



Report on stakeholder adaptation strategies in the CASCADE study sites

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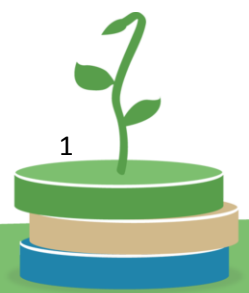
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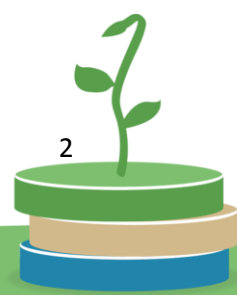
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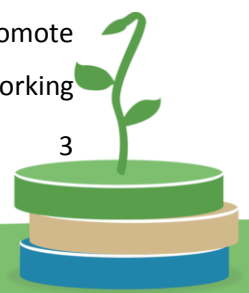
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1. INTRODUCTION

The interaction of human and biophysical factors has resulted in many changes to Mediterranean drylands, and in some areas has resulted in productivity losses and desertification (Hill et al., 2008). The inherent aridity and unfavourable soils, with poor water holding capacity, low organic content and low nutrient levels, inhibit primary production and ecosystem resilience (Lavee et al., 1998). Coupled with negative impacts from agriculture through contaminants such as nitrates, pesticides and heavy metals, and the effects these have on already scarce water resources, the future sustainability of the region's drylands is in question. Problems of degradation are expected to intensify as temperature and rainfall extremes increase under climate change (Ballester et al., 2010, Schär et al., 2004). Such changes are expected to exacerbate fire-related challenges in some areas of the region (e.g. Portugal) and problems of erosion on sloping land (e.g. in Spain). At the same time, social and institutional pressures, including policy-driven financial, incentive and resource allocation decisions, look set to add further to land quality changes and associated adverse conditions (Mazzucato and Niemeijer, 2000).

Environmental problems are typically complex, uncertain, multi-scale and affect multiple stakeholders. These often interdependent factors demand transparent decision-making that has the ability to be flexible to variable and changing circumstances, and which embraces a diversity of knowledge and values (Reed, 2008). As environmental management is site-specific, the development of appropriate measures requires the integration of biophysical, socio-economic and socio-environmental information (Harrington et al., 2001; Sayer and Campbell, 2004). To achieve this, stakeholder participation is increasingly being sought and embedded into environmental research and decision-making processes, from local to international scales (Reed, 2008).

Participatory processes have been used to gather knowledge about land degradation and to build a bridge between local communities and researchers (Stringer et al., 2007, Stringer and Paavola, 2013, Reed et al., 2011). Stakeholder engagement can create greater awareness of environmental problems, facilitate participation in the development of solutions, and promote consciousness about environmental issues within society as a whole. Inclusive working



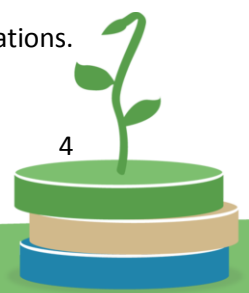
approaches are gradually becoming more visible in policy making in some parts of the Mediterranean, with shifts towards a collaborative approach involving the general public in sustainable development decision making (Hessel et al., 2014, Briassoulis, 2004). Additional knowledge and learning obtained through participation and collaborative processes offers policy makers more robust and substantiated data and evidence based on local factors. This can inform their decision making when reviewing, adjusting or applying a specific environmental policy (Stringer et al., 2014).

The work reported in this deliverable takes stakeholder engagement as its starting point. The aim of this research was to explore: a) whether stakeholders have noticed changes in environmental conditions and/or regime changes, and how they adapted to those changes, over and up to a period of 20 years from the present, and b) what kind of changes they expect to witness in the future (up to 20 years from the present) as well as what future changes, strategies and adaptation measures they perceive they might make to their land use and management, in order to adapt to those possible future changes. Achieving these aims provides useful information that can help to pinpoint where policy support might be needed in order to aid adaptation. The rest of this report is structured as follows. Section 2 presents the methodological approach employed in each study site. Section 3 presents the results. Section 4 provides a discussion linked to the wider adaptation to socio-environmental change literature in the Mediterranean and Section 5 sets out our conclusions and policy recommendations.

2. METHODS

2.1 Stakeholder analysis and evolution of approach

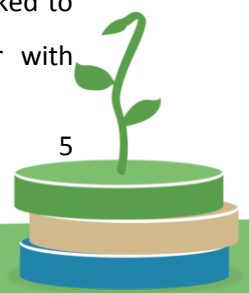
The initial proposal for this study was to carry out a stakeholder analysis, coupled with an integrated, geographically stratified stakeholder adaptation survey. The idea behind the stakeholder analysis was to identify individuals and groups that can affect, or are affected by, environmental changes within each study site (see Table 1 for list of study sites). To facilitate the stakeholder analysis process, the University of Leeds research team first asked all study sites to identify the main stakeholder categories in each site. The categories were: i) groups/associations/ organisations that represent and involve land managers (farmers, forest plot owners, natural area managers), ii) groups/associations/organisations that represent transient land users (herders, hunters, tourists), iii) governmental institutions (at various administrative scales), iv) Non-Governmental Organisations (NGOs), and v) other groups or associations.



Study sites were invited to adapt the categories in line with their own specific context. Study sites were also requested to provide the details of possible individuals in each stakeholder group who could provide a starting point for sampling in the survey, as well as indicating the approximate number of other actors within that particular stakeholder category in the study site. The Leeds team also asked study sites to highlight which of the stakeholders they had already engaged with during the wider CASCADE project. On receipt of the information requested from each site, and subsequent discussion with study site leaders, we found that the format of a geographically stratified stakeholder survey was unsuitable. The stakeholder inventories had revealed that most stakeholders were institutional stakeholders and could not be (geographically) sampled.

The types of stakeholders varied across the study sites and different levels of interaction between researchers and study sites had taken place already in the wider project. As such, a process had to be designed that allowed for flexibility in its application, whilst also maintaining academic rigour and comparability (cf. Stringer et al., 2014). Consequently, an alternative approach was designed. Individual perceptions of shifts in the environment and adaptation strategies were first elicited from a representative from each identified stakeholder group. This step required participants to answer a set of questions, presented in table form, prior to their attendance at the focus group. In the next step, a focus group discussion was organized at the study site level to discuss and identify whether different stakeholders were in agreement on the key changes and adaptation strategies. This two-step process intended to allow for comparison of views across stakeholders from different groups within the same site, and within stakeholders from the same groups across the different sites. The questions that were discussed in the focus groups were the same as those answered by individuals in each stakeholder group prior to the focus group being convened. The first four questions focused on the regime changes that stakeholders have experienced over the past 20 years, when the changes happened, what caused them, and how they responded to the changes. The second set of questions focused on how stakeholders would adapt to future changes, and what support was needed to help realise those adaptations. The list of questions can be found in Annex 1.

Each study site began with the same research process, though in some cases it was deemed necessary to modify the approach depending on the specifics of the local context, the stakeholders therein and in light of any previous stakeholder engagement activities linked to the project. A summary of the approach ultimately taken in each site, together with



information on the number of stakeholders present, is shown in Table 1 and Annex 2. Overall, the focus groups helped to support the development of rapport between researchers and stakeholders and built on the existing stakeholder engagement in the study areas. Across the six study sites there were two female and four male researchers leading the field work teams, while the Leeds University team comprised two females and two male researchers.

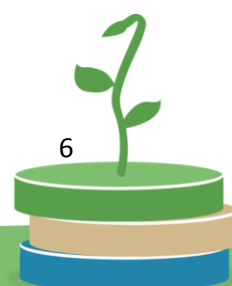
Table 1. Details of the methods and number of stakeholders per study site.

Study site	Methods used and number of stakeholders
Albatera, Spain	6 participants answered the questions individually. Five stakeholders participated in the focus group held in May 2014.
Ayora, Spain	A focus group was held in May 2014 with 12 participants from 5 stakeholder groups, and the 12 participants also answered the questions individually.
Randi Forest, Pissouri, Cyprus	16 participants from 6 stakeholder groups attended the meeting and 17 participants answered the questions individually during the period May-June 2014.
Messara, Greece	5 participants from 3 stakeholder groups were interviewed individually during May- June 2014.
Castelsaraceno, Italy	9 stakeholders from 6 groups filled in individual tables, and a focus group meeting was held in May 2014.
Várzea-Calde, Portugal	11 stakeholders from 4 groups filled in individual tables and 10 participated in the focus group held in Jan 2015.

Stakeholders were selected for involvement in the research based on their direct contact with land use and land management, whether this was for production, management or leisure purposes. Overall we gathered information from sixty stakeholders, of which 5 were female (Table 2).

Table 2. Stakeholder group and site study of female stakeholders.

Country	Stakeholder Group
Albatera, Spain	Governmental Institutions
Randi Forest, Cyprus	Environmental Department
Randi Forest, Cyprus	Pissouri City Council
Castelsaraceno, Italy	(Other) Local tourist
Várzea-Calde, Portugal	Governmental Organization



That there are few women participants in the research reflects the type of stakeholders using the land, such as farmers, shepherds, local councils and leisure users, as explained in the CASCASDE Report 07 on Gender Equality *“Our core stakeholders are only men, as no women are directly involved in land use / land management (Claringbould 2015, p.25)... Forest lands are typically family properties, but men are usually identified as the head of the household and, as such, have the main responsibility over management decisions as well as actions, and women attribute the main management responsibilities to their husbands (Claringbould 2015, p.26) ”.*

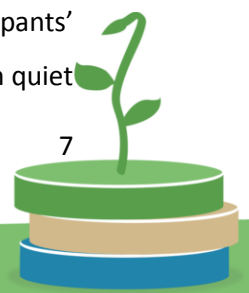
Therefore, stakeholders working in land use and management roles are largely dominated by men, in the study sites (Claringbould, 2015). It can be seen in the table above, most female stakeholders that the on-site researchers were able to contact (4 out of 5), were working in local councils and environmental departments. This is a reflection of the type of roles women are undertaking in the study sites.

Although female stakeholders can provide alternative information and expertise due to labour division and the different roles that they play in administering livelihoods, they may not have the power to make decisions or address changes (Claringbould, 2015).

2.2 Focus group process

The first of the focus group discussions was held in May 2014; the last in January 2015. In general each focus group followed (to a context-appropriate extent) a similar format. A short presentation and introduction to the CASCADE project was first given by the study site researchers. This was done using simple terminology, adapted for a lay audience. A question and answer session was then held in order to address anything that was unclear, and to allow any queries from the stakeholders to be answered prior to discussions. As the types of changes that occurred at each study site were different from each other, focus group convenors necessarily adapted the definition of “regime change” to the context of each study site.

The discussions started with a blank sheet, and a volunteer was asked to suggest an answer to the first question, which the rest of the group could then use as a basis for discussion. For each answer, the objective was to try to ensure that the group reached a consensus. If consensus could not be reached, the majority view(s) was recorded. In some sites, this meant that comparison of different views within the group was not always possible. All participants’ perspectives were actively sought by encouraging input from those who might have been quiet



or may have otherwise not actively contributed. A photographic record of the focus group was taken in many study sites after obtaining the prior consent of the participants (see Figures 1-7 for photos from Castelsaraceno, Italy; Várzea-Calde, Portugal and Ayora, Spain).



Figure 1 and 2.
Stakeholders during
the focus group in
Castelsaraceno,
Italy.



Figure 3 and 4. Stakeholders during the focus group in Várzea-Calde, Portugal.

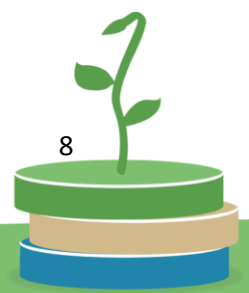
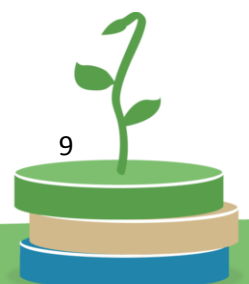




Figure 5, 6 and 7.
Stakeholders during
the focus group in
Ayora, Spain.

The sets of answers from study sites (in table form; one set completed by individuals, the other by the focus group participants) were returned to the Leeds team who input the data into MS Excel. Simple, descriptive statistics were used to describe the data and characterise the participants using the SPSS statistical package (SPSS, 1996). Qualitative data were analysed under key themes relating to the nature of the changes reported by participants; the types of adaptations undertaken; and the types of necessary support, as suggested by each group of stakeholders and categorized by the sector in which they operate. Only specific statements were considered in the sample. General statements such as “*we need better policies*” were not included in the analysis. Findings are presented in the sections below.



3. RESULTS

This section first presents information on the stakeholders in each site. It then considers the drivers of change across all six sites, the broad categories in which adaptations currently sit and the economic and policy support needed across all the sites. The aggregated analysis is followed by a more detailed breakdown by study site.

3.1 Identifying the key stakeholders

A total of 60 stakeholders from six study sites (Albatera, Spain n=6, Ayora, Spain n=12, Castelsaraceno, Italy n=9, Randi Forest, Cyprus n=17, Messara, Greece n=5, and Várzea-Calde, Portugal n=11) participated in this aspect of the research. The stakeholders represented 36 different groups that could be categorised under six headings: 1) land users (farmers, shepherds, transient and sedentary land users, managers and hunters) (40%); 2) landscape users (naturalists, photographers, tourist guides) of environmental resources dedicated to non-extractive activities (5%), 3) government stakeholders from environment departments, local councils and forestry departments (39%); 4) stakeholders from environmental NGOs (8%); 5) the private sector (3%) who were only present in Várzea-Calde, Portugal, represented by sawmill proprietors; and 6) researchers (5%) who were only present in Spain, both in Albatera and Ayora (see Figure 8). It should be noted that not all sites had the same groups of stakeholders (see Annex 2 for a summary of stakeholders in each study site, as well as Figures 8 and 9).

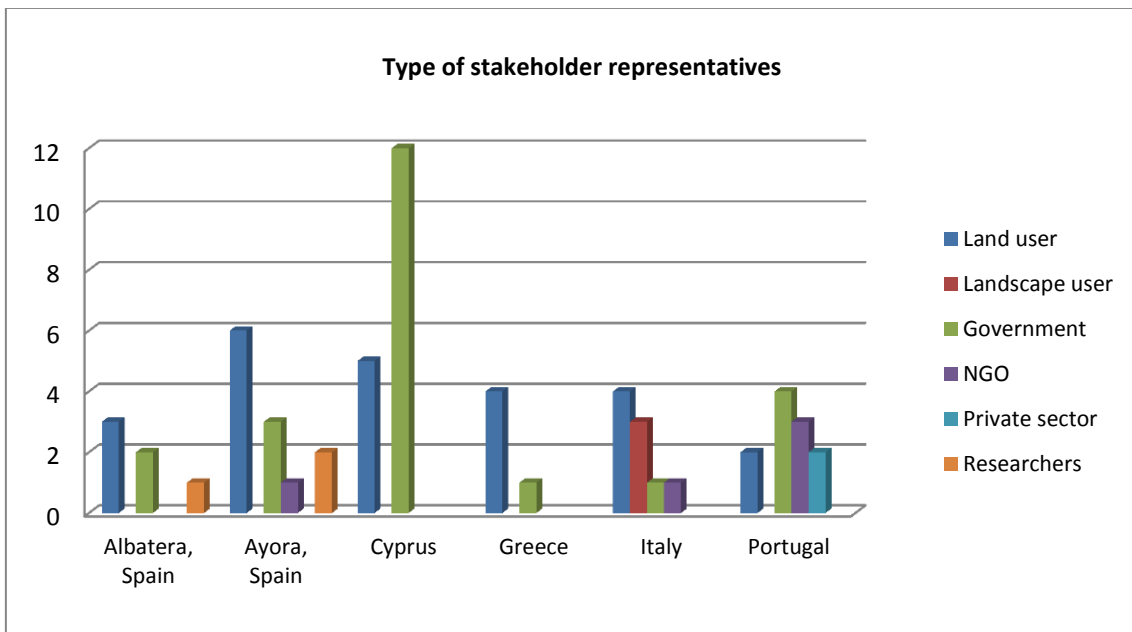
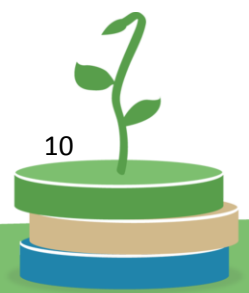


Figure 8. Number of participants per stakeholder group by study site.



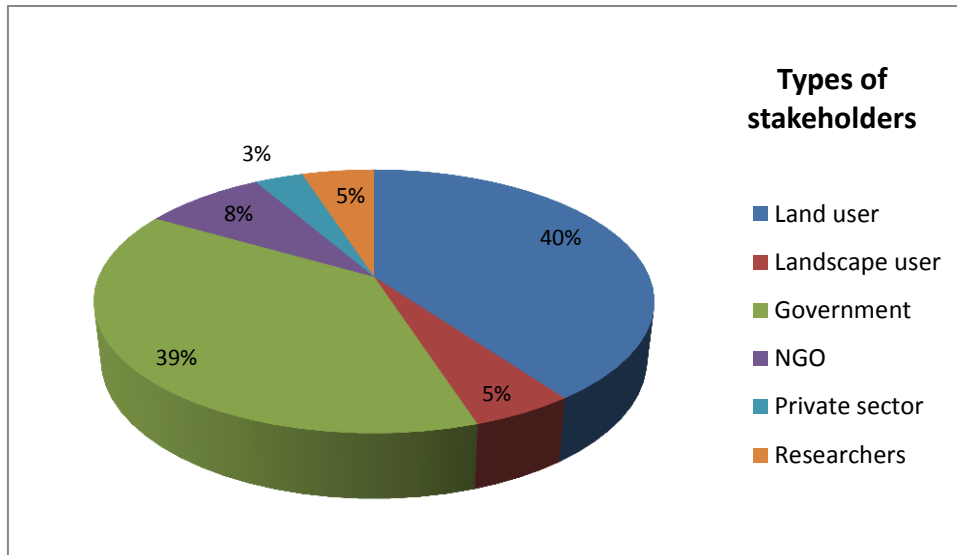


Figure 9. Percentage of stakeholders involved across the sample.

3.2 Perceptions of environmental conditions/regime changes across all six study sites

Stakeholders referred to a range of different types of regime changes including land use changes, environmental and ecological changes, and climatic events (see Table 3). However, they did not clearly differentiate between regime changes and the drivers of those changes. For example, erosion could be seen as both a regime change driven by changes in land use practices, and as a driver of vegetation loss. The fuzziness between changes/drivers was particularly apparent in relation to climate change events, which stakeholders quoted both as a change in themselves, and as a driver of change (Table 3). As most stakeholders had this ambiguous view across the study sites, and it was clear that they saw drivers and effects/consequences as part of a vicious cycle of use-damage-more intensive uses-more damage, the analysis we present here uses the stakeholders' views as stated. Another challenge with the data received is that when describing the changes in regime, most stakeholders referred to a period of more than 20 years ago, despite being asked only about the last 20 years. As such, they described the changes in the time frame that they had observed within their memorable lifetime, instead of referring to the time frame that was asked of them (Table 3 and Figure 10). This made it difficult to establish a reference/baseline period, which was deemed necessary to permit comparisons to be made and establish whether stakeholders were talking about the same change(s) as one another, or not. Finally, while stakeholders mentioned the changes taking place and the adaptations undertaken, specific changes were not always linked to specific adaptations. This further complicated the analysis.

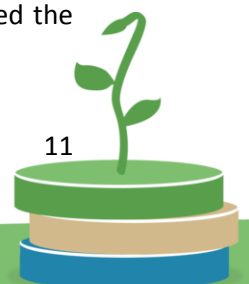


Table 3. Regime changes perceived by participants across all six study sites.

Regime Changes	Albatera, Spain			Ayora, Spain			Cyprus			Greece			Italy			Portugal		
	pre-1970	1980-2000	2000-	pre-1970	1980-2000	2000-	pre-1970	1980-2000	2000-	pre-1970	1980-2000	2000-	pre-1970	1980-2000	2000-	pre-1970	1980-2000	2000-
Invasive and exotic vegetation						x	x	x	x									x
Expansion of shrubland						x	x	x	x									x
Changes in the local fauna (generalists and/or exotic species)						x		x	x					x	x			x
Increase in wildfires						x											x	x
Plagues and diseases affecting trees						x								x	x		x	x
Decrease in pine regeneration																x	x	x
Abandonment of agricultural areas		x	x	x	x	x								x	x	x	x	x
Agricultural use of forested areas	x	x												x	x			
Land denudation and erosion	x	x	x		x	x	x	x	x					x	x			
Rangeland abandonment	x	x	x		x	x												
Increase in irrigated croplands	x	x	x															
Native vegetation reduction	x	x			x	x	x	x	x		x	x		x	x			
Increase in woodlands and forest			x															x
Droughts						x		x	x		x	x						
Abandonment of farming areas														x	x			
Reduced rainfall						x								x	x			
Increased temperatures, reduced seasonality differences, extreme weather conditions						x								x	x			
Changes in surface water bodies											x	x		x	x			



3.3 Stakeholder adaptations to change across all six study sites

A thematic analysis was carried out to empirically derive the areas into which the stakeholders are currently channelling their adaptation efforts. Four adaptation areas were identified: 1) environmental management adaptations, 2) socio-political adaptations, 3) socio-economic adaptations, and 4) cultural adaptations. Each of these categories shared some overlaps with other categories. However, categories were used in a consistent way so that the overlaps did not affect the key findings. Environmental management adaptation measures were the main activities that stakeholders undertook in response to regime changes across all study sites (67% of measures across sites). These referred mostly to prevention and management of deleterious environmental changes, and to the recovery of nature and rural practices. (Rural practices are an example of an adaptation that may also be considered in the cultural adaptation category. Given the links to land management, we classified rural practices under environmental management adaptations). Socio-political measures formed the next largest set of actions (15%) and consisted of improving land use and environmental management through cross-sector organization, advancing or creating policies for land use and land users, and patrolling to prevent illegal practices. Under socio-economic measures, stakeholders mentioned economic support, subsidies, and migration (see Table 4).

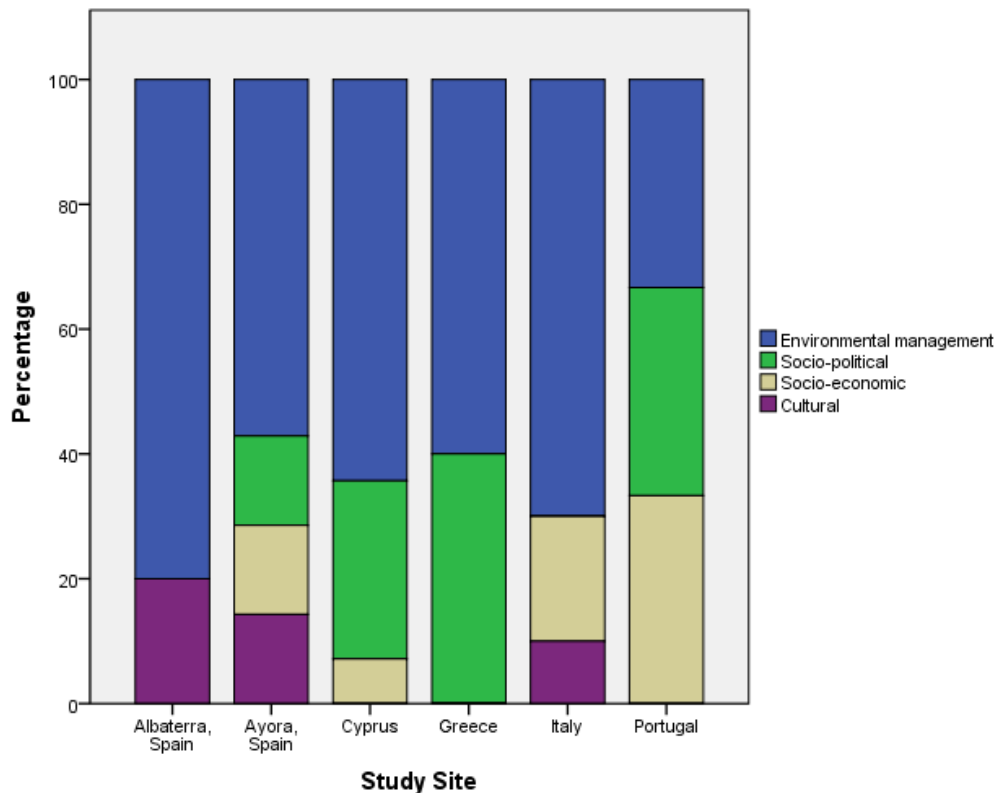


Figure 10. Percentage of each types of adaptation measure (n=57).

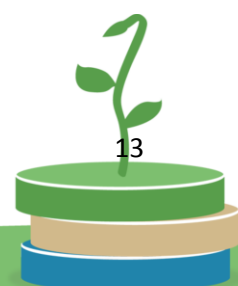


Table 4. Adaptation measures and practices mentioned by the stakeholders in the 6 study sites.

Study site	Environmental management	Socio-political	Socio-economic	Cultural
Albatera, Spain	<ul style="list-style-type: none"> • Promoting new restoration approaches in recent reforestation programs aimed at introducing a large variety of native species and improved restoration techniques • Multi-species pilot project (25 ha) and a further large-scale restoration project (600 ha), in the south facing slope of the Crevillent-Albatera range. The actions have favoured the establishment of tree, shrub and herbaceous species already present in the area and have established soil conservation measures. • Replacing olive, almond and carob trees with fig, pomegranate and lemon trees. 			<ul style="list-style-type: none"> • Practicing of constant educational and raising-awareness work through the association and a personal blog. The association regularly organizes and promotes cleaning and restoration activities in disturbed areas.
Ayora, Spain	<ul style="list-style-type: none"> • Respondents have had to look for more suitable places to install bee hives, with higher rainfall, to allow flowering • More resources have been devoted to vigilance and extinction but little to the primary causes of change (clearing and maintenance) • Changing game habits and protecting the land as much as possible • Developing more research aimed at reducing fire hazards and increasing ecosystem resilience • Elaboration of environmental reports with more detailed information about problems and solutions 	<ul style="list-style-type: none"> • Developing treatments and prevention plans although they are not always fully implemented 	<ul style="list-style-type: none"> • Economic support (subsidies/ compensation) has been provided to farmers whose crops were affected and damaged by large animals 	<ul style="list-style-type: none"> • Assuming a loss in resource value • Resignation and acceptance that losses will occur.



Study site	Environmental management	Socio-political	Socio-economic	Cultural
Randi Forest, Cyprus	<ul style="list-style-type: none"> • Use of rat baits • Road cleaning • Making terraces to stop erosion • Planting trees • Protecting the neck of the carob trees to avoid rat attack • Reproducing some of the native wild animal species and releasing them. • Protection of snakes and fox as they reduce the numbers of rats 	<ul style="list-style-type: none"> • Most of the land is private. Attempts are made to try to protect the governmental land by patrolling the area and observing the flora and fauna • We patrol the area and observe. We proposed to move some farms to another area which has more grass to graze and there is more water for shepherds to cultivate grass. • We inspect the area daily for outlaw hunters and observe and count the number of animal species present in the area. • The south–west area of the Pissouri village is included in the Nature 2000 project 	<ul style="list-style-type: none"> • Import food into the farm to feed the goats and allow the goats to go as far as they can to find food to graze 	
Messara, Greece	<ul style="list-style-type: none"> • Seeding barley or similar crops for animal fodder • Afforestation of the pastureland with <i>Ceratonia Siliqua</i> (documented in the World Overview of Conservation Approaches and Technologies (WOCAT)), which is now used as fodder, combined with rotational grazing. • Reduction of water pumped from the existing wells, and use of water for irrigation from the dam in Faneromeni • Common water harvesting watering points (as documented in WOCAT). 	<ul style="list-style-type: none"> • By applying the measures decided in the Water Management Plan • Development of the new irrigation plan of Messara Valley, based on the basic FAO plan¹ 	<ul style="list-style-type: none"> • Better distribution of subsidies (possibly through improved criteria) 	

¹ Construction of a dam in a neighbouring hydrological basin and transport of water to Messara, with the aim of save water so that springs traditionally used for livestock watering, do not dry up.



Study site	Environmental management	Socio-political	Socio-economic	Cultural
Castelsaraceno, Italy	<ul style="list-style-type: none"> • Clearing of uncultivated land sporadically • Hunters only clear areas suitable for hunting • Other land users avoid overgrown shrub areas • Moving pasture to surrounding areas • Increased hunting of pigeons and boar • Plans to cull foxes • Livestock farmers are able to use pastures for much longer periods in winter • Repairing of the river embankments every time there is a flood which perhaps has re-prioritised the local authorities' public spending, as investments are needed to repair and strengthen banks • Moving activities to areas not affected by erosion without restoring the affected areas • Investment in the upkeep of pathways and lanes which are essential for viability • Abandonment of crop rotation • Shelter construction 		<ul style="list-style-type: none"> • The sale of land to extra locals who purchase speculatively (to then access EU/EEC contributions) • Migration of locals from the countryside towards inhabited centres. • Livestock farmers have progressively abandoned their activities • Adaptation by purchasing low cost imported goods • Extra local forage purchase • Abandonment of sheep and cattle farming 	<ul style="list-style-type: none"> • No direct adaptation although awareness increased of the need to educate the younger generations about how to maintain and protect the local territory, both at school and through environmental awareness campaigns • Donating things no longer required to those in need
Várzea-Calde, Portugal	<ul style="list-style-type: none"> • I was forced to move the bee hives to other places with more balanced ecosystems. • Remove the affected trees. • Active forest production, plantations of <i>Eucalyptus globulus</i> and <i>Pinus pinaster</i>. • Logging and removal of the affected trees. 	<ul style="list-style-type: none"> • Constitution of the Municipal Forest Technical Offices. • Changes in the legislation of the forest sector. 	<ul style="list-style-type: none"> • More value attributed to the forest sector • Application for subsidies for clearing the forest and for reforestation. 	



When answering about the policy/economic support required to facilitate adaptation, stakeholders differed in their needs and visions for future efforts. Responses of wanting/ desiring/ needing differed from the measures they are already carrying out, in which they stated what was lacking, or identified better ways of implementing current efforts. Therefore, a further thematic analysis analysed the specific policy and economic recommendations mentioned by the stakeholders that they considered could facilitate their adaptations. Again, only specific recommendations were included in the analysis. A total of 76 specific recommendations were gathered across the six study sites (Figure 11).

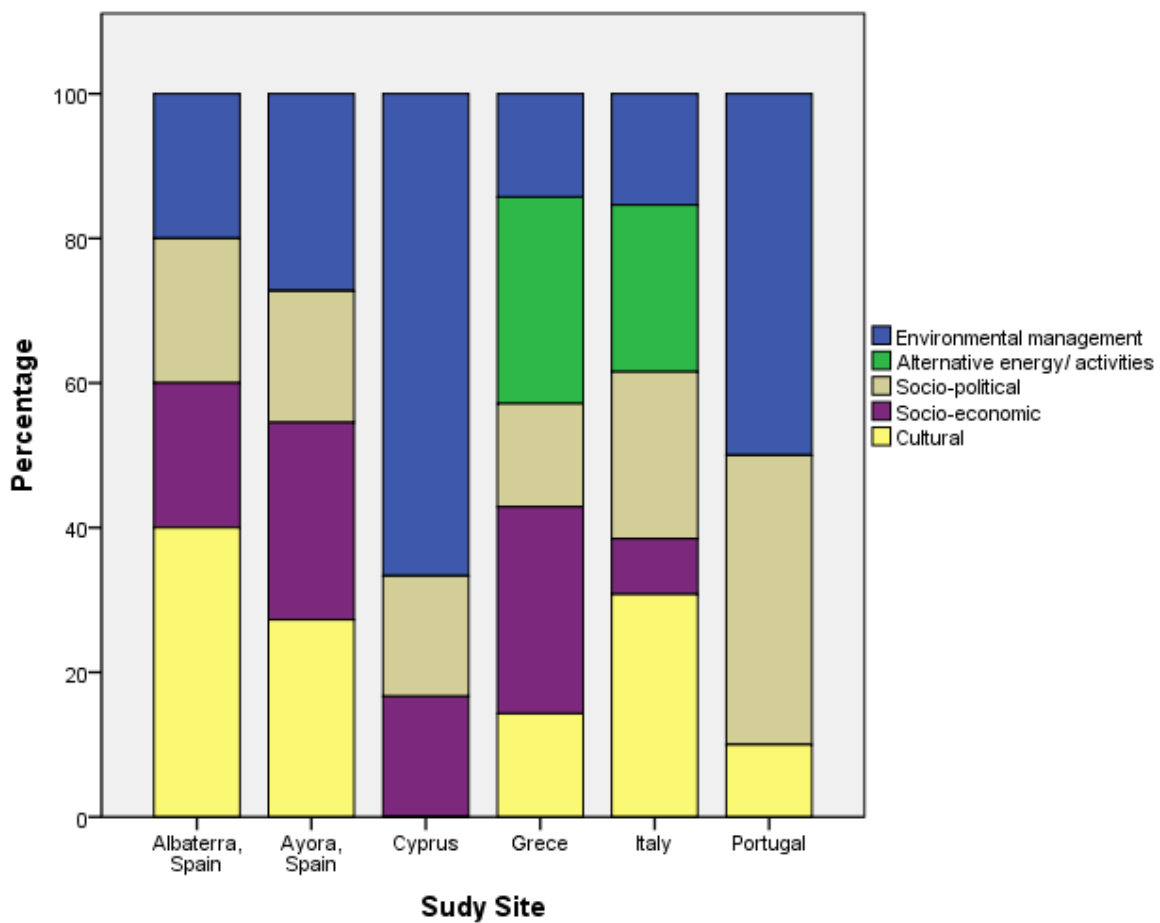
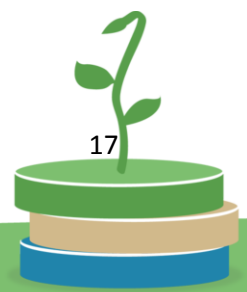


Figure 11. Types of measures required to facilitate future adaptation by country. Specific proposals were categorized using a thematic analysis according to the area to which they related (n=76 measures mentioned)



Most areas of support required were directed towards environmental management (30%) and socio-political and cultural measures (22% each). There were two categories that slightly differed here from those listed in Table 4. These referred to a) engagement in new activities/or new practices such as aiming for product certifications, engagement in or promotion of rural tourism, organising cooperatives, and the use of alternative energy sources; and b) other changes, in which there are efforts towards education, engagement of new generations in rural activities, reevaluation of rural stakeholders and traditional practices, which, with the exception of two stakeholders (from Italy and Albaterra, Spain) who stated that they were devoting efforts to education, was not currently being practised.

Proposals to incorporate new technology, alternative energy and activities such as integrating IT into farm management and promoting certification of products were categorized under “Alternative energy/activities” and accounted for 11% of the proposals (See Figure 11).

The previous sections have provided information on the aggregate responses of stakeholders regarding the changes taking place, the adaptations and areas where adaptation support is required. The following sections explore the specifics of responses in each of the study sites.

3.4 Albaterra, Spain

In Albaterra, the changes that were perceived by stakeholders were mostly environmental and due to land use shifts. Land use changes further consisted of abandonment of agricultural areas, agricultural use of forested areas and the consequent loss of forested areas, rangeland abandonment and an increase in croplands. Contrasting views were found in the individual responses. While a local government representative only mentioned a positive change because of reforestation efforts (carried out at the end of 1960 and throughout the 1970s, due to policy and economic drivers), an environmental researcher only mentioned “*landscape degradation*” during the last 20 years (due to causes such as “*poor recovery of previously degraded land, failed past reforestations and mining and water channelling works*”). However, both mentioned successful reforestation efforts as an adaptation measure (Table 5). An important land use change was recognized due to transition from rain-fed to irrigated agriculture, mainly on the foothills, as a result of new structures linked to Tajo-Segura inter-basin transfers.

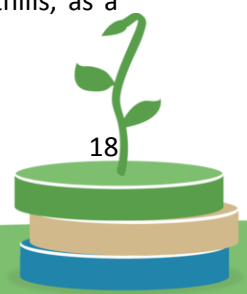


Table 5. Drivers of change identified by stakeholders in Albaterra, Spain.

Albaterra, Spain	Governmental institutions	Researchers	Sedentary land managers operating at small scale	Transient land users (Hunter/Hiking association)
Changes in agricultural practices (use of irrigation)	x		x	x
Intensity of grazing	x			
Loss of vegetation (lack of recovery)		x		
Mining		x		x
Changes in the value of produce			x	x
Rainfall decrease				x
Intensity of visitors				x
Urbanization				x

Awareness-raising was viewed as an adaptation measure by a representative of a hiking association and local blogger: *“I practice constant educational and awareness-raising work through my association and through a personal blog. My association regularly organizes and promotes cleaning and restoration activities in disturbed areas.”* Such efforts can be seen as both an adaptation and an effort that underpins the adaptation and behavioural change of other groups. However, it was also noted that land abandonment and environmental impacts were the unavoidable result of the low profits from agriculture, and the lack of financial incentives (see Table 5).

It was not possible to assess the degree of agreement between stakeholders during the focus group due to the way in which data were recorded. However, during the focus group, stakeholders recognized the importance of environmental restoration as alternative land management options, and the need to protect current resources. Stakeholders recognized that during the last 10 years the major driver of change has been urbanization, and an increase in outdoor activities. Regarding the low profitability of the crops, stakeholders perceived that their options are to replace traditional plantations such as olive, almond and carob trees with more profitable ones such as fig, pomegranate and lemon trees, as well as to either expand irrigation, or abandon land. At the same time, they recognized the importance of optimizing water use, and to implement tailored policies for the management of semi-arid land.

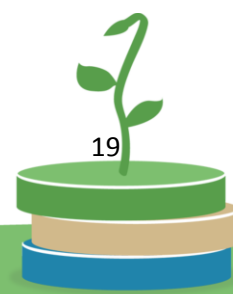


Table 6. Summary of future expectations, alternative land management options and policy/economic support required by stakeholder groups in Albaterra, Spain.

Stakeholder groups	What future regime changes do you expect?	What alternative land management options will you consider?	What policy / economic support is required to facilitate the adaptations and changes you mentioned?
Local political institutions	<ul style="list-style-type: none"> • If agriculture is not profitable, water supplies will diminish, leading to cropland abandonment, followed by natural vegetation colonization, but also severe erosion and resource losses. 	<ul style="list-style-type: none"> • Recovery of interesting or suitable private areas to the public domain to be restored. • Special protection to prevent severe removal of vegetation cover 	<ul style="list-style-type: none"> • Financial contributions to recover public ownership of certain areas and to restore them.
Government institutions	<ul style="list-style-type: none"> • No major changes, stability and reduced fire risk. 	<ul style="list-style-type: none"> • Restoration of riparian vegetation to improve the drainage network 	<ul style="list-style-type: none"> • Support for permanent forest management and maintenance works
Researchers	<ul style="list-style-type: none"> • No changes in terms of new restoration effort, given the economic situation and the trend of recent years 	<ul style="list-style-type: none"> • Maintain forest management and hydrological control • Forest management alternatives that promote environmental education, recreation and economic activities 	<ul style="list-style-type: none"> • Combined and coordinated financial support from the European Union, regional, and local governments.
Sedentary land managers operating at small scale (farmer)	<ul style="list-style-type: none"> • No changes, if agricultural products continue to be profitable and water for supplied • A disaster if drought periods (frequency and duration) increase 	<ul style="list-style-type: none"> • Changes in crop types 	<ul style="list-style-type: none"> • Secure water supply
Transient land users (hunter)	<ul style="list-style-type: none"> • If precipitation does not increase the changes that occurred in the past will be worse and faster 	<ul style="list-style-type: none"> • Change from punctual reforestations to continuous (annual) restoration programs 	<ul style="list-style-type: none"> • A sustained increase in material, human and financial resources
Transient land users (representative of hiking association) and NGO	<ul style="list-style-type: none"> • Probably the Tajo-Segura inter-basin transfer will not last or be functional for long, affecting irrigation agriculture • Future drier conditions driven by climate-change will affect future reforestation actions. • Hunting and livestock may decline. • If intensive recreational uses, livestock and hunting continue, the local flora and fauna will be adversely affected. 	<ul style="list-style-type: none"> • Evaluation of current management options 	<ul style="list-style-type: none"> • Consideration of long term impacts, and all groups affected in decision making. • Valiant local authorities, that take proper action when necessary- even if unpopular decisions have to be taken • Educational work with recreational users

3.5 Ayora, Spain

Stakeholders in Ayora perceived changes in vegetation, wildlife and rural practices. Regarding changes in vegetation, stakeholders noted the general loss of natural vegetation, the expansion of shrublands, and the accumulation of biomass causing “fuel load build-up”. Perceived changes in wildlife included the loss of small game species but the increase in big game species and an increase in pests. Land abandonment, undergrazing and soil erosion were also perceived (see Table 3). Stakeholders agreed that the main driver of change was wildfires, as well as the lack of, or poor, environmental management practices, and the use of windmills (Table 7).

Table 7. Drivers of change identified by the stakeholders in Ayora, Spain.

Ayora, Spain	Government institutions	Associations/Land owner	Permanent users and managers	Transient stakeholders	Researchers
Wildfires	x	x	x	x	x
Depopulation			x		x
Climate change	x		x		
Lack of /poor environmental management or mismanagement	x		x		
Droughts		x			
Windmill installation			x	x	x
Water scarcity	x				
Pests	x				
Undergrazing	x		x		
Changes in wildlife				x	
Changes in agricultural practices			x	x	
Flooding			x		



Decision makers mentioned that an increase in environmental research and management plans has occurred, however, these were not delivering the expected results, or, as a government representative asserted, *“they are not always completely implemented”*.

Permanent (as opposed to transient) land users and managers quoted more drivers of change and recognised changes in wildlife and agricultural practices as drivers, as well as wildfires and depopulation (see Table 7).

The forecasted expected changes were shared by all stakeholders, as they anticipated an increase in climate-related events. Their views can be summarized by a transient land user who predicted: *“More fires, invasion of and the introduction of big game species (wild sheep, wild boar, Barbary sheep (Ammotragus lervia)), steady disappearance of small game species, more installation of industries within the forest, and a reduction of precipitation”*. Two thirds of stakeholders representing land users detailed that they have not adapted to the changes or that they have absorbed the loss as part of their response. They mentioned that they are *“resigned”* to the detrimental changes as they will happen regardless of their efforts. Two stakeholders mentioned the relocation of their activities and protecting the land as their response to changes: *“Resignation, changing game habits and protecting the land as much as possible”*. In Ayora, there were 11 proposals to improve environmental conditions, however according to the stakeholders, only 5 measures were being implemented.

Stakeholders’ perceptions of the alternative management options, as well as the policy/measures required highlighted different perspectives within the different stakeholder groups: while land users focused on environmental management and cultural measures, government representatives focused on administrative and economic measures (Table 8).

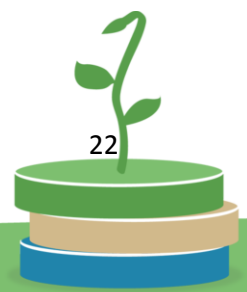
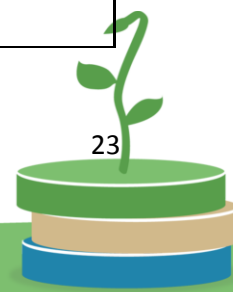


Table 8. Perceptions of alternative land management options and policies required by stakeholder groups in Ayora.

Stakeholder group	What alternative land management options will you consider?	What policy / economic support is required to facilitate the adaptations and changes you mentioned?
Researchers	<ul style="list-style-type: none"> • Managing the landscape towards mature forests – long term approach/scope. • Clearing forest lands, especially those reforested with pines in the past 	<ul style="list-style-type: none"> • Promotion of local employment in rural areas and economic activities within the forest sector. • Revision of European agricultural policies and directives (CAP) towards an intensification of the extensive uses of the land (promotion of grazing) and improve the protocols on early warnings of fire. • Avoidance of cuts in funds devoted to forest management and fire prevention.
Land users	<ul style="list-style-type: none"> • Encouraging society to restore the landscape (e.g. quads and motocross that destroy tracks and paths). • Cultivating set-aside agricultural lands with aromatic plants (good for beekeepers). • Using reforestation with less flammable species as natural firebreaks. • Building water ponds within the landscape to fight against fire. • Developing of systems for watering crops in case of extreme necessity. • Controlling industries (photo-voltaic, windmills). • Promoting green alternative energies and measures to increase biodiversity and, hence, more flowering plant options. 	<ul style="list-style-type: none"> • Greater support, especially workers, from the administration for fuel control (clearing) and forest track maintenance. • Education on the role of the forest (in soil protection) and raise society’s awareness so that they know that investment in the forest is profitable in the mid- and long-term. • Subsidies to municipalities in order to fix and attract population, encourage sustainable industries (cheese, milk, meat, etc) based on traditional uses of the land. • Enhance companies that produce renewable energy, and promote education campaigns to raise awareness about the negative consequences of using fossil fuels. The national administration should also increase subsidies to beekeepers because if this sector collapses, no pollination will occur and all ecosystems will degrade.
Government institutions	<ul style="list-style-type: none"> • Managing cooperatives for sustainable exploitation of forests and shrublands. • Grazing and cultivation of different forest crops. • Promoting the recovery of field houses (<i>‘casas de campo’</i>) and increase the number of people living there and using the ecosystem in traditional ways. 	<ul style="list-style-type: none"> • Subsidies to local people, reduction of taxes to farmers, rural industries and companies, increase support to rural areas, and requirements that big land owners reinvest in their lands. • Policy enforcement to ensure forest owners follow the environmental directives with the supervision of the environmental services of the public administration. • Greater investment in forest management to deliver an economic return



3.6 Randi Forest, Cyprus

Among the changes mentioned by the stakeholders in Randi Forest, Cyprus are: invasion of exotic species, soil erosion, droughts, expansion of shrubland and changes in wildlife and vegetation. The main drivers quoted were overgrazing, droughts and forest logging (100% agreement between stakeholders on logging) and wildfires (Table 9).

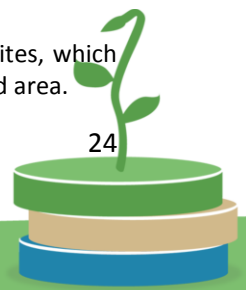
Table 9. Summary of the drivers of change identified by stakeholders in Randi Forest, Cyprus.

Randi Forest, Cyprus	NGO	Government Representative	Land users (Shepherds)	Environmental Managers (forestry department, fire brigade, wildlife services)
Overgrazing	x	x	x	x
Plagues, diseases	x	x		x
Wildfires	x	x		x
Droughts	x	x	x	x
Erosion	x	x		x
Forest logging	x	x	x	x
Outlawing of hunters				x

Stakeholders reported that changes in Randi Forest started in 1930, when logging for firewood was approved by the authorities. Negative effects of wildfires and land use changes were also recalled, however, these exceeded the time scale requested by the research. Members of the city council recalled: *“Old people in the village reported the cutting of the Randi forest in the 1930s: British authorities gave licences to the locals to cut the trees and use them as fire wood”*. Furthermore, changes in the original vegetation occurred within the last century, as recalled by an 83 year old shepherd: *“They say it used to be a forest. Since I remember, the area was covered by annual vegetation and shrubs”*.

When asked about their response to changes, only shepherds and wildlife services mentioned that they were actively doing something. The environmental department mentioned that the area was included in a Natura 2000² project, while the fire brigade did not provide an answer. The

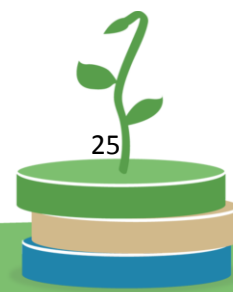
² Natura 2000, is the European Union network of protected areas. Cyprus has 61 Natura 2000 sites, which account for 1,760 km². However, the study site is in the marginal area and not inside the protected area.



environmental department participant explained that as it was private land, the public authorities are not authorized to intervene on it, although along with the wildlife services department, they did patrol the area. Land users and the city council mentioned environmental management measures such as use of rat baits, road cleaning, making land terraces to stop erosion, and planting trees as some of the measures being used (see Table 4).

Table 10. Summary of future expectations, alternative land management options and policy/economic support required by stakeholder groups in Randi Forest, Cyprus.

Stakeholder Group	What future regime changes do you expect?	What alternative land management options will you consider?	What policy / economic support is required to facilitate the adaptations and changes you mentioned?
Environmental managers (belonging to the state)	<ul style="list-style-type: none"> • More erosion. • Increase in thorny shrubs that may provide shelter for wild animals. However, they also act as kindle to fuel fires. Vegetation will decrease, thorny shrubs may cause fire, and erosion will increase. 	<ul style="list-style-type: none"> • Cultivate olive and carob trees • Fence some areas to stop overgrazing • Create terraces to stop erosion • New plantations to stop erosion 	<ul style="list-style-type: none"> • Subsidies for shepherds for less extensive grazing • Use of plants resistant to drought. • Provide the shepherds or the community council with olive and carob trees. • Provide alternative areas for the shepherds to establish their farms • Control construction • Control overgrazing and snake hunting, as snakes help to control the rats
Pissouri city council	<ul style="list-style-type: none"> • Shepherds will abandon their farms. • Less vegetation may result in more rats coming to the village. • More erosion 	<ul style="list-style-type: none"> • Cultivate olive and carob trees. • Plant trees to stop erosion 	<ul style="list-style-type: none"> • Subsidize shepherds to stop intensive grazing • Provide rat baits.
Land users	<ul style="list-style-type: none"> • Soil erosion • Only thorny shrubs resistant to drought will survive. 	<ul style="list-style-type: none"> • Only grow olive trees and carob trees • Grow plants resistant to drought. • Create terraces to stop erosion 	<ul style="list-style-type: none"> • Cutting of the thorny shrubs and provision of young trees or economic support. • Support for shepherds to provide dry food to the goats and stop grazing.



3.7 Messara, Greece

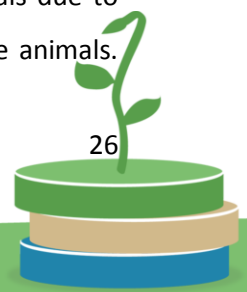
In Messara, the dates reported for changes were from around 30 years ago (~ 1984), as noted by three participants. All stakeholders mentioned human drivers of change, in terms of promoting the overuse of resources, and denouncing the use of incorrect/poor practices but also blocking positive change, as the removal of goats is not allowed. A transient land user stated that: *“due to socioeconomic conditions in the area, the number of farmers escalated in the 1970s.”* Furthermore, animal production started being subsidized by Greece and the EU, supporting the new farmers. As a result, the number of animals increased. Goats (vs sheep) are acknowledged as a driver of land degradation but heritage does not *“permit their removal”*.

The increase in grazing was felt to be motivated by high unemployment rates, while the intensification of agriculture and the change to irrigated crops, driven by subsidies, were considered as socio-economic drivers (Table 11). These were said to have caused a serious decrease in the natural vegetation, wildlife and water levels.

Table 11. Drivers of change identified by stakeholders in Messara, Greece.

Drivers	Groups of transient land users	Sedentary land managers operating at small scale	Governmental institutions
Intensity of farming	x		X
Inappropriate subsidies	x	x	
Increase in the intensity of grazing	x	x	
Environmental regulations in place	x		x
Changes in agricultural practices (use of irrigation)	x	x	x
Socio-economic conditions in the area	x	x	x
Intensity of water use		x	X

The main changes to traditional forms of land use quoted by stakeholders were the changes from subsistence agriculture to monoculture olive orchards, and difficulties in grazing animals due to the destruction of the pasture and the drying up of the springs that used to serve the animals.



Equally, all stakeholders mentioned that they have modified their practices in order to adapt to the changes. Sedentary land users stated that they have been seeding barley or similar crops for use as animal fodder, and using rotational grazing techniques, afforesting pastureland with *Ceratonia Siliqua*, which is now used as fodder, combined with rotational grazing, and using water from a dam. The status of the dam is unclear as it covers part of their current needs but it is possible that the price of water is more expensive than pumping from local wells.

These trends in land and water availability are expected by the stakeholders to continue and intensify if current practices continue. Negative socio-economic consequences were expected such as the abandonment of rural properties (see Table 12), as well as a lack of farming succession by younger generations, property loss by young farmers and conflicts between communities. As a sedentary land user stated: *“There has been an increase in conflicts in the community as farmers and pastoralists have to share the same resource (productive land). Pastoralists let the animals graze freely in the fields and that way they can destroy trees and other property.”*

Table 12. Summary of future expectations, alternative land management options and policy/economic support required by stakeholder groups in Messara, Greece.

Stakeholder Group	Future expectations	Alternative land options	Policy required
Land users	<ul style="list-style-type: none"> • Total destruction of the pasturelands. • Abandonment of traditional farming and grazing practices by younger generations • Loss of farms • Increase in conflicts between farmers and pastoralists 	<ul style="list-style-type: none"> • Subsidies allocated considering local characteristics • Development of a livestock park under a farmers' union with specific motives and targets using modern technology. • Switch to more traditional, less invasive practices • Use of greenhouses • Increase the potential of the dams by diverting a stream from a nearby watershed. 	<ul style="list-style-type: none"> • Changing the way that subsidies are distributed • Funding for innovating entrepreneurship actions in agriculture • Support Agricultural Product Certification • Enhance education and training • Provide organized strategies and policy regarding the agriculture and livestock sector.
Governmental Institutions	<ul style="list-style-type: none"> • Further increases in water demand will put water resources under further pressure, thus increasing conflict among users. 	<p>More efficient agricultural water consumption (e.g. greenhouses, drip irrigation etc.) so that water conflict is reduced</p>	<ul style="list-style-type: none"> • Applying the measures decided in the Water Management Plan



The policies and interventions suggested are mostly directed towards traditional forms of land use and environmental management. The need for tailored policies to suit local needs was pointed out by all stakeholders, such as the strategy proposed by a transient land user: *“It is needed to change the way that subsidies are distributed, taking into account the real productivity of each farmer e.g. the amount of produced milk, cheese, meat, olive oil, wine etc., and reducing taxes and fees of transportation, so that the end price of fodder in distant areas is lower.”* Investing in alternative and innovative agricultural projects was also mentioned, in the form of supporting the development of product certification, organizing producers, and improving water management by increasing the potential of dams *“by diverting a stream from a nearby watershed”* (see Table 12).

3.8 Castelsaraceno, Italy

Stakeholders in Italy perceived changes in the weather, wildfires, loss of vegetation and soil erosion (see Tables 4 and 13). In Castelsaraceno, 18 drivers of change were identified by stakeholders. The changes perceived were largely water-related and driven by climatic events such as reduction in rainfall and surface water changes. Changes in vegetation, pests and in traditional grazing and agriculture were also noted. Changes at higher altitudes were particularly worrying for stakeholders. As a local naturalist expressed: *“there is a progressive deterioration of grass cover on pasture land at higher altitudes and evident processes of erosion are manifesting increasingly year by year. I have even found numerous prehistoric artefacts in areas of heavy erosion”*.

It is interesting to note that land users (farmers and shepherds) did not mention climatic events as drivers of change. Instead, they tended to focus on human drivers, such as changes in agricultural and farming practices, water consumption and other environmental management practices.

Stakeholders in Italy proposed a total of 26 adaptation measures, of which almost half were measures towards environmental management and innovation/ alternative practices, and a third were cultural, as they aimed to train the next generation in areas such as farming and tourism, and generally to promote culture.

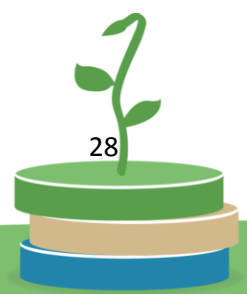
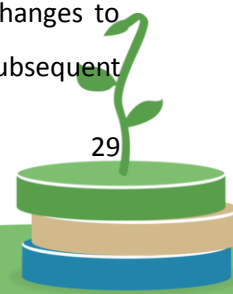


Table 13. Changes identified by stakeholders in Castelsaraceno, Italy.

Castelsaraceno, Italy Drivers of change	Government representative	NGO	Sedentary land Manager	Transient land user	Hunter association	Other local expert
Climate change	x	x				x
Concentration of rainfall in short periods						x
Human use of spring water/reduced water availability			x			x
Changes in agricultural/farming practices	x	x	x			x
Overgrazing			x			x
Oil extraction			x			
Pests			x			
Reduction/ abandonment, cultivation and/or farming			x			
Pollution	x			x		
Changes in agricultural and/or farming practices	x	x	x		x	x
Lack of environmental and infrastructure management		x			x	x
Environmental protection					x	
Other economic activities (industrialization)		x			x	
Policy incentives to cut vineyards					x	
Lack of environmental and infrastructure management						
Lack of regard for nature		x				
Lack of generational change		x			x	x
Lack of support for farming		x		x		x

During the focus group, perceptions of future changes highlighted incremental variations in climatic changes, a decrease of water flow and increase in flooding, an increase in changes to vegetation such as “the death of some traditional tree species at higher altitudes”, and subsequent



changes to wildlife. However there was a divide in the expected changes for land management. Some stakeholders were concerned that *“The total deactivation of agriculture and livestock farming with the eventual abandonment of the territory (depopulation) as there will not be a younger generation left to take over”* would unfold, while another vision was that there will be a *“return to agriculture and livestock farming with new innovations and access to new markets”*. The latter view is based on systemic changes and innovations, such as the mechanisation of farms, training of younger generations, promotion and export of local produce, creation of infrastructure and improvements in policy and administration, such as the reduction of bureaucracy and improvements in incentives to farmers. In the summary presented in Table 14, the views of different stakeholder groups about the future changes and management/policies needed can be contrasted.

Table 14. Summary of future expectations, alternative land management options and policy/economic support required by stakeholder groups in Castelsaraceno, Italy.

Stakeholder group	What future regime changes do you expect?	What alternative land management options will you consider?	What policy / economic support is required to facilitate the adaptations and changes you mentioned?
Landscape user	<ul style="list-style-type: none"> • Uncontrollable global warming. • Greater risk to riverbeds and increasingly devastating flooding. • Changes to vegetation. • Reduced productivity of pastures. • Growth of tourism in inhabited areas. • Increase numbers of young people coming into the agricultural sector with the creation of multifunctional farms (with services linked to tourism) • Decrease of tourism in deserted areas 	<ul style="list-style-type: none"> • Expansion of existing and new forests. • Eco-compatible regime change to water management. • Consideration given to the carrying capacity of grazing areas. • Increased infrastructure and services. • Free use or rental contract of farm land and/or pasture land. 	<ul style="list-style-type: none"> • Public incentives for use of alternative energy sources. • Abolition of incentives for the search for hydrocarbon deposits. • Incentives for reforestation of public and private areas. • Incentives for innovating local artisanship and traditional land management techniques. • Incentives to promote cultural and recreational activities in the local territory.

Stakeholder group	What future regime changes do you expect?	What alternative land management options will you consider?	What policy / economic support is required to facilitate the adaptations and changes you mentioned?
Land Users	<ul style="list-style-type: none"> • Disappearance of livestock rearing. • Further migration of young people. • Loss of local traditions. • Desertification. • Invasion of shrublands. • Return to agriculture, livestock farming and shepherding with modern innovations and techniques. 	<ul style="list-style-type: none"> • Mechanisation of farms. • Installation of solar panels. • Better infrastructure services for people. • Under grazing. • Setting up of cooperatives and associations between local stakeholders and the re-launch of agriculture. • Exporting local produce 	<ul style="list-style-type: none"> • Incentives and support for the younger generation's insertion into rural practices. • Creation of the necessary infrastructure for land and livestock farming • Reduction in bureaucracy generally and surrounding re-cultivation and livestock farming. • Regional training for farming, agriculture as well as courses to allow knowledge transfer across generations. • Public servants trained in agricultural and animal husbandry. • Incentives for setting up new farms and agricultural enterprises. • Recognition of local produce and livestock.
Government Representative	<ul style="list-style-type: none"> • Increase in wooded areas. • Changes in the fauna. • Land degradation. • Demographic changes. 	<ul style="list-style-type: none"> • Return to productive activities compatible with the local territory (agriculture and sheep farming). • Safeguarding of protected areas. • Revision of the waste management policy. • Development of tourism activities locally. 	<ul style="list-style-type: none"> • Cutting bureaucracy for those wanting to start agricultural activities. • Ad hoc policies for the safeguarding of the local territory. • Cultural investments in local citizens. • Nationalisation of the waste disposal industry.
NGO representative	<ul style="list-style-type: none"> • Increased global pollution. • Changing weather and climate. 	<ul style="list-style-type: none"> • End to the extraction of petroleum. • State incentives for the use of alternative energy sources. • Creation of voluntary conservation groups. 	<ul style="list-style-type: none"> • Economic support for training and education. • Support and recognition for volunteers and pensioners. • Incentives for private and public firms to lower their carbon footprint and operate at "zero impact".



The expectations for the region are also conditioned to different scenarios in agricultural abandonment. As a local expert stated, “there will be a growth in natural tourism in the areas still inhabited and where agricultural activities have not been abandoned, but [this potential] will decrease in abandoned areas where the landscape is more homogenous and less interesting”.

3.9 Várzea-Calde, Portugal

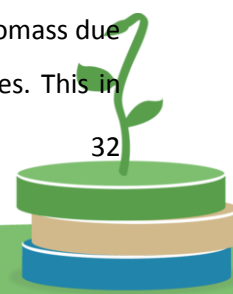
The main changes noticed by stakeholders in Várzea-Calde, Portugal were changes to biodiversity. These were more severe after 2000, attributable mainly to wildfires. Among the drivers of change mentioned by the different groups of stakeholders in Portugal are rural abandonment (100%), wildfires (75%) and changes in agricultural farming practices (50%) (Table 15).

Table 15. Drivers of change mentioned by different stakeholders in Várzea-Calde, Portugal.

Várzea-Calde, Portugal	NGO	Government representative	Land User	Private sector
Climate change			x	
Rural abandonment-reduction/ abandonment in cultivation and/or farming	x	x	x	X
Changes in agricultural and/or farming practices		x	x	
Lack of environmental and infrastructure management		x		
Wildfires	x	x	x	X
Environmental factors		x		
No fiscalization		x		

During the focus group, stakeholders were asked to vote for the two or three changes that they considered more relevant or more evident in the area. Afforestation of agricultural lands due to land abandonment was the most relevant change perceived by stakeholders (7 votes), followed by the increase of private forest areas occupied by fast growth species (Eucalyptus), the spreading of invasive species and the expansion of shrubland due mainly to wildfires (5 votes each).

Many of the drivers of change were considered to be closely interlinked. Most of the stakeholders mentioned that as a consequence of land abandonment, there was an increase in the biomass due to the lack of management, which in turn increases the risk and occurrence of wildfires. This in

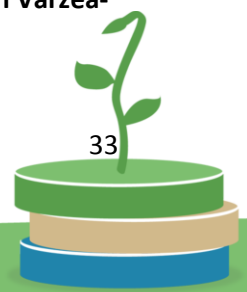


turn caused the abandonment of agricultural areas, as noted by a member of the private sector. During the focus group, it was also mentioned that the abandonment of agricultural areas led to the afforestation of land, dominated by fast growth species (*Eucalyptus globulus*), as well as the spread of invasive species such as acacias (*Acacia sp.*) and the expansion of shrubland. The changes in wildlife were also a cause of concern, and a representative from the Apiculture Association said that “*there is a decrease in the number of wolves, foxes, rabbits and hunting resources, and an increase of the wild boar population*”. It was generally considered that changes had led to a loss of environmental resilience, noticed through a decrease in pine regeneration and the appearance of marginal areas with unproductive soil.

Stakeholders in Várzea-Calde, Portugal found it difficult to answer the questions about adaptation measures, especially those relying on the forest for their livelihoods. A government representative asserted that an adaptation response to regime changes was the constitution of the Municipal Forest Technical Offices. The Municipal Forest Technical Offices were created by Government Order after the catastrophic summer fires of 2003 and 2005, with the aim of having forest technicians at the local level to support the design of the municipal plan for forest protection against fire, and to support local forest management. Other adaptation measures were to relocate activities (such as beehives for beekeeping) to more suitable areas, and actively manage the forests by removing affected trees and planting fast growing trees such as *Eucalyptus globulus* and *Pinus pinaster*. Almost every stakeholder (except the private sector representative) envisaged negative changes to the environment in the future, as a consequence of wildfires and the lack of, or poor, environmental management practices. The main consequences mentioned were the lack of regeneration of the natural vegetation, increased areas without vegetation or with shrublands or *Eucalyptus*, and a consequential decrease in agricultural and productive areas.

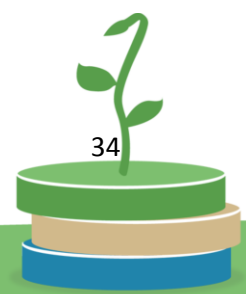
When asked about the economic/policy support needed to facilitate adaptations, stakeholders in Portugal mentioned 26 proposals that were not restricted to policy or economic support, but which also covered the facilitation and accessibility of the policies in place, and their enforcement (see Table 16).

Table 16. Summary of the stakeholders’ perceptions about future regime changes, the land management changes required, and policy/economic support needed for adaptation in Várzea-Calde, Portugal.



Stakeholder Group	What future regime changes do you expect?	What change(s) to current land management practices will be required?	What policy / economic support is required to facilitate the adaptations and changes
Government Representative	<ul style="list-style-type: none"> • Deforestation, loss of vegetation and increase in invasive species. • Increase in unmanaged forested areas. • Decrease of agricultural areas. • Lack of regeneration after wildfires. 	<ul style="list-style-type: none"> • Increased state intervention as a regulative force. • Incentives to increase agriculture. • Local awareness activities for landscape management, good practices and new alternatives. • Reinstate reforestation. 	<ul style="list-style-type: none"> • Major dissemination and accessibility to incentives and subsidies. • More support to private owners. • Restriction of Eucalyptus and support for <i>Pinus pinaster</i>. • Socio-economic policies to attract investment to rural areas.
NGO	<ul style="list-style-type: none"> • Frequency of wildfires increased. • Increase in shrubland and forest biomass. • Changes in biodiversity and the landscape. 	<ul style="list-style-type: none"> • Active forest management. • Diversification of forest areas • Increase buffer areas. • Improve or maintain forest paths and fire breaks. • Re-use agriculture areas. • Define forest properties in a registry at national level. 	<ul style="list-style-type: none"> • Subsidies for clearing forest biomass, repairing forest paths and support the activities of small-scale forest owners. • Technical support for local communities.
Private sector	<ul style="list-style-type: none"> • Decrease in the regeneration capacity of natural vegetation after wildfires. 	<ul style="list-style-type: none"> • Active forest management. • Forest land consolidation. 	<ul style="list-style-type: none"> • Simplify the bureaucratic processes to apply for public funds. • Increase fiscalization and the incentives for land consolidation.
Land user	<ul style="list-style-type: none"> • Increase in wildfires and shrubland. • Appearance of areas with unproductive soils. 	<ul style="list-style-type: none"> • Increase social responsibility, for individual plots. • Active forest management. 	<ul style="list-style-type: none"> • Increase the incentives for private forest owners.

One government stakeholder mentioned that there was a “*lack of forest management*” and “*no fiscalization*” and suggested that a useful adaptation measure would be the “*application of subsidies for clearing the forest and for reforestation*”.



4. DISCUSSION

The results from this research indicate that a combination of exploitation of the land, together with climate variability that has occurred in the Mediterranean, has resulted in the need for stakeholders to adapt as ecological thresholds are reached. Such changes are aggravated by the shortage of water resources and the unpredictability and uncertainty associated with weather and climate forecasts (see CASCADE deliverable 2.1).

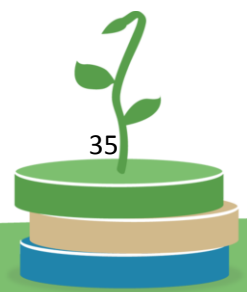
The intrinsic differences between bio-physical and climatic conditions across the study sites, plus the diversity in the socio-economic settings, make it highly challenging to compare the results and identify patterns in the changes and responses to change (see deliverables 2.1 and 2.2). While major land abandonment has occurred in Spain (Albatera), Italy and Portugal, an increase in grazing and croplands has also been reported. In contrast, study sites in Cyprus and Greece are still being used somehow intensively. In Cyprus, pressure from tourism expansion has meant that there has been an increase in urbanisation and population³, that has not been beneficial for the agricultural sector (see deliverable 2.1).

Regime changes

Comparison of the study sites in this research showed variations in stakeholders' perceptions of changes, their responses to changes, and their forecasts and proposals for changes. In Italy and Greece, stakeholders reported that intergenerational transfer of knowledge and land based skills are diminishing. Further changes in rural practices (i.e. buying seeds instead of keeping seeds) and the shift to cultivation of crops (e.g. olive tree cultivation) that also allow a second job, may also interrupt intergenerational knowledge transfer, as it may alienate users from their land, so the next generation would not have a way of learning the necessary practical agricultural trades/skills.

Land abandonment has had deleterious effects in every study site, for example, through the increase of fires and the risk of this occurring in Cyprus, Portugal, Italy and Ayora; through grassland degradation in Italy; and increases in pests and alien species in Italy and Cyprus. In places where intergenerational replacement was low, stakeholders were more concerned about the environment and sustained more negative forecasts about the future of rural areas. These

³ Half of the population in Pissouri are expatriates; see deliverable 2.1 for study site details.



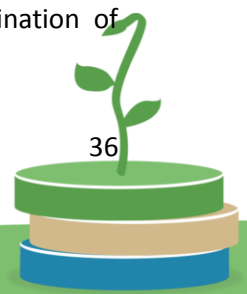
concerns are not specific to the Mediterranean. Land abandonment is increasing worldwide (Cramer et al., 2008, MacDonald et al., 2000, White, 2011).

Intergenerational transfer and family succession in farms has been reported to have been reduced due to migration to urban areas. This trend has been noted specifically in rural Europe and the Mediterranean (Turk et al., 2013), suggesting that stakeholder concerns are empirically grounded. Such changes and trends have further implications for loss of local knowledge on the use of natural resources and on environmental management practices, as transfer of local knowledge has been highlighted in the literature as an important adaptation tool (Berkes et al., 2000). CASCADE researchers have noticed that land use is very resilient to environmental degradation within a generation, but can change abruptly between generations (i.e. farmers will stay farmers despite the degradation, but their children will probably not continue to use the land). Such changes have already occurred in Italy. However, the traditional system of splitting farm to children still holds strong in Crete, and land redistribution is a big step towards efficiency, yielding beneficial outcomes in several areas in Crete (Christoforou, 2015 *pers. comm*).

Drivers of change

Stakeholders in Ayora and Italy were inclined to explore alternative energy, however, it is noticeable that in some parts of Greece there are efforts to control wind power expansion. In Ayora, windmills were signalled by stakeholders as drivers of change. Windmills were installed by a large energy company. This suggests that private sector involvement in rural areas is growing in importance in driving change.

Qualitative research has shown that there is often a tension between management institutions and other stakeholders, regarding the environmental resources that institutions are managing (Folke et al., 2007). In 2 of the study sites, stakeholders mentioned policies and institutions as one of the drivers of change; in Italy policy incentives to cut vineyards and the ensuing change of crops were deleterious to the environment, while in Greece, subsidies for animal production caused an increase in grazing intensity. Furthermore, policies that avoid improvement of practices such as “goat removal” were also impeding the flexibility of stakeholders’ responses. Removing goats can improve conditions in cases of overgrazing, whereas in undergrazed areas a combination of livestock is more efficient as their foraging needs are complementary.



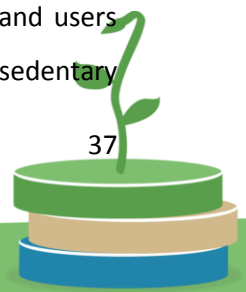
Adaptations to change

All management practices were considered as adaptations throughout this document, as this simplifies the analysis of stakeholder perceptions and responses to change. As the aim of deliverable 8.1 was to explore stakeholder perceptions, stakeholder responses to changes were compiled throughout the individual questionnaires and focus groups, and are reported in Table 3 as they were stated. However, it is important to note that there may be activities and measures that were not reported at the time, as stakeholders may not have perceived them as adaptation practices. Further practices currently been carried out by stakeholders to counteract or reverse biophysical changes have been gathered by CASCADE researchers using the WOCAT methodology and can be found in deliverable 7.1.

Adaptation efforts in some study sites were perceived to be the responsibility of land users. In Greece and Cyprus, stakeholders that were not in the 'land user' category answered that they did not need to adapt as they did not have any land or the land was private property, therefore they were unable to carry out any activity to prevent or manage detrimental changes. In the same line, civil servants' answers to adaptation efforts focused on promoting or providing support to land users to carry out environmental management activities.

In some study countries, the same actions or adaptations were seen as either good or bad. In Italy, tourism was viewed as a positive alternative adaptation activity, while in Cyprus, stakeholders stated that it should be controlled as it threatens environmental resources. The same discrepancy has been noted for wind turbines and water usage. This suggests that the types of strategies and adaptations proposed may need careful evaluation, taking into account both their costs and their benefits for the environment and society, looking particularly at which parts of society "win" and which "lose".

Water usage perceptions and statements can be a subject of debate and discussion. In Albaterra an increase in irrigation was mentioned as an adaptation response to regime changes. However, it is important to note that use of irrigation is also the result of having easy access to water, which in turn has caused further degradation of the land. In Greece, sedentary and transient land users have different access to water. It was reported by the CASCADE researchers, that only sedentary



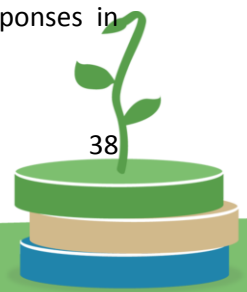
land users can take advantage of the dam, while transient land users feel that they were judged poorly by the authorities as they exploited spring water at higher ground. As a result of mainly agricultural consumption, spring and surface water has decreased, which is causing stress to transient users.

Expected changes

The expected regime changes, and how positive or negative people's perceptions are, can influence how actively stakeholders respond, and how willing and hopeful they are to embrace change and the future results of change (Fazey et al., 2009). This is observed in the literature too, where it is noted that social and environmental characteristics affect the resilience of a place, and how society will cope or adapt to climatic events (Costa et al., 2011).

In Italy there was a lack of consensus regarding the future changes that are expected. While some stakeholders predicted that farming and grazing will eventually stop due to the lack of a younger generation to take over, others expected a reactivation and revitalisation of rural activities, mainly through the improvement and modernisation of practices, such as mechanisation of farming, and the provision of training and incentives to younger generations, as well as a reduction in bureaucracy and greater engagement in exports.

In Cyprus every stakeholder expected that an increase in erosion and detrimental changes in vegetation and wildlife will occur. At the same time, land users stated measures required for adaptation circumscribed to policy enforcement and governmental support in the form of subsidies, rat baits and trees. These responses indicate a lack of self-empowerment, with stakeholders being dependent on external support. Stakeholders in Albaterra showed a similar trend in their requirements for future measures. In contrast, stakeholders in Greece and Italy mentioned education, strategic organisation and better water management as future strategies for adaptation. Research on how to implement these types of efforts needs to be backed up with qualitative information. Farmers' responses to policy and environmental changes can be related to how they are presented to them (Nainggolan et al., 2012). As every adaptation measure is mediated by culture, culturally informed approaches are needed to set up new measures. Cultural enquiry, for example through ethnographic research, can document knowledge, responses in behavior and practices (Adger et al., 2013).



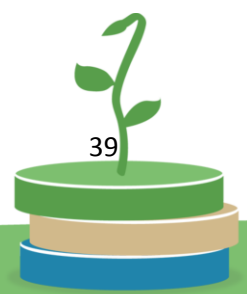
Required policy and support

Stakeholders with environmental awareness, such as local naturalists, expressed that environmental education and consideration of long term impacts were a necessary step to reach more successful environmental management and adaptation goals. This point can be validated by the low number of stakeholders who mentioned the importance of the conservation of the natural landscape, although most manifested concern for the loss of resilience of the environment, and noted erosion and other consequences for anthropogenic land uses.

In Portugal, Italy and Spain, stakeholders stated that dissemination of information and knowledge about incentives and subsidies was required in order to improve accessibility so that local land users could make full use of such initiatives. More attention to how stakeholders engage with adaptation initiatives is crucial. As they are the first receivers of policies for adaptation, investing in dissemination and information is vital for the success of any initiative (Bonzanigo et al., 2015). Furthermore, stakeholders can perceive changes to create different degrees of risk. Regardless of how damaging invasive vegetation can be, wider research involving stakeholders in Spain found that it is only perceived as moderately problematic, which has, in turn, resulted in limited management efforts (Andreu et al., 2009).

5. POLICY RECOMMENDATIONS AND CONCLUSION

Different stakeholders typically have different suggestions and hold different priorities, therefore decision making and the prioritization of measures will require stakeholder engagement at every stage of the process. Further research will be important to gather information from female stakeholders, as this can increase our understanding of the relationship between land and livelihoods. A more gendered approach requires a methodology to be designed that captures differences between males and females. Where possible this will be considered in future CASCADE stakeholder sampling. Some of the differences in views between stakeholders have been illustrated in this report and these have important implications for environmental governance for adaptation. Policy recommendations emerging from our findings are detailed below. For further recommendations, and complementary information, please see Deliverable 7.1.

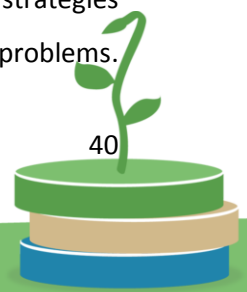


The relation between different governance levels working on adaptation is often overlooked (Adger et al., 2005). Cross-sector organisations will need to be appropriately designed and tailored to the ethos of both stakeholders and institutions. Different stakeholders mentioned diverse levels of autonomy and state intervention as being desirable. While in Spain stakeholders demanded strong decision making, in Italy it was proposed that adaptation action should be organised through land user cooperatives that may require different levels of autonomy. Such stakeholder organisation needs to be dynamic, with institutions able to recognise how individuals and the community work and to acknowledge their efforts (Keshavarz and Karami, 2013) and empower them by facilitating participation in community efforts towards environmental management (Fraser et al., 2006).

Although participation is required, the benefits of strong law enforcement and decision making were also recognized. Stakeholders in Albaterra, Spain mentioned the need for strong and informed decision makers, able to take appropriate decisions despite the unconformity of some sectors.

Current conflicts between farmers and shepherds in several of the study sites due to overgrazing indicate that strong communication and organizational efforts are vital, not only for environmental management, but to prevent further conflicts within the community. The offer of alternative livelihoods for shepherds as well as options for less extensive grazing, and site-specific policies for grazing are needed. It was noticed by CASCADE researchers that educated farmers in Greece seem to support intensive grazing.

Promoting stakeholders' visions of long-term environmental management which consider the reconciliation of environmental management with rural traditions, may facilitate stakeholder engagement in new proposals and management schemes to help avoid regime changes or reduce their negative impacts. However, economic aspects must not be overlooked. While technological alternatives can help to decrease land degradation, policy incentives to boost the viability of these measures need to be in place (Fleskens et al., 2014). Finally, adaptation strategies can sometimes increase problems or create new ones (Fazey et al., 2009). Efforts towards adaptation and environmental management therefore need to be monitored in order to assess which strategies are successful and helping to build adaptive capacity and which are leading to further problems.

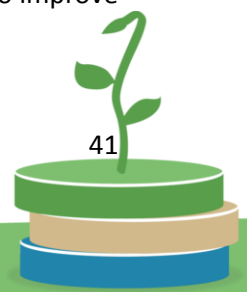


An indicator system or other type of standardised assessment could help to monitor the success of the measures, and inform the decision making of future steps.

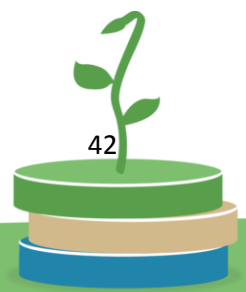
Measures for fire prevention efforts and environmental conservation need to consider short term and long term consequences for land users, to avoid disengagement and land abandonment. Incentives and strategies to prevent land abandonment need to be in place, with efforts approached from different angles, in order to develop a comprehensive strategy that includes social, cultural and economic considerations. Particular factors that need to be considered include the revalorisation of rural practices, incentives and support to new generations in the form of education and financing, and the formation of cooperatives and other communal efforts. Communication between stakeholders should be improved in order to maximise efficiency and knowledge transfer. A simple example of this is that land users should notify the fire service when they decide to clear land or burn cuttings.

Stakeholders are complementing their subsistence products with imports, which has food security implications that need to be considered in future management and adaptation programmes. New techniques, alternative activities such as ecotourism, promoting local culture, integrating IT technology into farming practices and the development of product certification were some of the adaptation measures that stakeholders mentioned. These indicated that along with subsidies, programmes and workshops are necessary (for building adaptive capacity through training) to support the development of such measures. In Italy and Greece, programmes aiming to engage younger generations are vital, due to migration and the abandonment of rural practices. Such training should include the adoption of new technologies as well as the dissemination of local knowledge. However, stakeholders also mentioned the need for more informed and specialized decision makers and technicians, suggesting that training needs to be provided for every sector of the community and also for a range of different stakeholders.

Supporting small scale farmers to comply with bureaucracy and legislation or a flexible administration is vital. Most farmers have serious problem accessing markets because they cannot afford to produce according to the necessary EU standards. This is a major hindering factor for land management as land users are forced to remain small-scale and do not have funds to improve



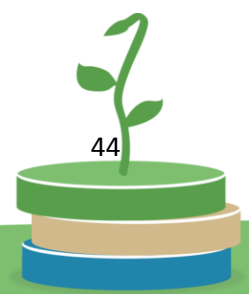
management and/or to adapt. National/EU subsidies have further caused major land abandonment in Italy and Cyprus.



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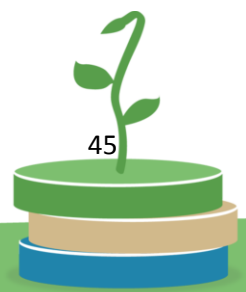
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Annex 1. Questions asked to the stakeholders both individually and in the focus group.

- 1 What regime changes have you experienced in the last 20 years (since 1994)?
- 2 When did the regime change take place?
- 3 What was the driver(s) of the change
- 4 How did you adapt/respond to the change?
- 5 What future regime changes do you expect?
- 6 What change(s) to current land management practices will be required?
- 7 What alternative land management options will you consider?
- 8 What policy / economic support is required to facilitate the adaptations and changes you mentioned?



Annex 2. Participants in each study site (identified by their stakeholder group).

2a Albaterra, Spain

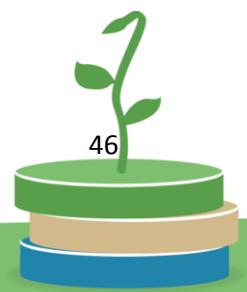
Stakeholder group

- 1 Local Political institutions (Head of Environment Department in Local Council)
- 2 Governmental Institutions
- 3 Researchers (forest researcher)
- 4 Sedentary land managers operating at small scale (farmer)
- 5 Transient land users (Hunter)
- 6 Transient land users (Representative of sport/recreational (hiking) association) and NGO

2b Ayora, Spain

Stakeholder group

- 1 Researchers
- 2 Permanent users and managers
- 3 Government institutions
- 4 Associations/Land owner
- 5 Transient stakeholders
- 6 Researchers
- 7 Government institutions
- 8 Government institutions
- 9 Permanent users and managers/NGO
- 10 Permanent users and managers
- 11 Permanent users and managers
- 12 Transient stakeholders



2c Randi Forest, Cyprus

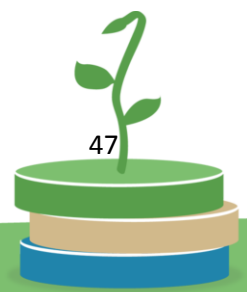
Stakeholder group

- 1 Environmental Department
- 2 Forestry
- 3 Forestry
- 4 Forestry
- 5 Pissouri City Council
- 6 Pissouri City Council
- 7 Pissouri City Council
- 8 Shepherd
- 9 Shepherd
- 10 Shepherd
- 11 Shepherd
- 12 Shepherd
- 13 Wild life services
- 14 Wild life services
- 15 Fire Brigade
- 16 Fire Brigade
- 17 Fire Brigade

2d Messara, Greece

Stakeholder group

- 1 Groups of transient land users
- 2 Sedentary land managers operating at small scale
- 3 Sedentary land managers operating at small scale
- 4 Sedentary land managers operating at small scale
- 5 Governmental institutions



2e

Castelsaraceno, Italy Stakeholder group

- 1 Local expert, naturalist
- 2 Farmer, Sheperd
- 3 Governmental Representative
- 4 Transient Land Users Representative
- 5 NGO representative
- 6 Transient Land User
- 7 (Other) Local expert
- 8 (Other) Local tourist
- 9 Sedentary Land Manager

2f

Várzea-Calde, Portugal Stakeholder group

- 1 Non-Governmental Organization
- 2 Governmental Organization
- 3 Governmental Organization
- 4 Governmental Organization
- 5 Non-Governmental Organization
- 6 Non-Governmental Organization
- 7 Forest owner
- 8 Private sector
- 9 Governmental Organization
- 10 Private sector
- 11 Forest owner

