
INITIATING PARTICIPATORY MONITORING OF LAND
MANAGEMENT OPTIONS – THE DESIRE PROJECT IN
PORTUGAL AND MOROCCO



MSc Thesis by Patricia Santos

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Initiating Participatory Monitoring of Land Management Options – The DESIRE Project in Portugal and Morocco

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SUMMARY

This research looks into the process and outcomes of initiating participatory monitoring of land management options implemented in the DESIRE study sites in Portugal and in Morocco. Through a collaborative approach, with this research stakeholders were given the opportunity to further discuss land management options, to experiment with monitoring methods in the field and to decide on the selection of a set of environmental indicators and a participatory monitoring schedule. In these participatory monitoring actions, participants across levels of organization with different knowledges interacted, exchanged information and made decisions. Such approach is grounded on lessons learned from participatory research literature and on concepts of co-management of socio-ecological systems. The methodology for the implementation of these participatory actions was conceptualized as a sequence of four steps that, through interviews, workshops and surveys, look into the 1) site conditions, 2) what happens during these participative processes, 3) how outcomes are perceived by the participants and 4) how to give continuity and follow-up to the participatory monitoring. The methodology was successfully tested in the three study sites. In Góis and Mação study sites, in Portugal, the main desertification problem is recurrent forest fires and the monitored land management option consists of fuel management strips. In Sehoul, Morocco, the management goal is sustainable agricultural development and the DESIRE project is experimenting with plantation of *Atriplex* shrubs for gully control, which was monitored within this research. The use of the conceptualized methodology was followed in both Portuguese study sites, but had adjustments in Sehoul. In total 31 participants were present in the participatory monitoring workshops and were asked about their opinions and perceptions on the process. The integrated comparison of the results, done quantitatively, gave evidence that there is relationship between the initial conditions of the participants' group and the process and their final perceptions. Resulting that in Mação there were better pre-conditions, because more participants were landowners and were associated to civic organizations, and also better achievement of process objectives and better matching with the final perceptions. This approach aims to give a perspective on how to develop participatory frameworks that reach the objectives and give evidence of outcomes.

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LIST OF ABBREVIATIONS

AFN – National Authority in Forestry in Portugal
CDFCI – Commission for the Defence of Forest Fires in Portugal
CT– Regional extension offices in Morocco
DA – Department of Agriculture in Morocco
DPA – Provincial/regional department of agriculture in Morocco
FMS – Fuel Management Strips
FORM-ON – Interview form on Organizations and Networks
FORM-PP – Survey form on Participation Process
GC – Gully Control
GOV – Governmental Organization
GTF – Technical Forestry Office in Portugal
MADRP – Ministry of Agriculture, Rural Development and Fisheries
NGO – Non-governmental Organization
PMDFCI – Municipal Plan for the Defence of Forest against Fires in Portugal
PM – Participatory Monitoring
PMW – Participatory Monitoring Workshop
SLM – Sustainable Land Management
SNBPC – National Service of Firemen and Civil Protection in Portugal
Sous-CT – Local extension offices in Morocco
SS – Study Site of the DESIRE project
SST – Study Site Team of the DESIRE project
SW1 – First Stakeholder Workshop of the DESIRE project
SW2 – Second Stakeholder Workshop of the DESIRE project
UGF – Forest Management Unit in Portugal
WB – Work Block
WB 4 – Work block for the implementation and monitoring of efficiency

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CHAPTER 1. INTRODUCTION

This research looks into the process and outcomes of initiating participatory monitoring of land management options implemented in a context of desertification. The DESIRE project goal is to develop a participatory framework to select sustainable land management options adjusted to local context to combat desertification. Embedded in the DESIRE project, this research was done in three study sites, two in Portugal and one in Morocco. Through a collaborative approach, this research aims to give stakeholders the opportunity to further discuss land management options, experiment with monitoring methods in the field and come to the selection of a set of environmental indicators. In these participatory monitoring actions, participants across levels of organization with different knowledge interact and exchange information to monitor the selected land management options. The methodology for the implementation of these actions was conceptualized as a sequence of four steps that look into what happens during these participative processes and what outcomes are perceived by the participants.

This chapter includes the background information about the research and the context within it was developed. The focus is on the complexity of land management to combat desertification and how the research builds on what was done earlier by the DESIRE project. The chapter ends with the research's problem statement, research questions and objectives.

1.1. BACKGROUND

The establishment of the United Nations Convention to Combat Desertification (UNCCD) in 1977 brought desertification to the table as a worldwide complex problem. Desertification can threaten future food and energy security and is estimated to currently affect about forty per cent of the Earth's land mass (World Bank, 2008). Seventy per cent of all drylands suffer from desertification and over one billion people in hundred countries are being directly affected by desertification (UNCCD, 2007). Desertification is defined as the continuous loss of land productivity which concerns the degradation of global environmental goods. This land degradation is an outcome of change in climatic and human driving forces operating synergistically in different timescales (Puigdefábregas and Mendizabal, 1998). Scientists agree about the multi-dimensional character of desertification and about the need to adopt strategies that integrate multi-stakeholder, multi-method and multi-level processes (Turner *et al.*, 1995; Puigdefábregas, 1998; Geist and Lambin, 2004; Baartman *et al.*, 2007; Stringer *et al.*, 2007; Schwilch *et al.*,

2009). Research approaches try to better understand the complexity of social-ecological systems capacity to adapt and respond to change (Armitage *et al.*, 2009; Cundill and Fabricius, 2009). This complexity context is the drive for supporting the adoption of adaptive co-management and multi-level collaborative governance of natural resources (Armitage *et al.*, 2009). One requirement to deal with uncertainty and complexity is to continuously gather information to enable a better planning for Sustainable Land Management (SLM) (Abbot and Guijt, 1998; Estrella *et al.*, 2000; Stringer *et al.*, 2006). And this has given great impetus to environmental monitoring, namely by involving stakeholders in participatory monitoring. Besides the controversy around participatory approaches, developments show that the involvement of stakeholders provides opportunity to get people together and actively engage in identifying problems and deciding on solutions (Abbot and Guijt, 1998, Reed, 2008). Interaction and learning processes are inherent to participation. The desired outcomes of this type of initiatives to combat desertification is to improve the effectiveness of the selection of locally suitable strategies and to have stakeholders implementing by themselves the land management strategies to reduce land degradation. Therefore, participatory projects, such as the DESIRE project, aim to involve stakeholders in all stages of the project, from identification to monitoring, so that they can see the effects themselves. The objective is to provide evidence of mitigation potential of the selected land management practices, by field testing and monitoring of the SLM strategies (technologies and approaches). Ultimately these collaborative processes occurring in each study site should outlast the lifetime of the DESIRE project and expand the use of sustainable land use practices (Schwilch *et al.*, 2009).

This research aims at initiating participatory monitoring (PM) action in three study sites (Góis and Mação in Portugal and Sehoul in Morocco), with the goal to engage local organizations and individuals in the selection of environmental indicators. Collective monitoring will give stakeholders the opportunity for interaction, information exchange, observation, and experimentation while assessing the effectiveness of SLM strategies. Implementing participatory monitoring is a challenge (Estrella and Gaventa, 1998; Estrella *et al.*, 2000; Mutimukuru *et al.* 2006; Stringer *et al.*, 2007). Initially there is need to further gain knowledge regarding the social-ecological system, in this case of the three study sites, to understand the local conditions and adapt the participatory action to the context of the stakeholders. The objective of this research is to develop a stepwise methodology to implement a PM initiative, describe what happened in the study cases and understand how the participants perceived the developments of the process.

1.2. CONTEXT OF THE RESEARCH

This research follows the developments of the DESIRE project. The project is funded under the EU's Sixth Framework Programme (FP6) and brings together 28 partner organizations, research institutes and non-governmental organisations. The three study areas of this research are included in the DESIRE project, two in Portugal and the other in Morocco. Therefore this chapter presents the DESIRE project framework and summarizes the results from the previous participatory initiatives, such as the two stakeholder workshops.

1.2.1. THE DESIRE PROJECT FRAMEWORK

DESIRE stands for 'desertification mitigation and remediation of land' and its goal is to come up with alternative strategies for the use and protection of vulnerable areas. In this five year project (2007 - 2012) a series of soil and water conservation measures, applicable to both developing and industrialized countries, are selected with stakeholders and are field-tested. The methodology is being applied in 16 Study Sites (SS) in 14 countries (Figure 1). Each of the study sites is coordinated by a group of researchers, the Study Site Team (SST). They facilitate the workshops and collect and report on their study site and communicate results. This project integrates stakeholder participation and makes use of existing tools such as the database of the World Overview of Conservation Approaches and Technologies (WOCAT). The project aims to use the lessons learned by implementing context-specific technologies and approaches to mitigate desertification together with a suitable participatory approach. These SLM strategies are meant to be identified, assessed and tested together with the stakeholders involved, aiming to enhance ownership, feasibility and applicability of selected SLM strategies (Schwilch *et al.* 2009).

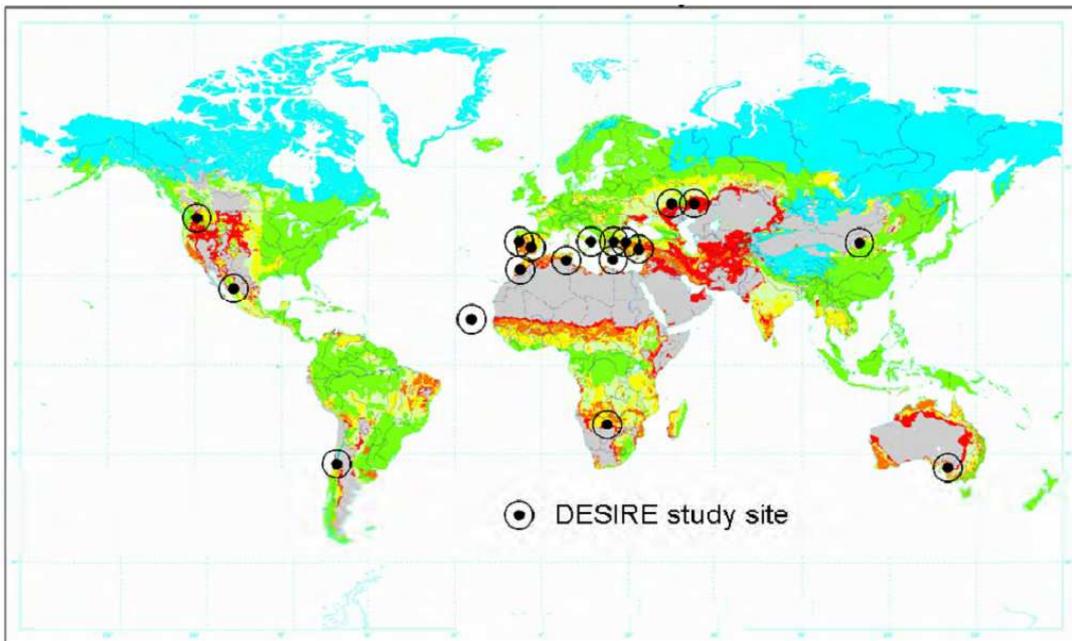


Figure 1. The DESIRE Study Sites, Hotspots of Desertification (source: www.desire-project.eu).

The whole process of DESIRE, from initial co-learning on desertification problems to screening of actual and potential solutions, to selection and negotiation of viable land management technologies and approaches for implementation, aims at being participative. The DESIRE project's framework has the following sequential working blocks (Figure 2): Inventory of hotspot target areas, Definition of desertification indicators, Development of set of conservation and remediation strategies in cooperation with the stakeholders, Implementation and monitoring of efficiency, Evaluation and up-scaling of results, Design of data information system and dissemination of results. Finally the results will be translated into a series of practical guidelines for good agricultural practices and environmental management, which will be disseminated to practitioners, agricultural extension staff, governmental authorities, policy makers, NGOs, land users, land owners, and local communities.



Figure 2. The DESIRE framework is structured in six work blocks.

Monitoring is expected with an ecological and socio-economic assessment of the selected SLM options, but the participatory approach in monitoring is missing. This research proposes the implementation of PM in three study sites. The context of this research is within Work Block 4 (WB 4), the implementation and monitoring of efficiency phase. Following the process initiated with the two stakeholder workshops (SW1 and SW2) the aim of this research is to organize a third moment of interaction: a participatory monitoring workshop (PMW). Table 1 shows the sequence of the framework of the DESIRE project from which the PMW derives. The ultimate goal of this PM initiative is the selection of indicators for the evaluation of the desertification mitigation strategies in different contexts and the dissemination of successful options.

Table 1. Integration of the Participatory Monitoring Workshop in the framework of the DESIRE project.

Work Block Objectives	
WB1 - Identify Study Sites	
WB2 - Select scientific indicators and determine desertification index	
WB3 - Identify collectively the SS main desertification problem (First Stakeholder Workshop (SW1) & - Select most promising mitigation strategies for field testing (& Second Stakeholder Workshop (SW2)	
WB4 - Implementation and monitoring phase & the Participatory Monitoring Workshop (PMW) to identify and select local indicators for monitoring of the implemented strategies	
	Long-term assessment of the effectiveness of land management practices to mitigate desertification and dissemination of successful strategies

1.2.2. THE SELECTED STUDY SITES

Portugal (Góis and Mação) and Morocco (Sehoul) are two of the 16 hotspots of the DESIRE project and were selected as case studies for this research. The project is now under development in these locations aiming at identifying the local causes of desertification and defining the best mitigation strategies. The two stakeholder workshops have taken place, through participatory learning approaches and using decision support tools for the selection of technologies and approaches. The implementation and monitoring phase follows and, with this research, a participatory monitoring phase aims at giving continuity to the stakeholders' participation process.

From the DESIRE scientific report (Baartman *et al.*, 2007), an initial analysis of the perceived problems and causal factors of desertification for the two study countries is given in Table 2. Portugal's two study sites, Góis and Mação, are both in semi-arid climate and have steep slopes. The areas are predominantly forested and suffering from recurrent forest fires. The study site in Morocco is in the Sehoul plateau, an agro-pastoral region with signs of accentuated land degradation. The use of inadequate agriculture and forestry practices is the most common causal factor perceived to trigger desertification, also on other DESIRE study sites. Land abandonment in Portugal and overexploitation in Morocco, coupled with inadequate agriculture and forestry practices, are perceived as the main causes of desertification problems.

Table 2. The perceived problems and causal factors of desertification in Portugal and Morocco.

	Problems	Causes
Portugal	Water erosion	Forest fire Inadequate forestry practices
	Vegetation degradation	Forest fire
	Land use changes	Land abandonment
Morocco	Water erosion	Inadequate agricultural practices
	Vegetation degradation	Overgrazing Forest diseases
	Overexploitation of water	Increasing demands for irrigation and/or human consumption/ urbanisation
	Wind erosion	Rock/ sediment type

Desertification is a cyclic process where often one desertification problem leads to another (Baartman *et al.*, 2007). The prevalence of inadequate practices reflects a lack of knowledge or capacity to adapt and prevent problems of desertification. Therefore, building local capacity, learning and sharing information should always be considered as components of the implementation of SLM strategies. Desertification and land degradation have been subject of many research projects devoted to understand the complexity and mitigate effects, improve information management and networking facilitation (see Baartman *et al.* 2007, Appendix II: Previous and ongoing projects). Still, what is missing? The dominant opinion, reflected in the strategic plan of the United Nations Convention to Combat Desertification, attaches high priority to the collaboration between researchers and land users for the integration of scientific and local knowledge for the development of more sustainable solutions (UNCCD, 2007). So, what is missing seems to be a easy-to-use framework for exploring problems and solutions and for decision-making that enables collective and multilevel learning processes between natural and social scientists, institutions, policy-makers, and land users (Stringer *et al.*, 2007; Schwilch *et al.*, 2009).

1.2.3. THE STAKEHOLDER WORKSHOPS

The participative approach of the DESIRE project is initiated in WB3 (defining potential SLM strategies). Two stakeholder workshops took place in each of the project's Study Sites for the identification and selection of measures ecologically effective, socially accepted and financially viable. The first stakeholder workshop (SW1) aimed at the identification of existing and potential SLM strategies, through participatory learning approaches (mind-mapping, problem tree, water and biomass cycles, and field visits). Indicators were explored, resulting in indicators mainly regarding vegetation regeneration, public participation, and investments (Deliverable 3.1.2). The second stakeholder workshop (SW2) aimed at selecting the set of technologies and most promising approaches in a context of desertification. The stakeholders that participate in the workshops make the selection of the strategies through step-wise methodologies using decision support tools: World Overview of Conservation Approaches and Technologies (WOCAT) database, Multi-objective Decision Support System (MODSS) and decision making software (Facilitator). These workshops had, in each study site, the facilitation of the study site teams composed by experts from local Research and Innovation organizations, mainly universities. A brief analysis on the first and second stakeholder workshops and their general results is given below. This information regarding strengths and weaknesses of the process and outcomes of the workshops has been derived from DESIRE project reports. I was present at the two days SW2 workshop in Portugal, Góis in February 2009, with participants of both Portuguese study sites (Góis and

Mação). These two study sites are grouped, since they have similar conditions. Therefore, the workshops allowed also the exchange of experiences between the two study sites. The implementation of the workshop's prescribed methodology, with facilitation of the local Study Site Team, was considered successful in later reports, since it followed the methodology and reached the objectives. In the end, the participants selected from a set of SLM options that, in their perspective, best suited their problem and the ecological, social-cultural and economic context. For Portugal the desertification problem identified in SW1 (March 2008) was forest fires and the objective was the reduction of burnt area. Existing SLM approaches and technologies found in the field to combat wildfires were strategic fuel management strip network and infrastructure (watch-towers, water points, road network). The proposed approaches and technologies to be the most promising were: prescribed fire, preventive silviculture, fuel management strip network and infrastructures. In Morocco the same workshop methodology was applied with the objective of improving sustainable agriculture, resulting in the selection of the following set of SLM strategies: gully treatment, mulch and no tillage, vegetation strips and cork oak forest rehabilitation.

THE FIRST STAKEHOLDER WORKSHOP

The report on the first stakeholder workshops (SW1) from all study sites provide lessons learned to be taken in account in this research (Deliverable 3.1.2). Several strengths and weaknesses of the methodology were identified regarding its process and outcomes: 1) The workshop's process was well structured in a sequence of steps and there is evidence that fostered informal discussion and motivated active participation; 2) Outcomes consisted of aspects such as: initiating stakeholder collaboration, mutual learning and dialogue by bringing different stakeholder groups together to discuss and reflect. Nevertheless, weaknesses of the methodology were: 1) The demanding process of selection and training of moderators for facilitation of multi-stakeholder and multi-level initiatives, even more in contexts with stakeholders with limited experience with participation; 2) From all the results, none of the study sites explicitly mentioned socio-economic or institutional constraints that must be considered in an overall SLM strategy and were most focused on environmental and technical aspects. With that results that many of the outlined SLM strategies are too general and would need to be discussed again and refined for better implementation.

THE SECOND STAKEHOLDER WORKSHOP

The second stakeholder workshop (SW2) aimed at selecting the set of most promising SLM options. The following can be said about the SW2 methodology (from Deliverable 3.3.3): 1) The process is well structured by breaking down the decision-making process into a series of steps; 2) Stakeholder groups are given equal votes and there is the possibility to negotiate until reaching consensus, which requires discussion and the exchange of information. It was referred that interaction among stakeholder groups improved from the process already started in the first stakeholder workshop. On the other hand, various weaknesses of the methodology used in the second stakeholder workshop were identified: 1) Less flexibility because the steps cannot be skipped and more complexity and therefore the implementation is more challenging for all partners involved; 2) The short duration of the workshop does not allow an in-depth discussion to clearly define some SLM strategies and take into account relevant socio-economic, institutional and policy issues.

From these lessons, the positive aspect of the process of the workshop was its structured step-wise approach that helps to breakdown decision-making. The methodological process suffered increased complexity and abstraction in the second workshop, making it more difficult for both the participants and the facilitators. The encounters gave opportunity for different stakeholder groups to interact, dialogue, discuss, negotiate, exchange information, knowledge and ideas. These workshops promoted joint learning and reflection. This existent willingness to participate should be motivated and participatory process repeated. It is pointed out in the reports that there was not enough time to discuss in-depth the socio-economic factors and operationalization of implementation of the selected SLM technologies and approaches. Therefore, it is also suggested to have additional future meetings, such as this research. At the end of two stakeholder workshops it was possible to identify promising land conservation practices for field testing and it was possible to establish a good basis for participative stakeholder cooperation in almost all study sites (Schwilch and Bachmann, 2009). From a total of 60 SLM measures of all study sites, 19 are agronomic, 10 vegetative, 23 structural and 25 are management measures. Examples are no-tillage, mulching, agro-forestry, vegetative strips, water harvesting structures, gully treatment, etc. This high variety of measures and study sites reflects the diversity of land degradation and desertification problems and the potential enrichment that may come out of the DESIRE project.

1.3. PROBLEM STATEMENT

On-going learning through monitoring is the cornerstone for effective decision making in resource management (Walters and Holling, 1990; Lee, 1993; Boyle *et al.*, 2001; Keen *et al.*, 2005; Stem *et al.*, 2005; Borrini-Feyerabend *et al.*, 2007). Along these lines, in the past decade a wide number of frameworks have been developed for participatory monitoring and assessment (Bellamy *et al.*, 2001; Campbell *et al.*, 2001; Hockings, 2003; Plummer and Armitage, 2007). Still, the ways in which learning as an outcome can be promoted through the implementation of these frameworks remains under development (Armitage *et al.*, 2007; Cundill and Fabricius, 2009). Since few published studies have dealt with the complexity of multi-level management (Pinkerton, 1994; Ostrom *et al.*, 2002; Brown, 2003; Armitage *et al.*, 2009), there is an interest to further test methodologies in different contexts and examine quantitatively the process and outcome of the participatory monitoring initiatives, to better understand the factors of successful implementation of collaborative frameworks.

1.4. RESEARCH QUESTIONS

This research will further explore the implementation of collaborative frameworks in the context of sustainable land management. The expected result from this research is the practical implementation of a methodology to initiate participatory monitoring in three study sites. The questions to be answered with this research are about:

1. What happened in the PM initiative?

Gives the description of the participants' conditions and of the process of the participatory monitoring workshop;

2. How did the participants perceive the outcome?

Gives the analysis of the participants' perceptions on the individual process of participation and about the group work and how these relate to the conditions and the process.

1.5. RESEARCH OBJECTIVES

To obtain answers to the research questions, the objectives of this research are:

1. Conceptualize a methodology for initiating a participatory process for environmental monitoring;
2. Test the methodology in three study sites; and
3. Analyze the results from the interviews, the process and the surveys.

1.6. SCOPE OF THE RESEARCH

The developed methodology was tested in three study sites of the DESIRE project: Góis and Mação in Portugal and Sehoul in Morocco. The participatory phase of the research took place during October and November of 2009. My previous presence in the second workshop from the DESIRE project in Portugal in February 2009 and in the DESIRE Plenary Meeting in Morocco in 19 to 24 October 2009, were excellent opportunities for getting to know the project's framework and have contact with the Portuguese and Moroccan participants and the several Study Site Teams.

1.7. OUTLINE OF THE REPORT

This report presents next the subjacent theoretical framework (Chapter 2). Reflecting on existent theories regarding desertification remediation and collaborative resource management, including lessons learned with participatory monitoring, that will give the base for the conceptualization of the methodology. This includes the problem of sustainable land management to combat desertification and the concept of participation in adaptive co-management of social-ecological systems. These aspects are then related to the research questions. Chapter 3 gives the description of the study site systems and the respective SLM strategies selected to be tested and monitored. In Chapter 4 the methodological framework derived from the theoretical framework is described in-depth by step and by activities. Results and discussion are presented in Chapter 5 following the steps from the method. In Chapter 6 the conclusions from this research are drawn.

CHAPTER 2. THEORETICAL FRAMEWORK

In this chapter main concepts regarding desertification and participation are defined, establishing the terms that describe part of the reality to be researched. Main concepts are: desertification and sustainable land management and participatory monitoring in adaptive co-management of social-ecological systems. The last section of this chapter gives objective information on the approach of this research and the clear relation between the underlying theory and the research questions.

2.1. DESERTIFICATION

Desertification is defined as the degradation of land, with loss of topsoil and fertile land, in arid, semi-arid and dry sub-humid areas, caused primarily by human activities and climatic fluctuations (UNCCD, 2007). Consequences of land degradation are reduced land productivity, socio-economic problems, including uncertainty in food security, damage to ecosystems, migration and limited development (IPCC, 2007). Degraded land is costly to reclaim and, if severely degraded, may no longer provide ecosystem functions and services (environmental, social and economic) that are critical for society and development (LADA, 2008). There is pressing need to mitigate desertification through the implementation of SLM strategies, which are designed to protect natural resources for the support of land-based production systems for current and future generations (UNCCD, 2007). Understanding and quantifying desertification is a complex task. The Land Degradation Assessment in Drylands (LADA) comes from work undertaken by several projects and institutes to identify land degradation hot spots and bright spots on the basis of Normalized Difference Vegetation Index and a number of other global databases. These results show that land degradation is increasing (LADA, 2008). Where as the assessment of 1991 indicated that 15% of the land surface was degraded, in 2008 this has raised to 24%, meaning that new areas are being affected. The UN Convention opened an important new phase in the battle against desertification for both developing and developed countries. Nevertheless, desertification can only be reversed if real changes are made in local and international behavior that ultimately lead to sustainable land management and food security (MA, 2001). Combating desertification is in fact part of a much broader objective: the sustainable development of countries affected by drought and desertification.

A variety of SLM strategies, aim to suppress the above and below problems of land degradation and improve soil productivity. These comprise technologies and approaches that ideally take in account ecological, social and economic dimensions. These can be agronomic, vegetative, structural and management strategies, or combined. Many have been studied, implemented and tested in different contexts, and are included in the WOCAT database. Examples are: no-tillage, mulching, agro-forestry, vegetative strips, water harvesting structures, gully treatment, etc (see WOCAT, 2007). Information available is rather tending towards environmental and technical aspects, but also includes implementation approaches that consider the social, economic and institutional factors as ways and means of implementing technical measures (WOCAT, 2007). A strategy is generally considered as a plan of action designed to achieve a particular goal. Here the terms measure and practice, strategy, and option, associated with management, refer to the SLM site-specific technology or approach selected to mitigate desertification.

Desertification is considered to be the result of indirect factors, like population pressure, socioeconomic and policy factors, and globalization, as well as direct factors such as land use patterns and practices and climate change related processes (MA, 2005). This is leading ultimately to a downward spiral of social-ecological degradation and poverty. Desertification in the Mediterranean region, for example, is being triggered by particular conditions. According to the UNCCD and the countries themselves (UN, 1994), these problematic conditions include:

- Semi-arid climatic conditions affecting large areas with seasonal droughts;
- High rainfall variability and sudden high-intensity rainfall;
- Uneven relief with steep slopes;
- Unsustainable exploitation of water resources;
- Extensive forest losses due to frequent wild and anthropogenic fires;
- Deterioration of traditional soil and water conservation measures associated to land abandonment.

Authors recognize that both biophysical and socio-economic factors should be considered in mitigating desertification, as they interact and reinforce each other in the degradation process (Turner et al, 1995; Puigdefábregas, 1998). A number of typical pathways can lead to desertification (see Geist and Lambin, 2004), all coming to the conclusion that the problems of desertification are mostly biophysical, while the causes derive from the interaction between biophysical and socio-economic factors. Problems such erosion, overexploitation, forest fires, and flooding, along with unsustainable water and land management, urbanization, land abandonment, and inadequate policies, cause the system to enter a positive feedback loop of which the final outcomes are land degradation and disruption of local socio-economies. Due to these multiple dimensions of problems and causes, combating desertification involves a wide range of measures and its remediation

requires long-term strategies to be applied to complex social-ecological systems under high uncertainty and change drivers.

2.2. PARTICIPATORY MONITORING IN CO-MANAGEMENT

Though being a time and site restricted research, the development of this theoretical framework considers that this research can be the beginning of a longer term collaborative process for land management and that there is potential for its continuation so that the management of these specific sites can evolve towards an adaptive co-management model. The selected study sites systems are now considered to be under desertification stress and in process of change, therefore the initiative of DESIRE project. This research sees adaptive co-management of social-ecological systems theory as the model for achieving sustainable land management.

2.2.1. CO-MANAGEMENT OF SOCIAL-ECOLOGICAL SYSTEMS

Literature on co-management has shown that this governance model is tending to develop into adaptive co-management, to deal with increasing levels of uncertainty for reaching sustainable management of social-ecological systems (Armitage *et al.*, 2007; Berkes, 2009). It is by creating a forum for interaction, learning, trust building, access to knowledge, and conflict resolution that the bridging of multi-level knowledge and organizations can lead to multi-stakeholder arrangements for sustainable land management (Berkes and Folke, 1998; Olsson *et al.*, 2004; Folke *et al.*, 2005). Such model adjusts well to the complex context of desertification affecting the study sites and also the aim of researching participatory processes and outcomes.

The review on adaptive co-management for social-ecological complexity (Folke *et al.*, 2005; Armitage *et al.*, 2008; Berkes, 2009) gives basis for the following understanding of the social-ecological systems approach (Figure 3). The inherent characteristics of adaptive co-management link individuals and groups and foster collaboration and knowledge mobilization across vertical and horizontal scales (multi-level and within level of organization). It mobilizes the stakeholders into interaction and diverse learning opportunities (experiential and experimental). Ideally, with long-term maturation, the system slowly expands in scale (scope and problem complexity). The current body of knowledge agrees that the adaptive co-management of social-ecological system is imbedded in uncertainty and complexity. Another aspect to consider is that each process of adaptive co-

management has to continue to be seen as highly context specific case-studies without possible use of blueprint approaches (Ostrom, 2007). Since, local situations have specific problem drivers and management objectives, to connect these local situations to the adequate management options a flexible decision-making platform must exist that encompasses space for interaction and learning between individuals and groups (Armitage *et al.*, 2009). These platforms can be deliberately set up for stakeholders to interact and share information, such as meetings and workshops (Mutimukuru, 2006). This involves institutional and organizational arrangements that promote interactive feedback between individuals and environment. The management options are tested and monitored in order to determine the performance of the SLM measure and its change impact. The collaboration in monitoring and assessment can then create a permanent flux of information for further decision-making and further understanding of the system (Young, 2002). And in return of adopting and implementing the management options, change occurs to the initial site-specific conditions, such as the identification of a new problem. This feedback flux requires that processes of interaction and learning keep occurring in the system which is desirable in the course of systematic participatory monitoring (Folke *et al.*, 2005).

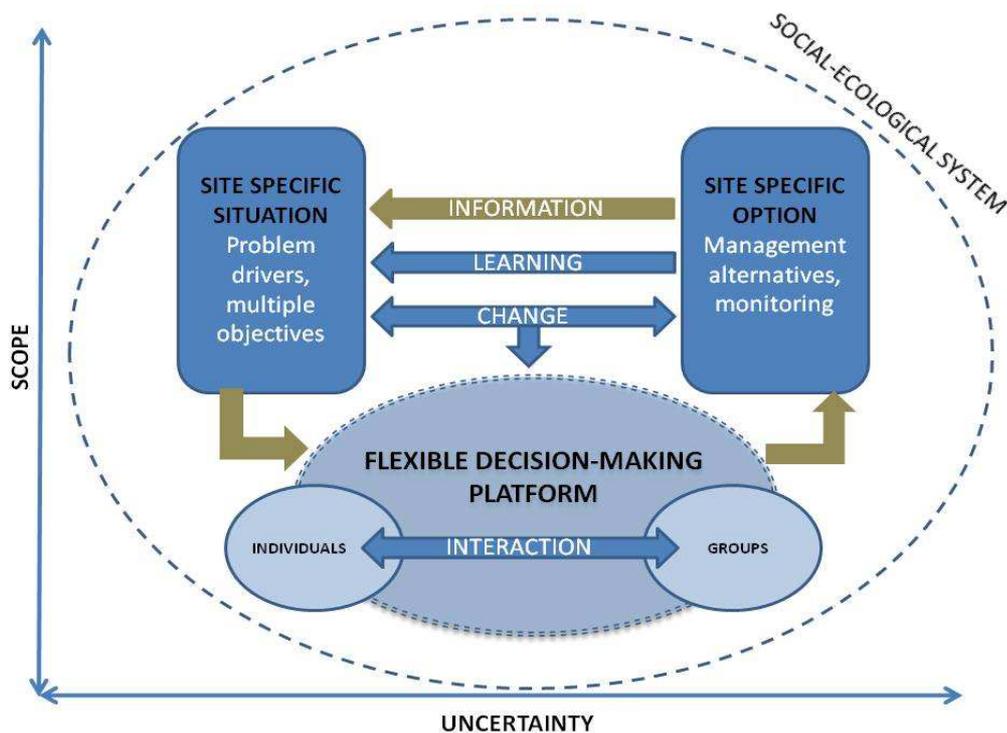


Figure 3. Schematic model for adaptive co-management of social-ecological systems (Adapted from Folke *et al.*, 2005; Armitage *et al.*, 2008; Berkes, 2009): integrating a flexible platform where individuals and groups from specific contexts interact, creating a flux of information leading to the selection of a specific solution, which will trigger change and learning to deal with uncertainty.

Adaptive co-management is a task-oriented decision-making approach that aims at promoting innovation, conflict resolution, knowledge co-production, social learning and the bridging of organizations (Berkes, 2009). It is path-dependent, meaning the outcome is highly influenced by the history of the case (Chuenpagdee and Jentoft, 2007). Meaning that implementing such model can have quite unpredictable impacts. In fact, there is always possible significant impact from a singular individual that cannot be foreseen (Pinkerton, 2007). For successful adaptive co-management the implementation of such management model should initially take into account the conditions of the system, its contextual variables at different domains (ecological and social), and objectives (Ostrom, 2007, Armitage *et al.*, 2009). Ten preconditions have been identified in Armitage *et al.*, 2009, from where an adaptation simplified for this research lead to the following eight conditions for successful adaptive co-management. The implementation of such framework will benefit from being a small scale system; with clear social entities with shared interests; and with clear property rights; stakeholders should have access to management options; and accept to commit; the existence of key individuals that can maintain the process focus; the openness of participants to share between knowledge systems; and the provision of resources and explicit policy support for multi-stakeholder collaboration will enhance success. Of course, some of these conditions can not be assessed *a priori*, such as the willingness to commit, but they can direct the way the process is conceptualized. At some point of the participatory process it will be possible to evaluate if these conditions are present and understand how to best adapt the framework to the context.

Adaptive co-management actually presents a weak track record when it comes to deal with poverty and empowerment, maybe a sign that the above conditions for success are too many or are not being met. This participative management model is often criticized for reinforcing local elite power, state control, and the exclusion of marginalized stakeholders with complex regulatory capture processes (Berkes, 2009). It is not able to guarantee equity and internal fair power distribution or empowerment of marginalized groups. As referred, the influence of few factors or an individual can have unexpected impact, positive or negative, and in real-life contexts maintaining fairness is challenge. On the other hand, it is by collaborative governance of natural resources that the people affected by decisions can have a say and interact among themselves. This fact promotes legitimate management practices and partnerships where knowledge acquired at different organizational scales can be bridged towards sustainable land management.

In a managed system individual and organisational learning can take place, is even defended that social units learn and that people can perform better than in group learning than in individual learning (Wals *et al.*, 2007; Armitage *et al.*, 2009). The

group should constitute a community of practice, of people sharing common concerns and pursuing knowledge by based in practice (Wenger, 1998). The engagement in learning and co-management of social-ecological systems has the potential to change the way agencies and networks work towards SLM (Berkes, 2009). These networks are structured around resource management and depend on the interconnections and interaction among environment, people and organizations within a social-ecological system (Armitage *et al.*, 2009). The methodology developed within this research aims to give opportunity to initiate such an approach by creating a forum for multi-level interaction and sharing of information.

2.2.2. SOCIAL LEARNING

In collective resource management literature, learning is mostly approached as experiential, reflective, learning-by-doing and learning-as-participation, in which multiple stakeholders across levels of organization collaboratively test and explore management strategies to address uncertainty (Armitage *et al.*, 2009). Nevertheless, the learning process remains under a conceptual paradigm (see Armitage *et al.*, 2007). One possible definition of learning is that it is an individual process based on observation and imitation through interactive feedbacks within the social-ecological system (Armitage *et al.*, 2009). The co-management approach to resource management stresses the importance of creating opportunities for linking experience, reflection and experimentation, between individuals and groups (see Kolb, 1984). In this context Keen *et al.* (2005) defined social learning as “the collective action, interaction and reflection that takes place amongst individuals and groups when they work to improve the interrelationships between social and ecological systems”. Interaction, exchange of information and learning are then subjacent outcomes of collaborative processes occurring in social-ecological systems. Participatory monitoring processes, by promoting a forum for interaction, can potentially promote social learning as an outcome. Despite there is little evidence to support the claim that the participation of stakeholder in environmental decision-making can promote social learning (Reed *et al.*, 2008), to an extent, this has been limited by the absence of adequate methods to quantify social learning (Prell *et al.*, 2007). It is suggested then that social learning can be considered as learning that takes place through interaction and exchange of information in social networks (Reed *et al.*, 2008). And, therefore, PM can promote social learning. Thus the challenge is to verify this hypothesis through the analysis of the participants perceptions on the social learning features: interaction and information exchange. Along this body of knowledge, the process of joint learning has been widely explored and lately conceptually explained by the occurrence of a sequence of steps (Downs, 1998; Berkes, 2009). King and Jiggins (2002) brought together previous literature on the subject of social learning in co-management and defined three learning loops (Figure 4). The single-loop learning involves the collective identification of alternatives to solve specific problems, thus fixing errors. While,

double-loop learning occurs when participant's worldviews and values are challenged resulting in the reconsideration of the management goals. Triple-loop learning occurs as the norms and protocols of management change on the governance level.

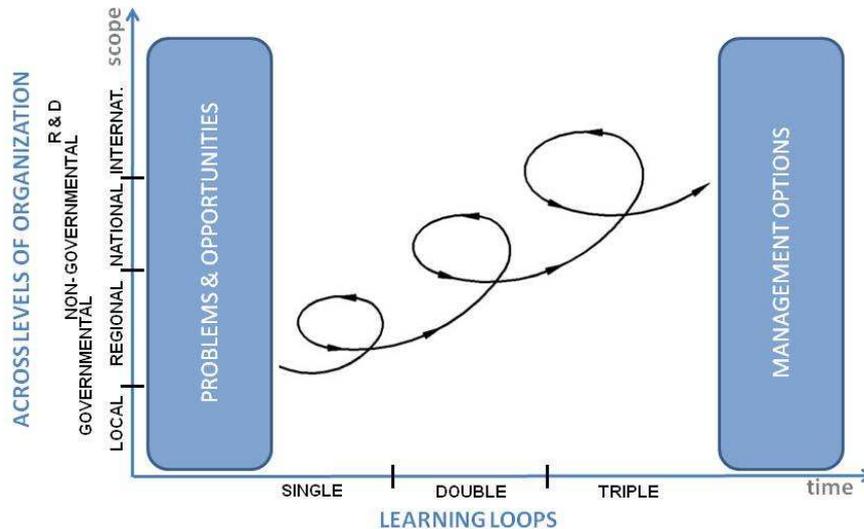


Figure 4. Potential of learning loops occurring across levels of organization and problem scope throughout time (adapted from Berkes, 2009).

These loops can be a starting point to better understand the learning process in co-management of natural resources and maybe use a step-wise approach when dealing with continuous joint learning. Learning is, in this perspective, an interaction surrounded by an environment of reflection, problem-solving analysis, collaboration and negotiation, drawing together individual and collective learning in a process of change through time (Armitage *et al.*, 2009). Therefore, there is the interest to extend joint initiatives across levels of organization, such as multi-level participation in environmental monitoring.

2.2.3. PARTICIPATORY MONITORING

On-going learning and participatory monitoring are the foundations to effective decision-making in adaptive co-management of natural resource systems (Walters and Holling, 1990; Keen *et al.*, 2005; Borrini-Feyerabend *et al.*, 2004). Trends emphasise the need for partnership working and using information from participatory approaches to develop better environmental policies (Richards *et al.*, 2004). Literature indicates that participatory approaches to monitoring may enable

experimental learning, contribute to building trust and change behaviours and that the quality and durability of the decisions is likely to be greater (Estrella *et al.*, 2000; Fisher, 2000). There is evidence that stakeholder participation can also enhance the quality of environmental decisions, possibly due to the increased information inputs (Reed, 2008). Multi-level public participation is a social, cultural and political process of bringing people together to share views and to enhance collective decision-making (Guijt, 1999). Using PM as a tool for tackling uncertainty in land management has its theoretical basis in constructivism, where the learning and adaptation arises from the addition of new flows of information on the already existent conception of reality of the participants, through systematic assessments of their environment (Ross & Nisbett, 1991 in Allen *et al.*, 2002). This theorization of learning with change by participatory processes perfectly accommodates to the PM principles, where participants are motivated to experience, interact, reflect and plan action. And, then monitor the action to feed the process' cycle. And, step by step stakeholders learn and engage in more complex discussions with wider scopes and in longer-term initiatives. It is argued that this integration of local knowledge and scientific knowledge can contribute to a more comprehensive understanding of complex systems and processes and that decisions based on such knowledge are likely to be more robust (Hansen, 1994; Reed *et al.*, 2006; Stringer and Reed, 2007; Reed *et al.*, 2007).

Those who are affected by or can affect a decision are defined as stakeholders (after Freeman, 1984). The participants are the individuals that choose to take in an active role in making decisions that affect them (Wandersman, 1981; Wilcox, 2003; Rowe *et al.*, 2004; Reed, 2008). As stated above, PM involves the assessment of change through a process of interaction and sharing of information that involves stakeholders groups (Guijt, 1999). It is the drive for accountability and for access to more knowledge in natural resource management for better providing answers to environmental challenges that has given great impetus to environmental monitoring (Abbot and Guijt, 1998). Yet, the monitoring information is not always appropriate and the methods can be too costly in many of the situations in which environmental information is necessary (Danielson *et al.*, 2007). The PM process, by adapting monitoring methods to make them more accessible for local people to monitor change themselves, tends to simplify costs. The aims of PM are also to improve local awareness of key issues and local capacity to create and sustain solid partnerships between stakeholders (Abbot and Guijt, 1998; Estrella *et al.*, 2000). Participatory monitoring, community monitoring, or collaborative monitoring are all terminologies sharing the same multiple purposes (Estrella *et al.*, 2000): a) improve project planning and implementation through context specific approaches; b) strengthen organizations and institutional learning through bridging of individuals and groups; and c) inform policy. It is with involvement of the stakeholders that projects can adapt and be flexible to local contexts and changing conditions. The focus here is on the fact that participation gives opportunity to

locals to have a voice and promotes the finding of socially accepted long-term solutions to collectively identified problems (Stringer *et al.*, 2006). Such that, the success of participatory approaches is likely to then empower stakeholders to define goals themselves as well as the actions required to achieve them (Allen *et al.*, 2002; Campbell and Vainio-Mattila, 2003; Schwilch *et al.*, 2009). And, ultimately, multi-stakeholder participation in social-ecological systems results in better management policies and plans (Colfer, 2005). Participation allows people to express their priorities and increases the sense of ownership improving the long-term sustainability.

The verification of the many claimed benefits of using participation processes is highly limited by the absence of quantification and also by the scattered inputs from several different knowledge areas (Reed, 2008). It is claimed that participation promotes a democratic social society, increases public trust in decision-making, empowers stakeholders to use their knowledge, enables interaction and may or may not promote social learning (Blackstock *et al.*, 2007; Richards *et al.*, 2004). These are normative benefits that should be felt by the stakeholders under successful approaches. It is also claimed that participative research gets the type of insights that make interventions be better adapted the context, and thus enhancing adoption and diffusion (Reed, 2008). An essential aspect of the benefits of participation, and namely participatory monitoring, is the increased information exchange, which feeds the decision-making system. Nonetheless, in real-life contexts, from groups of people the unexpected is expected. Participation processes can create potentially negative interactions with power structures (Kothari, 2001), by reinforcing inequities or by creating dysfunctional consensus (Cooke, 2001). Point out as weaknesses are also the signs of disappointment and fatigue of stakeholders after repeated meetings and their doubts regarding the risks and their real influence in the decisions. From these growing concerns about participation processes research can only aim at keep learning from mistakes and develop more sensitive approaches and find adequate quantifiable evaluation criteria for its processes and outcomes (Reed, 2008). What comes out of this reflection is that further research is needed to design more effective participatory processes where stakeholders make durable decisions. There is need to replicate and compare participation processes in different social-ecological contexts, and test different approaches and methods in similar contexts. From the lessons learned a recent review from Reed (2008) gathers a set of best practices when working with participatory research. A first view over the study cases of this review indicates that outcomes are necessarily uncertain and risky. Then what are so far the best practices identified to deal with such challenging process? Authors have been agreeing in two features that can highly determine the process. These are that participation must be institutionalized and that funding must be provided outside of research project's agendas (Reed,

2008). Besides this, a participatory process should be tailor-made to the context, to adapt to the type of participants, the level of engagement and the objectives of the action. Participation process should better start early in the project with clear objectives and with highly qualified facilitation. It is also recommended that the action includes representatives of the several levels and scales of organization, such as local and regional, governmental and non-governmental, policy-makers and users, private and public. The integration of these several knowledges is a main objective of participation.

In practical terms, it is important to keep in mind that to implement the PM processes, flexibility is a very important feature, as examples from many projects have shown (see Estrella *et al.*, 2000). Flexibility allows responding to unexpected changes, challenges and opportunities commonly associated to real-life situations. The main advice regarding the issues that are important to consider collectively in a PM approach is as follows (Abbot and Guijt, 1998):

- Clarify the objectives of the project / activity being monitored;
- Select the methods to collect indicators and to share the information depending on the available time, skills and resources;
- Decide the frequency and timing of monitoring by choosing best time of the year and frequency, reaching a monitoring schedule;
- Clarify to what extent each group is willing to participate in different tasks;
- Continue with systematic monitoring and facilitate follow-up to keep information exchange, periodic meetings and adjustments.

The creation of a collaborative monitoring system, which is the aim of this research, is used here to see whether SLM measures were implemented as prescribed (compliance monitoring) and/ or to assess the effectiveness of the SLM measure relative to the management objectives (effectiveness monitoring). The goal of PM is to give evidence if the input of change is having an effect (Armitage *et al.*, 2009). The idea behind the participatory processes is to understand the system and collectively select indicators. These PM activities have the shared ultimate aim of creating land user groups knowledgeable and motivated to independently assess and care for their resources.

2.3. CONCEPTUAL APPROACH

In a context of desertification the management goal is to achieve sustainable resource use. The long-term goal for scholars of sustainability science is to recognize which combination of variables tends to lead to relatively sustainable and productive use of resource systems operating at specific spatial and temporal scales (Ostrom, 2007). There is evidence that the use of multi-level and multi-scale collaborative approaches for land management can enhance the quality of environmental decisions, possibly due to more comprehensive information inputs

(Reed, 2008). The adaptive co-management of social-ecological systems theory defends that participatory monitoring promotes and maintains the needed flux of information and interaction for the good functioning of the management model. Workshops are a way of creating a forum for interaction and for exchange of information to feed that flux. The aim with this research will be to choose the appropriate approach and participatory methods in order to create a flexible platform for stakeholder interaction. And, with this further explore the implementation of collaborative methodologies and tools in different contexts. With the practical implementation of the methodology conceptualized during this research to initiate participatory monitoring it will be possible to explore what happened in each of the processes and how did the participants feel about the process and the outcomes in terms of interaction and information exchange.

Through semi-structured interviews with key stakeholders and contact with local and regional potential participants, it is expected to get insight into the case study systems and get the stakeholders engaged in the action. The participants will experiment in the field with the process of collective monitoring of SLM practices. Together they constitute the system and the workshop the platform for the interaction, exchange of information and decision-making to occur. In such action the individuals are induced to reflect on the management options and discuss their ideas. The participants identify and select themselves the environmental indicators that in their opinion best evaluates the SLM practice and also define the methods for data gathering and the monitoring schedule. A reflection moment in the end of the action with individual surveys will give participants opportunity to evaluate their participation in the process. Follow-up to this action is expected, but further understanding of the system is needed to identify appropriate communication channels.

To undergo this process of monitoring and participation three existing conditions must be present. First, the selected SLM strategy must be implemented in the field and accessible to be monitored. Second, there must be contact with the local study site teams of the DESIRE project to have access to technical information and contacts of stakeholders. Third, it is necessary that the local key organizations and potential participants are willing to participate. In this research the initially considered key stakeholders are the landowners and the organisations (governmental and non-governmental, local and regional), other land users, and also the researchers working with the DESIRE project. Rather than attempting to meaningfully engage with the wider public the size of the participants group was kept manageable and depending also on the participation level and the context.

CHAPTER 3. DESCRIPTION OF STUDY SITES AND

SELECTED SUSTAINABLE LAND MANAGEMENT OPTIONS

In this Chapter a description is given of the three study sites. This includes their conditions in terms of location, land use systems, biophysical, social and institutional settings, and the developments within the DESIRE project. Two of the study sites are in Portugal, in Góis and Mação, and the other in Morocco, in Sehoul (Image 5). The first two study sites have much in common, including the identified problem and selected SLM options, and also their institutional setting. In fact, in the DESIRE project the two Portuguese study sites were joined and, therefore conclusions regarding drivers of desertification and impacts are the same. Yet, they have slight differences that are explored in the results chapter regarding the process and outcomes of the participative action. This Chapter starts with a good overview of the three study cases and then the next three sections further describe individually their contexts and desertification drivers. The last section gives the description of two SLM options selected for monitoring, the fuel management strips in Portugal and the gully control in Morocco.



Figure 5. Location of the three study sites: Góis, Portugal; Mação, Portugal; and Sehoul, Morocco (Source: Google maps)

3.1. STUDY SITE CONTEXT

This section starts by giving an overview of the study sites context (Table 3), where the location, the ecological and socio-economic conditions, and the selected SLM options within the DESIRE project are presented. Whenever otherwise stated all information stated in this Chapter derives from the deliverables and reports from the DESIRE project, all accessible through the website (www.desire-project.eu). The project has gathered wide information on the ecological and socio-economic settings of the study sites, developed by the local study site teams. From the stakeholder workshops main desertification problems were collectively identified and the most promising SLM options selected. This section summarizes the key existing conditions within the three study sites in the table below, where it is possible to understand the proximity between the two study cases in Portugal, both focused on forest management to prevent wildfires. A good couple of study sites for comparing the process and outcome from the same methodology in similar contexts. The study case in Morocco lies in marginalized agricultural land and has a broader objective: to improve sustainability. The land use, rainfall, type of soil, and social settings are the initial conditions of the SS, along with the desertification problems and drivers and objectives. The selected SLM options are the potential changes to the system that have been implemented within DESIRE project using participatory approaches. A further look into the context of the three study sites follows in the next three sections.

Table 3. Synthesis of the context of the three study sites: location, ecological and socio-economic setting, desertification problems drivers, management objective and SLM options selected within DESIRE project.

		Góis	Mação	Sehoul
Location		Central Portugal	Central Portugal	20Km of Rabat, Morocco
Ecological setting		Forestry and shrubland 600 to 1000 mm Stony and shallow Cambisols	Extensive pasture and forestry 1200 mm Stony and shallow Lithosols	Agro-pastoral lands and cork oak forest 500 mm Stony Paleozoic sandy loams
Social setting		Outmigration and ageing population Low socio-economic levels	Outmigration and ageing population Low socio-economic levels	Low income from small landowners Low investment
Desertification pressures	Problem	Forest fires	Forest fires	Aridity and urban pressure
	Drivers	Frequent wildfires Poor agricultural and forestry practices	Frequent wildfires Poor agricultural and forestry practices	Over-exploitation of water for irrigation and consumption Land use change Inadequate land management
	Objective	Reduce burnt area	Reduce burnt area	Sustainable development of agriculture
	Selected SLM option	- Fuel management strip network (FMS) - Prescribed fire - Infrastructure of forest support - Preventive forestry	- Fuel management strip network (FMS) - Prescribed fire - Infrastructure of forest support - Preventive forestry	- Gully control(GC) - Rotation with fodder strips - Rotation of annual crops - Strips of Olive trees - Oak forest rehabilitation

3.1.1. PORTUGAL – GÓIS

In the Valtorto catchment in Góis is being tested a specific SLM technique of using prescribed fire. This is a privileged place to test this in a way that allows the measurement of impacts at catchment scale (0.08 km²). The implementation of fuel management strips is also undertaken in this municipality.

LOCATION

Góis municipality has an area of 264 km² (INE, 2001). It is an isolated mountain area, located 45 km from Coimbra in Central Portugal's sub-region Pinhal Interior Norte (40°06'26.28" N 8°06'57.19" W).

BIOPHYSICAL DESCRIPTION AND LAND USE SYSTEM

Góis has an annual rainfall of about 1200 mm, concentrated during winter season. Soils are very stony and shallow Lithosols. It is characterized by very steep slopes (> 20°). The attitude ranges between 600 and 730 m.

The local land use systems are extensive pastures with small ruminants, subjected to prescribed fire from time to time to provide new pasture, and forestry with dense shrubland. A more conservative mosaic land use used to prevent the progression of forest fires, foster economic and ecological diversity. Where nowadays, the largest part of the Góis municipality is used for forestry with plantation of *Eucalyptus globulus*. The plantations of Eucalyptus together with the abandonment of the land are some of the reasons for the loss in biodiversity and the trigger of forest fires. The major challenges are to reduce forest fire occurrence, economy diversification and income increase to prevent the emigration of the inhabitants to the cities.

SOCIO-ECONOMIC AND INSTITUTIONAL SETTING

Góis has 4499 inhabitants with a population density of 17 hab/Km² (2006). In 2006 it showed a negative population growth rate of -1 % and an ageing index of 288 (pop > 65 years old / pop < 15 years old *100). A high percentage of the population (32%) is over 65 years old. People that cannot read or write represent 21% of the population and only 10% of the inhabitants hold a secondary school degree, the remaining of the people have just basic education. Furthermore, the municipality has lost almost half of its population since 1960. This coincided with the change in land use from the previous mosaic system to timber production forestry. And with less people to manage the land, forest fires become an important degradation factor, mainly due to their recurrence.

Forest fires are a national problem reflected in the existence of many organs and policy developments. In terms of institutional organizations the two Portuguese study areas share the same setting, briefly presented in Table 4.

Table 4. Institutions involved in natural resource management in Portugal.

National Level	<ul style="list-style-type: none"> - AFN - National Authority for Forestry (part of the Ministry of Agriculture, Rural Development and Fisheries - MADRAP) - SNBPC - National Service of Firemen and Civil Protection
Regional Level	<ul style="list-style-type: none"> - DRAPC - Regional Department of Agriculture and Fisheries of the Central Region - UGF - Forest Management Unit
Municipal Level	<ul style="list-style-type: none"> - GTF - Forest Technical Office (part of Municipal Council)
Non-governmental	<ul style="list-style-type: none"> - Forestry Associations

Portugal is a democratic republic. Land ownership is mainly private and usually dominated by many owners with small properties with limited resources. The problem of forest fires in Portugal is under regulation of several different governmental organs, from the Ministry of Agriculture, Rural Development and Fisheries (MADRAP) to the firemen and civil protection services (SNBPC), from national to local levels, which makes it an even more complex issue to manage. Forest management legal status has suffered changes after the 2003 severe wildfire with restructuring of regional committees and introduction of new organs for the defense of forest against fires. The main existing laws and policies for natural resource management are the following, but more legal regulations apply to forest management turning it into a problem surrounded by dense bureaucratic structures, that limit ability to respond to change (MA, 2005). Examples are: National Forest Policy, National Strategy for Forestry, National Action Plan to Fight Desertification, National Plan to Protect Forest against Fires, and Regional Plan to Forest Planning. Land is mainly privately owned and these landowners are represented in the making of these plans by national, regional and local authorities for whom they voted for, but more directly by the contact with local forestry associations.

From the above information, the list of stakeholders identified for both Portuguese SS is presented below:

- Landowners
- NGOs / Community based organizations, such as the Forestry Associations
- Local government and municipal services, such as the Forest Technical Office (GTF);
- Municipal Service of Firemen and Civil Protection (from SNBPC);
- National Authority to Forest (AFN) and Forest Management Unit (UGT); and
- Research Institutes and Universities, such as the University of Aveiro.

DESIRE PROJECT DEVELOPMENTS AND DESERTIFICATION DRIVERS

The local Study Site Team of Góis is from the University of Aveiro, Department of environment and land use planning (DAO), represented by Prof. Celeste Coelho. They do the coordination and implementation of the DESIRE project in the study site of Góis, in collaboration with Coimbra Agriculture University College (ESAC), University of Swansea and ALTERRA. The language used in the SS is Portuguese. I was present at the second stakeholder workshop in February 2009 in Góis as a Portuguese observant and had the opportunity to meet the Portuguese SSTs and the participants from Góis and Mação. I also helped to translate the proceedings of the two-day workshop to English for Gudrun Schwilch, the official observant representing DESIRE project's team responsible for WB4 (implementation and monitoring). For this research I will be the interviewer and facilitator of group work of the two participative actions to take place in Portugal. Meeting the workshop participants and SSTs in advance created a potential trust that favored the continued contact and exchange of information leading to the willingness to participate in the actions of this research.

The identified desertification problem in both Portuguese SS is the occurrence of forest fires. The main form of land degradation is water erosion and nutrient loss after fire. Undoubtedly, the drivers of land degradation and subsequent impacts in this area are:

a) Frequent wildfires impact's is soil erosion, biodiversity loss, decreased water quality and diminished wood production. The identified socio-economic drivers are the out-migration of active population and ageing of population parallel to land use change with failure to clean up forests. Environmentally this degradation is reinforced by the introduction of exotic tree species (*Pinus pinaster*, *Eucalyptus globulus*),, negligence to remove litter and by severe drought periods. Pressures to the system are that wildfires cause increased water repellence of soil, increased

runoff, decreased soil organic matter and decreased water quality. The responses identified within the DESIRE project are mulching with timber waste, use of prescribed fire, reforestation, seeding and preventive forestry (fuel load management through mosaic landscape planning).

b) Poor agricultural and forestry practices are resulting in soil erosion, soil nutrient depletion. Again the socio-economic context of out-migration, ageing population, land use change, lack of integrated planning, abandonment of traditional agro-forestry practices for large-scale monoculture forest plantations, are major drivers of desertification. The land inheritance system is also fostering further fragmentation with smaller properties and abandonment. The biophysical setting of soil sensitivity to erosion, existence of slope and severe drought periods coupled with introduction of exotic tree species and dysfunctional management resulting in absence of litter removal, are all driving further land degradation. This leads to pressures such as decreased crop production and decreased farm income.

Reasons for an increase in the occurrence of fires are linked to depopulation and ageing and changes in land use systems. They include: abandonment of traditional agro-silvo-pastoral practices and replacement with monocultural forestry plantations (*Eucalyptus globulus* and *Pinus pinaster*) with accumulation of inflammable material. Contributing to land degradation is unsustainable management of forest with problems with land tenure and land division through inheritance; globalization and market forces; inadequate agricultural and environmental laws and lack of their implementation; low financial resources; and poor access to financial support. Reduction of forest fire occurrence is complex and the creation of partnerships for the sustainable management of forest represents a major challenge both in Góis and Mação regions.

3.1.2. PORTUGAL – MAÇÃO

Mação is a UNCCD Pilot Area in Portugal, meaning that environmental and socio-economic degradation drivers have been triggered in this region. The dominant land use is forestry which has been suffering from severe drought periods and repetitive wildfires leading to soil and vegetation productivity losses. The local population is characterized by ageing and outmigration dynamics, leading to socio-economic degradation. Development projects in the region have been attempting to reverse degradation processes and with the DESIRE project's participatory approach the aim is to test SLM strategies and conservation technologies to deal with the problem of forest fires.

LOCATION

The municipality of Mação is situated in Central Portugal (39°33'19.17''N 7°59'59.88''W), in the sub-region Pinhal Interior Sul, district of Santarém, located in the lower Tejo river basin.

BIOPHYSICAL DESCRIPTION AND LAND USE SYSTEM

Mação lies in a transition zone between the Atlantic and the Mediterranean climate types with wet winter seasons and dry summers. Rainfall varies from 600 mm to 1000 mm and is concentrated in winter. Soils are very shallow and stony Humic cambisols on steep slopes (> 20°).

The region was dominated by agro-silvo-pasture systems characterized by mosaic patterns until the middle 20th century. At present is dominated by forestry of *Pinus pinaster* and *Eucalyptus globulus*. An important part was burned recently and gave way to regeneration of stands and shrubland. Present activities to restore ecosystem from wildfires involve mostly reforestation programmes.

SOCIO-ECONOMIC AND INSTITUTIONAL SETTING

Mação has an area of 401 km² and 7419 inhabitants with population density of 18. hab/km² (2006). About 16% of the population works in the primary sector. Since the 1950s, the municipality has suffered substantial depopulation, with more than 50% of the inhabitants migrating in 50 years. In 2006 it showed a negative population growth rate (-2.2%) and an ageing index of 379.

Since Mação Municipality is a UNCCD pilot area, it has been subject of several land management and development projects aiming to combat desertification and improve forest management. For example: MEDCHANGE – ‘Effects of land use and land management practices changes on land degradation under forest and grazing ecosystems’ (1997-2000), and FIREGUARD – ‘Monitoring Forests at the Management Unit Level for Fire Prevention and Control’ (2002-2005). DESIRE project used this existing knowledge for the identification of desertification drivers and impacts. The complexity of the problem of forest wildfires is a good example of the need to integrate knowledges and levels of organization in order to find locally feasible alternatives.

DESIRE PROJECT DEVELOPMENTS - PROBLEM DRIVERS

This section is the same as in for the study site of Góis, since the two sites were treated as one. In Portugal are the only study sites which the problem is wildfires. The fact that forest management for combating wildfires is so highly embedded in national policy makes the portfolio of SLM options limited. No innovative SLM technology or approach was introduced during the stakeholder workshop decision-making and therefore the selected SLM strategies are already implemented in the field.

3.1.3. MOROCCO – SEHOUL

This region of Sehoul was selected because it consists of marginal land with high poverty level and with significant indicators of vulnerability and degradation. Desertification in this region is both related to natural and human factors (aridity and poverty) and is exacerbated by events of drought. Changes in the region are leading to land use change, over-exploitation of water resources and the transformation in the sub-urban dynamics and emergence of new activities such as tourism. Also, the expansion of the surrounding cities and rapid urbanization is increasing desertification risk.

LOCATION

The study area considered is on the Sehoul Plateau, covers 397 Km² and is located between the highway from Rabat to Fes in the north and the Grou River in the south (33°56'2"N, 6°40'40"W).

BIOPHYSICAL DESCRIPTION AND LAND USE SYSTEM

The Sehoul commune is located in the Atlantic plateau of Morocco in a sub-humid environment. Annual rainfall is 480-500 mm with one single rainy season from October to May. The dominant slope is about 8°. The substrate consists of red soil of Paleozoic schists and sandstones with its top horizon often covered by a crust. The organic layer is fragile and rapidly destroyed during dry years.

The study area consists of a catchment mainly covered by annual crops and partly covered by cork oak forest. The Mamora forest, which occupies 30% of the Sehoul commune, is composed of cork oak and in its eastern part by matorral. Forest's main uses are pasture and firewood, along some other non-timber products (e.g. oak acorns). Due to the proximity of urban agglomerations, the forest is also visited for leisure. The crop system associates grain production and free grazing. Agriculture is rain fed using crops such as Barley or Wheat. The irrigated farms represent only about 4% of the commune's cultivated area. Tillage is done with animal traction in

October or November and sowing is after first rains with the harvest normally at end of June. The income from agriculture is very low and all the stubbles are grazed leaving the soil bare at the time of the first rains. Nowadays soils degraded immensely, presenting rills and gullies. Also, superficial groundwater resources are declining due to an increasing demand for consumption and irrigation and the limited use of water harvesting techniques. The main water resources are represented by the reservoir of the dam Sidi Mohamed ben Abdellah (SMBA) which is expected to increase capacity and a smaller dam Al Arjat Sghir. The inhabitants of the Sehoul commune are dependent on withdrawal of groundwater from artificial wells, while the SMBA reservoir is forbidden for the use by direct pumping and entirely devoted for the cities water demand.

Current land management trends include replacement of evergreen oak forest by fast growing trees such as Eucalyptus species and the increase of agriculture area. Therefore, areas traditionally occupied by sustainable forest and shrubland are experiencing a change and intensification of land management practices, leading to the use of the poor Lithosoils in an unsustainable manner. In summary the main factors contributing to desertification in the region are: The reduction of the fallow periods; uncontrolled access and overgrazing, afforestation with exotic species; and weak soil's cover which results in soil compaction and higher runoff. The Sehoul region is characterized by soil erosion, land degradation, and low productivity. This has led to reduced willingness to investment in improved management strategies. There are, however, several measures like crop rotation, mobile grazing, ploughing along the contour, that can with little investment significantly restore soil fertility in the region.

SOCIO-ECONOMIC AND INSTITUTIONAL SETTING

The population density increased during the 20th century through natural growth, but also through immigration to this rural area close to the cities of Rabat and Sale. Several processes occurred simultaneously: increased demand for water, over-use of the forest for grazing and cutting of trees for firewood for rural population and for charcoal for the cities. At the southern fringes of the Mamora forest, agriculture expanded to meet the needs of an increasing population in neighbouring cities. The adoption of off-farm activities and emigration represent now the options for small farmers to respond to the scarcity of their income. Improvements are necessary. Morocco is a republic monarchy. Only recently sustainable land management has been receiving more attention and several laws now exist, both customary and formal, but they lack further development and integration (e.g. the national programme for desertification control). The possible main stakeholders are:

- Individual landowners and farm's families
- Local vulgarization agency (Sous-CT)
- Regional agriculture agency (CT d'Oulja de Salé)
- Local Municipality (Sehoul's commune)
- Agency for the management of the Bouregreg River basin
- Local associations

DESIRE PROJECT AND PROBLEM DRIVERS

The Study Site Team in Morocco is from the University Mohammed V, the Faculty of Human sciences (Chair UNESCO-GN) and represented by Prof. Laouina. The main language in the region is Arabic. Only people from the SST can speak in French and some in English, otherwise contacts with stakeholders are always in Arabic. For this reason the implementation of this research in Sehoul needs the facilitation of the participatory action to be done by the SST. The interviews and surveys are translated to Arabic and the content and form of the action is to be discussed with the SST in French.

The main form of land degradation in Sehoul region is increasing aridity and increasing urbanization pressure. Undoubtedly, the major drivers of land degradation processes are the following leading to the subsequent impacts:

a) Over-exploitation of irrigation and drinking water extraction subsequently leading to ground water depletion and changes in groundwater availability and quality. Policy is under development to regulate water use (e.g. National programme for desertification control).

b) Inadequate land management impact negatively on land productivity. The socio economic drivers are lack of soil and water conservation, reduction of fallows, increased animal load, and commercial farming that is pushing local communities to the sloping and marginal lands and into the forest. The soil is of very weak structure and the torrential autumn rains are environmental drivers of degradation in the region. One possible response identified with the DESIRE project is fencing.

c) Land use change as been leading to soil erosion by water. With urbanization, outmigration, land abandonment, conversion to agriculture and degraded lands being used for pasture, the region is in declining process of degradation. Fragile soils, introduction of mechanization, deforestation, land cover change, cultivation sloping lands, overgrazing has increased pressure on marginal lands. Afforestation is seen as an option to reduce land degradation.

3.2. SELECTED SLM OPTIONS

From the two stakeholder workshops of DESIRE project undertaken in the study sites the outcome was the selection of set of site-specific SLM options. The selected options for Portugal and Morocco are listed above in Table 5 and the two selected to be monitored with this research are further explored in this section. Explanation is given about the objectives and characteristics of the two SLM strategies that were considered for monitoring in Portugal and Morocco. These two options were selected since they were implemented in the field and were possible to be monitored at the time of this research. Further explanation about the implementation of these SLM options in the field is given in the results chapter.

The main aim of the experimental set-up of these options in the field is to test these remediation techniques. There is wide supportive information of the application and effectiveness of these options elsewhere (e.g. WOCAT). The implementation of these trials will allow the stakeholders to see by themselves the impacts and performance of the option in local context. In each study area the stakeholders identified together the main local problem and selected criteria to evaluate technologies and approaches for the management of their lands, and then selected the set of most promising SLM options to be implemented.

One of the selected SLM options in Portugal to reduce burnt area, both for Góis and Mação, is the implementation of Fuel Management Strips (FMS). This option is under national legislation that prescribes in detail the characteristics and implementation, resulting that the monitoring assumes form of compliance monitoring. Unlike the case in Morocco where the workshops led to the selection of a broader set of SLM options, one of them the intercropping with Gully controlplanted with a forage shrub (*Atriplex* spp.) to reduce erosion by water. This option is to be implemented in private properties by the farmers. The participative monitoring of the Gully control(GC) in Sehoul will gather stakeholders to discuss and evaluate the effectiveness of this management measure relative to the management objectives. This, either compliance or effectiveness, monitoring can allow the needed flow of information to be used for improved decision-making regarding the sustainable development of the regions.

3.2.1. PORTUGAL

FUEL MANAGEMENT STRIPS

The planning of fuel management strips (FMS) establishes a strategic network of controlled combustibility (see Figure 6). This is part of the National Plan for Forest Fires Defense (PNDFCI) and its regional planning is defined by the National Forestry Authority (AFN). The implementation is nationally regulated with clear indications (DL-124/2006): the FMSs must have a width of no less than 125 meters and an arboreal cover inferior to 50% and the coppice higher than 3 meters. The total and partial removal of vegetation creates an interruption in fuel charge with the aim to reduce the area affected by wildfires and to facilitate interventions by protecting infrastructure. The costs of implementation are high, but reduced during maintenance. The planning and implementation should also take into account local landscape and fire history.

3.2.2. MOROCCO

GULLY CONTROL

The gully rehabilitation with shrub plantation of *Atriplex spp.* is implemented in one experimental plot in Sehou. It is done for Gully control (GC). These have at least 1 meter interval, leaving space for possible intercropping (see Figure 7). The objectives of this practice are to maintain soil cover after crop harvesting and to reduce erosion during rainy period. Also the presence of the perennial shrubs will increase water infiltration and provide palatable forage production for grazing during summer periods. The adoption of this practice is done for the rehabilitation of existing gullies and to prevent further gully formation. This technology using *Atriplex* species, but also with *Opuntia spp.*, have been used in North Africa, Middle East and American continent. Until now, the best combination has been to associate these forage shrubs with typical cereal crops, like barley. The plantation of *Atriplex* can provide environmental benefits and restore soil fertility as a consequence of their drought resistance, organic matter supply, and deep root development (Mulas and Mulas, 2004).

Fuel Management Strips in Portugal



Figure 6. View of Fuel Management Strips, along access and electric networks (source: www.timberica.com).

Gully control with *Atriplex* in Morocco



Figure 7. View of a plantation of *Atriplex* strips with crops (above; source: Mulas and Mulas, 2004) and of the study area in Sehoul with detail of the *Atriplex* shrub plantation (below).

CHAPTER 4. METHODOLOGY

This research produced the conceptualization of a methodology for initiating a participatory process for ecological monitoring and analyzing its process and outcome. The expected results from this method include the procedure – what happened – and the results from the surveys – how did the participants perceived the process. This methodology was tested in three study sites. The research is initiated with a literature review about theory and practice of participatory monitoring (PM). It was the theoretical framework on adaptive co-management of social-ecological systems and PM and lessons learned that were used as fundament for the conceptualization on how to organize and facilitate a focus-group workshop and on how to appraise the process and its outcome. The choice of the participatory approach was analyzed in consultation with the local study site teams and the local interviewed organisations to be better adapt approach to the local context. This methodology has four practical steps to initiate and assess the implementation of a participatory monitoring framework. The implementation of the developed methodology and the data collection of this research were successful. Three participatory monitoring workshops took place. Thus, this report is the result of the analysis of the process and outcome from the interviews, the one-day monitoring workshops and the surveys in the three study sites.

4.1. THEORETICAL JUSTIFICATION

A specific theoretical framework is built for the conceptualization of the step-wise methodology developed for this research. The foremost concepts are derived from the model of adaptive co-management of social-ecological systems (Folke *et al.*, 2005; Berkes, 2009) associated with a problem-solving approach with regard to natural resource management (Barrett, 1985). This framework, in a broader sense, is based on the concepts of learning-as-participation and multi-level interaction. In practice it is focused on suggesting a methodology to initiate a participatory approach for environmental monitoring of sustainable land management alternatives. The main constraint found in this kind of research is the need for a much longer time span to get a good insight into the complex mechanisms of these social-ecological systems to understand the impact of a participatory action. This research is time constrained and also site restricted, thus analyzed as local case studies. This is often the case with such topics of research when “how” or “why” questions are posed and the researcher has little control over a set of events (Yin, 2003). Because of the focus on contemporary phenomena within real-life context and use of participatory approaches, case studies require time and are considered site specific. What is possible with this research is to establish and test a step-wise

approach to engage stakeholders in environmental monitoring in a collaborative learning-by-doing process and assess participatory and learning perceptions regarding the outcomes of PM of specific land management strategies.

4.2. DESCRIPTION OF METHODOLOGICAL STEPS

The methodological steps developed for this research are derived from the concepts of the theoretical framework. The developed methodology consists of four steps that follow a problem-solving approach: Orientation, Implementation, Reflection and Follow-up (Figure 8). Each of the steps tries to find answers about 1) the conditions of the social-ecological system of the study site, 2) the way the implementation process of the PMW; 3) how the participants perceived the experience with the process in terms of participation and learning; and 4) how to best continue and disseminate the PM results and feed information to the system. Participation is present in all steps. With the initial interviews (FORM-ON), the implementation of the PMW, the surveys on the process of participation (FORM-PP), and in last step, the follow-up, the participants have a major role in the continuity of the process.

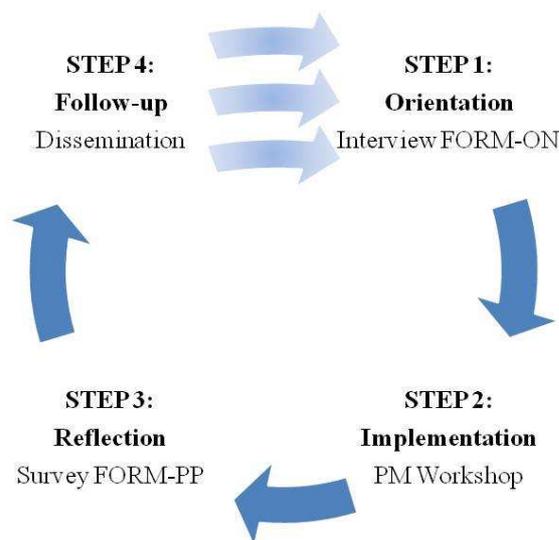


Figure 8. The steps of the methodology for initiating the participatory monitoring: orientation, implementation, reflection, follow-up.

Each step is described below. In STEP 1 with the semi-structured interviews with representatives of local governmental and non-governmental organisations take place the first contact with the primary stakeholders. With them is made a

collaborative decision-making regarding the selection of potential participants and of best place, date and duration for the workshop. From this first step it is possible, or not, to follow to the implementation of the PMW in STEP 2. From this workshop results the discussion over the selected SLM measures, the collaborative selection of indicators and the data gathering. Participants have then the opportunity in STEP 3 for reflecting with an individual and anonym survey regarding the matching of expectations over their participation and learning in the one-day workshop. The last step, STEP 4, is partly independent from this research, since it relies on the commitment of participants, organizations, and study site teams to continue the process with exchange of information and with meetings. The objectives of each step of the methodology reflect lessons-learned from the literature review. First step focus on information exchange (knowledge generation and transfer), the meeting of representatives of different level organizations and create the openness to make collaborative decision-making (interaction). In second step, having the insight on the context, the objective is to conceptualize a context-specific approach and contact the participants in order to implement a hands-on approach of the PMW. This should be followed by a focus-group discussion and selection of most relevant environmental indicators. The objectives of the surveys in the third step are to assess the process outcomes and gain further insight on the participant's conditions. The follow-up of this process is essential for this to be considered PM, meaning collaborative and systematic monitoring. Finding channels of communication and dissemination are the objectives of the fourth step. The workshop provides a forum for interaction by getting the stakeholders together in an experiential learning environment. The following explanation of the methodological steps tries to be broad and applicable to other study sites.

STEP 1 | ORIENTATION

This first step sets the scenario for the implementation of the PM process. The objective is to describe the current situation. This was done through the contact of the Study Site Team (SST) and local organizations (key stakeholders). If some of the basic preconditions to proceed with the PM process are missing, the application of this methodology should be reconsidered. This methodology for initiating a PM process is intended only if 1) there is support from a local SST; 2) at least two people from local organizations are available for interviews; and 3) if both show willingness to participate and give logistical support.

a) Information exchange with the SST allows establishing the point of situation and meeting the representatives of the SST and access local support and information (DESIRE project reports and contacts of participants from the previous stakeholder workshops). The SST then suggests which local organizations should be the key stakeholders and provides their direct contacts.

b) Interview with representatives of the local organizations to get insight in the local context specifically regarding the implementation of the selected land management strategy and gather the contacts of the potential participants. Both a governmental and a non-governmental organization are contacted and interviewed to have two points of view over the issue of land management. These are the primary stakeholders. These should be active in local resource management and have direct contact with the land owners and decision makers. This sampling is purposive and uses volunteers willing to be interviewed. The meeting takes place ideally in the organization's premises to reduce the need of disruption of the professionals' workday and allow openness. The interview is based on a survey. The interview form is shown in Appendix A (FORM-ON - Organizations and Networking) and constitutes a qualitative survey using semi-structured interviewing method. This survey inquires about the functions, services and network of the organization, their perspective on the decision-making chain regarding the SLM measure and on the concept of PM. The idea of these interviews is to take them as semi-formal conversations, since it is a first contact, and mainly listen and allow brainstorming to gather a wider picture of the local social-ecological system's functioning and decision-making process.

The aim of these interviews with the local organizations is to get insight in the local context regarding the implementation of the selected SLM strategy. The following action-steps were used:

- inform local community about the project and the realization of the PM workshop;
- appraise the organization's capacities, services, normal activities and network functioning;
- become acquainted with local values, perceptions and knowledge of current and alternative land management practices;
- identify the network and decision-making system regarding the implementation of the selected land management strategy;
- assess the interest and understanding of the role of monitoring and participatory monitoring;
- identify their perception of what is missing in the organization and the local community for achieving a sustainable land management, giving time to discuss options for future action;
- investigate the willingness of the organization to integrate monitoring in their normal activities and their willingness to assume tasks to participate in the process;
- ask organizations for logistical support to carry out the PM workshop, by providing a meeting space, transport, and refreshments (note this question

requires use of common-sense and must be adapted to the interviewers and local context and capacities);

- gather suggestions about the site to be monitored where the SLM technology is implemented and about the best date, time and duration for the PM workshop;
- Inquire who are the key stakeholders and potential participants (organizations' representatives and individual citizens) and ask their direct contacts.
- Further explain the objectives and procedures of the PM workshop and make initial arrangements for the implementation.

c) Decide place, time and logistics. At this point a date and place of the workshop can be decided by contacting the interviewed people and inquiring about the best date, the best site to monitor the selected SLM strategy, and to confirm the available logistical support.

STEP 2 | IMPLEMENTATION

The main objective of this workshop is to provide a platform on which interaction and reflection can take place. Therefore, participatory tools that best suit the local context are selected in order to promote trust building. In this step the following activities take place: conceptualization, sampling of participants and implementation of the workshop.

a) Conceptualization of the PM Workshop. The questions to be answered to plan the action are: what are the goals and key concepts of the monitoring workshop, what participatory tools to use to reach them, and with what logistics. In this research the issue to be collectively discussed is the field testing of a SLM measure implemented to mitigate desertification. For this research the specific objective of the workshop is to collectively select a set of environmental indicators that can represent the change in the study cases' main desertification problems. The learning goals of the participative action expected by following this methodology are identified in Table 5.

Table 5. Learning goals of the PMW.

Learning goals of methodology	Collectively explore the concept of PM
	Define the objectives and key concept of the SLM measure
	Experiment with ecological monitoring methods
	Individually reflect on the participation process

This step includes also to gather materials needed for the workshop and summarize information regarding the main concepts to be discussed and the definition of the selected strategy to be monitored (in written format if applicable, such as info-kits about the SLM measure, monitoring matrix, contacts). This step also includes clarifying and practicing the facilitation of the workshop.

b) Sampling of participants is based on the suggestion of the key stakeholders suggested in STEP 1. These are the local landowners, the regional and local government representatives related to the issue, the non-governmental associations, and the researchers from local R&D institutions that are active networkers in the region (in this case from the DESIRE project). The group of invited stakeholders should include the different scales of governance: user groups, policy makers, decision makers, and experts. The size of the group should be manageable and facilitate active discussion and participation from all the individuals present. The group should have around 10 people.

c) The PM Workshop. The main actions conducting to the PM Workshop are here explored in the format of an agenda (the agendas of the three study cases are in Appendix B). A basic sequential approach to the procedure focused the workshop on main concepts (in bold) with the following activities:

1. Reception and definition of the objectives of the day

Reception to the meeting space and presentation of facilitators and participants (presentation can be either done by the facilitator or by self-presentation). Begin activity with introduction of the project and the objectives of the day (including a request whether one agrees on the agenda and the closure time);

2. Collective brainstorm about key concepts

Lead brainstorming session about key concepts: What is monitoring? And, participation, participatory monitoring, indicators, methods for data acquisition? Give examples. Describe and define the objectives and characteristics of the selected SLM strategy.

3. Practical exercise about indicators

Exercise: participants individually find one indicator that could measure the effectiveness of the selected SLM strategy (either by writing it in a post-it or saying it, while the facilitator writes it down). These examples of indicators are collected and read by the facilitator and aggregated when there are repetitions. For each indicator a method to achieve its measurement is discussed. In this way the participants have a first

contact with the process of selecting operational indicators and further examples are given;

4. Field visit to choose indicators and experiment with monitoring methods

Visit the field site where the selected strategy is implemented: let the sub-groups work independently. Define two sub-groups: divide the participants in a way that each group has representatives of all organizational scales and a similar size (5, 6 people). Each sub-group chooses four indicators and methods. Next, the sub-groups experiment with the methods and get the first results for the chosen indicators. Promote intra-group debate on the advantages and disadvantages of the indicators and allow time for the sub-groups to take the measurements independently. If possible repeat the measurements in a second monitoring site. When both sub-groups have the monitoring matrix filled in (Appendix C) the activity is announced closed and it is time for the lunch break;

5. Lunch break

6. Plenary discussion to select final set of indicators

Have plenary discussion for the selection of indicators. On the return to the meeting space from the break (e.g. lunch) is important to re-enforce the concepts of systematic monitoring and operational indicators. Following this, a volunteer from each sub-group is asked to present their chosen indicators and methods and write them on a big piece of paper (if appropriate). After this the discussion is open to all participants and the analysis of the chosen indicators begins. The selection criteria for the indicators are created by the participants as they discuss whether the indicator is operational, measurable, simple, and pertinent. When five to six indicators have been collectively selected and the respective methods carefully described, a round of opinions is taken to see whether there is consensus and whether there are no concerns regarding the result.

7. Decide on dates and task division for next monitoring schedule

Decide dates and task assignment for next PM by passing around forms with a contact list and a one-page form to assess the individual opinion on the best dates for the next monitoring activity and on the tasks each feels able to take responsibility for to ensure the realization of the next monitoring activity.

8. Summarize and seek group comments and agreement with the results

Summarize the key issues and results, seek general agreement and ask about doubts and suggestions. Stress the importance of repeating these measurements in order to achieve a systematic participatory monitoring.

9. Hand-out the survey on the participation process (FORM-PP)

Hand-out the survey form for assessing the process of participation and learning. This is an individual and anonymous form (Appendix D: FORM-PP – Process of Participation). It aims to characterize the participants' group, to evaluate the day, and to assess the individual perceptions on the process of learning, interacting, sharing information, discussing, and the value of the information and of the results. These subjects will be then analyzed in STEP 4.

10. Finalize the workshop

Finalize activity: making sure all contacts and surveys forms are collected as well as filled in. Conclude by giving the word to participants to comment on the day and evaluate the degree of their willingness to continue with the process and expectations over the use of the results. The workshop is then officially finished.

STEP 3 | REFLECTION

This step is a rather individual process, since reflection will take place during and at the end of the PMW day, but will continue after it. So, this is a simplified reflection and assessment of the perceptions of the participation process and outcomes.

a) The reflection survey handed out at the end of the PM workshop (FORM-PP) serves as an individual reflection on the activities and learning processes of the day and as well as a central point of this research. The analysis of these surveys will give the information to answer the question on how the participants felt about the process. The questions refer to their perceptions and expectation on the day, the learning, contributing, having voice, sharing and interaction and the utility of the information exchange within the group and of PM results.

b) Analyze participants' conditions, this means their characteristics such as their education level, the ratio of land ownership, self-employment, and experience in interacting with associations and with participation in meetings. Also, to evaluate gender balance and give insight whether there may be different preconditions in the three study sites that can have effect on the outcome of the workshop process.

c) Evaluate the procedure with the participant's statements, the individual surveys and the selection of indicators. Evaluate the favourable and less favourable

conditions that can have influenced the process and then the strengths and weaknesses of this methodological approach can be identified to improve the method for future uses.

STEP 4 | FOLLOW-UP

PM is a systematic process expected to promote access to information and influence the impacts of monitoring activities. It is through communication between facilitators, participants, SST and the rest of the community, along structured data management, that the continuity of PM can be obtained. Thus, this final step of the methodology is actually crucial to make the one-day PMW result in the start-up of a continued process of collective monitoring. An extended application of this methodology to other study sites, namely the ones of the DESIRE project, could be an excellent opportunity for testing the efficiency of the sequence of steps and reach an improved flexible methodological framework to initiate participatory monitoring.

a) Facilitate communication: keep periodic contact between the participants, taking into account that this would require facilitation by the local SST. Promote meetings of the participants group to undertake the preparation and the monitoring and seek contact with further stakeholders.

b) Set data management: report results on next PM dates and task division and put participants in contact to encourage partnerships; promote participants' self-action to allow the inclusion of other indicators, other sites, other SLM strategies, and other stakeholders in the monitoring process. Make information accessible through monitoring manuals: give access to the summary of decisions of the PM Workshop, the list of selected indicators and methods, and guidance to continue with the monitoring in following years; ask support from participants to have the documentation available for consultation (most probably an organization). Initiate the data management: create an initial, simple database for the insertion of the monitoring data and assign a person that volunteered to be responsible for maintaining the database.

c) Disseminate and test the suggested methodological steps for engaging in PM to other regions of the region, the country and other study sites of the Desire-project, is, as said above, out of the scope of this research. Nevertheless, it must be included in an holistic view of the research.

CHAPTER 5. RESULTS AND DISCUSSION

The organization of this chapter follows the steps from the above methodology conceptualized to initiate participatory monitoring. Therefore it is divided in four sections and it is finalized with a section for discussion and reflection. For each methodological step results and discussion are given. These are the product of testing the methodology in the three study sites. The results and discussion of the first step have been based on the interviews with representatives of local organizations and give insight into the decision-making chain for implementing the selected SLM option and into the institutional networks for Portugal and Morocco. The way and context in which the land management decisions are taken can unveil the system's complexity, main actors and partnerships. This information helps to define how to approach the PM implementation. This contact with local key stakeholders is the source for contacting potential participants and initiate exchange of information. The results and discussion of the second step give the description of the participants and also of the place, time and logistics for the implementation of the PMW. The three participatory processes, in Góis, Mação and Sehoul, are described by exploring what happened in each of the workshops. This is supported with photographs of the collective activities and of the monitoring sites. Also, it is presented the list of indicators and methods selected by the participants during the PMW. The third step takes into analysis the surveys about the perceptions of the participants over the process of the PMW. The fourth step gives the results from the opinions of the participants regarding the PM schedule. This section gives also recommendations on how the follow-up of this initiative can be pursued with use of results locally and within the DESIRE project. In the end the last section gives an integrated analysis of the results and explores the participants' individual and anonymous perceptions on the process and makes a comparative analysis of the initial conditions of the participants found to have influence in the differences in the processes and perceptions of the three workshops. Last sub-section gives some points for reflection regarding the results but also the research process as a whole.

5.1. STEP 1 ORIENTATION: INTERVIEWS WITH ORGANIZATIONS

The setting of each social-ecological system in study includes the analysis of the information on the study sites and the selected SLM measures (see Chapter 3), and is complemented with the interviews with the local organizations. In this step the results from the interviews done in each case study to local governmental and non-

governmental organizations were analysed (FORM-ON). From this results a summarized chain of links between organizations that lead to the decision-making chain regarding the implementation of the specific SLM option. This gives information on the dimension of the systems. Also, the organizations were asked about their contacts and partnerships to figure out their institutional networks, which are presented aiming to give insight into the complexity level of the functioning of these three systems.

5.1.1. PORTUGAL

DECISION-MAKING CHAIN

The selected SLM option in Portugal is the Primary Strip Network System for Fuel Management – in short, Fuel Management Strips (FMS). Main identified organisations and their functions in the process of implementing this SLM strategy are indicated in Figure 9 in the form of a decision-making chain. The implementation of FMS is regulated in national legislation (Decreto-Lei 124/2006) by the Ministry of Agriculture, Rural Development and Fisheries (MADRP) and its subsidiary the National Authority in Forestry (AFN). The planning is done at national and at regional levels by the Forest Management Unit (AFN/UGF), but also includes the local municipality and its Technical Forestry Office (CM/ GTF). The municipal plan for the defence of forest against wildfires (PMDFCI) is then brought for approval to a multi-level Commission for the Defence of Forest Fires (CDFCI). This commission has representatives of the national, regional, and local governmental authorities, the local association (NGO) and the local National Service of Firemen and Civil Protection (SNBPC). All of them directly related to forest management. The responsibility of executing this plan is of the national authority (AFN), but it is shared with the local authority (CM/ GTF) and the local association working with forest management. For example, in the two study sites, the field workers, machinery and fuel to execute the FMS were allocated by either the local association (NGO) or the local authority (GTF), but were paid through the national authority. Once the FMS is done the national authority is responsible for ensuring it complies with the regulations. Often this monitoring is done by the local authority (GTF), but without the aim of recommending improvements. Its results serve only to give evidence of legal compliance. Therefore, monitoring remains with question mark since it was also not clear for the interviewees who were responsible for the monitoring and assessment or what results should come from it.

PORTUGAL

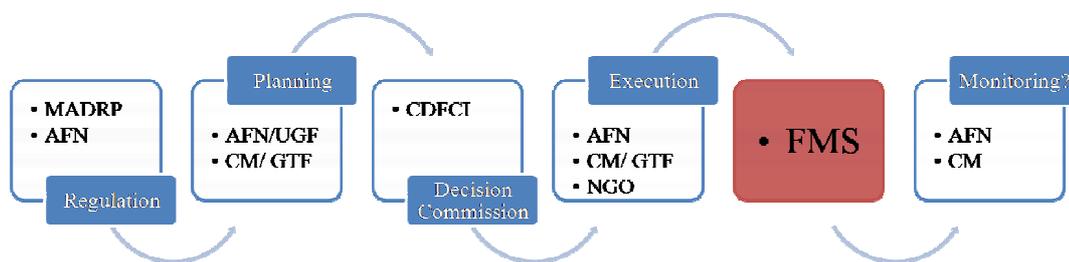


Figure 9. Decision-making chain for the implementation of Fuel management strips (FMS) in Portugal.

Diverse components in the decision-making chain are needed to reach the implementation of the specific SLM option - FMS. In the interviews with the organizations it was questioned how regulation, planning, decision, execution and monitoring are obtained. All actions are supervised by governmental organizations. Nevertheless with the presence of the multi-level component – the CMDFI, where landowners and land users are represented by the NGO – the decision-making chain represents all the stakeholders. The knowledge of the interviewees about the objectives and characteristics of the selected option (FMS) was confused and often reported to the legal document with the management prescriptions. The complexity of the problem of forest fires is nationally wide and requires an holistic response, making this one SLM option seen as insufficient. Its monitoring gains in terms of collaboratively clarify concepts, but can not assess its efficiency in reducing the burnt forest area. The participative monitoring of the environmental efficiency of FMS can better be joined in the future with the monitoring of the set of options for a better understanding on how to manage forest in a sustainable way.

INSTITUTIONAL NETWORK

The institutional networks were first analyzed separately for the Góis and Mação study sites, but their similarities allowed a subsequently synthesized view of Portugal's forest management network (Figure 10). The two organizations interviewed in each study site were asked with whom they have contacts, how regularly, and about the type of information exchanged. These links with other organizations and individuals were then classified as official partnerships (yellow arrows) and as frequent contacts with governmental and non-governmental

organizations (blue arrows). This made possible to establish part of the network that relates to forest management, along the different levels of organization.

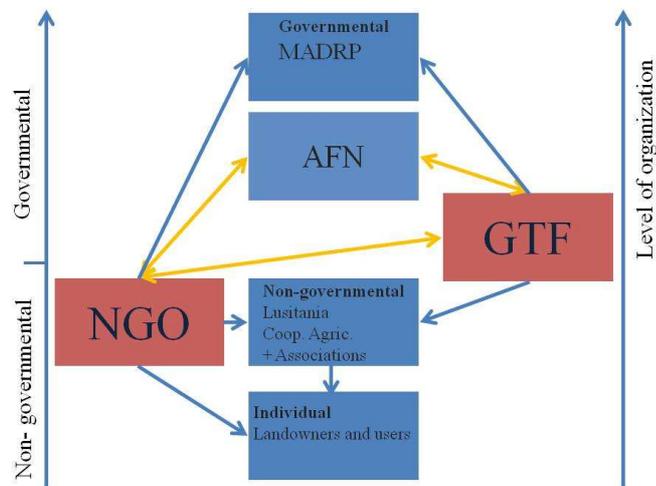


Figure 10. Synthesized network of Portuguese forest management between governmental and non-governmental components and along levels of organization showing existent partnerships (3 yellow arrows).

Interviews were done in Góis and Mação study sites with the local NGOs involved in forest management (AFCG and Aflomação, respectively) and with the respective local Technical Forestry Offices (GFT) – coloured red in the network scheme. These have partnerships with the forestry national authority (AFN) and among themselves. The two local organizations share also frequent contact with involved components, governmental and non-governmental. The individual landowners and land users have their connection to the network through the non-governmental organizations, mainly the interviewed NGO. Considering that partnerships are fundamental for the creation of a flexible decision-making and land management strategy, the links in yellow (partners) are more important for the development of a flexible, but institutionalized, decision-making platform. These links can make the difference in the success of the implementation of PM. In Portugal three of these links could be identified. Also the link between the NGO and the individuals could be considered a partnership, since many landowners are associates, but not all landowners and land users, so it was not classified in this analysis as a partnership.

In the FORM-ON, the question on the opinion about the relevance of monitoring, the usefulness of its results, and the importance of monitoring to have participation of stakeholders, got a high value in both Portuguese study sites, averaging 4.9 using the Likert scale (1 - 5). This reveals agreement about the importance of monitoring and willingness to integrate monitoring in their activities as well as to participate in participatory monitoring meetings. To achieve a long-term PM system it is necessary to have clear outcomes that can give all points of view and funds must be

available for such actions. One suggestion was to integrate PM in a regional initiative for forest management. The main concerns of the key stakeholders were about possible monotony, the theoretical approach and their doubts were about the utility of the outcomes and its impact in policy improvements. The interviewees identified as outcomes of PM: the awareness, cooperation, exchange of ideas and experiences, the involvement of institutions and individuals, the chance to learn to improve forest management and the opportunity to talk, interact and participate.

5.1.2. MOROCCO

DECISION-MAKING CHAIN

The perceived situation of Moroccan agricultural management towards the implementation of *Atriplex* spp. plantation for gully rehabilitation was assessed by interviewing one representative of the provincial/regional department of agriculture (DPA) and one locally active non-governmental organization (NGO), the Association Moustakbal. The governmental hierarchy for decision-making was carefully explained during the interview with the DPA representative. The decision-making chain is an attempt to express the process necessary for the implementation of the selected option – Gully control (Figure 12). In Sehoul the adoption of this vegetative measure is dependent on the investment of the landowners. Any support would have to come from higher levels of organizations with access to funding. As far as understood by the two interviewees there is no kind of national or regional support to implement soil and water conservation measures. General regulations come, as in Portugal, from the Ministry of Agriculture, Rural Development and Fisheries (MADRPM) and the subsidiary department of agriculture (DA). The planning is done at regional scale by the regional department of agriculture (DRA). Contact with the landowners occurs through the regional and the local extension offices (CT and Sous-CT, respectively). Landowners had contact with this, and others, SLM options also through the Research and Development organization, the University Mohammed V. The field-sites where experimentation plots from the DESIRE project have been established are in the land of two farmers who have been long collaborating with the University. These accepted to donate the plots in exchange of knowledge and resources. It is clear that the investment and adoption of SLM options by these and other farmers in the region is unpredictable and maybe dependent on the success of these field-tests that can favour imitation by neighbouring farms. The monitoring is considered important by the interviewees,

but is missing in the national planning. With DESIRE and this research, opportunity exists to monitor the efficiency of locally selected options and monitoring indicators and further engage stakeholders in decision-making. More awareness about the need to include stakeholders has resulted in previous local meetings to discuss sustainable agricultural management and, furthermore, the DPA showed interest in improving the support for farmers to invest in combating desertification.

MOROCCO

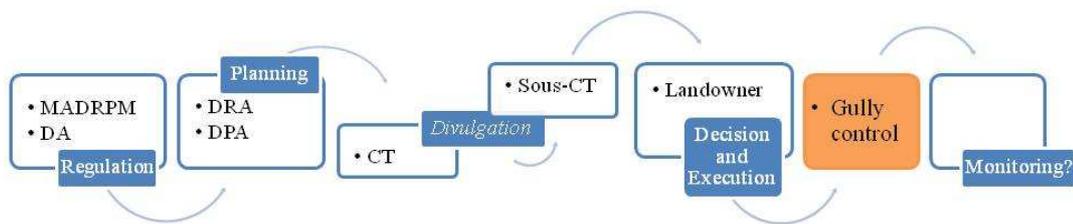


Figure 11. Decision-making chain for the implementation of Gully control with *Atriplex* in Sehoul (Morocco).

This decision-making chain for Sehoul is clearly missing a link with non-governmental and civic organizations. During the research it was not possible to identify any NGO directly working with agricultural development in the region. The association Moustakbal focuses on promoting organic agriculture and its activity in the study site is quite reduced, but they were the only ones willing to participate. The process of creating an association or cooperative was discussed in the interviews with the NGO and the DPA and several limitations were identified that justify the lack of civic organizations working in the study area, such as excessive bureaucracy. The absence of non-governmental components in the decision-making can be a sign of a highly top-down approach to land management.

INSTITUTIONAL NETWORK

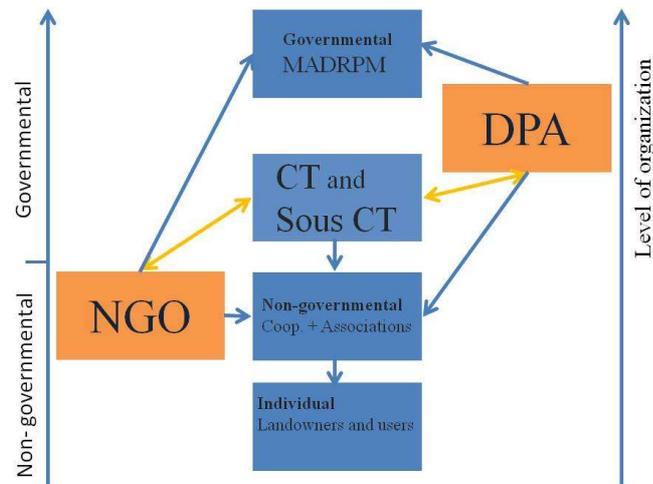


Figure 12. Synthesized network of Moroccan agricultural management between governmental and non-governmental components and along levels of organization showing existent partnerships (2 yellow arrows).

In Morocco interviews were made with the DPA and a local NGO. These have relations with governmental and non-governmental components, but not between themselves (see Figure 12). The local and regional extension agencies (CT and Sous-CT) are the linking component between the NGO and the DPA, and the main connection with the individual landowners and land users. In this network scheme only two partnership linkages are found (yellow arrows). And the individual farmers who are the actual decision-makers and executors regarding the SLM option are quite isolated in the network. Little civic activity was identified in the Sehoul study site, since it was actually difficult to contact a local association. This is a sign that further multi-level interaction is missing and there is room for improvement towards a more collaborative and inclusive land management.

In Sehoul the participants' main concerns regarded the utility of the monitoring was the lack of integrated information exchange, especially the information exchange with the landowners and land users. Nevertheless the key stakeholders saw PM as a way to get new information, learning about soil conservation and as an opportunity to participate and exchange ideas. The DPA could not offer support to the initiative, since the system is based on a strict hierarchy, such that not even the interviewee could be present on the day of the PM without official authorization, which would

take too much time. The NGO was interviewed late in the process, but the one person interviewed was present in the day of the PMW initiative.

A basic difference exists between the two case studies in Portugal and the one in Morocco. In both countries the study sites are mainly private property. However, in Portugal the implementation of the selected SLM measure is under national legislative regulation and the decision-making is mainly in the hands of governmental organizations, including funding for implementation. While, in Morocco the final decision-making and execution of SLM is the responsibility of the individual landowners. This difference makes stakeholders' initial openness and willingness to participate quite reduced. In Sehoule the smallholders and other stakeholders are less interested in the problem and show less trust in the success of the implementation of the SLM option and, therefore, are in general more resistant to participation. Where as in Portugal, the landowners and other stakeholders show interest in the national problem, have gained internal trust through existing multi-level relationships and were willing to support participative initiatives. In the longer term the adoption and expansion of the implementation of SLM options becomes highly dependent on the availability of resources and funding. The implementation and dissemination of the SLM options selected through the DESIRE project will have most difficulties to continue in long-term in cases such as Morocco, but also in Portugal there are limitations, since there is little funding and national-to-local integration. In contexts where multi-level and civic relations exist give a better setting for initiating a participatory monitoring system.

5.2. STEP 2 IMPLEMENTATION: PARTICIPATORY MONITORING WORKSHOP

Three workshops took place within this research. The first was on October 14th 2009 in Góis, the second on October 15th in Mação, and the third on November 19th in Sehoule, Morocco. To arrive at the implementation of the Participatory Monitoring Workshop (PMW) it was essential to have contact with the key stakeholders (FORM-ON) and maintain the exchange of information and support from the DESIRE project Study Site Teams (SST). With the initial interviews, besides getting insight into the system's network functioning, it was possible to assess the willingness of the organizations to participate and to exchange information about the site and, very importantly, the contacts of stakeholders identified as potential participants interested and engaged in the issue of forest fires. With the key stakeholders it was also discussed what could be good areas to monitor FMSs and what best dates and arrangements could be set. Also these first

contacts inquired about possible logistical support. The support for the PM action that were suggested with these interviews were: a venue to hold the workshop, transportation to the venue and to the field site, and refreshments for the workshop's lunch break. The facilitation of the workshops was done by me in both Portuguese sites with support of one person of each of the SSTs. In Morocco the facilitation was done by one member of the local SST with support of other two speakers from the Moroccan team. This was obvious because I do not speak Arabic and it was preferred the presence of a facilitator that is already known to the participants group. Nevertheless, it was possible to give orientation so that the defined methodology could be well followed in all study sites. Of course some adjustments were necessary for each case, for example in Morocco, where the type of venue, the structure and duration of the workshop were quite different.

These interviews resulted in a quite positive response, since the organizations gave the logistical support that made it possible to implement the workshops. In Góis the main support came from the GTF and from the Municipality by providing lunch and partial transportation. Other vehicles were from the NGO and the SNBPC (fire-fighters). The venue was offered by the local fire-fighters. In Mação the local NGO and GTF keep close relations and both supported the research by providing resources and open information flow. The venue was in the GTF building and the transportation covered by vehicles from the GTF, the NGO, the UGF and the SNBPC (national-guard). Lunch was offered to the participants by the Municipality of Mação. In Morocco there was less support from the interviewed organizations. The support to implement the workshop came from the SST from the University of Mohammed V. The team keeps good relations with the two farmers that have experimental plots from the DESIRE project on their land and this made negotiations possible. The workshop was done outside the farm house in Hannanat, on walking distance to the monitoring site. It was the family of the farmer that cooked the food that was purchased by the SST for the lunch break. And, the transport to collect the participants along the way to the farm and back was provided by the University. Also, the SST was responsible for implementing the PMW's methodology and facilitating the workshop.

5.2.1. PARTICIPANTS' DESCRIPTION

The participants group aimed to have representatives of the interviewed local organizations (both governmental and non-governmental), of regional and decision-making organizations involved in forest management, of the local landowners and

land users, and of the local teams of DESIRE project. Gender was also taken into account by trying to include women as much as possible. This group structure was achieved in the Portuguese sites with eleven participants in each PMW, but in the workshop in Morocco the interviewed representative of the DPA was not present and also there was no regional representative. Table 6 gives the information on the participants.

Table 6. Description of the groups of participants of the PMWs in the three study sites showing: total number of participants (Total), number of participants from regional government (Regional GOV), number of participants representing local government (Local GOV), non-governmental organizations (NGO), individual landowners and land users (Land users), and participants from research and development institutions (R&D).

	Total	Regional GOV	Local GOV	NGO	Land users	R&D
Góis	11	2	3	2	3	1
Mação	11	2	4	1	3	1
Sehoul	9	0	2	1	5	1

In total 31 participants experimented with the defined methodology in the workshops. The age of the participants was mostly around 31 and 50 years old, representing the active population. The education level was higher in Mação than in Sehoul. In total nine women participated, ranging from the category of regional government in Góis to land user in Mação and researcher in Morocco. In Morocco there were no regional representatives present, while in both Portuguese study sites two representatives of the UGF, the regional forest management unit, were present. These regional stakeholders are closer to the decision-making and planning process and therefore their presence is important to improve the bridging of these organizations and the connection between participatory decision-making and policy making. In Portugal there was a balance between the five categories selected as well as between governmental and non-governmental (5-6 people each). While in Morocco there was dominance of landowners and land users (56%) with only two governmental participants from the local Sous-CT (see Figure 13)

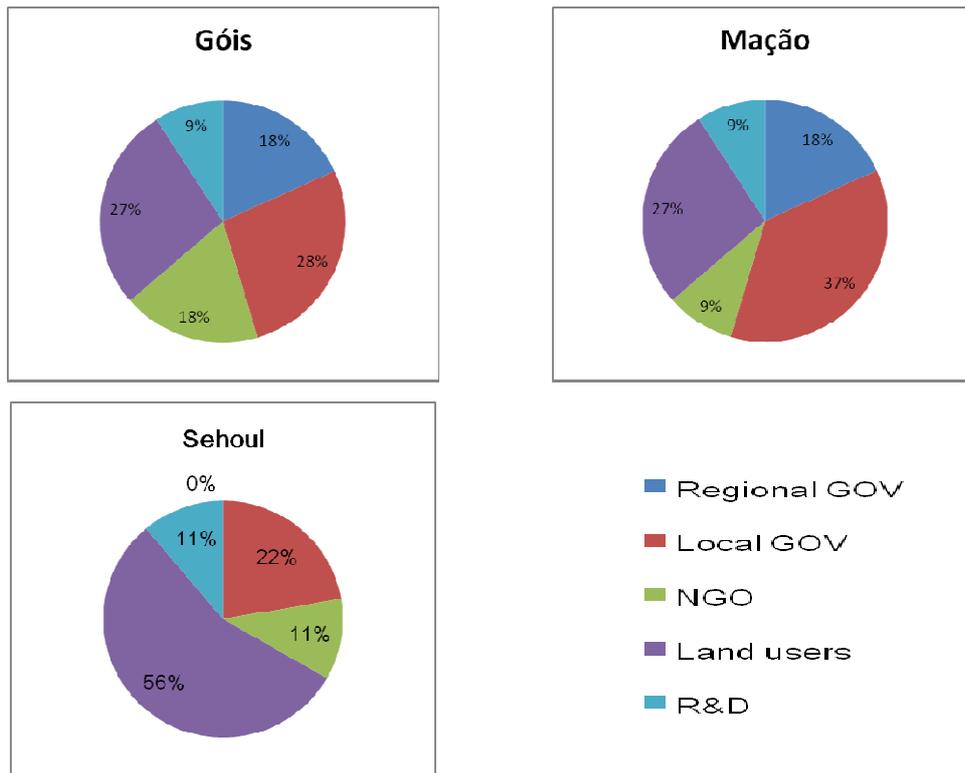


Figure 13. Composition in percentage of the participants groups in Góis, Mação and Seihoul.

The group size was kept around ten participants, to be manageable considering the experience of the facilitators. In Portugal this was enough to reach a good representation of the components involved in the decision-making chain and institutional network. In Morocco it would have been interesting to have had the opportunity to have regional representatives and have reached a higher number of participants. Nevertheless, this absence might have given the dominant group of landowners and land users the openness to dialogue and exchange ideas about land management. There was even a suggestion made different workshops should be organized for landowners, policy makers and other only for women. Other ways of initiating PM would be possible and interesting to experiment with. But so, the good sampling and good participation level along the adequate use of this methodology give evidence, in Portugal and partially in Morocco, of the potential of this methodology to initiate PM.

5.2.2. THE PARTICIPATION PROCESS – WHAT HAPPENED?

The description of the process of participation follows the activity sequence defined for the implementation of the PMW, presented in the chapter of methodology for STEP 2. The description of the PMW process is given below for each of the study sites. This description is supported by the field notes, observations, photographs and individual surveys. Summarizing, the PMW was composed of the following activities:

1. Reception and definition of the objectives of the day
2. Collective brainstorming about key concepts
3. Practical exercise about indicators
4. Field visit to choose indicators and experiment with monitoring methods
5. Lunch break
6. Plenary discussion to select final set of indicators
7. Decide on dates and task division for next monitoring schedule
8. Summarize and seek group comments and agreement with the results
9. Hand-out the survey on the participation process
10. Finalize the workshop

Góis

In Góis the PMW took place in the building of the fire-men department, in a big room where chairs were disposed a circle (Figures 14 and 15). The participants arrived around 9:30 and when all expected participants were present the PMW was initiated. The initial approach had to be partly explanatory, so first I presented myself and the assistant facilitator, Tanya Esteves, and then explained the rationale of the project and objectives of the day. After that each person was asked to present their names and functions. The agenda of the day was explained and the predicted finishing hour was defined so that all participants could stay until the end of the PMW, approximately at 16:00. The strategy of the workshop was to divide the key concepts in three areas: 1) what is monitoring and participatory monitoring; 2) what are indicators, what is their utility and how can we measure them; and 3) what are the characteristics and objectives of the SLM option being monitored.

With the available resources, the main concepts were exposed on written A4 pages on the wall as the concepts were collectively explored. The presentation of these concepts was brief and minimally dynamic with agreement of understanding from the participants and with examples and some questions from the participants. The definition of the SLM option, the FMSs, generated better brainstorming regarding the clarification of the characteristics and need to integrate this option with other measures to decrease the incidence of wildfires. Then in order to better understand the concept of indicators an exercise was done where each of the participants writes in a post-it an example of possible indicator for monitoring the FMSs. Some examples were given, such as the ones sited during the first stakeholder workshop, for example vegetation cover estimative. The indicators were grouped and later the group discussed their objectives and how these could be measured in the field and in long-term. The following step was the field visit to identify indicators and experiment with measuring methods (Figure 13). The participants were divided in two sub-groups, defined by the facilitator in advance, so that 5 to 6 people from all four backgrounds work together. The sub-groups were separated in the field and received the monitoring matrix form where they fill in four indicators, the methods to measure them and the measured value. The sub-groups worked to choose the indicators, take notes and used, for example a meter, and experimented with taking measurements. Then, after both sub-groups were finished the participants go to have lunch in a restaurant and after went back to the venue. Back on the venue in the fire-fighters building, one volunteer from each of the sub-groups held their presentation of the chosen four indicators and methods. Only after both sub-groups have presented, the plenary discussion began, looking to select from eight indicators a final set of five to six indicators to monitor the FMS. Some of the indicators were the same for both sub-groups and therefore easily joined and adjusted in the plenary discussion. Others required discussion between participants on whether they were measurable and pertinent. After an hour and a half the group agreed, with moderation of the facilitator, and successfully reached the selection of five indicators and methods. These are presented in the next section of this chapter in Table 7.

The decision regarding the periodicity and next best date for monitoring FMSs was discussed in a plenary session. The agreement was to continue PM yearly. In the last stages of the PMW I gave the participants a form to put on their names and contacts, and another form their them to give suggestions for the next PM date and choice of task that they would they accept to volunteer for, such as making contacts for next PM and data management. Along these also the survey form on the participation process (FORM-PP) was handed out to the participants. This is a written survey, individual and anonymous. This can have restrictions such as for example in Góis where I had to support an older landowner in filling out the survey form, but otherwise there were no questions and participants were acquainted with the Likert scale. When all participants were finished with the FORM-PP the PMW was officially finished. Their active participation was acknowledged and they were asked to give comments and suggestions. The participants had comments, such as 'hope that more of these actions take place and that this continues to lead to good results'.



Figure 14. The venue and the view of the information exposed on the key concepts and the results from the practical exercise.



Figure 15. The arrival to the field and the participants in sub-groups choosing indicators and experimenting with measuring methods.

MAÇÃO

The approach to the implementation of the PMW was the same as in Góis, since these two study sites share many of common conditions and the facilitation was made by the same person. Similar steps to coordinate the PMW led to similar results concerning, for example the indicators. The same number of participants and similar conditions made it possible to execute the brainstorming and practical exercise in the room, travel by car to the monitoring site, have lunch break in a restaurant, and come back to the venue to collectively select the indicators in a plenary discussion (Figures 16 and 17). In Mação the presence of the person representing the regional UGF was very expressive. His technical knowledge and argumentative behaviour led to interesting discussions, but in two occasions voice had to be given explicitly to other participants.

Also in Mação the participants were divided in two sub-groups. After lunch break the group went back to the venue and each sub-group presented their set of four indicators chosen in the field and wrote them on fixed papers. The discussion to go from the two sets of four indicators from the two sub-groups to a set of six indicators was interesting. The participants discussed in depth each of the indicators and ways to measure them until reaching consensus in the selection of six indicators for PM (in Table 8).

When the indicators were selected it was time to discuss the periodicity of the PM and define the best date for next monitoring. The forms about dates and tasks were handed out and passed around. As well as the handing out of the surveys on the participation process (FORM-PP). The PMW was finalized by acknowledging the presence of all participants and asking for comments. Participants were satisfied with the day's activity and showed willingness in seeing the process of PM continuing over time.



Figure 16. Visit to the field and participants experimenting with measuring indicators.



Figure 17. Participants in the field measuring indicators and in the venue presenting and discussing the selected indicators and methods.

SEHOUL

In Sehoul the PMW took place on the property of a farmer that is participating in the DESIRE project by having two experimental plots on his land. The venue was in Hannanat, outside the farm house under the Eucalyptus trees (Figures 18 and 19). The van from the University Mohammed V passed along the way to pick up the participants. In Sehoul there were 9 participants. Around 10:30, the participants were present and tea was served. The facilitator of the PMW was by Professor Aderghal with the assistance of two other speakers, members of the local SST. Meetings with the local SST and an oral presentation set the steps and agenda for implementing the PMW in Sehoul, including the development of an information kit about the workshop. The PMW was initiated with self-presentation of the SST and then the participants. And the explanation of the key concepts followed the strategy in the information kit, as occurred in the other two PMWs described above. Differences were that there was no practical exercise to clarify the concept of indicator and that the group was not divided in smaller sub-groups in the field visit. This was mainly due to lack of time, but also to a less structured sequence of the workshop with the use of two other speakers and longer explanatory phase.

The group walked to the field site where the DESIRE project plot is laid out for gully rehabilitation with Gully control with plantation of *Atriplex* shrubs (Figure 17). There the whole group discussed what could be indicators of the efficiency of this SLM option to reduce erosion and favour the rehabilitation of existing gullies. There was quite a discussion and a very interesting exchange of information between the farmers and the technicians and researchers. The understanding of some concepts such as percentage was not clear to the participants, leading to the choice of rather vague indicators and measuring methods. Besides this lack of connection between the local and scientific knowledge, also the sun and warm weather quickly made the participants eager to go back to the venue for lunch break and leave decisions for the later plenary discussion. Back from the field the group had lunch prepared by the family of the landowner. And around 14:00 the plenary discussion to select the indicators was initiated. They selected the indicators and methods collectively reaching a set of five indicators (Table 9).



Figure 18. The participants and venue in Sehoul.



Figure 19. The participants in the field, discussing ideas and experimenting with measuring indicators.

5.2.3. LIST OF INDICATORS

From each of the PMWs the monitoring matrixes resulted in a set of four indicators. These indicators and methods and measurements were selected by the stakeholders in the field during the PMW. In Portugal there were two sub-groups in each study site, where from eight indicators the stakeholders had to select in plenary discussion the final set of five to six indicators. While, in Morocco there was only one set of indicators defined by the whole groups of participants. These results are presented in the tables grouped below.

GÓIS, 14 OCTOBER, 2009



Figure 20. The FMS that was monitored in Góis.

Table 7. Indicators chosen by the sub-groups and selected in plenary discussion by the participants in Góis's PMW.

Sub-group A:

Indicator	How (Method)	Result
Tree cover	Number of trees in parcel of 26x26m ² (because FGC is 26 meters wide)	21 trees
Width of the strip (FMS)	In meters	26 m
Shrub cover + Maximum height	Cover % in parcel of 26x26m ² + measure height	< 20% + 50cm
Combustibility	Identify shrubs and herbs species	<i>Lavandula</i> spp.

Sub-group B:

Indicator	How (Method)	Result
Density of trees	Number of trees in a parcel of 26x26m ²	20 trees
Width of the strip (FMS)	In meters	26 m
Vegetation height	Averaged using a stick to measure	30cm
Soil erosion signs	Observation of erosion signs: rills, sediment, slope	0 erosion rills; 1% sediment; 0% slope

Selected indicators:

Indicator	How (Method)
Width of the strip (FGC)	In meters
Tree density	Number of trees in a parcel of 26x26m ²
Ground cover and Vegetation height	% of bare soil, shrubs and herbs in a parcel of 26x26m ² ; average of 5 measurements
Signs of soil erosion	Observation of erosion signs: presence/absence of erosion lines and sediment + slope and type of soil
Combustibility	Type of vegetation found in the parcel of 26x26m ²

The width of the FMS and the tree cover were indicators selected by both sub-groups in Góis. About vegetation, the indicators are the percentage of bare soil and the average vegetation high. The type of species of vegetation found in this sampling gives an indication about the combustibility. Observing soil erosion signs is an indicator that was suggested by one of the sub-groups and accepted in plenary discussion by the whole group for being a simple and pertinent indicator.

MAÇÃO, 15 OCTOBER, 2009

In Mação two sub-groups were formed during the field visit of the PMW. The table below shows the indicators chosen by the sub-groups and is followed by the list of indicators selected in the plenary discussion.



Figure 21. The FMS that was monitored in Mação.

The tree cover is again identified as indicator by both sub-groups in Mação. In the sub-group A, one of the indicators, the stump cover, was later abandoned, since this would be a variable that is managed and that did not give any insight for the monitoring of the FMS. From the tree diversity and the type of combustible the sub-group B looked to find a way to indicate degree combustibility, resulting that the participants selected in the plenary session the indicator combustible type (percentages of categories of dead material) and combustible charge (dry weight of litter sample). Further discussion led to a new indicator considered important, the intervention method, since this can give an indication on the long-term effectiveness of different techniques to make FMS.

Table 8. Indicators chosen by the sub-groups and selected in plenary discussion by the participants in Mação's PMW

Sub-group A:

Indicator	How (Method)	Result
Tree cover	Number of trees in a parcel of 10x10m ²	26 trees
Stump cover	Number of cut trees, stumps in a parcel of 10x10m ²	173 stumps
Diameter at breast height (DBH)	Measure 5 thickest trees in a parcel of 10x10m ²	x cm
Perimeter at breast height	Measure 5 thinnest trees in a parcel of 10x10m ²	x cm

Sub-group B:

Indicator	How (Method)	Result
Tree diversity	Species of trees in a parcel of 10x10m ²	Pines and cork oak
Width of the strip (FMS)	In meters	74 meters
Type of combustible	% of present categories of combustible material in a parcel of 10x10m ²	95% Fine dead; 1% Residues; 0,5% Waste
Number of trees	Number of trees in the parcel of 10x10m ² + medium height and age of trees	9 trees; 2-3 meters high; 13 y.o.

Selected indicators:

Indicator	How (Method)
Tree cover	Number of trees in a parcel of 10x10m ²
Width of the strip (FMS)	In meters
Diameter at breast height	Measure 5 trees in the parcel of 10x10m ²
Combustible charge	Weight a sample of 1x1m of litter*
Type of combustible	% of alive/ dead material, fine/thin/thick
Intervention method	Describe how FGC was made: mechanic, motor-manual, prescribed fire

* Biomass/fuel load determinations: Samples of above-ground biomass (including litter) will be collected from 1 m² plots from representative slope sites. These will be dried at 105°C and weighed to estimate fuel loading.

SEHOUL, 19 NOVEMBER, 2009

In the PMW in Sehoul the decision was made not divide the participants in two sub-groups and rather to make the choice of possible indicators with the whole group. These indicators chosen in the field had later to be further discussed in the plenary session to reach agreement on what to measure and how. From this plenary discussion the participants agreed about the selection of the following set of indicators to monitor the implementation of vegetative strips.



Figure 22. The plantation of grass strips of *Atriplex* that was monitored in Sehoul.

Table 9. Indicators selected by plenary discussion by the participants in Sehoul PMW.

Selected indicators:

Indicator	How (Method)
Compact soils	Presence/ absence of bare compacted paths
Soil erosion signs	Presence/ absence of erosion rills
Ground cover	Plenty, fair or little cover in a 1x1m ² parcel
Gully width	Measure in meters
Vegetation development	Presence/ absence of perennial plant species (eg. <i>Lavadula</i> spp.)

The participants observed together the field and one of the landowners made the remark of the fact that the soils are highly compacted. Giving the example of the paths of grazing animals as a sign of soil compaction and where nothing grows anymore. The discussion in the field was quite fruitful and involved the different participants from different backgrounds. Some lack of organization limited the selection of indicators. The first identified indicators were presence or absence of compact soil and erosion signs, the variables that the plantation of *Atriplex* aims to reduce. The ground cover was considered important to exist, and there were signs in the enclosure plot with *Atriplex* that there was increased cover. The decision was to classify the vegetation cover as plenty, fair or little. This simplification was necessary, due to the lack of understanding of percentage of cover. The attention was then diverted to the existing gullies. The group discussed causes and problems of gullies and chose the width of the gullies as an indicator. Expecting that with the implementation of the SLM option this width would be reduced. The observation of the vegetation gave an indication that the diversity was higher inside the enclosure and there was presence of perennial plants that can indicate improved soil quality. Therefore their presence, such as *Lavandula* spp., was selected as an indicator. This indicator's selection reflects some of the difficulties to achieve collective decision-making, where sometimes the decision is rushed and would have a different outcome when more time would have been available to understand what is being monitored and why.

5.3. STEP 3 REFLECTION: SURVEYS ON PARTICIPATION

In this section the results from the individual and anonymous surveys are analyzed. The participants' answers after experiencing the PMW process reveal their expectations, opinions and perceptions on the individual level and on a collective level. This shows whether the expectations were met, whether they agreed with the group composition and the usefulness of PM, and how they perceived the outcomes of the process.

5.3.1. THE PERCEPTIONS OF THE PARTICIPANTS – HOW DID PARTICIPANTS FEEL?

The question in the participation process survey (FORM-PP) regarding the participants' perception used the Likert scale. Participants replied in the end of the PMW to each of the fourteen questions in a scale from 1, meaning strongly disagree, up to 5, meaning strongly agree. In total 31 participants were surveyed. Each of the questions is then averaged for each study site and expressed in the graph below (Figure 23). At first sight one sees that the answers in Sehoul had the higher values and that in general the answers' values are high, demonstrating that they feel that the initiative matched their expectations and that they have learned from it. In other words, these values reflect the general agreement from the participants with the formulated questions. It is true that the PMWs went well and in general participants were satisfied with the opportunity to meet and participate in the monitoring of SLM strategies and it was possible to follow the methodology and to select indicators. Nevertheless, these general high values can be partly explained by a certain politeness of the participants and a tendency to agree. A further developed and tested survey could improve the insight into the perceptions of the participants.

The analysis of the results of the survey is divided in three sections. In the first section (A1 to A3), the first three questions of the survey, is given the evaluation of the PMW: if it corresponded to expectations and if the participants agree with the group composition and potential use of the monitoring results. These had responses higher than 3.5 and highest in Sehoul, with values above 4. These are good signs that this research accomplished to implement workshops that corresponded to the expectations of the participants that took the time to be present. Meaning, that participants' sampling was successful. And also the participants agreed with the group structure. Even though, for example for Sehoul, the survey shows high agreement with the group composition, but later it was suggested that there should be more participants and also regional representatives present. Managing to have the regional representatives from Sehoul in the workshop would have cost much time and paperwork to invite regional representatives, and therefore they were not present. The sampling of participants could be wider or with higher numbers, but

this approach of a small group of ten people from local and regional, and governmental, non-governmental organizations and landowners and users, seems to have worked well in Portugal.

The next questions take in account the individual perception of the participants in the process (B1 to B6), such as if they feel they have exchanged information with others, learned, contributed, had voice and felt to have influence in the results. It is visible in the lower values for the question about their contribution, where in all study sites participants have little notion of how much they contribute to the process. They understand that they have a voice in the discussion, but do not recognize that they are also teaching and not only learning. From these results, in all the three study sites the participants felt that they had learned and exchanged information with others, and discussed and influenced the results. This is a very positive response to the PMW activities and demonstrates how participative approaches can reach the goal of promoting learning, individual and joint, and interaction between multi-level stakeholders in an experiential setting.

The third section regards the perceptions over the group work and dynamics (C1 to C5). Evident is that the participants in Sehoul felt that there was dominance and by this they mean dominance of the facilitators. They felt they were more listening, since most of the time the facilitators had the word. While in Portugal there is less variation and less dominance, also because forest fires are a shared interest and a national problem. And, also because the participants present were more technical oriented and used to meetings. It is visible that the participants in Góis and Mação had the perception that there are no conflicts. An explanation is that the word conflict, as well as discussion, is perceived as high tension discussion with strong conflict, not a healthy discussion of ideas as intended. Therefore, the general reaction is to say no, there are no conflicts. Where, the score on the question whether there were differences of opinion was ranked higher and accepted as a good factor to stimulate a healthy discussion of ideas. This lack of conflict can be real in this research, since participants shared the objectives to improve land management and there was no major tensions observed between individuals or groups. In a context where conflict exists the implementation of PM occurs in an

even bigger challenge. In general in all study sites the participants agreed with the results and that these were an outcome from the whole group work. Participants agreed with the use and utility of the monitoring results and with the value of the information exchanged in the PMW. Again this shows a very positive feedback from the participants' perceptions of the PMW. This can be partly caused by politeness of the participants, but also a genuine answer showing that people are willing to participate and become aware of the developments regarding issues that concern them directly.

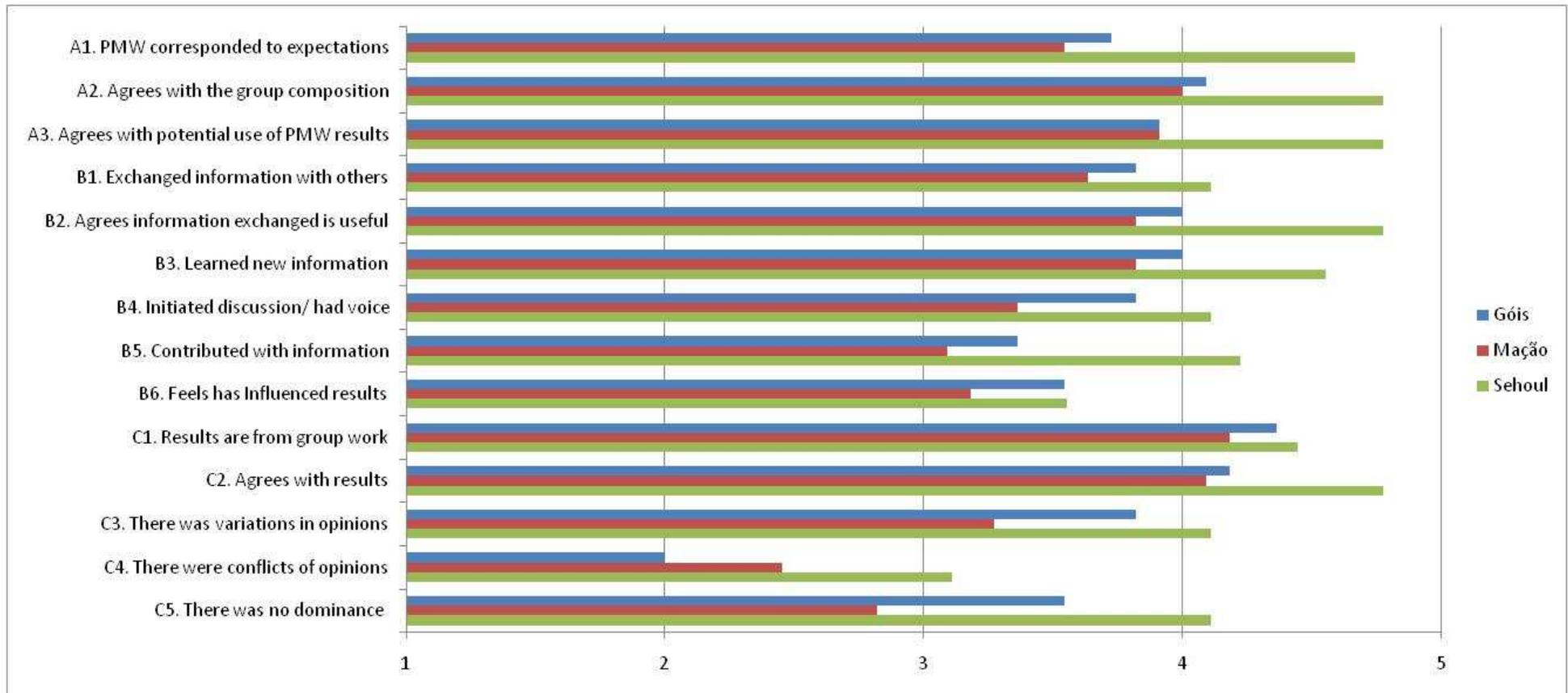


Figure 23. Results from part of the survey FORM-PP for the three study sites, Góis, Mação and Sehoul, regarding the averaged: Expectations about the PMW and its results (A), the Individual perceptions over the process of the PMW (B) and the Perceptions over the collective process (C), using averaged Likert scale with maximum standard deviation of 0.88, from 1 to 5.

5.4. STEP 4 FOLLOW-UP: SCHEDULE AND USE OF RESULTS

Monitoring as well as participatory monitoring should be done systematically and continuously, but it also should be flexible and periodically adjusted. The follow-up from the three PMWs is in the responsibility of the local participants and not in reach of this research. Nevertheless, the importance of this fourth step must be stressed and simple recommendations can be given to promote the continuation of the PM process. Below the monitoring schedule is given for each study site. The section finalizes with brief exploration on how to make use of the PM results and expand to further test this methodology in other social-ecological contexts.

5.4.1. MONITORING SCHEDULE

The monitoring schedule was defined collectively in the end of each of the PMW in the three study sites. After that I sent the Portuguese participants the information on the results from their opinions for the best date and tasks for the next monitoring. The realization of this hypothetical next PM depends on the local participants and SST willingness, commitment and organizational skills. For each study site the results from the opinions about the next PM are given below.

GÓIS

The participants suggested an annual monitoring of the FMS and identified the best date for the next PM in the winter, around November to February, after the wildfires season. Regarding the task division, the responsibility for data management was accepted by the NGO and the GTF, but also from two individual landowners, Mr. André Claro and Mr. António Ferreira. These individuals showed the most interest in continuing with the PM process and therefore might become people with key roles to make PM happen next year. For organizing the next PM and making the contacts the volunteers were the NGO and the same two individual landowners that volunteered. The decision resulted in the monitoring schedule with the NGO having the task to make the contacts to organize the next PM action and the GTF the task to manage the data.

MAÇÃO

In Mação the suggested date for the next PM of FMS, also expected to be done annually, is in May 2010 or in October 2010. This was not agreed between participants. For the organization and contacting the participants for the next PM, the NGO is the responsible. For the task of data

management the volunteers were the GTF and one individual landowner, Mrs Maria Fernanda Romão da Costa. The landowners showed great availability and interest in the continuation of the process. Actually, from Mação came the first and only reply to the follow-up e-mail sent to the participants concerning the next dates for PM, demonstrating interest.

SEHOUL

In Sehoul the whole process was more rushed and unstructured, with the results that only the periodicity of the next PM was defined and no task division was made, failing to reach a monitoring schedule. It was suggested that the PM of the Gully control with *Atriplex* should be made annually. Since the monitoring site is on the farm of one of the PMW participants there is potential for the PM to be continued by this farmer and improved with the support of the local SST.

5.4.2. USE OF RESULTS

The data gathered collectively in the three study sites should be shared within the participants by the local NGO or the study site team of the DESIRE project. These local data can and should be integrated in the scientific monitoring data of the project, looking to integrate the local and the scientific knowledge. The manner in which this information is shared with the stakeholders cannot be assumed easily determined. In Portugal it is possible to use e-mail to contact all participants and this makes the organization of the data and the maintenance of contact between participants much easier. While in Morocco the contact has to be personal and information must be taken to the local participants by the SST or the Sous-CT, to give continuity to the PM process. Since, the selected indicators are relatively simple and the periodicity is annual, the expectation about the self-organized repetition of the PM next year is still positive. The integration of PM in other activities of the organizations and/or individuals and SSTs can foment the systematization of the PM process as well as the expansion to other regions through the UGF in Portugal and the Sous-CT in Morocco. Along this perspective, another possibility of giving follow-up to this research is to introduce this methodology in other study sites of the DESIRE project. This is possible, as it was in Portugal and Morocco, with the support of the local SST and local organizations.

5.5. INTEGRATED ANALYSIS OF THE RESULTS

5.5.1. COMPARING PRE-CONDITIONS, PERCEPTIONS AND PROCESSES

In the course of this research much information was gathered about the three social-ecological systems and the participants and process of the workshops. With this information from the three PMW processes an attempt is made in this section to understand what can be the key initial conditions of the group of participants that can trigger successful participatory process and outcome. This can be done by quantifying the pre-conditions that are most correlated with the outcome. The outcome is quantified through the perceptions of the participants, such as exchange of information and learning. And then compare pre-conditions and process evaluation with the participants' perceptions of the PMW, since these participants are the people that make the process and make outcomes possible.

The integrated evaluation of the process of the PMW in the three study sites gives an indication of how well the procedure was applied and how well it reached the objectives. See Table 10 for the objectives that were taken in account for the calculation of the process evaluation.

Table 10. Integrated analysis of the achievement of the process objectives.

	Góis	Mação	Sehoul
Followed methodology?	√√	√√	√
Reached the selection of indicators?	√√	√√	√√
Decided date for next PM?	√√	√√	X
Decided task division?	√√	√√	X
Follow up with feedback?	√	√√	X
SUM of √ - Process evaluation	9	10	3

From the factors identified from the list of needed conditions to initiate PM or co-management in Armitage et al., 2009, selected to fit this research topic, the analysis lead to two equal weighted factors of participants' pre-conditions that are shown to have significant correlation in the process's outcomes: 1) The fact that a participant is a landowner, since he/she is probably thinking in a small scale perspective and has interest in the issue of land management; 2) Participants that are associated to some civic organization and therefore are more experienced with participating in meetings, such that this factor gives indication that the participants are more willing and prepared to actively express their ideas to others (Table 11). For the perception index was accounted the individual and collective perceptions over the process of the PMW. And for the evaluation of the process was done a simple quantification of the fraction of achieved objectives, such as the deciding on the indicators list and PM schedule. These index values vary between zero and one, with higher value showing better result. The question is how the initial pre-conditions match with the outcomes and the achievement of objectives, meaning that a better matching would mean a better overall process (Figure 24).

Table 11. The study sites' Pre-condition index (average of participants two key conditions: being landowner, belonging to an association with experience in attending meetings) and the Perception index over the outcomes of the process (average of the questions regarding the individual perceptions and the perceptions over the group's process).

	Góis	Mação	Sehoul
Landowner	0.64	0.64	0.44
Associated	0.36	0.55	0.11
Pre-condition index	0.50	0.59	0.28
Individual perceptions	0.75	0.70	0.84
Perceptions over the collective process	0.72	0.67	0.82
Perception index	0.73	0.68	0.83
Process index	0.41	0.45	0.14

From the pre-condition index one would say that the PM went best in Mação (0.59), second in Góis (0.50) and with more limitations for Sehoul (0.28). The comparison of the pre-condition index with the perception index could give evidence if better participants' group conditions lead to better participants' perception and process of the PMW, and therefore better overall outcome. This analysis is simplistic and requires that further continuation of PM processes occurring in the same study sites and that the same methodology is applied in other sites. But, even, with just one workshop this can give insight that the pre-conditions have relation to what was perceived by the participants as outcomes. Getting to know the pre-conditions of the participants at early stage of the initiation of PM could then improve implementation, by giving information on what are the needs and the aspects that could be worked with the participants.

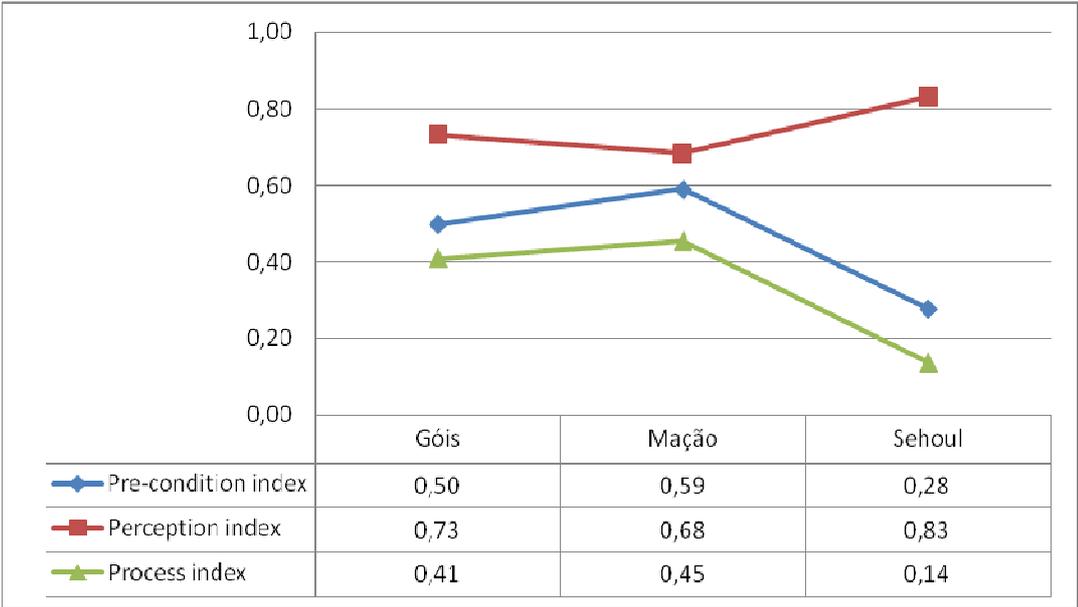


Figure 24. Plotting of the pre-condition, perception and process indexes for each study site.

Triangulating the results that Mação had the better matching of the indexes and therefore had the best process and outcome of the PM initiative with observations, the result is confirmed. What observations show is that Mação has a good local network with the presence of a very active NGO (Aflomação) that has many associates, some of them participants of the PMW, giving a good initial interaction platform for initiating PM. This is reflected in the openness of this NGO to exchange information and exchange e-mails with me and also in the observed close relation with the GTF and local landowners. While, in Góis, the GTF acts as main driver, but the local NGO (AFCG) showed less willingness to participate and also there were less associated landowners. In

Should the lack of associative behavior and experience with group meetings can have also hampered the participatory process. This might mean that adapted approaches and tools must be used in such situations to promote a more active participation and clearer outcomes. Such as having longer workshops and using scenario building strategies (Walker et al., 2002). Besides the confirmation of the hypothesis that there is relation between initial conditions and the process and outcomes, I think this quantitative analysis can be further explored and turn out to produce a measurable approach using preconditions and perceptions of participatory processes outcomes for the improvement of implementation. This type of exploration of quantified variables to understand the pre-conditions of the participants and quantify the outcomes through the participants' perceptions, can lead to a better understand the performance of the implementation of participatory monitoring frameworks.

5.5.2. POINTS FOR REFLECTION

With this research besides the achievement of the objectives and the answers for the research questions, it has some limitations. A first point of limitation is the number of participants and how it is representative of the local communities. Well, as referred in the theoretical framework, the objective here was not to include the whole community but to have representatives of the main components working in land management. Therefore, this was achieved, at least in the Portuguese study sites. A second point of reflection concerns the number of factors used in calculating the pre-condition, perception and process indexes. Further research in other study sites could come up with more factors that are correlated. Or, we could consider to give weights to the factors according to their correlation factor. Nevertheless, results from this research show that as it was done the method and conclusions make sense if we take in consideration other authors such as Armitage (2009). The third point of reflection is about the follow-up of this participatory processes. The whole research was a pleasant challenge, where I've learned much about scientific method and communication, but also about collaborative process and facilitation of workshops. The feeling is that the processes initiated with this research should have follow-up and be continued with the stakeholders. The reality is that this research ends as well as the DESIRE project and only with self-initiated workshops or with a strong commitment from the local study site teams could this participatory monitoring be continued over time. And, this is the problem with many of the initiated participatory projects over the world, they are all project bounded and projects end.

CHAPTER 6. CONCLUSIONS

Overall the process and outcome of this research methodology to initiate participatory monitoring were positive in terms of the achieved results and also according to the perceptions of the participants. In the three case studies, with site specific social-ecological settings and desertification problems, this methodology successfully implemented participatory monitoring workshops. The methodology was structured through a series of steps and activities. This included semi-structured interviews with local organizations, multi-level participatory monitoring workshops, and quantitative surveys regarding the participants' perceptions. This methodology resulted in all the study sites - Góis and Mação, in Portugal and Sehoul in Morocco - in the selection of local indicators to monitor specific sustainable land management options – fuel management strips and gully control, respectively. The conclusions concern the strengths and weaknesses of the methodology and the analysis of the process and comparison of the initial conditions of the participants' and final perceptions after the participation in the monitoring workshops.

THE METHODOLOGY

The four steps of this methodology are in principle all important for the analysis of the process and outcome of participatory monitoring. Nevertheless, it is better adapted to a situation where there is a project already in contact with key stakeholders and that supports the initiative. In all cases, the first step is to make contact with key stakeholders. This is followed by the sampling of multi-level participants. The next step is to conceptualize and organize the implementation of the participatory monitoring workshop. It is assumed that the workshop takes place with sufficient participants, around ten people, representing individual land users and groups from governmental and non-governmental backgrounds. The methodology foresees a final individual reflection about expectations, opinions and perceptions over the PMW process. This step became crucial for this research. The fourth step, on the other hand, besides being fundamental for the continuation of any PM process, falls outside the scope of this research. However, some information for future actions is suggested. In this sense, all the four steps of this methodology are important parts of the whole conceptual approach of this research. It reached the research objectives of conceptualizing and testing a methodology to initiate PM and to analyze the resulting process and outcome in three study sites. The methodology has achieved the objectives, but there is space for improvement. With more attention given to the interviews and especially to the survey questions, much more

could be analyzed. In practical terms, it was important to have local and experienced people moderating the workshops and it was crucial that the local government and the study teams supported the actions. Having in advance a good insight into the participants' conditions, such as the education level, is also important, and this information can be obtained in an earlier stage of the methodology rather than in the end of the workshop, to better adapt the approach and duration of the participatory workshop. Differences exist in the implementation of the methodology between the study sites, especially for the case study in Sehoul, Morocco. The correct use of the series of steps and activities of this methodology was successful in both Portuguese study sites and made it possible to arrive at the selection of the site's monitoring indicators and monitoring schedule. In Morocco the whole procedure was more challenging and was adjusted so that it did not fully cover all activities as prescribed. The process of identification of the local organizations to interview in Sehoul was more hierarchical and more time consuming and therefore there were no regional stakeholder representatives present in the workshop. During the workshop process in Sehoul the participants were not divided in sub-groups to take the field visit and in the plenary discussion there was predominance of the moderation team, making the participation less active. And in the end the selected indicators and monitoring schedule decisions could have been much improved with more time for plenary discussion.

Looking back at these case studies it is clear that the strength of this methodology is that it creates a flexible platform for participants to interact in an informal environment and experiment with monitoring indicators in the field. This forum for exchange of information promotes collective discussion and decision-making. A representative group of participants including multi-level stakeholders is thought ideal, but several combinations of workshop's participants could be considered and tested. Take for example Sehoul, where it was suggested to do a workshop just for farmers and another just for women. The results show that the participants agreed with the group composition and their expectations towards the PMW were met. This methodology's step-wise approach and its *a priori* flexibility for experimenting methods for implementation, make it a useful framework for initiating participatory monitoring in several contexts. Results show that the participants felt that they learned and exchanged information. As points of weakness and improvement, it was found that this methodology is highly dependent on the first contact with key stakeholders and their support. This can be overcome by integrating the PM in existing activities of organizations and in particular governmental agencies and/or research and development

projects. There was a suggestion for example to integrate PM in some kind of regional initiative. The objectives of for the first contact with key stakeholders were achieved with the conceptualized semi-structured interviews. While the survey about the participation perceptions requires further testing to find the questions give a real insight in the initial conditions of the group of participants and their perceptions after the participatory workshop. The follow-up from these participatory initiatives and their dissemination and methodological development is now uncertain, probably requiring institutionalization and continued support.

THE PARTICIPANTS' PRE-CONDITIONS, PERCEPTIONS AND THE PROCESS EVALUATION

From the knowledge about the study sites and the SLM options implemented in the field and the information on the description of the participants, derives the setting for the analysis of the conditions that can affect the process of participatory monitoring. A basic assumption is that these social-ecological systems are under a context of desertification and have initial site-specific conditions that will influence the process and outcomes. These stakeholders are expected to have common interest in land degradation problems and are willing to become involved. Many conditions affect the participatory process, but for analysis purposes of this research after several experiments in analyzing the data, there were two factors that most related to the final perceptions: the presence of landowners and of participants that are associated to civic organizations. These two key conditions were selected to analyze the pre-conditions of the group of participants. These chosen conditions are interpreted as positive indicators of interest and preparedness of the participants for actively participate in the PMW, and therefore achieve the expected outcome. These conditions give the pre-condition index. For each study site, also a perception index was calculated analyzing the survey on the perceptions of the participants in the end of the PMW. Also the PMW process was evaluated in terms of achieved objectives, giving the process index. Then these were compared with the pre-condition index. These revealed strong correlations within study site. For both Portuguese study sites there are smaller differences between pre-conditions and final perceptions and process evaluation, while for Morocco the indexes diverged the most. In Sehou the perceptions answers were the highest, either because of politeness or because these participants are less used to meetings and feel they have learned more than in Portugal, where 40 – 50% of the participants had experience with meetings and have higher education level. The matching of the initial conditions and final perceptions can indicate better process, and this can be seen in the results of this research. So, that in Mação a higher pre-condition index lead to a better

process and outcome (higher process and perception indexes). More interest and preparedness in Portugal, especially in Mação, resulted in better matched final perceptions. While, in Morocco the process had the highest perception index, even though the participants had low initial conditions to take full advantage of the workshop. Of course the number of factors considered to calculate these indexes should be increased and maybe weighted to give a real insight in the initial conditions of the group of participants and their perceptions after the participatory workshop. However, these results show that there is potential, through such quantitative approach, to further evaluate and improve the conceptualization of more sensitive frameworks for participation. Further testing of this methodology in other sites, such as other study sites of the DESIRE project, would produce more data for assessing the hypothesis that implementing local participatory monitoring can lead to learning outcomes and enhance collective land management. Also, experimenting with quantitative analysis of this data can lead to new insights about the relation between initial conditions of participants and their perceptions over the outcomes and the evaluation of the process.

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APPENDIXES

APPENDIX A – FORM-ON

FORMULÁRIO: ORGANIZAÇÕES & NETWORKING

Gestão da Território e da Floresta na Prevenção de Incêndios

LOCAL PT - _____
DATA/HR _____

1 – IDENTIFICAÇÃO DA ORGANIZAÇÃO

1.Nome	-
2.Contactos 2.1Morada 2.2Telefone/Fax 2.3Website 2.4Email	- - - -
3.Nome de entrevistado 3.1Função 3.2Contacto directo 3.3Participou no WB1/2	- - - -

2 – DESCRIÇÃO

1.Denominação fiscal	-			
2.Ano de constituição	-			
3.Acção geográfica	-			
4.Nº funcionários total	Total - Por género - 1: mas.....; 2: fem..... Por idades - 1: <30.....2: 30-40.....3: >40.....			
5.Nº funcionários Por funções Educação (1:<Liceu;2:Licenciat;3:>Lic.)	Direcção	Executiv	Administ	Outro (ex.sapadores)
	-	-	-	-
	-	-	-	-
6.Infra-estruturas Instalações (1:N; 2:S, quantas?) Veículos (1:N; 2: S, quantos?) Comunicação (1:N; 2: S, quais?)	- - -			
	Telef <input type="checkbox"/> Fax <input type="checkbox"/> Computadores <input type="checkbox"/> Nºc/Internet.....			

3 – FUNCIONAMENTO

1. Missão	-	
2. Responsabilidades principais	-	
3. Actividades	---	Elaborar planos Reunir com outras organizações Gerir Recursos Humanos (sapadores) Gerir Logística (máquinas, combustível) Informação aos proprietários/locais Executar trabalho na floresta Encontros/Congressos Outros
4. Funções/ Serviços prestados	-	
5. Serviços prestados a quem?	-	

4 – NETWORKING

1. Com quem comunicam?	
1.1	Com que organizações têm parcerias/protocolos oficiais (PARC)? - - -
1.2	Quais organizações governamentais ligadas à Floresta/território (GOV)? - - -
1.3	Quais organizações não governamentais ligadas à Floresta/território (ONG)? - - -
1.4	Quais organizações locais não ligadas directamente à Floresta (OUTRA)? - - -

1.5	Quais organizações internacionais (europeias/mundiais) têm contacto (INTERN)? - - -					
1.6	População local - Nomes de indivíduos, proprietários florestais, outros (POPUL)? Outros contactos? - - -					
		PARC	GOV	ONG	OUTRA	INTER
2.Canal de comunicação? (1:carta; 2: email; 3:oral,telef; 4:físico;5:outro)						
3.Frequência de contacto (ao longo de um ano)? (1: <1vez; 2: 1vez;3: > 4vezes ;4: >10vezes; 5: > 20 vezes/semanal)						
4.Tipo de contacto? (1:formal; 2:informal; 3:peçoal; 4: outro)						
5.Tipo de informação trocada? (1: técnica/profissional; 2: divulgação; 3: organização; 4: outra)						
6.Valor da informação? (I:Inadequada/irrelevante; PA: parcialmente adequada/interessante; A: adequada/importante)						
Obs.:						

5 – ESQUEMA DE RELAÇÕES (ex: para implementação de uma FGC)

1. Quem decide? - local a implementar? - - quando? - - divisão de tarefas/custos? -	2. Quem planeia/gere? - local a implementar? - - quando? - - quem, o quê? -	3. Quem executa? - vai para o campo? - - quem? - - com que meios? -	4. Quem monitora? - fiscaliza execução? - - verifica resultados? - - propõe melhorias? -

6 – MONITORIZAÇÃO PARTICIPATIVA

1. Classifique as seguintes afirmações usando a escala de 1 a 5:	Discordo totalmente	Discordo pouco	Não concordo nem discordo	Concordo pouco	Concordo totalmente
	1	2	3	4	5
1.1 É importante ter um sistema de monitorização da implementação de medidas de gestão florestal e prevenção de incêndios.					
1.2 Os resultados de monitorização são úteis para a melhoria da gestão florestal.					
1.3 É importante que as organizações e agentes envolvidos na gestão florestal executem eles próprios as actividades de monitorização (participativa).					

<p>2. Existe na sua organização um sistema de monitorização? Qual? Com que objectivos? Resultados?</p> <p>-</p> <p>-</p>
<p>3. Há possibilidade integrar a monitorização participativa nas actividades da organização? Se SIM, em que actividade pode ser integrada e como?</p> <p>-</p>
<p>4. A organização tem interesse em participar na monitorização das medidas implementadas (abrangidas pelo projecto DESIRE)? Se SIM, classifique de 1: algum interesse, 2: um pouco; 3: n/a; 4: muito; a 5: extremo interesse.</p> <p>-</p> <p>-</p>
<p>5. Identifique que tarefas podiam ser levadas a cabo pela vossa organização para implementação do sistema de monitorização participativo?</p> <ul style="list-style-type: none"> - calendarização dos momentos de monitorização - contacto dos participantes (ser entidade de contacto) - impressões de formulários - transporte para o campo - levar a cabo os métodos e medições de indicadores - gerir a informação adquirida em base de dados - fornecer esclarecimentos <p>-</p> <p>-</p>
<p>6. Na sua opinião, quantas vezes por ano e em que época do ano seria possível/desejável levar cabo a monitorização (ex: das FGC)?</p> <p>-</p>

7 – EXPECTATIVAS E NECESSIDADES

1.O que o levou a participar no projecto DESIRE?

- contactos
- aprendizagem
- aceder a financiamentos
-
-

2.Dê exemplos de outros projectos em que tenham participado. Tinha expectativas semelhantes?

-

3.Identifique as necessidades da Organização para melhoria da Gestão Florestal?

- contactos
- infra-estruturas
- recursos humanos
- financiamento
- conhecimento específico (ex. para candidatura a projectos)
-
-

4.Quais as necessidades locais para a prevenção de incêndios florestais?

- melhor sistema de comunicação
- melhores infra-estruturas
- regras e regulamentos quanto a responsabilidades
- descentralização/ centralização
- consciencialização dos envolvidos
- cursos/ aprendizagem
- melhoria gestão/conhecimento potencial da floresta
-
-

O passo seguinte deste projecto é organizar uma **visita de campo** com participantes do projecto DESIRE, assim como não participantes (se residentes e proprietários florestais). Esta saída de campo participativa tem como objectivo explicar os objectivos do projecto e da monitorização, e principalmente identificar colectivamente **indicadores e métodos**. Igualmente serão definidas e atribuídas **tarefas** e respectiva **calendarização** para implementação de um **sistema de monitorização participativa**.

8 – DISPONIBILIZAÇÃO DE RECURSOS PARA PROJECTO DE IMPLEMENTAÇÃO DE MONITORIZAÇÃO PARTICIPATIVA:

RECURSOS HUMANOS

- condutores
- equipa de monitorização (integrada nas actividades da organização)
-

RECURSOS MATERIAIS

- local de encontro (recinto)
- transporte para o campo
- alimentação ligeira para equipa de trabalho
-

9 – SUGESTÕES PARA SAÍDA DE CAMPO?

(riscar o não aplicável)

- Primeira Quinzena de Outubro
Primeira semana/Segunda semana
- Período
Semana/ Fim-de-semana
Manhã/ tarde
- Local
Zona de demonstração
Zona com FGC
Outra:
- Quem devem ser os participantes
Associação Florestal
Gabinete Técnico Florestal
Outras associações
Outros participantes do DESIRE
Proprietários Florestais/ Membros de ZIF
Outros:

10 – PODE DAR OS CONTACTOS DE ASSOCIAÇÕES & PROPRIETÁRIOS LOCAIS POSSIVELMENTE INTERESSADOS EM PARTICIPAR NESTA VISITA DE CAMPO?

APPENDIX B – AGENDA OF THE PMW



AGENDA – 15 de Outubro 2009, Mação

VISITA DE CAMPO – MONITORIZAÇÃO PARTICIPATIVA DE FAIXAS DE GESTÃO DE COMBUSTÍVEL

9:30 – **Recepção dos participantes no recinto**

Boas vindas & apresentações

Breve informação sobre o Projecto Desire & Equipas Coordenadoras

Objectivos deste projecto de iniciação de sistema de monitorização participativa

10:00 – **Objectivos do dia**

Definições: Monitorização participativa & Faixas de Gestão de Combustível (FGC)

Exercício de identificação de indicadores para FGC

11:00 – **Saída para o campo**

Grupos definem 4 indicadores cada (uso de formulário)

Grupos experimentam os métodos (medições + fotografia de ponto fixo)

Saída para a segunda FGC (?) - repetição das medições de indicadores

13:00 – **Retorno ao recinto** - Pausa para refeição

14:00 – **Início dos trabalhos da tarde no recinto**

Apresentação por grupo dos indicadores, métodos e resultados obtidos

Discussão em plenário e definição dos indicadores seleccionados

Definição de calendarização e divisão de tarefas para próxima monitorização

15: 30 – **Entrega de formulário individual sobre o processo participativo**

16:00 – **Encerramento** & Tempo de troca de ideias sobre diferentes estratégias de implementação das FGC, etc.

APPENDIX C – MONITORING MATRIX

MONITORIZAÇÃO PARTICIPATIVA

ELEMENTOS DA EQUIPA		DATA
QUANDO FOI FGC EXECUTADA?		LOCAL
DESCREVA MÉTODO DE EXECUÇÃO DA FGC		

	NOME DO INDICADOR	O QUE MEDE?	MÉTODO DE MEDIÇÃO	DIFICULDADES/VANTAGENS	VALOR MEDIDO
1	-	-	-	- - - -	-
2	-	-	-	- - - -	-
3	-	-	-	- - - -	-
4	-	-	-	- - - -	-

APPENDIX D – FORM-PP



LOCAL
DATA

FORMULÁRIO: PROCESSO DE PARTICIPAÇÃO

Este questionário é pessoal e pretende reflectir **a sua opinião**.

Por favor leia com atenção e preencha **todo** o formulário com **letra maiúscula** e quando indicado [] marque com [X] **uma** opção que melhor reflecte a sua situação/opinião.
Obrigada por participar.

1. PARTICIPAÇÃO

1.1 Participa nesta iniciativa como representante de organização ou como proprietário florestal?

1.1.1 [] Representante organização governamental

1.1.2 [] Representante organização não governamental

1.1.3 [] Proprietário florestal

1.2 Esteve presente nas oficinas do Projecto Desire?

1.2.1 [] Não

1.2.2 [] Sim, só na primeira, em Março 2008

1.2.3 [] Sim, só na segunda, em Fevereiro 2009

1.2.4 [] Sim, em ambas

1.3 Já tinha participado em iniciativas semelhantes, onde tem oportunidade de ouvir, falar e discutir temas que lhe dizem respeito e à sua região?

1.3.1 [] Não

1.3.2 [] Sim, por exemplo:.....

1.4 Refira um aspecto positivo desta iniciativa?

.....

1.5 Refira um aspecto negativo desta iniciativa?

.....

2 – APRENDIZAGEM

Responda às seguintes questões usando a escala de 1 a 5:	1 – Nada; 5 – Muito				
	Marque com X				
	1	2	3	4	5
2.1 A participação nesta iniciativa correspondeu às suas expectativas?					
2.2 Considera que aprendeu?					
2.3 Considera que contribuiu/ ensinou?					
2.4 Considera que trocou informação importante com outros participantes?					
2.5 Considera que o que aprendeu hoje ser-lhe-á útil futuramente?					
2.6 Iniciou discussão/ participou/ teve voz?					
2.7 Houve variação de opiniões no grupo?					
2.8 Houve conflito de opiniões?					
2.9 Houve dominância/ influência de um ou mais participantes?					
2.10 O resultado (escolha de indicadores, etc.) resultou do trabalho do grupo?					
2.11 Considera que teve influência nos resultados?					
2.12 Concorda com os resultados obtidos?					
2.13 Concorda com o potencial dos resultados obtidos?					
2.14 Concorda com a constituição do grupo de participantes?					

3 – PERCEPÇÃO

Classifique as seguintes afirmações usando a escala de 1 a 5:	Discordo totalmente	Discordo pouco	Não concordo nem discordo	Concordo pouco	Concordo totalmente
Marque com X	1	2	3	4	5
3.1 É importante ter um sistema de monitorização da implementação de medidas de gestão florestal e prevenção de incêndios.					
3.2 Os resultados de monitorização são úteis para a melhoria da gestão florestal.					
3.3 É importante que as organizações e agentes envolvidos na gestão florestal executem eles próprios as actividades de monitorização (participativa).					

4 – INFORMAÇÃO

4.1 A sua idade?

- 4.1.1 menos de 30 anos
- 4.1.2 31 a 40 anos
- 4.1.3 41 a 50 anos
- 4.1.4 mais de 51 anos

4.2 Género?

- 4.2.1 Homem
- 4.2.2 Mulher

4.3 Nível máximo de educação obtido?

- 4.3.1 Ensino Básico, 1º ciclo (4º ano)
- 4.3.2 Ensino Básico, 2º ciclo (6º ano)
- 4.3.3 Ensino Básico, 3º ciclo (9º ano)
- 4.3.4 Ensino Secundário (12º ano)
- 4.3.5 Ensino Superior (Bacharelato ou Licenciatura)
- 4.3.6 Ensino pós-graduado

4.4 É proprietário de terrenos rurais?

- 4.4.1 Não
- 4.4.2 Sim

Se Sim,

- a) Quantas propriedades/parcelas têm?
- b) Quantos hectares de terra tem (+/-)? hectares
- c) Em que Concelho se localiza(m) a(s) propriedade(s)?
- d) Qual o uso do solo em percentagem (+/-)?
 - 1: Produção florestal %
 - 2: Agrícola%
 - 3: Construído%
 - 4: Outro(s) uso(s), quais?, %

4.5 Qual o seu principal ramo de actividade profissional/ fonte de rendimento?

Sou.....

4.6 Na sua principal actividade, trabalha por conta própria ou conta de outrem?

- 4.6.1 Outrem
- 4.6.2 Conta própria

4.7 Faz parte de alguma associação local ligada à gestão da floresta?

- 4.7.1 Não
- 4.7.2 Sim – Qual/ quais?

Se sim,

- a) Qual a sua função na associação?
- b) Participa nas reuniões da associação? Não Sim

5 – SUGESTÕES PARA OPERACIONALIZAR A IMPLEMENTAÇÃO DESTE SISTEMA DE MONITORIZAÇÃO PARTICIPATIVA:

.....
.....
.....
.....

MUITO OBRIGADA PELA SUA PARTICIPAÇÃO

