Final Report Summary - MEMOLA (MEditerranean MOntainous LAndscapes: an historical approach to cultural heritage based on traditional agrosystems)

Executive Summary:
MEMOLA project (2014-2017) proposes an interdisciplinary approach to cultural landscapes of Mediterranean mountainous areas, taking as a central axis the historical study of two natural resources essential to generate agro-systems: water and soil. The study focuses on four areas: Sierra Nevada (Spain), Monti di Trapani (Italy), Colli Euganei (Italy) and Vjosa Valley (Albania). Coordinated by the University of Granada (Spain), the project is integrated by an international team of researchers and experts coming from the academic and business context. It includes ten partners from five different countries (Spain, Italy, Albania, England and Ireland) and integrates historians, archaeologists, anthropologists, agronomists, botanists, edaphologists, hydrologists and architects. It aims to analyse cultural landscapes taking as a central axis the diachronic study of the relationship between human populations and natural resources. The construction of landscapes is based on strategies of production...
and reproduction of societies, each one with their particular characteristics, throughout history. To understand the landscape it is necessary to research the historical and cultural processes that have led to a specific relationship with the environment, aimed at the extraction and use of resources in specific social contexts. Thus, the project applies an integrated approach to assessing the role of landscapes in European cultural heritage. The project contributes to economic development and biodiversity protection by engaging with policy decision makers and community stakeholders in long-term resilience strategies. The levels of expected project impact are: A) CULTURAL HERITAGE: Diffusion and valorisation of historical sites and intangible will promote a revalorization of the rural areas, contributing to strengthening their local identity. Its preservation implies the maintenance of the regional cultural peculiarities and traditions, both productive and cultural. B) SOCIOECONOMIC: The valorisation, dissemination and specific actions carried out on these landscapes, will contribute to enhancing social awareness and, at the same time, have a positive impact on the social and economical tissues of the studied areas. C) ENVIRONMENT: Identification of socio-ecosystem management strategies that prevent environmental degradation, provide food and habitat to living organisms, and support other natural processes and functions of the Mediterranean mountain ecosystems.

Some of the most innovative MEMOLA outcomes include:

• LOCAL DEVELOPMENT. The rehabilitation of 9 traditional irrigation system in the areas of Sierra Nevada and Vjosa Valley, which has been considered one of MEMOLA´s best practices by the European Commission.
• DIGITAL COMMUNICATION. The study area of Colli Euganei can be visited using the APP Passeggio sui Colli Euganei which includes 2 itineraries to discover the landscape and historical and cultural heritage of the Euganean Hills.
• The MEMOLA EDUCATIVE NETWORK is the result of relationships nurtured with local schools since the beginning of the project. This collaborative includes, among other activities, workshops, field visits and the design and evaluation of educational resources.
• 3 MEMOLA POLICY BRIEFS which include guidelines and recommendations on landscapes and agrosystems protection policies.
• The MEMOLA NETWORK includes a wide range of other scientific institutions, projects and networks with interests in common and collaboration relationships.

Project Context and Objectives:
The MEMOLA project develops through nine work packages, which are organised in four blocks:

1. HISTORICAL ARCHAEOLOGICAL STUDIES, of the four areas selected for the project: WP1 Sierra Nevada (Spain), WP2 Colli Euganei- Padova Valley (Italy), WP3 Vjosa Valley (Albania), WP4 Trapani Mountains (Italy). Ongoing activities in these four WPs are similar in terms of the objectives to be achieved, but with the specific characteristics of each study area. This is largely an historical-archaeological study that will support environmental analysis (WP5 & 6).

2. ANALYSIS OF POTENTIAL CURRENT AND HISTORICAL LAND USES & SUSTAINABILITY STUDIES AND ECOSYSTEM SERVICES. These activities correspond to WP5, coordinated by UCO, and WP6, coordinated by UNIPA. The Both W.P are oriented to develop at each of the areas of study a set of biophysical models, with socio-economic and institutional components, all leading to the integration of land use, water use and management of agricultural productivity and ecosystem services.
3. OUTREACH ACTIVITIES- SOCIO-ECONOMIC IMPACT. This block includes WP7, coordinated by UGR, and WP9, coordinated by ARQUEO. Both are mainly focused on community involvement, which refers to local residents as well as local stakeholders and policy makers. WP7 includes project dissemination activities, with an emphasis on working with local schools and implementation of fieldwork activities and exhibitions. WP9 involves activities towards reinforcing the socio-economic dimension of the project.

4. INTERNAL MANAGEMENT WORK, corresponding to WP8, and that will be covered in the next section of this report.

WORK PACKAGE 1-4: HISTORICAL-ARCHAEOLOGICAL STUDIES: WP1. SIERRA NEVADA (SPAIN), WP2. COLLEI EUGANEI OF PADOVA (ITALY), WP3. VJOSA VALLEY (ALBANIA) AND WP4. TRAPANI MOUNTAINS (ITALY)

Duration: Month 1-48
WP 1 Leader: UGR
WP 2 Leader: UNIPD
WP 3 Leader: CeRPHAAL
WP 4 Leader: USHEFF

• Conduct a specific historical and archaeological study in the four Mediterranean mountain landscapes of: Sierra Nevada (Granada-Almería, Spain), Monti di Trapani (Trapani, Italy), Colli Euganei (Padova, Italy), Vjosa Valley (Albania).
• Quantitatively assess the long-term historical uses of water and soils in the study areas. Analysis of agrosystems (crops and livestock), via the collection and examination (archaeological fieldwork and ethnographic surveys) of the historical traces that remained fossilised in the landscape.
• Comparative study of the four sample areas in order to unveil the commonalities and differences.
• Analysis of the productivity and resource use efficiency in the four historic sample-areas, through agronomic and hydrological resource-management models, taking into account the global climate change, and the EU policies and strategies (European Landscape Convention, European water policy, Common Agricultural Policy, Joint Programming Initiative (JPI) on Cultural Heritage and Global Change)

WORK PACKAGE 5: ANALYSIS OF POTENTIAL CURRENT AND HISTORICAL LAND USES.
Duration Month: 4-40
WP 5 Leader: UNIPA

• Quantitatively assess the long-term historical uses of water and soils in the study areas. Analysis of agrosystems (crops and livestock), via collection and examination (archaeological fieldwork and ethnographic surveys) of the historical traces that remained fossilized in the landscape.
• Comparative study of the four sample areas in order to unveil the commonalities and differences.
• Analysis of the productivity and resource use efficiency in the four historic sample-areas, through agronomic and hydrological resource-management models, taking into account the global climate change, and the EU policies and strategies (European Landscape Convention, European water policy, Common Agricultural Policy, Joint Programming Initiative (JPI) on Cultural Heritage and Global Change)
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WORK PACKAGE 6: SUSTAINABILITY STUDIES AND ECOSYSTEM SERVICES.
Duration Month: 1-48
WP 6 Leader: UCO

- Analysis of ecosystem services starting from mountain agricultural and livestock spaces in the Mediterranean. Examine the role played by agroecosystems in maintaining biodiversity (wild and cultivated, including their ancestors). Trace an historical trajectory of agroecosystems leading to the creation of a “High Nature Value farmland”.

- Proposals for improving resources-use efficiency and conservation of cultural landscapes associated with traditional agricultural and livestock activities, in order to contribute to a sustainable development of the study areas from a social and environmental point of view, while enhancing their heritage and natural values.

WORK PACKAGE 7: OUTREACH ACTIVITIES
Duration Month: 1-48
WP 7 Leader: UGR

- Promote the protection of agropastoral mountain landscapes, within the strategies of the European Landscape Convention, with the aim of proposing some of these areas to the UNESCO world heritage list.
- Foster and disseminate traditional skills and know-how. This will allow reinforcing the local identity of rural communities within the study areas, involving local communities in our research as active members possessing the knowledge that must be preserved as a vehicle to ensure the survival of their own landscapes. The dissemination will take place for both general and specialised public by conducting outreach activities such as: workshops, conferences, exhibitions, publications, social media, project website, and so on.
- Development and maintenance of a project website, as an important dissemination and working tool.

WORK PACKAGE 8: INTERNAL MANAGEMENT WORK.
Duration Month: 1-48
WP 8 Leader: UGR

- Promotion and development of new study methodologies for cultural landscapes that will be fuelled by an interdisciplinary research team, combining the principles and methods of archaeology with modern hydraulic and soils analyses techniques, remote sensing and terrestrial imaging scanner analysis, archaeobotanical studies and specific analyses of the isotopic composition of archaeological woods and seeds.
- Organization of periodic workshops, courses and seminars among project members in order to share the different working techniques and specific methodologies of every area included in the study, thus contributing to the training of the research staff of each of the participant partners.
- Development and maintenance of a project website, as an important dissemination and working tool.
WORK PACKAGE 9: SOCIO-ECONOMIC IMPACT
Duration Month: 5-48
WP 9 Leader: ARQUEO

- Analysis of the productivity and resource use efficiency in the four historic sample-areas, through agronomic and hydrological resource-management models, taking into account the global climate change, and the EU policies and strategies (European Landscape Convention, European water policy, Common Agricultural Policy, Joint Programming Initiative (JPI) on Cultural Heritage and Global Change).
- Proposals for improving resources-use efficiency and conservation of cultural landscapes associated with traditional agricultural and livestock activities, in order to contribute to a sustainable development of the study areas from a social and environmental point of view, while enhancing their heritage and natural values.
- Promote the protection of agropastoral mountain landscapes, within the strategies of the European Landscape Convention, with the aim of proposing some of these areas to the UNESCO world heritage list.
- Foster and disseminate traditional skills and know-how. This will allow reinforcing the local identity of rural communities within the study areas, involving local communities in our research as active members possessing the knowledge that must be preserved as a vehicle to ensure the survival of their own landscapes. The dissemination will take place for both general and specialised public by conducting outreach activities such as: workshops, conferences, exhibitions, publications, social media, project website, and so on.

Project Results:
The work performed since the beginning of the project has been very intensive across all implementation areas: research, community outreach, and socio-economic development. In addition, the managing of the Consortium and coordination of all project components resulted in the establishment of a long-term collaborative network which includes researchers from various academic and technical backgrounds. This network has surpassed project consortium consolidating the multidisciplinary approach that gave sense to MEMOLA’s multilayered implementation.

Find a summary of MEMOLA project final results ANNEX 1 (Infografía)

1. RESEARCH

To understand the process of historical landscapes formation in connection to natural resources utilization, in particular, soil and water, MEMOLA project dedicated an important effort to establish the scientific research, communication, and collaboration with a broad panel of specialists.

In regards to the research work packages the activities performed corresponded to: 1) Hydraulic and Archaeological prospection campaigns in the four areas of study, 2) Ethnographic fieldwork, also performed at the four study areas; 3) Archaeological excavations at Pago del Jarafi-Lanteira (Sierra Nevada), Montagnon (Colli Euganei), Pizzo Monaco (Monti de Trapani), Magjerice-Permet (Upper Vjosa Valley), which included ongoing archaeobotanical analysis, geochemistry analysis and study of archaeological materials and artefacts. All archaeological excavations counted with, at least, 300
volunteers coming from different European and non-European countries. 4) Hydrological and Agronomical field work at Sierra Nevada, Colli Euganei, Monti Di Trapani and Vjosa Valley 5) Botanical and edaphological field work at Colli Euganei, Monti Di Trapani and Vjosa Valley. 6) Technical documentation, bibliography search and archival documentation for the four areas of study. In order to quantitatively assess long-term historical uses of water and soils in the study areas, the following deliverables were issued: D.5.1. Report on the final land use distribution model D.5.2 Report on the final water use efficiency model D.5.3 Pedology report D.5.4 Report on vegetation mapping and landscape Conservation D.5.5 Water evaluation report D.5.6 Archaeological report and D.5.7 Land evaluation report.

Research work has been driven by the necessity of building an integrative and multidisciplinary approach to study long-term changes in cultural landscapes. Applied historical research, with an emphasis in archaeology, took place within the framework of sustainable development, community participation and ecosystem services management analysis. Thus, activities in each of the work packages dedicated to research have been multidimensional and fruitful (ANNEX 2).

The excavation performed at Pizzo Monaco (Italy) resulted in finding one of few medieval collective fortified granary (agadir) still present in the Mediterranean. It served to store surplus production as well as a safe deposit for the most valued goods of the people who reside at the settlement located in the lower part of the mountain, what today is the fountain of Baida (watch video here: http://memolaproject.eu/node/1359). In this study area, fieldwork main focus was to locate hydraulic resources such as fountains, water springs, historical irrigation channels, irrigation pools and underground channels, among others. The input of the local population, especially the elderly, has been crucial to understanding the traditional distribution of water in the territory and irrigation practices lost 30 and 40 years ago. This information is very relevant to understand the relationship between traditional irrigation systems and the Islamic elements still fossilized in the landscape of this territory. Thus, fieldwork activities were linked to the possibility of locating archaeological sites next to the hydraulic elements that were documented. The spatial data obtained during the hydraulic survey and ethnographic interviews has been uploaded to project geo-database. In total, 8 archaeological sites were located, 33 springs and 113 hydraulic structures including 4 wells, 2 cisterns, 63 rafts, 83 wells, 2 watering holes and 22 alcubillas (Cuba).

In the framework of the MEMOLA project, the role of local farmers knowledge and perceptions on soil for the historical land use through the spatial distribution of crops and the various management practices have been assessed in three areas of Monti di Trapani region (Sicily) with different historical land uses and soil types (Bosco Angimbè, Bosco Baronia and Balata di Baida), covering a total of 500 ha approximately. The specific objectives of the study were: (1) to identify the farmers’ soil classification systems and the criteria on which it is based; (2) to assess the farmers’ ability to identify and map the different soil types; (3) to compare scientific-technical and local knowledge on soil; and (4) to evaluate the links between Local Soil Knowledge (SLK) and farmers’ decision on crop allocation and management. Understanding the local knowledge and perceptions of soil is a challenging task and a learning process, especially as farmers’ soil categories are not always apparent or transparent. For this reason, the applied methodology in this study was based on an interdisciplinary approach, combining and integrating technical methods and participatory appraisal tools. One of the main conclusion of this research was that the use of LSK could allow for a rapid and inexpensive design of a sustainable resource management model, providing site-specific information on soil properties and their suitability for different crops.
specific recommendations for agricultural practices. This is becoming more important as alternative agricultural systems which rely on natural soil fertility, such as organic farming, are expanding in the area.

Archaeologist team at Pizzo Monaco, conducted specific studies through hydrological surveys and archaeological excavation to better understand the sequence of land occupation. The archaeological surveys were complemented by the identification of water points, agricultural terraces, pastures, forest, traditional roads, to comprehend the relationships between human beings and the exploitation of natural resources. The agronomy and pedology team focused on understanding local soil and water management practices and analyzed the productivity and resources use efficiency. Botanists were involved in performing biodiversity evaluation (including both spontaneous and cultivated plants) and land evaluation processes, in order to assess the potentiality of agroecosystems in terms of natural vegetation and agricultural exploitation.

The agrosystems surrounding the town of Calatafimi were selected as representatives of the case study in Sicily. These agrosystems are the outcome of the historical relationship between man and nature, resulting from complex interactions between biodiversity (at all levels, including species richness, ecosystem, and biotope diversity) and cultural diversity, including material and non-material aspects (architectural heritage, historical irrigation systems, local traditional agricultural practices, dialectal culture).

The botanist team designed and performed procedures to define and map vegetation series. To identify homogeneity at different spatial scales, they started from a hierarchical-based deductive approach in GIS environment, that identified nine different series. The two most important, in terms of extension and agricultural suitability, were the Genisto aristate-Querco suberis sigmetum and the Oleo sylvestris-Querco virgilianae sigmetum. Typical agricultural land-uses associated to each vegetation series were then identified.

Vegetation series analysis allowed the definition, with a deterministic approach, of theoretical landscape trajectories, both in the progression towards higher naturalness states (woodlands) and in the regression towards lower naturalness states (pastures and agricultural systems). Regression stages’ identification gave valuable insight on agricultural suitability characteristics.

During MEMOLA project, analysis and mapping of actual vegetation have been understood as tools to support the investigation of the causes and consequences of land use patterns. Vegetation is the most used indicator in ecosystem and landscape analysis and evaluation. Spontaneous plant communities are in fact strictly linked to environmental characteristics of a territory. The presence of a plant community is always an indication of a defined environmental condition such as climate, substrate, soil, etc. This link between vegetation and its environment is enclosed in the very definition of phytocoenosis, intended as a living collection of plant life forms that are found together, interacting as a community within an ecosystem.

The role of vegetation as diagnostic character of ecosystems has been acknowledged by Directive 92/43 CCE “Habitat”, the pillar of biodiversity conservation in Europe. The Directive is aimed at the conservation of species and habitats, the latter identified with plant communities. Within this framework, MEMOLA project issued a report that described the methodology and results regarding vegetation data collection and mapping. Vegetation mapping datasets have been published on Project Georepository and are available to the workgroup for further landscape analysis.

The work at Sierra Nevada study area has been very successful in terms of research and community
involvement activities. The archaeological studies surpassed its scientific data gathering orientation, by outreaching local communities and stakeholders during its execution. In the case of the work developed in the villages of Cañar, Lugros and Lanteira, field surveys (hydraulic and archaeological), ethnographic interviews and cartography data, took place during the restoration campaigns of the historical irrigation systems, in which the local irrigators communities, the Sierra Nevada Natural Park and civil associations actively participated (watch video here: http://memolaproject.eu/node/1358).

The archaeological excavation in the area of El Jarafi, Lanteira started in September, 2014. Several archaeological Islamic sites were identified, containing very significant archaeological elements: silos, a medieval house, an Islamic cemetery containing 22 tombs and another necropolis, this time of Christian rite. The finding of a small rural mosque has attracted important media and public attention since it represents one of its kind. The pottery analysis corroborates aspects related to the chronology of the site, identified between 7th and 13th centuries. (ANNEX 3)

The Barjas traditional Irrigation System (Sierra Nevada-Spain), also known as acequia, had been out of use for more than 20 years when in 2014 was restored following the traditional techniques in the area under the scope of MEMOLA and the assistance of the local irrigation community. More than 180 volunteers from different points in Spain and other countries participated. The acequia of Barjas, was selected to serve both goals of modelling and assessing the potential ecosystem services. The water distribution and management model was defined as the combination of a hydrological distributed module, to quantify the amount of water that flows naturally into the ditch from the contributing catchment, and a one-dimensional semi distributed hydrological routing module, to evaluate the water flow along the system. Field data analyses to derive the ditch 3D representation, the effective hydraulic conductivity of the bed materials, and the calibration of the routing model. Hydrological simulation of the contributing catchment by using WiMMed model (Watershed Integrated Model for Mediterranean Environment), previously calibrated and validated in the catchment of the study area from snow monitoring and water flow values downstream. The ditch model is intended as a tool to manage this kind of traditional irrigation systems. The adopted formulation allows the evaluation of scenarios related to both climate variability and water use allocation (i.e. How much water flows along the ditch if a) the year is very dry, or b) a farmer diverts certain volume of water). Thus the water model designed during project implementation will serve to respond to this and other relevant questions.

At the study area of Vjosa Valley, participatory approach methodologies applied during the MEMOLA project in the territory allowed to strengthen the link between the past and the present, between research objectives and community needs. The MEMOLA team present at this study area of Albania, followed a model to find ways for directly involving the communities in the research, in order to build a system profitable for both researchers and community.

Activating the locals in the research efforts, allowed researchers to provide a considerable amount of raw data, regarding the “Cultural assets of the Landscape”: including information on the places names, archaeological remains, monuments, historical channel, land-parcels, traditional practices, etc. While studying their lives and their relationship with the territory, many became active members in the research through the implementation of two of the most relevant research activities performed in this study area: a) The construction of a Vlachs historic building – Kalive; b) The recovery of the historical channel at the villages of Vllaho and Psillotere.
The first activity goal was to recuperate Historical Practices of the Vlach Community. The Vlachs people of the Vjosa Valley were a nomadic pastoral people until the 20th century. The MEMOLA project proposed to reinforce the local identity of rural communities as a vehicle to ensure the survival of landscapes. MEMOLA project in collaboration with the municipality of Përmet, students from “University of "Aleksandër Xhuvani”, Elbasan, and volunteers from the Vlach community of the Valley, constructed a historical Vlach dwelling, locally known as Kalidhe or Kalive. The goal was to materialize the construction memory of the historical dwelling, in use until the 60’s of the last century. Its construction enabled to transmit to younger generations many of the forgotten historical knowledge, regarding the traditions, customs and ways of life of this community, which is an integral part of the history of the Upper Vjosa Valley. In addition, the construction was an experiment in the field of archaeology, which attempted to generate construction elements and features from residential or service structures of the Early Medieval Period identified in the region.

Regarding the second community involvement/research activity, the study of traditional irrigation brought important results regarding their historic evolution in relation to agrarian land use, and the importance of the efficiency use of these traditional systems in the current societies. Only a few of these network structures are currently in use, and this due to the political and social changes that affected the country in early and later years of the 1990’, associated with an extreme land parcelization of property, land abandonment, decrease of peasantry population, land erosion, imbalanced and non-sustainable agrarian policies, and etc. In the later years, however, has become evident, a tendency of the agrarian communities to adapt to the traditional practices, as it is the recovery of traditional channels or the construction of other irrigation supply mechanisms, such as the large or small water tanks (topila).

At the study area of Colli Euganei (IT) most of the archaeological activities unfolded from the excavation at Castle Montagnon (Montegrotto), a medieval fortified settlement turned into a rural residential site. The survey area was identified thanks to the integration of written sources, that attest the presence of a castle from the first half of the eleventh century, with the remote sensing, where the LiDAR images were, in fact, valuable to identify the main structures the castle, as the outer wall and the moat, preserved in close-up but covered by dense vegetation. The excavation focused on three particular areas: 1) Excavation of the structures belonging to the late medieval rustic villa, with exposure of the walls and floors of use, analysis of stratigraphic sequences and phases that have transformed the defensive structures of the castle in rural lodging. 2) Excavation of a settlement context in poor materials, characterized by broken bricks and mortar hearths, overlying structures probably related to buildings connected to the walls. 3) Excavation of a section of the ditch, to understand the extent of the outer defenses of the castle. The excavation yielded a fair amount of ceramic materials, especially late medieval. To get a complete view of the archaeological context and with the aim of obtaining material for analysis archaeobotany (especially seeds), samples of soils obtained from specific layers were floated and analysed.

The Padua team performed the recognition on the surface of all anomalies interpreted on raster images obtained by remote sensing (LiDAR, Radar, Aerial photographs). For instance, the historical photographs and LiDAR images, allowed recognizing traces of the paleo-riverbeds and their relation with the settlement patterns and the formation of agrarian landscapes. In order to perform the agrosystems analysis, researchers studied land property history of the area by examining two chronological contexts: Modern Age, using quantitative data from the Napoleonic (1828) and Austrian (1846) cadastres, and current
maps; and various flashbacks based on several qualitative data extracted from documents and material record from XII to XVIII centuries. These data were collected in a summary of the cadastral map, where it is possible to see for each property the land use (a type of crop, if is a forest, pasture, etc.) and its extension. These data have been incorporated into a geodatabase in the GIS platform that was analyzed by the UCO team to compare historical and current land uses in the sample areas. Three different sample areas were selected to carry out this comparison based on the analysis of the archaeological and historical shreds of evidence, the pedological and agronomic characteristics, the recovery of climatological and hydrological data or the topography features.

Linked to the research on forests, ethnoarchaeological research and activities have been carried out aimed at tracing the dynamics of the forest landscapes of Euganean Hills. This research was developed in collaboration with forest managers of the Regional Park and local associations. From their point of view, this approach was essential and helped them to better manage forest areas in a particularly complex context, related to the fragmentation of forest property. Part of this research focused on better understanding the issues surrounding these forest areas, by proposing a survey not only of forest owners and managers but also of the local population as a whole and of occasional users of these areas. This analysis, which is still ongoing, highlights some particularly interesting results. For example, the Robinia tree found in this area illustrates the complexity of the situation. While for botanists, ecologists and forest managers this taxon is considered an invasive and endangering local biodiversity, some of the local population appreciate this tree, not only for the quality of its wood but also for its aesthetic aspects. The work on the history of this forest provides valuable elements for discussion on forest policies to be implemented in the coming years.

The actions initiated with local associations and the inhabitants of the Regional Park seem particularly promising in that they raise awareness of the origin of current forest landscapes and promote a different way of looking at these areas, which are so often considered "natural". The construction of an experimental charcoal kiln in October 2017 allowed explaining in detail, to more than 150 people, the process of transformation of forest areas by past human activities. The very positive feedback from those in charge of the Euganean Hills Regional Park and from local associations suggests that these areas will be better taken into account during the development of local policies.

As a main project research result, it has been developed specific GIS Cartography of all four study areas, including digital cartography with archaeological sites, land uses and water uses (ANNEX 4). All the collected data is managed through 2 different GIS platforms: 1). a GIS designed by the team of Padua in which is being incorporated all the elements that make up the historical and current landscapes of the study area: primary and secondary viability, hydraulic network, productive structures, agricultural parcel type, uncultivated activities, settlements, residential and religious architecture, productive activities and so on. 2) The other platform is the MEMOLA Georepository, where it has incorporated vector and raster layers and documents about Euganean Hills: a) Archaeological data map b) Hydraulic survey with watermills (http://georepository.memolaproject.eu/layers/geonode:watermills). c) Hydraulic elements. d) Napoleonic cartography. e) Past and current land uses (http://georepository.memolaproject.eu/maps/113). This tool allowed the exchange of information, materials, and publications among all project components.
2. COMMUNITY INVOLVEMENT AND OUTREACH

EDUCATION

Community involvement work has targeted a diverse number of stakeholders. Numerous meetings have been held at a local and regional level with representatives from village councils, regional offices for heritage and cultural promotion, institutions for environmental and territorial management, among others. To reinforce the local identity of rural communities within the study areas, involving local communities in the research as active members, MEMOLA project’s strategy was to foster and disseminate traditional skills and know-how among the general public.

The project has been very fruitful regarding actively involving the educational communities present in all study areas (ANNEX 5). Through MEMOLA project a total of 164 teachers and 28 schools have been reached. During these four years, almost 2000 students have participated in at least one of the 50 workshops implemented and/or 40 field activities. This line of local work has been an ongoing process and the relationships build have provided more collaborative opportunities inside and outside schools.

Some of the most relevant, and successful, Educative resources developed were gathered in Deliverable “Educative Resources” (D7.5). Additionally, project website dedicates a section to gather all educational resources so that they are available under a Creative Commons Attribution 4.0 International License (http://memolaproject.eu/resources).

EDUCATIONAL ACTIVITIES AND RESOURCES

MEMOLA project facilitated four collaborative educative networks that included twenty schools located at each of the study areas. MEMOLA outreach teams have worked with school educators, to design over thirty educative activities for primary and secondary school students. During the development of these activities, we evaluated the interest of the students and identified the need of educational tools to support educators to introduce topics related to Cultural Landscape in their curriculums. As a result, we have developed several high-quality educational resources: 1 storytelling book, 2 didactic notebooks and 2 EBooks (ANNEX 6). All these are to be used as formative instruments based on the territory characteristics and cultural and biodiversity heritage in which the students reside. The goal was to enhance student learning autonomy, by acquiring practical knowledge applicable to a diverse array of topics, such as natural science, arts, history, and applied math, among others. The main objectives included: 1) to learn about the cultural and hydraulic landscapes where students reside; 2) to understand how human beings have intervened in these landscapes, and 3) to learn about the different heritage and cultural elements that characterize them.

The storytelling book shows the everyday life of the Vlachs people of the Valley, a historic Latin-speaking transhumant community who for centuries have lived in the Balkans, including the territories of the Upper Vjosa Valley. The story begins with the moment they arrive in their caravans from the winter meadows, the selection of the place for the establishment of the camp and the construction of the dwelling. The story takes children into a historical journey to the past life of the Vlachs community and teaches about their traditional way of life, how shepherds built their houses, what were the functionality of this type of shelters, and their strategic location as part of the intangible, farming and cultural heritage of the Upper Vjosa Valley. To develop this educative resource the team of CeRPHAAL, has developed an in-depth ethnographic and historical research of this community and built a dwelling based on the traditional
knowledge and techniques of the local Vlachs shepherds with the support of university students. The educative resource includes theoretical workshops and guided visits to the reconstructed infrastructure.

The didactic notebook titled “La Alpujarra, Cultural Landscape” focuses in the study area of Sierra Nevada, and more specifically on the cultural, natural and historical landscape of the region of La Alpujarra, located between the provinces of Granada and Almeria. This educative resource explains the concept of “cultural landscapes”, the historical evolution, natural characteristics and heritage elements applied to the area of study. The content has been designed by the following MEMOLA project partners: Universidad de Granada, Universidad de Córdoba, and Centro UNESCO Andalucía. Additionally, have participated: the Department of botany from Universidad de Granada, the Instituto Interuniversitario de Investigación del Sistema Tierra en Andalucía and Instituto Geológico y Minero de España, as well as local artists who provided the illustrations. This Educational resources were adapted to be available as a book available for download with iBooks on MAc or IOS device. Is a multi-touch book with interactive features.

The didactic notebook titled “Water Landscape of Colli Euganei”, include the study of the main elements that have formed the Eugenian cultural landscapes through the history of this study area based in Padua, Italy. More specifically, it contains the study of water uses from the Middle Ages to the present day, such as navigation channels, watermills and the transformation of river course. Students receive two notebooks. One includes the main concepts in landscape archaeology, and the second notebook contains four fieldwork activities. These fieldwork activities teach students how to use the main instruments for landscape study, such as remote sensing, historical cartography, archaeology of architecture and ethnoarchaeology. Each activity develops in a different setting, i.e. the historical cartography takes place at the Museum of Stanghella, where one of the most important historical maps of medieval wetlands distribution is preserved.

Other Resources
The production of audiovisual materials, such as digital storytelling, animation pieces, and documentaries, has been a great success for educational purposes, project visibility and community outreach (ANNEX 7). The latest two animation videos have had great impact on two thousand views of the Spanish version, and it has also been translated into English, French and Arab. Watch videos following these links:
- What are traditional irrigation systems? http://memolaproject.eu/node/2318
- Why are traditional irrigation systems important? http://memolaproject.eu/node/2317

The pedagogical team of the MEMOLA project has designed educative tools that can be easily integrated, and complement, the school educative programs at each study area. The contents can be transversely applied to the different courses by proposing a participatory and active methodology. Schools represent key sites to educate and raise awareness for the maintenance of cultural landscapes.

Workshops with local schools, which included field activities and intergenerational meetings, have surpassed project expectations. Teachers, students, and families from the rural communities located at the four study areas have significantly benefited from being part of the MEMOLA educational network. MEMOLA outreach coordinators organized eight thematic workshops about cultural landscapes and heritage protection (1), Historical Hydraulic systems-Mills and Channel systems (4), Plants and Crops (3).
in addition, intergenerational encounters were promoted through school field visits and presentations of parents and grandparents invited to “show and tell” about cultural traditions, agricultural and water management community practices.

Some of these activities and workshops included:
- Project presentation to the Educational Community of ISS Euganeo Secondary School (Este) March 2016. UNPD.
- Laboratory of Archaeology of Architecture as a tool for the study of watermills Secondary School IIS Euganeo in Este. April, 2016. UNPD (http://memolaproject.eu/node/1210)
- Celebration of the Archaeological Experience Day. Lanteira (Spain)
- Celebration of the National Heritage Day. Permet (Albania).
- European Researchers’ Night 2015 and 2016. Sept. 2015 (UGR)

Field Activity. Archaeodrome:
1. The University of Granada, in collaboration with archaeology students, built an archaeodrome at "Jesus-Maria Cristo de la Yedra" Primary School (Granada). 75 students learned to be archaeologists for one day, practicing excavation techniques and methodology, completing archaeological forms and sieving archaeological sediments. They have also learned how to interpret the material culture, identifying the chronology and the functionality of the different structures and finds. See pictures here: http://memolaproject.eu/node/1432
2. Master practices. 60 students in physical and forensic anthropology at the University of Granada have made a full week of master practices at "Cristo de la Yedra" school archaeodrome (Granada). http://memolaproject.eu/node/1984
3. The High School Fray Luis of Granada and the University of Granada put together an archaeodrome for High School students. Students between 14 and 15 years old, during their course, have investigated Middle Age and Bronze Age material culture which can be possibly found in a real archaeological excavation and moreover built an archaeodrome. To build the medieval structure, the High School Carlinda from Málaga has collaborated as well. On the 16th of June, during the educational activity, students between 14 and 15 years old acted as excavation directors, leading their younger fellows, 12 and 13 years old: more the 60 students pretended to be archaeologists for a day.

MEMOLA WEBSITE (memolaproject.eu)
The MEMOLA public website has been a very dynamic tool to promote and integrate all project components on an internal level as well as an external one. This platform has been launched in June 2014 so it has been publicly available for almost four years, and with all probabilities will continue for two more years. It is available in three languages: English, Spanish and Italian. In general, the website has received a significant amount of visits: 146,068 page views occurred during 39,313sessions by 23,909 users very well spread across the globe, with visits from 139 different countries and an average session duration of 3:51 minutes.
Considering that the website is very specialised in its content, these numbers are quite good and in line with expectations. After the first six months, when the average number of visits of 115/week, the website popularity increased and kept steady around 215 visits per week in the last 3 years. See Public Website Traffic Report and social media impact in ANNEX 8

CONFERENCES AND SEMINARS
MEMOLA project also incorporated facilitating conferences and seminars to share project findings, proposals and also initiate conversations among stakeholders. Thus, the presence of project representatives and partners has been very active. Given the interdisciplinary nature of the project, interventions cover areas such as history and archeology, agronomy, soil science, botany, anthropology, heritage protection, citizen participation, education, land use planning and natural resources management. All scientific and public conferences are published on MEMOLA website and can be found in ANNEX 9. Project Consortium organized 5 conferences, 16 seminars, 6 workshops; and participated in 107 external events.

In November 2017, the MEMOLA final conference was celebrated in Granada. The closing of the project was organized so that the Consortium could share final results and visit one of the study areas in Sierra Nevada. This was a three-day event in which the 1st day consisted of a public conference held at the Humanities building of Universidad de Granada. Partners presented project final results, organised in the following blocks:


MEMOLA Recommendations to Protect BioCultural Heritage. 1). José Francisco Ruiz Ruiz, José Mª Martín Civantos (UGR): Rural communities and communal water uses: Resilience, empowerment and defence. 2) José Mª Martín Civantos, Elías Fereres Castiel, Margarita García Vila, Giuseppe Lo Papa, Roger Doonan, Giuseppe Bazan (UGR, UCO, UNIPA, USHEFF): Policy recommendation for water uses, soil and agrodiversity preservation. 3) Lara Delgado Anés, Eglantina Serjani, Alexandra Chavarrià Arnau, Liliana Bova Calvo, (UGR, CERPHAAL, UNIPA, USHEFF, ARQUEO): Socioeconomic analysis of the case study areas.
Julia Sarabia, Rocco Corselli (UGR, CeRPHAAL, UNIPD, USHEFF, ARQUEO): Sowing seeds for future: educative resources and experiences.


The 2nd day was dedicated to Consortium coordination. Mr. Zoltan Krasznai, EU policy and project officer at DG Research and Innovation "Reflective Societies" joined the Consortium and gave a presentation on H2020 and future funding opportunities to continue the work. During the third day, partners visited the high mountain irrigation channels of Dehesa del Camarate (Acequias de Careo). A unique mountainous landscape located at the Natural Park of Sierra Nevada. La Dehesa del Camarate is one of the botanical treasures of Sierra Nevada. It is the best and most complete mixed forest of Granada and much of Andalusia.

EXHIBITIONS
The organization of exhibitions was another task included in the project to promote the local knowledge present at the communities we were working with and reinforce their local identities, tangible and intangible heritage by putting them into value. Thus, during the project period, the following exhibitions were organized: 1) Old Photo Exhibition about rural life in the village of Cañar (Sierra Nevada), which also became a virtual exhibition; Exhibition “Archeologia e didattica al bar”. After workshop implemented at Liceo Artistitico di Trapani, students showed at an exhibition their art work about the local hydraulic systems. (http://memolaproject.eu/node/1126. 3) The virtual exhibition “Recovering Irrigation Channels”. Which can be watched here: http://memolaproject.eu/node/1674.

MEMOLA BEST PRACTICES
Some of the most highly recognized results of MEMOLA project has been the recovery of traditional practices linked to the use of natural resources. The loss of traditional knowledge has been a big concern in this project since it is connected to the disappearance of the landscape in which sustainability was nurtured. Thus, an important effort has been developed in this line of work throughout all the study areas, however, the case of the traditional irrigation channels from the medieval historic period has become especially significant (ANNEX 10).
In the study area of Sierra Nevada, working with Local Irrigator Communities played a key role for the protection and defence of the traditional irrigation systems present in this territory. Their knowledge of traditional water management and its relation to the maintenance of the cultural landscape is crucial for the analysis of current and historical land uses and the assessment of ecosystem services and sustainability in the area. MEMOLA project started with the Irrigation Channel of Barjas in the village of Cañar, and this experience became the pilot for other interventions that have taken place in other rural sites, including at the study area of Vjosa Valley (Albania).

The rehabilitation of the traditional irrigation system of Barjas, located in the municipality of Cañar (Sierra Nevada), took place between February and March of 2014. This activity has been considered one of MEMOLA’s best practices becoming an intervention that encompassed key research and socio-economic objectives of the project. After twenty years of abandonment, water is nowadays running through its channels allowing the monitoring of its ecosystem services. Its recovery has also provided a unique opportunity for archaeologists to reconstruct a medieval infrastructure from the Islamic period in Southern Spain, which is connected to a wider hydrological network crossing the mountainous landscapes of Sierra Nevada and connecting hundreds of villages. In regards to community involvement, this campaign was also a great success, counting with the participation of almost 20 public and private institutions, such as local associations and educative centres, and 300 volunteers. Print and radio media gave great coverage, contributing to increasing the visibility of the project and its proposals for cultural heritage conservation. Local community ties were substantially strengthened after this campaign, allowing outreach coordinators to easily start working with local schools, cultural associations and residents in general. Municipal councils and public institutions also showed great interest in the project and met with the MEMOLA team to explore strategies for sustainable development.

Finally, a documentary about the campaign was produced to be used as an educational and outreach tool. The documentary has been watched online 2500 times and screened for academic and general audiences at community events and conferences. One year after the recovery of the irrigation channel of Barjas, the MEMOLA team, along with the local irrigator community, organised its cleaning followed by a community meal. Approximately one hundred people participated in the event.

This pilot intervention surpassed expectations and became recognized by EU Commission as one of the Top FIVE innovative projects of Radical Innovation. Humanities Research Crossing Knowledge Boundaries and Fostering Deep Change. In addition, the national association Hispania Nostra, headed by the Spanish Queen Mother Sofia of Greece, included this pilot as Good Practices in Landscape Conservation.

By the end of 2017, MEMOLA project team in Spain and Albania have recovered 9 traditional irrigation systems, involved almost 200 volunteers. Among them we would like to highlight the following:

- Maguillo Irrigation system (Lanteira) April 18th to 21st, 2016. In this occasion the MEMOLA project collaborated with the Emilio Muñoz High School, from Cogollos Vega, students from the Forest management and the Environment Technical Degree and from the Forest Uses and Environmental Conservation Degree. A total of 45 students have cleaned the historical irrigation system of careo which had been abandoned for over 10 years. (http://memolaportage.eu/node/1029)

- Lugros Irrigation System (Lugros). Two weekends during the month of May, 2016. The irrigation systems management and the Environment Technical Degree and from the Forest Uses and Environmental Conservation Degree.
are located at El Camarate, 2000 m high and within the protected area of Sierra Nevada. The campaign was developed using traditional techniques with the Lugros and Guadix Irrigators communities, and in collaboration with the irrigators communities from Policar and Graena, Lugros municipality, the Natural and National Park of Sierra Nevada and the environmental territorial office in Granada. This activity counted with 40 the participation of 40 volunteers. Watch video here: http://memolaproject.eu/node/2019

- Royal Irrigation Channel of the Alhambra, (Granada). December 1st and 4th, 2016 The monument located in the city of Granada count with an important medieval irrigation system. Public workers from the monument contacted the MEMOLA team to support the organization of a volunteer cleaning campaign. More information here: http://memolaproject.eu/node/1668

3. SUSTAINABLE DEVELOPMENT & SOCIO ECONOMIC IMPACT.

One of project main goals is to actively contribute to the economic development and biodiversity protection by engaging with policy makers and community stakeholders in long-term resilience strategies. The purpose is to implement an “ecosystem services” approach to attend to historical relations between natural ecosystems and humans’ wellbeing, in order to contribute to present sustainability and conservation challenges.

MEMOLA project included interventions that aimed to have a positive impact on the social and economic tissues of the studied areas. Part of the objectives seeks for the development of specific conservation proposals to improve resources use efficiency without losing the values and traditional practices that structure and maintain landscapes. These proposals were based on the analysis of agricultural and livestock productivity, as well as on community activities that involved local residents as possessors of knowledge that must be preserved to ensure the survival of the landscapes. Sustainable development work is based on project commitment to actively engage with local communities, governmental and non-governmental agencies for the development of long-term resilience and sustainability strategies. Find a summary of most relevant activities implemented in regards to local development (ANNEX 11).

ECOSYSTEM SERVICES & SUSTAINABILITY ANALYSIS

MEMOLA project included as a goal to draw context-tailored strategies of preservation, diffusion, and valorisation of the cultural heritage and of the environment in historical landscapes, and to stimulate a sustainable development in rural areas, under the light of their current problems within the context of climate change. To achieve this, one of the specific objectives addressed the analysis of ecosystem services in these areas. As we have mentioned before, in the study area of Sierra Nevada (Spain) the traditional irrigation systems associated to agriculture during centuries have provided support for maintaining rural societies in marginal areas in mid and high mountain areas. The traditional irrigation systems found in Cañar, Sierra Nevada, are a singular example of historical interaction between man and nature that has resulted in a current agroecosystem mainly provisioning and regulating services (since snowmelt and runoff water is both diverted to recharge some areas in the region, and circulated to productive areas to water crops), but also contributes to the regulating, supporting and cultural services in this region. The major objective of this deliverable was to assess the ecosystem services of traditional irrigation systems and provide an efficient model as a tool to quantify water distribution by these systems in MEMOLA Field.
the study area of Sierra Nevada, one of the case studies in MEMOLA. Field campaigns were performed for monitoring and calibrating the model, and water fractions were estimated for illustrating the ecosystem services provided by this traditional system (Activity 6, WP6). The model itself provides the irrigation systems’ users with a simple, easy-to-handle tool for both assessing the system functions and its sustainability for future horizons considering their major sources of vulnerability in a global warming framework.

Working with local farmers to assess the sustainability of resource use and management has been decisive to achieve a meaningful impact for local communities. In the case of Monti di Trapani, the focus was on the role of local farmers’ knowledge and perceptions about the soils in relation to the historical land use and management practices. The identification of the soil classification systems of farmers and the criteria on which it is based, linked to the evaluation of the farmers’ ability to identify and map the different soil types, was a key step. Nevertheless, beyond the comparison of the ethnopedological classification approach versus standard soil classification systems, the study also aimed at understanding local soil management and land use decisions. This information is crucial to lay the basis for more sustainably managed agroecosystems. The investigations had the following objectives: 1. To identify farmers’ soil classification systems and the criteria on which it is based. 2. To assess farmers’ ability to identify and map the different soil types. 3. To compare scientific-technical and local knowledge on the soil. 4. To evaluate the links between local knowledge on soil and farmers’ decision on crop allocation and management.

THEMATIC SEMINARS AND MEETINGS
Consortium partners have held numerous meetings with local stakeholders in regards to 1) Project presentation and collaboration opportunities, 2) Capacity building and training 3) Coordination of community activities 4) Local development needs assessment and strategies identification 5) Networking.

The project has nurtured a diverse and broad collaboration network where the stakeholders’ group has been organised under different categories, depending on their characteristics: Universities, SME, Research networks and Centres, Public Institutions and Local associations. Project website highlights MEMOLA EducatiVe network, and the Irrigators Communities due to their relevant role in the project as community partners.

Working with Local Irrigators Communities played a key role for the protection and defence of the traditional irrigation systems in the study area of Sierra Nevada. Their knowledge of traditional water management and its relation to the maintenance of the cultural landscape is crucial for the analysis of current and historical land uses and the assessment of ecosystem services and sustainability in the area. A particularly active irrigator community in the project has been the one from the village of Cañar. Organised farmers have been fundamental in the rehabilitation campaign of the Traditional irrigation system of Barjas. They have also been very active in working with the MEMOLA team in identifying specific economic and social development needs of the residents in the area. An example was the organization of the seminar held in Cañar about organic farming and market-access opportunities. Local small business “Con-Sumo Cuidado”, specialized on this topic, gave a presentation followed by a conversation in which the following questions were addressed: what are the benefits of becoming a cooperative? What are other local farmers associations in the area developing organic farming? What organic products are more sustainable and profitable? As a follow-up, the MEMOLA team organized a meeting between organic producers belonging to ECOVALLE association and farmers of ECOCÁÑAR in order to facilitate the development of more sustainable processes.
order to learn from their Participatory Guarantee System and to exchange experiences. Trapani Mountains (Sicily). A good example of the work developed with local farmers was the seminar “Traditional fruit tree grafting in Sicily” senior farmers engaged in dialogue and shared their knowledge with researchers and other farmers who wanted to learn how to reproduce an original cultivar and repair an injured tree, among other practices.

POLICIES & DECISION MAKERS
MEMOLA project coordinator and partners have been very active in participating in European meetings in which policymakers, other innovative projects, and colleagues were present. The goal was to present MEMOLA project findings and recommendations as well as participate as experts for new funding proposals for Europe's Cultural Heritage. Some of the most relevant events were:

- REFIT Project. Working across boundaries: integrating different stakeholder approaches to cultural landscapes. Cirencester, September 17 2017
- HERCULES project final conference 'Sustainable Futures for Europe’s Heritage in Cultural Landscapes. Brussels October, 4 , 2016
- WORKSHOP ON CULTURES AND CITIZENSHIP. FP7 and H2020 projects dealing with cultures and citizenship. Brussels April, 8 2016
- RICHES Workshop The Context of Change and the Move from Analogue to Digital. Online May 14 2015
- RICHES project. Conference Cultural Heritage: December 4th 2014
- PREFORMA Project. Networking session for EC projects in CH. Pisa December 4th 2014

Working with local and regional policy makers has been an important part of the work developed by MEMOLA partners.

At Trapani Mountains and Vjosa Valley, working with local and state governmental offices have been crucial to gain support for project activities implementation, especially in regards to archaeological excavations. Thanks to the archaeological work performed during project implementation, local and regional officials have facilitated excavation permits and housing for volunteers involved in the second phase of excavations campaigns at Pizzo Monaco (July 2015) and Lanteira (August-September, 2015). Mayors of the villages of Calatafimi Segesta (Sicily), Lugros and Órgiva (Sierra Nevada) have highlighted the role that MEMOLA project is developing to promote their local heritage and opportunities for economic development.

At the study area of Sierra Nevada besides from introducing the goals and work of the project at a local and regional level, the meetings have been held around two main issues: 1) Institutional resources to
support the sustainability of local community interventions; 2) Protection of traditional Irrigation systems in Sierra Nevada from ditch modernization projects. This second issue has guided the First Policy Brief of the MEMOLA project submitted in July, 2015 to the Commission. This document is also the product of the work developed by UCO, UGR and ARQUEO analyzing the role and impact of the Water Framework Directive and EU Water Blueprint strategy on the current uses of water and lessons learned from the past that may be useful to inform current and future EU policies.

MEMOLA project has made an important effort for the recognition of the Irrigator Communities as repositories of invaluable historical knowledge of community water management and distribution. Irrigator Communities are part of the traditional irrigation systems. Both are producers of cultural landscapes that need to be recognised and protected. Thus, MEMOLA project represented by ARQUEO and UGR, has intensively worked with more than 60 irrigators communities from Sierra Nevada, with an average of 200 members each, to promote the creation of The Historical and Traditional Irrigators Communities Association of Andalucía. The association was constituted in March of 2015. It is a pioneer project that intends to be an organizing platform for and driven by, former irrigators working for the defence of their interests and historical water rights, the conservation of the historical irrigation systems, and their social and political recognition (ANNEX 13).

Thanks to the strong relationship between the MEMOLA project group in Granada and the association of traditional irrigators communities it was possible to issue a collaborative map of the irrigation channels systems. Between the provinces of Granada and Almeria (Andalucía-Spain) it is estimated that there are 550 irrigators communities, 830 historical irrigation spaces which compound 200,000 hectares and more than 90,000 irrigators. The online collaborative map represents the first step to make all this data visible and concrete for sustainability and protection purposes. See map here (http://regadiohistorico.es/)

POLICY BRIEFS
Three important Policy Briefs have been issued and presented at different local, regional, national and European venues (ANNEX 14)

POLICY BRIEF 1. The Impact Of European Water Policy On Water Cultural Heritage. Dedicated to the impact of European policy on water cultural heritage associated with historical irrigation systems. Working with local farmers in the area of Sierra Nevada enabled interesting conversations in regards to the current context of water modernisation policies. Much of the information shared with MEMOLA expert team by local farmers, thoroughly informed the content of the first project policy brief. This document, delivered in June 2015, summarised the findings in regards to the impact of European water policies on the water cultural heritage associated with historical irrigation systems.

POLICY BRIEF 2. Soil As Environmental and Cultural Heritage And The Importance Of Soil Protection. The second Policy Brief summarises recently developed perspectives on soils that have emerged from the findings of the project. The critical environmental dependency of soils is well-established yet to date soils have been undervalued and poorly recognized as cultural materials. MEMOLA has demonstrated that soils are an extensive cultural resource and form part of Europe’s rich cultural heritage. This brief stresses the need for a comprehensive European policy for soil protection and management that recognizes the complex nature of soil and seeks to promote an awareness of soils as having a dual inheritance that stems from both cultural and natural processes.
POLICY BRIEF 3. AGROBIODIVERSITY AS MEDITERRANEAN AGRARIAN HERITAGE. This policy brief summarises the MEMOLA project findings regarding the role agrobiodiversity has in reactivating Mediterranean agricultural systems. Traditional varieties are the best ambassadors of the landscape in which they are cultivated. Preserving them by intergenerational knowledge transfer may be a way to reactivate traditional agroecosystems creative cycles and to improve social and cultural resiliency. The brief also presents policy development recommendations to establish mechanisms and criteria to define its values and for their protection.

CULTURAL ROUTES

The project incorporated the development of cultural routes in the areas of study, as a strategic activity that combined project impact dimensions: Cultural heritage, Socioeconomic and Environmental. The Cultural Routes main purpose was to build capacity for local communities and stakeholders, defining different possibilities that could be attractive to them. Local and regional governments, National Parks and Agencies of Natural protected areas, Cultural and Environmental Associations, Local Schools, and local residents, were involved in the processes of planning and tailoring most of the routes developed within the framework of MEMOLA project (ANNEX 15).

4. INTERNAL MANAGEMENT WORK

The University of Granada (UGR) was the leader for the management of the Consortium in its role as project coordinator. Key objectives for the successful internal coordination of the Consortium were reflected in WP8, which articulated efficiently the workflow to comply with the timeline and deliverables specified in the work package, to ensure the high quality of the project. Since its beginning, MEMOLA project developed two internal coordination levels. 1. Level towards internal organization, which referred to the organizational structure of the Consortium, and the roles involved in it. 2. Level towards project implementation. Additionally, through the execution of project WPs, different work groups were created to coordinate tasks that were transversally applied in all study areas, such as: The community outreach workgroup, the website and online communication workgroup, the agrosystems strategies analysis workgroup, and the archaeological excavations summer campaigns workgroup, among others. Most of these workgroups were task-oriented and formed by interdisciplinary teams. All partners submitted a six-month project report to the management team providing a description of the work performed, a summary of advancements towards objectives and milestones, significant (outreach and academic) activities, potential obstacles found and collaborative work with other institutions, local organizations and stakeholders.

Consortium meetings and internal capacity building activities. The kick off meeting was celebrated in Granada, SPAIN, on February 2014. The coordination office took the opportunity of having all partners at the table to celebrate a three-day working meeting that included a visit to the MEMOLA study area of Sierra Nevada. The successfulness of the meeting structure constituted a precedent for following Consortium meetings. The second Consortium meeting was celebrated in April, 2015 at Calatafimi-Segesta (Sicily-Italy). The third Consortium meeting was celebrated in April 2016, at Permet- Gjirokastër (Albania). The fourth Consortium meeting was celebrated in April 2017 at the University of Granada, Spain.
Consortium meeting was held in Padova during April 21st-23rd, 2016. A total of 20 people attended the meeting. It was facilitated by project coordinator and management support team and the methodology used was based on: individual presentations and working groups. Meeting desired outcomes were: 1) Share and Evaluate Project 2016-2017 implementation, per each study area; 2) Evaluation of project socio-economic and scientific impact; 3) Review MEMOLA work plan and deliverables timeline up to the end of the project; 4) Review of Consortium agreements and expected final results.

In November 2017, the MEMOLA final conference was celebrated in Granada. The closing of the project was organized so that the Consortium could share final results and visit one of the study areas in Sierra Nevada.

This was a three-day event in which the 1st day consisted of a public conference held at the Humanities building of Universidad de Granada. Partners presented project final results, organised in the following blocks: 1) Land uses and agrodiversity; 2) Water uses and Historical Irrigation Systems; 3) MEMOLA recommendations to Protect Biocultural Heritage; 4) Archaeological Findings; and 5) MEMOLA community Involvement and Communication. The 2nd day was dedicated to Consortium coordination.

Mr. Zoltan Krasznai, EU policy and project officer at DG Research and Innovation "Reflective Societies" joined the Consortium and gave a presentation on H2020 and future funding opportunities to continue the work. During the third day, partners visited the high mountain irrigation channels of Dehesa del Camarate (Acequias de Careo). A unique mountainous landscape located at the Natural Park of Sierra Nevada. La Dehesa del Camarate is one of the botanical treasures of Sierra Nevada. It is the best and most complete mixed forest of Granada and much of Andalusia.

One of the goals of this conference was to share among Consortium partners the main results obtained after four years of project implementation. Another goal was to provide the space to discuss what worked well and what the issues were or concerns need to be considered for future projects collaboration opportunities. Both goals provided rich insight and lessons learned for future work. An example of these conversations was regarding the capacity to develop new study methodologies for cultural landscapes, included as one of the project results. The capacity of researchers and experts from different disciplines to work and share their expertise has produced important and insightful debates during consortium meeting and work plan activities. Interdisciplinarity has taken shape in several ways and across MEMOLA project. Fieldwork activities, work groups, workshop and seminars, and even in writing and publishing recommendations for policy briefs, has taken researchers and project collaborators coming from different disciplines and backgrounds to work together. At the same time, partners considered that the next step should be transdisciplinary knowledge production, or in other words the capacity of creating a new paradigm for the study and protection of cultural landscapes. A new approach, able to move from a multidisciplinary approach into a transdisciplinary one. This challenge has been embraced for further development in future projects.

Potential Impact:
MEMOLA project has been profoundly committed to the science that promotes long-term social change with an impact on contemporary issues. It aimed to anticipate, using archaeological research on the landscape, the long-term consequences of social, economic and political decision-making (See the previous section for more information).

There are three interconnected levels in which MEMOLA most significant potential impact is structured:
A) CULTURAL HERITAGE: The historical and archaeological study of the four selected Mediterranean areas allowed a better comprehension of the formation processes of historical landscapes, thus implementing and improving strategies for conservation and protection of these territories. Three of the areas analysed are important nature reserves (Sierra Nevada, Colli Euganei, and Trapani) and contain a consistent archaeological and monumental heritage (castles, ancient farms, cortijos, archaeological sites, etc.), which is nowadays in danger of destruction. Through the study, diffusion and valorisation of these historical sites (within the landscape where they are located), we achieved a revalorisation of these cultural assets, enhancing the attractiveness of the territories. In addition, intangible cultural heritage represented by centennial oral shared knowledge pertaining to the local communities is extremely important since it conforms local identities. Its preservation implies the maintenance of the regional cultural peculiarities and traditions, both productive and cultural.

The pertinence of the studied regions to a common research and valorisation network, whose partners are sharing objectives and methodologies, created communication links among the studied regions. The system established helped local institutions and communities to pursue better decision-making about territorial management, environmental issues and heritage protection; and enhance a sense of belonging to a common European identity.

B) SOCIOECONOMIC: The valorisation, dissemination and specific actions carried out on these landscapes, contributed to enhancing social awareness and, at the same time, had a positive impact on the social and economical tissues of the studied areas:

1) Specific conservation proposals involved improving efficiency in the use of resources without losing the values and traditional uses that structure and maintain the landscapes. Water is one of those essential resources in the Mediterranean area;
2) According to the strong dissemination of all results carried out by the project, MEMOLA project aimed for the promotion of a sustainable agricultural and cultural development in these areas, many of them impoverished and with a high youth unemployment rate.

C) ENVIRONMENT: The environmental dimension of this study (water, land and other resources as finite and vulnerable) allowed the identification of ecosystem management strategies that prevent environmental degradation, provide food and habitat to living organisms, and support other natural processes and functions of the Mediterranean mountain ecosystems. The analysis of the environmental impact of historical agricultural land-uses has been an essential factor in generating conservation strategies, impacting directly on the future environmental health of the mountain range.

The MEMOLA project aimed to have a positive impact on the environmental viewpoint of different stakeholders and on new policies formulated in the regions. In particular:

1) Alternative, integrated natural resources management approaches have been identified, and an evaluation framework produces to explicitly determine relative advantages and disadvantages of all these practices and the tradeoffs involved.
2) A set of assessment criteria for environmental services of the Mediterranean mountain agroecosystems were defined. 3) The results of the project will serve as a reference of the key aspects to be considered in drawing up proposals for mountain agroecosystem management rules (EU policies) that have a positive
There are at least three transversal elements which define MEMOLA project future impact:

1. Meaningful participation of local agents and governance.

MEMOLA project has had an impact on the debates and proposals involving the need for supporting and promoting self-governance structures present in local communities. Historical and communal organization aimed at natural resources management, such as The Historical and Traditional Irrigators Communities Association of Andalucía, play a crucial role in the preservation and protection of cultural landscapes. The project has promoted local communities participation by acknowledging and inviting them to be active members. Their involvement has been indispensable to gather landscape and cultural protective practices based on traditional knowledge, as well as problematic conflicts derived from natural resources exploitation. Local organizations and communities capacity building have been a long-term goal emerged during project implementation, which was not part of MEMOLA initial proposal, but that emerged as necessary during project implementation. Strengthening communal organization structures have been considered a long-term impact strategy. The recognition of the Irrigators Communities as political actors with concrete proposals for the protection and sustainability of their territories played an important part when project partners invited them to participate at meetings with political representatives from local and regional governments. Their recommendations informed and promoted regional legislation issued for the protection of historical irrigation systems, as well as became the main ideas included in the recommendations of MEMOLA first Policy brief.

2. Proposals for the development of new methodologies and an integrated approach for the study and protection of Cultural landscapes

A) Regarding scientific knowledge production and funding opportunities. MEMOLA project coordinator and partners have been very vocal at EU level, when introducing the need to develop a new paradigm in which a multidisciplinary approach transforms into a transdisciplinary approach. This is both a scientific and funding proposal challenge. At a scientific level, there is a strong need for the development of integrated methodologies, measurement scales, and theoretical approaches. In terms of EU funding and open calls, it is common that a project designed by a team coming from Humanities background needs to “translate” their proposal into a more environmental/natural sciences framework in order to be competitive. Even though funding calls are developed under multidisciplinary principals, including cross-cutting issues and integrated approaches, there is still a gap in administrative and evaluation processes. In no fewer occasions, at a national and a European level, humanities-based proposals fit into calls that are evaluated under the framework of natural sciences and/or engineering.

B) Regarding environmental policies, MEMOLA partners who attended many stakeholders meetings have realised how conservation policies that rule natural reserves and parks, are often based on a biocentric point of view. This perspective promotes the idea that the presence of human beings represents a hazard for nature and therefore, agrarian activities should be abandoned, without considering that such human activities produced those landscapes in the first place. MEMOLA project has been promoting an understanding of landscapes as socio-ecosystems instead of an ecosystem vision, by integrating cultural practices and human presence in the landscapes.
3) New project proposals and funding opportunities.

All MEMOLA partners are today involved in new project proposals that include expanding MEMOLA lesson learned and best practices.

REACH SOCIAL PLATFORM. The Universidad de Granada (UGR) participates in this project as a partner bringing the experience gain during MEMOLA project into the platform. REACH uses pilots to study more in depth some of these communities, to engage with them in participatory activities, to discover and promote best practices, and to create the conditions to encourage their commitment beyond the project’s end. The objective of pilots is to advocate the socio-economic value of civic participation in preservation, use and management of CH, by exemplifying best practices in the development of resilient policies in the community and territorial preservation, education, data management, protection of intellectual rights, etc. Furthermore, the pilots should demonstrate successful cases of job creation and economic growth based on CH use and re-use, innovation in cultural tourism, and examples of improved public services for CH management. RURAL HERITAGE is one of the thematic areas included in this platform and for which Sierra Nevada Study area will be piloted.

The pilot plans to:

Promote a participatory mediation process between local stakeholders, farmers and communities and the regional and national administrations and institutions involved in the cultural, territorial and environmental management of Sierra Nevada (Spain)

Compare the situation of Sierra Nevada with Carpathian projects

Discuss the creation of a co-governance initiative for the territorial safe-keeping as the best way to protect agrarian heritage (tangible and intangible) and rural landscapes promote a more resilient rural CH improving local engagement and public participation in policy-making, economic, cultural and social initiatives and territorial and environmental management.

List of Websites:
http://memolaproject.eu/

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