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Master Thesis

Spatial Planning and Climate Change Adaptation In Mainland Portugal

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Dedication

I dedicate this thesis to all the personnel at CEDRU in Lisbon,
who have offered me the best imaginable opportunity to conclude my studies.
In particular, I would like to express my deepest gratitude to Sérgio Barroso,
without whose support this work would have never been possible.

Spatial Planning and Climate Change Adaptation in Mainland Portugal

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Introduction

The present work is the product of a traineeship carried out by the author in 2019 at CEDRU (*Centro de Estudos e Desenvolvimento Regional e Urbano)* in Lisbon, during the third phase (identification of adaptation options) of development of the Metropolitan Plan for Climate Change Adaptation of the Lisbon Metropolitan Area.

The text analyses the relations between spatial planning and climate change adaptation in Mainland Portugal.

Chapter one provides an analysis of Portuguese spatial planning as an institutional technology, based on the analytical framework proposed in the article "Planning Systems as Institutional Technologies: a Proposed Conceptualization and the Implications for Comparison" (Umberto Janin Rivolin, 2012). Accordingly, Portuguese spatial planning is described in terms of structure, tools, discourse. Practices of spatial planning (in the context of climate change adaptation) are exposed in chapters 3 and 4. In Portugal, spatial planning has progressed very slowly during the XX century, under the influences of urban regulative planning, regional economic planning, and environmental planning. The entrance of Portugal in the European Economic Community in 1986 has greatly contributed to a reconsidering of spatial planning in the national context, culminating in the 1998 reform that established planning as an autonomous public policy. Since then, the territorial management system has been deeply re-structured on the principles of multi-level and multi-sectorial governance.

Since their introduction in Portugal, climate change adaptation policies have strongly promoted spatial planning as a means for inter-sectorial coordination and integration. In no more than a decade, spatial plans for adaptation have spread throughout the national territory, first on municipal basis, then at the NUTS III scale. Since 2017, a second generation of municipal plans for adaptation has raised considerably the national average quality of spatial tools, namely in terms of scientific and cartographic bases, monitorisation and evaluation processes, and multi-sectorial compatibility. Climate change adaptation policies have been introduced in Portugal since 2010, for the increasing urging from the international community (chiefly the European Union) for climate action at all levels. Specifically, the European Strategy on Climate Change Adaption (2013) has provided a framework for the action of all Member States and cities, while the following Multiannual Financial Framework of the EU (2014-2020) has furnished large funding resources for adaptation in Europe. Since the publication of the Green Paper on adaptation in 2007, the European Commission has stressed the key role of spatial planning for climate change adaptation, assigning distinct tasks to local, regional, and national authorities. Chapter two contains a description of European policies for adaptation, preceded by a conceptual definition of climate change adaptation.

Chapter three reports the main facts concerning the development of planning for climate change adaptation in Mainland Portugal. It also includes an assessment of all the adaptation tools currently in force, of municipal and intermunicipal scale. Municipal plans are the most significant tools until now, resulting more numerous, more structured, and more advanced. Their assessment has been conducted through a contextual adaptation of the Adaptation Policy Credibility (APC) framework presented in the article "Are local climate adaptation policies credible? A conceptual and operational assessment framework" (Marta Olazabal et al.,2019). The framework applied allows for a comprehensive evaluation of the local adaptation plans adopted in Mainland Portugal, in their general characteristics and main types. Metropolitan and intermunicipal plans for adaptation were introduced more recently in Portugal, only half of them are already in force, and their heterogeneity allows for only a qualitative assessment. In any case, their introduction represents a potential break-through for both spatial planning and adaptation policies in Portugal.

In particular, the Metropolitan Plan for Climate Change Adaptation in the Lisbon Metropolitan Area (PMAAC-AML, 2020) represents the state of the art of climate change adaptation in Portugal, introducing a new governance model integrating the sectorial, territorial and adaptive dimensions. Chapter four reports the main features of the PMAAC-AML, focusing on methodology, governance model and integration of adaptation in spatial planning.

Finally, Chapter 5 discusses the relations between climate change adaptation and spatial planning policies developed until now in Mainland Portugal.

1. The Portuguese system of spatial planning and governance

This chapter will provide a framework of the current system of spatial planning in Portugal. The analysis will follow the methodology presented by Janin in the article "Planning Systems as Institutional Technologies: a Proposed Conceptualization and the Implications for Comparison" (Umberto Janin Rivolin (2012): Planning Systems as Institutional Technologies: a Proposed Conceptualization and the Implications for Comparison, *Planning Practice and Research*, 27:1, 63-85).
Therefore, the Portuguese system will be examined in its:

• structure, that is the overall set of constitutional and legal provisions allowing and ruling the operation of the planning system. These confer legitimacy to certain combinations of planning and control activities, attributed to the planning system in order to assign individual rights for land use;

• tools, including all established instruments for territorial planning and governance. These result from the formulation of policies based on the structure of the system, and frame the development of practices, which generate multiple solutions for the implementation of these policies;

• discourse, concerning the overall assessment of territorial governance outcomes, carried out by the epistemic community, aimed at the selection of virtuous practices and at the achievement of consensus for the reformation of the system's structure;

• practices, composed of the variety of solutions generated from the social experience of planning and control activities in the institutional context, whose eventual success can give way to selective processes of policy transfer and to an overall improvement of the system.

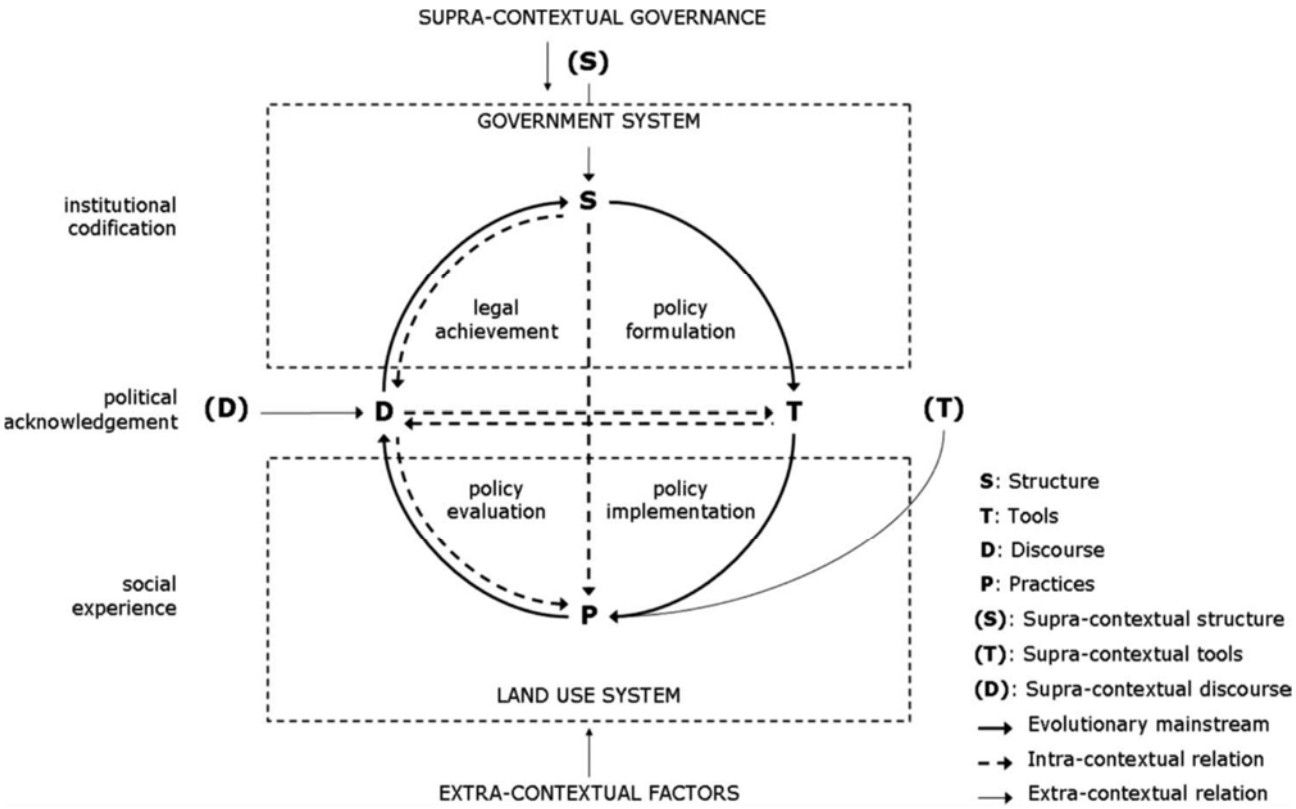


Fig. 1 Synchronic model of the planning system as an institutional technology. (source: Janin Rivolin 2012)

1.1 Structure

1.1.1 Mainland Portugal

The territory of the Republic of Portugal includes an area on the Iberian Peninsula (Continental or Mainland Portugal) and two archipelagos in the Atlantic Ocean, Madeira and the Azores, both autonomous regions with own regional governments. Given the climatic and administrative differences that separate the insular regions from Mainland Portugal, these have been excluded from this work.

Continental Portugal covers an area of 89,060 km2, with a population of 9,796,934 and an average population density of 114.5/km. Its urban network shows great unbalances between the littoral belt and the more interior areas, as a product of an historical trend that was emphasized in modern times: first with the industrialization of the national economy (strongly dependent on maritime transport), then with the raise of tourism as one of the richest economic sectors. These dynamics originated issues of overpopulation and unregulated urbanization in the coast, while most of the interior is chronically affected by economic depression and depopulation. Despite the recurring intentions of the central government to promote a more equilibrated urban development, its investments on infrastructure and economic growth have mostly favoured this asymmetry in the name of international competitiveness.

The western coastal fascia between Setúbal and the river Minho constitutes the urbanized backbone of the country, concentrating not only most of the population but also 80% of industrial activities and 58% of the national GDP. This is an area structured on a polycentric urban model, with strong polarities on the two metropolitan areas of Lisbon and Porto, and in the current context of the continental urban network has gained new status as the Atlantic Metropolitan Region. On the southern coast, despite its initial peripherality, the region of Algarve experienced in the last decades a very rapid growth based on the profits of tourism, and it is recognized today as the third metropolitan region in the country.

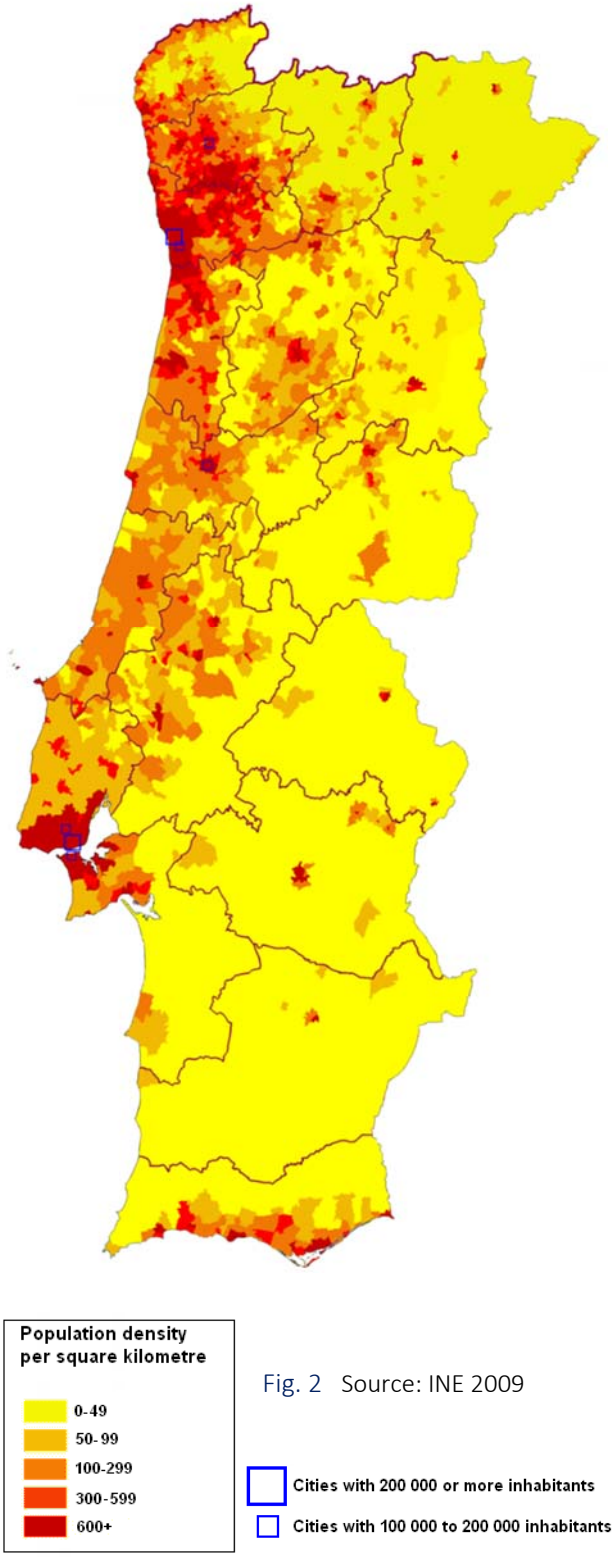


Fig. 2 Source: INE 2009

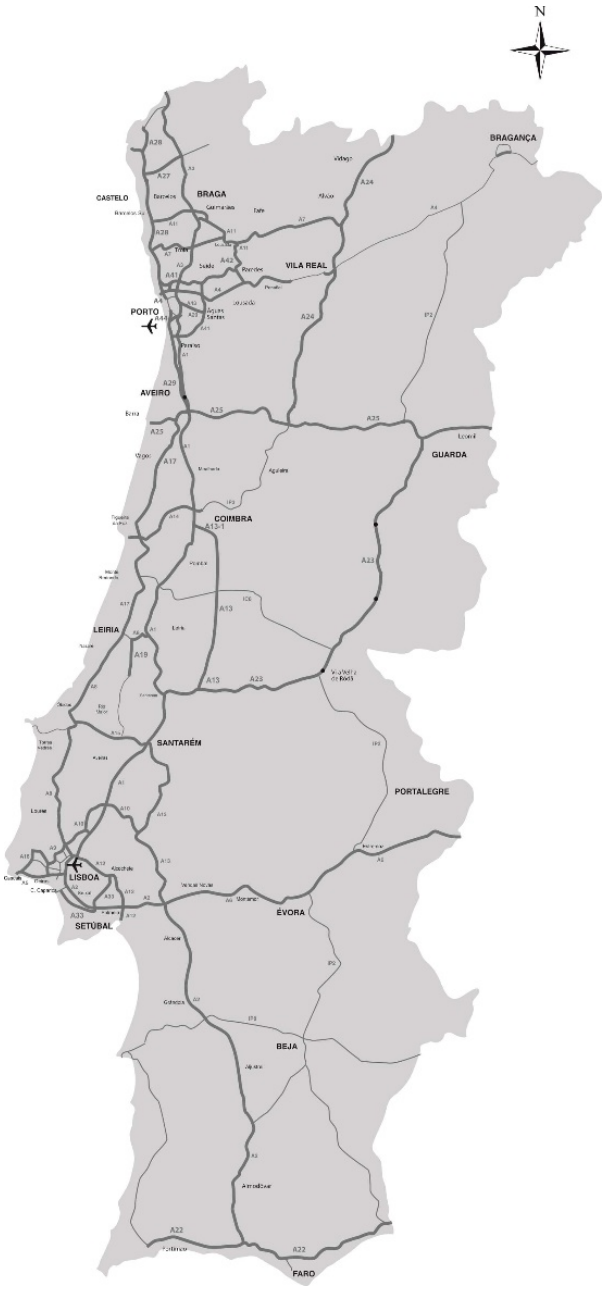


Fig. 3 Main road network

Source: Infraestruturas de Portugal

Administratively, Portugal is officially an unitary and decentralized state, organized under the principles of subsidiarity, local government autonomy, and democratic decentralization of the public service. Nonetheless, operationally, Portugal stays bound to a highly centralized system. The administrative divisions are organized into three tiers of government, as specifically identified by the Constitution: civil parishes (*freguesias*), municipalities (*municípios*, 278 in the Continent) and administrative regions (*regiões administrativas*). Though the latter have never been officially implemented, in the administrative structure their place has been gradually taken by the plan-regions (five areas corresponding to the NUTS II boundaries). In the field of spatial planning, the regional authority is assigned to the Commissions for Regional Development and Coordination (CCDR), even if these organs are not legitimated through public elections but through temporary appointment of officials by the Government. The competence for spatial planning is thus shared between the national Government (and administration) and the local authorities: the municipalities and the CCDRs. Recently, Intermunicipal Communities based on the NUTS III boundaries have been introduced in planning practices. More details on the intermediate level of governance are contained in chapter 1.3.2.

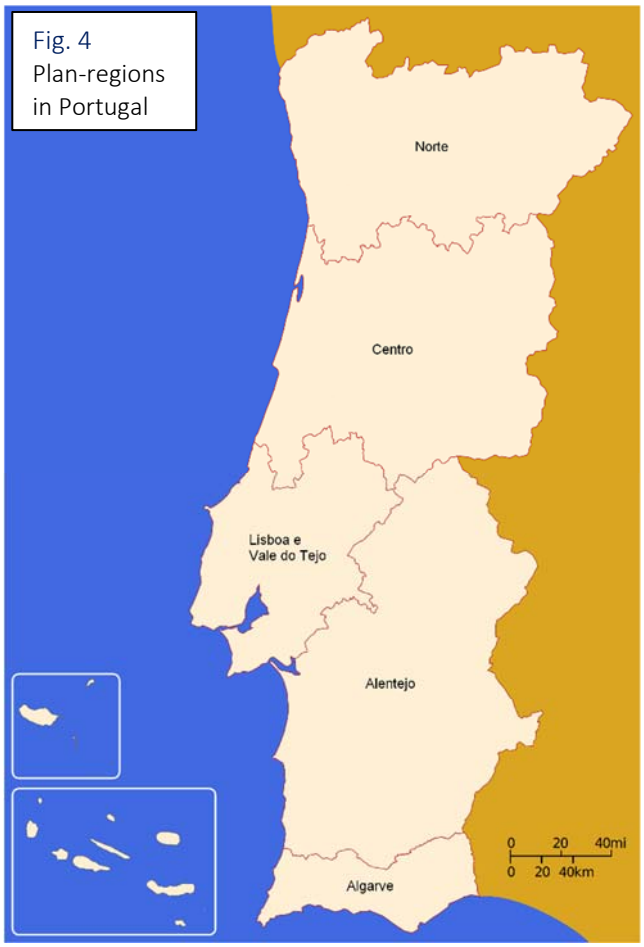


Fig. 4
Plan-regions
in Portugal

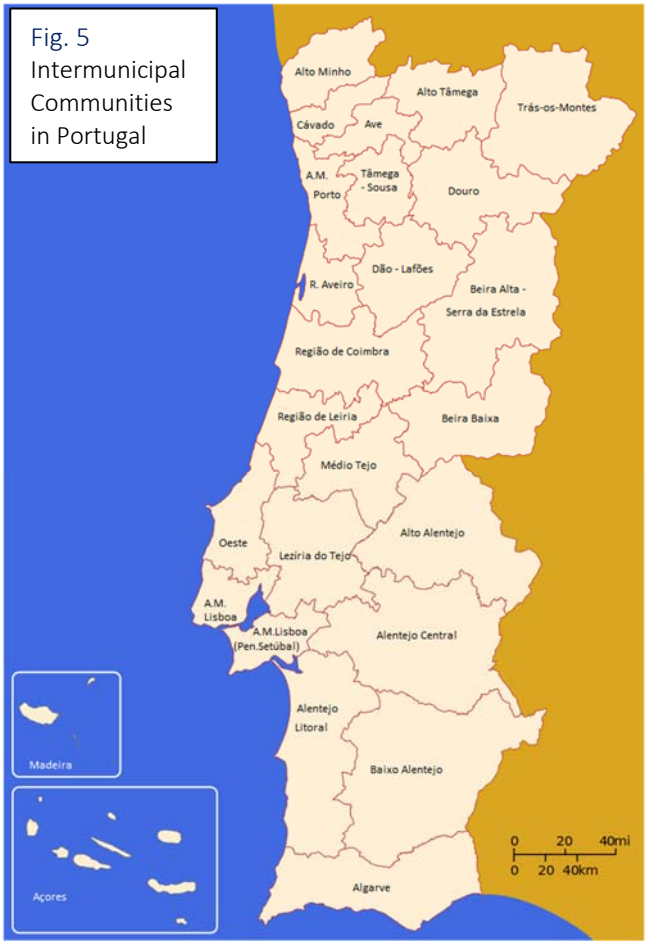


Fig. 5
Intermunicipal
Communities
in Portugal

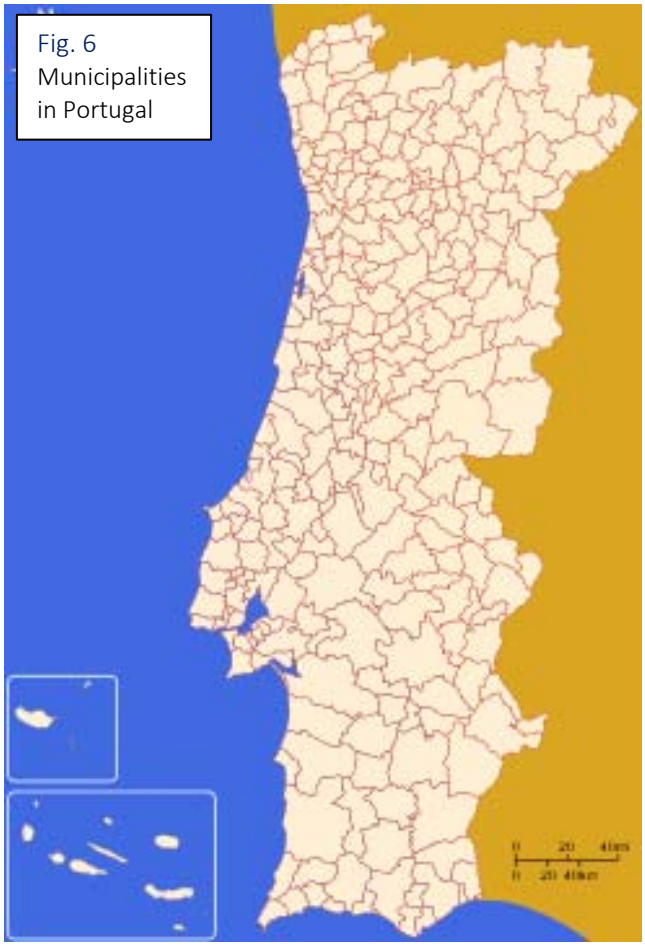


Fig. 6
Municipalities
in Portugal

1.1.2 Early introduction of spatial planning in Portugal

Contextual factors of the development of spatial planning in Portugal

Consensually, there is no one history of planning per se in Portugal, but what we can see in the Portuguese contemporary planning system, practice and culture is the fusion of three main influences: urban planning or urbanism; regional planning; and environmental planning.

As far as urban planning is concerned, its significance in the Portuguese territorial administrative system grew since the 1940s and throughout the 1950s and 1960s, as the country experienced a series of unanticipated migratory flows. These were due in part to the rural exodus towards the main urban centres of people drawn by the expectation of an increase in the quality of life and better employment opportunities; but also to the massive inflow of former inhabitants of the Portuguese colonies fleeing from the expected negative consequences of the collapse of the colonial empire. For the greater part of four decades there was a grave shortage of urban land for development and an overall difficulty in accessing suitable housing; and the unmet demand in terms of dedicated allotments for housing developments and public facilities, alongside real estate speculation, illegal allotments and clandestine construction, became a permanent contextual feature of the evolution of planning throughout this period. Urban planning evolved in a reactive fashion: instead of planning ahead, the core issue to be addressed was to quickly set in place enough instruments to allow for the regulation of land use, occupancy and development. This reactive stance is embodied in the early urbanism legislation from the 1940s and 1950s, the Lisbon Regional Director Plan from the 1960s, and the first Land Act (*Lei do Solo*) of 1970.

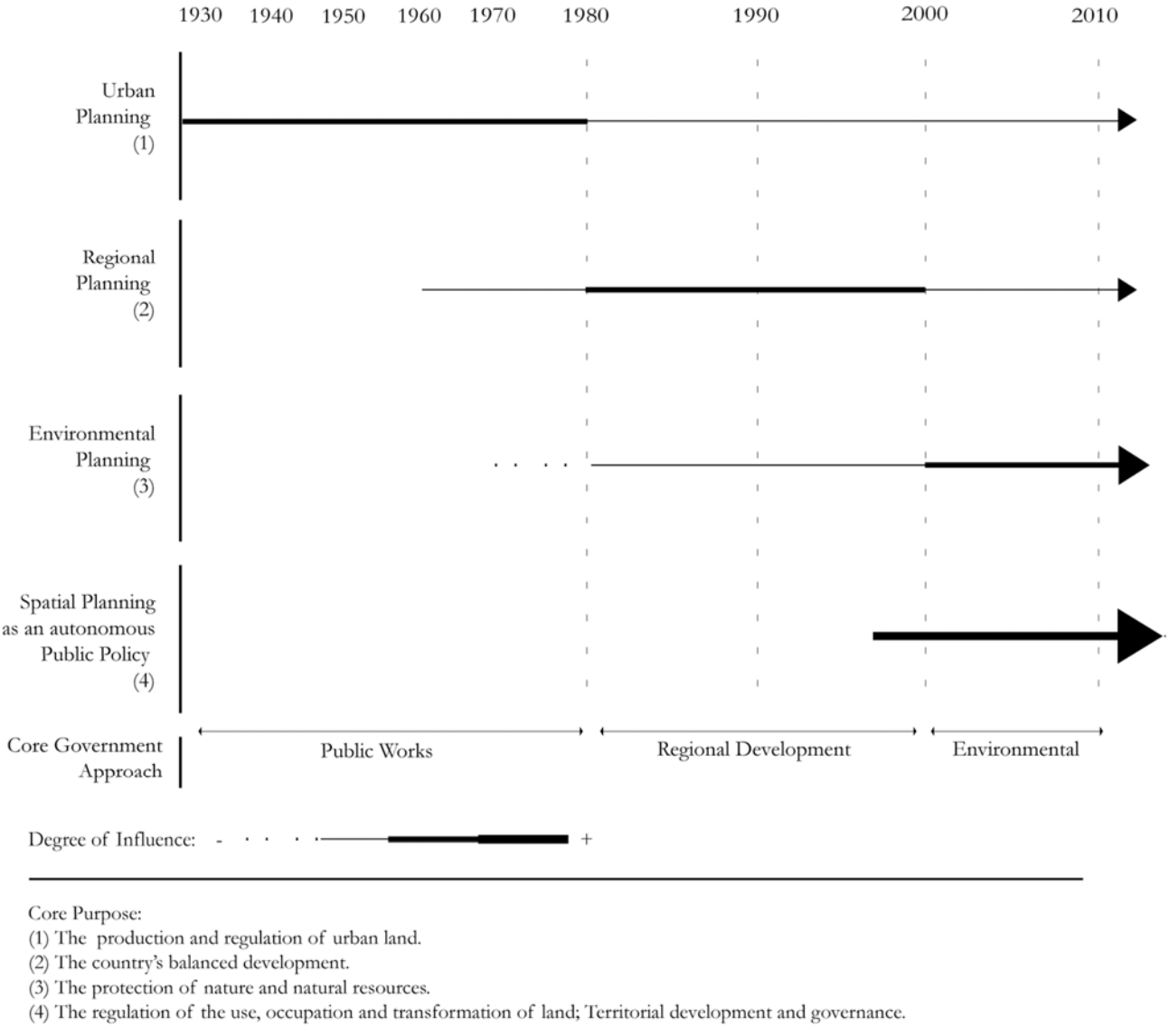


Fig. 7 The Development of the Portuguese Planning Environment. Source: Mourato 2011

The cumbersome approval procedures and political context meant that very few plans were approved until the 1970s. However, informally approved plans, when available, were used to guide urban expansion. At the institutional level, the political recognition of the necessity to create a coherent urban management approach to the country's main cities can be traced as far back as 1944 with the creation of the Directorate-General of Urbanisation Services (DGSU, *Direção Geral para os Serviços de Urbanização*). In sum, out of the necessity to contain the negative effects of unexpected demographic migrations came the opportunity for urban planning to strengthen its role in public policy.

Alongside the significant demographic migratory movements there was also a great unevenness in terms of the location of economic activities, and Regional planning did also start developing in Portugal during the long rulership of the Estado Novo (1933-1974), in the framework of the 5-years economic development plans. Since 1953, for the central Government these were instruments to organize the national development, initially with no concrete spatial dimension, through the definition of strategic nation-wide objectives with the aim to modernise and stimulate the country's scant, underdeveloped economy. Though they found reasonable success in the more accessible areas, these initiatives proved a complete failure in the more remote regions, resulting in the exacerbation of the disparities between more and less developed areas. From the acknowledgement of this process, the Government's approach slowly moved towards a more conscious and determined attention to regional planning, inspired by the centralized French model of *amenagement du territoire*. This shift became clear in 1966 with the creation of the Division for Regional Planning, whose work had a strong influence on the following economic development plans, enduring even after the fall of the regime. The III Economic Development Plan (1968-1973) issued the first clear sign of acknowledgment by the government that the ongoing industrial modernisation had paved the way to an increase in regional disparities. This plan hoped to rebalance the network of mid-sized towns and reshape the location of industrial activities, mainly through the creation of regional growth poles as idealised in the theory of François Perroux. In the context of this plan was also theoretically introduced the idea of a general plan that would cover the entirety of the country's territory. Interestingly, the IV Economic Development Plan (1974-1979) highlighted territorial planning as one of the main objectives, and it was to be achieved alongside the rectification of regional disparities. Nevertheless, the 1974 Revolution that ended a 48-year long dictatorship had the unintended consequence of halting any and all plans that were about to be put into practice. In any case it is clear how, just like urban planning, regional planning developed as a form of correctional reaction to the negative outcomes of the urban-industrial development dynamics in Portugal. And just like as in the context of urban planning, one public institution stood out as a leading influence: the Technical Secretariat of the Presidency of the Council (1962-1974).

Environmental planning only acquired a relevant role in development since the 1970s. Nevertheless, it grew very rapidly to become one of the decisive factors in spatial planning, for the support it enjoys from the international planning community. Its political autonomy was sanctioned in 1974 with the founding of the Ministry for Social Equipment and the Environment (*Ministério do Equipamento Social e Ambiente*, MESA), which integrated the National Commission for the Environment (*Comissão Nacional do Ambiente*, CNA) created in 1971.
The entrusting of environmental policies to the European Union since the 1980s has given way to a vigorous empowerment of environmental planning in the domestic planning community, culminating in the absorption of spatial planning competences by the Ministry of Environment since the 2000s.

1974-1985: the institution of local authorities

Since historical times the role of spatial planning as a public policy in Portugal has followed the subsequential political trends oscillating between the authoritarian and centralizing attempts of the central government and the struggle for empowerment of the local authorities.

During the rulership of the Estado Novo the central government reserved for itself the control over all spatial developments, excluding any initiative from the local authorities. Only the major urban centres were encouraged to prepare blueprint plans for the organization of the booming urbanization and the providing of housing, making way for the affirmation of the urban planner as a professional figure in Portugal. In the meantime, the rural space became object of study and projects of agrarian and forestry professionals that worked in the framework of the economic development plans.

With the Carnation Revolution of 25 April 1974, the fall of the authoritarian regime aroused high expectations for radical transformations concerning the exercise of power, the role of local communities and the participation of citizens in decision making. At the time, compared to the others Western European countries Portugal resulted gravely underdeveloped in basic infrastructures, welfare, housing, and overall quality of life. The first Constitution of the Portuguese Republic, promulgated in early 1976, envisioned a nation based on local powers democratically elected through direct and universal suffrage. Though ignoring any clear reference to planning as a public policy, the Constitution contained references to the right to housing, to the narrowing of the differences between the city and the countryside, to the harmonious development of all of the national territory, to the protection and promotion of the natural, environmental and cultural patrimony.
It is with these premises that in the post-revolution period the local authorities became the driving force of the main transformations in the national territory, and spatial planning was marked by a growing emphasis on the municipal scale and on the strengthening of regulations . The decentralised ideal of the Constitution, however, had to wait several years for its translation in the ruling legislative framework, and more than two decades for its practical implementation. Namely, the Directorate General for Urban Planning (*Direção Geral do Planeamento Urbano*, DGPU, a ministerial division) showed great resistance to the decentralisation of its competencies, and besides the municipalities still did not have recourse to sufficiently qualified human resources for the tasks they were assigned to fulfil.
Thus the process of structural decentralisation advanced gradually with targeted reforms in favour of the financial, patrimonial, and legislative autonomy of local authorities. Against the backdrop of illegal urban development and edification, the municipalities were accorded to take legal possession of any illegal allotment or housing project. The Local Authorities Act (*Lei das Autarquias* Locais, 1977), which defined the remit of the power of local authorities, namely in terms of territorial planning, created the Municipal Director Plan (*Plano Diretor Municipal,* PDM). The latter embodied several conceptual innovations: it covered the whole of the municipality (rather than only the urban areas); it required an explicit socio-economic strategy to which land use proposals should relate; and it established rights and mechanisms for public participation. In 1982, it became mandatory for all the 308 municipalities in Portugal as the central government aimed to intensify planning activity at the local level in order to ensure that by the end of the decade Municipal Director Plans (PDMs) would cover the whole country, a demand which to some extent emanated from Brussels. In 1984 a renewed Local Authorities Act assigned to the municipalities the responsibility to prepare and approve the PDM, although central government retained the right to ratify the plan. Nevertheless, the lack of technical support to the local authorities led to just four out of the 308 municipalities having their PDM by the early 1990s.

While the local authorities advanced in their struggle for emancipation from the government, regional planning did not receive much attention during the first years of the Republic. The Constitution envisaged the establishment of a regional level of administration, but this was fully implemented only in the insular territories, while in Continental Portugal the attempts to establish administrative regions never succeeded. Nevertheless, five Commissions for Regional Coordination (*Comissões de Coordenação* Regional, CCR) were created in 1979 as regional organs of the central State, and gradually replaced the regional offices of the DGPU in the support of the municipalities, gaining a key role in the planning process and facilitating the process of decentralisation.
In the meantime, environmental planning made its appearance in Portuguese planning, rapidly growing to become one of its main dimensions. On this respect, the institution of the National Agricultural Reserve (RAN, 1982) and of the National Ecological Reserve (REN, 1983) operated a delimitation and classification of not only the more valuable soils for agriculture and forestry, but also those considered crucial for the equilibrium of the natural ecosystems and for the prevention of risks, forbidding any ordinary intervention in all these areas.
In the early 1980s the three contextual bodies of influence (urban planning, regional planning and environmental planning) were repositioned, occupying different places in the organisation of the State. Planning, alongside environment and natural resources were under the wing of the Ministry for the Quality of Life; housing and urbanism fell under the responsibility of the Ministry for Social Equipment; and economic and regional development were to be delivered by the Ministry of the Interior Administration. This organisational structure played a structural role in defining the cultural perception of planning in Portugal that persists until today. As a consequence of the ministerial distribution of policy competencies, planning became almost exclusively identified as a tool for the regulation of the land use, occupancy and transformation.

1985-1995: The influence of the European Environmental Directives and Structural Investment Funds

The entrance of Portugal in the European Economic Community in 1986 marked the beginning of a new phase in the history of the country, launching a period of great economic growth but also of fundamental political reforms. Concerning spatial planning in particular, two factors played a key role in the transformations of the national system. The adaptation of the legislation to the environmental directives of the EEC produced a strong empowerment of environmental planning in Portugal, conferring it an increasing authority on all levels of governance. At the same time, the reform of the European Structural and Investment Funds (ESIF) in 1988 gave way to the resurgence of regional development planning, which had disappeared from the national perspective after the brief experimental period between 1968 and 1974. The rapid growth of these two dimensions brought more robustness and equilibrium to the spatial planning system, previously over-focused on urban regulation, paving the way for a later comprehensive reform in 1999.

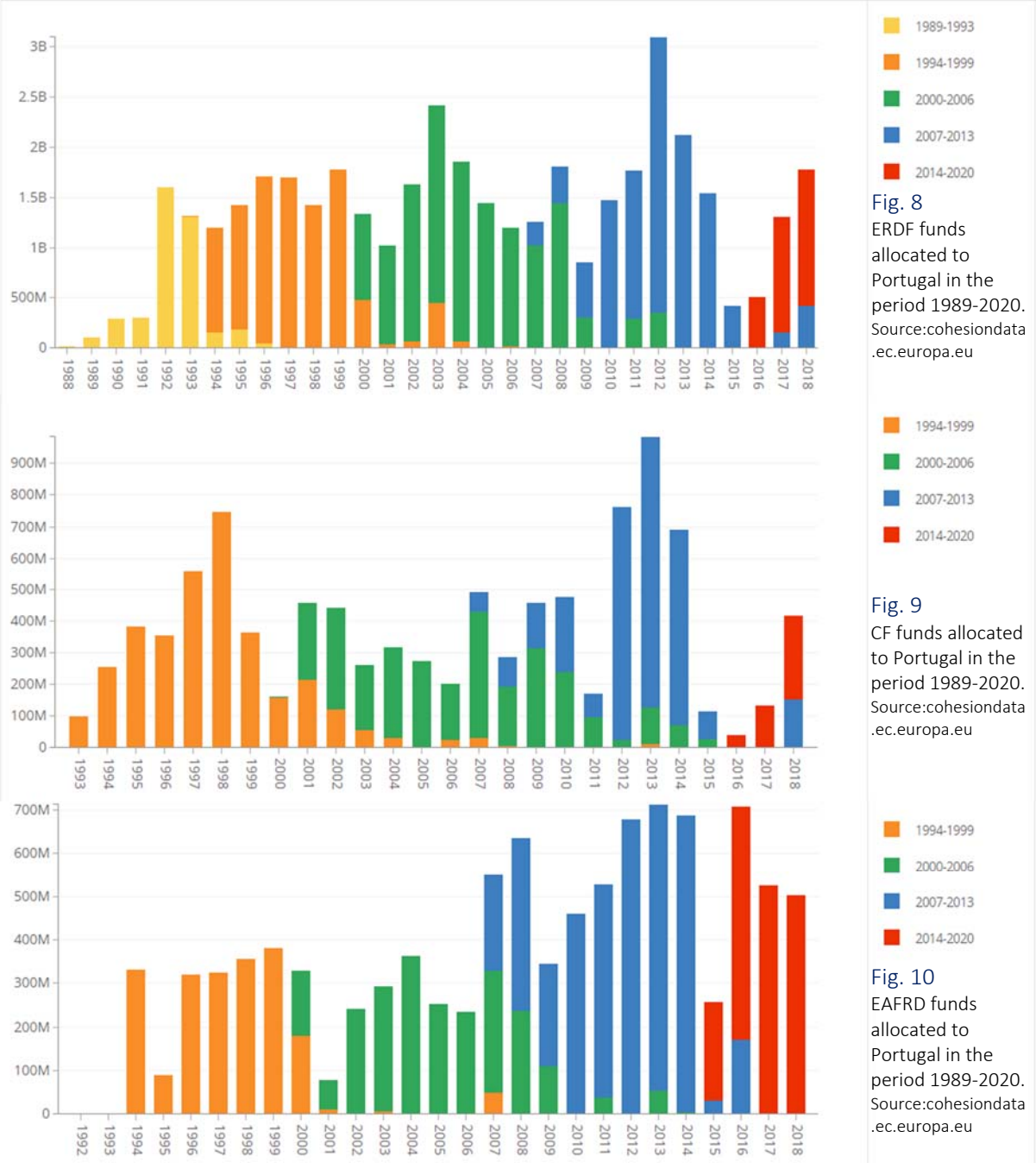


Fig. 8
ERDF funds allocated to Portugal in the period 1989-2020.
Source:cohesiondata.ec.europa.eu

Fig. 9
CF funds allocated to Portugal in the period 1989-2020.
Source:cohesiondata.ec.europa.eu

Fig. 10
EAFRD funds allocated to Portugal in the period 1989-2020.
Source:cohesiondata.ec.europa.eu

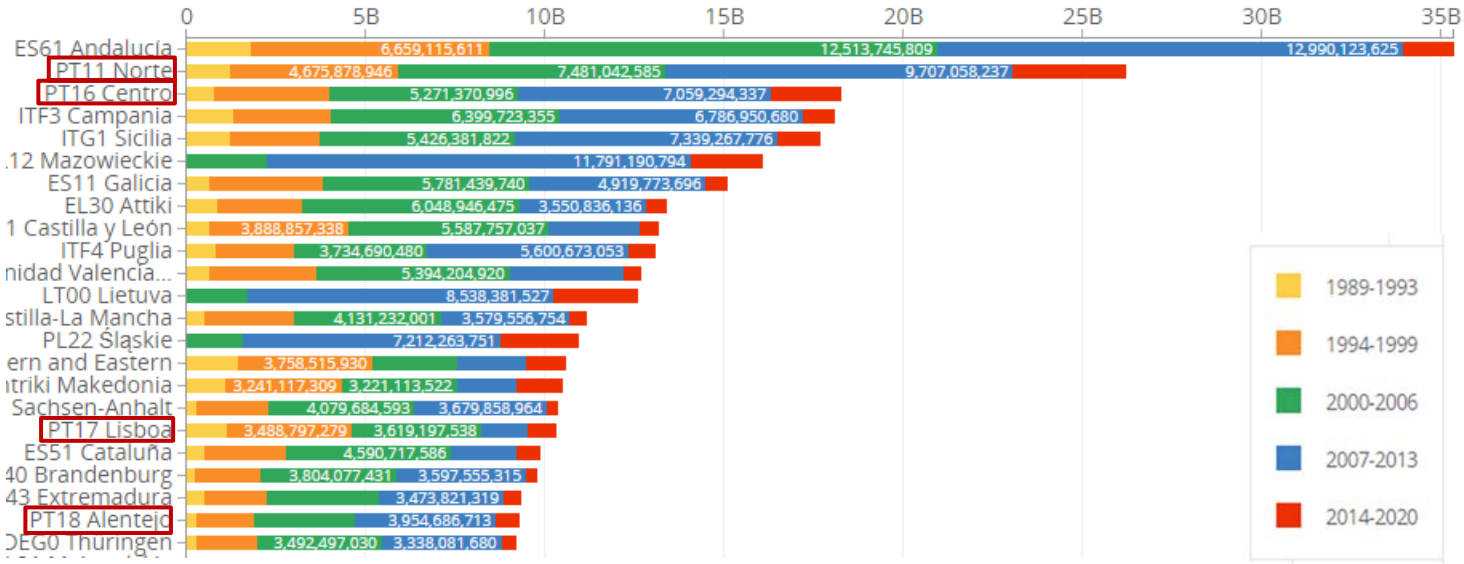


Fig. 11 Historic EU payments by NUTS-2 region. Portuguese regions marked in red. Source:cohesiondata.ec.europa.eu

Throughout this period, Luís Valente de Oliveira served as the sole Minister for Economic Planning and Territorial Administration for a whole decade (X, XI and XII Constitutional Governments - PSD). Previously head of the Regional Coordination Commission of the Northern Region, he was knowledgeable about the European policy arena dynamics and the demanding nature of the European integration process and the impact it would have in Portugal. He was also aware of the domestic state of affairs in terms of the then embryonic Portuguese planning system and of the expected difficulties in structuring a whole territorial management system (e.g. legislative framework, planning instruments, planners' capacity building, etc.) while undergoing the necessary institutional adaptation process required by the accession process. At the head of Ministry responsible for the management of the ESIF in Portugal, Valente de Oliveira chose as his main objective the adaptation of the domestic planning system to the European requirements, starting from the provision of a PDM for each of the 308 municipalities. In 1990, a reform reinforced the compulsory nature of the PDM, prohibiting the unprovided municipalities to execute expropriations for public utility and to be eligible for programs financed through the ESIF, though simplifying both the technical requirements and the approval procedures. By the mid-1990s over 200 PDMs were in place, but the last PDM was ratified by the central government only in 2003. This first generation of municipal plans resulted very limited in its scope (mainly urban) and nature (overly regulative and devoid of strategic vision), but they achieved their aim in introducing the concept that construction and urbanization should be subject of an order imposed by the administration for the overall benefit of the citizens. Concurrently, the 1989 constitutional revision stated for the first time the need to secure correct planning as a constitutional imperative and a fundamental task of the State.

In the meantime, within the planning epistemic community and among decision-makers, there was a growing feeling of frustration with the overly complex, slow and rigid nature of the available instruments for land use, occupation and transformation regulation. The limits of the rational and technocratic modern approach to planning began to be questioned in terms of their suitability allowing for planning to fulfil its role. Taking stock of the experience that Barcelona had gathered in the context of the 1992 Olympic Games, planners introduced the use of collaborative and participatory frameworks that envisaged the shared development of not only a strategic vision for the city, but also of the identification of key intervention guidelines. For a six years long period ending in 1996, a series of procedural innovations in the process of planning policy-making were put into practice.
As a result, a far more strategic and proactive approach began to gain support, radiating from the ground-breaking decision taken by Jorge Sampaio, Mayor of the city of Lisbon, to create a strategic development plan for the capital in 1992. Sampaio embodied a pro-strategic planning approach to the development of Lisbon, projected as a major metropolis in the Iberian Peninsula and in the Euro-Atlantic space. From this first experiment in the capital, there was a voluntary mimicking process throughout the country, which resulted in a growing number of strategic territorial planning initiatives, not only at the city level but also at the municipal and inter-municipal level.
In the context of the II Cohesion policy Framework (1994-1999), the Minister for Economic Planning and Territorial Administration decided to support this process through the PROSIURB (Program for Consolidation of the National

Urban System and Assistance to the Execution of the PDM), which required the preparation of a strategic plan to the cities that intended to benefit from the program.
In parallel with these processes, environmental planning grew more autonomous and reinforced its political clout. In 1987, the Fundamental Environment Act was approved, triggering the institutionalisation of environmental policy as a community policy under the banner of the European Single Act. The introduction in 1988 of the Regional Spatial Plans (PROT, *Planos Regionais de Ordenamento do Território*) marked a shift of paradigm in Portuguese regional planning: from the emphasis on economic development and advancement of urbanization that characterised the economic development plans in the period 1968-1974, to the valorisation of the natural, environmental and landscape resources in the name of a more responsible regional development. Unfortunately, the initial strictly regulative nature of the PROTs prevented the first generation of these plans to result efficient in their purpose. In 1991, the Ministry for the Environment and Natural Resources was created, hijacking a series of policy domains previously integrated in the Ministry for Economic Planning and Territorial Administration. This political strengthening process culminated in 1995 with the approval of the National Plan for Environmental Policy. The increasing autonomy of environmental planning, though, weakened the link between environment and territorial planning, and induced an instrumental approach in the latter as a mere tool to achieve the objectives of environmental policy.

In 1995, during its final months in office, the XII Constitutional Government circulated a draft Spatial Planning Act (*Lei de Bases de Ordenamento do Território*, LBOT) that attempted to initiate a profound reform in the Portuguese planning system. The contents of the proposed legislation demonstrated a strongly interventionist approach with an implicit challenge to the planning powers of local authorities. It appears that part of the motivation behind this legislative venture was to demonstrate to Brussels that a lingering local planning system would not endanger the impact of structural funds on the ground. There was also an implicit message to the local authorities: the Special Plans (*Planos Especiais de Ordenamento do Território,* PEOT) indicated that if central government saw fit to replace the Municipal Director Plans (PDM) it would do so. The underlying rationale was to have a mechanism to apply pressure on the local authorities that fell behind in terms of the design and implementation of their PDM. The reform was not sufficiently exposed to the public debate, and the opposition of all parties ratified its failure.
The PEOT, however, was introduced in the legislation as a category of extraordinary top-level plans imposed by the central administration for the protection of important natural areas such as coastlines and natural reserves, falling within the spectrum of environmental planning.

1.1.3 Emancipation of spatial planning as an autonomous public policy

1995-1999: Portugal in the European Spatial Development Perspective

The decade long process of development of the European Spatial Development Perspective (ESDP), which was completed in 1999, had an influence on Portuguese spatial planning that reached beyond the financial aids of the structural funds and the empowerment of environmental planning. Through the introduction of a more strategic approach to planning, by outlining a clear set of priorities, and by inducing a new lexicon, all of which were voluntarily taken on board by the then 15 member-states of the European Union, the ESDP process not only updated but also reinforced regional planning as a body of influence. But the most important impact of the ESDP on the emancipation of planning in Portugal is that it provided a springboard for planning in terms of domestic validation, gave it political weight and provided it with the legitimacy to call for a more central role as the coordination mechanism for all collaboratively developed policies with a spatial impact.

The participation of Portugal in the development of the ESDP was rather cautious and obscured by the shadow of the structural funds, mirroring the domestic power dynamics of different policy-making bodies. The intra-governmental delegation that represented Portugal in the CSD was composed of senior public officials from the Directorate-General for Regional Development (*Direção-Geral do Desenvolvimento Regional,* DGDR), responsible for the management of the cohesion funds, instead of the Directorate-General for Spatial Planning and Urban Development (*Direção-Geral de Ordenamento do Território e Desenvolvimento Urbano,* DGOTDU), responsible for spatial planning. This was only to change in 1999 as the whole process came to a close, from then onwards the DGOTDU established a more active involvement in the European spatial policy agenda. Unfortunately, the consequences of this conspicuous institutional dichotomy lasted through the ESDP dissemination stage up until the

Action Programme for the implementation of the Territorial Agenda (2007), and this considerably undermined the potential impact that the European spatial planning discourse could have on the domestic planning environment. Nevertheless, if at the time of the first reunion of the spatial planning Ministers in 1989 Portugal could count on a merely embryonic territorial organisation, a year before the conclusion of the ESDP (1999) the Planning and Urbanism Policy Act (LBPOTU) granted a new role to spatial planning in Portugal, clearly defining its outlines and supporting it with a solid and updated legislation. The reform also introduced the National Program for Spatial Planning Policies (PNPOT), the first instrument to formulate a comprehensive and authoritative territorial vision at

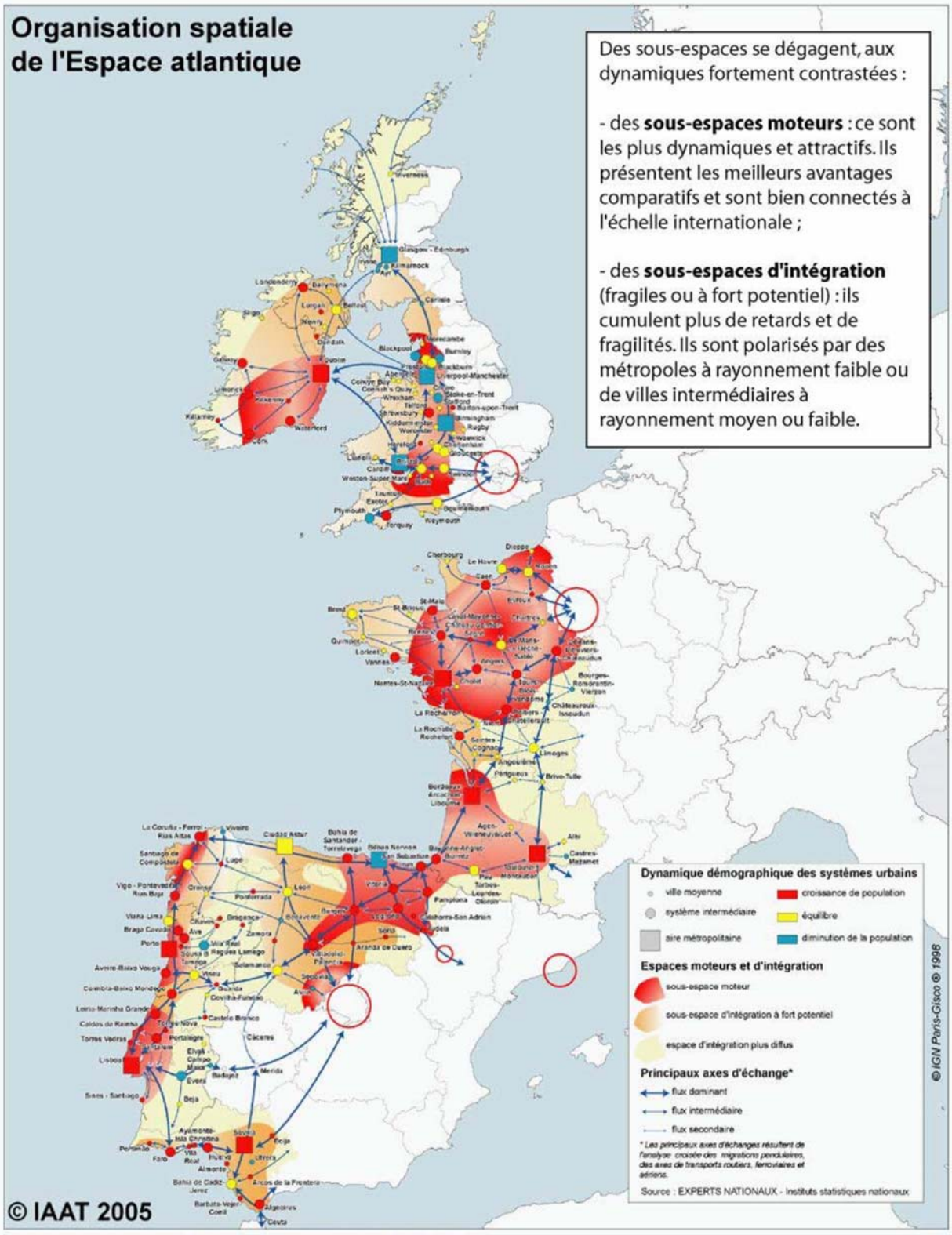


Fig. 12 Spatial organisation model for the Atlantic Arc elaborated in the Interreg Atlantic Area Programme.
Source: atlanticarea.eu

the national scale, which follows the ESDP in envisioning Portugal in the European space, and for the first time recognises spatial planning as an autonomous public policy of primary importance and key strategical value.
Officially, Portugal had from the outset a strong interest in the conceptualisation and development of the ESDP. The document produced to support the 1992 work meeting, hosted by the Portuguese Presidency in Lisbon, expressed the "necessity for a concept of spatial development on a Community scale" and a "coherent vision of the whole Community's territory". But in spite of a public display of support, there was some scepticism among Portuguese Officials, based on the suspicions that the ESDP would substitute the previous cohesion policy and that the enlargement of the Union to include less developed economies in Eastern Europe would mostly prevaricate the fruition of the cohesion funds for Portugal. In sum, the prevailing stance of the Portuguese at this point was therefore of active involvement in the preparation of the ESDP but withholding of full commitment until the real impact and reach of the document was clearer. There was a broad consensus that the concept of an EEC-wide strategy was worth debating, mainly because of the potential lack of control concerning the spatial impacts and coordination of competitor interests vested in the regional, transport, competition and common agricultural policies. In addition, it was understood to be strategically important for Portugal to actively participate in the discussion of the ESDP since there was a growing perception that it would influence the future allocation of structural funds. Another ground for interest was that there was an expectation that the ESDP, as an external reference framework, could provide an added layer of consistency to the maturing Portuguese planning system.

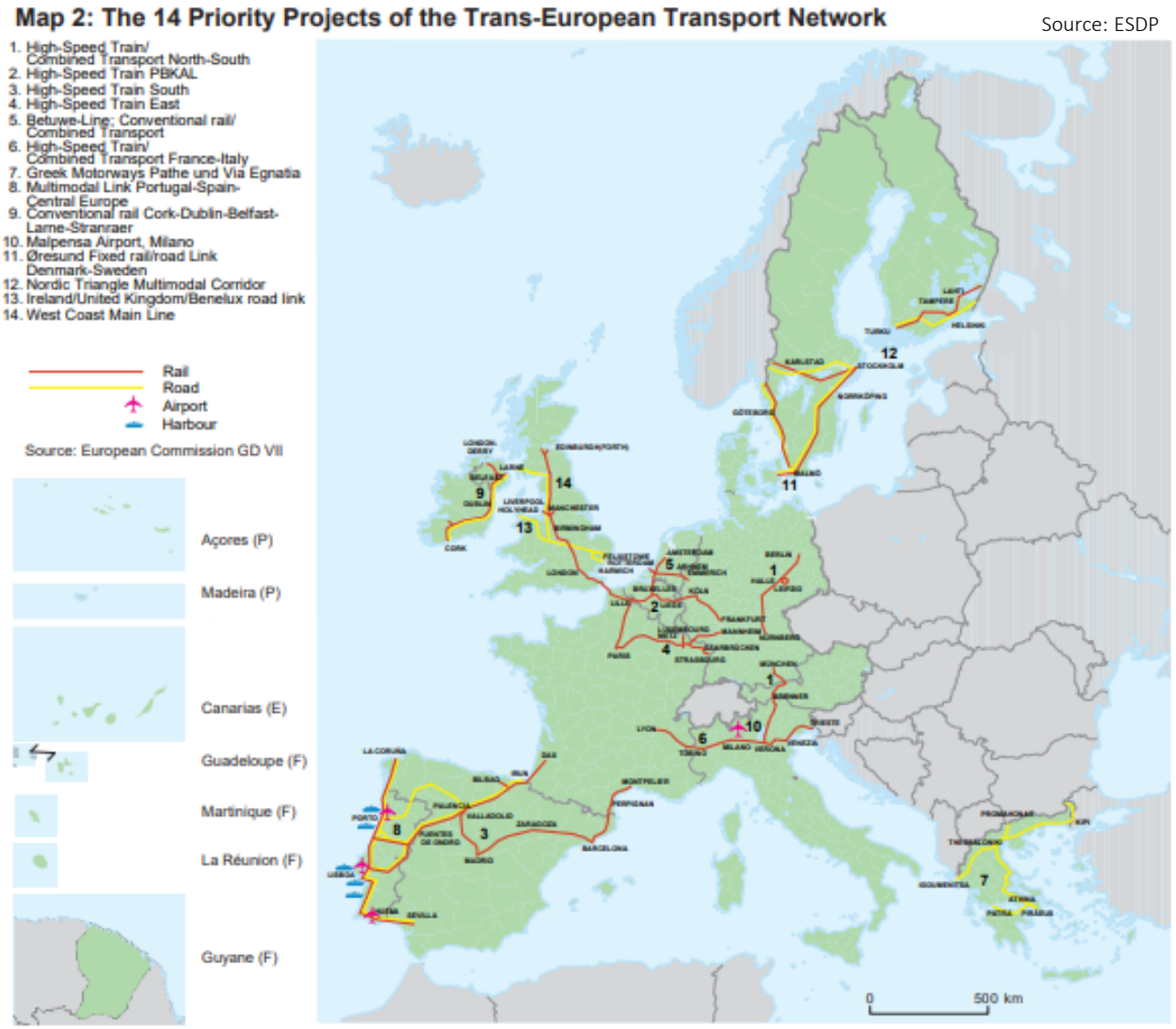


Fig. 13 The Trans-European Transport Network (TEN-T) presented in the ESDP was extremely supporting for European investments in Portugal, and became the main object of concrete interest for the Portuguese delegation participating in the process.

After the release of the 1997 Noordwijk first official draft of the ESDP, a series of debates were organised in Portugal throughout the first half of 1998, which saw the involvement of the five Commissions for Regional Coordination (CCR), the two Autonomous Regions, the National Association of Portuguese Municipalities, the National Social and Economic Council, and one national seminar hosted in Lisbon. There was also a direct acknowledgement of the ESDP in the National Plan for Socio-Economic Development (*Plano Nacional de Desenvolvimento Economico e Social,* PNDES) 2000-2006, which embodied the Portuguese strategic guidelines on the application of the 2000-2006 CSF. Under the secondary title of 'A Strategic Vision for the XXI Century', the PNDES embraced to a large extent the overall ESDP ethos, if seldom referring to the document explicitly. The concern towards the influence of the ESDP on the following CSF, though, shifted the spotlight away from another potential innovation for Portugal embedded in the ESDP: namely, its instrumental focus on new forms of spatial planning, which was not object of formal discussion in this phase.

Instead, this new interpretation of spatial planning gained the focus of the Ministry of Equipment, Planning and Territorial Administration (*Ministério do Equipamento, do Planeamento e da Administração do Território*, MEPAT) led by João Cravinho in the period 1995-1999 (XIII Constitutional Government – PS). Cravinho had been a junior member of the Technical Secretariat of the Presidency of the Council while the IV Economic Development Plan was being drafted and the concept of a national level planning policy discussed, and held a unique knowledge of the planning dynamics in Portugal. During his ministerial appointment, in 1998, the Planning and Urbanism Policy Act (*Lei de Bases da Política de Ordenamento do Território e de Urbanismo*, LBPOTU) underwent parliamentary approval and, in 1999, a new decree-law defined the legislative identity of each of the instruments of territorial management. The LBPOTU represents the first systematic reform of the legal framework governing spatial planning in Portugal, establishing it as an autonomous public policy founded on a basic law approved by the parliament. Its objective is

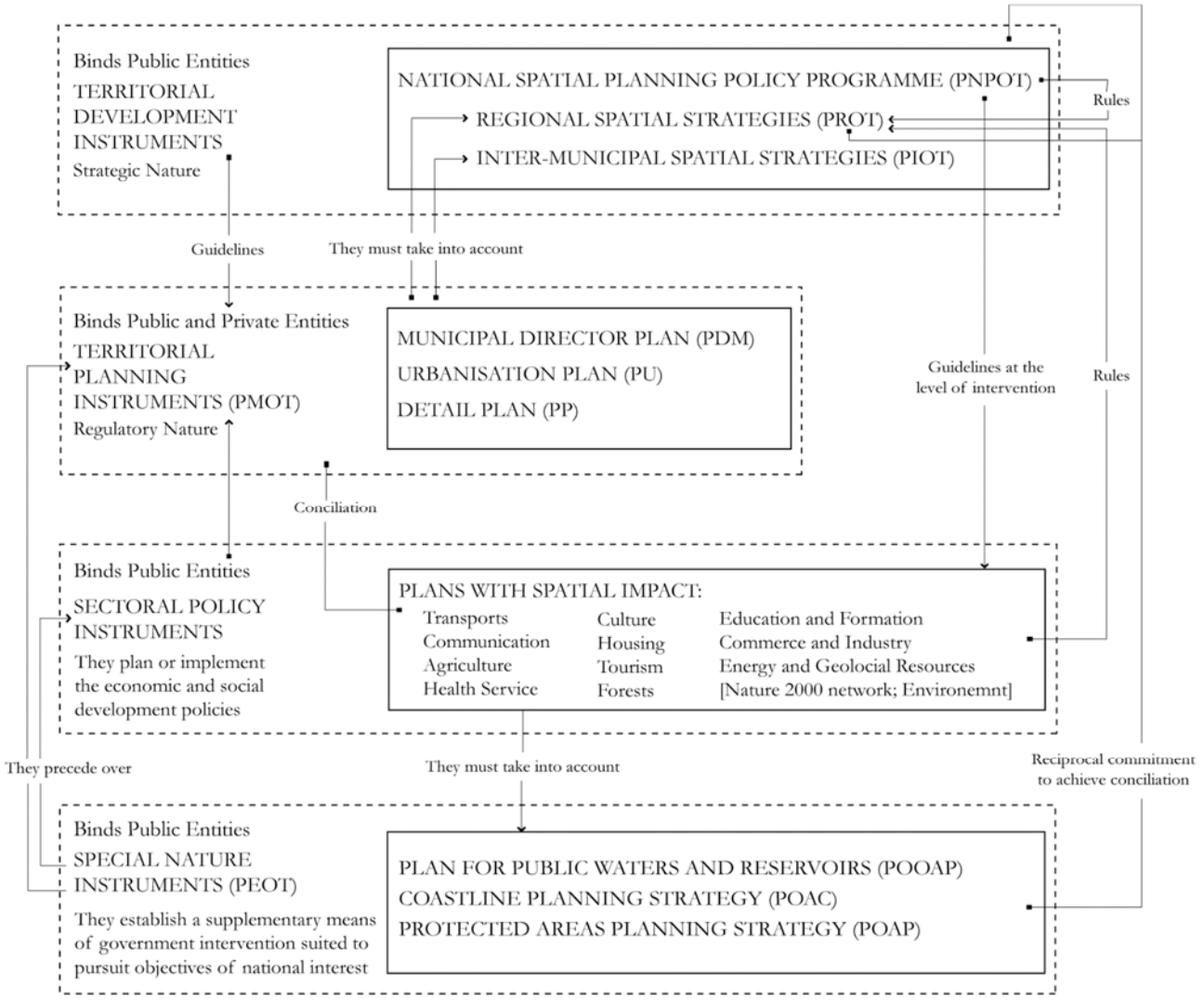


Fig. 14 The spatial planning system framework introduced through the LBPOTU. Source: Mourato 2011

to assure correct use and organisation of the national territory in a perspective of valorisation (specifically in the European space), aiming towards an integrated and sustainable development of the country and of its regions and cities. With the institution of the duty of the State in securing planning, the LBPOTU defined the principles, purposes and objectives of territorial planning, and it established a coherent territorial management system.
For the first time was operated a distinction between territorial development programmes, of strategical and programmatic character, and land-use plans, meant to regulate private initiatives and implement sectorial policies of the State in the territory. Namely, the territorial development programmes (PNPOT, PROT and PIOT) are under the responsibility of national and regional authorities (such as the ministries and CCRs) and are hierarchically effective on others instruments of the public administration, while the land-use plans (PMOT, PDM, PU and PP) are appointed to the municipal authorities to exercise the exclusive right over spatial transformations in their territories, integrating and coordinating territorial programmes and sectorial policies of national and regional level. The only exception is the Special Plan (PEOT), an instrument used by the State to grant the protection of specific environmental interests (water reservoirs, coastlines and other protected areas) against private interventions, which would often originate conflicts between municipalities and the Ministry of Environment.
Equally in line with the European mainstream, the LBPOTU introduced in Portugal the principles of coordination of sectorial policies with significant impacts on the territory and of periodic monitorisation and evaluation of spatial planning policies. Furthermore, it clarified the duty of the administration (at all levels) to promote through all means the information on the national territory and on the plans currently predisposed for its management, in order to secure the right to information of all Portuguese citizens.

In sum, the LBPOTU established in Portugal an exhaustive system for spatial governance, clearly defining spatial planning both in its general terms as a fundamental public policy and in its specific functioning involving various institutional actors to develop distinct but interdependent instruments, and finally designating unambiguous forms of coordination between spatial planning and all sectorial policies with significant spatial impacts. Clearly, the development of the LBPOTU was deeply influenced by the ESDP process, as would appear in the instruments developed in the following decade, namely the National Plan for Spatial Planning Policies and the second generation of regional plans, which finally sanctioned the reception of the ESDP and a new proactive approach to planning in Portugal.

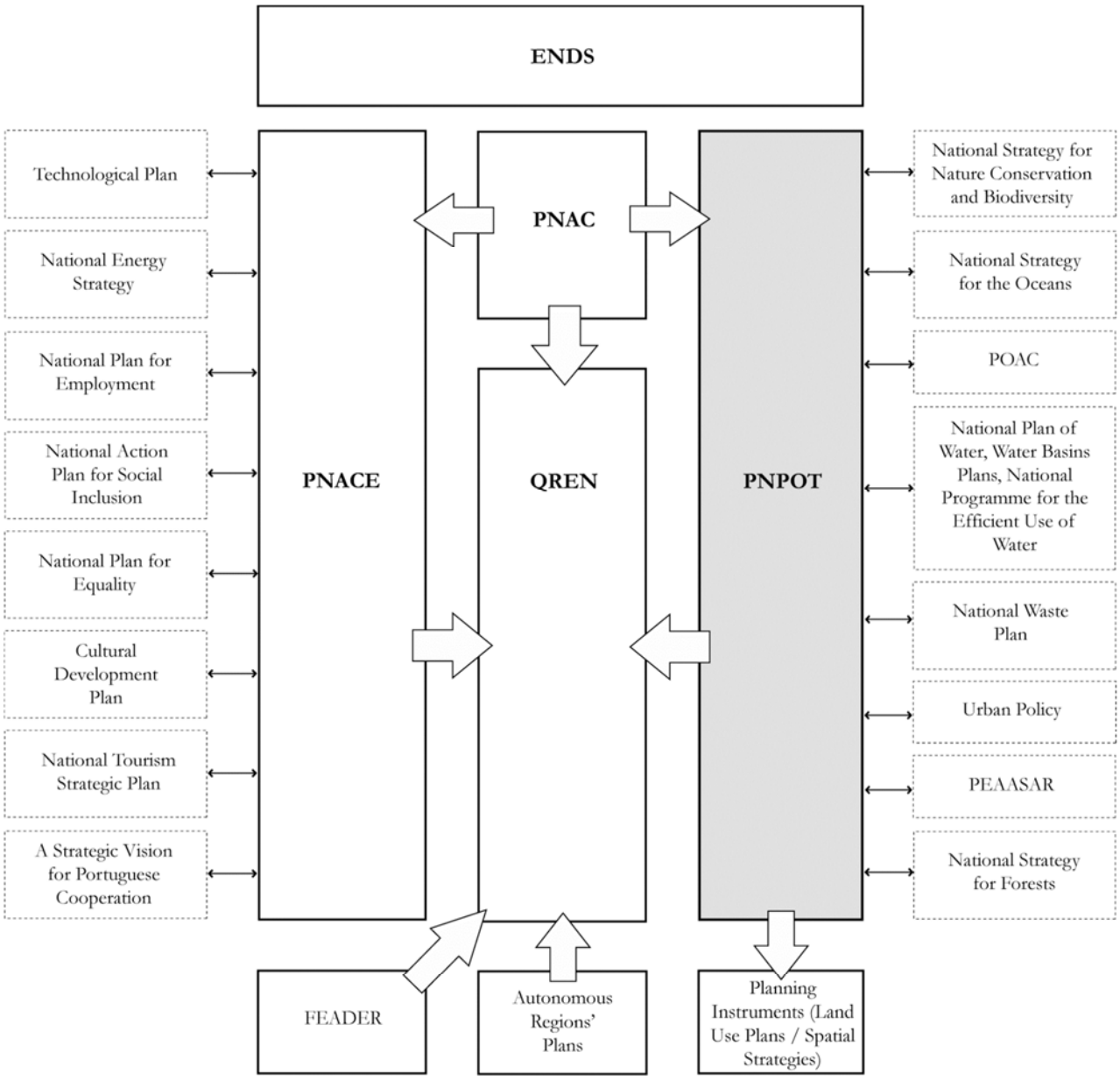
2000-2013: experimentation of multi-level governance

With the coming into office of the XIV Constitutional Government (PS) in 1999, a new political/institutional cycle began. From that moment onwards, and despite the unsettled political period between 2002 and 2005, the evolution of planning can be described along three main lines of reasoning. First, the institutional tradition of the Ministries of Economic Planning previously addressed was replaced by a set of alternative governative solutions that built on the concept of a mixture of distinct policy areas. In this new cycle, planning has always been included in the ministries that also supervised environmental policy, highlighting a more regulative planning dimension but also supporting spatial planning through the much more authoritative environmental policies. Second, at a political level a priority was made to make fully operational the instruments of the territorial management system that had been outlined in the LBPOTU. Furthermore, and as far as the whole territorial management system is concerned, an additional effort was set in place in order to simplify, decentralise and qualify not only its design but also its implementation. In this context, the parliamentary approval of the National Spatial Planning Policy Programme (PNPOT) is without a doubt the most relevant fact. Third, a series of theme-focused planning initiatives emerged, and two of these would develop into systematic and cohesive policy agendas. These emphasised the need for swift action in terms of urban rehabilitation, and the need to tackle global warming effects, especially in coastal areas.

The new framework introduced by the LBPOTU was aimed at granting a new relevance to spatial planning through an increased emphasis on coordination both in vertical (among the national, regional and local levels) and horizontal (among sectorial policies) terms. To achieve an enhanced equilibrium among the various scales of planning, by prompting more conscious and autonomous initiatives from the decentralized authorities, the central administration decided to focus its efforts on two parallel directions: first, the undisputed leadership of the whole process of renovation through the newly introduced PNPOT; and second, an extensive and constant modernization of the tools, of the knowledge base, of the legal framework, in short of all the constituents of the spatial planning process, with the aim of removing any obstacle based on malfunctions in its organization and of providing new ways to ensure effectiveness to the planning tools.

Thus, the process of elaboration of the municipal plans was gradually simplified leaving more autonomy to the local authorities, which at the same time were encouraged to raise strategical significance of their plans.

In the meantime, the Commissions for Regional Coordination were reformed into Commissions for Regional Development and Coordination (*Comissões de Coordenação e Desenvolvimento Regional*, CCDR) and assigned to the Ministry of Environment. The usual distribution of funds according to NUTS II regions by the EU has always encouraged the affirmation of regional authorities for a better management of the funds. The responsibility for the elaboration of the PROTs has finally consecrated the CCDRs as regional authorities of spatial planning, supervising the increasingly complex interactions between the national and municipal levels. The second generation of these plans, designed in consistency with the first PNPOT, drifted away from the over-regulative emphasis of their precursors, embracing a strongly strategical character. The focus of the CCDRs stays however on environmental planning, namely on the conservation of natural areas and all soil with significant ecological or agricultural value.



ENDS	National Strategy for Sustainable Development	PNACE	National Action Programme for Growth and Employment
FEADER	European Agricultural Fund for Rural Development	PNPOT	National Spatial Planning Policy Programme
PEAASAR	Strategic Plan for Water Supply and Sewage Services	POAC	Coastline Planning Strategy
PNAC	National Programme for Climate Change	QREN	National Strategic Reference Framework

Fig. 15 The Coordinative Role of the PNPOT. Source: Mourato 2011

The National Spatial Planning Policy Programme (*Programa Nacional da Política de Ordenamento do Território*, PNPOT) symbolized the passage from the overly regulative focus of the Government, based first in the codification of urban planning and then in the pre-eminence of environmental protection, to a strategic approach leading up to an integrated and inclusive program of nation-wide renovation. The hierarchical superiority of the PNPOT made it the igniter of the process of implementation of the new framework introduced by the LBPOTU: the coming into effect of its first edition in 2007 laid the basis for the development of the new PROTs in the following years, which in turn served as fundamental supports for the elaboration of the new generation of PDMs. Moreover, the PNPOT became a tool to affirm and defend spatial planning in the action of the State, imposing a system of dependency and coordination between itself and the other major national strategies. Specifically, the PNPOT sets out one of the key missing elements necessary for a coherent territorial management system: it identifies both the territorial and sectoral instruments (yet with a spatial impact) that will be the cornerstone of the implementation of national planning policy, regardless of their administrative, legislative, financial, or tax-related nature. In other words, the PNPOT is a national instrument of policy coordination and a platform for actor cooperation.

The first PNPOT consists of two parts: a diagnosis report and an action programme.

The diagnosis report is structured in four chapters providing:

- a contextualisation of Portugal at the Iberian, European, Atlantic and global level;
- an outline of the main issues, trends, conditions and territorial development scenarios of the Portuguese territory, identifying 24 problems considered to be the main obstacles that planning would face in its implementation timeframe (i.e. twenty years);
- a strategic diagnosis of the different Portuguese regions and their territorial sub-units;
- the proposal (based on the analysis of the 24 problems identifies in chapter 2) of a spatial development vision entitled Portugal 2025.

The PNPOT's territorial model is illustrated by a set of three maps depicting: risks and natural hazards; natural, agricultural and forestry systems; and the urban and accessibility systems in Mainland Portugal.

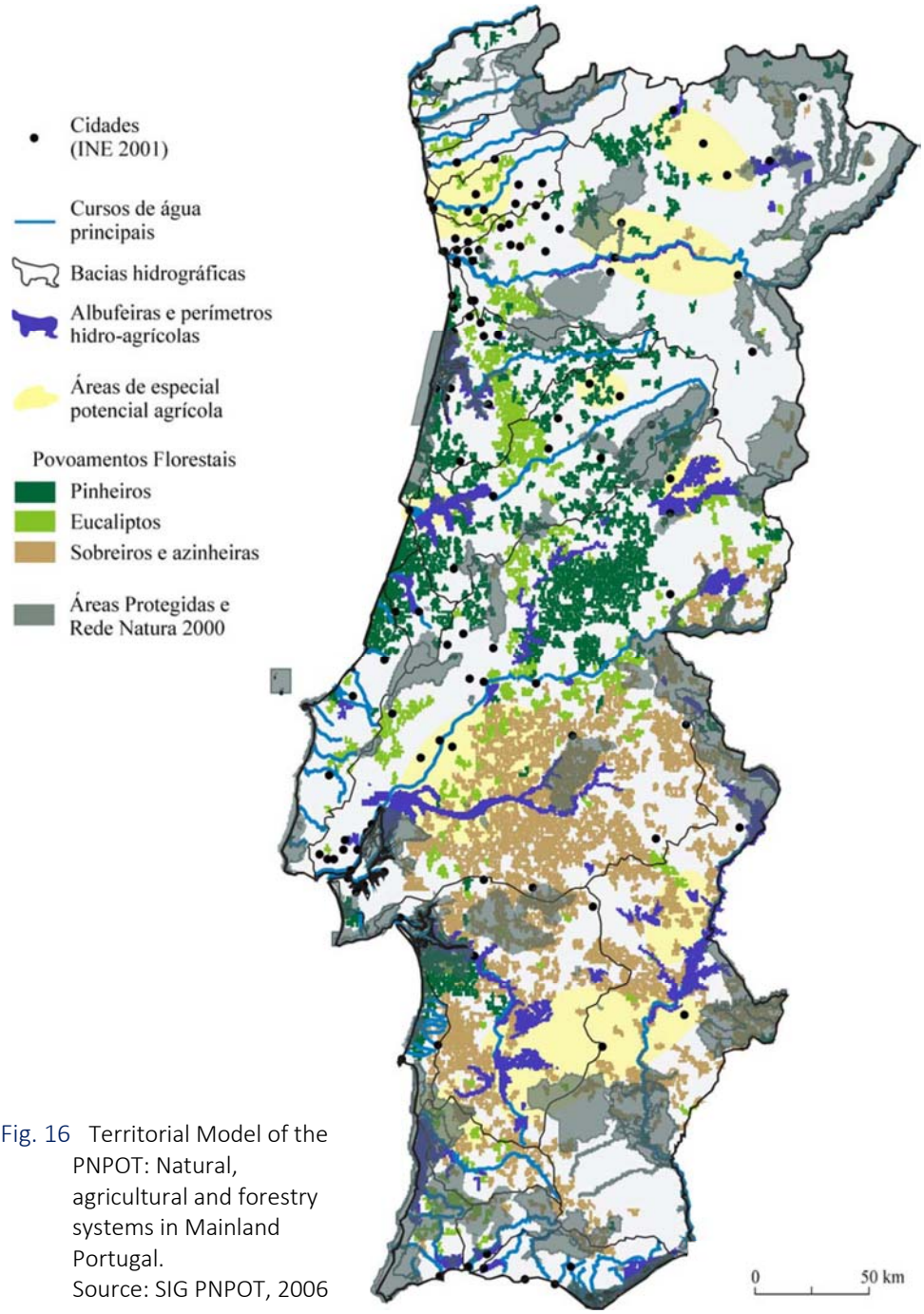


Fig. 16 Territorial Model of the PNPOT: Natural, agricultural and forestry systems in Mainland Portugal.
Source: SIG PNPOT, 2006

The action programme consists of the policy programme and the guidelines for the elaboration of the instruments for territorial management and for the coordination of sectorial policies. The policy programme is structured around six strategic objectives, each aggregating a set of specific objectives, which identify priority measures. The six strategic objectives are:

• To preserve and value biodiversity, natural resources and the natural landscape and cultural heritage, to use in a sustainable way the geological and energy resources, and to monitor, anticipate and minimise natural risks;

• To reinforce Portugal's territorial competitiveness and integration in the global, Atlantic, European and Iberian spaces;

• To promote territorial polycentric development and reinforce the necessary infrastructures to achieve territorial integration and cohesion;

• To secure territorial equity in the provision of infrastructures and collective equipments, as well as a universal access to series of general interest, in order to promote social cohesion;

• To expand advanced information and communication networks and infrastructure, and to promote its use by citizens, businesses and public administration;

• To enhance the quality and efficiency of territorial management, promoting informed, active and responsible participation by citizens and institutions.

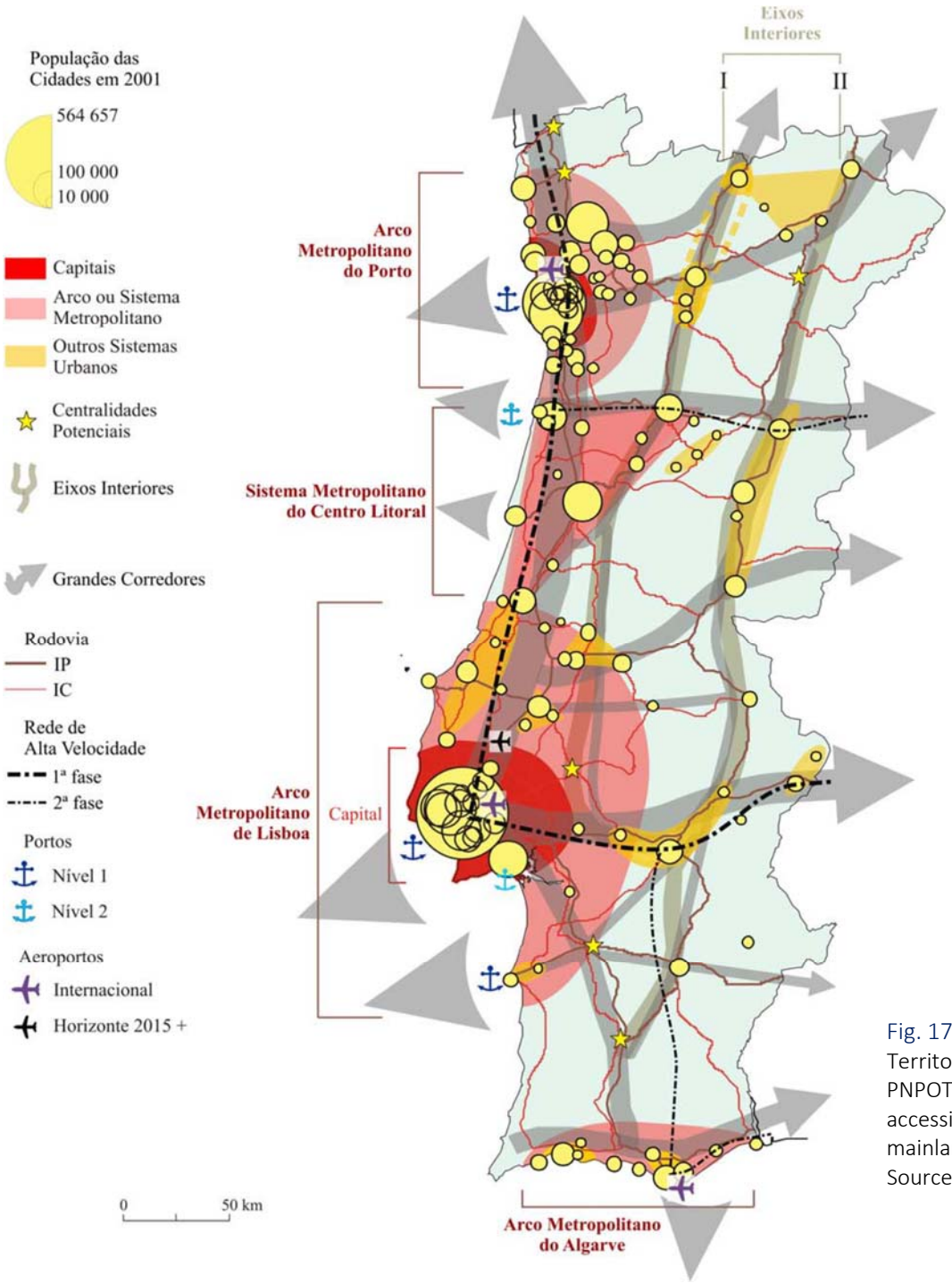


Fig. 17
Territorial Model of the PNPOT. Urban and accessibility systems in mainland Portugal.
Source: SIG PNPOT, 2006

The XVII Constitutional Government (PS), ruling between 2005 and 2009, adopted an integrated approach to planning unifying the main policies with spatial impacts under the Ministry for Spatial Planning, Regional Development and the Environment (*Ministério do Ambiente, do Ordenamento do Território e do Desenvolvimento Regional*); assigning a Junior Minister to each one of these areas. João Ferrão, the appointed Junior Minister for Spatial Planning, was a geographer with an academic background and experience in European planning research. His mandate was marked by great efforts for the renovation of planning and most notably for a proactive Portuguese participation in the European spatial development community.
Under his direction (shared with the Director-General of the DGOTDU Vítor Campos) a work group was assembled to prepare the 14th section of the European Conference of Ministers Responsible for Spatial/Regional Planning (CEMAT), held in Lisbon in 2006 with the theme: "Networks for sustainable spatial development of the European continent: bridges over Europe". The session was devoted to the implementation of the Guiding Principles for Sustainable Spatial Development of the European Continent at national, international, transnational, transboundary and inter-regional levels and of the CEMAT Pan-European Model Network (Regions of innovation). The intention was to further align the guiding principles for sustainable territorial development held by CEMAT (2002) with the spatial development agenda of the EU. In particular, in the Resolution on Polycentric Development "promoting competitiveness and reinforcing cohesion", adopted at the 14th CEMAT session in Lisbon, it is clear that all countries need to engage in more strategic planning processes, and territorial governance mechanisms, as an indispensable condition for an integrated and balanced development of the whole of the European continent. In brief, what the CEMAT 2006 attempted was to extend the core principles of the ESDP to the near totality of the European countries (47) that hold a seat in CEMAT.
Later, in mid-2007, an informal ministerial meeting on territorial cohesion and regional policy took place in Ponta Delgada (the Azores), with the task to draft the First Action Programme (AP1) for the implementation of the Territorial Agenda of the European Union. This was a further step in the process that, building on the ESDP and the CEMAT experience, was initiated in Rotterdam in 2004 and led to the adoption of the Territorial Agenda of the European Union in Leipzig in May 2007, under the German Presidency of the European Council. The AP1 was prepared to be implemented in the period 2007-2011, in the context of the framework established by the Treaty of Lisbon, amending the Treaty on European Union and the Treaty establishing the European Community, that recognized territorial cohesion as the third dimension of Cohesion Policy. In the Azores meeting the First Action Programme was designed to provide a framework to facilitate the implementation of the Territorial Agenda, giving the Ministers, the European institutions and all other concerned stakeholders a structured but flexible platform to promote the debate and influence decisions on European development issues, ensuring that the territorial dimension is adequately taken into consideration when assessing current policies and designing the future policies of the European Union and bearing in mind the up-coming EU budget review. The AP1 also provided the Ministers with a structure for formulating common territorial initiatives and recommendations, building further on the ESDP and on the CEMAT's Guiding Principles, and focusing on the territorial priorities and challenges set by the Territorial Agenda to be made operational with the aim of influencing policymaking both at European Union and Member States levels.

The active participation in the continental debate for spatial development gave new credibility to Portugal in the European community, but it also proved to be a key factor in the legitimation and empowerment of spatial planning in the national context. Namely, the emerging of a European concept of spatial development, which directed the EU territorial agenda and therefore the development of all Member Countries, called for the affirmation of specialized professionals to implement the communitarian project. In Portugal, the lack of qualified professionals has been one of the main limits of spatial planning since its first conception, growing even more jarring in the first 2000s with the generalisation of the municipal plans and the new relevance acquired by planning in the national strategy. Despite the proliferation of academic courses in the field, an organisation of the labour market has never been implemented, and spatial planners still lack official recognition from the State as autonomous professionals.
The ministry led by Ferrão started tackling this issue in 2006 with the proposal of an accreditation and registry system for spatial planning professionals with coordination tasks in multidisciplinary teams (SAR). Clearly, the inter-sectorial approach on which the new framework was based seemed to point towards the affirmation of a new professional figure specialized in the management of complex processes based on several distinct contributions. The objective of the SAR was therefore to establish minimum requirements for the selection of this figure, who would assume officially the role of coordinator in an inter-sectorial team, often resulting informally in the position of director of the process. The SAR adopted an inclusive approach, consulting and engaging all the professionals usually participating in the planning process, providing the context for an open debate among all the professionals

in order to reach an autonomous agreement among the parts that the State could subsequently ratify. The participation in the initiative was very positive but the debate drifted rapidly towards a trench battle between conflicting interests, lastly being suspended and never resulting in any conclusion. The main object of disagreement was on whether the coordinator of a team should be selected for its professional experience or for its academical formation. On the two opposite sides were lined up, respectively, the professional orders of the architects and the engineers, and the professional (private) associations of spatial planners. The architects and engineers, besides boasting the prestige and power granted by professional orders recognised by the State, had rapidly affirmed themselves (in the lack of any designated professional figure) as supervisors of the first local plans developed since the 1990s; and were represented in the SAR by established professionals with decades of recognised experience to back their position. The spatial planners that had been formed through a proper academical course, on the other hand, had mostly been excluded from the participation in the first plans and were usually confined to marginal positions in the planning process. Furthermore, the associations that represented their interests reflected the fragmentation that characterized the academical approach to the discipline, namely scattering planners across: the AUP (*Associação dos Urbanistas Portugueses*), founded in 1983 by planning professionals of all the main disciplines and since then endeavouring the establishment of an autonomous order for spatial planners; the APPLA (*Associação Portuguesa de Planeadores de Território*) born in the 1990s in the context of the first national spatial planning course in the University of Aveiro; and the APROURB (*Associação Profissional dos Urbanistas Portugueses*) created in the early 2000s and coordinated by the Lusophone (private) University. Finally, in the context of the SAR, the professionals representing this side were generally young planners, perhaps recognised for remarkable academical careers, but with no professional experience that could be compared with that of the older architects and engineers. In this way, the issue of the requirements for the coordination of inter-sectorial planning teams gave rise to conflicts with no quick solution available, and stays unsolved today, even if in 2019 the three associations of spatial planners joined in the APU (*Associação Portuguesa de Urbanistas*), prospecting new developments in the debate.

2014-2020: consolidation of multi-level governance

Given that a PDM is referred to the ten years following its approval, and that most municipalities adopted their first PDM around the mid-1990s, in the second half of the 2000s started the process of revision of these plans, and the adoption of a second generation of PDMs. This period was accompanied by reiterated interventions of the Government on the RJIGT (Legal Regime of the Spatial Planning Tools, which sets the requirements for their validation), in order to shorten the process for the revision of a PDM. At the same time, however, for being the most important and diffused tool the PDM started including a growing number of mandatory components (such as noise regulations, more strict environmental rules or, more recently, climate change adaptation policies) that require more extensive analyses, so that municipalities need today much more resources to develop a PDM.
Thus the revision of the PDMs progressed very slowly, until in the mid-2010s became clear that a comprehensive reform of the LBOTPU was needed.

The XIX Constitutional Government (PSD), governing between 2011 and 2015, has launched a set of comprehensive environmental reforms, aimed at the setting Portugal on the path of sustainable development.
The reform of the Land Act (*Lei de bases gerais da política pública de solos, de ordenamento do território e de urbanismo*) in 2014 formulated a reinterpretation of the territorial management instruments in order to structurally integrate in these tools key environmental policies. Most significantly, to stop the urban expansion on rural land was abolished the class of peri-urban soil (*solo urbanizável*) from the PDMs, establishing unified urban and rural classes. But in more general terms the new Land Act clarified greatly the distinctions operated in 1998 by the LBOTPU (and in 1999 by the first RJIGT) among the various tools of the Portuguese territorial system. In particular, the PDM has been confirmed as the one and only plan to determine land-use, and the directives set by the spatial programmes (PNPOT, PROTs, PEOTs) should all be confirmed by the PDM. Previously, there had been many cases of conflict between municipalities and national authorities, for the insufficient consideration of the PEOTs by the municipalities, and the subsequent pretension of the PEOTs to impose land-use regulations on the local PDMs. The reformed RJIGT (in 2015) has imposed to all municipalities the revision of their PDMs according to the new Land Act, setting a deadline that has gradually been postponed until 2020. Following this date, in the old PDMs all peri-urban soil will automatically become rural soil, making therefore illegal any new construction on it.
Concurrently, the reform assigned to intermunicipal instruments the same relevance of municipal plans, introducing Urbanisation and Detail Plans of intermunicipal scale, and allowing municipalities to conjointly adopt Intermunicipal Director Plans instead of individual PDMs. This is to relate to the establishment, in 2013, of univocal Intermunicipal

Communities (*Comunidades Intermunicipais,* CIM) covering the whole national territory and based on the NUT III statistical regions. The Intermunicipal Communities have thus obtained increased competence and support, allowing for the final suppression of the districts and the closing a ten-year period of general confusion over legal authority at the sub-regional scale (see chapter 2.3.2 – The intermediate level of governance).

Established in 2015, The XXI Constitutional Government (PS) has reintroduced, after fifteen years of suppression, the Planning Ministry. This used to be the part of the Ministry of Economy that in the 1980s and 1990s managed regional development, which in the meantime has become competence of the Ministry for Territorial Cohesion. Part of the economic planning (with spatial impacts) stays however to the Planning Ministry, while still another Ministry is reserved to Housing and Infrastructures. In this framework, Spatial Planning appears as the competence of one of the four state secretaries of the Ministry of Environment, together with Nature and Forests Conservation. In this period, nevertheless, spatial planning saw its role re-affirmed by the revision of the PNPOT, started in 2016 and concluded in December 2019. The second version of the PNPOT is supported by larger and more in-depth analyses, and is structured on a more extensive strategical scope, compared to the first version. Its contents are resumed in chapter 1.2.1.

1.2 Tools

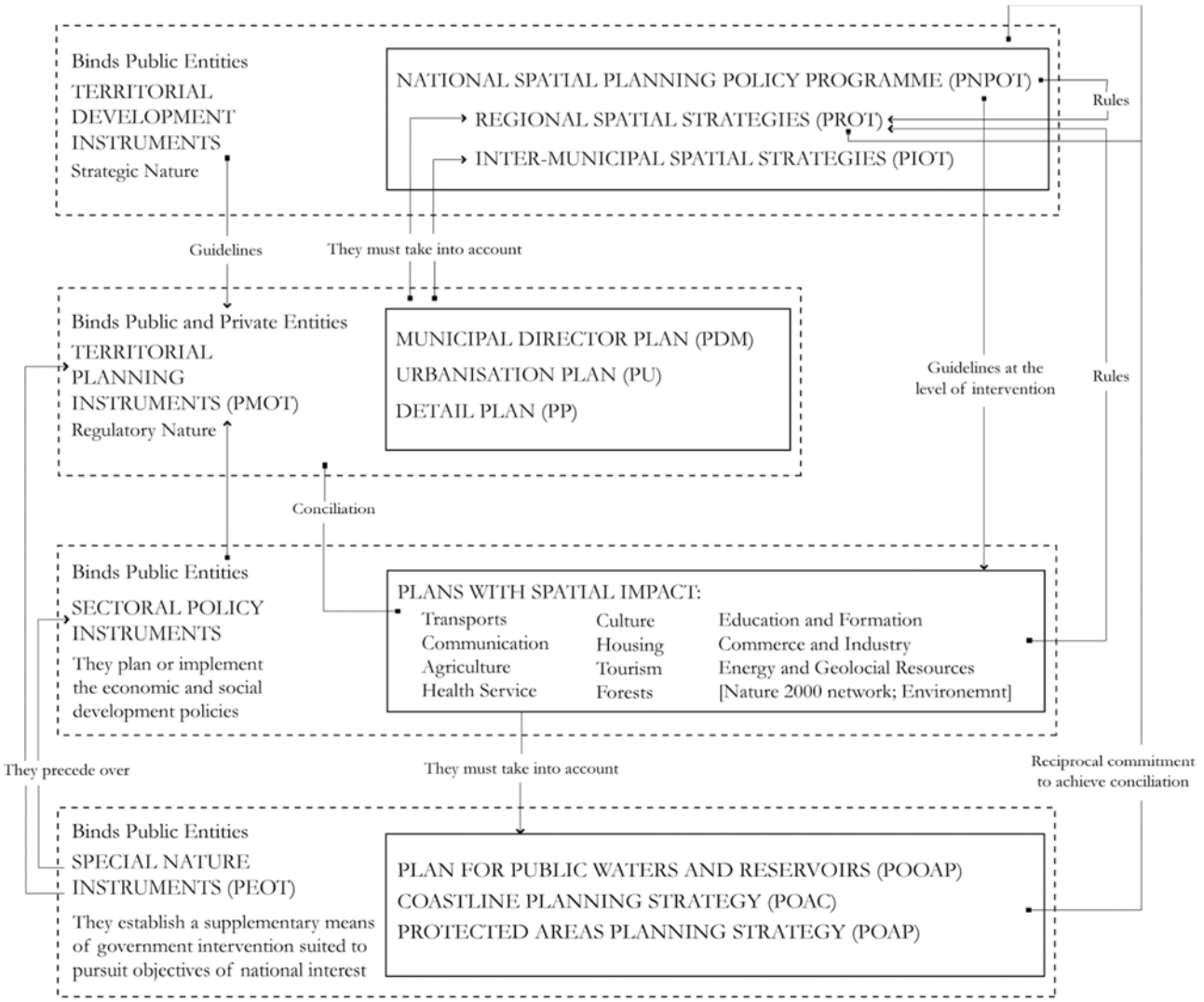


Fig. 18 The current spatial planning system framework in Portugal. Source: Mourato 2011

1.2.1 National planning

The National Programme for Spatial Policies (PNPOT)

The National Programme for Spatial Policies (*Programa Nacional da Política de Ordenamento do Território*) PNPOT is the top instrument of the territorial management system in Portugal. It defines objectives and strategic options for territorial development and establishes the model of organization for the national territory. The PNPOT is the reference framework for other territorial programmes and plans and a guiding instrument for strategies with territorial impact. The PNPOT was created by the Basic Law of the Territorial and Urban Planning Policy of 1998, with the aim of providing the country with a competent instrument for the definition of a prospective, complete and integrated vision of the organization and development of the territory, promoting the coordination and articulation of public policies on a territorial basis.

The development of the PNPOT is led by the Directorate-General for the Territory (*Direçãoo-Geral do Territorio,* previously DGOTDU, Directorate-General for Spatial Planning and Urban Development) of the Ministry of Environment and Spatial Planning, and the final programme is approved through an ordinary law by the national parliament.

The first PNPOT was approved in 2007, closing a 5-year long process of elaboration and discussion. Its development was influenced by the ESDP (1999) and by the European adoption of territorial cohesion as the third pillar of the EU (2007), and the document was instrumental in the programming of the cohesion policy 2007-2013 in Portugal. In 2014 the PNPOT was subject to an evaluation, which laid the basis for a revision of the programme started in 2016 and concluded with the approval of a new PNPOT in December 2019.

The PNPOT (in force since 2019) is composed of two parts: a strategic analysis and an action plan. The horizon of the programme is set to 2030 (mainly for the action plan), with long-term considerations reaching until 2050.

The strategic diagnosis is structured on three pillars:

- critical transformations and territorial trends:
    - climatic and environmental transformations,
    - socio-demographic transformations,
    - technological transformations,
    - socio-economic transformations.
- territorial principles and challenges:
    - territorial principles:
        - strengthen territorial governance and subsidiarity
        - promote dynamics of territorial organization
        - valorise local diversity and specificity
        - reinforce territorial equity and solidarity
        - promote sustainability in resource use
        - promote integrated territorial approaches
    - territorial challenges:
        - sustainable management of natural resources
        - promote a polycentric urban system
        - promote inclusion and territorial diversity
        - enhance internal and external connectivity
        - promote territorial governance
- territorial model:
    - natural system
    - social system
    - economic system
    - connectivity system
    - urban system
    - critical vulnerabilities
    - territorial model

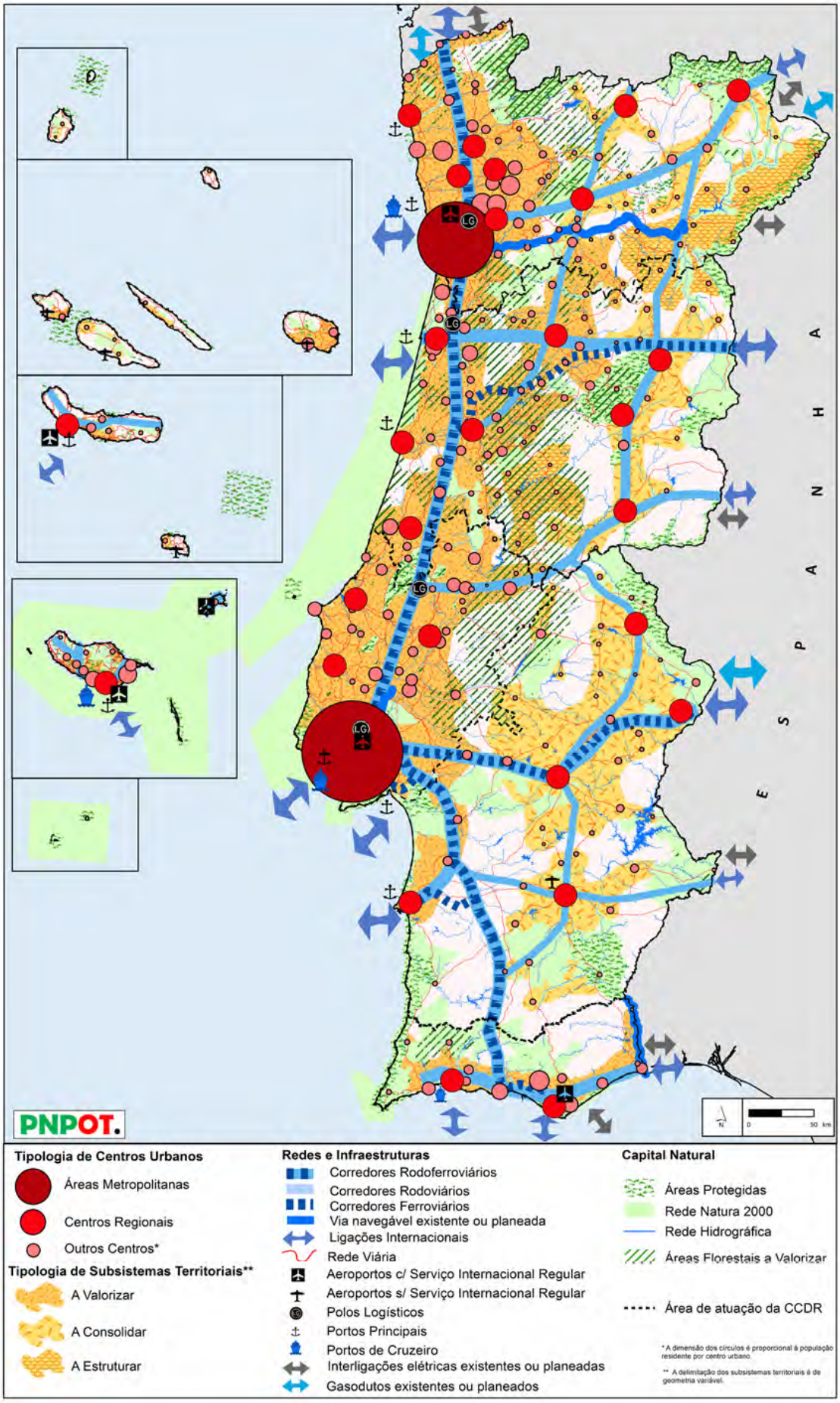


Fig. 19 Main Territorial Model of the PNPOT. Source: PNPOT 2019

The territorial agenda for 2030 is based on ten commitments:

- strengthen the territorial systems according to their centrality;
- attract new residents and manage the demographic evolution;
- adapt territories and generate resilience;
- accelerate the energetic transition;
- provide compensations for ecosystem service;
- enlarge the territorial economic basis through more knowledge, innovation and training;
- Promote collaborative initiatives to strengthen a new territorial culture;
- Integrate new approaches for sustainability in the spatial planning instruments;
- Decrease the exposition to risks through the spatial planning instruments;
- Enhance the territorial efficiency of the spatial planning instruments.

These commitments guided the choice of the policy measures of the action plan, which are organised in five dominions of intervention: natural, social, economic, of connectivity and of territorial governance. The policy measures are also systematised for the operationalisation of the territorial model presented in the strategic analysis, according to its six components listed above. Finally, the action plan identifies the guidelines for spatial planning tools development, updating and integration; and describes the governance model for the PNPOT (including monitoring and evaluation).

1.2.2 Regional planning

The Regional Programme for Spatial Planning (PROT)

A Regional Programme for Spatial Planning (*Programa Regional de Ordenamento do Território*, PROT) defines a model for the spatial organisation of a region. Namely it establishes:

- The regional structure of the urban system, of the infrastructures and of the public equipment of regional interest, granting the protection and valorisation of the areas of regional interest in terms of economy, agriculture, forestry, natural conservation, environment, landscape and heritage;
- The objectives and principles regarding the localization of activities and major public investments at the regional level, their priorities and respective programming;
- The spatial implications of the application at the regional level of the policies established in the PNPOT and in the sectorial plans in effect, and of the policies of regional interest to be developed through intermunicipal and municipal plans in the area;
- The environmental policies at regional level, including regional ecological structure for the protection and valorisation of the environment, together with the reception in the region of the environmental policies and measures prescribes by sectorial and special programmes.

The contents of a PROT consist of strategical options, guidelines, and a set of graphic materials illustrating the substantial directives defined, together with a scheme representing the proposed territorial model, containing the principal systems and networks of regional significance. Besides an environmental dossier, a PROT includes a programmatic dossier containing:

- The evaluation of the territorial dynamics; including evolution of the soil, transformation and occupation of land, demographic trends, structure of human settlements, and a projection of economic, social and cultural development of the region;
- The identification of landscape units;
- The analyses characterizing the regional structure for the protection and valorisation of the environment and heritage;
- The localization of agricultural, forestry and grazing lands having significance for the regional strategy of rural development;
- The representation of the networks for transport, mobility and public equipment;
- The implementation programme;
- The identification of financial sources and means.

A PROT also comprehends an environmental dossier which identifies, describes and evaluates the possible impacts on the environment of the application of the programme and the reasonable alternatives, considering the respective objectives and spatial ambit of application.

The responsibility for the development of a PROT is assigned to the Regional Commission for Coordination and Development (CCDR) of the region, while its approval is executed by the Government.

For a detailed description of a PROT, see chapter 3.4.

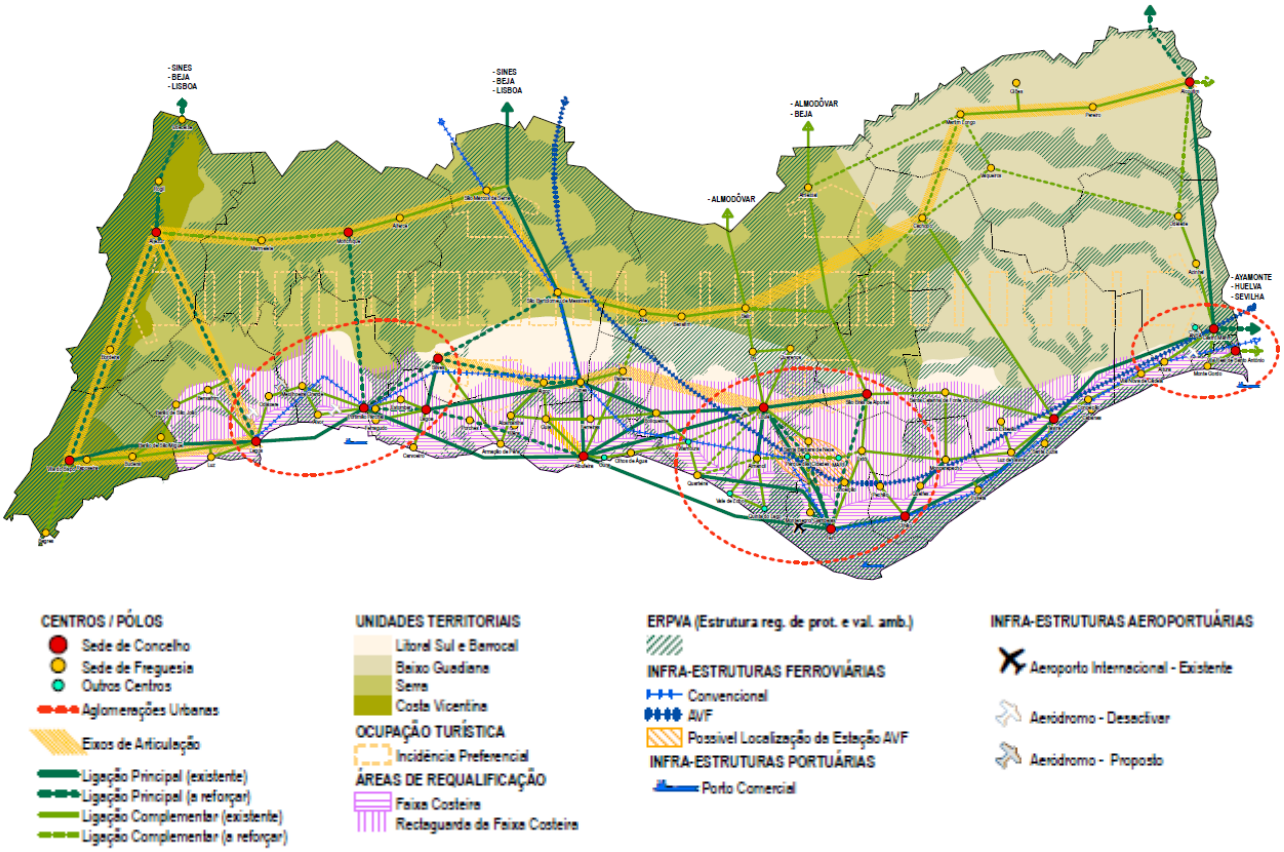


Fig. 20 Territorial Model of the PROT-Algarve. Source: CCDR Algarve

1.2.3 Municipal planning

The Municipal Director Plan (PDM)

The Municipal Director Plan (*Plano Diretor Municipal*, PDM) establishes the spatial development strategy of the municipality, the municipal policies on soil, land-use and urbanism, the municipal territorial model, the options for localization and management of public equipments and the relations of interdependency with the neighbouring municipalities, integrating and articulating the directives of the national, regional, and intermunicipal plans. The PNPOT and the PROT especially are guiding references for the development of a PDM.

The PDM provides the framework for the development of all municipal plans and for the sectorial interventions of the state administration in the municipal territory, in appliance of the principle of coordination of sectorial strategies. The adoption of a PDM is compulsory for all Portuguese municipalities. Its development is established though a deliberation of the Municipal Chamber (the executive organ of the municipality), and its approval is decreed by the Municipal Assembly (the deliberative organ of the municipality). To come into force, a PDM must first obtain the ratification of the State, and for this reason the local CCDR provides consulting services to the municipalities in the process of development of their PDMs. The municipal plans (and first of all the PDM) are the only spatial planning instruments that bind not only public but also private entities.

The municipal territorial model is based on:

- The classification of soil:
    - Urban;
    - Rural

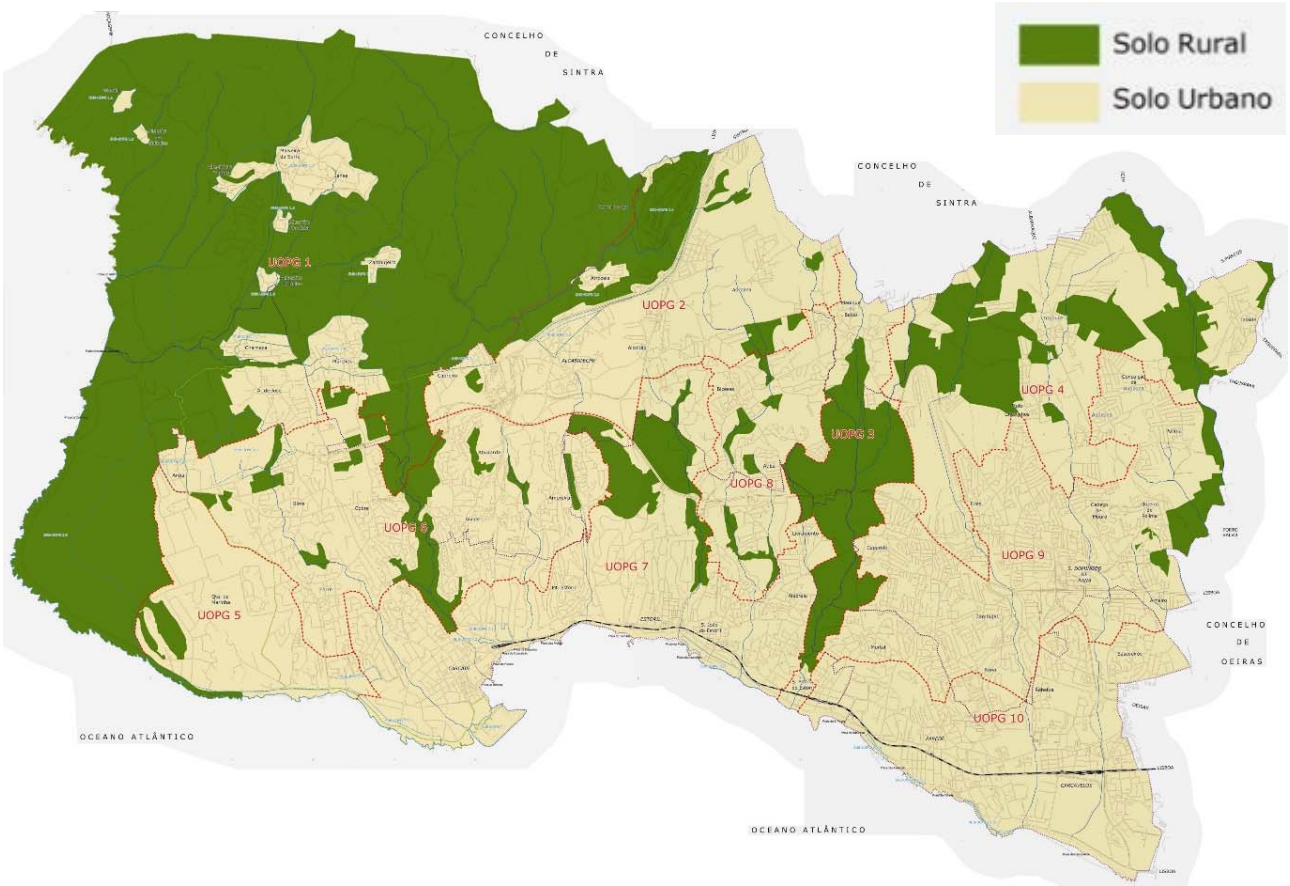


Fig. 21 PDM of the Cascais Municipality. Spatial plan - 0101 Classification of soil. Source: PDM Cascais 2017

The Qualification of soil:

- Urban:
  - Central space;
  - Residential space;
  - Space for economic activities;
  - Green space;
  - Space for special uses (recreation, tourism or loisir);
  - Low density space (periurban areas to be developed in terms of sustainability)
- Rural:
  - Agricultural space;
  - Forestry space;
  - Space for the exploitation of geological and energy resources;
  - Agro-industrial space;
  - Natural and landscape space;

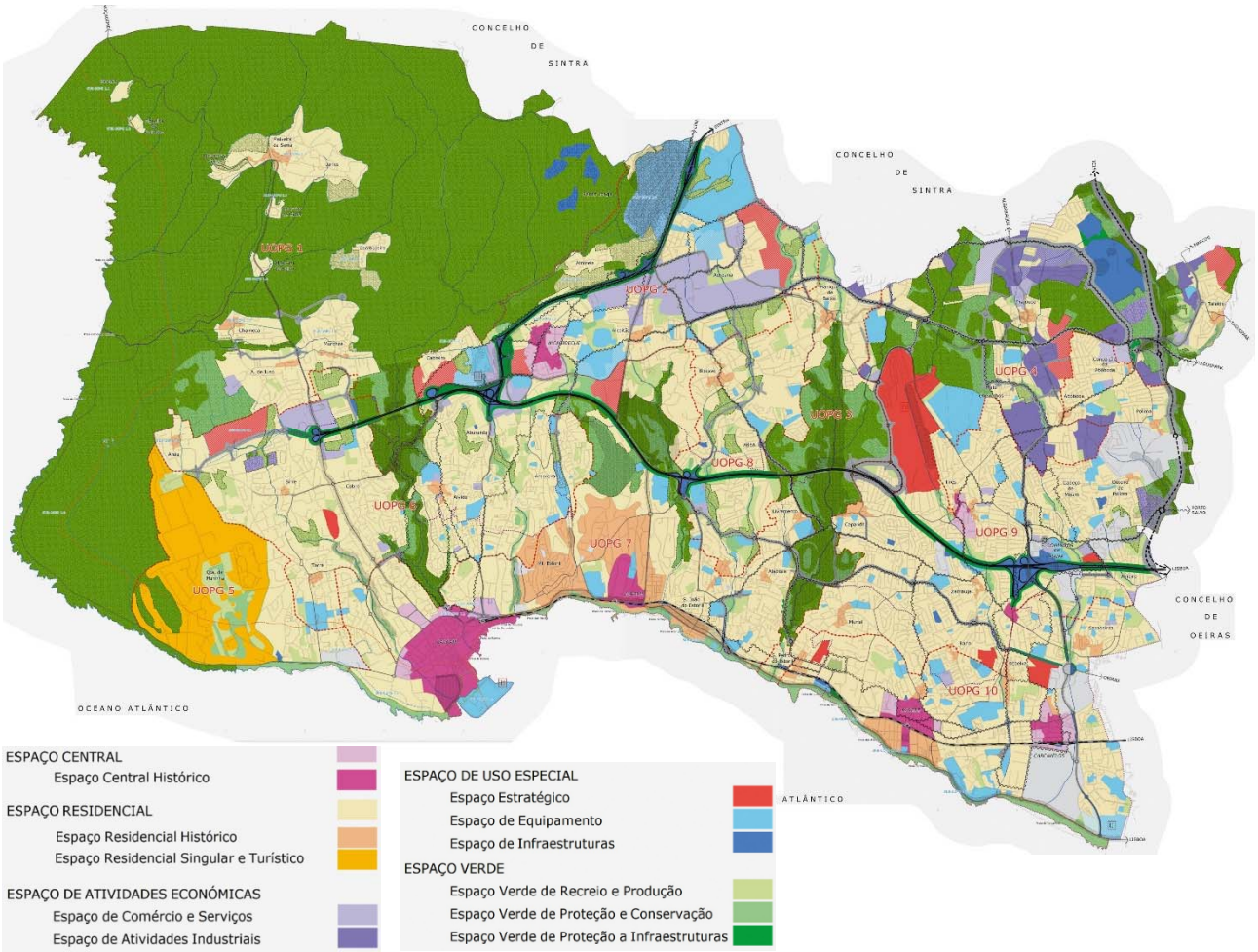


Fig. 22 PDM of the Cascais Municipality. Spatial plan - 0102 Qualification of soil. Source: PDM Cascais

A PDM establishes:

- The characterization of the municipal territory in economic, social and biophysical terms; including the identification of the cultural values, of the urban system, of the networks of transport, public equipments, education, public health and security, together with the systems for telecommunication, energy, gas, catchment, water provision and treatment, draining and treatment of effluents, waste deposit and treatment;
- The objectives of local economic development and the measures of municipal intervention in the land market;
- The identification of the municipal ecological structure and the sustainability principles to be adopted, together with the available means and proposed actions for the protection of natural, cultural, agricultural, forestry and water resources;
- The spatial organization of uses and activities through the definition of classes and categories of spaces;
- The strategy and principles for the localization, distribution and development of industrial, touristic, commercial and service activities;
- The identification and qualification of rural soil, granting the proper execution of the programmes and policies for the development of agriculture and forestry and for the management of geological and energetic resources;
- The identification and demarcation of the urban areas, defining the municipal urban system and the corresponding housing programmes, as well as the conditions for promotion of urban regeneration and rehabilitation, and for the reconversion of urban areas of illicit genesis;
- The identification of areas of public interest for expropriation, together with the respective management rules;
- The principles for the definition of areas to be ceded to the municipality for the provision of public services in new developments, and the related rules of management;
- The principles for compensation and redistribution of benefits and tasks of the urban management;
- The qualitative and quantitative specification of urbanistic parameters to be established in Urbanisation and Detail Plans, and in plans that are suppletive of PU and PP;
- The programming of the implementation of the planning options settled, and the definition of operational units for the management of the plan, identifying for each the objectives and the reference terms for the development of urbanization and Detail Plans;
- The identification of persistent conditioning factors, namely protection areas and reservations, as well as those necessary for the implementation of plans of emergencies and civil protection in the municipal ambit;
- The identification and demarcation of the areas aimed at the conservation of the archeologic information contained in the soil and subsoil;
- The conditions for intervention on urban rehabilitation areas and degraded urban areas in general;
- The articulation of the municipal territory organization model through the regulation of the employable municipal plans;
- The protection and conservation of natural resources and values that condition land occupation, use and transformation;
- The period of validity, monitoring system and conditions for revision of the plan.

A PDM is composed of:

- A regulation;
- A spatial plan (typically with 1:10 000 scale factor) representing: the model of spatial organization of the municipal territory, according with the structuring systems and the classification and qualification of soils, the operational units defined for planning and management, and the demarcation of the areas for the protection of natural values and resources;
- A map of the conditioning factors (typically with 1:10 000 scale factor), identifying the administrative easements and the restrictions for public utility in force, which can constitute limitation and impedance to any form of exploitation, including the areas of natural, environmental, cultural and heritage significance

It is also attended by:

- A report of the plan, which explicates the strategy and model of local development, namely the strategic objectives and the options with territorial basis adopted for the spatial organisation model, as well as the respective technical foundations, supported by the evaluation of the environmental, economic, social and cultural conditions for implementation;
- An environmental dossier, where are identified, described and evaluated the potential effects on the environment of the application of the plan and the reasonable alternatives, considering the respective objectives and scope of application;
- An implementation programme, containing dispositions on the execution of the priority interventions of the State or municipality in the mid-term, and the framing of the State and municipal interventions in the long-term;
- A plan for financing and assuring economic and financial sustainability.

Fig. 23 PDM of the Cascais Municipality. Map of the conditioning factors - 0203 Infrastructures.

Source: PDM Cascais 2017

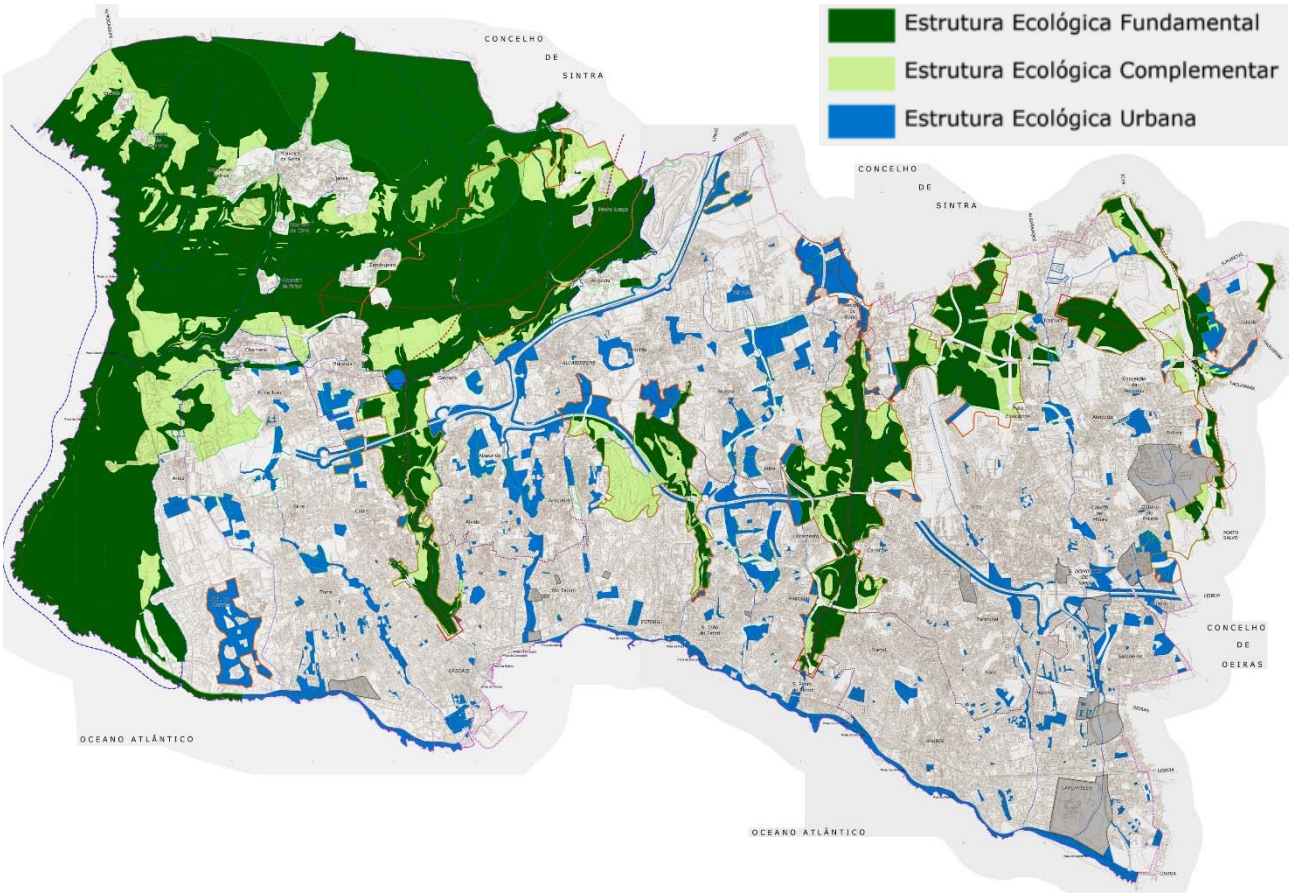


Fig. 24 PDM of the Cascais Municipality. Spatial plan – 0103 Municipal Ecological Structure.

Source: PDM Cascais 2017

Finally, a PDM comprises the following complementary components:

- A regional contextualization map, which indicates the main urban centres, communication routes, infrastructures and equipments, and reports the programmes and plans in force on the municipal territory;
- A map of the current situation, showing the land occupation at the date of deliberation of the development of the plan;
- A plan and report informing on the urban works in process, comprising the respective bureaucratic references such as licenses and authorisations;
- A noise map;
- A report on the public discussion phase and on its ponderation;
- A set of qualitative and quantitative indicators to support the monitorization of the plan.

The Urbanisation Plan (PU)

An Urbanisation Plan (*Plano de Urbanização*, PU) develops and concretizes the PDM. It structures the occupation and use of land, providing the framework for the application of urban policies and localizing infrastructures and public equipments. The areas that can be object of a PU are:

- Any area internal to a urban perimeter as defined by the PDM; plus areas of rural soil complementary to one or more urban perimeters, that are necessary to operate an integrated planning intervention;
- Other areas of the municipal territory that can be allocated for urban uses and functions, such as parks and equipments for industry, logistics or services, or touristic enterprises and associated infrastructures.

An Urbanisation Plan determines:

- The definition and characterization of the intervention area, identifying and demarcating the cultural and natural values to protect and the archeologic information contained in the soil;
- The general setting of the urban organization; comprising the qualification of soils, the structuring road network, the localization of public equipments, the ecological structure, and finally the urban system of circulation and of public and private transport and parking;
- The zoning of the various urban functions, namely residential, industrial, commercial, touristic, for services, or for waste management, together with the identification of areas to recover, regenerate or convert;
- the adaptation of the urban perimeter defined in the PDM, according to the defined zoning and general setting of the urban organization, including the tracing and dimensioning of the networks of general infrastructures that structure the area, and the principles for locating and dimensioning the public equipments;
- The conditions of application of the instruments for soil and urban policies prescribed by the law, specifically those concerning the rehabilitation and regeneration of degraded urban areas;
- The urbanistic indicators and parameters that can be applied to each of the spatial categories;
- The scope and objectives of the operational units for planning and management, the procedures of compensation and redistribution of benefits and tasks, and the system of implementation of the plan

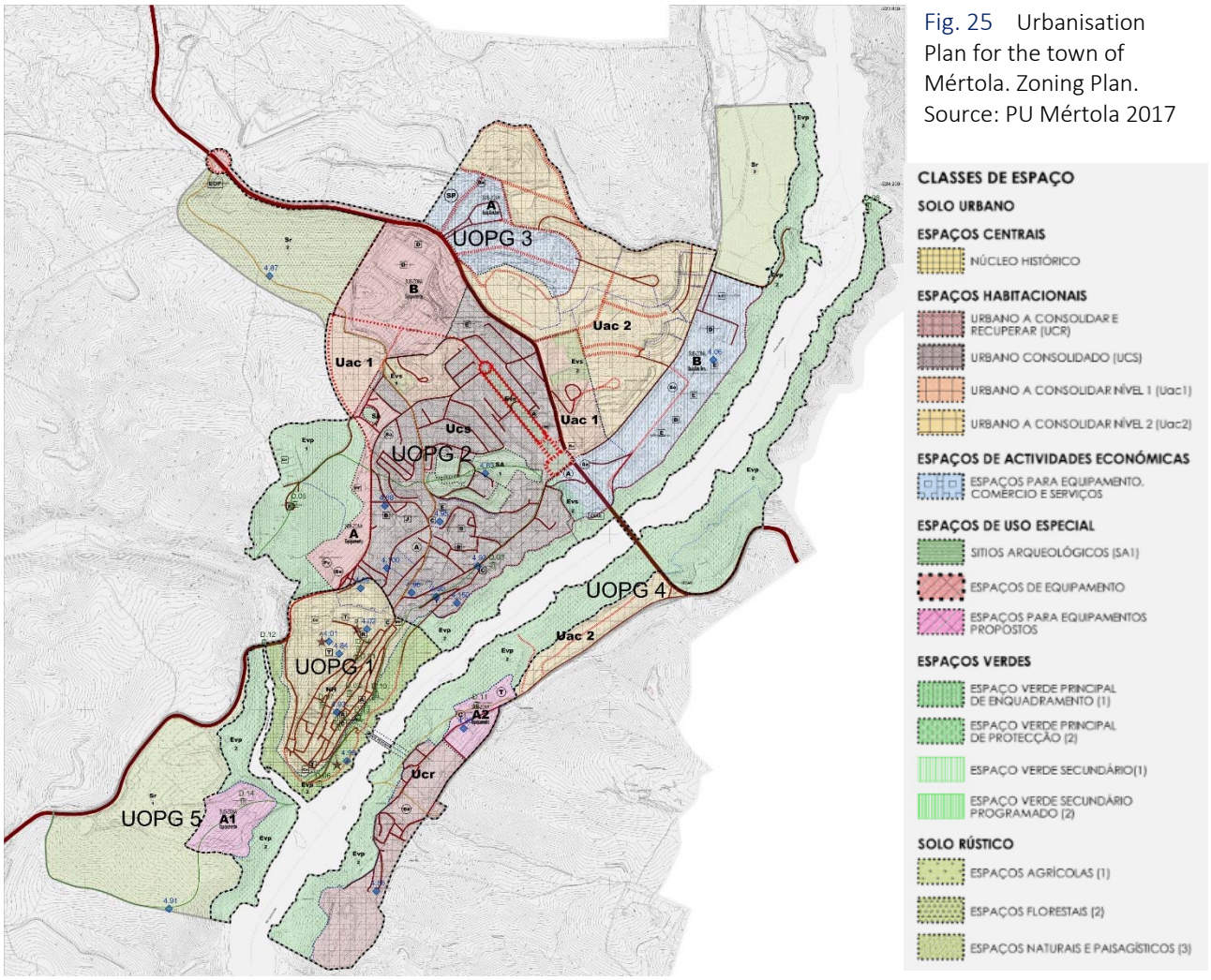


Fig. 25 Urbanisation Plan for the town of Mértola. Zoning Plan. Source: PU Mértola 2017

An Urbanisation Plan is composed of:

- A regulation;
- A zoning plan (typically with 1:2000 or 1:5000 scale factor) based on a qualification of soil analogous to that of the PDM;
- A map of the conditioning factors (typically with 1:2000 or 1:5000 scale factor).

Additionally, it includes:

- A report of the plan, which explicates the strategy and model of local development, namely the strategic objectives and the options with territorial basis adopted for the spatial organisation model, as well as the respective technical foundations, supported by the evaluation of the environmental, economic, social and cultural conditions for implementation;
- An environmental dossier;
- An implementation programme;
- A model of redistribution of benefits and tasks;
- A plan for financing and assuring economic and financial sustainability.

The Detail Plan (PP)

A Detail Plan (*Plano de Pormenor,* PP) develops in detail the proposal for occupation of an area in the municipal territory, establishing rules for the footprints of infrastructures, for the design of public spaces, for the footprint and volumetry of buildings and for their integration in the landscape, for the localisation and organisation of public equipments. A PP covers contiguous areas of the municipal territory, constituting a part or the whole of a unity or sub-unity of planning and management.

A Detail Plan determines:

- The definition and characterisation of the intervention area;
- The projected transformations of lots and the rules for urbanisation works;
- The urban project;
- The distribution of functions and the definition of urbanistic parameters;
- The operations of demolition, conservation and rehabilitation of existing constructions;
- The rules for occupation and management of the public spaces;
- The implantation of infrastructure networks;
- The regulation of edification works;
- The identification of systems for the plan implementation and its timeframe, and for the programming of the relative public investments and their articulation with private investments;
- The definition of procedures for compensation and redistribution of benefits and tasks.

A Detail plan contains:

- A regulation;
- An implantation map (typically with 1:1 000 scale factor);
- A map of the conditioning factors (typically with 1:1 000 scale factor).

QUADRO SÍNTESE

UNIDADE DE EXECUÇÃO (m2)		PARCELA	ÁREA PARCELA (m2)		ÁREA IMPLANTAÇÃO (m2)		Nº DE PISOS	ÁREA DE CONSTRUÇÃO DO EDIFÍCIO (m2) HABITAÇÃO	MISTO	TERCIÁRIO	ESTACIONAMENTO	LUGARES DE ESTAC [8]	PARCELA	ÁREA TOTAL CONSTRUÇÃO (m2)	Nº DE FOGOS [7]	EQUIPAMENTO (m2)	ALTURA DE EDIFICAÇÃO (m)	ÁREA DE IMPERMEABILIZAÇÃO (m2)	ÍNDICE OCUPAÇÃO DO SOLO (%)	ÍNDICE DE IMPERMEABILIZAÇÃO (%)	VOLUMETRIA DO EDIFÍCIO m3)
1	29 233.89 [9]	01	3 473.66	A	737.30	1 474.60	20		14 000.00		9 988.70	400	[3]	24 623.42	40 [7]		100.9	3 473.66	42.45	100	74 393.57
				B	415.91		1			423.38					N/A		N/A				N/A
				C	119.03		3						[1]		N/A		N/A				N/A
				D	202.36		2		211.34				[2]		N/A		7.5				1 517.70
		02	3 054.15			1 221.28	7	7 327.68			2 270.58	91	[2]	9 598.26	54		9	3 054.15	39.99	100	10 991.52
		03	6 059.47	A	6 059.47	6 059.47	3			1 731.56	10 480.70	419		13 969.97	N/A		N/A	6 059.47	1	100	N/A
				B	491.20		1			491.11					N/A		9				4 420.80
				C	522.74		2			1 083.30					N/A		4.5				2 352.33
				D	150.82		1			183.30					N/A						0.00
		04	1 997.74	A	468.02	1 023.98	4	1 403.37			1 929.07	77	[2]	5 711.29	27		33.3	1 929.07	51.25	97	15 585.07
				B	315.96		3	631.92					[2]				11.6				3 665.14
				C	240.00		9	1 440.00		306.93			[4]				33.3				7 992.00
		08	15 475.59		N/A		N/A					[6]	[5]	N/A	N/A		N/A	N/A	N/A	N/A	N/A
2	4 500.00 [9]	05	1 167.77			560.12	4	1 660.00			1 171.12	47	[2]	2 831.12	9		13.95	1 167. 77	47.96	100	7 813.67
		06	1 363.03			921.13	4	2 840.00			1 363.03	55	[2]	4 203.03	21		13.95	1 363.03	67.58	69	12 849.76
		07	1 161.46			441.25	3					[6]	[5]	N/A	N/A	1 323.75	11.5	441.25	37.99	38	5 074.38
ÁREA TOTAL PPRUFC (m2)		TOTAL						15 302.97	14 211.34	4 219.58	27 203.20	1 089		59574.06	151	1 323.75					
103 399.61																					

Fig. 26 Detail Plan for the Urban and Functional Rehabilitation of Cacilhas (in Almada municipality). Implantation plan. Source: PPRUFC Almada 2018

These are associated to:

- A report providing the technical justifications for the solutions proposed in the plan;
- An environmental report;
- Additional materials for support of the operations to be implemented;
- An implementation programme;
- A model of redistribution of tasks and benefits;
- A plan for financing and assuring economic and financial sustainability.

Intermunicipal plans

The Intermunicipal Plan (*Plano intermunicipal de Ordenamento do Território,* PIMOT) was introduced for the first time in the 1990s, as a means to develop sub-regional strategies or to administrate particular areas divided among more municipalities. In 2014 the reformed Land Act has granted to the Intermunicipal Plan the same legitimacy of the PDM. This means that a municipality can now choose, in association with contiguous municipalities, to adopt a PIMOT instead of a PDM. These tools, however, have not spread significantly, and their use is still confined to very few exceptional cases.
In any case, the 2014 Land Act has also introduced Urbanisation Plans and Detail Plans of intermunicipal scale, therefore intermunicipal planning comprises now the same components of municipal planning, and the descriptions of municipal plans above are also valid for analogous intermunicipal tools.

1.3 Discourse

1.3.1 Urban network, regional disparities, and national competitiveness

At a first glance, the unbalance of human settlements between the littoral and the interior is the most prominent characteristic of the human geography of Portugal. The State has always been strongly centralised, and the priority areas for public investments have always been the two metropolitan poles, in the name of national competitiveness. Additionally, since the XV century maritime exchanges represent the main resource for the economic growth of the nation, reinforcing the preference for coastal settlements that has structured the country since its foundation. The peripherality of the country has never encouraged investments towards the continent; and in recent time the Interreg programmes of collaboration with Spain have not produced a turning point in the urban network, except in the rare brief tracts of the border with sufficient density on both sides (mainly in the northern portion and in the Elvas-Badajoz corridor).

The regional disparities in urban infrastructures, job availability, social services, and demographic trends, have risen as a major theme of national debate since the 1960s. Namely, the III Economic Development Plan (1968-73) has acknowledged for the first time the counter-productive effects of the previous plans, proved by the simultaneous depopulation of the interior and congestion of the surroundings of Lisbon and Porto. The plan introduced therefore a series of initiatives for governmental investments in less favoured regions aiming at an equal development throughout the national territory. This new approach has brought the introduction of regional planning practices in Portugal, which nonetheless have been abruptly interrupted by the 1974 revolutionary process. The new republican aspirations, based on the ideals of sovereignty of local communities, have abolished all interference of the Government in regional affairs, in favour of the new regional democratic administrations to be instituted. The administrative regions, however, have never been implemented, and Portugal has been left for two decades with no univocal strategies at the regional scale.
The Government has proceeded in facing regional disparities with a reiterated distinction of its development strategies for the littoral and interior macro-regions, aiming at the structuring of a solid hierarchical urban network covering the whole territory. The hierarchy of urban centres, in fact, has always been very unclear (except for the major poles of Lisbon and Porto) for the lack of coordination in the dynamics of development at the regional scale. The district capitals (see Fig. x) have achieved urban status throughout the 1980s attracting the decentralisation of

public offices and the settlement of the immigrant population of Portuguese origin escaped from the former African colonies in the previous decades. The dismissal of the districts in later years, however, has in many cases deprived these centres of the supremacy on their sub-regional context. In the meantime, the immigrant population of foreign origin (which for the falling of the national birth rate has become determinant for demographic growth) has kept concentrating in the metropolitan areas, further enlarging the populational gap between these and the rest of the country.

Globalisation, forcing cities worldwide to compete for survival, has had a strong impact on the national dynamics, fostering the national priority of larger metropolitan agglomerations that could impose themselves in the Iberian, European, and Atlantic networks. At the same time, the introduction of the European CSF (since the 1990s) has produced a season of large investments in public infrastructure, especially addressing the road network, which have transformed radically the relationships among regions, shortening considerably the distances among them. Thus, the polycentric enlargement of the metropolitan agglomerations (mainly the capital one) for international competition has become the new strategical objective at the turn of the century.

The urban system presented by the first PNPOT (2007) testifies this trend, subordinating most centres to the Lisbon and Porto metropolitan arcs. Echoing the concurrent administrative experiment of the Urban Communities (small-scale metropolitan systems), the two arcs are connected through the creation of a central metropolitan system, resulting from the aggregation of three rising centres with a pole on Coimbra, while the surviving cities in the interior are left isolated with no clear development lines. The expansion of the Lisbon metropolitan region would have been the key to the whole process, supposedly providing the nation with a gateway of global relevance. This expansion, even if already effective in functional terms since the 2000s, has lacked political leadership for its complete fulfilment, and the 2010s crisis has finally silenced ambitious development plans throughout the country. The second PNPOT (2019) appears much more refined in its model of urban system, proposing a unified network based on interurban relations and consequently postulating territorial systems to valorise, consolidate or structure.

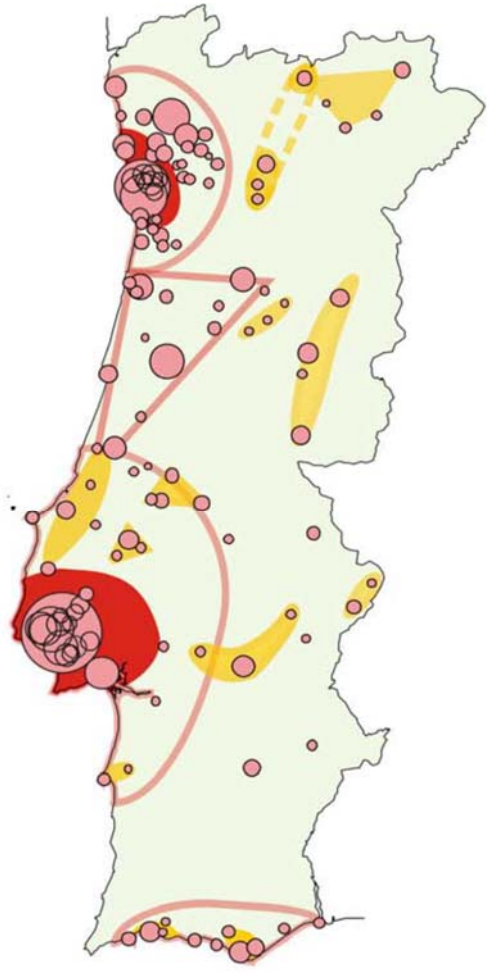


Fig. 27 Urban system in the first PNPOT (2007). Source: SIG PNPOT, 2006

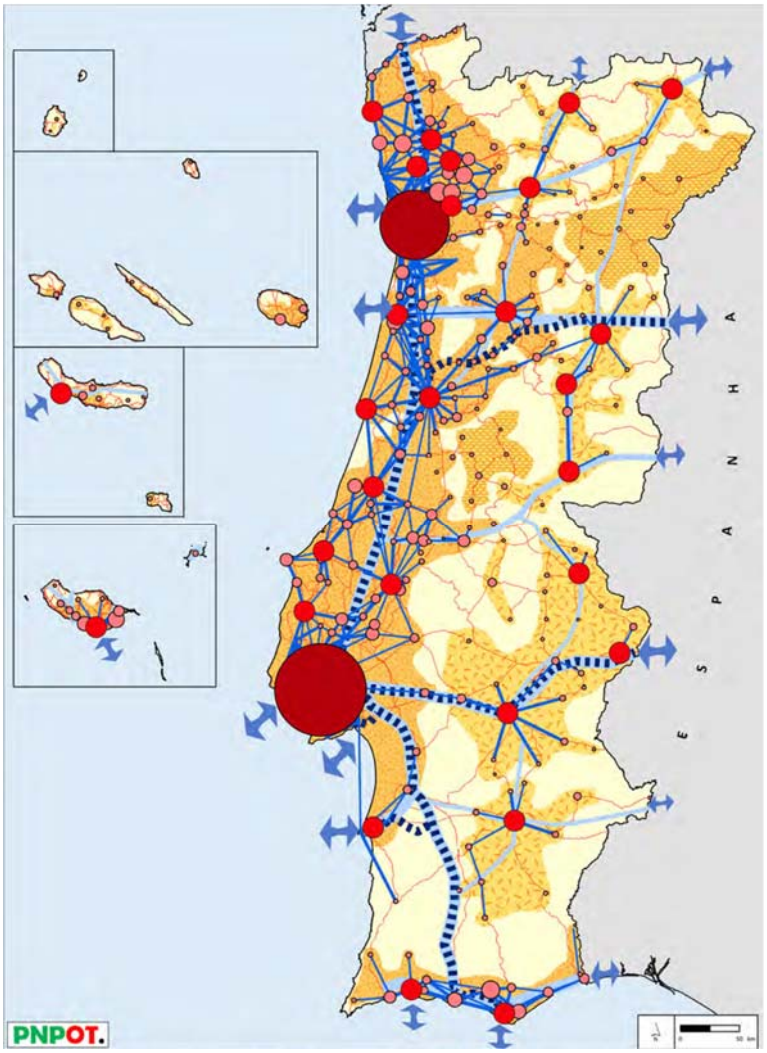


Fig. 28 Urban system in the second PNPOT (2019). Source: SIG PNPOT, 2019

In the last twenty years, in any case, the issue of regional asymmetries has mostly left the national debate to be integrated in the European territorial cohesion policy, and is now centred on the rural space rather than on the urban network.

Finally, to be interpreted correctly, the littoral vs interior issue needs to be related to a broader set of asymmetries: urban vs rural, centre vs periphery, and capital vs regions (or Lisbon vs Norte). The latter, in particular, provides interesting details in the unceasing reverberations that it originates in the political arena. With the restriction of the Lisbon NUTS II area to the proper Metropolitan Area (AML) in 2002, the capital has renounced to most of the European funds (in favour of the Centro and Alentejo regions) and has started being identified, among the public opinion, as the designated area of Government pertinence. While the Algarve region can survive without receiving EU funds (thanks to the most developed tourism economy), the AML (concentrating a third of the country's population) strives hardly to gather enough funds to fulfil its tasks. Though various plans projected its enlargement, the AML has actually been in many ways downsized and seceded from its sphere of influence, minimising its potential for growth. The lack of international competitiveness of Lisbon does not represent a problem only for the capital, but gravely undermines the benefit of the whole country, which in this situation lacks a development hub and global gateway, and in short cannot have access to global affairs. The intervention of the Government, which could compensate for the European funds in the AML, is opposed by the other regions in the political scene. Namely, the Norte region, accounting for the highest regional contribution to the national GDP, exerts the stronger pressures on the Government, systematically accused of favouring the capital (i.e. itself). These remarks are often advanced directly by the Porto Metropolitan Area (AMP) which, having never officially parted from the Norte region, is the only metropolitan area to receive substantial funds from the EU. Obviously, without the AMP the Norte could never result the most productive region, nor enjoy such exceptional representation in the national arena, and so both parties profit conspicuously from this alliance.

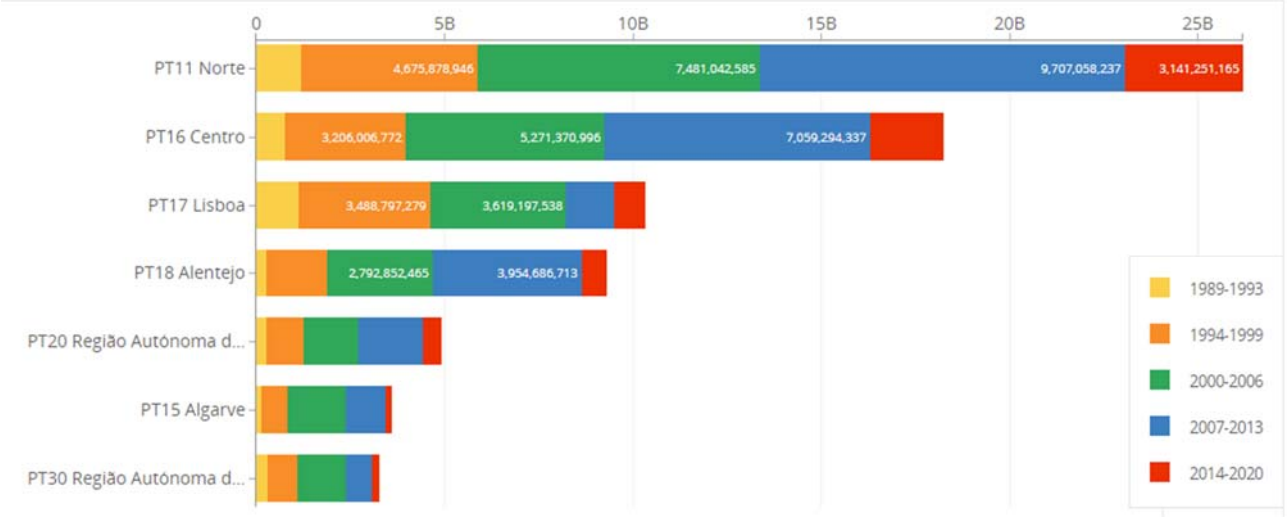


Fig. 29 Historical EU payments to Portugal by NUT II region. The Lisbon region has been reduced to the strictly metropolitan area in 2002. Source:cohesiondata.ec.europa.eu

1.3.2 The intermediate level of governance

Historically, the most relevant subdivision of the national territory are the districts (distritos). These were created in 1835, inspired by the French *départements*, as decentralized organs of the State, whose chief officers were nominated by the Government. Mainland Portugal was therefore subdivided in eighteen districts, each covering the sub-regional area gravitating around a major city, which gave its name to the district and housed its offices. Through time, the districts have become a strong reference for the population, who often still recognize them as the only subdivisions of Portugal. Nevertheless, the Republican Constitution of 1976 specifically identified, as first level divisions of Portugal, the autonomous regions (Azores and Madeira) and the administrative regions (to be created in Mainland Portugal). The Constitution defined the districts as a transitional level of administration, awaiting the formation of the administrative regions. In the constitutional intent, the administrative regions were

granted equal legitimacy with the national government and the municipal authorities, being thought as public bodies democratically elected by the citizens of the corresponding territory.

In 1980, the Government published a White Book on Regionalisation, and throughout the first two decades of the Republic the projects for regional subdivision have been numerous, elaborated both by official organs and political parties. None of these projects, however, satisfied a sufficient portion of the population, who started to lose interest and trust in the regionalisation process. Finally, in 1998 a referendum asked the public opinion on regionalisation and on the proposed institution of eight administrative regions in compliance of the Constitution. Beside the fact that the number of citizens participating did not even reach the 50% (nullifying the consultation), the 60% of the voters rejected the regions proposed as well as the regionalisation project per se. In short, the main obstacle to regionalisation can be traced back to the prevailing reluctancy of the citizens to associate in regions whose boundaries are not based in what they recognise as their regional identity. These boundaries are in many cases hard to define, and above all it is improbable that such regions would be homogeneous in size (area and population) or would assure an equilibrated development. It is important to note that, typically,

Fig. 30 Historical districts of Portugal.

the Portuguese people tend to recognise themselves in a binary identity based on their hometown (or parish) and nation (Portugal), while a regional identity is usually not significant for the population.

In any case, the referendum put to an end to the efforts of the Government for the implementation of the constitutional administrative regions, and in the early 2000s a new debate started, aiming at filling the gap of intermediate governance in Portugal. To explain the conclusions reached, it is necessary to point out two elements that had proved very significant in the previous decade:

- the subdivision of Portugal (since 1989) according to the Nomenclature of Territorial Units for Statistics (NUTS) elaborated by the European Statistical office;
- the foundation, in 1991, of the metropolitan areas of Lisbon and Porto.

Fig. 31
Portuguese NUTS II and NUTS III regions in 1999. Source: INE

The introduction of the NUTS subdivisions was instrumental in the eligibility of Portuguese regions for the Cohesion and Structural Funds. The management of these funds, which played a pivotal role in the unprecedented season of public works during the 1990s, called for the creation and strengthening of suitable territorial organs, that would therefore be assigned to the regions defined by the NUTS II and III subdivisions.

Namely, the NUTS II regions approved correspond to the five planning regions that were introduced in the pre-revolutionary period (Norte, Centro, Lisboa e Vale do Tejo, Alentejo e Algarve). These regions had started receiving decentralized offices of the State in the early 1970s, with the Planning Commissions. Already in 1979 these had been substituted by the Commissions for Regional Development (CCR), which received though the years some bureaucratical competencies theoretically entitled to the administrative regions. With the start of the CSF cycle, the CCR were greatly empowerment and started assuming a proactive approach to planning. These organs were reformed in 2003 as Commissions for Regional Development and Coordination (CCDRs), receiving a better legitimation and more responsibilities. Their functioning has been subject to a number of reforms, but they have never risen to become publicly elected bodies, instead the Government still plays a key role in the determination of their officers.
Nonetheless, the CCDRs can be seen as consolidated institutions, through which the national policies are quite effectively spread in the territory. In the field of spatial planning, the CCDR:

- provide technical support to the municipalities for the correct elaboration of plans;
- are responsible for the elaboration of the PROTs, which guide the implementation of the PNPOT in the regions and provide strategical directions at the regional scale;
- operate in the inter-sectorial coordination of policies;
- are the competent authorities for RAN (Agricultural National Reserve) and REN (Ecological National Reserve), as well as for the general protection of the environmental resources in the region, which is also included in the PROTs.

Concerning the NUTS III level, the delimitation of regions was less easy because there was no significant reference for regional units of that size (the districts were usually larger in both population and area). Furthermore, in the first stages of the cohesion policy there was not great emphasis stressed on this level; while in Portugal at the same time the districts were still operational in some sectors.

In the meantime, however, the metropolitan areas of Lisbon and Porto had been created in 1991, with the aim to impose order on these large conurbations, at the time over-populated and gravely deficient in terms of social services. The metropolitan areas were designed on the model of free associations among the municipalities of a conurbation, whose tasks are largely simplified by the shared management of common issues. The metropolitan configuration of these regions made for a relative success of these associations, which started being regarded as a new model of supra-municipal administration. Thus, in the post-referendum regionalisation debate of the early 2000s, emerged the idea to extend the formation of intermunicipal associations to the whole territory.

A law passed in 2003 supported the creation of more intermunicipal communities, specifically of three types: Great Metropolitan Areas (the already existing metropolitan areas of Lisbon and Porto); Urban Communities (analogous to the former but smaller, with a minimal population of 150 000); and

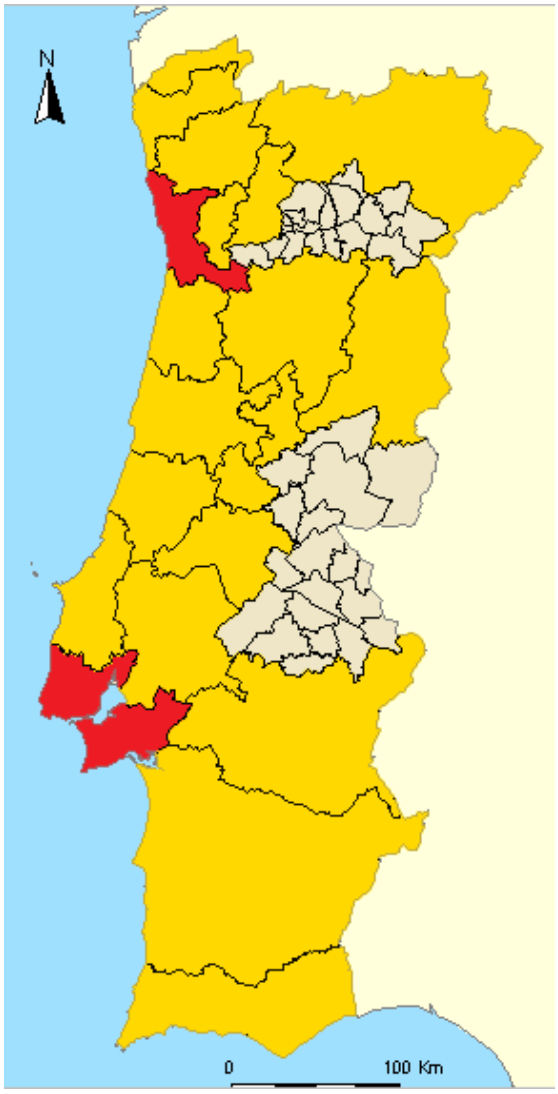


Fig. 32 Urban Communities (in yellow) and Great Metropolitan Areas (in red) around 2007. Source: ComUrb Oeste

Intermunicipal Communities for general purposes, which however did not receive much attention or competencies in the first place. After a law in 2008 that unified the three categories, law 75/2013 specifies two types of administrative regions: metropolitan areas (áreas metropolitanas) and intermunicipal communities (comunidades intermunicipais). The intermunicipal communities, now based by law on the NUTS III statistical regions, became obligatory, replacing the urban communities, the intermunicipal communities for general purposes and some metropolitan areas that were created in 2003 and abolished in 2008.

Already in the 2000s, but especially since 2011 (with the new European Territorial Agenda), the NUTS III level gathered increasing interest by the European organs responsible for the cohesion policy, for the key role it can play in Integrated Territorial Development policies. In this way authorities with relevant competencies over NUTS III regions have started managing significant portions of the cohesion policies in their areas. In Portugal, the intermunicipal communities (CIM) have gained in the last twenty years a substantial weight in the administration for various reasons:

- their relatively autonomous organisation, together with the limited size, allows for an effective association of the municipalities, which have always been disinclined to regional aggregations;
- they are able to concentrate a basic amount of qualified human resources that gather a comprehensive knowledge of the territory, whereas municipalities very seldom can afford such offices;
- in the providing of services to the citizens, they often grant an efficiency that is significantly superior to the one that could be offered by the single municipalities, which usually are gladly willing to delegate these tasks to the CIMs;
- they are the better option available to substitute the districts, which have not been abolished (as expected) with the 1998 referendum, but with the gradual transfer of their competencies to the CIMs and other organs (including the CCDRs).

In the field of spatial planning specifically, the intermunicipal communities do not have any official competence other than the elaboration of Intermunicipal Director Plans (PIMOTs), which today can even substitute PDMs but have not a large diffusion yet. In any case, through the management of the CSF since the 1990s, the CIM have obtained a primary role in soft planning and social service policies, which today exert a decisive influence on spatial transformations. The coordination by the CIMs of the climate change adaptation plans exposed in chapter 4 is a perfect example of this.

In sum, the main institutions for the intermediate level of governance in Portugal today can be identified in:

- the CCDRs, of regional scale, that are the main responsible for hard planning processes;
- the CIMs, of sub-regional scale, that are the main responsible for soft planning policies (see chapter 1.3.3).

Fig. 33 Portuguese NUTS II and NUTS III regions in 2013. Source: INE

1.3.3 Role and scope of spatial planning

As reported in chapter 1.3.1, spatial planning has developed in Portugal as a common ground for various professionals and political actors. Accordingly, the Government has subordinated planning to the prevailing development policy of each period: urbanism, regional economy, environmental policies. Through the LBPOTU framework and the PNPOT process, since the early 2000s, a new interpretation of spatial planning as an autonomous public policy has been advocated, although failing to impress a lasting mark in Portugal. Rather, in later years planning has been reconfirmed as a tool (among others) for the correct implementation of sectorial policies, mainly environmental. Despite the fact that spatial planning in universally recognised as a transversal inter-sectorial policy with no fixed boundaries, its configuration in Portugal can appear more as a multiplicity of sectorial policies which recently started measuring their spatial impacts and mutual dependencies.
The lately developed spatial planning system suffers greatly from the inconstancy of the national Government, which still determines the sorts of planning in Portugal. Significantly, all the structural reforms of the Portuguese planning system have succeeded thanks to the leadership of Ministers with a thorough understanding both of the local and of the national planning dynamics. The prevailing of the Directorate-General for planning, over those managing environmental, economic or administrative policies, has also proved of primary importance in the process. These two factors, though, have rarely been verified, mainly for the usual disinterest of the Government in investing in reforms of the planning system, and for the habitual supremacy that economic or environmental considerations tend to have over other contributions in the Government.

The Portuguese planning system is predominantly judged as over regulative and lacking strategical value. After forty years since the introduction of the PDM, the efforts made to simplify and accelerate its process of elaboration are still far from satisfying the needs of many municipal authorities. The emphasis on strategical planning, in any case, has grown enormously in the last decades, especially in the European discourse, while the Portuguese planning system was still mostly unprovided of effective regulative tools. In any case, with the introduction of the PNPOT since 2007, and with the subsequent second generation of Regional Plans, the Portuguese system has improved greatly in strategical contents, and the gap that still separates it from other more consolidated European national systems has been largely reduced since the start of the century.

The shifting affiliation of planning in various policy sectors, together with its late emergence as an independent dominion, explain the lack of both a consensual academical community and a cohesive professional association dedicated to spatial planning in Portugal. Generally, universities do not provide an interdisciplinary formation, and spatial planning is taught as a sub-dominion of broader disciplines such as architecture, engineering, or geography, precluding the potential development of an autonomous professional community. The adepts' societies reflect this fragmentation, with the proliferation of minimal associations of specialists that rarely engage in common debates (see chapter 1.1.3 - 2000-2010: establishment of multi-level spatial governance). The lack of a common ground for the discussion and development of spatial planning on its inter-sectorial bases can be identified as the main cause of the recurring discrepancies in the interpretation of the planning process by the various stakeholders involved, including sometimes even the same technical personnel. Furthermore, the scarce visibility that planning enjoys in the national media coverage (together with the usual exiguousness of the work of dissemination carried out by the authorities) encourage the prevailing negative image among public opinion of spatial planning as a bureaucratic obstacle to free enterprise or as an institutional legitimation of real estate speculations.

In any case, the growing relevance of spatial planning in European strategies has provided the national community of both an extensive potential for development and an authoritative support for planning initiatives. The introduction at the continental scale of a unified language, of a consistent framework for spatial planning, of a clear set of common priorities, together with the regular shared experimentation and debate of solutions, have produced a radical redefining of the interpretation of planning in all Member Countries.
Starting from the European Territorial Agenda, in recent times the Portuguese planning community has centred its focus on the concept of Integrated Territorial Development and on the distinction between hard and soft planning policies. Here, hard planning can be brought back to the hierarchy of administrative instruments set out by the State, including not only plans (vinculating private action) but also programmes (binding only the public authorities); whereas soft planning is understood as the intersection of policies with direct spatial consequences that frame the cohesion policy without pretensions on land use, such as strategic development plans, mobility plans, public health services, social assistance, etc.

Integrated Territorial Development represents Europe's response to the increasing complexity and interdependency of social issues, often degenerating into wicked social problems. Soft planning is based therefore on a holistic approach to public intervention and on a new emphasis on the implementation (rather than on the modelling) of policies. Thus, soft planning practices result far more effective in the achieving of short-term targets and in strengthening the social resilience of a territory; while hard planning is still useful for the management of the hard infrastructure that functionally sustains the territory.

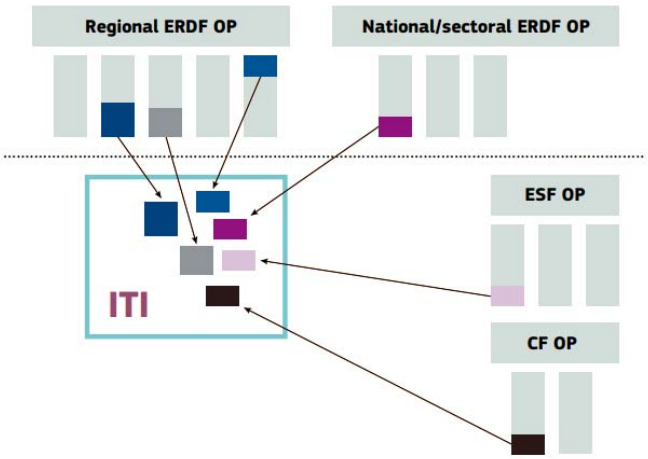
The Territorial Agenda of the European Union

The new territorial cohesion objective introduced by the Lisbon Treaty in 2007 acknowledges that economic and social cohesion cannot be achieved at the European level without a stronger focus on the territorial impact of EU policies. To achieve this objective, in 2011 the EU Ministers responsible for spatial planning and territorial development (in cooperation with the European Commission and with the endorsement of the Committee of the Region) have reviewed the Territorial Agenda launched in 2007 and agreed upon the new Territorial Agenda of the European Union 2020 (TA2020). The objective of the TA2020 is to provide strategic orientations for territorial development, fostering integration of territorial dimension within different policies at all governance levels and to ensure implementation of the Europe 2020 Strategy according to territorial cohesion principles. Accordingly, an integrated and territorial approach is multi-dimensional, tailored to place-specific features and outcomes. The right place-based approach – in the form of a new Cohesion Policy – to the wellbeing of citizens would be one that understands people's relation to a place, respects and is aware of their needs, responds to those needs with specific solutions and initiatives from the territory, reinforces cooperation among territories based on comparative advantages, accordingly modifies legislative, normative and administrative frameworks and, finally, acknowledges and supports the substantial and large number of place-based experiences already alive all over the EU territory – an approach that encourages the wider integration of territories beyond administrative borders rather than territorial and investment fragmentation.
With this in mind, the common provisions proposed by the European Commission for the 2014-2020 cohesion policy introduced new integrating tools that can be used to implement territorial strategies on the ground, linking the thematic objectives identified in the Partnership Contracts and Operational Programmes and the territorial dimension: integrated territorial investments (ITI) and community-led local development (CLLD).

Integrated territorial investments (ITI) allow EU Member States to bundle funding from several priority axes of one or more Operational Programmes (EU programmes) to ensure the implementation of an integrated strategy for a specific territory. It is important to underline that ITIs can only be effectively used if the specific geographical area concerned has an integrated, cross-sectoral territorial strategy. The key elements of an ITI are: 1) a designated territory and an integrated territorial development strategy; 2) a package of actions to be implemented; and 3) governance arrangements to manage the ITI.

Illustration of the construction of an ITI

Source: EC



A cross-sectoral integrated development strategy addresses the development needs of the area concerned, and should be designed in a way that the actions can build on the synergies produced by coordinated implementation. Any geographical area with particular territorial features can be the subject of an ITI, ranging from specific urban neighbourhoods with multiple deprivations to the urban, metropolitan, urban-rural, sub-regional, or inter-regional levels. An ITI can also deliver integrated actions in detached geographical units with similar characteristics within a region (e.g. a network of small or medium-sized cities). It is not compulsory for an ITI to cover the whole territory of an administrative unit.

Community Led Local Development (CLLD) is a specific tool for use at sub-regional level, which is complementary to other development support at local level. CLLD can mobilise and involve local communities and organisations to contribute to achieving the Europe 2020 Strategy goals of smart, sustainable and inclusive growth, fostering

territorial cohesion and reaching specific policy objectives. The main aims of CCLD are: 1) to encourage local communities to develop integrated bottom-up approaches in circumstances where there is a need to respond to territorial and local challenges calling for structural change; 2) to build community capacity and stimulate innovation (including social innovation), entrepreneurship and capacity for change by encouraging the development and discovery of untapped potential from within communities and territories; 3) to promote community ownership by increasing participation within communities and build the sense of involvement and ownership that can increase the effectiveness of EU policies; and 4) to assist multi-level governance by providing a route for local communities to fully take part in shaping the implementation of EU objectives in all areas.
The area and population coverage of a given local strategy should be coherent, targeted and offer sufficient critical mass for its effective implementation. It is up to the local action groups to define the actual areas and population that their strategies will cover, even if they must be consistent with criteria that the Commission will lay down through a delegated act. For reference, the 2007-2013 provisions concerning the population coverage under the LEADER programme aim at a minimum population of 10 000 and maximum of 150 000. The average population concerned by the URBAN II programmes funded by the ERDF in the 2000-2006 period was approximately 30000 inhabitants.

Community-led local development may be an element that can be used as one of the building blocks to implement an ITI. There are, however, important differences between an ITI and CLLD. CLLD is a strictly bottom-up approach. It is the local action group that determines the content of the local development strategy and the operations financed under it. The ITI on the other hand does not prejudge how decisions are taken on the investments themselves – this process may be top down, or bottom up, or a combination of the two. As such, CLLD could, for example, be one component of an integrated urban strategy implemented through an ITI.

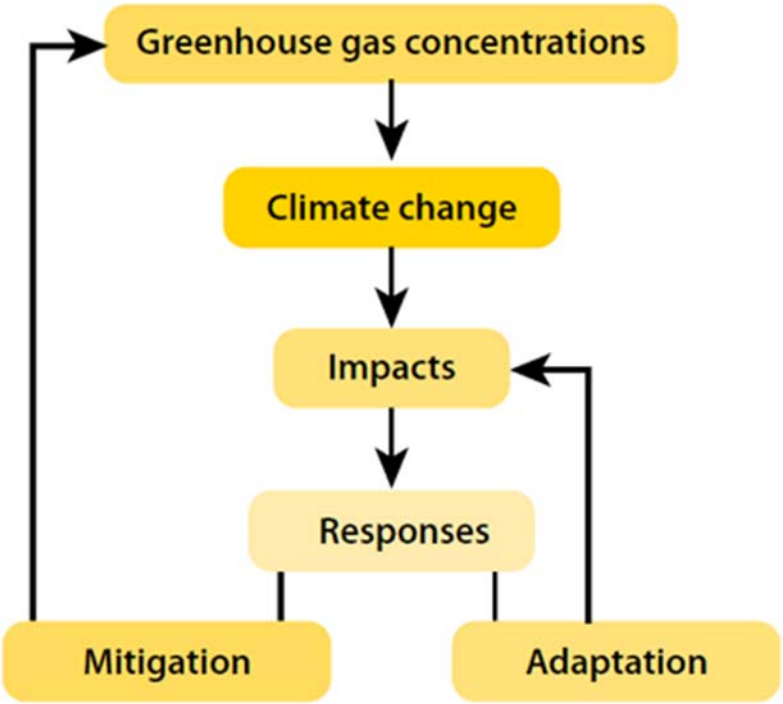
2. Climate change adaptation in the European Union

2.1 Climate change adaptation

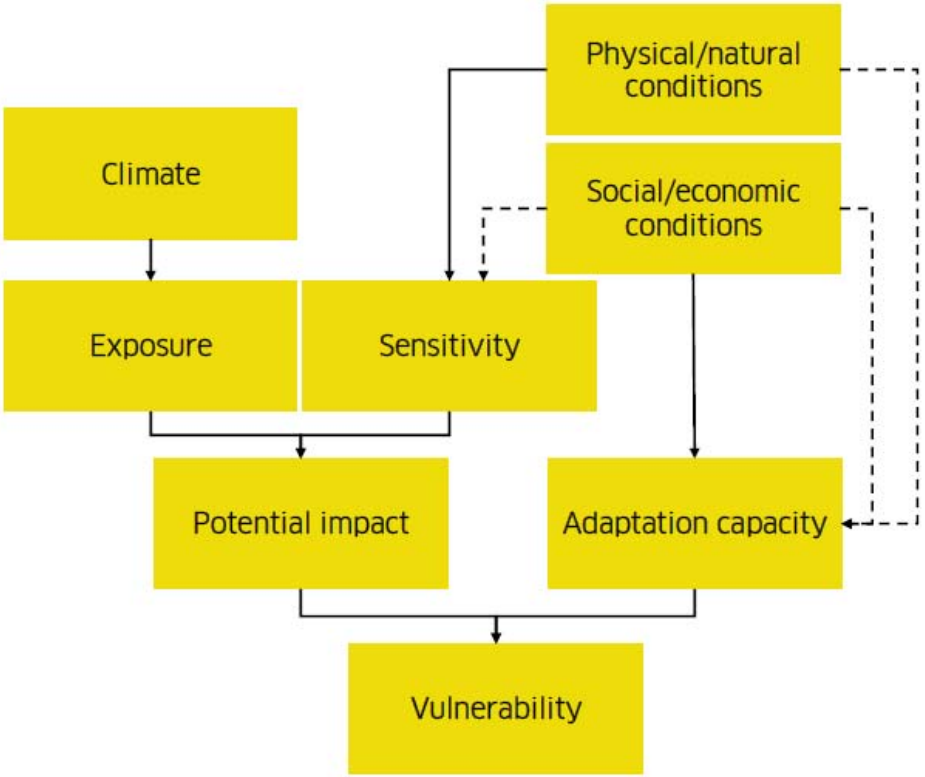
Definition

Adaptation is one of the two fundamental policies that can be put in place to contrast climate change, the other being mitigation. Namely, adaptation actions tackle the consequences and impacts of climate change on the natural environment, the ecosystems and the human societies, whereas mitigation actions are effective on its causes (i.e. greenhouse gas emissions). Just as much as mitigation, adaptation efforts are now consensually recognised as unavoidable, since that even the most stringent mitigation efforts cannot avoid further impacts of climate change in the next few decades.

According to the Intergovernmental Panel on Climate Change (IPCC): 'Adaptation is the process of adjustment to actual or expected climate and its effects. In human systems, adaptation seeks to moderate or avoid harm or exploit beneficial opportunities. In some natural systems, human intervention may facilitate adjustment to expected climate and its effects.' The IPCC also distinguishes two main types of adaptation: 'In incremental adaptation the central aim is to maintain the essence and integrity of a system or process at a given scale. Transformational adaptation changes the fundamental attributes of a system in response to climate and its effects.'



Key concepts of adaptation



The scheme presented above gathers the main conceptual elements concerning adaptation, which will be described in the following paragraphs.

Vulnerability is the propensity or predisposition to be adversely affected by climate impacts. It is used to "quantify" the need of adaptation that a system requires. Thus, a system with high vulnerability is more likely to suffer damages from a climate impact than a system with low vulnerability. In the same way, all adaptation actions aim at reducing the vulnerability of the system on which they are applied, by acting on some of the factors which cause it. The concept of vulnerability is the most crucial in adaptation, and as such it has been subject to various differing interpretations in theory studies and practical applications, proving that its key-role can steer the whole process of adaptation towards many different outcomes. Generally, vulnerability is the product of potential impacts and adaptive capacity.

Potential impacts are the result of the combination of exposure and sensitivity. Impacts can be direct (e.g. soil erosion) or indirect (e.g. decreases in production and revenue).

Exposure is the only factor of vulnerability that directly derives from the climatic parameters, comprising the magnitude of a climatic event, its characteristics and variabilities. The factors of exposure include temperature, precipitation, sea-level, the hydrological balance etc. as well as their associated extreme events (such as extreme rainfall, floods, meteorological droughts).

Sensitivity expresses the probability that a system would suffer damages from a climatic impact (described by the exposure). It is based on the natural and physical conditions of the system such as topography, land-use, soil capacity to resist erosion, hydrological infrastructures; but it also refers to human activities which have impacts on these conditions, such as agriculture and water management.

Adaptive capacity consists in the aptitude of a system to adapt to the various potential impacts which concern it. It results from the combination of many factors of social nature, mainly comprising socio-economical, structural, institutional, and technological resources and capability, through which the system can prepare and implement adaptation measures facing actual and/or future impacts.

Given this framework, modifications of the physical and/or social conditions of a system are the means to achieve a minor vulnerability of a system. Generally, interventions on the physical conditions can decrease its sensitivity to events to which it is exposed, aiming at the reduction of the potential impacts to the degree they don't exceed the adaptive capacity of the system; interventions on the social conditions, on the other hand, can directly increase the adaptive capacity, enhancing the resilience of the system to the potential impacts.

The scale of adaptation

While climate change mitigation is referred to a global scale, so that mitigation actions can be implemented in the same way world-wide, adaptation is extremely dependent on local factors. Namely:

- changes in local climate are consequential to its intrinsic characteristics, resulting in contrasting outcomes among the various regions affected (e.g. changes in annual precipitation in Southern vs Northern Europe: decrease vs increase);
- exposure and sensitivity to climate impacts descend directly from climate and physical/natural conditions, both essentially local characteristics;
- local specificities, involving social, economic, and environmental dimensions, are determining factors of adaptative capacity and resilient development;
- vulnerability to climate impacts, in concrete terms, results from a complex intersection of factors with social, environmental and spatial value, which can (realistically) be detected only at the local scale.

The emphasis on the local scale for adaptation has grown considerably with the association of climate change adaptation with disaster-risk management, especially since the publication in 2012 of the IPCC Special Report on Managing the Risks of Extreme Events and Disasters to Advance Climate Change Adaptation (SREX).
The IPCC Fifth Assessment Report (AR5,2014) explains in chapter 14 - Adaptation Needs and Options that:

- Among the many actors and roles associated with successful adaptation, the evidence increasingly suggests two to be critical to progress: those associated with local government and those with the private sector (medium evidence, high agreement). These two groups will bear increasing responsibility for translating the top-down flow of risk information and financing and in scaling up the bottom-up efforts of communities and households in planning and implementing their selected adaptation actions. Local institutions, including local governments, non-government organizations (NGOs), and civil society organizations, are among the key actors in adaptation but are often limited by lack of resources and capacity and by continuing difficulties in gaining national government or international support, especially in developing countries. {14.2.3}
- The causes and solutions of vulnerability take place at different social, geographic, temporal, and political scales. Therefore, to identify critical needs of populations, and the underlying conditions giving rise to these needs, some social assessments can benefit by looking across institutional domains and by spanning from the local to the national. Local assessments provide a means to identify existing vulnerabilities; the policies, plans, and natural hazards contributing to these vulnerabilities; as well as identifying adaptation actions. Social needs include the range of needs for human security, which include the universal and culturally specific, material, and non-material elements necessary to people to act on behalf of their interests. More specifically, at this level, social needs can be evaluated in terms of availability of natural, physical, human, political, and financial assets; stability of livelihood; and livelihood strategies.
- Among the important institutions in both developed and developing countries are those associated with local governments as they have a major role in translating goals, policies, actions, and investments between higher levels of international and national government to the many institutions associated with local communities, civil society organizations, and non-government organizations (NGOs). SREX Chapter 5 (IPCC,2012) extensively assesses the role and importance of the local scale institutions when adapting to extreme weather and climate events, highlighting that extreme weather and climate events are acutely experienced at local levels, and that local knowledge is important for managing impacts. As institutional actors, local governments and community institutions influence the distribution of climate risks, mediate between levels of government as well as between social and political processes, and establish incentive structures that affect both individual and collective action at all levels (Agrawal and Perrin, 2008). They are in a pivotal position to promote widespread support for adaptation initiatives, foster intergovernmental coordination, and facilitate implementation, both directly and through mainstreaming into ongoing planning and work activities.[…] Community-based adaptation (CBA) refers

to the generation and implementation of locally driven adaptation strategies, operating on a learning-by-doing, bottom-up, empowerment paradigm that cuts across sectors and technological, social, and institutional processes.

Chapter 15- Adaptation Planning and Implementation of the AR5 reports that:

- Climate adaptation is context dependent and it is uniquely linked to location, making it predominantly a local government and community level of action. Among these efforts are adaptation plans that utilize local knowledge. Local knowledge-based adaptation is focused primarily on the use of traditional knowledge to increase adaptive capacity at the community level. In addition to raising adaptive capacity, local knowledge often highlights vulnerabilities and impacts that may not be well known, especially when the areas where local knowledge is still held are remote and poorly monitored.
- Local governments play a central role addressing the challenges of adaptation planning and implementation. However, scholars stress the important role of partnerships among public, civic, and private sectors in CCA. Inclusive and participatory approaches in adaptation planning at the local level are encouraged by international organizations.
- A combination of topdown and bottom-up activities may strengthen local adaptation planning and implementation. Connecting adaptation planning strategies and local development needs and plans and the use of low-regret strategies can also support local adaptation strategies and their implementation.
- As part of highlighting private sector involvement, studies from developing and developed countries emphasize the need for stakeholder participation, representation, accountability, and equality to influence the sharing and shaping of knowledge in adaptation decision making and achieve change on the ground. Participatory approaches potentially allow maintaining regard for the highly localized and contextual nature of climate adaptation, balance standardization and context in adaptation planning and implementation, and bolster support for and facilitate implementation. Elaborate forms of participatory designs for facilitating a coproduction of knowledge, interactive learning, and stakeholder exchange, mediated by boundary organizations and knowledge brokers, are being undertaken but more are needed.

2.2 European policies for climate change adaptation

2.2.1 European strategy for climate change adaptation

Green paper

To stimulate discussion on the topic at European level, the European Commission adopted a Green Paper on adaptation to climate change on 29 June 2007, recognizing that adaptation has become an unavoidable and indispensable complement to mitigation actions. According to the document, climate change will heavily affect Europe's natural environment and nearly all sections of society and the economy. Moreover, the Green Paper warns that there will be quite large differences in the severity of regional impacts within Europe, and therefore calls for multilevel governance, in order to achieve efficient coordination between measures in Member States, regions and communities. In this context, the role of the EU would be to support adaptation efforts by adjusting relevant policies, filling knowledge gaps and coordinating strategies.

The Green Paper focuses on four lines of priority actions to be considered:

• Early action to develop adaptation strategies in areas where current knowledge is sufficient, through EU sectoral and other policies and the available Community Funds;

• Integrating global adaptation needs into the EU's external relations and building a new alliance with partners all around the world;

• Filling knowledge gaps on adaptation through Community research and exchange of information, and integrating results into policy and practice;

• Setting up a European Advisory Group on Adaptation to Climate Change to analyse coordinated strategies and actions under the European Climate Change Programme.

To the first pillar, early action in the EU, is dedicated special focus, with a further division of this priority action into three main policy options:

- Integrate adaptation when implementing and modifying existing and forthcoming legislation and policies; this section thus delineates a first framework of key sectors for climate change adaptation policies in Europe (agriculture, economy, energy, transport, health, water, coasts, ecosystems);

- Integrate adaptation into existing Community funding programmes, such as the Structural and Investment Funds that finance the EU cohesion policy;

- Develop new policy responses, concerning which the paper states that "Spatial planning could provide an integrated framework to link up vulnerability and risk assessment with adaptive capacities and adaptation responses thus facilitating the identification of policy options and cost-efficient strategies. Consideration should be given to setting up innovative financing arrangements dedicated to adaptation to support the implementation of coordinated adaptation strategies, especially in the most vulnerable regions and sections of society in Europe. The EU has a role in establishing and coordinating assessment frameworks and platforms or networks for information exchange. "

So the Green Paper recognises spatial planning as a cross-sector issue and emphasises the relevance of the development of minimum requirements for spatial planning, land use and land use change; and it invokes the EU to support the Member States for the development and implementation of guidance documents, case studies and good practices. Namely, chapter 4 of the Green Paper includes a section on the role of Member States, regional and local authorities, which states that: "Adaptation is complex because the severity of the impacts will vary from region to region, depending on physical vulnerability, the degree of socio-economic development, natural and human adaptive capacity, health services, and disaster surveillance mechanisms. Multilevel governance is therefore emerging on climate change adaptation involving all actors from the individual citizens and public authorities to the EU level. Action should be taken at the most appropriate level and be complementary, based on joint partnerships."

The document also assigns different competencies to Member States and regional/local authorities, declaring spatial planning as the main adaptation instrument for the latter, but ascribing to the former the responsibility to develop adaptation strategies since that "Experience and expertise in designing effective adaptation strategies and implementing policies is still limited. Information-sharing on adaptive response measures could greatly reduce learning costs across Member States, regions, municipalities, and communities" and "Rapid response capacities to climate change would need to be accompanied by a strategy for disaster prevention and alert both at national and European level."
At the same time, addressing regional authorities, the document states that: "Spatial planning is a cross-sectoral issue which makes it a suitable tool to define cost-effective adaptation measures. Minimum requirements for spatial planning, land use and land use change, with respect to adaptation could play a key role for awareness raising among the public, decision makers and professionals and for triggering a more proactive approach at all levels. The development of specific technical guidance documents and case studies and good practice could be considered. EU support for implementation could be provided to regions for exchanging good practices."
Considering the local level, its role is stressed because: "Many decisions influencing directly or indirectly climate change adaptation are taken at the local level. This is also where detailed knowledge on the local natural and human conditions is available. Therefore local authorities have an important role to play. For example detailed land management and land use practices could be explored in partnership with farmers to prevent erosion and mud streams reaching houses and settlements. In Southern Europe some municipalities have developed, together with the farmers, initiatives for saving water through electronic management and distribution systems for irrigation of crops. In regions with rising rainfall and rainfall spells, separate collecting systems for sewage and stormwater could be considered to reduce the otherwise increasing need for sewage overflows."

Finally, the paper indicates ecosystem services and land use as the main focus of the EU adaptation effort, but it does not yet address in any detail the fundamental issue of how ecosystems are important means of reducing impacts of climate change, although these were already promoted elsewhere as better and cheaper adaptation options than the older heavy technical solutions.

White paper

The Commission's Green Paper started the discussion for adaptation policies at European scale, which rapidly converged towards the elaboration of a dedicated European strategy. This position was ratified by the European Commission in 2009 with the White Paper - Adapting to climate change: Towards a European framework for action, which set the guidelines for the design of a European adaptation strategy. The leading motives adduced for an adaptation framework at European scale are:

- The transboundary nature of many challenges projected in Europe as consequences of climate change;
- The urgent need of adaptation policies in all Member countries, many of which had not yet started any adaptation process at the time of publication of the document;
- The substantial work of innovative scientific research, coordination of policies and exchange of information, to be carried out at the continental scale, which is fundamental for the development and support of solid and effective adaptation policies in any location in the EU.

The EU's framework was conceived to start with a first phase for preparing a comprehensive EU adaptation strategy to be implemented during phase 2, commencing in 2013. Phase 1 was structured on four pillars of action:

• building a solid knowledge base on the impact and consequences of climate change for the EU,

• integrating adaptation into EU key policy areas;

• employing a combination of policy instruments (market-based instruments, guidelines, public-private partnerships) to ensure effective delivery of adaptation;

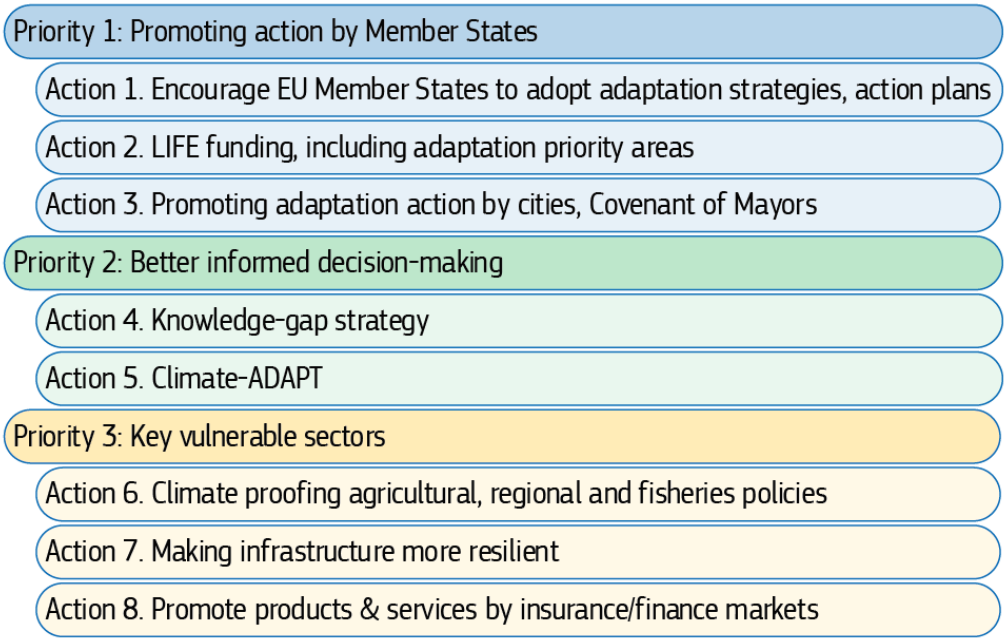
• stepping up international cooperation on adaptation.

The White Paper abetted a crucial development of climate adaptation policies in the EU, through the introduction of some conceptual elements that were raised by various sources as critical contributions to the Green Paper on adaptation, regarding the importance of ecosystem-based adaptation. Namely, the document specifies that: "Strategies focused on managing and conserving water, land and biological resources to maintain and restore healthy, effectively functioning and climate change-resilient ecosystems are one way to deal with the impact and can also contribute to the prevention of disaster as addressed in a recent Commission Communication. Evidence suggests that working with nature's capacity to absorb or control impact in urban and rural areas can be a more efficient way of adapting than simply focusing on physical infrastructure. Green Infrastructure can play a crucial role in adaptation in providing essential resources for social and economic purposes under extreme climatic conditions. Examples include improving the soil's carbon and water storage capacity, and conserving water in natural systems to alleviate the effect of droughts and to prevent floods, soil erosion and desertification."

The White Paper also set guidelines regarding present and future financing sources for climate adaptation policies, and collaboration practices to be followed among Member States and between the EU and external organizations such as the UNFCCC.

The EU Strategy on adaptation to climate change

The European Commission adopted an 'EU Strategy on Adaptation to Climate Change' 6 in April 2013. The general aim of the EU Adaptation Strategy is to contribute to a climate resilient Europe by ensuring that adaptation considerations are integrated into all relevant EU policies. The EU Adaptation Strategy is designed as a "framework strategy" analogous to the framework directives that set general goals, outline the course of action, and suggest processes for the implementation without regulating all specific details. The Adaptation Strategy itself is a short document of 11 pages, but it builds on extensive Commission Staff Working Documents covering seven areas of interest, such as infrastructure, health, cohesion, rural development and coastal development. The Strategy is built strongly around the idea that other policy areas and sectors pick up the ball – as the real climate adaptation 'work' will have to be done in the sectors.



The EU Adaptation Strategy has three objectives:

1. Promoting action by Member States; The Commission encourages all Member States to adopt comprehensive adaptation strategies (15 had strategies as of mid-2013) and will provide guidance and funding to help them build up their adaptation capacities and take action. The Commission will also support adaptation in cities by launching a voluntary commitment based on the Covenant of Mayors initiative.

2. Promoting better informed decision-making; by addressing gaps in knowledge about adaptation and further developing the European Climate Adaptation Platform (Climate-ADAPT) as the 'one-stop shop' for adaptation information in Europe.

3. Promoting adaptation in key vulnerable sectors; through agriculture, fisheries and cohesion policy, ensuring that Europe's infrastructure is made more resilient, and encouraging the use of insurance against natural and man-made disasters.

The implementation of the EU Adaptation Strategy is based on eight actions:

1. Encourage all Member States to adopt comprehensive adaptation strategies
    - As part of the Adaptation Strategy package the Commission has provided guidelines to help Member States formulate adaptation strategies.
    - The Commission will develop an 'adaptation preparedness scoreboard', identifying key indicators for measuring Member States' level of readiness.
    - In 2017, the Commission will assess whether action being taken in the Member States is sufficient. If it deems progress insufficient, the Commission will consider proposing a legally binding instrument.

2. Provide LIFE funding to support capacity building and step up adaptation action in Europe (2014-2020)
    - A climate-action sub-programme will be created under the 2014-2020 LIFE funding programme for the environment. This will substantially increase the LIFE funds available to combat climate change.
    - Priority vulnerable areas have been identified to steer discussions with Member States on the 2014-2020 LIFE work programme.

3. Introduce adaptation in the Covenant of Mayors framework (2013/2014)

• The Commission will support adaptation in cities. It will do this in particular by launching an initiative, based on the model of the Covenant of Mayors, through which local authorities can make a voluntary commitment to adopt local adaptation strategies and awareness-raising activities.

4. Bridge the knowledge gap

• The Commission will work further with Member States and stakeholders to identify adaptation knowledge gaps and the relevant tools and methodologies to address them. The findings will be fed into the programming of Horizon 2020, the EU's 2014-2020 framework programme for research and innovation, and will address the need for better interfaces between science, policy making and business.

• The Commission will promote EU-wide vulnerability assessments, taking into account, inter alia, the cross-sectoral EU overview of natural and manmade risks that it will produce in 2013. It will in particular support the Joint Research Centre in its work on estimating the implications of climate change and undertake a comprehensive review of what global climate change will mean for the EU.

5. Further develop Climate-ADAPT as the 'one-stop shop' for adaptation information in Europe

• The Commission and the European Environment Agency will improve access to information and develop interaction between Climate-ADAPT and other relevant platforms, including national and local adaptation portals (2013/2014).

• Special attention will be given to cost-benefit assessments of different policy experiences and to innovative funding, through closer interaction with regional and local authorities and financial institutions.

• Work on the inclusion of the future Copernicus climate services (previously known as GMES – Global Monitoring for Environment and Security) will start in 2014

6. Facilitate the climate-proofing of the Common Agricultural Policy (CAP), the Cohesion Policy and the Common Fisheries Policy (CFP)

• As part of the Adaptation Strategy package the Commission has provided guidance on how to further integrate adaptation into the CAP, the Cohesion Policy and the CFP. This guidance aims to help managing authorities and other stakeholders involved in programme design, development and implementation during the 2014-2020 budget period.

• Member States and regions can also use funding under the 2014-2020 Cohesion Policy and CAP to address knowledge gaps, to invest in the necessary analyses, risk assessments and tools, and to build up capacities for adaptation.

7. Ensuring more resilient infrastructure

• In 2013 the Commission will launch a mandate for European standardisation organisations to start mapping industry-relevant standards in the area of energy, transport and buildings and to identify standards that need to be revised to achieve better inclusion of adaptation considerations.

• The Adaptation Strategy package provides guidelines to help project developers working on infrastructure and physical assets to climate-proof vulnerable investments.

• Drawing on the results of its Communication on Green Infrastructure, adopted in May 2013, the Commission will explore the need to provide additional guidance for authorities and decision makers, civil society, private business and conservation practitioners to ensure the full mobilisation of ecosystem-based approaches to adaptation. This will be done by the end of 2013.

8. Promote insurance and other financial products for resilient investment and business decisions

• The Green Paper on the insurance of natural and man-made disasters, adopted as part of the Adaptation Strategy package, is a first step towards encouraging insurers to improve the way they help to manage climate change risks. A report on the results of the public consultation associated with the Green Paper will be published in the second half of 2013.

• The Commission's aim is to improve the market penetration of natural disaster insurance and to unleash the full potential of insurance pricing and other financial products for risk-awareness prevention and mitigation and for long-term resilience in investment and business decisions (2014-2015). A process has been launched to increase involvement of the insurance and financial sector. The results of this exercise will be disseminated via Climate-ADAPT in particular.

Implementation of the EU Strategy on adaptation to climate change

Objective 1: Promoting action by EU Member States

National Adaptation Strategies

The European Commission has developed guidance for national adaptation strategies in consultation with the EU Member States. By mid 2018, 26 of the 28 Member States had adopted national adaptation strategies. Most countries have also complemented this with a National Adaptation Plan.

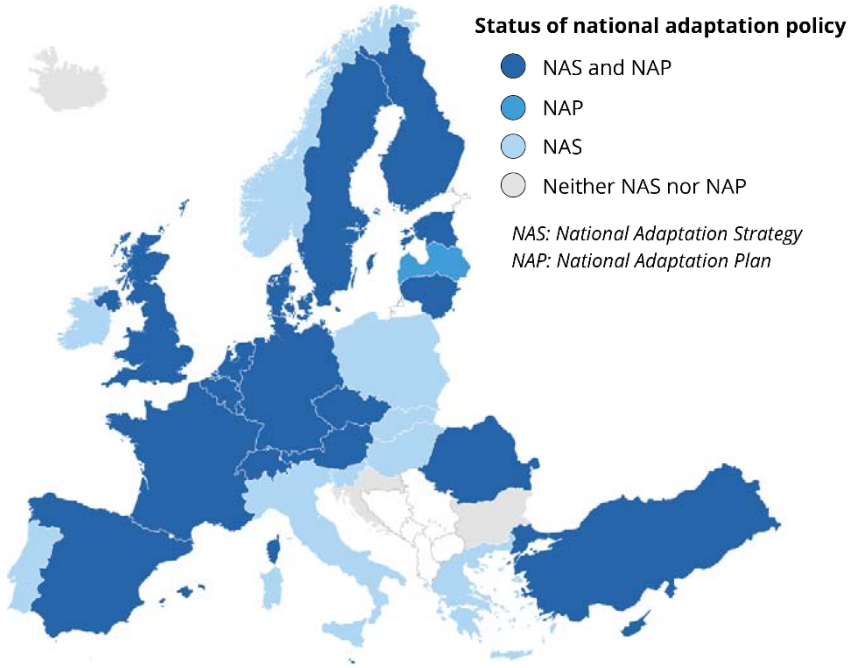


Fig. 34 Status of national adaptation policies in EU Member States. Source: EC

LIFE funding for adaptation

The EU budget has an important role to play in promoting climate action in all sectors of the European economy and in catalysing the investment needed to meet greenhouse gas reduction targets and ensure climate resilience. The EU institutions have agreed that at least 20 % of the €960 billion EU budget for 2014-2020 should be spent on climate mitigation and adaptation, some three times the previous level. The LIFE environment fund for the period will have a new €864 million climate sub-programme for mitigation and adaptation. The LIFE Programme for the Environment and Climate Change 2014-2020 consists of two sub-programmes, namely the environment and climate action. LIFE Climate Action supports projects in the development of innovative ways to respond to the challenges of climate change in Europe. Funding is available through project action grants, operational support to NGOs, and financial instruments that leverage private finance through loans and guarantees. For more information, see chapter 2.2.2.

Covenant of Mayors

Mayors Adapt (the Covenant of Mayors Initiative on Adaptation to Climate Change) was launched by the Commission in March 2014 and merged into the Covenant of Mayors initiative in 2015, introducing an integrated approach on mitigation and adaptation.

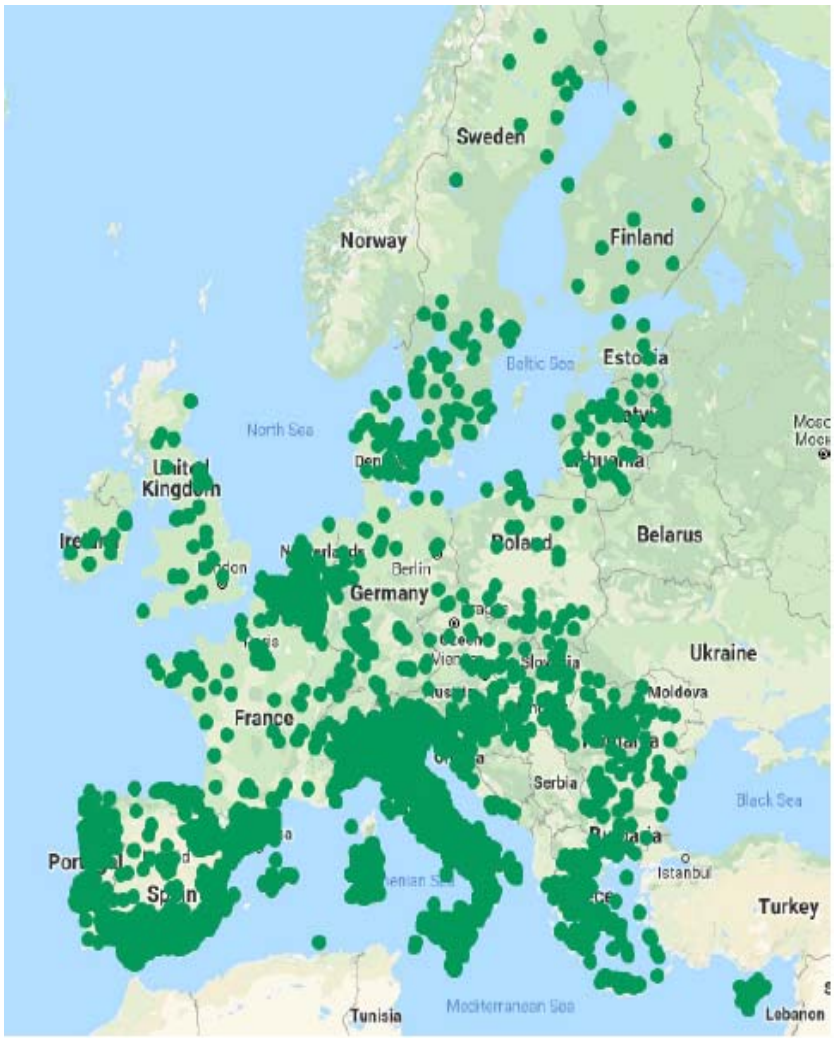


Fig. 35 Signatories of the Covenant of Mayors Initiative. Source: EC

Signatories to the Covenant voluntarily commit to develop a climate vulnerability and risk assessment and an action plan for targeted adaptation options, including reporting every two years, within two years of signing up to the initiative. The Covenant office (implemented and funded by the Commission) informs, mobilises and supports local authorities, in cooperation with the Commission's JRC who prepare guidelines for the local authorities' actions. The Commission also ensures that the relevant EU funds and financial instruments can support the Covenant signatories in their actions. By 30 April 2018, 1076 Covenant signatories from 25 EU Member States, covering around 60 million inhabitants, had committed to conduct vulnerability and risk assessments, and develop, implement and report on adaptation plans. According to recent surveys, it is estimated that about 26% of all EU cities (both Covenant cities and non-Covenant) and 40% of EU cities of more than 150.000 inhabitants have already adopted adaptation plans. In general, cities in Eastern and Southern Europe have fewer local adaptation plans, whereas Central and Northern European cities often have such plans.

Building on the success of the Covenant, the Global Covenant of Mayors for Climate and Energy was launched in 2017 bringing together the Compact of Mayors and the Covenant of Mayors in a worldwide campaign.

Through the Global Covenant of Mayors, cities and local governments around the world are voluntarily committing to tackle climate change, mirroring and exceeding the commitments set by their national governments through the Nationally Determined Contributions process under the Paris Agreement. The Global Covenant of Mayors is the largest of its kind, comprising thousands of cities and towns across 6 continents and more than 120 countries. It represents nearly 10 % of the world's population.

Objective 2: Better-informed decision-making

Knowledge gaps

There has been a substantial increase in the knowledge base since the publication of the EU Adaptation Strategy in 2013. However, none of the main knowledge gaps have been fully closed and new gaps have emerged in sectors such as ecosystem-based adaptation, relationship to sustainable development goals, global transboundary (spill-over) effects, infrastructure resilience, mountainous areas, long-term lack of water resources, high-end climate change, health, coastal areas, and biodiversity. A substantial number of research projects cover adaptation, including those with EU funding under the FP7 and Horizon2020 programmes. Water, nature, and agriculture are among the most frequently addressed topics.

Climate-ADAPT

Prior to the Strategy, Climate-ADAPT was already launched in March 2012 as a web portal in common ownership of the Commission and the EEA with the objectives to build a consistent and updated knowledge base, in particular:

- to facilitate the collection, sharing and use of information on climate change impacts, vulnerability and adaptation in the EU;
- to assist an effective uptake of the relevant knowledge by decision-makers; and
- to contribute to a greater level of coordination among sectors and institutional levels.

Climate-ADAPT aims to support Europe's adaption to climate change and helps users access and share data and information on topics such as projected climate change in Europe; current and future vulnerability of

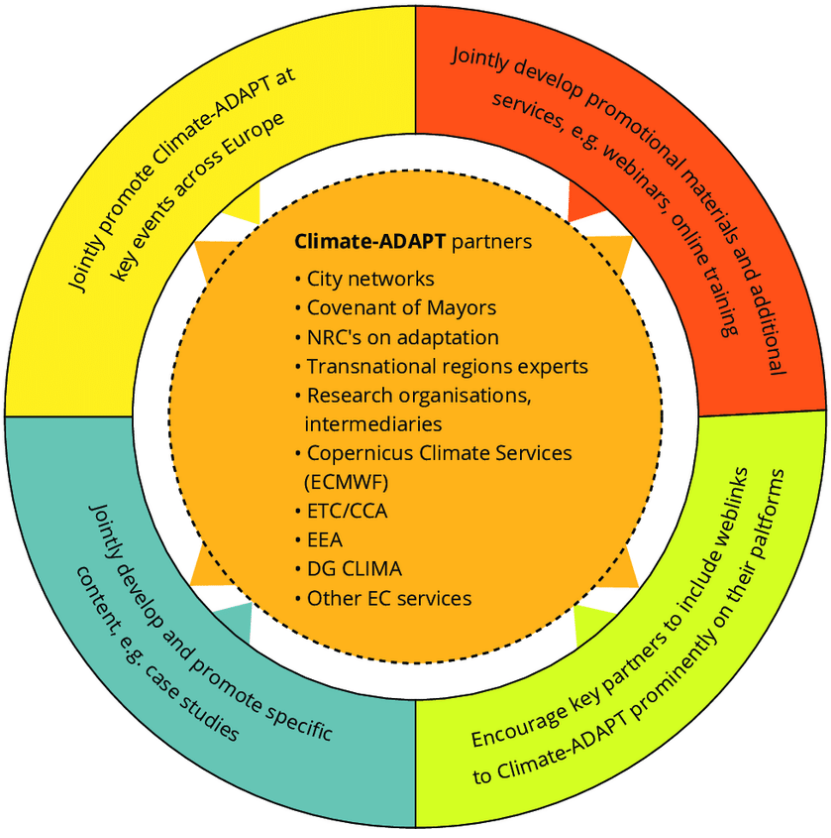


Fig. 36 Climate-ADAPT partnership and purposes. Source: EC

regions and sectors; EU-level, national and transnational adaptation strategies and actions; adaptation case studies and potential adaptation options; and tools that support adaptation planning.

At the time of the launch, the various other relevant EU services and platforms, such as the Copernicus Climate Change Service or the Disaster Risk Knowledge Management Centre did not yet exist. While Climate-ADAPT experienced a high volume of users immediately after its launch in 2012, as compared with other EEA products, users needed more encouragement to make use of it, to upload relevant information and to collect data and information from local and regional levels, including private sector initiatives. National adaptation portals existed in six Member States and more limited adaptation portals in eight others, but the information transfer between national and local levels was not optimal. The Strategy noted the need to improve access to information and develop interaction between Climate-ADAPT and other relevant platforms, including national and local adaptation portals.

Climate-ADAPT had more than 400 000 visitors between 1 March 2013 and 31 March 2018, with the most visited pages being the database, the adaptation support tools, the case studies, EU policy pages and the country pages. The number of registered users (i.e. recipients of the newsletter) amounted to about 5 000 in April 2018. The core of Climate-ADAPT lies in its knowledge database and web pages, which currently comprise more than 2 400 items in total.

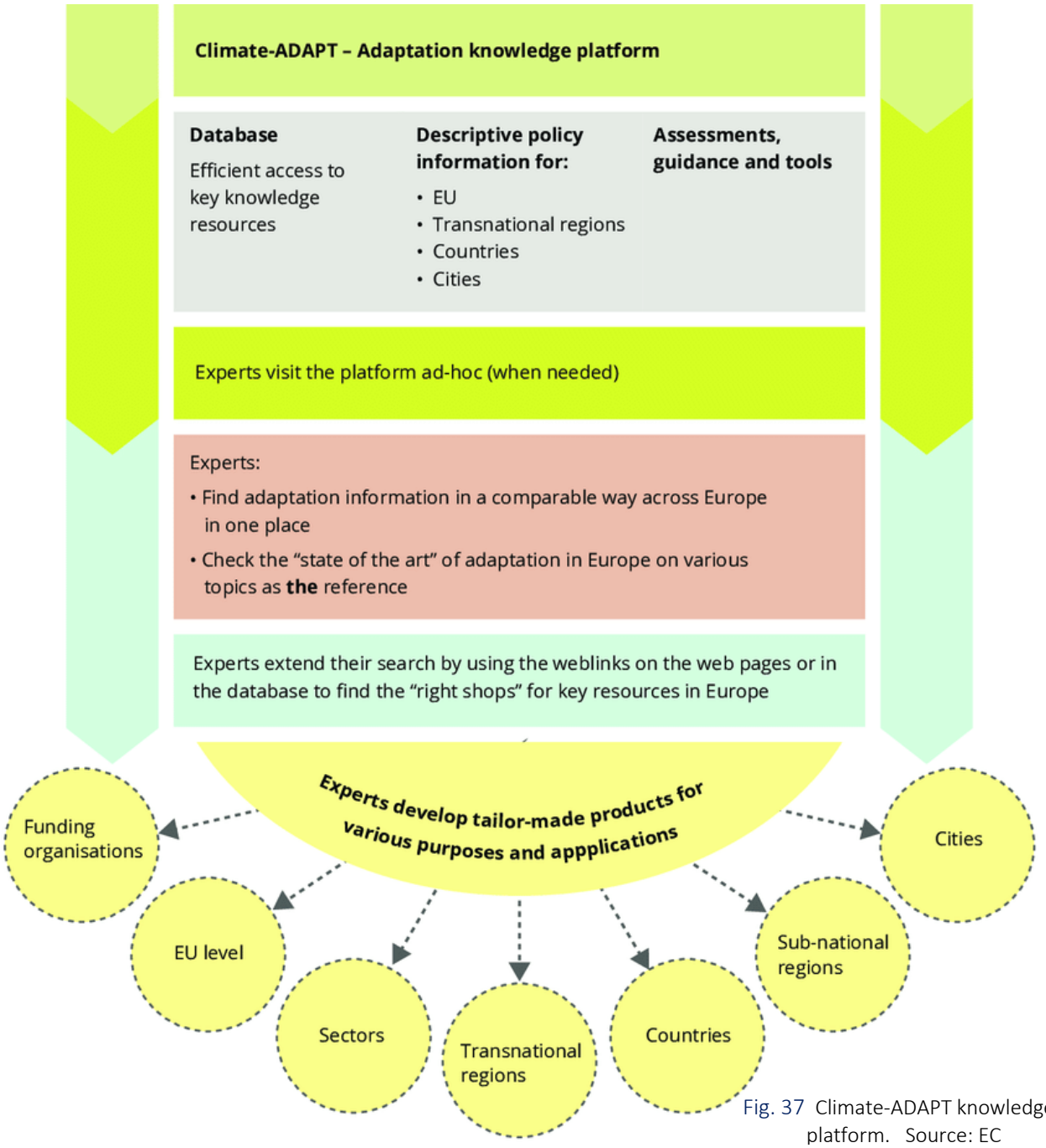


Fig. 37 Climate-ADAPT knowledge platform. Source: EC

Objective 3: Key vulnerable sectors

Climate proofing policies and funds

By the time of the launch of the EU Adaptation Strategy in 2013, adaptation had already been mainstreamed into a broad range of sectors at EU level, with legislation and policy documents having been adopted or Commission proposals tabled by 2013. However, adaptation had yet to be mainstreamed into social and education policies, tourism, fisheries, insurance and trade. Further work was also required for energy, transport, the EU's outermost regions, disaster risk reduction, health, and in particular, funding programmes under the EU budget i.e. the so-called 2014-2020 Multiannual Financial Framework (MFF).

The following advancements were made after the Strategy publication in 2013:

1. Legal provisions on climate change were included in the framework governing the ESIF funds, the Common Provisions Regulation (CPR), notably:
    a. A 20% EU mainstreaming objective for climate mitigation and adaptation, 20% earmarking of funding for low-carbon economy (TO4)
    b. Horizontal provision for mainstreaming sustainable development, including climate change adaptation in all programmes and investments
    c. A thematic objective (TO5) on "climate change adaptation, risk prevention and management"
    d. An ex-ante conditionality which fixed the existence of national/regional risk assessments (also of climate risks) as a pre-condition to funding under TO5, taking into account also the NAS where available
    e. detailed climate tracking methodology and common output indicators
    f. The requirement to assess and address the climate change adaptation needs and disaster resilience of major projects.
2. Three guidance documents were published alongside the Strategy to help Member States authorities to consider climate adaptation effectively within the programming cycles of ESIF, CAP and CFP.
3. Several guiding factsheets were produced on mainstreaming both mitigation and adaptation, listing also a set of possible adaptation actions with examples.
4. The Commission provided extensive climate-related comments on all of the ESIF Partnership Agreements and most of the fund-specific programmes. In the implementation phase, it only approved major projects (those that receive more than € 50 or 75 million EU support) that were climate-proofed.

The EU institutions have agreed that at least 20 % of the €960 billion EU budget for 2014-2020 should be spent on climate mitigation and adaptation, some three times the previous level.

The LIFE environment fund for the period had a €864 million climate sub-programme for mitigation and adaptation. Under the EU Regional Policy, the European Regional Development Fund and the Cohesion Fund address climate change adaptation, for example in relation to flooding and coastal erosion, urban adaptation, climate-resilient infrastructure, and ecosystem-based approaches. Under the EU Agricultural Policy, the European Agricultural Fund for Rural Development notably targets climate change adaptation through the themes of biodiversity, water, soils, and genetic resources. In terms of direct funding, the European Commission provides a current overall estimate of all ESIF allocations to climate adaptation at EUR 41.5 billion. It estimates that allocations to TO5 ("Promoting climate change adaptation, risk prevention and management") are EUR 7.3 billion and EUR 32 billion from the ERDF / CF and the EAFRD, respectively. However, given the nature of ESIF, there is also a significant time lag effect in this policy area, so that results and impacts cannot be fully assessed yet.

Beyond the direct funding there are a number of advancement in terms of horizontal mainstreaming, such as climate-proofing of major projects and increased used of green infrastructure solutions (as opposed to grey infrastructures) across different thematic areas.

In the next budget period, 2021-2027, the European Commission has proposed to increase the target for climate related expenditure from 20 % to 25 % of the EU budget.

Climate resilient infrastructure

The support for making infrastructure resilient to current and future climate conditions involves two main approaches. First, integrating climate resilience in infrastructure investments starting with the major projects funded by the European Regional Development Fund and the Cohesion Fund in the period 2014-2020. There are about 550 major projects currently foreseen for EU funding in this period, with a cost of about € 90-95 billion of which the EU contribution will be in the range of about € 60-65 billion. The climate resilience is pursued through a

climate vulnerability and risk assessment followed by the identification, assessment and implementation of relevant adaptation options. Second, on a mandate from the European Commission, the European Standardisation Organisations (CEN/CENELEC) undertook an analysis resulting in an initial list of 12 industry standards to be revised and one standard to be written in order to ensure that new major infrastructure projects are climate resilient – this additional work has started. They also adopted a 'Guide for addressing climate change adaptation in standards'.

Insurance and finance

While significant effort is undertaken at the national and European levels to prevent damage caused by weather and climate related disasters, for example through adaptation strategies, climate proofing of investments, national risk assessments and other disaster and climate risk policies, not all risks can be averted. The residual risk may affect all areas of society. The European Commission is encouraging insurers and others to enhance cooperation and increase the availability and use of loss data to improve adaptation measures at local level, for example in the urban context. Sustainable finance is the contribution of private investments to environmental, social and governance considerations. In May 2018, the European Commission adopted a package of measures implementing several key actions announced in its action plan on financing sustainable growth. The European Commission is currently setting up a technical expert group on sustainable finance. Its mandate includes the preparation of a taxonomy for investments in climate change mitigation and adaptation and other environmental activities. It aims to conclude the taxonomy for climate change adaptation and mitigation in 2019.

2.2.2 Mainstreaming of adaptation in the European Multiannual Financial Framework 2014-2020

European Structural and Investment Funds

The European Structural and Investment Funds promote eleven so-called Thematic Objectives, of which Thematic Objective 5 'Promoting climate change adaptation, risk prevention and management', is the key thematic objective regarding adaptation. National and/or regional risk assessments for disaster risk management are a precondition (ex-ante conditionality) for funding under Thematic Objective 5, and national climate change adaptation strategies and related climate vulnerability assessments are required, where appropriate, to inform national risk assessments. This Thematic Objective is covered by the European Regional Development Fund (including the European Territorial Cooperation Goal), the Cohesion Fund and the European Agricultural Fund for Rural Development. The cross-sectorial nature of climate change adaptation means that other Thematic Objectives are also potentially relevant to climate change adaptation, typically supporting adaptation more indirectly. Thematic Objective 6 (environment and resource efficiency) provides most of the indirect contribution to climate change adaptation.
In April 2017, the Directorate-General for Climate Action (DG CLIMA) of the European Commission published a final report on the mainstreaming of adaptation into the ESIF 2014-2020. According to the report, the total share for climate action in the ESIF 2014-2020 is EUR 113.8 billion, which is 25 % of the EU support excluding the Youth Employment Initiative. From this climate action amount, 54 % (EUR 62.1 billion) is dedicated for action related to adaptation (mainly through the European Agricultural Fund for Rural Development). Thus, about 14 % of total EU support (excluding Youth Employment Initiative) covers support that directly targets climate change adaptation as well as support that indirectly promotes this.

All five funds provide support for climate action. Still, only the Regional Development Fund (ERDF), the Cohesion Fund (CF) and Rural Development Fund (EAFRD) provide support specifically targeted for climate change adaptation. In the ERDF and the CF, climate change adaptation is mostly addressed through considering flooding, coastal erosion, heatwaves and water scarcity/droughts. The EAFRD translated the thematic objectives into Union priorities for rural development. All the rural development priorities have potential for climate action, but the potentials for adaptation are the highest in UP4 (Restoring, preserving and enhancing ecosystems related to agriculture and forestry). The key themes through which the Rural Development Programmes target climate change adaptation are biodiversity, water, soils and genetic resources. Although not specifically relating to Thematic Objective 5, the European Social Fund and the European Maritime and Fisheries Fund will also indirectly contribute to climate change adaptation. Yet, their financial allocation cannot be tracked.

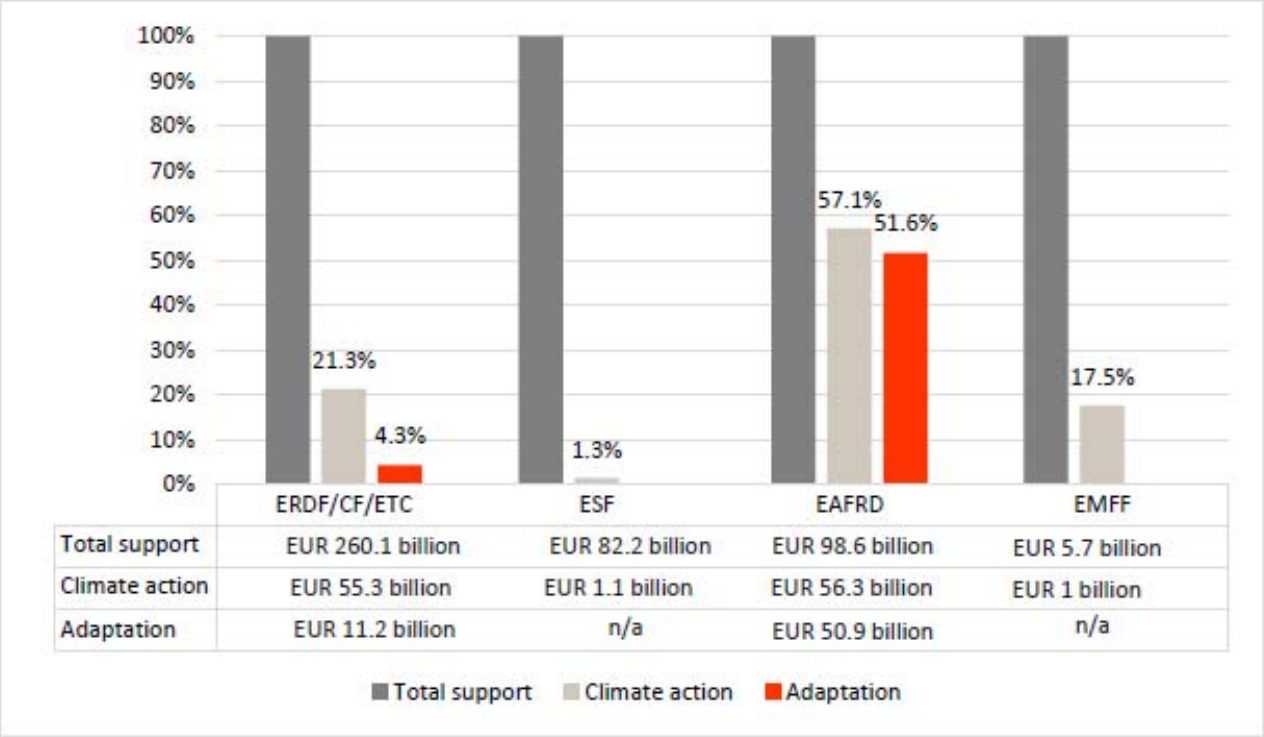


Fig. 38 Share of ESIF support for climate action (mitigation, adaptation) and adaptation separately in each fund, including the respective allocations (in EUR billion). Source: DG CLIMA

IP	ERDF / CF
5a	Supporting investment for adaptation to climate change, including ecosystem-based approaches
5b	Promoting investment to address specific risks, ensuring disaster resilience and developing disaster management systems
6d	Protecting and restoring biodiversity and soil and promoting ecosystem services through Natura 2000 and green infrastructure
IP	**ETC**
5a	Supporting investment for adaptation to climate change, including ecosystem-based approaches
5b	Promoting investment to address specific risks, ensuring disaster resilience and developing disaster management systems
6d	Protecting and restoring biodiversity and soils and promoting ecosystem services through Natura 2000 and green infrastructure
11b	Enhancing institutional capacity of public authorities and stakeholders through cooperation
FA	**EAFRD [7]**
3b	Supporting farm risk prevention and management
4a	Restoring, preserving and enhancing biodiversity
4b	Improving water management, including fertilizer and pesticide management
4c	Preventing soil erosion and improving soil management
5a	Water efficiency (increasing efficiency in water use by agriculture)
6b	Local development in rural areas

Fig. 39 Key Investment Priorities (ERDF incl. the ETC goal, CF) and Focus Areas (EAFRD) with relevance for climate change adaptation. Source: DG CLIMA

According to the DG CLIMA report (2017), EU support under the ESI Funds in Portugal for the 2014-2020 period amounts to EUR 25.2 billion, out of which EUR 5.1 billion is allocated for climate action. Out of the total ESIF expenditure for Portugal, 3.8 % (or EUR 954.1 million) is marked for climate change adaptation, and an additional EUR 1.47 billion is allocated for actions that could contribute to 'climate change adaptation and/or climate change mitigation.

The CF programme 'Sustainability and Resource Use Efficiency' (*Programa Operacional Sustentabilidade e Eficiência no Uso dos Recursos*, PO SEUR) is the key instrument for tackling climate change adaptation with the support of ERDF/CF, amounting to EUR 401 million. The contents and outcomes of PO SEUR are detailed in chapter 3.1.3.
The national OP on Sustainability and Resource Use Efficiency is the only one that addresses adaptation in Portugal. Adaptation issues are not addressed in the regional OPs for Mainland Portugal. This centralised approach used for the ERDF and CF can be beneficial through its potential as a catalyst. It can ensure that similar, and potentially mutually supportive initiatives be promoted throughout the country. However, the approach may at the same time entail the risk of limiting the focus to region-specific adaptation challenges and needs.

Priority axis			Selected IFs	Selected IPs	Specific Objective	Actions to be supported	Horizontal principles on sustainable development
Title	No	Title					
Sustainability and Resource Use Efficiency	2	Promoting climate change adaptation, risk prevention and management	21, 85, 86, 87	5i	5i1. Strengthening capacities to adapt to climate change through the adoption and coordination of cross-sectoral, sectoral and territorial measures	Actions foreseen in the national strategy of adaptation to climate change are notably regional, inter-municipal, municipal and sectoral. Focus is on anti-desertification plans, promotion of green structures, research, information, and tools relevant to adaptation actions. Some specific actions focuses on coastal protection of areas under risk, forest fires, floods, and accidents and catastrophes.	The principle of sustainable development is horizontally assumed in the OP strategy with particular emphasis in the implementation of the 'polluter pays' principle, the promotion of green economy and the shift to low carbon economy.
				5ii	5ii1. Shoreline protection against risks, with particular emphasis on coastal erosion.		
					5ii2. Strengthening risks management capacities of the institutions involved, from the perspective of resilience.		

Fig. 40 Overview of the PO SEUR. Source: DG CLIMA

As in most other European countries, in the ESIF 2014-2020 the EAFRD is the major source of financing for climate change adaptation in Portugal. Its support can be estimated exceeding EUR 1 billion, even if it is particularly difficult to evaluate it since that it distributes funds according to rural development priorities instead of thematic objectives. The EAFRD has financed three Regional Development Programmes, one for Mainland Portugal and one for each of the Autonomous Regions. The focus of the RDP programme for Mainland Portugal is mainly on water issues, as shown through the allocation to UP 4a and 5a. In terms of measures, it mainly makes use of M10 and M13. M10 is the key climate measure according to the Regulation, it poses clear emphasis on natural resources management, and it could be expected to drive climate adaptation forward in the rural areas. M13 is quite generic as defined by the Regulation and its climate adaptation contribution in the Portuguese case should be found in relation to conserving and promoting landscape types and historic and extensive agricultural or forest systems with little climate impact or low-resource use.

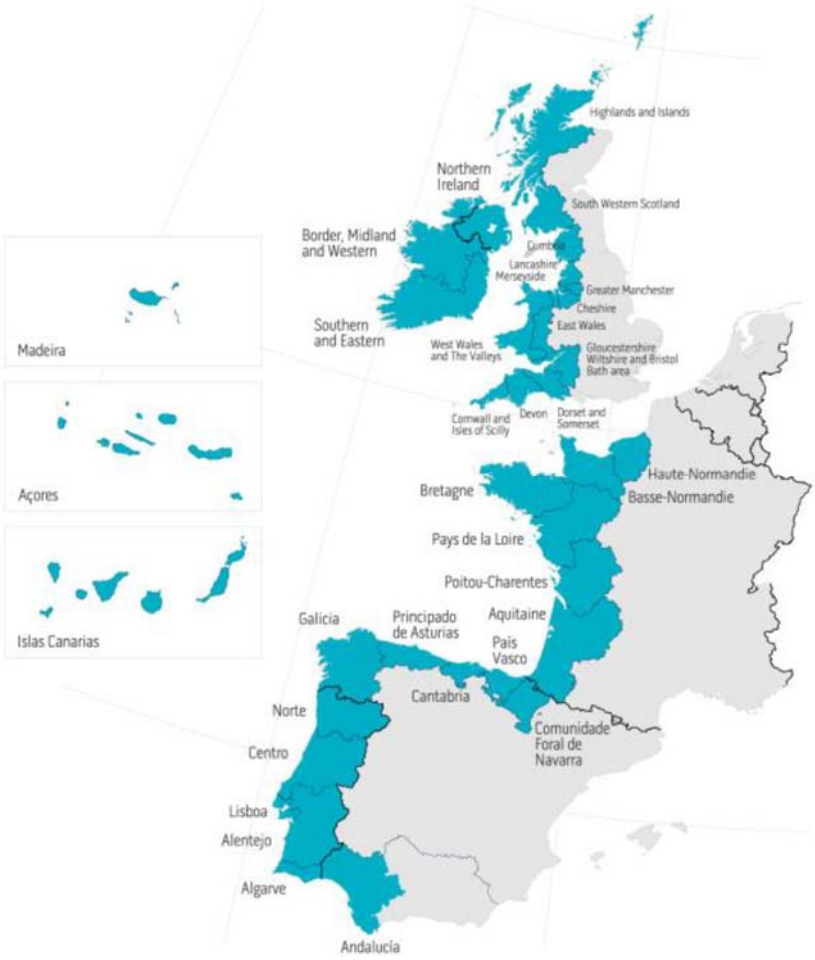
EU support in EUR million/Fund	ERDF	CF	EAFRD	Total for climate change adaptation
Climate change adaptation	21.8	394.0	538.3	954.1
Climate change adaptation and/or climate change mitigation	227.5	94.4	1,148.4	1,470.3

Fig. 41 Overview of the total ESIF EU support to climate change adaptation in Portugal. Source: DG

Of the four European Territorial Cooperation programmes (financed by the ERDF) involving Mainland Portugal, three allocate funds for climate change adaptation. These are the trans-national cooperation programmes Atlantic Area and South West Europe, and the cross-border cooperation programme between continental Spain and Portugal (POCTEP Interreg).

CP		Priority axis		Selected IFs	Selected IPs	Specific Objective	Actions to be supported	Horizontal principles on sustainable development
Title	PT	No	Title					
Interreg ES-PT (POCTEP)	CB	3	Promoting climate change adaptation, risk prevention and management	21, 85, 86, 87	5b	5.B. Increase the territorial resilience to natural risks in the Cross-border cooperation space	• Shared infrastructure and equipment for the prevention and fight against forest fires and other natural disasters; modernisation of risk management systems; improve knowledge on risk (identification studies, risk mapping) raise public awareness about natural hazards; training on identified risks for personnel in order to improve their risk management capacity; initiatives and actions to promote the recovery and restoration of areas affected by natural disasters. • Creation of Cross-border networks of natural and cultural spaces; management of tourism based on common environmental resources; promotion of environmental tourism; promotion of traditional products coming from protected areas. • Joint management for the protection and conservation of Cross-border natural spaces; environmental awareness raising and training on the protection of natural resources in protected areas; connectivity of environmental infrastructure and services; scientific research on the protection and recovery and the use and sustainable management of natural resources; exchange of environmental information, support to networks and design of common programmes for environmental volunteering. • Integrated planning of collective sustainable transport; promotion of systems of intelligent transport and sustainable mobility; joint management of the urban environment and green urban itineraries; development of sustainable urban models through energy self-sufficiency and the promotion of a low-carbon economy. • Reduction of contamination in waste fields through exchange and cooperation; pilot actions for the collection and management of solid urban waste; coordinated management of water treatment in Cross-border areas in shared river basins; innovative models for the sustainable use of water.	The programme aims to promote sustainable development, explicitly considering the environmental dimension as one of the basic pillars of strategy. Thus, the actions aimed at environmental conservation and sustainable use of natural resources has a significant presence in the planned measures, articulating a specific priority axis for this purpose. Furthermore, the most important environmental problems relate to the exposure of the area to various natural hazards (fires, floods, pollution of aquifers, drought, and erosion) which are sometimes aggravated by human action and they are adequately addressed by the programme.
					6c	6.C. Protect and valorise natural and cultural heritage as a support of the economic base of the Cross-border cooperation area		
					6d	6.D. Improve the protection and sustainable management of natural spaces		
					6e	6.E. Reinforce sustainable local development along the Cross-border area		
					6f	6.F. Increase the level of efficiency in the use of natural resources to contribute to the green economy in the cooperation area.		
South West Europe	TN	4	Promoting climate change adaptation, risk prevention and management	87	5b	5b. Improvement of the coordination and efficiency of instruments for prevention, risk management and rehabilitation of affected areas.	• Actions that aim to strengthen and disseminate the results of the emergency plans. Early warning systems and the implementation of safety devices against the threat of natural disasters such as floods, periods of drought or continuous rain, periods of intense heat, or on the contrary periods of intense cold. Development of risk management tools. Tools for supporting transferrable systems of observation, measurement and prevention. Tools and methodologies for the regeneration of soil damaged by natural disasters.	The new version of the programme makes reference to climate-related elements of sustainable development, notably renewable energies. The ex-ante assessment and the strategic environmental assessment of the programme provide the necessary elements to ensure that the South West Europe programme maintains a respect for the principle of sustainable development and contributes to its compliance. Proposed projects that may have significant negative environmental impacts will integrate compensatory measures in order to be considered by the Selection Committee.

Fig. 42 Overview of the contribution to adaptation of the Interreg programmes Sudoe and POCTEP. Source: DG CLIMA



The Atlantic Area Interreg Programme assigns the third of its five priorities to the strengthening of the territory's resilience to risks of natural, climate and human origin, allocating EUR 20.3 million. The only objective (3.1) aims at activating transnational cooperation to strengthen risks prevention, emergency and crisis management planning, monitoring, surveillance, exchange of know-how, improving operational capabilities, information systems and mapping, data dissemination, training and guidance material. This approach is structured around a triple dimension: local and regional authorities, the civil society and the industry.

Fig. 43 Regions (NUTS-II) participating in the Interreg Atlantic Area programme.
Source:atlanticarea.eu

Climate change adaptation in the Atlantic Area Interreg Programme: project examples

AA-FLOODS
Enhanced prevention, warning, coordination and emergency management tools for floods at local scales

Lead Partner: Agencia de Régimen Especial del Ciclo Integral de las Aguas del Retortillo (ES)
Total budget: EUR 2.483.642 | ERDF: 1.862.731 Duration: Mar 2019 – Mar 2022

Floods are climate change phenomena that affect a considerable number of people in the Atlantic Area, as increasingly intense rains overflow rivers and create runoffs in urban areas. Lately, floods are becoming ever more frequent and damaging due to climate change, increasing torrential rains and extreme tidal phenomena.
AA-FLOODS aims to bring those actors together and build and test new tools, plans and regulations to enhance flood risks management and response. The ultimate goal is to reduce human and material damages due to flooding by improving the tools of prevention, alert and crisis management, and transferring regional tools and capabilities to the local scale. Greater proximity to those affected and more precise and detailed analysis will lead to more effective prevention, preparation and protection against floods.

Partnership
> Consejería de Medio Ambiente y Ordenación del Territorio - Junta de Andalucía (ES)
> Águas do Algarve (PT)
> British Red Cross (UK)
> Trinity College Dublin (IE)
> Bóreas Desarrollo y Tecnología, S.L. (ES)
> Universidade da Coruña (ES)
> The Rivers Trust (UK)
> Université de Nantes (FR)

AGEO - Platform for Atlantic Geohazard Risk Management
Lead Partner: Instituto Superior Técnico - Universidade de Lisboa (PT)
Total budget: EUR 3.223.240 | ERDF: 2.417.430 Duration: 01.06.2019 - 31.05.2022

The Atlantic region is exposed to a range of low-probability / high-impact events and various hazard risk scenarios, which, due to the low likelihood of occurrence and/or the high cost of mitigating action, lack the level of preparedness for effective monitoring and response. AGEO aims to pilot a new form of engagement between civil society and local authorities for geohazards-related local capacity building, and encourage the local use of innovative Earth observation products and services provided by European data infrastructures, in particular Copernicus. The project will foster a more efficient uptake of Copernicus data, products and services on regional level. AGEO will launch several Citizens' Observatory pilots on geohazards according to regional priorities to demonstrate how citizens' involvement in geohazard risks prevention can strengthen regional and national risk management systems.

Partnership
> Associação Portuguesa de Geólogos (PT)
> La Palma Research Centre (ES)
> Instituto Geológico y Minero de España (ES)
> Université de Bretagne Occidentale (FR)
> United Kingdom Research and Innovation - British Geological Survey (UK)
> University College Dublin (IE)
> Centre d'Etudes et d'Expertise sur les Risques Environnement Mobilité et Aménagement (FR)
> Laboratório Nacional de Energia e Geologia (PT)
> Universidad de La Laguna (ES)
> Laboratório Nacional de Engenharia Civil (PT)
> Universidade da Madeira (PT)
> Câmara Municipal de Lisboa (PT)

The Sudoe (South West Europe) Interreg Programme dedicates the fourth of its five priority axes at improving the coordination and effectiveness of prevention, disasters management and rehabilitation tools for damaged areas (thematic objective 5b). Thus it allocates EUR 17 million (12% of the programme total) to finance projects for the development of common emergency plans, the implementing early warning systems, the development of transnational risk management tools, the creation of tools and methodologies for the regeneration of soil damaged by natural disasters.

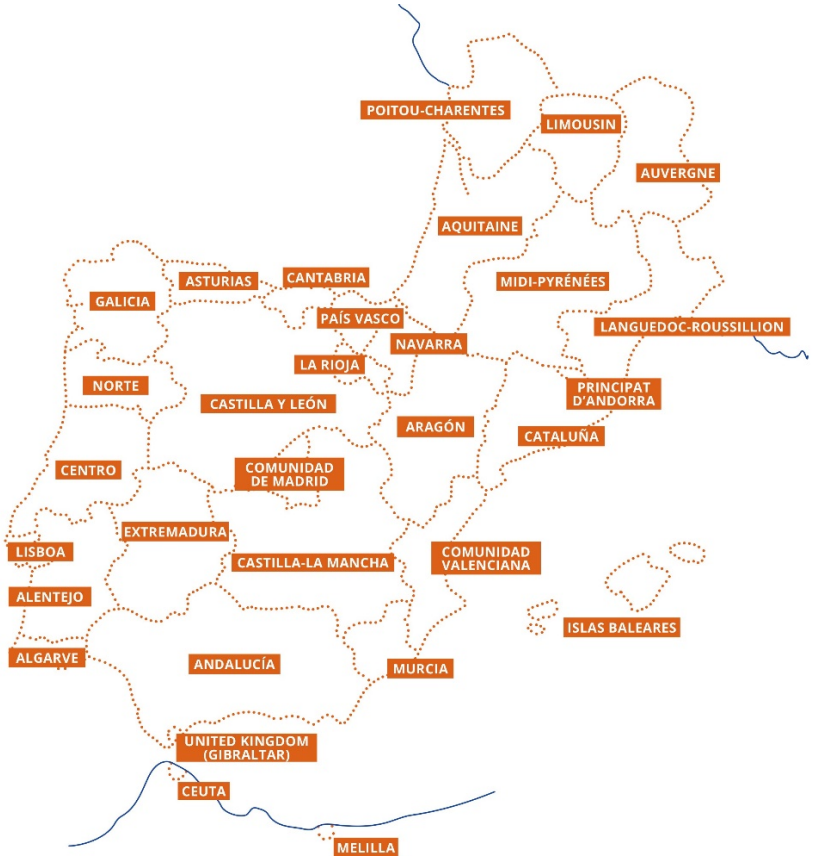


Fig. 44 Regions (NUTS-II) participating in the Interreg South West Europe programme. Source:interreg-sudoe.eu

Climate change adaptation in the Sudoe Interreg Programme: project examples

MONTCLIMA - Climate and natural risks in the SUDOE mountains

Lead Partner: Consorcio de la Comunidad de Trabajo de los Pirineos (ES)
Total budget: EUR 1.401.811,29| ERDF: 1.051.358,47 Duration: 01/07-2019 - 31/12/2021

Mountains are the most affected territories by natural risks and it is foreseen that those risks will increase due to climate change – risks which do not know administrative boarders and require a transnational coordination.
To respond to this challenge, MONTCLIMA provides a transnational strategic framework to prevent and manage natural risks in the Southwestern Mountains. It develops 4 pilot projects:

- Innovation and culture of wine to prevent soils erosion;
- Adaptative forests' management to prevent forest fires and improve the resilience to dryness;
- Improvement of the protector role of forests and;
- Follow-up of the river basins' dynamics to reduce the risks of torrent flooding.

Among others, some of the main tools will be a mapping with information on vulnerable areas, the history of catastrophes in mountain areas and a collection of good practices.

Partnership
Centro de Investigación Ecológica y Aplicaciones Forestales Centre de Recerca Ecologica (ES)
NEIKER-Instituto Vasco de Investigación y Desarrollo Agrario, SA (ES)
Fundación Centro de Servicios y Promoción Forestal y de su Industria de Castilla y León (ES)
Instituto Politécnico de Bragança (PT)
Office National des Forets (FR)
GEIE FORESPIR (FR)
Centre d'Etudes et d'Expertise sur les Risques, l'Environnement, la Mobilité et l'Aménagement (FR)
Comunidade Intermunicipal da Região de Leiria (PT)

RISKCOAST
Development of tools to prevent and manage geological risks in the coasts linked to climate change

Lead Partner: Centre Tecnologic de Telecomunicacions de Catalunya (ES)
Total budget: EUR 1.435.000,00 | ERDF: 1.076.250,00 Duration: 01/10-2019 - 30/09/2022

RISKCOAST promotes innovation to face a set of threatens linked to climate change: landslides, fields' subsidence due to the intense exploitation of aquifers during droughts, erosion and loss of soils after torrents, erosion of sandy coasts and deltas regression. The project offers a whole vision of risks, which affect in particular the coasts of the Sudoe's territory, by taking into account the hydrological basin. RISKCOAST proposes a set of natural renovation measures, adapted to every risk and territory, respecting environmental protection measures and a minimum impact on ecosystems. For this purpose, RISKCOAST provides strategies for a more coordinated and efficient management of risks, based on 3 phases of emergencies' management: prevention, response, renovation, and validation through participative simulacrums. In another hand, the project promotes the creation of a participative platform to improve the communication between the scientist community and society.

Partnership
Instituto Geológico y Minero de España (ES)
Bureau des Recherches Géologiques et Minières (FR)
Centre d'Etudes et d'Expertise sur les Risques, l'Environnement, la Mobilité et l'Aménagement (FR)
Universidad de Granada Vicerrectodado de Internacionalización (ES)
Asitec, Ingeniería Urbanismo y Medio Ambiente, SLP(ES)
Instituto de Geografia e Ordenamento do Território da Universidade de Lisboa (PT)

The Interreg V-A Spain-Portugal (POCTEP) programme identifies as the third of its four priorities Sustainable growth: adaptation to climate change, prevention and management of risks, reduction of the environmental impact of economic development and promotion of resource efficiency; reserving for this EUR 51.9 billion (11% of the programme total).

Climate change adaptation in the Interreg V-A POCTEP Programme: project examples

Iberian Center for the Forest Investigation and Firefighting

Lead Partner: Junta de Andalucía-Consejería de Agricultura, Ganadería, Pesca y Desarrollo Sostenible (ES)
Total budget: EUR 24 666 660.81| ERDF: 18 499 995.63 Duration: 2018-04-01 / 2021-12-31

Forest fires are one of the most serious challenges that the cross-border territory of Spain-Portugal faces. This project consists of the creation of the Iberian Center for the Investigation and Fight against Forest Fires (CILIFO), although it also includes the reinforcement of aerial and terrestrial infrastructures to fight forest fires, as well as training and awareness plans on both sides of border. Its objectives are:

- To strengthen and combine the cooperation, the operating procedures and the training between the Forest Fire Preventing and Extinguishing devices in the cooperation area of the Alentejo-Algarve-Andalusia Euroregion.
- To promote lasting and quality employment creation in the area; reduce the economic cost of fires creating rural economy linked to the landscape.
- To improve the involved administrations and authorities' capacity to respond to forest fires in the three participating regions.

Partnership
Agencia de Medio Ambiente y Agua de Andalucía (ES)
Agencia Estatal Consejo Superior de Investigaciones Científicas - Estación Biológica de Doñana (ES)
Fundación ONCE para la Cooperación e Inclusión Social de Personas con Discapacidad (ES)
Instituto Nacional de Investigación y Tecnología Agraria y Alimentaria , O.A., M.P. (INIA) (ES)
Universidad de Cádiz (ES)
Universidad de Córdoba (ES)
Universidad de Huelva (ES)
Fundación Delegación Fundación Finnova (ES)
Comunidade Intermunicipal do Algarve (PT)
Município de Castro Marim (PT)
Municipio de Loulé (PT)
Município de Monchique (PT)
Município de Tavira (PT)
Universidade de Évora (PT)

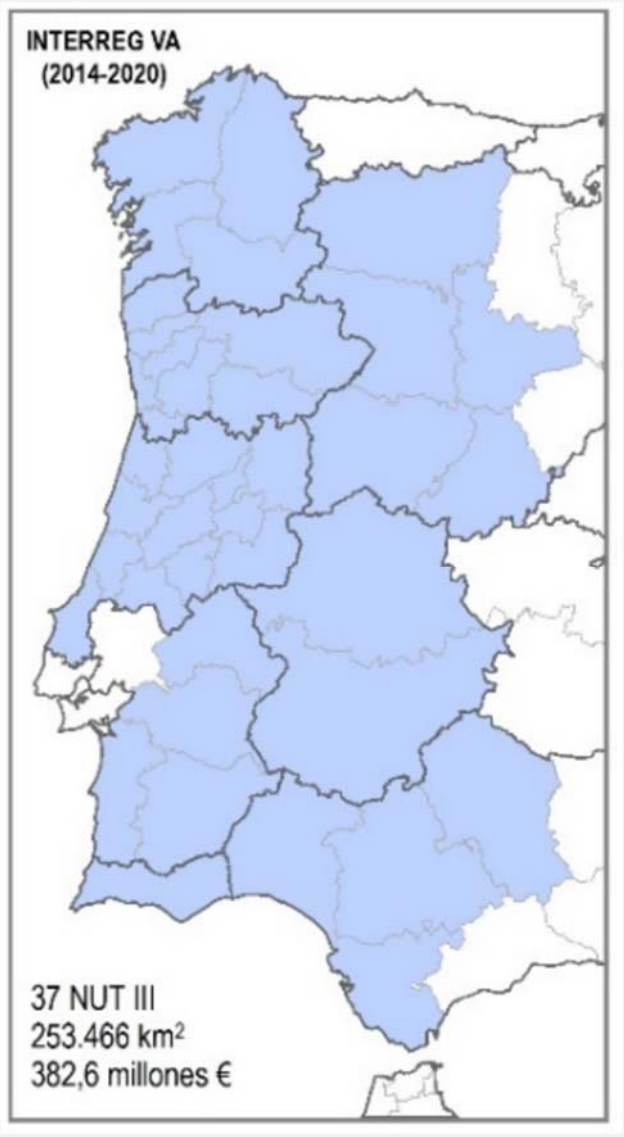


Fig. 45 Regions (NUTS-III) participating in the Interreg V-A POCTEP programme. Source: poctep.eu

MarRisk - Adaptation to climate change of the coast of Galicia and north of Portugal

Lead Partner: Consellería de Medio Ambiente e Ordenación do Territorio. Xunta de Galicia (ES)
Total budget: EUR 2 957 049.88| ERDF: 2 217 787.46 Duration: 2015-01-01/ 2019-12-31

MarRisk wants to ensure intelligent and sustainable growth of the coastal areas of Galicia and Northern Portugal by assessing the most important coastal risks in a climate change scenario. Floods, intensification of extreme events, episodes of toxic algae or coastal erosion are examples of risks to be analyzed in order to improve the resilience of traditional economic sectors and other emerging sectors such as marine renewable energies. In this way, the adaptation of the Cooperation Area to possible catastrophes will be improved and applications and services will be developed to guarantee a coordinated response (PI5.B), since environmental risks require a cross-border approach.

Partnership
Centro Tecnológico del Mar (Fundación CETMAR) (ES)
Instituto tecnológico para el control del medio marino de Galicia (INTECMAR) (ES)
Agencia Estatal Consejo Superior de Investigaciones Científicas. Instituto de Investigaciones Marinas (IIM-CSIC)(ES)
Instituto Nacional de Investigación y Tecnología Agraria y Alimentaria , O.A., M.P. (INIA) (ES)
Universidad de Vigo (ES)
Instituto Español de Oceanografia (IEO) (ES)
Instituto Português do Mar e da Atmosfera (IPMA) (PT)
Centro Interdisciplinar de Investigação Marinha e Ambiental (CIIMAR) (PT)
Universidade do Minho (PT)
Universidade de Aveiro (PT)
Agência Portuguesa do Ambiente, I.P (APA, I.P.) (PT)
Instituto de Engenharia de Sistemas e Computadores, Tecnologia e Ciência (INESC TEC) (PT)
Instituto Hidrográfico (IHPT) (PT)

LIFE Programme

LIFE ("The Financial Instrument for the Environment and Climate Action") is a programme launched by the European Commission and coordinated by the Environment and Climate Action Directorates-General
The LIFE Programme for Environment and Climate Action 2014-2020, with a budget of € 904.5 million, is dedicated to addressing the challenges of climate change across the EU. It supports the implementation of the strategic priorities of EU climate policy including Climate Change Adaptation.

The sub-programme for Climate Action covers the following priority areas:

- 'Climate Change Mitigation' will focus on reducing greenhouse gas emissions;
- 'Climate Change Adaptation' will focus on increasing resilience to climate change;
- 'Climate Governance and Information' will focus on increasing awareness, communication, cooperation and dissemination on climate mitigation and adaptation actions.

The programme specifically aims to:

- support the development and implementation of adaptation policies, including mainstreaming across policy areas;
- improve the knowledge base for the development, assessment, monitoring, evaluation and implementation of adaptation measures;
- facilitate the development and implementation of integrated approaches;
- contribute to the development and demonstration of innovative climate change adaptation technologies, systems, methods and instruments.

There are a number of instruments through which adaptation-related projects are implemented:

- Traditional projects (action grants) for climate resilient action with demonstrative, best practice or pilot nature, as well as information, awareness and dissemination projects that promote awareness raising.
- Integrated projects on a large territorial scale (regional, multi-regional, national or trans-national) implementing climate plans or strategies required by specific Union legislation, developed pursuant to other Union acts or developed by Member States' authorities, ensuring involvement of stakeholders and coordination with and mobilisation of at least one other relevant Union, national or private funding source. Technical Assistance is available for the preparation of integrated projects.
- The Natural Capital Financing Facility (NCFF), a financing instrument managed by the European Investment Bank.
- Operational grants to non-governmental organisations (NGOs) operating in the field of climate action and policy development at European level.

The LIFE Multiannual Work Programme 2018-2020 dedicates €123,85 million to Climate Change Adaptation. Applicants may be public bodies, private commercial organisations and private non-commercial organisations.
LIFE funded adaptation projects have contributed to the development of adaptation plans and strategies on national, regional and local levels; mainstreamed adaptation into key sectors, such as agriculture, forestry, water management, urban planning, health, biodiversity management etc.; or addressed specific climate change related concerns in sectors through concrete implemented measures; as well as tested and developed innovative technologies and solutions for adaptation, raised awareness, encouraged stakeholder participation, enhanced adaptation governance, and developed the knowledge base for adaptation.

LIFE projects for Climate change adaptation in Mainland Portugal

The LIFE Programme 2014-2020 has allocated EUR 6.37 million for climate change adaptation in Portugal, financing 13 projects involving 33 national partners. The following are some examples of these projects.

LIFE-MONTADO-ADAPT - MONTADO & CLIMATE; A NEED TO ADAPT

Coordinator Partner: Associação de Defesa do Património de Mértola - Portugal
Total budget: EUR 3.439.746 | LIFE: 2.051.538

Mediterranean ecosystems have been identified as being among the most likely to be impacted by climate change. A further clear trend towards drier and hotter conditions is predicted in the Mediterranean area. Here, substantial warming (about 1.5°C in winter and almost 2°C in summer and a significant decrease in precipitation (5-10% is likely to occur in the period 2021–2050, compared to the reference period of 1961–1990, although at local level changes might be even more dramatic.
The predicted climatic trends in the Mediterranean region are expected to enhance the risk of erosion and may increase desertification, which involves interacting changes in vegetation, soils, water availability and local climate. One Mediterranean ecosystem, known as Montado in Portugal and Dehesa in Spain, that is noted for its traditional agroforestry management practices, is becoming increasingly uneconomical. Income per hectare is insufficient to live on, causing rural depopulation.

LIFE-MONTADO-ADAPT has two objectives:

- Introducing innovative adaptation technologies in Portuguese and Spanish Montado and Dehesa (M/D landscapes and communities, through demonstration of sustainable and profitable Integrated Land Use (ILU systems, which help restore the landscape's multi-functional character and its contributions to socioeconomic development, environmental services, biodiversity conservation and carbon sequestration; and
- Maximising the transformational impact of these adaptation technologies and ecosystem services, and securing their replication and upscaling, through a farmer-to-farmer ILU adoption plan, developed commercialisation channels, sustainability and carbon certification, and a marketing plan for regional produce.

The project is aligned with the EU Adaptation Strategy objective of improving the knowledge base for better informed decision-making on adaptation, by ensuring that the lessons learned – the methods and tools developed - from the project's land-use demonstrations become available for replication purposes.

The project is expected to achieve the following results:

- Establish an Integrated Land Use system on 1 250 hectares of M/D land with combined methods e.g. inter-planting, diseased tree removal, reforestation, forage crop establishment and livestock fencing;
- Safeguard and improve biodiversity functions, including a 10% improved presence of indicator species for birds and butterflies and a restored plant diversity and structural complexity matching habitat requirements for the Iberian lynx (Lynx pardinus;
- Improved socioeconomic benefits of M/D land, including at least eight viable income sources for domestic and international markets, a €150 per hectare (or 300% increase in farmers' incomes, an increase in employment of 1 full-time equivalent per 10 hectares, and an overall increase in internal rate of return to at least 6%;
- A carbon sequestration increase of 1 tonne CO2 equivalent per hectare subject to carbon-saving activities;
- To ensure widespread adoption and replication of the adaptation technologies, the project will established a self-supporting commercial enterprise responsible for collective purchases, sales, marketing and farmer-to-farmer promotion;
- This company will sign at least 10 cooperation agreements with commercial partners for products and eco-services, and promote their products at two trade fairs;
- Eleven project partners will be trained as promoters, each successfully transferring their knowledge to 11 other farmers (110 farmers and an estimated 10 000 hectares in total resulting in certified ILU designs for their land; and
- Creation of synergies with national governments, forest authorities, agricultural and environmental authorities, the WWF, and other public and private entities in order to achieve policies and legislation beneficial to M/D development.

Partnership

ANSUB – Associação dos Produtores Florestais do Vale do Sado - Portugal
AYUNTAMIENTO DE VILLASBUENAS DE GATA - Spain
CONSEJERIA DE MEDIO AMBIENTE Y ORDENACION DEL TERRITORIO) - Spain
DEHESA DEL GUIJO, S.A. - Spain
Empresa de Desenvolvimento e Infraestruturas do Alqueva - Portugal
EXPLOTACIONES AGROPECUARIAS LA RINCONADA SL - Spain
FACULDADE DE CIENCIAS DA UNIVERSIDADE DE LISBOA - Portugal
Forestry Service Group - Netherlands (the)
Grupo Casablanca-Cáparra SL - Spain
ICNF - Instituto da Conservação da Natureza e das Florestas, IP - Portugal
Instituto Nacional de Investigação Agrária e Veterinaria - Portugal
Sociedade Agricola do Freixo do Meio, Lda - Portugal
TerraSIG Lda. - Portugal
UNAC - União da Floresta Mediterrânica - Portugal
Universidad de Extremadura - Spain
Universidade de Évora – Portugal

LIFE DESERT-ADAPT - Preparing desertification areas for increased climate change

Coordinator Partner: Università degli Studi della Campania Luigi Vanvitelli - Italy
Total budget: EUR 4.063.805| LIFE: 2.433.020

The International Panel on Climate Change (IPCC has identified Mediterranean ecosystems as being among the most likely to be affected by climate change, with a clear tendency towards drier and hotter conditions. Substantial warming and a significant decrease of precipitation is likely to occur in the period to 2050, although at local level changes might be even more dramatic, with an increase in extreme events, such as heat waves, droughts, heavy rain, wind storms or storm surges.

These events will probably lead to a depletion of surface and ground waters, depletion of aquifers, salinisation in coastal areas and desertification. These phenomena could lead to changes in vegetation, soils, water availability and local climate to the point of unsustainable support for key soil ecosystem services. Shortage of water availability is also expected to significantly decrease crop productivity and forest and biomass extent, resulting in the likely crossing of critical thresholds of ecosystems services, especially in the summer period. Climate change has already resulted in significant biodiversity loss, range contraction of species, erosion, salinisation, rangeland degradation and loss of agro-biodiversity.
LIFE DESERT-ADAPT aims to demonstrate the positive effect of an integrated ecosystems approach that combines climate change adaptation and mitigation targets with improved socioeconomic development opportunities in areas subjected to land degradation and desertification. It will:

- Demonstrate Desertification Adaptation Models (DAMs, aimed at countering aridification and subsequent land desertification in one region of Italy, of Spain and of Portugal. These DAMs will include innovative adaption technologies concerning land use, soil conservation and plant support – they will demonstrate combinations of techniques and species variations with regard to soil, plants and seeds, growing aids, mycorrhizae and facilities for ecosystem services. By incorporating climate change variables and structural and functional landscape complexity they seek to optimise resilience and adaptation to climate change, targeting the improvement of ecosystems and the socioeconomic system;
- Develop a farmer adoption system – a commercial approach with short supply chains providing economic incentives for farmers to adopt DAM land use systems – to maximise outreach to farming communities;
- Promote and replicate the DAMs and the project's unique combinations of techniques and income sources from products and services among different stakeholders. In particular, local farmers seeking opportunities from climate resilient and profitable land use and policy-makers, to enable upscaling in the project's regions and beyond;
- Contribute to climate change mitigation through the climate-resilient land use systems introduced to enable the recovery of vulnerable and desertified land areas. These will lead to an increase in overall carbon sequestration in the soil and in above-ground vegetation and lower the carbon footprint of the farmed products.

Expected results:

- Demonstration of innovative adaptation technologies, where the innovative part is the way in which methods are combined and integrated and in the balance achieved between economic benefits and benefits for the environment, biodiversity and climate;
- Establishment of 10 DAMs;
- 1 000 ha of land in Italy, Spain and Portugal managed through a combination of methods such as inter-planting, reforestation, water-saving technologies and soil protection;
- Improved biodiversity, including a 50% increase in soil functional biodiversity; an increase of at least 10% of indicator species for birds and butterflies, invertebrates, soil fauna; and a 30% increase of nectar-producing plants in support of pollinating species (at least three species introduced by the project;
- Improved socioeconomic benefits, with at least eight viable income sources selected from possible combinations of bio-products and ecosystem services; a €100 per ha (or 100% income increase for farmers; an increase in employment to 0.1 full-time employees per ha and an overall Internal Rate of Return improvement of at least 6%; and
- A net carbon removal of one tonne of CO2 per ha;

Partnership
Associação de Defesa do Património de Mértola - Portugal
Ayuntamiento de Hoyos - Spain
Ayuntamiento de Valverde del Fresno - Spain
CENTRO INTERDIPARTIMENTALE DI RICERCA SULL'INTERAZIONE TECNOLOGIA-AMBIENTE- Università di Palermo(IT)
CONSORZIO SICILIANO LEGALLINEFELICI - Italy
FACULDADE DE CIENCIAS DA UNIVERSIDADE DE LISBOA - Portugal
Forestry Service Group BV - Netherlands (the)
FREGUESIA DE CABEÇA GORDA - Portugal
Municipality of Lampedusa e Linosa - Italy
Município de Serpa - Portugal
REAM SRL - Italy
SOCIEDADE AGRÍCOLA DA SOBREIRA, LDA - Portugal
Sociedade Agrícola Vargas Madeira, Lda - Portugal
Societa Agricola Franco Turco - Italy
TerraSIG Lda. - Portugal
Universidad de Extremadura - Spain
Universidade Nova de Lisboa - Faculdade de Ciências Sociais e Humanas - Portugal
Viveros Forestalis La Dehesa SL - Spain

LIFE ADAPTATE - Common methodology for the development of Sustainable Energy and Climate Action Plans in European municipalities

Coordinator Partner: Instituto Fomento Región de Murcia - Spain
Total budget: EUR 3.214.997 | LIFE: 1.763.487

According to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change, if emissions continue to rise at the current rate, the global average temperature will increase 2.6-4.8ºC, and sea levels will become 0.45-0.82 metres higher by the end of this century. Urban ecosystems are especially sensitive to weather-related events and climate change impacts, which are accelerated in built-up areas.
Despite the success of initiatives such as the Covenant of Mayors, few local authorities have implemented policies for adapting to climate change. Municipalities across Europe could benefit from a common methodology for developing sustainable energy and climate action plans.

LIFE ADAPTATE's main objective is to contribute to improving climate policy and legislation at local level in the European Union, in line with the EU Strategy on adaptation to climate change and the 2030 climate and energy framework. The project targets in particular, the process of design and implementation of local adaptation policies, their coordination with mitigation actions and the adaptation of local policies to meet climate change challenges.
Specific objectives are to:

- Help six municipalities in Spain, Portugal and Latvia to develop sustainable energy and climate action plans. These 'SECAPS' will incorporate the synergies, experiences and know-how of stakeholders, supporting latest technologies and a public participative approach;
- Implement, monitor and assess the SECAPs in order to improve them and collate experiences for subsequent replication and transfer;
- Demonstrate the positive impacts of pilot actions related to mitigation /adaptation at local level and the different approaches that can be used to address similar risks in local authority areas across Europe, i.e. widening the knowledge base of adaptation measures;
- Test and demonstrate cooperation schemes among local authorities in the three countries and highlight the positive impacts of involving members of the public;
- Demonstrate and transfer the process of including the evaluation of climate change impact and development of mitigation and adaptation measures policies at local level, especially in planning-related policies and projects; and
- Develop resources and guidelines for transfer and replication of tools, results and achievements.

Expected results:

- Six municipalities in Spain, Portugal and Latvia to have carried out local vulnerability assessment studies and developed and implemented sustainable energy and climate action plans;
- A further 18 local authorities to have begun preparing similar plans within two years of the end of the project;
- Demonstration of pilot climate adaptation actions to increase resilience to floods and forest fires;
- Registration of at least six municipalities in the Covenant of Mayors with future registration of at least 18 additional municipalities in Spain, Portugal and Latvia;
- Reduction of the average temperatures by 2ºC in pilot areas of Águilas, Cartagena and Lorca (Spain) and Alfândega da Fé and Mértola (Portugal). This will be achieved by creating shaded areas and a natural lagoon of around 1 000 m2;
- Increased resilience to flooding in Smiltene, Latvia (population: 14 000) through the restoration of Lake Vidusezers;
- Encouragement of natural regeneration of native plant species in Mértola through the creation of a 2.4 ha woodland;
- A sustainable tourism plan for Mértola adapted to climate change impacts;
- Reduction of forest fire risk in Alfândega da Fé by encouraging the recovery of 50 ha of former abandoned land; and
- Production of 37 970 kWh/year of renewable energy in in Águilas through various mitigation measures.

Partnership

Alfândega da Fé Municipality - Portugal
AYUNTAMIENTO DE ÁGUILAS - Spain
Comunidad Autónoma de la Región de Murcia. Consejería de Agua, Agricultura y Medio Ambiente. - Spain
Ekodoma Ltd. - Latvia
EuroVértice Consultores, S.L. - Spain
EXCELENTÍSIMO AYUNTAMIENTO DE LORCA - Spain
EXCMO. AYUNTAMIENTO DE CARTAGENA - Spain
Instituto Fomento Región de Murcia - Spain
IrRADIARE, Science for evolution, Lda. - Portugal
Mértola Municipality - Portugal
Smiltene Municipality – Latvia

LIFE LUNGS - Towards a more resilient Lisbon UrbaN Green InfraStructure as an adaptation to climate change

Coordinator Partner: Município de Lisboa - Portugal
Total budget: EUR 2.739.725| LIFE: 1.506.384

Lisbon, the biggest city in Portugal, faces growing threats linked to climate change because of its geographical location and climate. Annual average rainfall is decreasing, although the city experiences more winter rainfall. This means longer droughts and more seasonal floods,reducing soil water uptake and soil conservation. Meanwhile average temperatures are increasing by 14C per year, with up to 5C higher maximum temperatures. Climate change will therefore have a negative impact on Lisbon citizens life quality and health and its urban green areas.LIFE LUNGs main objective is to implement the municipal climate adaptation strategy (EMAAC by making use of urban green infrastructure as a tool for climate change adaptation. It will also promote and develop related ecosystem services. Its overall aim is to increase Lisbons resilience and resistance to climate change. It will target water use by developing zero rainwater waste urban green infrastructure and increasing flood resistance, while maintaining a quality, resilient ecological base. By developing more green spaces, it will also tackle rising temperatures caused by urban heat islands.

Expected results:

- better use of rainwater by trialling zero rainwater waste areas and implementing rain-fed ecosystems in an area of over 100 ha;
- over 100 ha of shaded areas thanks to tree planting, with improved microclimate conditions within the urban, green areas of vora;
- improved flood resilience in over 100 ha of the urban green infrastructure areas;
- around 115 ha to benefit from increased resilience against soil erosion by using natural-based solutions;
- around 740 tonnes of CO2 sequestered;
- replication of the project once at EU level during the project lifetime, and three times afterwards: two cases in Portugal and one at EU level;
- reproduction of project activities in five private green areas in Lisbon;
- share technical knowhow with around 20 municipalities in the Lisbon metropolitan area and with five other Portuguese municipalities which are working on climate adaptation; and
- encourage more local urban farmers to use more water-efficient and climate-adapted irrigation.

Partnership

Ayuntamiento de Málaga - Spain

3. Climate change adaptation in Mainland Portugal

According to the European Environment Agency Report No 1/2017 (Climate change, impacts and vulnerability in Europe 2016*)* and the IPCC 5th assessment report, Portugal is one of the most vulnerable countries to climate change in Europe (drought, reduction in annual rainfall, increase in average annual temperature, increase in heat waves and increase in extreme events) and further has a poor ability to adapt (lack of personnel training, poorly developed local adaptation strategies, inconsistency of policies at the national, regional and local levels, etc.). The subscription of the Kyoto Protocol in 1997 marked the beginning of climate policies in Portugal. Throughout the 2000's the country developed a series of mitigation measures aimed at fulfilling the Kyoto targets. Adaptation was rarely approached until 2010, with the development of the first municipal strategies and national strategy for adaptation.

Among the main climate impacts concerning Mainland Portugal, the issue of coastal erosion has been the first to receive attention, especially since the 2000s, and has become the initial main focus for climate change adaptation policies. Droughts, annual rainfall reduction and extreme heat are the other main issues that have been addressed since the introduction of adaptation policies. In later years, however, the issue of wildfires has rapidly become the first concern for both the authorities and the public opinion. Above all, the wildfires of 17 June 2017 in Pedrógão Grande, causing 66 deaths and 204 injured people, have had a deep impact on the population, who has started questioning the action of the authorities on the issue. Thus the prevention and management of wildfires has surged to the top of the political agenda of the Government, which in 2018 has imposed the compulsory maintenance of rural terrains by the respective owners. These, however, are usually hard to identify, for the fragmentation of propriety through generations and the depopulation of the rural space. So the Government is forced to find other solutions, proving the need of spatial planning policies for climate change adaptation.

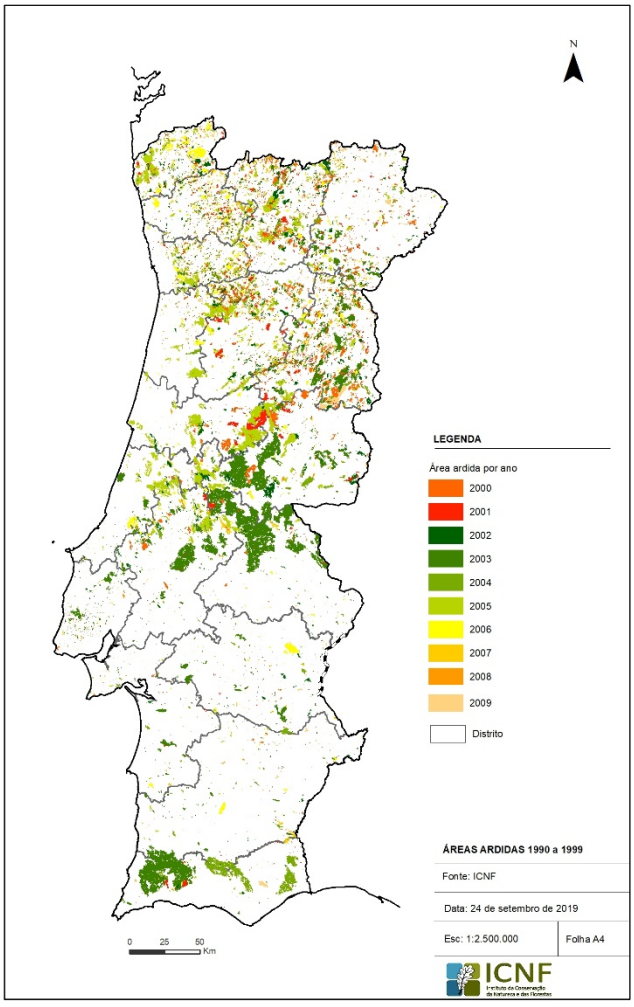


Fig. 46 Areas burnt for wildfires in Mainland Portugal in the period 2000-2009 . Source: ICNF

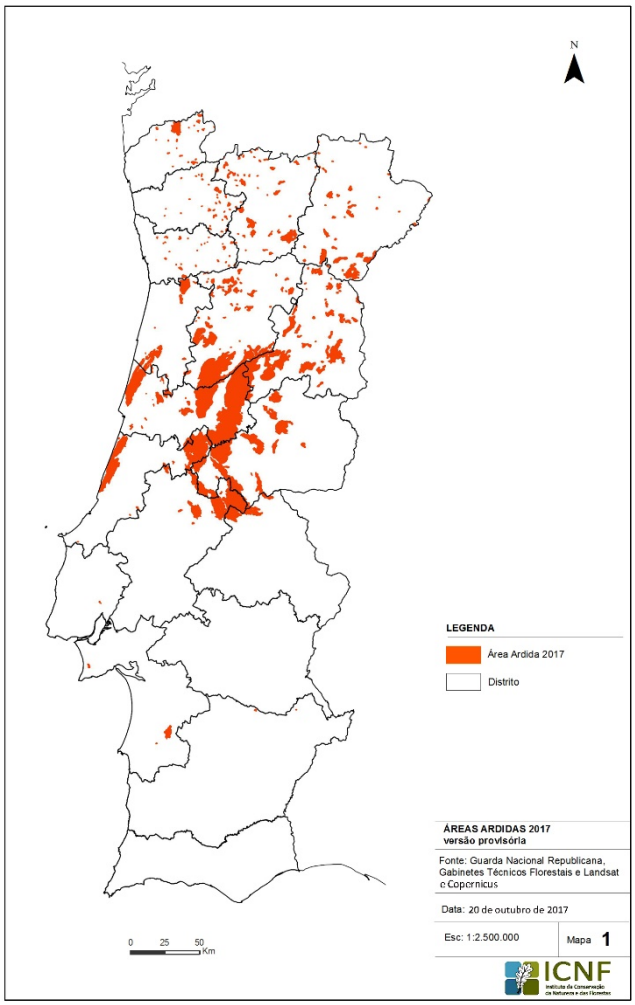


Fig. 47 Areas burnt for wildfires in Mainland Portugal only in the year 2017. Source: ICNF

3.1 Chronological framework

3.1.1 2010-2014: the first national and local strategies

The National Strategy for Climate Change Adaptation - ENAAC

The first climate adaptation instruments in Portugal were introduced in 2010 at the local and national level. At the local level, the plans in Sintra and Cascais provided excellent examples of adaptation tools for the local scale, though remaining unfollowed until the ClimAdaPT.Local project in 2015. At the same time, given the growing relevance of climate adaptation in the EU discourse and in public opinion, the national government decided to capitalize and expand the research work started with the SIAM projects and adopted a national strategy for adaptation in 2010.

The SIAM Projects (1999-2003)

The SIAM projects are the first comprehensive research work on climate change adaptation carried out in Portugal.

SIAM Climate Change in Portugal. Scenarios, Impacts and Adaptation Measures

The project was carried out between 1999 and 2002 by a group of Portuguese researchers around the FCUL (Faculty of Sciences of the University of Lisbon), who later gathered in the CCIAM research team (in FCUL). Its aim was to execute the first integrated evaluation of the impacts and adaptation measures to climate change in Continental Portugal in the XXI century. The studies were based on future climate scenarios obtained through models of general circulation of the atmosphere, and they were referred to a set of socio-economic sectors and biophysical systems: water resources, coastal zones, agriculture, human health, energy, forests and biodiversity, fishing. Additionally, a sociological analysis investigated the impact of climate change on Portugal. The SIAM project furnished a basis for advanced research on climate change in Portugal and resulted in the publications of its results in 2002.

SIAM II

The SIAM Project II operated between 2002 and 2003 on three main axis:

- The expansion of the research already developed on Continental Portugal through SIAM I to the Atlantic archipelagos of Azores and Madeira.
- The Production of a detailed analysis of a localized case study, in the Sado river estuary, as a 2nd step research;
- The focused divulgation of the SIAM I results through regional meetings between the sectors' research teams and local stakeholders.

The SIAM projects laid solid foundations for all subsequent climate adaptation research in Portugal. In 2005 the foundation of the CCIAM (Climate Change Impacts, Adaptation and Modelling research group) at FCUL adopted the SIAM results as basis for a permanent research work. CCIAM is since the leading research center on climate science in Portugal.

This group of researchers was also responsible for the first local adaptation plans in Portugal, in Sintra (2009) and Cascais (2010). These plans were informed and led by FCUL as a continuation of the SIAM projects, received generous funding from the municipalities, and are still considered milestones in local adaptation for the depth of the studies they are based on.

The first phase of ENAAC (National Strategy for Adaptation to Climate Change) took place between 2010 and 2013, aiming at raising knowledge and awareness on climate change adaptation, informing international cooperation, and mostly identifying and implementing adaptive measures. The strategy's objectives proved largely optimistic at the closure of the first phase in 2013, though it showed notably effective in some ways, namely: In involving all the main sectorial agencies and experts in a nation-scale debate on climate change adaptation; In introducing climate adaptation as a primary theme in most of the sectors targeted; and In proceeding with the identification of sectorial adaption measures.

The preliminary studies for the strategy were concluded in 2007 by the Environment Institute (later APA) and formed the basis of the work carried out in 2009 by an inter-ministerial commission including the representatives of 30 public agencies.

APA – National Institute for the Environment

The Portuguese Environment Agency (Agência Portuguesa do Ambiente, APA) is a public institute within the scope of the Portuguese Ministry of the Environment and Energy. It was created in 2012 in result of a merging process involving 9 different institutes, with the aim of unifying all public agencies involved in the development and monitorization of environment and sustainable development policies. It works in close cooperation with other public, private and non-governmental organizations, to ensure a high level of protection and enhancement of environmental systems. In 2012 APA was assigned the management of the Portuguese Carbon Fund and it is since the main institution responsible for climate change adaptation at the national level, managing the general coordination of both ENAAC 2020 and AdaPT Program.

ENAAC was structured on 4 main objectives:

- Knowledge; constituting the basis of all operations of adaptation to climate change, it is focused on the need to consolidate and develop a solid scientific and technical basis;
- Reduce vulnerability and increase adaptive capacity; constituting the core of the strategy, it is composed of the phases of identification, prioritization and implementation of adaptation measures;
- Participation, divulgation and raising awareness; aimed at delivering knowledge on climate change to all social parts, at conveying the need of action and, mostly, draw the major participation possible in the definition and implementation of the strategy;
- International co-operation; tackling the national responsibilities in international cooperation for climate change adaptation, and Portuguese role in international negotiations.

ENAAC adopted a sectorial approach with an a priori identification of nine priority sectors that was performed through a methodology aimed at:

- Balancing the fragmentation of the problem;
- Maximizing knowledge and involvement of participants;
- Containing the number of sectorial teams, in order to grant unitarian coherence to the strategy.

Furthermore, some sectors had already developed, or were developing, significant works which (in direct or indirect form) contributed to the objective of ENAAC. In the same way, all the experiences already developed at regional and local level on adaptation to climate change were targeted for integration in the ENAAC. Finally, the priority sectors of ENAAC are: spatial planning, water resources, public safety, human health, energy and industry, tourism, agriculture forests and fishery, coastal areas, biodiversity; thus adding two sectors (spatial planning and public safety) to the

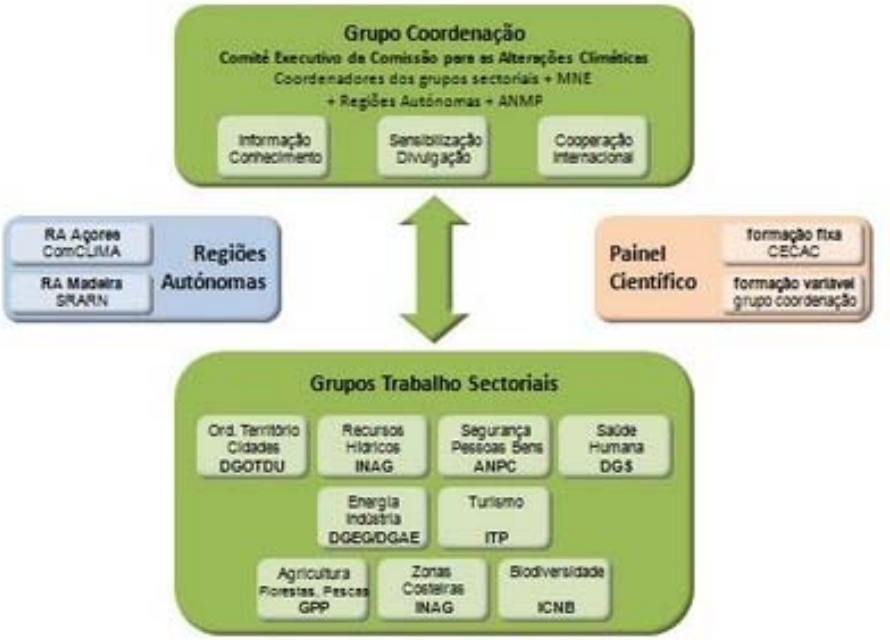


Fig. 48 Organisational structure of the first ENAAC. Source: ENAAC 2010

sectorial framework already introduced by SIAM. The sectorial approach was intended to grant broader consistency in the identification of sectorial adaptation measures. On the other hand, the functional interrelations among dominions should have made possible an effective prioritization of measures through the identification of synergies and the prevention of eventual conflicts among sectors.

The first implementation period of ENAAC had to start in 2010, under the coordination of CECAC (Executive Committee for the Climate Change inter-ministerial Commission); however, a government change in 2011 led to significant restructuring of the Ministry of Environment, a reduction in government agencies and the downgrading of environmental issues in general and climate change in particular in governmental priorities. At a time of severe economic and financial crisis (Portugal Memorandum 2011-2014), ENAAC was put on hold and by mid-2013 there was still little information on the work carried out by sectorial groups.
This situation changed drastically in July 2013, when a crisis in the agreement between the two main government parties (PSD and CDS-PP), brought to the creation of the Ministry of Environment, Spatial Planning and Energy. The newly nominated minister Jorge Moreira da Silva, who had matured a considerable expertise on climate change policies working for the European Union and the United Nations in the previous decade, was responsible for structural reforms in energy, water, waste, spatial planning and housing sectors, including the Green Taxation Reform and the Portuguese Green Growth Commitment (*Compromisso para o Crescimento Verde*, 2015).
The changes in the government in summer 2013 put an end to the first phase of ENAAC, in order to approve a renewed and strengthened strategy as soon as possible. The first phase of the strategy was thus concluded in September 2013 with the publication of the progress report, containing resumes of all the works carried out by the teams and the main negative and positive aspects detected. The main limitation was a general lack of sufficient organization, particularly in managing the interactions among the various teams and actors, together with the need of a better involvement of actors, especially referring to local authorities. On the other hand, the comprehensiveness of the coordination group, the flexibility granted to the sectorial teams for their individual works, and the leadership role of the national agency for the environment (*Agência Portuguesa do Ambiente*, APA) were considered positive points and good foundation grounds for the renewal of the strategy.

Environmental Fund

The Portuguese Carbon Fund (*Fundo Português de Carbono*, FPC) was instituted by the Portuguese government in March 2006 to support the economic transition towards resilience, competitiveness and low carbon, through the financing of climate change-related measures. The functioning of the fund aims at discouraging the massive use of fossil fuels in Portugal while at the same time providing financial support to low-carbon policies and projects. After being initially sustained through an annual endowment from the government budget, since 2013 the FPC is financially self-sufficient after being entitled the incomes on the taxes on heating diesel oil, low efficiency lamps and biofuel production, plus the incomes associated to the European Union Emissions Trading System (EU ETS). Shortly before, the FPC had passed from ministerial control to the management of APA (Portuguese Environment Agency). Keeping these premises, in 2016 the FPC was incorporated in the more comprehensive Environmental Fund (*Fundo Ambiental*), which gathers all public funds for environmental policies to achieve a superior financial capacity and allow better coordination and flexibility in financing and management. The Strategic Framework for Climate Policies 2030 (QEPiC, 2015) identifies the Portuguese Carbon Fund as the first financial instrument of implementation for climate policies in Portugal.

The AdaPT Program

Given the comprehensiveness and slow rate of development of the national strategy, the ENAAC team decided to assign further financing resources to a program parallel to ENAAC that would promote adaptation at the local level, both implementing the measures already known and available contained in the ENAAC and experimenting new solutions to fill the knowledge gap on climate change adaptation measures.
In the framework of the EEA Grants 2009-2014, the AdaPT program was designed to financially support the activities relating to "Adapting to Climate Change" in Portugal. Its development was guided by the terms set out in the Memorandum of Understanding between Portugal, Norway, Iceland and Liechtenstein under the Financial Mechanism of the European Economic Area (EEA FM / EEA-Grants). The program proposal was submitted by the National Focal Point to the authorities of donor countries in November 2012 and was approved during the 1st quarter of 2013.

The program was informed by the needs and contributions of the coordination group of ENAAC. The program operator was the Portuguese Environmental Agency (APA) as manager of the Portuguese Carbon Fund (FPC), while the program partner on behalf of the donor country was the Norwegian agency responsible for the areas of civil protection and climate change (Direktoratet for Samfunnssikkerhet og Beredskap, DSB).
The total budget for ADAPT was € 3,529,412 (€ 3,000,000 EEA FM + € 529,412 FPC).

EEA Grants

Through the European Economic Area (EEA) Agreement, signed in the city of Porto in May 1992, Iceland, Liechtenstein and Norway are partners, in the internal market, of the Member States of the European Union.
As a way of promoting a continuous and balanced strengthening of the economic and trade relations, the parties of the European Economic Area Agreement have established a Multiannual Financial Mechanism, known as the EEA Grants, through which Iceland, Liechtenstein and Norway provide financial support to Member States of the European Union with the greatest deviations from the European average GDP per capita, which includes Portugal.
The two major EEA Grants objectives are:

- To reduce the economic and social disparities in the European Economic Area;
- To strengthen the bilateral relations between beneficiary and donor countries.

Since the coming into force of the Agreement in 1994, Iceland, Liechtenstein and Norway, as donor States, have contributed to finance Portugal for economic and social development.
The EEA Grants for the period 2009-2014 supplied a net allocation of 53,603,750€, destined to promote a close cooperation between the institutional entities and partners of the donors and beneficiaries States, in projects linked to the following programmatic areas:

- Marine and Inland Waters
- Renewable energies
- Climatic changes
- Non-Governmental Organizations
- Public health
- Gender Equality and Work Life Balance
- Cultural Heritage and Arts

The program aimed to finance projects that would strongly contribute to its main objective: to increase capacity to assess vulnerability to climate change and to raise awareness and education on climate change.
On this basis, four project areas were proposed:

- One pre-defined project of divulgation: the creation of a web Climate Portal in order to give easy access by the general public and the other project promoters to systematized informations about climate scenarios of regional scale, including the data processing of the 5th IPCC Assessment;
- Local adaptation: aimed at building the capacity of local administration of agents (municipalities and municipal companies) for the development of Local Strategies for Adaptation to Climate Change, it resulted in the ClimAdaPT.Local program;
- Education and climate change award: thought to integrate and complement the environmental education in the field of climate change mitigation and adaptation in the areas in pilot schools. One of the project components will be a premium (funding) for the best project implementation measures related to climate change in schools;
- Sectoral projects: development studies or implementation measures (pilot or demonstration) identified as relevant in the context of the sectoral groups of ENAAC. The tenders launched in this area resulted in the financing of 8 sectorial projects of adaptation to climate change concerning water management, reforestation, economy resilience, and tourism.

3.1.2 2015-2016: dissemination of local adaptation strategies

ENAAC 2020

The period between 2013 and 2015 saw a systematization of the government's climate policy under the Ministry of Environment, Spatial Planning and Energy. The main strategic output of this phase was the Strategical Framework for Climate Policies (*Quadro Estratégico para a Política Climática*, QEPiC) in 2015, gathering the government's instruments on mitigation and adaptation to climate change for the 2030 horizon. The QEPiC proposal on adaptation was ENAAC 2020, a renewal of the original ENAAC with increased financial support, a more developed supporting strategy and a perfected organization scheme. The CIACC (Inter-ministerial Commission for Air and Climate Change) was made responsible for the political accompanying of the strategy.

ENAAC 2020 adopts the vision of a country adapted to the effects of climate change, through the continuous implementation of solutions based on the technical and scientific knowledge and on good practices.

ENAAC 2020 institutes an organization model that promotes the articulation among the sectors and parties involved, aiming at the pursuing of priorities in six thematic areas and nine priority sectors. To ensure comprehensiveness and coherence to the measures proposed in all sectors and areas, ENAAC 2020 designates some overall priorities, synthetized in three strategical objectives:

- Increase the knowledge on climate change
- Implement adaptation measures
- Promote the integration of adaptation in sectorial policies

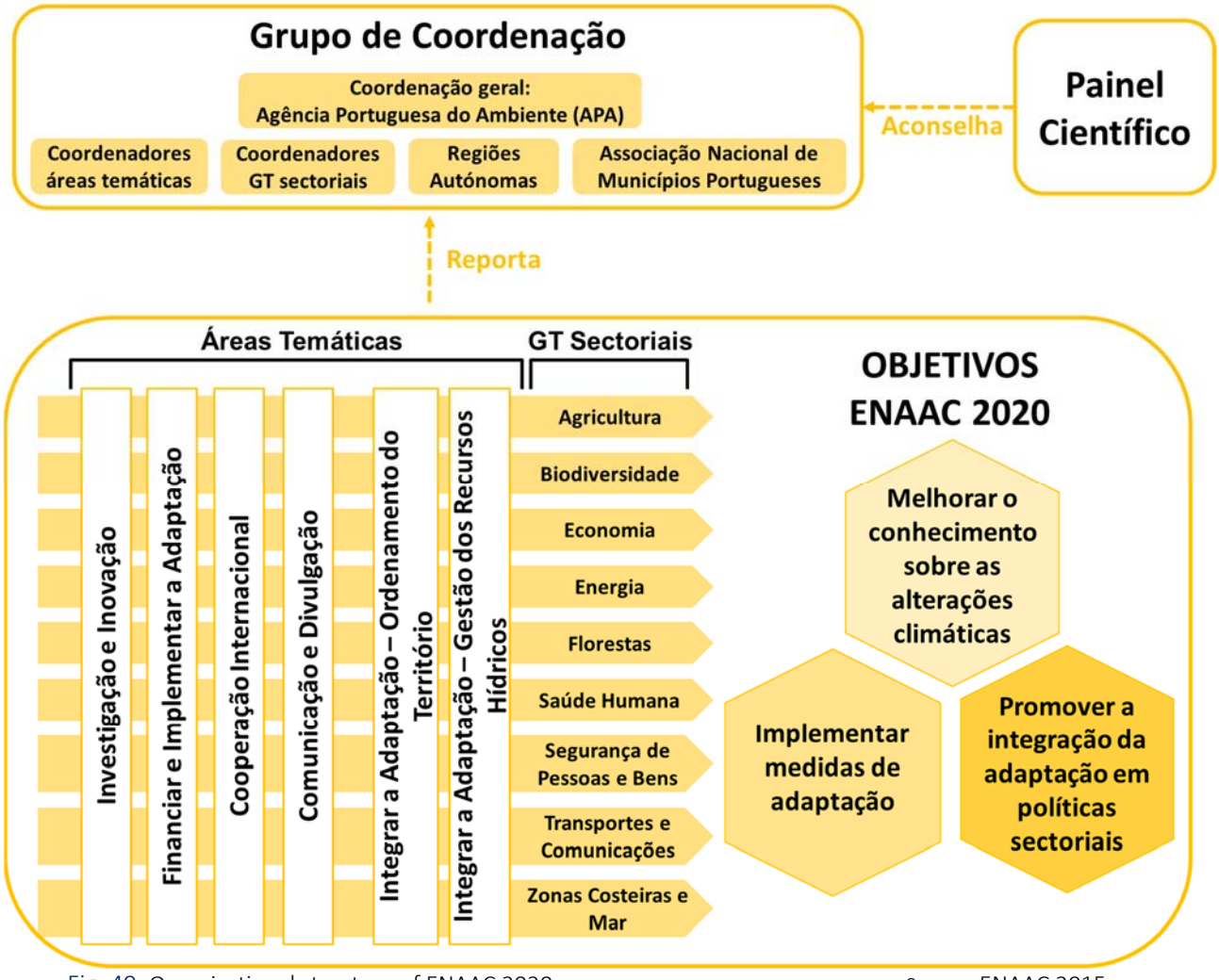


Fig. 49 Organisational structure of ENAAC 2020. Source: ENAAC 2015

The process of identification of adaptation measures was carried out by the teams in charge of each of the 9 sectors: agriculture, biodiversity, economy, energy, forests, human health, safety, transports and communications, and coastal areas and sea. Each team was charged to:

- Identify impacts, vulnerabilities and adaptation measures;
- Integrate adaptation in sectorial policies;
- Identify necessities and lacks of knowledge;
- Promote sectorial studies, identify sources of financing and mechanisms of monitorization;
- Prepare plans and activity reports;
- Contribute to the Thematic Areas work;
- Articulate when necessary with the other teams.

At the same time, the six thematic areas were thought to host inter-sectorial confrontations, with the aim of executing integration both vertically (in the different scales for adaptation, from international to local) and horizontally (among different sectors). The thematic areas are:

- Research and innovation: promote science and national knowledge in all the areas which are relevant for a coherent implementation of ENAAC 2020;
- Finance and implement adaptation: prioritization and articulation of funds and means available for the coherent financing of adaptation measures for the implementation of ENAAC 2020 and for the establishment of effective mechanisms of report, namely in the sphere of international obligations;
- International cooperation: promote the work of cooperation with other countries in the fields relevant for the implementation of ENAAC and all the analogous strategies of other regions of the world, favoring the countries with privileged positions for the Portuguese cooperation;
- Communication and promotion (national platform for adaptation): supports the development, systematization and dissemination of the information needed for a coherent decision-making in adaptation policies;
- Integration of adaptation in spatial planning: promote the introduction of the adaptive component in the instruments for spatial policy and management, including the training of sectorial agents on everything that involves the local integration of specific adaptation measures;
- Integration of adaptation in the water management sector: promotion of the introduction of the adaptative component in the instruments for water policies and management, including the training of sectorial agents on all that involves water management.

In this way, the National Strategy identifies spatial planning (together with mater management) as the main tool to integrate sectorial policies, and actually as the only setting for the confrontation, harmonisation and integration of sectorial policies that are developed individually up to that point.

The ClimAdaPT.Local project

In order to complement the ENAAC process at the local level, APA chose to address half of the AdaPT programme budget to a project area, submitted to call, with the aim of “improving the capacity of Portuguese municipalities to incorporate adaptation to climate change in their planning tools and local interventions”. The winning project was submitted by the ClimAdaPT.Local consortium, led by FCUL and including both public and private partners with expertise in climate change adaptation, most notably the Norwegian cCHANGE.

ClimAdaPT.Local operated with a strong strategical approach, aiming at a vision of "conscientiousness of all Portuguese municipalities facing local scenarios, impacts and vulnerabilities to climate change; their inter-sectorial formation and multi-level governance accomplishing adaptation to climate change to gain resilience, autonomy and sustainability", and declaring its mission as "being a process of integration in the planning tools of the municipalities of the main guidelines and objectives of the European and National Strategies on Adaptation to Climate Change, so as to prove that local-scale adaptation can promote the implementation of the objectives of EEA Grants". The general objective of ClimAdaPT.Local was to start in Portugal a continuous process of development of Municipal Strategies of Adaptation to Climate Change (*Estratégias Municipais de Adaptação às Alterações Climáticas*, EMAAC) and their integration in the municipal planning tools. This was to be achieved through the updated formation of municipal officers, the raising of awareness among local actors, and the development of tools and products facilitating the elaboration and implementation of EMAACs, in the 26 pilot municipalities first and in all Portuguese municipalities then. ClimAdaPT.Local adopted the following operational objectives:

- The development of 26 EMAAC in partnership with the respective municipalities;
- The conduction of a formative program in local adaptation to climate change, addressing 52 municipal officers (two for each municipality involved in the development of EMAACs);
- The establishment in Portugal of a Network of Municipalities for Adaptation to Climate Change, constituting a forum for reflection and dynamization of public policies in the field of adaptation;
- The creation of an online platform for the sensibilization of local and national communities and the empowerment of technicians and elected officials, promoting the relevance of local adaptation.

The 26 pilot municipalities were chosen according to the priorities of inclusiveness and comprehensiveness of the project, starting from the representation of a municipality from each Inter-Municipal Community (NUTS III), including the Metropolitan Areas of Lisbon and Porto and the Autonomous Regions of Azores and Madeira.

The main aims of this choice were:

- To face the climatic differences of all the regions in Portugal, building a comprehensive framework of all the climate change impacts affecting the national territory, and therefore experimenting solutions for all the vulnerabilities that any Portuguese municipality could face in the future;
- To spread adaptation tools in all Portuguese regions, as a way of disseminating adaptation.

In result of the choices of the pilot municipalities, at the conclusion of the ClimAdaPT.Local project the municipalities equipped with an adaptation strategy served around 4 million inhabitants (40% of the country's population).

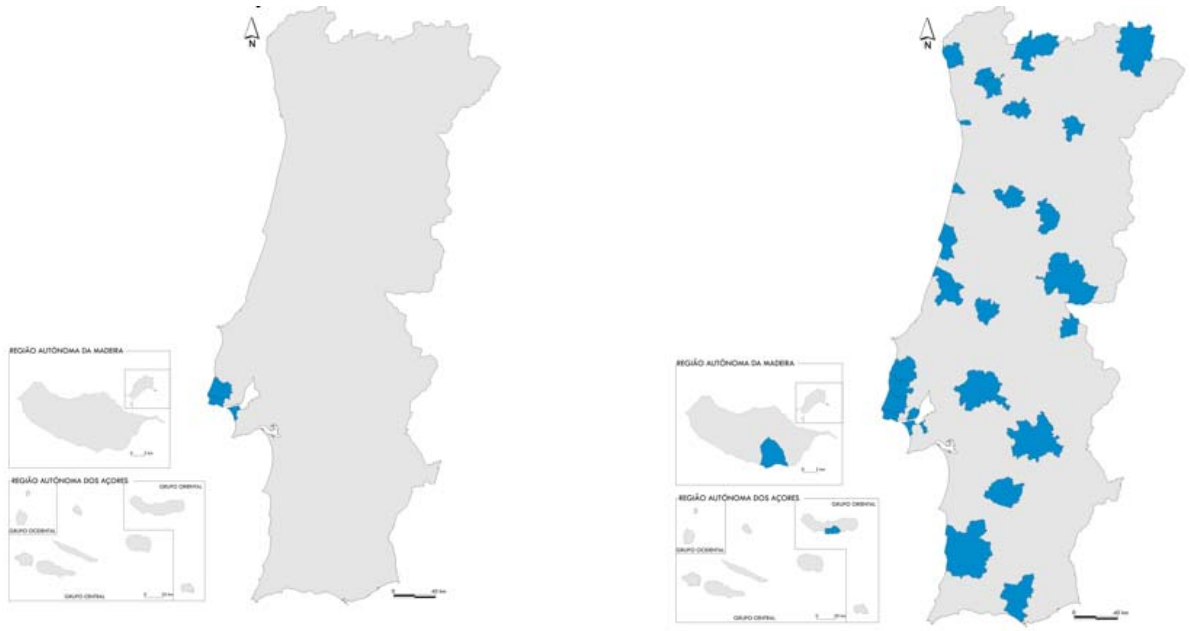


Fig. 50 Portuguese municiplaities provided with a climate adaptation strategy before and after the ClimAdaPT.Local project. Source: ClimAdaPT.Local

The program was concluded in december 2016 and proved notably successful in achieving its overall objective of raising adaptive capacity at the local level, producing, besides the first 26 EMAACs, the creation of the network of municipalities for local adaptation to climate change.

The EMAAC as a tool for planning adaptation policies

The ClimAdaPT.Local project had the main objective and result of introducing municipal adaptation strategies (*Estratégias Municipais de Adaptação às Alterações Climáticas*, EMAAC) as the main tool for local-scale adaptation in Portugal.
Before ClimAdaPT.Local, adaptation strategies were already introduced in three municipalities of the Lisbon Metropolitan Area, namely Sintra, Cascais and Almada. All three were actively involved in the ClimAdaPT.Local process. While the Almada ELAC was a plan mainly focused on mitigation policies, with only marginal attention to adaptation, the plans of Sintra and Cascais still represent excellent examples of adaptation planning in Portugal, because they succeeded in capitalizing the research work developed first through the SIAM projects and later by CCIAM, and for the large availability of resources that were assigned for the development of these plans by the respective municipalities.
The ClimAdaPT.Local had, on the contrary, the priority of dissemination of adaptation rather than its innovation, and its main outcome was the structuring of the EMAAC model on a unified methodology based on international adaptation examples. The methodology had primary importance because it was the main requirement for funding and because it provided a structure of procedure that could be applied immediately by all the 26 pilot municipalities, and later by any other municipality. This methodology is the Decision Support for Municipal Adaptation (*Apoio à Decisão em Adaptação Municipal,* ADAM), which is an adaptation to the Portuguese context of the Adaptation Wizard developed by UKCIP, which at the time had already been arranged and applied in Germany, USA and Australia beyond the UK.

The UKCIP adaptation wizard

The UKCIP (UK Climate Impacts Programme) is a leading team in climate adaptation research since its establishment in 1997. The UKCIP Adaptation Wizard is meant to be a general methodology that can be applied to any adaptation process, in whatever location. It is composed of the following phases:

- Getting started, which includes involvement of stakeholders, definition of scopes and objectives of the process, and the main factors to consider;
- Current climate vulnerability, which revolves around the Local Climate Impacts Profile;
- Future climate vulnerability, based on the projections of future local climate changes;
- Selection of local adaptation options; composed of a first identification of solutions responding to specific climate impacts, and their subsequent evaluation and prioritisation according to their general performance and local feasibility;
- Monitor and review of the final implementation of policies, in order to redirect it to the initial aims and grant resilience to the adaptation policy advanced.

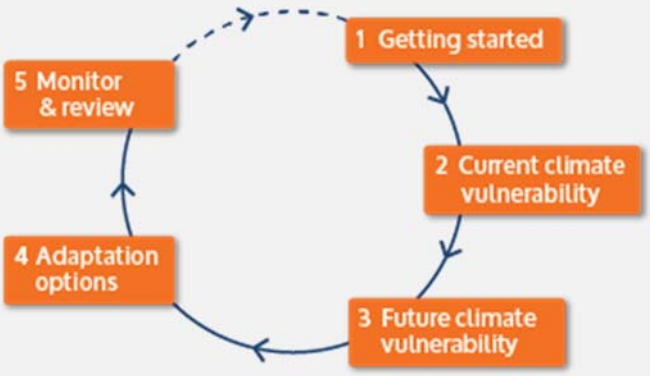


Fig. 51 UKCIP Adaptation Wizard Source: UKCIP

Given the different climatic scenarios to which each strategy is applied, all EMAAC differ largely in the solutions proposed, but they were all developed according to the ADAM methodology, in identifying first local vulnerabilities and consequently the necessary adaptation measures. Detailed studies of the local climates, such as those developed by CCIAM in Sintra and Cascais, were unfeasible in the financial and schedule limits of ClimAdaPT.Local, given the climatic singularity of each of the 26 municipalities.

Identificação e consequências do evento climático					Capacidade de resposta				Limiares
5. Data do evento climático	6. Tipo de evento climático	8. Impacto	9. Detalhes das consequências	10. Localização	11. Responsáveis pela resposta	12. Responsáveis pelo planeamento da resposta	13. Ações / respostas	14. Eficácia das ações / respostas	15. Limiares críticos?
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Fig. 52 Structure of a Local Climate Impacts Profile, identifying the type and consequences of each event, and the kind and efficacy of the response put in place. Source: EMAAC Évora

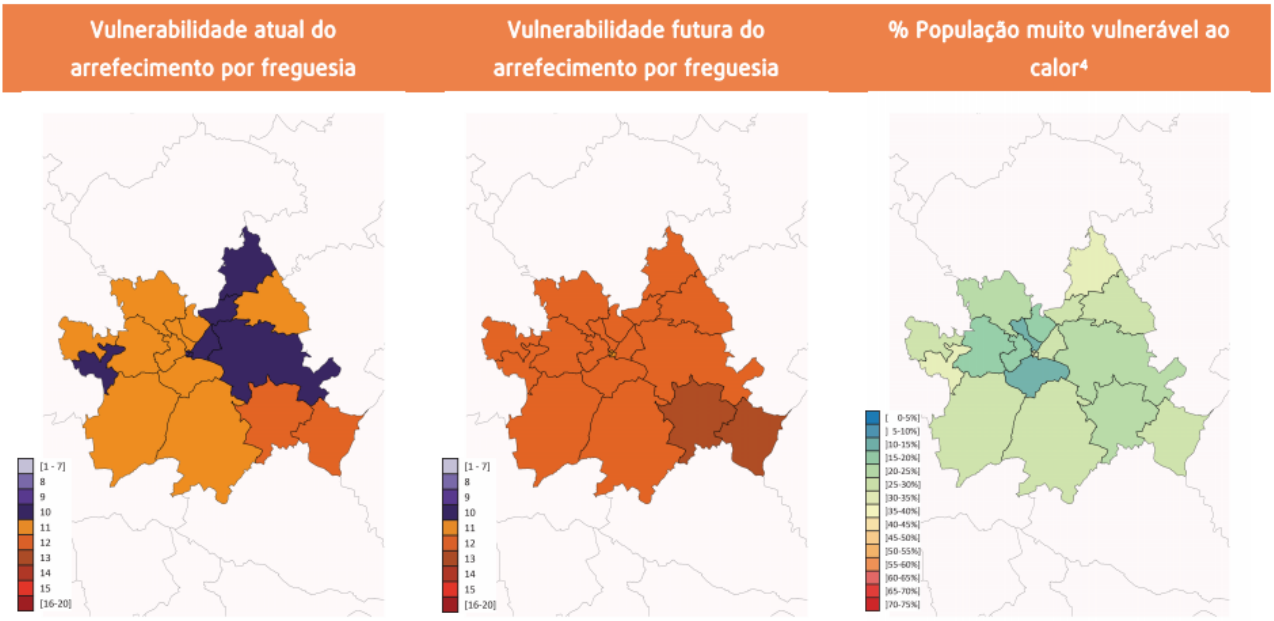


Fig. 53 EMAAC: current (left) and future (centre) vulnerability to extreme heat of the residential buildings in the municipal territory, disaggregated on parishes. On the right, percentage of residents with high vulnerability to extreme heat. Source: EMAAC Évora 2016

#	ID	Opções de adaptação	Critérios							Média global
			Eficácia	Eficiência	Equidade	Flexibilidade	Legitimidade	Urgência	Sinergias	
23	5.5	Redimensionamento de condutas	4,10	3,20	3,80	4,00	4,10	3,40	4,40	3,86
24	4.4	Adequação das espécies plantadas	3,60	3,50	3,60	3,90	4,00	4,10	4,00	3,81
25	1.6	Regulamentação de critérios de eficiência no uso da água no turismo, indústria, agricultura e florestas	3,60	3,60	4,30	3,40	3,90	4,00	3,90	3,81
26	1.1	Redução da contaminação do meio hídrico por descargas difusas	2,70	2,60	4,40	3,60	4,50	4,50	4,10	3,77
26	1.7	Adoção de mecanismos de incentivo ao uso de medidas construtivas sustentáveis	3,60	3,50	3,70	3,90	4,30	3,70	3,70	3,77
28	2.2	Implementação de sistemas de drenagem urbana sustentável	3,90	3,00	4,10	3,80	4,10	3,50	3,90	3,76
29	1.2	Promoção da vegetação nas zonas de máxima infiltração do sistema aquífero	2,70	2,50	4,30	3,90	4,40	4,20	3,80	3,69
30	1.5	Manutenção da multifuncionalidade do espaço rural	2,60	2,90	4,00	3,70	4,40	3,90	3,90	3,63
31	1.4	Promoção de condições de manutenção de habitats e espécies da flora e da fauna associadas a linhas de água e zonas húmidas	2,70	2,60	4,00	4,00	4,40	3,80	3,80	3,61
32	5.6	Limpeza de linhas de água	3,50	3,50	3,00	3,00	4,50	3,00	3,50	3,43

Fig. 54 Priorisation matrix of an EMAAC. The criterias set by the ClimAdaPT.Local project are: efficacy, efficiency, equity, flexibility, legitimacy, urgency, and synergies. Each measures receives a grade between 0 and 5 for each of these criteria, then the average score of the measure determines its priority level. Source: EMAAC Évora,

ClimAdaPT.Local was therefore successful in spreading adaptation as a methodology, but also limited for what concerns the implementation of adaptative measures. Each EMAAC lists the adaptation measures more appropriate for the climate change impacts that the municipality will experience in its territory, by none of them includes the localization of critical points and necessary interventions, which was left to the municipality's initiative and management capacity. Also in some cases the description of the measures proposed is minimal and does not provide support for implementation. This was the main cause for the second generation of adaptation plans which, in some municipalities which had already adopted EMAAC, translated the strategic measures there contained to implementation plans (*Planos Municipais de Adaptação ás Alterações Climáticas*, PMAAC) including detailed cartography and priorization of measures.

The Adapt.local network

In accordance with the ENAAC 2020 vision (a country adapted to the effects of climate change, through the continuous implementation of solutions based on the technical and scientific knowledge and on good practices), ClimAdaPT.Local foresaw as ultimate objective the foundation of a permanent association to gather the results achieved and actively promote and spread them throughout the whole national territory.

These are the main reasons that brought to the establishment, in December 2016, of adapt.local (*Rede de Municípios para a Adaptação Local às Alterações Climáticas*), the Portuguese network of cities for local adaptation to climate change. This partnership gathers in a permanent seat all the actors that participated to the ClimAdaPT.Local project, with emphasized leadership of the municipalities, and aiming at the growth of the network through the adhesion of other municipalities active in the development and/or implementation of their EMAACs or other local adaptation policies. Adapt.local aims to affirm the importance of the local scale for adaptation to climate change in Portugal, and it adopts as mission the beginning of a continuous process of elaboration of EMAAC, raising the capacity of municipalities and other organizations to incorporate adaptation to climate change in their policies, planning tools and interventions.

The primary areas of intervention of adapt.local are those envisioned for it in the ClimAdaPT.Local project: dynamization of local adaptation, technical enabling, and promotion of apprenticeship among peers. Adapt.local adopted therefore an action plan for the period 2018-2021 with main objectives:

- Dynamize local adaptation to climate change;
- Encourage the exchange of knowledge among municipalities;
- Promote the training of municipal officers
- Manage and enlarge the system of information supporting the training activities.

The same action plan 2018-2021 indicates as strategic priorities:

- Dynamize local adaptation to climate change
- Strengthen the notoriety and the acknowledgment of the partnership's added value
- Promote training and networked learning.

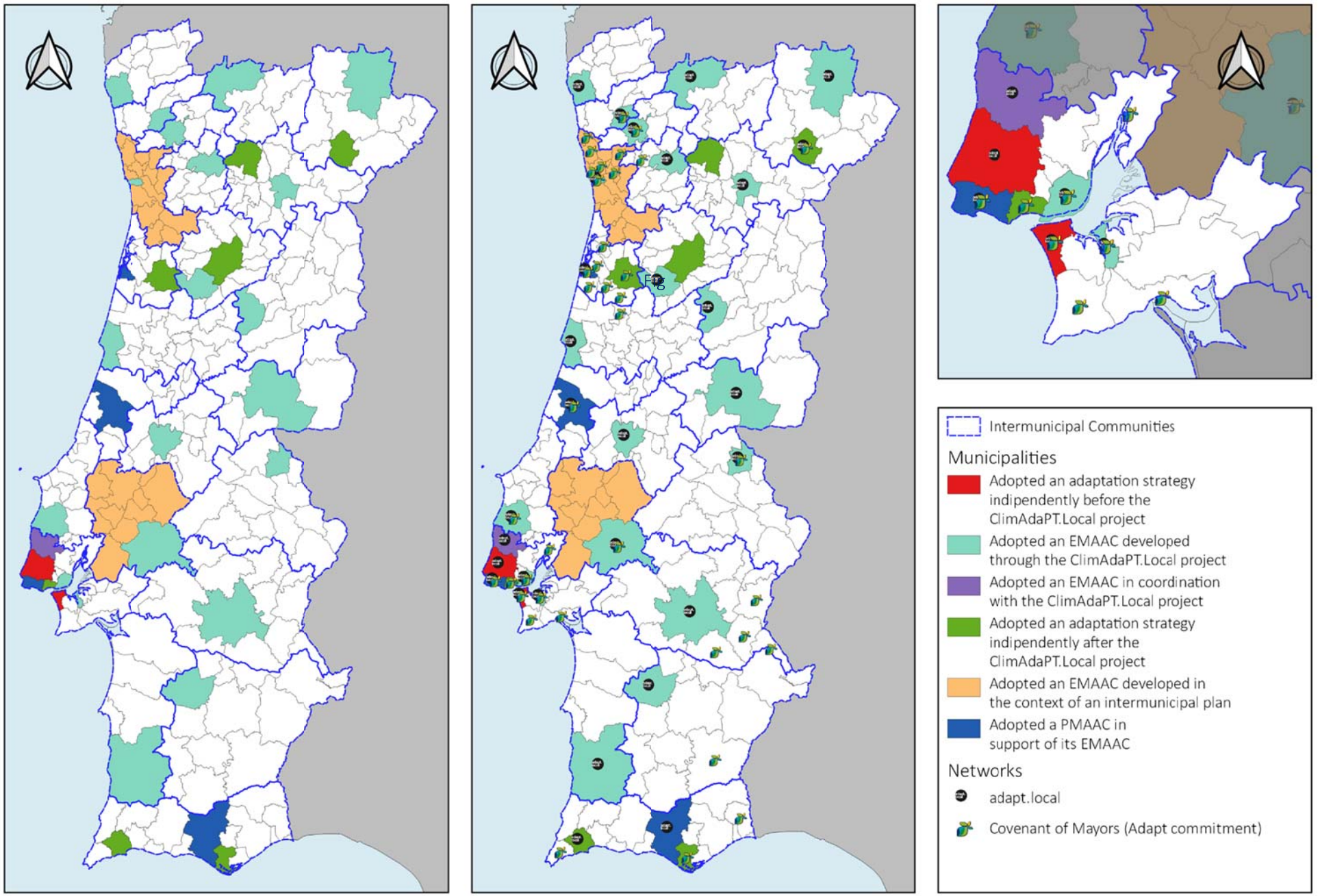


Fig. 56 Municipalities that have adopted an EMAAC (left) and that participate in adaptation knowledge networks (centre). On the right, a zoom on the Lisbon Metropolitan Area. Source: author's own elaboration

3.1.3 2017-2020: systemisation of local adaptation plans

PO SEUR

The Operational Programme for Sustainability and Efficient Use of Resources (*Programa Operacional Sustentabilidade e Eficiência no Uso dos Recursos*, PO SEUR) was established through an Execution Decision from the European Commission on December 16, 2014 and is one of the 16 programmes created for the operationalization of the Portugal 2020 Strategy. This is the partnership agreement established between Portugal and the European Commission gathering the action of 5 European Funds - ERDF, Cohesion Fund, ESF, EAFRD and EMFF - for the economic, social and territorial development policy to be promoted in Portugal between 2014 and 2020.

Specifically, the PO SEUR was conceived to contribute to the sustainable growth priority, addressing the transitional challenges to a low carbon economy based on a more efficient use of resources and on the promotion of greater resilience to climate risks and catastrophes. These targets are also (contextually) pursued by the Regional Operational Programmes, with which the PO SEUR is integrated for the implementation of policies.

The strategy foreseen for PO SEUR refers a multidimensional perspective of sustainability based on three strategic pillars which are the root of the three Programme Investment Axes:

- Axis I - Support the transition to a low carbon economy in all sectors;
- Axis II - Promote climate change adaptation and risk prevention and management;
- Axis III - Protect the environment and promote resource use efficiency.

With 401M€ allocated by the Cohesion Fund, POSEUR's II Axis results the largest source of funding for climate change adaptation in Portugal. It was structured on two interconnected Investment Priorities thought to be operationalized in a complementary way:

- Investing for adaptation to climate change including ecosystem-based approaches;
- Investing to develop resistance to catastrophes and risk management, and to face specific risks such as coastal erosion and rural fires.

The objective of the first IP is to increase adaptation capacity through the adoption of sectorial, territorial and transversal measures, with the target of implementation of the 30% of measures contained in plans and strategies in 2023. The second IP aims at the immediate reduction of coastal erosion and wildfires, allocating a specific portion of funds (50% of the overall budget of Axis II for coastal erosion, around 12% for wildfires) and posing clear targets for 2023. The two Investments Priorities are conceived as complementary actions with the same objective: as the first IP is aimed at financing the enhancement of knowledge and adaptation planning in order to develop proper solutions that today are not yet available, the second IP is meant to provide conspicuous funds for the prevention and management of the major risks which most gravely affect Portugal today.

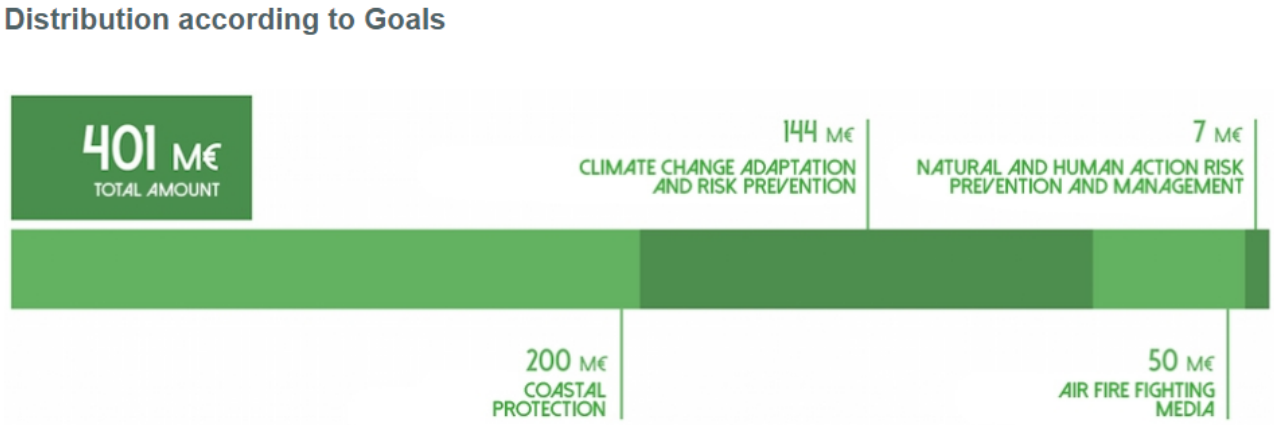


Fig. 57 Distribution according to Goals of the funds for the Axis II of the PO SEUR. Source: poseur.portugal2020.pt

The first Investment Priority is specifically meant to promote the development of climate change adaptation plans. Namely, priority actions in this area are: territorial plans and strategies of municipal, intermunicipal or regional scale; sectorial plans framed in the ENAAC 2020; immaterial actions against desertification; actions promoting green infrastructures (especially in the context of regional Operational Programmes); production of information and tools for decision-making support; modernization of the meteorological systems; public communication and sensibilization. In this framework, local spatial plans that are based on the identification of vulnerabilities and specific priorities of intervention are identified as the paramount tools for climate change adaptation, adducing the following reasons:

- Climate change impacts are experienced at the local scale;
- The spatialization of climate change adaptation makes possible inter-sectorial interventions based on local characteristics, which better serve the needs of the local communities and stakeholders.

Investment Priority	Section SR	Specific Goals	Performance Indicators	2023 Aim
Support investment for the adaptation to climate changes, including approaches based on ecosystems	Section 12	Reinforce the capacity to adapt to climate changes by adopting and articulating cross-cutting, sectorial and territorial measures	Level of implementation of the adaptation to climate changes measures resulting from strategies and plans	30,0%
Promotion of investments to approach specific risks, ensure the resistance to catastrophes and develop catastrophes management systems	Section 11	Protection of the coastline and its populations from the risks, especially the ones related to coastal erosion	Percentage of mainland coastline in critical erosion situation	9%
		Reinforcement of management to address risks in a perspective of resilience, empowering the institutions involved	Active forest fires with a duration exceeding 24 hours	

Fig. 58 Investment Priorities for the Axis II of the PO SEUR. Source: poseur.portugal2020.pt

Reinforce the capacities of adaptation to climate changes by adopting and articulating cross-cutting, sectorial and territorial measures	• Municipal, intermunicipal and regional plans of adaptation to climate changes; • Sectorial plans of adaptation to climate changes and/or integration of the mentioned adaptation; • Immaterial actions part of the action plan to fight desertification; • Information, modelling and staging systems; • Prevision, alert and response systems; • Restructuring and modernising meteorology systems.
Protection of the coastline and its populations from the risks, especially the ones related to coastal erosion	• Protection and rehabilitation of natural coastal systems, namely dune systems; • Actions to restore the sedimentary dynamics balance; • Artificial replenishment of beaches as coastal protection intervention; • Reinforcement of quotas in low coastal areas threatened by the advance of waters; • Minimisation of the risk associated to the instability of cliffs.
Reinforcement of management to address risks in a perspective of resilience, empowering the institutions involved	• Own aviation resources for missions of the Civil Protection; • Personal Protective Equipment; Rescue and Prevention Vehicles; • Interventions on the infrastructures to reinforce capacity to operate; • Forest defence network against fires.

Fig. 59 Types of eligible operations for the first (above) and second (center and down) Investment Priorities of the Axis II of the PO SEUR. Source: poseur.portugal2020.pt

Intermunicipal plans

The European MFF 2014-2020, through the PO SEUR, assigned an unprecedented amount of funds for climate change adaptation in Portugal. As in the case of ClimAdaPT.Local, these were allocated for the development of local plans for the implementation of the National Strategy for Adaptation, since that the competence on spatial transformations is exclusive to the municipal authorities in Portugal (see chapter 2.2.3). The objective, once again, was to provide the municipalities with governance tools for adaptation, so that they could have access to external funding and succeed in the implementation of measures. The eligibility for PO SEUR funds, however, required the development of tools with intermunicipal (NUTS III) scale. Thus, in the field of spatial planning, the PO SEUR actually resulted in the development of a climate change adaptation plan for each of the 23 Intermunicipal Communities of Mainland Portugal, through a process led by the respective CIMs, which in many cases had been established only some years earlier (see chapter 2.3.2). The other requirements for the development of these plans were the correct application of the adaptation methodology of the EMAACs (developed in the ClimAdaPT.Local project), and the complete compliance with the ENAAC. Thus, the adoption of the intermunicipal scale for climate change adaptation plans was motivated by the following objectives:

- To accelerate the action for adaptation of municipalities, providing all of them with the fundamental analyses of the local climate, the identification of the main climate impacts, and a first selection of measures to be implemented. These operations result more effective at the NUTS III level, whereas the NUTS II boundaries often include areas with great heterogeneity in local climate;

- To assure the most effective integration between the municipal policies, supervising interventions in their territories, and the sectorial policies through which the ENAAC 2020 is implemented, that were already formulated at the intermunicipal scale with the involvement of CIMs. Moreover, the CIMs gradually assumed a primary role in the implementation of both sectorial and cohesion policies since their institution, and their systematic organisation enforced by the Government in 2013 clearly aimed at an increased relevance of these organs in the following EU Financial Framework;

- To promote adaptation policies of intermunicipal scale (which in Portugal had not yet been introduced), that result indispensable for some sectors and for some particular regions (namely the metropolitan areas, see chapter 4).

The adoption of a climate change adaptation plan is scheduled for all the Intermunicipal Communities of Mainland Portugal. Currently, more than half have already adopted an adaptation plan, while the others are still in the process of development or of approval of the candidature for funding by PO SEUR. The plans already in force show large heterogeneities in contents and approach, as will be detailed in chapter 3.2.2.

The second generation of municipal adaptation plans

In parallel with the introduction and spreading of intermunicipal plans, adaptation planning kept developing at the municipal scale with renewed funding from the PO SEUR. Namely, some of the municipalities that had already adopted an adaptation strategy in previous years decided to elaborate an action plan leading the implementation of measures. These gathered the measures contained in the EMAAC to schedule their financing and implementation according to their priority.

The adoption of a PMAAC after an EMAAC was also influenced by the specific vulnerabilities that each municipality faced: cases where the main or only risk was flood usually did not need new cartographic material, which already existed in sufficient detail, and only had to stress priority for water management interventions. The same cannot be said in municipalities where the main risks were heat waves or sea level rise, since that both phenomena are completely new to local management. In these cases, adaptive interventions require detailed analysis of the local vulnerabilities to climate change impacts, aimed at the production of new cartographic material for risk management.

The first of these tools was the Action Plan for Climate Change Adaptation (*Plano de Ação para a Adaptação às Alterações Climáticas,* PA^{3}C^2*)* of Cascais, which had been one of the first municipalities to adopt an adaptation strategy in 2010. The plan contains a schedule of actions to implement until 2030, with detailed descriptions of the measures proposed including calculated costs. Those developed in Ílhavo (2018), Lagos (2018) Leiria (2019), and Loulé (2020) are Municipal Plans for Climate Change Adaptation (*Plano Municipal de Adaptação às Alterações Climáticas,*PMAAC). Except for Ílhavo (where the strategic component was developed together with the plan) all these municipalities had participated in ClimAdaPT.Local and adopted an EMAAC in 2016. Basing on the respective EMAACs, the PMAACs furthered considerably the knowledge base on the most relevant climate facts of the municipalities, presenting highly detailed cartography to support decision-making.

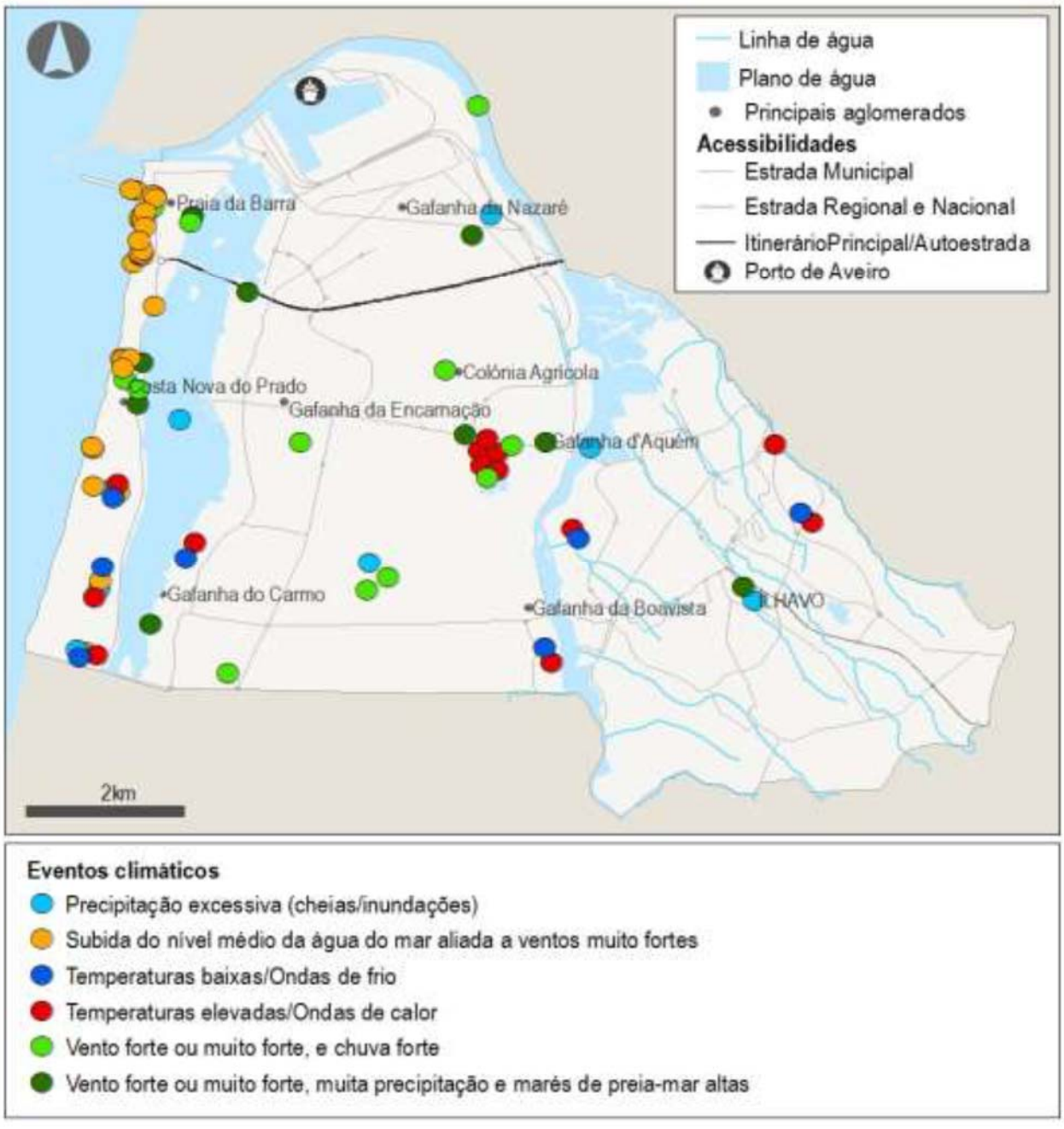


Fig. 60 PMAAC Ílhavo: mapping of the climate impacts registered in the municipality. Source: PMAAC Ílhavo

Namely, the PMAACs feature:

- Greater knowledge of the climate and the territory:
    - Bioclimatic evaluation
    - Analysis of current and future climate risks (modeling)
    - Sensitivity analysis (exposed elements)
    - Analysis of current and future vulnerability indexes (relationship between climate risks, climate sensitivity and adaptive capacity)
- Better integration of the sectoral dimension:
    - Systematic analysis, by sectors, of current and future climate vulnerabilities
- Better operationalization of the plans:
    - Action plans and project fiches
    - Financing programs
    - Specific directives for the integration of adaptation in land use management and planning

In sum, and especially in terms of scientific (namely cartographic) bases, the PMAACs represent a giant step ahead in planning for climate change adaptation in Portugal. In a broader perspective, these plans amount to a value in supporting knowledge, clearness of dispositions, and support for implementation, which is usually not found in any single spatial planning tool at the municipal scale, surpassing in detail most of the PDMs.

Quadro 43. Nível de prioridade e programação temporal das ações de adaptação prioritárias

Medida	Nº	Ações de adaptação prioritárias	Investimento	Nível de prioridade	Programação temporal dos investimentos					
					2019-2020	2021-2022	2023-2024	2025-2026	2027-2028	2029-2030
1	1	Reforço do cordão dunar Barra - Costa Nova	2.673.700€	1	X					
	2	Alimentação artificial da Praia da Barra	9.300.000 €	1	X	X	X	X	X	
	3	Alimentação artificial de areias entre os esporões E8 e E12	30.000.000 €	1	X	X	X	X	X	
	4	Construção de obra transversal - esporão - na Praia da Barra	3.000.000 €	1	X	X				
	5	Prolongamento de obra longitudinal aderente – enrocamento	1.000.000 €	1		X				
	6	Construção de quebra-mar destacado na Praia da Barra	300.000 €	1	X	X				
	7	Sistema de *bypass* da barra do Vouga	a definir	2			X	X	X	X
	8	Renaturalização dos cordões dunares com espécies autóctones	150.000 €	1	X					
	9	Implementação de depósitos de areia de emergência	a definir	1	X					
2	10	Recuperação da margem da Ria de Aveiro no troço Costa Nova - Vagueira	a definir	3			X			
	11	Recuperação da margem da Ria de Aveiro no troço Rua da Riamar - Praia da Barra	a definir	3			X			
	12	Recuperação da margem da Ria de Aveiro no troço Cais dos Bacalhoeiros - Gafanha da Nazaré	a definir	1	X					
	13	Recuperação da margem da Ria de Aveiro no troço Rua do Sul (de Gafanha de Aquém à Gafanha da Boavista)	a definir	1	X					
	14	Recuperação da margem da Ria de Aveiro no troço Via da Ria (entre a A25 e a rotunda)	a definir	4				X		

Fig. 61 PMAAC Ílhavo: prioritisation of measures and temporal programming of investments. Source: PMAAC Ílhavo

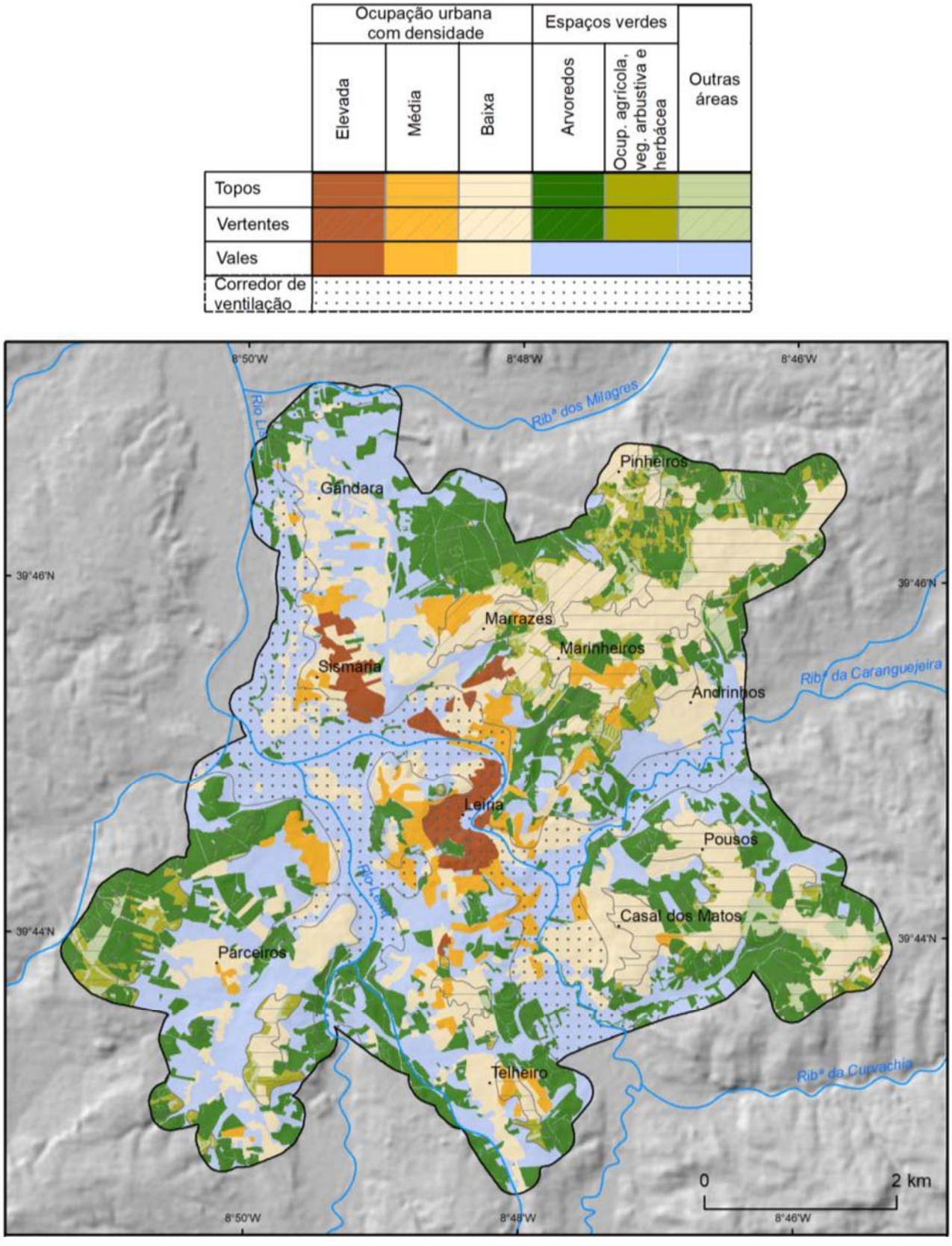


Fig. 62 PMAAC Leiria: Local Units of Homogenous Climatic Response (ULRCH - *Unidades Locais de Resposta Climática Homogénea*) Source: PMAAC Leiria

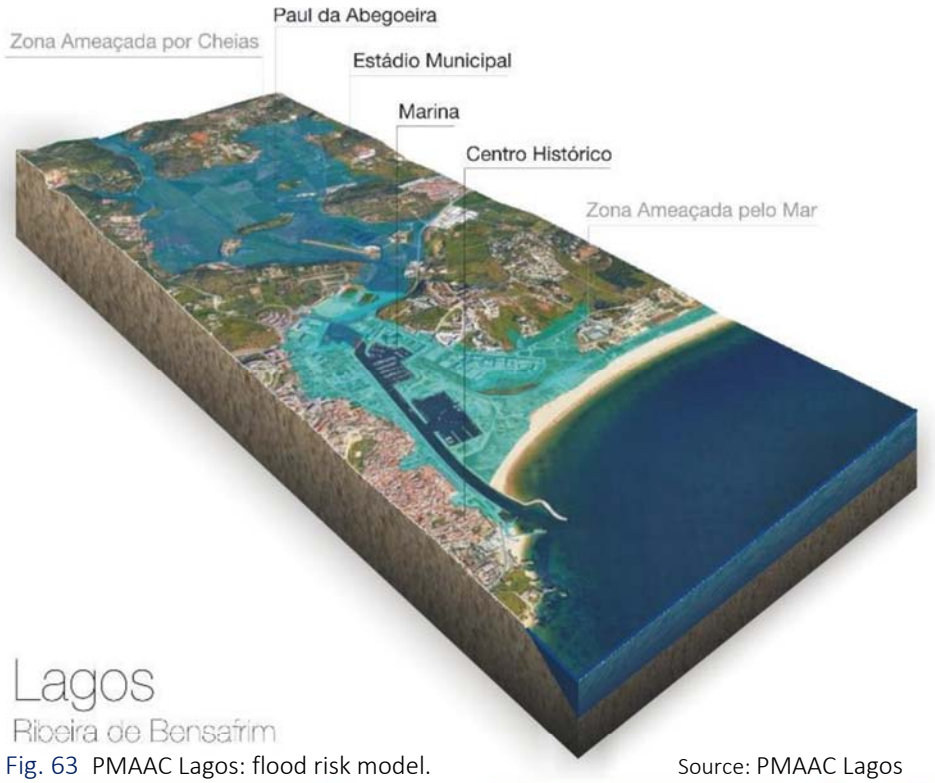


Fig. 63 PMAAC Lagos: flood risk model. Source: PMAAC Lagos

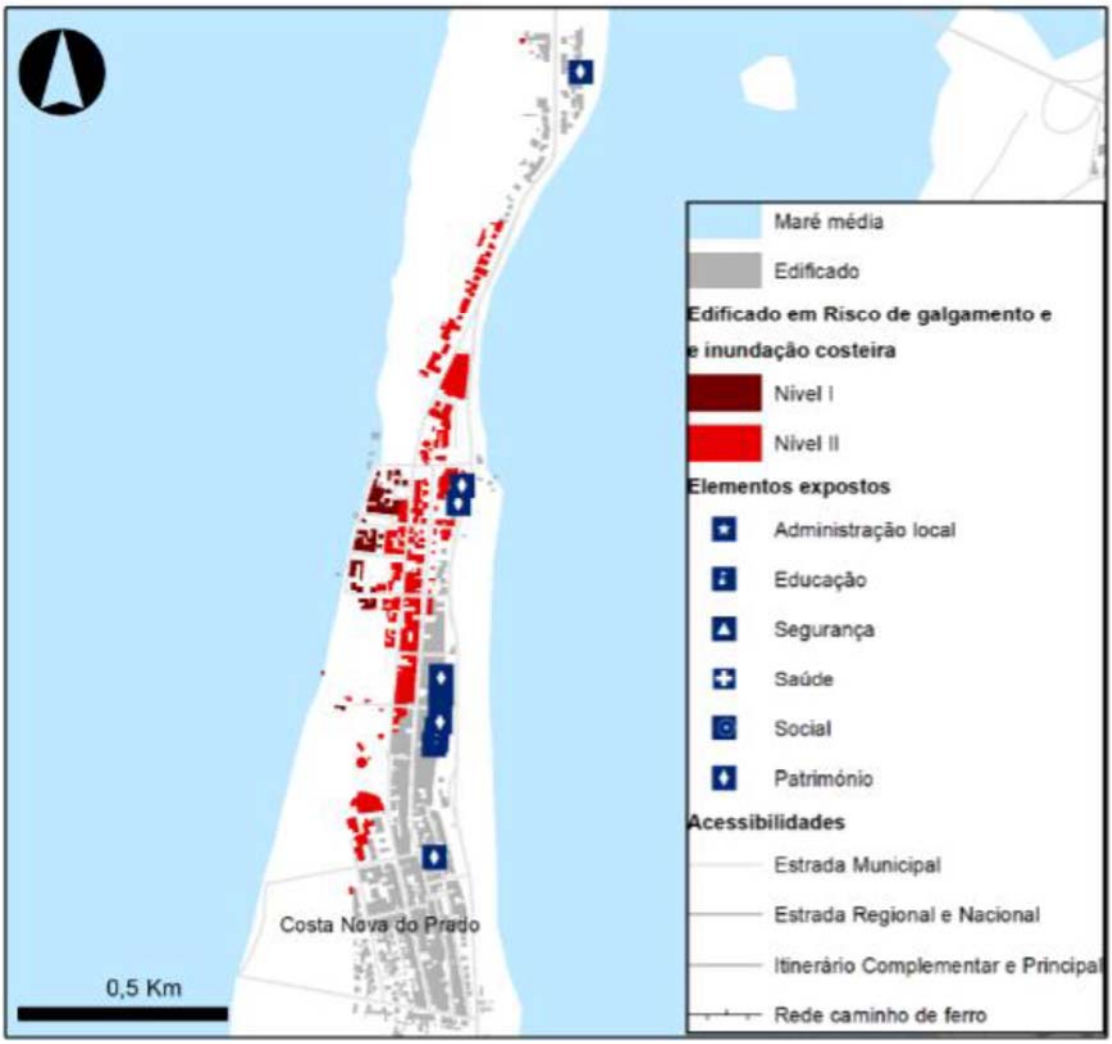


Fig. 64 PMAAC Ílhavo: buildings and facilities sensitive to coastal flooding and storm surge in climate change scenario (2071 2100, RCP8.5) Source: PMAAC Ílhavo

3.2 Assessment of local plans for climate change adaptation

3.2.1 Municipal strategies and plans

Municipal plans (of any kind) are the most determining spatial planning tools in Portugal because the competence on spatial transformations is exclusive to the municipalities, and because local authorities are the only ones with a clear understanding of local dynamics. In climate change adaptation, the responsibility of local authorities is even increased, since that both climate and adaptative capacity are distinctive characteristics of each particular place.
All the first spatial tools for climate change adaptation in Portugal were developed as municipal strategies. Also, all the most advanced tools for adaptation developed until now are municipal plans. Before the introduction of intermunicipal plans, spatial planning for adaptation was only developed at the municipal level, while all the actions contained in ENAAC 2020 are sectorial measures implemented by the respective competent authorities at the national, regional and eventually sub-regional scale.
The municipal instruments for climate change adaptation currently in force in Portugal can be divided in two main groups:

- Strategies (Estratégia Municipal para a Adaptação às Alterações Climáticas, EMAAC); mostly developed in 2015-16 with the ClimAdaPT.Local project, and in any case based on the ClimAdaPT.Local methodology (see chapter 3.1.2). Currently 57 municipalities have adopted an EMAAC;
- Plans (Plano Municipal de Adaptação às Alterações Climáticas,PMAAC) developed in four municipalities that had previously adopted an EMAAC (see chapter 3.1.3).

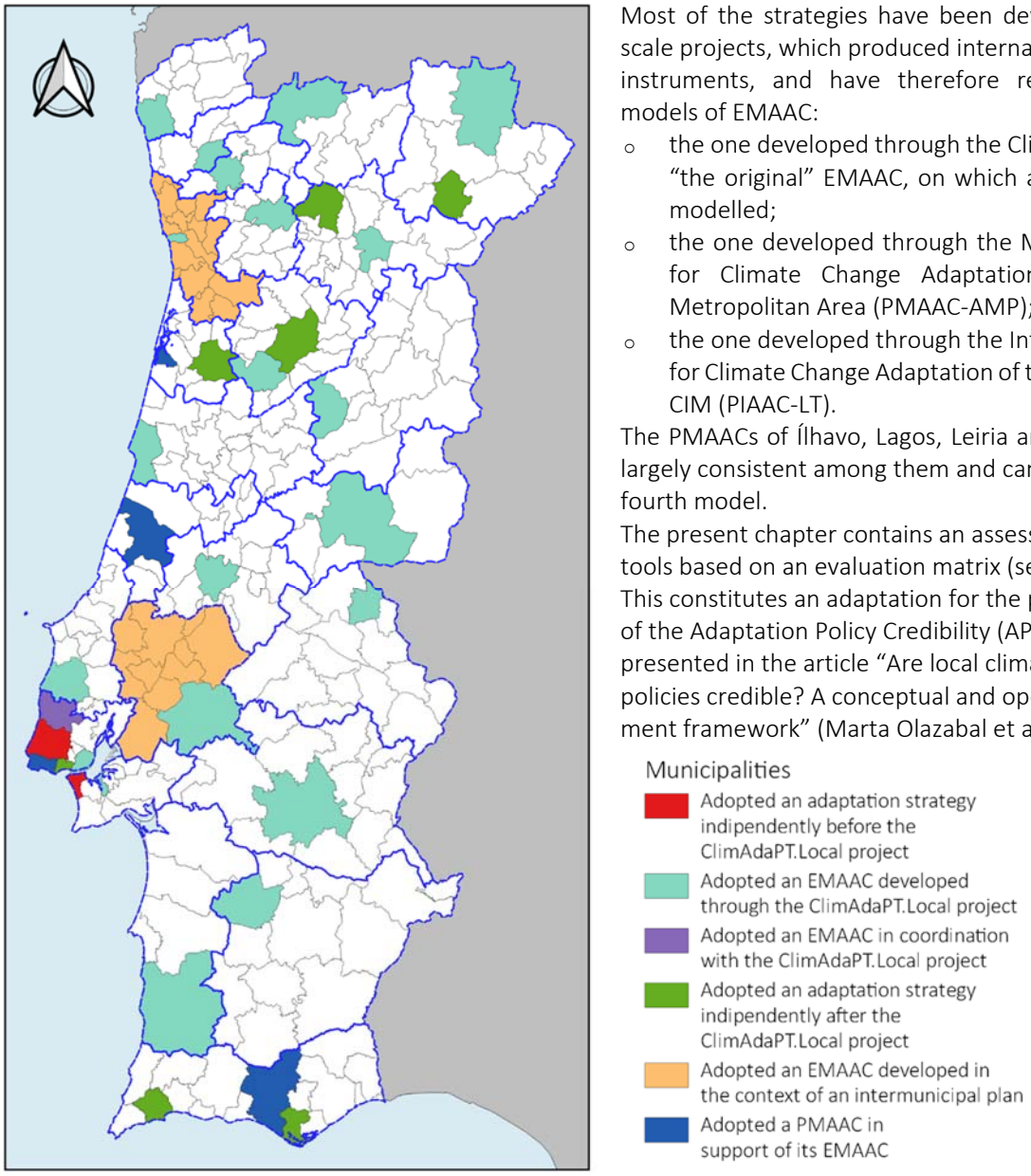


Fig. 65 Municipal adaptation tools in Mainland Portugal. Author's elaboration

Most of the strategies have been developed in large-scale projects, which produced internally homogeneous instruments, and have therefore resulted in three models of EMAAC:

- the one developed through the ClimAdaPT project, "the original" EMAAC, on which all the others are modelled;
- the one developed through the Metropolitan Plan for Climate Change Adaptation of the Porto Metropolitan Area (PMAAC-AMP);
- the one developed through the Intermunicipal Plan for Climate Change Adaptation of the Lezíria do Tejo CIM (PIAAC-LT).

The PMAACs of Ílhavo, Lagos, Leiria and Loulé are also largely consistent among them and can be considered a fourth model.
The present chapter contains an assessment of these tools based on an evaluation matrix (see Appendix). This constitutes an adaptation for the present context of the Adaptation Policy Credibility (APC) framework presented in the article "Are local climate adaptation policies credible? A conceptual and operational assessment framework" (Marta Olazabal et al., 2019).

The Adaptation Policy Credibility framework

The Adaptation Policy Credibility (APC) framework was developed in the context of the CLIC project, involving a group of researchers of the Basque Centre for Climate Change (BC3). It was presented in the article "Are local climate adaptation policies credible? A conceptual and operational assessment framework" (Marta Olazabal, Ibon Galarraga, James Ford, Elisa Sainz De Murieta & Alexandra Lesnikowski (2019) Are local climate adaptation policies credible? A conceptual and operational assessment framework, *International Journal of Urban Sustainable Development*, 11:3, 277-296).

The Adaptation Policy Credibility (APC) framework was developed based on a review of the literature identifying key aspects of climate adaptation planning processes, and used to assess the climate adaptation plans put in effect in the 120 largest coastal cities world-wide.

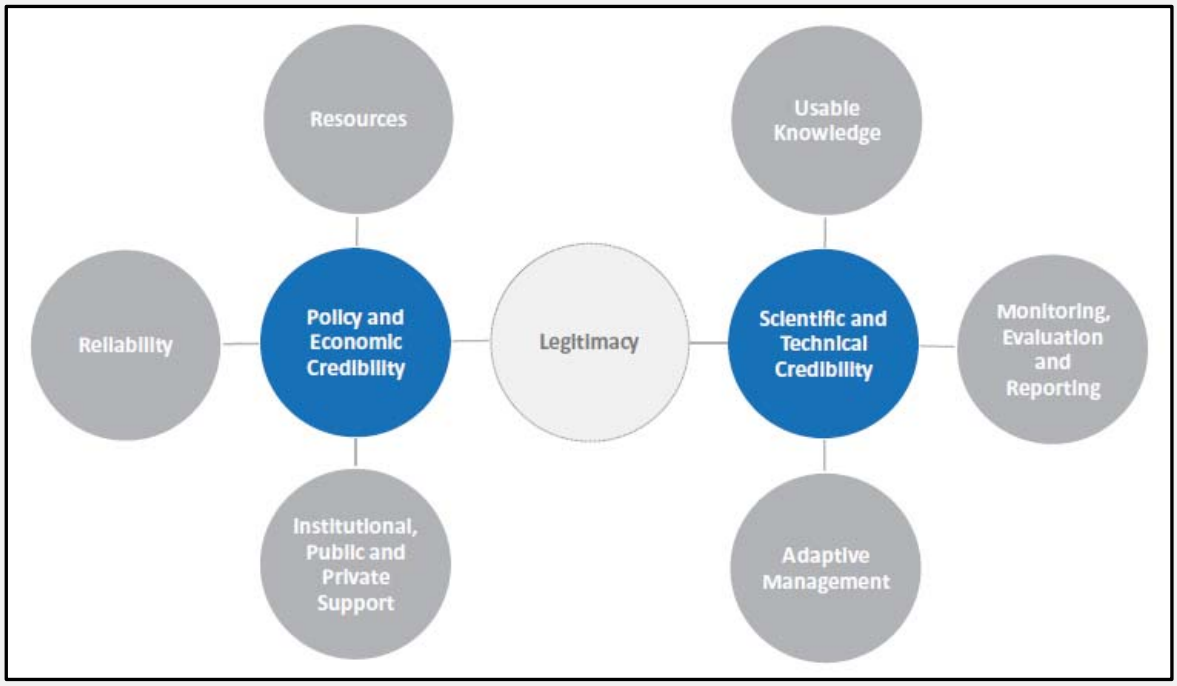


Fig. 66 Conceptual framework of the APC. Source: Olazabal et al., 2019

For the seven components identified in the conceptual framework (Figure x), a review of the relevant literature has been performed resulting in the identification of 17 indicators and 53 assessment metrics. The Appendix includes the original list of indicators selected and the complete list of metrics with extended descriptions and the respective evaluation methods.

Most of the metrics are qualitative and are defined as closed questions (e.g. Yes or No). Positive responses reflect a contribution to the credibility of the policy, and are therefore awarded with 1 point, otherwise, 0 points. For a few open questions has been defined a specific evaluation method that translates quantitative data into 1 or 0.

A lack of information or clarity on the question under assessment either in documents or on the authority's official websites is indicative of a low credibility; therefore, 0 points are given. Finally, to build the composite credibility index, the scores of the metrics across the indicators are summed up. The maximum score for a plan, and therefore, the maximum credibility score, is equivalent to the total number of metrics, i.e. 53.

The framework has been tested using climate adaptation policies of 4 cities with population of over 1 million on different continents and representing different degrees of development, namely: Copenhagen, Durban, Quito and Vancouver. All the cities selected are internationally known for their action on adaptation and are recognized early adaptors; they all have adaptation plans approved between 2006 and 2012, meaning that the plans are all well documented and may even have been revised. Figures x and x show the final credibility index scores for each city. The best results were obtained for Quito, followed by Vancouver, Copenhagen and Durban. The average credibility index score for these four cities considered to be early and high or extensive adaptors is 29.25 (SD = 3.32) out of a total of 53. Even in the case of extensive adaptors, there are clear areas for improvement, though these may differ between the cities.

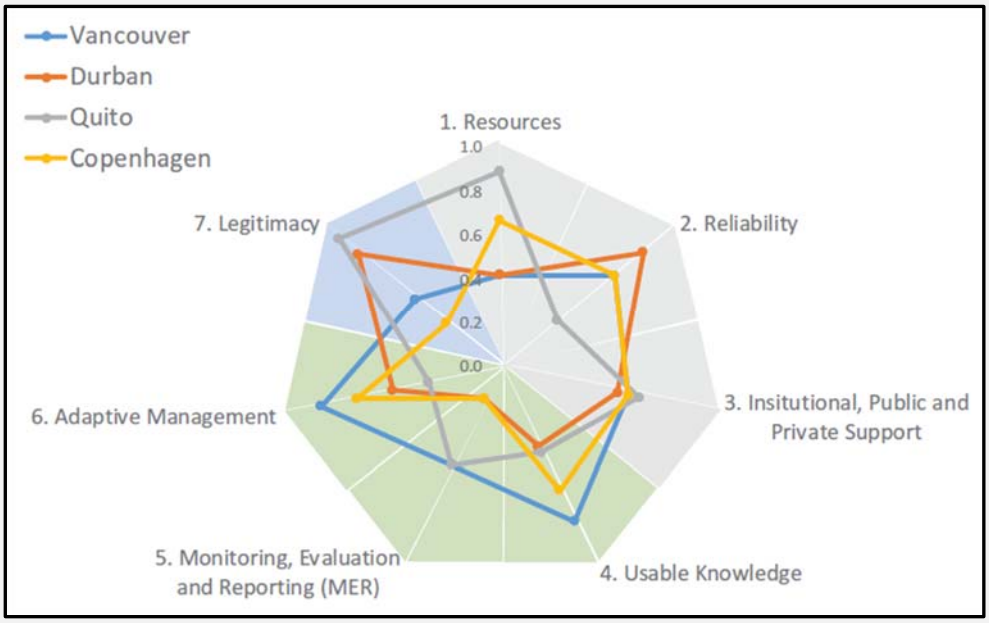


Fig. 67 Normalised credibility scores by component. Shaded areas define the three major areas: policy and economic credibility (grey), scientific and technical credibility (green) and legitimacy (blue). Source: Olazabal et al., 2019

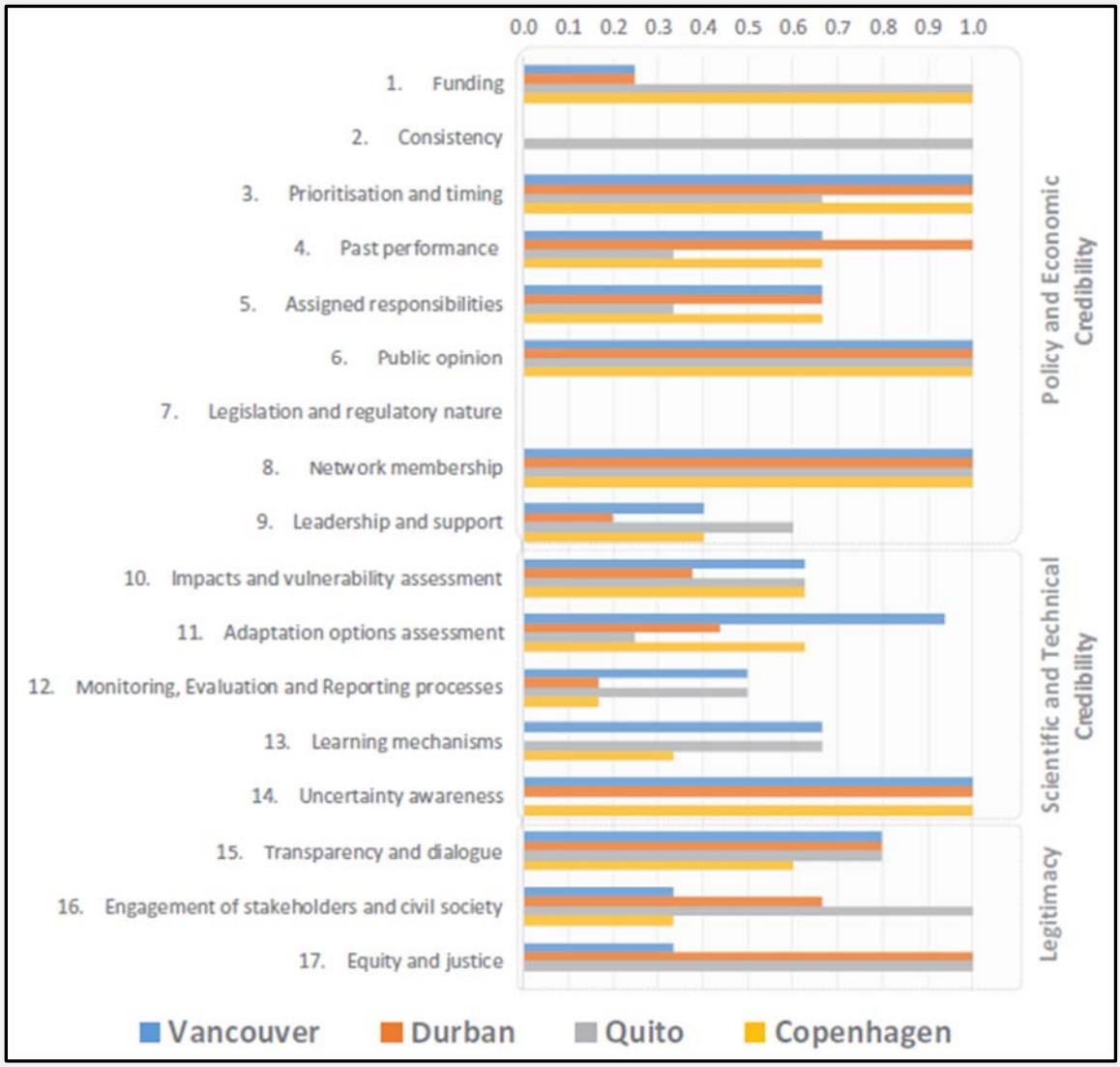


Fig. 68 Normalised credibility scores by indicator. Source: Olazabal et al., 2019

While the APC has been developed to be applied to the largest coastal cities worldwide, the plans examined here serve small municipalities in Mainland Portugal. The only cases on which the APC could be reasonably applied are Lisbon and (perhaps) Porto. Many metrics of the APC refer to factors that are usually relevant in a metropolitan context, but not at the municipal scale. Others are meant to be applied to renewed planning tools, that is with at least five years past since the development of their first version, and none of the tools here analysed corresponds to this case (the second generation plans presented are mostly action plans for the implementation of measures contained in a previous strategy).
Consequently, a direct application of the APC on the Portuguese sample would not produce any useful information. The APC framework has therefore been adapted by the author to be applied to the Portuguese context. Namely, the weights of some indicators on the total credibility score have been modified because their metrics cannot be properly applied to the tools here examined. All the changes operated are detailed in the Appendix.
The framework applied comprises 48 metrics instead of the original 53. Moreover, the indicators applied contribute in different proportions to the total score assigned to each plan, compared to their respective weights on the total score calculated though the APC. Therefore, the total score assigned to these plans is not to be compared to those presented in the APC pilot application above.
On the other hand, the relative performance (on a 0 to 1 scale) of each plan according to conceptual components can be compared to one measured through the APC (figure x), since that these are less affected by the specific number of metrics used.

Results of the assessment

The average performance of Portuguese municipal adaptation tools shows a general grave deficit in adaptive management and Monitoring, Evaluation and Reporting. This is explained by the scarce development of these components in the ClimAdaPT.Local project, whose limits in terms of time and resources did not allow for the consolidation of all aspects of adaptation planning. Furthermore, the project was not thought as a means to impose (through the EMAAC) to the municipalities any management (or funding) choice, but rather as a training workshop for the municipal officials involved, who would later be able to implement the strategies in their municipalities.
The methodology established by ClimAdaPT.Local, on the other hand, explains the medium/high performance on usable knowledge (assessment of impacts, vulnerabilities and adaptation options), resources (priorisation and timing), reliability (assignment of responsibilities), support (adaptation networks), and legitimacy (dialogue and engagement of stakeholders). However, with the exception of usable knowledge, all these components show also many lacks, chiefly in funding and equity and justice (considerations on the socially distributed impacts of adaptation measures).

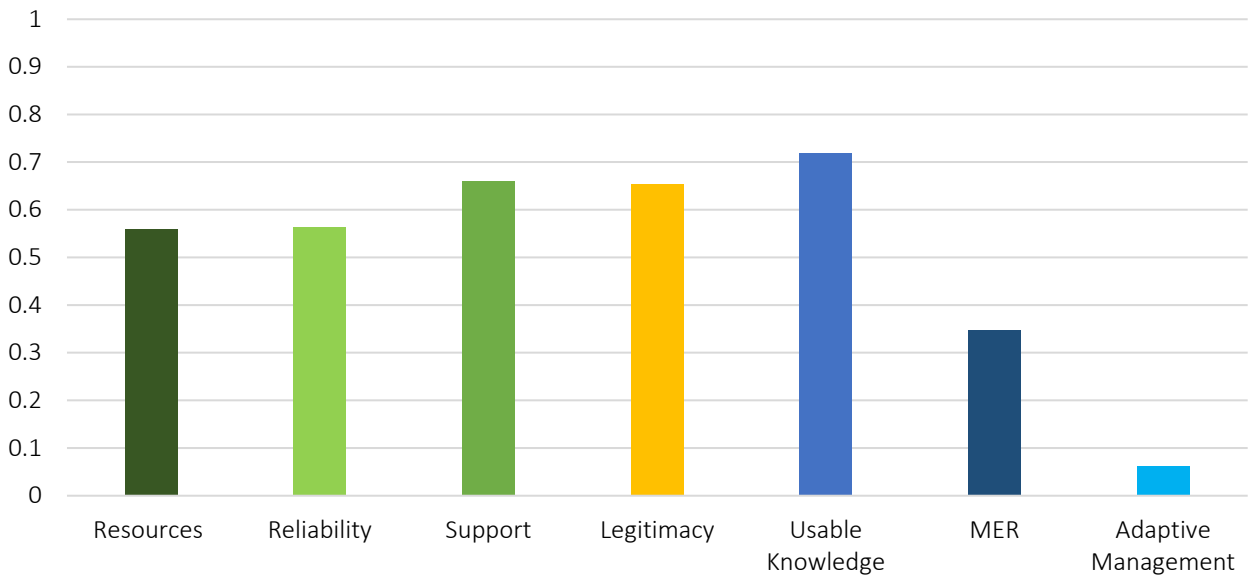


Fig. 69 Average credibility score of municipal tools according to conceptual components. Elaboration of the author.

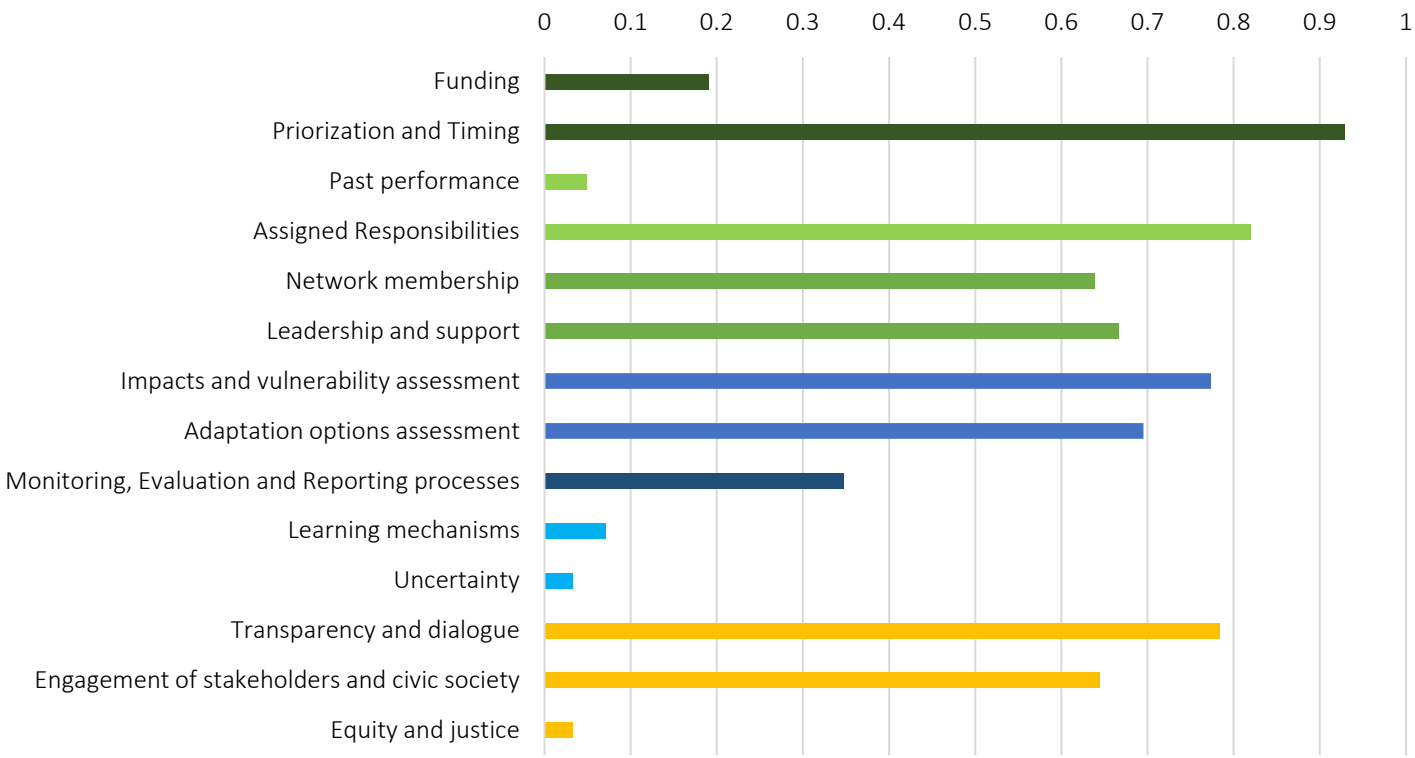


Fig. 70 Average credibility score of municipal tools according to indicators. Elaboration of the author.

The maximum total credibility score that can be achieved in this assessment is 48 (1 point for each metric). The results of the assessment confirm the categorisation proposed above. Most EMAACs have been developed in large projects: ClimAdaPT.Local (average score 30, Lisbon reaches 34), the PIAAC-LT (average score 29), and the PMAAC-AMP (average score 26). Cascais (together with Sintra) represents an exception for having adopted for first adaptation policies. The few EMAACs developed outside of these contexts do not compete with the rest.

The assessment also proves that the EMAAC is a tool established by the ClimAdaPT.Local project, which has not been perfectioned later. The other municipalities that have adopted an EMAAC did not even succeed in fulfilling its potential, developing strategies that result inferior to the 2016 EMAACs. Those of the PIAAC-LT have advanced the resources component (providing details on funding sources and budgets) and usable knowledge (with parish scale assessments), but result gravely lacking in reliability, support and MER (for a general lack of clarity on responsible parties). Those of the PMAAC-AMP are more equilibrated but still not competitive to the ClimAdaPT.Local strategies.

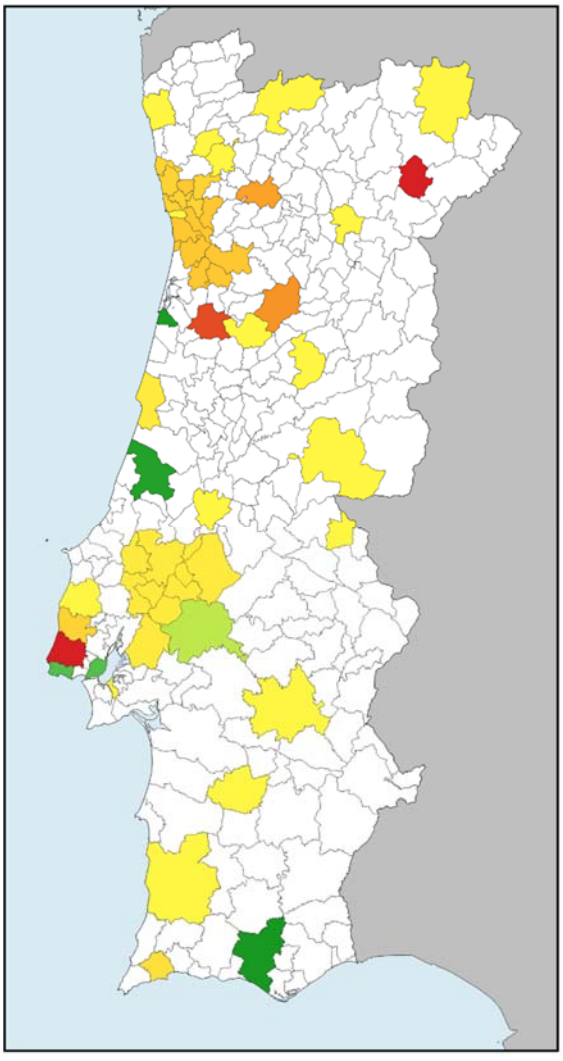


Fig. 71 Total credibility score achieved by each of the municipal adaptation tools. Lower scores in red, medial scores in yellow, higher scores in green. The lowest is 11 (in Alfândega da Fé), the highest is 45 (in Leiria). Elaboration of the author.

Only the second generation of tools, composed of action plans, has contributed to a progress of adaptation planning. The first of these plans was adopted in 2017 by Cascais, who follows its adaptation path independently from the other municipalities. In spite of its title of action plan, this tool does not surpass an EMAAC in resources nor reliability, while in terms of usable knowledge results even inferior. On the other hand, it developed the first adequate MER framework and introduced learning mechanisms in Portuguese adaptation planning.
On the contrary, the PMAACs result perfect completions of the respective EMAACs. Scoring more than 30 (the Ílhavo PMAAC scores 39), these tools have more than doubled the total credibility score of their municipalities. According to the assessment framework here applied, these tools have brought to perfection municipal planning for adaptation. The only conceptual component which does not achieve the maximum score in at least one of these plans is MER, which stays at 0.8 on 1. The advancements of these plans in terms of usable knowledge go far beyond the scope of the assessment framework here applied (see chapter 3.1.3). Finally, the high scores achieved in legitimacy and adaptive management components constitute the most outstanding results, not only for adaptation but for Portuguese spatial planning on the whole.
The following figures report the results of the assessment of the main types of adaptation tools.

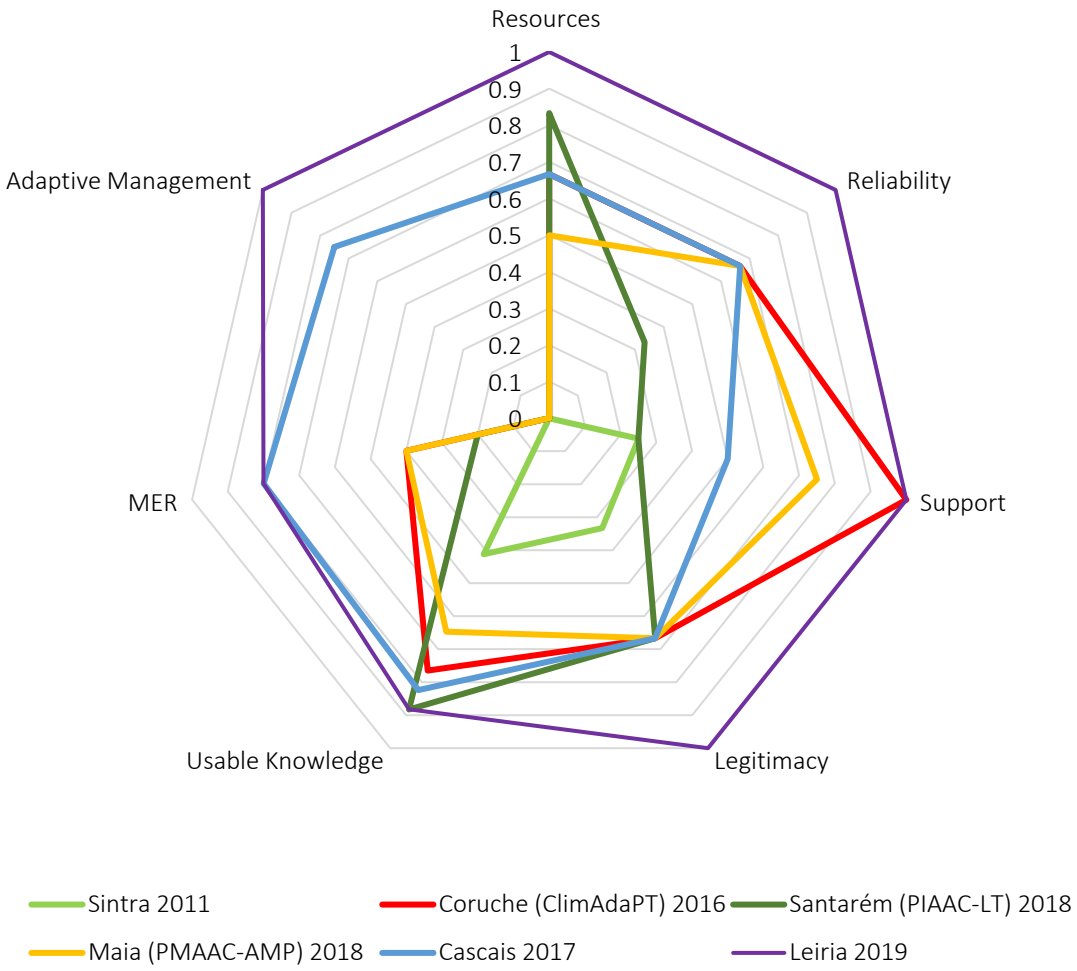


Fig. 72 Credibility scores of the main types of adaptation tools in Mainland Portugal. Author's elaboration

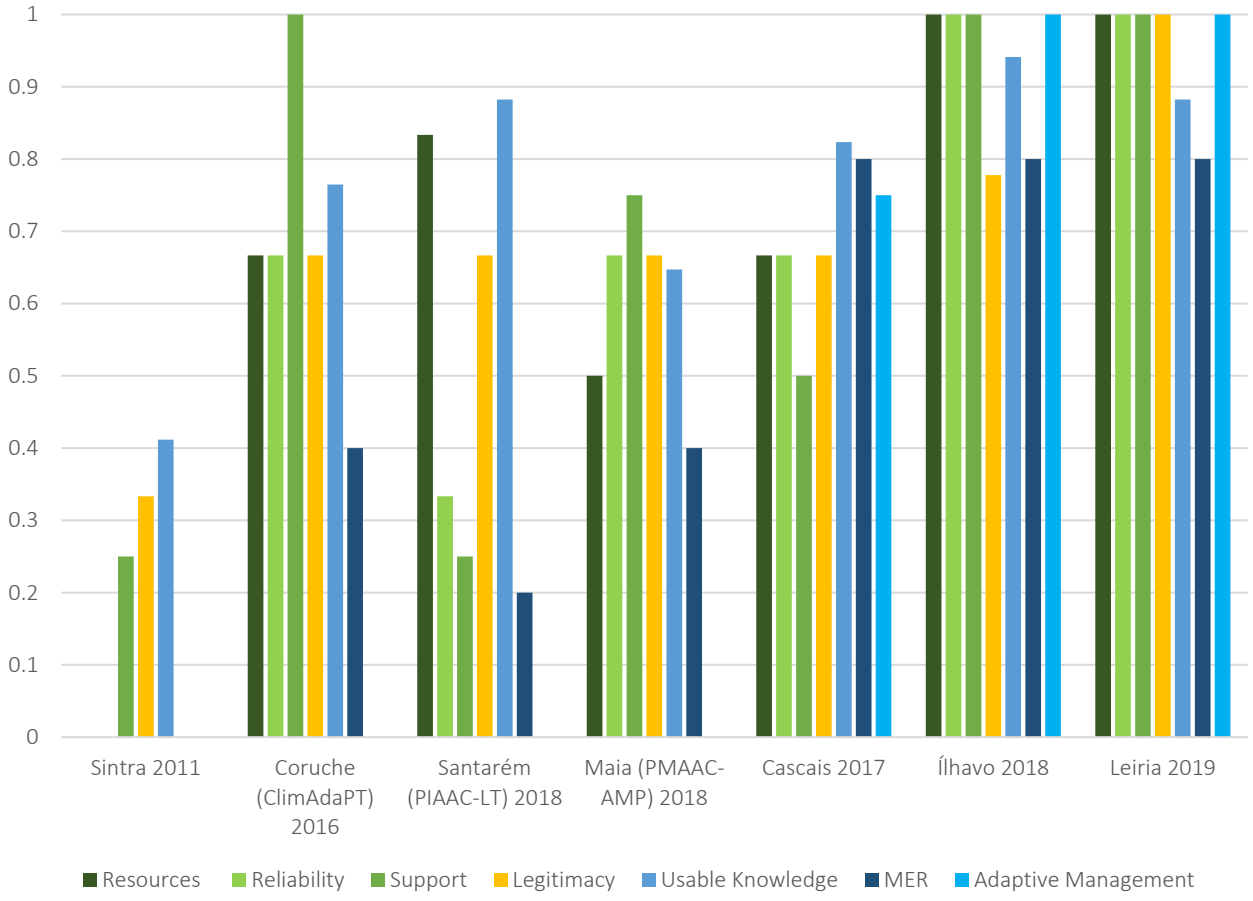


Fig. 73 Credibility scores of the main types of adaptation tools in Mainland Portugal. Author's elaboration

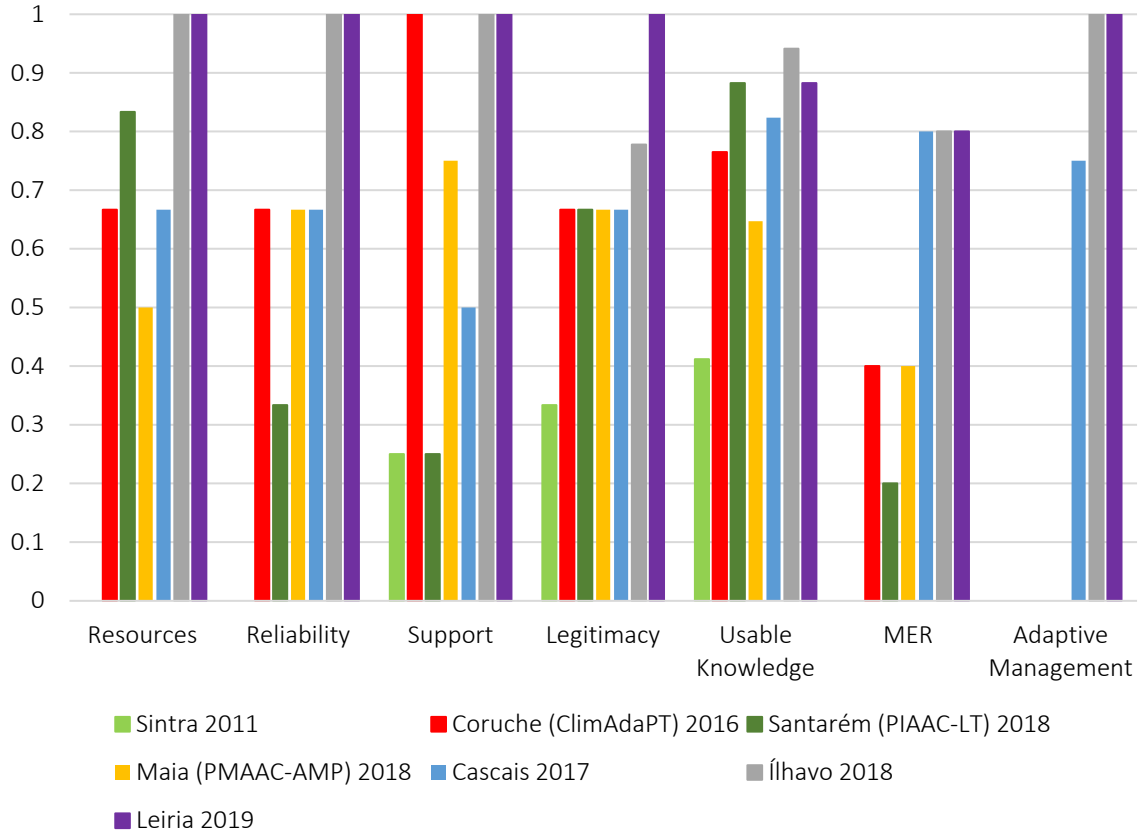


Fig. 74 Credibility scores of the main types of adaptation tools in Mainland Portugal. Author's elaboration

Fig. 75 Credibility scores of the main types of adaptation tools in Mainland Portugal. Author's elaboration

3.2.2 Intermunicipal plans

Intermunicipal plans for climate change adaptation (*Plano Intermunicipal/Metropolitano para a Adaptação às Alterações Climáticas,* PIAAC/PMAAC) have been introduced in Portugal during the EU MFF 2014-2020 with the PO SEUR programme (see chapter 3.1.3). At the present moment, the process of development and adoption of these tools is concluded only in around half of the intermunicipal communities, so the sample here analysed is reduced to the fifteen plans already available.

While in the ClimAdaPT.Local project all EMAACs were developed collectively, with the active participation of the municipal officials responsible for the strategies, these intermunicipal plans were developed individually with the leadership of the respective CIM (Intermunicipal Community, see chapter 1.3.2). Thus, while the EMAACs are consistently homogeneous in approach, methodology, contents and conclusions, the intermunicipal plans show large heterogeneity among them. The requirements for their financing (the intermunicipal scale, the adoption of the ENAAC 2020 sectorial framework, the following of the EMAAC methodology for the identification of climate vulnerabilities and adaptation measures) are their only common characteristics.

In terms of contents and approach, the PIAACs can be mostly ascribed to one of three categories:

- Plans developed in support of the municipal authorities (e.g. PMAAC-AMP and PIAACs of Lezíria do Tejo, Médio Tejo, Baixo Alentejo and Beira-Serra de Estrela), which identify the measures with the highest priority at the intermunicipal scale, to be implemented by the respective municipalities;
- Plans advancing an intermunicipal approach to climate change adaptation (e.g. PIAACs of Oeste, Ave, Alentejo Central and Viseu Dão-Lafões), which identify adaptation measures to be implemented at the intermunicipal scale and usually assign specific tasks to the respective CIMs, together with policies of municipal level supporting and fomenting the action of local authorities;
- Plans with sectorial approach (e.g. PIAACs of Alto Minho, Região de Coimbra and Tâmega e Sousa), developed strictly for the implementation of the ENAAC 2020 at the local and sub-regional level and directed to guide the action of the respective sectorial authorities, with scarce consideration for spatial planning tools.

The PMAAC of the Lisbon Metropolitan Area integrates these three approaches with a focus on the intermunicipal dimension, as will be detailed in chapter 4. The PIAAC of Algarve is solidly based on a sectorial approach but includes also guidelines for municipal implementation of measures.

Another determining factor in the value of adaptation plans is the grade of spatial detail that is used to conduct climatic analyses and to localise areas of intervention for the implementation of measures. On this respect, climate change adaptation poses serious challenges to the elaboration of spatial plans, for the lack of cartography concerning climate at the local scale. All the adaptation plans here analysed are based on spatial climate analyses and on the identification of climatic sub-regions internal to the territory analysed.

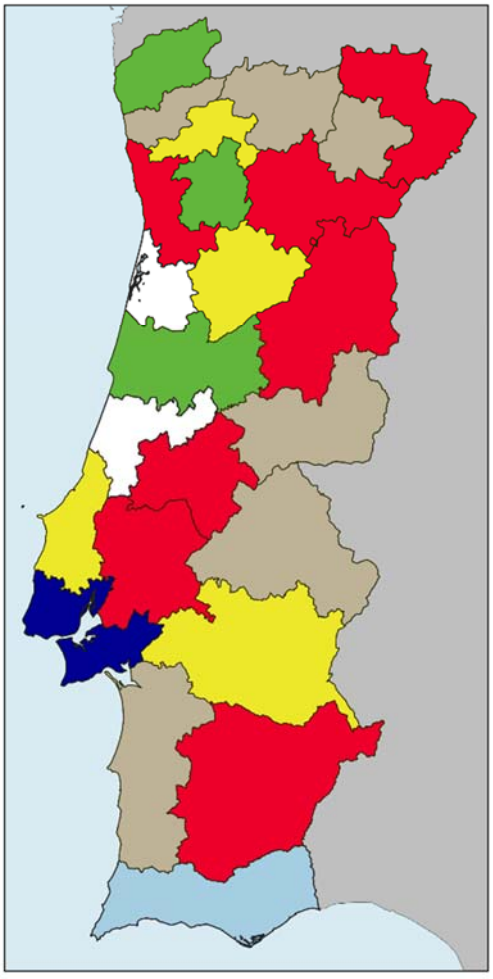


Fig. 76 Intermunicipal adaptation plans. Author's elaboration

Namely, cartographic materials describing the local risk of climate impacts are the necessary basis for the prioritisation and implementation of adaptation measures. These analyses are often made for the first time for the development of this plan. Specifically, the risk cartography concerning floods is already existing for all the national territory. Cartography interesting local temperatures or sea-level rise, on the other hand, was usually not available before the development of adaptation plans.

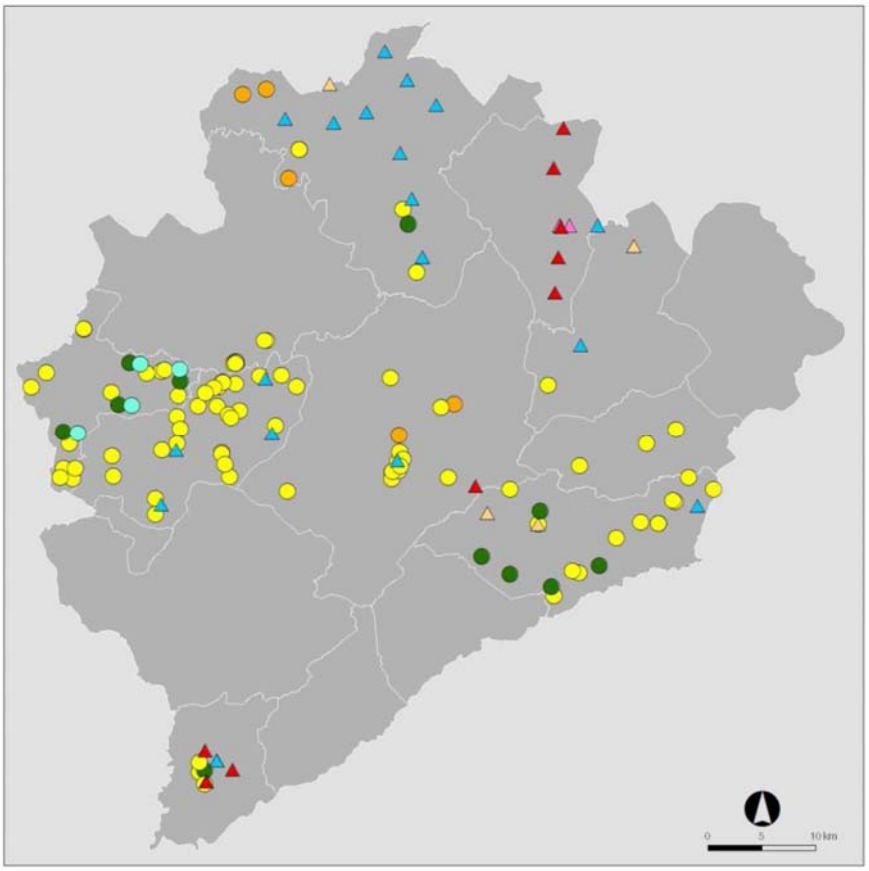
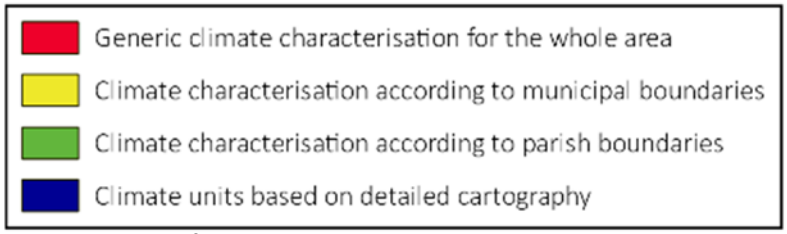


Fig. 77 Main consequences of extreme climate events in the Viseu DãoLafões region, 2001-2017 Source: PIAAC Viseu

The scale of detail through which these analyses are conducted, in any case, varies greatly among these plans. The municipal strategies are all based on the distinct characterisation of climate trends and impacts for the various parishes composing the municipal territory, except for the later second generation of plans where are introduced high-detail maps. Some of the intermunicipal plans (which are all more recent than most of the municipal strategies) also apply detailed cartography to the analysis of climate and the selection of measures, while others report climate trends and impacts according to the boundaries of parishes, or even municipalities. Others still report overall climatic trends at the NUT III scale, with no distinction of internal areas whatsoever.
In the case of intermunicipal plans, this distinction determines the direction of the plan itself, because in lack of detailed cartography the municipalities (or parishes) are brought to select individually where to implement the measures proposed by the plan, whereas the disposition of climatic cartography at the intermunicipal scale allows to the municipalities to immediately identify priority areas and to trigger synergies for the implementation of measures at the sub-regional scale, which is the primary objective of these plans.

The PIAACs of Alentejo Central and Viseu Dão-Lafões, as later the PMAAC-AML, have integrated the advancements in climate cartography developed with the second generation of municipal plans, including the mapping of climate impacts and vulnerabilities, and the identification of Local Climate Zones.



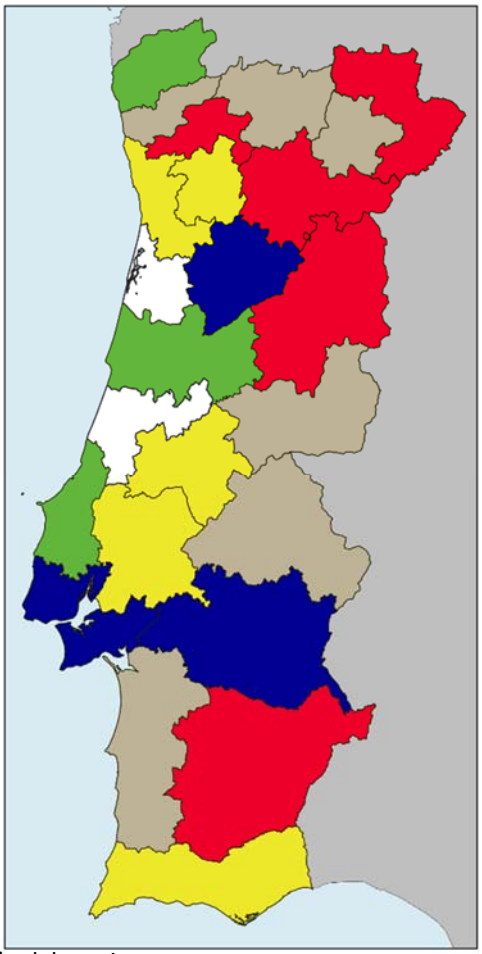


Fig. 78 Degree of spatial detail in intermunicipal adaptation plans. Author's elaboration

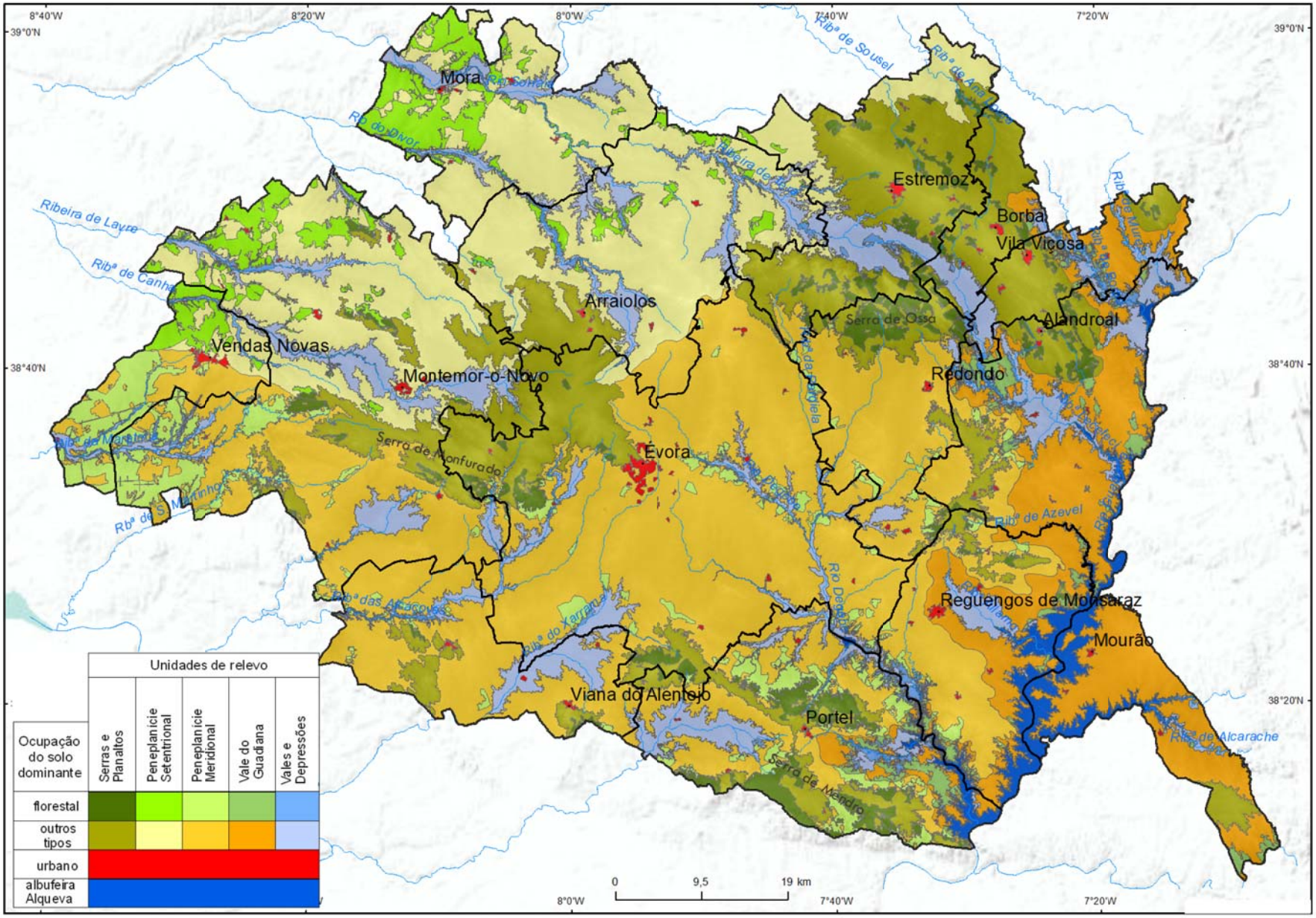


Fig. 79 (Territorial) Units of Homogeneous Climatic Response in Alentejo Central. Source: PIAAC Alentejo Central

4. Case study: the Metropolitan Plan for Climate Change Adaptation of the Lisbon Metropolitan Area

The PMAAC-AML (*Plano Metropolitano de Adaptação às Alterações Climáticas da Área Metropolitana de Lisboa*) is the top spatial tool for climate change adaptation policies in the Lisbon Metropolitan Area (see chapter 1.4). In the Portuguese context, it belongs to the category of intermunicipal adaptation plans financed through the PO SEUR (see chapter 3.1.3). Building on the extensive scope of adaptation solutions experimented nationally in later years, the PMAAC-AML integrates all the key components of adaptation planning in a process with advanced governance implications, representing the state of the art of spatial planning for climate change adaptation in Portugal in 2020.

The PMAAC-AML was commissioned by the AML through a public contest in September 2017 to a consortium composed of: CEDRU (*Centro de Estudos de Desenvolvimento Regional e Urbano*), IGOT (*Instituto de Geografia e Ordenamento do Território*, the Geography and Planning Department of the University of Lisbon), WE CONSULTANTS (MEGALOCI – *Plataforma Empresarial e Território*), TIS (TIS.pt – *Consultores em Transportes Inovação e Sistemas*) and ESRI (ESRI Portugal – *Sistemas e Informação Geográfica*).

Its strategic objectives are:

- the improvement of the technical and scientifical knowledge on adaptation and its application on the metropolitan territory, chiefly through the definition of a basic adaptation scenario for the AML and the evaluation of current and future risks and vulnerabilities in the AML;
- the training of institutional agents and of the entire community of the AML in the field of climate change adaptation;
- the adoption of a transversal culture of adaptation in the AML, mainly aimed at the implementation of ecosystem-based adaptation measures, and at the integration of climate change adaptation in the metropolitan and municipal planning.

4.1 Methodological structure of adaptation planning

The conventional methodology for adaptation planning in Portugal is the one prescribed for the EMAACs, based on the UKCIP Adaptation Wizard (see chapter 3.1.2 The EMAAC as a tool for planning adaptation policies). This is an elementary procedure, focused on correctness and coherence for the assessment of climate vulnerabilities, the identification of adaptation options, and the priorisation of adaptation measures, lacking sufficient foundations for the implementation of the plan and managing of the adaptation process (see chapter 3.2.1).
Building on the experience gathered since the first adaptation strategies, the methodology adopted for the development of the PMAAC-AML is the product of a consistent refinement of the minimal EMAAC approach, and represents a milestone in the progressive establishment of a substantial modus operandi for climate change adaptation planning in Portugal.

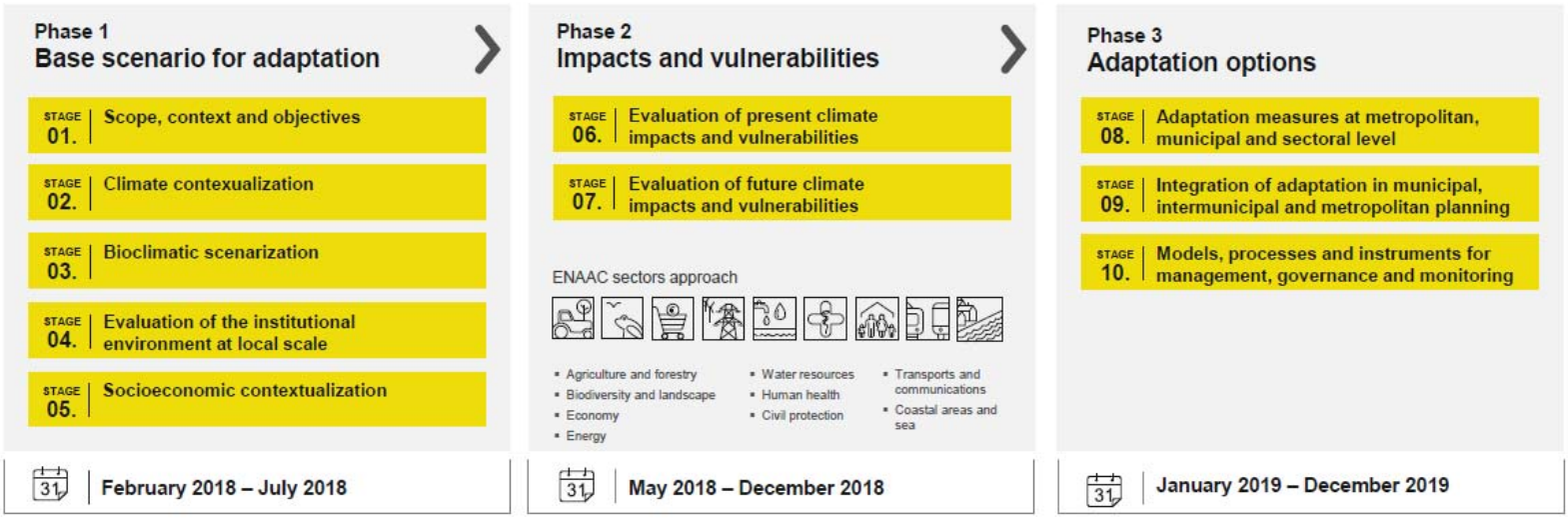


Fig. 80 Methodological programme of the PMAAC-AML Source: PMAAC-AML, 2020

Specifically, the PMAAC-AML succeeds for the first time in solidly integrating the three main factors determining the success of adaptation planning: the scientific bases supporting all components of the plan, the sectorial approach to adaptation (as advanced by the National Strategy, which remains the main support for the legitimation of adaptation policies), and the consistent support for territorial operationalisation of the plan. The whole development was accompanied by a large involvement of local stakeholders, sectors representatives, and (even if with less success) local communities, including numerous moments of public exposition and discussion of the advancement of the plan. On the whole, all the phases of adaptation planning appear significantly consolidated in the PMAAC-AML, as compared with other Portuguese adaptation plans.

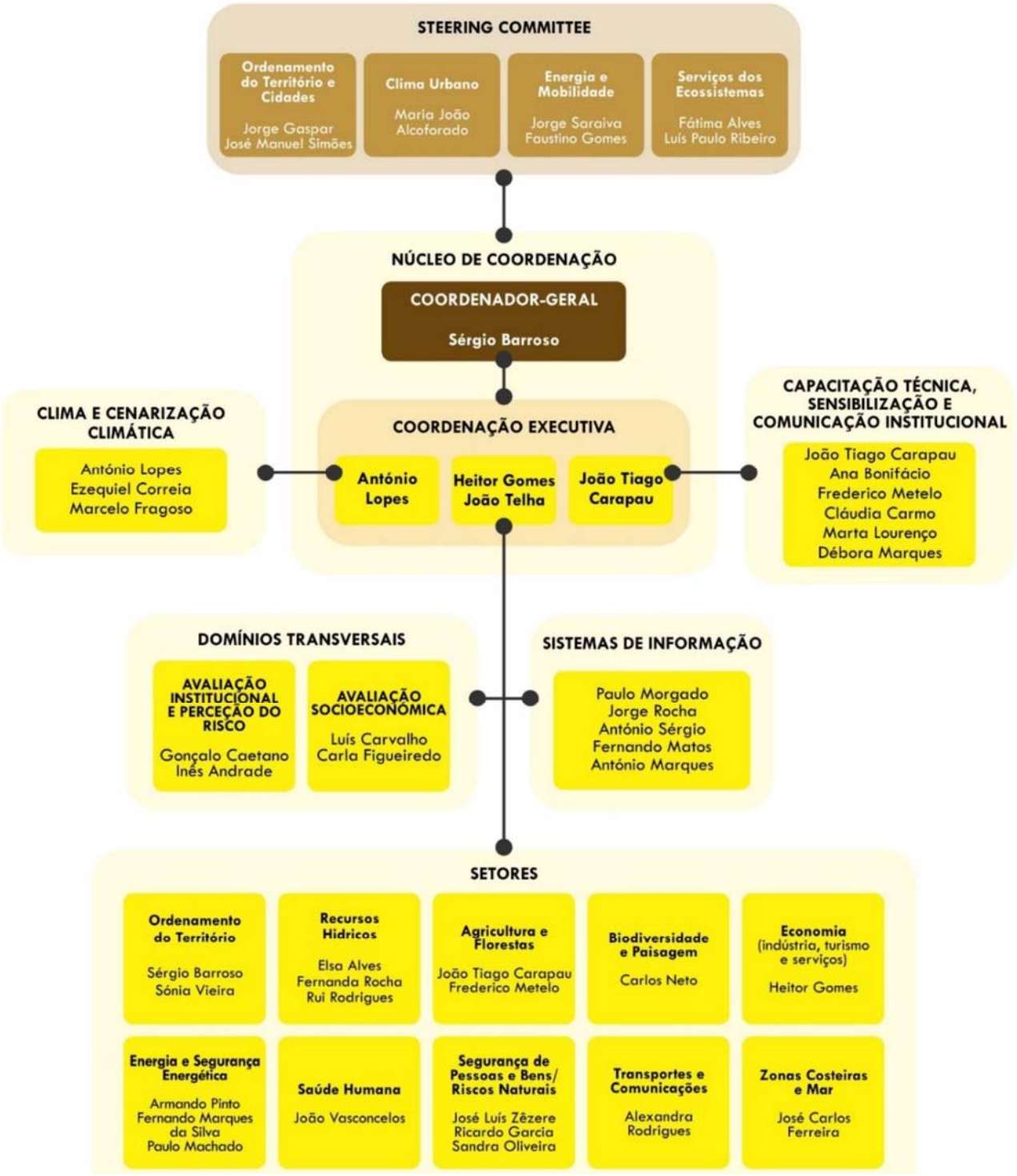
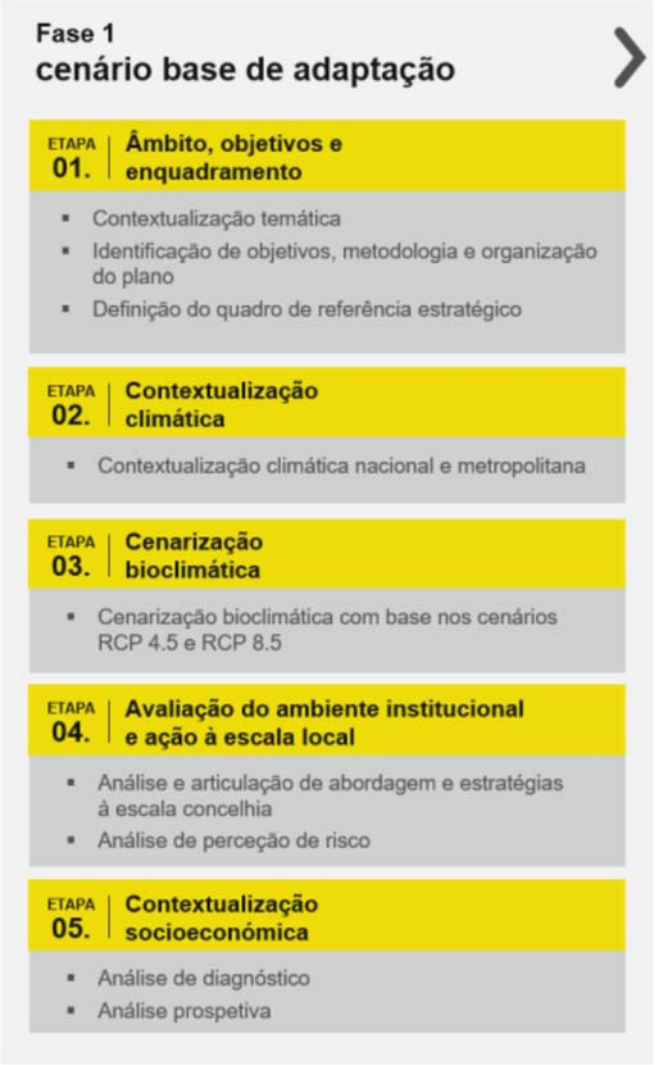


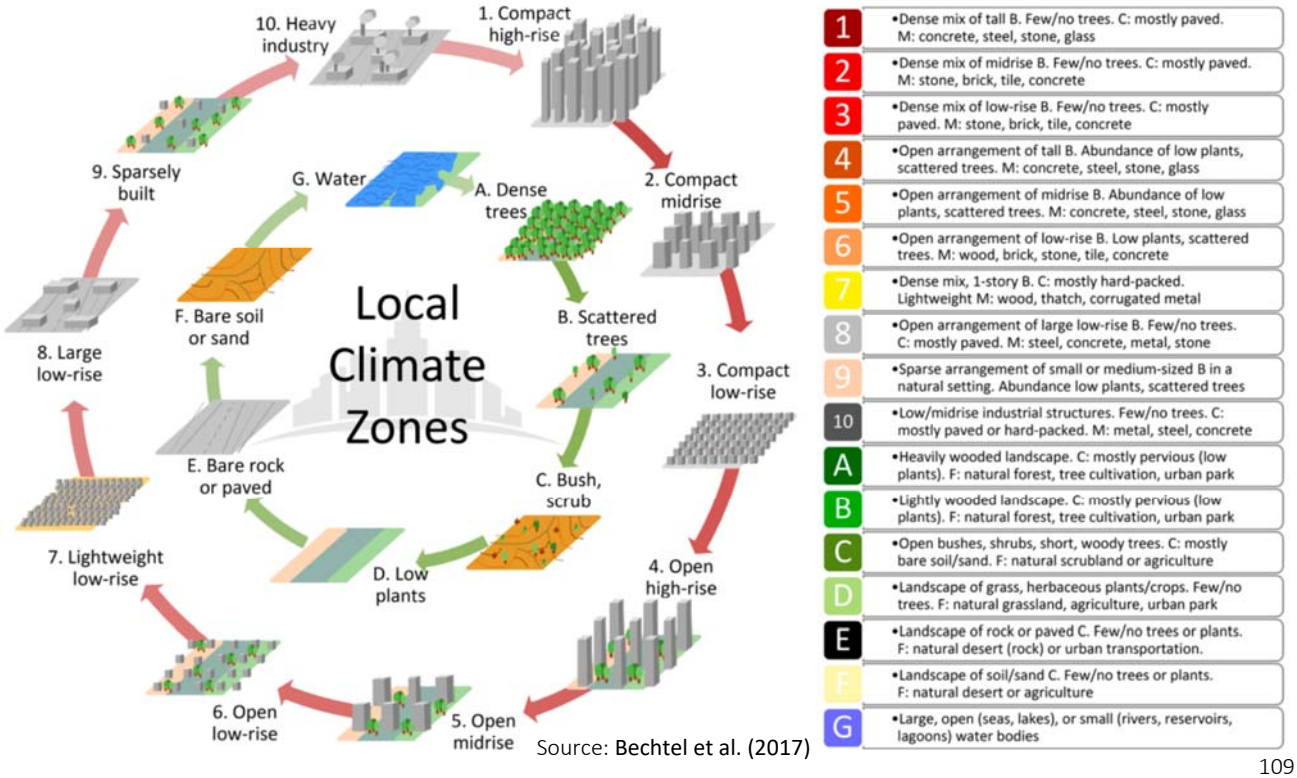
Fig. 81 Organisational structure of the PMAAC-AML Source: PMAAC-AML, 2020

Phase 1 – Base scenario for adaptation

Following the intermunicipal adaptation plans of Viseu-Dão Lafões and Alentejo Central (see chapter 3.2), the PMAAC-AML operated a thorough analysis of the local climate, providing a clear characterisation of climatic sub units internal to the AML.

Climate contextualisation (Stage 2) was grounded on the identification of eight Morpho-climatic Units (UMC), mainly based on altitude. These are the geographical objects for which the plan is developed, both in analyses and proposals. Indications given to each municipality are based on the particular Units which cover its territory.
The Morpho-climatic Units were used for the demarcation of Homogeneous Climatic Response Units, resulting from their intersection with the Local Climate Zones (detailing classes of land-use, which inform on the different responses to each climate conditions) and satellite mapping detecting synchronic surface temperatures in the AML. Thus, the Homogeneous Climatic Response Units integrate climatic inputs of natural and artificial origin, rendering a realistic representation of local climates in the AML.
On these bases, climate contextualisation reports the main climatic data regarding temperatures, rainfall and winds, including the highlighting of recent trends.





Source: Bechtel et al. (2017)

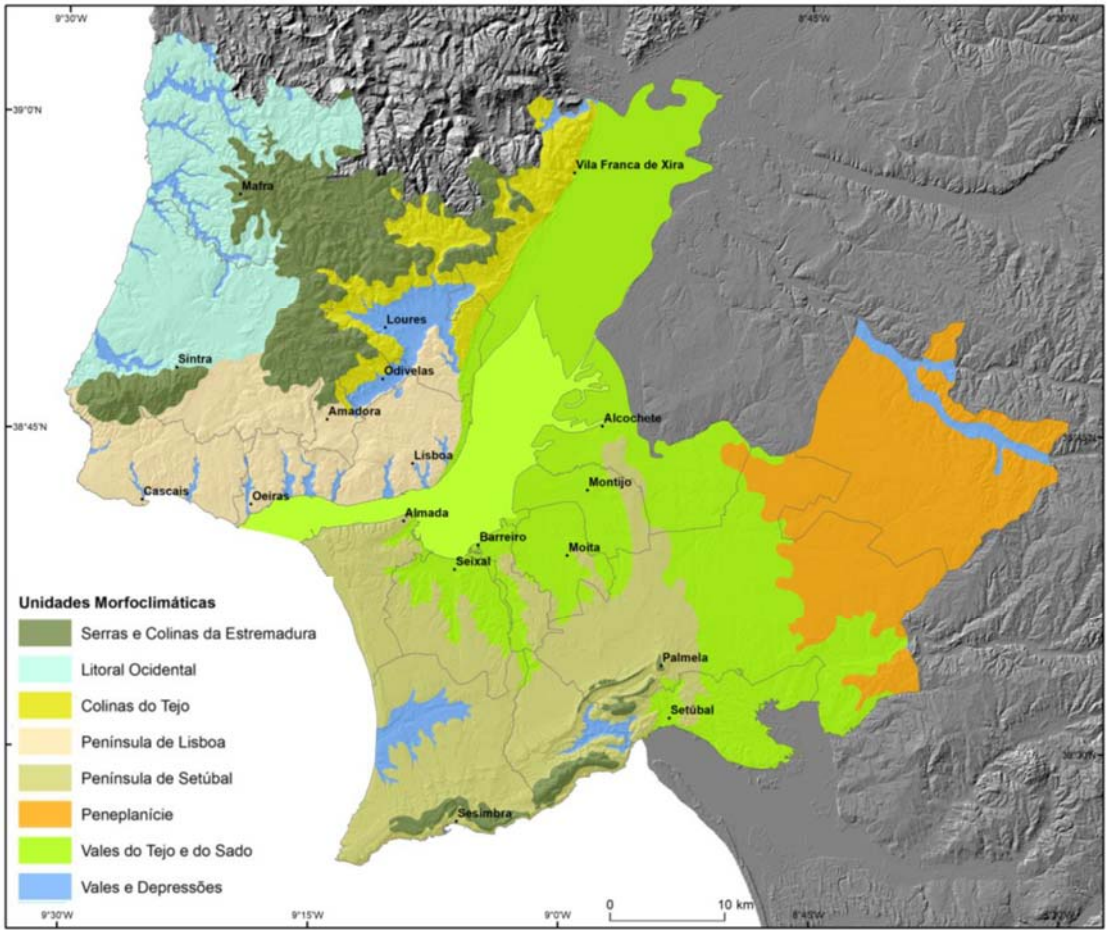


Fig. 82 Morpho-climatic Units (UMC) in the AML. Source: PMAAC-AML, 2020

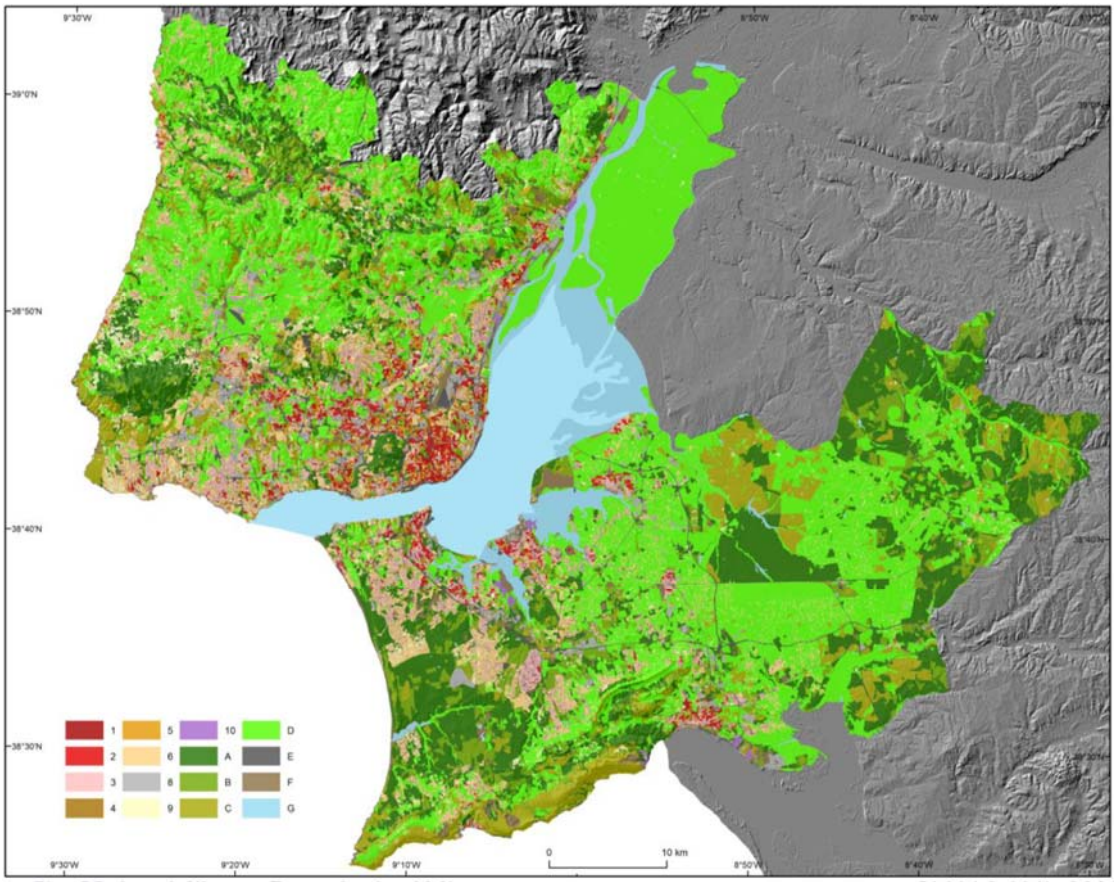


Fig. 83 Local Climate Zones in the AML. Source: PMAAC-AML, 2020

Bioclimatic scenarisation (Stage 3) was performed according to two Representative Concentration Pathways (RCP) elaborated by the IPCC:

- RCP 4.5, supposing an increase of the CO_2 in the atmosphere until 520ppm in 2070, with a smaller increase until 2100;
- RCP 8.5, supposing an increase of the CO_2 in the atmosphere until 520ppm in 2070, and a further increase until 950ppm in 2100.

The parameters used for the bioclimatic scenarisation are:

- Thermal parameters:
    - Average temperature
    - Maximum temperature (Tx)
    - Minimum temperature (Tn)
    - Number of extreme heat days (Tx>35ºC)
    - Number of summer days (Tx>25ºC)
    - Number of tropical nights (Tn>20ºC)
    - Number of days of heatwave
    - Number of days of coldwave
    - Number of days of frost (Tn<0ºC)
    - Bioclimatic comfort index

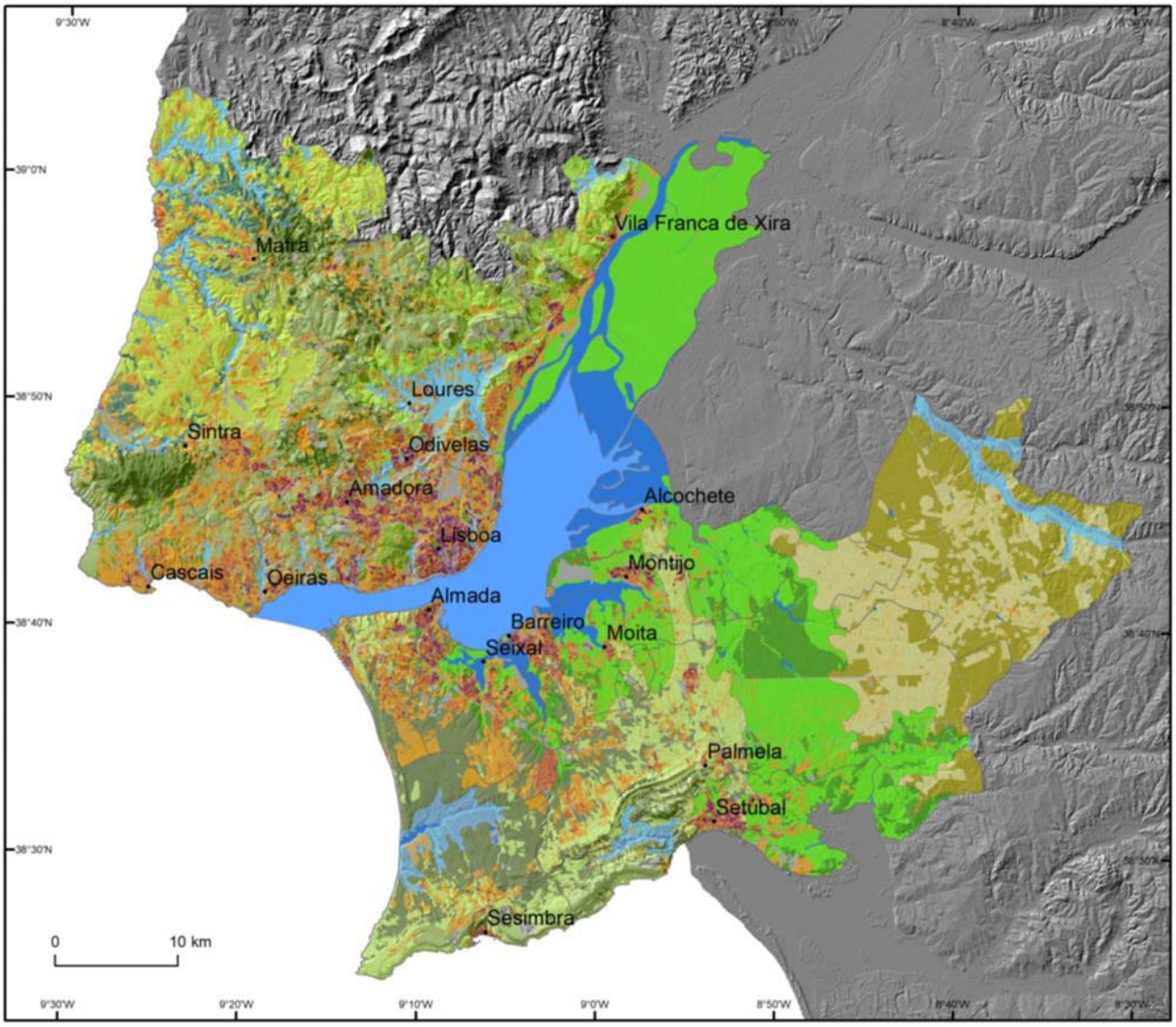


Fig. 84 Homogeneous Climatic Response Units in the AML. Source: PMAAC-AML, 2020

- Pluviometric parameters:
  - Cumulated rainfall
  - Number of days with P>1mm
  - Number of days with P>10mm
  - Number of days with P>20mm
  - Number of days with P>50mm
  - Drought index
- Anemometric parameters:
  - Average wind speed
  - Number of days of strong wind (>5,5 m/s)
  - Number of days of very strong wind (>10,8 m/s)

Each parameter was projected to 2070 and 2100 according to the two RCP (4.5 and 8.5) and to the eight Morpho-climatic Units.

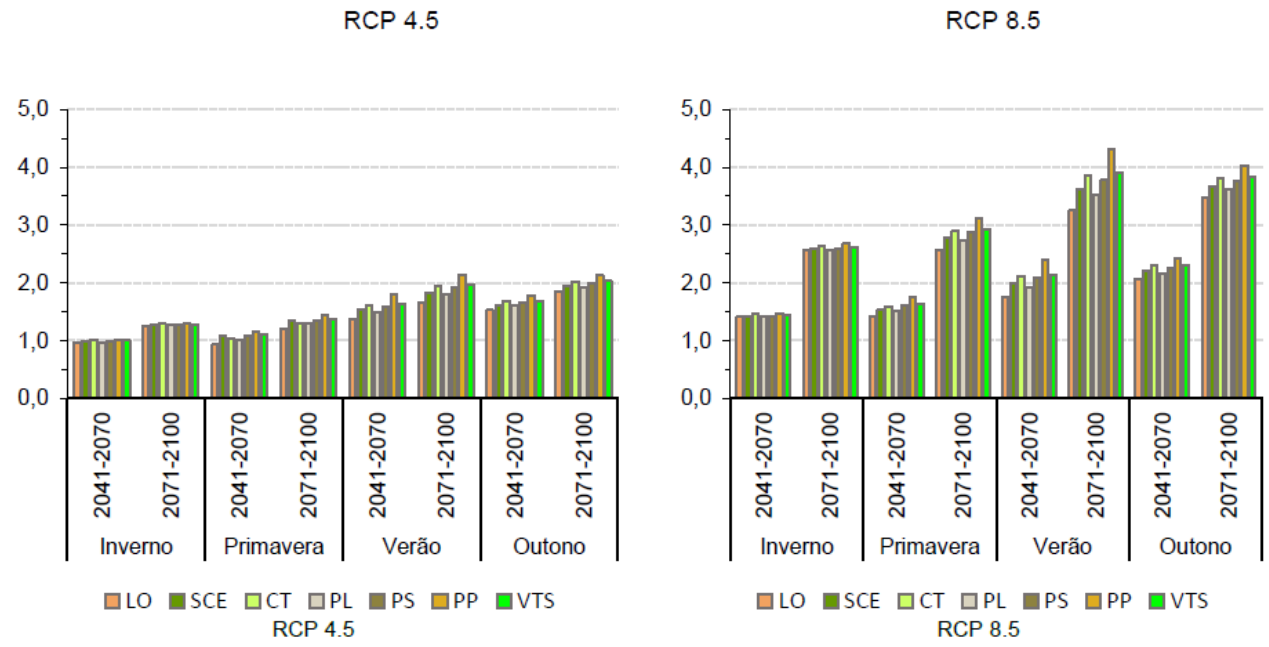


Fig. 85 Seasonal anomalies of the average temperature in Morpho-Climatic Units. Source: PMAAC-AML, 2020

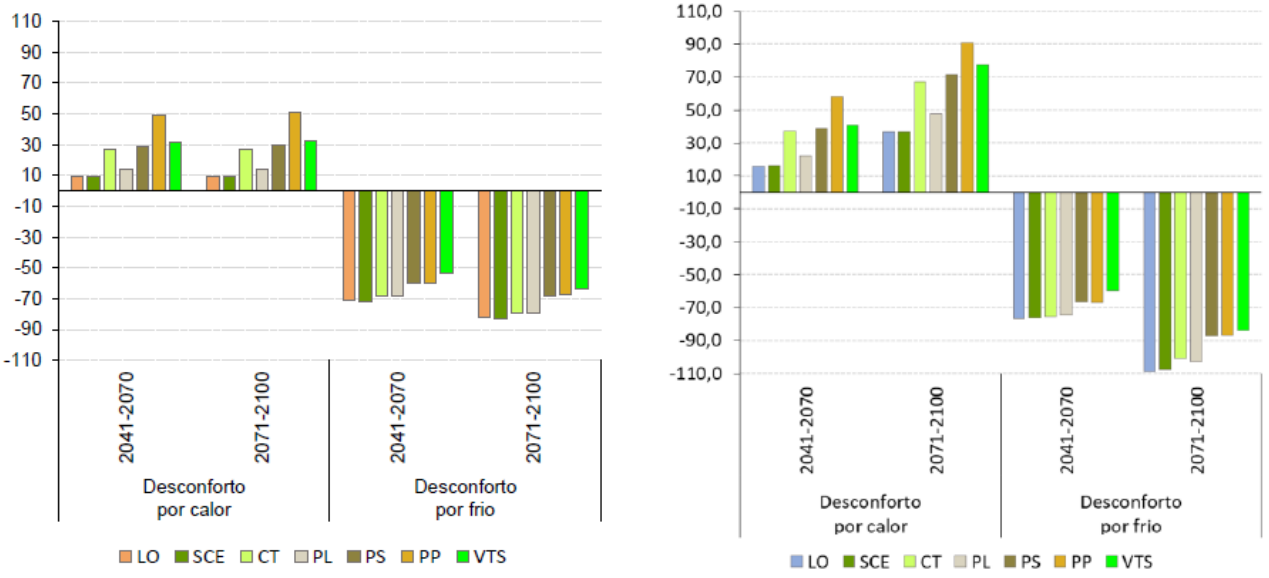


Fig. 86 Anomalies of the yearly number of days of thermal stress (bioclimatic discomfort) in Morpho-Climatic Units. Source: PMAAC-AML, 2020

While Stage 2 and 3 provided a foundation for the estimate of potential local climate impacts, Stage 4 and 5 were dedicated to assessing adaptive capacity and socio-economical vulnerabilities in the AML. The conclusions of the Phase 1 would therefore base the assessment of climate impacts and vulnerabilities, which is the object of Phase 2.

The assessment of adaptive capacity (Stage 4) has been conducted according to its definition by the IPCC, considering as determining factors economic resources, technology, information, infrastructures, institutions, and equity. The appraisal of institutional adaptive capacity provides the identification of all (public and private) institutions that could play a key role in promoting climate change adaptation in the AML. Instrumental adaptive capacity has been evaluated through the detecting, in all plans in force in the AML, of current and potential integration of adaptation policies. The risk perception analysis was executed through a public survey conducted on the population and on municipal officials, which enquired not only the general awareness concerning climate change, but also the general understanding of the main climate risks and vulnerabilities in the AML, and the assigned responsibilities for adaptation to institutions and policy tools.

Socio-economic contextualisation (Stage 5), as well, has been executed considering both the current conditions and the foreseeable future scenarios in the AML. It comprises a socio-demographic characterisation (and prospective scenarisation), an evaluation of recent development visions adopted by the AML, and the contextualisation of sectorial policies in the area. The latter is also systematised in a set of SWOT matrixes referred to each one the sectors in relation with climate change in the AML.

	INCIDÊNCIA TEMPORAL					INCIDÊNCIA ESPACIAL			
	Pesada		Emergente			Geral		Específica	
	-2	-1	1	2		-2	-1	1	2
Forças									
Características endafoclimáticas propensas ao desenvolvimento agrícola e florestal	■					■			
Dinâmica crescentemente positiva do setor a nível produtivo, quer em termos quantitativos, quer sobretudo no que concerne aos parâmetros de qualidade			■				■		
Aparecimento de alguns novos produtores, com técnicas de produção inovadoras e conceitos de mercado diferenciados e valorizadores dos produtos			■				■		
Reforço da produção vitivinícola e hortofrutícola nos últimos anos, em alguns concelhos da margem sul da AML			■					■	
Presença da maior exploração agropecuária e florestal de Portugal (Companhia das Lezírias, em Vila Franca de Xira), exemplo de boas práticas produtivas		■							■
Fraquezas									
Contínua urbanização do território, com perda significativa de solos com potencial agroflorestal (diminuição progressiva da SAU e de área florestal)	■					■			
Pouca representatividade do setor na geração de emprego, representando menos de 2% do emprego total da AML		■				■			
Dificuldade na vulgarização de espaços agrícolas de produção agroalimentar de proximidade (por exemplo, hortas urbanas) nos concelhos mais urbanizados				■				■	
Não existência de uma política territorial coerente e integrada de promoção dos produtos agroalimentares da AML	■					■			
Escassa articulação das orientações estratégicas e das atividades autárquicas com os agentes agropecuários e florestais presentes nos concelhos	■							■	

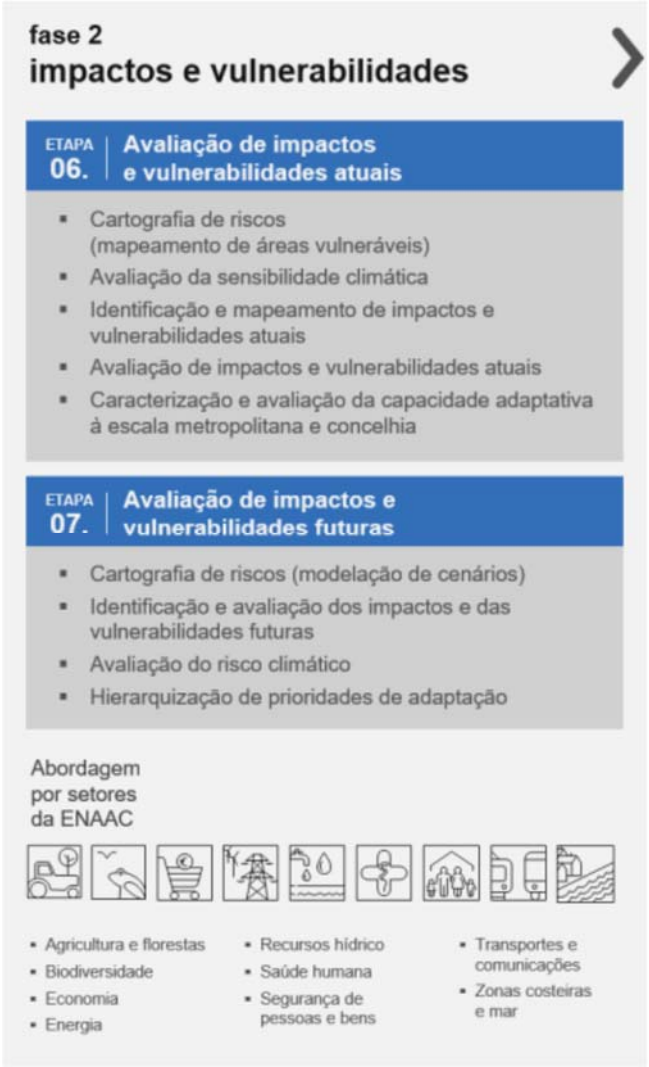
Fig. 87 SWOT matrix characterising the sector of agriculture and forestry in relation to climate change. Source: PMAAC-AML, 2020

Phase 2 – Impacts and vulnerabilities

Phase 2 was dedicated to the characterisation of climate vulnerabilities in the AML. According to its conceptual definition (see chapter 2.1), vulnerability was calculated as the product of risk (exposure to climate impacts), sensitivity and adaptive capacity.

The evaluation was conducted separately for each risk, including: rural fires, hydric erosion of soil, hillside instability, flooding, estuarine inundation, extreme heat and heatwaves, droughts, windstorms, and coastal inundation, erosion and retreat.

For each risk, every parish in the AML was assigned a score (with value 0 to 1) for current exposure, future exposure, sensitivity, adaptive capacity, and finally current and future vulnerability.



The appraisal of current risks was performed through the application of a specific method (e.g. the risk of rural fire was calculated through the application of the heuristic model PMDFCI). Thus, the areas exposed to risk were demarcated, and to each parish was assigned a score indicating the percentage of its area exposed to risk.

The Local Climate Impact Profile (the same applied in the EMAACs), compiled for each municipality to register all impacts in the period 2000-2018, was used as a means to verify and eventually correct the results of the risks evaluation.

The projection of future risks was obtained through the application of the bioclimatic scenarisation operated in Phase 1. The parameters determining each risk were identified, and the projection of future risks was obtained according to the foreseen changes in the relative parameters. For example: if would be detected in its territory a future increase in the frequency of heatwaves, days of extreme heat, and droughts, a parish whose current exposure to rural fires had been calculated as medium or high would be assigned a future exposure index high or very high.

Sensitivity has been obtained through the intersection, for each risk, of the areas exposed with the sensible elements. These had been previously mapped, after determining a set of sensitivity indicators for each risk, considering elements relevant for all sectors of the ENAAC 2020 (such as resident population, vulnerable groups, or transport infrastructure). Thus, the sensitivity score of each parish was obtained from the substantiality of its sensible elements exposed to risk.

Adaptive capacity was also described by a number of indicators identified for each risk. This parameter, however, was calculated at the municipal scale, since that for most indicators there was no information available at the parish scale. In this case too, the Local Climate Impacts Profile was consulted to verify the outcomes obtained, since that it contains the responses put in place during/after each impact, and their results.

Finally, the current vulnerability index (of each parish, to each risk) was calculated as the weighted product of current exposure (weight 40%), sensitivity (weight 40%), and adaptive capacity (weight 20%).

The future vulnerability index, in the same way, was calculated as the weighted product of future exposure (weight 40%), sensitivity (weight 40%), and adaptive capacity (weight 20%); thus considering changes only in the field of exposure, since that there are no elements available to assess changes in sensitivity and adaptive capacity until 2100.

All the results obtained in this phase are expressed in cartographic pieces, which support the identification of the most vulnerable areas and the priorisation of adaptation measures.

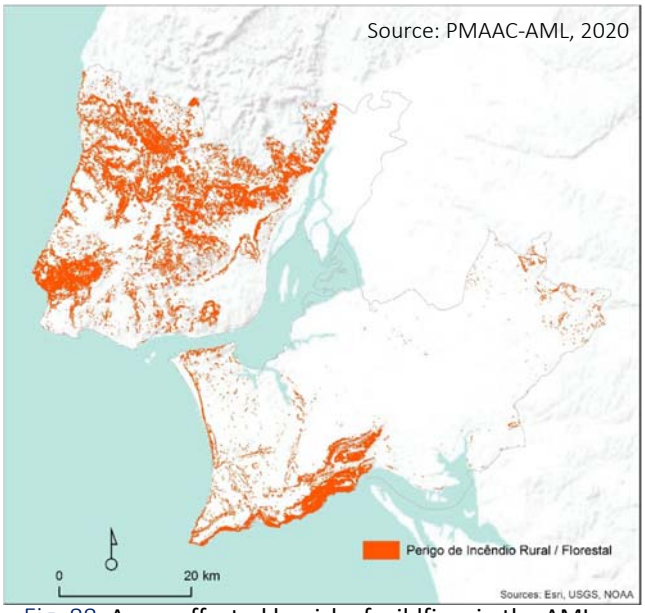
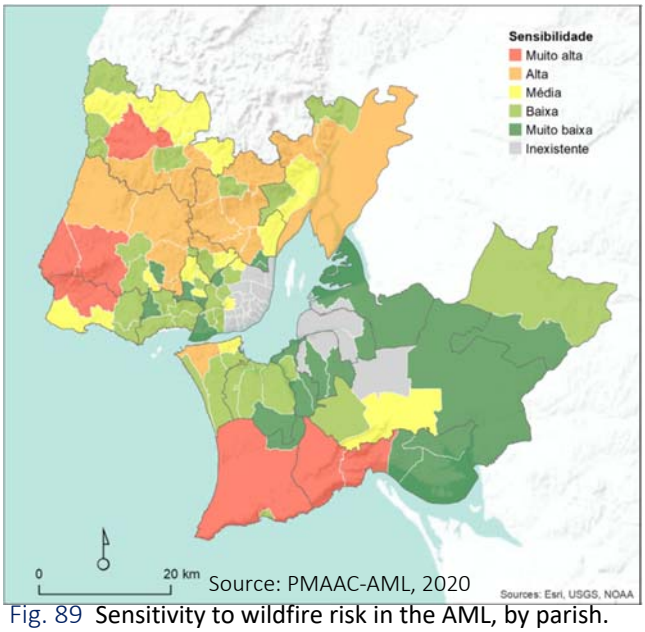
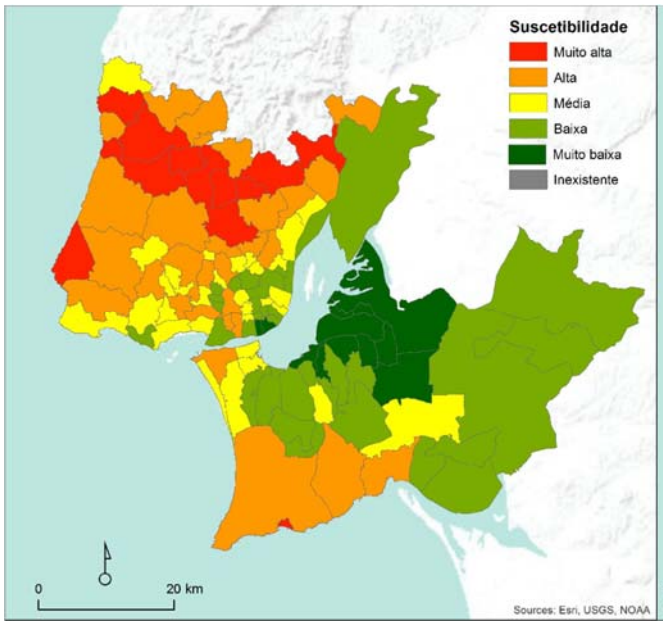


Fig. 88 Areas affected by risk of wildfires in the AML.



Source: PMAAC-AML, 2020

Fig. 89 Sensitivity to wildfire risk in the AML, by parish.



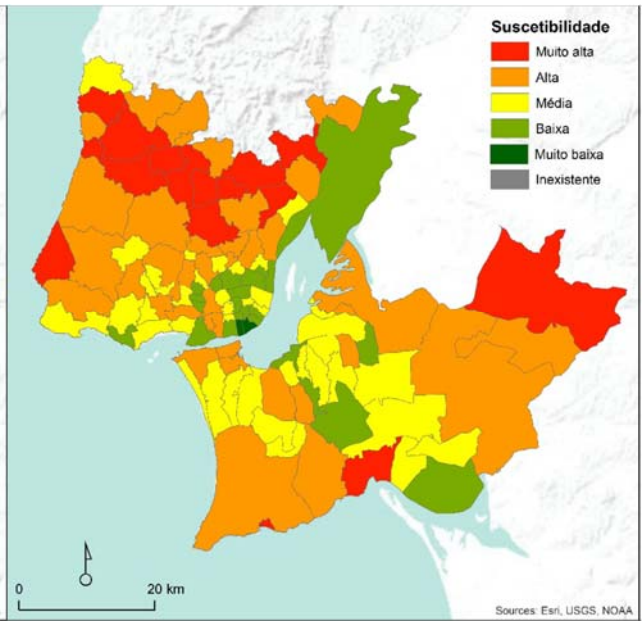
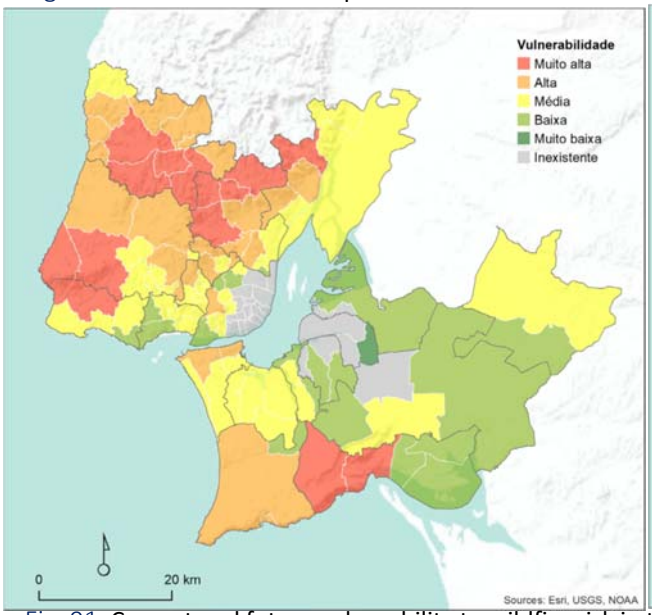


Fig. 90 Current and future exposure to wildfire risk in the AML, by parish.

Source: PMAAC-AML, 2020



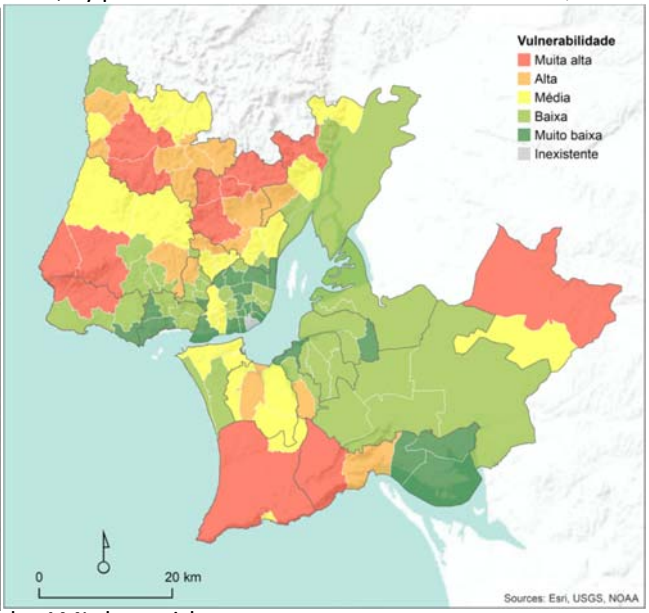


Fig. 91 Current and future vulnerability to wildfire risk in the AML, by parish.

Source: PMAAC-AML, 2020

Moreover, all the Phase 2 has been conducted adopting the sectorial framework of the ENAAC 2020, therefore all considerations have been structured on the following sectorial dimensions: agriculture and forestry, biodiversity and landscape, economy, energy, water resources, human health, safety of people and goods, transport and communication, and sea and coasts.

For each of these sectors, a thorough examination of sensitivity and adaptive capacity has been performed, supporting the identification of climate impacts and vulnerabilities, at the present moment and in the future. This operation has included the compilation of sectorial Climate Impacts Profiles, the identification of climate impacts affecting each sector, and the evaluation of the main risks.

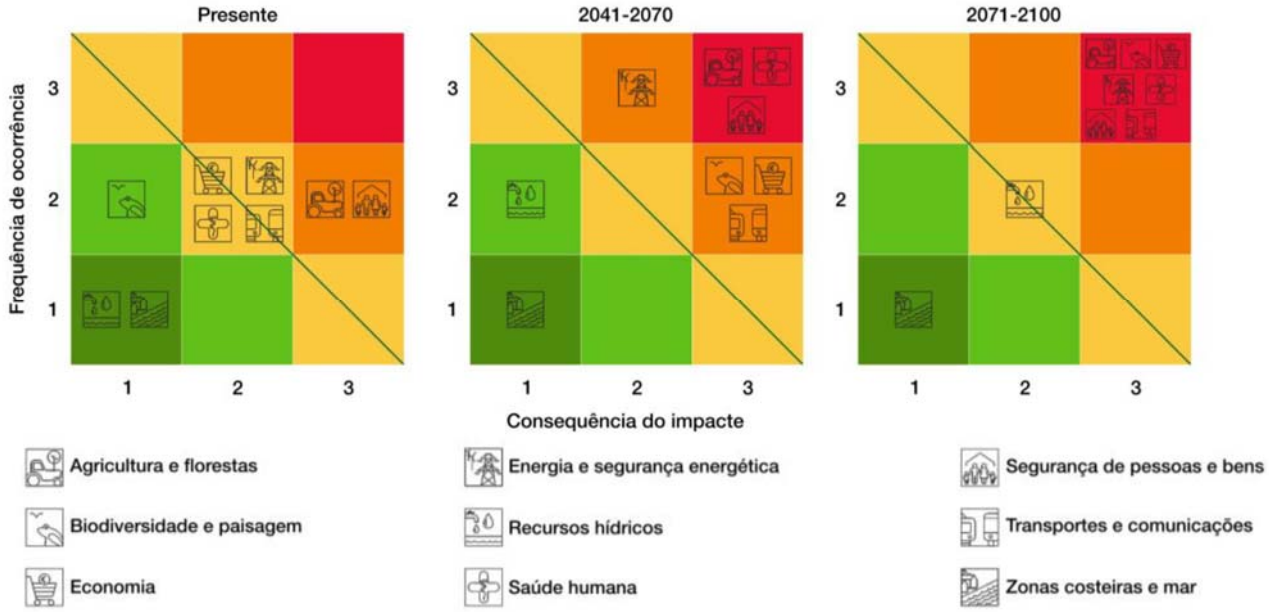


Fig. 92 Expected evolution of sectorial risks associated to high temperatures. Source: PMAAC-AML, 2020

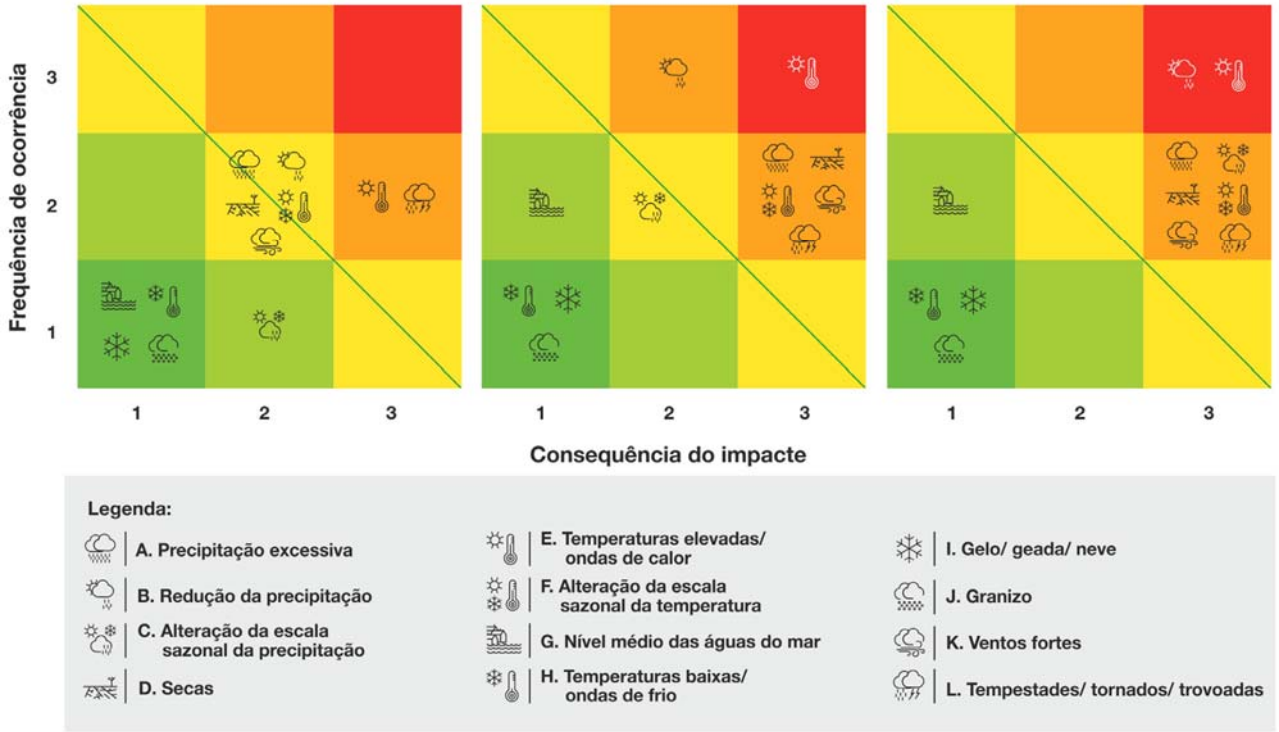


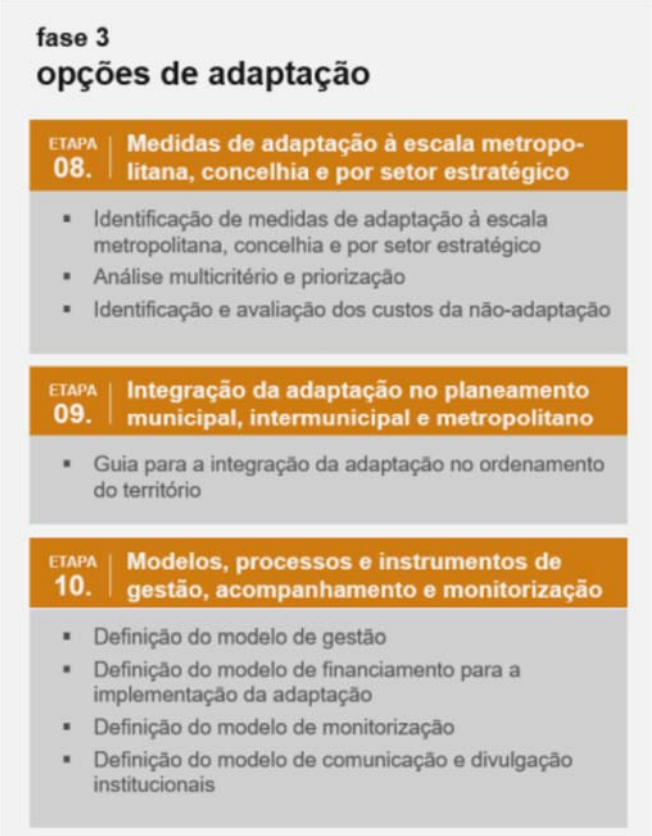
Fig. 93 Expected evolution of impacts on the sector "Agriculture and Forestry" (2020-2070-2100). Source: PMAAC-AML, 2020

Phase 3 – Adaptation options

Building on the extensive information support developed in Phases 1 and 2, Phase 3 was dedicated to the selection of adaptation options and to the designing of a model for the operationalisation and management of the plan. Keeping in mind the challenges identified at its outset (see chapter 4), the PMAAC-AML finally adopted as strategic objectives:

- To reduce exposure to risks by mitigating climate impacts on people and goods;
- To increase the adaptive capacity to climate impacts;
- To promote the enhancement of knowledge over climate change and related impacts and vulnerabilities.

Phase 3 was focused on the risks that (according to the evaluation of impacts and vulnerabilities) result relevant for the AML, namely: extreme heat and heatwaves, sea-level rise, droughts, and flooding. The policies to be implemented for the adaptation to these phenomena constitute the Metropolitan Adaptation Agenda, which systematises all adaptation measures with the highest priority to be undertaken in the AML.



Município	Temperaturas elevadas	Subida do nível médio das águas do mar	Secas	Cheias e inundações
Alcochete	1	1	2	-
Almada	2	3	1	2
Amadora	2	-	-	1
Barreiro	2	1	1	-
Cascais	3	2	2	3
Lisboa	3	1	1	3
Loures	3	1	1	3
Mafra	3	2	-	3
Moita	1	1	1	-
Montijo	2	1	2	-
Odivelas	2	-	-	3
Oeiras	1	1	-	1
Palmela	2	1	2	2
Seixal	2	1	1	-
Sesimbra	2	2	2	2
Setúbal	3	2	1	3
Sintra	3	2	-	2
Vila Franca de Xira	2	1	3	2

Fig. 94 Priority degree of the main climate risks in each municipality of the AML. Source: PMAAC-AML, 2020

Moreover, for each of the nine sectors has been elaborated an adaptation strategy, resulting in nine Metropolitan Agendas for Sectorial Adaptation.
The Metropolitan Adaptation Agenda is composed of four strategies, each responding to one of the main risks. These are further developed into strategic objectives systematising the priority measures identified, which are finally translated into actions to implement.
The priority actions have been selected through a multi-criteria analysis and subsequent priorisation, together with the determination of the costs for not adapting. Each strategic objective is extensively illustrated, reporting its priority and the actors to involve for its implementation.
Adaptation measures, in the same way, are described thoroughly, for each reporting type, costs, benefits, efficacy, timeframe, areas interested, responsible parties, forms of implementation.

Besides adaptation strategies and measures, Phase 3 also defined a model for implementation, management, and monitorisation of the PMAAC-AML (see chapter 4.2), and the forms of integration of adaptation policies into the spatial plans of the AML (see chapter 4.3).

4.2 Implementation of policies and governance model for adaptation

Climate change adaptation, for its intrinsic characteristics, poses serious challenges to the aptitude of public authorities to provide just solutions, calling for a new approach to governance that could prepare local communities to face high uncertainty and complexity. The development of the PMAAC-AML involved a large assortment of actors, professionals and stakeholders, aiming at an inclusive and participated model of governance. In recognising that climate change tends to aggravate social disparities (since that less favoured groups do not dispose of enough adaptive capacity), the vision adopted for the PMAAC-AML promotes climate change adaptation as an means to increase the resilience of the AML, to affirm a more equitable model for territorial development, and to support its capacity of innovation and global appeal. This objective has emerged from the principles that led the development of the plan: principles of action for adaptation (sustainability, territorial equity, social justice) and principles of governance for adaptation (cooperation, metropolitan i.e. intermunicipal governance, local initiative). In sum, the highest ambition of the PMAAC-AML is to found a cooperative approach to governance in the AML, capable to endure and strengthen through the years, since that any other attitude would not prove enough solid to provide effective adaptation solutions to climate change, which demand the highest adaptability and cohesion.

Therefore, the PMAAC-AML sets out a clear framework for the implementation of adaptation policies. The adaptation process will be carried out at the metropolitan scale, following the priorities identified and the implementation of the sectorial agendas. The local (technically, the municipal) scale, in any case, is confirmed to be

Fig. 95 Flowchart of the operationalisation of the PMAAC- AML. Source: PMAAC-AML, 2020

the key to the fulfilment of the plan, since that only in this ambit can be ignited those participative processes that would determine the success of adaptation efforts on the long run. Thus, the plan vigorously exhorts all municipalities to undertake a serious adaptation path, starting from the elaboration of a municipal adaptation strategy (still non-existent in two thirds of the municipalities of the AML). Once supplied with a strategy, local authorities have mainly three ways to implement adaptation policies: integration in municipal policies, integration in spatial tools and regulations, and focused interventions on strategic locations (such as the areas of highest vulnerability).
The AML is charged with a no lesser responsibility in the promotion of adaptation for the metropolitan conformation of the region: the continuity of the urban space, the supramunicipal dimension of the water basins, and the grave vulnerability of ecological corridors require the elaboration of projects at the sub-regional scale. Therefore the PMAAC-AML introduces in Portugal the figure of Strategical Metropolitan Projects, responding to the four main risks affecting the region. Their development is primarily assigned to the AML, that has to coordinate the action of municipalities for the execution of intermunicipal adaptation policies. The Strategical Metropolitan Projects have not yet been designed in detail, though their typologies and intervention areas have already been defined. Moreover, the AML is responsible for the overarching management of the plan and the integration of adaptation in the regional planning tools, such as the PROT-AML, the Regional Operative Programme and all the programmes for the direction of cohesion funds in the Lisbon region, which constitute the main funding source for adaptation policies in the area.

The process of management, monitorisation and evaluation of the PMAAC-AML was also examined thoroughly in its elaboration, aiming at the assimilation in the AML of the extended participative approach that has led the development of the plan, based on vertical (inter-governmental) and horizontal (inter-sectoral and inter-territorial) integration.
The political management of the PMAAC-AML is assigned to the Metropolitan Council (deliberative organ of the AML, composed by the mayors of member municipalities) and the Metropolitan Executive Commission (executive organ of the AML). The strategical management is of responsibility of a specific Metropolitan Workteam for Climate Action, internal to the AML. The technical management of the plan is also responsibility of the AML, through a technical office that would follow the metropolitan adaptation process. The strategic supervision of the plan is

Projetos Estratégicos Metropolitanos			
Riscos climáticos prioritários	**Territórios Prioritários**	**Formas de Adaptação**	**Tipologia de Projeto Metropolitano**
Temperaturas elevadas	Áreas urbanas compactas	Intervenções integradas de amenização térmica em bairros (espaços públicos), equipamentos e habitações.	Rede metropolitana de ecobairros
		Intervenções integradas de criação de corredores verdes urbanos	Corredores verdes urbanos de ventilação
Subida do nível médio da água do mar	Bairros costeiros vulneráveis ao galgamento e inundação	Retirada planeada de edificações, renaturalização e recuperação de sistemas dunares.	Retirada planeada bairros costeiros vulneráveis (POC-ACE)
Secas	Corredores ecológicos metropolitanos	Criação de corredores verdes metropolitanos, continuidade ecológica, preservação de galerias ripícolas, faixas de descontinuidade	Corredores ecológicos / parques metropolitanos
	Espaços verdes	Reutilização de águas residuais tratadas para rega de espaços verdes	Projetos intermunicipais de reutilização de águas residuais tratadas
Cheias e inundações	Bacias hidrográficas com maior vulnerabilidade	Intervenções que visem reduzir a velocidade de escoamento, potenciar a retenção a montante e incrementar a infiltração e a drenagem urbana	Corredores azuis metropolitanos Intervenções integradas de drenagem urbana de áreas críticas

Fig. 96 Characterisation of the Strategic Metropolitan Projects of the PMAAC- AML. Source: PMAAC-AML, 2020

assigned to a specific Metropolitan Platform for Climatic Action, gathering sectorial experts, members of the Strategical Council for Metropolitan Development (consultative organ of the AML), as well as representatives of economic, social, cultural and environmental interests in the AML. The scientific monitoring is assigned to a specific Scientific Panel for Supervision and Orientation, composed of recognised experts in climate change and in the ENAAC sectors, supporting the action of the Metropolitan Platform for Climatic Action.
The monitorisation function is mainly charged to municipalities, that have to gather all the required data for their territories. These would be subsequently systematised and made accessible to the public by the AML.

The monitorisation, evaluation, and reporting process has been granted a primary relevance in the PMAAC.AML, and a comprehensive system has been disposed for it. This employs a very large number of indicators to be measured annually in each municipality, comprising: climatic indicators (monitoring trends in the climate of the AML), climate impacts indicators (carrying on the compilation of the municipal Local Climate Impacts Profiles), adaptive capacity indicators (the same used in its calculation in Phase 2, tracking all changes in these conditions), vulnerability indicators (the same used in its calculation in Phase 2, tracking all changes in these conditions), and implementation indicators (reporting the progress made in the implementation of measures, detailing their types,

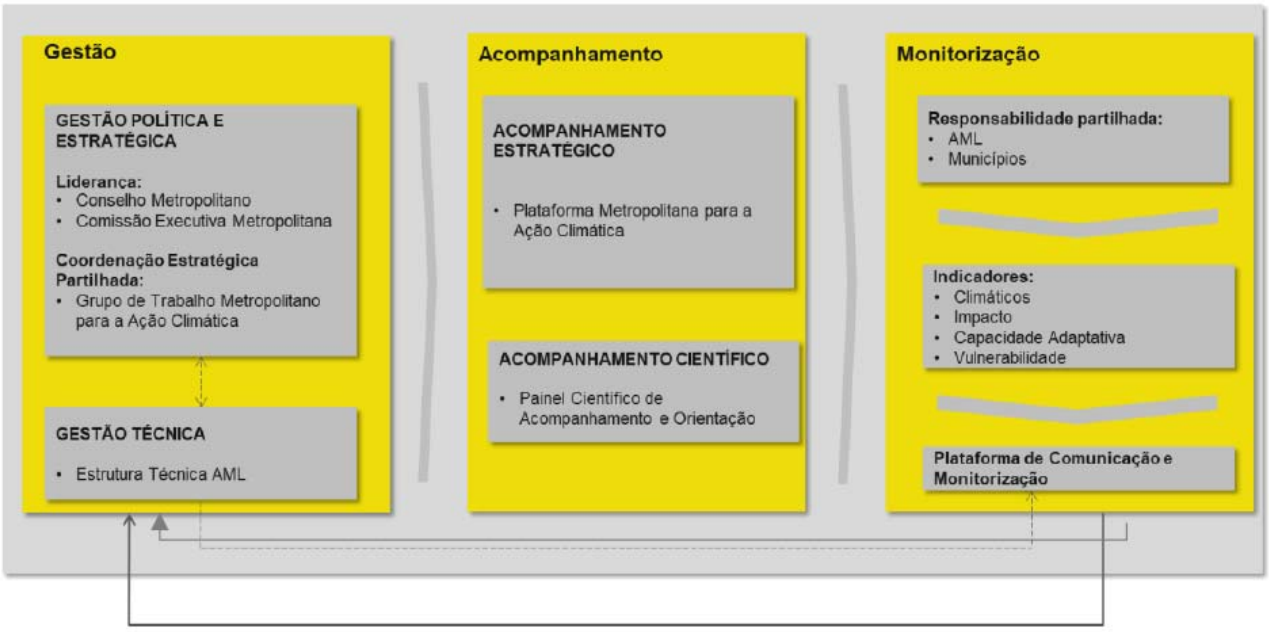


Fig. 97 Integrated model for the management, supervision and monitorisation of the PMAAC- AML.Source: PMAAC-AML

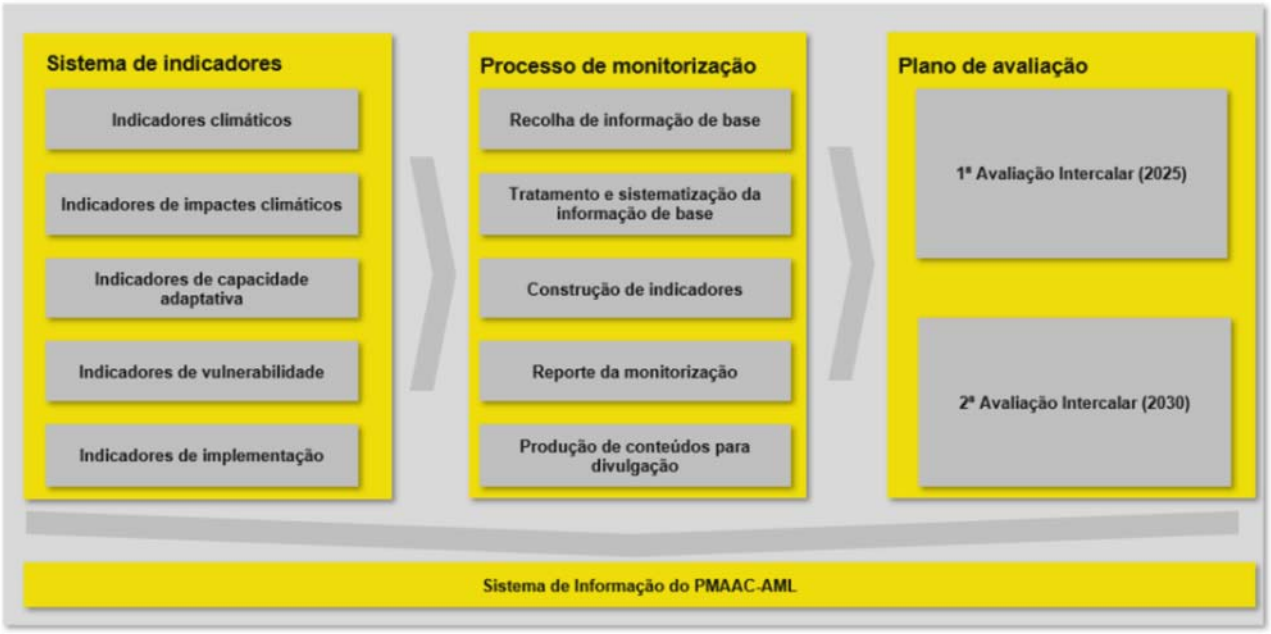


Fig. 98 Monitorisation and evaluation model of the PMAAC- AML Source: PMAAC-AML, 2020

sectors, and promoters). The MER process is of shared responsibility between the AML and municipalities. Namely, the municipalities have to measure and systematise all indicators which are based on local information, while the technical office for adaptation of the AML gathers data with external origin (such as the National Statistics Institute). The latter is also responsible for the systematisation and updating of the indicators and gathered data, and ultimately for the publication of the MER results, through the AML online information system but also through the yearly publication of a specific report.
The MER process will also found two plans of evaluation of the PMAAC-AML, already scheduled with a 5-years periodicity. The first one, to be developed 2025, is thought to correct any imperfection that would be detected in the system of the plan, while the second one is intended to inform the revision of the PMAAC-AML, to be performed before 2030 in order to be effective for the following decade.

Finally, the PMAAC-AML is made completely available for public consultation by the AML through its online Geovisualisation Platform. This includes all information concerning climate risks, impacts and vulnerabilities in the AML, and it reports all adaptation policies implemented in the region.

Procedimentos	Indicadores				
	Climáticos	Impactes climáticos	Capacidade adaptativa	Vulnerabilidade climática	Desempenho
Recolha de informação de base	AML	Municípios	AML	Municípios	AML / Municípios
Tratamento e sistematização de dados	AML	Municípios	AML	AML / Municípios	AML / Municípios
Construção de indicadores	AML	AML	AML	AML	AML
Reporte da monitorização	-	AML	-	-	AML / Municípios
Produção de conteúdos para divulgação	AML	AML / Municípios	AML	AML	AML / Municípios

Fig. 99 Distribution of responsibilities for the monitorisation of the PMAAC- AML. Source: PMAAC-AML, 2020

Procedimentos	Atores			
	AML	Municípios	Avaliadores externos	*Stakeholders* metropolitanos
Promoção, contratação e gestão	◆			
Acompanhamento	◆	◆		
Desenvolvimento das avaliações	◆		◆	
Contributos no âmbito de processos participativos		◆		◆
Divulgação dos resultados	◆	◆		

Fig. 100 Distribution of responsibilities for the evaluation of the PMAAC- AML. Source: PMAAC-AML, 2020

4.3 Integration of adaptation measures in spatial planning tools

It must be kept in mind that climate change adaptation in Portugal is mainly advanced through sectorial measures, whose implementation competes to sectorial authorities rather than municipalities. The latter, however, keep the decisive authority over spatial transformations in their territories. Thus, the integration of adaptation in spatial planning constitutes a crucial passage for climate policies, enabling the municipalities to accompany the work of sectorial authorities. To support this process, the PMAAC-AML has been complemented with a specific guide directed to local authorities (*Guia para a integração da adaptação no planeamento municipal, intermunicipal e metropolitano*). This provides a characterisation of all spatial plans in the AML and detailed indications for their integration of the adaptation measures advanced by the PMAAC-AML.

The spatial plans in force in the AML are:

- the Regional Programme for Spatial Planning (*Programa Regional de Ordenamento do Território*, see chapter 1.2.2) of the Lisbon Metropolitan Area (PROT-AML), currently in urgent need of revision. It is of responsibility of the regional CCDR and contains the regional key strategical directives for development and fundamental restrictions for environmental protection;
- two Programmes for Coastal Areas (*Programas de Orla Costeira,* POC) and five Special Plans for Protected Areas (*Programas Especiais de Área Protegida,* POAP), which constitute PEOTs (Special Plans for Spatial Planning), they are under direct responsibility of the State and defend the strict conservation of the most valuable natural areas in the region;
- 18 Municipal Director Plans (*Planos Directores Municipais,* PDM, see chapter 1.2.3), one for each municipality, which are the most important tools for spatial planning in Portugal, since that they frame the spatial policy of each municipality binding the action of private actors and all other municipal plans;
- 27 municipal Urbanisation Plans (*Planos de Urbanização,* see chapter 1.2.3), distributed on eight municipalities;
- 153 municipal Detail Plans (*Planos de Pormenor,* see chapter 1.2.3), distributed on all the municipalities of the AML.

The sectorial plans, that are as well pivotal for adaptation, are not considered in this phase, for they are formally not spatial planning tools, but mainly because for each individual sector of the national strategy for adaptation the PMAAC-AML comprised an extremely detailed discussion of context, climate impacts and vulnerabilities, adaptation options, and adaptation agenda in the AML.

Given that the PEOTs and PROT-AML will need, for their revision or operationalisation, to earnestly consider all phases and results of the PMAAC-AML, the guide focuses on the municipal plans, which can give way to the immediate implementation of adaptation measures, and also need more exhaustive support for their revision.

The forms of integration of adaptation in spatial planning considered by the PMAAC-AML are framed in four main dimensions:

- strategical: adaptation should inform the elaboration of long-term development strategies and the definition of favourable orientations for land-use; especially in the PDMs, which should integrate a strategical approach to adaptation in their development and so in plan reports, preliminary analyses, and environmental reports;
- regulative: reforming the land-use management procedures according to the identified characteristics of local climate change, updating the regulations of all municipal plans;
- operational: respecting the priority of urgent localised interventions for adaptation and imposing sustainable standards to all interventions allowed, following the indications of the PMAAC-AML and other local adaptation tools; primarily in action plans, funding plans, and executive projects;
- territorial governance: promoting the coordination, awareness-raising and capacitation of all local actors, institutions, and citizens; embracing an integrated participative approach in the elaboration of plans.

Following this dimensional characterisation of the integration of adaptation in spatial tools, and distinguishing between municipal plans (PDMs) and land-use plans (Urbanisation Plans and Detail Plans), the PMAAC-AML specifies, according to priority risk, the operations that are required to the municipalities affected. These descend directly from priority actions of the Sectorial Agendas, and lay the premises for their implementation.

Diretivas	Notas de implementação	Objeto da integração	Ações PMAAC-AML
Dimensão estratégica PDM			
Avaliar a necessidade de reconverter e reconfigurar a rede viária municipal que atravesse áreas florestais	Proceder, nos estudos de base da revisão do PDM, a um levantamento da rede viária municipal que atravesse áreas florestais, cruzando com cartografia de risco atual e futuro de incêndio florestal Identificar alternativas de traçado (com base em estudos prévios) Avaliar os efeitos significativos no território (ambientais, sociais e económicos) destas alterações	▪ Relatório ▪ Relatório ambiental	A3.2 Transportes e comunicações
Dimensão regulamentar PDM			
Identificar as áreas de risco de incêndio em cenário futuro de alterações climáticas	Cruzar as zonas de suscetibilidade elevada a incêndios florestais/rurais com a localização de pessoas e bens através da BGE e da BGRI e de levantamentos funcionais	▪ Regulamento ▪ Planta de ordenamento	A9.1 Segurança de pessoas e bens
Estabelecer faixas de proteção em áreas de risco de incêndio	Atualizar a cartografia das faixas de gestão de combustível envolventes a edificações e vias de circulação, áreas e espaços industriais, comerciais e de serviços, em consonância com os PMDFCI	▪ Planta de ordenamento	A9.1 Segurança de pessoas e bens A5.1 Economia
Dimensão operacional PDM			
Realizar as intervenções necessárias para reconverter a rede viária municipal que atravessa as áreas florestais	Projetar e definir os investimentos necessários à reconversão das redes de transporte	▪ Programa de execução ▪ Plano de financiamento ▪ Processo	A3.2 Transportes e comunicações
Realizar as intervenções necessárias para reconverter as redes de telecomunicações em áreas florestais	Projetar e definir os investimentos necessários ao enterro de cabos e outras ações de reconversão das infraestruturas de telecomunicações	▪ Programa de execução ▪ Plano de financiamento ▪ Processo	A3.3 Transportes e comunicações
Dimensão da governação territorial PDM			
Instalar um sistema intermunicipal de recolha e armazenagem de biomassa sobrante das atividades agrícolas e florestais	Articular com outras entidades da administração pública (AML, municípios, administração central) a promoção da instalação do sistema intermunicipal	▪ Processo	A7.3 Agricultura e florestas

Fig. 101 Directives for the integration of adaptation in spatial planning tools. Source: PMAAC-AML, 2020

5. Conclusions

Both the IPCC AR5 and the EU Strategy for Adaptation recognise that spatial planning is a pivotal policy for climate change adaptation, especially at the local level. The case of Mainland Portugal, examined in this work, confirms this fact entirely.

According to all studies conducted, both from international and national experts, Portugal shows grave vulnerabilities to climate change. Except for flooding, all the main risks threatening the national territory (extreme heat, droughts, coastal erosion and sea-level rise) do not meet at present (anywhere in the world) with solutions able to cope with the impacts expected in Portugal. Building on the work of a consistent group of expert professionals, and on the funding and knowledge-sharing support provided by the European Union, Portugal has recently undertaken a long and uncertain path for adaptation to climate change, that will determine its fortune throughout the course of the century.

After decades marked by unprecedented mass migrations, lack of basic urban services, uncontrolled construction, and real estate speculation, spatial planning has been institutionally established in Portugal as a fundamental and autonomous public policy around the turn of the century. Since then, planning is founded on a comprehensive system based on vertical (inter-governmental) and horizontal (inter-sectorial and inter-territorial) integration, and authorities of all levels are due not only "to assure a correct spatial planning and an harmonious development throughout the national territory" (a Constitutional requirement), but also to monitor and evaluate all spatial policies actuated, and further to report to all citizens about their outcomes, involving them into participation. This turn has been strongly influenced by the concurrent elaboration of the European Spatial Development Perspective, and has intensified the participation of Portuguese planners in the continental discussion on territorial development and in the planning of spatial transformations in Portugal. The process has also been accompanied by the reformation of administrative territorial units, and by the emergence of new patterns in national development. It must be kept in mind, however, that the first generation of systemic planning instruments has achieved covering the whole national territory only in 2003, and that the standards required by the law concerning the equality and transparency of the planning process are generally still far from been assured. The previous lack of an institutional buttress for spatial planning can be identified as the primary cause of its late evolution in Portugal, which explains its frail roots and scarce development of components that tend to consolidate at a later stage (such as MER or management processes).

Climate change adaptation, rapidly rising as one of the priority policies in the national agenda, has strongly affirmed spatial planning as a fundamental means for the integration and coordination of policies. Indeed, while the national strategy has established the sectorial framework for adaptation, the planning and implementation of adaptation measures have developed from the outset with a strong municipal leadership, fostering the spreading of local adaptation strategies (EMAACs), their systemisation and refinement. Overall, these municipal adaptation tools boast notable institutional and technical support, and prove a good reception of some fundamental practices for adaptation such as characterisation of climate risks and vulnerabilities and identification and priorisation of adaptation measures. Similarly to other Portuguese planning tools, on the other hand, these strategies also display deficits in funding resources, MER processes, adaptive management and equality, all of which are as well determining factors in climate change adaptation. In any case, a few virtuous municipalities have autonomously decided to proceed in their path for adaptation, and have later adopted action plans entailing advanced cartography, detailed operational programmes complete with funding information, and credible mechanisms for the monitoring, evaluating, and managing of the adaptation process.

In the meantime, the territorial focus of adaptation planning has moved from the municipal to the intermunicipal scale. This shift has permitted to cover, in the timeframe of five years, the whole national territory with local adaptation plans, taking advantage of the unprecedented founding for adaptation granted by the European Cohesion Fund since 2014. The development of these tools has been led by the lately instituted Intermunicipal Communities, whose territorial limits allow them to provide a more effective support to both sectoral and municipal authorities, the actors responsible for the implementation of planned adaptation to climate change. Even if these plans show marked heterogeneity (with some mostly ignoring spatial planning as a driver of adaptation), they have found ultimate realisation in 2020 with the adaptation plan for the Lisbon Metropolitan Area (PMAAC-AML). The PMAAC-AML represents a milestone in the national advancement not only of climate change adaptation, but of spatial planning as well. Through the adoption of a consummate methodology, and directly aiming at the introduction of a new model of governance for adaptation, it has succeeded in faultlessly integrating the adaptative, sectoral, and territorial dimensions of planning. Moreover, its development and management processes

incorporate substantial elements for the involvement and participation of local communities, which is by now unusual in the Portuguese context.

The adaptation plan for the Lisbon Metropolitan Area, together with the latest municipal adaptation plans, document the strict interdependence for development between spatial planning and climate change adaptation policies in Portugal.
Since 2015, the National Adaptation Strategy recognises the strategical potential of spatial planning policies to manage the complex territorial transformations that the country is forced to undertake. As a matter of fact, any other approach would have brought to the juxtaposition of unrelated sectoral plans which, considering the escalating impacts that Portugal will suffer for the exacerbation of current climate trends, would eventually result in sectoral conflicts bearing tragical consequences on the national territory. The adoption of spatial planning as a pivotal policy for adaptation has necessarily handed over the management of the adaptative process to the municipalities, whose sovereign authority on spatial planning is undisputed. Thus, where led by personalities with sufficient awareness of the future climatic scenarios, the municipalities have undertaken the identification of the consequences of climate change in their territories and the search for local solutions, joining national and/or international knowledge-sharing platforms for adaptation. Local powers reclaim the leadership of the adaptation process conscious of the facts that climate change impacts are experienced locally, according to the specificities of local climate, and that the elaboration of adaptation measures must start from urgent local needs. Moreover, only in the municipal context adaptation planning can achieve a significant active involvement of local communities and stakeholders, which is consensually recognised as one of the main prerequisites for a successful adaptation process. Ambitious local leaderships are inclined to integrate adaptation in their policies since that it provides them with long-term perspectives that can inform the elaboration of resilient strategies for local development. Furthermore, the certain availability of external funding for adaptation is often a determining factor in encouraging local actors to undertake interventions in their territories and try to launch at the local level the transition to a green economy, fastening social and environmental sustainability.

Yet Portuguese municipalities still face serious limits in terms of human resources, which make them mostly unable to carry out extensive climatic surveys and monitorisation practices. Therefore, even if politically responsible for adaptation, most municipalities still need to ask for technical support to external bodies. With these premises, the Intermunicipal Communities instituted in 2013 gained relevance during the operationalisation of the 2014-2020 cohesion policy programmes funding the adaptation process.
Intermunicipal Communities are now mandatory institutions for the coordination of municipal action in each of the NUTS III regions of Portugal, but they are rooted in general intermunicipal associations that have consolidated their position through the previous decade by effectively managing most of the territorial implementation of the cohesion policy programmes. It is important to note that Intermunicipal Communities do not represent a third political actor, but rather an assembly organ gathering all contiguous municipal representatives for univocal deliberation on common matters: metropolitan and intermunicipal governance in Portugal must be regarded as an expansion of municipal competences rather than as the task of a new territorial authority. Employing a sufficient number of qualified human resources with thorough knowledge of local territories, Intermunicipal Communities supply a number of municipal services whose management is greatly simplified at the sub-regional scale. In this way they play a key role in the territorial coordination and planning of sectorial policies, and sectorial authorities find in the Intermunicipal Communities a more useful interlocutor than the municipalities.
But intermunicipal associations have especially grown as a platform for the discussion and implementation of soft planning policies, which have recently gained more attention than usual hard planning practices. On this regard, it is possible to detect a nexus with the fundamental classification of adaptation actions operated by the European Environment Agency in 2013, which distinguishes between hard measures (consisting in physical transformative interventions on the territory) and soft measures (including policy, legal, social, management and financial measures that can alter human behaviour and styles of governance). A direct application of this framework for adaptation to the Portuguese territorial system naturally assigns soft adaptation actions to the responsibility of Intermunicipal Communities (decisive on soft planning policies), while municipalities (and to a lesser extent the CCDRs) plan and lead the implementation of hard adaptation measures (keeping undisputed authority on hard planning, i.e. land-use regulation).

In this way, the organisation of territorial adaptation has been by now configured with municipal political leadership and intermunicipal/intersectoral technical support. The intermunicipal adaptation plans recently introduced are the

concrete form in which Intermunicipal Communities guide municipalities in their autonomous implementation of adaptation policies. Conversely, in the Portuguese spatial planning system intermunicipal planning is theoretically conducted through purely voluntary plans adopted by small intermunicipal associations (realistically involving no more than three municipalities) founded for the same purpose. These spatial tools are under every respect analogous to the ordinary municipal plans, and meant to complement (or rather substitute) them. In practice however, intermunicipal plans amount by now to a few exceptional cases (besides quite dated), and overall Portuguese municipalities exhibit marked unwillingness to systematically collaborate among them.
In any case, the consequences of climate change on the Portuguese territory will most likely induce a significant boost to intermunicipal spatial planning, whether assuming its institutionalised form or (more probably) through new spatial tools conceived for adaptation. Namely, the increasing importance acquired by water basins and large-scale green infrastructures urges neighbouring municipalities to establish solid agreements among them, overcoming their historic reluctance to associate. The Strategic Metropolitan Projects already advanced by the PMAAC-AML are the clearest example of such initiatives, and in any case the Metropolitan Areas, for their specific territorial and governmental features, will most likely become laboratories for the experimentation of this kind of tools. In fact it is probable that metropolitan municipalities, given their strong interdependencies, will reach the point of developing intermunicipal plans regulating land-use, finally introducing in this way a hard planning form of intermunicipal coordination. For the rest of the country this possibility is to exclude, even if intermunicipal planning will surely keep growing in the field of soft planning. By now, some intermunicipal adaptation plans also suggest the further development of specific intermunicipal plans for adaptation according to priority risk and with the definition of the sectors involved, but none advances clear proposals in this sense as the PMAAC-AML.
In any case, given the priority that is currently assigned to the consolidation and expansion of green infrastructures, and the diffused recognition of their transversal value for integrated development, the elaboration of intermunicipal plans for their management would most likely transcend the climatic dimension, and more broadly aim at the generation of synergies for territorial cohesion. In this way climate change adaptation could contribute to provide solid foundations for the consolidation of regional dynamics that currently do not find stable bases, as municipalities oscillate between the subordination to metropolitan poles and the exclusion from development opportunities.

Thus, as local spatial planning has affirmed itself as the pivotal policy to enforce adaptation to climate change, the Portuguese system of spatial planning (based on the municipal level) is being strongly influenced by the introduction of adaptation planning.
The firm supporting role assumed by the European Union on climate policies contrasts strongly with the historic inconsistency of institutional support and funding resources that have heavily undermined the success of many past planning processes in Portugal. The dynamism that has characterised adaptation planning is far superior to the usual standards of Portuguese planning, achieving in less than ten years the launching and gradual spreading of two families of municipal tools (or two generations, strategies and action plans) and the covering of the whole national territory with intermunicipal plans (still to be completed but already advanced). Differently from most of the proper spatial tools, adaptation plans have spread from the start in equal proportions throughout the national territory, being experimented on the largest variety of municipal contexts. It must be noted, however, that smaller municipalities often fail in developing adaptation tools that can be qualitatively compared to the national average, revealing that such cases demand increased support.
The emphasis that climate change imposes on the planning components of adaptive management, monitoring, evaluation and reporting of policies represents a precious opportunity for the development of the Portuguese planning system, that has vainly tried to systematically integrate these components since its institutional reform in 1998. Currently, all the most advanced adaptation plans (both municipal and intermunicipal) already include serious mechanisms for their monitoring, evaluation, reporting and management. These could be easily transposed in the corresponding spatial plans during their next revision, considerably raising their effectiveness, transparency, and credibility.
Even more, the key role assumed in adaptation planning by the components of equality in public policies and advanced territorial knowledge and control poses fundamental challenges to the national planning practices. The grievous issue of equality, that has accompanied the development of planning in Portugal since its beginnings, is sure to grow to unbearable proportions with the increasing frequency of wildfires throughout the national territory, the intensification of flooding around watercourses and heatwaves in compact urban areas, and the augmenting exposure to storm surge of extremely vulnerable coastal settlements. In fact, any correct operational priorisation of adaptation actions forces authorities to direct their first investments to the protection of less favoured social

groups. At the same time, the relatively high awareness and preoccupation of the public opinion regarding climate change could induce local communities to question the action of the authorities and eventually denounce asymmetries in the distribution of the social impact of their policies. On this respect, the moral responsibility of local authorities to equally and thoroughly spread information on the local impacts of climate change will prove crucial for the development of a fairly participative adaptation process. In any case, a governmental integration of adaptation, based on an inclusive participative approach and focusing on the mitigation of social disparities originated or aggravated by climate change, would surely result in a significant re-evaluation of spatial planning by the Portuguese public opinion, that often does not recognise planning as a an equitable policy.
At the same time, the territorial adaptation process requires extremely advanced analyses of local characteristics resulting in detailed cartographic material. Apart from in-depth considerations of local socio-economic contexts, public authorities need to base their adaptation policies on advanced surveys of their territories. Sea-level rise and wildfire risk in particular force municipalities to impose strict regulations on land-use based on the careful mapping of their territories, whereas flooding risk and extreme heat impose a diffused re-thinking of the urban environment and a renewed attention towards the rural space.
Probably however, the most significant influence of climate change adaptation on the Portuguese planning system derives from its clear identification of spatial planning as the primary means for integrated development. Even if naturally associated to environmental policies, adaptation planning is based in fact on an integrated approach where the social, economic, and territorial dimensions also play a determining role. This strategic approach, ultimately embodied by the PMAAC-AML, prefigures the overcoming of the historical fragmentation of Portuguese planning among environmental protection, economic development and urbanistic regulation, aiming at the systemisation in Portugal of a holistic conception of planning.

All these elements have raised the attention towards adaptation planning of the national planning epistemic community, that advocates for the mainstreaming of adaptation in spatial planning. A first stage of this process has already started with the integration in municipal spatial plans of the adaptation measures indicated in municipal or intermunicipal adaptation tools, according to local priority risks. However, given the sectorial nature of the measures to implement, this operation needs extensive support to municipal offices from technical professionals, which should therefore be included in every local adaptation process. All the most advanced adaptation plans already provide detailed guidelines for the integration of the proposed measures in municipal plans, and in these cases the only uncertainty left concerns the amount of human resources that each municipality can afford to assign to adaptation policies.
As suggested by many, however, the integration of adaptation in spatial planning must aim at much more than the formal coordination of measures or regulations between adaptation and spatial plans. Rather, the mainstreaming of adaptation would need its implantation as a strategical transversal dimension in every spatial planning process from the local to the national scale. Possibly, this process could take place with the next generation of regional and municipal plans in areas where the adaptation process is already advanced, such as the Lisbon Metropolitan Area and the municipalities where adaptation action plans have been enforced.
The PMAAC-AML contextually formulated a conceptual framework for the integration of adaptation in spatial planning. Accordingly, adaptation should assume a key role in the strategical, regulative, operational, and governmental dimensions of planning. The introduction at the national level of a conceptual approach such as this, necessarily led by the next NAS and PNPOT, would decisively promote the systematic integration of adaptation in spatial planning policies. Namely, the providing of an analytical framework for the integration of adaptation in spatial planning in the National Adaptation Strategy could base the compulsory inclusion in every territorial adaptation tool of clear and extensive indications for the integration of their measures in all spatial plans interesting the area. Further systematisations could support the distribution of responsibilities for adaptation among authorities, basing on the extensive indications on the subject already provided by the IPCC, the European institutions, and other international organisation supporting the development of climate policies. Accordingly, the strategical integration of adaptation would be mainly object of Regional and Intermunicipal Plans (PROTs and PIMOTs), whereas Municipal Plans would cover the operational (PDM) and regulative (PDMs, PPs and PUs) dimensions. A governmental integration, on the other hand, would probably need to be posed as a transversal objective by both the NAS and PNPOT, aiming at an overall reformation of governance practices in Portugal. The revision of the PNPOT (2019) has already advanced in this direction, designating territorial governance as one of its five dominions of intervention and promoting inclusive and adaptive planning processes, the decentralisation of tasks and the strengthening of territorial networks for cooperation.

In other words, the way in which the next generation of spatial planning tools will interpret and contribute to local adaptation processes (started with the adoption of adaptation tools) will determine not only the outcome of climate change adaptation policies, but also to a certain degree the development of the Portuguese planning system.

The development of a new National Strategy for Adaptation to guide the post-2020 period will most probably provide solid foundations for the development of comprehensive adaptation policies throughout the national territory. Compared to its 2015 antecedent, the next strategy will be informed by a set of experimentations of adaptation planning extremely expanded, and by an extensive list of adaptation measures developed for all regions of the country. Moreover, the process of refinement of adaptation plans, both at the municipal and intermunicipal scale, has already produced considerable outcomes, whose advancements can be systematised to raise the overall quality of Portuguese adaptation planning, promoting the exchanging of information and best practices among local authorities. Finally, the concrete forms of intermunicipal cooperation for adaptation constitute a key spatial planning practice that will need adequate guidance from national planning authorities in order to be applied equally in all regions.

If the announced raising of the European funding for climate policies for 2021-2027 should take place, it would certainly promote new substantial developments in Portuguese adaptation planning. The Portuguese Environmental Fund is also increasing its support to climate change adaptation. The CCDRs would be probably engaged to enhance their commitment for adaptation, since that they administer major ecological infrastructures in large territories and their scale allows for a consistent integration of adaptation with mitigation policies. As a matter of fact, the PNPOT (2019) specifically designates the regional (together with the intermunicipal) scale as the preferable level for the development of comprehensive sustainable policies comprising adaptation. These elements prefigure a possible integral mainstreaming of adaptation (or rather of climate action together with other sustainability policies) into the next generation of Regional Spatial Programmes (PROTs). Once again, this could be most favourably experimented in Lisbon Metropolitan Area, that unlike other intermunicipal associations (except Algarve) is object of a dedicated PROT, and that is now at a relatively advanced stage of its adaptation process. The PMAAC-AML and its Strategical Metropolitan Projects will certainly prove decisive in the conception of the next PROT-AML, as well as in the local sectorial plans for the management of water resources, coastal and estuarine areas, biodiversity, transport, forestry, etc.

The deepening of knowledge on climate change advanced at the national, regional, and sub-regional scales will considerably increase the support provided to municipalities for the implementation of adaptation policies. If encouraged by external support, municipalities will certainly keep leading the Portuguese adaptation process, fostering the improvement of spatial planning for adaptation. Municipalities with larger territories, or affected by sea-level rise or extreme heat, will surely invest in the production of advanced cartographic materials to guide the implementation of adaptation measures, thus also enlarging the information support needed to improve local spatial plans. At the same time, the municipalities that have already financially committed themselves to public works for adaptation are most likely to eventually incorporate these in more comprehensive strategies for integrated development and/or in their spatial planning tools. A first example of this approach has already been supplied by the Municipal Plan for Climate Action of Loulé (2020), which integrates the dimensions of climate change adaptation, mitigation and governance. Such choices, if successfully carried out, could generate local synergies that would launch a self-sustaining long-term adaptation process, founded on advanced local knowledge and probably less demanding of the funding support that currently is needed from external sources.

List of Abbreviations and Acronyms

APA Portuguese Environment Agency (*Agência Portuguesa do Ambiente*)

CCIAM Climate Change Impacts, Adaptation and Modelling research group

CCR Commissions for Regional Coordination (*Comissões de Coordenação Regional*)

CCDR Commissions for Regional Development and Coordination (*Comissões de Coordenação e Desenvolvimento Regional*)

CDS-PP People's Party (Christian democratic and national-conservative) (*CDS – Partido Popular*)

CEMAT European Conference of Ministers Responsible for Spatial/Regional Planning

CF Cohesion Funds

CIACC Inter-ministerial Commission for Air and Climate Change (*Comissão Interministerial do Ar e das Alterações Climáticas*)

CIM Intermunicipal Community (*Comunidade Intermunicipal*)

CSF Common Strategic Framework

DGDR Directorate-General for Regional Development (*Direção-Geral do Desenvolvimento Regional*)

DGPU Directorate General for Urban Planning (*Direção Geral do Planeamento Urbano*)

DGOTDU Directorate-General for Spatial Planning and Urban Development (*Direção-Geral de Ordenamento do Território e Desenvolvimento Urbano*)

EARDF European Agricultural Fund for Rural Development

EEA European Environment Agency

EEC European Economic Community

EMAAC Municipal Strategy of Adaptation to Climate Change (*Estratégia Municipal de Adaptação às Alterações Climáticas*)

ENAAC National Strategy on Adaptation to Climate Change (*Estratégia Nacional de Adaptação às Alterações Climáticas*)

EMFF European Maritime and Fisheries Fund

ERDF European Regional Development Fund

ESDP European Spatial Development Perspective

ESF European Social Fund

ESIF European Structural and Investment Funds

ETC European Territorial Cooperation

EU European Union

FCUL Faculty of Sciences of the University of Lisbon (*Faculdade de Ciências da Universidade de Lisboa*)

ICNF Nature and Forestry Conservation Institute (*Instituto da Conservação da Natureza e das Florestas*)

INE National Statistical Institute (*Instituto Nacional de Estatística*)

IPCC Intergovernmental Panel on Climate Change

LBPOTU Planning and Urbanism Policy Act (*Lei de Bases da Política de Ordenamento do Território e de Urbanismo*)

MAOTDR Ministry for the Environment, Spatial Planning and Regional Development (*Ministério do Ambiente, do Ordenamento do Território e do Desenvolvimento Regional*)

MEPAT Ministry of Equipment, Planning and Territorial Administration (*Ministério do Equipamento, do Planeamento e da Administração do Território*)

NAS National Adaptation Strategy

NUTS Nomenclature of Territorial Units for Statistics

PDM Municipal Director Plan (*Plano Diretor Municipal*)

PEOT Special Plan for environmental conservation (*Plano Especial de Ordenamento do Território*)

PIMOT Intermunicipal Spatial Plan (*Plano intermunicipal de Ordenamento do Território*)

PMAAC Municipal Plan of Adaptation to Climate Change (*Plano Municipal de Adaptação às Alterações Climáticas)*

PMAAC Metropolitan Plan of Adaptation to Climate Change (*Plano Metropolitano de Adaptação às Alterações Climáticas*)

PMOT Municipal Spatial Plans (*Planos Municipais de Ordenamento do Território*)

PNPOT National Spatial Planning Policy Programme (*Programa Nacional da Política de Ordenamento do Território*)

PO SEUR Operational Programme for Sustainability and Efficient Use of Resources (*Programa Operacional Sustentabilidade e Eficiência no Uso dos Recursos*)

PP Detail Plan (*Plano de Pormenor*)

PROT Regional Spatial Programme (*Programa Regional de Ordenamento do Território*)

PS Socialist Party (*Partido Socialista*)

PSD Social-democratic Party (liberal-conservative) (*Partido Social Democrata*)

PU Urbanisation Plan (*Plano de Urbanização*)

RAN National Agricultural Reserve (*Reserva Agrícola Nacional*)

REN National Ecological Reserve (*Reserva Ecológica Nacional*)

RJIGT Legal Regime of Spatial Planning Tools (*Regime Jurídico dos Instrumentos de Gestão Territorial*)

SIAM Climate Change in Portugal. Scenarios, Impacts and Adaptation Measures - SIAM Project

UKCIP UK Climate Impacts Programme

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Comunidade Intermunicipal do Algarve (2019). *Plano Intermunicipal de Adaptação às Alterações Climáticas do Algarve*

Comunidade Intermunicipal do Alentejo Central (2018). *Plano Intermunicipal de Adaptação às Alterações Climáticas do* Alentejo Central

Comunidade Intermunicipal do Médio Tejo (2018). *Plano Intermunicipal de Adaptação às Alterações Climáticas do Médio Tejo*

Comunidade Intermunicipal de Viseu Dão Lafões (2017). *Plano Intermunicipal de Adaptação às Alterações Climáticas de Viseu Dão Lafões*

Comunidade Intermunicipal do Ave (2020). *Plano Intermunicipal de Adaptação às Alterações Climáticas do Ave*

Comunidade Intermunicipal da Região de Coimbra (2017). *Plano Intermunicipal de Adaptação às Alterações Climáticas da Região de Coimbra*

Comunidade Intermunicipal da Lezíria do Tejo (2018). *Plano Intermunicipal de Adaptação às Alterações Climáticas da Lezíria do Tejo*

Comunidade Intermunicipal do Baixo Alentejo (2018). *Plano Intermunicipal de Adaptação às Alterações Climáticas do Baixo Alentejo*

Comunidade Intermunicipal de Tâmega e Sousa (2019). *Plano Intermunicipal de Adaptação às Alterações Climáticas de Tâmega e Sousa*

Comunidade Intermunicipal das Beiras e Serra da Estrela (2019). *Plano Intermunicipal de Adaptação às Alterações Climáticas das Beiras e Serra da Estrela*

Comunidade Intermunicipal do Oeste (2018). *Plano Intermunicipal de Adaptação às Alterações Climáticas do Oeste*

Comunidade Intermunicipal das Terras de Trás-os-Montes (2018). *Plano Intermunicipal de Adaptação às Alterações Climáticas das Terras de Trás-os-Montes*

Área Metropolitana de Lisboa (2020). *Plano Metropolitano de Adaptação às Alterações Climáticas da Área Metropolitana de Lisboa*

Appendix

Assessment framework for municipal adaptation tools in Portugal

The following pages contain the framework applied for the assessment of Portuguese municipal adaptation tools detailed in chapter 3.2.1, preceded by the original Adaptation Policy Credibility framework (source: Olazabal et al. 2019).

The framework applied has resulted from an adaptation of the APC that is detailed here.
The following metrics of the APC have been removed:
M#1 - Has an overall budget been assigned for the plan? (all plans are financed mainly by external funds)
M#2 - Is the creation of the plan funded with own resources? (all plans are financed mainly by external funds)
M#4 - Does the plan fully or partially secure funding for the implementation of the measures proposed? (all plans are financed mainly by external funds)
M#5 - Overall plan budget relative to the city's GDP (%) (all plans are financed mainly by external funds)
M#6 - Number of measures (N) contained in a plan relative to resources (all plans are financed mainly by external funds)
M#11 - Performance regarding climate change mitigation policies (there are not significant mitigation policies at the municipal level in Portugal)
M#12 - Is there a history of abolishment of previous environmental policies or institutional bodies? (there is no way to verify this)
M#13 - Plan creation: has the plan been written by the planning department? (most municipalities do not have a dedicated planning department)
M#15.2- Level of specificity: have the assigned parties smaller subdivisions? (most municipalities do not have such complicated structures to make necessary further smaller subdivisions)
M#16 - Is the public concerned (not only aware) about climate change according to last surveys? (there is no way to verify this at the municipal scale)
M#17 - Has the plan been developed in response to any specific national or regional legislative/regulatory framework that makes their development compulsory?
M#18 - Legally binding nature: Is the plan a set of recommendations or does it compel implementation? (implementation becomes compulsory only through the integration of adaptation measures in the spatial planning tools, see chapter 4.1)
M#21 - Has the plan been led by an institutional climate champion with institutional power?
M#23 - Are there other supporting public bodies? (only financing is provided by other public bodies)
M#35 - Has the MER process been assigned a budget?
M#52 - Were communities or social advocacy groups involved in the framing and identification of those adaptation strategies? (the equity and justice component is not that developed yet)
M#53 - Does the plan present a full understanding of the beneficiaries of the proposed adaptation measures? (the equity and justice component is not that developed yet)

The following metrics of the APC have been added:
Resources – Funding - Does the plan identify financing sources for implementation?
Resources – Funding - Does the plan identify financing sources for the implementation of each measure?
Usable knowledge – adaptation options assessment - Are the adaptation options identified in terms of localization for implementation?

The removal and adding of metrics has modified the relative weight of each indicator on the total score. The table below reports the relative weight of indicators in the framework applied, as compared to the relative weight they have in the APC. Indicators with value 1 have the same number of metric in the APC and in the adapted framework.

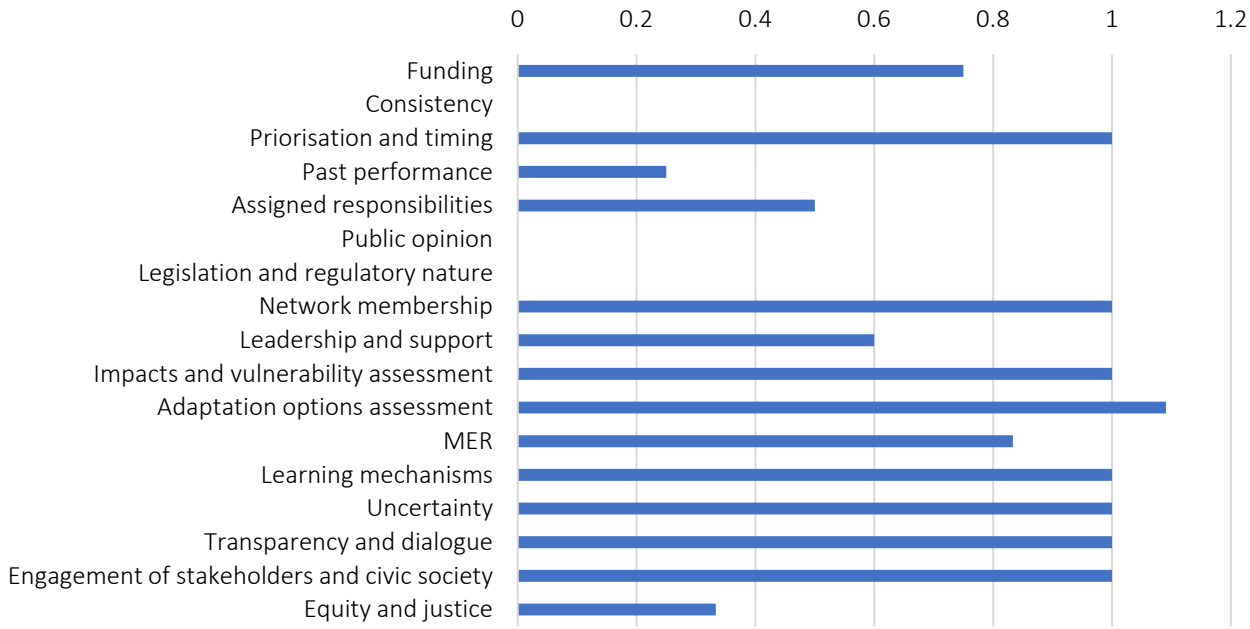

Table 1. Operational framework for the assessment of local adaptation policy credibility.

Major Area	Components	Indicators (i#)	No. Metrics	Description (*)
Policy and Economic Credibility	1. Resources	1. Funding	3	Funding refers to the allocation of economic resources to the overall plan, and also to each of the specific measures contained in the plan (Ford and King 2015). It is assumed that an adaptation policy that does not assign economic resources to implementation or monitoring would not be credible. Woodruff and Stults (2016) also find that plans funded by higher governmental levels (or other sources) score lower in quality. It is therefore assumed that, if plans have been self-funded, there is greater intentionality and also greater efforts will be made to ensure quality and achieve objectives.
		2. Consistency	2	This indicator aims to assess the magnitude and coherence of the adaptation economy according to what is contained in the plan and the resources of the city. With this in mind, here, a set of metrics that weight the plan budget against the city's gross domestic product at the time of plan approval are proposed (Georgeson et al. 2016).
		3. Prioritisation and timing	3	Because of the distributive and long-term nature of climate change impacts, setting priorities is a key to progress on adaptation (Smith 1997; Füssel 2007; Lobell et al. 2008). Prioritisation is also useful to mainstream adaptation into existing policy and reduce competing interests (Champalle et al. 2015). It is thus argued that an adaptation plan that does not clearly say what is important and what is not (by, e.g. establishing prioritisation criteria among the selected measures at the time of implementation), is likely to be less effective than one that does.
	2. Reliability	4. Past performance	3	Past policy performance, regarding climate change or environmental policy matters in general, is important for the credibility of current policies (Averchenkova and Bassi 2016). This indicator takes into account the stage of the adaptation plan under analysis and performance of mitigation policies in place, assuming that mitigation has been addressed before adaptation (Reckien et al. 2014).
		5. Assigned responsibilities	3	According to Woodruff and Stults (2016), plans having been written by planning departments correlates with higher quality. Further, the provision of human resources to implement planned actions is essential to prove readiness for adaptation (Ford and King 2015) and, in this case, it also provides credibility to the plan. Adding to this, it is here argued that it is important not only whether responsible parties are assigned but also whether responsibilities are clearly specified.
	3. Institutional, Public and Private Support	6. Public opinion	1	Public awareness of climate change and perception of risk affect adaptation readiness (Ford and King 2015). Public awareness not only supports policy development and implementation (Averchenkova and Bassi 2016) but is also important in the achievement of policy objectives (Millard-Ball 2012).
		7. Legislation and regulatory nature	2	In cases where there is supporting national legislation or regulations, guidelines for the development of plans are provided (Heidrich et al. 2016). This is here understood as a factor that strengthens the credibility of local climate plans. Climate policies also need to organise action and actors to be credible, and legally binding policies would help this to become a reality (Jordan et al. 2015).
		8. Network membership	1	Considering adaptation-networking research to date, previous local adaptation tracking studies have shown the importance of international climate networks in engaging cities in climate action (De Gregorio et al. 2014; Reckien et al. 2015).
		9. Leadership and support	5	In general, politics affect the credibility of planning (Muchadenyika and Williams 2017). In addition, climate adaptation plans need strong political leadership and authority that builds external and internal legitimacy (Anguelovski et al. 2014). Additionally, Averchenkova and Bassi (2016) argue that, the existence of public and private bodies that support climate change action is essential to build credible policies. A dedicated public climate change body and the support of the upper-tiers of government and the private sector is also critical to channel action (Bulkeley and Broto 2013; Schwarze et al. 2016; Heidrich et al. 2016).

(*Continued*)

Table 1. (Continued).

Major Area	Components	Indicators (i#)	No. Metrics	Description (*)
Scientific and Technical Credibility	4. Usable Knowledge	10. Impacts and vulnerability assessment	4	Independently of the approach taken to assess risks, vulnerable populations and assets and related climate impacts should be identified and assessed. Performing an analysis of (cascading) impacts would reduce potential new vulnerabilities (Adger et al. 2005) that may arise from decisions taken on the sole basis of direct observable impacts, this way, reducing the emergence of maladaptive processes (Barnett and O'Neill 2010; Juhola et al. 2016).
		11. Adaptation options assessment	4	In order to ensure that planned adaptation actions are adequate and reasonable (i.e. the best available adaptation options are selected), a preliminary list of potential options should be identified and evaluated (see, e.g. listed options by Stults and Woodruff 2016 in the US). Further, it is important that adaptation actions are connected to climate impacts and the different levels of risks identified in order to verify that planned actions are indeed adequate for expected changes.
	5. Monitoring, Evaluation and Reporting (MER)	12. Monitoring, Evaluation and Reporting (MER) processes	6	In any planning system, MER mechanisms are necessary to govern implementation processes and ensure that plan objectives will be achieved. In the evaluation of local climate adaptation plans, the existence of monitoring systems has been used as an indicator of plan quality (Woodruff and Stults 2016) and climate preparedness (Heidrich et al. 2013) and has been claimed to be a key enabling component in adaptation pathway approaches (Kingsborough et al. 2016; Haasnoot et al. 2018).
	6. Adaptive Management	13. Learning mechanisms	3	Learning and adaptive management are goals of the evaluation of climate adaptation processes and progress (Preston et al. 2011). Flexibility allows preparedness for unexpected events and efficiency of resource use. Adaptation management requires of the recognition of tipping points after which an adaptation action no longer meets the specified objectives and an alternative adaptation pathway needs to be taken (Haasnoot et al. 2013; Haasnoot et al. 2018). Through different operationalizing approaches (see, e.g. Kingsborough et al. 2016), climate adaptation policies can provide flexibility and better embrace uncertainty (Adger et al. 2005).
		14. Uncertainty awareness	1	One important factor that should be taken into account when designing and planning for adaptation is uncertainty. There are different kinds of uncertainty in a climate change context and different strategies for dealing with it in the design of projects and plans (Markandya 2014). Some strategies could entail developing a risk management process, taking into account different scenarios and the widest possible range of outcomes, evaluating the different options against various criteria, or adopting flexible management approaches beyond climate-related uncertainties.
Common Component	7. Legitimacy	15. Transparency and dialogue	5	Policy transparency is critical to raise awareness and provide legitimacy to policy processes. Social acceptance of adaptation options and trust are also important factors (Adger et al. 2005) together with clarity of the rules, availability of information, and the existence of public dialogue (Cosens 2013). Because of the cultural connotations of this, there are no universal models for creating legitimate policies (Adger et al. 2005). Notably, plans also need to be legitimate within the administrative entities responsible for the creation of the plan (this links with Indicator 9; Leadership and support see ref. Anguelovski et al. 2014).
		16. Engagement of stakeholders and civil society	3	Participation of the public, communities, organisations and businesses is an important element in adaptation decision making (Few et al. 2007; Collins and Ison 2009; Sarzynski 2015) because it can help to overcome barriers explicit to adaptation (Biesbroek et al. 2013) and because, as part of a public policy process, it helps to create legitimate plans. Further, it is important to bring into the process stakeholders with legitimate reasons to be there (Mitchell et al. 1997). Additionally, involvement should be sought from individuals with multiple different types of relevant expertise (Weichselgartner and Kasperson 2010).
		17. Equity and justice	3	Equity is a central element for successful climate change adaptation (Adger et al. 2005). Adaptation to climate change is intrinsically spatial (Shi et al. 2016); however, factors related to equity and social vulnerability, which in many cases are reflected in space, are often not taken into account in adaptation policy as much as physical factors (Hughes 2015). To achieve equitable and just adaptation opportunities, participation may be instrumental, if communities or social justice advocacy groups are engaged (Shi et al. 2016). Identifying who is directly or indirectly benefitting from the adaptation action is also relevant to achieving these objectives (Eisenack and Stecker 2012).

(*) See A1 for further details on metrics and evaluation methods

APPENDIX 1 – TABLE 1 EXTENDED

Table A1.1 is based on Table 1 of the manuscript and includes metrics, evaluation method for each metric and the pilot application including the scores for each city.

MAJOR AREA	COMPONENTS	INDICATORS (I#)	M#	Metric description	Evaluation method	Vancouver	Durban	Quito	Copenhagen	MAX SCORE
						30.25	**26.25**	**33.5**	**27**	**53**
POLICY AND ECONOMIC CREDIBILITY	RESOURCES	I#1. Funding	M#1	Has an overall budget been assigned for the plan? (Y/N)	Y=1/ N=0	0	0	1	1	1
			M#2	Have specific budgets been assigned for each of the measures contained in the plan? (Y/N)	Y=1/ N=0	0	0	1	1	1
			M#3	Is the creation of the plan funded with own resources? (Y/N)	Y=1/ N=0	1	1	1	1	1
			M#4	Does the plan fully or partially secure funding for the implementation of the measures proposed? (Y/N)	Y=1/ N=0	0	0	1	1	1
		I#2. Consistency	M#5	Overall plan budget relative to the city's GDP (%)	1 if >= 0.193 %; 0 if < 0.193 %	0	0	1	0	1
			M#6	Number of measures (N) contained in a plan relative to resources	1 if N>=17 and M#4=1, 1 if N<17 and M#4=0, 0 if N>=17 and M#4=0	0	0	1	0	1
		I#3. Prioritisation and timing	M#7	Does the plan set a timetable for adaptation implementation? (Y/N)	Y=1/ N=0	1	1	0	1	1
			M#8	Does the plan set any criteria for prioritisation during the implementation phase? (Y/N)	Y=1/ N=0	1	1	1	1	1
			M#9	Has the plan demonstrated capacity to evaluate these criteria on each identified option? (Y/N)	Y=1/ N=0	1	1	1	1	1
	RELIABILITY	I#4. Past performance	M#10	Stage of the adaptation plan (Revised/unrevised)	Revised=1/ Unrevised=0	0	1	0	0	1
			M#11	Performance regarding climate change mitigation policies		-	-	-	-	-
MAJOR AREA	**COMPONENTS**	**INDICATORS (I#)**	**M#**	**Metric description**	**Evaluation method**	**Vancouver**	**Durban**	**Quito**	**Copenhagen**	**MAX SCORE**
			M#11.1	*Has the plan been implemented or is being implemented? (Y/N)*	Y=1/ N=0	1	1	0	1	1
			M#11.2	*Is there evidence of any emissions reductions as a result of the plan? (Y/N)*	Y=1/ N=0	1	1	0	1	1
			M#12	Is there a history of abolishment of previous environmental policies or institutional bodies? (Y/N)	Y=0/ N=1	1	1	1	1	1
		I#5. Assigned responsibilities	M#13	Plan creation: has the plan been written by the planning department? (Y/N)	Y=1/ N=0	0	0	0	0	1
			M#14	Does the plan assign a coordinator of the implementation phase? (Y/N)	Y=1/ N=0	1	1	0	1	1
			M#15	Responsible parties for each measure:		-	-	-	-	-
			M#15.1	*Does the plan assign responsible parties for each measure contained in the plan? (Y/N)*	Y=1/ N=0	1	1	1	1	1
			M#15.2	*Level of specificity: have the assigned parties smaller subdivisions? (Y/N)*	Y=0/ N=1	1	1	1	1	1
	INSTITUTIONAL, PUBLIC AND PRIVATE SUPPORT	I#6. Public opinion	M#16	Is the public concerned (not only aware) about climate change according to last surveys? (Y/N)	Y=1/ N=0 (Depending on the data source this will be measured differently but, in general, 'Yes' would mean 50 or more % of population concerned about climate change)	1	1	1	1	1
		I#7. Legislation and regulatory nature	M#17	Has the plan been developed in response to any specific national or regional legislative/regulatory framework that makes their development compulsory? (Y/N)	Y=1/ N=0	0	0	0	0	1

MAJOR AREA	COMPONENTS	INDICATORS (I#)	M#	Metric description	Evaluation method	Vancouver	Durban	Quito	Copenhagen	MAX SCORE
			M#18	Legally binding nature: Is the plan a set of recommendations or does it compel implementation?	0 if 'set of recommendations'; 1 if 'compels implementation'	0	0	0	0	1
		I#8. Network membership	**M#19**	Is the city committed to any international or national climate network related to adaptation i.e. that includes adaptation-related knowledge transfer, commitment or capacitation? (Y/N)	Y=1/ N=0	1	1	1	1	1
		I#9. Leadership and support	**M#20**	Is the plan framed in a higher-level (regional or national) plan/policy/program? (Y/N)	Y=1/ N=0	0	1	0	1	1
			M#21	Has the plan been led by an institutional climate champion with institutional power? (Y/N)	Y=1/ N=0	1	0	1	0	1
			M#22	Is there a dedicated local public climate change body? (Y/N)	Y=1/ N=0	1	0	1	0	1
			M#23	Are there other supporting public bodies (e.g. regional authority) (Y/N)	Y=1/ N=0	0	0	1	1	1
			M#24	Are there supporting private lobbies (e.g. NGOs, business associations) (Y/N)	Y=1/ N=0	0	0	0	0	1
SCIENTIFIC AND TECHNICAL CREDIBILITY	**USABLE KNOWLEDGE**	**I#10. Impacts and vulnerability assessment**	**M#25**	Does the plan develop a risk assessment? (Y/N)	Y=1/ N=0	1	1	1	1	1
			M#26	What is the spatial level of the assessment? (house level, district level, city-level)	'House-level' or 'district-level' = 1; City-level = 0	1	0	1	1	1
			M#27	Does the assessment consider cascading impacts? (Y/N)	Y=1/ N=0	0	0	0	0	1
			M#28	Future risks:		-	-	-	-	-
			M#28.1	*Are future climate scenarios taken into account? (Y/N)*	Y=1/ N=0	1	1	1	1	1
			M#28.2	*Have social and economic city scenarios been taken into account? (Y/N)*	Y=1/ N=0	0	0	0	0	1
MAJOR AREA	**COMPONENTS**	**INDICATORS (I#)**	**M#**	**Metric description**	**Evaluation method**	**Vancouver**	**Durban**	**Quito**	**Copenhagen**	**MAX SCORE**
		I#11. Adaptation options assessment	**M#29**	Has a preliminary list of adaptation alternatives been identified and evaluated? (Y/N)	Y=1/ N=0	1	0	1	0	1
			M#30	Are adaptation actions connected to the impact and level of risk identified (i.e. they are defined to eliminate the unacceptable risks)? (Y/N)	Y=1/ N=0	1	1	0	1	1
			M#31	Are the following criteria considered in the evaluation of actions?		-	-	-	-	-
			M#31.1	*Effectiveness (Y/N)*	Y=1/ N=0	1	1	0	1	1
			M#31.2	*Cost-efficiency (benefits/costs) (Y/N)*	Y=1/ N=0	1	1	0	1	1
			M#31.3	*Integration with broader social goals (Y/N)*	Y=1/ N=0	1	1	0	1	1
			M#31.4	*Environmental sustainability (e.g. by implementing a Strategic Environmental Assessment - SEA) (Y/N)*	Y=1/ N=0	1	0	0	0	1
			M#31.5	*Flexibility and robustness (against different scenarios) (Y/N)*	Y=1/ N=0	0	1	0	1	1
			M#31.6	*Timing (Y/N)*	Y=1/ N=0	1	0	0	0	1
			M#31.7	*Mal-adaptation (inc. mitigation trade-offs or other issues not considered above) (Y/N)*	Y=1/ N=0	0	1	0	0	1
			M#31.8	*Resources available (inc. information, finance, leadership, management capacity) (Y/N)*	Y=1/ N=0	1	1	0	0	1
			M#32	Does the plan include an assessment or consideration of potential barriers to adaptation? (Y/N)	Y=1/ N=0	1	0	0	1	1
	MONITORING, EVALUATION AND REPORTING	**I#12. Monitoring, Evaluation and Reporting**	**M#33**	Does the plan define a MER process? (Y/N)	Y=1/ N=0	1	1	1	1	1
			M#34	Does the plan specifically assign a responsible for the MER process? (Y/N)	Y=1/ N=0	1	0	1	0	1

MAJOR AREA	COMPONENTS	INDICATORS (I#)	M#	Metric description	Evaluation method	Vancouver	Durban	Quito	Copenhagen	MAX SCORE
	(MER)	processes	M#35	Has the MER process been assigned a budget? (Y/N)	Y=1/ N=0	0	0	0	0	1
			M#36	Does the plan identify monitoring objectives and indicators? (Y/N)	Y=1/ N=0	1	0	0	0	1
			M#37	Does the plan set a method and/or process to evaluate outcomes of the monitoring process? (Y/N)	Y=1/ N=0	0	0	1	0	1
			M#38	Does the plan report to any higher-level authority or organisation through an official process? (Y/N)	Y=1/ N=0	0	0	0	0	1
	ADAPTIVE MANAGEMENT	I#13. Learning mechanisms	M#39	Does the plan define a readjustment process i.e. an iterative process to manage existing adaptation strategies according to results of MER or new scenarios? (Y/N)	Y=1/ N=0	1	0	1	1	1
			M#40	Does this process include a set of indicators / warning metrics? (Y/N)	Y=1/ N=0	0	0	0	0	1
			M#41	Does the plan specifically assign a responsible party for readjustment process? (Y/N)	Y=1/ N=0	1	0	1	0	1
		I#14. Uncertainty	M#42	Does the plan consider uncertainty in its design (e.g. by using a decision-method that includes uncertainty) and in the assessment and selection of adaptation options (e.g. by considering low regret measures, different scenarios, flexible approach)?	Y=1, or 1 if M#25 =1, or M#31.5=1, or M#39=1; 0 if M#25 =0, and M#31.5=0, and M#39=0;	1	1	0	1	1
COMMON COMPONENT	LEGITIMACY	I#15. Transparency and dialogue	M#43	Is the full process of screening, scoping and definition of the plan and later approval described in the plan or in an attached document or public site? (Y/N)	Y=1/ N=0	1	1	1	1	1
			M#44	Are the people/groups involved in the process of plan creation (in any role such as developers, designers or participants) named in the document? (Y/N)	Y=1/ N=0	1	1	1	0	1
MAJOR AREA	**COMPONENTS**	**INDICATORS (I#)**	**M#**	**Metric description**	**Evaluation method**	**Vancouver**	**Durban**	**Quito**	**Copenhagen**	**MAX SCORE**
			M#45	Does the plan or any attached documents related to it refer to which kind and how information (scientific or else) used to lead decisions has been produced and used? (Y/N)	Y=1/ N=0	1	1	1	1	1
			M#46	Have different departments of the city been involved in the design of the plan (Y/N)?	Y=1/ N=0	1	1	1	1	1
			M#47	Has the plan been formally exposed to a period of public information and debate? (Y/N)	Y=1/ N=0	0	0	0	0	1
		I#16. Engagement of stakeholders and civic society'	M#48	Did the plan include a process of participation with stakeholders (including other departments) and civic organisations? (Y/N)	Y=1/ N=0	1	1	1	1	1
			M#49	Did the process of participation include the public? (Y/N)	Y=1/ N=0	0	0	1	0	1
			M#50	Is there a clear evidence on the multiple expertise brought by participants (in the process of participation)? (Y/N)	Y=1/ N=0	0	1	1	0	1
		I#17. Equity and justice	M#51	Is there evidence that the plan addresses distributive impacts of climate change (e.g. by considering vulnerability in the most marginalized and disadvantaged groups) and develops adaptation measures accordingly? (Y/N)	Y=1/ N=0	1	1	1	0	1
			M#52	Were communities or social advocacy groups involved in the framing and identification of those adaptation strategies? (Y/N)	Y=1/ N=0	0	1	1	0	1
			M#53	Does the plan present a full understanding of the beneficiaries of the proposed adaptation measures? (Y/N)	Y=1/ N=0	0	1	1	0	1
					TOTAL	**30.25**	**26.25**	**33.5**	**27**	**53**

Climate change adaptation plans in Continental Portugal municipalities: **Evaluation Matrix**		Major Area	POLICY AND ECONOMIC CREDIBILITY								
		Components	RESOURCES						RELIABILITY		
		Indicators	Funding			Priorization and Timing			Assigned Responsibilities		Past performance
		Metrics	Does the plan identify financing sources for implementation? (Y=1/N=0)	Does the plan identify financing sources for the implementation of each measure? (Y=1/N=0)	Have specific budgets been assigned for each of the measures contained in the plan? (Y=1/N=0)	Does the plan set a time horizon for the implementation of each measure? (Y=1/N=0)	Does the plan set any criteria for prioritisation during the implementation phase? (Y=1/N=0)	Has the plan demonstrated capacity to evaluate these criteria on each identified option? (Y=1/N=0)	Does the plan assign responsible parties for the implementation phase? (Y=1/N=0)	Does the plan assign responsible parties for each measure contained in the plan? (Y=1/N=0)	Stage of the adaptation plan (Revised=1/ Unrevised=0)
Municipality	Year	Total score (max 48)									
Sintra	2009	11	0	0	0	0	0	0	0	0	0
Cascais	2010	19	0	0	0	0	1	1	0	0	0
Amarante	2016	22	0	0	0	1	0	0	1	1	0
Barreiro	2016	30	0	0	0	1	1	1	1	1	0
Braga	2016	30	0	0	0	1	1	1	1	1	0
Bragança	2016	30	0	0	0	1	1	1	1	1	0
Castelo Branco	2016	30	0	0	0	1	1	1	1	1	0
Castelo de Vide	2016	30	0	0	0	1	1	1	1	1	0
Coruche	2016	31	0	1	0	1	1	1	1	1	0
Évora	2016	30	0	0	0	1	1	1	1	1	0
Ferreira do Alentejo	2016	30	0	0	0	1	1	1	1	1	0
Figueira da Foz	2016	29	0	0	0	1	1	1	1	1	0
Guimarães	2016	30	0	0	0	1	1	1	1	1	0
Ílhavo	2016	31	0	0	0	1	1	1	1	1	0
Leiria	2016	30	0	0	0	1	1	1	1	1	0
Lisbon	2016	34	0	0	0	1	1	1	1	1	0
Loulé	2016	30	0	0	0	1	1	1	1	1	0
Montalegre	2016	30	0	0	0	1	1	1	1	1	0
Odemira	2016	30	0	0	0	1	1	1	1	1	0
Porto	2016	30	0	0	0	1	1	1	1	1	0
Seia	2016	30	0	0	0	1	1	1	1	1	0
São João da Pesqueira	2016	30	0	0	0	1	1	1	1	1	0
Tomar	2016	30	0	0	0	1	1	1	1	1	0
Tondela	2016	30	0	0	0	1	1	1	1	1	0
Torres Vedras	2016	30	0	0	0	1	1	1	1	1	0
Viana do Castelo	2016	30	0	0	0	1	1	1	1	1	0
Mafra	2016	27	0	0	1	1	1	1	1	1	0
Cascais	2017	29	0	0	1	1	1	1	1	0	1
Alfândega da Fé	2018	11	1	0	0	0	1	0	0	0	0
Agueda	2018	16	1	0	0	0	1	1	0	0	0
Viseu	2018	21	0	0	0	1	1	1	0	0	0
Almeirim	2018	29	0	1	1	1	1	1	0	1	0
Alpiarça	2018	29	0	1	1	1	1	1	0	1	0
Azambuja	2018	29	0	1	1	1	1	1	0	1	0
Benavente	2018	29	0	1	1	1	1	1	0	1	0
Cartaxo	2018	29	0	1	1	1	1	1	0	1	0
Chamusca	2018	29	0	1	1	1	1	1	0	1	0
Coruche	2018	29	0	1	1	1	1	1	0	1	0
Golegã	2018	29	0	1	1	1	1	1	0	1	0
Rio Maior	2018	29	0	1	1	1	1	1	0	1	0
Salvaterra de Magos	2018	29	0	1	1	1	1	1	0	1	0
Santarém	2018	29	0	1	1	1	1	1	0	1	0
Arouca	2018	26	0	0	0	1	1	1	1	1	0
Espinho	2018	26	0	0	0	1	1	1	1	1	0
Gondomar	2018	26	0	0	0	1	1	1	1	1	0
Maia	2018	27	0	0	0	1	1	1	1	1	0
Matosinhos	2018	27	0	0	0	1	1	1	1	1	0
Oliveira de Azeméis	2018	26	0	0	0	1	1	1	1	1	0
Paredes	2018	26	0	0	0	1	1	1	1	1	0
Póvoa de Varzim	2018	27	0	0	0	1	1	1	1	1	0
Santa Maria da Feira	2018	26	0	0	0	1	1	1	1	1	0
Santo Tirso	2018	27	0	0	0	1	1	1	1	1	0
São João da Madeira	2018	26	0	0	0	1	1	1	1	1	0
Trofa	2018	26	0	0	0	1	1	1	1	1	0
Vale da Cambra	2018	26	0	0	0	1	1	1	1	1	0
Valongo	2018	27	0	0	0	1	1	1	1	1	0
Vila do Conde	2018	27	0	0	0	1	1	1	1	1	0
Vila Nova de Gaia	2018	26	0	0	0	1	1	1	1	1	0
Ílhavo	2018	39	1	1	1	1	1	1	1	1	1
Lagos	2018	30	1	1	0	1	0	0	1	1	0
Leiria	2019	33	1	1	1	1	0	0	1	1	1
Cascais PECAC+PA3C2	2017	35	0	0	1	1	1	1	1	0	1
Leiria EMAAC+PMAAC	2020	45	1	1	1	1	1	1	1	1	1
Ílhavo EMAAC+PMAAC	2020	44	1	1	1	1	1	1	1	1	1
	Average	27.7705									

ClimAdaPT.Local project

PIAAC-LT

PMAAC-AMP

Climate change adaptation plans in Continental Portugal municipalities: **Evaluation Matrix**

			Major Area	POLICY AND ECONOMIC CREDIBILITY				SCIENTIFIC AND TECHNICAL CREDIBILITY				
			Components	INSTITUTIONAL, PUBLIC AND PRIVATE SUPPORT				USABLE KNOWLEDGE				
			Indicators	Network membership	Leadership and support			Impacts and vulnerability assessment				
			Metrics	Is the city committed to any international or national climate network related to adaptation? (Y=1/N=0)	Is the plan framed in a higher-level (regional or national) plan/policy/program? (Y=1/N=0)	Is there a dedicated public climate change body? (Y=1/N=0)	Are there supporting private lobbies (e.g. NGOs, business associations)? (Y=1/N=0)	Does the plan develop a risk assessment? (Y=1/N=0)	What is the spatial level of the assessment? ('House-level' or 'district-level' = 1; City-level = 0)	Does the assessment consider cascading impacts? (Y=1/N=0)	Are future climate scenarios taken into account? (Y=1/N=0)	Have social and economic city scenarios been taken into account? (Y=1/N=0)
	Municipality	Year	Total score (max 48)									
	Sintra	2009	11	1	0	0	0	1	0	1	1	1
	Cascais	2010	19	1	0	0	0	1	0	1	1	1
ClimAdaPT.Local project	Amarante	2016	22	1	1	1	1	1	0	1	1	0
	Barreiro	2016	30	1	1	1	1	1	0	1	1	1
	Braga	2016	30	1	1	1	1	1	0	1	1	1
	Bragança	2016	30	1	1	1	1	1	0	1	1	1
	Castelo Branco	2016	30	1	1	1	1	1	0	1	1	1
	Castelo de Vide	2016	30	1	1	1	1	1	0	1	1	1
	Coruche	2016	31	1	1	1	1	1	0	1	1	1
	Évora	2016	30	1	1	1	1	1	0	1	1	1
	Ferreira do Alentejo	2016	30	1	1	1	1	1	0	1	1	1
	Figueira da Foz	2016	29	1	1	1	1	1	0	1	1	0
	Guimarães	2016	30	1	1	1	1	1	0	1	1	1
	Ílhavo	2016	31	1	1	1	1	1	1	1	1	1
	Leiria	2016	30	1	1	1	1	1	0	1	1	1
	Lisbon	2016	34	1	1	1	1	1	1	1	1	1
	Loulé	2016	30	1	1	1	1	1	0	1	1	1
	Montalegre	2016	30	1	1	1	1	1	0	1	1	1
	Odemira	2016	30	1	1	1	1	1	0	1	1	1
	Porto	2016	30	1	1	1	1	1	0	1	1	1
	Seia	2016	30	1	1	1	1	1	0	1	1	1
	São João da Pesqueira	2016	30	1	1	1	1	1	0	1	1	1
	Tomar	2016	30	1	1	1	1	1	0	1	1	1
	Tondela	2016	30	1	1	1	1	1	0	1	1	1
	Torres Vedras	2016	30	1	1	1	1	1	0	1	1	1
	Viana do Castelo	2016	30	1	1	1	1	1	0	1	1	1
	Mafra	2016	27	1	1	0	1	1	0	1	1	0
	Cascais	2017	29	1	0	1	0	1	0	0	1	0
	Alfândega da Fé	2018	11	1	0	0	0	1	0	1	1	0
	Agueda	2018	16	1	0	0	0	1	0	0	1	0
	Viseu	2018	21	0	0	0	0	1	0	1	1	1
PIAAC-LT	Almeirim	2018	29	0	1	0	0	1	1	1	1	1
	Alpiarça	2018	29	0	1	0	0	1	1	1	1	1
	Azambuja	2018	29	0	1	0	0	1	1	1	1	1
	Benavente	2018	29	0	1	0	0	1	1	1	1	1
	Cartaxo	2018	29	0	1	0	0	1	1	1	1	1
	Chamusca	2018	29	0	1	0	0	1	1	1	1	1
	Coruche	2018	29	0	1	0	0	1	1	1	1	1
	Golegã	2018	29	0	1	0	0	1	1	1	1	1
	Rio Maior	2018	29	0	1	0	0	1	1	1	1	1
	Salvaterra de Magos	2018	29	0	1	0	0	1	1	1	1	1
	Santarém	2018	29	0	1	0	0	1	1	1	1	1
PMAAC-AMP	Arouca	2018	26	0	1	1	0	1	0	1	1	0
	Espinho	2018	26	0	1	1	0	1	0	1	1	0
	Gondomar	2018	26	0	1	1	0	1	0	1	1	0
	Maia	2018	27	1	1	1	0	1	0	1	1	0
	Matosinhos	2018	27	1	1	1	0	1	0	1	1	0
	Oliveira de Azeméis	2018	26	0	1	1	0	1	0	1	1	0
	Paredes	2018	26	0	1	1	0	1	0	1	1	0
	Póvoa de Varzim	2018	27	1	1	1	0	1	0	1	1	0
	Santa Maria da Feira	2018	26	0	1	1	0	1	0	1	1	0
	Santo Tirso	2018	27	1	1	1	0	1	0	1	1	0
	São João da Madeira	2018	26	0	1	1	0	1	0	1	1	0
	Trofa	2018	26	0	1	1	0	1	0	1	1	0
	Vale da Cambra	2018	26	0	1	1	0	1	0	1	1	0
	Valongo	2018	27	1	1	1	0	1	0	1	1	0
	Vila do Conde	2018	27	1	1	1	0	1	0	1	1	0
	Vila Nova de Gaia	2018	26	0	1	1	0	1	0	1	1	0
	Ílhavo	2018	39	1	0	1	0	1	1	1	1	1
	Lagos	2018	30	1	1	1	0	1	1	1	1	1
	Leiria	2019	33	1	0	1	0	1	1	1	1	1
	Cascais PECAC+PA3C2	2017	35	1	0	1	0	1	0	1	1	1
	Leiria EMAAC+PMAAC	2020	45	1	1	1	1	1	1	1	1	1
	Ílhavo EMAAC+PMAAC	2020	44	1	1	1	1	1	1	1	1	1
		Averag	27.7705									

Climate change adaptation plans in Continental Portugal municipalities: **Evaluation Matrix**		Major Area	SCIENTIFIC AND TECHNICAL CREDIBILITY											
		Components	USABLE KNOWLEDGE											
		Indicators	Adaptation options assessment											
		Metrics	Has a preliminary list of adaptation alternatives been identified and evaluated? (Y=1/N=0)	Are adaptation actions connected to the impact and level of risk identified? (Y=1/N=0)	Is effectiveness considered in the evaluation of actions? (Y=1/N=0)	Is cost-efficiency (benefits/costs) considered in the evaluation of actions? (Y=1/N=0)	Is integration with broader social goals considered in the evaluation of actions? (Y=1/N=0)	Is environmental sustainability considered in the evaluation of actions? (Y=1/N=0)	Is flexibility and robustness considered in the evaluation of actions? (Y=1/N=0)	Is timing considered in the evaluation of actions? (Y=1/N=0)	Is mal-adaptation considered in the evaluation of actions? (Y=1/N=0)	Are available resources considered in the evaluation of actions? (Y=1/N=0)	Are the adaptation options identified in terms of localization for implementation? ('House-level' or 'district-level' = 1; City-level = 0)	Does the plan include an assessment or consideration of potential barriers to adaptation? (Y=1/N=0)
	Municipality	Year	Total score (max 48)											
	Sintra	2009	11	1	1	0	0	0	0	0	0	0	0	1
	Cascais	2010	19	1	1	1	0	1	1	0	1	1	0	1
ClimAdaPT.Local project	Amarante	2016	22	1	1	0	0	1	0	0	0	0	0	1
	Barreiro	2016	30	1	1	1	1	1	0	1	1	0	1	0	1
	Braga	2016	30	1	1	1	1	1	0	1	1	0	1	0	1
	Bragança	2016	30	1	1	1	1	1	0	1	1	0	1	0	1
	Castelo Branco	2016	30	1	1	1	1	1	0	1	1	0	1	0	1
	Castelo de Vide	2016	30	1	1	1	1	1	0	1	1	0	1	0	1
	Coruche	2016	31	1	1	1	1	1	0	1	1	0	1	0	1
	Évora	2016	30	1	1	1	1	1	0	1	1	0	1	0	1
	Ferreira do Alentejo	2016	30	1	1	1	1	1	0	1	1	0	1	0	1
	Figueira da Foz	2016	29	1	1	1	1	1	0	1	1	0	1	0	1
	Guimarães	2016	30	1	1	1	1	1	0	1	1	0	1	0	1
	Ílhavo	2016	31	1	1	1	1	1	0	1	1	0	1	0	1
	Leiria	2016	30	1	1	1	1	1	0	1	1	0	1	0	1
	Lisbon	2016	34	1	1	1	1	1	0	1	1	0	1	0	1
	Loulé	2016	30	1	1	1	1	1	0	1	1	0	1	0	1
	Montalegre	2016	30	1	1	1	1	1	0	1	1	0	1	0	1
	Odemira	2016	30	1	1	1	1	1	0	1	1	0	1	0	1
	Porto	2016	30	1	1	1	1	1	0	1	1	0	1	0	1
	Seia	2016	30	1	1	1	1	1	0	1	1	0	1	0	1
	São João da Pesqueira	2016	30	1	1	1	1	1	0	1	1	0	1	0	1
	Tomar	2016	30	1	1	1	1	1	0	1	1	0	1	0	1
	Tondela	2016	30	1	1	1	1	1	0	1	1	0	1	0	1
	Torres Vedras	2016	30	1	1	1	1	1	0	1	1	0	1	0	1
	Viana do Castelo	2016	30	1	1	1	1	1	0	1	1	0	1	0	1
	Mafra	2016	27	1	1	1	1	1	0	1	1	0	1	0	1
	Cascais	2017	29	1	1	1	1	0	0	0	0	0	1	0	1
	Alfândega da Fé	2018	11	1	1	0	0	0	0	0	0	0	0	0	0
	Agueda	2018	16	1	1	1	0	1	0	1	1	0	1	0	0
	Viseu	2018	21	1	1	1	1	1	0	1	1	0	1	0	0
PIAAC-LT	Almeirim	2018	29	1	1	1	1	1	0	1	1	0	1	1	1
	Alpiarça	2018	29	1	1	1	1	1	0	1	1	0	1	1	1
	Azambuja	2018	29	1	1	1	1	1	0	1	1	0	1	1	1
	Benavente	2018	29	1	1	1	1	1	0	1	1	0	1	1	1
	Cartaxo	2018	29	1	1	1	1	1	0	1	1	0	1	1	1
	Chamusca	2018	29	1	1	1	1	1	0	1	1	0	1	1	1
	Coruche	2018	29	1	1	1	1	1	0	1	1	0	1	1	1
	Golegã	2018	29	1	1	1	1	1	0	1	1	0	1	1	1
	Rio Maior	2018	29	1	1	1	1	1	0	1	1	0	1	1	1
	Salvaterra de Magos	2018	29	1	1	1	1	1	0	1	1	0	1	1	1
	Santarém	2018	29	1	1	1	1	1	0	1	1	0	1	1	1
PMAAC-AMP	Arouca	2018	26	1	0	1	1	1	0	1	1	0	1	0	1
	Espinho	2018	26	1	0	1	1	1	0	1	1	0	1	0	1
	Gondomar	2018	26	1	0	1	1	1	0	1	1	0	1	0	1
	Maia	2018	27	1	0	1	1	1	0	1	1	0	1	0	1
	Matosinhos	2018	27	1	0	1	1	1	0	1	1	0	1	0	1
	Oliveira de Azeméis	2018	26	1	0	1	1	1	0	1	1	0	1	0	1
	Paredes	2018	26	1	0	1	1	1	0	1	1	0	1	0	1
	Póvoa de Varzim	2018	27	1	0	1	1	1	0	1	1	0	1	0	1
	Santa Maria da Feira	2018	26	1	0	1	1	1	0	1	1	0	1	0	1
	Santo Tirso	2018	27	1	0	1	1	1	0	1	1	0	1	0	1
	São João da Madeira	2018	26	1	0	1	1	1	0	1	1	0	1	0	1
	Trofa	2018	26	1	0	1	1	1	0	1	1	0	1	0	1
	Vale da Cambra	2018	26	1	0	1	1	1	0	1	1	0	1	0	1
	Valongo	2018	27	1	0	1	1	1	0	1	1	0	1	0	1
	Vila do Conde	2018	27	1	0	1	1	1	0	1	1	0	1	0	1
	Vila Nova de Gaia	2018	26	1	0	1	1	1	0	1	1	0	1	0	1
	Ílhavo	2018	39	1	1	1	1	1	1	1	1	0	1	1	0
	Lagos	2018	30	1	1	0	0	0	0	0	0	0	0	0	1
	Leiria	2019	33	1	1	0	0	0	0	0	0	0	0	1	1
	Cascais PECAC+PA3C2	2017	35	1	1	1	1	1	1	0	1	1	1	0	1
	Leiria EMAAC+PMAAC	2020	45	1	1	1	1	1	0	1	1	0	1	1	1
	Ílhavo EMAAC+PMAAC	2020	44	1	1	1	1	1	1	1	1	0	1	1	1
		Average	27.7705											

Climate change adaptation plans in Continental Portugal municipalities: **Evaluation Matrix**		Major Area	SCIENTIFIC AND TECHNICAL CREDIBILITY								
		Components	MONITORING, EVALUATION AND REPORTING (MER)					ADAPTIVE MANAGEMENT			
		Indicators	Monitoring, Evaluation and Reporting processes					Learning mechanisms			Uncertainty
		Metrics	Does the plan define a MER process? (Y=1/N=0)	Does the plan set a timeframe for the monitoring of each measure? (Y=1/N=0)	Does the plan specifically assign a responsible for the MER process? (Y=1/N=0)	Does the plan identify monitoring objectives and indicators? (Y=1/N=0)	Does the plan report to any higher-level authority or organisation? (Y=1/N=0)	Does the plan define a readjustment process based on the MER results?	Does the plan specifically assign a responsible party for readjustment process? (Y=1/N=0)	Does this process include a set of indicators / warning metrics? (Y=1/ N=0)	Does the plan consider uncertainty in the selection of adaptation options? (Y=1/N=0)
	Municipality	Year	Total score (max 48)								
	Sintra	2009	11	0	0	0	0	0	0	0	0
	Cascais	2010	19	0	0	0	0	0	0	0	0
ClimAdaPT.Local project	Amarante	2016	22	0	1	1	0	0	0	0	0
ClimAdaPT.Local project	Barreiro	2016	30	0	1	1	0	0	0	0	0
ClimAdaPT.Local project	Braga	2016	30	0	1	1	0	0	0	0	0
ClimAdaPT.Local project	Bragança	2016	30	0	1	1	0	0	0	0	0
ClimAdaPT.Local project	Castelo Branco	2016	30	0	1	1	0	0	0	0	0
ClimAdaPT.Local project	Castelo de Vide	2016	30	0	1	1	0	0	0	0	0
ClimAdaPT.Local project	Coruche	2016	31	0	1	1	0	0	0	0	0
ClimAdaPT.Local project	Évora	2016	30	0	0	1	1	0	0	0	0
ClimAdaPT.Local project	Ferreira do Alentejo	2016	30	0	1	1	0	0	0	0	0
ClimAdaPT.Local project	Figueira da Foz	2016	29	0	1	1	0	0	0	0	0
ClimAdaPT.Local project	Guimarães	2016	30	0	1	1	0	0	0	0	0
ClimAdaPT.Local project	Ílhavo	2016	31	0	1	1	0	0	0	0	0
ClimAdaPT.Local project	Leiria	2016	30	0	1	1	0	0	0	0	0
ClimAdaPT.Local project	Lisbon	2016	34	1	0	1	0	0	1	1	0	1
ClimAdaPT.Local project	Loulé	2016	30	0	1	1	0	0	0	0	0	0
ClimAdaPT.Local project	Montalegre	2016	30	0	1	1	0	0	0	0	0	0
ClimAdaPT.Local project	Odemira	2016	30	0	1	1	0	0	0	0	0	0
ClimAdaPT.Local project	Porto	2016	30	0	1	1	0	0	0	0	0	0
ClimAdaPT.Local project	Seia	2016	30	0	0	1	1	0	0	0	0	0
ClimAdaPT.Local project	São João da Pesqueira	2016	30	0	1	1	0	0	0	0	0	0
ClimAdaPT.Local project	Tomar	2016	30	0	1	1	0	0	0	0	0	0
ClimAdaPT.Local project	Tondela	2016	30	0	1	1	0	0	0	0	0	0
ClimAdaPT.Local project	Torres Vedras	2016	30	0	0	1	1	0	0	0	0	0
ClimAdaPT.Local project	Viana do Castelo	2016	30	0	1	1	0	0	0	0	0	0
	Mafra	2016	27	0	1	0	0	0	0	0	0	0
	Cascais	2017	29	1	1	1	1	0	1	1	1	0
	Alfândega da Fé	2018	11	0	0	0	0	0	0	0	0	0
	Agueda	2018	16	0	0	0	0	0	0	0	0	0
	Viseu	2018	21	0	0	0	0	0	0	0	0	0
PIAAC-LT	Almeirim	2018	29	0	0	0	1	0	0	0	0	0
PIAAC-LT	Alpiarça	2018	29	0	0	0	1	0	0	0	0	0
PIAAC-LT	Azambuja	2018	29	0	0	0	1	0	0	0	0	0
PIAAC-LT	Benavente	2018	29	0	0	0	1	0	0	0	0	0
PIAAC-LT	Cartaxo	2018	29	0	0	0	1	0	0	0	0	0
PIAAC-LT	Chamusca	2018	29	0	0	0	1	0	0	0	0	0
PIAAC-LT	Coruche	2018	29	0	0	0	1	0	0	0	0	0
PIAAC-LT	Golegã	2018	29	0	0	0	1	0	0	0	0	0
PIAAC-LT	Rio Maior	2018	29	0	0	0	1	0	0	0	0	0
PIAAC-LT	Salvaterra de Magos	2018	29	0	0	0	1	0	0	0	0	0
PIAAC-LT	Santarém	2018	29	0	0	0	1	0	0	0	0	0
PMAAC-AMP	Arouca	2018	26	0	1	1	0	0	0	0	0	0
PMAAC-AMP	Espinho	2018	26	0	1	1	0	0	0	0	0	0
PMAAC-AMP	Gondomar	2018	26	0	1	1	0	0	0	0	0	0
PMAAC-AMP	Maia	2018	27	0	1	1	0	0	0	0	0	0
PMAAC-AMP	Matosinhos	2018	27	0	1	1	0	0	0	0	0	0
PMAAC-AMP	Oliveira de Azeméis	2018	26	0	1	1	0	0	0	0	0	0
PMAAC-AMP	Paredes	2018	26	0	1	1	0	0	0	0	0	0
PMAAC-AMP	Póvoa de Varzim	2018	27	0	1	1	0	0	0	0	0	0
PMAAC-AMP	Santa Maria da Feira	2018	26	0	1	1	0	0	0	0	0	0
PMAAC-AMP	Santo Tirso	2018	27	0	1	1	0	0	0	0	0	0
PMAAC-AMP	São João da Madeira	2018	26	0	1	1	0	0	0	0	0	0
PMAAC-AMP	Trofa	2018	26	0	1	1	0	0	0	0	0	0
PMAAC-AMP	Vale da Cambra	2018	26	0	1	1	0	0	0	0	0	0
PMAAC-AMP	Valongo	2018	27	0	1	1	0	0	0	0	0	0
PMAAC-AMP	Vila do Conde	2018	27	0	1	1	0	0	0	0	0	0
PMAAC-AMP	Vila Nova de Gaia	2018	26	0	1	1	0	0	0	0	0	0
	Ílhavo	2018	39	1	1	1	1	0	1	1	0	1
	Lagos	2018	30	1	0	1	1	0	1	1	1	0
	Leiria	2019	33	1	0	1	1	0	1	1	1	0
	Cascais PECAC+PA3C2	2017	35	1	1	1	1	0	1	1	1	0
	Leiria EMAAC+PMAAC	2020	45	1	1	1	1	0	1	1	1	1
	Ílhavo EMAAC+PMAAC	2020	44	1	1	1	1	0	1	1	1	1
		Average	27.7705									

Climate change adaptation plans in Continental Portugal municipalities: **Evaluation Matrix**		Major Area	COMMON COMPONENT								
		Components	LEGITIMACY								
		Indicators	Transparency and dialogue					Engagement of stakeholders and civic society			Equity and justice
		Metrics	Is the full process of screening, scoping and definition of the plan and later approval described in the plan? (Y=1/N=0)	Are the people/groups involved in the process of plan creation (in any role) named in the document? (Y=1/N=0)	Does the plan refer to which kind and how information used to lead decisions has been produced and used? (Y=1/N=0)	Have different departments of the city been involved in the design of the plan? (Y=1/N=0)	Has the plan been exposed to a period of public information and debate? (Y=1/N=0)	Did the plan include a process of participation with stakeholders and civic organisations? (Y=1/N=0)	Did the process of participation include the public? (Y=1/N=0)	Is there a clear evidence on the multiple expertise brought by participants (in the process of participation)? (Y=1/N=0)	Is there evidence that the plan addresses distributive impacts of climate change and develops adaptation measures accordingly? (Y=1/N=0)
Municipality	Year	Total score (max 48)									
Sintra	2009	11	1	1	1	0	0	0	0	0	0
Cascais	2010	19	0	1	1	1	0	1	0	0	0
Amarante	2016	22	1	1	1	1	0	1	0	1	0
Barreiro	2016	30	1	1	1	1	0	1	0	1	0
Braga	2016	30	1	1	1	1	0	1	0	1	0
Bragança	2016	30	1	1	1	1	0	1	0	1	0
Castelo Branco	2016	30	1	1	1	1	0	1	0	1	0
Castelo de Vide	2016	30	1	1	1	1	0	1	0	1	0
Coruche	2016	31	1	1	1	1	0	1	0	1	0
Évora	2016	30	1	1	1	1	0	1	0	1	0
Ferreira do Alentejo	2016	30	1	1	1	1	0	1	0	1	0
Figueira da Foz	2016	29	1	1	1	1	0	1	0	1	0
Guimarães	2016	30	1	1	1	1	0	1	0	1	0
Ílhavo	2016	31	1	1	1	1	0	1	0	1	0
Leiria	2016	30	1	1	1	1	0	1	0	1	0
Lisbon	2016	34	1	1	1	1	0	1	0	1	0
Loulé	2016	30	1	1	1	1	0	1	0	1	0
Montalegre	2016	30	1	1	1	1	0	1	0	1	0
Odemira	2016	30	1	1	1	1	0	1	0	1	0
Porto	2016	30	1	1	1	1	0	1	0	1	0
Seia	2016	30	1	1	1	1	0	1	0	1	0
São João da Pesqueira	2016	30	1	1	1	1	0	1	0	1	0
Tomar	2016	30	1	1	1	1	0	1	0	1	0
Tondela	2016	30	1	1	1	1	0	1	0	1	0
Torres Vedras	2016	30	1	1	1	1	0	1	0	1	0
Viana do Castelo	2016	30	1	1	1	1	0	1	0	1	0
Mafra	2016	27	1	1	1	1	0	0	0	1	0
Cascais	2017	29	0	1	1	1	1	1	1	0	0
Alfândega da Fé	2018	11	1	0	1	0	0	1	0	0	0
Agueda	2018	16	1	0	1	0	0	1	0	0	0
Viseu	2018	21	1	1	1	1	0	1	0	1	0
Almeirim	2018	29	1	1	1	1	0	1	0	1	0
Alpiarça	2018	29	1	1	1	1	0	1	0	1	0
Azambuja	2018	29	1	1	1	1	0	1	0	1	0
Benavente	2018	29	1	1	1	1	0	1	0	1	0
Cartaxo	2018	29	1	1	1	1	0	1	0	1	0
Chamusca	2018	29	1	1	1	1	0	1	0	1	0
Coruche	2018	29	1	1	1	1	0	1	0	1	0
Golegã	2018	29	1	1	1	1	0	1	0	1	0
Rio Maior	2018	29	1	1	1	1	0	1	0	1	0
Salvaterra de Magos	2018	29	1	1	1	1	0	1	0	1	0
Santarém	2018	29	1	1	1	1	0	1	0	1	0
Arouca	2018	26	1	1	1	1	0	1	0	1	0
Espinho	2018	26	1	1	1	1	0	1	0	1	0
Gondomar	2018	26	1	1	1	1	0	1	0	1	0
Maia	2018	27	1	1	1	1	0	1	0	1	0
Matosinhos	2018	27	1	1	1	1	0	1	0	1	0
Oliveira de Azeméis	2018	26	1	1	1	1	0	1	0	1	0
Paredes	2018	26	1	1	1	1	0	1	0	1	0
Póvoa de Varzim	2018	27	1	1	1	1	0	1	0	1	0
Santa Maria da Feira	2018	26	1	1	1	1	0	1	0	1	0
Santo Tirso	2018	27	1	1	1	1	0	1	0	1	0
São João da Madeira	2018	26	1	1	1	1	0	1	0	1	0
Trofa	2018	26	1	1	1	1	0	1	0	1	0
Vale da Cambra	2018	26	1	1	1	1	0	1	0	1	0
Valongo	2018	27	1	1	1	1	0	1	0	1	0
Vila do Conde	2018	27	1	1	1	1	0	1	0	1	0
Vila Nova de Gaia	2018	26	1	1	1	1	0	1	0	1	0
Ílhavo	2018	39	1	1	1	0	0	1	0	1	1
Lagos	2018	30	1	1	1	1	1	1	1	1	0
Leiria	2019	33	1	1	1	1	1	1	1	1	1
Cascais PECAC+PA3C2	2017	35	0	1	1	1	1	1	1	0	0
Leiria EMAAC+PMAAC	2020	45	1	1	1	1	1	1	1	1	1
Ílhavo EMAAC+PMAAC	2020	44	1	1	1	1	0	1	0	1	1
	Average	27.7705									

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