

HERCULES

Sustainable futures for Europe's HERitage in CULTural landscapES: Tools for understanding, managing, and protecting landscape functions and values

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D1.4: Report on categorisation of drivers, outcomes and actors of landscape dynamics

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Executive summary

This deliverable of work package 1 is comprised of two parts which strive for a common goal: to synthesize the knowledge gained from the project concerning drivers and outcomes of persistence and change in Europe's cultural landscapes. Each of these parts has been or will shortly be submitted to peer-reviewed journals, and here we present the draft manuscript versions that are being reviewed. The synthesis is between two fields of scientific research and practice – land use science and landscape ecology/ science – which are growing, but not always towards the same directions. Both fields include a substantial body of literature on the theme of what drives land use / landscape change. The research we performed in HERCULES touches on both fields and here we will present mostly results and insights that seek to provide common links between the fields and also to prove useful in conceptualizing, planning and applying landscape research and at a second level also research policies. We feel that this is an important task for HERCULES, since it is expected from us to guide further research and linkages between scientific and research communities and also among researchers, practitioners and policy makers.

The first part has the objective to characterize the diversity of methods to study the driving forces of landscape change on the basis of the method/ approach used for their conceptualization and their contribution to the system under study. We sketch the way in which different approaches are related to spatial scales, epistemological aims and conceptual models and subsequently to determine the complementarity and range of applications. The intention is to contribute towards a deeper clarification and structuring of driving forces research and to specify the added value of the very diverse studies found in the literature. Our goal is to provide a blueprint that will help in establishing scale-specific models suitable for planning and conducting landscape change research. In particular, we answer three questions: (a) How does the selection of driving forces-actors-change-models influence the results of a study? (b) How does the consideration of different spatial scales influence the results of a study? (c) Are the conceptual models for understanding landscape change complementary, or rather deliver contradicting results? The different approaches of the drivers of landscape change are first discussed by using a framework that links different conceptual models of causal chains with research questions and spatial scales. We then place on this matrix empirical evidence from our HERCULES research with different approaches for the same landscape to provide insights for discussing the suitability of different approaches for specific questions and scales.

What stems from this synthesis is that the need to move from a “one case study and one research method approach” to performing cross-site analyses. Although this seems to be a step in the right direction for understanding in more depth the inherent complexities involved, it does not touch another issue that we believe is important and has been discussed in this paper: the need for a plurality of

research approaches. The empirical material from different models of conceptualizing who change a landscape and why it changes reveals some important issues.

The first of these issues is related to the different understandings of the same changes, even for a landscape where the identification of actors involved was relatively straightforward and the changes rather limited and slow. The different approaches were partly redundant, partly complementary, but it was also clear that each one could not cover all the issues raised as important from the other approaches. From a more pragmatic view: can we afford to be as pluralistic as in this paper and adopt different questions and methods for the same landscape? We believe that plurality is important and helpful, but at the same time we realize that this may be far from contemporary research practice. We hope to help though all those that want to ask questions on landscape change and find methods to answer them to adopt the approach that will be more fruitful for the type of questions asked, while at the same time also alerting them that there may be more that the findings of their approach suggest. In this sense there is no way to answer which is the best approach. This plurality is also helpful for contextualizing the input provided by one approach. The issue of the validity of what stakeholders say and consider as important seems to be a good example for this point.

In the second part of the deliverable, we realise that the design of effective responses to safeguard cultural landscape values in Europe needs collaborative action among the stakeholders involved. Despite considerable progress made by the European Landscape Convention to link landscape science, policy and practice, a joint research-action agenda is still missing. We respond to this challenge by identifying common priority questions for the sustainable management of cultural landscapes in Europe. To that aim, we gathered, in a first phase, the most relevant research questions from the research community in this field. In a second phase these questions were prioritized by three stakeholder groups: scientists, policy-makers and practitioners. The importance ranks and the similarity between groups' priorities were calculated and analysed. We found that the research question addressing the issue of how to secure sustainable cultural landscapes where it is not economically profitable was the most important, with high agreement among all stakeholders. Alignment among the three groups was generally high, being higher between practitioners-scientists and practitioners-policy-makers than between scientists and policy-makers. Our exercise can assist the implementation of the European Landscape Convention by outlining future applied research directions and by strengthening the ties between the multiple stakeholders involved in the stewardship of European cultural landscapes.

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Introduction

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The first part has the objective to characterize the diversity of methods to study the driving forces of landscape change on the basis of the method/ approach used for their conceptualization and their contribution to the system under study. We sketch the way in which different approaches are related to spatial scales, epistemological aims and conceptual models and subsequently to determine the complementarity and range of applications. The intention is to contribute towards a deeper clarification and structuring of driving forces research and to specify the added value of the very diverse studies found in the literature. Our goal is to provide a blueprint that will help in establishing scale-specific models suitable for planning and conducting landscape change research. In particular, we answer three questions: (a) How does the selection of driving forces-actors-change-models influence the results of a study? (b) How does the consideration of different spatial scales influence the results of a study? (c) Are the conceptual models for understanding landscape change complementary, or rather deliver contradicting results? The different approaches of the drivers of landscape change are first discussed by using a framework that links different conceptual models of causal chains with research questions and spatial scales. We then place on this matrix empirical evidence from our HERCULES research with different approaches for the same landscape to provide insights for discussing the suitability of different approaches for specific questions and scales.

In the second part of the deliverable, we realise that the design of effective responses to safeguard cultural landscape values in Europe needs collaborative action among the stakeholders involved. Despite considerable progress made by the European Landscape Convention to link landscape science, policy and practice, a joint research-action agenda is still missing. We respond to this challenge by identifying common priority questions for the sustainable management of cultural landscapes in Europe. To that aim, we gathered, in a first phase, the most relevant research questions from the research community in this field. In a second

phase these questions were prioritized by three stakeholder groups: scientists, policy-makers and practitioners. The importance ranks and the similarity between groups' priorities were calculated and analysed. We found that the research question addressing the issue of how to secure sustainable cultural landscapes where it is not economically profitable was the most important, with high agreement among all stakeholders. Alignment among the three groups was generally high, being higher between practitioners-scientists and practitioners-policy-makers than between scientists and policy-makers. Our exercise can assist the implementation of the European Landscape Convention by outlining future applied research directions and by strengthening the ties between the multiple stakeholders involved in the stewardship of European cultural landscapes.

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Part 1: From concepts to practice: A portfolio of approaches on drivers of landscape change for a Mediterranean island locality

1.1 Introduction

Landscape change has been the focus of a growing body of literature in the past years (see Plieninger et al., 2015; Qviström and Vicenzotti, 2016; Helfenstein et al., 2014 for different aspects of this literature), paralleled by a continuous increase in use of the term landscape in studies related with land use, environmental change, agriculture, land management, etc. The underlying drivers or causes of these landscape changes have been investigated by many different approaches, with corresponding terminology (see Meyfroidt, 2015; Eiter and Potthoff, 2016). Consequently - as shown by a number of meta-analyses (Plieninger et al., 2016, Van Vliet et al., 2015a; 2015b) – consensus on the exact meaning of the term ‘driver’ is lacking.

The objective of this paper is to characterize the diversity of methods to study the driving forces of landscape change on the basis of the method/approach used for their conceptualization and the contribution to the system under study. We aim to sketch the way in which different approaches are related to spatial scales, epistemological aims and conceptual models. Subsequently we aim to determine the complementarity and range of applications. The intention is to contribute towards a deeper clarification and structuring of driving forces research and to specify the added value of the very diverse approaches found in the literature. Our goal is not to provide a unifying definition of driving forces, but rather provide a blueprint that will help in determining and establishing scale-specific models suitable for planning and conducting landscape change research. In particular, we will attempt to answer three questions in relation to the concept of driving forces: (a) How does the selection of driving forces-actors-change-models influence the results of a study? (b) How does the consideration of different spatial scales influence the results of a study? (c) Are the different approaches for understanding the driving forces of landscape change complementary, or might they also deliver contradicting results?

We will first discuss in more detail the different approaches of the drivers of landscape change, then we will relate the conceptual models to research practice by using a framework that links different conceptual models of causal chains with research questions and spatial scales. We use the application of the different approaches for the same landscape as a means to provide insights for discussing the complementarity and suitability of the different approaches for specific questions and scales of analysis.

1.2 Drivers of landscape change: a review of the terminology and concepts

The analysis of drivers of landscape change is a core field of research in land change science, building on a long tradition in geography to understand why landscapes change or remain unchanged, why they evolve faster or slower and what are the causal mechanisms of regime shifts (Müller et al., 2014). Already more than 25 years ago, Kates, Turner and Clark (1990) stated that a general theory of human-environment relationships would have to conceptualize the relations among the driving forces of human-induced change, their mitigating processes and activities, and human behaviour and organization. Thus, the system under study includes real-world changes (i.e. land change), human agency (i.e. actors) and influential factors, which are most typically called driving forces (Bürgi et al. 2004), but also have been termed keystone processes (Marcucci 2000) or simply drivers (Wood and Handley 2001). These driving forces form a complex system of dependencies, interactions and feedback loops and they affect several temporal and spatial levels, making their study challenging.

The diversity of approaches, scales and fundamental research interests within land change science led to a great diversity of studies relating in one way or another to the concept of driving forces (Eiter and Potthoff 2016). Recent attempts to standardize the use of certain core terms and concepts by Meyfroidt (2015) are a reaction to the confusing diversity in terminology – which however might also be seen as an expression of a vibrant field including diverging epistemological interests which results in a certain diversity in terms and their meanings.

One attempt to provide an overview on different conceptual representations of the systems under study in land science, was presented by Hersperger et al. (2010, Figure 1.1) by distinguishing four basic models to represent the relationship of land change (C), driving forces (DF), and actors (A). The four models include the DF-C model, in which driving forces are directly related to land change, i.e. the model assumes that driving forces directly cause the observed land change while (unlike in the other three models) actors are not explicitly addressed. The model DF-A-C represents a chain of events from driving forces affecting actors and subsequently actors causing change. By putting the driving forces first, one assumes that they determine the actor's actions that result in change. The third model, called DFA-C model, sees driving forces and actors in close interaction resulting in landscape changes. Therefore, the interplay of driving forces and actors, including feedback, are put at the core of the study. The AC-model puts actors on central stage. Driving forces are just one of the elements of the environment in which actors take their decisions. The model represents the understanding that land change is often the cumulative result of individual agents' decisions.

The four models have different applications and may be used at different scales. Commonly, the more weight is put on single actors' decisions, the smaller the scale of study will be, as larger scale studies inevitably have to include more diverse actors, which have to be assessed and integrated adequately. Relations between the study scale, the approaches chosen and the role of quantification, data availability, and up-scaling therein,

have recently been discussed by Eiter and Potthoff (2016), who distinguish between process-based vs. structure-based approaches.

In this paper we will use these four models in a spatial context, link them with specific research approaches and then “test” these with the findings of a number of different, multi-scale, research approaches for a nested hierarchy of landscapes.

1.3 Towards a new conceptualization of drivers of landscape change research

Conceptually, landscapes are multi layered, reflect long-term histories and are managed by actors that respond to larger-scale policies and incentives. Therefore, landscape research should, by definition, address multiple spatial, temporal and institutional scales. At the same time, such a multi-scale approach it is limited by practicalities, such as particular objectives of the research or availability of data. Typically, longer-term studies have to rely on sparse archives with great gaps in available sources, while large-scale studies cannot use all the details that may be gathered on smaller scales.

In order to spatially contextualize the four models proposed by Hersperger et al. (2010), and to link them to specific research approaches, we tabulated the four conceptual models with four different spatial scales commonly used in landscape change research: the case study level, which is typically small in extent and is related with a specific locality (a village, a municipality, a landscape, a watershed, etc.); the small region level, which is defined by administrative or natural boundaries (for Europe at the NUTS III or NUTS II levels) and typically includes many landscape types; the national level, which is related with country-wide approaches; and the supra-national level, which addresses the scales of greater regions (the European Union, Europe, Eurasia, etc.).

In Figure 1.1, we have placed in the upper-left corner (“case study”/ “small region” scales and DF-C model) research that aims at understanding the functioning of the landscape system, addressing questions such as: How has the landscape developed (e.g. via oral histories, local texts and narratives)? What are the values assigned to these landscapes by its users (e.g. via questionnaires, image elicitation or public participation Geographical Information Systems - PPGIS; Palomo et al., 2013; Fagerholm et al., 2012; Scolozzi et al., 2014)? What are the drivers of landscape change (e.g. Bürgi et al., 2015; Lieskovský et al., 2015)? These approaches tend to be spanning over years and decades, rather than longer terms. Longer term studies often include external as well as internal drivers, but may indicate the local actors involved and their overall landscape management practices.

If the actor analysis is more detailed, research approaches tend to fall into the lower-left corner of Figure 1.1 where feedback and diversity of behaviours are studied in more detail. In the lower-left corner, actors and their role are central. The approaches used account for a wide diversity of actors at the local scale, their

motivations, perceptions and adaptive responses to landscape continuity and change including landscape stewardship and awareness raising approaches (e.g. Vallés-Planells et al., 2014; van Berkel, and Verburg, 2014; Castella et al., 2005). Methods include co-design of stewardship options during stakeholder workshops and agent-based models to evaluate alternative landscape futures representing the diversity and development of agent behaviour. Here, the barriers and opportunities for action within the studied area – landscape are central topics of research.

Conceptual models	Study aim	Scale of analysis			
		Case study	Small region	National	Supra-national
Driving force - Land change (DF-C)	Exploration Generation of hypothesis Estimation of parameters for theoretical models	Case study analysis of landscape history and driving factors of past and current landscape change (Case A)		Synthesis and meta-analysis	Decision support for informed policy (Case E)
Driving force - Actor - Land change (DF-A-C)	Understanding causal chain driving forces - actors-change Identifying specific combinations of driving forces and actors that lead to change				
Driving force/Actor - Land change (DFA-C)	Interactions among actors and drivers of land change, including feedbacks Policy analysis and intervention	Raising awareness and stewardship options (Case C) ; Evaluation of landscape values (Case D) ; Agent-based modeling of landscape change (Case B)			
Actor - Land change (A-C)	Actor behavior and decision making resulting to land change Interactions among actors of land change, including feedbacks Policy analysis and intervention Social learning				

Figure 1.1: The four conceptual models of Hesperger et al. (2010), with scale of analysis and research approaches for the case studies of the Gera landscape

In the upper-right corner of Figure 1.1, research refers to larger spatial scales and involves methods and questions that either operate at a larger scale or enable the contextualization and synthesis of case-studies in this larger scale analysis (e.g. Willemen et al., 2010; Levers et al., 2016; Loran et al., 2016; Stürck et al., 2015; Gennaio et al., 2009; Jepsen et al., 2015; Thapa and Rasul, 2006; van Zanten et al., 2016). What are the patterns of historical landscape continuity and change and also what approaches can be used for the

evaluation of landscape services? Techniques employed include spatial data analysis but also narrative analysis at the level of countries or supra-national units. At the same time, in the upper-right corner research aims at informing decision making, policy design and evaluation (e.g. via ex-ante models that evaluate the impact of alternative policies). Often these approaches use simplified conceptual models, disregard actor diversity and strongly simplify actor behavior as a consequence of the scale. Confrontation and linkages of these large scale efforts with the “realities” encountered in case-study work is important. Another approach to address these larger scales is by upscaling and contextualizing case-studies within the area by meta-analysis of existing case studies to identify what drivers the case studies have in common or how context determines the drivers. Alternatively, outscaling from case studies might be done based on the representativeness of the case study for a larger area (Vaclivic 2016)?

The lower-right corner of Figure 1.1 is left empty, as methods fully accounting for agency hardly exist at such large scales, in spite of pleas for including agency better in large-scale landscape change assessments (Verburg et al., 2016). At these scales, agency does not necessarily refer to individual, but may also refer to institutional agents. Processes of exchange and consultation with all institutions involved in landscape policies, including farmers and land owner associations, can be a way to account for agency at such levels of aggregation.

In the next section we will present the implementation of a number of different approaches that are placed at different places in Figure 1.1 for a particular landscape, i.e. Gera area on Lesbos Island, Greece, including approaches at national and European levels that account for greater scales. The findings of the different researches on landscape changes and the related driving forces allows a comparative approach that can (a) highlight similarities and differences between the different approaches that concern the findings, but also the underlying conceptual models; (b) allow the discussion of how each of these perspectives explains landscape changes or whether they even consider these as changes or not; and (c) perform a “reality check” of the abstract conceptualization of Figure 1.1.

1.4 The case of the Gera landscape

Gera is located in the South-Eastern part of Lesbos Island in the North-Eastern Aegean Sea (Figure 1.2). Its climate is Mediterranean, its terrain hilly and its landscape has consisted of terraced, continuous olive plantations (until roughly 450-550m altitude) and forested areas (from 450-500m altitude upwards) since the end of the 18th century. Olive plantations are characterized by traditional low-input management practices and by scattered trees (Stroosnijder, et al., 2008). Tree density is low, ranging typically from 20 to 50 trees per ha. The management is comprised of mowing and/or tillage, rarely of grazing. Pesticide use is minimal and irrigation not usual, although both are becoming more common. Harvesting is usually performed by hand and variability of annual yield is high, due to variable conditions and modest fertilization and irrigation

practices. Labour requirement is very high in harvesting, pruning, maintenance of terraces and walls, scrub control, etc. The olive plantations on slopes steeper than 10–15% are all terraced, either in pocket type (a single terrace in semi-circle around one tree), in parallel-braided type, or often in mixed types. The abundance of pocket terraces is a unique characteristic for olive cultivation globally. Due to low attractiveness of olive cultivation for the younger inhabitants of the area, many plantations are abandoned or neglected (little other land management is practiced besides collecting olives). Population has decreased in the last decades (-37% from 1951 to 2011 and -13% between 2001 and 2011), in line with the trend of the whole island. Gera is also ageing, with more than a quarter of its population being older than 65. The economy of the area depends on agriculture, almost exclusively olive oil production, and in a lesser degree on tourism and the public sector.

Table 1.1: Summary of different research approaches, changes detected and driving forces

Research Approach / questions / time line	Conceptual Model	Landscape changes / drives
Historical landscape changes (Case A) Aims: How did the landscape change? What were the dominant processes and temporal trends? What driving forces were responsible? Timeline: from the 1950s until 2010s (with older insights).	DF-C model	A dynamic relationship between olive plantations and forest areas Decrease of olives Conversion of olives into urban areas (less important). Driving forces: “international” / economic (low price levels for olive oil; less favourable trade position) “national” / economic - social, (reported lack of efficient policies, reported lack of infrastructure, rural exodus) “local” / social – economic (unwillingness of young people to engage professionally with olive cultivation; low profitability of olive farming).
Decision making processes (Case B) Aims: Describe and quantify landscape changes and their causes / driving forces at multiple scales with the use of a model to assist decision and policy making. Timeline: last decade and 25 years in the future	A-C model.	Three farmer groups were identified: active part timers; professionals and detached farmers, with distinct rationales and different management decisions. Polarization between professionals and detached farmers, indicating continuation of abandonment. Continuation of cultivation dependent on newcomers and successors Driving forces: “cultural drive” for preservation of landscape International prices and profitability of farms Only combination of macro-drivers and local initiatives seems to be able to reverse abandonment trends
Stakeholder perspectives and landscape stewardship (Case C) Aims: Elicit stakeholders’ perceptions of landscape change and values with three workshops, including discussing principles of a management plan for olive cultivation. Also witness interactions and gain insights on social capital. Timeline: last decade	DFA-C and A-C models	Realization of abandonment of olives (viewed negatively) Need to preserve traditional management and cultural practices and combine traditional with “expert” knowledge on management and new technologies Driving forces: Major obstacle a widespread lack of trust to institutions and cooperation in general, International forces also recognized, but given less importance than local and then national ones
Evaluation of landscape values (Case D) Aims: Capture local opinions regarding preferences, perceptions, feelings and values assigned to the landscape by its residents, with the use of a participatory GIS approach of 170 respondents. Timeline: today and last decade	A-C model	Aesthetic, spiritual and cultural linkages of locals with their landscape: the sea plays a major role in these appreciations, and the villages are also centres for free time and sociocultural activities and highly appreciated as such Abandonment was recognized as important and urban growth in the coastal zone.
Policy support (Case E) Aims: Critical syntheses and meta-analysis of driving forces at national and international levels and of their interrelation across scales. Timeline: Last 2-3 decades	DF-A-C model	Key driving forces operating at multiple scales: Local scale: demography, aging population, social unattractiveness of farming, low profits and lack of adequate infrastructure such as roads. National scale: existing incentives for rural and tourism development and fragmented laws and regulations leading to unplanned urban sprawl EU level: CAP, markets and international competition.

In the following sub-sections, we sketch different research approaches to this landscape in order to highlight similarities and differences on how each approach explains landscape changes differently (Table 1): (a) an analysis of historical landscape change (Case A, placed in the upper-left corner of Figure 1.1, using historical maps and remote sensing data, official statistics and oral histories), (b) an investigation of decision-making processes (Case B, lower-left, based on agent-based modelling), (c) public awareness raising (Case C, lower-left, building on workshops with local stakeholders), (d) evaluation of landscape services (Case D, lower-left, using PPGIS data of local residents), and (e) provision of policy support (Case E, upper-right, using stakeholder input and expert analysis). The data are taken from published (Bürgi et al., in press; Zagaria et al., in press; submitted; Garcia-Martin et al., in press; Kizos et al., in press) and unpublished material from the European research project HERCULES (with some input from the European research project VOLANTE).

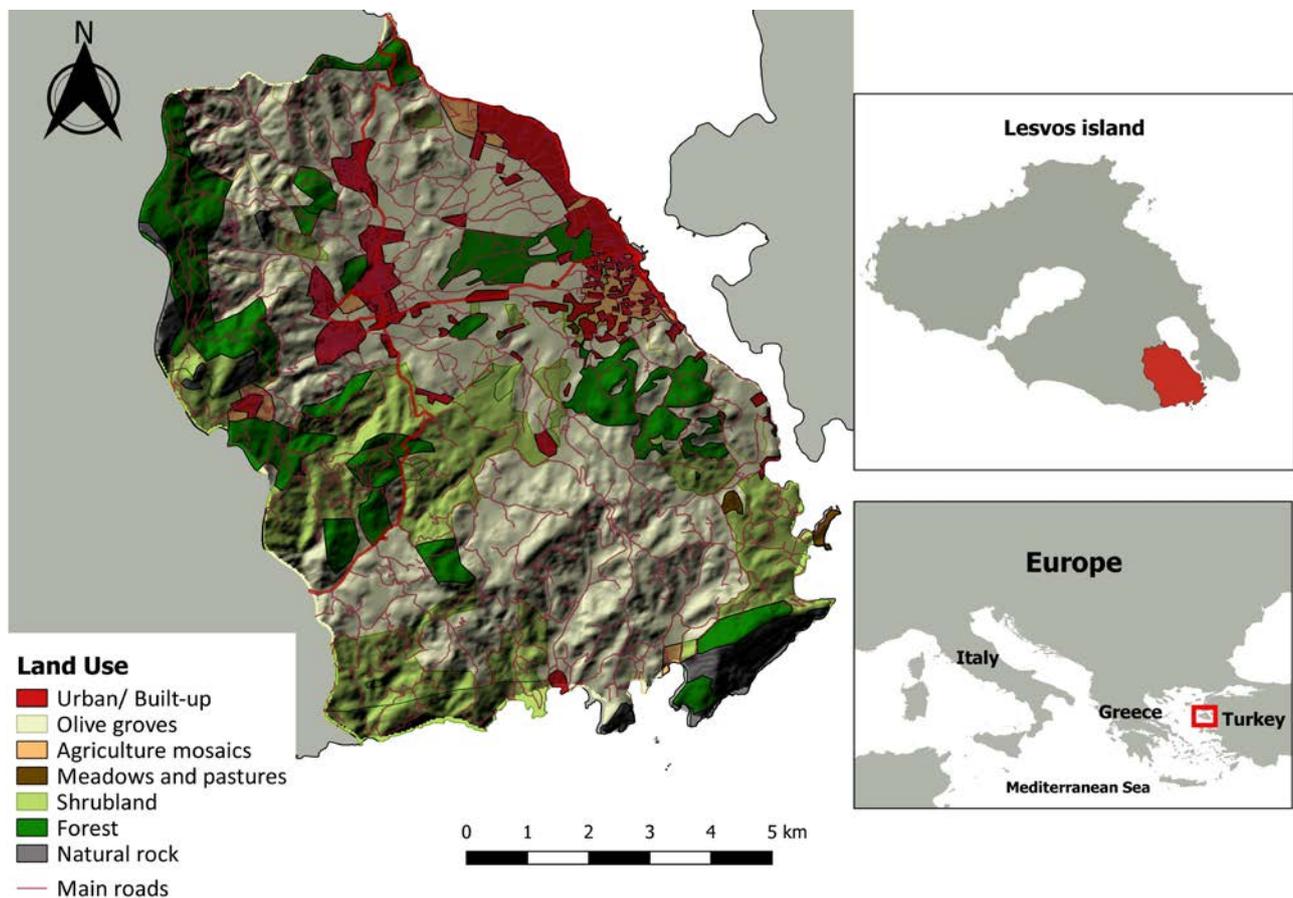


Figure 1.2: Location of the Gera study area on Lesvos island, Greece

1.4.1 Historical landscape change (Case A)

The analysis of historical landscape change asked (Bürigi et al., in press): How did the landscape change (if at all)? What were the dominant processes and the temporal trends? What driving forces were responsible for the changes and processes observed? The data sources used were historical maps and remote sensing data, along with official statistics and interviews with aged local informers (long-term residents, old enough to have first-hand memories of land use and landscape change in the past 50 years) and information from secondary literature for a timeline from the 1950s until the 2010s.

The analysis indicates that between 1960 and 2012, there was a dynamic relationship between olive plantations and forest areas, as olive groves were abandoned and converted to forest (though, in the analysis, it was not always easy to distinguish between forests, wooded grasslands, shrubs and olive plantations), but at the same time some abandoned fields that had previously turned to forest areas were cleared and converted into olive plantations again, albeit at a slower rate. Other processes, such as the conversion of olive plantations into urban areas were of much less importance. Consequently, the proportion covered by olive plantations decreased from 67.8% to 60.8% and wooded grassland and shrubs increased from 7.6% to 12.8% of total land cover. Evaluation of official statistics pointed to some reasons, such as population decline, ageing and decreasing numbers of farms. The oral histories agreed with a “declining” view of olive cultivation, with stories of hard labour in the past and a more “alive” landscape back then.

This case is already pluralistic methodologically, as the driving forces were determined by experts using the DF-C model (placing it into the upper-left corner in Figure 1.1), but they were also verified partially by local residents through the oral histories which fall under the DFA-C model (so partially at least it is also placed in the lower-left corner in Figure 1.1). The crosstabulated findings reveal that the driving forces are to some extent international, such as low price levels for olive oil and the decline of the position of Lesvos as a formerly regional industrial centre for olive and soap industries that served international markets. National driving forces include the (reported) lack of efficient policies, but also the Greek implementation of the Common Agricultural Policy (CAP) after the 1980s, and the (reported) lack of infrastructure investments. Greatest relevance, however, had driving forces at the local level, such as the unwillingness of young people to engage professionally with olive cultivation even in the current economic crisis, preferring “educational advancement” and moving away from the farming profession altogether. Structural limitations, such as the labour-intensive terraces and the limited accessibility due to the rugged terrain, made olive farming even less attractive.

1.4.2 Decision-making processes (Case B)

For decision-making processes that change the landscape at the local level, an agent-based modelling approach was used (Zagaria et al., in press; submitted), aiming to gain insights on landscape changes, their

underlying causes and their enabling and emergent driving forces at multiple scales, operationalizing the A-C model (lower-left corner in Figure 1.1). An agent-based model was built to delineate future alternatives of landscape continuity and change, assisting decision and policy making. The model was based on data of farmland characteristics, past and present management regimes, farmers' decision making behaviours and their future prospects (individual and sectoral) acquired from 100 interviews with land managers and farmers in the area.

Based on the collected data, three main farmer groups were identified: the active part-timer (composed primarily of farmers with multiple income activities from a wide range of sources, with extensive agricultural knowledge and largely motivated to keep farming as one of their occupations and as part of their family tradition), the professional (mostly full-time farmers, educated with extensive agricultural knowledge) and the detached farmer (the predominant type in the area, with part-time engagement in agriculture, less educated and with lower "cultural drive" to stay in cultivation), all with quite distinct rationales for their behaviours and different management decisions and in consequence different landscape outcomes.

Taking into account these differences and land value, farmland characteristics and different prospects of every farmer group for the next 10 years, a model simulated the landscape changes likely to occur from these decision-making options under three different scenarios, a) business as usual, b) agricultural liberalization and c) tourism and heritage conservation. Results indicate that the continuation of olive cultivation in Gera is highly dependent on the number of newcomer and successor farmers (as the existing farmers' population is aged), but the preservation of the landscape and management practices that conserve it are also linked with the appreciation of the landscape for its cultural values as well as for production of olive oil. Local initiatives towards more "sustainable" practices seem to favour such an approach. At the same time, the results show a polarization between professionals and detached farmers, indicating continuation of land abandonment. Only a combination of macro-drivers that support higher profitability on one hand and local initiatives on the other hand seems able to reverse land abandonment trends in an upcoming period of 25 years and sustain local farming population. This combination is not very far from the findings of the historical change approach, but here the focus is on local initiatives rather than national ones and on the farmers and landowners. The historical change analysis fails to encompass the internal diversity of the actors of landscape change and the widely diverging trajectories that their different behaviours lead to; while the agent based modelling approach does not account for the national context of policies and other factors that have influenced landscape change in the past.

1.4.3 Understanding stakeholder perspectives and awareness raising (Case C)

To illustrate approaches related to landscape stewardship, we organized a series of local workshops to elicit stakeholders' perceptions of landscape change and values at local levels (Kizos et al., in press). Although we

did not consider any particular model from the beginning, DFA-C and A-C ones were used in the end to make sense of the results (placing thus this approach in the lower-left part in Figure 1.1). Landscape values are process and context-dependent, without claim to objectivity, and formed through a structured process of communication, participation, social learning and negotiation. The approach used a “scientific”, an “applied” and a “humanistic” angle to describe how landscapes are regarded by different stakeholders. Three workshops took place: First, an introductory scoping workshop was arranged, aiming to reveal the landscape issues important for local stakeholders. Participants were openly invited to discuss the changes that they perceive in the landscape, identify different sets of values and discuss and present ideas and practices to manage these values. In the second workshop, the ideas emerging from the first one were further developed, including the principles of a plan to manage olives. In the third workshop, the plan was discussed again along with concrete policies and local initiatives that are necessary for it to become reality. Another purpose of performing the workshops was to witness interactions between the different stakeholders and gain insights on the social capital in the area and its role in driving landscape change.

The findings of the process reveal that stakeholders perceive the abandonment of olives as negative and express the need to preserve traditional management and cultural practices. In particular, they wish to integrate the many layers of heritage in the cultural landscape of the area and also traditional knowledge along with “expert” knowledge on management and new technologies. A major obstacle to actual actions is a widespread lack of trust to institutions and cooperation in general, although stakeholders recognize that cooperation is necessary and indeed the only way forward. International forces are also recognized, but given less importance than local and national ones.

1.4.4 Evaluation of landscape values (Case D)

Landscape values are becoming central in landscape management and planning, in particular the issue of how landscapes are evaluated by different groups of landscape “users” (Fagerholm et al., 2012). We captured local opinions regarding preferences, perceptions, feelings and values assigned to the landscape by its residents, using an A-C model, as the participants were asked to describe landscape changes and evaluate them, but not the corresponding driving forces (placing this approach into the lower-left part of Figure 1.1). To this end, a public participation GIS approach was designed via a web-based questionnaire with predefined location-based and non-location related questions (Garcia-Martin et al., in press). The questionnaire included sections of personal information, socio-economic background, habits and the locations and/or localities of these habits, places of appreciation and inspiration, the respondent’s relationship to the area and land uses for 170 respondents in a representative sample in terms of age, gender and residence location.

The findings from this approach reveal the aesthetic, spiritual and cultural linkages of the locals with their landscape: not surprisingly, in the Gera case, the sea plays a major role in these appreciations, being

perceived as the most attractive place for recreation, leisure time activities and aesthetic value. The villages are also major centres for free time and sociocultural activities and highly appreciated as such, while cultivated land and “natural areas” are more used and appreciated for provisioning services and less for cultural ones, highlighting the fact that people spend most of their time working in “nature” and do not appreciate it in different ways than non-locals and urban residents. Concerning landscape changes, abandonment was recognized as important in many locations around the area and urban growth in the coastal zone, while the intensification of some fields in the coastal plain was also mentioned. The importance of the sea was confirmed by asking locals, who described that even before the emergence of tourism, all households of the five non coastal villages moved collectively to the coast for the summer months. These preferences were “hidden” by the rest of the research approaches used.

1.4.5 Policy support (Case E)

The driving forces of the changes of the landscapes of Lesvos were analysed at the national and island levels with the use of experts. The approach involves critical synthesis and meta-analysis of driving forces at national and international levels as a necessary step in conceptualizing local level case studies in larger scales. The final objective was to study and identify driving forces of landscape change at multiple scales, highlight the most prominent driving forces of landscape change and understand how they interrelate across scales, with an DF-A-C approach, as the most important actors were also recognized (placed in the upper-right corner of Figure 1.1). The approach included a thorough survey of the literature (scientific articles, national reports and records from other sources) on issues affecting landscape change, focused mainly at revealing the impacts of existing national and EU level policies on the Greek landscape by looking at common policies, directives and regulations. At the national and regional scales, during a workshop with policy formulation and implementation-related stakeholders (that operate at different levels of management, organization and administration) the implementation of national and European policies and the identification of direct and indirect impacts to the landscape of Lesvos was discussed, including participatory conceptual mapping approaches.

Overall, the multiscale analysis identified key driving forces operating at multiple scales. At the local scale the most prominent are demography, aging population, social unattractiveness of farming, low profits and lack of adequate infrastructure such as roads. At the national scale, the most prominent were existing incentives for rural and tourism development and the fragmented laws and regulations, leading to unplanned urban sprawl at the expense of rural or forested land. At the EU level, policies are the key drivers of change that are tightly interconnected with more local-level drivers. Support of the Common Agricultural Policy is very important, given the strong dependency of farmers (one of the key actor groups recognized) to subsidies, and therefore closely related to their low profits and thus to the social unattractiveness of the

sector. But, this reasoning does not provide a cause-effect relationship with landscape change, in fact it could be argued that in the absence of the CAP, abandonment would be far greater and despite all its shortcomings, the CAP actually helped in preserving a farming community in the area. This was missed by the participants and in our minds clearly reflects one shortcoming of how stakeholders tend to react when confronted to establish cause-effect relationships of drivers and changes (or no changes) in the landscape. Other “international” forces, including markets and international competition, have been identified as key drivers as well for abandonment and landscape change. Participants in the workshops and researchers stressed the existence of a gap regarding the comprehensive assessment of implications of EU policies and their cause-effect relationship across scales.

1.5 Discussion

In this paper, we characterize the diversity of methods to study the driving forces of landscape change, sketching how different approaches are related to spatial scales, epistemological aims and conceptual models but also comparing these approaches for a particular case study. Our approach was not designed from the beginning to perform all these approaches deliberately. But, as different research questions were set (all related to driving forces, actors and changes of the particular landscape) and methodologies designed to address them, we realized that we were slowly covering different conceptual models, providing thus multiple angles to discuss conflicts and complementarities arising from this comparison of methods, actors, driving forces and results (landscape changes). Although not all conceptual models are discussed in the same detail and not all possible methods were employed, we believe that the multiplicity of our approaches and their comparability (after all they refer to the same landscape for similar time periods), allows for an analysis of conflicts and complementarities in the methods and can provide a valuable guide of the benefits and the dangers of doing monothematic or poly-thematic landscape change research.

On the issue of complementarity, the very definitions of the different models suggest that some of these work better together with others (Hersperger et al., 2010 also discuss this point). DF-C approaches seem to work well with DF-A-C approaches, as they appear to provide the exploration and the generation of assumptions (in DF-C models) that can then lead to the understanding of causal chains of actors and changes with particular driving forces and the identification of specific combinations of driving forces and actors that lead to change (in DF-A-C models). In the same vein, A-C models in theory work well with DFA-C models, as interactions among actors of land change, and actors’ behavior and decision making that (may) result to land change (in A-C models) can act as the basis for identifying interactions among actors and drivers of land change and provide the key to policy analysis and intervention (in DFA-C models). These are not the only possible combinations though, as the scale of the approach may determine complementarities or conflicts.

In our case studies, our findings suggest high degree of complementarity for the identification of the changes from a variety of viewpoints and analysis tools. Even if our landscape has not changed too much over the past decades (compared to other “hot-spots” in Europe, Kuemmerle et al., 2016) and these changes have been rather gradual. This is related to the type of changes (abandonment of the dominant livelihood, farming, which was not replaced though by another economic activity that would leave its marks on the landscape) and the type of landscape, since olive plantations are a typical “land use legacy” (Plieninger et al., 2011). But even here, the selection of slightly different sets of actors (e.g. farmers, non-farmer residents, younger-older residents, culturally driven land managers, administrators) has yielded different prioritization of the driving forces of these changes. The historical analysis (DF-C model, Case A) failed to encompass the internal diversity of “actors” that was revealed by the agent-based approach (A-C model, Case B) and which was proven very important for understanding small scale dynamics and processes of change. At the same time, the agent-based approach does not account for the national context of changes in the detail that it should, as it is based on what the “agents” themselves say and, as it is proven by the rest of the opinions of stakeholders (in A-C model, Case C), very often these seem to be “blind” to obvious facts and drivers when they need to establish cause-effect relationships of drivers and changes in the landscape. Another issue that was brought forward is related with the values of the landscape and its changes, which are captured directly by the PPGIS approach (Case D) and indirectly by the stewardship approach (Case C) and almost completely ignored by all other approaches. The role of the sea and how highly this is valued, may be the key of understanding the dynamics and the drivers behind some changes that would be inexplicable by the other approaches, especially concerning the coastal zone.

On the issue of scale, our results were mostly for the case study level. Nevertheless, the issue of upscaling the results of the agent based (Case B, A-C model), the PPGIS (Case D) and the stewardship approaches (Case C) proved to be very difficult. Some of these findings are case study specific, but some the results might well be related to some proxy variables, which then would allow to transfer some of the locally gained insights (e.g. regarding the importance of distance to the sea also for local inhabitants) to other regions in a meaningful way. Vaclavic et al (2016) have developed a method to investigate the transferability of case study findings based on similarity of locations as determined based on spatial data. However, many of the case study specificities are not easily represented in spatial data, limiting the potential of using this approach.

For driving forces, there were no real conflicts as well and indeed an approach that can link more than one of these models can provide deeper understanding of the inherent complexities of dealing with landscape changes. A major difference between the models is the role that they provide to the “voice” of stakeholders and actors of landscape change. While this role is indirect and deducted by the analysis of quantitative data in the models that seek to describe the changes and then use “experts” or “past knowledge” to understand these changes, others focus more on what the actors say about these changes. Of course these are not contradicting, but rather complementary approaches. Most of the researchers tend not to think about the

underlying model they are using, but just start from the available data or preferred/familiar approaches, without much thinking about the implications. The examples offered here demonstrate that this is rather restricting for the breadth and the validity of the results derived.

1.6 Conclusions

Landscape studies are evolving fast. The need to move from a “one case study and one research method approach” to performing cross-site analyses has been suggested for more than a decade now and has been slowly been taken up, as the rise of the meta-studies of the case study literature suggest. Although this seems to be a step in the right direction for understanding in more depth the inherent complexities involved, it does not touch another issue that we believe is important and has been discussed in this paper: the need for a plurality of research approaches. The empirical material from different models of conceptualizing who change a landscape and why it changes reveals some important issues.

The first of these issues is related to the different understandings of the same changes, even for a landscape where the identification of actors involved was relatively straightforward and the changes rather limited and slow. The different approaches were partly redundant, partly complementary, but it was also clear that each one could not cover all the issues raised as important from the other approaches. From a more pragmatic view: can we afford to be as pluralistic as in this paper and adopt different questions and methods for the same landscape? We believe that plurality is important and helpful, but at the same time we realize that this may be far from contemporary research practice. Although we cannot answer which is the best approach, we would like to stress the necessary linkages between the different “corners” of Figure 1.1 and call for greater plurality in landscape research to understanding the full complexity of landscape change, considering cross-scale relations, different levels of application, different time periods etc. This plurality is also helpful for contextualizing the input provided by one approach. The issue of the validity of what stakeholders say and consider as important seems to be a good example for this point. Another issue is the validity of land cover / use data in the light of the stakeholders consider as “change” and even more importantly how they value this change. Here the plurality suggested may indeed provide a key to go deeper than first appearances.

The analysis provides a number of trajectories of combinations, “blueprints” for doing landscape change research at different spatial scales, i.e. guidance in the selection of approaches. One that derives from our cases combines DF-C models (e.g.) historical analyses that can provide historical “depth” and deal with “hidden” and not very well understood locally drivers (in a parallel larger scale approach with DF-A-C or DF-C models) and an analysis of the decision making process (A-C models) that would enable first to understand local decision making and actor diversity and then to “confront” local stakeholders – actors in a second phase of the project with the results of the historical analyses. Complementing the decision making analysis with more information on the consequences for landscape change (in a DFA-C model) could lead to

stewardship options and local action - response. Such an approach would move from the upper to the lower parts of Figure 1.1. The opposite trajectory –from the lower to the higher parts of Figure 1.1- could also prove useful for an analysis of upscaling A-C local stakeholder decision making and valuation of landscape processes into understanding casual links of DF-A-C models and planning policies at regional, national and supra national levels.

Part 2: Priority questions for the science, policy and practice of cultural landscapes in Europe

2.1 Introduction

In many cultural landscapes, in particular those with multiple landowners and multiple jurisdictions, governance is conducted through collaborative frameworks, and decisions and implementations are taken through complex processes among multiple organizations (Goldsmith and Eggers 2004; Borrini-Feyerabend et al. 2007; García-Martín et al. 2016). There is a web of multi-organizational, multi-governmental and multi-sectorial relationships that characterize such networks. In many places, establishing and implementing policies relies increasingly on partnerships, shared decision-making and wielding influence rather than on power of single actors (Mitchell et al. 2009). The design of effective responses to safeguard cultural landscapes values in Europe needs therefore collaborative action of the stakeholders involved from landscape research and governance to practice.

European policies are increasingly considering integrated approaches to landscape management (Stenseke 2016). Moreover, the European Landscape Convention (ELC) aims to correct the lack of integrated perception of landscapes as a unique mosaic of cultural, natural and geological features and to establish a better public and policy-maker awareness to devise a suitable protection for these features throughout Europe. However, although the ELC can be regarded as having amply promoted these targets (European Council 2006), a joint agenda between scientists, land users and politicians is still missing (Conrad et al. 2011).

In the last decade, there have been increasing concerns about the importance of scientific evidence underpinning management and policy decisions related to the conservation of natural resources (Sutherland et al. 2004; Cooke et al. 2010). Several barriers limiting the implementation and adoption of science-based policies in nature conservation have been identified.

On the one hand, scientific research activities are often not focused on issues of relevance to decision-makers (Pullin et al. 2004; Pullin and Knight 2005; Cooke et al. 2010). On the other hand, practitioners and policy-makers are often insufficiently motivated to commit resources to gathering scientific information (Fazey et al. 2005; Braunisch et al. 2012).

To solve these issues and promote a multidirectional information flow, a series of studies identifying priority research questions of relevance to decision-makers has been conducted. In 2006, Sutherland et al. (2006), facilitated the first of several participatory exercises to identify priority research questions, opportunities for developing new policies and emerging issues in biological conservation. All the exercises had a common structure but individual differences. Those in which priority

questions were identified are known as “the 100 questions exercises”. The standard method used involves soliciting questions from a large sample of stakeholders and then using a group of experts to condense and coalesce the questions submitted, to yield a list of 100 questions (Cooke et al. 2010; Sutherland et al. 2011; Braunisch et al. 2012).

To date, in the ecological field, several such exercises have been completed at country levels (Sutherland et al. 2006, 2011; Cooke et al. 2010; Fleishman et al. 2011; Rudd 2011; Braunisch et al. 2012), and three with a global focus (Sutherland et al. 2009; Sutherland et al. 2013; Pretty et al. 2010). Exercises in other parts of the world such as in Australia (Morton et al. 2009), the European Alps (Walzer et al. 2013) and Israel (Kark et al. 2016) have also been carried out. The exercises conducted to date have had a rather broad focus and have included themes such as exploitation, forestry, fisheries, agriculture, food systems, urban development and ecosystem services (Cooke et al. 2010). Priority question exercises have also been proven useful in other policy areas outside conservation (Sutherland et al. 2011).

To date no exercise of this type has been performed on cultural landscapes, although several horizon scanning studies are available. In 1999, scientists from all over Europe, set out new directions for cultural landscape development providing perspectives for a sustainable future and priorities for the next century (Vos and Meeke 1999). Wu and Hobbs (2002) determined the key issues and research priorities in landscape ecology and the challenges and identified new directions for conserving cultural landscapes at a global scale. As a reflective exercise, the journal *Landscape and Urban Planning* dedicated its volume 100 to identifying challenges in landscape research (Gobster 2011). One year later, ten tenets and six questions for the landscape urbanism were interpreted and analysed by Thompson (2012). At European level, the most recent horizon scanning exercise identified findings from six important areas of landscape research, discussing how these findings may advance the study of ecosystem change and society (Plieninger et al. 2015).

According to different studies, the current challenge is to better connect landscape science to landscape policy and action (Opdam et al. 2001; Wu and Hobbs 2002; Termorshuizen and Opdam 2009; Gobster 2011; Swaffield 2012). To address this challenge, landscape research can identify options for recoupling social and ecological subsystems, both at the practitioner and policy level (Plieninger et al. 2015). Therefore, the aim of this paper is to identify research priority questions for landscapes in Europe as a way to outline future research directions and strengthen the needed ties between academics, policy-makers, managers and practitioners (Rudd 2011; Sutherland and Freckleton 2012; Kark et al. 2016). This priority setting exercise can support the implementation of the European Landscape Convention in channelling their capacities and resources towards questions that need to be urgently addressed to facilitate significant progress in the sustainable management of cultural landscapes in Europe.

2.2 Methods

For the aim of our study, we considered three stakeholder groups: scientists, policy makers and practitioners. Ranking the importance that each group conferred to each question was important to identify common priorities. Therefore, to avoid the difficulties of ranking questions without biasing the formulation process (Sutherland et al. 2006, 2009, 2011; Pretty et al. 2010), we adapted the two-step method implemented by Braunisch et al. (2012).

2.2.1 Development of the questionnaire

In April 2016, an initial workshop with 10 landscape experts took place. The aim of the workshop was to define the framing criteria for the formulation of the questions. Based on the criteria of Sutherland et al. (2011), three principles were agreed as the most relevant for the formulation of our questions: i) the questions should be answerable through a realistic research design, ii) they should have a realistic spatial and temporal scope which could be addressed by a research team and iii) they should not be answerable by yes or no. During this first workshop, the most relevant areas of knowledge concerning cultural landscapes in Europe were also identified by literature review and group discussion. During a second workshop, a group of 21 experts from 13 different European universities, non-governmental organization (NGOs), companies and research institutes performed the first formulation of questions testing the framing criteria and the proposed categories explained below.

To address the concerns that a group of experts cannot be reasonably expected to collect the most important questions for landscapes (Braunisch et al. 2012), the participants canvassed their professional networks giving them the opportunity to supplement the list. They arranged workshops, seminars and direct interviews with other colleagues, experts of landscapes in Europe at their corresponding institutions. A total of 27 external experts belonging to nine European research institutes and universities were consulted.

In the next phase, the questions were transferred to a database for further refinement through a two-step revision process with the research team. During the first phase we analysed the consistency of the questions with the framing criteria and the defined categories. In the second step, the questions were reworded and re-categorized through conceptual clustering (Boubacar and Niu 2014). At this stage we tried to achieve a compromise by framing the questions so that they were sufficiently general to be applicable to a broad range of landscapes concerns but also specific to the European context (Sutherland et al. 2011; Braunisch et al. 2012).

The questions were synthesized into a questionnaire using Google Forms and was firstly tested by the research team. This platform allows developing easy accessible personalized surveys, inviting several participants at the same time, handling big amount of responses and exporting the results in

formats suitable for further analysis. The survey structured in eight interconnected sections corresponding to the following categories identified by the expert group:

Category 1. Landscape justice

Questions of power relations and environmental justice have not been exhaustively considered in European landscape research, and stronger consideration of, for example, social stratification, control of labour and access to land remains a desideratum (Widgren 2012). The challenge is to tackle injustice relating to the inter-connected social, cultural, economic and environmental benefits and burdens, goods, services and agencies arising from landscape. The refugee crisis is a tangible proof that both the origins and consequences of landscape injustice are far-reaching, providing new agendas for landscape research (Jorgensen 2016).

Category 2. Co-creation of knowledge

Co-production of knowledge is becoming increasingly important in landscape related decisions. Landscapes are closely linked to actors and their land use practices (Bieling et al. 2013). Therefore, the knowledge of laypersons must be taken into consideration in landscape related decisions (Hernández-Morcillo et al. 2014). Knowledge of the actors is also a precondition for sketching future landscape developments, especially for accommodating new land uses, e.g., wind turbines or photovoltaic plants, in landscapes (Dû-Blayo 2011). However, although public participation is referred to in numerous texts concerning landscape management, including the European Landscape Convention, it still remains a challenge (Conrad et al. 2011).

Category 3. Landscape change (scales and drivers)

The interwoven linkages between people and landscapes raise the issue of investigating the processes that change them, the actors involved and the rates of change, both short and long term (Schneeberger et al. 2007). Five major types of driving forces that affect cultural landscapes have been distinguished: socioeconomic, political, technological, natural and cultural (Brandt et al. 1999; Bürgi et al. 2004). Among these drivers, there can be strong linkages, dependencies and feedback loops across several temporal and spatial levels and with different rates of change. Land abandonment and agricultural de-intensification is the most prominently driver of landscape change, affecting 65% of European landscapes at different rates (Plieninger et al. 2016). Most of these driving forces do not have an impact on landscapes directly but through actors (Hersperger et al. 2010; van Vliet et al. 2015).

Category 4. Landscape stewardship

The topic of landscape stewardship is currently emerging in the literature (Gobster 2011; Penker et al. 2013). A landscape stewardship approach is understood as an inclusive notion for all collaborative efforts toward landscape sustainability (Ode Sang and Tveit 2013). Landscape

stewardship can inform on the successful inter-sectorial coordination of activities, policies or investments and can further add a diversity of perspectives and ways of knowing, including local and traditional knowledge of landscapes and natural resources (Plieninger et al. 2015).

Category 5. Climate change

Cultural landscapes contain characteristics and features, both natural and human-made, that react to changes in climate which in turn affects their heritage values. Climate change trends and data can be extrapolated to identify potential vulnerabilities in cultural landscapes. With vulnerabilities identified, adaptation strategies can be developed to provide the tools managers need to plan for plausible climate scenarios that may present themselves incrementally or abruptly in the future (Young 2011).

Category 6. Landscape services and human well-being

Research on landscape values and meanings has shown that the relationship between ecosystem services and human well-being is a complex one (Raudsepp-Hearne et al. 2010). Categories and frameworks that explain the role of ecosystems in human well-being have been made by experts, but laypersons may have different understandings of a landscape's contributions to their well-being than experts (Bieling et al. 2014). The research reviewed has also pointed to the social complexities of ecosystem services, especially to the visible and invisible conflicts around them (Scholte et al. 2015).

Category 7. Creating, enhancing and protecting cultural values in landscapes

Landscapes exhibit diversified and interconnected types of values ranging, for instance, from intangible features such as spiritual values and outdoor recreation through water and climate regulation to the provision of food (Termorshuizen and Opdam 2009). Precise understanding of the complexity of assigning values to landscapes is important for decision-making on the protection or development of cultural landscapes. Ecosystem management has to expand its focus beyond the conservation of physical manifestations of values (Plieninger et al. 2015). It may be more relevant to foster possibilities for a broad and increasingly differentiated public to experience these sites and to acquire memories, meaning, values and knowledge, for instance, in the course of community walking initiatives or storytelling (Clark et al. 2003; Dobson 2011; Evans and Jones 2011).

Category 8. Landscape assessment tools

Despite the scarcity of global-scale land use intensity datasets new opportunities are arising to fill the existing data gaps and to derive new land assessment tools. Data availability is rapidly improving, and new algorithms and computer processing capacities allow for better use of these datasets (Kuemmerle et al. 2013). Frameworks, methods and modelling tools for assessing drivers, processes and actors of landscape change allow analysis of the in-depth dynamics of local and

regional socio-ecological systems. However, current challenges in landscape assessments tools still remain, for example: i) to organize the amount of (technical) resources in an accessible and transparent way, (ii) to enhance application and participation of the tools or iii) to integrate subjective valuations of landscapes.

2.2.2 Survey

In July 2016, the online questionnaire was shared following different strategies to reach the three stakeholders groups. We approached the scientific community via personalized emails to European landscape researchers and representatives of umbrella organizations such as the International Association of Landscape Ecology (IALE), the European Network of Universities for the Implementation of the European Landscape Convention (UNISCAPE), Landscape Research Group (LRG) and the Permanent European Conference for the Study of the Rural Landscape (PECSRL). In parallel, the community of local practitioners was reached through identified pre-existing list of integrated landscape initiatives (García-Martín et al. 2016). Policy-makers were targeted through databases of the European Landowners' Organization (ELO).

The survey was designed to avoid double responses. To classify the stakeholder group, we asked the participants to specify their role (scientist, policy-maker or practitioner) depending on the time and character of the activity they dedicate to cultural landscapes. This distinction was important for the statistical analysis of priorities and correlations between stakeholder groups. In each category of topics, participants were invited to select the three questions most important for them in their daily work. Finally, we gave the opportunity to contribute with additional questions not included in the questionnaire.

2.2.3 Data analysis

The received responses were firstly validated, eliminating those that did not submit the complete questionnaire or selected more or less than three questions per category. The validated responses were converted into a binary response matrix and exported to MATLAB R2014b programme to be analysed with the statistical toolbox. To enable comparison of the obtained replies, we normalized the responses between -1 for the less selected questions to 1 for the most preferred questions. Then the results were evaluated as follows: first, we calculated the mean and the standard deviation of normalized votes per question and stakeholder group. Then we calculated the ranks for each stakeholder group, the total rank of the mean values and the total rank of the standard deviation. To evaluate the relationship between practitioners', policy-makers' and scientists' priorities, we performed pairwise Pearson's correlation analyses between the three groups for all the questions and within each category.

2.3. Results

2.3.1. Questionnaire

The first process of collection within the expert group workshop resulted in 122 research questions. The second process canvassing the respective working networks of the expert group finished one month later, in May 2016, with 255 research questions. In the first filtering process a total of 72 questions did not fulfil the framing criteria, 27 were reworded and 9 were re-categorized. After the second filtering round, we obtained the 65 questions which entailed the final questionnaire (Table 2.1).

Table 2.1: List of final questions which formed part of the questionnaire

Categories	Question
C 1. Landscape justice	Q1. How to set up a range of indicators in order to help landscape planners to improve landscape justice (e.g. landscape access, land market and social equality)?
	Q2. What is the role of different interest groups (e.g. ethnicity, class, gender, age, language and education) in the appreciation, shaping and preservation of cultural landscapes?
	Q3. What barriers exist to access cultural landscapes? To what degree is access to public landscape goods and services class dependent?
	Q4. How can landscapes contribute to improve safety?
	Q5. What are the impacts of the economic crisis on cultural landscapes?
	Q6. What are the environmental side effects (tele-connections) of cultural landscape preservation on other areas, especially those outside Europe?
	Q7. How can we manage conflicts of interest to advance landscape justice?
C 2. Co-creation of knowledge	Q8. How to foster public participation and exchange of knowledge via online communities for landscape assessment and management?
	Q9. What are the different understandings of the human-nature relationship that drive diverging landscape values?
	Q10. How to use traditional ecological knowledge in cultural landscape management?
	Q11. To what extent do cultural landscapes contribute to building an European identity?
	Q12. How to strengthen the links between people and cultural landscapes?
	Q13. What threats and opportunities do people perceive around cultural landscapes?
C3. Landscape change (scale and drivers)	Q14. What are the effects of land abandonment on European landscapes?
	Q15. What are the spill-over effects of protected areas on their surrounding landscape?
	Q16. How much can a landscape change before people lose their bound to it?
	Q17. What are the drivers, rates, and spatial hotspots of cultural landscape change?
	Q18. How can landscape changes be predicted, to better adapt to and mitigate their effects?
	Q19. How are cultural landscapes impacted by the globalization and competition for land?
	Q20. How can we develop solutions that fit the local context but still fulfil large-scale needs?

Categories	Question
	Q21. How should we cope with abandoned lands (preservation versus redevelopment)?
	Q22. What are the factors that make some landscapes more resilient than others?
	Q23. How are drivers of change interconnected at different scales?
C 4. Landscape stewardship	Q24. How to maintain different landscape values through integrated landscape management?
	Q25. How to manage controversial forms of heritage in landscapes (e.g. industrial heritage)?
	Q26. What are the impacts of ceasing public support programmes on cultural landscapes?
	Q27. How to design and implement landscape indicators of good governance?
	Q28. How would a European landscape strategy affect the landscape at a regional/local level?
	Q29. What motivates people to become active stewards of the landscape?
	Q30. What is the potential of local products certification for cultural landscape management?
	Q31. What institutional settings are required to steward cultural landscapes in Europe?
	Q32. How can conflicts between European policies affecting landscapes be addressed?
	Q33. How to improve the bankability of cultural landscapes?
C 5. Climate change	Q34. To what degree can nature-based solutions mitigate climate change effects in landscapes?
	Q35. What is the effect of climate change on cultural landscapes?
	Q36. How do changes in energy provision and demand affect cultural landscapes?
	Q37. To what extent are cultural landscapes threatened by climate policies?
	Q38. How do cultural landscapes contribute to climate change mitigation and adaptation?
C 6. Landscape services and human well-being	Q39. How do cultural landscapes contribute to public health?
	Q40. How can we manage landscapes to maximize beneficial effects on human well-being?
	Q41. How can landscape maintenance be financed through the health benefits of a well-managed landscape?
	Q42. What makes an area of land valuable for its inhabitants?
	Q43. What are the effects of changing population structure on cultural landscapes of Europe?
	Q44. How do emerging demands for ecosystem services shape cultural landscapes?
	Q45. How to harmonise local demands for services with national, European and global demands?
	Q46. To what degree are landscape ecosystem services perceived by different stakeholders to contribute to human well-being in different parts of Europe?
Q47. What is the role of cultural landscapes for the preservation of endangered species?	
C 7. Creating, enhancing and protecting cultural values in landscapes	Q48. How dynamic are the cultural values that people ascribe to landscapes over time?
	Q49. How much overlap exists between biological and cultural values in European landscapes?
	Q50. What is the potential of citizen science and media to elicit cultural landscape values?
	Q51. How do younger European generations value cultural landscapes?

Categories	Question
	Q52. How do changing lifestyles affect cultural landscapes?
	Q53. How does rewilding affect landscape values?
	Q54. How can landscape managers participate in the benefits of landscape valorisation through the tourism and recreation industry?
	Q55. How can aesthetic experiences of landscapes be enhanced through new technologies?
	Q56. How to secure a sustainable cultural landscape where it is not economically profitable?
	Q57. What are the impacts of Genetically Modified Organisms on cultural landscape values?
	C 8. Landscape assessment tools
Q59. How to assess the effects of new legislation, technology, societal trends etc. on landscape as an early warning system?	
Q60. To what extent are regionally protected foodstuffs a good indicator for landscape value?	
Q61. How can we integrate subjective and objective perspectives on landscape valuation?	
Q62. How to create a data-driven, meaningful map of European landscape types that is aware of land management, landscape structures, land-use history and landscape values?	
Q63. How effective and complementary are different approaches to assess landscape values?	
Q64. How to foster public participation into cultural landscape assessments?	
Q65. Which methods are able to identify the tele-connected drivers of landscape change?	

2.3.2 Participation to the survey

A total of 509 European governmental organizations, NGOs, companies, landowners, universities and research institutes working directly on landscape management at local, national and European scale were directly invited to the self-administered online survey. Between June and July 2016, we obtained 170 replies from which 46 declared themselves as practitioners (27.1%), 18 as policy-makers (10.6%) and 106 as scientists (62.3%). The response rate falls among those of related studies (e.g. Rosenberg et al. 2010; Rudd 2011, Braunisch et al. 2012), which obtained 53%, 42% and 33% return rates, respectively. (33.5%) and is within the range of what can be expected from a web survey (Kaplowitz et al. 2004). Besides, it can be considered an acceptable result taking into account that the survey required time and specific knowledge about cultural landscapes in Europe and that it was distributed only in English language and for a reduced period of time during the holiday season.

Despite the attempt to maintain a balanced representation of the three stakeholder groups, scientists had the highest participation rate. Universities and research centres across Europe represented 41.2% of those organizations at which respondents were based. The respondents were located in 17 different European countries, with Germany (11.1%) and The Netherlands (10.6%) being the most

frequent ones. A total of 34 responses were found defaulted (20%) so that a final sample of 77% of the scientists, 78% of the policy-makers and 79% of the initial practitioners remained.

2.3.3 Data analysis

Scientists, policy-makers and practitioners' priorities differed across questions and categories. In Table 2.2, the normalized mean of votes with the corresponding ranking per question and stakeholder group is displayed, highlighting the top ten important questions for each group. Within category 7 (creating, enhancing and protecting cultural values in landscapes) we found the overall most important question (Q56). How to secure sustainable cultural landscapes where they are not economically profitable was as well ranked as the first priority question for policy-makers (PM) and the third for practitioners (P), but only rank 14 for scientists (S). (Q56 – RMean: 1, RankP: 3, RankPM: 1, RankS: 14).

Three of the questions ranked within the overall top ten (Q19 – RankMean: 2, Q20 – RankMean: 7, Q22 – RankMean: 6) belonged to category 3 (landscape change). Better knowledge about the impacts of globalization and land competition on cultural landscapes was considered the second most important question in the total ranking (Q19 – RankMean: 2) and was also very highly ranked by policy-makers and practitioners (RankP: 4, RankPM: 2, RankS: 17). Question 7 about the management of conflicts of interest to advance landscape justice was the only question that ranked among the top ten priority questions for all stakeholders' groups.

Priorities of each group were distributed unevenly across all categories except in category 5 (climate change) where none of the questions were found within the top ten most relevant for any group. The most important question for practitioners was how to create data-driven and meaningful maps of European landscape types (Q62 – RankP: 1). Policy makers' main interest coincide with the most important question of the total rank (Q56) while scientists' top priority (Q22) related to finding the factors that make some landscapes more resilient than others.

After evaluating the standards deviation rank, we observed the similarity of stakeholders' priorities across categories. Category 2 (co-creation of knowledge) and category 5 (climate change) had in average the highest agreement among the three groups while category 1 (landscape justice) and 6 (landscape services and human well-being) were the categories with most diverging priorities.

Two of the least interesting questions were found within category 8 (landscape assessments tools) (Q60, Q65). Distal drivers of landscape change (Q65 – RankMean: 60) and the use of regionally protected foodstuffs as an indicator for landscape value (Q60– RankMean: 65) were among the questions with the lowest amount of votes from the three groups.

Table 2.2: Normalized numbers of votes per question (N=65) and stakeholder group (-1= not important, 0=neutral, 1=important question). (QID= Identification number of each question, MeanS= Mean of normalized number of votes of scientists, MeanPM= Mean of normalized number of votes of policy-makers and MeanP= Mean of normalized number of votes of practitioners, TotalMean= Mean of normalized number of votes per question, SD= Standard Deviation of the normalized mean of votes, RankS- RankPM- RankP = Ranks of each variable per stakeholder group). Highlighted cells indicate the top ten most important questions for each stakeholder group.

Category	QID	Mean S	Mean PM	Mean P	Total Mean	SD	Rank S	Rank PM	Rank P	Rank Mean	Rank SD
C1. Landscape justice	1	-0.06	-0.11	0.22	0.02	0.18	33	46	14	29	41
	2	0.63	0.08	0.63	0.45	0.32	5	24	5	5	58
	3	0.09	-0.21	-0.36	-0.16	0.23	25	53	61	47	49
	4	-0.63	-0.30	-0.53	-0.49	0.17	62	61	65	64	37
	5	-0.52	0.27	-0.12	-0.12	0.40	60	5	41	41	62
	6	-0.14	-0.11	-0.30	-0.18	0.10	40	47	60	49	12
	7	0.63	0.27	0.46	0.45	0.18	4	4	7	4	39
C2. Co-creation of knowledge	8	-0.57	-0.29	-0.26	-0.37	0.17	61	60	55	59	38
	9	0.31	0.00	0.09	0.13	0.16	19	32	20	18	31
	10	-0.08	0.19	-0.15	-0.01	0.18	34	12	42	32	40
	11	-0.50	-0.48	-0.44	-0.47	0.03	58	65	64	63	3
	12	0.50	0.19	0.32	0.34	0.15	9	11	9	10	29
	13	0.31	0.38	0.32	0.34	0.04	18	3	10	9	4
C3. Landscape change (scale and drivers)	14	-0.34	-0.25	-0.11	-0.23	0.11	53	56	38	57	16
	15	-0.34	-0.15	0.06	-0.14	0.20	52	50	21	44	42
	16	-0.11	-0.35	-0.23	-0.23	0.12	38	64	50	56	17
	17	-0.11	0.13	0.01	0.01	0.12	35	20	23	30	18
	18	-0.41	0.04	-0.23	-0.20	0.23	56	28	51	52	48
	19	0.31	0.52	0.64	0.49	0.17	17	2	4	2	36
	20	0.70	0.13	0.47	0.43	0.28	3	18	6	7	53
	21	-0.30	-0.06	-0.23	-0.19	0.12	49	40	52	51	19
	22	0.93	0.23	0.18	0.45	0.42	1	7	16	6	64
	23	-0.11	-0.15	-0.28	-0.18	0.09	37	52	56	50	11
C4. Landscape stewardship	24	0.50	0.13	0.76	0.47	0.31	7	17	2	3	57
	25	-0.15	-0.15	0.01	-0.10	0.09	42	51	24	39	9
	26	-0.37	0.04	-0.28	-0.21	0.22	54	29	57	55	45
	27	-0.15	0.04	0.18	0.02	0.16	41	26	17	28	33
	28	-0.11	-0.06	-0.05	-0.07	0.03	36	38	34	38	1
	29	0.43	0.04	-0.05	0.14	0.26	12	27	35	16	51
	30	-0.34	-0.06	-0.23	-0.21	0.14	50	41	53	53	25
	31	0.20	0.13	-0.05	0.09	0.13	20	22	36	22	21
	32	0.47	-0.06	0.01	0.14	0.29	10	36	25	15	54
	33	-0.34	-0.06	-0.23	-0.21	0.14	51	42	54	54	26
C5. Climate change	34	-0.25	-0.12	-0.16	-0.18	0.07	47	48	43	48	7
	35	-0.02	0.17	0.24	0.13	0.14	32	13	11	17	24
	36	0.02	0.17	-0.05	0.05	0.11	29	14	32	26	15

Category	QID	Mean S	Mean PM	Mean P	Total Mean	SD	Rank S	Rank PM	Rank P	Rank Mean	Rank SD
	37	-0.25	-0.31	-0.22	-0.26	0.04	48	62	49	58	5
	38	0.02	-0.02	-0.05	-0.02	0.03	30	34	33	33	2
C6. Landscape services and human well-being	39	-0.24	0.19	-0.06	-0.04	0.22	45	9	37	35	46
	40	-0.13	0.10	-0.17	-0.07	0.14	39	23	45	37	28
	41	-0.47	0.19	-0.17	-0.15	0.33	57	10	46	46	60
	42	0.18	0.00	0.12	0.10	0.09	21	31	18	21	10
	43	0.33	-0.10	0.12	0.12	0.21	15	45	19	20	44
	44	0.06	-0.10	0.23	0.07	0.16	26	44	12	24	34
	45	0.33	-0.29	-0.17	-0.04	0.33	16	59	47	36	59
	46	0.10	0.00	0.00	0.03	0.06	24	33	29	27	6
	47	-0.20	0.00	0.23	0.01	0.22	43	30	13	31	47
C7. Creating, enhancing and protecting cultural values in landscapes	48	0.50	-0.06	-0.28	0.05	0.41	8	43	58	25	63
	49	0.12	0.23	0.01	0.12	0.11	23	8	26	19	14
	50	0.01	-0.25	-0.11	-0.12	0.13	31	57	39	40	20
	51	0.43	0.13	0.41	0.32	0.16	11	19	8	11	35
	52	0.58	0.13	0.01	0.24	0.30	6	21	27	13	56
	53	-0.22	-0.06	-0.11	-0.13	0.08	44	39	40	42	8
	54	-0.37	-0.06	0.01	-0.14	0.20	55	37	28	45	43
	55	-0.64	-0.35	-0.17	-0.39	0.24	63	63	44	61	50
	56	0.39	0.52	0.70	0.54	0.16	14	1	3	1	30
	57	-0.72	-0.25	-0.28	-0.42	0.26	64	58	59	62	52
C8. Landscape assessments tools	58	-0.25	0.05	-0.20	-0.13	0.16	46	25	48	43	32
	59	0.02	0.24	-0.02	0.08	0.14	28	6	30	23	27
	60	-0.82	-0.24	-0.43	-0.50	0.30	65	55	63	65	55
	61	0.78	-0.05	-0.02	0.24	0.47	2	35	31	14	65
	62	0.13	0.14	0.79	0.36	0.38	22	15	1	8	61
	63	0.06	-0.14	0.04	-0.02	0.11	27	49	22	34	13
	64	0.40	0.14	0.21	0.25	0.13	13	16	15	12	22
	65	-0.52	-0.24	-0.37	-0.38	0.14	59	54	62	60	23

2.3.4 Correlation analysis

Correlations between stakeholder groups

Significant positive correlations ($p < 0.001$) of the priority values given to all question were found among the three groups of respondents (see Figure 2.1). The correlation between policy makers and practitioners' responses was the highest ($r=0.64$). The priorities expressed by practitioners and scientists were also correlated ($r=0.61$). The lowest correlation ($r=0.49$) was found between policy-makers and scientists.

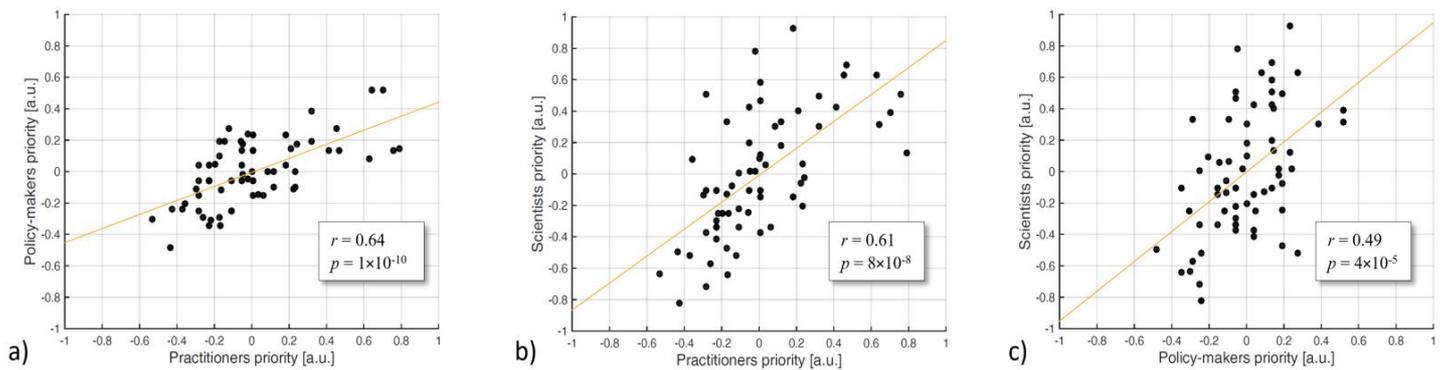


Figure 2.1: Pairwise stakeholder groups correlations of the normalized numbers of votes per question (N=65) (-1=unimportant, 0=neutral, +1=important). a) Correlation between policy-makers and practitioners, b) Correlation between scientists and practitioners, c) Correlation between scientists and policy-makers.

Stakeholder group correlations within categories

To further examine the stakeholders' connections per thematic area, we analysed the correlation coefficients of each pairwise correlation across categories. In Figure 2.2a the correlation coefficient values for each paired group in each category (N=8) are shown. The graph reveals that almost all categories had positive pairwise correlations. Especially, category 2 (co-creation of knowledge) showed the highest positive correlations between practitioners and policy makers and practitioners and scientists.

The highest correlation between policy makers and scientists was found in category 5 (climate change). In category 7 (cultural values of landscapes) practitioners and policy makers' responses were highly correlated.

A unique exception was found in category 6 corresponding to "landscape services and human well-being" where a highly negative correlation between scientists and policy-makers' priorities was found. Within this category the question 45 corresponding to how to harmonize local ecosystem services demands with national, European and global demands, obtained the most opposite responses from policy-makers (MeanPM=-0.29) versus scientists (MeanS=0.33). In Figure 2.2.b the negative correlation between scientists and policy-makers in category 6 (landscape services) is displayed.

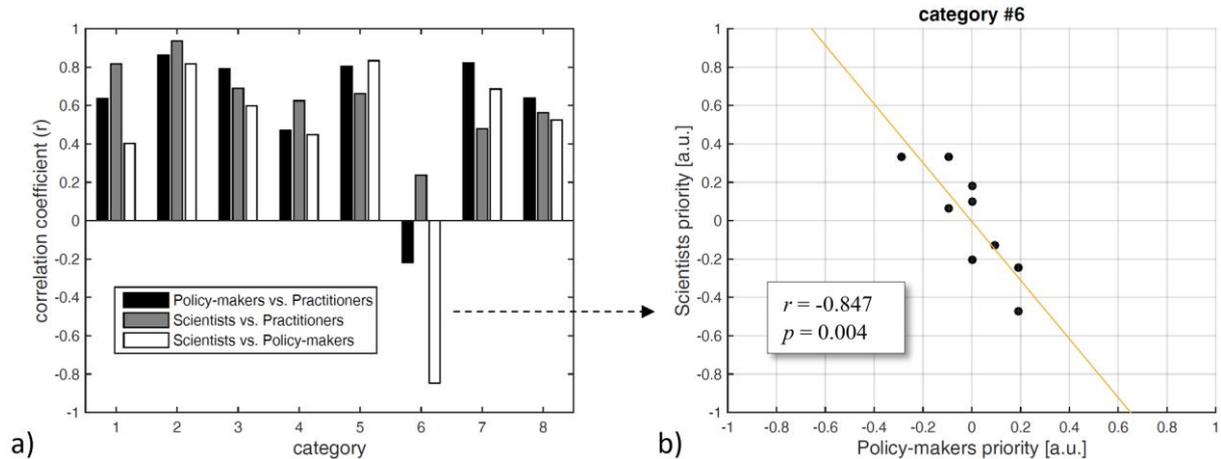


Figure 2.2: a) Pairwise correlation coefficients per categories (Policy-makers vs. Practitioners, Scientists vs. Practitioners, Scientists vs. Policy-makers). b) Capture of the negative correlation between policy-makers and scientists in category 6 (landscape services).

2.3.5 Additional questions

The respondents had the opportunity to comment and to propose additional questions that were not included in the questionnaire. We received a total of 28 questions. Some of the subsidiary questions were similar to the ones of the questionnaire. After revision, 10 questions were considered redundant and the remaining questions were classified as follow.

Table 2.3: List of the additional questions provided by the respondents and sorted by categories.

Category	Additional questions
C1. Landscape justice	What influence do social exclusion, poverty and discrimination have on cultural landscape management?
	How can we develop guidance for managers and policy makers on ethical decision making in the context of landscape?
	What are the effects of the unequal distribution of landownership on the European landscape, and on the interests of the majority of its inhabitants?
C4. Landscape stewardship	How can Euro-centric landscape research be designed to maximize insights that are generalizable to also address non-European landscape questions?
	How could research on (European) landscapes foster the development of local, national or European policies for the preservation and development of green infrastructure?
	How should public policy be structured in order to foster landscape as a central vehicle of sustainable development?
	How can proper landscape management buffer and reduce landscape pressures throughout sub-urbanization and agglomeration tendencies in Europe and shifting developments in rural areas?

Category	Additional questions
	What effects would a tax on the value of land have? What are the conditions (governance modes, knowledge, financing, legislation) to create new cultural landscapes?
C6. Landscape services	Which are the links between landscape functions and ecosystem services? What are the contributions of cultural landscapes to conservation, enhancement and creation of European green infrastructure? How can the use of the landscape services concept foster collaboration in landscape stewardship?
C7. Creating, enhancing and protecting cultural values in landscapes	How does the psychology of space influence human beings in their perception of cultural landscapes? Would teaching environmental conservation in schools make a difference in the future for valuing cultural landscapes? How to educate landowners about the meaning of natural values on their property and motivate them for their protection?
C8. Landscape assessments tools	How can systematic tools like Strategic Environmental Assessment meaningfully address landscape and cultural heritage? In what ways can the delineation of long-term coupled human-natural systems inform contemporary cultural landscape studies? What will be the place of fundamental landscape research about the historical and prehistorical developments of our cultural landscapes?

2.4 Discussion

Landscape ecologists have sought to forge strong relationships between academic and non-academic scientists; among researchers, practitioners, and policymakers; and between theory and application. To respond to this challenge, a new way of communication and collaboration between researchers, politicians and practitioners is needed (Knight et al. 2008; Roux et al. 2006). This requires improving the flow of information from applied research outcomes towards policy-makers and practitioners (Pullin et al. 2004), and directing applied research towards the research gaps and needs identified by the practitioners themselves (Knight et al. 2008; Roux et al. 2006; Sutherland et al. 2006; Braunisch et al. 2012). Priority questions exercises as the one presented here seem to be a sensible way to advance a collaborative cultural landscape agenda in Europe by identifying those areas where different societal groups have similar or diverging priorities. Especially these differences are a starting point for further discussion and joint learning.

The two-step methodology adapted from Braunisch et al. (2012) to be applicable to different stakeholders' groups has proven to be appropriate for the aim of this study. The soliciting questions process and the generation of the questionnaire was detached from the rating; hence the formulation of the questions was not affected by the necessity to rank them (Sutherland et al, 2006, 2011; Braunisch et al. 2012). We obtained relevant information about: i) the most important thematic areas and questions around cultural landscapes in Europe, ii) the priority questions for practitioners, policy-makers and scientists, and iii) the level of agreement in prioritisation among the three stakeholders groups. The analysis of this information allows us to unite the interests of landscape researchers, politicians and land managers through a set of priority questions which could serve as a first step for a joint research-action agenda.

2.4.1 Caveats

Questionnaire

The overall process of soliciting and managing the questions was done in collaboration with different scientific groups. At this stage, we aimed for a balance between maintaining the meaning of the original questions and rewording them. Besides, we tried to find a compromise between too general and too specific questions while maintaining the context of cultural landscapes in Europe. Finally, although the questionnaire was designed to choose only one main activity as scientist, practitioner or policy maker, the self-categorisation into one group did not fit the professional activities of some respondents. Eight participants reported to work at the interface between science and policy (3 respondents), practice and science (3 respondents) and practice and policy (2 respondents).

Potentials and limits of ranking

Most of the previous priority questions exercises avoided ranking the importance of the questions because according to the authors the process of rating would increase the pressure to create broad questions and would probably be biased towards the specific interest of the respondent (Sutherland et al. 2006, 2011). However, rankings after publication of the lists of questions are being conducted and used for testing differences in priority within and among sectors (Sutherland 2011). The additional identification of priorities could be helpful for the generation of regional research agendas and decisions on the allocation of funding (Braunisch et al. 2012).

2.4.2 Further implementation

From priority questions to joint action

Overall, scientists, practitioners and policy-makers' priorities about cultural landscapes in Europe are positively correlated. This could indicate that already existing landscape joint-research initiatives such as the ELC, IALE, UNISCAPE or PECSRL would have had a cohesive effect. Topics of high convergence such as climate change impacts on cultural landscapes show best chances for successful science-policy-practice collaborations.

Though, our exercise pointed to a certain gap between the interests of scientists and policy-makers working with cultural landscapes. A significant disagreement between them appeared in the thematic area of "landscape services", which could be related to scale differences, as one possible explanation. Policy-makers were interested in the local impact of cultural landscapes on public health and the potential monetary benefits derived to continue managing sustainable landscapes. In contrast, scientists were interested in the accommodation of landscape services at European scale. Fields of disagreement and diverging perspectives and priorities could indicate to areas where future joint research-action activities should be directed to. The difference perspectives on landscape services, could indicate the field where new insights and joint knowledge creation needs to emerge.

Practitioners into science-policy interfaces

Science-policy platforms have been largely reinforced in the last decades but implementation of science based policies still remain challenging. By decisively including practitioners into science-policy interfaces more effective responses to safeguard cultural landscape values could emerge. Practitioners are fundamental actors in the definition of a common research-action agenda since they provide the direct connection to the real problems of cultural landscape management in Europe.

In the present exercise, practitioner priorities overlap considerably with those from policy-makers and researchers in our study. This could be due to the recent "social turn" in landscape studies that many research projects involve landowners and other stakeholders in their studies and there is a two-way street opened: research-action and evidence based management. Although a next step is still needed to go beyond participatory research with practitioners to a collaborative co-creation of knowledge.

2.5 Conclusions

Communication channels between landscape researchers and politicians need to be reinforced. Policy-research partnerships support a synergistic relationship between policy actions and knowledge building, each benefiting from advances in the other (Mayer et al. 2016). Priority questions exercises like the one presented here have the potential to promote discussion and could

have an impact on agenda setting for science and policy priorities. However, previous studies have shown that it is unclear whether this translates into specific research and policy outcomes (Lane 2010; Sutherland et al. 2011). To ensure such translation, existing mechanisms to enhance collaborations could be used such as the “Coordination Action of a Joint Programming Initiative (JPI) on Cultural Heritage” or the European Horizon 2020 Research Programme. Such a mechanism can connect the critical mass of research teams working on cultural heritage at European level and could promote a common agenda to be implemented in transnational activities.

Co-creation of knowledge and enhancing collaborations in cultural landscape management seems to be already a common priority for all the stakeholders involved. This signal suggests that research programmes or funding mechanisms that stimulate co-creation of knowledge between scientists and practitioners could be received positively in both communities and might have a high chance of actually improving practical relevance of landscape research, as well as the scientific evidence base of landscape practices.

Acknowledgements

We especially thank the expert contributions received for the development of the questionnaire as well as the respondents to the survey for their time and suggestions.

Conclusion

This deliverable of work package 1 is comprised of two parts which strive for a common goal: to synthesize the knowledge gained from the project concerning drivers and outcomes of persistence and change in Europe's cultural landscapes. This synthesis between two fields of scientific research and practice – land use science and landscape ecology/ science – is very closely related to the research performed in HERCULES and here we have presented results and insights that seek to provide common links between the fields and also to prove useful in conceptualizing, planning and applying landscape research and at a second level also research policies. We feel that this is an important task for HERCULES, since it is expected from us to guide further research and linkages between scientific and research communities and also among researchers, practitioners and policy makers.

Landscape studies are evolving fast. We think that our research clearly demonstrates the need to move from a “one case study and one research method approach” to performing cross-site analyses with a plurality of research approaches. This can help in making sense of the different understandings of the same changes, even for a landscape where the identification of actors involved was relatively straightforward and the changes rather limited and slow. The different approaches were partly redundant, partly complementary, but it was also clear that each one could not cover all the issues raised as important from the other approaches. Although we cannot answer which is the best approach, we would like to stress the necessary linkages between the different “corners” of Figure 1.1 and call for greater plurality in landscape research to understanding the full complexity of landscape change, considering cross-scale relations, different levels of application, different time periods etc. This plurality is also helpful for contextualizing the input provided by one approach. The issue of the validity of what stakeholders say and consider as important seems to be a good example for this point. Another issue is the validity of land cover / use data in the light of the stakeholders consider as “change” and even more importantly how they value this change. Here the plurality suggested may indeed provide a key to go deeper than first appearances.

The analysis provides a number of trajectories of combinations, “blueprints” for doing landscape change research at different spatial scales, i.e. guidance in the selection of approaches. One that derives from our cases combines DF-C models (e.g.) historical analyses that can provide historical “depth” and deal with “hidden” and not very well understood locally drivers (in a parallel larger scale approach with DF-A-C or DF-C models) and an analysis of the decision making process (A-C models) that would enable first to understand local decision making and actor diversity and then to “confront” local stakeholders – actors in a second phase of the project with the results of the historical analyses. Complementing the decision making analysis with more information on the consequences for landscape change (in a DFA-C model) could lead to stewardship options and local action - response. Such an approach would move from the upper to the lower parts of Figure 1.1. The opposite trajectory –from the lower to the higher parts of Figure 1.1- could also

prove useful for an analysis of upscaling A-C local stakeholder decision making and valuation of landscape processes into understanding casual links of DF-A-C models and planning policies at regional, national and supra national levels.

In the second part of the deliverable, communication channels between landscape researchers and politicians need to be reinforced. Policy-research partnerships support a synergistic relationship between policy actions and knowledge building, each benefiting from advances in the other. Priority questions exercises like the one presented here have the potential to promote discussion and could have an impact on agenda setting for science and policy priorities. However, previous studies have shown that it is unclear whether this translates into specific research and policy outcomes. To ensure such translation, existing mechanisms to enhance collaborations could be used such as the “Coordination Action of a Joint Programming Initiative (JPI) on Cultural Heritage” or the European Horizon 2020 Research Programme. Such a mechanism can connect the critical mass of research teams working on cultural heritage at European level and could promote a common agenda to be implemented in transnational activities. Co-creation of knowledge and enhancing collaborations in cultural landscape management seems to be already a common priority for all the stakeholders involved. This signal suggests that research programmes or funding mechanisms that stimulate co-creation of knowledge between scientists and practitioners could be received positively in both communities and might have a high chance of actually improving practical relevance of landscape research, as well as the scientific evidence base of landscape practices.

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