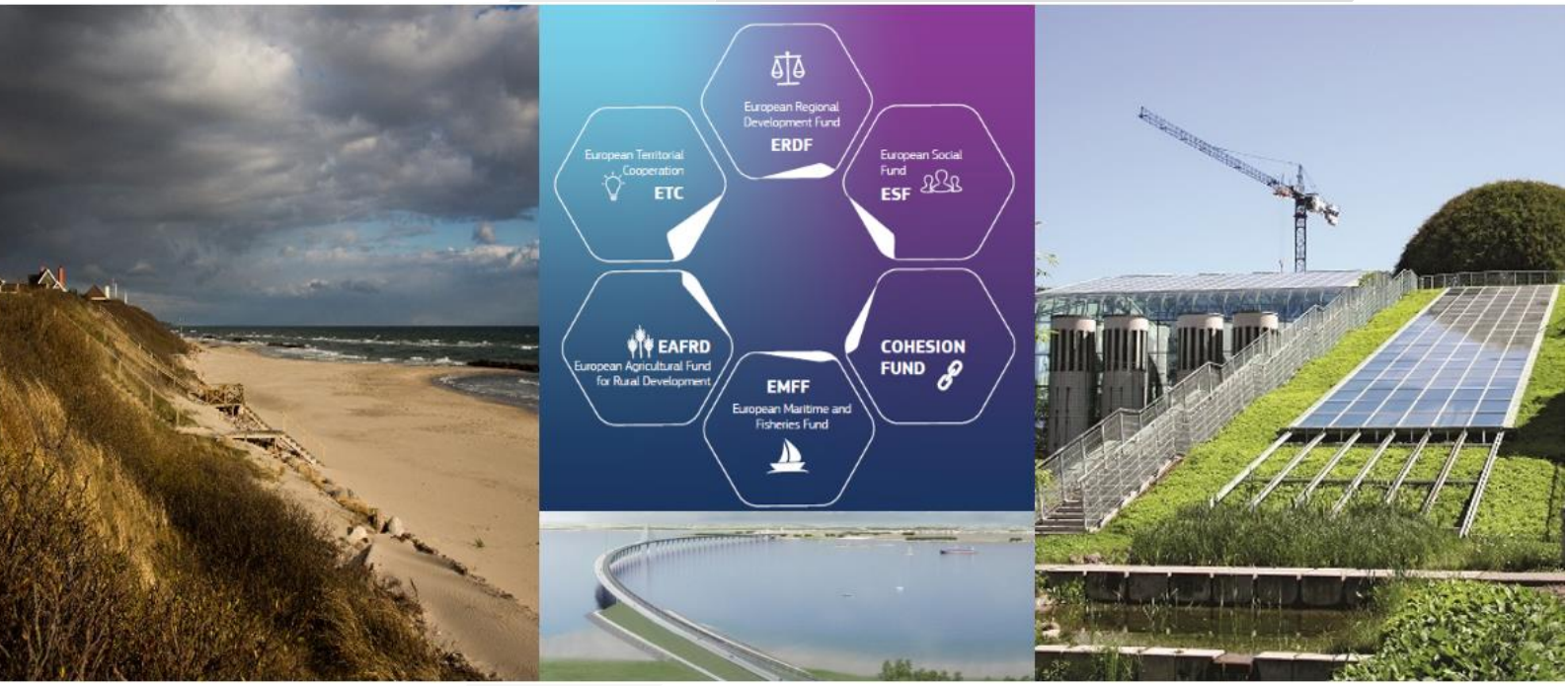
Mainstreaming of adaptation to climate change into the ESI Funds 2014-2020

Annex A - Case Studies



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Annex A - Case Studies

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1 Introduction

Annex A presents a number of case studies selected vis-à-vis main threats from climate change and their related hazards and needs. The purpose is to provide a deeper and example-based understanding of how climate change adaptation needs and challenges have been addressed in the programming of ESIF. The case studies focus on priorities that are important and visible within the respective programmes and that have received sizeable financial allocations. They refer to relevant, major projects where relevant, listed in the referenced programmes (with ERDF/CF funding).

The following case studies are described in detail:

- Water scarcity and drought – Spain
- Flooding – Romania
- Rural development and climate change adaptation – Poland
- Sea level rise, coastal erosion and coastal flooding – France
- European territorial co-operation and climate change adaptation (Danube, Adriatic-Ionan, Ireland-Wales and Spain-Portugal)
- Climate change adaptation in outermost regions (OR)

2 Water Scarcity and Drought

2.1 Illustrative examples from Spain

Projected changes in climate extremes in Europe will be marked inter alia by heat waves and droughts. The duration and intensity of droughts, especially in Southern Europe and the Mediterranean, are projected to increase.(1) The Mediterranean region is expected to suffer multiple stresses due to climate change. Increasing heat waves and droughts, coupled with competition for water will increase vulnerability in terms of composition of species, habitat losses, land degradation and land and forest production losses.(2)

Spain is very vulnerable to climate change due to its geographic and climatic conditions and its socio-economic situation. Hence there is a need to respond urgently and effectively to the effects of climate change. According to the Country Position Paper, Spain's vulnerability to climate change aggravates risks associated with forest fires, erosion and external phenomena such as droughts and floods, while there is also a high risk of desertification affecting almost three quarters of the country's territory.

This case study deals with climate change adaptation in the programming of ESIF in Spain with a particular view to illustrating how the challenges related to water scarcity and drought have been addressed by specific programmes. Spain's Partnership Agreement and relevant ESIF Programmes constitute the basic source of information on needs, challenges and foreseen adaptation actions. They serve to illustrate how the priorities and objectives on water scarcity and drought, which are areas of strategic priority both at national and regional level, have been translated into the expected results and activities of specific programmes (with particular attention to ERDF and EAFRD). In addition, a brief overview of national and regional adaptation strategies demonstrates their consistency with the Partnership Agreement in the field of water scarcity and drought.

2.1.1 Spain's Partnership Agreement

The fight against climate change has a prominent place in Spain's Partnership Agreement, with €7.99 billion(3) (almost 22 % of the total ESI Funds) dedicated to climate change objectives. Out of this, €1,83 billion is allocated to Thematic Objective (TO) 5, which addresses adaptation issues, through the EAFRD and the ERDF (c. 88 % and 12 % respectively).

The SWOT analysis of the Partnership Agreement identifies the low level of precipitation in Spain which, coupled with increased pressure on surface and underground water especially from agriculture, limits the availability of water

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[1] Based on regional and global climate simulations in the IPCC, 5th Assessment report, Working Group II, Chapter 23

[2] Idem

[3] Based on an estimate included in the adopted version of the PA.

resources. The SWOT analysis refers to the sustainable use of natural resources, especially water, as one of the territorial challenges in mountainous areas and in insular areas, i.e. the Canary Islands. In the latter, water scarcity is specifically highlighted as one of the territorial weaknesses that need to be addressed. Water scarcity is not limited to rural and insular areas, with metropolitan areas also being faced with the challenge to improve management of water resources.

Analysis of TO5 in the Partnership Agreement

The analysis of TO5 stresses the impact of temperature rises on prolonged droughts and on the expansion of areas affected by desertification. Projections point to a 5 % reduction of water resources in Spain over the 2014-2040 period, most notably in the Canarias region, where projections point to a reduction of 14-25 % in 2040.[4] Water resources in this region are exceptionally fragile due to insularity and the reliance on underground water resources that are subject to over-exploitation. Water scarcity is expected to also affect the south and east river basins, albeit to a lesser extent.

Against this backdrop, the Partnership Agreement emphasises the importance of developing adaptation measures, in accordance with national and regional climate change adaptation plans. The prevention and fight against droughts and desertification fall under the two key strategic priorities of the Partnership Agreement under TO5:

- Prevent and fight against forest fires, erosion and desertification
- Prevent and fight against floods and droughts, mitigate their effects and predict their occurrence.

Lines of action

In order to address these two strategic priorities, Spain will implement two main lines of action:

1. Sectorial evaluations of impacts, vulnerability and adaptation to climate change – Eight sectorial groups are specified, of which three are of particular relevance to the water scarcity and drought: a) water resources, b) agriculture and livestock, and c) soil and desertification.
2. Management of risks through prevention – such actions include emergency plans and civil protection plans.

Types of foreseen measures under TO5

The Partnership Agreement stipulates that measures addressing the management of **water resources** under river basin management plans and under special plans for situations of alert and temporary drought should promote investments for the prevention of drought (for instance, irrigation pools in agricultural holdings). The river basin management plans include measures that on the one hand moderate the demand for water and on the other hand increase the supply guarantee for different water uses. The Partnership Agreement states

[4] Source: Estudio de los impactos del cambio climatico en los recursos hidicos y las masas de agua, Ministerio de Medio Ambiente y Medio Rural y Marino, 2010 (Ministry of Agriculture)

that these investments should also support the National Plan of Priority Actions with respect to hydrological-forest restoration.

Measures in the **agriculture and livestock sector** will promote actions for the prevention of droughts and the control of desertification. These include actions to reduce the pressure on water demand from irrigation and adaptation of crops. Further, it is foreseen to restore agricultural and forest soils affected by desertification.

The fight against **desertification** is ensured by integrating the objectives of the National Action Plan for Adaptation to Climate Change (PNACC in Spanish) into the National Action Plan for the Fight against Desertification (PAND in Spanish). Indicative measures foreseen in the PAND include inter alia: an integrated system for the evaluation and surveillance of desertification in Spain; analysis, research, innovation and studies and programmes; restoration of soils affected by desertification (planning and restoration of river basins in degraded arid and semiarid zones); network of demonstration projects for the restoration of areas affected by desertification; and creation and management of protection belts in forests against erosion.

The role of ESI Funds

According to the Partnership Agreement, Spain will use the ERDF to finance adaptation actions targeting water scarcity and drought through measures in the fields of water resources, as well as soil and desertification. EAFRD will finance adaptation actions mainly in the field of agriculture and livestock, but also soil and desertification. In particular, Spain will use the EAFRD to finance inter alia the creation of water reservoirs in agricultural holdings, the modernisation of irrigation systems to reduce water losses, the development and implementation of prevention plans to address specific risks including drought risks and plans for the prevention of forest fires as a means to reduce desertification risks.

Types of measures foreseen under TO

Following the increased pressure on water resources from increased demand in the south and south-east of Spain [5] and the need to improve the efficiency of irrigation systems, TO6 foresees actions that will indirectly fight water scarcity and drought. Although 70 % of the actions related to water resources are targeted at water purification and treatment, the intervention logic addresses also the management of water reserves. More specifically, TO6 will support the reduction of water losses in distribution systems (ERDF) and the improvement of water efficiency in irrigation (EAFRD). In this regard, the intervention logic of TO6 reflects the challenges of reducing water losses in distribution systems and modernising the current irrigation systems to achieve improved efficiency in the use of water, in accordance with the national irrigation plan. It stresses the contribution of ERDF to awareness raising and information actions for reducing the demand for water and the contribution of EAFRD to the modernisation of irrigation infrastructures, given that irrigation for agriculture is the main user of water in Spain. Although not directly targeted at water scarcity and drought,

[5] Although water scarcity occurs as a consequence of climate change due to less precipitation and higher temperatures, human activities also add pressure on water resources, in particular in areas with high population density, tourist inflow (this is the case of Canarias for instance), intensive agriculture and water demanding industries.

water saving actions under this TO will also have an impact on reducing the risk of droughts.

Ultra-peripheral region of Canarias

A separate axis of the Partnership Agreement with a dedicated financial allocation (EUR 484 million) is devoted to the Canarias region due to its peripheral and insular character. It is a region with specific challenges in terms of scarcity of strategic resources including water, leading to high dependency on desalination and reverse osmosis plants, which involve a high level of energy consumption.[6] Therefore, the improvement of infrastructure and use of water constitutes a key priority, in addition to the need to comply with the Water Framework Directive.

2.1.2 National and regional adaptation strategies

The national strategic framework for adaptation

The national strategic framework for adaptation to climate change is the National Action Plan for Adaptation to Climate Change[7] (PNACC in Spanish), adopted in July 2006. Both the PNACC and its work programmes were taken into account in the elaboration of the Partnership Agreement, especially in the contents of TO5.

The PNACC sets the context in relation to water scarcity and drought by estimating the effects of climate change on water resources. These are manifested specifically through a general decrease in water supplies by 5-14 % (potentially reaching a 20-22 % decrease in scenarios for the last part of the 21st century), including specific severe decreases in water supplies in arid and semi-arid areas by 50 %[8] and increased hydrological variability in the Atlantic basins.

Regional adaptation strategies

All Spanish regions (autonomous communities) have developed their own climate change strategies or plans or have created climate change observatories, while some have developed strategies or plans devoted to adaptation to implement the strategy of the PNACC.[9] The majority of them deal with scarcity of water resources, the risk of droughts, impact on biodiversity and the link between drought and desertification. Some illustrative examples are provided in section 2 below.

Conclusion

The Partnership Agreement presents a clear link with the national adaptation strategy (PNACC) by promoting actions that are consistent with the content of the PNACC work programmes. Although the Partnership Agreement does not refer to regional adaptation strategies, these exist in several Spanish regions

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[6] It is worth noting the Canarias region energy dependency on imported fossil fuels, with negative climate consequences.

[7] http://www.magrama.gob.es/es/cambio-climatico/temas/impactos-vulnerabilidad-y-adaptacion/pna_v3_tcm7-12445_tcm7-197092.pdf

[8] Arid and semi-arid areas account for around 30% of the Spanish territory.

[9] Climate change adaptation plans at the regional level exist in Andalucía, Asturias, Canarias, Castilla y León, Cataluña, and La Rioja.

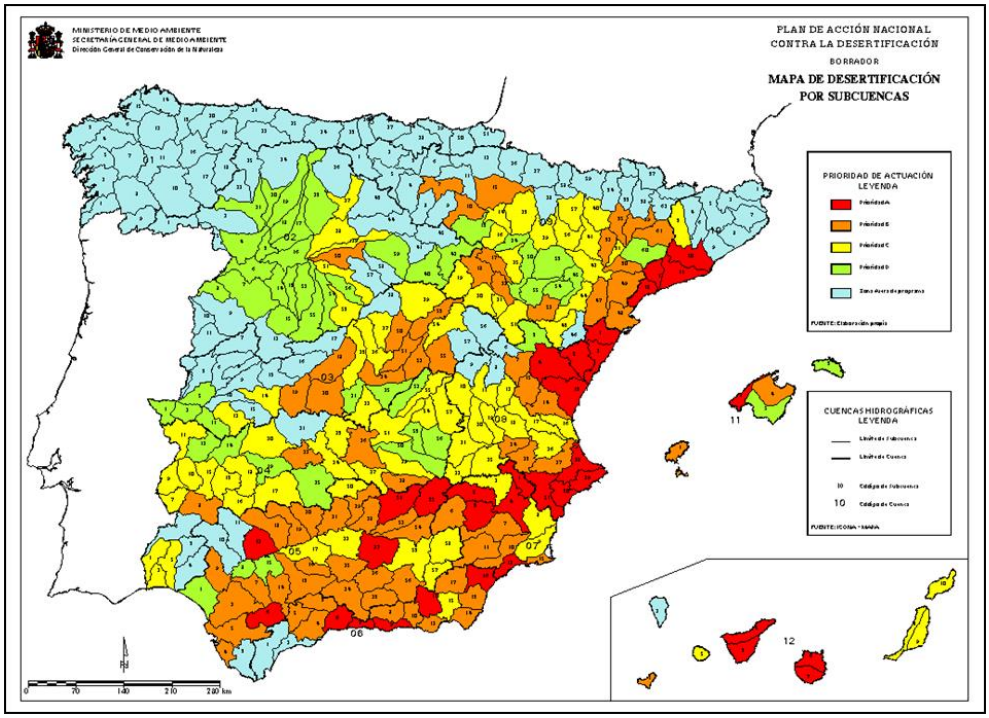
and contain actions to address water scarcity, drought and desertification that are coherent with both the Partnership Agreement and the PNACC.

2.2 Water scarcity and droughts in selected programmes: illustrative examples

Spain is divided into 17 administrative units, the autonomous communities, plus the two autonomous cities of Ceuta and Melilla. The Partnership Agreement analyses the current situation in Spain with reference to socio-economic and environmental indicators for each autonomous community. The specific needs and challenges of each autonomous community are in turn depicted in the regional programmes, which reflect the overall approach of the PA as well as the specific priorities for each region.

This section provides a summary of how water scarcity and droughts are addressed in the ESIF programmes of two selected regions (autonomous communities) in Spain: Andalucía and the Canary Islands (Canarias). These two regions were selected as representative for their water scarcity and drought problems (figure 1). The map below shows in red the areas of Spain that suffer most from over-exploitation of water resources and desertification. Most of these red zones are found in Andalucía and the Canarias. The next most fragile areas are those marked in orange and again there is a significant incidence in Andalucía.

Figure 2-1 – Spanish regions impacted by over-exploitation of water resources and desertification; Source: National Action Plan against Desertification [10]



[10] https://latidosdesdeelfondodelatierra.wordpress.com/2013/12/20/programa-de-accion-nacional-contra-la-desertificacion-pand/

2.2.1 ERDF and EAFRD in Andalucía

The ERDF and EAFRD programmes are coherent with the regional adaptation plan of Andalucía. This plan is the operational means by which the region will implement the PNACC.

ERDF Operational Programme

The ERDF Operational Programme[11] identifies climate change adaptation challenges under TO5, notably the high exposure to natural risks including drought and desertification and the reduction of water resources. The OP is linked to and supportive of the regional Plan for Climate Action and the regional Climate Change Adaptation Plan, which identify the same challenges, notably the rise in the frequency and duration of droughts that lead to a reduced availability of water resources, the rise of the aridity index with a consequent disappearance of humid areas and the rise of desertification processes. In addition, the ERDF Operational Programme stresses that the region suffers from over-exploitation of water resources in river basins, which may lead to a permanent disappearance of certain ecosystems and may also limit the availability of water to the population.

These challenges are addressed by the Operational Programme principally under TO5, IP5a and IP5b and to some extent also under TO6, IP6b and IP6d. Amongst those, IP5b is the one that most explicitly emphasises water scarcity and drought. The framing of IPb5 takes as a starting point three key challenges: The longer duration of droughts and the consequent reduction in the availability of water resources; the increased aridity index and the consequent potential disappearance of humid zones, and the increase in desertification processes.

[11] ERDF OP Andalucia (CCI: 2014ES16RFOP003)

Table 2-1: Investment Priorities in Andalucía's ERDF OP addressing water scarcity and drought under TO5

IP	Expected results	Actions	Selection criteria
IP5a	Promotion, modernisation and upgrading of planning and observation systems for the prevention of risks, including drought and desertification risks	The elaboration of manuals for the incorporation of risk prevention instruments in spatial planning; Development of early alert systems against climate adversities and natural phenomena (droughts, forest fires, etc.).	Actions that address specific serious problems caused by climate change, in line with the regional Plan for Climate Action; Coherence of actions with the assessment of risks in Andalucía and with the regional strategy for adaptation to climate change.
IP5b	Increased restoration of zones affected by natural catastrophes and a reduction of the effects of drought	Civil protection measures that guarantee civil security against emergencies and specific risks, including droughts. Specific projects include the implementation of measures for the prevention of and defence from droughts.	Actions that address specific serious problems caused by climate change, in line with the regional Plan for Climate Action; Coherence of actions with the assessment of risks in Andalucía and with the regional strategy for adaptation to climate change; Actions that minimise the vulnerability of the Andalucía territory to the negative effects of climate change; Actions dedicated to the defence from and prevention of extreme drought effects (in line with the river basin management plans and the Special Drought Plans of the intracommunity basins of Andalucía).

Water scarcity is addressed also through TO6, notably IP6b, which foresees actions that may effectively deliver the expected results. Specifically, the proposed actions address the issue of water losses, which is of particular concern in a region exposed to increased drought risks. Modernisation of infrastructures and substitution of networks, for instance, will contribute to water savings and efficiency. Similarly, the connection of water exploitation systems and water management actions will also contribute to more efficient water use, while guaranteeing adequate water supply to citizens, As a consequence, there will be a reduced need to carry out non-controlled extractions or seek other water sources, and thus reduce pressure on this scarce resource. The envisaged actions could be more effective if they included the incorporation of new technologies to improve the efficiency in the use of water resources, however, this may be implicit in the actions related to modernisation of infrastructures or the support to water management systems.

Table 2-2: Investment Priorities in Andalucía's ERDF OP addressing water scarcity and drought under TO6

IP	Expected results	Actions	Selection criteria
IP6b	Water savings and efficiency in the use of water resources; Increased security and quality of water supply; Reduced non-controlled extractions of water, which puts more pressure on an already scarce resource; Reduced demand for water especially in areas that suffer from water scarcity.	Improvement of the supply network and modernisation of infrastructures; Substitution of existing networks with more efficient ones and with no water losses; Connection of water exploitation systems as per river basin management plans; Support to water management actions and systems.	Actions that comply with river basin management plans and respect cost-effectiveness criteria; Prioritisation of actions that have most impact on the efficiency of water resources; Infrastructures that contribute to savings and efficiency of water resources.

There are no major projects listed in Andalucia's ERDF OP.

Rural Development Programme

The Rural Development Programme [12] identifies the limited availability of water as one of the main effects of climate change mainly caused by irregular rainfall. The hydrological balance in 2011 was negative (i.e. water demand was much higher than the available water resources). Increased frequency and intensity of droughts is another important impact of climate change leading to increased risk of forest fires and to intensified desertification processes.

Agriculture is one of the main economic activities in the region. The sector is the single most important water user in the region and a sector that is highly prone to the impacts of droughts. Thus, improved management of resources, including water resources, the development of instruments for the prevention and management of risks and the promotion of strategies that improve water management, are amongst the needs identified in the Rural Development Programme. The rural development strategy of Andalucía prioritises the needs it aims to address and the need to promote strategies that improve water management is depicted as the first priority.

The choice of Union Priorities for the Rural Development Programme takes water scarcity and drought into account.

[12] EAFRD RDP Andalucia (CCI: 2014ES06RDRP001)

Table 2-3: Union Priorities in Andalucía's RDP addressing water scarcity and drought

Union Priority	Actions	Relevant action lines of the regional adaptation strategy
UP 5A	Envisages investments in irrigation through M04, to guarantee the use of water and to reduce the impacts of droughts	Water savings and efficiency
UP 3B	Foresees the collection of comprehensive information in relation to climate change risks under M05 More detailed actions to address water scarcity and drought are incorporated in the design and content of measures M04, M05, M08 and to some extend in measures M13 and M16.	Management of drought processes

Thus, the Rural Development Programme of Andalucía aims to address the challenges of water scarcity and drought principally through water management and irrigation efficiency actions under M04, preventive (e.g. water storage) and recovery actions under M05 and prevention and repair of damages associated with droughts in forests under M08. M13 and M16 may also indirectly contribute to address water scarcity and drought through the maintenance of agricultural activity (M13) and the inclusion of water management and efficiency in water in the selection criteria for the creation of operational groups (M16). The indicators are not explicitly linked to drought, however they address water management and risk management.

Conclusion

Andalucía addresses **drought and desertification** primarily through the ERDF Operational Programme, which devotes a substantial part of TO5 to risk prevention and management actions. Water scarcity is less prominent in this OP and addressed mainly through TO6. **Water scarcity** in Andalucía is principally addressed by the RDP, mainly through water management and irrigation efficiency actions under measure 4 (investments in physical assets) and to some extent under measure 5 (restoring agriculture production potential) through preventive (water storage) actions. Droughts are addressed to some extent under measure 8 (investments in forest area development).

Both the ERDF Operational Programme and the RDP are aligned with the Partnership Agreement, notably by promoting drought prevention actions (ERDF) and water management and irrigation efficiency actions (EAFRD) as foreseen under the analysis of TO5 of the Partnership Agreement. The actions envisaged are aligned with the results of the scenario analysis of the regional adaptation strategy, which conclude that drought is one of the main concerns of the region, while desertification processes are expected to increase substantially by the end of the century. They are also coherent with the immediate action lines proposed in the regional adaptation strategy, namely, water savings and efficiency and the management of drought processes. These actions also reflect the challenges identified in the national plan for adaptation to climate change (PNACC) and support the implementation of the PNACC work programmes.

2.2.2 ERDF and EAFRD in Canarias

Canarias regional adaptation plan

The regional adaptation plan of Canarias identifies the reduced availability of water and the rise in the frequency and duration of droughts, especially in medium and low semi-arid latitudes, as one of the major effects of temperature rises due to climate change. The ERDF and EAFRD programmes are coherent with this regional adaptation plan and its measures related to water scarcity and drought.

ERDF Operational Programme

The ERDF Operational Programme of Canarias[13] is aligned with the regional adaptation plan by identifying water scarcity as one of the key challenges facing the region given that water is one of the strategic natural resources. Given this scarcity, the region relies heavily on infrastructures for desalination and treatment of wastewaters.

The Operational Programme addresses this challenge through TO6, IP6b, notably with the specific objective '*Meeting the requirements of the Water Framework Directive through investments in infrastructures for the treatment, depuration and re-utilisation of waste waters and improvements in the quality of water*'. The actions foreseen under IP6b are consistent with the regional adaptation plan. They are also consistent with the expected results, given that the implementation of technologies to reuse water will improve the efficiency of desalination and water treatment and consequently guarantee the availability of water in the long-term.

Table 2-4: Actions foreseen under IP6b in Canaria's ERDF OP addressing water scarcity and drought

Expected results	Actions	Selection criteria	Relevant regional adaptation plan measures
More efficient and more modern infrastructures for desalination and water treatment	Implementation of technologies to reuse water and reduce water scarcity	Actions to be consistent with the Canarias smart specialisation strategies and blue growth	Treatment and re-use of waste water given the forecasted reduction of fresh water resources

There are no major projects listed in the Canarias ERDF Operational Programme.

Rural Development Programme

Water scarcity is a prominent issue in the Canarias Rural Development Programme[14], recognised as a major weakness and a threat on which the intervention logic of the programme is developed. The islands rely heavily on water originating from desalination (of sea water) and reuse (or wastewater treatment) systems that represent 30 % of total water consumption. Desalination systems that use thermal and membrane technologies (the first

[13] ERDF OP Canarias (CCI: 2014ES16RFOP007)

[14] EAFRD RDP Canarias (CCI: 2014ES06RDRP005)

based on evaporation and the second based on semi-permeable membranes to separate salts from water) are costly and with potentially negative environmental impacts due to their high energy input (stemming mainly from imported fossil fuels in Canarias). Reuse or wastewater treatment systems are cheaper than desalination processes but still more expensive than drawing water from natural reserves. As a consequence, the approach used in Canarias for guaranteeing water supply can be both costly and environmentally damaging.

Agriculture plays an important role from an economic and land use point of view. At the same time, it is the main consumer of water (47 % of the total water consumption in Canarias), and irrigated land represented almost 30 % of the Canarias archipelago in 2009 (the equivalent at national level was around 13 %).[15] The scarcity of water has led agricultural holdings to modernise their irrigation infrastructure towards techniques that optimise the use of water. Despite this progress, water scarcity is still an issue that limits agriculture in many areas.

The Rural Development Programme is consistent with the Partnership Agreement and the National Plan for Adaptation to Climate Change (PNACC)[16] in stressing the needs, notably to improve the availability of water, to increase efficiency in water use and to address natural disasters.

The Rural Development Programme strategy puts special emphasis on water management through specific actions to achieve water savings and reduce the pressure on scare water resources, incorporated in the design and content of measures M01, M02, M04, M08 and M10. These are accompanied with common target indicators in relation to water management (T7, T10, T11, and T14). The actions supported by the Rural Development Programme are consistent with the regional adaptation plan.

Table 2-5: Specific actions to reduce pressure on water resources incorporated in Canaria's RDP measures (M01, M02, M04, M08 and M10)

Measure / FA	Actions	Selection criteria	Relevant regional adaptation plan measures
M01 – Knowledge transfer (FA 2A, 5A)	Training actions related to the efficiency of water resources in view of their scarcity. They complement related investments under M04	Training activities related inter alia to the efficient use of resources	Awareness-raising campaigns on water savings and rational consumption of water as a consequence of water scarcity
M02 –Advisory services (FA 2A, 5A)	Advisory services inter alia in water management and techniques for water savings		Studies on innovative approaches for water storage

[15] EAFRD RDP Canarias, section 4.1.1, version 2.0, 18/12/2015 (CCI: 2014ES06RDRP005)
[16] They both include a dedicated section to the ultra-peripheral region of Canarias

M04 – Investments in physical assets (FA 2A, 5A)	4.1 Investments in agricultural holdings: improvements in irrigation systems, water reservoirs, water pools, pumping and implementation of new irrigation structures or improvement of existing ones. Also, installations for water treatment in order to increase the repositories of water on farms; 4.2 Investments in processing/marketing and/or development of agricultural products: water savings, installation of equipment for the treatment and reuse of wastewater and responsible use of natural resources; 4.3 Investments in infrastructure related to the development, modernisation or adaptation of agriculture and forestry: investments in water savings to facilitate compliance with national norms; investments in wastewater treatment and reuse, responsible use of natural resources and investments in irrigation (e.g. implementation of more efficient systems, systems to control water consumption, desalination of sea water for irrigation use in areas prone to drought).	Prioritisation of investments in irrigation that achieve the highest water savings Investments related to wastewater treatment and reuse Actions that include inter alia the construction of water storage facilities, the use of desalinated or treated water rather than surface or underground water and the substitution of irrigation by gravity with irrigation by pressure to save water.	Treatment and re-use of waste water given the forecasted reduction of fresh water resources More efficient desalination systems
M08 – Investments in forest area development (FA 4B, 4C)	Preventive actions in forests against droughts and desertification, such as the introduction of species resilient to drought through the planting of adequate trees and shrub species; Restoration of habitats and the recovery of threatened species that have been affected by adverse climate effects; Elaboration and implementation of restoration plans.	Prioritisation of actions that improve the conservation status of forests	Evaluation of the main impacts of drought on forest ecosystems
M10 – Agri-environment-climate (FA 4A, 4B, 4C)	Although not directly related to water scarcity and drought, payments for complying with agri-environmental and climate commitments will contribute inter alia to increase the efficiency in the use of water resources and will improve the availability of water resources, addressing the problems of scarcity and natural constraints.	Priority to agricultural holdings in Natura 2000 areas	Promotion of water saving measures in all sectors given the scarcity of water resources on the islands

Conclusion

In the Canarias region, the Rural Development Programme is the main instrument for managing one of the key weaknesses and threats of the archipelago, namely the scarcity of water resources. With heavy emphasis on investments in irrigation infrastructure and systems through M04, the Rural Development Programme aims to promote water savings, efficient use of water resources and to reduce the dependency on natural water resources by

promoting the use of desalinated water and treated wastewater. The Rural Development Programme is innovative in complementing M04 with training and advice under M01 and M02 in the field of water savings and efficiency. Droughts are also addressed, albeit to a lesser extent than water scarcity, under M08 through, for example, the introduction of drought resilient species. Finally, M10 has an indirect effect on the efficient use of water resources. The indicators are not explicitly linked to drought, but they address water management and risk management.

The ERDF Operational Programme complements the Rural Development Programme by focusing on water scarcity through e.g. investments in water treatment and depuration. However, the ERDF Operational Programme is less focused on water scarcity and drought in comparison with the Rural Development Programme, the latter being the main driver for change in this field in Canarias.

Both the Rural Development Programme and the ERDF Operational Programme are aligned with the Partnership Agreement and its proposed actions for the adaptation of irrigation systems to achieve water savings and efficiency and the use of regenerated or desalinated water. The proposed ERDF and EAFRD actions have a direct link to measures supported by the regional adaptation plan and reflect the challenges and proposed lines of actions of the national adaptation plan (PNACC).

2.2.3 Allocation of Union support to water scarcity and drought in the Spanish case studies

ERDF

Andalucía and Canarias together allocate EUR 170.9 million [17] of Union support to climate change adaptation and water management (IPs 5 and 6 in Andalucía and Canarias). This represents around 78 % of the total Union support allocated to these IPs in Spain [18] (table 2-6). When looking at the specific actions under each IP, approximately 50 % of the ERDF Union support for adaptation in Andalucía goes to water scarcity and drought as well as 12 % of the Union support to water management. In Canarias, 10 % of the Union support allocated to IP6 goes to actions related to water scarcity. Most significant of all is that one third of the ERDF Union support to climate change adaptation in Spain is concentrated on water scarcity and drought actions under IP5 in Andalucía.

[17] Calculated on the basis of financial allocations to interventions fields related to water management (IF 21) and adaptation to climate change (IF 87). In Canarias, IF85 is also taken into account as there are actions related to water scarcity under this IF.

[18] Given that the country overview for Spain is not yet available, we assume as 'Spain' those regions/OPs with a financial allocation to climate adaptation objectives, which, in addition to Andalucía and Canarias, include Aragon and País Vasco.

Table 2-6: ERDF estimated allocation to Water Scarcity and Drought (WSD) in Spanish case studies

OP	Inter-vention field (IF)	ERDF Union Support for climate action by IF (MEUR)	Share (%) IF of total climate action in case studies	Assumption of distribution of climate action amongst the relevant IPs				Estimated share (%) of WSD in IF & amount on WSD (MEUR)	Basis for estimation
AND (2014ES16 RFOP003)	87	140.2	64 %	IP 5a: around half the activities for early warning systems, efficient water management, including drought. Assumption: c. 50 % to Water Scarcity & Drought (WSD)	IP 5b: around half of the activities for specific risks (flood, fire, drought). Assumption: c. 50 % to WSD, assuming fire leads to desertification			50 % WSD or 70.1 MEUR	*Union support distributed amongst 2 IPs. Therefore, the average of 50 % of IP5a and 50 % of IP5b for WSD.*
	21	19.4	9 %	IP 6a: focuses on waste, therefore 0 % WSD	IP 6b: actions include water quality (50 %) and efficient water supply. Assumption: c. 50 % to WSD.	IP 6c: not relevant for WSD	IP 6d various: various activities for biodiversity, recovery degraded soils. Therefore 0 % WSD	12 % WSD or 2.3 MEUR	*Union support split amongst 4 IPs, of which 50 % of IP6b for WSD (i.e. 25 % of 50 %).*
CAN (2014ES16 RFOP007)	87	5.8	3 %	IP 5a: focused on forest fires, therefore 0 % WSD				0 % WSD	*No actions for WSD*
	85	5.5	3 %		IP 6b: water scarcity, coastal water quality and low energy technologies in waste treatment. Assumption: c. 30 % to WSD.	IP 6c: not relevant for WSD	IP 6d: not relevant for WSD	10 % WSD or 0.55 MEUR	*Union support split amongst 3 IPs, of which 30 % of IP6b for WSD (i.e. 30 % of 30 %)*
GAL (2014ES16 RFOP015)	87	39.5	18 %						
PV (2014ES16 RFOP021)	87	9.5	4 %						
TOTAL		**219.9**	**100 %**					**73.0**	

EAFRD

A similar exercise for EAFRD (table 2-7) reveals that Andalucía and Canarias allocate EUR 388.3 million of Union support to adaptation measures; EUR 151.3 million to water scarcity and drought. It is estimated that Andalucía allocates approximately EUR 143.3 million to water scarcity and drought, mainly through irrigation investments and prevention and recovery actions in forests (or 43 % of the climate adaptation allocation under M4, M5 and M8 and to some extent also under M13 and M16). Canarias allocates EUR 8 million to water scarcity and drought actions (or 15 % of the climate adaptation allocation to measures M1, M2, M2, M4 and M10) through training and advisory actions, irrigation and water efficiency as well as risk prevention actions (see assumptions in the table). When compared to the total Spanish allocation of Union support to climate change adaptation, the allocation to water scarcity and drought by Andalucía and Canarias represents 20 % of the total, making the EAFRD contribution to water scarcity and drought these regions quite significant.

Table 2-7: EAFRD estimated allocation to water scarcity and drought in Spanish case studies (Andalucia 2014ES06RDRP001, Canaries 2014ES06RDRP005)

RDP	Measure	EAFRD Union Support for climate action on adaptation (MEUR)	Adaptation related focus areas	WSD actions	Estimated share (%) of adaptation expenditure to WSD	Assumption behind estimated share	Amount on WSD (MEUR)
AND (2014ES06RDRP001)	M04	151.5	4B, 5A	Investments in irrigation (FA 5A)	50 %	One of 2 focus areas deals with WSD	75.8
	M05	2.5	3B, 4C	Water storage and recovery from catastrophes, incl. drought (FA 3B)	50 %	Both FAs deals with WSD, approx. half the actions	1.3
	M08	124.9	4A, 4C	Prevention and recovery of damages from disasters, including droughts (4A, 4C)	40 %	Two out of 5 sub-measures deal with WSD actions	50.0
	M13	53.8	4A, 4B, 4C	Maintenance of agricultural activity	30 %	All sub-measures contribute to the maintenance of agricultural activity and thus indirectly to risk prevention and efficiency in the use of resources.	16.1
	M16	1.9	6B	Water management and water efficiency in the selection criteria for the creation of operational groups	10 %	Only in selection criteria	0.2
Total AND		**334.6**					**143.3**
CAN (2014ES06RDRP005)	M01	0.4	4A, 4B, 4C, 5A	Training on efficiency of water resources	13 %	One FA deals specifically with training related to WSD	0.1
	M02	0.6	3B, 4A, 4B, 4C, 5A	Advisory services inter alia in water management and techniques for water savings	11 %	One FA deals specifically with training related to WSD	0.1
	M04	24.4	4A, 4B, 4C, 5A	Improve irrigation systems, water savings	20 %	One out of 5 FAs deals with WSD actions	4.9

RDP	Measure	EAFRD Union Support for climate action on adaptation (MEUR)	Adaptation related focus areas	WSD actions	Estimated share (%) of adaptation expenditure to WSD	Assumption behind estimated share	Amount on WSD (MEUR)
	M08	14.9	4A, 4B, 4C	Risk prevention: water storage	10 %	Around one third of one FA deals with WSD related actions	1.5
	M10	13.4	4A, 4B, 4C, 5A	Water efficiency, water availability	11 %	Around one ninth of the measure focuses on water efficiency and availability	1.5
Total CAN		**53.7**					**8.0**
Total AND + CAN		**388.3**					**151.3**
Total Spain		**3,697.1**					

2.3 Conclusions and recommendations

Spain has a well-developed framework for analysing and assessing the impacts of climate change. It is the national plan for adaptation to climate change, known as PNACC in Spanish. This has formed part of the basis for the elaboration of the Partnership Agreement, in particular in the analysis of TO5 and the design of proposed actions under this thematic objective. Water scarcity, drought and desertification are extensively analysed in the PNACC and addressed in the PA, which focuses on two priority areas: a) the prevention and fight against forest fires, erosion and desertification and b) the prevention and fight against floods and droughts, to mitigate their effects and predict their occurrence.

The ERDF and EAFRD programmes take on board the actions proposed in the Partnership Agreement, notably in the fields of water resources, agriculture and desertification. The two Spanish regions most affected by water scarcity and drought are Andalucía and Canarias.

The emphasis in Andalucía is on droughts and desertification through the ERDF, which devotes a substantial part of TO5 to risk prevention and management actions, including inter alia early alert systems, the incorporation of risk prevention instruments in spatial planning and civil protection measures. Water scarcity is to some extent addressed by TO6 inter alia through the modernisation of infrastructures and the substitution of networks, this contributing to water savings and efficiency. The Rural Development Programme is, however, the main instrument for addressing water scarcity, notably through water management and irrigation efficiency actions and through preventive (water storage) actions. The Rural Development Programme also addresses droughts to some extent, mainly through investments in forest area development.

In Canarias, the emphasis is on water scarcity, one of the key weaknesses and threats of the archipelago, which is addressed extensively through the Rural Development Programme and complemented with the ERDF Operational Programme. The Rural Development Programme aims to promote water savings, the efficient use of water resources and to reduce the dependency on natural

water resources by promoting the use of desalinated water and treated wastewater. To this end, it places strong emphasis on investments in irrigation infrastructure and systems. The Canarias Rural Development Programme is innovative in complementing investments with training and advice in the field of water savings and efficiency. At the same time, it addresses drought, albeit to a lesser extent than water scarcity, through the introduction of drought-resilient species. The Rural Development Programme is complemented with the ERDF Operational Programme, which also focuses on water scarcity through, for instance, investments in water treatment and depuration. However, the ERDF Operational Programme is less focused on water scarcity and drought in comparison with the Rural Development Programme, the latter being the main driver for change in this field in Canarias.

In both regions, the proposed ERDF and EAFRD actions have a direct link to measures supported by the regional adaptation plans and reflect the challenges and proposed lines of action of the national adaptation plan (PNACC).

3 Flooding

3.1 Illustrative examples from Romania

Romania is among the most flood-prone countries in Europe, with approximately 1.3 million hectares subject to floods affecting nearly 500,000 citizens. The main areas at risk are located along the Danube, the main rivers of the Romanian Plain (Siret, Buzau County; Arges, Olt, Jiu Rivers) and the Banat-Crisana Plain (Somes Cris, Mures Rivers). The disaster profile of Romania places floods among the most common natural hazards in terms of their frequency and constitute by far the greatest economic loss from natural hazards.[19] An increasing number of flood events have occurred in recent years, causing extensive losses and damages across the country (e.g. the floods of 2005-2010 period produced a total loss of more than EUR 3 billion, including 15,600 destroyed houses).[20]

This study outlines the needs and challenges of climate change adaptation related to floods in the 2014-2020 programming period of ESIF in Romania, with a particular view on how flood issues have been addressed by the individual programmes. Romania's Partnership Agreement and the relevant ESIF Programmes serve as the basis this study.

3.1.1 Romania's Partnership Agreement

The Partnership Agreement acknowledges the high exposure of the Romanian territory to climate-change related extremes and floods are recognized among the key natural risks associated with and exacerbated by climate change. In some instances, as the Partnership Agreement states, the national response capacity to floods was exceeded by their severity.

During the 2014-2020 period, Romania will address floods through investments under Thematic Objectives (TOs) 5 and 6. Climate adaptation against floods are directly addressed under TO5, 'Promoting climate change adaptation, risk prevention and management' (e.g. disaster risk management associated with climate adaptation to extreme events; sustainable water management system resilient to climate change), and indirectly under TO6. 'Preserving and protecting the environment and promoting resource efficiency' e.g. actions to enhance the resilience of protected areas to climate change, ecosystems conservation and restoration).

The prevention, monitoring and management of natural risks exacerbated by climate change (e.g. floods, drought) are among the core development needs identified in the Partnership Agreement, which reflect the actions foreseen to support climate change adaptation in Romania with respect to floods. The key areas of actions identified are as follows.

[19] Disaster risk profile according to CRED EM-DAT (http://www.preventionweb.net/countries/rou/data/).

[20] Natural Disaster Insurance Pool (NDIP) (www.paid.ro).

Flood risk management is an important component in assessing climate change adaptation challenges and needs and in integrating climate change concerns into ESI Fund programming and involves assessment and mapping of risks, monitoring of risks, prevention and mitigation measures, coordination, and developing and maintaining an adequate response capacity. As provisioned in the Partnership Agreement, a National Working Group for Risk Assessment (GLERN) was established, consisting of experts in risk assessment from central authorities and independent experts from the academic and private sectors whose responsibility is to coordinate efforts in national risk assessment.

According to the Partnership Agreement, a set of working instruments for national risk assessment will be developed under the project 'Support for fulfilling ex-ante conditionality 5.1 – National Risk Assessment' (RO RISK Project, under the Administrative Capacity OP (ACOP), with a preliminary deadline for fulfilment end of 2016). This project will provide also a first report on the risks confronting Romania, including a prioritization of risks, including floods.

Monitoring of risks is carried out by a centre within each of the line ministries with responsibility for a given risk. These centres feed into GIES (General Inspectorate for Emergency Situations) which is responsible for informing local authorities which has statutory responsibility for informing and protecting the population.

Prevention and mitigation measures are aimed at improving Romania's capacity to anticipate, prevent and respond to extreme natural and man-made emergencies, as well as to develop adaptation and resilience measures to the negative consequences of climate change. Prevention measures span over: education, non-structural measures and preparedness measures. As stipulated in the PA, Romania has the National Strategy for the prevention of emergency situations, the National Strategy for Flood Risk Management, and aim to create the National Platform for Disaster Risk Reduction (PNRRD) which establishes the necessary objectives and actions to be implemented. Some actions to support these strategies and plans will be funded through the Large Infrastructure Operational Programme (LIOP), AC OP and Rural Development Programme (RDP).

As for developing and maintaining response capacity, Romania's response capability comprises GIES coordinating input from different services via the Ministry of Internal Affairs, local authorities and volunteers in the affected areas. The investments will cover modules specified in EU legislation in the field of civil protection through the Administrative Capacity OP. Taking into account the cross-border effect of floods, GIES may draw down international support organized through bilateral agreements with neighbouring countries, partially supported through the Romania-Bulgaria and Romania-Hungary Cooperation Programmes. This is also in line with the requirements of the EU Strategy for the Danube Region.

3.1.2 National and regional adaptation strategies

Based on the findings of the analysis of Development Challenges and the SWOT Analysis, the main development needs in the Partnership Agreement are in line with flood-related actions identified in the:

- National Climate Change Strategy 2013-2020;
- outcome of the future national risk assessment (RO RISK project);
- national strategy for the prevention of emergency situations;
- National Strategy for Flood Risk Management in the medium and long term, developed taking into account the provisions of Directive 2007/60/EC on the assessment and management of flood risk;
- River Basin Management Plans (for the 11 River Basins of Romania) elaborated by National Administration 'Apele Romane' in accordance with the provisions of the Directive 2000/60/CE;
- National Sustainable Development Strategy (2013-2020-2030). Herewith, the main actions to support flood adaptation are related to:
- improving Romania's capacity to anticipate, to prevent and to respond to extreme natural and man-made emergencies;
- improving Romania's adaptation and resilience to the negative consequences of climate change, including flooding events;
- improving Romania's adaptation and resilience to other natural and man-made risks; and
- establishing the legal and technical standards framework for launching a multiannual programme for the relocation of houses situated in flood-risk areas.

3.2 Illustrative Examples

Table 3-1 denotes the Romanian programmes with references to flood-related aspects. Direct references in relation to flood risk and corresponding climate adaptation actions are found in the Large Infrastructure Operational Programme (LIOP), Administrative Capacity (AC OP), Romania-Hungary Cooperation Programme (RO-HU CP), and Romania-Bulgaria CP (RO-BG CP), while indirect references are found in the Rural Development Programme (RD OP) and the Competitiveness OP (COP). Expenditures for climate adaptation actions, although mostly allocated in the LI OP and RD OP, do not reflect funds aiming to support flood-specific adaptation actions. This is more obvious for the other OPs, with less or no climate adaptation expenditure.

Table 3-1: Romanian ESIF programmes with flood-related aspects, and corresponding climate change adaptation action (ERDF/CF/ESF/ETC: IF087, EAFRD: UP3b, 5a, 6b; MEUR)

CCI	Fund	Title	Climate adaptation action (MEUR)
2014RO16RFOP002	ERDF	Regional Operational Programme	-
2014RO16RFOP001	ERDF	Competitiveness Operational Programme	-
2014RO16M1OP001	ERDF/CF	Large Infrastructure Operational Programme	469.1
2014RO06RDNP001	EAFRD	Rural Development Programme	728.0
2014TC16RFCB021	ERDF (ETC)	Romania-Bulgaria Cooperation Programme	17.3
2014TC16RFCB049	ERDF (ETC)	Romania-Hungary Cooperation Programme	5.3
2014RO05SFOP001	ESF	Administrative Capacity Operational Programme	-

3.2.1 Adaptation in ERDF/CF

Romania has programmed three ERDF programmes, of which one is combined with CF. Of those OPs, only the Large Infrastructure OP actively addresses the challenge of adapting to floods, while the remaining OPs address floods in a rather implicit manner.

The Large Infrastructure OP[21] aims at promoting sustainable economic growth and safe and efficient use of natural resources. In relation to floods, it supports environment protection and risk prevention through TO5 and indirectly under TO6. The main adaptation actions, IPs, IFs and indicators for these two TOs are presented in Table 3-2. Although LIOP was expected to specifically address the issue of flood adaptation through actions related to flood protection infrastructure, the foreseen actions and result/output indicator do not reflect a direct reference to these aspects. The main actions refer to the need of increasing the disaster response capacity of civil protection authorities and population and rehabilitation of degraded ecosystem, which may further decrease the flood risk.

[21] Large Infrastructure OP (CCI: 2014RO16M1OP001)

Table 3-2: Adaptation actions, and corresponding IPs, IFs and indicators under TO5 and TO6, Large Infrastructure Operational Programme

Thematic Objective	Adaptation actions with relevance to floods	Investment Priority	Result Indicators	Output Indicators	Intervention Field
TO5	Increasing of civil security through the improvement of disaster response capacity of authorities involved in the management of crisis situations and flood protection measures	5i, 5ii	2S47 Mean annual economic damages caused by adverse hydrological events (targeted by the programme), 2S49 Average response time to emergency situations	CO20 Risk prevention and management: Population benefiting from flood protection measures, 2S50 No. of units equipped for emergency situations	85, 87
TO6	Restoration of wetlands and floodplains; maintenance and restoration of degraded ecosystems and provided services (afforestation, green corridors)	6d	2S37 Rehabilitated degraded ecosystems	2S39 Area of rehabilitated degraded ecosystems	85, 87

The Regional OP[22] includes a limited contribution to flood adaptation by TO7, aimed at increasing the disaster resilience of transport infrastructure. Under PA6/IP7b (Enhancing regional mobility by connecting secondary and tertiary nodes to TEN-T infrastructure, including multimodal nodes), the OP supports the development of forest belts for enabling the protection of road infrastructure against extreme weather and hydrological events (including those exacerbated by climate change) like floods and avalanches[23].

The Competitiveness OP[24] indirectly targets the issue of extreme events and disasters, proposing through PA 1 (IP 1a) to develop dedicated space applications to monitor the disaster and extreme events. Within this investment priority, a research project has been proposed *(the International Centre for Advanced Studies – DANUBIUS-RI 'river-delta-sea' systems)***,** as the future pan-European ESFRI (European Strategy Forum on Research Infrastructures) major infrastructure in the field of the integrated management systems. DANUBIUS-RI is a flagship project under priority area 7 of the EUSDR knowledge-based society, aimed as a research infrastructure for the Danube Delta, thus flood-related issues can be tackled within its research priorities.

3.2.2 Adaptation in ETC

There are two ETC programmes in Romania that specifically address flood risk in a cross-border context. The Romania-Bulgaria Cooperation Programme (CP)[25] addresses the floods in the Danube River Basin and their effects in the

[22] Regional OP (CCI: 2014RO16RFOP002)

[23] See more information on ho forests influence avalanches under: http://www.slf.ch/ueber/organisation/warnung_praevention/projekte/wald_lawinen/index_EN

[24] Competitiveness OP (CCI: 2014RO16RFOP001)

[25] Romania-Bulgaria Cooperation Programme (CCI: 2014TC16RFCB021)

Romanian and Bulgarian cross-border. As summarised in Table 3-4, this CP provides specific support for flood adaptation actions under PA3 (*A safer region*) – IP5b *To improve joint risk management in the cross-border area*, aiming to promote investments for risk prevention and management (e.g. for detection, early warning and alert systems and risk mapping and assessment) and creation of joint structures for emergency situations (e.g. highly specialised units/civil protection modules). Furthermore, this CP indirectly supports flood prevention through the actions foreseen under PA4 (*A green region*), through the selection of TO6 (IP6d – *To enhance the sustainable management of the ecosystems from the cross-border area*), and through biodiversity and ecosystem restoration measures. The CP also promotes co-operation on research related to the prediction and prevention of floods. However, the results and output indicators concentrate only on flood risk management and prevention, and do not cover the whole range of foreseen adaptation actions relevant to floods.

Table 3-4: Adaptation actions, and corresponding IPs, IFs and indicators under TO5 and TO6, Romania-Bulgaria Cooperation Programme

Thematic Objective	Adaptation actions with relevance to floods	Investment Priority	Result Indicators	Output Indicators	Intervention Field
TO5	flood prevention measures, development of risk management system and cross border rescue services/system, promotion of green-infrastructure solutions, joint landslide-flood management and risk prevention actions for reforestation of river banks, forest sanitation	5b	R3.1. The quality of the joint risk management in the CBC area	CO20. Risk prevention and management: Population benefiting from flood protection measures 5b.1. Population benefiting from actions of risk management 5b.2. Number of joint partnerships in the field of joint early warning and emergency response	87
TO6	protection, preservation and restoration of biodiversity and ecosystems, and promoting ecosystem services	6d	R2.2. NATURA 2000 sites from the cross-border area with coordinated management tools	CO23. Nature and biodiversity: Surface area of habitats supported to attain a better conservation status	85

The Romania-Hungary CP[26] makes reference to flood issues in the context of natural disasters management, mentioning that around 376 localities in the cross-border area are at risk of floods. The programme targets adaptation actions specifically under PA5 (*Improve risk-prevention and disaster management*), with specific output and result indicators on the quality of emergency management in the cross-border area and population safety, as indicated in Table 3-5. Some indirect connections to floods can be identified also in PA1 – *Joint protection and efficient use of common values and resources* (Cooperating on common values and resources), through IP 6b with actions concerning prevention – protection against pollution, especially flood-related pollution. However, the result and output indicators as well as the intervention field under the PA do not point to the flooding-related issues.

[26] Romania-Hungary Cooperation Programme (CCI: 2014TC16RFCB049)

Table 3-5: Adaptation actions, and corresponding IPs, IFs and indicators under TO5, Romania-Hungary Cooperation Programme

Thematic Objective	Adaptation actions with relevance to floods	Investment Priority	Result Indicators	Output Indicators	Intervention Field
TO5	Emergency response actions to floods	5b – Promoting investment to address specific risks, ensuring disaster resilience and developing disaster management systems	R 5/b Quality of the joint risk manageme nt	5/b 1 Population safeguarded by improved emergency response services	87

3.2.3 Adaptation in ESF

Romania has an ESF allocation through Administrative Capacity OP[27] to support climate change adaptation needs. However, the AC OP did not explicitly target flood issues, TO5 not being selected. However, some indirect actions can be identified, supporting the improvement of the national system of emergency management in natural risk assessment and management and better inter-institutional coordination. The supported actions aim to strengthen the ability of risk management public administration authorities to raise awareness of exposure to risks and to ensure prevention of risks. The OP contributes to the fulfilment of the ex-ante conditionality 5.1 – National Risk Assessment financing of the RO RISK project (coordinated by IGSU), which aims to elaborate a national assessment of natural risks affecting Romania (including floods).

3.2.4 Adaptation in EAFRD

Romania has drafted one national RDP[28], which addresses climate adaptation through a wide range of actions. In terms of adaptation to floods, the RDP is likely to contribute indirectly through measures in agriculture and forestry sectors including: afforestation of agricultural and non-agricultural land, which will reduce water run-off and increase carbon sequestration; and watershed management on agricultural and forestry land, which will help to reduce floods and increase soil protection. Table 3-6 reflects the RDP contribution through specific needs, measures and indicators that indirectly may be seen as targeting floods: e.g. Land management measures, soil protection and biodiversity conservation.

[27] Administrative Capacity OP (CCI: 2014RO05SFOP001)

[28] Rural Development OP (CCI: 2014RO06RDNP001)

Table 3-6: Needs, measures, indicators by Union Priority/Focus Area, in Romania's Rural Development Programme

Union Priority/focus area	Needs	Measures	Context Indicators	Result Indicators	Target indicators
UP 3/3B	010 Risk management in agriculture	M17 Risk management	Forest and wooded land (1000 ha) Protected forest (%)	R11 Percentage of forestry land under management contracts to improve soil management and/or prevent soil erosion R20 Percentage of agricultural and forest land under management contracts contributing to carbon sequestration or conservation	T13 Percentage of forestry land under management contracts to improve soil management and/or prevent soil erosion (%) T19 Percentage of agricultural and forest land under management contracts contributing to carbon sequestration or conservation (%) T08 Percentage of forest/other wooded area under management contracts supporting biodiversity (%)
UP4/4A	012 Maintaining the biological diversity and environmental value of agricultural and forestry lands 016 Protecting and improving soil resources 017 Adaptation to the effects of climate changes 013 Supporting a sustainable forest management	M10 Agri-environment-climate; M13 Payments to areas facing natural or other specific constraints; M15 Forest-environmental and climate services and forest conservation			
UP4/4B					
UP4/4C					
UP5/5A	017 Adaptation to the effects of climate changes 012 Maintaining the biological diversity and environmental value of agricultural and forestry lands 016 Protecting and improving soil resources 017 Adaptation to the effects of climate change	M04 Investments in physical assets through *Sub-measure 4.3 Investments in the development, modernization or adaptation of agricultural and forestry infrastructure;* M10 Agri-environment-climate			

3.3 Conclusions and recommendations

The following observations can be drawn with respect to Romania's approach to flood-related actions:

- During the 2014-2020 period, Romania will support actions related to floods under three Thematic Objectives using ESIF resources through TO5 and indirectly through TO6.
- Direct references to flood-related aspects are found in the Large Infrastructure OP , Administrative Capacity OP[29], Romania-Hungary Cooperation Programme [30] and Romania-Bulgaria Cooperation Programme [31] and indirect references in Rural Development OP[32], Regional OP[33] and Competitiveness OP [34].
- The main actions refer to risk management and assessment, early warning systems and land management works for floods protection (e.g. forest restoration and afforestation).
- Although it would have been expected of LIOP to support measures related to flood protection infrastructure, this OP makes no references in this matter, it only include some non-structural measures.
- Unexpectedly, some OPs (e.g. ROP) do not specifically target the issue of flooding, although it would have been likely to, compared to the previous financing period.
- An important ex-ante conditionality related to floods is still to be fulfilled in Romania. The national risk assessment (RO RISK) has a preliminary deadline for fulfilment at the end of 2016 under the Administrative Capacity OP. The project is expected to carry out a first evaluation of risks in Romania (including floods) and develop a toolkit for national risk assessment.
- The financial allocation for flood-related actions cannot be separated from the climate change-related allocations since they are addressed together under the Investment Priorities.

[29] Administrative Capacity OP (CCI: 2014RO05SFOP001)

[30] Romania-Hungary Cooperation Programme (CCI:2014TC16RFCB049)

[31] Romania-Bulgaria Cooperation Programme (CCI: 2014TC16RFCB021)

[32] Rural Development OP (CCI: 2014RO06RDNP001)

[33] Regional OP (CCI: 2014RO16RFOP002)

[34] Competitiveness OP (CCI: 2014RO16RFOP001)

4 Rural development and climate change adaptation in Poland

4.1 Climate change adaptation needs and challenges in Poland

The climate of Poland is changing[35]. The intensity of drought, hurricane-force winds, tornadoes and hail has increased and long-term prognosis further shows that the climate in Poland will be changing. The changes relate primarily to:

- milder winters and less freezing nights and days during a year;
- longer periods without rain; and
- more frequent extreme weather events.

In concert, these changes will challenge Polish agriculture, but they also bring opportunities: In some regions, the growth period will become longer. Consequently, several farming practices will have to adapt, such as dates for sowing and fertilization and changes in crop rotations and crop usage. The changes are imposed on an agricultural system already challenged by the large proportion of Polish soils that are of medium to low suitability for intensive agricultural production[36]. Additionally, many soils show low levels of soil organic matter content. The soil characteristic aggravates the risks of water deficits and seasonal droughts, since sandy soils are less able to retain water than loess, loam and clay soils are, and ultimately this can lead to erosion by wind during dry periods.

All in all, the expected changes in precipitation may require changes in water management, irrigation practices and drainage systems, including the need for more effective water and soil management (e.g. storing water, small water retention projects). Practices against erosion (mainly wind and water) should also be taken into account. Lastly, changes in water and soil conditions may lead to various new plant diseases, which can require the development or acquisition of crop varieties and breeds better suited to the new conditions.

4.1.1 RDP needs and SWOT analysis

The SWOT analysis of the RDP identifies climate change in Poland and its impacts on the agricultural sector as a relevant challenge that needs to be addressed. In the below table, the needs identified in the RDP are matched against the needs listed above. Overall, it shows that the PL RDP plays an important role in addressing adaptation, and that it is intended to contribute toward the responses to all identified changes.

[35] http://klimada.mos.gov.pl/en/climate-change-in-poland/

[36] 60 % of them are sandy soils and 30 % are very acidic

Table 4-1: Matching of adaptation needs identified in grey literature and those identified in the RDP.

Climate adaptation needs	Identified RDP need
Changes in farming practices in response to changing growth conditions	Improving soil quality and productivity via promotion of sustainable farming (improve fertilization management, maintain soil carbon content, organic farming)
Improving soil organic matter content in the soils	
Maintaining biodiversity in agricultural areas	Maintaining the endangered local breeds of animals and plants
	Improving resilience of ecosystems due to restoring and preserving biodiversity in key areas, including Natura 2000 areas and areas with natural handicaps, forestry areas
Protection of agriculture against heavy rainfall	Protection of agricultural land, incl. plants and animal production, against natural disasters due to extreme weather events
Adapting agricultural buildings to the expected, new weather conditions	Investments in rural areas (water and sewage systems) and at the farm level in order to modernize farms and optimize building systems to protect animals against stress and diseases
Improve water availability for agriculture production	Protection and improvement of the groundwater Sustainable farming (improve fertilization management, maintain soil carbon content)
Practices to prepare for droughts and improve water retention	

Although the last-listed need incorporates investments in the modernization of water infrastructure, mostly at farms, the most notable omission is a need to address the changing water cycle in a coordinated and comprehensive manner.

4.2 National policy framework for adaptation

In 2009, the Polish government adopted nine sectorial national strategies for development. Having assessed adaptation needs at the national level, in 2013, the government adopted the '*Strategic Adaptation Plan for sectors and areas vulnerable for climate change until 2020, with a perspective on 2030*' (in short, 'Adaptation Plan'). The Adaptation Plan includes and systematises adaptation actions that have been mentioned in the nine sectorial national strategies for development. One of the national strategies is devoted to rural development and agriculture – this is the *National Rural Development Strategy 2012-2020*[37] (RDS). According to this, agriculture is most vulnerable to changing climate (temperature, precipitation, etc.) and extreme weather events. In the RDS, a number of necessary responses are identified:

[37] http://www.minrol.gov.pl/Informacje-branzowe/Strategia-zrownowazonego-rozwoju-wsi-rolnictwa-i-rybactwa-na-lata-2012-2020/Dokumenty-analizy

- informing farmers about crops less vulnerable to climate changes,
- better mechanisms for risk management,
- changing some agro-technical practices,
- promote proper management of agricultural soils,
- restoring agricultural production potential in areas damaged by natural disasters, and
- eliminating water deficits in the most vulnerable agricultural areas.

The Rural Development Programme (RDP) is only one of many instruments fulfilling the Adaptation Plan, but it is the main tool related to agriculture and the landscape. The RDP refers to the priority of the EU Adaptation Strategy to Climate Change, in terms of increasing the resilience of key sectors vulnerable to climate change (such as agriculture) and addressing and bridging the knowledge and information gap. It secures financing to partially realise the National Rural Development Strategy 2012-2020.

The table below shows the interrelation between the Adaptation Plan and the National Rural Development Strategy 2012-2020, and how the RDP covers these issues.

Table 4-2: Relations between the RDP, the Adaptation Plan and the National Rural Development Strategy 2012-2020, Poland

Aims of the Adaptation Plan	Rural Development Strategy and adaptation actions	Rural Development Programme
Adaptation of the agriculture and fishery sector to climate change and actions to combat climate change	1. To develop an early monitoring system to inform about possible effects on animals and plant production from changes in climate 2. Investments at the farm level and via advising/training in order to adapt agricultural buildings	RDP promotes sustainable practices and organic farming, guarantees investment support and trainings, enhanced to maintain viable agricultural production in low-favoured areas
Promotion of innovative solutions towards adaptation in agricultural production	Promote innovative solutions towards adaptation via trainings and advisory services.	RDP includes education and trainings on innovations
Establishing solutions for support in the case of losses due to natural disasters and catastrophic weather events due to climate change	Restoring agricultural production potential damaged by natural disasters and catastrophic events via direct measures in the RDP	RDP provides a measure to compensate losses in animal and plant production that occurred due to natural disasters
Implementing protection measures in order to protect agricultural land and land with high soil significance (reach in C carbon)	Sustainable forest management: enhancing afforestation on low-quality soils, protect soils, create ecological corridors, protection against wind	RDP includes measures inside and outside Natura 2000 farming areas in order to protect them. An afforestation measure is proposed, but with limited financial support.

The Partnership Agreement includes reference to the adaptation issues of the EAFRD. This confirms that the RDP will build on the National Rural Development Strategy 2012-2020 and address adaptation issues.

4.3 Programming EAFRD for 2014-2020

The contribution to the 30 % environmental and climate-specific EAFRD target is above 30 %. The calculation of Union support assigned to Union Priorities 4 and 5 from all measures dedicated to climate action and the environment amounts to 39.4 % (EUR 3.38 million)**.** The majority of this is devoted to adaptation rather than mitigation actions. For comparison, it should be mentioned that the Polish RDP has the lowest total climate allocation of all RDPs at the EU28 level, but 11th highest allocation of all MS (16 %), when it comes to total adaptation action.

Table 4-3 Overview of adaptation and mitigation allocation in the Polish RDP and in neighbouring RDPs

MS	Adaptation Action (%) (FA 3b, 5a, 6b)	Mitigation and/or Adaptation Action (%) (FA 4a, 4b, 4c)	Climate Action (%)	Climate Action (MEUR)	Total Support (MEUR)
PL	6.4	32.2	41.2	3,386.8	8,221.0
CZ	2.0	64.3	67.1	1,546.8	2,305.7
DE	10.6	48.7	64.0	5,948.9	9,302.1
LT	4.3	26.7	40.0	644.5	1,613.1
SK	5.1	43.2	49.2	760.6	1,545.3
EU-28	7.6	44.2	57.3	56,305.3	98,241.6

As can be seen, the PL RDP allocates less overall funding to climate action than those of neighbouring MS, but allocates a larger share for adaptation action than neighbouring MS, except DE. In all, 6.4 % is allocated to dedicated adaptation measures, while 30.8 % is allocated to measures that can have adaptation and/or mitigation benefits. Compared to the overall allocation to UPs/FAs across MS, the Polish RDP allocate a slightly smaller percentage to adaptation actions (FA 3b, 5a, and 6b), and comparatively even less to adaptation and/or mitigation actions (FA 4a, 4b, and 4c) and dedicated mitigation actions (FA 5b-5e).

4.3.1 Financial allocation (UPs and FA level)

According to the intervention logic and budget allocation, only the afforestation measure is devoted to mitigation, which addresses Focus Area 5e. The remaining climate-relevant Union support addresses Union Priority 4 and Focus Areas 3b and 6b, related primarily to adaptation.

Table 4-4 Overview of UP allocation for measures in the Polish RDP

ME/ UP	UP 3b	UP 4a	UP 4b	UP 4c	UP 5a	UP 5b	UP 5c	UP 5d	UP 5e	UP 6b	Climate Action
	(in MEUR)										
M01	0.7 (0.0 %)	2.5 (0.1 %)	2.5 (0.1 %)	2.5 (0.1 %)	-	-	-	-	-	-	8.1 (0.2 %)
M02	-	-	-	-	-	-	-	-	-	-	-
M04	-	21.0 (0.6 %)	21.0 (0.6 %)	21.0 0.6 %	-	-	-	-	-	-	63.0 (1.9 %)
M05	105.6 (3.1 %)	-	-	-	-	-	-	-	-	-	105.6 (3.1 %)
M06	-	-	-	-	-	-	-	-	-	-	-
M07	-	-	-	-	-	-	-	-	-	254.5 (7.5 %)	254.5 (7.5 %)
M08	-	-	-	-	-	-	-	-	191.5 (5.7 %)	-	191.5 (5.7 %)
M09	-	-	-	-	-	-	-	-	-	-	-
M10	-	251.1 (7.4 %)	251.1 (7.4 %)	251.1 (7.4 %)	-	-	-	-	-	-	753.4 (22.2 %)
M11	-	148.5 (4.4 %)	148.5 (4.4 %)	148.5 (4.4 %)	-	-	-	-	-	-	445.4 (13.2 %)
M13	-	459.4 (13.6 %)	459.4 (13.6 %)	459.4 (13.6 %)	-	-	-	-	-	-	1,378.2 (40.7 %)
M16	-	-	-	-	-	-	-	-	-	-	-
M19	-	-	-	-	-	-	-	-	-	187.1 (5.5 %)	187.1 (5.5 %)
Total	106.4 (3.1 %)	882.4 (26.1 %)	882.4 (26.1 %)	882.4 (26.1 %)	-	-	-	-	191.5 (5.7 %)	441.6 (13.0 %)	3,386.8 (100.0 %)

As can be seen above, adaptation action is programmed under FA3b using M05, while FA5a (on water efficiency) is not used at all. Some adaptation benefits can also be expected under FA6b, using measure M07 and M19 (LEADER), which focuses on fostering local development in rural areas. However, it is clear that the largest allocation is under UP4 (FA4a-4c), programmed using M10, M11 and M13, measures which can contribute adaptation and/or mitigation actions.

4.3.2 Measures

The RDP's financial allocation related to climate action is oriented significantly towards payments for areas with natural constraints (M13), Agri-environment-climate (AECM, M10), and organic farming (M11). Promotion of sustainable farming methods will be realised by AECM (M10) and organic farming (M11) with the support of advisory and trainings (M01). The need related to ensuring economic viability due to climate change and natural constraints is to be delivered mainly by payments for areas with natural constraints (M13), partially by advisory and trainings (M01) and by restoring agricultural production (M05). Interestingly, none of the funds are disbursed through M17, which concerns the management of risks, and can be used to pay financial compensation to farmers

through insurance or mutual funds to cover losses caused by adverse climatic events, and thus exactly covers the need to ensure economic viability of farmers affected by extreme weather events and climate change. This is noteworthy, as natural hazards have been identified as a risk in the RDP. Measures related to forestry (M08) address needs related to biodiversity.

Table 4-5: Indicated support for climate action in Poland per Measure, climate action category, and total EAFRD support (MEUR)

Measure	Adaptation Action (%) (FA 3b, 5a, 5b)	Mitigation and/or Adaptation Action (%) (FA 4a, 4b, 4c)	Climate Action (%)	Climate Action (MEUR)	Total Support (MEUR)
M01	0.0	0.2	0.2	8.1	36.9
M02	-	-	-	-	47.7
M04	-	1.9	1.9	63.0	2,120.2
M05	3.1	-	3.1	105.6	264.1
M06	-	-	-	-	1,406.1
M07	7.5	-	7.5	254.5	684.0
M08	-	-	5.7	191.5	191.5
M09	-	-	-	-	256.4
M10	-	22.2	22.2	753.4	753.4
M11	-	13.2	13.2	445.4	445.4
M13	-	40.7	40.7	1,378.2	1,378.2
M16	-	-	-	-	36.9
M19	5.5	-	5.5	187.1	467.7
TA					132.5
Total	16.2	78.2	100.0	3,386.8	8,221.0

Adaptation measures

In the above table, it can be seen that direct climate change adaptation is being realized by the following measures:

By 'Restoring agricultural production (M05)', which targets Focus Area 3b, and by 'Basic services and renewal (M07)' and 'LEADER (M19)', both of which target Focus Area 6b. Furthermore, payments for areas with natural constraints (M13), agri-environment climate measure – AECM (M10), organic farming (M11), and the forestry measure (M08) deliver combined mitigation-adaptation benefits. The latter measures are related to Union Priority 4 (Focus Area 4a, 4b and 4c).

Key actions contributing to climate adaptation

Table 4- below lists key measures and sub-measures that are contributing to climate change adaptation. The key actions have been identified based on close scrutiny of the original Polish text of the RDP.

Table 4-6: Examples of climate adaptation actions in the Polish EAFRD

Key Measure	Sub-measure	Purpose	Requirement for land owners	Key climate adaptation contribution
M05: Restoring agricultural production potential damaged by natural disasters and catastrophic events and introduction of appropriate prevention actions	To compensate damages due to natural events	After natural disasters or catastrophic events during which damages of agricultural production are recorded, farmers will be able to apply for compensation. The list of natural disasters and catastrophic events embraces: spring frosts, droughts, floods, heavy rainfalls, storms and winds, hails.	- Payments for 'force majeure'.	M05: Restoring agricultural production potential damaged by natural disasters and catastrophic events and introduction of appropriate prevention actions
M08: Investments in development of forest areas and improving the viability of forests	To afforest low-productivity agricultural land In this measure the premium for afforestation is given for farmers to cover the costs of new afforestation, as well as a nursing premium for farmers to cover the costs of nursing, protection against wild animals, and nursing, biological protection. A limited amount of support is possible.	- to have afforestation plan approved by the local authorities - maintain afforestation for 5 years and later on change the land status into the forest land In the selection criteria, projects will be preferred that are part of ecological corridors, or are at risk of water erosion, or are along the watercourses	- Building resilience of local environments and improving land use.	M08: Investments in development of forest areas and improving the viability of forests

M10: Agri Environment Climate Measure (AECM)	10.1.1. Sustainable farming	To promote sustainable farming practices and reduce the loss of soil matter content on arable lands.	- to have agri-environmental and fertilization plan - to maintain landscape elements - to use 4 crops in the main crop in one year (one crop up to 65 %, all cereals no more than 65 %, each crop no less than 10 %) - carry on a soil analysis (PH, P, K, Mg, and C-organic) twice (in first and last year of the programme) - ban on using the communal waste waters as fertilizer - use at least in the 4th year a catch crop, and also plough the straw and manure - to mow (until 31 July) or graze during the vegetation period on grasslands - collect the mowed biomass	This measure promotes practices that will increase the resilience against water deficit or long term agricultural droughts.
	10.1.2.Protecting soils and waters	Proper soil management done by farmers either against soils erosion or against reduction of soil matter content. This measure covers areas vulnerable to water erosion, with low soil matter content, also vulnerable to nitrates pollution.	- A farmer should apply at least one of these three options: 1) stubble crops or 2) catch crops or 3) green buffer zones on arable land with more that 20 % slope. - Green cover must be maintained in-between the main crops. - Catch crops of at least 3 species must be applied, one of them must be a honey plant. - To sow catch crops until 15th September - a ban of agricultural practices on the field before 1st of March - no catch crops consisting only from cereals - ban of fertilization on catch crops - ban of using pesticides on catch crops - no use of communal waste waters as fertilizer - plough the biomass of catch crops (not applicable for no tillage systems) - maintaining the green cover according to cross compliance	This measure promotes practices that will increase the resilience of soils against depletion.
	10.1.4.Protecting high nature value areas and species inside and outside Natura 2000	To improve the conditions of endangered bird species or improving and maintaining the habitats conditions via extensive farming systems on grasslands and on nature areas (but not agriculture land)	- ban of ploughing, use of communal waste water, under sowing, destroying soil structure - no use of plant protection substances - ban of creating new or restoring drainage systems - Depending on the birds' species: special grassland management regarding mowing, grazing, limited fertilization should be applied.	This measure promotes liveable habitats for biodiversity and practices, setting aside nature areas to create areas for nesting for species.
	10.1.3. Maintaining traditional orchards	To maintain areas of traditional orchards	- maintain the local trees species - maintain all grasslands and landscape elements - Mowing and then collecting of grass must be done at least once in a vegetation period.	This measure enhances maintaining natural habitats for nesting of certain species (birds, insects).

As can be seen, the main adaptation in agriculture is delivered through M05 and M10, while M08 supports the forest sector only. Based on the planned actions and their content, the adaptation action can be grouped into three categories:

- Soils and farming practices on land
- Biodiversity protection
- Natural hazard restoration

When compared to the needs and necessary responses identified earlier, it is found that issues related to water management have been left unaddressed, i.e. no adaptation action targeting water efficiency or quality was found.

4.4 Regional perspectives: Polish Climate Change Adaptation in a Central European perspective

The climate adaptation action under the Polish RDP is organised in three pillars (soil management, biodiversity and natural hazards). One noteworthy issue not addressed is water. As the surrounding Member States (LT, SK, CZ) and regions (DE länders, Berlin and Brandenburg, and Mecklenburg-Vorpommern) share similar environmental and climatic conditions, expectedly and ideally these would concentrate on addressing some of the same issues. Differences in programming may reveal specific decisions taken by the Polish Managing Authority, and add context to understanding these decisions and their importance from an adaptation point of view.

4.4.1 Challenges and objectives

Interestingly, none of the neighbouring RDPs identifies soil issues as a challenge in an adaptation context. The LT and SK RDPs identify natural hazards as a risk, which is consistent with the Polish selection. The Berlin/Brandenburg and SK RDPs further identify flooding as an issue to address, and while the expected change in rainfall patterns would suggest that flooding could become an issue in PL, this has not been taken forward. Both PL, SK and Mecklenburg-Vorpommern identify the need to strengthen knowledge and advisory on climate adaptation, but in neither case has it resulted in dedicated programming of measures.

Despite differences in identified challenges, the variety in objectives is somewhat less pronounced. In the Czech RDP, improving soil management is an objective, indicating the same preference as in Poland. Water efficiency is highlighted as well here, indicating that all Member States in the region except for Poland are concerned with water issues. The Polish objectives include one that reads '*to protect the environment and adapt to climate change*'. This is fairly general, but Mecklenburg-Vorpommern and Slovakia RDPs mirror this, thus the Polish approach is no different.

4.4.2 Programming of measures

The financial allocations for Poland and neighbouring MS and regions are listed in the below table. The specific allocation for the measures most relevant to climate adaptation can be found in appendix A.

Table 4-7 Overview of financial allocation in the Polish RDP compared to neighbouring RDPs

MS	CCI	RDP	Adaptation Action (%)	Mitigation and/or Adaptation Action (%)	Climate Action (%)	Total Support (MEUR)
PL	2014PL06RDNP001	National	6.7	32.2	41.2	8,221.0
CZ	2014CZ06RDNP001	National	2.0	64.3	67.1	2,305.7
DE	2014DE06RDRP007	Berlin + Brandenburg	13.0	48.5	62.1	1,050.7
DE	2014DE06RDRP011	Mecklenburg-Vorpommern	13.2	40.6	56.7	936.8
LT	2014LT06RDNP001	National	4.3	26.7	40.0	1,613.1
SK	2014SK06RDNP001	National	5.1	43.2	49.2	1,545.3

Firstly, it should be observed that the Polish programme is by far the largest of the regional programmes, and absolute allocations can then be misleading if compared. That said, the share of funds allocated for adaptation action is the third largest, smaller than the two German RDPs (Mecklenburg-Vorpommeren and Berlin-Brandenburg), but larger than the four national RDPs (CZ, LT, and SK). In all three national programmes but the Czech, climate action as such comprises just above one-third of the total financial support. In CZ, climate action takes up almost two-thirds, but adaptation action is a very small share of this. According to these numbers, it should be expected that the PL RDP would be a regional high achiever in terms of adaptation benefits in particular, but also climate action as such.

Seen in this perspective, the limited adaptation action listed in Table 4- does not indicate that the PL RDP will deliver adaptation benefits superior to those of neighbouring RDPs. The next paragraphs compare PL adaptation action with action under the same measures in neighbouring RDPs.

M05: Of the neighbouring regions, only Berlin/Brandenburg and Slovakia makes use of this measure, which is interesting in light of all regions identifying some sort of climate hazard as a risk. The implementation and formulation of the measure does not vary significantly in the three cases, partly because the scope in the regulation text is quite narrow and leaves little choice for the individual Managing Authority. In absolute numbers, the Polish allocation is the largest of the three (105 MEUR), but in relative terms the allocation is similar to the others (around 3 % of total climate allocation in all RDPs).

M08: All of the mentioned RDPs programme M08. The measures have been programmed in a very generic way in most RDPs, and only the LT programme mentions ecosystem resilience as a key benefit, as is the case in Poland. In that light, the Polish approach appears to be more directed towards adaptation than most neighbouring RDPs, even if one main component of the measure in Poland is afforestation, which first and foremost contributes to mitigation.

M10: M10 is a key adaptation measure overall, and has been programmed in all RDPs. The climate adaptation contribution from M10 in Poland is indirect, as it is programmed through UP4, which can deliver both adaptation and mitigation benefits, depending on the programming, as is the case in all other neighbouring RDPs. The LT RDP mentions climate mitigation as part of the *raison d'être* for M10, but none of RDPs explicitly articulate adaptation in the measure description.

In summary, the Polish RDP is quite similar in programming as compared to neighbouring RDPs. However, it does make use of a dedicated adaptation measure (M05) that few other of the neighbouring countries make use of, meaning that one must expect a greater preparedness towards natural hazards in Polish agriculture than in neighbouring countries. That said, the Polish programme is an exception in that it does not lend much importance to water issues in terms of water efficiency improvements and managing flooding risks, which seems to be high on the agenda in many other central European RDPs. These points, in combination with the relative high share of (total) allocation for adaptation action, allows for some points of observation and recommendation.

4.4.3 Conclusions and recommendations

The overall line is that the Polish RDP allocates a significant amount of financial support for adaptation, and includes measures that could target most of the adaptation needs identified in the national adaptation plan and in the RDP itself. However, in concrete action it is noted that there are lost opportunities concerning water management, and that the measures hold little actual adaptation when scrutinised.

That said, most climate-relevant actions are related to adaptation rather than mitigation, which is confirmed in the intervention logic via addressing particular RDP union priorities and focus areas. The more elaborate conclusion would be that the Polish RDP includes adaptation actions, but not at a level or of a nature that justifies the high share of allocated funds reported in accordance with the tracking methodology or the alternative approach taken in this study. In short, concrete operations delivering direct adaptation is only found in two measures and only addressing a subset of the needs identified as relevant for PL. Yet the adaptation allocation is comparatively high; the programme has the highest absolute and second highest relative share of financial support dedicated to adaptation action in the region, but does not stand out compared to neighbouring RDPs in terms of action. In terms of focus, the PL RDP concentrates adaptation action in the area of farming practices, while to a large extent leaving out water management, despite the fact that both the needs section and neighbouring RDPs identify water as an adaptation issue.

The following recommendations have been identified regarding lost opportunities, meaning needed action that Polish Agriculture could benefit from, but which has not been planned:

- The Polish programme mainly targets managing risks associated with climate hazards, as well as resilience building in soil and biodiversity domains. That said, the formulation of M10 is focussed on environmental management and not adaptation (or mitigation). While this seems to be a tendency in many RDPs across the Union, the Polish programme would in particular benefit from a more climate adaptation oriented programming approach, as it is exactly this measure that drives much of the climate adaptation in Poland.

- Polish RDP does not include measures related to water storing, water management in soils, and actions securing crops/soils against long droughts (e.g. improving water retention in soils). These, however, are important as Poland almost every year suffers from droughts or long non-precipitation periods appearing locally and regionally, which has an impact on the volume of yields, as well as productivity of soils. Neighbouring RDPs in DE and SK reflect this, and the Polish programme would benefit from doing the same.

- The level of soil organic matter is low in Poland, therefore more emphasis could be put on agri-environmental schemes and other measures on practices aiming at improving/rebuilding it.

- Drainage systems on agricultural land require further modernization in order to be able to collect water from the fields and store it (also helpful in the case of heavy rains). No dedicated Water operations have been found in the RDP, and so water issues are not well-integrated and not prioritized.

- Also, managing flooding risks could be become a key climate adaptation discipline for decades to come due to changing rainfall patterns, but this has not been addressed by the RDP.

Appendix A

MS	CCI	RDP	Measure	Adaptation Action (MEUR)	Mitigation and/or Adaptation Action (MEUR)	Climate Action (MEUR)	Total Support (MEUR)
CZ	2014CZ06RDNP001	National	04	-	-	-	422.4
			05	-	-	-	-
			08	-	34.7	42.4	42.4
			10	-	678.8	678.8	678.8
			11	-	248.0	248.0	248.0
			13	-	507.7	507.7	507.7
DE	2014DE06RDRP007	Berlin + Brandenburg	04	-	-	-	-
			05	22.2	-	22.2	22.2
			08	-	58.5	58.5	58.5
			10	-	69.8	71.4	71.4
			11	-	133.4	133.4	133.4
			13	-	125.4	125.4	125.4
DE	2014DE06RDRP011	Mecklenburg-Vorpommern	04	-	7.5	32.5	209.1
			05	18.0	-	18.0	18.0
			08	-	21.8	21.8	21.8
			10	-	125.9	125.9	125.9
			11	-	125.0	125.0	125.0
			13	-	-	-	-
LT	2014LT06RDNP001	National	04	-	2.6	5.2	526.9
			05	-	-	-	-
			08	-	18.9	85.3	85.3
			10	-	72.4	106.8	106.8
			11	-	113.1	113.1	113.1
			13	-	215.3	215.3	215.3
PL	2014PL06RDNP001	National	04	-	63.0	63.0	2,120.2
			05	105.6	-	105.6	105.6
			08	-	-	191.5	191.5
			10	-	753.4	753.4	753.4
			11	-	445.4	445.4	445.4
			13	-	1,378.2	1,378.2	1,378.2
SK	2014SK06RDNP001	National	04	-	33.8	41.2	403.4
			05	20.8	-	20.8	20.8
			08	-	83.9	84.1	84.1
			10	-	106.7	106.7	106.7
			11	-	67.2	67.2	67.2
			13	-	360.2	360.2	360.2

5 Sea level rise, coastal erosion and coastal flooding

5.1 Illustrative examples from France

France has a specific geographical location including three sea basins. The country encompasses 11 coastal regions, as well as 7 outermost regions. 19 million people live in coastal areas (less than 1 hour driving), which are characterised by continuous demographic growth and strong conflict between soil artificialisation and natural areas preservation.

Coastal erosion affects one quarter of the littoral zone. The most important level of erosion is observable in the North of France (North Sea and the Channel), as well as in some outermost regions.

As regards maritime submersion, around 230,000 Households (in 1,000 townships) are exposed to high risks (2 meter sea level increase) and 770,000 households when considering a 5-meter sea level increase.

The most important recent event is the windstorm *Xynthia*, which crossed Western Europe between 27 February and 1 March 2010. In the département of Vendée (Pays de la Loire), cities like La Faute-sur-Mer, L'Aiguillon-sur-Mer, and La Tranche-sur-Mer were flooded with water levels reaching up to 1.5 metres. 35 people were killed in the département and 12 in the neighbouring département of Charente-Maritime (6 more in the southern part of the Atlantic coast).

Beyond these climate events, the rise of the sea level is threatening important coastal areas, some of which are already below sea level, including in the Mediterranean coastal area (especially La Camargue at the delta corridor of Le Rhône, which could disappear in the upcoming decades).

All combined (sea level rise, coastal erosion and flooding), one third of the French shoreline is exposed to climate change risks (1,800 km).

Figure 5-1 Map : submersible areas in the scenario of a sea level rise of 2 meters

Source: floodfiretree.net

5.1.1 France's Partnership Agreement

As it regards the Partnership Agreement, climate-related needs have been, to a certain extent, identified in coastal areas. Management of resources and natural risks are acknowledged as acute challenges.

ERDF Funds, notably by the use of TO5, are expected to contribute to:

- the increase of areas and population protected against sea submersion;
- the consolidation of risk monitoring / forecasting & early alert systems; and
- the increase of the population's awareness and the use of pedagogic tools.

The specific needs and challenges in the outermost regions are also underlined. The Partnership Agreement emphasises the need for prevention and management of the three types of climate-related risks in outermost regions (costal erosion, marine submersion and extreme weather events, such as cyclonic swells).

EAFRD is not specifically directed towards coastal areas although it can intervene in some coastal natural areas (wetlands, etc.). EMFF is not directly linked to Thematic Objective 5.

The PA also stresses that numerous projects can target these areas, which leads to some uncertainty in terms of the cumulative impact. Strategic planning and integrated management is thus all the more important for these territories.

5.1.2 National and regional adaptation strategies

Historically speaking, France has developed a very effective risk management system for inland flooding but is not well organised for coastal submersion and erosion risks.

Xynthia tempest in 2010 has contributed to tackling this issue more seriously and led to the adoption of several plans and strategies at the national and territorial levels.

Regarding sea flooding, a specific emergency plan was adopted in 2011, *le Plan submersion marine* (PSR), which is also elaborated at the territorial level. In addition, the first national strategy for flooding risk management was adopted in 2014 (in line with the EU flooding Directive).

These plans are being implemented but unfortunately too often constrained to embankment infrastructures, the maintenance of which is very costly. Still, a change in the global approach has been initiated with the concept of 'sustainable management of the coastline' departing from the idea that the coastline should be immovable. Henceforth, concrete infrastructures & enrockment of banks are not systematically privileged and some old structures are now being demolished.

Besides the PSR, territories have coastal risk management plans, which provide some guidance to local policy-makers and monitoring tools (including coastal erosion issues). While the national authority is still responsible for the security and control aspects, local authorities can, on a voluntary basis, develop integrated plans in the framework of collaborative governance, which enable them to have access to specific funds.

5.2 Sea level rise and coastal risks in selected programmes: illustrative examples

The table below synthetize for regional ERDF programmes, the use of TO5 and potential contribution to issues specifically related sea level rise & coastal risks. Note that even if some OP did not select TO5, these issues can be partially dealt through TO1 and TO6 (restoration of coastal marshes, sandy lawns, etc.).

Table 5-1: Overview of the programme's contribution to Sea level & coastal risk management

Title Adopted Programme	Allocation to TO5 (EUR)	Sea level & coastal risk addressed in the OP?
Metropolitan France		
Regional programme Aquitaine 2014-2020	29,500,000	Coastal erosion & flooding
Regional programme Languedoc-Roussillon 2014-2020	33,656,640	Coastal erosion & flooding
Regional programme Picardie 2014-2020	9,000,000	Coastal erosion & flooding
Regional programme Martinique Conseil Régional 2014-2020	33,142,408	No
Regional programme Nord-Pas de Calais 2014-2020	32,000,000	Coastal erosion & flooding
Regional programme Corse 2014-2020	12,000,000	Coastal erosion
Regional programme Pays de la Loire 2014-2020	6,850,000	Sea level rise & flooding
Regional Programme ERDF-ESF PACA	-	No
Regional Programme ERDF-ESF Bretagne	-	No
Regional Programme ERDF-ESF Poitou-Charentes	-[38]	Coastal erosion & flooding (partly through TO1)
Regional Programme ERDF-ESF Haute-Normandie	-	Coastal erosion & flooding (partly through TO1)
Regional Programme ERDF-ESF Basse-Normandie	-	No
Outermost regions		
Regional programme Réunion Conseil Régional 2014-2020	27,960,000	Coastal erosion
Regional programme Guadeloupe Conseil Régional 2014-2020	65,500,428	Sea level rise & flooding
Regional Programme ERDF-ESF Guadeloupe et St Martin Etat 2014-2020	3,750,000	No
Regional programme Martinique Conseil Régional 2014-2020	33,142,408	No
Regional Programme ERDF-ESF Guyane	-	No
Regional Programme Mayotte	-	No

[38] Regional measures have been implemented during the last programming period to strengthen embankments and fight against floods

5.2.1 Focus on ERDF in Pays de la Loire

The Region is characterised by the importance of its coastal area (450 km of coastline and 60 km of estuaries) and is one of the most exposed to the sea level rise and coastal risks (such as Xynthia tempest).

Against this backdrop, TO5 was selected under the ERDF programme and specifically tackles this issue with almost EUR 7 million allocated to this Investment priority 5a (2.34 % of the OP total financial amount).

The OP will support communication actions and raising the awareness of the population, as well as territorial planning and physical investments to fight and prevent the risk of flooding. Selection for these operations will be made with regard to their consistency with other local plans concerning flood and submersion management risks. However, no indication is given regarding the type of works and equipment that are privileged in terms of flood prevention.

The Common Output Indicator '*Population benefiting from flood protection measures'* is relevant and a substantial target value is provided, but the result indicator '*population covered by a prevention plan*' does not appear so appropriate, since these plans are mandatory since 1995.

In addition, TO6, which is combined in the same Priority Axis as TO5 aims at preserving ecological continuity by developing green and blue infrastructures (*trame verte et bleu*) and rehabilitating brownfields. However, no specific mention is made toward the protection of coastal areas and the potential contribution of some ecosystems to flooding prevention.

The other Priority Axes do not consider climate change adaptation.

The most interesting feature of this programme may be the approach adopted in terms of integrated local strategies. It promotes an integrated approach to sustainable territorial development that specifically concerns TO4, 5 and 6. It is here expected that the local authorities submit integrated action plans addressing environmental and climate-change related issues. Two of the nine eligible territories are exposed to coastal submersion risks (Guérande and Saint Nazaire) and have already integrated risks prevention operations in their strategies (including the protection of the natural wet lands of La Brière and monitoring / awareness campaigns).

In terms of general coordination, it should be mentioned that there is unfortunately little coordination in mechanisms with other Programmes, notably the Loire Plan and also with the regional OP for Poitou-Charente, which faces similar and sometimes shared issues regarding coastal risks (la baie de l'Aiguillon).

5.2.2 ERDF in Languedoc-Roussillon

Languedoc-Roussillon is a typical maritime region where about 50 % of the population lives by the coast, hence facing erosion and submersion risks of a littoral nature: flat topography with lagoons, spits and wetlands. The OP thus concentrates on the reduction of vulnerability to flooding and supports actions to ensure a better resilience to coastal risks.

Priority Axis 4 mobilises two TOs and four Investment Priorities (IPs). TO5IPb is dedicated to the reduction of flood risk. Three others under TO6 support the sustainable management of water and water environment, green tourism, and the management of green and blue infrastructures. Overall, it is expected that this Priority Axis will provide a total expenditure of EUR 38 million dedicated to climate change adaptation. However, it is difficult to identify the specific amount that will be invested to address coastal risks, especially for TO6 (inland flooding is also an important issue for this region and physical restoration of rivers is one of the programme priorities).

In terms of mainstreaming, the integrated approach to territorial development does not address adaptation issues (only mitigation).

On the contrary, research priorities from the regional Smart Specialization Strategy do address climate change adaptation. Two domains of the regional Smart Specialization Strategy focus on climate-related matters: 'sustainable water management' and 'littoral economic development'. The one on littoral economy is particularly interesting on the perspective of socio-economic adaptation toward climate change and aims at facilitating strategic planning tools and approaches toward coastal areas (a specific local governance has been implemented: le 'Parlement de la mer').

5.3 Conclusions and recommendations

Most of the littoral regions have adopted specific strategies regarding sea level rise and coastal risks, notably through the selection of TO5. In metropolitan France, the most exposed territories, such as Nord-Pas-de-Calais, Pays de la Loire or Languedoc-Roussillon address this issue at a satisfactory level. These specific issues are not systematically addressed in outermost regions, despite their importance for example in French Guiana or Mayotte (see case study on Outermost regions' adaptation strategies).

Furthermore, it should be noted that some regions like Basse-Normandie or PACA (which incorporates most of La Camargue natural area) do not address sea level rise and coastal risks issues even through some substantial threats are identified.

In terms of actions, the ERDF could better focus on new forms of flood protection / ecological engineering with Living Shorelines, such as shellfish reefs, coastal wetlands or stabilisation of sand dunes.. The use of geotextiles could also be further experimented.

Although this is a new national political orientation, reducing the urbanisation in the most exposed areas – because of coastal erosion (spits, cliffs, etc.) or their level under the sea – should be clearly supported through ERDF Funds.

Of course, early alert systems still need to be financed, as this kind of equipment is still not fully adopted in all exposed area. In addition, it appears that in France very little communication on the prevention of such risks has been made (which can explain the heavy human damage when climatic events occur).

These kind of strategies or operations are not politically attractive because the results can only be observed in the long run. Quite often, their effects cannot be observed at all since they aim at preventing any occurrence. On the contrary, some actions to be undertaken can lead to public reluctances (limitation of access toward natural coastal areas, *strategic* withdrawal spatial planning approaches, etc.).

In terms of governance two approaches are required:

- at the local level, the development of integrated approaches (as seen for Pays de la Loire) and the possibility to mix ERDF, EAFRD and even EMFF funds (although the French OP does not provide much answers to these issues) and

- at the interregional level, better co-operation at the sea basin levels between regional Managing Authorities (Pays de la Loire & Poitou-Charente, PACA and Languedoc-Roussillon, etc.), although the reducing of the number of French regions will automatically answer to this requirement (fusion of Picardie & NpdC or Poitou-Charente with Aquitaine).

6 Climate change adaptation in ETC

The cross-border and transnational character of programmes under European Territorial Cooperation (ETC) provides a convenient scope for climate change adaptation due to the borderless nature of climate change. Overall, the ETC programmes were quite successful at mainstreaming climate adaptation.

The underlying chapter presents four case studies on climate adaptation in the ETC. Two of the selected programmes are transnational and cover the Danube River Basin and the Adriatic-Ionian region. These two programmes were selected based on their high content of climate adaptation action and are good examples of implementing the EU macro-regional strategies. The last two programmes chosen have a cross-border scope and respectively address the border between Ireland and United Kingdom, and Spain and Portugal. The former was chosen because it exhibits the highest climate adaptation share of its type, while the latter partially reinforces the maritime strategy of the Atlantic Arc.

6.1 Danube Transnational Programme

6.1.1 Overview

The Danube Transnational Programme[39] (DTP) covers the countries of the Danube River Basin, which consists of nine Member States (Austria, Bulgaria, Croatia, Czech Republic, Germany, Hungary, Romania, Slovakia and Slovenia), three accession countries (Bosnia and Herzegovina, Montenegro and Serbia) and the neighbouring regions of Ukraine and Moldova. The programme mainly focuses on soft actions, such as joint planning, exchange of information, etc. to promote co-operation in the heterogeneous Danube Region. The DTP organises its interventions into three priorities, of which Priority Axis (PA) 2 '*Environment and culture responsible Danube region*' has a clear focus on climate change adaptation. The Priority Axis targets Thematic Objective 6 '*Environment and resource efficiency*' and contains two adaptation relevant Investment Priorities (IPs). The relevance of climate action in the programme is demonstrated through a share of 25 % of the programme's Union support being allocated for climate-related actions, which accounts for EUR 50.45 million. Of that, EUR 16.3 million are earmarked to adaptation interventions.

The main document that underpins the DTP is the European Union Strategy for the Danube Region (EUSDR), which covers all countries/regions of the Danube Basin. The programme can partly be seen as an implementation tool of that strategy, as it supports the activities of the EUSDR with a number of actions in the fields of water and flood management and nature preservation that are equally highlighted in the strategy and the DTP. The DTP as well as the EUSDR, adopt the regional water and flood management, and climate adaptation strategies of the United Nation's International Commission for the Protection of the Danube River (ICPDR), which are major policy tools of adaptation within the region.

[39] Danube Transnational CP (CCI: 2014TC16M6TN001)

In summary, the DTP puts considerable emphasis on climate change adaptation, and its links to the underlying strategies are well established. The above suggests that the programme duly supports joint efforts to tackle the most urgent adaptation issues.

6.1.2 Summary of ETC programme

Aspirations of the Danube Transnational Programme (DTP)

The DTP aims to achieve a higher degree of territorial integration and co-operation primarily in research, environment protection, water management, transport and energy, through improving institutional frameworks; physical interventions are supported on pilot-project bases only.

The DTP organises its measures in four PAs, showing a clear thematic concentration and a sound application of the horizontal principle of sustainability.

Actions with significant impact on climate change adaptation are organised under PA2 '*Environment and culture responsible Danube region*'. Within this axis, the most climate adaptation-relevant IP is 6b, which addresses water and environmental risk management including flood management efforts, while IP6d covers interventions regarding preservation of ecosystems and the development of green infrastructure.

In summary, the programme focuses on 'soft' measures rather than infrastructural investments. The selection of investment priorities indicates that the main aspiration of the programme is to promote the preservation of the natural resources through cross-border co-operation in the fields of water and flood management, protection of biodiversity supporting sustainability and climate resilience.

Climate change adaptation – particular aspiration of Priority Axis 2

Under PA2, adaptation is supported with 32.4 % of the total climate action accounting for EUR 16.3 million through actions particularly in the fields of water management, management of climate-related risks and the preservation of ecosystems (

Table 6-1). The climate actions of the relevant IFs targeting adaptation – particularly IF021 and IF087 – clearly show the commitment to tackle climate adaptation challenges.

Table 6-1: The Investment Priorities (IPs) and Intervention Fields (IFs) under PA2 with amount of climate adaptation action, and corresponding share of total climate change adaptation

PA	Investment Priority	Intervention Fields	Climate action (MEUR)	Share (%) of climate change adaptation action
2	6b – Investing in the water sector to meet the requirements of the Union's environmental acquis and to address needs, identified by the Member States	21. Water management and drinking water conservation	5.0	30.8
	6d – Protecting and restoring biodiversity and soil and promoting ecosystem services, including Natura 2000, and green infrastructure	85. Protection and enhancement of biodiversity, nature protection and green infrastructure	2.5	15.4
		86. Protection, restoration and sustainable use of Natura 2000 sites	2.5	15.4
		87. Adaptation to climate change measures and prevention and management of climate-related risks	6.3	38.4
		Total	16.3	100

The planned interventions of PA2 support the achievement of three specific objectives (SO) as shown in Table 6-2 below.

Table 6-2: Summary of relevant IPs and specific objectives, actions envisaged and expected results in PA2

Investment priority	Specific objective	Expected climate change adaptation results	Actions supported
6b – Investing in the water sector to meet the requirements of the Union's environmental acquis and to address needs, identified by the Member States, for investments that go beyond those requirements	**2.1 – Strengthen transnational water management and flood risk prevention** Strengthen joint and integrated approaches to further develop and implement River Basin Management Plans in the Partner States in line with the overall Danube River Basin Management Plan in order to improve transnational water management and flood risk prevention contributing to the sustainable provision of ecosystem services	Further protected and enhanced status of all waters, to ensure the sustainable, long-term use of water resources, and sound flood risk management. (See section 2.A.5 of the DTP for details)	Actions that contribute to the strengthening of transnational water management and flood risk prevention are to be supported. The types of actions include raising awareness regarding the best practices in environmental protection (e.g. waste treatment, water management), development of information sharing systems, integrated policies for water and groundwater quality management, flood forecasting, harmonisation of operative flood protection methods.
6d – Protecting and restoring biodiversity and soil, and promoting ecosystem services, including through Natura 2000, and green infrastructure	**2.3 – Foster the restoration and management of ecological corridors** Strengthen effective approaches to preservation, restoring and management of bio-corridors and wetlands of transnational relevance to contribute to the better conservation status of ecosystems of European relevance.	Improved strategic frameworks and developed concrete solutions to restore, conserve, and improve a network of green infrastructures/ bio-corridors in the Danube region consisting of natural and semi-natural habitats. Improved strategic and operational co-operation and interoperability among the emergency response authorities and stakeholders at	Improving the knowledge base and build up consistent and reliable data information sources, restoration and revitalisation of sensible landscapes and rivers, integrated management of habitats, protection and recolonization of endogenous species, control of invasive species, raising awareness on sustainable land use and soil protection, mitigating the negative effects of land uptake and fragmentation. Awareness-raising and

Investment priority	Specific objective	Expected climate change adaptation results	Actions supported
	2.4 – Improve preparedness for environmental risk management Establish and develop a more effective governance system for environmental protection addressing emergency situations and improve the preparedness of public authorities and civil protection organisation contributing to the reduction of risks and impact on ecosystem services, biodiversity and human health.	all levels in the Danube countries. (See section 2.A.5 of the DTP for details)	environmental education can also be part of wider project actions. In the case of risk management, the actions to be supported target the development of joint strategies and action plans for more effective management of natural and manmade disasters; building up a common knowledge base and data observation capacities, and mechanisms for the exchange of information; joint development of tools, development and practical implementation of education, training and capacity building.

It is clearly demonstrated by the actions and the selected intervention fields that the main focus of adaptation efforts in the programme is on water and flood risk management. Particular emphasis is put on the control of flood risks, increasing water quality and availability. Other adaptation issues, such as the management of droughts, forest fires, provision of ecosystem services through the development of green infrastructure and sustainable use of natural resources are also addressed. The objectives are to be achieved through the following actions:

- mitigating conflicts of interest;
- promoting dialogue between water users, raise awareness;
- capacity-building to support sound water management;
- effective information sharing, better integrated policies, joint action plans;
- transnational actions, co-operation to enhance flood forecasting and preparedness;
- transnational disaster management systems, integrated approach in rehabilitation of river systems; and
- implementing common strategies for sustainable use of resources.

The actions under PA2 are indicated to be interlinked with innovative adaptation technologies and risk management in other parts of the programme. Furthermore, some interventions are linked to mobility issues, and the development of inland waterways and ports, where the integrated approach, exchange of know-how, and best practices concerning sustainability can ensure improved adaptation capacities.

Indicators

The result and output indicators for the most adaptation-relevant SOs are listed in the table below.

Table 6-3: Result and output indicators of the specific objectives of PA2

Specific objective	Result indicators	Output indicators
2.1 – Strengthen transnational water management and flood risk prevention	Intensity of co-operation of key actors in the programme area in order to strengthen transnational water management and flood risk prevention	Number of strategies for improving transnational water management and flood risk prevention developed and/or implemented; Number of tools for improving transnational water management and flood risk prevention developed and/or implemented; Number of pilot actions for improving transnational water management and flood risk prevention developed and/or implemented
2.3 – Foster the restoration and management of ecological corridors	Intensity of co-operation of key actors in the programme area in order to foster the restoration and management of ecological corridors	Number of strategies for strengthening approaches to preservation, restoring and management of bio-corridors and wetlands developed and/or implemented; Number of tools for strengthening approaches to preservation, restoring and management of bio-corridors and wetlands developed and/or implemented; Number of pilot actions for strengthening approaches to preservation, restoring and management of bio-corridors and wetlands developed and/or implemented
2.4 – Improve preparedness for environmental risk management	Intensity of co-operation of key actors in the programme area in order to improve preparedness for environmental risk management	Number of strategies for improved co-operation and interoperability among the emergency response authorities and stakeholders developed and/or implemented; Number of tools for improved co-operation and interoperability among the emergency response authorities and stakeholders developed and/or implemented; Number of pilot actions for improved co-operation and interoperability among the emergency response authorities and stakeholders developed and/or implemented

The result indicators measure the intensity of co-operation in transnational water management and flood risk prevention, restoration and management of ecological corridors, and environmental risk management. Due to the nature of the ETC programmes, part of the result is the co-operation between the actors in itself. In order to judge whether there has been an increase in co-operation, the responsible authority will conduct a survey at the beginning of the co-operation programme period to provide a baseline. The survey will be conducted among relevant actors e.g. in water management and flood prevention. The survey will be repeated several times during the programme period to measure an eventual increase in co-operation intensity.

The output indicators specifically describe which kind of outputs the co-operation programme aims at achieving, e.g. development of joint strategies, tools for actions and pilot projects in transnational water management and flood risk prevention, restoration and management of ecological corridors, and environmental risk management. The comparison of the baseline values and the targets of the output indicator will make it possible to measure whether the expected outputs are achieved in relation to climate change adaptation. For example, the cooperation programme targets to develop or implement ten 'tools for improving transnational water management and flood risk prevention'. The result and output indicators provide the Managing Authority with a specific tool to monitor that the co-operation programme delivers on climate change adaptation.

Climate change in project selection

The guiding principles for project selection according to Section 2.A.6.2 of the DTP are described in general ways in Section 5.3.3. These include the actual and durable contribution of the project to sustainable development. Although the specific section on project selection mentions sustainability, it is not elaborated in detail and linkages among sustainability, climate change adaptation and project selection are not clearly established.

Horizontal principle of sustainable development

The commitment of the DTP to environmental sustainability is described in Section 8.1 under Horizontal principles. Numerous aspects of sustainable development common to all PAs and IPs are listed as criteria to be assessed in selecting operations. Selection criteria relevant to climate change adaptation are defined, such as contributing to the development of green infrastructure, enhanced awareness of adaptation and the reuse of waters. Adopting these selection criteria, the programme explicitly aims to support the horizontal principle of sustainable development, enhancing climate change adaptation in particular. However, the linkages between the specific procedures of project selection and the sustainability criteria defined in the section are not clearly developed.

Coordination with other ETC programmes

The DTP has no direct reference to other ETC programmes regarding climate change adaptation. Some of these programmes show though a clear coherence and synergy with the aspirations of DTP.

From a transnational point of view, the DTP exhibits coherence and potential synergies with the Central Europe as well as Alpine Space programme. The common topics concern water and flood risk management, and the safeguarding of biodiversity. Besides these two transnational co-operation programmes, a number of cross-border co-operation programmes also consider adaptation issues. For example, the cross-border programmes of Hungary (with Austria, Croatia, Romania and Slovakia) quote the EUSDR as an important point of reference. The most important areas cover sustainability in general, and specifically actions concerning the co-ordinated use of natural resources, water and flood risk management, and the development of the related institutional systems.

In all three cases, a specific co-ordination is not specified. Yet, the DTP indicates that it actively seeks coordination with other geographically overlapping ETC programmes through the exchange of information with the respective Managing Authorities (MAs). The objective of such coordination is to minimise the duplication of efforts and maximise the synergies of actions in the application as well as the implementation phase of projects.

6.1.3 Summary of adaptation-related initiatives, synergies

The relation of the DTP and adaptation-related strategies

Although the DTP is an independent financing instrument, it also serves as an important tool in the implementation of the EU Strategy for the Danube Region

(EUSDR) [40], the river and flood management and adaptation plans of the UN's International Commission for the Protection of the Danube River (ICPDR)[41], and the protocols of the Carpathian Conventions[42]. The DTP, at the same time, can benefit from existing knowledge and already established institutional networks. This approach has been widely recognised throughout the development of the DTP and is also visible in the organisation of the programme implementation, audit and monitoring. The general interrelatedness of the EUSDR and the DTP is well reflected in the fact that, besides the policy fields addressed by both documents, the DTP assigns considerable amount of support for the development of the institutional capacities of the Danube Strategy Points of the EUSDR.

There are several fields of actions where the DTP directly supports the achievement of the strategic goals set up in the EU and UN policies. These primarily cover the policy fields of water and flood management, the conservation of ecosystems and the development of green infrastructure, as well as the sustainable use of natural and cultural resources. The specific climate change adaptation fields of the DTP serving the implementation of the EUSDR and the other related strategies / conventions of the UN are as follows:

[40] Communication, EU Strategy for Danube Region, COM(2010) 715; {SEC(2010) 1491}

[41] https://www.icpdr.org/main/activities-projects/climate-change-adaptation

[42] http://www.carpathianconvention.org/protocols-to-the-convention.html

Table 6-4: Links of the DTP to the EUSDR and the UN Conventions in supporting climate change adaptation.

Danube Transnational Programme				EUSDR Priority / focus areas Synergies with UN ICPDR / UN Carpathian Convention
Thematic objective	**Investment priorities**	**Specific objective**	**Keywords and actions in the DTP**	
TO6	6b Investing in the water sector to meet the requirements of the Union's environmental acquis	2.1 Strengthen transnational water management and flood risk prevention	Water policy integration Development of common operations, joint planning, monitoring and early warning systems for water and flood management Awareness raising, training and education in flood risk management	EUSDR: Priority Area 4 Water Quality: River management plans Priority Area 5 Environmental Risks: Flood management and preparedness UN Conventions: ICPDR-Danube River Basin and Flood Management Plans ICPDR-Strategy on Adaptation to Climate Change
TO6	6d Protecting and restoring biodiversity and soil, and promoting ecosystem services, including through Natura 2000, and green infrastructure	2.3 Foster the restoration and management of ecological corridors	Developing knowledge bases Formulating common strategic frameworks and developing specific solutions for ecosystems Promotion of integrated approaches in general and specifically with environmental water and flood management interest Awareness raising, training and education in risk management	EUSDR: Priority Area 5 Environmental Risks: Management of flood areas, floodplain restoration Priority Area 6 Biodiversity, landscapes, quality of air and soils: Ecosystem protection and restoration, green infrastructure and corridors UN Conventions: ICPDR-Danube River Basin and Flood Management Plans ICPDR-Strategy on Adaptation to Climate Change Carpathian Convention Protocol on Conservation and Sustainable Use of Biological and Landscape Diversity Carpathian Convention Protocol on Sustainable Forest Management

Strategic background of the DTP: The EU Strategy for the Danube Region

The most important framework/strategic document referred to in the Danube Transnational Programme is the EUSDR. The Strategy aims to establish '*a sustainable framework for policy integration and coherent development*' of the region through setting out priority actions laid down in the accompanying Action Plan (AP).[43]

The EUSDR addresses the challenges of the diverse region, focusing on several issues, among which mobility, energy, the environment and risk management receive primarily attention.

The most important pillar with regards to climate adaptation is '*B) Protecting the Environment in the Danube Region*'. This pillar covers the priority areas of water quality (4), environmental risks (5), and biodiversity, landscapes and the quality of the air and the soils (6). The sound correspondence of the specific objectives of DTP PA2 with these priority areas is clear and direct. The table below shows how DTP can contribute to achieving strategy targets (i.e. how it builds on the EUSDR).

[43] SWD Action Plan, EU Strategy for the Danube Region, SEC(2010) 1489

Table 6-5: Climate adaptation relevant Priority Areas and objectives of the EUSDR and contribution of DTP

Pillar	Priority Area	Objectives	Planned actions under the DTP contributing to EUSDR objectives
B – Protecting the Environment in the Danube Region	4 – Water quality	- Water- management and quality - Support the development and implementation of regional and sub-regional river basin management plans to secure availability of water resources - Collection, management and dissemination of information and knowledge	-developing strategies, pilot actions for improving transnational water management - integrated policies for water and groundwater quality management
	5 – Environmental risks	- Flood management - Climate change adaptation	- strategies, pilot actions for improving transnational flood risk prevention - strategies for improved co-operation and interoperability among the emergency response authorities and stakeholders pilot actions for improved co-operation and interoperability among the emergency response authorities - harmonisation of operative flood protection methods
	6 – Biodiversity, landscapes and quality of the air and soils	- Strengthen ecosystems to serve as buffer to climate change - Preserve ecosystems threatened due to climate change	- strategies for strengthening approaches to preservation, restoring and management of bio-corridors - pilot actions for strengthening approaches to preservation, restoring and management of bio-corridors and wetlands - raising awareness in environmental protection, systems for sharing information - training and capacity building integrated management of habitats

The actions of the fourth priority area of the EUSDR focus on water management and quality. This strategic direction is addressed in IP6b of the DTP under SO 2.1 '*Strengthen transnational water management and flood risk prevention*', aimed at water and flood policy integration. Projects of the EUSDR foreseen include, for example, the adoption of the Management Plan of the valuable habitat of the Danube Delta endangered by several climate impacts, such as the rise of the sea level, droughts and extreme storms.

The most important priority area of the pillar from the point of view of climate change adaptation is '*5) the Management of Environmental Risks'*. The area is primarily involved with flood management and climate change adaptation issues.

These policy fields, set out in the EUSDR, are reflected in IPs 6b and 6d of the DTP through actions in research and development on the climate change impacts, the preparation of adaptation plans on regional and local levels, and the development of flood risk management plans and systems with the participation of multi-national stakeholders.

Priority area 6 concerns the preservation of natural assets and landscapes in which the role of climate change adaptation is twofold: firstly, ecological systems serve as buffers against the impacts of climate change and secondly, their existence is threatened by changing climatic conditions. This priority is primarily supported by the actions of common research, planning and management of IP6d, specifically targeting the restoration and management of ecological corridors (SO 2.3) of the DTP.

Also beyond the above described specific themes, the representation of the EUSDR has been widely ensured in the programming, implementation and monitoring processes of the DTP, maximising synergies between the two strategic endeavours of the EU.

Other related strategies and programmes

The actions related to climate change adaptation foreseen in the EUSDR are greatly interwoven with the activities of the UN's International Commission for the Protection of the Danube River (ICPDR). The AP extensively recognises this, as it is also set out in the Joint Paper on Co-operation and Synergy for the EUSDR Implementation – Priority Area 4 (water quality) and Priority Area 5 (environmental risk), prepared by the ICPDR, and the 2016 Danube Declaration of the 14 Danube countries of the ICPDR, also adopted by the European Commission. The activities of the ICPDR in relation to climate change adaptation are already visible in the AP, when referring to the ICPDR's *Danube River Basin Management Plan*, *Flood Risk Management Plan of the Danube River Basin District* and *Strategy on Adaptation to Climate Change*. The DTP, recognising the strategic and operative inputs of the ICPDR, defines actions under IP6b and IP6d that target the implementation of the ICPDR strategies through, for example, the setting up of early warning systems, the preparation of specific water and flood risk management or river rehabilitation plans.

Besides the ICPDR, the UN Framework Convention on the Protection and Sustainable Development of the Carpathians (Carpathian Convention), covering some DTP countries gives guidance by establishing protocols in the policy fields of sustainable use of natural resources in general, and specifically, inter alia, the role of forests and flood and soil management. The specific objectives and actions envisaged of the DTP (see above) are in line with the provisions of the protocols on the use of natural resources and contributes to enhanced capacities and the co-operation of member states in giving adequate response to the challenges identified therein.

Finally, there are a number of other cross-national programmes and instruments, for example LIFE, Instrument for Pre-accession (IPA), Central Europe ETC and the EU Civil Protection Financial Instrument, that can build on

the synergies of actions foreseen in the DTP, and the EUSDR. The mutually promoted strategic aspirations are, for example, water and flood management and rehabilitation of ecosystems.

6.1.4 Conclusions and recommendations

The Danube Transnational Programme (DTP), by nature, focuses on 'soft' actions through joint initiatives to strengthen knowledge, innovation and research. Whereas the programme covers several issues, the major focus areas of climate change adaptation-relevant actions are water and flood management and the conservation of the ecosystems and green infrastructure. This is reflected in the selection of the IPs and IFs and the considerable share of financial support allocated.

The aspirations of the DTP highly interrelate with those of the European Union Strategy for the Danube Region (EUSDR) showing clear contribution of DTP to the achievement of the strategy with a clear focus on water management, flood prevention and sustainable use of resources. The DTP can thus be considered an important tool in the implementation of the EU Strategy, while it also supports related aspirations of the ICPDR in river management.

Considering the large number of countries involved and the need for co-ordination to fully exploit potential synergies with the activities of the EUSDR, the UN-International Commission for the Protection of the Danube River (ICPDR) and the Carpathian Convention protocols on the use and management of natural resources under the programme, it is important to rely on the available knowledge and networks of these institutions. Actions envisaged under the DTP are expected to result in effective co-operation of international stakeholders, extensive sharing of data and information, promoting joint efforts in adaptation. Also, the setting up a common system (institutional background, procedures, and IT support) to enhance and monitor the efficiency of co-operation in the policy field of climate change adaptation to achieve strategic goals is foreseen. Similar co-ordination efforts with the accession countries of the Danube Basin are envisaged under the programme through, the Instrument for the Pre-Accession Assistance (IPA).

A guiding principle for project selection is the actual and durable contribution of the project to sustainable development, however, it should be more explicitly elaborated with stringent selection criteria defined in Section 8.1 on sustainability. To strengthen climate change adaptation efforts in the region, it is recommended that projects aiming at building common practices, databases, forecast systems, innovative tools, knowledge base, etc. contributing to the preparedness of stakeholders and efficient climate-related risk management receive priority. Such co-operation is of particular importance given the wide geographical coverage of the DTP, which involves both countries that demonstrate major advancements in climate change adaptation (such as Germany or Austria) and also countries where, next to the urgent need for socio-economic development, climate change issues receive less attention.

6.2 The Adriatic-Ionian Cooperation Programme

6.2.1 Overview

The Adriatic-Ionian Cooperation Programme (ADRION) covers 31 regions from four EU Member States (Greece, Italy, Croatia and Slovenia) and four EU candidate countries (Albania, Bosnia and Hercegovina, Montenegro and Serbia).[44] The ADRION region covers a wide transnational area with more than 70 million inhabitants and diverse natural characteristics. The overall objective of the programme is to act as a policy driver and governance innovator, fostering European integration among the Partner States in the region. With regard to climate change adaptation, the programme addresses the need to adapt to climate change and supports co-operation and development of early warning systems, risk management and prevention tools.

6.2.2 Summary of ETC programme

The Adriatic-Ionian Cooperation Programme (ADRION) foresees interventions in four EU Member States (Greece, Croatia, Italy, and Slovenia) and four non-EU countries (Albania, Bosnia and Herzegovina, Montenegro, Serbia). The programme focuses on 'soft' measures and contributes to the promotion of research and innovation networks, preservation and promotion of sustainable use of natural and cultural heritage (including risk management and prevention), as well as strengthening connectivity, mobility and transport systems in the region. Climate change adaptation is addressed in the programme through actions supporting development of early warning systems, risk management and prevention tools linked to climate change effects.

The ADRION programme's area is severely confronted with natural risks such as floods, drought, fire, storms and has low climate change adaptation capacity and low interoperability of civil protection organisations. The SWOT analysis identifies the needs to manage the high environmental vulnerability in the region, strengthen administrative capacity and share common tools and methodologies to collect and evaluate data. Thus, climate change adaptation is explicitly addressed through increasing awareness, harmonising management approaches, facilitating knowledge transfer and fostering shared potentials.

The ADRION programme is organised around 4 Priority Axes (PA) and 4 Thematic Objectives (TOs), namely TO1, TO6, TO7 and TO11. The programme allocates 28.3 % (EUR 23.6 million) of Union support to climate action through TO1, TO6 and TO7. Out of this amount, EUR 7.9 million are allocated to climate change adaptation through IF087 in PA2 'Sustainable region' (cf. Table 6-6). IF087 focuses on adaptation to climate change measures and prevention and management of climate-related risks.

[44] Adriatic-Ionian (CCI: 2014TC16M4TN002)

Table 6-6: Climate change adaptation-relevant Priorities with corresponding TOs, Investment Priorities (IP), Intervention Fields (IF), climate adaptation support (MEUR) and proportion of total Union support for climate action under the programme (%).

Priority Axis	Priority	Thematic Objective	Investment Priorities	Intervention Fields	Climate adaptation action (MEUR)	Share (%) of total Union support for climate action in programme
2	Sustainable Region	TO6	6c and 6d	21, 85, 86, 87	7.9	9.5

Climate change adaptation – particular aspiration of Priority Axis 2

Climate change adaptation is explicitly addressed under TO6 in PA 2 'Sustainable Region'. PA 2 focuses on TO6 'Preserving and protecting the environment and promoting resource efficiency'. Around 9.5 % (MEUR 7.9) of total Union support is allocated to IF087, which focuses on adaptation to climate change measures and prevention and management of climate-related risks. Other IFs, such as IF021 'Water Management', IF085 'Protection of Biodiversity and IF086 'Protection and Restoration of Natura 200 sites' can potentially support adaptation actions.

Only one Investment Priority (IP), namely 6.d, directly supports climate adaptation actions (cf. Table 6-7 below). The specific objective 2.2 focuses on enhancing the capacity in transnational tackling of environmental vulnerability, fragmentation, and the safeguarding of ecosystem services in the ADRION area. Under this objective, the recognised environmental risks related to climate change mainly include droughts and floods. Furthermore, the programme identifies the need to tackle and manage preservation and fragmentation challenges, risks and climate change adaptation.

Table 6-7: Summary of relevant IPs and specific objectives, expected results, actions supported, result and output indicators in PA2

Investment Priority	6.d – Protecting and restoring biodiversity and soil and promoting ecosystem services, including through Natura 2000, and green infrastructure
Specific Objective	2.2 – Enhance the capacity in transnationally tackling environmental vulnerability, fragmentation, and the safeguarding of ecosystem services in the ADRION area
Expected Results	- Common understanding of the ADRION area's needs in the fields of environmental protection, biodiversity management, ecosystem services and climate change adaptation - Increased availability of data and information for delivering evidence-based responses - Harmonizing infrastructures and management structures in the fields of environmental protection, biodiversity management, ecosystem services and climate change adaptation
Actions supported	- Enhancement of frameworks and platforms for the interoperability of existing databases and integration of management approaches (adaptation assessments etc.) especially on civil protection, floods management, risk management etc. - Development of implementation strategies, models and testing of pilot activities of risk management and climate change adaptation in terrestrial and aquatic environments - Implementation of research and evaluation activities including awareness-raising and environmental education - Enhancement of networks and working groups for increasing capacity in the fields of biodiversity protection, increasing marine knowledge, development of transnational special spatial plans - Development of systems, procedures and early warning systems - Enhancement and exchange of best practices in coordination with initiatives on civil protection, floods management, risk management.
Result indicators	Level of capacity of the involved organisations to operate transnational, providing service and management regarding environmental vulnerability, fragmentation, and the safeguarding of ecosystems' services.
Output indicators	1. Number of supported transnational co-operation networks 2. Number of strategies and action plans developed in the field of environmental protection

The expected results primarily focus on developing a common understanding of the ADRION area's needs in the field of climate change adaptation, as well as harmonising infrastructures, management structures and risk response mechanisms (cf. Table 6-7).

The ADRION programme lists a number of adaptation actions to be supported (see Table 6-7). These actions focus on:

- improving transnational and regional co-operation of risk management (climate change adaptation in terrestrial and aquatic environments);
- increasing capacity in the fields of biodiversity protection (Natura 2000 and EMERALD networks); and
- development of early warning systems for pollution and natural and manmade hazards.

Climate change in project selection

The guiding principles for the selection of a project under PA2 list a number of strategic assessment criteria, which are rather general and can potentially be relevant to all the projects under this Cooperation Programme (CP). Selection criteria relevant to climate change adaptation are not specified, but the reference that the project has to be relevant to IP6d is made. Furthermore, a reference to the horizontal principles is also made, though it is clearly stated in the CP that the strategic assessment criteria have absolute primacy over the other two criteria, including coherence to horizontal principle criteria.

Horizontal principle of sustainable development

The horizontal principle of sustainable development is described in section 8.1 of the CP and is considered in each PA. A list of climate change-relevant principles and guidance is included in the CP. Specifically relevant for adaptation are:

- contribution to efficiency in the use of resources (water management and sustainable land use); and
- contribution to better awareness for the adaptation to climate change and risk prevention.

Furthermore, beneficiaries are asked to promote eco-innovations aiming to make a more sustainable use of natural resources under all PAs. More precisely, beneficiaries are asked to describe in their project proposals the efforts they will undertake to reduce the project's 'carbon footprint'.

Indicators

The result and output indicators are general and do not have adaptation-specific focus (see Table 6-7). The output indicator '*Number of strategies and action plans developed in the field of environmental protection*' could potentially address adaptation. However more specific focus on adaptation could be established.

Links to other ETC programmes

The ADRION programme identifies potential for co-operation with other Union instruments in the area of environmental protection and climate change. There, transnational co-operation operations can build capacity and improve the readiness of regions to develop and apply innovative solutions for environmental protection and management, resource efficiency and climate change mitigation and adaptation, thus complementing actions of LIFE and Horizon 2020.

The ADRION programme also states that it will seek coordination with other ETC programmes, such as ENPI CBC Med and Alpine Space, although no direct reference to climate change adaptation is made.

6.2.3 Summary of relevant adaptation strategies

The EU Strategy for the Adriatic and Ionian Region (EUSAIR) is a macro-regional strategy adopted by the European Commission in 2014 and the core policy document behind the ADRION programme. The strategy aims at creating synergies and fostering coordination among all territories in the Adriatic-Ionian region. The strategy focuses on four pillars: 1. Blue growth, 2. Connecting the region (transport and energy networks), 3. Environmental quality, and 4. Sustainable tourism. The design of the ADRION programme is closely aligned to the pillars of the EUSAIR.

With regard to climate change adaptation, PA2 (IP 6.d) is aligned to the EUSAIR Pillar 3 on Environmental Quality. The overall objective of Pillar 3 is to address the issue of environmental quality, with regard to marine, coastal and terrestrial ecosystems in the region. The ADRION region is vulnerable to disasters and the impact of climate change and comprehensive actions to adapt to those circumstances are needed. Thus, the EUSAIR Action Plan promotes co-operation in this area through different actions, such as conducting adequate comprehensive risk assessment, implementing a disaster risk management policy, as well as developing a regional strategy on adaptation to climate change. This is reflected in the ADRION programme and actions supported under PA2 IP 6.d, though no direct link between actions supported and Pillar 3 is explicitly made in the Cooperation Programme. Furthermore, no further reference on adaptation to the EUSAIR is made in the Cooperation Programme.

In addition, the selection criteria of a project under the Cooperation Programme include the relevance and coherence of the project with the EUSAIR strategy and the contribution to the achievement of its objectives, though not as a primary focus of the selection criteria.

Pillar 3 on Environmental Quality also contributes to the South East Europe 2020 Strategy of the Regional Cooperation Council, in particular to the Environment Dimension of its Sustainable Growth Pillar, by addressing issues related to water quality, disaster risk reduction and climate change mitigation and adaptation.

6.2.4 Conclusions and recommendations

The Adriatic-Ionian Cooperation Programme (ADRION) covers a total of 31 regions in a total four Member States and four non-EU countries. As is common for ETC programmes, the ADRION focuses on ‘soft’ actions through joint initiatives to increase awareness, harmonising management approaches, facilitating knowledge transfer and fostering shared potentials. Climate adaptation actions are indicated under Investment Priority (IP) 6d. The actions to be supported focus on the development, sharing and integration of early warning systems, risk management and prevention tools linked to the impacts of climate change.

While the guiding principles for project selection do not include an explicit reference to climate change adaptation, the selection criteria require projects’ relevance and coherence with the EUSAIR strategy and the contribution to the

achievement of its objectives. Climate change adaptation is therefore implicitly considered through the EUSAIR's Pillar 3 on environmental protection; yet, this is not the primary focus of the selection criteria. In terms of the horizontal principle of sustainable development, climate change adaptation is considered by evaluating, among others, the contribution to a better awareness for the adaptation to climate change and risk prevention of candidate projects.

The design of the result and output indicators does not provide an explicit mechanism to track the climate adaptation progress in the programme region. Therefore, monitoring the actions under IP 6d closely is recommended, as climate change adaptation output may be concealed behind the output indicator *'Number of strategies and action plans developed in the field of environmental protection*' (see Table 6-7).

While the ADRION programme exhibits similarities with the EU Strategy for the Adriatic and Ionian Region (EUSAIR) when it comes to climate change adaptation through environmental protection measures, no direct links are specified in the CP itself. This leads to the recommendation to seek stronger coordination with the EUSAIR to utilise the ADRION's potential to be a partial implementation tool of the EUSAIR or at a minimum a synergetic counterpart.

6.3 Ireland Wales Cross-border programme

6.3.1 Overview

The Ireland Wales Cooperation Programme (IWP) covers the areas of South-Eastern Ireland and Western Wales.[45] The main adaptation focus of this programme lies on knowledge-gathering and dissemination on the impacts of climate change. Particular attention is paid to the Irish Sea and coastal communities, due to their economic as well as ecological importance to the region. Although it does not foresee concrete actions, the programme allows for the tracking of climate change adaptation and includes appropriate measures to ensure the support of projects that address climate change adaptation.

6.3.2 Summary of ETC programme

The Ireland Wales Cooperation Programme 2014-2020[46] (IWP) covers areas on the southern, south-eastern, and eastern coast of Ireland, and the south-western, western, and northern coast of Wales (United Kingdom). The aspiration of the IWP is to address challenges and development needs commonly shared across the border in the Programme area. More specifically, the programme targets opportunities to exploit synergies in research and innovation needed to improve the competitiveness and economic performance of the territorial area, sustainably utilise the potential of cultural and natural assets to improve the tourism sector, and increase the capacity and knowledge of climate change

[45] UK-IE – United Kingdom-Ireland (Ireland-Wales) (CCI: 2014TC16RFCB048)
[46] UK-IE – United Kingdom-Ireland (Ireland-Wales) (CCI: 2014TC16RFCB048)

adaptation. One key goal of this programme is to preserve and enhance the coastal and maritime environment to fully utilise the Irish Sea's blue growth potential.

The IWP is structured into three Priorities, which respectively address research, development and innovation (Thematic Objective (TO); TO1), climate change adaptation (TO5), and preserving and protecting the environment (TO6). The specific objectives (SO) that correspond to these TOs are increased knowledge transfer collaboration (SO1), increased capacity and knowledge of climate change adaptation (SO2), and the sustainable realisation of natural and cultural assets (SO3).

The Priority on climate change adaptation has a key focus on adaptation of the Irish Sea and coastal areas due to their particular ecological as well as economic importance to the programme area, and the added value of a cross-border approach. Like many other ETC programmes, the content of the IWP does not provide 'hard' investments in climate change adaptation, and focusses instead on the gathering and dissemination of knowledge and awareness, by supporting actions of a rather preparatory than concretely adaptive nature, such as knowledge transfer or strategy development. Therefore, the planned interventions shall provide funding for piloting, test bedding activities and best practices, which may also be of value to other ESIF programmes. The co-operation programme dedicates all climate action to adaptation. EUR 27.72 million are therefore dedicated to the main adaptation Intervention (IF087), which results in a climate share of 37 % for the entire IWP.

Table 6-8: Climate change adaptation-relevant Priorities with corresponding TOs, Investment Priorities (IP), Intervention Fields (IF), climate adaptation support (MEUR) and proportion of total Union support for climate action under the programme (%).

Priority Axis	Priority	Thematic Objective	Investment Priorities	Intervention Fields	Climate adaptation action (MEUR)	Share (%) of total Union support for climate action in programme
2	Adaptation of the Irish Sea and Coastal communities	TO5	5a	87	27.7	35

Climate change adaptation – particular aspirations of Priority Axis 2

The interventions under this Priority address two cross-border specific challenges identified for the programme area: vulnerability to the impacts of climate change and utilisation of the potential of the Irish Sea. The programme therefore sees specific value in better knowledge of climate change impacts on the Irish Sea and coastal communities, and improving the capacity to adapt to these. In the following table, the envisaged results and actions under this Priority are summarised.

Table 6-9: Summary of relevant IPs and specific objectives, expected results, actions supported, result and output indicators in the Priority Axis 2

Investment Priority	5a – Supporting investment for adaptation to climate change, including ecosystem-based approaches
Specific Objective	SO2 – To increase capacity and knowledge of climate change adaptation for the Irish Sea and coastal communities
Expected Results	Actions in this SO will achieve four results. 1) Better knowledge within Irish Sea coastal communities to adapt to climate change. 2) Increased knowledge of the impacts specific to the Irish Sea region (negative as well as positive) and greater capacity of adaptation. 3) Increased acknowledgement and capacity to benefit from potential positive impacts (e.g. extended and more intense tourism season). 4) Increased capacity to share knowledge on climate change across the region. Eligible actions must address identified challenges. Any output of projects is to be measured in terms of research as well as degree of knowledge dissemination and awareness raising.
Actions supported	The overall aim of the supported actions is to reduce knowledge gaps, transfer knowledge amongst key stakeholders and wider dissemination to affected communities. Types of actions may be oriented on network or strategy development, knowledge transfer or adoption, enabling investments into development of processes, products, studies, or services, and minor scale investments for actions with added cross-border value. Specific actions are not planned, however indicative actions are listed.
Result Indicators	Levels of knowledge of adaptation to climate change amongst communities and businesses
Output Indicators	Number of pilot projects completed Number of new awareness raising initiatives targeting coastal communities Number of organisations cooperating in enhancing the marine and coastal environment

As becomes evident from SO2, the adaptation content of the IWP is concentrated on actions that equip affected stakeholders and communities with the required knowledge to address adaptation in a more precise manner. Indicative actions therefore include:

- knowledge-sharing platforms and mechanisms;
- jointly commissioned research to reduce evidence gaps on local impacts;
- development of impact assessment tools;
- knowledge, expertise, best-practice transfer of adaptation measures;
- development of knowledge and understanding of the Irish Sea environment;

- joint development of tools to stimulate cross-border knowledge exchange;
- cross-border pilot projects on awareness and knowledge dissemination; and
- knowledge transfer on nature-based adaptation solutions.

Despite the absence of major 'hard' investments, the IWP programme has the potential to deliver pilot and research activities tailored to the local marine environment, which may even be applicable in a national or EU-wide context.

Indicators

With the programme aspiration to explore and disseminate potential climate change adaptation strategies, the definition of the result and output indicators enables an appropriate tracking of progress with the indicated actions. The scope of the actions in the output indicators could have nevertheless been more tailored to a climate change adaptation context. For example, the output indicator *'Number of new awareness raising initiatives targeting coastal communities'* (cf. Table 6-9) may not exclusively be related to adaptation. Further, the definition of the level of knowledge on adaptation is hard to define, and therefore not a particularly objective measure.

Climate change in project selection

The guiding principles clearly accommodate climate change adaptation by requiring operations to develop or implement (technological, organisational, financial, regulatory and institutional) solutions that concretely increase the programme area's adaptation to climate change. The types of pilot and research activities financed under the IWP are thus likely to lead to a clear improvement of the region's climate change adaptation. In addition, the selection criteria oblige projects to incorporate the horizontal principle of sustainability, which is explained in further detail below.

Horizontal principle of sustainable development

The horizontal principle of sustainable development is applied in every project phase, from preparation to evaluation, through actions that are clearly specified. For example, candidate projects across all Priorities are assessed based on, inter alia, environmental protection requirements, climate change adaptation, disaster resilience, and risk prevention. Further examples are the guidance of projects through specialist advice, education of programme staff and stakeholders on the benefits of sustainable development, or ways to actively integrate sustainable development into projects. Yet, none of the actions has a targeted focus on climate change (adaptation). Nonetheless, every project application must demonstrate how it contributes to sustainable development. The specification of the sustainability principle is moreover in line with the declared intentions of both countries' Partnership Agreements to ensure that the Managing Authority incorporates measures to monitor and evaluate projects in their relation to sustainable development.

Complementarity to other programmes

Overall, the IWP exhibits complementarity with other interregional and transnational programmes, thematically as well as for the scaling up of successful projects. The identified complementarity is however mostly not

related to climate change adaptation. Further, identified complementarities with climate change adaptation contents with other programmes are only of a potential nature. The programmes identified are the LIFE programme and the EAFRD and EMFF programmes of both Member States. Concrete complementarity will thus need to be identified, as concrete operations of projects advance.

Link to national strategies

The IWP is linked to several national frameworks of Ireland and the United Kingdom. Concerning climate change adaptation, the Programme mentions direct links to the Irish Government's 'National Climate Change Adaptation Framework' (2012) and the Welsh Government's 'Climate Change Strategy for Wales' (2012). However, the link is not elaborated further than the mere mentioning of the frameworks.

6.3.3 Conclusions and recommendations

The geographic focus of climate change adaptation in the Ireland Wales Cooperation Programme (IWP) lies on the Irish Sea and coastal communities. The IWP addresses climate adaptation through actions on knowledge gathering and dissemination on the local impacts of climate change. While the planned actions are only an indication of possible actions, the expected results demonstrate a clear vision of the adaptation of the programme region through the IWP: 1) Better knowledge within Irish Sea coastal communities, 2) increased knowledge of the impacts specific to the Irish Sea region, 3) increased acknowledgement and capacity to benefit from potential positive impacts, and 4) increased capacity to share knowledge on climate change across the region.

The guiding principles for project selection clearly require candidate projects to develop or implement solutions that concretely increase the programme area's adaptation to climate change. Therewith, the adaptation-relevance of projects is likely to be ensured. In terms of the horizontal principle of sustainable development, projects throughout all Priorities are evaluated on, inter alia, climate change adaptation relevant aspects (environment, disaster, risk). In addition, continuous specialist guidance, education of programme staff and stakeholders on the benefits of integrating sustainable development into projects will be provided. Based on these requirements and support activities, it is a valid conclusion that climate change adaptation will be mainstreamed throughout all actions.

The design of the IWP's result and output indicators allow for a concrete tracking of the indicated actions for this programming period; yet, the indicators could benefit from a definition that is more tailored to adaptation.

Although the IWP does not indicate any 'hard' investments, it provides a good example of climate adaptation action of a 'soft' or 'preparatory' kind. Furthermore, it can be considered as a strong case of well-developed guiding principles and sustainable development principles.

The IWP has links to the Irish as well as the Welsh adaptation strategies. However, whether the IWP is an implementing part of these strategies is unclear. Ensuring a strong link between both is recommended, as the IWP in its adopted design provides a strong framework to increase the region's capacity for climate change adaptation.

6.4 Spain-Portugal Programme (POCTEP)

6.4.1 Overview

The Spain Portugal Cooperation Programme covers the regions of Galicia, Castilla y León, Extremadura and Andalucía in Spain and the regions Norte, Centro, Altentejo and Algarve in Portugal.[47] The main adaptation focus of this programme lies on risk management and prevention in relation to forest fires, floods, droughts and erosion, under Thematic Objective 5 (TO5). Climate adaptation action is explicitly incorporated in the expected results, actions, indicators and guiding principles under the relevant investment priorities.

6.4.2 Summary of ETC programme

Aspirations of the Spain-Portugal Programme (POCTEP)

The Spain-Portugal Cooperation Programme 2014-2020[48] (POCTEP in Spanish or Portuguese) covers five co-operation areas with distinct characteristics: a) Galicia (ES) and North of Portugal; b) North of Portugal and Castilla y León (ES); c) Centro region of Portugal and Castilla y León (ES); d) Alentejo (PT), Centro (PT) and Extremadura (ES); and e) Alentejo (PT). Algarve (PT) and Andalucía (ES).

The POCTEP consists of four Priority Axes (PA), which foresee actions on 1) smart growth through innovation (Thematic Objectives 1, 2) inclusive growth for the competitiveness of business (TO 3) sustainable growth through risk prevention and the management of natural resources (TOs 5, 6 and 4) enhancing institutional capacity (TO 11).

The programme is centred primarily on sustainable growth, with almost 40 % of ERDF Union support allocated to Priority Axis 3. Direct climate adaptation is found under TO5, where the programme follows the Specific Objective (SO) of increasing territorial resilience to natural hazards in the co-operation region (see Table 6-10).

[47] ES-PT – Spain-Portugal (CCI: 2014TC16RFCB005)

[48] ES-PT – Spain-Portugal (CCI: 2014TC16RFCB005)

Table 6-10: Climate change adaptation-relevant Priorities with corresponding TOs, Investment Priorities (IP), Intervention Fields (IF), climate adaptation support (MEUR) and proportion of total Union support for climate action under the programme (%).

Priority Axis	Priority	Thematic Objective	Investment Priorities	Intervention Fields	Climate adaptation action (MEUR)	Share (%) of total Union support for climate action in programme
3	Sustainable growth through cross-border co-operation on risk prevention and improving the management of natural resources.	TO5	5b	87	16.2	15.07

Climate change adaptation – particular aspirations of Priority Axis 3

In terms of climate adaptation action, the interventions under this Priority address three cross-border adaptation-specific challenges identified for the programme area, of which one contains direct climate change adaptation: the exposure of the co-operation area to various natural risks (forest fires, floods, river basin pollution, droughts, erosion). Table 6-11 below summarises the envisaged results and actions related to climate adaptation under this Priority.

Table 6-11: Summary of relevant IPs and specific objectives, expected results, actions supported, result and output indicators in the Priority Axis 3

Investment Priority	5b – Promoting investments to address specific risks, ensuring disaster resilience, and developing disaster management mechanisms
Specific Objective	SO1 – Increase the territorial resilience to natural risks in the cross-border co-operation space
Expected Results	Prevention of natural risks, some aggravated by human activity (floods, forest fires, soil erosion, pollution of water beds).
Actions supported	Joint infrastructure and equipment for the prevention and fight against forest fires and other natural disasters. Modernisation of risk management systems. Improve knowledge on risks (identification studies, evaluation of impacts, risk mapping). Actions to raise public awareness about natural hazards. Training of service personnel on identified risks in order to improve their risk management capacity. Initiatives and actions to promote the recovery and restoration of areas affected by natural disasters. Elaboration of multi-risk strategies to address natural risks of a cross-border nature. Studies to integrate climate change risks in strategic installations (nuclear, energy, etc.).
Result Indicators	Number of forest fires active for more than 24 hours.
Output Indicators	Population benefiting from flood protection measures. Population benefiting from forest fire protection measures.

It is evident from Table 6-11 that the adaptation content of Priority Axis 3 is concentrated on risk prevention actions under TO5 that aim to build capacity through training, awareness raising and the development of knowledge on risks, including the assessment of their impacts and their prevention. Climate adaptation acquires a strategic relevance by being incorporated in strategies and infrastructures of strategic importance, such as cross-border energy infrastructures.

Indicators

The programme includes result and output indicators that enable the assessment of achievements in relation to climate adaptation. For instance, the capacity of the programme to address forest fire and flood risks is depicted in the result and output indicators. Given that many of the actions under TO5 are related to awareness raising, knowledge development and training, it would be relevant for the programme to include some indicators that assess the increase in the knowledge base and its translation into concrete adaptation actions, e.g. culminating into '*more research projects on innovative methods and systems for risk prevention'* or into '*improved capacity to manage natural risks related to forest fires, floods, droughts and other natural catastrophes'*.

Climate change in project selection

The guiding principles clearly accommodate climate change adaptation by requiring operations under IP 5b to prioritise major risks and to assess the adequacy of projects to the co-operation strategy in the field of risk prevention and improved management of natural resources. In addition, the selection criteria oblige projects to incorporate the horizontal principle of sustainability, which is explained in further detail below.

Horizontal principle of sustainable development

The programme aims to promote sustainable development, explicitly considering the environmental dimension as one of the basic pillars of its strategy. Thus, the actions aimed at environmental conservation and sustainable use of natural resources have a significant presence in the planned measures. Furthermore, the most important environmental problems relate to the exposure of the area to various natural risks (fires, floods, pollution of aquifers, drought and erosion), which are sometimes aggravated by human action and are adequately addressed by the programme.

Complementarity to other programmes

The Spain-Portugal co-operation area forms an important part of the Atlantic Arc sea basin, whose maritime strategy includes inter alia adaptation as one of its fundamental elements. Furthermore, the programme exhibits complementarity with EAFRD and EMFF, though explicit references to complementarities with these funds in the field or risk management are not specified, despite there being clear potential for such. Where adaptation is clearly mentioned is in the potential synergies with the LIFE programme. More concretely, there is potential complementarity with LIFE in the context of 'integrated projects' in fields related inter alia to climate change adaptation, although specifics are not provided. Concrete complementarity will thus need to be further detailed, as concrete operations of projects advance.

Link to national strategies

The approach to adaptation in the Spain-Portugal co-operation programme follows the recommendations of the National Plan for Climate Change Adaptation (2014-2020). Furthermore, the investment in climate change adaptation is consistent with the national challenges identified by the European Commission in the relevant Position Paper for each country.

6.4.3 Conclusions and recommendations

The Spain Portugal Cooperation Programme (POCTEP) addresses climate change adaptation in four Spanish and Portuguese regions respectively. Interventions aim at the prevention of the regional natural risks associated with climate change, i.e. floods, forest fires, soil erosion, pollution of water beds. The supported actions are of a wide variety and include, among others, shared risk and knowledge management, modernised infrastructures and equipment, and raising public awareness. The descriptions of the expected results and actions to be supported show a clearly formulated approach to climate adaptation action.

The guiding principles of project selection require projects focus on major risks and demonstrate adequacy to the identified needs. The horizontal principle of sustainable development does not explicitly account climate change adaptation, but implicitly does so by promoting the environmental dimension of projects. Nevertheless, a more explicit consideration of climate adaptation would benefit a stronger mainstreaming of climate adaptation throughout all interventions in the programme.

The design of the result and output indicators enables a limited degree of tracking climate adaptation action in the programme region. Yet further output indicators that cover other aspects of the supported actions can improve the traceability of actions. Possible examples are the number of shared training hours or the number of awareness-raising events.

The co-operation area of the POCTEP consists of a part of the Atlantic Arc's maritime strategy and the programme reinforces the strategy through sustainable development and solutions to enhance the potential of the marine and coastal areas. While sustainable environmental development also brings about climate adaptation benefits, it is also recommended to establish complementarity on direct climate adaptation, to widen the extent of climate change adaptation in the region.

7 Outermost Regions

7.1 Overview

7.1.1 Outermost Regions specific characteristics

Outermost Regions (ORs) face a number of challenges related to their geographical characteristics, in particular: remoteness, insularity, small size, difficult topography and high sensitivity to extreme weather events and climate hazards.

They benefit from tropical climate conditions with average temperatures between 25 and 29 °C (the temperature can exceeded 30 °C on more than 250 days per year) and an average rate of humidity between 75 and 85 percent. These conditions have impacts on infrastructures and equipment but also human health: the heat risk index[49] is often over 40 points.

The territories of Guadeloupe, Martinique and La Reunion include volcanic mountainous areas, which are mostly covered with forests. Although its topography is not particularly constraining, the territory of French Guiana is difficult to access because of its constantly changing coastlines (strong soil erosion and silting linked to sea and river streams), very dense river basin and luxuriant vegetation, with the Amazonian forest covering more than 90 % of the territory.

ORs are highly exposed to natural risks which frequently provoke important damages and demand a steady monitoring. These risks are:

- cyclones and coastal risks linked to cyclones, such as storm tides;
- volcanic risks;
- seismic risks, landslides and tidal waves; and
- soil erosion and floods.

For Caribbean regions, cyclones come from the Atlantic or from the centre of the Caribbean and the Gulf of Mexico, in August and September, and are responsible for numerous damages. As for La Réunion, it is regularly under cyclonic alert from December to March.

The exposure of La Réunion to soil erosion is one of the highest in the world. The speed of soil disappearance ranges from 0.5 to 1 meter within 70 years, whereas it takes 100,000 years to reconstitute this quantity. Landslides and crumbling risks are also very high in the region, as well as flood risks, because of the density and prominent slopes of the river basin.

[49] https://en.wikipedia.org/wiki/Heat_index

7.1.2 Climate change risk assessment

Data on risks in ORs are very heterogeneous, in particular as full assessments have not been undertaken in all regions. Various sources of knowledge are available, each emphasizing on different aspects and using different measuring tools.

The French ORs are particularly exposed to climate change, particularly the impact on the evolution of ocean characteristics (sea level rise, rise of temperatures in ocean surface areas, acidity of water). They will also be confronted by extreme weather conditions from heatwaves to stronger tempests and cyclones. For example, in the Indian Ocean, the registered average speed of cyclones has increased by 26km/h between 1981 and 2006 (cf. Mayotte SWOT analysis in the RDP p.73). Water warming is likely to increase the share of most powerful cyclones (which have already doubled since 1970) rather than multiplying their number.

Foreseen consequences of these climate change patterns in ORs are:

- coral bleaching;
- coastal erosion and increased vulnerability of mangroves (fishing nurseries & natural barrier against submersion);
- marine submersion and inland floods (after tempest / cyclones episodes);
- multiplication of landslides and crumbling risks (in mountainous areas);
- withdrawal of rainforests due to the rise of temperatures;
- spreading of invasive species and diseases; and
- increased forest fires.

Biodiversity and high concentration of endemic species may be at risk in this sensitive context. French ORs and territories have 26 times more plant species, 60 times more endemic birds, and more than 100 times more fish species than continental France.[50] As an example, 5,500 plant species have been recorded in French Guiana, including more than 1,000 tree species, along with 700 species of birds, 177 species of mammals, and over 500 fish species.

[50] http://www.outre-mer.gouv.fr/IMG/pdf/Passeport_Biodiv-EN-complet-v3.pdf

Table 7-1 Climate change effects by OR[51]

Regions		Estimated effects of climate change
Caribbean	Guadeloupe	Increase of sea water temperature, increase of the frequency of extreme weather events, such as drought and heavy rainfall and the intensity of tropical cyclones, change in duration and characteristics of the rainy and dry seasons.
	Martinique	Between 1960 and 2000, temperature has increased by approximately 1.5 °C; the sea level has risen by approximately 3.5 mm per year. Both hurricane and thunderstorm seasons have become more variable in their timing.
	Saint-Martin	As for the other Caribbean French OR, the intensity and frequency of hurricanes is expected to increase. One of the key features of the island is the existence of barrier beaches or sandbars which are low and narrow. These areas are considered to be vulnerable to temporary flooding (or permanent inundation for the lowest lands). Temperature increases could worsen the water deficit.
	French Guiana	Temperatures have risen by +0.28 °C per decade over the period 1965-2009. An increase in rainfall during rainy season (which could increase risks of landslides) and decreased rainfall during the dry season (which could lead to an increase in the occurrence of wildfires). Risk of extinction of tropical forest species is considered one of the most significant issues for the region. Coastal flooding and inundation. Coastal erosion is identified as a key issue in Guyana, with several areas threatened by marine submersion (Cayenne Island, Kourou and Mana).
Indian Ocean	La Réunion	Winters are likely to become drier and extreme weather events more severe. Further reduction in rainfall could exacerbate the risk of forest fires (a multiplication of these fire forest is already noticeable). Sea level is expected to rise between 0.2 and 0.6m by 2100. Coastal flooding and landslides are among the main risks faced by La Réunion. A decrease in the frequency of cyclones, but an increase in their magnitude.
	Mayotte	Rainfall is likely to decrease in the winter. Between 1993 and 2011, a 3 to 5 mm per year increase in sea level has been observed. Flooding due to sea level rise. High levels of soil erosion
Atlantic Ocean	Canary Islands	The local temperatures have increased by nearly 0.1 °C per decade since 1944. Average precipitation levels follow a decreasing trend, while extreme heat and rainfall events have increased. The most relevant impact are altered cloud banking intensities and altitudes, which has repercussions on the local weather and distribution of the laurel rainforests, affecting the hydrogeological recharge of aquifers and local biodiversity. In the marine-coastal areas, higher waves, seal-level rise and bigger storm surges are likely to increase coastal erosion and damage shoreline ecosystems.
	Azores	The temperatures are expected to increase in the region by 1.9-2.4 °C until the end of the century, and the frequencies of 'summer days' (>25 °C) and 'tropical nights' (>20 °C) are likely to increase. Although the annual precipitation is expected to increase, a shift in rainfall patterns will lead to wetter summers and drier remaining seasons.
	Madeira	Similar to Azores, the climate scenarios for Madeira predict the same temperature increase, with a likely higher occurrence of extreme heat episodes. The yearly precipitation amount is expected to decrease in all seasons, with the exception of summers, which halves the annual water recharge capacity by the end of the century. Nevertheless, the occurrence of extreme rainfalls will increase considerably, accompanied by floods and landslides.

7.1.3 Socio-economic impacts and policy issues

As for risk assessment, data allowing an overview of economic and social impacts of climate change are diverse and heterogeneous.

[51] *'The economic impact of climate change and adaptation in the Outermost Regions », Final report, European Commission, June 2014'*

Spatial planning & infrastructures

First of all, it is important to underline the high concentration of population along coastal zone areas because of the inaccessibility of inlands (topology and dense rainforest). The population, economic activity and infrastructures are hence particularly exposed to sea-level rise and coastal flooding. These specific geographic characteristics raise questions of the possibility to adopt *strategic* withdrawal spatial planning approaches, as the inlands are unhospitable and quite often protected (natural reserve, UNESCO patrimony, etc.).

It is foreseen that infrastructure damage due to climate change related events (i.e. floods, landslides and sea level rise may be increasingly costly in the next decades). ORs also depend on water resources that are highly sensitive to sea level rise and rainfall patterns and which involve important investments (and maintenance) in water treatment, storage and distribution infrastructures. In general terms, these regions face great challenges in terms of infrastructure development and adaptation (natural risk resilience, thermic isolation, corrosion resistance of materials).

Agriculture & fishery

This sector represents important economic activities in these regions compared to EU continental economies (where the industrial sector is notably higher).

In the field of agriculture, torrential rains and cyclones have caused dramatic damage to regional production in the last ten years, in particular market gardening and sugar cane and banana plantations. In Martinique, 100 % of banana plantations are destroyed when the territory is struck by extreme climate hazards (cf. RDP p.127).

In Guiana, several agricultural areas are located in the beds of rivers or on the coastline, such as the Mana polder, which is the second rice production area in France after Camargue. These production are severely threatened by sea level rise and marine submersion (level beyond the sea is close to 0 meter in this region).

Agriculture production is also facing an increasing risk of competition for water between agricultural and domestic sector / tourism activities during droughts. Salinisation of aquifers is also observed that has the potential to impact water availability for agriculture.

Extreme weather conditions, water shortage and spreading of invasive species and diseases are likely to result in yield decrease, which will not be compensated by market prices (increasing competition with ACP countries and the withdrawal of trade protective measures – Economic Partnership Agreements).

Fishery will also be impacted by the disappearing of mangroves (fish nurseries), the rise of water temperature and acidity. Coral bleaching may result in future outbreaks of food poisoning and fish consumption interdictions.

Tourism

Extreme weather events and temperature rises, as well as a possible loss in biodiversity, will reduce the attractiveness of the ORs as holiday destinations. This will reduce the income of these regions considerably (although less in the French ORs than the Canary Islands and Madeira, which depend more on this sector). In addition, tourism will be affected by the increasing problem of water provision in some of the regions.

Moreover, health risks and in particular the risk of increased vector-borne diseases becomes an important threat for tourism attractiveness. During the last 10 years, several diseases have already caused severe decline of tourism frequentation (chikungunya, dengue fever and, very recently, zika).

Social and sanitary impact

These regions are still characterised by an important share of low social class. An important part of the population is either unemployed or low-skilled workers in traditional sectors – who are the most exposed to climate change. Housing insecurity and precarious living is especially worrying, considering the higher risk of natural hazards.

In some ORs, low education levels also contribute strongly as social causes of mortality. Through lack of sufficient information or financial means, patients consult the doctor when the disease is already at an advanced stage. The number of general practitioners, and particularly specialists, per inhabitant are below the national average, and access to hospitals and other health centres remains difficult for isolated parts of the territories.

In addition, global climate change is likely to increase the risk of the appearance of climate refugee migration in some regions already facing economic immigration (Mayotte & Guiana notably). This migration raises some social issues but also environmental ones (illegal fishing, gold mining, deforestation, etc.).

7.2 Illustrative Examples

7.2.1 EU programmes general contribution to adaptation objectives

Globally, ORs did concentrate substantial parts of their Union support towards the fight against climate change, even though they do not have the same regulatory obligations, notably regarding the thematic concentration on Thematic Objective 4 (TO4), which requires a minimum share of the ERDF budget to be allocated to TO4. ORs are not subject to such concentration to offset the additional costs that are linked to the special characteristics and

constraints of the ORs, such as long transport distances or the lack of human capital in the local market.(52)

ERDF/ ESF

CCI	Title	Climate action under TO5 (MEUR)	OR-specific climate adaptation action (MEUR)	Climate adaptation action (MEUR)	Climate mitigation and/or adaptation (MEUR)	Share (%) of total support dedicated to direct climate adaptation
2014FR05 M2OP001	Guadeloupe & St Martin	1.5	1.5	1.5	0.5	0.7
2014FR16 M0OP009	Guadeloupe	18.3	11.7	14.2	12.0	2.3
2014FR16 M0OP011	Martinique	-	-	-	2.8	-
2014FR16 M2OP011	Guyane	-	-	-	1.6	-
2014FR16 M2OP012	Mayotte	-	-	-	4.3	-
2014FR16 RFOP007	La Réunion	28.0	22.0	28.0	29.2	2.5

below summarises climate adaptation action in the French OR ERDF OPs. The two Portuguese OR ERDF OPs (Madeira, Azores) and the Spanish OR ERDF OP for Canary Islands are not included. All OPs indicate actions that address climate mitigation and/or adaptation. In contrast, direct climate adaptation action, as expressed through IF087 and IF100, is found in half of the OPs. All those OPs that address direct climate adaptation do so through use of the specific IF dedicated to climate adaptation in the ORs (IF100). In those three OPs, the primary focus lies on flood prevention, especially of strategic public buildings, such as schools. Another aspect addressed in Reunion is securing road networks from landslides and obtaining a better understanding of them.

[52] ERDF Regulation (EU) 1301/2013, Articles 4 and 12

Table 7-2: Summary of climate adaptation action in the OR ERDF/ESF OPs by climate action under TO5, climate adaptation specifically dedicated to ORs (MEUR), total climate adaptation action (IF087 & 100; MEUR), supportive climate adaptation (IF021, 65, 85).

CCI	Title	Climate action under TO5 (MEUR)	OR-specific climate adaptation action (MEUR)	Climate adaptation action (MEUR)	Climate mitigation and/or adaptation (MEUR)	Share (%) of total support dedicated to direct climate adaptation
2014FR05 M2OP001	Guadeloupe & St Martin	1.5	1.5	1.5	0.5	0.7
2014FR16 M0OP009	Guadeloupe	18.3	11.7	14.2	12.0	2.3
2014FR16 M0OP011	Martinique	-	-	-	2.8	-
2014FR16 M2OP011	Guyane	-	-	-	1.6	-
2014FR16 M2OP012	Mayotte	-	-	-	4.3	-
2014FR16 RFOP007	La Réunion	28.0	22.0	28.0	29.2	2.5

ETC

Table 7-3 below shows the same output as the table above, but for the French OR ETC co-operation programmes (CPs) in the ORs. Note that the CP for Madeira-Acores-Canary Islands (MAC) is not included. Here, three of the five CPs indicate climate adaptation under TO5. Furthermore, climate adaptation action is found in four CPs. However, none of the adaptation action makes use of IF100. From the table, it becomes clear that the share of climate adaptation in the ETC CPs is substantially higher than in the ERDF OPs.

The nonexistence of climate adaptation in the Mayotte OP is compensated through two ETC CPs Ocean with a total over EUR 18.2 million allocated to climate adaptation.[53] French Guiana is the only region where neither the OP nor CP has climate adaptation.[54] It should be noted that French Guiana and Mayotte still lack basic infrastructures and therefore, other TOs have been prioritised instead. For the two French cross-border programmes (St. Martin and Mayotte), the emphasis on climate adaptation action lies on flood prevention and management in St. Martin, and the adaptation of healthcare and emergency services to climate change in Mayotte. In both cases, a strong emphasis lies on strengthening institutional capacity. For the two remaining transnational programmes with direct climate adaptation action (Caribbean and Indian Ocean), the strengthening of institutional capacity to respond to threats and

[53] Mayotte-Comores-Madagascar ETC CP (CCI: 2014TC16RFCB051) & Indian Ocean ETC CP (CCI: 2014TC16RFTN009)

[54] Guyane ERDF/ESF OP (CCI: 2014FR16M2OP011) & Amazonia ETC CP (CCI: 2014TC16RFTN010)

implement management systems for natural and environmental disasters lies at the core of the supported actions.

Table 7-3: Summary of climate adaptation action in the OR ETC CPs by climate action under TO5, climate adaptation action (IF087; MEUR), supportive climate adaptation (IF021, 65, 85, 86), and corresponding direct climate adaptation share (%)

CCI	Title	Climate action under TO5 (MEUR)	Climate adaptation action (MEUR)	Climate mitigation and/or adaptation (MEUR)	Share (%) of total support dedicated to direct climate adaptation
2014TC16 RFCB043	St Martin/Saint Maarten	3.0	3.0	0.6	30.0
2014TC16 RFCB051	Mayotte Comores Madagascar	-	3.3	-	27.0
2014TC16 RFTN008	Caribbean	14.1	14.1	2.9	21.9
2014TC16 RFTN009	Indian Ocean	5.1	4.1	3.3	6.5
2014TC16 RFTN010	Amazonia	-	-	0.9	-

EAFRD

The EAFRD's main contribution to climate change adaptation comes from M05, which supports the development of risk prevention, rehabilitation of agricultural lands and reconstitution of production that is potentially damaged by natural disasters (cf. Table 7-4).

It must be underlined that the impact of climate-related risks in agricultural areas will primarily be addressed in the National Rural Development Programme (national RDP), which specifically addresses risk management. It supports the implementation of two tools (harvest insurance and mutual funds) that allow farmers to benefit from partial compensation of their economic losses in case of unfavourable climatic phenomena. M10 (Agro-environment-climate) will also contribute to increased climate resilience of rural territories through an extension of grass areas and plantation of trees, which limit soil erosion.

Table 7-4: Summary of climate adaptation action in the OR EAFRD RDPs by total ESIF support (MEUR), direct climate adaptation action (UP3b, 5a, 6b; MEUR), supportive adaptation (UP4a, 4b, 4c; MEUR), and corresponding direct climate adaptation share (%)

CCI	Title	Total ESIF support (MEUR)	Climate adaptation action (MEUR)	Climate mitigation and/or adaptation (MEUR)	Share (%) of total support dedicated to direct climate adaptation
2014FR06RDRP001	Guadeloupe	174.0	42.5	22.4	24.4
2014FR06RDRP002	Martinique	130.2	12.1	19.0	9.3
2014FR06RDRP003	Guyane	112.0	18.6	6.4	16.6

2014FR06RDRP004	La Reunion	385.5	86.6	93.5	22.5
2014FR06RDRP006	Mayotte	60.0	5.0	8.7	8.3

7.2.2 Addressing the Outermost Regions' specific adaptation needs

An overview of selected thematic objectives, actions and indicators addressing climate change adaptation in OPs is presented in the table below:

Table 7-5: Selected TOs, actions and indicators addressing climate change adaptation in OR ERDF/ESF OPs

Fund	Name	Selection of TO5	Mainstreaming of adaptation in other TOs	Main actions	Main relevant indicators
ERDF/ESF	Guadeloupe	Yes	Yes (TO1, TO6)	Prevention and management of floods in strategic public buildings and schools, Trainings for partners of the building sector; Research and innovation projects and equipment on risk management; Investments in the wastewater treatment system	Population benefiting from protection measures from floods
ERDF/ESF	Guadeloupe & St Martin	No	Yes (TO6)	Investments in the wastewater treatment system	Additional population served by improved wastewater treatment
ERDF/ESF	Guyane	No	Yes (TO6)	Quality control of bathing water, development of drinking water distribution networks	Additional population served by improved wastewater treatment
ERDF	La Réunion	Yes	Yes (TO6, TO7)	Observation and experimentation for a better understanding of landslides and coastal erosion; securing road networks exposed to erosion, landslides and flooding; Investments in the wastewater treatment system; Construction of a new coastal route to suppress traffic restriction days due to risks of landslides or marine submersion	Population benefiting from flood protection measures; Number of buildings protected through embankments; Aprons secured or suppressed
ERDF/ESF	Martinique	Yes	Yes (TO8)	Works of protection against the tsunamic risk; Awareness-raising on all risks; Studies and investments for rainwater management; Trainings for NEETs related to the prevention and management of disasters	Population benefiting from risks protection measures
ERDF/ESF	Mayotte	No	Yes (TO6)	Investments in the wastewater treatment system	Additional population served by improved wastewater treatment

ERDF/ESF regional OP strategies

ERDF regional OP strategies focus on natural risk management, partially caused by climate change (IP5Ib; IP5a has not been selected in any programme). Three regional programmes directly tackle climate-related risks: Guadeloupe, La Réunion and Martinique. They notably aim at prevention and management of floods or securing infrastructures exposed to climate-related risks, such as landslides. For instance, the Guadeloupe ERDF-ESF OP seeks to improve protection of strategic public buildings and schools from floods. This addresses one of the socio-economic impacts of climate change mentioned above (i.e. exposure of infrastructures to climate-related risks).

In addition, for TO5 mobilisation, ERDF-ESF regional programmes indirectly address climate change adaptation notably through the angle of water quality (improvement of water management and/or wastewater treatment under TO6). The improvement of water quality plays an important role in reducing exposure to health risks and making ORs safer for local populations and tourists. Moreover, it increases climate resilience of biodiversity, which is enhanced as a source of economic development in the tourism sector. Therefore, it indirectly contributes to tackling consequences of climate change related to both health and tourism.

Mainstreaming of climate change adaptation is also observable in these programmes through TO1 on research & development activities: forest and marine resources monitoring in Guiana, risk management in Guadeloupe (and to some certain extent in Martinique) and technologies aiming at reducing the impact of corrosion and degradation of materials caused by humidity, heat, sun and sea air. Climate change adaptation is also mainstreamed in Martinique in TO8 through training actions related to prevention and management of disasters.

It is important to mention that most of those activities are to be regarded as passive strategies against climate change and comprise e.g. funding for preservation of natural assets, water distribution and treatment, disaster management & sanitary emergencies, compensation schemes, etc.

Text Box 7-1 Climate change adaptation in the ERDF OP of La Réunion

Climate change adaptation in the La Réunion ERDF OP (CCI: 2014FR16RFOP007)

19.6 % of the ERDF Union support is dedicated to climate change adaptation measures in the La Réunion ERDF OP. This OP addresses adaptation issues through various angles, both directly (through TO5) and indirectly (through TO6 and – although questionable – TO7).

This region is particularly exposed to climate-related risks including coastal erosion, landslides and floods. This constant threat has consequences mainly on population safety (body damages) and transportation (submersion, access break). All municipalities are exposed to at least 5 major natural risks. Therefore, the Managing Authority has decided to put the emphasis on knowledge of natural risks and impacts of

climate change. The OP supports observation and experimentation for a better understanding of landslides and coastal erosion, as well as securing road networks exposed to erosion, landslides and flooding. Moreover, investments in the wastewater treatment system are planned in the OP (in line with the Partnership Agreement), which contributes to a better water resource management and a better water quality. This plays a role in climate resilience of ecosystems in water environments. Actions financed under TO7 are also linked to climate change adaptation (according to selected intervention codes); they aim at the construction of a new coastal route to suppress traffic restriction days due to risks of landslides or marine submersion.

ETC

ETC programmes provide interesting opportunities in terms of longer term strategies, such as the elaboration of planning tools to integrate climate change impacts in territorial policies (Indian Ocean Area) or shared planning strategies, purchase of lands, installations and economic development of the Belle Plaine river basin (Saint-Martin Area).

ETC programmes are designed at 'regional' level, which means their geographical scope allows them to cover territories struck by the same climate-related risks (e.g. hurricanes and flooding in the Caribbean). Therefore they are particularly relevant for dealing with climate-related issues that are by definition transnational. It is visible in ETC programmes involving French ORs as they co-finance projects, such as the creation of a regional network of climate observers (Caribbean Area), the creation of a regional centre dedicated to risk management (in La Reunion – Indian Ocean Area), a training centre to fight forest fires (Mayotte-Comores-Madagascar) or mobility and exchange of medical staff (Mayotte-Comores-Madagascar).

Text Box 7-2 Caribbean Area ETC programme

Focus on Caribbean Area programme (CCI: 2014TC16RFTN008)

With more than EUR 14 million of ERDF funds, this programme is ambitious. Actions to be supported in this ETC programme demonstrate a rather comprehensive approach of co-operation on climate-related risks management. They include

- research projects, observation and monitoring,
- joint training (for decision makers and professionals notably in the building sector) and exchanges on risk management tools
- Joint information actions towards the local populations,
- joint emergency plans
- Reinforcement of insurance mechanisms (Caribbean Catastrophe Risk Insurance Facility)

Health risks caused by vector-borne tropical diseases, which are likely to extend because of air and inland water warming, (*Leptospira, chikungunya, dengue fever and zika)* are also dealt with through this programme. In addition to medical research, monitoring and crisis management plans, the programme will also finance the analysis of these diseases' economic impact and the added-value of prevention systems.

EAFRD

As it regards EAFRD, most of actions also aim at addressing natural risks: compensation actions, rehabilitation of damaged lands, warning and monitoring networks. Some other interesting actions can be underlined aiming at coping with climate change on a longer run: introduction of climate change-resilient varieties of sugarcane, sustainable management of banana plantations to limit soil erosion (Guadeloupe), grassing of lands to limit soil erosion (Guiana), strengthening of environmental functions of forest (Martinique), plantation of trees and hedges to improve resilience of crop toward tempest and heatwaves (Mayotte), development of check dams, co-operation in agronomics with climate change adaptation perspectives (La Reunion). These actions directly address socio-economic impacts of climate change related to the primary sector (agriculture and fisheries), in particular the destruction of sugar cane and banana plantations and more broadly the need for protection of activities (and employment) linked to this sector.

7.2.3 Key enabling factors and barriers

In order to go beyond short-term natural risk management issues, adaptation mainstreaming approaches is the only viable option, and requires a long-term perspective, especially by mobilizing extra funds not initially targeted towards adaptation. This approach is to a certain extend implemented in ORs though human capital-oriented actions (planning tools and joint trainings for decision-makers, professional training in new or evolving sectors, social innovation and behaviour change), as well as more physical investments (water infrastructures, environmental functions of natural areas, research activities on resilient plants and materials, etc.).

Some actions can successfully combine adaptation and mitigation (where more funds have been allocated and can be used), for example in the energy or building sector (energy efficiency & resilience). An interesting example is the development of wind turbines with folding mast[55] (40 minutes to the ground), that can better face extreme weather events.

It is important to note that these integrated approaches in a tropical-specific context represent an opportunity in terms of economic development (engineering, specific building materials, etc.). ORs are also in a position to serve as platforms for technological and scientific co-operation through monitoring and observation of natural hazards and biodiversity in their respective areas. The ORs already have and remain in a position to further develop research infrastructures that may be used to enhance health protection in their regional areas as a whole. This is why ETC plays a substantial role in supporting the fight against climate change at the right scope.

The fight against climate change is, however, hindered by important short-term issues in these regions ranging from urgent social concern to severe budget

[55] http://www.energiesdelamer.eu/publications/1686-82une-eolienne-resistante-aux-cyclones-recompensee

constrains (even bankruptcy for some local authorities). EU funds programming issues, and the threat of financial correction are also potential barriers:

- Few adaptation-related indicators have been included in the performance framework of ERDF regional programmes. It is noteworthy that none of the output indicators related to the percentage of population covered by flood or other risks protection measures have been included in the performance frameworks. These frameworks rather include indicators linked to other thematic objectives when TO5 is combined with other TOs in one priority axis (PA). La Réunion ERDF OP is an exception, as the indicator on buildings protected by embankments has been included in the performance framework (PF), although the PA also deals with industrial enterprises (TO3) and transportation (TO7). In Guadeloupe, Guadeloupe-Saint Martin and Mayotte, indicators on wastewater treatment have been selected in the PF; but this issue is not just linked to climate change. No indicator related to adaptation has been selected in the PF of Martinique and Guyane OPs. When indicators are not included in the PF, this means actions linked to these indicators are likely to be less prioritised by Managing Authorities who are likely to focus instead on actions targeted by the PF.

- Beyond the issue of inclusion in the performance framework, the automatic decommitment rule applies to all types of actions financed by the programmes including adaptation related actions. This rule implies that the share of EU support that has not been used for pre-financing payment or intermediary payment within 2 years of the end of a programming year is sent back to the European Commission and can no longer fund any project eligible under the programme.

In this context, Managing Authorities can be led to focus on the operations with the most financial weight and / or contributing to the output indicators selected in the performance framework. The need for fast programming, and the lack of project engineering expertise often lead to accepting all projects even when these do not address climate change adaptation in the most effective way.

7.3 Conclusions and recommendations

All ORs face common challenges, whether located in the Caribbean, in the Indian Ocean or in Amazonia, accentuated by their geographical specificities: more powerful cyclones, high temperature episodes, coastal erosion, coral bleaching, multiplication of erosion and landslides, spreading of invasive species and vector-borne diseases, etc.

The impact on human activities is likely to be significant considering ORs' fragile socio-economic contexts (importance of traditional sectors, such as agriculture, tourism, immigration, lack of infrastructures & precarious housing, etc.).

Substantial allocations for TO5 have been made in the ERDF and most of all in ETC OP. In addition, mainstreaming on other TOs (TO1 and TO6 especially) is, to a certain extent, observable. EAFRD also contributes significantly to adaptation objectives.

A wide coverage of issues in the programmes can be observed: risk monitoring, protection of infrastructures, sustainability of agricultural activities, protection from health risks, and tourism (whether through regional OPs/RPDs or through ETC programmes). However, the OPs mainly support passive strategies (risk management) rather than proactive and/or long term strategies (land-planning, economic activities' transformation, etc.). Yet, some opportunities related to climate change adaptation exist for these regions, especially by developing specific and economically valuable expertise for tropical areas (engineering, building materials, medicine, etc.).

In this respect, the 'regional' scope of ETC programmes is particularly relevant for dealing with climate adaptation issues. These programmes are complementary to ERDF regional programmes. Managing Authorities for these programmes have seized the opportunity to use them as financing tools and policy frameworks for adaptation actions.

Some barriers can, however, hinder the contribution of these programmes to climate change adaptation processes. These barriers notably result from social urgency (and reduced public spending) in some of these regions, weak enforcement of climate commitments (indicators/targets for TO5, strict selection criteria, etc.) and the lack of project engineering expertise (use of calls for proposals, selection processes, etc.).