



Climate change adaptation of major infrastructure projects

Country report for Italy

Prepared by:

Antonio De Rose (EY)
Filippos Anagnostopoulos (EY)
Anthony Tricot (EY)
Navdeep Sandhu (EY)
Ilse Laureysens (Arcadis)

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Unit F1 – Closure and Major Projects

Contact: Jonathan DENNESS, Head of Unit

Camelia-Mihaela KOVÁCS, Administrator

E-mail: REGIO-MAJOR-PROJECTS@ec.europa.eu

*European Commission
B-1049 Brussels*

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

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

1. INTRODUCTION

The [EU Strategy on Adaptation to Climate Change](#) of 2013 includes actions to enhance the resilience of infrastructure and mainstream climate adaptation into the European regional and cohesion policy. The [Common Provisions Regulation](#) (CPR) of 2013 states under article 8 that climate change mitigation and adaptation, and risk prevention shall be taken into consideration for investments made with the support of the European Structural and Investment Funds (ESI Funds). The regulation integrates climate change adaptation considerations into the preparation and approval of major projects¹ or other projects funded by the ESI Funds through the requirement to conduct climate change vulnerability and risk assessments. In coordination with the ESI Funds, and complementary 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 Italy focuses on the adaptation to climate change of infrastructure projects supporting the requirement to undertake climate change vulnerability and risk assessments by presenting:

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

Country Overview

The Italian the [National Adaptation Strategy to Climate Change](#) (NAS) was adopted in June 2015. There is also work in progress on development of the National Adaptation Plan for Climate Change (NAP). The review of the NAS is planned for 2020. The development of Regional and Sectorial Adaptation Actions, Strategies and Plans is currently underway in the different regions. The [Ministry for the Environment, Land and Sea](#) has the primary responsibility for elaborating the National Adaptation Strategy and Plan and their coordination through the Institutional Panel, which includes other ministries, regional committees, the National Association of Italian Municipalities and the Union of Italian Province. The [Italian National Institute for Environmental Protection and Research](#) (ISPRA) is the formal authority maintaining primary responsibilities for infrastructure, disaster risk and climate data.

Some resources on climate adaptation are available in Italy, however the country does not have a dedicated national website providing access to climate change adaptation. Weather data can be gathered from [Meteoam](#), the Italian meteorological service, while

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

the [Euro-Mediterranean Centre on Climate Change \(CMCC\)](#) holds more climate-related data. Climate research is supported via a number of research institutes, including the - Institute of Atmospheric Sciences and Climate of the National Research Council ([ISAC](#)), the Institute for Environmental Protection and Research ([ISPRA](#)), and the Lombardy Foundation for the Environment ([FLA](#)). The [INGV-CMCC](#) has performed a set of climate scenario integrations for Italy following the protocol prescribed for the IPCC CMIP3 simulations. A national report ([‘Climate change impacts on coastal areas: Economic quantification of impacts and adaptation measures - synthesis of results and methodological indications for future research’](#)) produced in 2007, through a partnership between the Italian Agency for Environmental Protection and Technical Services ([APAT](#)) and [CMCC](#), proposed a set of methodologies for the economic assessment of impacts that climate change (i.e. sea level rise, increase of storminess and temperature variations) has on Italian coastal zones. At a regional level, the Abruzzo Region and the National Agency for New Technologies, Energy and Sustainable Economic Development (ENEA) conducted a [feasibility study](#) in 2011, which focused on the coastal marine environment, coastal zones, mountain areas and production activities. The [“Report on the state of scientific knowledge on impacts, vulnerability and adaptation to climate change in Italy”](#) (2015) presented a comprehensive assessment of climate change impacts and vulnerabilities. The [INTACT](#) risk framework is a methodology adopted in Italy for infrastructure-related projects. This project aims to draw together knowledge from stakeholders and experts, analyses and assessments, to help and make critical infrastructure more resilient to extreme weather. Another tool used within Italy for climate change adaptation projects is [TRUST](#) (Tool for Regional Scale Assessment of Groundwater Storage Improvement in climate change adaptation). Within the urban sector, a range of initiatives were implemented by Provinces, Cities and Municipalities, such as Ancona’s [local adaptation plan](#). The national government, with [Italiasicura](#) have developed adaptation methods for overcoming emergencies in key areas for social, cultural and economic activity; such as hydrogeological disruption, water-related infrastructure issues and improving the resilience of school buildings. Regionally, the Faenza municipality implemented a Bio-Neighbourhood [incentive programme](#) for developers within the urban planning regulations to cope with rising temperatures related to 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](#).

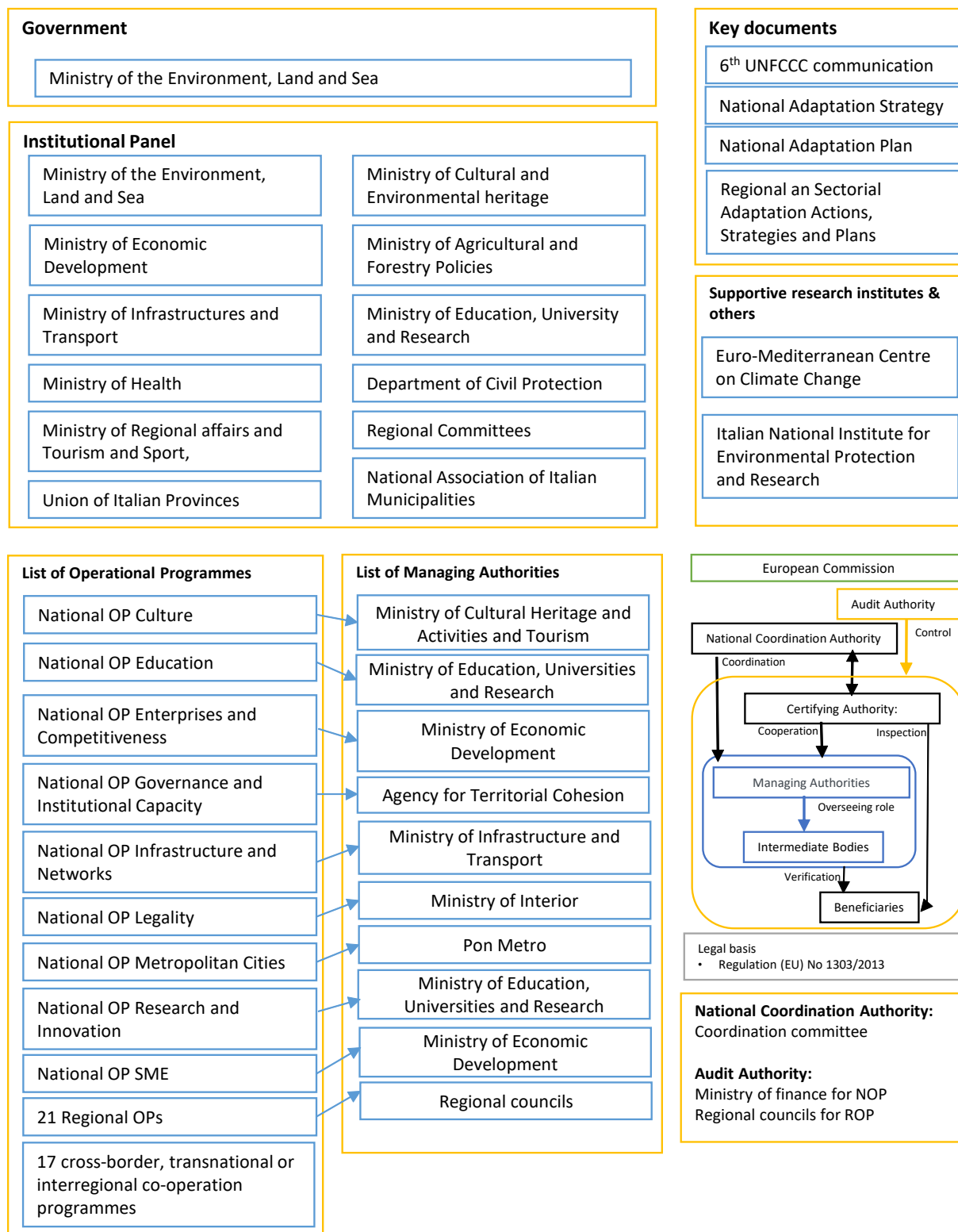
The present report identifies little information on the adaptation of infrastructure sectors. The transport, energy and waste sectors are not involved in the national or regional authority climate change adaptation plans or initiatives organised by governmental bodies. With regard to EU funding of Italy’s broadband infrastructure, there is comprehensive guidance provided in [‘European Funding for Broadband 2014 – 2020’](#). The report states that the 2014 - 2020 total budget for broadband deployment in Italy is approximately €1,161 Million, higher than any other Member State involved. A number of relevant projects are making progress in the field of urban climate adaptation; such as [ACT](#) (Adapting to Climate change in Time), [UHI](#) (Urban Heat Island, [CHAMP](#) (Local Climate Change Response) and [EU Cities Adapt](#) (Adaptation Strategies for European Cities). These focused on developing and implementing an adaptation strategy for local authorities. Two projects related to climate adaptation in the water sector are [ClimWatAdapt](#)², addressing vulnerability assessments and potential key adaptation measures assessment; and [STRADA](#)³, developing adaptation strategies in the Italy Switzerland trans-boundary territory.

Two case studies for climate adaptation in Italy are included in the accompanying country report. These include the [modelling of water scenarios and sectoral impacts for climate adaptation](#), and the [TRUST tool](#) for regional scale assessment of groundwater storage improvement in adaptation to climate change.

² (Climate Adaptation - Modelling water scenarios and sectoral impacts

³ (Climate change adaptation strategies for the management of natural hazards in the in trans-boundary areas

2. LEGAL, POLICY AND INSTITUTIONAL FRAMEWORK



The [Italian National Strategy on Adaptation to Climate Change](#) (NAS) was adopted in 2015 by the Ministry for the Environment, Land and Sea ([IMELS](#)) and provides guidance to address climate change adaptation, actions to build adaptive capacity, and concrete proposals on cost-effective adaptation measures and priorities. IMELS is responsible for the following three environmental areas: energy, climate and air pollution. Regional adaptation strategies are being developed with the support of IMELS. Only the Lombardia Region has adopted a regional strategy so far. IMELS was supported in the elaboration of the NAS by the Institutional Panel. The implementation of the NAS will be supported by a National Action Plan which is currently being prepared by IMELS, with the support of the Institutional Panel.

ERDF is absorbed through regional Operational Programmes (21) managed by the relevant regional authorities, and thematic National Operational Programmes managed by the relevant line ministries.

3. RESOURCES

This country report has reviewed the currently available resources in Italy for adapting to the impacts of climate change across six key infrastructure sectors. Adaptation to climate change is integrated in the legal basis⁴ for ESIF-funded projects, through the processes of vulnerability and risk assessments which are, broadly:

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

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

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

Resources	Explanation
Data Availability	The availability, accessibility and applicability of data on climate projections and impacts, on past and historic events, on geophysical parameters, on long-term scenarios, on economic, environmental and social impacts, etc.
Methodologies	The existence of quantitative or qualitative methodologies (a system of processes, a set of principles and rules) for integrating climate change adaptation in the development of infrastructure projects.
Tools	The availability of tools for planning, evaluation, impact estimation (i.e. software, maps, computer simulations, long term climate forecasts etc.) to assist with the adaptation of infrastructure to climate impacts
Guidance	The provision of guidance on how to use methodologies (i.e. for conducting climate change vulnerability and risk assessments) or develop the required infrastructure project documentation relating to climate adaptation.
Design Standards	The availability of published engineering design standards (i.e. by BSI, DIN, ISO) for infrastructure projects that include sections or appropriate provisions to ensure resilience to climate change impacts

⁴ 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

System	The institutional and legal framework that the formal authorities work with to deliver their primary responsibilities for climate adaptation, infrastructure, and management of European Structural and Investment Funds
Institutional capacity	The human and technical capacity of institutions to carry out their functions. It depends on being adequately resourced, on having the appropriate expertise, and on collaborating effectively and enforcing laws and regulations

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.

Italy does not have a dedicated website providing access to climate change adaptation relevant information or data, e.g. a repository of key documents or a climate services website.

The country's Sixth National Communication on the UN Framework Convention on Climate Change ([UNFCCC](#)) uses climate change adaptation data which has been submitted to produce climate projections by industry (see "Sector preparedness").

Weather data can be gathered from [Meteoam](#), the Italian meteorological service, while the [Euro-Mediterranean Centre on Climate Change \(CMCC\)](#) holds more climate-related data. Several climate scenarios and projections covering the country have been conducted in recent years by the Euro-Mediterranean Centre for Climate Change (CMCC) and the Italian National Agency for New Technologies, Energy and Sustainable Economic Development (ENEA).

The [Italian National Statistics Institute](#) (Istat) is the leading state authority on 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.

Climate research is supported via a number of research institutes, including the - Institute of Atmospheric Sciences and Climate of the National Research Council ([ISAC](#)), the Institute for Environmental Protection and Research ([ISPRA](#)), and the Lombardy Foundation for the Environment ([FLA](#)). In addition, several Universities as well as several regional Agencies for Environmental protection (ARPAs) are actively conducting research on climate data monitoring, regional climate modelling and regional impacts assessment.

The National Adaptation Strategy is based on several climate scenarios and projections carried out by CMCC and the Italian National Agency for New Technologies, Energy and Sustainable Economic Development (ENEA). As part of the NAS, the report published in 2014 the "[Report on the state of scientific knowledge on impacts, vulnerability and adaptation to climate change in Italy](#)" presented a comprehensive assessment of climate change impacts and vulnerabilities, with the aim to identify key vulnerabilities, sectors and related measures.

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

The EU produced a study adopting a methodology ([‘Exploring climate change vulnerability across sectors and scenarios using indicators of impacts and coping capacity’](#)) allowing users to explore vulnerability to changes in ecosystem services, as a result of climatic and socio-economic changes. It focuses on the vulnerability of Europe across multiple sectors, by combining the outputs of a regional integrated assessment (IA) model and the [CLIMSAVE IA Platform](#) (IAP), with maps of coping capacity based on the [five capitals approach](#). The presented methodology enables stakeholder-derived socio-economic futures to be represented within a quantitative integrated modelling framework, in a way that changes spatially and temporally with the socio-economic storyline. Vulnerability was mapped for six key ecosystem services in 40 combined climate and socio-economic scenarios.

A national report ([“Climate change impacts on coastal areas: Economic quantification of impacts and adaptation measures - synthesis of results and methodological indications for future research”](#)) produced in 2007, through a partnership between the Italian Agency for Environmental Protection and Technical Services ([APAT](#)) and [CMCC](#), proposed a set of methodologies for the economic assessment of impacts that climate change (i.e. sea level rise, increase of storminess and temperature variations) has on Italian coastal zones. The research identified three types of coastal zone adaptation (‘Retreat, Accommodation and Protection’) which generate different costs and benefits. The objective is to lay the foundations for defining a methodological framework to be applied for the assessment of local adaptation strategies.

At a regional level, the Abruzzo Region and the National Agency for New Technologies, Energy and Sustainable Economic Development (ENEA) conducted a [feasibility study](#) in 2011, which focused on the coastal marine environment, coastal zones, mountain areas and production activities. This study aimed at identifying technical, scientific, methodological, procedural and public elements needed to tailor the methodologies and procedures put forward by IPCC and UNEP to the Italian case for the identification of possible adaptation options. The ultimate goal includes building a field-tested prototype that could be taken up as a reference method for analysis of climate change adaptation at the national level.

3.3. Tools

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

The [INTACT](#) wiki is the platform on which the knowledge, tools and methods, developed in the EU project [INTACT](#) are shared with the world. On it, you can find information, references, guidance and experiences on how to ensure continued resilience of critical infrastructure in the context of changing climate and related extreme weather events. The [INTACT](#) risk framework is a methodology adopted in Italy for infrastructure-related projects. This project aims to draw together knowledge from stakeholders and experts, analyses and assessments, to help and make critical infrastructure more resilient to extreme weather. A practical example is presented in the Case Study section.

Another tool used within Italy for climate change adaptation projects is [TRUST](#) (Tool for Regional Scale Assessment of Groundwater Storage Improvement in climate change

adaptation). This tool addresses the development of adaptation strategies for the ground water as well as of innovative actions to stop the slow but also progressive decline of the level of groundwater of the Veneto and Friuli regions.

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. There is no national guidance available relevant to climate change adaptation and the reader is referred to the European Climate Adaptation Platform [Climate-ADAPT](#), and search with keywords. The following sector guidance is available:

Within the urban sector, a range of initiatives were implemented by Provinces, Cities and Municipalities, such as:

- Ancona Municipality developed a [local adaptation plan](#) (in the framework of the ACT project) in close collaboration with local stakeholders and based on a methodology designed by [ISPRA](#) with the aim to be applied also in other European cities; and
- Genova Province developed an Adaptation Action Plan (under the [GRaBS](#) project) to cope with the territory vulnerabilities that might be worsened by climate change and through planning strategies aimed at increasing the environment natural defenses. The involvement of local stakeholders and citizens was a core pillar of the project.

Italy makes use of knowledge and guidance derived from the European level, such as the DG CLIMA Publications: [Climate Change and Major Projects](#) and the non-paper [Guidelines for Project Managers - Making vulnerable investments climate resilient](#); while it uses JASPERS Guidance and the soon to be finalized document: Basics of Climate Change Adaptation Vulnerability and Risk Assessment. More information can be adapted to the local level through the publication of the report by the European Financing Institutions Working Group on Adaptation to Climate Change [Integrating Climate Change Information and Adaptation in Project Development](#). Further publications include:

- [Adapting infrastructure to climate change](#) – Working document 137;
- Adaptation in Europe. Addressing risks and opportunities from climate change in the context of socio-economic developments, [Report no.3](#);
- [Climate Change, impacts and vulnerability in Europe 2016](#) – an indicator – based report.

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 Italian national standards authority, Ente Nazionale Italiano di Unificazione ([UNI](#)), 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).

The national government, with [Italiasicura](#) have developed adaptation methods for overcoming emergencies in key areas for social, cultural and economic activity; such as hydrogeological disruption, water-related infrastructure issues and improving the resilience of school buildings.

Regionally, the Faenza municipality implemented a Bio-Neighbourhood [incentive programme](#) for developers within the urban planning regulations to cope with rising temperatures related to climate change, with a focus on enhancing synergies between climate change adaptation and mitigation, quality of life and development. For this purpose, the incentive programme authorises additional building capacity with respect to the approved standards for buildings having distinctive features of environmental sustainability.

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 Italian Ministry for Environment, Land and Sea (MATTM), approved the [National Adaptation Strategy](#) to Climate Change (NAS) in June 2015 with a Directorial Decree of the Climate Change and Energy General Director. Review of the NAS is planned for 2020.

The Climate Change and Energy Department (DG-CLE) of MATTM with the support of the EuroMediterranean Centre for Climate Change (CMCC) and scientists from different Italian research institutes is currently developing the Italian National Adaptation Plan for Climate Change (NAP).

The development of Regional and Sectorial Adaptation Actions, Strategies and Plans is currently underway in the different regions. The process is developing at different speeds as some regions have a regional plan or strategy for adaptation (e.g. Lombardia, Emilia Romagna, Autonomous Province of Trento, Valle d'Aosta). Several regions (Abruzzo, Molise) are reviewing their regulatory measures (EIA) and planning tools (EU Structural Funds) considering adaptation. Cities and regions are also involved, as 150 are promoting adaptation at local level by facilitating the European Covenant of Mayors for Climate and Energy programs (e.g. Lazio, Abruzzo). Also, under the European cooperation for regional development programmes (ERDF), for the regions Calabria, Sicilia, Campania and Puglia, MATTM has coordinated a project to support the regional environmental authorities for the implementation of the principles of the SNAC in the future regional adaptation plans.

Within the water sector, law 267/1998, also known as [Legge Sarno](#), is the main legal mechanism involving the implementation of hydrogeological protection in line with the [Water Framework Directive](#) and requires the authorities responsible for hydrological basins management to detect risk areas, set up prevention plans and establish

regulations to avoid additional risk due to anthropogenic factors; it is also the legal basis for identification and funding of urgent preventive measures.

A monitoring system, in order to evaluate progress in implementing the NAS isn't yet in place neither at national level as well as at regional level. The NAP will provide guidelines for monitoring the implementation of adaptation actions and their efficiency.

Responsible authorities

The Ministry for the Environment, Land and Sea (IMELS) has the primary responsibility for elaborating the [National Adaptation Strategy](#) and Plan and their coordination through a the Institutional Panel, which includes other ministries, regional committees, the National Association of Italian Municipalities and the Union of Italian Province. The [IMELS](#) focuses on the integration of adaptation into sectoral policies, whilst regional governments are entrusted with the implementation of local adaptation plans of action; some regions have started working on adaptation, particularly with respect to aspects such as research and monitoring.

The [Italian National Institute for Environmental Protection and Research](#) (ISPRA) is the formal authority maintaining primary responsibilities for infrastructure, disaster risk and climate data. The institute performs scientific, technical and research functions as well as assessment, monitoring, control, communication, training and education activities. They support the [Ministry of Environment](#) in several sectors i.e. marine and water environments, soil, air, habitats, ecosystems and biodiversity. Furthermore, they facilitate the coherent implementation of national environmental policies through the scientific and technical co-ordination with the 21 environmental agencies of the Italian regions and autonomous provinces.

Management of the ESI Funds

Italy has nine national operational programmes, and 21 regional OPs, while it is also participating in 17 cross-border, transnational or interregional co-operation programmes. The managing authorities for the national OPs are the Ministry of Cultural Heritage and Activities and Tourism, the Ministry of Education, Universities and Research, the Ministry of Economic Development, the Agency for Territorial Cohesion, the Ministry of Infrastructure and Transport, the Ministry of Interior, while for the Regional OPs the Managing authorities are the Regional Councils. The management of the system is ensured by a Coordination committee which acts as the National coordination authority, and by the Ministry of Finance and the Regional Councils which act as the audit authorities.

3.7. Institutional Capacity

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

Technical and human resources

The present study has identified a number of institutions and resources which contribute to the knowledge base for climate adaptation. However, a concise assessment of the overall technical and human capacity for climate adaptation is elusive. Research has focused on climate change and adaptation in the context of the Special Integrative Fund for Research (FISR), the Strategic Programme for Sustainable Development and Climate Change, and the National Research Programme. Climate related research projects encompass a wide range of specific themes, including research on the impacts of climate change and on the development adaptation technologies.

Effective collaboration

The design and implementation of the NAP requires both the "vertical" coordination between different levels of territorial government and the "horizontal" coordination between different policies. For this purpose, the plan will provide an indication of roles and responsibilities for implementing integrated adaptation actions

For the elaboration of the Italian NAS there was involvement of the national scientific community and the establishment of a Scientific Panel about 100 national scientists and sectoral experts from the National scientific institutions and Universities. The relevant Institutional Authorities were also involved through the establishment of an Institutional Panel of relevant Ministries and National, Regional and Local Authorities.

The MATTM has established an interregional Panel with the national State-Regions commission for climate change and an inter-ministerial Panel. The aim is to build a ground for adaptation to collect the points of view of all actors involved in NAP and share and evaluate the state of the implementation of adaptation actions at national, regional and local level. The following Ministries participate to this panel and presents their point of view and initiatives on adaptations:

- Ministry of Economic Development
- Ministry of Agricultural and Forestry Policies
- Ministry of Infrastructures and Transport
- Ministry of Health
- Ministry of Education, University and Research
- Ministry of Cultural and Environmental Heritages

Financial resources

The [ESI Funds are enabling the development of major projects](#) in the 2014 – 2020 programming period for Italy. Concerning major projects, by early 2018, there have been 53 Million EUR approved for Network Infrastructures in Transport and Energy; 11 Million EUR for Low-Carbon Economy; 18 Million EUR in Environment Protection & Resource Efficiency; 3 Million EUR for Research and Innovation; 42 Million EUR for Information and Communication technologies. The [dataset will be updated regularly](#) to reflect changes in the programme lists and major project notifications.

According to the [ESIF-viewer](#), Italy is planning investments of 32.5 Billion EUR. Projects under the Thematic Objective 5 on promoting climate change adaptation, risk prevention and management will be receiving 932 Million EUR, with an additional 2 548 Million EUR approved for Network Infrastructures in Transport and Energy (Thematic Objective 7); 2730 Million EUR in Environment Protection & Resource Efficiency (Thematic Objective 6); and 1615 Million EUR for Information and Communication Technologies (Thematic Objective 2). The shares within these Thematic Objectives that may relate to climate adaptation are unknown.

Financial resources for adaptation are expected to be obtained from the application of the Directive 2003/87/CE (art. 3) concerning the setting up of the Emissions Trading Scheme. The revenues of the auctions can be used, up to the extent of 50% of the total, to support adaptation to climate change impacts. On this basis, the Ministry of Environment has spent part of the revenues for the containment of little landslides in mountain cities, caused or worsened by climate change. 17 regions and almost 55 municipalities were involved in this program. This initiative implied the approval of program agreements between the Ministry of Environment and the beneficiary Regional Administration.

4. SECTOR OVERVIEW

4.1. Introduction

Since 2014, the requirements for major projects to obtain ESIF funding⁵ demand that project applications integrate climate change considerations⁶, 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*.⁷

4.2. Transport

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

Road infrastructure

No specific strategy on making Italian 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 Italian 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.

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

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

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

Airport infrastructure

No specific strategy on making Italian 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 airport infrastructure. See section 4.1 for more information.

4.3. Broadband

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

With regard to EU funding of Italy’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 Italy is approximately €1,161 Million, higher than any other Member State involved.

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

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

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.

Existing studies⁹ on the expected costs of inaction for coastal areas are limited to few vulnerable areas (the Fondi Plains, the Sangro River basin and the Grado and Marano

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

⁹ By Foundation Eni Enrico Mattei (Fondazione Eni Enrico Mattei - FEEM) and Italian National Agency for New

Plains) for which the direct costs were calculated in terms of land loss. For the Sangro River basin, the estimated costs are around €14 million for the reference scenario at 2100; considering higher hydro-geological vulnerability, the estimated costs would increase to about 73 Million EUR. Furthermore, the CIRCE124 project estimated the loss of coastal areas in Italy in 2050 under the IPCC SRES A1B scenario at about 0.7% of the national territory, with an indirect economic impact on the Italian GDP at - 0.18%, in terms of loss of coastal infrastructure and agricultural land.

A number of relevant projects are making progress in the field of climate adaptation:

- [ACT](#) (Adapting to Climate change in Time) - supporting local authorities, in particular the ones of the European cities in the Mediterranean basin in developing a concerted Local Adaptation Strategy to increase cities resilience to climate change, taking into account environmental, social and economic impacts of climate change; in Italy it was carried out by the Municipality of Ancona;
- [UHI](#) (Urban Heat Island) aiming to develop strategies to mitigate, adapt to, prevent and manage the risks related to the urban heat island phenomenon, involving agencies, departments and directorates of Emilia-Romagna and Veneto Regions; their areas of intervention are the metropolitan cluster of Bologna–Modena and the urban corridor of Venezia–Padova. In this context the Veneto Region organized an international conference on climate adaptation in urban areas;
- [CHAMP](#) (Local Climate Change Response) - “aimed at training and supporting local and sub-regional authorities in implementing an integrated management system for climate change mitigation and adaptation, and to promoting the model European-wide”; and
- [EU Cities Adapt](#) (Adaptation Strategies for European Cities). Three Italian cities (Alba, Padova and Ancona) were selected to participate to the training and capacity building phase for developing and implementing an adaptation strategy. Within the project, Ancona is considered a “peer city” that is advanced in its adaptation process and it will support the other “starting cities”.
- [LIFE MASTER ADAPT](#): MAInSTreaming Experiences at Regional and local level for adaptation to climate change. The project aims to identify and evaluate new multilevel governance tools in order to help regions and local authorities in developing adaptation policies to cope with climate change. Enhancement of at least 40 climate change adaptation measures in participating territories is aimed for, including flood risk measures in Lombardy, water efficiency and extreme weather monitoring measures in Sardinia and measures to improve water management, increase green connectivity and reduce coastal erosion in Venice.

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

4.5. Energy

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

(transport, cooling, etc.) and transport (electrified vehicles, dynamic traffic information, etc.).

During the present study, no known sector resources that include climate adaptation were identified, or suggested by the interviewed national authorities. See section 4.1 for information on more 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), 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 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.

The direct costs of hydrogeological risks (floods and landslides) for three Italian regions (Calabria, Lazio and Lombardia) were estimated at 103 million Euros in terms of value of the land under flood risk and at 187 million Euros in terms of value of the land at risk of landslides¹⁰. The expected direct costs of floods for Italy in 2050 under the IPCC SRES A1B scenario could be 1.6 billion Euros¹¹. The related impact on the national GDP would amount to 457 million Euros in 2050¹². The projected increase of droughts frequency and water scarcity, especially in Southern Italy, is very high on the policy agenda. It drives the development of suitable responses in combination with the other components of EU water regulation. Implemented initiatives are presented below:

- With the implementation of the (2000) EU Water Framework Directive, Italy issued water emergencies regulations to address water crises, providing both technical and financial support for emergency measures. In March 2007, the Council of Ministers approved "Practical guidelines to deal with possible water crises", that provide indications to all water management structures for undertaking monitoring and appropriate enforcement activities;
- Ad hoc organizations for crisis management were established, such as a "Drought control room" for drought events in the Po River basin, and a "Coordination Unit for the management of water resources" shared between Puglia and Basilicata Regions, to regulate water usage and to take the necessary measures to prevent water crisis;
- A number of Italian structural funds include irrigation networks as well as drinking-water distribution networks, not only for water emergencies.
- In terms of cohesion funds, Italy has a water programme, also useful in providing necessary information for water crisis prevention.

At the catchment level, the [River Basin Management Plan of the Po River catchment](#) aims at the identification of shared strategies for water management and adaptation to climate

¹⁰ Carraro C. and Sgobbi A. (2008)

¹¹ Flörke M. et al. (2011); ClimWatAdapt (Climate Adaptation modelling water scenarios and sectoral impacts - (<http://climwatadapt.eu/>)).

¹² Francesco Bosello (2013)

change; in addition, the [Watershed Authority of the Arno River Basin](#) took into account climate change impacts in mapping flood hazard and risk in support to river Basin planning.

In 2016, the Ministry of Environment established a [National Panel on Coastal Erosion](#) (TNEC), with the technical support of ISPRA, the national scientific community and the involvement of all the Italian coastal regions. One of the tasks of the Panel was to draft [national guidelines for coastal protection](#) in anticipation of climate change.

Two projects related to climate adaptation in the water sector are:

- [ClimWatAdapt](#) (Climate Adaptation - Modelling water scenarios and sectoral impacts) addressing vulnerability assessments and potential key adaptation measures assessment;
- [STRADA](#) (Climate change adaptation strategies for the management of natural hazards in the in trans-boundary areas), developing adaptation strategies in the Italy Switzerland trans-boundary territory, with a focus on managing water resources and on adaptation to hydro-geological hazards in the context of climate change in Alpine environment.

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 transposed 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

Climate Adaptation - Modelling water scenarios and sectoral impacts	
Project description	This project addresses a number of strategic issues and knowledge gaps identified in the EU's White Paper on Adaptation
Photograph	N/A
Budget	Funded by the European Commission DG Environment, Tender DG ENV.D.2/SER/2009/0034
Climate Change Vulnerability and Risks	N/A
Climate change adaptation measures	Project results include models, frameworks, scenarios and tools for decision support; the assessment of vulnerability and key adaptation measures are also addressed
Good practice	The project results represent a series of tools able to support the strategic approach envisaged in the White Paper, which will help to ensure coherency, timeliness and effectiveness of adaptation measures, improve the knowledge base and facilitate the exchange of best practice between countries and regions
Further information	http://www.cmcc.it/projects/climate-adaptation-modelling-water-scenarios-and-sectoral-impacts and https://www.ecologic.eu/13939

TRUST – Tool for regional scale assessment of groundwater storage improvement in adaptation to climate change	
Project description	The project aim has been the development of adaptation strategies for the ground water of the Veneto and Friuli regions
Photograph	N/A
Budget	N/A, Funded by the European Commission (LIFE Plus)
Climate Change Vulnerability and Risks	Water availability
Climate change adaptation measures	Development of innovative actions to arrest the slow but also progressive decline of the level of ground water in

	Veneto and Friuli regions
Good practice	The creation of a group of stakeholders for the management of water in Friuli and Veneto regions to increase the knowledge of the effects of climate change on ground waters and measures to reduce the impacts.
Further information	http://www.cmcc.it/projects/trust-tool-for-regional-scale-assessment-of-groundwater-storage-improvement-in-adaptation-to-climate-change

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