River. The construction of all hydropower plants is supposed to take into account extreme weather conditions regarding flood risk and extreme precipitation. With a specific focus on water infrastructure, USAID has developed [a Methodology for Incorporating Climate Change Adaptation in Infrastructure Planning and Design](#), which is used in Slovenia. A project on [waste water collection and treatment in the area of the aquifer of Ljubljansko Polje](#) has been approved to be funded by EU Cohesion Policy funds in the 2014 – 2020 programming period.

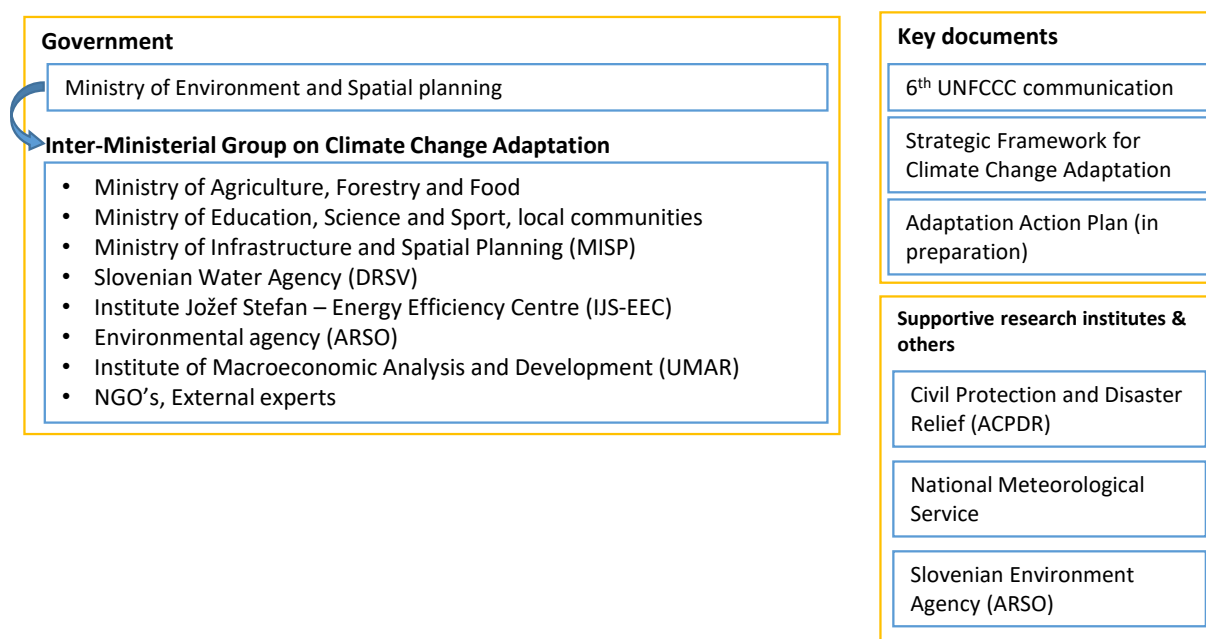
Case studies identified in Slovenia include a TUPAS University project on [integral adaptation strategies to mitigate flooding effects](#), demonstrating how to devise climate adaptation strategies in a participatory manner; and the redesign of the Podutik flood reservoir through increasing [ecosystem-based climate adaptation services](#).



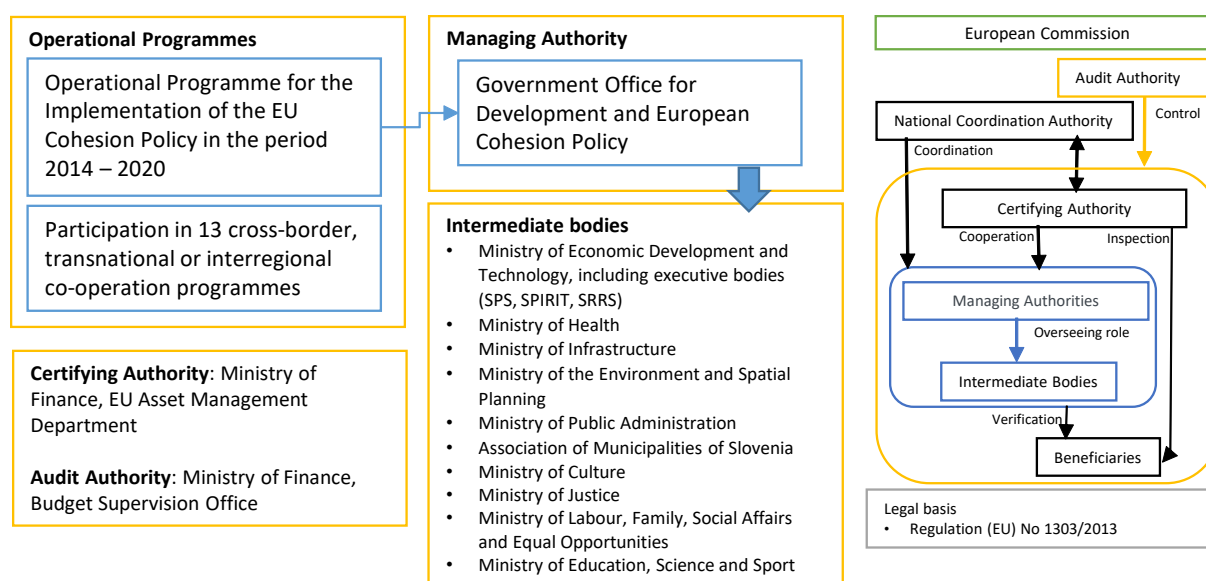


## 2. LEGAL, POLICY AND INSTITUTIONAL FRAMEWORK

The Ministry of Environment and Spatial Planning (MOP) is responsible for the implementation of climate change adaptation policies in Slovenia. In December 2016 the Ministry adopted the [Strategic Framework for Climate Change Adaptation](#) that proposes individual horizontal measures or activities that contribute to adaptation to climate change, mainly via the process of environmental impact assessment (EIA). The Inter-Ministerial Working Group on Climate Change Adaptation was formally established in September 2016, with responsibilities over the monitoring of the overall implementation of guidelines every two years.



Through its national operational programme, Slovenia has been allocated € 3.87 billion from [ESI Funds](#) for the period 2014-2020. With a national contribution of € 1.02 billion, Slovenia has a total budget of € 4.9 billion to be invested in various areas. These range from innovation and competitiveness of enterprises to support for SMEs and agriculture and fishery holdings, the low carbon economy, transport, environment, sustainable employment, social inclusion, education and public administration.



### 3. RESOURCES

This country report has reviewed the currently available resources in Slovenia for adapting to the impacts of climate change across six key infrastructure sectors. Adaptation to climate change is integrated in the legal basis<sup>2</sup> 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
<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

<sup>2</sup> 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 [Ministry of Environment and Spatial Planning](#) (MOP), the [Ministry of Agriculture, Forestry and Food \(MKGP\)](#), the [Slovenian Environment Agency](#) (ARSO) and the [Slovenian Water Agency](#) (DRSV), are the main organisation providing information on climate change.

ARSO provides [scientific data and information on current climate change, extreme climate events and their impacts](#), including a [list of climate change indicators](#). It also provides an overview of trends on individual climate variables in Slovenia during the last 50 years.

The [Statistical Office of the Republic of Slovenia](#) (SURS) is the leading state authority on national statistics, maintaining a national database of statistics relating to the economy, society and the environment. The exact content of this database was not examined in the context of the present study. The online portals [National Meteorological Service of Slovenia](#) and [Environmental Information](#) provide climate-related information on different sectors. These portals provide climate data though were identified as the key sources. No other robust repositories for knowledge on climate change adaptation in Slovenia were identified. All measured data, modelling and designing of flood protection measures or other water infrastructure, performed by the Environment Agency are publicly available and free of charge.

A new portal is being set up which is intended to provide more climate data. This is set to come online by 2018 and would be managed by MOP. Also [environmental data](#) for the Municipality of Ljubljana (e.g. hydraulic modelling, designing of the flood protection measures and information on water infrastructure) is publicly available.

No research institutes were identified within this study as carrying out activities related to climate adaptation. The MOP [notes](#) that "there is limited research on climate change adaptation, with limited resources devoted to the subject." Adaptation related research is principally carried out by the MKGP due to it having responsibility for the most vulnerable sectors.

ARSO has published some studies with impact assessment and vulnerability information, principally for the most vulnerable sectors in Slovenia, including water, agriculture and forestry. To date a full scale economic assessment of impacts and vulnerability assessment hasn't been undertaken in Slovenia. 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. Vulnerability analysis and risk assessments are part of the process of infrastructure project construction and accompanying requirements via the EIA process rather than being a climate change adaptation process in itself. MOP considers that EIA is a vital procedure for ensuring consideration of climate change risks, impacts and vulnerability. MOP also noted that the EC provides the standardised climate change adaptation methodologies to be used in infrastructure projects. In the initial planning stages of a large infrastructure project, an analysis is performed in accordance with the [Non-paper Guidelines for Project Managers:](#)

[Making vulnerable investments](#), the outcomes are used during design and upon completion of the project documentation, the solutions are checked by re-evaluating vulnerability and risk.

The [Institute for Water of the Republic of Slovenia](#) (IZVRS) implements many [guidelines](#) set by the EU. IZVRS is part of a project, [Danube Sediment Management – Restoration of the Sediment Balance in the Danube River](#) whose goal is a set of guidelines for sediment management in the Danube River. This will assist in the implementation of the measures stated in [Slovenia's Water Management Plan for the period 2016-2021](#). It was identified that the United States Agency for International Development (USAID) [Methodology for Incorporating Climate Change Adaptation in Infrastructure Planning and Design](#) is used in Slovenia. The EU-funded TURAS project has developed [a methodology for assessing direct and indirect flood based economic losses to allow prioritization and evaluation of adaptation measures, and provides a place-based strategy for Ljubljana and the surrounding municipalities](#). The construction of all hydropower plants is supposed to take into account extreme weather conditions regarding flood risk and extreme precipitation.

### **3.3. Tools**

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

No tools were identified within the present study that are designed specifically for climate change adaptation. However, there are several tools available from different institutions, including the ARSO [online portal](#), that are used throughout the planning and construction phases of major infrastructure projects and have some link to climate adaptation. These tools include environmental indicators, catalogue of data sources on the environment, weather portal, and EIONET data for Slovenia.

The most important analytical information on risk and vulnerabilities to climate change in specific sectors is from the Administration of the Republic of Slovenia for Civil Protection and Disaster Relief ([ACPDR](#)) and from [ARSO](#).

- ACPDR (2017) [Analytical information on performing risk assessments](#)
- ARSO (2017) [Analytical information on vulnerability to climate change](#)

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 [Climate Change Adaptation by Spatial Planning in the Alpine Region](#) (CLISP) is an international project in the Alpine region that focuses on the issues of climate change and spatial planning. The project incorporates vulnerability analysis in ten local model regions and assessed the climate change preparedness of existing spatial planning systems. A [manual](#) was produced to assess the response to climate change and is recommended by MOP for the preparation of sustainable urban strategies. The MOP prepared guidelines in 2014 for [taking climate change into account when performing risk assessments](#).

The project on the [Integral flood Protection Measures of the Vipava River Basin](#) is to prepare guidelines for the integrated flood protection measures in areas of significant impacts of floods on the River Basin scale and a pilot project of implementation of these guidelines in the Vipava River Basin.

Similarly, the IZVRS and Slovenia in general, implement the guidelines set by the EC. The [Danube River Protection Convention](#) whose objective is to ensure that surface waters and groundwater within the Danube River Basin are managed and used sustainably and equitably is used as general guidance. All guidelines for the implementation of the [Water Framework Directive](#) are followed in the process of preparation of the [Water Management Plan of the Danube River Basin](#) and the [Adriatic Sea Basin \(NUV II\)](#). The Urban Planning Institute released in 2006 guidelines on [Adapting to Climate change with spatial planning tools](#)

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

### **3.6. System**

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

#### ***Institutional and legal framework***

In December 2016, MOP adopted the [Strategic Framework for Climate Change Adaptation](#) as described earlier. Emphasis is placed on mainstreaming climate change impacts and adaptation methods and on the efforts that have to be carried at sector level when undertaking development and spatial planning. The Strategy will be followed by an Action Plan of adaptation measures, which will be prepared taking into account the national risk assessments and a comprehensive national climate change vulnerability assessment. Stakeholder consultation on the development of the comprehensive national climate change risks assessment were led in 2014. A system for the monitoring and reporting of adaptation action of sectoral policies will be developed in the framework of the NAP, based on sectoral indicators.

The most relevant sectoral acts in adapting to climate change are in the spatial planning, urban farming and planning, agriculture and forestry, construction and energy sectors;

the Energy Act (EZ-1), the Act on the Motorway Company in the Republic of Slovenia (ZDARS-1), and the Construction Act (ZGO-1). There are no legal acts in respect to climate change adaptation in the transportation sector. Only the agriculture sector has a legal framework dealing specifically with climate change adaptation with the [Strategy for the Adaption of Slovenian Agriculture and Forestry to Climate Change](#) (2008) and following [action plan](#). Due to lack of funding, the action plan has not been updated after 2012.

Climate change adaptation initiatives at the local and/or regional levels were until now mostly based on one-off participation in various projects. Currently, adaptation actions are limited to adjustments of the contingency plans. However adaptation strategies are to be developed at subnational level in 2018.

In August 2014, Government adopted the Decree Implementing the Decision on a Union [Civil Protection Mechanism](#). In 2016, selected risk assessments and the National Disaster Risk Assessment (NDRA) were [updated to include climate change impacts](#). The NDRA presents the overall risk assessment for disasters presenting identified risks for the country and as such a first step of a comprehensive risk management.

The National Risk Assessment is undertaken in line with thematic ex-ante conditionality 5.1, according to which, national or regional risk assessments for disaster management need to be taking into account climate change adaptation.

The revised EIA Directive has been [transposed](#) and Slovenian authorities are now expected to include resilience and adaptation to climate change in their assessments.

### ***Responsible authorities***

According to the State Administration Act (ZDU-1), the responsibility for climate change lies with Ministry of Environment and Spatial Planning (MOP) whose objectives in this regard are:

- Enabling the implementation of environment cohesion during the 2014-2020 period by ensuring appropriate human and financial resources;
- Achieving strategic and implementation plans for maintaining river beds, flood barriers and irrigation systems; and
- Updating legislation on spatial planning.

Additional formal authorities who has primary responsibilities across infrastructure sectors is the Ministry of Infrastructure ([MZI](#)). The Administration of the Republic of Slovenia for Civil Protection and Disaster Relief ([ACPDR](#)) is responsible for disaster management and the Slovenian Environment Agency ([ARSO](#)) is responsible for climate data.

The Administration for Civil Protection and Disaster Relief under Ministry of Defence, is the national coordination body for risk assessment processes (providing links with adaptation related policies through Interministerial working group on Disaster Risk Assessments) and also responsible for national emergency response plans in co-operation with other ministries.

The [Slovenian Environment Agency](#) (ARSO) provides scientific data and information on climate change impacts as well as observations and projections for future climate change in Slovenia. The ARSO also published some studies with impact assessment and vulnerability information for mainly water sector in Slovenia.

The Inter-ministerial Working Group on Climate Change Adaptation is the main coordination body for the development of adaptation policy. It is led by the MOP and gathers members from all concerned ministries, agencies and government offices, with the expert support of the ARSO.

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



Slovenia has one Operational Programme for the Implementation of the EU Cohesion Policy in the period 2014 – 2020, and is also participating in 13 cross-border, transnational or interregional co-operation programmes. The management Authority is the Government Office for Development and European Cohesion Policy, while the role of the intermediary bodies is held by various ministries, such as the Ministry of Infrastructure and the Ministry of the Environment and Spatial Planning, but also by entities such as the Association of Municipalities of Slovenia. For the management system of the ESI Funds, the certifying Authority is the EU Asset management Department within the Ministry of Finance, while the Audit Authority is the Budget Supervision Office, again within the Ministry of Finance.

### **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.

A system for measuring the effectiveness of adaptation actions has been developed within the Strategic Framework for Climate Change Adaptation. A system for periodic review of adaptation action at sectoral and local level and the allocation of reporting responsibilities is also in the framework of the National Action Plan on Adaptation. The Plan provides a framework to monitor progress via a set of preparedness indicators.

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

The institutional capacity (human, technical, equipment) relevant to climate change adaptation is currently developing further. The Strategic Framework for Climate Change Adaptation and the European requirements for climate adaptation in major projects are contributing to the development of capacity. The Slovenian authorities are taking into consideration the EU requirements to make vulnerable investments climate resilient through the EIA process. The development of methodologies and guidance on climate adaptation is a strong foundation for the institutional capacity to further develop. Research has been progressing, as shown by the programme of the TUPAS University on Integral adaptation strategies to mitigate flooding effects (more information in the case studies section).

The ARSO disseminates some [information on adaptation](#). The Ministry of Environment and Spatial Planning and the Ministry of Agriculture, Forestry and Food have some information and material on adaptation-related issues, such as the information on the [impacts on agriculture](#). Other Ministries and Agencies provide educational and training materials related to measures in their sectors, which also contribute to increasing resilience to climate change impacts (such as energy efficiency, health protection programme). Promotional and educational material is made available and disseminated also through participation in European projects, such as C3Alps. Despite quite a few activities carried out, a capacity building and communication programme as such is only being developed and planned to be funded by the Climate Fund in the future.

#### **Effective collaboration**

The Interdepartmental Working Group on Climate Change Adaptation has members from all concerned ministries, agencies and government offices, and was officially nominated by the Government in September 2016. The Group serves as a main reference point during the process of adaptation policies' development, led by the Ministry with a help of external experts and the ARSO. The Group serves the purposes of horizontal and vertical coordination for adaptation policy-making.

Transboundary cooperation to address common challenges with relevant countries is conducted bilaterally and mostly in the cross border cooperation programmes based on an assessment of common priority sectors and risks such as floods. Recent natural disasters, such as floods, hailstorms and sleet have drawn more attention to the transboundary issues both in terms of preventive and relief actions.

### **Financial resources**

The [ESI Funds are enabling the development of major projects](#) in the 2014 – 2020 programming period for Slovenia. Concerning major projects, by early 2018, there have been 145 Million EUR approved for Network Infrastructures in Transport and Energy; 108 Million EUR in Environment Protection & Resource Efficiency; The [data set will be updated regularly](#) to reflect changes in the programme lists and major project notifications.

According to the [ESIF-viewer](#), Slovenia is planning investments of 3.1 Billion EUR. Projects under the Thematic Objective 5 on promoting climate change adaptation, risk prevention and management will be receiving 86 Million EUR, with an additional 265 Million EUR approved for Network Infrastructures in Transport and Energy (Thematic Objective 7); 438 Million EUR in Environment Protection & Resource Efficiency (Thematic Objective 6); and 69 Million EUR for Information and Communication Technologies (Thematic Objective 2). The shares within these Thematic Objectives that may relate to climate adaptation are unknown.

The [EEA and Norway Grants](#) have allocated 37.7 Million EUR for the period 2014 – 2021. Specifically, the Norwegian Environment Agency has allocated 14.5 Million EUR for the Climate Change Mitigation and Adaptation programme.

## **4. SECTOR OVERVIEW**

### **4.1. Introduction**

Since 2014, the requirements for major projects to obtain ESIF funding<sup>3</sup> demand that project applications integrate climate change considerations<sup>4</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](#)

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<sup>3</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>4</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>



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>5</sup>

## **4.2. Transport**

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

### **Road infrastructure**

The [Draženci – Gruškovje](#) project is cited as an example of good practice, given its detail. Yet, despite the fact that climate change adaptation is normally taken into account during the EIA process, in this case due to maturity of the project it was done post-EIA. The climate change adaptation assessment did result in certain design changes (i.e. fences, increased flood barriers, and application of different asphalt).

No specific strategy on making Slovenian roads more climate resilient was retrieved from desk study or interviews. But more general materials are available which apply to all types of projects, including road infrastructure. See section 4.1 for more information.

### **Railway infrastructure**

No specific strategy on making Slovenian railways more climate resilient was retrieved from desk study or interviews. But more general materials are available which apply to all types of projects, including railway infrastructure. See section 4.1 for more information.

### **Airport infrastructure**

No specific strategy on making Slovenian airports more climate resilient was retrieved from desk study or interviews. But more general materials are available which apply to all types of projects, including road 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.

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<sup>5</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.

In the 2014 – 2020 programming period, there are eight ongoing projects for a total funding of € 57.5 Million, though it is not clear if climate change adaptation is fully integrated.

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>6</sup>

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

#### **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.

Slovenia has only two cities (Ljubljana as a capital is considered medium size and Maribor is a small city), so the urban heat island effect and the like climate change impacts are less significant in Slovenia than in other countries with major urban centres. Some climate change adaptation related practices include increasing green spaces in cities (parks, green roofs, urban gardens), sustainable drainage systems, collection and use of rainwater, underground waste collectors, and equipping and training civil protection units. The TURAS project developed [a methodology for assessing direct and indirect flood based economic losses to allow prioritization and evaluation of adaptation measures](#). In the [Climate Change Adaptation by Spatial Planning in the Alpine Region](#) CLISP project, a [manual](#) for assessing the response to climate change in spatial planning procedures was prepared. The MOP recommended the guide to municipalities as a list of recommended sources for the preparation of sustainable urban strategies for urban municipalities in Slovenia in 2015.

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 transmission and 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, overhead power lines, 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

<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.

(pumping installations, ...), the food system (transport, cooling, ...), transport (electrified vehicles, dynamic traffic information, ...), etc.

Though the [Climate Change Adaptation by Spatial Planning in the Alpine Region](#) (CLISP) project is also relevant for the energy sector, there are no specific methodologies to increase the climate change resilience of existing infrastructure of the energy sector.

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

#### **4.6. Water**

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

While flood prevention is the responsibility of national government, the Municipality of Ljubljana is active in implementing protection when natural disasters occur. Currently, the Municipality has prepared a Flood Protection Plan, and a Water Retention Project (at Brdnikova) which is being built in response to flooding of the Glinščica River. The [Brdnikova Water Retention Project](#) is cited as an example of a small and innovative approach to climate change adaptation.

IZVRS is part of a project titled "[Danube Sediment Management – Restoration of the Sediment Balance in the Danube River](#)" whose goal is to provide a set of guidelines for sediment management in the Danube River. This will assist in the implementation of the measures stated in Slovenia's [Water Management Plan](#) for the period 2015-2021. There are activities for flood protection in the industrial zone of Pameče in connection with the [Rehabilitation of the Mislinja River](#). The rehabilitation is the basis for the new [Municipal Spatial Plan](#).

A project on [wastewater collection and treatment in the area of the aquifer of Ljubljansko Polje](#) has been approved to be funded by EU Cohesion Policy funds in the 2014 – 2020 programming period. While still in preparation, the JASPERS network experts were involved for technical assistance on climate adaptation, and thus the implementation of the project ought to include measures to anticipate on climate risks.

The Slovenian Environment Agency hosts the [Drought Management Centre for South-Eastern Europe](#) (DMCSEE), which monitors and assesses drought, and drought related risks and vulnerability for the whole South East Europe region.

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.

During the present study, no known sector resources that include climate adaptation were identified, or suggested by the interviewed national authorities. Nevertheless, waste infrastructure needs to comply with environment legislation, such as the Landfill Directive and the Industrial Emissions Directive.

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

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

Integral adaptation strategies to mitigate flooding effects	
Project description	The TUPAS university is demonstrating how to devise climate adaptation strategies in a participatory manner, and provides decision makers with the necessary building blocks
Photograph	N/A
Budget	N/A
Climate Change Vulnerability and Risks	A <a href="#">FLOOD DAMAGE ASSESSMENT</a> is promoted to provide quantitative monetary estimates of flood consequences and risk, and to gain insight into how the system works (e.g. which components contribute most to risk). A <a href="#">SPRAWL MONITOR</a> tool provides trends and changes on the urban fringe in order to integrate in adaptation strategies related to suburban development and flood risk

	management
Climate change adaptation measures	The <a href="#">GO GREEN</a> module is considering green infrastructure in flood risk management plans and understanding the added value it gives to the functioning of the city. It is also promoting the understanding of decisions involved in the planning process, and sharing good practice in terms of planning, designing, installing and managing urban green infrastructure. An often promoted measure is the <a href="#">MULTIBENEFIT FLOOD RETENTION</a> approach of integrated measures with multiple co-benefits for the development of an overall flood risk management strategy
Good practice	Integration of holist planning, stakeholder involvement, public education, ecosystem-based approaches into climate adaptation planning
Further information	<a href="http://www.turas-cities.org/topical_strategy/5">http://www.turas-cities.org/topical_strategy/5</a>

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

Brdnikova Water Retention	
Project description	The redesign of the Podutik flood reservoir is increasing ecosystem-based climate adaptation services by creating a multifunctional blue-green infrastructure
Photograph	N/A
Budget	N/A
Climate Change Vulnerability and Risks	Increased flood risk
Climate change adaptation measures	The flood reservoir Podutik has been redesigned into a multifunctional flood reservoir that provides a broad range of ecosystem services through the integration of nature-based technologies (Eco Technologies).
Good practice	Using green infrastructure in a climate adaptation strategy serves multiple goals, including improving and maintaining a good ecological status (of nearby watercourses in this case study) and mitigating floods (in the nearby settlements of the city of Ljubljana).
Further information	<a href="http://www.turas-cities.org/pilot/14">http://www.turas-cities.org/pilot/14</a>



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