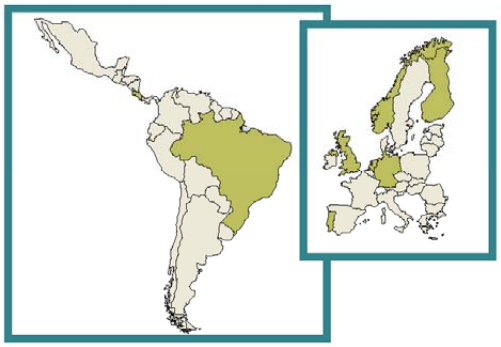

REPORT

Issue No. 6/2012

POLICYMIX - Assessing the role of economic instruments in policy mixes for biodiversity conservation and ecosystem services provision

Assessment of the role of economic instruments in the Portuguese conservation policymix - a national coarse grain analysis

Rui Santos, Paula Antunes, Pedro Clemente, Thaís Ribas

policymix.nina.no

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About POLICYMIX. POLICYMIX focuses on the role of economic instruments for biodiversity conservation and ecosystem services provided by forest ecosystems. POLICYMIX evaluates the cost-effectiveness and benefits of a range of economic versus regulatory instruments in a variety of European and Latin American case studies.

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Santos, R., Antunes, P., Clemente, P., Ribas, T.

Rui Santos (CENSE), Paula Antunes (CENSE), Pedro Clemente (CENSE), Thaís Ribas (CENSE)
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CONTACT DETAILS
Paula Antunes, mpa@fct.unl.pt

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Acronyms

AEM	Agri-environment measures
AGRO	Operational Plan for agriculture and Rural Development
ASHNV	Agriculture Systems of High Natural Value
CAP	Common Agriculture Policy
CLC	Corinne Land Cover
CN	Curve Number
EEA	European Environmental Agency
EFT	Ecological Fiscal Transfers
ES	Ecosystem Services
EU	European Union
FCM	Municipal Cohesion Fund
FEF	Financial Equilibrium Fund
FGM	General Municipal Fund
FSM	Municipal Social Fund
GHG	Greenhouse Gases
ICNB	Institute for Nature Conservation and Biodiversity
ITI	Integrated Territorial Interventions
LFL	Local Finances Law
NSNBC	National Strategy for Nature and Biodiversity Conservation
PNAC	National Program for Climate Change
ProDer	Rural Development Program 2007-2013
PROF	Regional Forestry Plans
RFCN	Fundamental Network for Nature Conservation
RNAP	National Network for Protected Areas
RURIS	Rural Development Program for Continental Portugal 2000-2006
SCI	Site of Community Interest
SPA	Birds Special Protection Area

Summary and conclusions

Abstract

This report presents a coarse grain analysis of two economic instruments in the Portuguese conservation policymix - Ecological Fiscal Transfers and Agri-environment Measures, focusing on their role and interactions with other policy instruments, and on the assessment of its (potential) impact on forests and biodiversity conservation.

The performed analysis provides the background, further research questions and identifications of tasks for the fine grain analysis that will be developed at Mourão-Moura-Barrancos, on the southeast of Portugal, in the next phase of the POLICYMIX project.

Case study location and conservation characteristics

Biodiversity loss has been extensively addressed as one of the most serious challenges of environmental policy. **Portugal** is considered, in a European context, a biodiversity rich country, with 30% of the territory covered by forests. Forest biodiversity in Portugal is mostly associated to human-shaped habitat/landscape, such as ***montados*** or cork oak (***Quercus suber***) and holm oak (***Quercus rotundifolia***) forests. ***Montado***s are multifunctional systems that, besides forming a diversity of habitats of high conservation value, contribute to climate regulation, water cycle regulation, soil quality, protection against fire and provision of cork and other products. Thus, the protection of *montados* is fundamental to national goals related to climate regulation, biodiversity conservation and maintenance of socio-economic activities in rural areas.

While the coarse-grain analysis considered the whole continental Portugal, the fine grain study will focus on a selected area in the southeast portion of the country.

Besides agriculture and infrastructure expansion, *montados* are currently threatened by pine and eucalyptus monoculture, which associated to a scarce and fragmented native forest and to high frequency of fires has had high negative impacts on species diversity. Increases in land abandonment rates may also jeopardize *montados*, as the conservation value of this ecosystem depends on the maintenance of the shrub-grassland matrix through human management. In addition, poor agriculture practices are increasing the spread of diseases (e.g. pathogenic fungi), and preventing *montados* natural regeneration with new oak trees, which threatens it sustainability in the long-run.

Current economic instruments in biodiversity conservation

In Portugal, as worldwide, policies regarding forest/biodiversity conservation have traditionally relied on regulatory approaches directed towards the conservation of species and their habitats, such as protected areas regulations (e.g. the Fundamental Network for Nature Conservation - RFCN, Decree-Law No. 142/2008, including Natura 2000 network and national network of protected areas, such as national parks, natural parks and reserves). Direct regulations, namely the establishment of protected areas, are seen as effective instruments to control environmentally harmful activities and safeguard a minimum level of conservation in rather short time. They contribute to slow down the degradation of ecosystems in targeted areas, although they have been, in general, insufficient to ensure long-term conservation.

Protected areas impose land use restrictions or impact agricultural and forest management practices in some territories, and both local private and public actors have to bear the management and opportunity costs of conservation. The low success of traditional conservation policies is partially explained by a mismatch between those who bear the costs and those who benefit from conservation actions, since the benefits generated flow beyond local, regional and national borders. In Portugal conservation costs are unevenly spread, with some with some public and private actors facing costs related to protected areas or conservation activities.

Over the last few years economic instruments for biodiversity conservation has been proposed and gradually implemented in several countries, in order to address the mentioned problems and to increase the policy effectiveness and, mainly, its cost-effectiveness. They can include, for example, compensatory measures to reconcile the local costs and national benefits of biodiversity conservation. However, concerns are raised about the real potential of economics instruments to improve the policy performance, namely due to its application in the context of a range of other policy instruments that may be conflicting or overlapping.

The aim of this report (a deliverable under WP7 of the project) is to analyse economic instruments in the Portuguese conservation policy, addressing public and private actors and from a national coarse grain perspective, exploring their roles in the policy mix and allowing the identification of clear research questions and tasks for the local fine grain analysis that will be carried out in the next phase of the POLICYMIX project. Two particular economic instruments that may fulfill the role of compensatory measures were selected and analyzed in the coarse grain analysis: Agri-environment measures (AEM), which are financial incentives designed to encourage farmers to protect the environment on their farmland – including forest and agroforest systems, consisting of payments made to farmers in return for a service – that of carrying out agri-environmental commitments that

involve more than the application of usual good farming practice and more than legal requirements (specifically directed to private actors); and Ecological Fiscal Transfers (EFT), which since 2007 integrate the annual transfers from the national general budget to the municipalities in order to compensate them for land-use restrictions imposed by protected areas (specifically directed to local public actors).

No concrete evidences of the effectiveness of these instruments were found on the national case study. The EFT effectiveness has been threatened by changes simultaneously introduced in other funds and allocation criteria in the 2007 amendments of the Local Finances Law. Crossover effects that arise as a result of the different changes, the introduction of smoothing rules to avoid drastic fluctuations and the small magnitude of the ecological component, contribute to hide the financial incentive offered to municipalities by the ecological signal. In regards to AEM, the coarse grain analysis showed evidences of low implementation due to, among other factors, unfavourable economic scenario, complex eligibility requirements, insufficient financial compensation, lack of technical support and administrative constraints.

New and potential economic instruments

The coarse grain analysis did not focus on proposing new economic instruments at a national level, but on proposing changes to the EFT scheme in order to improve their effectiveness and/or cost-efficiency. The ecological criterion considered in the EFT is based on a single indicator, the amount of Classified Areas. Therefore, aspects related to the "relevance" (e.g. representativeness) or "quality of management" of protected areas, or to the environmental benefits provided by areas outside networks for nature conservation are not taken into account. In this context, it was proposed the inclusion of new ecological indicators that could better link financial compensations to the positive externalities (e.g. ecosystem services) each municipality provides to society, and several scenarios for different magnitudes of the ecological signal were simulated. For example, scenarios for the allocation of public funds were developed considering as alternative indicator the sum of the mean provision of cultural, regulating and supporting services by each municipality.

Changes will also be proposed to the AEM during the fine grain analysis. The effectiveness and efficiency of this instrument can be enhanced through the inclusion of new measures and/or target ecological features, as well as through the introduction of new criteria for the allocation of incentives (improve targeting). Lack of data at national scale hindered impact evaluation of this instrument and, consequently, the proposal of changes and scenarios in the coarse grain assessment.

Lessons from the implementation of EFT in Brazil (*ICMS Ecológico*) for several years (e.g. "quality" criterion in Paraná) are relevant for the analysis and proposal of changes to the Portuguese

instrument. Also the simulations results on the implementation of a new EFT scheme in Germany, will be relevant namely to propose alternative ecological criteria in intergovernmental fiscal transfers. The German study suggests that both area-based and qualitative indicators should be taken into account to assess conservation responsibilities of each State, and a set of ecological indicators were presented, which can be inspiring for the Portuguese case. In regards to the AEM, it is expected that voluntary contracts designed by Finland and Norway and the Costa Rica experience can be a source of lessons for the changes that will be proposed in the Portuguese scheme.

Instrument interactions in the federal/national/state Policymix

The policy strategy for biodiversity conservation is mainly based, since the 1980's, in command-and-control instruments, namely the establishment of ecological reserves and natural parks and the protection of endangered species and habitats. The costs arising from restrictions imposed by command-and-control policies, as well as the need to increase effectiveness, efficiency and equity of conservation policies led to the introduction of complementary economic instruments. The new policies started to recognize the central role of private and public stakeholders as land managers and active actors, and tried to align their interests in conservation goals. The instruments implemented in a first stage were subsidy-based (i.e. forest development subsidies, followed by the introduction of AEM), and focused on compensating private actors for conservation costs. In 2007, an ecological criterion was incorporated in intergovernmental *fiscal transfers* in order to compensate also local public actors (municipalities).

We did not find any evidence that policymakers and policies in Portugal dealing with the application of economic instruments have been visibly influenced by experiences (e.g. PES, TDR, EFT) in other states/countries.

To identify the role of selected instruments in the policymix, a preliminary assessment of the interactions among EFT, AEM and other direct regulation and sectorial instruments was performed. The report presents the preliminary findings, but due to lack of information at the national level, the need for a detailed analysis in the fine grain study was identified, in order to explore in more detail the interactions in terms of: goals, resources, implementation, outputs and intermediate and final outcomes.

With the current design, EFT interact mainly with regulations establishing the classification of protected areas, as well as with the remaining criteria adopted to compute the fiscal transfers from the national to the local level. However it would also be important to promote an interaction with instruments influencing the "quality" of conservation areas (and of their management). AEM have a relevant interaction with land-use plans and conservation management/sectoral plans that identify

conservation priorities and objectives at the local level, and set specific rules for land occupation and management. Negative interactions can also happen due to the complexity of land use policies and other sectoral regulations, which affect the ability of actors to identify existing rules and guidelines. This situation is particular relevant for AEM, as it introduces additional problems for landowners to assess their eligibility to funded measures, and because some land use restriction conflict with available measures.

AEM also interact with other economic incentives oriented to the agriculture and forest production and management, namely also resulting from the Common Agricultural Policy (CAP) (e.g. incentives for biological production; compensation for maintaining some specific crop systems). In the design of AEM and EFT more important than the establishment of the absolute value for the incentive is to find the adequate relation with other existing and sometimes conflicting incentives (relative price) as well as to assure the complementarity with the regulatory instruments that define the baseline for the economic instrument action.

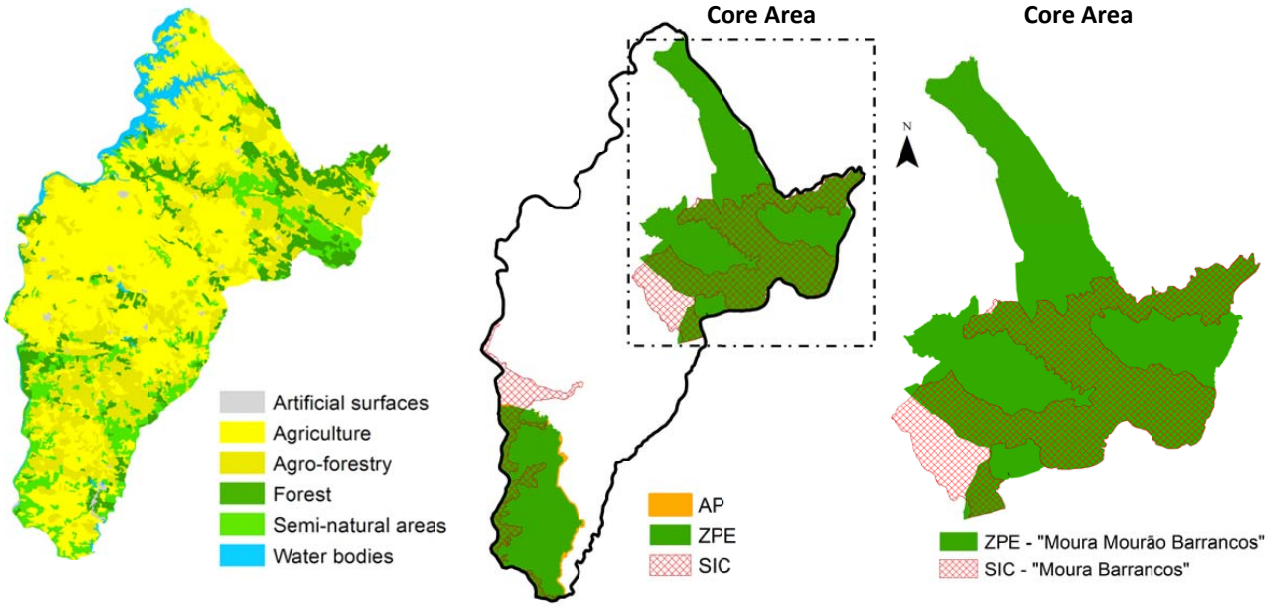
It is desirable to align the incentives of EFT and AEM, considering both public and private local actors. If EFT are designed to compensate for the opportunity costs of biodiversity conservation in terms of lost tax revenues for local governments while agri-environment schemes cover the management and production opportunity costs for conservation measures, the two instruments can become complementary. Complementarity among instruments is also desirable when AEM address local private actors within protected areas.

The fine grain case study will focus on the potential of EFT, AEM, and Classified Areas (i.e. Fundamental Network for Nature Conservation, and Natura 2000 Network) to complement each other. The demarcation of protected areas is considered one of the essential regulatory instruments for biodiversity conservation in Portugal. However, it creates several restrictions to land use both for private actors (Natura 2000 does not exclude human activity, but restricts management practices) and public actors, who then have to bear the costs of conservation. EFT based on the amount and restriction level imposed by Classified Areas in each municipality can, if effectively applied, compensate public actors for the limitations imposed and increase acceptance of new and existing protected areas. Complementarily, AEM addressing local private actors within protected areas (e.g. measures oriented to landowners in within Natura 2000 sites) may compensate private actors for their conservation costs.

Local fine grain analysis – research questions and challenges

Fine grain case study site description

The local case study area is located in the southeast of Portugal, in the left bank of the Guadiana River. It encompasses multifunctional landscapes, agriculture parcels, urban settlements, national protected areas and Natura 2000 sites (a Site of Community Interest and a Birds Special Protection Area). The use of traditional agro-pastoral and extensive oak woods (*montados*) in the region originates from the existence, in mosaic, of *carrasco*, broom and an important extension of perennial pastures spontaneous under-covered. In wetter areas there are also the cork oak and clumps of oak (*Quercus suber*). These agro-forest areas are the habitat of species with a high protection status, such as the Iberian lynx (*Lynx pardinus*), the imperial eagle *(Aquila heliaca*) and the black vulture (*Aegypusmonachus)*. The Site of Community Interest *Moura-Mourão-Barrancos* and the Birds Special Protection Area *Moura-Barrancos* will be the core area to develop the fine grain analysis, representing around 900 km^2 (30% of the total local area).



Local case study area. A) Land use according to CORINE Land Cover 2006; B) Classified areas: AP = National Protected area; SIC= Site of Community interest; ZPE = Bird special Protection Area.

Economic instrument effectiveness

The coarse grain analysis showed that, in general, implementation of AEM has been low. Thus, the ecological effectiveness of this instrument at local level is not expected to be high. EFT are not expected to be highly effective at local level either, since the national case study showed that the criteria and algorithm adopted for the allocation of transfers end up eroding the ecological signal in play.

The fine grain assessment will focus on identifying constrains in the current design of the AEM scheme that may be preventing this instrument from achieving its full conservation potential. Improvements will be proposed in order to ensure spatial continuity of conservation actions and guarantee minimum area requirements for specific conservation goals, therefore increasing AEM ecological effectiveness.

In this stage of the fine grain analysis the Marxan software, which provides decision support to a range of conservation planning problems, will be used. Marxan was primarily designed to address a class of reserve design problems known as “the minimum set”, where the goal is to ensure a given representation of biodiversity features for the smallest possible cost. To date, Marxan has been used mostly with the purpose of helping design reserve systems. In Portugal, however, biodiversity is many times associated to ecosystems highly dependent on human management, for which reserve systems are not a suitable conservation approach. For this reason, the present work aims to use Marxan with Zones, an extension of Marxan that incorporates new functionality and broaden its utility for practical application, for a conservation planning task other than setting protected areas, which is optimizing the distribution of AEM that address conservation of particular human-shaped systems. The main methodological challenge for the tasks proposed is to obtain refined spatial data on the distribution of AEM and ecological features.

Economic instrument costs and benefits

Estimating costs and benefits at local level of both AEM and EFT is an important step to better assess the impact of these instruments, as well as to propose changes to increase their cost-effectiveness. In regards to the EFT, the aim of the fine grain analysis is to identify opportunity, management and transaction costs associated with PAs for municipalities, as well as how do they relate to amounts received as compensation through the EFT-LFL scheme. In addition, we will assess the effects of introducing new ecological criteria for municipalities in the case study area. For the AEM the idea is to assess the opportunity costs for local landowners and their relation with currently received compensations, as well as estimating acceptable compensation payments based on the WTP/WTA of landowners for the new proposed AEM actions/measures.

The central methodological approach to carry on the tasks proposed above is conducting choice experiments with private actors (landowners), benefiting from the previous work developed for the German and Dutch cases, and cooperating with the Costa Rica team.

Economic instrument equity and legitimacy

Equity and legitimacy of the economic instruments considered were poorly assessed during the coarse grain phase due to limitation of conducting such analysis at national level. For this reason, we plan to better investigate these aspects directly with the main stakeholders for the local case study. For the EFT, we will try to assess the perceived fairness by the local public actors, and the scheme contribution to change their perceptions and attitudes towards biodiversity conservation. We also want to identify the main beneficiaries of AEM and, with these answers make proposals to improve fairness (procedural and outcome) in the scheme.

Interviews and focus groups will be the methodologies employed to help estimating equity and legitimacy of EFT and AEM at local level.

Institutional opportunities and constraints for economic instruments

The coarse grain analysis showed that there are several institutional constrains undermining the effectiveness of AEM. For the local case study we want to interview local actors in order to identify the institutional factors affecting participation in AEM in the local area. With a clear idea of these factors, we plan to propose a more effective scheme by identifying target actors and management entities, as well as proposing new rules and guidelines.

Integrated Policymix assessments

Analysis of EFT and AEM effectiveness, cost efficiency and social legitimacy will be performed considering interactions between the three instruments mentioned (PA, EFT and AEM). Conclusions will be derived regarding the way instruments effectiveness can be enhanced through design changes, in light of their co-existence with other current conservation instruments.

1 Introduction

1.1 Background

Biodiversity loss has been extensively addressed as one of the most serious challenges of environmental policy. The POLICYMIX project aims to contribute to achieving the European Union goals of reversing trends in biodiversity loss beyond 2010 through the use of cost-effective and incentive-compatible economic instruments. For this, it focuses on the role of economic instruments in a mix of operational conservation policy instruments.

The project runs from 2010-2014, and is divided in three phases: Phase 1 encompasses a review of international experiences and the development of a common impact assessment methodologies framework. In Phase 2, POLICYMIX will work with forest ecosystems in seven case studies in Europe and Latin America. Phase 3 involves assessment and dissemination of findings.

The present report is a deliverable under WP7 – POLICYMIX Case studies: coarse grain analysis, included in Phase 2. The coarse grain analysis conducted herein addresses the role and impact of economic instruments for biodiversity conservation at the national level in Portugal. A fine grain study will be further undertaken in a Natura 2000 site in southeast Portugal, with a particular focus on *montado* landscape.

Portugal is considered, in a European context, a biodiversity rich country, with 30% of the territory covered by forests. Forest biodiversity in Portugal is mostly associated to human-shaped habitat/landscape, such as *montados* or cork oak (*Quercus suber*) and holm oak (*Quercus rotundifolia*) forests.

In Portugal, as worldwide, policies regarding forest/biodiversity conservation have traditionally relied on regulatory approaches directed towards the conservation of species and their habitats, such as protected areas regulations (e.g. the Fundamental Network for Nature Conservation - RFCN, Decree-Law No. 142/2008, including Natura 2000 network and national network of protected areas, such as national parks, natural parks and reserves).

Protected areas impose land use restrictions or impact agricultural and forest management practices in some territories, and both local private and public actors have to bear the management and opportunity costs of conservation. The low success of traditional conservation policies is partially explained by a mismatch between those who bear the costs and those who benefit from conservation actions, since the benefits generated flow beyond local, regional and national borders.

In Portugal conservation costs are unevenly spread, with some with some public and private actors facing costs related to protected areas or conservation activities.

Over the last few years economic instruments for biodiversity conservation has been proposed and gradually implemented in several countries, in order to address the mentioned problems and to increase the policy effectiveness and, mainly, its cost-effectiveness. They can include, for example, compensatory measures to reconcile the local costs and national benefits of biodiversity conservation. However, concerns are raised about the real potential of economics instruments to improve the policy performance, namely due to its application in the context of a range of other policy instruments that may be conflicting or overlapping.

1.2 Research questions and objectives

The objectives of this report are:

- Conduct a "coarse grain" assessment at the national level of the role and potential impact of existing and potentially new economic instruments in policies for biodiversity conservation addressing public and private actors, in Portugal.
- Focus the assessment on two selected instruments within the current POLICYMIX of biodiversity conservation: a) ecological fiscal transfers (EFT), which since 2007 integrate the annual transfers from the national general budget to the municipalities in order to compensate them for land-use restrictions imposed by protected areas (specifically directed to local public actors); and b) agri-environment measures (AEM), which are financial incentives designed to encourage farmers to protect the environment on their farmland – including forest and agroforest systems, consisting of payments made to farmers in return for a service – that of carrying out agri-environmental commitments that involve more than the application of usual good farming practice and more than legal requirements (specifically directed to private actors).
- Provide the basis for cross-case comparisons of legal and institutional, and instrument roles context between different case studies in the project by using the POLICYMIX analysis framewok (WP2) and assessment criteria proposed in the draft guidelines (WP3-WP6).
- Provide recommendations on improving the instruments design at a national level.
- Provide recommendations on improving policy mix analysis methodologies proposed in the draft guidelines (WP3-WP6).
- Identify clear research questions and tasks for the local fine grain analysis that will be carried out in the next phase of the POLICYMIX project.

The research questions of particular interest for the ex-post analysis are:

- What are the impacts of the EFT scheme that has been implemented in Portugal?
    i. How do we measure effectiveness of EFT schemes?
    ii. What is the role of EFT in the policymix for biodiversity conservation in Portugal?
    iii. What is the distribution of costs and benefits among municipalities in relation to the previously existing scheme?
    iv. How does this distribution relate with biodiversity values and ecosystem services?
- What has been the effectiveness of AEM for biodiversity conservation and ecosystem services (ES) provision in Portugal?

i. What biodiversity values and ES have been favored by AEM?
ii. What is the total amount paid in AEM related to biodiversity conservation and ES provision?
iii. What is the distribution of AEM payments? Who have been the main beneficiaries?
iv. What are the institutional factors affecting participation in AEM?

The research questions of particular interest for the ex-ante analysis are:

- How should the Portuguese EFT scheme be improved in order to increase effectiveness (ecological and distributional)
  i. Should the ecological criterion be based on other ecological indicators?
  ii. Should other ES be introduced as an ecological indicator?

1.3 Methods and clarifications

This report will focus on policies related to conservation of biodiversity and sustainable use of ecosystem services in forests and agro-forest systems (main focus of POLICYMIX proposal). Following the POLICYMIX analysis framework the report will also address some key policies and instruments in other sectors that are in synergy or conflict with forest ecosystem services or biodiversity conservation.

In order to answer the research questions proposed above, the present coarse grain analysis followed the framework for assessing instruments in policy mixes for biodiversity and ecosystem governance proposed by Ring *et al.* (2011a), and presented in Figure 1.

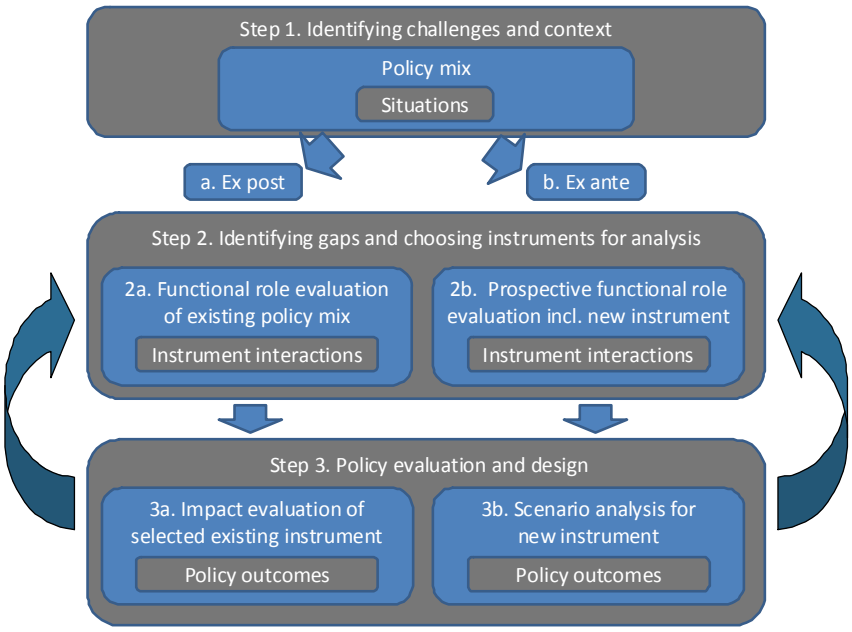


Figure 1 – Policy mix analysis framework and pathways

The first step of the framework consists on a scoping phase, where challenges and contexts are identified in order to gaining understanding of the policy objects (i.e. biodiversity and forest conservation; ecosystem services sustainable management). Spatially explicit analyses were conducted using surrogate indicators derived from digital cartography to map biodiversity features and ecosystem services provision along Continental Portugal.

Following, Step 2 focuses on the functional role of policy instruments. The main instruments in play affecting our policy objects were selected for analysis. Their roles in the policymix were investigated, as well as possible synergies and conflicts between them. Changes were proposed to one existing instrument (EFT) in order to enhance its role in the policymix.

The last step, Step 3, consist of a detailed policy evaluation where two pathways for analysis can be distinguished: impact evaluation and scenario analysis. Impact evaluation was conducted for both AEM and EFT, while new scenarios were constructed only for proposed changes in the EFT. The two pathways of analyses were based in four main assessment categories/criteria: conservation effectiveness (WP3), costs and benefits of conservation (WP4), social impacts and legitimacy (WP5) as well as the institutional options and constraints (WP6) (POLICYMIX guidelines, available at http://policymix.nina.no)

1.4 Case study comparisons - instrument, methodology and ecosystem services clusters

The POLICYMIX project contains seven case studies from six different countries. The following table gives an overview of comparative dimensions of instrument types for analysis and methodologies for detailed case study analysis (or for some, even at the national, coarse grain level).

Elements of commonality and synergies between case studies

Case clusters			Costa Rica	Mato Grosso	São Paulo	Portugal	Finland	Germany	Norway
Instrument		**Specification**							
	REDD+	international/national	P	P	P				
	EFT	national/state		C&P	C	C&P		P	P
	Certification	national/state	C	C			C		C
	Offsets/TDR/HB	National/state		C	C				
	PES	national / state agri-env.	C	C&P	C&P	C	C	C	P
		project /local		C	C				
		C=current, P=proposed or potential. Table includes only economic instruments addressed in 2 or more case studies							
Methodologies		*Only methodologies addressed in 2 or more cases studies*							
WP3	**GIS mapping**								
		Composite B&ES indices	?	?		X		?	X
		Biodiversity & habitat quality	X	X	X	X	X	X	X
		Pollination&pest control	X	X	X				
		Carbon & timber	X	X	X	X	X	X	X
		Run-off &infiltration&erosion	X		X	X		X	
		Non-timber forest products	X	X					
		Recreation	X					X	X
		? = subject to findings of the coarse grain analysis							
	Landowner & forest user surveys								
WP4 & WP5		Value transfer - available datasets	?	?					X
		Choice experiment - contract design				X		X	
		Opportunity costs	X	X	X	X	X	X	X
		Transaction costs	X	X	?	?	X	X	X
		Social impact & legitimacy				X	X		X
		? = Subject to findings of the coarse grain analysis							
WP6	**Existing instrument evolution, path dependency**		X	?	?	X	?	?	X
	Proposed instrument architecture		X	X	X	X	X	X	X
WP3-WP4..WP9	**BACI: Before-after-control-impact evaluation**		PES	EFT			PES		
WP3-WP6..WP9	**Scenario evaluation, incl. GIS mapping**			EFT		X		EFT	
WP3-WP6..WP9	**MCA: Multi-criteria analysis**								
		MacBeth, other MCA software	?		X	?	?		?
		Marxan - spatial site selection	X			?	?		X

1.5 Outline of report

The outline of the report is as follows. Chapter 2 provides thorough overview of the biodiversity status, challenges and context for biodiversity conservation policy in Portugal. This is based on Step 1 in the policy mix analysis framework described in the previous section. It is also provide a timeline describing when key policy instruments were introduced in Portugal. Chapter 3 provides the assessment of the role of most important current economic instruments in Portugal, and gives a brief background to direct regulation and other instruments (economic or otherwise) that may be important for the assessment of instrument interactions. Chapter 4 presents potential changes in the role of economic instruments that will be further analyzed. These two chapters draw from Steps 2a and 2b, respectively, of the policy mix analysis framework. Chapter 5 makes a brief synthesis of chapters 3 and 4, with particular emphasis on how instruments interact (i.e. corresponding to a synthesis of Step 2). Chapter 6 evaluates de impact of two economic instruments that are the focus of this coarse grain analysis: the Local Finance Law (Ecological Fiscal Transfers) and Agri-environment measures. Chapter 7 analyses possible scenarios deriving from proposed changes in the Portuguese Ecological Fiscal Transfers. Finally, Chapter 8 outlines research questions for the fine grain analysis that is under way in the project, and Chapter 9 presents the most relevant data gaps faced in the national level case study.

2 Identifying biodiversity status, challenges and context

2.1 Biodiversity status

Portugal is considered, in a European context, a biodiversity rich country. According to the Portuguese Millennium Ecosystem Assessment (Proença *et al.,* 2009), more than 400 species of terrestrial vertebrates have been identified and estimations points out to the existence of more than 3000 vascular plant species. This high diversity of species results from a combination of natural and historical factors. Portugal is in the enclave of two biogeographic zones receiving both Atlantic and Mediterranean influences, which, together with the country's orography and soil diversity, creates a variety of habitats (Proença *et al.,* 2009). In addition, over the past 10.000 years the Mediterranean basin observed a complex "coevolution" between natural ecosystems and human societies (Blondel, 2006), which has resulted in unique landscapes (Figure 2).

Continuous land and resource management that included, among others, domestication of species, water management, controlled burning and livestock husbandry, led to substantial changes in species diversity and ecosystem functioning in Portugal, creating sustainable human-shaped systems (Blondel, 2006). Although some may argue that human activity has caused degradation of natural systems (Thirgood, 1981; McNeil, 1992), many scientists point out that human presence contributed for maintaining landscape diversity in the region (Fabbio *et al.,* 2003; Blondel, 2006). Indeed, some of these human-shaped systems are of high conservation value, namely *Montados*, extensive cereal crops and terraces (Santos-Reis and Correia, 1999; Delgado and Moreira, 2000; Pereira *et al.,* 2005), and host a great diversity of autochthones races and agriculture species (ICN, 1998; Blondel and Aronson, 1999).

Another relevant aspect in regards to Portuguese biodiversity is the fact that the south of the country is part of a world biodiversity hotspot, the Mediterranean Basin. This basin is considered a region of high interest for conservation due to the great number of endemic plant species, and the current threat they are facing due to habitat destruction (Myers *et al.,* 2000).

It is important to highlight that the Archipelagos of Azores and Madeira highly contribute to the biodiversity of the country; however, this study focus only on Continental Portugal.

Currently, Portuguese biodiversity is under threat, mainly due to agriculture expansion and intensification, land abandonment, and urban development. In regard to forests, the occurrence of fires is considered the major threat (Pereira *et al.* 2009). In Continental Portugal are considered under threat 17 species of mammals, 76 bird species, 7 reptiles, 16 amphibians (Cabral *et al*., 2005), as well as about 10% of the country's plant species (IA and MAOT 2005).

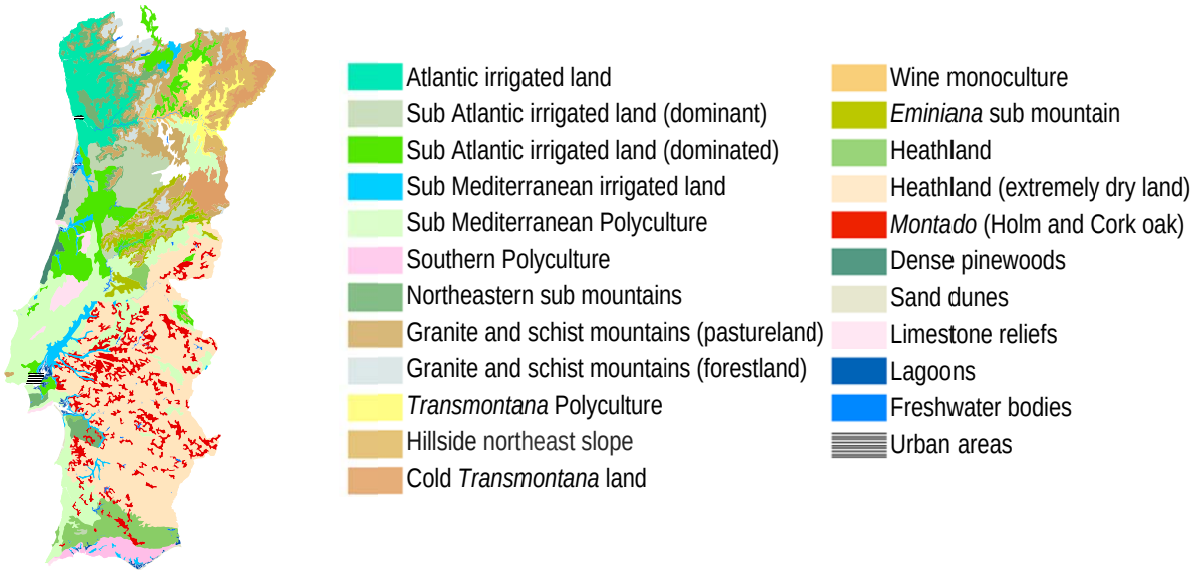


Figure 2 - Landscapes of Portugal. (Source: Instituto do Ambiente, 2003)

According to the Portuguese Millennium Ecosystem Assessment (Proença *et al.,* 2009), recent changes in biodiversity status derive from a set of both direct and indirect drivers. The most relevant direct drivers are land use change, overexploitation of resources, pollution, occurrence of fires, introduction of exotic species, and climate change; while are considered indirect drivers the inclusion of Portugal in the EU and the influence of directive environmental and socio economic policies.

In special regards to forests, the expansion of pine and eucalyptus monoculture, associated to a scarce and fragmented native forest and to high frequency of fires has had high negative impacts on species diversity (Proença *et al*., 2009). Pine and eucalyptus trees are species of elevate risk of fire (Núñez-Regueira *et al*., 2000; Fernandes *et al.,* 2009), especially when compared to native oak trees whose bark – the cork – is extremely resistant to fire. Furthermore, the environmental consequences of eucalyptus and pine monocultures has been a source of concern due to their use of hydrological resources (Doerr *et al*., 1998) and impoverishment of local biodiversity (Onofre, 1990; Abelho and Graça, 1996).

The abandonment of agriculture fields has been considered a threat to biodiversity because it favors the occurrence of fires due to growing of shrubs (Moreira *et al.,* 2001), and because it can decrease species habitats associated to human-shaped ecosystems. However, it is important to highlight that the consequences of land abandonment to biodiversity are controversial. While it represents a threat to the survivor of species associated to agriculture areas in extensive regime, it can have positive impacts on the diversity of species associated to native habitats that can be regenerated (Proença et al., 2009).

The abandonment of agricultural fields can be seen as a consequence of rural population decreasing and aging. Among other factors, the national economic situation does not offer great alternatives for rural populations, leading to mass migration to urban centers (Graça, 1996) and consequent abandonment of traditional practices that were crucial to maintain certain habitats. In addition, the observed trend has conducted to a progressive loss in traditional knowledge that goes from management practices to the identification of medicinal plants (Pereira *et al.,* 2005).

2.1.1 Spatially explicit analysis

This section aims to characterize the status of biodiversity in Portugal through a spatially explicit analysis. As data on direct biodiversity indicators (*e.g.* species distribution) are rarely available at national scale, surrogates indicators derived from digital cartography were used to map the distribution of biodiversity features, a common approach in coarse-filter analysis. The surrogates considered were the distribution of forest ecosystem and protected areas (Figures 3 and 4, respectively).

2.1.1.1 Forest Cover

Originally, native Portuguese forests were distributed in two major units. The Center and North regions, influenced by Atlantic climate, were covered by deciduous forests formed mainly by the oak species *Quercus robur*, *Quercus pyrenaica*, *Quercus faginea* (Caldeira Cabral and Telles, 1999). Evergreen Holm Oak (*Quercus ilex*) and Cork Oak (*Quercus suber*) forests were found in the South region, associated to a Mediterranean climate (Caldeira Cabral and Telles, 1999). This original distribution, however, was severely affected by the spread of species of commercial value (*i.e. Pinus pinaster* and *Eucalyptus globulus*) and by other drives of land use change, such as fires and agriculture expansion (Radich and Alves, 2000; Pereira *et al.,* 2002). Currently, native oak forests represent less than 4% of the national forest cover (DGRF, 2007).

The CORINE land cover (CLC) geographic database was used as a source to map current forest cover. Beside the three CLC forest classes (*i.e.* Broad-leaved forest, Coniferous forest, and Mixed forest), agro-forest was also included in the map because this class encompasses one of the most biodiversity rich ecosystem in Portugal: the *Montado* agro-silvo-pastoral system.

According to the last CLC version (2006), forests cover about 30% (approximately 26.400 km^2) of the Portuguese territory (Figure 3). Broad-leaved forests and Agro-forests are predominant in the south portion of the country, representing 38% and 24% of the total forest cover, respectively. Coniferous and Mixed forests correspond, respectively, to 20% and 18% of the total forest cover, and are more frequent in the north.

Changes in forest distribution over time were assessed by comparing CLC 2006 and 1990 versions. The results show that about 13% of forest areas were lost between 1990 and 2006 (Figure 4). Almost 90% of the area lost was converted to the CLC class "Transitional Woodland Shrubs", which in Portugal corresponds to clear-cut and new cultivated areas, as well as degraded forest or forest under regeneration (Caetano *et al.* 2007). While Agro-forest systems and Broad-leaf forest did not experience major changes during the period considered (only 2% and 5%, respectively, were converted to other land uses), about 15% of mixed forest and 32% of coniferous forests were lost.

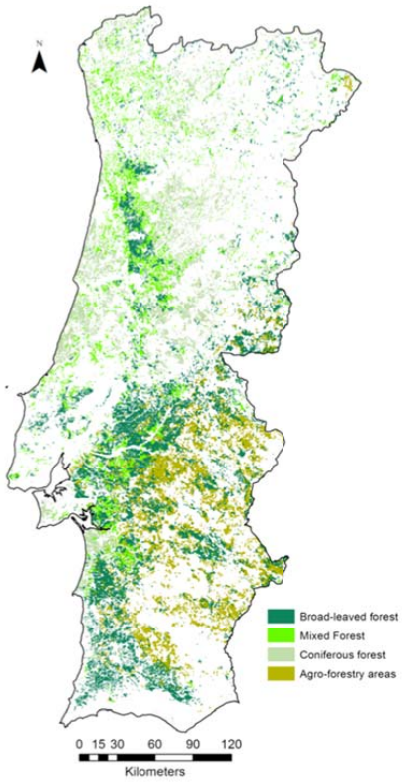


Figure 3 - Forest cover in Portugal. Source: CLC 2006

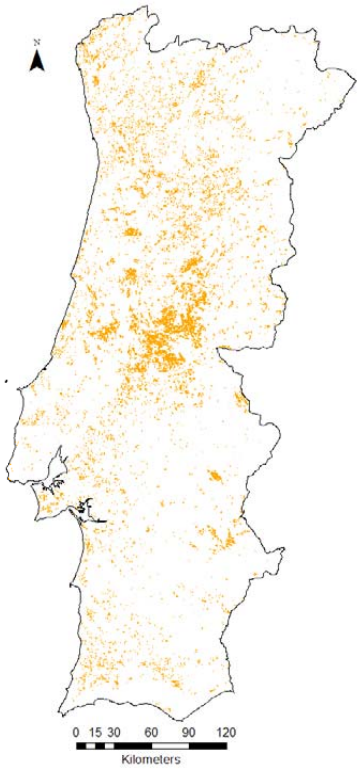


Figure 4 - Forest areas converted to other land uses between 1990 and 2006. CLC 2006; CLC 1990.

2.1.1.2 Protected Areas

The distribution of protected areas was mapped (Figure 5) taking into account sites classified under the three most relevant networks for biodiversity conservation in Portugal: i) The National Network for Protected Areas (RNAP), which includes Natural Parks, National Parks, Natural Reserves, Protected Landscapes and Natural Monument natural; ii) The Natura 2000 network, which includes Special Areas for Protection of Birds (SPA/ZPE) and Sites of Community Interest (SCI/SIC); and iii) The "Ramsar Convention". Geographic data was obtained from the Institute for Nature Conservation and Biodiversity (ICNB).

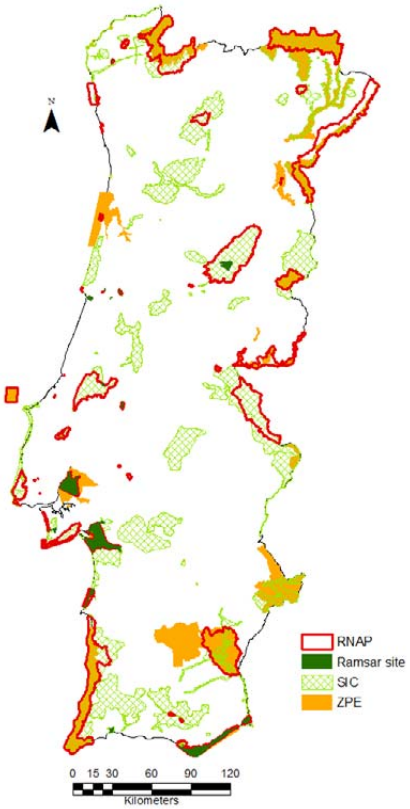


Figure 5 - Protected Areas in Portugal. Source: ICNB

Together, protected areas cover about 20% of the national territory and are the main instrument for biodiversity conservation in Portugal. In terms of representativeness, this network appears to be satisfactory, as it encompasses diverse ecosystems and protects species of high conservation value. For instance, the Natura 2000 network alone comprises 88 habitat types, 84 plant species and 229 animal species (Law Decree nº 140/99, April 24th). There are, however, serious management gaps that can jeopardize the efficiency of protected areas for biodiversity conservation, such as lack of monitoring and enforcement (Proença *et al.,* 2009).

2.1.1.3 Environmental Services

This work also aimed to characterize the status of forest ES in Portugal through a spatially explicit analysis. Such analysis, however, was limited by the availability of reliable data on ES indicators suitable for building national scale maps. The services successfully mapped were Carbon Storage; Water Cycle Regulation; Erosion Control, Soil quality, and Timber provision (Figures 6 to 10, respectively). The idea is to use the maps produced for building scenarios where ES are taken into account as ecological indicators in the policy instruments analyzed.

Erosion Control

Erosion control was modeled as a function of vegetation cover and soil erosion potential, following the methodology used by Egoh *et al.* (2008) and Maes *et al.* (2011). The European Environmental Agency (EEA) modeled soil erosion potential in the Mediterranean basin by deriving 3 erosion classes (low risk, medium risk, and high risk) from the combination of three sets of factors: soil, climate and steepness. We intersected the EEA soil erosion potential map the CLC forest classes (*i.e.* Broad-leaved forest, Coniferous forest, Mixed forest and Agro-forestry), in order to spatially identify forest ecosystems located in areas of different erosion risk. Assuming that all forest types considered have the same ability to curb erosion, we gave more weigh to forests located in areas with high erosion risk. Four classes were derived in order to represent the capacity of forest ecosystems to prevent erosion: no relevant capacity (non forest areas); low capacity (forest ecosystems situated in low erosion risk areas); medium capacity (forest ecosystems located in medium erosion risk areas); and high capacity (forest ecosystems situated in areas of high erosion risk).

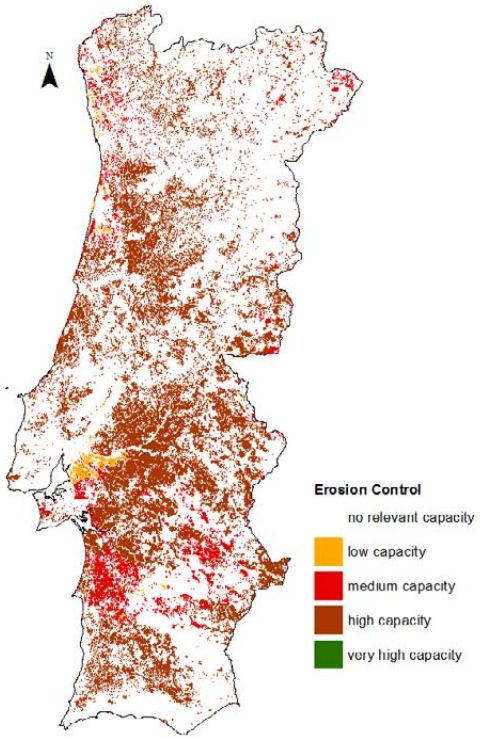


Figure 6 - Capacity of forest ecosystems to prevent erosion. Data source: CLC 2006; EEA 2003

Soil Quality Regulation

Soil quality regulation refers to the role ecosystems play in: i) maintaining soil's biota diversity and productivity; ii) in regulating water and solute flows; and iii) in nutrient cycling and storage (Layke, 2009). Soil organic matter is a vitally important attribute in providing energy, substrates, and the biological diversity necessary to sustain key soil functions (Franzluebbers, 2002). Following Maes *et al.* (2011) and UNEP-WCMC (2009) we used soil carbon content as an indicator to address the capacity of ecosystems to maintain the quality of soils. The soil organic carbon content map was obtained from European Soil Data Center[1] and is shown in Figure 7.

[1] http://eusoils.jrc.ec.europa.eu/library/esdac/index.html

Global Climate Regulation

Global climate regulation refers to the influence that ecosystems have on the global climate by emitting or extracting greenhouse gasses from the atmosphere. In the present work we focus on the role played by forest in global climate regulation by capturing and storing carbon dioxide. Two main indicators are commonly used to assess forest climate regulation services: carbon sequestration and storage. In this study, only carbon storage was mapped due to the lack of data to map carbon sequestration at national scale.

Carbon storage was mapped following Molin (2010). The author estimated values of vegetation carbon density for each CLC class based on data from The Portuguese National Inventory Report on

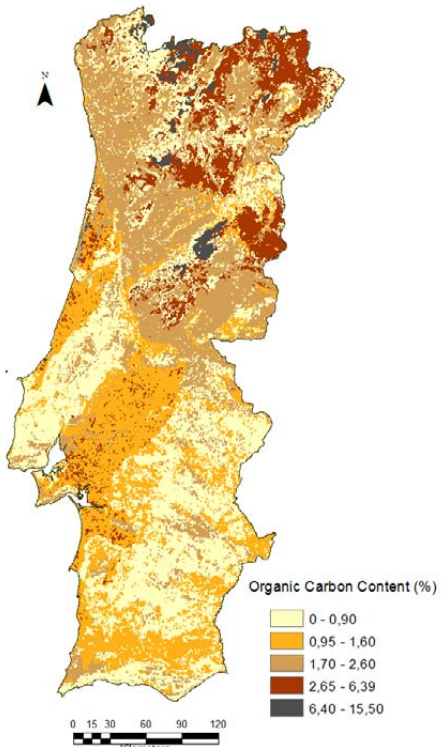


Figure 7 - Soil Organic Carbon Content. Source: ESDAC, 2005

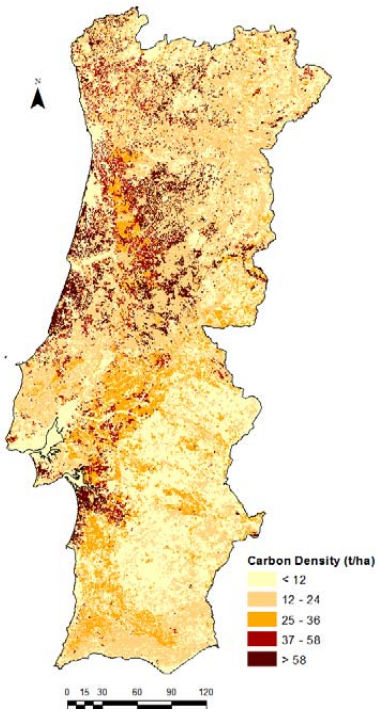


Figure 8 - Carbon density in ton/ha.

Greenhouse Gases[2] (both 1990-2007 and 1990-2004 versions), and on similar assessments done for other countries (Cruickshank *et al.,* 2000). Values of carbon density consider stems, branches, foliage and roots but do not include litter, microbial biomass and soil organic carbon.

[2] Ferreira, V. G., T. C. Pereira, et al. (2006). Portuguese National Inventory Report on Greenhouse Gases, 1990-2004 Submitted under the United Nations Framework Convention on Climate Change. Institute for the Environment, Amadora, Portugal.

Pereira, T. C., T. Seabra, et al. (2009). Portuguese National Inventory Report on Greenhouse Gases, 1990-2007 Submitted under the United Nations Framework Convention on Climate Change and the Kyoto Protocol. P. E. Agency. Amadora, Portuguese Environmental Agency.

Water Cycle Regulation

Water cycle regulation refers to the influence ecosystems have on water runoff, flooding, and aquifer recharge, specifically regarding the water storage potential of ecosystems or landscapes (Layke, 2009).

In this work we focus on a particular aspect of water cycle regulation, which is the influence of different land uses on soil water permeability. As data on direct indicators, such as water soil infiltration, was unavailable or not suitable for building a national scale map, we used Curve Number (CN) as a proxy indicator. The CN method (USDA-SCS, 1986) combines land cover and soil data to estimate the amount of runoff from a parcel of land. More specifically, it estimates the percentage of a precipitation event that will reach the stream network, ranging from 30 (forest and well-drained soil) to 98 (impervious surface) (Reistetter and Russell, 2011). Thus, we assume that the service Water Cycle Regulation is high where CN is low. The CN map for Portugal was obtained from the National Information System on Water Resources (SNIRH) and is presented in Figure 9.

Timber Provision

Timber provision considers the products derived from trees harvested from natural forest ecosystems and plantations (Layke, 2009). In this work, we assessed the capacity of forests to produce timber using as indicator regional timber standing stocks.

The National Forest Inventory provides data on standing stocks per Regional Forest Plans (PROF) (FloreStat, 2010). PROFs are sectorial instruments of regional administrations that establish the standards for use of forests in Portugal (AFN, 2009). The timber stock for each PROF division is presented in Figure 10.

2.2 Biodiversity policy goals, targets and key issues

As part of the EU all nationnal environmental policies related to biodiversity protection are influenced by european directives and their goals, such as the Habitats Directive or the Birds Directive. Additionally, Portugal has implemented the Natura 2000 Network, a pan-European network of protected area, which is considered the centerpiece of EU nature and biodiversity policy (EC, 2012). The overall goal of these policies is to maintain or restore the habitats and species at a favorable conservation status in their natural range.

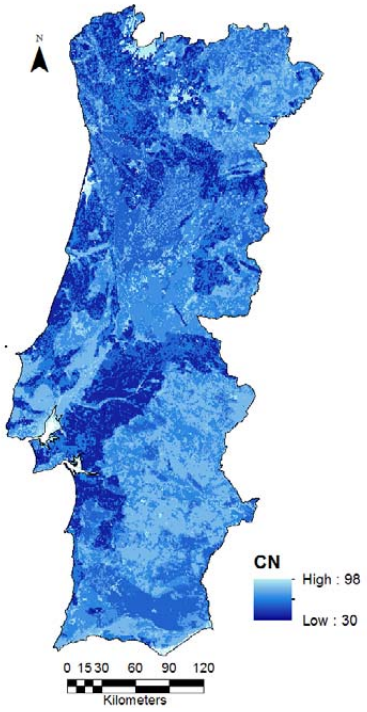


Figure 9 - Curve Number (express the amount of runoff from a parcel of land); Source: SNIRH, 2010

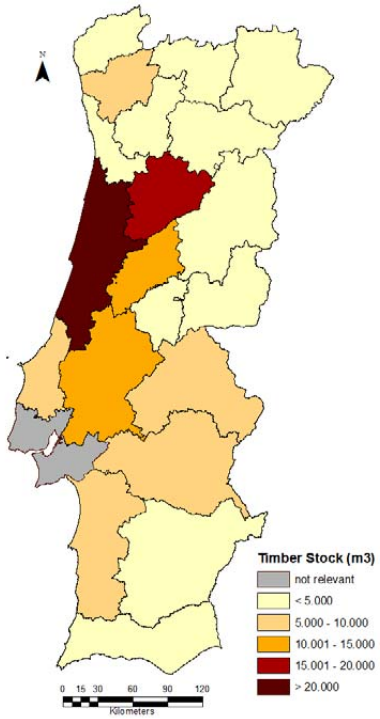


Figure 10 - Timber standing stock (m^3) per Regional Forest Plans (PROF). Data source: FloreStat 2010.

Besides the aforementioned Directives that explicitly target biodiversity conservation, other common directives have influence over national conservation targets, such as the Common Agriculture Policy (CAP) through subsidies for agriculture production and AEM. Some AEM are focused on reducing the process of land abandonment in rural areas, and in promoting conservation of agriculture extensive systems.

Changes in cultural values and public attitude towards the environment and its biodiversity are also likely to have a profound impact over the conservation of species (Prince, 1998), and, although slowly, they are observed in Portugal. Portugal has taken several actions in order to reverse the negative biodiversity trends observed in the past few years. In a broad scale, the country has taken part in several international agreements for environmental conservation, such as The Convention on Biological Diversity, the Ramsar Convention, as well as the CITIES and the BONA conventions.

At the national level, the National Strategy for Nature and Biodiversity Conservation (NSNBC) has been the most important reference document for biodiversity policy in Portugal. The strategy was adopted in 2001 (Resolution of the Ministries Council nº 152/2001, October 11th) and defines the fundamental principles, objectives and lines of action for nature and biodiversity conservation until the year of 2010. The Portuguese Government expected that the NSNBC could be a reference not

only for public bodies, but also for private actors such as citizens and representative associations, whose contribution is crucial for materializing the conservation objectives pursued.

The NSNBC was created in response to the Environmental Law from 1987 (*Lei de Bases do Ambiente*, Law nº 11/87, April 7th), which predicted the creation of a national strategy for nature conservation, and took into account the international compromises assumed under the Convention on Biological Diversity (CBD). The NSNBC was considered the most important strategic tool to achieve the European Community goal to "halting the loss of biodiversity by 2010 and sustaining ecosystem services for human well–being" (EC, 2006).

The NSNBC is structured in ten strategic options:

1. Promoting scientific research and knowledge about the natural patrimony, as well as monitoring species, habitats and ecosystems
2. Create a Fundamental Network for Nature conservation and the National System of Classified Areas by integrating the National Network of Protected Areas
3. Enhancing protected areas and ensuring the conservation of their natural, cultural and social patrimony.
4. Conserving and enhancing the natural patrimony of sites integrated in the Natura 2000 Network
5. Developing all over the national territory specific actions for conservation and management of species and habitats, as well as actions for safeguarding and enhancing landscape features and geological, geomorphologic and paleontological aspects.
6. Integrating nature conservation and principles for sustainable resource utilization in Spatial Planning and Sectorial policies.
7. Improving cooperation between central, regional and local administration.
8. Promoting environmental education
9. Raising awareness and ensuring information and participation of public and private actors.
10. Intensifying international cooperation.

The document contains a detailed explanation of each objective mentioned, as well as priority actions to be implemented in order to achieve them. However, proper quantitative and/or qualitative targets (*e.g.* percentage of the territory under protection networks; population size of endangered species) are not specified.

The NSNBC has been last evaluated in 2009 (mid-term evaluation). A full revision has started in 2011 and is still ongoing.

2.3 Historical policy context

Until the 1980's, forest policy in Portugal focused on promoting new plantations, namely through national incentive programs such as the Forestry Development Fund and the Portuguese Forest Project implemented in partnership with the World Bank. As a result, there was an expansion of public and private forests (*e.g.* pine and eucalyptus forests), especially in the North and Central regions of the country. During this period, the main policy strategy for biodiversity conservation was the establishment of ecological reserves by restricting public and private land uses in areas of ecological interest.

Economic instruments for forest management and biodiversity conservation were introduced after the country joined the EU in 1986. These were typical European subsidy-based instruments, such as AEM. In fact, joining the EU pushed Portugal to design a set of structural policies to modernize agricultural and forest sectors. The successive Community Support Frameworks played an important role in national policymaking process in regard both to regulative and economic instruments.

The first Community Support Framework (1989-1993) was partially used to finance the Forest Action Program, which aimed to promote afforestation, improve existing forests, recover degraded stands, prevent fires, promote multiple uses of forests, as well as to stimulate timber production and certification (Soveral, 1996).

The second Community Support Framework (1994-1999) financed the Forestry Development Program and the implementation of measures considered compulsory by the CAP, such as AEM and forestation of agricultural areas. The implementation of AEM through the CAP initiated in the late 1980s, however, it was only in 1992 that the *Council Regulation EEC no. 2078/92* stipulated that all Member States were required to implement agri-environment programs in their territories.

AEM in Portugal have focused simultaneously on protecting environmental values, and tackling social issues that affects rural areas, such as land abandonment. To achieve these objectives, following policies started to recognize the central role of landowners as land managers and proactive actors. By recognizing agriculture as a multifunctional land use (*i.e.* not limited to the production of marketable products, but also able to offer other goods and services) these measures introduced a key political change in Portugal: the integration of biodiversity conservation and the ecosystem service concept into agricultural and forest policies.

AEM had high participation levels and investment in this period, particularly favoring the shift of agricultural areas (low productivity or small size) into forest areas. New techniques for forest

management and new species that came along with these measures also had an influence on following policies, however, not always positive.

The CAP reform that took place in 1999, known as the "Agenda 2000", strengthen the incentives for forestation in agricultural areas, as it recognized the key role of forests for biodiversity and landscape conservation, as well as for climate regulation. Also, deprived areas (*i.e*. areas in disadvantage due to physical and/or natural characteristics) and areas with environmental restrictions (*e.g.* areas under the Natura 2000 network) received reinforcements in compensatory subsidies.

The third Community Support Framework (2000-2006) approved the Plan for Agriculture and Rural Development that includes, among others, the AGRO (Operational Plan for agriculture and Rural Development) and the RURIS (Rural Development Program for Portugal 2000-2006). AGRO encompassed a diverse set of incentives designed to foster a strong alliance between agriculture as a modern and competitive activity, and sustainable development of rural areas in its environmental, economic and social dimensions. RURIS intended to enhance economic competitiveness of agroforestry activities, safeguarding environmental values and social cohesion, incentive multi-functionality of farms, and strengthen farmer's initiative and association. Both initiatives had a strong focus on forestation; however, agri-environmental measures were specifically applied through the RURIS program.

Table 1 summarizes the scope of the aforementioned instrument in terms of approved projects, approved investment, and forested area. The data show that Regulation CEE 2080/92 approved much more projects than the other instruments, however, it was under the AGRO that investment were higher. Nonetheless, the instrument that most contributed for increasing and improving management of forest areas was, by far, the Forest Action Program.

Table 1 - Outcomes of applied economic instruments in Portugal until 2005, according to the number of projects, investment approved and new forest areas.

Program	No. projects	Investment (€)	Forestation (Hectares)
Forest Action Program	2.140	159.057.330	325.344
Reg. CEE 2328/91	390	9.239.066	15.146
Forest Development Program	4.498	130.469031	226.262
Re. CEE 2080/92	7.075	164.696.241	173.343
AGRO*	3.496	271.213.578	133.420
RURIS*	2.073	47.488.230	33.021
Total	**19.672**	**782.163.476**	**906.536**

Source: (National Forest Strategy, 2006); *data available until 2005

Another relevant economic instrument for forest conservation is the Permanent Forest Fund, which is a system of incentives created in 2004 in order to support forestry. This initiative is funded entirely by the Portuguese national budget, mostly by a tax on oil products, and aim to integrate the funding from both the National Strategy for Forests and the National Plan for Defense Against Forest Fires. Most of its resources have been allocated to municipalities in order to promote fire prevention and firefighting actions. However, recent changes in this instrument structure encourage the support of new forest certification schemes as well as existing schemes, such as the Forest Certification Council (PEFC) or the Forest Stewardship Council (FSC).

Following, in 2006, it was created the Portuguese Carbon Fund aiming to finance projects to reduce greenhouse gas (GHG) emissions, thus contributing to comply with the limit values established by the Kyoto Protocol. The Fund's budget of €354 million for the period of 2008 to 2012 should be used, among others, to finance afforestation or reforestation projects that lead to a reduction or removal of 5.000 ton of CO_2 equivalent until December 13th 2012. However, from twelve submitted projects to date, only one was related to forest plantation and it was rejected.

In 2007 a new economic instrument specifically relevant for biodiversity conservation was introduced in Portugal with the restructure of the Local Finances Law (LFL – Law 2/2007, 15th January). This law establishes the general principles and rules for the transfer of the State fund (national government) to the local level (municipalities) (Santos *et al.*, 2012). Since 2007, it incorporates an ecological criterion (*i.e.* it positively discriminates municipalities with land classified under conservation networks in the allocation of funds), which aims to compensate municipalities for the restrictions imposed by biodiversity conservation actions. Therefore, the LFL ecological criterion corresponds to an ecological fiscal transfer.

Going back to AEM, on the forth and current Community Support Framework (2007-2013), the National Rural Development Program 2007–2013 (ProDer) was created. This national strategy aims to increase the competitiveness of agricultural and forestry sectors, promote sustainable use of rural areas and natural resources, as well as to revitalize rural areas, both economically and socially. Several agri and silvo-environment actions are encompassed by this program, as it will be discussed later (see Section 4.4). With special regards to forest, the program prioritizes the maintenance and improvement of existing forest areas, and also includes measures targeting the conversion of agriculture areas into forests.

In 2009, the Portuguese government created the Fund for Nature Conservation and Biodiversity in order to finance initiatives that support management of the Fundamental Network for Nature Conservation. The idea is to promote nature conservation through economic valuation of biodiversity

and ecosystem services, and the implementation of this instrument was a clear step towards meeting the goals established in the National Strategy for Nature Conservation and Biodiversity from 2001. Among several objectives, the Fund aims to create, or contribute to, specific financial mechanisms that support entrepreneurship in classified areas of high relevance for nature and biodiversity conservation. The Fund may establish joint financing mechanisms with other public or private funds, national or international, related to the development of mechanisms for economic valuation of ecosystem services, namely market-based instruments or biodiversity offsets and banking.

Following, it is presented a timeline of the economics instruments and regulation policies for biodiversity conservation and forest management described in this section.

Table 2 - Timeline of economics instruments and regulation policies in Portugal for biodiversity conservation and forest management

DIRECT REGULATION	YEAR	ECONOMIC INSTRUMENTS
National Ecologic Reserve	1983	
1986 Portugal's adhesion to the EU		
Fundamental Law on Environmental Policy	1987	
	1991	Forest Action Program (1991-1993) Regulation (EEC) 2328/91
National Network of Protected Areas	1993	
	1994	Forestry Development Program (1994-1999) Regulation (EEC) 2080/92 and 2078/92
Fundamental Law on Forest Policy	1996	
Natura 2000 Network	2000	AGRO (AEM, 2000-2006) RURIS (AEM, 2000-2006)
National Strategy for Biodiversity and Nature Conservation	2001	
	2004	Permanent Forest Fund
National Strategy for Forests	2006	Portuguese Carbon Fund
	2007	ProDer (AEM, 2007-2013) Local Finances Law (LFL)
Fundamental Network for Nature Conservation Natura 2000 Network Sectoral Plan	2008	
Forest Code	2009	Fund for Nature Conservation and Biodiversity

2.4 Choosing instruments for analysis

In Portugal policies regarding forest and biodiversity conservation are mainly based on regulation, typically command-and-control instruments. The Portuguese legal regime for the conservation of nature and biodiversity, on the application of Decree-Law No. 142/2008, establishes the Fundamental Network for Nature Conservation (RFCN) and envisages the establishment of the national register of natural classified values. This network includes Natura 2000 sites and the national network of protected areas, such as natural parks.

Direct regulations play an important role in the policymix for environmental conservation because, by prohibiting certain action, they can stop environmentally harmful activities and safeguard a minimum level of conservation in rather short time. However, the demarcation of protected areas creates several restrictions to land use both for private actors and public actors, who then have to bear the costs of conservation.

Usually, conservation costs are unevenly spread, with some municipalities and landowners facing land-use restriction related to protected areas, whereas other are free to promote business and economic development (Ring, 2008). In this case, compensatory measures are required for reconciling the local costs and global benefits of biodiversity conservation. A variety of economic instrument can play this role, and their selection should take into account who bears the costs (public or private actors) and who benefits from conservation (Ring and Schröter-Schlaack, 2011).

This report aims to Identify and characterize economic instruments that address both types of actors, and to explore how their roles in the policymix could be enhanced. AEM (*i.e.* measures designed to encourage farmers to protect and enhance the environment on their farmland) are the first instrument selected, since they are specifically directed to private actors (landowners). EFT integrating the annual transfers from the national general budget to the municipalities (Local Finances Law - LFL), are the second instrument selected as they were designed in order to compensate public actors (municipalities) for land-use restrictions imposed by protected areas and Natura 2000 sites.

3 Role of existing economic instruments

Since biodiversity threats are variable and shall be addressed through different approaches, specific responses have been implemented. The impacts derived from agriculture have been tackled with the implementation of AEM, which promote sustainable management of ecosystems and the maintenance of traditional agriculture practices. High public investment has been applied in the prevention and combat of fires, one of the major threats to Portuguese forests. Other relevant initiatives are the increase in the control of invasive species, the efforts to integrate the tourism sector in environmental policies, and the increase of requirements of Environment Impact Evaluations for a variety of public and private projects (Proença *et al.*, 2009).

3.1 Direct Regulation

Public policies for biodiversity conservation in Portugal date back to the 1980's, and have focused on the widespread strategy of removing areas from economic and territorial development processes in order to preserve them, thus benefiting nature and communities. This rationale of using command-and-control instruments for biodiversity conservation that limit or restrict activities and land use still prevails nowadays. Species and their habitats have been on the spotlight of national conservation efforts.

With the growing of human pressures leading to increasing fragmentation of ecosystems, it was perceived that the protection of relatively isolated areas, even large ones, does not guarantee the preservation of key natural values. Conservation policy was then redesigned to manage those areas as a whole, synchronized with land-use planning policies, which created higher complexity and potential conflict, but also pushed for transparency and active involvement of all actors in the decision-making process, avoiding or minimizing the loss of natural, social and economic values.

As previously described in chapter 2.4, several direct regulation instruments regarding biodiversity conservation and forests are in play in Portugal, however, this chapter will only focus on the ones that directly affect the economic instruments subject of analysis (EFT and AEM). For this purpose, three key regulation instruments will be briefly described: i) the Legal Framework for Nature Conservation and Biodiversity; ii) the Natura 2000 Network Sector Plan; and iii) the Regional Plans for Forest Planning. These three instruments are highly relevant due to their roles in establishing conservation areas, defining land management rules and rights, and restricting land use change in forest areas.

3.1.1 Legal Framework for Nature Conservation and Biodiversity

The Legal Framework for Nature Conservation and Biodiversity (Decree-Law n. º 142/2008 of 24 July) regulates the new Fundamental Network for Nature Conservation (RFCN), reorganizes the management of classified areas, foresees the introduction of new economic instruments, and set up a connection with other land use instruments. This framework does not establish any quantitative targets regarding the share of the national territory that should be under conservation networks. The document is restricted to general objectives, such as: promoting conservation and sustainable use of biodiversity and natural values; and reinforcing the mechanisms for Portugal commitments to the European Union and United Nations (*i.e.* halting biodiversity loss until and after 2010).

Classified areas in Portugal are defined by the RFCN, comprising: a) National System of Classified Areas (SNAC), which includes the National Network of Protected Areas (RNAP), the Natura 2000 Network and all other areas classified under international commitments; and b) Continuity areas, which includes the National Ecological Reserve, the Hydrologic public domain and the National Agricultural Reserve (Figure 11). The main goals of continuity areas are to promote the spatial continuity of other classified areas, the connectivity of biodiversity values throughout the country, as well as proper integration and development of human activities. Classified areas for nature conservation in Portugal sums up to about 22% of the mainland, but some areas wholly or partially overlap.

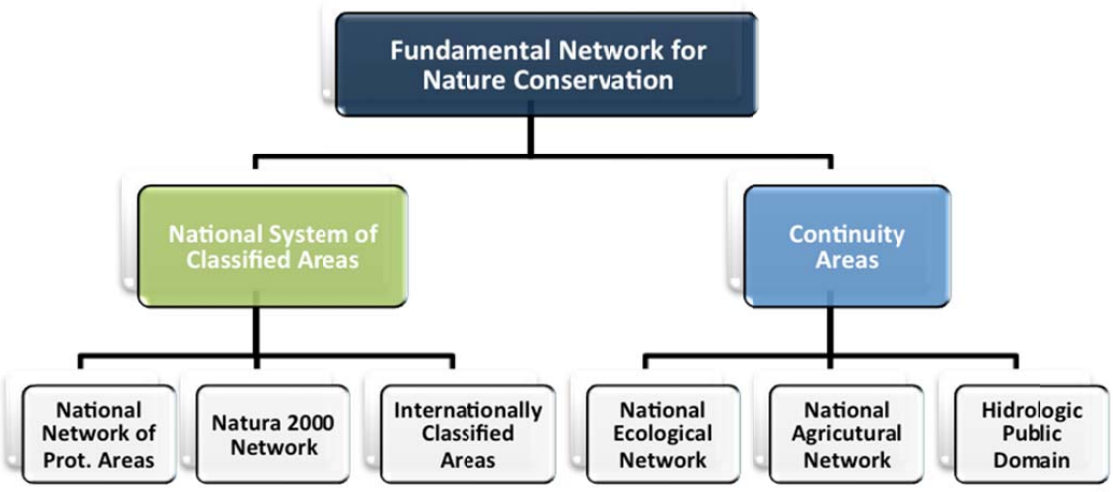


Figure 11- Fundamental Network for Nature Conservation

The Legal Framework for Nature Conservation and Biodiversity also introduced the creation of private protected areas, which can also be classified and become part of the National Network of Protected Areas. In this case, the area will be subjected to a management protocol agreed with the national authority, following its classification. This process does not grant private owners with any

special rights, nor limits land use and management in place. The classification of private areas is maintained while the biodiversity values and nature conservation goals that granted the classification remain.

The management of classified areas continues to be primarily a public responsibility (Table 3), however the new regime introduces the following concept: "the management tasks of protected areas at national, regional or local level, as well as the implementation of conservation measures or active support, can be assigned to public or private "(Article 13th).

The national authority promotes the participation of local authorities, private sector, organizations representing civil society and other public bodies in the exercise of conservation actions and funding the National System of Classified Areas, when such participation is possible, appropriate and useful to the defined conservation goals.

Table 3 - Legal authorities for biodiversity conservation in Classified Areas

<table>
<tr><td>Institute for Nature and Biodiversity Conservation</td><td colspan="2">Manage Classified Areas of National scope</td></tr>
<tr><td>Associations of Municipalities</td><td>Manage Classified Areas of Regional scope</td><td rowspan="2">Participate in the management of protected areas of national scope, by integrating the strategic advisory boards.</td></tr>
<tr><td>Municipalities</td><td>Manage Classified Areas of Municipal scope</td></tr>
</table>

The Legal Framework for Nature Conservation and Biodiversity also foresees the creation of the Fund for Nature Conservation and Biodiversity (implemented by Decree-law 171/2009, August 3rd), in order to support an appropriate management of fundamental infrastructures that support nature conservation, namely areas that make up the Fundamental Network for Nature Conservation, by allocating resources to projects and investments. This includes environmental education, scientific research, participate in market-based instruments, sponsor private entrepreneurism and promote habitat and species protection. This instrument is partially funded by the Portuguese national budget, but also by taxes, donations, funds resulting from environmental compensations instruments (e.g. Environmental Impact Evaluation), and other diverse sources.

In addition, it introduces visiting fees (implemented by Ordinance nº 1397/2009 October 13th) to the access of areas under the National System for Classified Areas, as well as to the use or consumption of any goods or services by private agents, to patrimonial revenues, and revenues from marketing or brands related with them.

There is also a serious effort of articulation with other land use policy instruments, such as the Regional Land Use Plans, Sector Plans and Special Land Use Plans, in order to favor the connectivity of classified areas, improving the ecological quality and territorial sustainability of the entire network.

3.1.2 Natura 2000 Network Sector Plan

Another important instrument for biodiversity conservation, with particular emphasis on Natura 2000 Network, is the Natura 2000 Network Sector Plan, approved by the Resolution of the Ministers Council nº 115-A/2008 of July 21th. This instrument implements the national policy for conservation of biological diversity, which aims at safeguarding and developing the existing Sites of Community Interest (SCI) and Special Protection Areas (SPA), establishing guidelines for management and other standards, which compliance with shall be the responsibility of central and local governments.

The Plan also establishes a set of management guidelines for each one of the SCIs and SPAs, grouped by themes and including specific procedures (e.g. direct management of species or habitats) depending on the geographic areas of the natural values that were the basis of their classification, their ecological requirements and conservation goals associated with those values. By doing so, it can manage at a macro scale and national level, the uses and management regimes compatible with the maintenance of classified areas in a favorable conservation status, under which the SICs and the SPAs were created, thus assuring a sustainable use of the territory and an effective protection of biodiversity values.

3.1.3 Regional Forestry Plans (PROF)

The PROF, regulated by Decree-Law no. 204/99 of June 9, are in play for twenty years, and are policy instruments for the management of forest areas, public and private (> 100ha), and intend to frame and establish specific rules of occupation, use and forest planning and management, to ensure their protection and increase their productivity. Currently the country is organized in 21 forestry regions, each one with an approved PROF.

This instrument fits the guidelines of forest policy provided by other levels of planning and policy making, including the Fundamental Law on Forest Policy and the National Strategy for Forests, but it also links up with instruments and policies of other sectors, such as agriculture or land use planning. In this sense, it provides the appropriate institutional and technical framework to minimize conflicts related to land use categories and competing forestry models in the same territory.

PROF three main goals are: (1) assess the potential of forest areas; (2) define the list of species to focus on the actions of expansion and conversion of forests; and (3) define critical areas regarding

fire risk, sensitivity to erosion and ecological, social and cultural importance, as well as specific rules for forestry and sustainable use of resources to apply in these areas. The plans have a multifunctional approach, integrating the functions of timber production, protection of landscape and conservation of habitats, flora and fauna, but also activities such as grazing, hunting, fishing and recreation.

As sector instruments of land use management, the PROF are based on a combined and interconnected approach of technical, economic, environmental, social and institutional features, involving all the actors directly engaged, to establish a consensual strategy for forest management and use. For this purpose the preparation of each plan included an active participation of representatives from central, regional and local governments as well as non-governmental organizations with direct interest in forest resources, meeting at a Joint Coordination Committee. Were also held several information sessions at the stage of public consultation, to improve the final version of these plans and reconcile the competing interests.

3.2 Sector-wise economic instruments that may affect conservation

Many environmental problems, such as the ones related to biodiversity conservation, can only be solved through consistent measures taken by government authorities in cooperation with the business sector and civil society. Governments are responsible to develop coordinated policies that integrate biodiversity concerns into each one of the key ministries actions, such as finance, trade, industry, energy, transport, agriculture and health. Besides, it is essential to involve different levels of governance (*i.e.* national, regional, and local) to ensure the successful development and implementation of coherent conservation policies.

Taking into account the complexity and multi-sector nature of biodiversity conservation problems, conservation policies may require the combined use of different instruments. Usually, frameworks and guidelines are combined with a variety of other tools, as for instance emissions trading licenses, incentives based on information such as labeling or establishing construction standards. The private sector and civil society have an important role in shaping these instruments in a way that combined they can potentiate each other.

Following, several sectorial instruments that influence or potentially affect biodiversity conservation policies are presented (Table 4), although only some of them are directly linked to the economic instruments selected for the present work. They are briefly described in the following pages, as well as their connection to AEM and EFT.

Table 4 - Sectorial instruments potentially affecting conservation

Sectors	Activities	Instruments (examples)
Food Production	• Agriculture • Livestock • Fishing	PRODER Program Agro-environmental measures
Land-Use Policy	• Urban areas and Rural areas • Forests	Land Management Plans for Protected Areas
Tourism		Projects of potential national interest or of strategic importance (PIN+)
Industrial production	• Timber	Certification of Sustainable Forest Management (GFS)
Energy and climate change	• Biofuels	National Program for Climate Change (PNAC)
Water management		River Basin Management Plans

3.2.1 Land-Use Policy

Instruments for land use management recognize natural systems, as well as their resources and natural values essential to a sustainable use of the territory, and establish basic measures and thresholds to ensure the renewal and enhancement of natural heritage. In Portugal, the evolution of land-use policy, particularly for biodiversity conservation and forest planning, resulted on an increasing number of instruments, which is a consequence of differences both in the territorial scope of action and on specific objectives of each plan.

The rules for land use policy were established in 1998 by the Fundamental Law on Land-use Planning and Urbanism, which organization is shown in Table 5.

The increased complexity introduced into land use policies has reduced clarity and awareness of all actors involved, affecting particularly the ability to identify existing rules and guidelines for land use planning and operational management of a given sector, or of a determined geographical area. This situation has particular impacts on AEM, as it introduces additional problems for landowners to assess their feasibility to funded measures, and because some land use instruments conflict with the available measures.

Table 5 - Land-use planning instruments in Portugal

Instruments	Role	Actors
National/ Regional		
National Program for Land Use Policy	Establish the main options for land use planning on national territory, and connect them with strategic tools of other relevant sectors. It also aims to cooperate with EU's land use plan.	Public
Special Land Use Plans (e.g. Land Management Plans for Protected Areas, Land Use Plans for Estuaries)	Protection and integrity of the biophysical space, enhancement of existing resources and the conservation of environmental and landscape values. Land use is conditioned or prohibited, by several criteria, including biodiversity conservation.	Public and Private
Sector Plans (e.g. Natura Network 2000 Sector Plan; Forestry Regional Plans)	Programs and strategies for the various sectors of central government. Among the currently applied are Forestry, Environment, Agriculture, Transports, Energy and geological resources and Tourism.	Public
Regional Land Use Plans	Regional strategy for land use development, integrating the options set out at national level and municipal strategies for local development. Outlines the framework for the development of municipal plans for land use planning.	Public
Municipal		
Inter-municipal Territorial Plans	Ensure coordination between regional and municipal plans, thus correcting regional imbalances	Public
Municipal Plans for Land Use Planning (e.g. Municipal Master Plans, Plans of Urbanization)	Establish the parameters for land use and land occupation, suitable for conservation and enhancement of natural resources and values	Public and Private

Another impact of this multiplicity of planning tools is on species management, such as pine trees, which can be simultaneously covered by 20 different plans, from regional forestry management plans, municipal master plans, watershed plans and several other (National Forest Strategy, 2006). Besides the obvious difficulties in applying all goals and measures established in the several existing plans, in some cases they are also conflicting. Moreover, there is an overlap of managing and responsible institutions, which are currently distributed by the ministries of agriculture and environment, economy, national administration, among others. Depending on the activity, a forest owner may have to deal with several institutional bodies, considering only the central government.

3.2.2 Climate Change

In 2006, through the Resolution of the Council of Ministers nº 104/2006 of 23 August, the Portuguese government approved the National Program for Climate Change (PNAC 2006). The PNAC

2006 was developed to meet the country's GHG reduction commitments under the Kyoto Protocol and the EU Burden Sharing Agreement, and to anticipate impacts of climate change and propose adaptation measures to reduce negative impacts. Among others, PNAC's objectives are strengthening the Portuguese Carbon Fund budget, and creating policies and measures to act in the following sectors: Energy, Transport, Fluorinated Gases, Agriculture and Livestock, Forestry and Waste.

With special regards to forestry, the PNAC 2006 comprises one single measure, which is to improve forest management of existing stands taking as a reference date December 13th 1989. For this purpose, Portugal decided to adopt Forest Management activities predicted in the Article 3.4 of the Kyoto Protocol, using the agreed total limit for Portugal at a maximum of 800 Gg CO2e. This measure adds to a previously measure for creating new forest areas, implemented by the PNAC 2004.

The values of forested areas used in the baseline scenario and on projections for new plantation areas are based on goals and targets set in the PROF, and the data used refers only to new afforestation under AEM. In PNAC 2006, data referred to the measure *Sustainable development of forests,* of AGROS program and measure *Afforestation of Agricultural Land,* of RURIS program. This option is a clear incentive to implementing and executing agri-environment funds specifically for new forest areas, as they are essential for Portugal to comply with its national obligations regarding climate change.

3.2.3 Water Management

Synchronizing national strategies for water management and biodiversity conservation is, among other similar initiatives for intersectorial convergence, a goal of the Environmental Ministry. This link is observed, for example, in challenges involved in maintaining and restoring ecological quality of rivers or and protecting wetlands.

In this context, the Portuguese Water Law (Law nº 58/2005, December 29th) includes in its Article 29 the implementation of River Basin Management Plans, which are sectorial instruments aimed at managing, protecting and enhancing environmental, social and economic value of water, considering the river basin unit. These plans take into account the geographic location of areas classified under conservation networks, as well as their specific environmental objectives, which are usually more demanding than global objectives established by River Basin Management Plans.

The measures included on these instruments are tailored to the reality of each sector in order to facilitate their direct application or integration into other planning instruments. Despite their ultimate goal of protecting water resources, both quantity and quality, they also support nature

conservation and biodiversity. For that matter it is relevant to highlight measures for wild bird conservation and those related to conservation of natural habitats and wild flora and fauna.

The Water Law also foresee the development and implementation of Complementary Measures to the River Basin Management Plans, which are measures that aim to protect and enhance water resources by providing the opportunity to develop different types of interventions. Those include measures to protect and restore the hydrological network, the rehabilitation of degraded streams and their riparian zones, as well as the preservation of protected aquatic and riparian species and habitats. In addition, there are measures directed to the conservation of coastal areas, estuaries, and wetland.

Municipalities are responsible for applying these conservation measures in coastal areas and estuaries, while landowners are responsible for applying them in urban areas and other private areas. In other cases, such as public protected areas, the application of the programmed measures relies on the government body of competence in the referred area or a representative.

Although the need for water management is explicitly recognized, supports provided under the ProDer are almost exclusively aimed at collective infrastructures, mostly of public nature, and therefore, not directed to the private sector. This is reflected on *measure 1.6 - Irrigation and other collective infrastructure*, which aims at increasing water availability, to cope with irregular rainfall distribution, reduce the pressure on water usage and to ensure its efficient use. The activities supported under this measure are selected taking into account their global water consumption, but also the suitability with more efficient methods of irrigation, such as drip irrigation, and the effectiveness of water usage.

The overall goal of this link between instruments is to ensure water availability through the ProDer program, and align it with biodiversity conservation.

3.3 Local Finance Law (Ecological Fiscal Transfers)

Fiscal transfer schemes redistribute public revenues from national and regional governments to local governments aiming to provide the latter with financial resources to fulfill their local public functions, and to help reducing fiscal inequalities (Boadway and Shah, 2007). Usually, the redistribution of public revenues to lower levels of government is based on socioeconomic indicators, reflecting the acknowledged relevance of the associated public functions. However, if ecological indicators are also considered, intergovernmental fiscal transfers can be an effective instrument to support the local provision of ecological goods and services with spillover benefits (Ring, 2002; Köllner *et al.,* 2002; May *et al.*, 2002; Ring, 2008a, b).

EFT are distributed according to ecological or conservation-based indicators, and allocated in the form of lump-sum or specific-purpose transfers (Ring *et al*., 2011b). They can compensate for the opportunity cost resulting from land-use restrictions and/or for local public expenditure on conservation actions and, for these reasons, are considered an innovative instrument to incentive local governments to enhance the quality of conservation areas within their territories, while also providing ecological benefits that flow beyond municipal boundaries (Ring, 2008a; TEEB, 2011).

Portugal has recently implemented EFT integrated in the annual transfers from the national general budget to the municipalities in order to compensate them for land-use restrictions imposed by protected areas and Natura 2000 sites. This instrument was introduced with the approval of a revised Local Finances Law (LFL – Law 2/2007, 15th January), which establishes the general principles and the rules for the transfer of funds from the State (national government) to the local level (municipalities).

The newly introduced Article 6 of the LFL, which is dedicated to the promotion of local sustainability, establishes that '*the financial regime of municipalities shall contribute to the promotion of economic development, environmental protection and social welfare*'. This general objective is promoted by several mechanisms, with special regards to a positive discrimination of the municipalities with land classified as Natura 2000 Network or other national protected areas in the allocation of funds.

In fact, the total area under protection and the percentage of municipal land occupied by protected areas are the only ecological criteria at play in this law. They are part of the set of indicators used to determine the distribution of the General Municipal Fund (FGM) (see Figure 12), which is allocated to municipalities as following:

- 5% is equally distributed to all municipalities;
- 65% is allocated as a function of population density (weighted in order to benefit less populated municipalities), and of the average number of stays in hotels and camping grounds;
- 30% is distributed considered the municipalities' topography and land surface under conservation networks:
    - 25% is distributed in proportion to the area weighted by elevation levels, and 5% proportionally to the land surface classified as Natura 2000 or other protected areas, in municipalities with less than 70% of their territory under conservation networks.
    - 20% in proportion to the area weighted by elevation levels, and 10% proportionally to the land surface classified as Natura 2000 or other protected areas, in municipalities with more than 70% of their territory under conservation networks.

The principle adopted for this intergovernmental fiscal transfer is non-earmarking, meaning that beneficiaries (local governments) are free to decide upon their use.

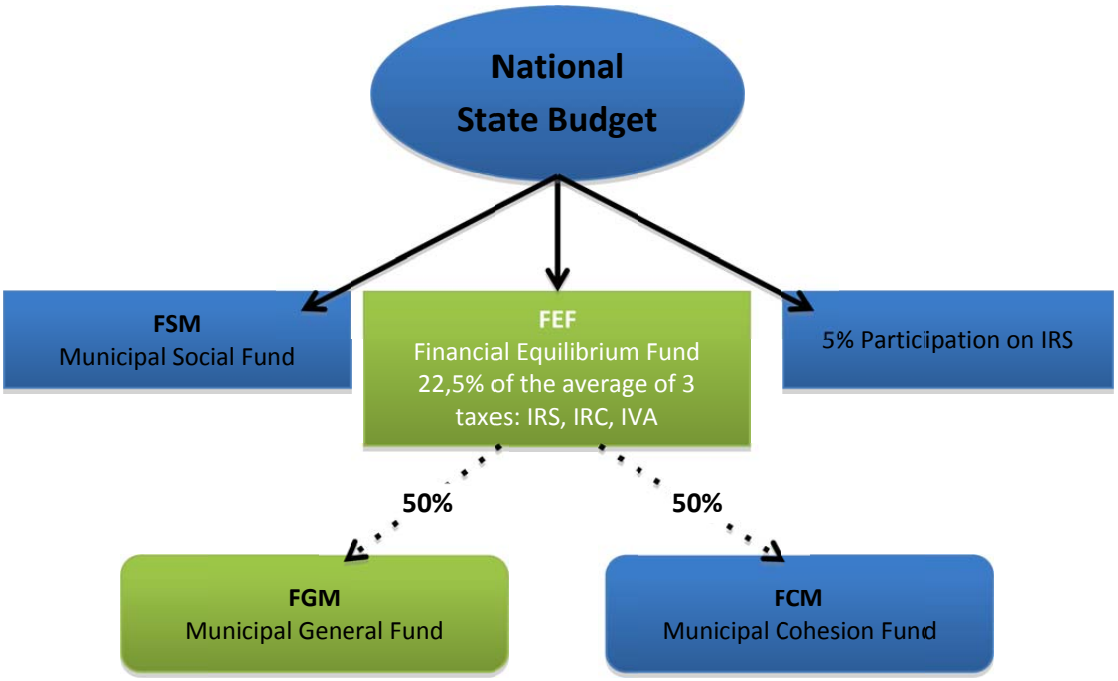


Figure 12 - Representative scheme of the allocation of State funds to municipalities

3.4 Agri-environment measures

AEM consist of payments made to farmers who commit themselves to adopt environment-friendly farming practices that go beyond legal requirements. Payments provided compensate for additional costs and income foregone resulting from employing environment-friendly practices stipulated in agri-environment contracts. The overall goals of this policy are preserving the environment and maintaining the countryside (European Commission, 2010).

Agri-environment schemes are compulsory to all EU Member States and are included in the Rural Development Program of each country. Measures are designed at national or local level in order to allow adaptation to different contexts (European Commission, 2010). However, proposed measures must be approved by the European Commission before integrating national Rural Development Programs.

The majority of agri-environment initiatives in Portugal have focused on promoting extensification and/or maintenance of traditional agricultural systems. They aim at protecting the environment, as well as alleviating social and demographic trends that has been threatening Portuguese rural areas

(Patricio *et al*., 2008). Currently, AEM are implemented as part of the ProDer (Rural Development Program 2007-2013), which is divided in four subprograms:

1) Competitiveness
2) Sustainability of rural areas
3) Revitalization of rural areas
4) Knowledge and skills

The three first subprograms are directly related to objectives set out in the national strategy for rural development, which are: i) improving the competitiveness of agricultural and forestry sectors; ii) promoting sustainability of rural areas and natural resources; iii) promoting social and economic revitalization of rural areas (ProDer, 2011).

Subprogram 1 contains measures to foster competitiveness of agriculture and forest sectors. Thus, financial incentives provided aim, among others, to improve necessary infrastructure, to innovate and develop business structure, to increase the value of high quality products, and to promote cooperation between companies in order to increase their access to markets. Subprogram 2 is the axis concerning the sustainability of rural environment, thus, it incentives environment-friendly production methods, promotes biodiversity conservation, and supports the protection of natural system of high environmental value and landscape integrity. Subprogram 3 aims to improve life quality through interventions to diversify the economy and create new job posts, infra structure and technological development, improving governance, and implementing specific local development strategy.

Subprogram 4 consists of crosscutting actions necessary to the implementation of ProDer measures, and consequently to the success of established national strategy objectives. This axis is specially focused on measures for knowledge development and capacity building.

Beneficiaries of ProDer actions can be natural person, such as individuals carrying out agriculture and forestry activities, and private legal entities, as for instance: companies, association of producers, cooperatives, NGO, and technology centers within the agricultural and forestry sectors. Some measures (*e.g*. Measure 3.2 Improving the quality of life; Measure 1.6 Irrigation systems and other collective infrastructures; Measure 4.1 Cooperation for innovation) are also accessible to public entities, such as public administration bodies and public research institutions.

Currently, the ProDer contains only two AEM that have been submitted and approved by the European Commission, both included in subprogram 2: a) Measure 2.2 Improvement of production methods - targets farmers countrywide; b) Measure 2.4 Integrated Territorial Interventions - consists of actions specifically designed to address local environmental concerns. The ProDer also

encompasses other measures that are not considered part of the EU agri-environment program, but which have the potential to contribute to environment conservation through protection of forests and biodiversity (*e.g.* Measure 2.3 Management of forest and agro-forestry areas). In addition, several measures are not direct linked to agri-environment objectives, but may also influence the well functioning of agri-environmental commitments through action such as: promoting knowledge, capacity building, and diversification and development of economic activities in rural areas.

Measures description

Following, it is presented a brief description of the current AEM in Portugal, as well as other measures of ProDer axis 2 considered relevant for forest and biodiversity conservation.

- AEM approved by the European Commission:

Measure 2.2 Improvement of production methods

This measure aims to support sustainable development of rural areas by incentivizing farmers to voluntarily adopt specific production methods and to preserve biodiversity. To accomplish this goal four actions are predicted:

Action 2.2.1. Changes in Agricultural Production Methods

Action 2.2.2. Protection of Domestic Biodiversity

Action 2.2.3. Conservation and Improvement of Genetic Resources

Action 2.2.4. Soil Conservation

Measure 2.4 Integrated Territorial Interventions (ITI)

The goal of ITI is to promote management of agricultural and forestry systems suitable for conserving rural landscapes and biodiversity in areas of special interest (*i.e.* areas comprising agriculture and forest systems relevant for conserving identified natural values).

Figure 13 - ITI sites. Source: ICNB

The ITI is implemented through 12 actions. Ten of them (Actions 2.4.3 to 2.4.13) are related to areas of special interest and have been designed according to particular conditions of each site. Figure 13 shows the distribution of areas considered by ITI.

The two actions left (Action 2.4.1 Support for ITI Management, and Action 2.4.2 ITI Management Programs) aim to help the implementation of this measure by activities such as: identifying sites

in need for intervention, designing and implementing new ITI, raising awareness among the target population about this measure, preparing technical standards and guidelines, and offering technical advice for ITI beneficiaries.

In general, the financial support for the ITI is divided in:

- *Agri-environment support*, which aims to conserve cultivated areas of high ecological value, maintain landscape feature, and preserve habitats and species under threat.
- *Silvo-environment support*, which aims to conserve or enhance forest areas of high biodiversity including native forest species, and preserve priority endangered forest habitats by favoring ecological succession, reducing artificial inputs and favoring natural cycles.
- *Non-productive investments*, which are necessary to fulfill agri-environment and forest-environment objectives

- AEM that are not part of the EU agri-environment program, but which have the potential to contribute to environmental conservation:

Measure 2.1 – Maintaining Agricultural Activity in Less-Favored Areas

Action 2.1.1. Maintaining Agricultural Activity outside the Natura Network

Action 2.1.2. Maintaining Agricultural Activity within the Natura Network

Measure 2.3. Management of Forest and Agro-forestry Areas (*Subprogram 2)*

Action 2.3.1: Risk Minimization

Action 2.3.2: Planning and Regeneration of Forest Stands

Action 2.3.3: Environmental Improvement of Forest Areas

Advantages and drawbacks of AEM

For some authors agri-environmental schemes are considered the most important and only realistic policy instrument to halt biodiversity loss in Europe (Donald & Evans, 2006; Warren et al., 2008)**.** This type of policy instrument can be efficient in promoting conservation at the landscape level as they are likely to be larger in scale and involve a higher number of farmers. Promoting landscape connectivity is particularly relevant for biodiversity conservation, as it allows higher levels of species dispersal and may result in more sustainable meta-populations (Merckx et al., 2009).

AEM can help to improve "multifunctionality" of agricultural systems (Dobbs & Pretty, 2004). Multifunctional systems can deliver important environmental services that cannot be produced by

other economic sectors, such as water cycle regulation, nutrient cycling, and biodiversity protection and flood control.

The Portuguese agri-environment scheme includes both measures focus on the inclusion of the greatest possible number of farmers ("broad and shallow"), and measures directed to specific local environmental questions ("deep and narrow"). While "broad and shallow" measures (*e.g.* Measure 2.2 Improvement of production methods) cover a vast area and promote conservation at the landscape level, "deep and narrow" measures (*e.g.* Measure 2.4 Integrated Territorial Interventions) focuses on priority areas.

One of the main disadvantages of the instrument analyzed is the fact that the benefits generated are not expected to continue if the program comes to an end. Farmers are not expected to bear income losses derived from the adoption of agri-environment practices, thus the permanence of these actions are conditional to the constant financial support of the EU and national governments.

3.5 Other initiatives relevant to Conservation

Considering the importance of forest ecosystem services, the National Forest Authority has recently created a working group which aim, among others, to identify interventions in forest areas, both in progress or proposed, that contribute to: i) soil protection; ii) carbon retention (soil and biomass); iii) water cycle regulation; iv) biodiversity conservation; v) landscape preservation; and vi) conservation of genetic resources. The National Forest Authority expect that the insights from the Forest Ecosystem Services working group can contribute to the revision process of the National Strategy for Forests and the National Action Program to Combat Desertification.

The main findings of the working group to date (Table 6) were presented in the workshop "Forest Ecosystem Services – Contributions for a green economy in Portugal", held in Lisbon in February 2012. The set of 32 projects identified encompasses initiatives at global, regional, national and local level. Both private and public financed projects were listed, however public-funded represent the majority. Biodiversity conservation was the service most represented among the initiatives analyzed.

Table 6 - Sample of the projects identified by the Forest Ecosystem Services working group

Scale	Project	Execution	Target Ecosystem Services							Funding	
			Soil	Carbon	Water	Biodiver.	Genetic variation	Landsc.	Cultural	Public	Private
Global	PRACTICE – Prevention and Restoration Actions to Combat Desertification	CEAM e LPN	X	X	X	X			X	FP7	
Regional	FOR CLIMADAPT - Adaptation of the Mediterranean forests to the climate change	AIFM e ADPM	X	X		X				MED	
National	Conservation of threatened plant endemic species in Portugal	CBA et al.				X	X				EDP
Local (Alentejo)	Enhancing the habitat of the Iberian lynx and Black Vulture in southeastern Portugal	LPN				X	X			LIFE	
Local (Center)	PRADS – Restoring degraded areas in Serra da Estrela	UTAD / URZE	X	X			X	X	X		URZE
Local (Lisbon)	PES in Holm oak Montados - GHoC e WebGIS HABEAS	WWF - CEABN / APFC	X		X	X					Coca-Cola

4 Roles of proposed and potential new economic instruments

As explained before, this report aims to identify and characterize economic instruments that address both public and private actors, and to explore how their roles in the policymix could be enhanced. Therefore, proposing new economic instruments is not the focus of the present coarse grain analysis. Instead, it is intended to propose changes in the selected instrument **EFT** that could possibly improve their effectiveness and/or cost-efficiency.

4.1 Ecological Fiscal Transfers

EFT are based only on a quantitative criterion, namely the amount of protected area each municipality comprises. Therefore, EFT do not take into account aspects related to the quality of protected areas or environmental benefits provided by areas outside networks for nature conservation. In this context, a primary idea is to propose changes in the criterion for the annual transfers from the national budget to the municipalities by including ecological indicators that better reflect the ecological value of protected areas and other ecosystems. This way, financial compensations would be more linked to the positive externalities (e.g. ES) each municipality provides to society.

Another idea to improve environmental effectiveness of the LFL would be earmarking ecological fiscal transfer for environmental purposes. To date, the principle adopted for fiscal transfer in Portugal is non-earmarking, meaning that beneficiaries (local governments) are free to decide upon their use. By earmarking EFT it is possible to create a causal link between municipal conservation measures and the ecological indicators used for the EFT. This idea, however, was not considered in the present national report and will be further developed in the fine grain analysis.

4.2 Agri-environment measures

The effectiveness and efficiency of AEM can be enhance through the inclusion of new measures or new target ecological features, as well as through the introduction of new criteria for the allocation of incentives (improve targeting). One specific primary idea regarding the latter is to use site selection models to derive priority areas for the allocation of measures.

Such changes, however, will be proposed only during the fine grain analysis. This is because lack of data at national scale hindered impact evaluation of this instrument and, consequently, the proposal of changes and construction of scenarios in the present coarse grain assessment.

5 Interactions of economic instruments and the policymix

5.1 Synthesis

This Chapter presents a qualitative assessment of the interactions between the instruments analyzed in Chapters 4. Such analysis is fairly superficial, as it evaluates functional roles and interactions for general types of land use types/stakeholders, not accounting for local/regional differences which will be further examined in the fine grain assessment. Thus, it aims to highlight main complementarities, synergies, overlaps and contradictions, focusing on the two instruments selected for analysis in this report, EFT and AEM. The results of this analysis are summarized in Table 7.

Table 7 - Interactions between instruments analyzed in Chapters 3 and 4.

	Ecological Fiscal Transfers	Agri-environment measures	Legal Framework for Nature Conservation and Biodiversity	Natura 2000 Network Sector Plan	Regional Plans for Forest Planning (PROF)	PNAC 2006	Portuguese Water Law	Land-use planning instruments
Ecological Fiscal Transfers		**i**	**i**	**n.r.**	**n.r.**	**n.r.**	**n.r.**	**i**
Agri-environment measures			**i**	**i**	**i**	**i**	**i**	**i**
Legal Framework for Nature Conservation and Biodiversity				**i**	**i**	**n.r.**	**i**	**i**
Natura 2000 Network Sector Plan					**i**	**n.r.**	**n.r.**	**i**
Regional Plans for Forest Planning						**i**	**i**	**i**
PNAC 2006							**n.r.**	**n.r.**
Portuguese Water Law								**i**
Land-use planning instruments								

i = interaction; n.r. = no relevant interaction

In general, EFT interact with instruments that regulate or influence the process of classifying areas under networks for nature conservation. As explained before, the amount of protected areas is the

ecological criterion used for redistributing public revenues to municipalities. Therefore, the Legal Framework for Nature Conservation and Biodiversity, which regulates the Fundamental Network for Nature Conservation, and land-use planning instruments, which set land use and conservation strategies at different territorial scopes, influence the operation of EFT.

AEM also interact with EFT. Instruments may overlap if local public actors (municipalities) are eligible to apply for AEM addressed to protected areas. However, if EFT aim to compensate for the opportunity costs of biodiversity conservation in terms of lost tax revenues for local governments, while AEM are funding management costs for conservation measures, overlap may be avoided.

In fact, there are in Portugal a few AEM that aim to help local public actors to bear management costs of conservation. This is the case of the "Integrated Territorial Interventions", a set of 13 agri-environment measures for promoting environment-friendly agriculture and forestry systems in areas of special ecological interest, which includes Natura 2000 sites and Natural Parks. If one considers that Portuguese EFT also intends to cover, in addition to opportunity costs, management costs faced by public actors, instruments would be overlapping. On the other hand, measures oriented to public actors but applied to areas outside conservation networks are more likely to complement EFT, as they guarantee the territorial continuity of conservation promoted within protected areas.

Complementarity among instruments is also expected when AEM are addressed to local private actors within protected areas. For instance, there are specific measures oriented to landowners in less-favored areas for agriculture (e.g. mountains) within Natura 2000 Network. In this case, while EFT explicitly address public actors, AEM aims to compensate private actors for their conservation costs (i.e. income loss associated to the restriction imposed by a conservation network).

Besides EFT, AEM interact with several other instruments considered. For instance, measures addressed to Natura 2000 zones help the implementation of Natura 2000 Network Sector Plan, which establishes a set of management guidelines for Natura 2000 sites. Note that biodiversity in Portugal is many times associated with rural areas (see Chapter 2), thus, maintaining sustainable agricultural activities is compatible with nature conservation goals in this country.

AEM are influenced by PROF and other land use planning instruments because they identify natural values and conservation priorities at the local level, and set specific rules for occupation, land use and management, offering basic guidelines for the design of effective measures. However, negative interactions can also happen due to the complexity of land use policies, which affect the ability of actors to identify existing rules and guidelines for land use planning and operational management of a given sector or geographical area. This situation is particular relevant to AEM, as it introduces

additional problems for landowners to assess their eligibility to funded measures, and because some land use restriction conflict with available measures.

In this context, it is important to highlight the impact of the multiplicity of land use planning tools in Portugal. There is an overlap of managing institutions, which are currently distributed by the ministries of agriculture and environment, economy, national administration, among others. Depending on the activity a forest owner may have to deal with several institutional bodies, only taking into account the central government. This overlapping of instruments has also impacts on species management. Pine trees, for instance, are covered by 20 different plans, from regional forestry management plans, municipal master plans, river basin management plans and several other (National Forest Strategy, 2006). Besides the obvious difficulties in applying all goals and measures established in the several existing plans, in some cases they are also conflicting.

The Portuguese Water Law can interact with AEM in two ways. First, it establishes the creation of River Basin Management Plans, which identify specific environmental objectives at the river basin level. Second, the Law includes a set of measures that, besides protecting water resources, aim to support nature conservation and biodiversity and can complement conservation actions taken under AEM.

In regards to the PNAC 2006, the values of forested areas used for the baseline scenario and for projecting new plantation areas refer only to new afforestation under AEM. This choice is a clear incentive to implementing and executing agri-environment funds specifically for new forest areas, as they are essential for Portugal to comply with its national obligations regarding climate change.

Other relevant interactions are those related to the Legal Framework for Nature Conservation and Biodiversity. This instrument interacts with the Natura 2000 sectorial plan and other land use planning instruments both because they influence the implementation and management of classified areas, and because the existence of a protected area will certainly influence management regulation of its surrounded areas, which is set by land use planning instruments. There is also a serious effort from this Framework for articulation with land use policy instruments in order to favor the connectivity of classified areas, improving the ecological quality and territorial sustainability of the entire network.

Beside these interactions with command-and-control instruments, AEM also interact with economic incentives oriented to the agriculture and forest production and management, namely those that result from the Common Agricultural Policy (CAP). For example, farmers applying to AEM measures targeting forestry can not apply to the national wide incentive (Single Payment Regime), which is

only granted to properties targeting agriculture. This reduces the incentive of landowners that have forest areas in their properties to apply to silvo-environment measures.

Even amongst AEM incentives, applying to several measures in the same period might reduced the overall incentive, as the combination of measures will lead to penalties (e.g. the incentive provided by measures such as biological production or compensation for maintaining some specific crop systems, will be reduced if landowners also apply to the measures specifically tailored for ITI's - *Integrated Territorial Interventions).*

6 Impact evaluation

6.1 Local Finance Law

6.1.1 Cost-effectiveness and benefits

6.1.1.1 Relevance of fiscal transfers

Intergovernmental fiscal transfers from central government are an important source of revenues for Portuguese municipalities, in average, they provide 60%of the total municipal revenues, revealing an important dependency from national funding. Beyond fiscal transfers, municipal revenues come from different sources, such as direct taxes (e.g. property taxes - *Imposto Municipal sobre Imóveis*) or indirect taxes/tariffs (e.g. water and sanitation).

In the majority of Portuguese municipalities fiscal transfers withstand for more than 75% of their total municipal revenues both for 2008 and 2009, as shown on Figure 2. However, the relevance of fiscal transfers for municipal revenues differs significantly between the municipalities. In 2008, for example, it ranged from 25% in Lisbon to 97% in Barrancos. The relevance of fiscal transfers is higher for inland municipalities than in costal municipalities, as the latter are typically more populated and developed, having other relevant sources of revenues, such as property taxes.

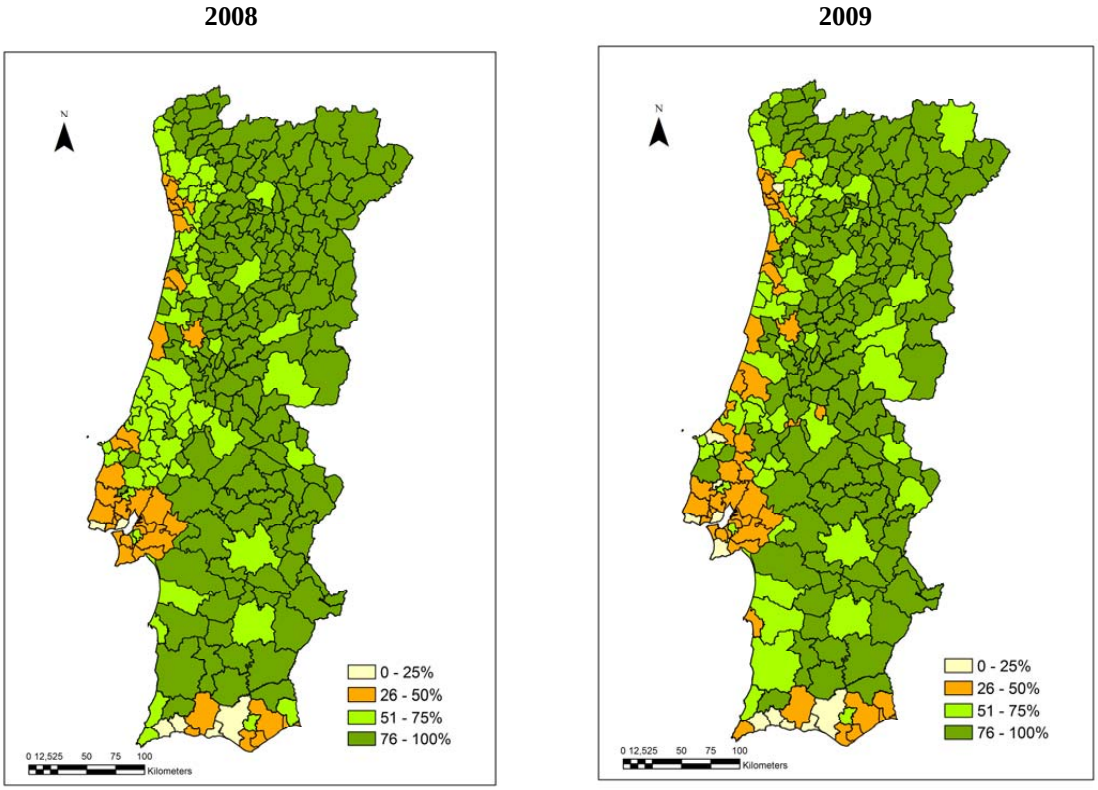


Figure 14 - Share of direct fiscal transfers in total municipal revenues, in 2008 (on the left), and 2009 (on the right)

All relevant changes in LFL allocation criteria have impacts in terms of funding and, particularly, to the development strategy of municipalities with a high dependency on fiscal transfers.

6.1.1.2 Comparison between the new LFL and the previous law

The changes introduced by the new LFL had an impact on fund allocation among municipalities. To assess it, the real transferred values of 2008 and 2009 were compared to the estimated transfers if applied the old LFL criteria, assuming an equal total value (Real National transferred value). This comparison allows the identification of which municipalities win and lose with the changes introduced (see Figure 15).

In 2008, 43% of municipalities won with the new LFL criteria, and Vila Nova de Gaia was the one with the highest gain (2,8%). On the opposite, Castro Marim has the highest loss, -10,3%, due to the new allocation criteria.

In 2009, slight changes were observed: 45% of municipalities won with the new criteria; however wins and losses are more significant. The maximum gain was 5,3%, for Loures, and the major loss was for Óbidos, -22,8%.

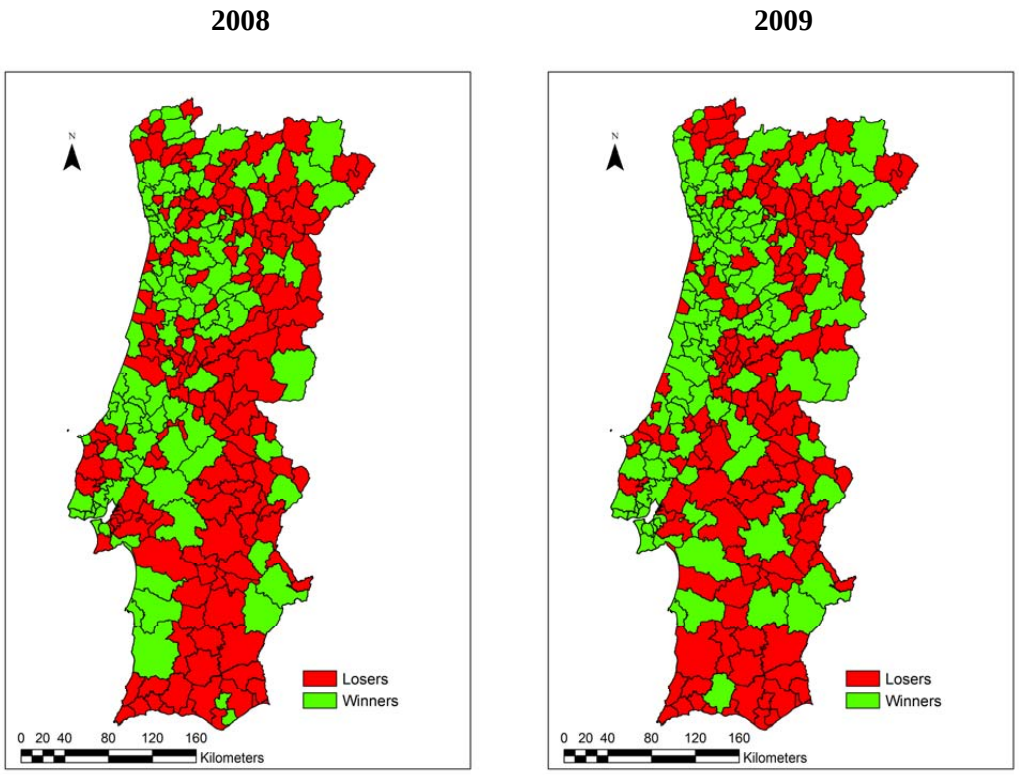


Figure 15 - Comparison of real transfers allocation based in the new and previous LFL criteria, using the same total transfer, in 2008 (on the left), and 2009 (on the right)

A more refined analysis was performed using a sample of municipalities (Table 8) divided in two groups: the ones with more than 70% of municipal area under classification status; and the ones with less than 70% of classified area. The reference year considered was 2008.

Only two municipalities (Vila do Bispo and Aljezur) have considerable negative variations, -5,9%, while all other municipalities vary between -1% and 1%. Vila do Bispo's outcome is very relevant in the sense that it has 97% of the municipality under classified status, thus being a major beneficiary from the ecological component introduced by this new LFL. In addition, in the group of municipalities with more than 70% of municipal area under classification status, only one wins with the new criteria for fund allocation. This indicates that the introduction of an ecological signal was not sufficient to counterbalance other effects and provide a higher incentive to those municipalities with a larger proportion of protected areas.

Table 8 - Comparison of real 2008 transfers allocation based in the new and previous LFL criteria

Municipalities	Share of Class. Conservation Area per Municipality	Real Transfers New Law 2008	Transfers Applying the Old Law but using the National Total Transfers value applied in the New Law	Differences	Comparing with the Real Transfers New Law 2008
	(%)	€	€	%	
Municipalities with **more than 70%** of Classified Areas					
MANTEIGAS	100%	3.749.243	3.780.659	**-0,8%**	**Loser**
BARRANCOS	100%	3.203.738	3.230.583	**-0,8%**	**Loser**
CAMPO MAIOR	100%	4.402.813	4.439.705	**-0,8%**	**Loser**
VILA DO BISPO	97%	3.767.189	3.988.693	**-5,9%**	**Loser**
TERRAS DE BOURO	95%	5.656.128	5.703.523	**-0,8%**	**Loser**
FREIXO DE ESPADA À CINTA	91%	4.803.725	4.843.976	**-0,8%**	**Loser**
MONCHIQUE	87%	6.448.121	6.502.152	**-0,8%**	**Loser**
MURTOSA	80%	3.693.300	3.724.248	**-0,8%**	**Loser**
ARRONCHES	79%	3.945.061	3.978.118	**-0,8%**	**Loser**
PORTO DE MÓS	76%	6.847.121	6.829.203	**0,3%**	**Winner**
ALJEZUR	73%	5.166.722	5.470.516	**-5,9%**	**Loser**
Municipalities with **less than 70%** of Classified Areas					
MÉRTOLA	60%	10.517.751	10.605.882	**-0,8%**	**Loser**
SESIMBRA	53%	5.128.655	5.184.736	**-1,1%**	**Loser**
AVEIRO	49%	9.190.900	9.176.537	**0,2%**	**Winner**
VIMIOSO	43%	6.079.020	6.129.958	**-0,8%**	**Loser**
SINTRA	36%	35.069.105	34.970.197	**0,3%**	**Winner**
AMARANTE	27%	14.374.890	14.381.184	**-0,04%**	**Loser**
VIANA DO CASTELO	15%	15.184.697	15.191.346	**-0,04%**	**Loser**

Municipalities	Share of Class. Conservation Area per Municipality	Real Transfers New Law 2008	Transfers Applying the Old Law but using the National Total Transfers value applied in the New Law	Differences	Comparing with the Real Transfers New Law 2008
PESO DA RÉGUA	12%	6.179.792	6.162.362	**0,3%**	**Winner**
GRÂNDOLA	9%	6.732.129	6.730.139	**0,03%**	**Winner**
ÉVORA	6%	13.799.015	13.805.057	**-0,04%**	**Loser**
AGUIAR DA BEIRA	3%	5.175.695	5.219.063	**-0,8%**	**Loser**
LISBOA	0%	62.579.750	62.403.250	**0,3%**	**Winner**
ALMEIRIM	0%	5.579.726	5.582.169	**-0,04%**	**Loser**
National Total		**2.406.532.952**	**2.406.532.952**		

6.1.1.3 Ecological transfer

In this section, it's analyzed in more detail the ecological signal introduced with the new LFL. For this, Table 9, shows the relevance of ecological transfers for municipalities with more than 70% of Classified Areas, on their total municipal fiscal transfer, and on total municipal revenues. The results for 2008 and 2009 are quite similar, with small variations of 1% or 2%.

In 2008, for this group of municipalities, the ecological transfers represents, in average, 24% of the total municipal transfer, and 18% of their total municipal revenues. In 2009, the values are 25% and 19%, respectively. These figures indicate that ecological transfers have a significant weight on the annual budget of these municipalities. In Castro Verde, this dependency is particularly higher, in 2009, the ecological component was 44% of the total fiscal transfer and 37% the total municipal revenues.

To better understand the relevance of the ecological component for municipalities, unit indicators are presented for a sample containing municipalities with more than 70% of classified area, and with less than 70%. Table 10 presents the ecological transfers per unit of municipal area (hectare), population (inhabitant) and classified area (hectare).

The unit value of the ecological signal is 49€ (2008) and 54€ (2009) per ha of protected area for municipalities with more than 70% of their territory under protection status, in

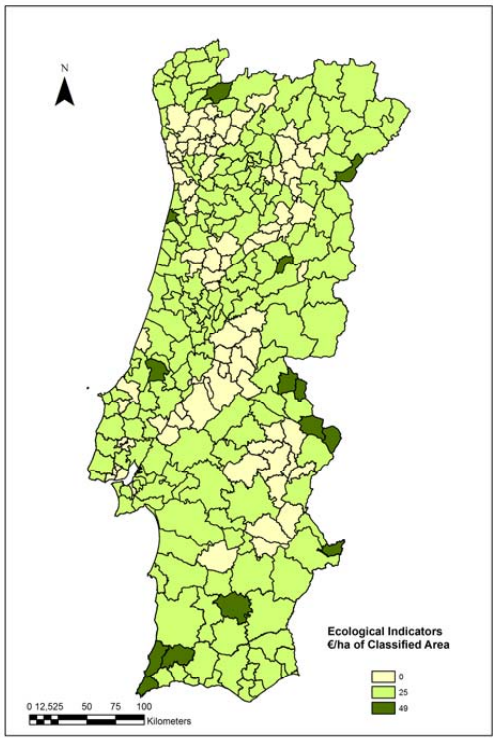


Figure 16 - Ecological transfers per unit of protected area (€/ha), in 2008.

the remaining municipalities the value are near to the half, 25€/ha in 2008, and 27€ for 2009. Municipalities with no classified area receive 0€. The spatial allocation of this indicator per municipality is shown on Figure 16.

The distribution of the ecological based funds per inhabitant varies significantly in the municipalities of the sample, even between municipalities belonging to the same group.

Even though the ecological signal is not globally very strong, it is relevant for the inhabitants of some municipalities with problematic socio-economic contexts and that have almost all the municipality area under protection status, as is the case of Barrancos.

Table 9 - Share of ecological transfers on municipal revenues, in 2008 and 2009.

		2008			2009		
	Share of Class. Conservation Area per Municipality	Ecological component	Share of the Ecological Component on Total Fiscal Transfer	Share of Ecological Component on Total Municipal Revenues	Ecological component	Share of the Ecological Component on Total Fiscal Transfer	Share of Ecological Component on Total Municipal Revenues
	(%)	(€)	(€)	(€)	(€)	(€)	(€)
MANTEIGAS	100%	599.120	16%	10%	662.433	17%	10%
MARVÃO	100%	760.953	22%	13%	841.144	23%	14%
BARRANCOS	100%	826.290	26%	25%	914.063	27%	26%
CAMPO MAIOR	100%	1.213.135	28%	25%	1.340.986	29%	24%
VILA DO BISPO	97%	855.718	23%	12%	946.153	25%	10%
TERRAS DE BOURO	95%	1.291.931	23%	21%	1.428.420	24%	22%
CASTELO DE VIDE	94%	1.226.599	31%	21%	1.356.209	33%	24%
FREIXO DE ESPADA À CINTA	91%	1.088.280	23%	21%	1.203.478	24%	22%
MONCHIQUE	87%	1.689.730	26%	18%	1.877.280	28%	19%
MURTOSA	80%	288.785	8%	6%	319.204	8%	6%
ARRONCHES	79%	1.217.399	31%	20%	1.346.156	32%	20%
PORTO DE MÓS	76%	982.326	14%	11%	1.086.111	15%	11%
CASTRO VERDE	76%	2.123.784	37%	34%	2.621.778	44%	37%
ALJEZUR	73%	1.167.256	23%	16%	1.306.925	25%	17%

Table 10 - Ecological Component Indicators

Municipalities	Ecological component (€)		Ecological Component per unit					
			€/inhab		€/ha Munc		€/ha CA	
	2008	2009	2008	2009	2008	2009	2008	2009
Municipalities with **more than 70%** of Classified Areas								
MANTEIGAS	**599.120**	**662.433**	159	178	49	54	**49**	**54**
BARRANCOS	**826.290**	**914.063**	468	528	49	54	**49**	**54**
CAMPO MAIOR	**1.213.135**	**1.340.986**	145	162	49	54	**49**	**54**
VILA DO BISPO	**855.718**	**946.153**	158	174	48	53	**49**	**54**
TERRAS DE BOURO	**1.291.931**	**1.428.420**	166	187	47	51	**49**	**54**
FREIXO DE ESPADA À CINTA	**1.088.280**	**1.203.478**	277	309	45	49	**49**	**54**
MONCHIQUE	**1.689.730**	**1.877.280**	271	306	43	47	**49**	**54**
MURTOSA	**288.785**	**319.204**	29	32	40	44	**49**	**54**
ARRONCHES	**1.217.399**	**1.346.156**	374	417	39	43	**49**	**54**
PORTO DE MÓS	**982.326**	**1.086.111**	39	43	38	41	**49**	**54**
ALJEZUR	**1.167.256**	**1.306.925**	218	245	36	40	**49**	**54**
Municipalities with **less than 70%** of Classified Areas								
MÉRTOLA	**1.897.556**	**2.131.244**	247	284	15	16	**25**	**27**
SESIMBRA	**254.735**	**281.673**	5	6	13	14	**25**	**27**
AVEIRO	**235.822**	**260.794**	3	4	12	13	**25**	**27**
VIMIOSO	**511.845**	**566.050**	103	115	11	12	**25**	**27**
SINTRA	**280.307**	**310.024**	1	1	9	10	**25**	**27**
AMARANTE	**201.737**	**223.139**	3	4	7	7	**25**	**27**
VIANA DO CASTELO	**117.831**	**130.096**	1	1	4	4	**25**	**27**
PESO DA RÉGUA	**27.797**	**30.701**	2	2	3	3	**25**	**27**
GRÂNDOLA	**170.081**	**187.996**	12	13	2	2	**25**	**27**
ÉVORA	**188.590**	**607.901**	3	11	1	5	**25**	**27**
AGUIAR DA BEIRA	**0**	**0**	0	0	0	0	**0**	**0**
LISBOA	**0**	**0**	0	0	0	0	**0**	**0**
ALMEIRIM	**0**	**0**	0	0	0	0	**0**	**0**
National Total	**2.406.532.952**	**2.513.722.014**						

6.1.1.4 Smoothing Mechanisms

According to the new LFL, the final value transferred to each municipality is based on a gross total transfer value, sum of the three main funds (FEF (=FGM+FCM), FSM and 5% participation on IRS), corrected according to the adjusting (smoothing) rules shown on Figure 17.

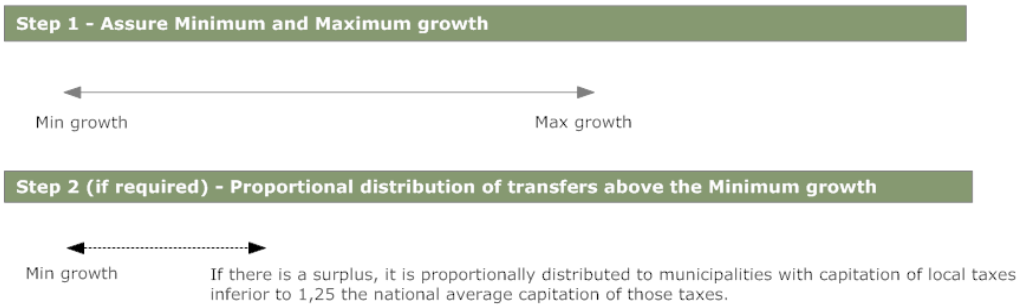


Figure 17 - Rules for adjusting the Gross Total Transfer value into the Final Real transfer

The goal is to provide **more evenness** in fund allocation between municipalities with different economic wealth and development and avoid strong variations each year. However, in the short term, they reduce the impact of the changes introduced by the new law on fund allocation.

To assess the impact of these smoothing mechanisms, for 2008, the real LFL transfers were compared to a scenario where the new local finances law was applied assuming that there was no ecological component (this means that the area criterion in FGM (30%) will only consider total municipal area, eliminating the weight attributed to the ecological component).

The comparison (Figure 6) shows several differences in the gross total transfer value, where some municipalities benefit from the presence of the ecological criterion, and others lose with its introduction. However, after applying the smoothing mechanisms established in the Law, the real effective impact of the ecological component is only on four municipalities, one of them winning and the other three losing, the remaining municipalities would not suffer any real changes.

The introduction of these smoothing mechanisms, which have a strong impact on fund allocation, is another factor that contributes to eliminate the financial incentive offered to municipalities by the ecological fiscal transfer scheme.

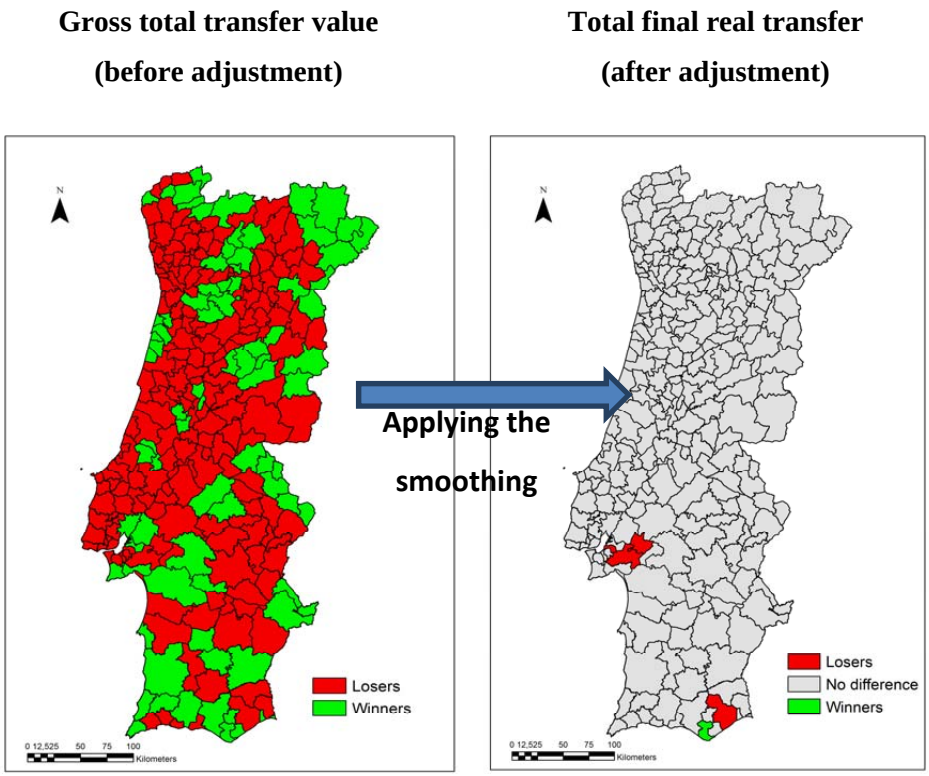


Figure 18 - Impact of the Smoothing mechanisms in 2008

6.1.2 Conservation effectiveness

As previously referred, the principle adopted for this intergovernmental fiscal transfer is non-earmarking, meaning that all transfers are received as lump-sum transfers, where beneficiaries (local governments) are free to decide upon their use. For this reason it not possible to clearly assess the ecological effectiveness resulting from the introduction of an ecological transfer, as the allocated funds are not necessarily applied in conservation measures. Beyond that, this mechanism is too recent, in an ecological timescale, to evaluate the existence of direct or indirect impacts (positive or negative) on protected areas, biodiversity and ecosystem services.

Nonetheless, it is relevant to compare the ecological transfers per municipality with its expenditure on biodiversity conservation. For this, it was used data available on *Municipal Surveys for Environmental Protection*, from the National Statistics Institute, regarding the "Biodiversity and landscape protection" domain. This category includes all necessary activities for the protection of ecosystems and habitats, fauna and flora, landscape protection, due to their aesthetic value, and for the preservation of natural sites, protected by national or international laws. It also includes activities aimed at the conservation of endangered species of fauna and flora, activities for forest management and protection, and the remodeling of affected landscapes to enhance its natural functions or add to their aesthetic value. Are also included the rehabilitation costs of abandoned mines or paths,

activities of restoration and cleaning aquatic sites, elimination of acids and artificial agents of eutrophication, pollution cleanup in aquatic sites, as well as cleaning coastal areas and beaches. This excludes activities related to the management of urban parks and gardens

The maps on Figure 19, illustrate the share of municipal expenditure on biodiversity protection in relation to its ecological transfer, in 2008 and 2009.

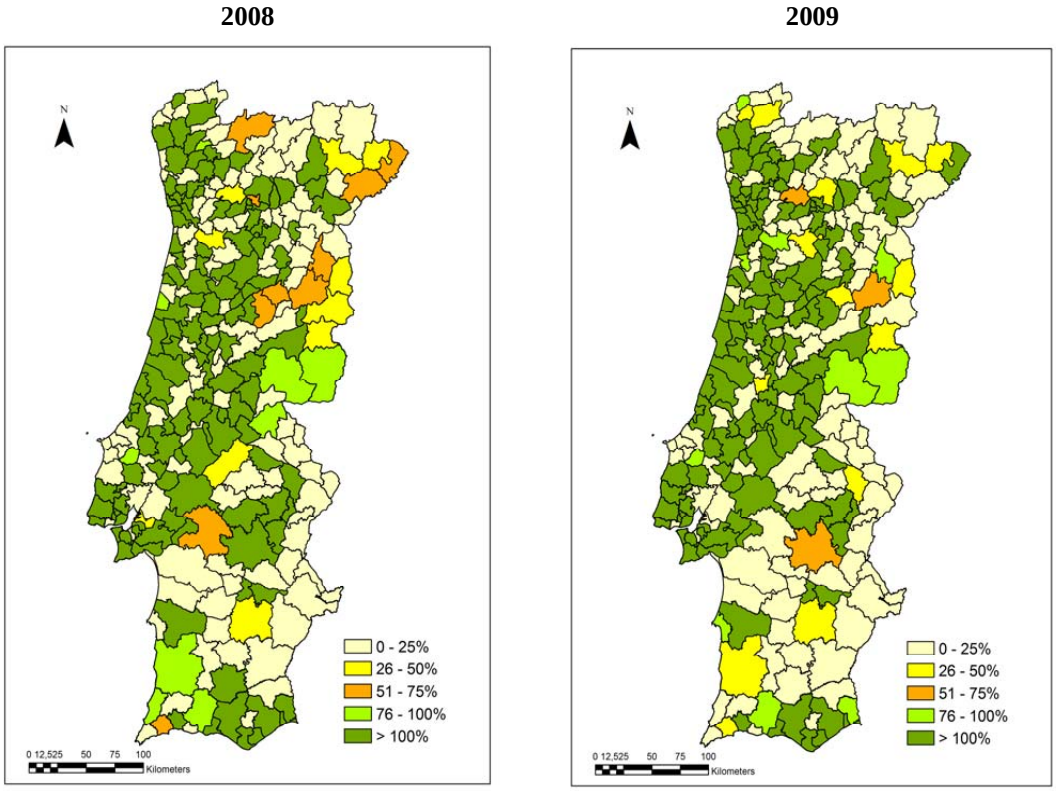


Figure 19 - Municipal expenditure on biodiversity conservation compared to Ecological transfers, in 2008 and 2009.

In both years approximately 48% of the municipalities have ecological expenditures higher than the ecological transfer they receive from the LFL. In a number of cases this happened because municipalities with no classified areas on their territory receive zero from the ecological component. However, biodiversity protection and conservation is not exclusive to classified areas, despite receiving nothing for that specific purpose municipalities still have ecological expenditures in areas that are not under a classification status.

In the remaining 52% of the municipalities the expenditures on biodiversity conservation are, in average, only 12% of the revenues from ecological transfers, mainly because several municipalities have no expenditure on biodiversity conservation.

Focusing the analysis on the group of municipalities with more than 70% of their territory under classification status (benefit with a higher percentage of ecological component in the FGM, 10%), it is

possible to verify that none of them has high shares of expenditure on biodiversity when compared to their ecological revenue from LFL transfers (except for Aljezur, in 2008). Furthermore, most have zero expenditure on biodiversity protection, according to the available data (Table 11).

Table 11 - Share of expenditure in ecological revenues, for Municipalities with more than 70% of classified areas

		2008			2009		
	Share of Class. Conservation Area per Municipality (%)	Ecological component (€)	Municipal Expenditure on Biodiversity Cons. (€)	Share of the expenditure in ecological revenues (%)	Ecological component (€)	Municipal Expenditure on Biodiversity Cons. (€)	Share of the expenditure in ecological revenues (%)
MANTEIGAS	100%	599.120	**102.000**	**17%**	662.433	**22.000**	**3%**
MARVÃO	100%	760.953	**0**	**0%**	841.144	**0**	**0%**
BARRANCOS	100%	826.290	**0**	**0%**	914.063	**0**	**0%**
CAMPO MAIOR	100%	1.213.135	**0**	**0%**	1.340.986	**0**	**0%**
VILA DO BISPO	97%	855.718	**0**	**0%**	946.153	**0**	**0%**
TERRAS DE BOURO	95%	1.291.931	**0**	**0%**	1.428.420	**0**	**0%**
CASTELO DE VIDE	94%	1.226.599	**284.000**	**23%**	1.356.209	**55.000**	**4%**
FREIXO DE ESPADA À CINTA	91%	1.088.280	**0**	**0%**	1.203.478	**0**	**0%**
MONCHIQUE	87%	1.689.730	**281.000**	**17%**	1.877.280	**131.000**	**7%**
MURTOSA	80%	288.785	**0**	**0%**	319.204	**0**	**0%**
ARRONCHES	79%	1.217.399	**65.000**	**5%**	1.346.156	**48.000**	**4%**
PORTO DE MÓS	76%	982.326	**121.000**	**12%**	1.086.111	**131.000**	**12%**
CASTRO VERDE	76%	2.123.784	**58.000**	**3%**	2.621.778	**118.000**	**5%**
ALJEZUR	73%	1.167.256	**1.038.000**	**89%**	1.306.925	**308.000**	**24%**

Amendments to the LFL, in 2007, relate to various funds and allocation criteria. For this reason, there are several cross-effects that have significant implications on the final allocation of funding to each municipality. Despite the ecological component positively discriminate municipalities with high percentages of classified areas, its introduction was not sufficient to counterbalance other effects

and provide a greater incentive to those municipalities with a larger proportion of conservation areas. These crossover effects that arise as a result of the several changes introduced in the Law contribute to hide the financial incentive offered to municipalities by the ecological signal.

Also, by introducing a significant number of changes simultaneously, the new LFL makes the ecological component of the new scheme difficult to grasp for the affected stakeholders (i.e. municipal authorities).

Other important conclusion is that the current ecological criterion used for fund allocation, based on a single indicator - quantity of classified areas - does not compensate all municipalities, despite their contribution to the protection and conservation of biodiversity and ES.

6.2 Agri-environment measures

This section analyzes the impact of AEM implemented in Portugal under the current Rural Development Program 2007-2013 (ProDer) and the previous program, Rural Development Program for Continental Portugal 2000-2006 (RURIS). Analyses were based on the information available in official evaluation reports due to the lack of access to more refined data.

RURIS

The RURIS was the main component of the National Agriculture Policy. It aimed to ally modern and competitive agriculture to the sustainable development of rural areas taking into account environment, economic and social aspects. The RURIS operated through 4 groups of measures, from which the two mostly relevant for environment and forest conservation were *Agri-environment measures* and *Forestation of agriculture land.*

AEM aimed to promote agriculture compatible to resource conservation and environment stability in order to improve the global sustainability of this activity. RURIS contained 34 AEM divided in 6 subgroups:

1. Protecting and improving the environment, soil and water
2. Conserving landscapes and maintaining traditional characteristics of agricultural lands
3. Conserving and enhancing cultivated land of high natural value
4. Conserving residual fragments of natural ecosystem in agriculture landscapes
5. Safeguarding genetic biodiversity
6. Regional Plans

ProDer

The RURIS program was replaced by the Rural Development Program 2007-2013 (ProDer), which contains only two AEM, but also comprises several other measures relevant for forest and environment conservation.

In general, the transition from one program to another was marked by a reduction on the diversity of measures. This happened because the ProDer main strategy is to promote the integration and complementarity of agriculture practices that provide several ecosystem services at once (Rosas *et al.*, 2009). Thus, the idea is no longer to create several different options of agri-environment compromises, but to incorporate them in the requirements of measures in general. For instance, ProDer Axis 1 aims to promote competitiveness of the agriculture sector simultaneously considering environment questions (*e.g.* supporting irrigation systems that sustainable use water; financing conversion to biological diverse pasturelands).

The two[3] ProDer AEM are *Improvement of production methods* and *Integrated Territorial Interventions (ITI).* While the first incentives the adoption of production methods that enhance ecosystem services and biodiversity (most of the RURIS AEM were incorporated in the set of criteria that determine these methods), the second refers to actions designed to conserve rural landscapes and biodiversity in areas of special interest (*i.e.* areas comprising agriculture and forest systems relevant for conserving identified natural values).

6.2.1 Cost-effectiveness and benefits

6.2.1.1 Execution

During the operational period of the RURIS, a total of €385 746 000 were invested in agri-environment contracts. The mean area covered by these measures was 586 617 hectares, and about 64 924 farmers were beneficiated. With regards to the measure "Forestation of Agricultural Land", it main aim was to remove agriculture production from areas of low agricultural aptitude. A total of €69 292 000 were invested to plant 48 755 ha of forests. Cork oak (*Quercus suber*) was the main species used, representing 52,4% of trees planted.

The total budget for the ProDer is about €4 558 428 798. The greatest share of this budget (43,3%) correspond to the Axis 2-*Sustainability of rural areas*, which comprises the AEM as well as most of other measures related to environmental conservation. Until 2010, €811 934 396 were invested in the axis 2, which represents 42,71% of its total budget (€1 901 151 306). In fact, this was the axis

[3] Currently the ProDer contains only two AEM that have been submitted and approved by the European Commission (**Measure 2.2**. and **Measure 2.4.)**. However, ProDer Axis 2 also encompasses other measures that have the potential to contribute to environment conservation (*e.g.* **Measure 2.1 and Measure 2.3)** and, thus, will be considered in this analysis.

were financial execution rate was higher, followed by Axis 1-*Competitiveness* with 17%. The financial execution of PRODER measures in Axis 2 is provided bellow, in Table 12.

Table 12 - Financial execution of ProDer measures in Axis 2

	Budget (x 1000€)	Payments 2007-2010 (cumulative) (x 1000€)	Financial execution
Measure 2.1 Maintaining Agricultural Activity in Less-Favored Areas	**749 257**	**396 717**	**53%**
Action 2.1.1 Outside Natura network	556.153	333 562	60%
Action 2.1.2 Within Natura network	193.104	63 046	33%
Measure 2.2 Improvement of production methods	**279 187**	**117 111**	**42%**
Action 2.2.1. Changes in Agricultural Production Methods	191 242	83 785	44%
Action 2.2.2. Protection of Domestic Biodiversity	29 479	11 445	39%
Action 2.2.3. Conservation and Improvement of Genetic Resources	52 079	21 406	41%
Action 2.2.4. Soil Conservation	6 387	475	7%
Measure 2.3. Management of Forest and Agro-forestry Areas	**245 657**	**50**	**0%**
Action 2.3.1: Risk Minimization	85 980	50	0,06%
Action 2.3.2: Planning and Regeneration of Forest Stands	98 263	0	0%
Action 2.3.3: Environmental Improvement of Forest Areas	61 414	0	0%
Measure 2.4 Integrated Territorial Interventions (ITI) (Action 2.4.4 – 2.4.13)	**178 388**	**17 739**	**9%**

6.2.1.2 Effectiveness

In regards to the RURIS program, the most notable agri-environment incentives in terms of investments, number of beneficiaries and area covered were, respectively, *Integrated Pest Management, Extensive Forage Systems, and Traditional Polycultural Systems (Table 13).*

Table 13 - Most relevant agri-environment measures implemented under the RURIS program

	Mean annual investment (M€)	Mean annual No. of beneficiaries	Mean area covered (ha)
Integrated pest management	102	16 000	131 000
Extensive Forage Systems	33	1 344	137 000
Traditional Polycultural Systems	74	30 000	80 000

A detailed description of quantitative targets and outputs of ProDer measures in Axis 2 is provided in Table 14. The measure *Maintaining agricultural activity in less-favored areas* (measure 2.1) was the

most representative in terms of budget, investment and financial execution, as well as area covered and percentage of the target area achieved. Besides, the measure *Improvement of production methods* (measure 2.2) had reached 42% of financial execution by the end of 2010 and most of its actions have reached a satisfactory percentage of the target output.

Table 14 - Targets and outputs of ProDer measures in Axis 2.

	Output (Hectares or Livestock units)	Target	% Achieved
Measure 2.1 Maintaining Agricultural Activity in Less-Favored Areas			
Action 2.1.1 Outside Natura network	830 244 ha	580 000 ha	143%
Action 2.1.2 Within Natura network	215 956 ha	220 000 ha	98%
Measure 2.2 Improvement of production methods			
Action 2.2.1. Changes in Agricultural Production Methods	408 589 ha	400 000 ha	102%
Action 2.2.2. Protection of Domestic Biodiversity	44 316 LU	40 000 LU	11%
Action 2.2.3. Conservation and Improvement of Genetic Resources	178 178 LU	240 000 LU	74%
Action 2.2.4. Soil Conservation	16 912 ha	40 000 ha	42%
Measure 2.3. Management of Forest and Agro-forestry Areas			
Action 2.3.1: Risk Minimization	373 ha	170 000 ha	0%
Action 2.3.2: Planning and Regeneration of Forest Stands	0	n/a	0%
Action 2.3.3: Environmental Improvement of Forest Areas	0	n/a	0%
Measure 2.4 Integrated Territorial Interventions (ITI) (Action 2.4.4 – 2.4.13)	85 191 ha	187 000 ha	45%

6.2.2 Institutional options and constraints

The information provided in Tables 12 and 14, together with complementary information from ProDer evaluation reports, allow the following conclusions:

- *Management of forest and agro-forestry areas* (measures 2.3) showed financial execution and target achievement near to 0%, which, can be explained by the following reasons:
    - Late regulation of this measure by the ProDer,
    - Unfavorable economic scenario that did not motivate potential beneficiaries to self-finance projects early stages.
    - New eligibility requirements that did not exist for previous programs.
    - Implementation and operation of this measure was based on recently created spatial planning systems (*e.g.* Regional Forest Plan; Forest Intervention Zones), whose management was not yet consolidated.

- Low rates of project approval as a consequence of the difficulty to fulfill technical eligibility requirements
- Payments not high enough to attract farmers. In previous programs financial incentives and compensations for income losses were higher.
- Bureaucracy in administration and process analysis and approval of applications.

- *Integrated Territorial Interventions* (ITI - measure 2.4) showed very low financial execution at the same time it reached 45% of its target output. This is explained by the fact that to the date the last ProDer report was published, contracts had been signed out but payments had not yet been delivered. Although the ITI have achieved 45% of their target area, their operation and efficacy have been limited by the following aspects:
  - Strict eligibility conditions and complexity of the commitments, which results from the fact that ITI are developed for very specific location with high natural values.
  - Insufficient financial compensation. In many cases payments offered do not cover the costs of forest activities proposed by this measure. Furthermore, sometimes limitations on the type of crops and harvesting periods generate income losses that are not totally covered by the program support.
  - Lack of technical support, which is necessary to help farmers to comply with the complex ITI requirements. For instance, required activities to minimize the impact of agriculture (*e.g.* detection and protection of bird nests) need technical support that is mostly not available.
  - Administrative constrains. The technical support necessary to ITI implementation and operation should be supported by a specific action included in measure 2.4: *Action 2.4.1- Support for ITI management.* However, administrative problems have been preventing the hiring of technical staff.
  - Lack of representatives in local meetings to inform farmers and local institutions about the advantages of joining the program.

6.2.3 Conservation effectiveness

The Final Evaluation Report of the RURIS program (AGROGES, 2009) assessed environmental results based on a "scoring" system, where a designated evaluation team classified the relative impact of each measure in 9 aggregated environmental objectives (see Table 15). For this, it was calculated the contribution of each measure to the set of sub-objectives that constitute each of the 9 objectives, and the results were weighted by the area covered by each measure, taking as reference the year 2005. The values obtained were transformed in a scale 0-5 (no impact to very high impact) and the

total contribution of the 34 agri-environment measures to the aggregated objectives was calculated, as shown in Table 15.

A high impact was verified to the objectives Biodiversity, Maintenance of Agriculture Practices and Conservation of Landscapes. This is a result of both the high number of measures influencing this objective, and the area covered by these measures.

Table 15 - Impact of RURIS agri-environment measures in 9 aggregate environmental objectives

Objectives	Impact	
	No. measures	Σ impact
1. Soil quality/ erosion control	17	44
2. Water Quality	13	34
3. Water quantity	2	7
4. Biodiversity	29	70
5. Habitats conservation	22	48
6. Conservation of rare/ endangered species	4	8
7. Landscape conservation	23	55
8. Continuity of agricultural activities in areas threatened by land abandonment	22	58
9. Cultural Identity	18	47

The same report also evaluated the program's environmental results based on specific objectives that correspond to "Common Evaluation Questions" determined by Common Agriculture Policy. Overall, most of the objectives were considered satisfactorily achieved, as shown in Table 16.

Table 16 - Assessment of specific objectives of the RURIS agri-environment measures

	No	Partially	Totally
Preserving singular characteristics of each rural area (Landscape Diversity)		X	
Maintaining and conserving sustainable exploitation methods that respect environmental protection requirements			X
Reducing the impacts of agriculture pollutants in water quality		X	
Soil Conservation		X	
Conserving landscapes and traditional characteristics of agricultural lands			X
Promoting recreational use of rural areas of high environmental quality	X		
Conserving and improving cultivated areas of high natural value			X
Conserving remaining fragments of natural ecosystems in rural areas	X		
Protecting genetic diversity in the context of each land use system			X

Regarding the environmental impact of the RURIS measure "Forestation of Agricultural Land", it was marked by a forested area considerably smaller than in previous national rural development programs. Although this intervention had positive environmental effects, the achievement of specific objectives (Table 17) was undermined by its low level of execution.

Table 17 - Specific objectives of the RURIS measure "Forestation of Agricultural Land"

Specific Objectives	Was the objective achieved?		
	No	Partially	Totally
Reallocate unproductive agricultural land to other land uses of high environmental value		X	
Soil conservation		X	
Increasing the offer and diversity of forest products	X		
Promoting technically and environmentally appropriate afforestation		X	
Rehabilitation of degraded land and mitigation of desertification effects		X	
Introducing socio-economic benefits to rural areas		X	

The ProDer Midterm Evaluation Report (ProDer, 2010) considered the following four indicators to assess the program's environmental outcomes:

1. Reversing biodiversity decline
2. Maintaining high natural values of agriculture and forest lands
3. Improving water quality
4. Contribution to climate change mitigation

The first indicator, *Reversing biodiversity decline*, is calculated based on the Common Farmland Bird Index. However, the set of samples collected to date is insufficient to estimate this index and to evaluate the program's effect as a whole. For this reason, the contribution of ProDer for reversing biodiversity decline has not yet been analyzed.

The indicator *Maintaining high natural values of agriculture and forest lands,* intends to express, qualitatively or quantitatively, changes in the area of agriculture and forest systems which have a positive impact on biodiversity. In fact, only agriculture system were considered in the ProDer Midterm Evaluation Report, as members of the evaluation team had not had access to forest data to the date the report was published.

The ProDer identified the four agriculture systems found in continental Portugal that are most relevant in terms of natural value (ASHNV, Agriculture Systems of High Natural Value):

- Semi-natural extensive grazing systems, which includes the *Montados* in the south portion of the country, and semi-natural meadows found in the North.
- Extensive arable crop systems in dry lands (South, North and Central Regions)
- Extensive permanent crops (Northeast and South regions)
- Traditional polycultural systems, which consist on mosaics of agriculture and semi-natural systems (North shore and Central Region).

The information available to date only allow for a qualitative assessment of ProDer impact in the area covered by ASHNV. In this regard, all the systems mentioned are effectively included in one or more measures, and AEM were considered especially relevant for the conservation of these systems.

The impact of ProDer agri-environment interventions on water quality has not yet been consistently analyzed. To date, ProDer evaluations have focused on the potential of measures to improve water quality, but empirical analysis are still missing. In summary, ProDer measures can positively affect water quality acting on three factors: i) fire occurrence; ii) use of fertilizers; and iii) manure deposition as a result from animal husbandry.

The program's contribution to climate change mitigation was assessed taking into account carbon emissions from livestock, rice crops, use of fertilizers, and burning waste. ProDer estimates that its two AEM promote sequestration of 0,5 $MtCO_2.yr^{-1}$. However, this value is a roughly estimative based on the total area covered by agri-environment payments in the year 2009, and it does not include emissions from fires that were avoided as a result of agri-environment intervention.

6.2.4 Distributive impacts and legitimacy

6.2.4.1 Regional distribution of measures

In general, RURIS agri-environment measures were mostly focus in the extensive production systems found in the south-central portion of the country, the Alentejo region. For several measures, implementation was very much concentrated in this region. The Alentejo, was the region where both the investment and the area under agri-environment contracts were the higher: €103M invested (26%) and a mean cover area of 273 941 hectares.

The spatial distribution of ProDer measures has been less concentrated. The Alentejo is still representing a high share of measures implemented, with special regards to the action *Changes in Agricultural Production Methods* (2.2.1) and *Soil Conservation* (2.2.4). However, the North region has

predominated in terms of investments and area covered by the actions included in Axis 2.

Socio-economic impacts

The RURIS Final Evaluation Report (AGROGES, 2009) assessed the social impact of the program based on the social fragility level of each municipality, which was calculated through four Indicators: i) population growth; ii) ageing index; iii) population density; and iv) total agriculture employment. By comparing the spatial distribution of RURIS financial support with the social fragility levels calculated, it was concluded that:

- RURIS measures have favored municipalities with high levels of social fragility;
- RURIS measures recognized and favored agriculture properties located in municipalities of high social fragility levels;
- RURIS supports were more relevant to social fragile municipalities, both considering each agriculture property and the overall income of the agriculture sector;

The ProDer Midterm Evaluation Report (ProDer, 2010), which is the most recent published evaluation of this program, has not consistently assessed social economic impact. However, the program's Ex-ante Evaluation Report (MAMAOT, 2007) highlights that there are several measures focused on promoting innovation and improving professional skills, which is likely to contribute to the sustainable growing of rural productive systems, to the development of new and more valuable products, and to the creation of new qualified jobs.

7 Scenario analysis

As previously explained, the current ecological criterion considered in the allocation of the FGM to municipalities is based on a single indicator, the surface of classified areas (Figure 20). The underlying reason to adopt this indicator is that protected areas impose land-use restrictions and corresponding opportunity costs.

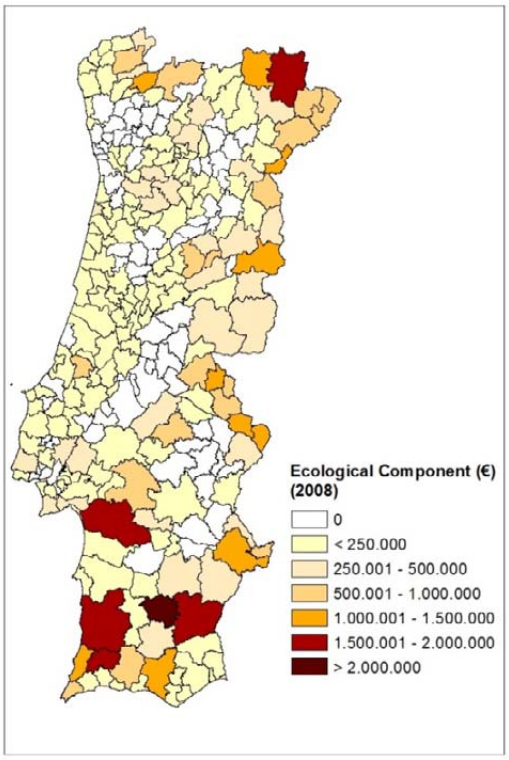


Figure 20 - Ecological funds distributed in 2008 by the Portuguese Local Finances Law

One expected outcome of this approach is that municipalities with no classified areas on their territory don't receive any ecological related transfer. However, the fact that some municipalities do not encompass protected areas does not mean that they are not contributing or investing in ecological aspects. Several municipalities with no classified areas within their territory exhibit higher expenditure on biodiversity conservation when compared to municipalities with high percentages of classified area. Ecological values and services are not restricted to protected areas or Natura 2000 sites, as they are a complex and connected network that covers all territory.

We are exploring the introduction of new ecological indicators, using them in alternative or complement to the current ecological criteria. The idea is to find indicators that better reflect ecosystem values and services and that can incentive all municipalities to incur in expenses to protect/restore relevant ecological values in their territories. Three scenarios for the allocation of the FGM are presented considering alternative indicators.

For each scenario, spatially explicit analyses were performed to investigate: a) the distribution of the FGM **ecological component** (i.e. the share of the FGM distributed to each municipality through the ecological criteria); b) the variation of the total sum allocated to each municipality from the FGM, taking as a reference the year 2008.

- **Scenario 1**

This scenario uses as an Indicator the sum of the mean provision of cultural, regulating and supporting services by each municipality. Values were estimated following Burkhard *et. al.* (2009), who propose a matrix linking landscape units (CLC classes) to capacity of ecosystem service provision,

ranging from 1-5[4]. The matrix values are a qualitative assessment based on expert evaluations (conceptual and from different case studies in Europe), therefore should be considered as hypotheses of possible capacities of ES provision.

The results of **Scenario 1** are shown in Figures 21 and 22. The share of the FGM allocated to the ecological component followed the value observed in 2008 (the total value transferred through the ecological criteria was around 6% of the FGM). The allocation of the ecological component using the indicator proposed is notably different from the year 2008, when it was based on the surface of protected areas (Figure 20). All municipalities received funds, suggesting that they all provide ecological services at some level. However, sums received by the municipalities were very low and more homogeneous comparing to real transfers in 2008. In average, municipalities received around €215.000 from the ecological component, and the highest and lowest transfers were observed in the municipalities of Mortágua (€354.004) and Porto (€27.051), respectively.

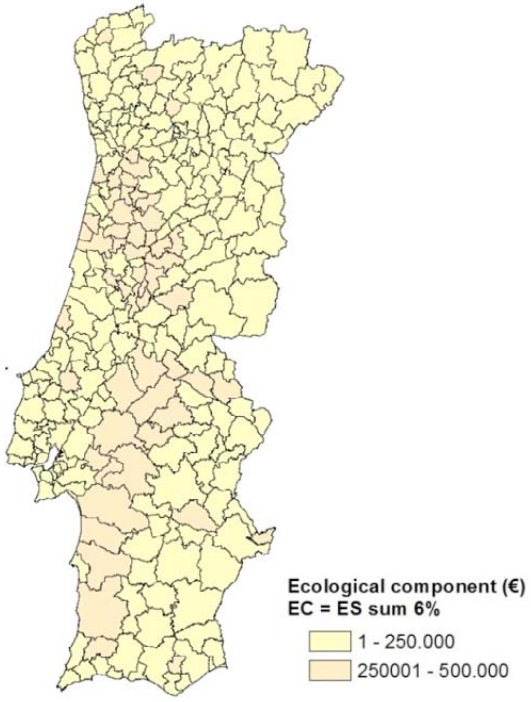


Figure 21 - Ecological component, according to Scenario 1

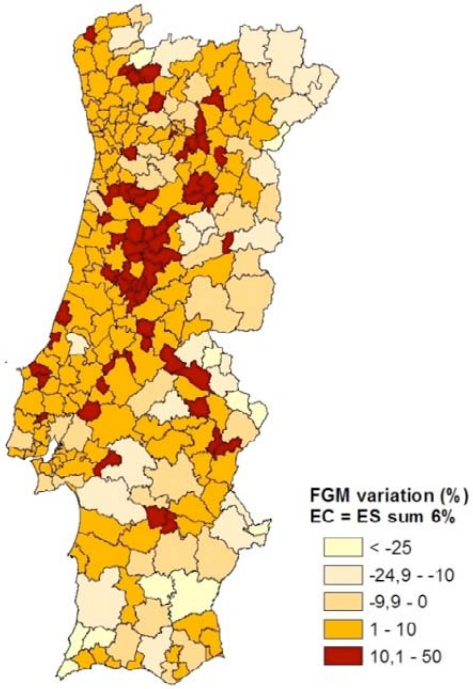


Figure 22 - Impact on FGM according to Scenario 1

[4]0 = no relevant capacity of the particular land cover type to support the selected ecological integrity component or to supply the selected ecosystem service, 1 = low relevant capacity, 2 = relevant capacity, 3 = medium relevant capacity, 4 = high relevant capacity and 5 = very high relevant capacity

In special regards to the impact of the new indicator on the distribution of the total FGM, the majority of municipalities (74%) increased their income. However, there were municipalities with significant losses, as for instance Castro Verde, with -40,3%.

The low value of ecological transfers allocated for each municipality is a consequence of the adoption of a criterion that implies a more uniform distribution of available funds than the previous criterion (that in global terms represents a low share of the FGM – around 6%).

- **Scenario 2**

Based on the findings from Scenario 1, it is proposed in Scenario 2 an increase in the ecological component to **18%** of the total FGM. This increase had an impact on the representativeness of other non-ecological criteria, which were proportionally reduced: *population density* corresponds in this scenario to 55% of the total FGM, and *total municipal area* to 22%.

The increase of the ecological component to **18%** of the FGM intended to amplify the weight of the ecological criteria in the FGM distribution, at the same time it was maintained as the third most relevant criteria, respecting the hierarchy established in the LFL. The indicator used in **Scenario 2** is the same as Scenario 1: the sum of the mean provision of cultural, regulating and supporting services by each municipality.

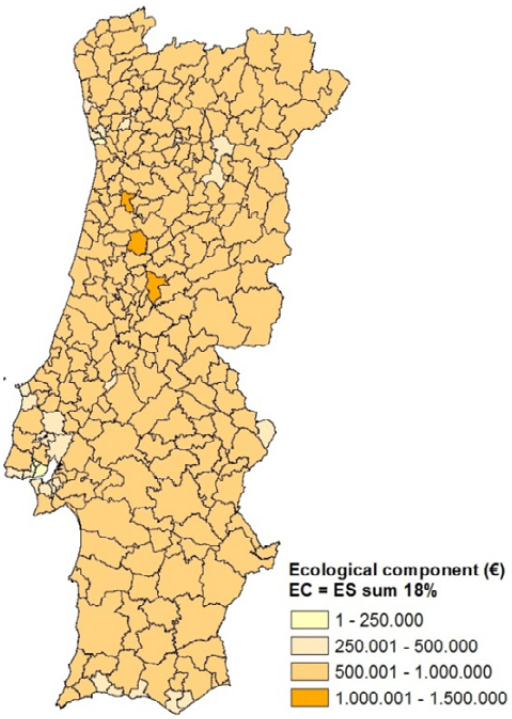


Figure 23 - Ecological component, according to Scenario 2

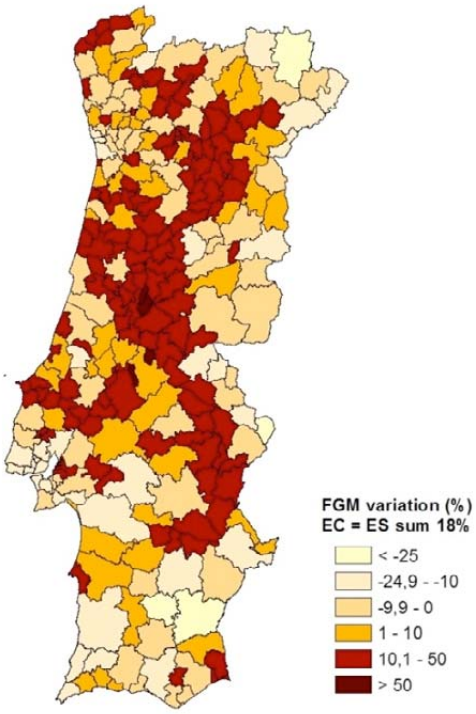


Figure 24 - Impact on FGM according to Scenario 2

As in Scenario 1, the ecological component allocation is more uniform among municipalities than with the criterion adopted in the LFL (87% receive between €500.000 and €1.000.000) (Figures 23 and 24). The impact on FGM favors mostly municipalities in the central and northern regions of Portugal.

The changes introduced by this new indicator have particularly negative impacts on municipalities with high percentage of classified area, as their income from the ecological component was significantly reduced. The resulting impact on FGM for municipalities such as Terras de Bouro (95% of classified area) and Castro Verde (76% of classified area) is, respectively, -22,9% and -38,6%.

- **Scenario 3**

The third scenario proposed maintains the ecological component as **18%** of the total FGM, similarly to Scenario 2, but bases fund allocation on **two indicators**: **1)** 50% of the ecological component (9% of FGM) uses the indicator composed by the sum of the mean provision of cultural, regulating and supporting services by each municipality; **2)** the other half will be calculated according to the indicator used in the current LFL, quantity of classified areas. The sum of both indicators will provide the final ecological transfer.

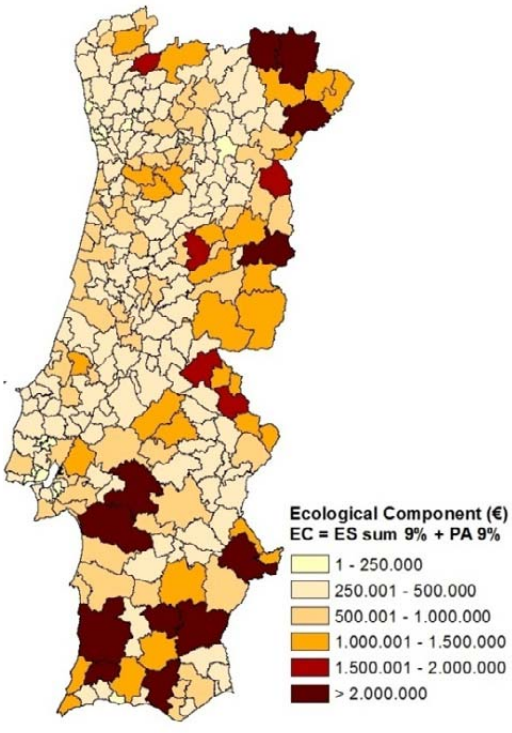


Figure 25 - Ecological component, according to Scenario 3

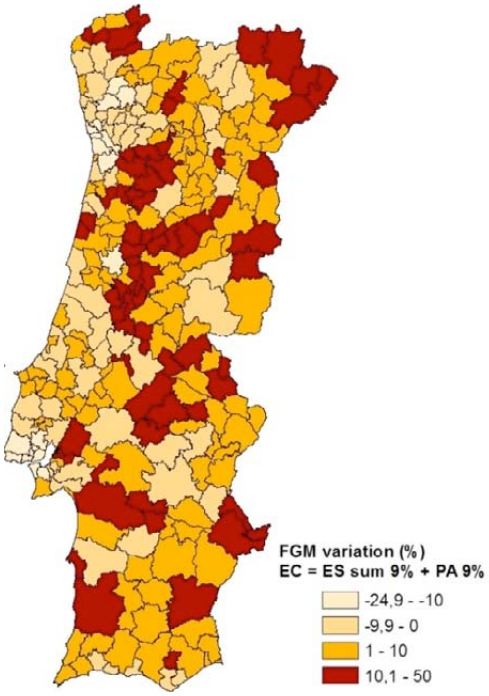


Figure 26 - Impact on FGM according to Scenario 3

When compared to the previous two scenarios, this option still provides ecological transfers to all municipalities, and significant amounts for transfer, in some cases above 2 million Euros (e.g. Castro Verde). The major difference is that the introduction of a composed indicator removed the evenness between municipal ecological transfers verified in the previous scenarios, thus avoiding the losses observed on scenarios 1 and 2 on municipalities with more than 70% of classified area.

By considering classified areas as indicator, it is possible to provide a fund allocation relatively similar to the current one (reference year of 2008), but granting more funds and using a more fairly approach as all municipalities receive some compensation.

Further research on scenario analysis will be developed, however the current exercise has shown that there are several opportunities to improve the Portuguese LFL in order to strengthen the incentives, both to maintain the existing biodiversity values and ecosystem services, and to create new conservation areas.

8 Further research questions for local fine grain analysis

Ex-Post Analysis AEM: What has been the impact of AEM in the case study area? Did Natura 2000 restrictions affect implementation of AEM? Or was Natura 2000 complementary, facilitating?

I. What is the ecological effectiveness of AEM in the case study area?
   - *Compare inside and outside Natura 2000;*
   - *Use site selection models to identify priority areas and compare their distribution to the distribution of agri-environment incentives.*

II. What are the amounts paid?

III. What have been the opportunity costs for landowners and how do they relate with received compensations?

IV. Who have been the main beneficiaries?

V. What is the perceived fairness (inside and outside Natura 2000)? What are the attitudes of different actor groups?

VI. Institutional factors affecting participation in AEM

Questionnaires will be applied to local stakeholders in order to help answering questions II - VI.

We intend to use ecosystem services maps to identify priority areas for the allocation of AEM (ex-ante and ex-post analysis), producing more refined maps by working with local data. However, the maps presented in the introduction are already a relevant contribution for indicators selection and improve acquaintance with ES mapping methodologies.

Ex-ante Analysis AEM: Should AEM evolve into a permanent PES scheme for Portugal?

i. What biodiversity values/ES and what practices within the case study area should be targeted?
   - *Use site selection models (Marxan) to define priority areas for the distribution of financial incentives according to local biodiversity/ES values.*

ii. What would be acceptable compensation payments?
   - *Questionnaires will be applied to local farmers to help answering these questions.*

iii. How can we promote fairness (procedural and outcome) in the PES scheme?

iv. What would be the rules of such scheme? How should it be funded? Who can enter the scheme? Who administers?

Ex-post Analysis EFT: What has been the impact of the EFT scheme in the case study area?

I. What have been the opportunity costs and additional expenditures associated with PAs for municipalities in case study area and how do they relate to amounts received?

II. What is the perceived fairness of EFT of main actors inside case study area? How has the scheme contributed to change their perception and attitudes towards biodiversity conservation and PA?

Interviews with local mayors will be conducted to help answering these questions.

Ex-ante Analysis EFT: How should the Portuguese EFT scheme be improved in order to increase effectiveness (ecological and distributional)?

i. What would be the effects of introducing quality criteria for municipalities in the case study area?

Ex-ante Analysis linking EFT and AEM: Should EFT and AEM be linked in a connected approach where the PES scheme would be managed by local authorities and tied to the EFT?

9 Data gaps in evaluating instruments' effectiveness

- Detailed information about regional and annual distribution of incentives from RURIS and ProDer were not found available. Although several requests for more refined data were sent to the MAMAOT (Ministry of Agriculture, Rural Development, and Fishing) nothing was provided to date. Due to this lack of access to data, impact evaluation had to base on information provided in RURIS and ProDer official evaluation reports, which were not enough for conducting spatial analysis of environment effectiveness and social economic impacts, neither to build scenarios.
- ProDer has defined indicators for environmental effectiveness and analysis of social economic impacts. However, data collection has not yet been completed– or not made available - in a way to allow estimations of the program outcomes.
- National data regarding the Local Finances Law execution was yet only available publicly until the year of 2009, which limited the number of years analyzed.

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