Executive Summary:
The HERCULES project strived for the empowerment of public and private actors to protect, manage and plan for sustainable cultural landscapes at local, national and Pan-European scales. HERCULES had the goal to increase understanding of drivers, patterns and social-ecological values of European cultural landscapes and to use this knowledge to develop, test and demonstrate strategies for their protection, management and planning. Key research aims included to:
• Synthesise existing knowledge on the drivers, patterns and outcomes of persistence and change in European cultural landscapes
• Close knowledge gaps regarding the dynamics and social-ecological values of cultural landscapes
• Generate tools for landscape observation and modelling in order to understand values of and threats to cultural landscapes in Europe
• Develop a strong vision of pathways towards protecting heritage in cultural landscapes
• Provide policy makers and practitioners with a cutting-edge Knowledge Hub to guide decision-making for the benefit of cultural landscapes

HERCULES produced a broad range of outputs that were targeted to science, practice and policy around cultural landscapes:

- A meta-analytic database of literature and expert knowledge on cultural landscape transformation case studies identified gaps and case study selection bias to serve as resource for scientists and practice for comparative analyses. Well-documented case studies on the long- and short-term histories and change in cultural landscapes provided examples of local management and in-depth insight of dynamics and values of cultural landscapes. Through the development of novel technologies and datasets to better understand, manage and protect cultural landscape heritage, HERCULES provided a scientific base for SMEs, stakeholders and practitioners working in the area of cultural landscape management and conservation.

- Among others, a tested Spatial Data Infrastructure provided guidelines and examples to facilitate the integration of different information in case studies. A Pan-European heritage-sensitive cultural landscape typology, validated by citizen engagement through crowdsourcing, provided a novel baseline concept (and data/maps) to characterise cultural landscapes and heritage values. This enabled the targeting of policy interventions by improving the assessment of trade-offs (e.g. between ecosystem services). New modelling approaches to assess future landscape developments and policy impacts on cultural landscapes at case study and Pan-European levels allowed monitoring and identification of areas of rapid change and stability and a targeted selection and implementation of policies and instruments.

- A roadbook for the management of heritage values in landscape sensitive to diverse environmental and societal contexts improved the communication of heritage and other cultural landscape values. It informs stakeholders, policy makers and local landscape managers in their efforts to protect cultural landscapes.

- A community-based Knowledge Hub for heritage-related landscape practice provided a powerful communication tool, enabling strong collaboration between science, practice and other stakeholders. A series of tests and demonstrations of the developed tools in case studies provided insight for the empowerment of landscape stakeholders. Policy recommendations based on analysing the successes and failures of instruments across various levels and policy domains can be used as guiding principles for conceiving and implementing policies at the landscape level and for establishing a framework to evaluate policies that seek to preserve or manage cultural landscapes.

Project Context and Objectives:

CULTURAL LANDSCAPES AND THEIR VALUES

Cultural landscapes are at the interface of nature and society. They have been shaped and maintained by people and their activities over millennia and thus express a tight interplay of physical features of the human environment with social structures and human ideas. Emphasizing the cultural dimension of such coupled systems implies a holistic view, in which humans perceive and value the existence of landscapes and, at the same time, interact with them and even create them. With this, landscapes not only integrate the natural and the human realm, but are also at the nexus of material and immaterial, perception-based dimensions.
The European Landscape Convention has acknowledged that landscapes are of importance for individual and societal well-being, whether in urban or rural areas and in outstanding or everyday landscapes. In Europe, landscapes are largely recognised because of their cultural value as well as because of their contribution to people’s quality of life through the provision of ecosystem services (provisioning, regulating and cultural services) and nature’s benefits. Different types of landscapes provide different services. In addition to that, different parts of society value landscapes differently, and this complexity generates a multitude of scholarly and societal questions. Therefore, the assessment and mapping of landscape values is currently attracting attention both within academic and policy arenas.

THE IMPORTANCE OF CULTURAL LANDSCAPE CHANGE

Cultural landscapes have undergone fundamental changes, both today and in their history, and their spatial-temporal dynamics is a defining feature. Partly reflecting global trends, partly exhibiting regional particularities, multiple causes are influential in reshaping European cultural landscapes. Among the causes of landscape change are urbanization, agricultural intensification, land abandonment and forest expansion, international commerce and trade, new demands of land for nature conservation, and development of renewable energy uses. Depending on prevailing social-ecological conditions, these trends find strongly varying regional expression, exhibiting diverse directions and pace. The magnitude of these changes has given rise to concerns that landscape sustainability – the capacity of a landscape to consistently provide long-term, landscape-specific ecosystem services essential for maintaining and improving human well-being – is currently at risk. In many parts of Europe, traditional landscape practices have been gradually replaced by more standardized and mechanized land uses, which has frequently been accompanied by social and ecological tensions. A central tendency is the fundamental decoupling of the socio-cultural and ecological subsystems in cultural landscapes, often leading to the degradation of biodiversity and cultural heritage values and rendering the future of many of these landscapes highly uncertain.

The understanding of the reasons behind landscape changes has been at the centre of recent landscape research. Knowledge on the drivers, causes, processes and outcomes of cultural landscape change is becoming more important, as attention is moving away from traditional sectorial policies toward integrated “landscape approaches” in natural resources management. In the European context, this view has been reflected in the cross-sectoral approach of the European Landscape Convention that calls for the integration of protection, planning and management of landscapes. Since the turn of the millennium, the number of case studies on driving forces of landscape change in Europe has grown substantially. However, the understanding of the patterns and processes of cultural landscape changes remains poor, among other reasons due to the strong variation of existing case studies over disparate spatial and temporal scales and the current spread of landscape research across many domains and disciplines within the human, social and natural sciences.

PROTECTION AND MANAGEMENT OF CULTURAL LANDSCAPES

The protection and management of cultural landscapes have attracted broad attention from scientists, policy makers, and the general public because of the visibility, for instance, caused by the acknowledgement of cultural landscapes in the UNESCO World Heritage Convention. Over the past years, several initiatives have called for integrated landscape approaches to the management of natural resources. For example, the global Landscapes for People, Food, and Nature Initiative, co-organized by the United Nations Environment Programme, the United Nations Food and Agriculture Organisation and
The United Nations Environment Programme, the United Nations Food and Agriculture Organisation and other international organizations, seeks to address rural landscape management that integrates food production, biodiversity and ecosystem conservation, and rural livelihoods within supportive institutional and policy contexts. The Satoyama Initiative, launched at the Tenth Meeting of the Conference of the Parties (COP10) to the Convention on Biological Diversity in 2010, aims at fostering the management and sustainable use of biodiversity and ecosystem services in human-influenced landscapes, mainly through broader global recognition of the social-ecological values of these environments. The Protected Landscape Approach of the International Union for Conservation of Nature (IUCN), introduced in 2003, encompasses large-scale landscape mosaics from cultivated to wild lands that have been shaped and influenced by human interaction over time and acknowledges the critical links between nature, culture and community for long-term sustainability of conservation. All these initiatives intend to preserve the regional diversity and heritage of cultural landscapes and, at the same time, seek to identify pathways to a more sustainable future.

In parallel to these global-scale developments, there is a growing bottom-up movement among civil society throughout Europe that demands for local and eco-products; is interested in local traditional knowledge and culture as connected to landscapes; is concerned about the conservation of biodiversity; longs for unique touristic destinations; is willing to participate more actively in decisions affecting cultural landscapes; and (if living in cities) is aiming to start a new life in rural landscapes. These initiatives are an expression of the liaison of two overarching developments: (1) an increasing demand for high-quality amenity landscapes and (2) a general trend toward decentralized landscape planning and policy. This movement typically builds on collaboration among different sectors and actor groups at many levels. Such collaborative initiatives have been termed “integrated landscape initiatives” or “landscape stewardship initiatives”.

To cherish and provide a future for cultural landscapes, we must be an active part of them – we have a share in their diversity and singularity. But despite the growing recognition and efforts toward conservation of the unique values of cultural landscapes, substantial challenges have inhibited safeguarding them. Current obstacles to sustainable landscape development that HERCULES addressed are:

- The existing knowledge gaps on landscape drivers, patterns and outcomes of cultural landscape dynamics across spatial and temporal scales
- The lack of understanding of the added values of cultural landscapes
- The absence of tools to assess landscapes across scales
- A lack of visions to re-couple people to the historical-cultural structures, functions and values of landscapes
- The absence of support systems to assist cultural landscape management and policies from local to European scales

HERCULES OBJECTIVES

The HERCULES project strived for the empowerment of public and private actors to protect, manage and plan for sustainable cultural landscapes at local, national and Pan-European scales. HERCULES had the goal to increase understanding of drivers, patterns and social-ecological values of European cultural landscapes and to use this knowledge to develop, test and demonstrate strategies for their protection, management and planning.

Key research aims were to:

- Synthesise existing knowledge on the drivers, patterns and outcomes of persistence and change in European cultural landscapes
European cultural landscapes
- Close knowledge gaps regarding the dynamics and social-ecological values of cultural landscapes
- Generate tools for landscape observation and modelling in order to understand values of and threats to cultural landscapes in Europe
- Develop a strong vision of pathways towards protecting heritage in cultural landscapes
- Provide policy makers and practitioners with a cutting-edge Knowledge Hub to guide decision-making for the benefit of cultural landscapes

To fulfil these objectives, the project was divided into ten work packages:

Objectives of WP 1 – Pan-European systematic review and meta-analysis
- To define core concepts around cultural landscapes and set-up a comprehensive and interdisciplinary framework to ensure consistency throughout all WPs
- To develop an innovative systematic review protocol to identify and quantify drivers, patterns and outcomes of persistence and change in landscapes at multiple spatial scales
- To quantify where possible the rates and patterns of landscape change, determine the underlying and proximate drivers and outcomes (i.e. landscape functions and values) of cultural landscape change and persistence, and identify the actors responsible for and impacted by cultural landscape change, including their perceptions
- To categorise archetypical combinations of drivers and outcomes of landscape dynamics at multiple spatial scales and their relation to policy changes

Objectives of WP 2 – Studying long-term landscape change
- To define an innovative methodological procedure for understanding the long-term development and transformation of cultural landscapes, drawing on recent insights from landscape archaeology, geography and (historical) ecology
- To create and test an infrastructural facility for retrieving and linking archaeological, historical and ecological data and geo-information (SDI) to support the interdisciplinary study of landscape change
- To develop models for analysing long-term trends in landscape history in the case study sites

Objectives of WP 3 – Landscape-scale case studies (short-term history)
- To select five to six diverse, representative, and understudied cultural landscapes across Europe in an interactive selection process as a basis for local-scale fieldwork and stakeholder interaction
- To reconstruct the changes and dynamics these landscape have faced in recent history
- To assess the role of the main driving forces, policies and responsible actors for the developments found
- To perform comparative analyses, incorporating the case study findings within the different WPs

Objectives of WP 4 – Cultural landscapes typology and recent dynamics
- To develop a cultural landscapes typology in consideration of the insights gained from the systematic meta-analyses (WP 1) and case study analyses (WP 2, WP 3)
- To map the current distribution of cultural landscapes based on indicators pertaining to land management, landscape structure, land use history and cultural heritage
- To reconstruct recent dynamics in cultural landscape and to detect hotspots and coldspots of cultural landscape loss
Objectives of WP 5 – Fine- and broad-scale modelling of future landscapes

- To connect scenarios of change in main landscape drivers to the impacts on landscape structures in diverse cultural landscape types
- To investigate the development in societal demand for ecosystem services provided by cultural landscapes under alternating future socio-economic developments and rural-urban interactions
- To assess the influence of broad macro-scale trends on local decision-making of land owners and managers within cultural landscapes

Objectives of WP 6 – Visioning for re-coupling social and ecological landscape components

- To perform a European-scale survey on land use practices
- To assess strengths and weaknesses of landscape practices
- To compile a roadbook on best landscape practices
- To develop innovative measures and compilation and prioritisation of policy options

Objectives of WP 7 – Development and testing of a Knowledge Hub for Good Landscape Practice

- To design and implement a Knowledge Hub for Good Landscape Practice
- To ensure efficient collecting, archiving, using, sharing and distributing of data and project results
- To act as major toolkit for communication of HERCULES insights and at the same time provide the means for collecting feedback and input through crowdsourcing tools

Objectives of WP 8 – Implementation of good landscape practices on the ground

- To organise stakeholder participation and workshops in HERCULES at the level of the selected case study landscapes
- To create cohesive guidance for SMEs, associations of citizens, public authorities and agencies which help identify and empower traditional skills and knowledge on cultural landscapes
- To test and demonstrate the Knowledge Hub with landscape practitioners on the ground
- To perform on-the-ground training and demonstration activities framed around “cultural landscape days” organized with landscape users

Objectives of WP 9 – Design of recommendations for landscape policy and practice, communication and dissemination

- To set up a stakeholder engagement strategy and organise stakeholder meetings at EU level
- To elaborate a communication strategy to disseminate findings in a concise and reader-friendly way
- To create ad hoc communication tools (website, social networking tools) around the Knowledge Hub for Good Landscape Practice
- To design recommendations for landscape policy and practice at EU level
- To organise a Final Conference in Brussels

Objectives of WP 10 – Project management and coordination

- To ensure the effective financial, administrative and scientific management of the project and coordination of all project participants
- To oversee the overall progress and integration of research components and results
- To maintain an effective and transparent communication flow
- To liaise with the Commission, Advisory Board and other external parties
To liaise with the Commission, Advisory Board and other external parties

**Project Results:**

**OBJECTIVE:** TO SYNTHESISE EXISTING KNOWLEDGE ON THE DRIVERS, PATTERNS AND OUTCOMES OF PERSISTENCE AND CHANGE IN EUROPEAN CULTURAL LANDSCAPES

**CULTURAL LANDSCAPES FRAMEWORK**

Essential for the project in the beginning was to get to a common understanding of core concepts and frame the overall perspective on cultural landscapes. Therefore, HERCULES developed a cultural landscape framework – mapping problems, analysing cultural landscapes and finding a way forward. It was centred on the following key characteristics of cultural landscapes:

1. Landscapes are shaped by the connections and disconnections between people and their environment.
2. Landscapes exhibit important biophysical structures and land use intensities.
3. Landscapes have experienced long-term histories, which have left land use legacies that critically determine the functions and values of many contemporary landscapes.
4. Landscapes are undergoing change at different rates, with a multiplicity of driving forces, processes, actors and outcomes.
5. Landscapes entail broad and diverse sets of values and meanings for people.
6. Landscape governance can follow a preservation or a stewardship approach, with the latter becoming increasingly influential.

The framework proposed that six knowledge areas of landscape research contribute to the study of human-nature relationships at large, considering nested multiscale dynamics of social-ecological systems; the stewardship of these systems and their ecosystem services; and the relationships between ecosystem services, human well-being, wealth and poverty (Fig. 1):

1. Linkages between people and the environment in landscapes
2. Landscape structure and land-use intensity
3. Long-term landscape history
4. Driving forces, processes and actors of landscape change
5. Landscape values and meanings
6. Landscape stewardship

It is important to note that these areas are partly overlapping and interconnected, but each one has a particular research focus. The framework formed the basis for further analyses in HERCULES. For instance, the basic dimensions of landscape research that it had defined formed the fundament of the cultural landscapes typology that was developed in WP4.

Further reading:

Deliverable 1.1. Report describing the cultural landscapes framework developed, including a dictionary of terms.


**SYSTEMATIC REVIEWS, INCLUDING A SYSTEMATIC REVIEW PROTOCOL**

Cultural landscape changes have been examined in many case studies for different landscapes, land-use systems as well as socio-economic and environmental contexts throughout Europe. Despite profound conceptual and case study-level knowledge, however, a systematic synthesis of existing case studies was lacking that goes beyond exemplary descriptions and abstract typologies. To overcome this limitation, we
lacking that goes beyond exemplary descriptions and abstract typologies. To overcome this limitation, we performed systematic reviews of the main fields of landscape research in order to synthesize and build on existing knowledge.

In a first step, a systematic review protocol was developed to define the procedures for the reviews: They used both qualitative and quantitative techniques to identify commonalities across the large number of existing European case studies and scrutinised which factors cause different cases to behave differently. The reviews were based on searching scientific databases as well as the internet for real-world cases from Europe. Study selection followed a multi-level process and included a study quality assessment. Extracted data was synthesised through meta-analysis and qualitative review techniques. Based on this protocol, a review of the literature in three research fields was performed:

The driving forces of landscape change in Europe: This review provides a first systematic synthesis of 144 studies that identify the underlying drivers and proximate causes of landscape change across Europe. The review concludes that future research needs to comprise:

- An expansion of the scope of studies to include underrepresented countries, biogeographic regions and land-use systems and to also consider drivers of landscape stability
- An improvement of conceptual clarity with regard to the role and identification of actors vs. driving forces of landscape change
- The deployment of more robust tools and methods to quantitatively assess the causalities of landscape change, while maintaining the holistic character of landscape studies
- Long-term studies that go beyond the use of satellite imagery, considering diverse types of data on landscape change
- A strengthening of standardized cross-site and cross-country comparisons of landscape change drivers to foster generalizability of insights
- The design of multi-scale studies that consider distal relations between actors, drivers and patterns of landscape change
- Stronger consideration of subtle and/or novel processes of landscape change

Rates and patterns of landscape change: This review provides a systematic synthesis of 48 studies with 86 different landscape changes that were used to calculate change rates and magnitude of this change across Europe. The review concludes that:

- More approaches that relate individual changes with drivers or processes of change are required
- An expansion of the scope of studies to include underrepresented countries and processes of change would improve comparability and width of the available cases
- The performance of long-term and multi-scale studies that consider diverse types of data sources and other aspects of landscape change would improve conceptual, geographical and thematic aspects of landscape change

Integrated landscape initiatives in Europe: This review focuses on local initiatives that aim to sustain landscapes and the services they provide through landscape stewardship approaches. Very little was known about their situation in Europe. Overall, 338 initiatives all over Europe were invited to participate in a self-administrated online survey. The responses have been systematically analysed to characterize the initiatives in terms of patterns, gaps, challenges and potentials.

The review on integrated landscape initiatives highlighted policy oriented gaps and directions for intervention. These are the need to:

- Provide long-term and on-going financial support to integrated landscape management and simplify funding paths
funding paths

• Provide a flexible legal framework based on the knowledge and experiences generated by integrated landscape initiatives in order to protect the interests of collaboratively managed landscapes from conflicting interests

• Tackle the lack of enforcement of existing laws that contribute to an integrated and sensitive management of landscapes

• Devote more resources to educate and train society about the importance of the integrated and collaborative management of landscapes, and about the importance of individual daily activities for the protection of the values of landscape

HERCULES has complemented the three core reviews by four additional reviews of important dimensions of landscape change, values, and practices in Europe:

• Agricultural land use change (van Vliet et al. 2015)
• Traditional ecological knowledge (Hernández-Morcillo et al. 2014)
• Landscape preferences (van Zanten et al. 2014)
• Cultural ecosystem services and landscape management / planning (Plieninger et al. 2015)

Further reading:
Deliverable 1.2. Systematic review protocol.
Deliverable 1.3. Report on the three individual systematic reviews (rates and patterns, drivers and outcomes, actors).


CATEGORISATION OF DRIVERS, OUTCOMES AND ACTORS OF LANDSCAPE DYNAMICS

The synthesis between two fields of scientific research and practice – land use science and landscape ecology/ science – was an important task for HERCULES, since it contributed to guide further research and linkages between scientific and research communities and also among researchers, practitioners and policy makers. The results for synthesising the knowledge gained concerning drivers and outcomes of persistence and change in Europe’s cultural landscapes can be divided in two parts.

Characterisation of 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: The results of a comparison of different research approaches (analysis of historical landscape change, investigation of decision-making processes, public awareness raising, evaluation of landscape values, provision of policy support with data from published and unpublished material), all applied to the same HERCULES study landscape, demonstrate 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...
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. The synthesis stresses necessary linkages between different approaches and calls for greater plurality in landscape research to understand 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.

Reinforcement of communication channels between landscape researchers and politicians: Policy-research partnerships support a synergistic relationship between policy actions and knowledge building, each benefiting from advances in the other. Therefore, HERCULES defined common priority questions for the sustainable management of cultural landscapes in Europe with the aim to promote discussion and give novel input to agenda setting for science and policy priorities. The HERCULES agenda setting exercise identified the research question of how to secure sustainable cultural landscapes where they are not economically profitable any more as the most important one, with high agreement among respondents from science, practice and policy. Alignment among the three groups was generally high, being higher between practitioners-scientists and practitioners-policy-makers than between scientists and policy-makers. This exercise assists 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. Co-creation of knowledge and enhancing collaborations in cultural landscape management is 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 are 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.

Further reading:
Deliverable 1.4. Report on categorisation of drivers, outcomes and actors of landscape dynamics.

OBJECTIVE: TO CLOSE KNOWLEDGE GAPS REGARDING THE DYNAMICS AND SOCIAL-ECOLOGICAL VALUES OF CULTURAL LANDSCAPES

LIST AND DOCUMENTATION OF CASE STUDY LANDSCAPES SELECTED FOR HERCULES
As a project that specifically refers to landscapes, the case studies form a cornerstone for HERCULES. The case study selection resulted in the identification of study landscapes which span a variety of different characteristics (e.g. the major biogeographical zones of Europe), include both outstanding heritage features and everyday landscapes with more hidden historical layers, cover rural and urban areas and are all firmly embedded in the project via a local contact person who was member of the HERCULES consortium (Fig. 2):
• Voeramaa and Kodavere (Estonia)
• Vooremaa and Kodavere (Estonia)
• Lesvos (Greece)
• Obersimmental (Switzerland)
• Grand Parc Miribel Jonage (GPMJ), Rhône-Alpes area (France)
• Sierra de Guadarrama foothills (Spain)
• Parc Naturel Régional d’Armorique (France)
• South West Devon (United Kingdom)
• Dutch river delta Rhine-Meuse (The Netherlands)
• Uppland (Sweden)

As it turned out that some WPs have specific requirements in regard to access to stakeholders, availability of historical maps etc., the consortium decided to select a total of nine case study landscapes (rather than the originally planned five to six landscapes) that were investigated in different intensities.

A detailed profile for each area was created. All study landscapes were described regarding their exact location, basic environmental characteristics, history, current sociodemographic and economic as well as landscape characteristics. This was complemented by an orthophotograph, a topographic map and a land cover map (CORINE data) for each study landscape, available historical maps, practical information on contact details for local actors and, if applicable, additionally for the focus area/study municipality for in-depth and stakeholder interaction-related investigations.

The study landscape descriptions served not only as a reference for all specific tasks connected to the case studies, but as a starting point and common basis for developing a comparative view on European landscapes, e.g. by developing and testing hypotheses on specific drivers of landscape change.

Further reading:
Deliverable 3.1. List and documentation of case study landscapes selected for HERCULES.

COMPILED TIMELINES OF CULTURAL LANDSCAPE CHANGE FOR THE STUDY LANDSCAPES

HERCULES used a case study approach to reconstruct and assess the short-term past changes and dynamics of cultural landscapes. Within the chosen landscapes smaller scale study municipalities were distinguished in order to carry out a more detailed analysis. For each study municipality, timelines of cultural landscape change were compiled – based on land-use/land cover (LULC) change analysis of maps and aerial images since the mid-19th century (Fig. 3). Some individual conclusions for the compiled timelines of specific study municipalities were drawn:

Alatskivi and Peipsiääre (Vooremaa and Kodavere, Estonia): The most remarkable change has been the drying up of wetlands and overgrowth of forest. Former studies showed that landscape change occurs congruently with politic changes, yet it evens out over larger territories. The convex trends of built-up area, agriculture and grassland and shrubs of the 20th century seem realistic, although the processes of gaining more agricultural land and forsaking poorer soils should flat out the differences. Otherwise the characterisation of the landscape by massive forest and scattered villages has been quite stable.

Gera (Lesvos, Greece): The most remarkable change from 1960 to 2012 has been the decline of agriculture whereas grassland and shrubs, especially wooded grasslands and shrubs, have heavily expanded. Forests, built-up areas and the road network have been increasing as well. Processes of modernisation and tourist influx are likely to have had impact on the abandonment of agriculture, which in turn may negatively affect the tourism industry that is in search for traditional olive landscapes.

Lenk (Obersimmental, Switzerland): The most remarkable factors are missing agriculture and presence of bare land in the form of natural rock and glaciers. The most obvious change has been the decrease and
Bare land in the form of natural rock and glaciers. The most obvious change has been the decrease and fragmentation of grassland and shrubs replaced by forest mosaic. Small opposing trends are for wetlands by grassland and forest and water bodies by bare land, the former is decreasing and the latter is increasing. Bare land is slowly growing by area but the area of glaciers is melting away. Built-up area shows small increasing trend, especially since 1992.

Colmenar Viejo (Sierra de Guadarrama foothills, Spain): The most remarkable change is related to 1946, when agriculture was in large amounts substituted with grasslands and shrubs. The area for forest is only very slowly growing since 1946. The land for agricultural production has “moved around” the urban area. Additional drop in agricultural lands emerged since 2000. Built-up area spreads as it is situated NW from Madrid. Since 1988 quarries emerge in the eastern side as the western part of the municipality is a regional park. Urban area with grasslands and shrubs dominate today.

Börje (Uppland, Sweden): The changes to detect are only minor ones. The overall number of patches seems to be in small decline. Built-up areas demonstrate a small steady growth preserving probably scattered mosaic land use. When 1861 grasslands and shrubs formed quite a share in landscape, their area diminished during the 20th century and rises only slightly in the 21st century. Similar to agriculture, forest seems to be gaining bigger plots for the same area.

These compiled timelines of cultural landscape change served as a basis against which comparisons of other methods (e.g. oral history interviews, major events and driving forces analysis, public participatory GIS, terrestrial photos etc.) were performed to comprehensively analyse landscape change trajectories.

Further reading:
Deliverable 3.2: Compiled timelines of cultural landscape change for the study landscapes.

DRIVING FORCES AND ACTORS FACILITATING PERSISTENCE AND CHANGE IN CULTURAL LANDSCAPES
One of the goals of HERCULES was to reconstruct and assess the short-term changes and dynamics of cultural landscapes, using a case study approach. We analysed how landscapes changed in six HERCULES study municipalities (SM) since 1850, i.e. Colmenar Viejo (Spain), Lenk (Switzerland), Börje (Sweden), Plomari & Gera (Greece), Alatskivi & Peipsiääre (Estonia) and Mobdury (United Kingdom). Abandonment was the most important process across all SMs included, and it was especially dominant in the 20th century. Afforestation, deforestation, expansion of agriculture and intensification of agriculture were also widespread. Whereas afforestation shows an increasing trend, deforestation and expansion of agriculture show a moderate, and intensification of agriculture even a strongly decreasing trend.

The SMs differ greatly regarding their average rate of change, with the fastest SM (Colmenar Viejo) showing about seven times higher rates of change than the slowest SM (Mobdury). However, all SMs depict great temporal variability of change in the course of the study period. Overall, it is interesting to note that in no SM the latest periods were showing the highest rates of change, but that this period even included the least dynamic period in one SM (Lenk).

We also evaluated if certain factors seem to be especially suitable to cause change or persistence across the different SMs. Infrastructural developments, (macro-) economic shifts and crises and increasing population numbers seem to have the potential to trigger massive landscape changes. However, the specific context determines if and how such developments have an impact on the landscape. An economic crises triggering emigration, such as in the case of Lenk 1876 to 1914, might well lead to agricultural abandonment, which however in the case of pastures in harsh alpine environment might not immediately lead to forest expansion. Abandonment due to the conversion of a community structure from (subsistence)
lead to forest expansion. Abandonment due to the conversion of a community structure from (subsistence) farming into commercial and industrial activities might however trigger rapid changes. Such changes can be largely facilitated by infrastructural developments, enabling easy commuting to nearby centres. Our study reflects the diversity and complexity of landscape change processes across Europe. The number of case studies does not allow to draw general conclusions, but enables to formulate further hypotheses for research and feedback to the local communities regarding their specific development.

Further reading:
Deliverable 3.3 Report on driving forces and actors facilitating persistence and change in cultural landscapes.

SUMMARY OF FACTORS FOSTERING RESILIENCE OF CULTURAL LANDSCapes
For insights into the causes of landscape change, information about resilience and impeding and stabilising factors hindering or slowing down landscape change is crucial. Studying landscape persistence, limiting factors, constraints to change and resilient behaviour of landscapes therefore deserves the same attention as analysing landscape change. We combined insights provided from four different angles, which all reveal specific aspects of resilient behaviour of cultural landscapes:

Map analyses of stabilising drivers: We found the most stable periods within the HERCULES SMs (for Colmenar Viejo in the period 1946-1971, and for Lenk during the periods 1876 to 1914 and 1992-2013) to be caused by three completely different sets of driving forces, i.e. stability with a declining share of the growing local population being actively involved in land management, stability due to an economic crises, and lately stability due to legal and political measures aiming and slowing down the rates of change. For studies analysing the driving forces of non-change however, stating causal relations, i.e. determining the driving forces of stability, seems to be tedious and can only be overcome by multi-source analyses and a solid conceptual background to determine at least plausible reasons for periods of stability in landscapes.

Map analyses of persistence: Our analyses allow to easily compare rates of change between different study regions and land-cover classes and to interpret them also as the reverse, i.e. the persistence of the different land-cover classes. The results are heavily influenced by the land-cover classification applied, as visible in the case of melting glaciers in the SM Lenk or the high dynamics in the SM Colmenar Viejo that were largely caused by a massive change from arable land into grasslands and shrubs. To better measure the persistence of a landscape, a persistence index was developed for numerical expression and comparison of persistence. The index is a novel way to synthesise the dynamics of landscapes in a single number. The higher this number is, the less dynamic, i.e. the more persistent a landscape is. Measuring the persistence of our study landscapes, one could conclude that Modbury and Lenk are the two most persistent ones, while Alatskivi/Peipsiääre and Colmenar Viejo are the least persistent ones.

Study on Public Participation GIS (PPGIS): A comparison of perceived versus actual landscape change processes shows that local residents are in general aware of landscape dynamics. However, not all types of change processes are acknowledged in a similar way. As our results from different study landscapes showed, people are well aware of the expansion of urban areas and traffic infrastructure as well upcoming new land uses and even stress these processes more than hectare-wise change rates would suggest. At the same time, other processes, particularly the abandonment of agriculture and even more afforestation are realised to a much lower degree. These specific perception patterns need to be taken into account in the course of landscape management, because they explain motivations for engaging in certain types of landscape stewardship actions, while providing little support for others.
landscape stewardship actions, while providing little support for others.

Conceptual perspective on resilience in High Nature Value (HNV) landscapes: We used a conceptual perspective of social-ecological resilience and High Nature Value (HNV) landscapes to refocus the attention of actors at the policy and management level on critical properties and variables of cultural landscapes, which is a prerequisite for formulating successful strategies to maintain cultural landscapes and their inherent values. In this conceptual contribution, we considered the following social-ecological system properties and components and their integration into cultural landscape management: (1) coupling of social and ecological systems, (2) key variables, (3) adaptive cycles, (4) regime shifts, (5) cascading effects, (6) ecosystem stewardship and collaboration, (7) social capital, and (8) traditional ecological knowledge. The contribution argues that previous landscape conservation efforts have focused too much on static, isolated, and mono-sectoral conservation strategies, and that stimulation of resilience and adaptation is essential for guiding cultural landscapes through rapid change.

The four different approaches revealed different aspects of persistence and stability in cultural landscapes, ranging from novel landscape metrics measuring persistence as visible in time series of (historical) maps, to perceived stability and change as visible in PPGIS studies. The differences between the approaches and results raise interesting questions, e.g. whether landscape planning and management of cultural landscape should consider more the mapped and measured or the perceived and memory-based aspects of persistence.

Further reading:
Deliverable 3.4. Summary report on factors fostering resilience of cultural landscapes.

SYNTHESIS OF CASE STUDY EVIDENCE RELATED TO THE LANDSCAPE TYPOLOGY, LANDSCAPE MODELLING, THE VISIONING PROCESS AND THE IMPLEMENTATION OF GOOD LANDSCAPE PRACTICE

A core aim of HERULES was to grasp local realities, while being able to draw conclusions valid beyond the case study boundary. Thus, local case studies were combined and complemented with European-level analyses. The work conducted in various activities in the study landscapes was synthesised from four different angles:

Analysis of landscape changes and their driving forces: In this analysis, we filled the gap between single case studies and meta-analyses by presenting a comparative synthesis of landscape changes and their driving forces in six study landscapes, using a consistent methodology. A LULC analysis based on historical and contemporary maps from the 19th and 20th century was combined with oral history interviews to learn more about the perceived landscape changes, and the remembered driving forces. Land cover and landscape changes were analysed regarding change, conversions and processes. Narratives on mapped land cover change, perceived landscape changes and driving forces were compiled. Despite a very high diversity in extent, direction and rates of change, a few dominant processes and widespread factors driving the changes found were determined, i.e. access and infrastructure, political shifts, labor market, technological innovations, and for the more recent period climate change.
Grasping peoples' perception supplements the analyses of mapped land use and land cover changes and allows to address perceived landscape changes. The list of driving forces determined to be most relevant shows clear limits in predictability: Whereas changes triggered by infrastructural developments might be comparatively easy to model, political developments cannot be foreseen, but might nevertheless leave major marks in the landscape.

Analysis of the perceptions of landscape values: In the second approached, we synthesised, tested and increased the current knowledge on the most and least common landscape values perceived by local stakeholders, the patterns in the spatial distribution of values, and their connection to different socio-economic backgrounds and landscape characteristics across Europe. The research consisted of a cross-site comparison study on how landscape values are perceived in six HERCULES study landscapes using Public Participation GIS surveys. We identified shared patterns in the perception of landscape values across Europe where recreation and aesthetics were the most common values, while different stakeholders perceived landscape values in a different way. Landscape values tended to be spatially related showing common patterns mainly responding to accessibility and the presence of water, settlements, and cultural heritage. However, people in each study site had their own preferences connected to the intrinsic characteristics of the local landscape, history, and traditions. The results encourage land planners and researchers to approach landscape values in relation to socio-cultural and bio-physical land characteristics comprehensively and acknowledging the complexity in the relationship between people’s perception and the landscape, to foster more effective and inclusive landscape management strategies.

Exploration of the relations between cultural ecosystem services and landscape features: The third approached capitalized on the increasing amount of online data shared on social networks, particularly geo-tagged photos, which are becoming an increasingly attractive source of information about cultural landscapes. Landscape photographs tell about the significance of human relationships with landscapes, human practices in landscapes and the landscape features that might possess value in terms of cultural ecosystem services. Our analysis explored some of the challenges of this emerging approach: (a) How to assess a broad suite of cultural ecosystem services, beyond aesthetic beauty of landscapes? (b) How to identify the landscape features that are relevant for providing cultural ecosystem services and determine trade-offs and synergies among cultural ecosystem services? To address these challenges, we developed a methodological approach suitable for eliciting the importance of cultural ecosystem services and the landscape features underpinning their provision across five HERCULES study landscapes. We performed a content analysis of 1.404 photos uploaded in Flickr and Panoramio platforms. Four bundles of landscapes features and cultural ecosystem services showed the relation of recreation with mountain areas (terrestrial recreation) and with water bodies (aquatic recreation). Cultural heritage, social and spiritual values were particularly attached to landscapes with wood-pastures and grasslands, as well as urban features and infrastructures, i.e. to more anthropogenic landscapes. A positive though weak relationship was found between landscape diversity and cultural ecosystem services diversity. The results can be of interest both for methodological purposes in the face of an increasing trend in the use of geo-tagged photos in the ecosystem services research and for the elicitation and comparison of landscape values across European cultural landscapes.

Infographics highlighting basic insights on landscape change and landscape values: A fourth activity took up on other HERCULES findings related to the case studies and provided concluding and general remarks on the study landscapes of HERCULES. Finally, the results of the studies were systematically composed and visualised to translate them into infographics. The infographics present quickly and clearly the high
and visualised to translate them into infographics. The infographics present quickly and clearly the high amount of data and knowledge gathered and are thus a useful tool to communicate them (Fig. 4–8).

The multitude of approaches and methods was one of HERCULES’ core and characteristic virtues – and it has been at the same time a re-occurring challenge throughout the project. At the same time, the wealth of case study work provided insights with relevance much beyond the case study boundaries. Moreover, European level analyses paralleled and complemented the analyses conducted on the case study level, allowing to interpret the latter in their European context. On the European level, the case study insights revealed the local diversity and richness of people and places, which can easily get lost in large-scale mapping approaches, but at the same time is the essence of cultural landscapes, as cultural landscapes are always specific and local. Recognising the population as experts for their everyday landscapes fosters using participatory approaches like oral history interviews or PPGIS e.g. in combination with modelling, and finally enables a true co-creation of knowledge. In such a way, science has an important role to play for empowering the local population regarding landscape issues, aiming at the implementation of good landscape practices.

Further reading:

Deliverable 3.5. Synthesis of case study evidence and relation to the landscape typology (WP 4), landscape modelling (WP 5), the visioning process (WP 6) and the implementation of good landscape practices (WP 8).
Oteros-Rozas E. et al. (2016): Using social media photos to explore the relation between cultural ecosystem services and landscape features across five European sites. Ecological Indicators, submitted.

INNOVATIVE INTERDISCIPLINARY PROTOCOL FOR UNDER-STANDING LONG-TERM LANDSCAPE DYNAMICS, BASED ON THE PERSPECTIVES OF HISTORICAL ECOLOGY, LANDSCAPE BIOGRAPHY AND COMPLEX SYSTEMS THEORY

To better understand the dynamics of cultural landscapes, one aim of HERCULES was to enhance methodologies to collect data and to create knowledge about the long-term dimension of cultural landscape change. Therefore, an innovative methodological procedure for understanding the long-term development and transformation of cultural landscapes was developed, drawing on recent insights from geography, landscape archaeology, (historical) ecology, anthropology and information science. In order to assess long-term interactions between social and natural drivers, three different concepts were integrated: 1) Landscape biographies, 2) Historical Ecology, and 3) Complex Systems Approach. Based on these concepts, the protocol described innovative methodological procedures for integrating long-term landscape history with:

• Geodesign was used to create a suitable work flow for planning and designing sensitive to the long-term character of processes and the historical foundations of societal values.
• Spatial Data Infrastructure (SDI) was used to develop an infrastructural facility for retrieving and linking archaeological, historical and ecological data and geo-information by academia as well landscape management practitioners (see below).
• Dynamic geospatial modelling was used to adopt and further enhance models that are able to close the gap between static mapping aimed at heritage professionals and dynamical modelling designed for
gap between static mapping aimed at heritage professionals and dynamical modelling designed for academic research. The protocol aimed to contribute to overall approaches for HERCULES by enhancing the role of long-term thinking and analysis in geodesign, urban planning, landscape design and stakeholder involvement. The technical aspects of the testing, which involve the dynamic models and Spatial Data Infrastructure, were done in close cooperation with the development of the HERCULES Knowledge Hub.

Further reading:
Deliverable 2.1. Innovative interdisciplinary protocol for understanding long-term landscape dynamics, based on the perspectives of historical ecology, landscape biography, and complex systems theory.

SPATIAL DATA INFRASTRUCTURE FOR LINKING GEOGRAPHICAL, ARCHAEOLOGICAL, HISTORICAL AND ECOLOGICAL DATA AND INFORMATION FOR THE CASE STUDIES
As one tool to facilitate case study work on cultural landscape change and values, HERCULES proposed the implementation of a SDI. The availability of digital tools and data to study long term changes in the landscape has, over the last decade, grown tremendously. Landscape research is nowadays unthinkable without the use of Geographic Information Systems (GIS) software as a tool to analyse and visualise spatial phenomena. The study of long-term landscape change would benefit considerably from improved availability of data about the history and heritage of the landscape and functionalities with which the data can be processed and shared through an SDI. The core function of an SDI is to enable users, beyond the level of a single institute or organisation, to share geospatial information. The SDI played a role in HERCULES by incorporating socio-economic, political and religious and ideological parameters. Data was collected (about natural characteristics and physical properties; social-economic land use and land use systems; political and religious aspects of past landscapes; and past experiences and meanings of landscapes) from a variety of sources as input for modelling long term landscape change. This was done for two study landscapes: The Dutch river delta Rhine-Meuse and the Swedish Uppland. Furthermore, the SDI offers functionalities to share knowledge with local professionals.

Further reading:
Deliverable 2.2. Spatial Data Infrastructure (SDI) for linking geographical, archaeological, historical, and ecological data and information for the case studies.

DYNAMIC MODELS FOR THE ANALYSIS OF LONG-TERM LANDSCAPE CHANGE USING ARCHAEOLOGY DATA AND THE LANDSCAPE BIOGRAPHY FRAMEWORK IN THE CASE STUDY SITES
Based on the interdisciplinary protocol for understanding long-term landscape dynamics two spatial dynamic modelling frameworks were applied in two study landscapes (Dutch Lower Rhine region and the Swedish Uppland region).
The presented modelling frameworks demonstrate the high potential of spatial dynamic modelling framework to better understand past landscape processes. However, it also shows that it is highly
framework to better understand past landscape processes. However, it also shows that it is highly complicated to simulate these spatial dynamics. The main problems are the quality and detail of available data, and the uncertainties in assumptions made. Interpreting and using the modelling results must therefore be approached with care and requires additional research.

The uncertainties in available data and the careful approach of the results make the modelling frameworks presented rather an academic tool for the sole purpose of supporting other scholars. The HERCULES Knowledge Hub could to that extent be used as a tool to bridge between academic spatial modelling experts, heritage landscape experts and non-scientific stakeholders. Thus, the Knowledge Hub tool was used for the integration of long-term landscape perspectives in planning and design practices.

Further reading:
Deliverable 2.3. Dynamic models for the analysis of long-term landscape change using archaeology data and the landscape biography framework in the case study sites.

OBJECTIVE: TO GENERATE TOOLS FOR LANDSCAPE OBSERVATION AND MODELLING IN ORDER TO UNDERSTAND VALUES OF AND THREATS TO CULTURAL LANDSCAPES IN EUROPE

TYPOLGY OF CULTURAL LANDSCAPES
A central task for HERCULES in assessing and synthesizing the existing knowledge dynamics, drivers, patterns and outcomes of cultural landscape transformations was the development of a cultural landscape typology, focusing explicitly on cultural heritage. This typology serves four major goals: (1) to capture the diversity of Europe’s cultural landscapes, (2) to support targeting policy efforts protecting and investing in cultural landscapes, (3) to provide spatial context for HERCULES case studies as well as other local studies of landscape change, and (4) to provide a platform for informing local communities through publicly available information on the occurrence of cultural landscape types. To create this new cultural landscape typology, we first identified how cultural heritage is incorporated in existing typologies and landscape classifications. Although a European typology with the explicit focus on cultural heritage is not available, many existing landscape typologies (on both a national and continental scale) used indicators that can be useful. Using the HERCULES cultural landscape framework as a starting point, we subdivided the review of these typologies in three dimensions of the cultural landscape.
Landscape structure and land use intensity: The two concepts combined tell us what the current use is of the landscape and are therefore indispensable to a categorisation of any type of cultural landscape.
History: Most historical analyses of landscapes has been carried out locally on historical features on and below the ground, typically based on intensive fieldwork. This is not feasible at the European scale. We did not find suitable, consistent and European-wide data on these types of indicators. However, we used studies and results that give good insight into the persistence of landscapes on a European scale what enabled us to identify this historical aspect of the landscape.
Value and meaning: This was the most difficult layer to operationalise due to both its often intangible nature and its multi-faced interpretability. Measuring this dimension often relies on the availability of
nature and its multi-faced interpretability. Measuring this dimension often relies on the availability of proxies, especially for classifications on a continental scale. The most obvious indicators of value and meaning on a European scale were the highly correlating aspects of recreation and aesthetics. A different indicator was based on Protective Designation of Origin of local food.

By revealing the location of cultural heritage across Europe, our typology helps identifying which landscapes deserve more attention in order to protect cultural heritage. The typology can generate awareness of unique landscapes in Europe among policymakers, scientists and the people. Moreover, the typology can unite those landscapes showing strong resemblance and cater for better conservation of cultural heritage on those landscapes.

Further reading:
Deliverable 4.1. Typology of cultural landscapes.

INDICATOR DATABASE AND REPORT DESCRIBING THE INPUT DATA, METHODOLOGY AND DATA QUALITY FOR EACH INDICATOR

A cultural landscapes map resulting from the cultural landscapes typology forms the basis to assess how cultural landscapes have been transformed during the recent decades in terms of land use change. Table 1 provides a summary of the indicators gathered and documented, the underlying datasets and the time period covered, related to:

- Land cover and use extents (land cover 2006, land conversions, farmland abandonment, protected areas)
- Landscape structure (field size patterns, green elements)
- Land management (fertilizer application, farm size, crop yields, grazing intensity, wood extraction)
- Landscape history (indicators: land use history)
- Landscape value (indicators: traditional foodstuffs, Panoramio images)

Further reading:
Deliverable 4.2. Indicator database and report describing the input data, methodology and data quality for each indicator.

REPORT AND MAPS OF THE CURRENT DISTRIBUTION OF CULTURAL LANDSCAPES IN EUROPE AND RECENT CHANGES THEREIN

The typology framework and indicator database were used to map the current distribution of cultural landscapes in Europe pertaining to agricultural and forestry systems (Fig. 9–10). Furthermore, we assessed how cultural landscapes have been affected by past land use changes and how they will be likely affected by future land use changes under different scenarios. The results of the analysis of cultural landscape patterns and past and future land change trajectories provide concrete entry points for improved and targeted policies to manage cultural landscapes in Europe:

- Identifying locations with a large spatial overlap of one or more cultural landscape dimension(s) with past land change trajectories help to understand the pathways of cultural landscapes and can trigger further investigation, e.g. if thecurrent patterns of the cultural landscape dimension might be the result of past...
Investigation, e.g., if the current patterns of the cultural landscape dimension might be the result of past land use changes (dependence) or may have persisted despite these changes (robustness/resilience). This could be especially relevant for designing EU climate action strategies as robust cultural landscapes could serve as an indicator of resilience from which valuable lessons can be learned and applied to the effective mitigation of climate change.

- Identifying locations with a large spatial overlap of one or more cultural landscape dimension(s) with future land change trajectories help to identify regions where current patterns of cultural landscapes may be at risk due to future land use changes. Based on this knowledge, policies can be designed and implemented that counteract or prevent undesired changes in cultural landscapes.
- Combining all information, knowing that current cultural landscapes persisted despite land use changes can have informative value if these current patterns face future land use changes. As current European cultural landscapes revealed a large spatial overlap with stable land systems with regard to past and future land change trajectories, this can be a starting point for discussions about the protection and preservation of current cultural landscapes with the goal of carefully designing future policies affecting land use (e.g., EU Common Agricultural Policy (CAP)) that might evoke land use changes that, in turn, might affect cultural landscapes.

Our cultural landscape typology and the resulting maps formed the basis for a model-based assessment of cultural landscape futures (see below), across a range of scenarios and at multiple levels, connecting EU-level policies with local decision-making by landowners and managers.

Further reading:
Deliverable 4.3. Report and maps of the current distribution of cultural landscapes in Europe and recent changes therein.

DOCUMENTATION OF THE MULTI-SCALE SCENARIO FRAMEWORK
HERCULES studied future changes in cultural landscapes, both at the EU scale and in a few case studies. In order to assess the future of cultural landscapes, scenarios of possible changes were developed. Scenarios can help to work with stakeholders and managers to better understand the driving forces in landscape change and can help to improve the adaptive capacity in anticipating and responding to landscape changes.

In a first step, the approach for scenario development was described, building on previous scenario studies from the European context. Many studies on the future of rural Europe had been performed that assessed the range of future changes of drivers for landscape change. Based on an inventory of these driver changes and scenarios, we identified the most important and most divergent drivers of change and identified knowledge gaps specific to cultural landscapes. In a second step, future threats and the actors for cultural landscapes were discussed in a EU-scale HERCULES workshop. Based on these inputs, we specified a set of EU-scale scenarios that explicitly address issues important for (features of) cultural landscapes.

Within the case studies, specific opportunities and threats were elaborated, however focusing on issues
Within the case studies, specific opportunities and threats were elaborated, however focusing on issues that are widespread in cultural landscapes in Europe. Examples are the impacts of tourism, of ageing farmer populations or of within- or between-country migration. As such, the scenario studies in the study landscape provide a more detailed elaboration of a selection of drivers of landscape change important at EU scale and with that fitting in the EU scale context. The EU scale scenarios were used to set the boundaries for the developments in the study landscape (Devon, UK; Lesvos, Greece) (see below).

Further reading:
Deliverable 5.1. Documentation of the multi-scale scenario framework.

MODEL-BASED ANALYSIS OF THREATS AND OPPORTUNITIES FOR CULTURAL LANDSCAPE DEVELOPMENT UNDER ALTERNATIVE SCENARIO CONDITIONS
To perform a model-based assessment of processes of change in cultural landscapes, we evaluated potential future threats to cultural landscapes at a European scale. It is assumed that processes like globalisation, demography and changes in affluence result in a polarisation of land use, with urbanisation and intensification as well as abandonment threatening the character and functioning of European cultural landscapes. We analysed how cultural landscapes are expected to change by 2040 under four scenarios. The scenarios are structured along two axes, one ranging from local development to global development, while the second axis indicates the level of government intervention. Land use and land cover changes under the scenarios were simulated with a coupled set of macro-economic and land use allocation models. Next, these changes were summarised into fourteen trajectories that represent well-known and significant land change trends in Europe, like (peri-) urbanisation, intensification and extensification of agriculture and forestry and land abandonment with subsequent rewilding. Cultural landscapes were mapped based on a “Landscape Character Index” (LCI), which was derived from landscape patterns, landscape structure and intensity of land use, and cultural significance. These three variables are commonly considered important features of cultural landscapes. An overlay of the LCI map and the cultural landscape map was made to assess which trajectories were most important for the future of European cultural landscapes (Fig. 11).

Our large-scale overview of threats to cultural landscapes in Europe resulted in important insights:
• While it is often assumed that cultural landscapes are threatened by urban sprawl and polarisation of land use, this analysis showed that mainly land abandonment and subsequent rewilding is expected to affect cultural landscapes.
• Abandonment and rewilding of cultural landscapes can result in loss of landscape quality, provision of ecosystem services including support for recreation and changes in biodiversity.
• These expected changes are for a large part scenario dependent. While few cultural landscapes face the threat of abandonment in all scenarios, the analysis showed that scenarios with CAP support and protection from global markets can limit loss of cultural landscapes.
• A large-scale overview of threats to cultural landscapes poses several limitations. The trajectories of change do indicate if and where a certain change is occurring, while the strength or the type of change is not further specified. Especially for intensification and extensification the exact way the management changes will have a strong impact on the landscape.

Further reading:
Deliverable 5.2. Model based analysis of threats and opportunities for cultural landscape development.
Deliverable 5.2. Model-based analysis of threats and opportunities for cultural landscape development under alternative scenario conditions.


ROBUSTNESS AND APPLICABILITY ASSESSMENT OF LANDSCAPE MANAGEMENT AND POLICY OPTIONS UNDER SCENARIO CONDITIONS

In order to assess the robustness and applicability of land management and policy options under scenario conditions for modelling changes in cultural landscapes, Agent Based Models (ABMs) were applied in two case study regions (Devon, UK; Lesvos, Greece). Both case studies explored the outcomes of land management and policy options on land systems using a liberalisation scenario with decreasing subsidies for landscape conservation, and a conservation scenario with stable or slightly increased subsidy schemes (i.e. outcomes on hedgerow quality, Fig. 12). Additionally, local initiatives as well as the compliance with agri-environment schemes (AES) were considered. For both case studies, participatory stakeholder workshops were conducted to implement local expert-knowledge on actual land change processes within the study regions into the modelling development and to verify its outcomes: ABMs proved to be a very useful tool to communicate land change modelling outcomes and to provide a platform for discussion among a diverse group of stakeholders, leading to an integrative process incorporating perspectives of different stakeholders and facilitating a structured discussion for future landscape policies. Especially for assessing the robustness and applicability of land management and policy options under scenario conditions, the input from stakeholders was important to obtain local expert-knowledge on ongoing land change processes in the study regions. Although the generalisation from two case studies to the European scale is difficult, the findings of this deliverable can pave the way for improving the development in rural regions and to assess the state of cultural landscapes in Europe. Results also provide starting points for designing and implementing similar studies in different locations across Europe and emphasise the value of ABMs to better understand the complex interactions of human-environment systems with regard to find solutions for the future management of cultural landscapes.

Further reading:
Deliverable 5.3. Robustness and applicability assessment of land management and policy options under scenario conditions.

OBJECTIVE: TO DEVELOP A STRONG VISION OF PATHWAYS TOWARDS PROTECTING HERITAGE IN CULTURAL LANDSCAPES

SURVEY ON LANDSCAPES PRACTICES INCLUDING GEOLOCATED DATASETS

One of the objectives of HERCULES was to develop visions for re-coupling social and ecological components in cultural landscapes and to translate them into policy and management options. We carried...
components in cultural landscapes and to translate them into policy and management options. We carried out a review on landscape practices as related to natural and cultural heritage in Europe, in order to provide a first European-wide compendium on the spectrum of heritage management practices. This was accompanied by the exploration and piloting of possibilities for a broad public to report on perceived landscape values and related good management strategies.

The review included different approaches (web based keyword search, canvassing of academic sources like journal and conference abstracts as well as resources of major organisations in the field of heritage and landscape, using personal contacts etc.) and yielded 97 examples from 21 European countries. Due to the language bias inherent in most of the available review approaches, Anglophone countries are dominating. Four types of approaches related to heritage values were distinguished. Conservation and development practices focus on conserving, protecting or re-vitalising heritage features and account for the greatest part of the examples found, but also the other three approaches are very common: activities striving for knowledge enhancement, artistic and creative approaches and approaches in the field of enhancing experiences.

As a second step for acquiring stakeholder-based, explicit and context-sensitive knowledge, the possibilities of using crowdsourcing approaches were explored via a literature and project review and by piloting a smartphone application. The review showed that motivating people to spend some of their free time collaborating in projects from which they do not see direct benefit is a challenge. However, experiences within other projects delivered several ideas for overcoming this challenge, most notably by including game-like elements. The smartphone application “My landscape ratings” was developed to provide the opportunity to upload pictures on valued places and includes questions on how the user is linked to that landscape.

Further reading:

ASSESSMENT OF STRENGTHS AND WEAKNESSES OF LANDSCAPE PRACTICES, BASED ON MINUTES OF STAKEHOLDER WORKSHOPS

First, the above mentioned database of landscape practices was assessed and evaluated by a body of experts to identify good landscapes practices. Second, a Strengths, Weaknesses, Opportunities, Threats (SWOT) analysis of the selected best practices was performed, also as an expert assessment. The methodology proposed in International Standard Organisation (ISO) 37101 Helpbox for Cultural Heritage Programs proved the most useful for this task. Third, both parallel and subsequently to this, the results of the analysis were discussed in the stakeholder meetings.

This work revealed that there is not “one” good practice and policy measure that could be recommended in every European cultural landscape. All initiatives listed deal with quite different issues and concerns. This helped us to include also supplementary initiatives for specific HERCULES case study with different landscapes and diverse stakeholders’ expectations, to illustrate a field of practice in a broader frame. The ISO DIS 37101 standard can serve as the common method to implement and prioritise such policy measures, each of them being very dependant of local context. A major good practice could be the integration of specific local issues, based on prior determination of the external and internal sustainability...
Integration of specific local issues, based on prior determination of the external and internal sustainability issues identified through the proposed ISO grid, that are relevant to the cultural landscape, and on involvement of stakeholders already at an early stage.

Further reading:
Deliverable 6.3 Minutes of stakeholder workshops.

INNOVATIVE STRATEGIES AND PRIORITISED SET OF RECOMMENDED POLICY MEASURES

The collected European examples of good landscape practices and the following assessment of its strengths and weaknesses (see above) were used to develop innovative measures and compile and prioritise policy options. As mentioned above, to fulfil this goal, we relied largely on the new ISO 37101 standard (released in July 2016) on ‘Sustainable development of communities – Management systems – Requirements with guidance for resilience and smartness’. Examples of innovative measures or ‘good practices’ were listed and prioritised through each of the twelve issues of the standard. It was therefore possible to illustrate each of the issues related to:

- Governance
- Education
- Innovation and creativity
- Health
- Culture and identity
- Living together
- Economy through sustainable production and consumption
- Place of living and working
- Safety and security
- Community infrastructure
- Mobility
- Biodiversity and ecosystem services

Further reading:
Deliverable 6.4. Report on innovative strategies and prioritised set of recommended policy measures.
Girod G. et al. (2017): Culture for and as landscape sustainability. Landscape Research, submitted.

PLACE- AND CONTEXT-SPECIFIC ROADBOOK ON BEST PRACTICES

After the review on good heritage management practices, a comprehensive roadbook on good landscape practices was developed. The roadbook was delivered in the form of an edited volume entitled “The Science and Practice of Landscape Stewardship”, to be published by Cambridge University Press in early 2017. Taking up the notion of transformative societal learning at the science-practice interface, the roadbook aimed at aligning analytical and applied perspectives to the understanding of landscape stewardship, with the interconnected aims of enhancing its understanding and fostering its implementation. The book responded to the call from prominent voices in landscape ecology and related landscape studies to move toward a science of landscape sustainability, i.e. toward a place-based, use-inspired science in changing landscapes. We proposed landscape stewardship as an inclusive notion for all individual and collaborative efforts toward landscape sustainability. At the heart of landscape stewardship are the actions of people, their appreciation for, and awareness of, the multiple landscape values that they perceive as crucial for their own well-being. In general terms, stewardship strategies...
values that they perceive as crucial for their own well-being. In general terms, stewardship strategies assess and reduce vulnerability to known stresses, develop proactive strategies to shape uncertain change and advance transformational changes to potentially more favourable trajectories. The roadbook consists of 19 individual chapters, contributed by leading authors in the field of landscape science and practice (see Table 2). In addition to that, the notion landscape stewardship was explored by performing interviews with stakeholders in one of the HERCULES study landscapes. Also, innovative practices on linking natural and cultural capital in landscapes through food networks were explored in a Japanese-European expert workshop.

Further reading:
Deliverable 6.2. Place- and context-specific roadbook on best practices.

STAKEHOLDER WORKSHOPS AT LOCAL LEVEL AND TRANSLATION OF LOCALISED LANDSCAPING SKILLS AND KNOWLEDGE INTO OPERATIONAL GUIDELINES
To ensure the involvement of stakeholders at local level throughout the project’s lifetime, workshops in the study landscapes with support of local partners were organised. At least three different series of workshops were performed in five study landscapes. The main goal was to link research with practice, while making the public as well as authorities, various organisations and industry more aware of the importance of the cultural landscapes, not only in terms of social well-being, but also of economic and ecological rural prosperity. The vision was to identify local needs for landscape management and to provide a forum for general exchange on findings developed by HERCULES.
The five different study landscapes revealed major differences of the issues at stake concerning landscape change, heritage and its management as well as engagement of local stakeholders. Some of the main issues discussed were:
- Organisation of local participation
- Provision of knowledge on traditional agricultural practices with low environmental impact
- Promotion of a combination of green frames and sustainable travel and transport infrastructure
- Cultural landscapes versus (new) infrastructure
- Integration of sustainable intensive agriculture into cultural landscapes
- Multifunctional land use

The local workshops had also the purpose to collect systematically localised landscape skills and knowledge, with the aim of providing cohesive guidance for local communities, associations of citizens, SMEs, public authorities and agencies and thereby empowering traditional skills and knowledge in cultural landscapes management. The following good practices were collected:
- Traditional agricultural practice
- Local food production
- Agroforestry
- Pastoralism
• Responsible water management
• Management of historical places
• Restoration and management of historic civil heritage
• Development of ecological routes

The operational guideline behind translating localised skills and knowledge into broader good landscape practices implemented by practitioners was a structured process. Fig. 13 set forward the different steps to collect and disseminate practices that contribute to the preservation of cultural landscapes and heritage in a sustainable way.

An analysis and comparison of all local workshops across the study landscapes showed that, despite differences, similarities emerged concerning the interplay between “expert” and “local” knowledge and between “insideness” and “outsideness”. Social capital plays an important part, as it provides the template for personal and collective evaluation of landscape changes and who and how should manage these changes. These findings are important to develop in-depth insights on dynamics and values of cultural landscapes and visions for re-coupling social and ecological components in cultural landscapes and translate them into policy and management options.

Further reading:
Deliverable 6.4. Report on innovative strategies and prioritised set of recommended policy measures.
Deliverable 8.2. Report on stakeholder workshops and on translation of localised landscaping skills and knowledge into operational guidelines.
Deliverable 8.4. Report on on-the-ground training and demonstration activities.

ON-THE GROUND TRAINING AND DEMONSTRATION ACTIVITIES

The on-the-ground activities helped us reaching the HERCULES goal to learn about the dynamics and values of cultural landscapes. First, the local workshops were a useful tool to develop in-depth insights on the dynamics and values of cultural landscapes and local people’s visions for re-coupling the landscapes’ social and ecological components and for translating them into policy and management options (see above).

In terms of identifying which experiences of cultural landscapes performed most successfully, innovative and likely to be successful elsewhere, a major lesson is that governance has to be adapted to the local context. The dynamics of cultural landscapes in terms of their sustainability reflects the human factors at work in the landscape as well as biophysical aspects. The cultural diversity of these human factors is fully reflected through the demonstration activities and Cultural Landscape Days undertaken.

Together with the local stakeholder, HERCULES organised five different Cultural Landscape Days. In the course of the events over time it became evident that the aim in celebrating landscapes was not only to draw the citizens’ attention to its beauty and variety of values, but to come to a dialogue on landscape and between people and their surroundings. We strived that with the events HERCULES could:
• Arise interest of people in the being an active part in their landscape, may they be perceived as “ordinary”, “everyday” landscapes or as highly valued, outstanding landscapes
• Gather and improve knowledge of people on the history, dynamics and recent processes of their
• Gather and improve knowledge of people on the history, dynamics and recent processes of their landscape
• Draw attention to the complexity of land use and land conservation
• Heighten public awareness of the specific values of their landscape and landscape features
• Create dialogue and bring together people with different stakes and interest in the landscapes
• Encourage people to take part in stewardship of their landscape

The cooperation with the local organising groups was in each case very fruitful and we owe them a lot for their enthusiasm and often voluntary commitment. Since each study landscape was free to organise the event as it fits, all were different. The feedback of the participants and organisers showed that the events were of interest to a broad range of different stakeholders and provided a forum to debate and reflect. Landscape encourages dialogue and serves as a medium: People become aware that they share a place, but that they might have different – or common – interests and problems.

The experiences of the different Cultural Landscape Days performed were summed up in a Guide to give advice and make suggestions to those who are interested in organizing a Cultural Landscape Day in the future. In terms of continuation of the established and well-received format, a regular exchange has been established with CIVILSCAPE, the international association of civil society organisations dedicated to landscape protection, management and planning. HERCULES will join and give input to foreseen CIVILSCAPE activities to make the landscape approach more prominent in the European Heritage Days in the upcoming months.

Further reading:
Deliverable 8.4. Report on on-the-ground training and demonstration activities.

STAKEHOLDER WORKSHOPS AT EU LEVEL
To ensure the effective involvement of stakeholders at a European policy level throughout the project’s lifetime, three EU-level workshops were organised. The workshops contributed to the flow of information top-down and bottom-up toward the target groups of the project and gathered participants from the European institutions, government agencies, NGOs, businesses, practitioners and academia. The workshop series created a platform where ideas, research and recommendations on cultural landscapes were exchanged.

“European Landscapes at a Crossroads” (Brussels, 23/05/201). Main issues were:
• Flexible policies to adapt to the genius loci of each landscape
• Landscape policies are based on a bottom-up approach
• Knowledge and values about landscape shall be shared
• Transdisciplinary research and cooperation to ensure the relevance of HERCULES and to take into account the different factors leading to the preservation of cultural landscapes
• Local engagement of actors having an impact on cultural landscapes
• Integration of landscape considerations in the economy

“Landscape Stewardship: Integrating a broad suite of landscape values into rural development policies” (Brussels, 03/06/2015). Main issues were:
• Absence of mainstream policy field focusing on landscapes
• Multiplicity of significations given to the concept of landscape stewardship in function of the stakeholder
• Diversity of framing, values and management actions among landscape stewards
• Need to foster innovative models of landscape stewardship

“The potential of labelling in landscape management” (Brussels, 31/05/2016). Main issues were:
The potential of labelling in landscape management (Brussels, 31/05/2016). Main issues were:

- Landscape labelling does not just have to be about the quality of the product but can be used to directly and indirectly promote management tools, procedures and actors which are involved in its production
- Expression of need for additional research on how to develop procedures which can upscale existing labels and on how to create new labels which promote landscapes comprehensively
- General agreement that labelling schemes often face the problem of a lack of consumer recognition
- The issues raised during the workshops were later fed HERCULES policy briefs and a set of recommendations for landscape policy and practice (see below).

Further reading:
Deliverable 9.2. Report on first two stakeholder workshops at EU level.

POLICY BRIEFS AND SET OF RECOMMENDATIONS FOR LANDSCAPE POLICY AND PRACTICE

Landscapes in Europe and beyond provide a range of functions and services for securing human livelihoods and contributing to well-being. Multiple interests, fragmented regulation, environmental threats and socio-economic dynamics pose challenges for sustainable landscape policy and management. In the light of agricultural intensification and the homogenisation of rural landscapes, policy-relevant questions for sustainable development and heritage preservation emerge, such as what new policy arrangements and management approaches are needed to conserve unique landscape characteristics, knowledge and practices; and how can landscape policy and management be better directed towards sustainable practices and outcomes? Addressing these challenges, HERCULES set out recommendations for landscape policy and practice based on the work undertaken in the HERCULES project. At its core, five key themes of new and innovative policy and practice approaches for fostering sustainable landscape conservation, development and identity were outlined in detail.

The first theme was about landscape stewardship. The central focus of this work explored how actors responsible for land management can be incentivised to sustainably manage their environment. In the UK, different land manager concerns regarding present and future agri-environmental schemes (AES) are compared and contrasted across different understandings of landscape stewardship. As a result, it turned out that a range of important landscape values co-exist such as “social relations”, “quality, local food production”, “biodiversity”, “cultural heritage”, or “recreation, tourism and lifestyles” that need to be taken into account when developing local environmental plans and management approaches.

Conceptual ideas and policy recommendations for landscape labelling were presented as a second theme. The guiding question was how labelling can be applied for cultural landscape preservation – and what can be learnt for the design and set-up of respective governance processes. Landscape labelling connects ideas of multifunctional landscape management with (eco-)certificates, geographic indication and payment schemes for ecosystem services. It largely expands the focus from certifying single products, services and production processes to an entire landscape. Based on the analysis of four labelling-like approaches that exist in Europe, concrete recommendations were presented to show how labelling can foster a debate on landscape characteristics, how it can be integrated into existing policy schemes and what supportive governance and policy conditions are needed to promote it.

The third theme takes up the idea of integrated landscape management (ILM) as a third theme for policy and practice recommendations, and how it can contribute to the implementation of the Sustainable Development Goals (SDGs) in Europe. Here the potentials of ILM are elaborated to support multifunctionality and integration across actors, sectors and scales. Taking three recent land-use conflicts as examples (agriculture production versus nature conservation, energy crop production versus cultural...
as examples (agriculture production versus nature conservation, energy crop production versus cultural landscape preservation, and urban sprawl), opportunities and challenges of SDGs implementation in Europe are outlined. Based on short essays written by invited experts from distinct European contexts/fields, key elements of ILM are identified and discussed for land-use conflict resolution and addressing SDGs, and lessons learned for future applications of ILM in the realm of sustainable development. Such key elements relate to common concerns, multi-actor and -sector collaboration, capacity building, adaptive management and learning. Accordingly, policy and management actions are suggested which are suitable for handling multiple interests and goals, and the future role of landscape research is highlighted to support SDG implementation on landscape level in Europe.

The fourth set of policy recommendations was dedicated to climate change and resilience of landscapes. As landscapes have severe effects on and for climate change and vice versa, careful attention needs to be paid to the factors shaping those landscapes and their sustainable management and governance. This policy brief highlighted how activities from agriculture and forestry affect climate change mitigation and adaptation at landscape level, such as for reducing emissions, carbon storage and sequestration, and management of ecosystems for increasing resilience. The policy recommendations presented advocate co-designing climate change adaptation measures across policy sectors, by taking local context conditions carefully into account. The sustainable provisioning of bundles of landscape goods and services by landscapes needs to be better promoted as well as the sustainable production capacity of renewable energy resources from land, fisheries and aquaculture environments. Key elements of a sustainable governance strategy are to foster innovation, capacity building and a closer involvement of consumers and citizens into decision-making processes.

The final theme in this deliverable promoted a landscape approach to environmental governance as centrally elaborated in the HERCULES project. The objective of this work was to encourage policy makers to think spatially about environmental and landscape-related policy rather than thematically or sectorally in order to cherish and support dynamic cultural landscapes in Europe. The many facets of human-environment and people-land interactions all need to be taken into account to enable effective environmental governance. As such, there needs to be a balance against the essentially sectoral and top-down landscape-related policies that dominate policy agendas such as those for biodiversity conservation and CAP greening, based on understanding landscape character and (most importantly) civil society participation. A landscape approach entails viewing and managing multiple land uses in an integrated manner, considering both the biophysical environment and the human processes that co-produce it, and reflecting the human well-being that depends on it. Building on these principles, the advantages and application areas of a landscape approach were translated into a policy narrative that aims to be easy to understand and relevant to policy makers at different administrative levels – from the local to EU level. Based on contributions from four studied European landscapes, the paper illustrates how good examples of sustainable landscape practice derive from interdisciplinary analyses of landscape taken as a whole. Further it demonstrates that the transdisciplinary and participatory co-design of policy, planning and management offers effective solutions to landscape conflicts and problems.

In addition to the recommendations given for each specific theme, the final conclusions set out comprehensive recommendations particularly for (a) landscape policy and management, and (b) for research policy. The latter underlines the need for further research on, and the creation of, enabling research conditions for landscape approaches and novel forms of landscape governance. Stable policy backup and financial research support are necessary requirements for the development, setup and evaluation of landscape policy and management solutions. Landscape research strives for the co-production of system, target and transformation knowledge which are key requirements for working...
production of system, target and transformation knowledge which are key requirements for working towards sustainable, societally relevant provisioning and financing of the bundle of functions, goods and services provide by the manifold landscapes in Europe.

Further reading:

OBJECTIVE: TO PROVIDE POLICY MAKERS AND PRACTITIONERS WITH A CUTTING-EDGE KNOWLEDGE HUB TO GUIDE DECISION-MAKING FOR THE BENEFIT OF CULTURAL LANDSCAPES

CROWDSOURCING POWERED DATA COLLECTION – INCLUDING SPATIAL AND ALPHANUMERICAL DATASETS, A SMARTPHONE-BASED APPLICATION AND A WEB-BASED GIS APPLICATION – FOR MODELLING, VISUALISATION, DISSEMINATION AND FURTHER USE OF RESULTING DATA

Across Europe, a multitude of approaches have been developed to protect and develop heritage values in cultural landscapes. Current approaches, however, mostly deal with specific features of cultural heritage and/or apply a local or regional spatial focus. It therefore still results difficult to overview existing experiences with heritage-related landscape practices and draw conclusions which are much needed to inform decision-making on landscape management and policy.

The HERCULES Knowledge Hub for Good Landscape Practices was developed to overcome this problem, allowing for learning and exchange on landscape practices on Pan-European scale and not limited to a particular feature type. We designed and implemented the Knowledge Hub for Good Landscape Practice, assigned to ensure efficient collecting, archiving, using, sharing, and distributing of data and project results amongst project partners, stakeholders and the general public (Fig. 14).

A multitude of regional or feature specific approaches were integrated to protect and develop heritage values in cultural landscapes. The Knowledge Hub is unrestrained: it is not limited to region and scale, nor does it impose a constraint on feature or data types, as long as they do carry a locational information. It provides the means for collecting feedback and input from both general public and professionals (landscape practitioners, managers and policymakers) and can act as a toolkit for communication of HERCULES insights between various parties. The Hub shares the knowledge based on the underlying questions: What is happening with cultural landscapes and how do you perceive these changes? At the same time it asks for feedback and thus builds a tool to apply citizen science in the HERCULES project.

In order to fulfil the objectives of such endeavour from the data management point of view, we gathered project-internal requirements, analysed user requirements and current state-of-the-art in GIS and cloud community. Based on that knowledge we defined hardware and software specifications, set up a data repository and implemented its access through three main viewports:
repository and implemented its access through three main viewports:

• Knowledge Hub web GIS application, implementing a powerful cloud web GIS editor and viewer with advanced GIS tools, which is available at http://kh.hercules-landscapes.eu and is the main access point to the data repository.

• Mobile applications, which are use-case-centric, provide means to crowdsources data collection in an organised and simple-to-use way. Since the data model (e.g. for the data collection) is defined from the web GIS application, the platform allows for fast deployment of new use-case-centric mobile applications.

“My landscape ratings” was configured to be a part of the European-scale survey on landscape practices (see above).

• HERCULES Labs – data explorers, http://labs.kh.hercules-landscapes.eu. In order to facilitate showcasing the results to the general (non-expert) public, the concept of “data explorers” has been included in the Knowledge Hub platform (see below). The Labs can be seen as the basic version of the Knowledge Hub, while the web GIS application remains as the expert version. Labs can also easily be integrated in other existing web pages, facilitating dissemination and re use of HERCULES results elsewhere.

• Satellite imagery has been identified valuable for achieving the goal of mapping and assessing landscape changes. With the introduction of Sentinel-2 data – a free public dataset from the earth observation programme Copernicus’ (European Commission in partnership with the European Space Agency) missions – it has become possible to add it to the Knowledge Hub. The application is available through Labs at http://labs.kh.herculeslandscapes.eu/herculesSL/index.html. Primarily targeted to the study landscapes of the HERCULES project, users are able to pinpoint and mark the changes they feel mostly affect the cultural landscapes.

The three viewports of the Knowledge Hub platform, web GIS application, mobile applications and Labs, together with the Sentinel-2 satellite data toolkit and the underlying (spatial) data repository infrastructure combine into the Knowledge Hub for Good Landscape Practice, a platform for efficient collecting, archiving, using, sharing, and distributing of data and project results amongst project partners, stakeholders and the general public.

Further reading:
Deliverable 7.1. Repository of spatial and alphanumerical datasets.
Deliverable 7.2. Smartphone based application for crowdsourcing powered data collection.
Deliverable 7.3. Web-based GIS application for crowdsourcing powered data collection.
Deliverable 7.4. Web-based GIS system for modelling, visualisation, dissemination and further use of resulting data.

PILOT APPLICATIONS OF THE KNOWLEDGE HUB IN STUDY LANDSCAPES, INCLUDING DETAILED FEEDBACK FOR REFINING THE HUB

At a series of co-design workshops with stakeholders, a range of needs for and a differentiation between different Knowledge Hub users were identified, resulting in the creation of a (front-end) complimentary portal called HERCULES Labs, designed as an intuitive platform where users can explore and interact with different (predefined) datasets, derived from the existing (back-end) Knowledge Hub (see above).

Thus, data and spatial information created and processed on the Knowledge Hub could be presented in a simplified way with HERCULES Labs, which was a vital addition to the communication and outreach capacity of the HERCULES project: http://labs.kh.hercules-landscapes.eu. Until today, the following Labs were created:
were created:

- Good Heritage Practices (http://labs.kh.hercules-landscapes.eu/widgetGHP.html)
- Good Landscape Practices (http://labs.kh.hercules-landscapes.eu/widgetGLSP.html)
- Share your Good Landscape Practices (http://labs.kh.hercules-landscapes.eu/themeLSL.html)
- Guidelines for Landscape Management (http://labs.kh.hercules-landscapes.eu/widgetGLP_guidelines.html)
- Cultural Landscape Change Explorer (http://labs.kh.hercules-landscapes.eu/widgetCLC.html)
- Cultural Landscape Characterisation (http://labs.kh.hercules-landscapes.eu/landscape_typologies.html)
- Future Cultural Landscape Dynamics (http://labs.kh.hercules-landscapes.eu/themeLD.html)
- Ecosystem Services in the EU (http://labs.kh.hercules-landscapes.eu/themeWF.html)
- HERCULES Study Landscapes (http://labs.kh.hercules-landscapes.eu/widgetHSL.html)
- Cultural Landscape Days (http://labs.kh.hercules-landscapes.eu/widgetCLD.html)

Further reading:
Deliverable 8.3. Report on pilot applications of the Knowledge Hub in case study sites, including detailed feedback for refining the hub.

Potential Impact:
POTENTIAL IMPACT

1) CONTRIBUTION TO INNOVATIVE SCHEMES AND SUSTAINABLE BEST PRACTICES

HERCULES provided comprehensive insight into sustainable practices of cultural landscape management. A substantial part of our work was to identify projects and organisations that act as role models and show good landscape practices across Europe. We did so through two surveys, one looking at heritage practices (Deliverable 6.1) and a second one looking at integrated landscape initiatives (Deliverable 1.3 García-Martín et al., Land Use Policy, 2016).

These examples of good practice can be explored on the Knowledge Hub where they provide a platform and repository for heritage (http://labs.kh.hercules-landscapes.eu/widgetGHP.html) and landscape (http://labs.kh.hercules-landscapes.eu/widgetGLSP.html) practitioners across Europe. We included as much information as possible with each project, including images, websites as well as contact details where possible.

After a review on good heritage management practices, a roadbook on good landscape practices was developed. To make the book relevant and compelling for landscape practitioners and policy makers alike, scholarly book chapters were complemented by a collection of 17 concise cases of good practices that exemplify the principles of landscape stewardship (also referring to historic and archaeological landscape values) and serve as a model to inspire implementation in other areas. Innovative landscape stewardship in the understanding of this book will particularly foster re-coupling of social and ecological realms for the protection and development of multiple landscape values. Cases were selected to span the spectrum of environmental and land use characteristics, thus representing the diversity of European landscapes, ranging from outstanding flagship landscapes to more ordinary landscapes. The practices portrayed cover individual action for landscapes, collaborative engagement at community level and innovative landscape policies at regional scales.

Furthermore, the insights from the case studies led to the development of innovative measures for effective protection, management and fostering of heritage values (Deliverable 6.4 http://labs.kh.hercules-landscapes.eu/widgetGLP_guidelines.html). The HERCULES guidelines promote dynamic management approaches that incorporate iterative feedback loops and improvement by strengthening cross services.
approaches that incorporate iterative feedback loops and improvement by strengthening cross services, actors and landscape design connected to daily uses. The guidelines emphasize that approaches to environmental governance are holistic, in the sense that they should take into account the biophysical environment, the human processes that co-produce it, and the human well-being that depends on it (Deliverable 9.4 Shuttleworth et al., Landscape Research, submitted).

2) ECONOMIC IMPACT ON THE RURAL AREAS AND SECTORS OF ACTIVITIES CONCERNED
To create favourable economic impact, we specifically explored how different types of landscape labelling can be applied for cultural landscape preservation and be used to raise awareness for and valorise cultural landscape services (Deliverable 9.4 Mann & Plieninger, Landscape Research, submitted). Landscape labels are powerful identifiers that promote multifunctional land use and foster social, cultural and environmental landscape values. Landscape labelling highlights the uniqueness of a landscape and the need for its conservation by financing particular management practices. Our analysis suggested that by re-configuring conceptual elements and governance strategies for integrated landscape management, geographic indication and payment for ecosystem services, together with a focus on cultural landscape and heritage preservation, landscape labels may improve sustainable landscape management. We emphasised four key insights into the specific role of landscape labelling in integrated landscape management:

1) Landscape labels are boundary objects for integrated landscape management.
2) Landscape labelling creates real world laboratories of change.
3) Landscape labelling needs to be integrated into existing policy instruments and strategies.
4) Landscape labelling depends on supportive governance structures and policy conditions.

In general, the socio-economic impact of HERCULES is difficult to measure. However, given the large number of practitioners, SMEs and institutions engaged and the enthusiasm that HERCULES has raised in the study landscapes, it is very probable that cultural landscapes have been revalorized both at local and pan-EU levels. These issues were presented and discussed at a side event to the European Commission’s Green Week 2016 on “Investing in a Greener Future”.

3) PROTECTION OF CULTURAL LANDSCAPES AND ASSESSMENT OF SOCIO-ECONOMIC IMPACTS
Cultural landscapes are understood and valued today in various and diverging settings. The findings of HERCULES:

1) Highlight and document this diversity based on a Pan-European typology that informs stakeholders, policy makers and local landscape managers seeking inspiration, justification, and assistance in protecting cultural landscapes (Deliverable 4.1 Tieskens et al., Land Use Policy, 2017, Levers et al., in press)
2) Offer qualitative highlights and quantitative predictions on drivers, patterns, and values of landscapes, including the feedback loops of protection and management itself (Deliverable 1.4 Deliverable 5.2 Deliverable 5.3 Kizos et al., Ecology and Society, submitted, Schulp et al., in preparation, Tieskens et al., Landscape Ecology, in press, Zagaria et al., Land Use Policy, submitted, Zagaria et al., Landscape and Urban Planning, submitted)
3) Provide examples of local management and in-depth insights of dynamics and values of cultural landscapes based on contextualised and transferable case studies (Deliverable 3.3 Deliverable 3.4 Bürgi et al., Landscape Ecology, submitted)
4) Assess landscape values that form the backbone of HERCULES to provide common threads across different geographical, social, and policy settings (Deliverable 3.5 García-Martín et al., Landscape...
Different geographical, social, and policy settings (Deliverable 3.5 García-Martín et al., Landscape Ecology, submitted, Oteros-Rozas et al., Ecological Indicators, submitted)

Cultural landscapes, biodiversity and socio-economics are closely linked, as the same processes of homogenisation and fragmentation that threaten cultural heritage landscapes are also detrimental to Europe’s biodiversity, evoke social problems and put many regional economies at risk. Therefore, synergies between planning, protecting and managing landscapes for their cultural, biodiversity, and socio-economic values were addressed by HERCULES:

- The cultural landscape framework developed in WP1 clarified the role of “high nature value” landscapes and of socio-economic considerations in the context of cultural landscapes (Deliverable 1.1 Plieninger & Bieling, Ecology and Society, 2013).
- Socio-economic variables were considered as fundamental drivers of landscape change in the reviews of WP1 and the empirical analyses of WP3. Also, D1.3 provided a review of the socio-economic realities of cultural landscape actors, namely Integrated Landscapes Initiatives.
- Cultural landscapes rich in biodiversity and with different socio-economic settings were included in the study landscapes (Deliverable 3.1).
- The landscape typology (WP4), the scenarios used for modelling of future landscapes (WP5), the roadbook on good heritage practice (WP6), the Knowledge Hub (WP7), and the demonstration activities for good landscape practices (WP8) all included aspects of biodiversity and socio-economics, next to their focus on heritage values.
- “Biocultural” linkages between cultural landscapes, food and biodiversity were explicitly addressed in a European-Japanese workshop (Plieninger et al., Sustainability Science, submitted).
- Specific contributions were made for the consultation during the mid-term assessment of the EU Biodiversity Strategy to 2020 (Deliverable 9.3).

4) TECHNOLOGIES AND DATASETS FOR MAPPING, ASSESSING, PROTECTING AND MANAGING CULTURAL LANDSCAPES

HERCULES was designed to make long-lasting impacts through the development of novel technologies and datasets to better understand, manage and protect cultural landscape heritage. The inclusion of SMEs and practitioners within the HERCULES consortium and the continuous interactions with policy makers throughout the project lifetime ensured the relevance, credibility, legitimacy, and practical applicability of the methods and tools and thus secured a maximum impact. Novel technologies, tools and datasets that were developed in HERCULES and impacts for science, policy and practice include:

- New Pan-European heritage-sensitive cultural landscape typology, including high-resolution datasets: Novel baseline concept and data/maps to delineate cultural landscape and specifically integrate heritage values, enabling targeting of policy interventions, improved assessment of trade-offs (e.g. between ecosystems services). (Deliverable 4.1 Tieskens et al., Land Use Policy, 2017)
- New geospatial datasets on landscape structure, land management, and cultural heritage: Novel datasets on important characteristics of cultural landscapes, new insights on cultural landscape patterns and drivers of change. (Deliverable 4.2)
- Meta-analysis database of cultural landscape case-studies: Resource for scientists and practice for comparative analyses, identifies knowledge gaps and case study selection bias. (Deliverable 1.2 Plieninger et al., Land Use Policy, 2016, García-Martín et al., Land Use Policy, 2016)
- Development of robust remote-sensing and mapping tools for landscape change analysis: Allows monitoring and identification of areas of rapid change and stability (important for identifying threatened cultural landscapes and for policy targeting), remote sensing-based tools will allow for assessment of future landscape change. (Deliverable 4.3 Kuemmerle et al., Environmental Research Letters, 2016).
future landscape change. (Deliverable 4.3 Kuemmerle et al., Environmental Research Letters, 2016, Levers et al., Regional Environmental Change, in press, Stuerck et al., Regional Environmental Change, in press)

• Citizen-based information and monitoring / crowdsourcing for good landscape practices: Cost-efficient data collection of cultural landscape characteristics not accounted for in traditional monitoring schemes, deeper engagement of the public in monitoring and managing cultural landscapes and validating science-based results (Deliverable 7.2 Deliverable 7.3 Tieskens et al., Land Use Policy, 2017, Oteros-Rozas et al., Ecological Indicators, submitted)

• New technologies for landscape change simulation and ex-ante assessment of policies (WP2, WP5): Open-source software made available through the Knowledge Hub for application by SMEs, authorities and academics, applicability beyond the specific application in HERCULES for future ex-ante assessments (Deliverable 2.3 Deliverable 5.3)

• Spatial Data Infrastructure: Provides guidelines and examples for setting up a SDI to allow the linkage of data from different domains in a geoinformation environment (Deliverable 2.2)

• Portfolio methods to analyse drivers of cultural landscape change: Overview and illustrative application of methods to analyse the underlying drivers of landscape change allowing insights to ensure proper selection and implementation of policies and instruments (Deliverable 1.4 Kizos et al., Ecology and Society, submitted)

• Knowledge Hub design: Provision of powerful communication and visualisation tools, a platform bringing together different data sources (spatial monitoring, model results, crowdsourced data) in a common environment enabling strong collaboration between science, practice and other stakeholders (Deliverable 7.4)

5) IMPLEMENTATION AND OPERATIONALISATION OF THE EUROPEAN LANDSCAPE CONVENTION

The European Landscape Convention (ELC) called for a better protection, management and planning of landscapes. Defining landscape as a central arena for sustainable development, the Convention has become the governing document steering both landscape management and, inadvertently, landscape research in Europe. In its framework (Deliverable 1.1 Plieninger et al., Ecology and Society, 2015) and roadbook (Bieling & Plieninger, Cambridge University Press, 2017), our project actively contributed to implementing the core ideas of the ELC through research by a) including all dimensions and types of landscapes, b) putting increased emphasis on public participation, c) focusing on designing measures appropriate for different contexts and scales, and d) encouraging support for capacity-building.

More specifically, we identified common priority questions for the sustainable management of cultural landscapes in Europe with the aim to promote discussion and give novel input to agenda setting for science and policy priorities (Deliverable 1.4 Hernández-Morcillo, Landscape Ecology, submitted). Our exercise assists 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.

To operationalise the ELC, we established a holistic perspective on of sustainable landscape planning that includes human, environmental and policy processes by elaborating on: Achieving the Sustainable Development Goals (SDGs) through landscape approaches: HERCULES elaborated how landscape approaches could contribute to the implementation of multiple SDGs, supporting multifunctionality and integration across actors, sectors and scales. Taking three recent land use conflicts as examples (agriculture production versus nature conservation, energy crop production...
use conflicts as examples (agriculture production versus nature conservation, energy crop production versus cultural landscape preservation, and urban sprawl), we discussed key elements of landscape approaches for past and future land use conflict resolution. Such key elements relate to common concerns, multi-actor and -sector collaboration, capacity building, adaptive management and learning. Accordingly, policy and management actions are suggested which are suitable for handling multiple interests and goals, and the future role of landscape research is highlighted to support SDG implementation on landscape level in Europe (Deliverable 9.4 Mann et al., Landscape and Urban Planning, submitted).

Integrated landscape initiatives (ILI): We provided a realistic and nuanced overview of ILIs in Europe that offers a “reality check” about the potential and outcomes of integrated landscape approaches. From our analysis, we derive a set of recommendations that could foster the development and mitigate the constraints for ILIs in the European context, e.g. regarding funding options, legal frameworks and capacity building (Deliverable 1.3 García-Martín et al., Land Use Policy 2016).

6) IMPACTS ON EU AND NATIONAL POLICIES AND PROGRAMMES
To achieve policy impact at local, national and EU scales was implicit in most HERCULES activities.

Policy activities were bundled around five key themes of new and innovative policy and practice approaches for fostering sustainable landscape conservation, development and identity: a) Landscape stewardship, b) Landscape labelling, c) Integrated landscape management and Sustainable Development Goals, d) Landscape resilience to climate change, and e) Landscape approaches as a governance strategy (Deliverable 9.4). Table 3 displays how the HERCULES recommendations in these key fields interact with relevant EU policies. HERCULES core recommendations for policy and practice are:

• Utilizing the landscape approach
• Creating a better narrative for landscape preservation
• Fostering stakeholder participation, collaboration and network creation
• Strengthening the focus on the local
• Working towards sound institutional interplay
• Including landscape initiatives in existing policies and strategies
• Establishing supportive governance structures and policy conditions
• Creating opportunities for experimentation, adaptation and learning

HERCULES core recommendations for the science-policy interface are:

• Fostering stakeholder participation, collaboration and network creation
• Strengthening the focus on the local
• Working towards sound institutional interplay
• Including landscape initiatives in existing policies and strategies
• Establishing supportive governance structures and policy conditions
• Creating opportunities for experimentation, adaptation and learning
• Creating a holistic and relevant information basis for decision-makers
• Strengthening social sciences for better understanding actors, interests and values
• Systematic learning from the past
• Facilitating the debate for a science-policy-society trialogue
• Specific research questions to be addressed in the future

7) EMPOWERMENT OF PUBLIC AUTHORITIES, AGENCIES, SMES AND CITIZEN ORGANISATIONS
Capacity building was one major impact that HERCULES was aiming at. To maximise impact, SMEs and
Capacity building was one major impact that HERCULES was aiming at. To maximise impact, SMEs and NGOs had been included as partners in the project, and stakeholders were involved in all stages of the project. The related activities encompassed the integration and valorisation of stakeholder knowledge on the one hand and the provision of innovative knowledge and applications to enable stakeholders to improve landscape related decisions and practices:

Sixteen local workshops were performed in five study landscapes throughout the project lifetime. The main goal was to link research with practice, while making the public as well as authorities, various organisations, and industry more aware of the importance of the cultural landscapes not only in terms of social well-being, but also of economic and ecological rural prosperity. We identified local needs for landscape management and provided a forum for general exchange on findings developed by HERCULES (Deliverable 8.2).

In addition, together with the local stakeholder, HERCULES organised five Cultural Landscape Days to come to a dialogue on landscape and between people and their surroundings. Options to ensure the permanence of the Cultural Landscape Days under the umbrella of CIVILSACPE (www.civilscape.eu) are currently discussed (Deliverable 8.4).

To ensure the effective involvement of stakeholders at a European policy level throughout the project’s lifetime, three EU-level workshops were organised (Deliverable 9.2). The workshops contributed to the flow of information top-down and bottom-up toward the target groups of the project and gathered participants from the European institutions, government agencies, NGOs, businesses, practitioners and academia. The issues raised during the workshops later fed HERCULES policy briefs (Deliverable 9.4) and a set of recommendations for landscape policy and practice (http://www.hercules-landscapes.eu/tartalom/publications/articles_5.pdf).

During the Final Conference in Brussels, the key messages and results have been presented to a wide audience, among them DG ENV, DG AGRI, DG RESEARCH, various national ministries, farmers representatives and NGOs (http://www.hercules-landscapes.eu/stakeholder_workshops.php?final_conference).

The Knowledge Hub for Good Landscape Practice, a platform for efficient collecting, archiving, using, sharing, and distributing of data and project results amongst project partners, stakeholders and the general public, was developed and implemented. It is being continued beyond the lifetime of HERCULES, and several Horizon 2020 proposals are aiming to make use of and to further develop the Knowledge Hub. A comprehensive roadbook on good landscape practices was developed (“The Science and Practice of Landscape Stewardship”, to be published by Cambridge University Press in early 2017, ISBN: 9781107142268).

Recognizing people as experts for their everyday landscapes requires using participatory approaches like oral history interviews (Bürgi et al., Landscape Ecology, submitted), PPGIS (Garcia-Martín et al., Landscape Ecology, submitted) or ABM (Tieskens et al., Landscape Ecology, in press, Zagaria et al., Land Use Policy, submitted), e.g. in combination with modelling, and finally enables a true co-creation of knowledge. In such a way, science has an important role to play for empowering local people regarding landscape issues, aiming at the implementation of good landscape practices. Capacity building was particularly successful among European landowners, thanks to the active engagement of ELO.

8) IMPACTS ON THE PROJECT PARTNERS
HERCULES was successful in enfolding networking impacts among its consortium partners. The following impacts were achieved:

- Learning across disciplines was fostered. A particular feature of HERCULES was that disciplines that
Learning across disciplines was fostered. A particular feature of HERCULES was that disciplines that had rarely worked together before started cooperating, e.g. human geography and environmental modelling (e.g. in the cultural landscape typology); social sciences and Geographic Information Sciences (e.g. in the mapping of landscape values).

Cooperation between partners from science and practice was particularly fostered. This resulted in academic publications authored or co-authored by SME- and NGO-partners (e.g. Girod et al., submitted, Kizos et al., Landscape Research, submitted), practice partners contributing to teaching at academic partners (e.g. ELO staff members at UCPH) and in academic partners contributing to policy events of non-academic partners (e.g. UCPH staff members at the European Biodiversity Conference of ELO). Close linkages to the business world were established by having three SMEs in the consortium (ALTICIME, FOC, NORDECO).

The continuous interactions in HERCULES resulted in numerous follow-up assignments for the involved partners. HERCULES partners arranged in new consortia that applied (among others) for Horizon 2020 projects on “Provision of public goods by EU agriculture and forestry: Putting the concept into practice”, “Demonstrating the concept of ‘Citizen Observatories’”, “Cultural heritage as a driver for sustainable growth”, and for various Marie Skłodowska-Curie Actions.

Almost all publications from HERCULES were authored jointly among several partners, including junior and senior researchers as well as often both scientists and practitioners.

9) NEED FOR A EUROPEAN APPROACH
While a European approach is of benefit for all kinds of research and demonstration activities, the need for a European perspective was particularly needed for cultural landscape research that had been fragmented across isolated case studies and disciplines. In its research agenda, HERCULES used three venues toward a European approach: a) Systematic reviews of existing case study evidence (Deliverable 1.2) b) Comparative analyses of a set of study landscapes across Europe (Deliverable 3.3 Deliverable 3.4 Deliverable 3.5) and c) Pan-European mapping and modelling (Deliverable 4.1 Deliverable 4.3.). In its action-agenda HERCULES targeted both local landscape and Pan-European scales by performing multiple series of stakeholder workshops in study landscapes and in Brussels (Deliverables 8.2 Deliverable 9.2).

10) ACCOUNT TAKEN OF OTHER RESEARCH ACTIVITIES
HERCULES closely linked and integrated its activities into the broader research community around cultural landscapes. Such opening of HERCULES occurred through expert workshops, invited guests at project meetings, arrangement of conference sessions, and invitations to researchers from outside HERCULES to contribute to the HERCULES blog and the roadbook project. Including the larger community of science and practice in HERCULES activities helped integrating disciplines, skills, and perspectives that the consortium partners did not have. It was also important for making HERCULES a central project of the European landscape community. Through this, we ensured that the HERCULES-Knowledge Hub on Good Landscape Practices is embraced by the community.

In particular, HERCULES had the ambition to make cultural landscape research a core topic of sustainability science. In parallel to presenting the findings and core topics at several major landscape related conferences, the project established linkages to the FUTURE EARTH research platform for global sustainability, sponsored by the Science and Technology Alliance for Global Sustainability. HERCULES operationalised these linkages by being endorsed by three FUTURE EARTH research projects:

- Program on Ecosystem Change and Society (PECS): HERCULES partners attended three PECS
Program on Ecosystem Change and Society (PECS): HERCULES partners attended three PECS workshops in Montpellier/France (02.-03.05.2015) and Stockholm/Sweden (28.-30.01.2015 and 12.-14.10.2016) and have contributed a landscape perspective to a special journal issue on PECS (Plieninger et al., 2015). HERCULES partners were particularly engaged in PECS synthesis activities on “Ecosystem service trade-offs and synergies: synthesizing and learning across case-studies”. HERCULES was frequently featured on the PECS website. Also, HERCULES arranged a workshop on “The value of ecosystem stewardship for managing social-ecological systems: insights from place-based research in different regions” at the PECS 2015 Conference in Stellenbosch/South Africa (03.-05.11.2015) and submitted another one on “Socio-cultural assessment of landscape values: Status quo and future directions” to the PECS 2017 Conference in Oaxaca/Mexico.

Global Land Project (GLP): HERCULES partners presented at the GLP Open Science Meeting in Berlin/Germany (19.-21.05.2014). Linkages were close, with the GLP chair being a HERCULES partner.

Integrated History and Future of People on Earth (IHOPE): Linkages to IHOPE were also close, with the Director of the International Project Office of IHOPE being HERCULES partner.

On the one hand, endorsement by FUTURE EARTH research projects helped to make HERCULES more widely known and to reach out to other communities of sustainability research. On the other hand, HERCULES and the broader landscape community used this linkage to feed important insights into sustainability science.

Further linkages have been established to the Landscape for People Food and Nature (LPFN) initiative. We actively cooperated with the LPFN initiative in its effort to perform continental reviews of integrated landscape initiatives by contributing a European continental review (García Martín et al. 2016). A speaker from LPFN delivered a keynote to the Final Conference of HERCULES on 04.10.2016 in Brussels/Belgium.

Finally, the link to the International Partnership for the Satoyama Initiative has been used to organise a special session at European-Japanese expert workshop on cultural landscapes and place-based food networks (Kizos et al, Food Policy, submitted; Plieninger et al., Sustainability Science, submitted).

**MAIN DISSEMINATION ACTIVITIES**

Stakeholders were central to the entire HERCULES endeavour. Stakeholders provided insight into what precisely they value in their surrounding landscapes and do so from very different perspectives depending on their professions and relationships to their surroundings. This was critical at the early stage of the HERCULES project as it allowed the identification of cultural landscape values, as well as landscape aspects that individuals feel are being threatened by transformations. The involvement of stakeholders throughout the project as it progresses was of equal importance as they ensured that the project affects real change on a local, regional, national and Pan-European level.

- The HERCULES website, including an intranet site, served as the most versatile public dissemination tool for the project (www.hercules-landscapes.eu). There was an average of 241 visits per week (202 unique users) with an average 2:30 minutes session duration. The most visited pages were: the “Homepage”, the “Cultural Landscapes Blog”, “Consortium” and the part on “Stakeholder Workshops”.
- HERCULES designed and implemented the Knowledge Hub for Good Landscape Practice (http://www.hercules-landscapes.eu/knowledge_hub.php) as a tool to ensure efficient collecting, archiving, using, sharing, and distributing of landscape-related data and project results amongst project partners, stakeholders (e.g. landscape practitioners, managers and policymakers) and the general public. It provides a platform for learning and exchange on landscape practices on Pan-European scale. A broad
provides a platform for learning and exchange on landscape practices on a Pan-European scale. A broad range of thematic applications from HERCULES partners, stakeholders, and the general public is active that are also useful to SMEs, including Good Heritage Practices, Good Landscape Practices, Guidelines for Landscape Management, Cultural Landscape Change Explorer, Cultural Landscape Characterisation and Future Cultural Landscape Dynamics. Interfaces allow the use of existing crowdsourced information on cultural landscapes, such as photos and site descriptions in GoogleEarth or Panoramio. Additionally, a smartphone app was developed to allow people to easily gather information about cultural landscapes (My landscape ratings, https://play.google.com/store/apps/details?id=com.sinergise.android.scaperatings) and feed them into an online database. This app disseminates place-specific information on cultural landscapes to end-users and allows users to engage in collecting data on the state and change in cultural landscapes by contributing observations and photos.

- Three series of EU as well as local stakeholder workshops were organised in five study landscapes (Modbury, UK; Grand Parc Miribel Jonage, France; Kodavere/Vooremaa, Estonia, Colmenar Viejo, Spain; and Lesvos, Greece). During the first workshop, participants were asked for input into the research plan to refine tasks and questions and to make sure that the research plan is as practice-and policy-relevant as possible. The workshops revealed stakeholder needs and were a platform for the exchange of ideas for landscape management and discussion of best practice-models. The mid-term workshops provided a reality check for the preparation of policy options, whereas the final workshops were used to discuss the results and provide feedback to the stakeholders.

- On-the-ground demonstration activities focusing on stakeholder-to-stakeholder communication organised with landscape users. Together with the local stakeholder, HERCULES organised five different Cultural Landscape Days (Modbury, UK; Grand Parc Miribel Jonage, France; Kodavere/Vooremaa, Estonia, Colmenar Viejo, Spain; and Lesvos, Greece). In the course of the events over time it became evident that the aim in celebrating landscapes was not only to draw citizens’ attention to its beauty and variety of values, but to come to a dialogue on landscape and between people and their surroundings.

- Concerning scientific publications, 27 journal articles were published in peer-reviewed and leading landscape journals in relation with the research that has been carried out in the context of the project. 27 more articles are submitted (including 16 for two special issues in “Landscape Ecology” and “Landscape Research”) or in preparation (2). The publications are collected on the project’s website. Open Access was either provided by publishing in Open Access journals or – where this was not possible – a preprint version was shared at the research data repository Zenodo (https://zenodo.org/communities/hercules-project/?page=1&size=20) that was created by OpenAIRE and CERN to provide a place for researchers to deposit datasets.

- The insights on the potentials of various landscape practices in specific contexts, stakeholder groups and fields of application were compiled in a roadbook on landscape stewardship. This roadbook delivers detailed and applicable information on the range of different approaches available to foster re-coupling of social and ecological realms for the protection and development of heritage values in cultural landscapes. The roadbook was delivered in the form of an edited volume entitled “The Science and Practice of Landscape Stewardship”, to be published by Cambridge University Press in early 2017.

- Furthermore, 53 scientific presentations at major landscape-related conferences (e.g. IALE, PECSRL, Brussels Green Week) and smaller workshops were held.

- The Cultural Landscapes Blog was launched in April 2014. The blog established a forum to promote the cultural landscapes theme and HERCULES throughout the communities of landscape science, practice, and policy on a regular base. Since its launch, 66 articles were featured on the blog, with 817 subscriptions to it. Contributions were mainly made by HERCULES partners and Advisory Board.
Subscriptions to it. Contributions were mainly made by HERCULES partners and Advisory Board members, but the blog was also open for contributions from outside.

- HERCULES also published 15 articles in the public press. They are made available on the HERCULES website (http://www.hercules-landscapes.eu/resources.php?media). During the stakeholder engagement activities several other information and factual outreach products were produced and published by external media entities about the project. These media coverages were mainly linked to the local stakeholder workshops and the Cultural Landscapes Days carried out in five locations.

- In the social media, the project was made available through Twitter (https://twitter.com/HerculesFP7 379 Followers), Facebook (https://www.facebook.com/HerculesLandscapes 802 likes) and YouTube (teaser video, https://youtu.be/I5Q33HN5OeY “What are cultural landscapes and why are they important to us?”, https://www.youtube.com/watch?v=k5yjyFKGJAs HERCULES Final Conference, https://www.youtube.com/watch?v=&_aduGcos3E).

- The results of the HERCULES studies were systematically composed and visualised to translate them into five infographics. The infographics present quickly and clearly the high amount of data and knowledge gathered and are thus a useful tool to communicate them (Project Context and Objectives, Cultural Landscape Typology, Drivers of Change, Integrated Landscape Initiatives in Europe, Examples of Integrated Landscape Initiatives in Europe).

- Communication about HERCULES through public relations is an important pillar of the communication strategy. The policy platforms promoting HERCULES took different forms such as conferences, workshops, presentations, seminars, stands at fairs and events related to environmental protection such as the Green Week (Brussels), Forum for the Future of Agriculture (FFA) conferences (Brussels), Mapping and Assessment of Ecosystems and their Services (MAES) workshops (Brussels), Biogeographical seminars (Thessaloniki, Florence, Madrid, Athens), Inter-LIFE conference (St Remy de Provence), Coordination Group for Biodiversity and Nature (CGBN) meeting (Brussels), and many more.

- Five policy briefs summarised the key findings and policy options for a non-specialist audience, outlining in detail key concepts and strategies for fostering sustainable landscape conservation, development and identity. These five concepts and strategies are 1) landscape stewardship, 2) landscape labelling, 3) integrated landscape management, 4) climate change and resilience of landscapes and 5) landscape approach to environmental governance.

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