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**GreenHeritage.**  
The impact of  
Climate Change  
on the Intangible  
Cultural Heritage



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# Comitato di Redazione



Presidente: Alfonso Andria [andria.ipad@gmail.com](mailto:andria.ipad@gmail.com)

Direttore responsabile: Pietro Graziani [pietro.graziani@hotmail.it](mailto:pietro.graziani@hotmail.it)

Direttore editoriale: Roberto Vicerè [redazione@quotidianoarte.com](mailto:redazione@quotidianoarte.com)

## Comitato di redazione

Claude Livadie Responsabile settore  
"Conoscenza del patrimonio culturale" [alborelivadie@libero.it](mailto:alborelivadie@libero.it)  
Jean-Paul Morel Archeologia, storia, cultura [moreljp77@gmail.com](mailto:moreljp77@gmail.com)  
Max Schvoerer Scienze e materiali del  
patrimonio culturale [schvoerer@orange.fr](mailto:schvoerer@orange.fr)  
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Territorio storico, ambiente, paesaggio  
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Adalgiso Amendola Osservatorio europeo  
sul turismo culturale [adamendola@unisa.it](mailto:adamendola@unisa.it)

## Segreteria di redazione

Eugenia Apicella Segretario Generale [univeur@univeur.org](mailto:univeur@univeur.org)  
Monica Valiante

## Progetto grafico e impaginazione

QA Editoria e Comunicazione

## Info

Centro Universitario Europeo per i Beni Culturali  
Villa Rufolo - 84010 Ravello (SA)  
Tel. +39 089 858195 - 089 857669  
[univeur@univeur.org](mailto:univeur@univeur.org) - [www.univeur.org](http://www.univeur.org)

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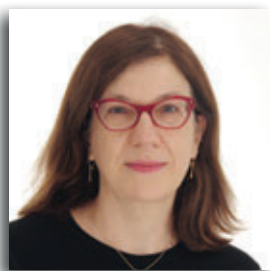
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[univeur@univeur.org](mailto:univeur@univeur.org)

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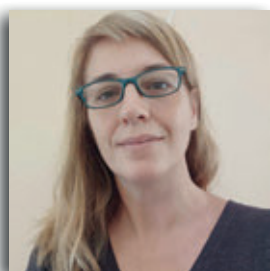
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# Climate Change and Intangible Cultural Heritage: three examples from Greece



Alexandra Bounia and Despina Catapoti  
*Dept. of Cultural Technology and Communication  
University of the Aegean, Greece*

## Introduction

As one more summer goes by in Greece, individuals and communities count the scars of the effects of climate change: heat-waves and other extreme weather phenomena, like rare sea and lightning storms have left behind water shortages, burned forests, destroyed crops, and dislocated communities. The impact goes beyond those immediately affected and urges for new policies, mitigation and adaptation measures, changes in attitudes and understandings. (Fig 1) It is not only tangible assets that are affected by these phenomena, however. It is also the intangible parts of life, i.e., the ways people live and express themselves,



Fig. 1: Penteli after the forest fire-August 2024.  
Source: Viveta Christouli.

their skills and knowledge, their communal practices, and beliefs. These are also shattered once their natural environment is destroyed, once this deep connection between people and their land is broken. The degradation of ecosystems, the decline in biodiversity resulting from climate change threaten traditional knowledge systems, environmental management practices and the social connections inherently tied to them. Put simply, all aforementioned factors pose serious threats to intangible cultural heritage (ICH).

While this realization is not a new one, it has certainly become more pronounced in recent years. In the wake of this development, within the scope of the EU funded project GreenHeritage (12/2022 – 11/2025)<sup>1</sup>, several case studies were explored in order to gain a deeper understanding of the interconnection between climate change and the protection of ICH. In the case of Greece, we focused in particular in ICH that are associated with *food* and *subsistence*; this particular category of ICH encompasses a wide range of parameters: food traditions and customs, geographical indications, food production, processing and storage, dietary customs, culinary practices and consumption habits.

In this article we are going to focus on three case studies – all chosen based on their relation to food from the National Inventory of ICH in Greece<sup>2</sup>: (a) the “mandras” in Lemnos, an island in the northeastern part of the Aegean Sea; (b) traditional practices of wild edible plants and (c) the agricultural and dietary tradition of carob, both on the island of Crete. Based on data collected through primary research (interviews with practitioners), we will explore how CC affects ICH and the life of people, identifying areas of expertise that need to be taken into consideration in the planning of mitigation policies by local, national and international authorities.

### The three case studies

#### *Case study [1]: The “mandras” of Lemnos*

The ICH of “mandras” (plural, singular “mandra” or “mantra”) or paddocks of Lemnos describes an organizational system of primary production, i.e. agriculture and livestock breeding (Fig. 2). It refers to a production system that brings together a series of environmental and cultural parameters, including biodiversity, climate, geology, traditional agricultural practices, and socio-economic structures. Around the “mandra” a whole system

<sup>1</sup> <https://greenheritage-project.eu/about/>

<sup>2</sup> <https://ayla.culture.gr>



Fig. 2: "Mandra" of Lemnos. Source: Alexandra Bounia. Fig. 3: A "mandra" from Lemnos. Source: Alexandra Bounia.

of buildings, pasture lands, agricultural productions and human relationships are structured, a system that supports mutual interaction allowing human survival for centuries (Fig 3).

The "mandra" is a complete production unit. It consists of a building with its auxiliary spaces and the agricultural and pasture land that surrounds it. Although it has as its reference point the buildings known as "mandra" and are recognized as important architectural monuments as well as a traditional methodology of building technique and knowledge, this ICH element extends far beyond the structures themselves: it refers to the core, spatially, financially, socially and symbolically of a holistic agricultural world, in other words a comprehensive system of primary organization. Its origins have been traced back to the Byzantine period and the system that it represents continues to this day, to support the life and the needs of its practitioners, i.e., the "kehaghias" (singular, plural "kehaghiades"). A "kehaghias" is a livestock breeder and farmer who apart from their main professional practice, keeps a small number of livestock and land that supports family income. The "kehaghias" may own the "mandra" (more common in modern times) or rent it (more common in the past). Therefore, the "mandra" is also the point where two social-economic groups of Lemnos are met: the "kehaghias" and the "boss" ("afentiko", singular), i.e. the owner of the land within which the "mandra" is located and which forms the "mandra". Having collected valuable experience from hundreds of years of practice, the "kehaghiades" apply a series of agricultural tech-



niques that allows them to maximize the benefit of using the land available to them and produce almost everything they need in order to survive. It is an impressive set of skills, knowledge and techniques that offers valuable examples of management of the land and its recourses. The buildings are usually located in the middle of the land, in a space that allows full visibility of the surrounding area, but also protection from the winds. This land is typically referred to as a "pair" meaning that it consists of plot that required a pair of oxen for its cultivation. The size of the land is not measured in hectares or any other modern units, but rather by its capacity to cater for two households, i.e., two families, that of the "kehaghias" and that of the owner of the land. It also consists of a flock of sheep and goats, the animals needed for plowing, and the possibility to provide enough to support taxation, export as well as the barter economy within the community of "kehaghiades". Each "pair" should have the cultivated land ("tsagiria" – plural) that were sown during the first rains of autumn and are also part of the pastureland during the period of animal bearing young, or bad weather conditions. The "pair" also consists of some mountain pasture plots which were called "moiradia" (plural).

As mentioned earlier, in the past, the "mandra" was given by the owner to a "kehaghias" to cultivate; the owner would get half of what the "mandra" would produce and often the "kehaghias" would be obliged to perform a series of other tasks for the owner (like taking care of their animals). Today, "mandras" are usually owned by the "kehaghias", or they are rented by them. Although the ownership situation has changed, the basic principles that the system of the "mandra" supports remain the same: the "mandra" still refers to a holistic management approach that consists of practical experience and traditional knowledge, symbolic and social relations that pass from one generation to the next; it creates a unique relationship between people and their land and support its sustainable use as part of a complex network of local social and economic relationships.

#### *Case study [2]: Traditional Practices of Wild edible plants in Crete*

The wild edible plants of Crete ("chorta"), the practices of collecting and processing them, the inventive yet simple way of preparing them, and their role in everyday life renders them into a rare intangible cultural asset (Fig 4). Wild plants, as an integral part of the Cretan dietary system, are a cultural and social asset that continuously permeates everyday life in Crete from prehistoric times to the present day. The consumption of wild plants in difficult times of war, scarcity, and deprivation ensured food and survival, while they are particularly preferred during long fast-



ing periods, hence their prominent role in monastic cuisine. The simplicity and moderation that characterize Cretan cuisine find expression in the nutritional utilization of wild plants. However, wild plants are also present on the festive table in Crete as the main dish combined with meat (e.g., wild greens with lamb). Gathering of wild plants, which was previously done by women of all ages, without excluding men, served as a learning process for younger generations to find edible wild plants, and even today it provides opportunities for social expression, as group outings to the countryside for this purpose are not uncommon. Additionally, the practice of "skouteliko," the exchange of small quantities of food among housewives, was also common in the case of wild plants. In general, the resourceful way in which Cretans use wild plants fulfills needs, balances social differences, and expresses collectivity.

Crete possesses a rich flora with approximately 1,800 known species and subspecies, of which more than 190 are endemic.



Fig. 4: An example of an edible wild plant from Crete. Source: National Inventory of ICH, Greece, <https://ayla.culture.gr/el/>

This plant diversity is due to its geographical location (isolation resulting in speciation) as well as the presence of different ecosystems, which in turn lead to the creation of various habitats with different microclimates (coastal zone, plains, semi-mountainous and mountainous zones, gorges, wetlands). Another characteristic related to Cretan flora is that many wild plants, both endemic and non-endemic, are edible (Fig. 5). The consumption of wild plants as main dishes, side dishes, or salads on a daily basis is a key characteristic of Cretan cuisine. Recent studies on the chemical composition and nutritional elements of several wild greens and vegetables consumed in Crete have



Fig. 5: An example of an edible wild plant from Crete, source: National Inventory of ICH, Greece, <https://ayla.culture.gr/el/>

demonstrated their significant nutritional value. The correlation between the exceptional health and longevity of Cretans and the nutritional components of wild greens and vegetables has been evidenced by numerous studies. In addition to vitamins, minerals, and carbohydrates, which are important nutrients known for their role in human health, wild greens and vegetables contain omega-3 fatty acids and numerous phytochemicals, products of the secondary metabolism of plants. Researchers have focused on these metabolites in recent years, as there is increasing evidence that these substances also influence human metabolism in a health-promoting manner.

#### *Case study [3]: Agricultural and dietary tradition of carob in Crete*

Carob trees have been cultivated in the Mediterranean since ancient times, usually in areas with mild and dry climates and poor soil (Fig. 6). Its value was recognized by the Greeks, who brought its cultivation from the Middle East (Syria, Palestine). In Crete, carob charcoal has been found in prehistoric (Late Minoan) layers. According to ancient sources, the tree grew in Syria, Ionia (where it was called "keronia"), Knidos, and Rhodes. According to some researchers, the tree was introduced during Roman times. It is believed to have reached Rome through Greece, as indicated by its Latin name, *Siliqua graeca* (Greek carob). Its scientific name, *Ceratonia siliqua*, comes from the ancient Greek word "keras" and the Latin word "siliqua," referring to the horn-shaped shape of the fruit. Dioscorides, a physician, pharmacologist, and botanist of the 1st century AD, named the fruit (pod and seeds) "keration" and the carob tree "keratea." According to Theophrastus,



Fig. 6: Carob tree, Crete. Source: National Inventory of ICH, Greece, <https://ayla.culture.gr/el/>

the Ionians of the 4th and 3rd centuries BC called it "keronia". The term "keration" is mentioned several times in the New Testament, especially in the parable of the Prodigal Son. Furthermore, the word "karati" in Greek jewelry-making is derived from the word "keration." The seeds of the carob tree have a stable weight ranging from 189 mg to 205 mg, which is why it was defined as the smallest unit of measurement for gold and precious stones (the modern "carat" has officially been defined as 200 mg). The Arabs, to whom the careful selection of carob varieties is attributed, spread it along the coasts of North Africa, Spain, and Portugal. Their contribution to the spread of carob is evident from the prevalence of the word "kharrub" throughout Europe and Greece, where it grows naturally in many island regions, especially in Crete.

With regard to the culinary use of carob in ancient times, although it was possibly cooked in Mesopotamia during the 2nd millennium BC and used by the Egyptians in the production of alcoholic beverages, there is no information about its use in the Greek territory. However, Dioscorides mentions the medicinal use of carob pods and "keratite wine." In a Cretan medical treatise from the 19th century, the seeds of carob trees and their therapeutic use are mentioned. Foreign travelers who visited Crete in the 19th century describe carobs as a food for both humans and animals. (Fig. 7) Carob also belongs to the family of "syrups," Byzantine beverages that evolved from the Ottomans. The drink made from carob syrup and cold water is still popular in Egypt, Lebanon, and Syria. In fact, during the Ottoman rule, it was African traders living in Crete who were the itinerant sellers of carob. Carob honey is





Fig. 7: Carob fruits from Crete, source: National Inventory of ICH, Greece, <https://ayla.culture.gr/el/>

prepared by boiling chopped and lightly pounded mature pods or pods and seeds. After boiling for a short time, they are left in water for twenty-four hours. Then they are strained, and the water is simmered until it reaches the desired density.

During the Second World War, Crete was a major exporter of carob pods, mainly to Northern Greece. A significant portion of the cargoes reaching the city of Thessaloniki were intended for the production of carob syrup.

### **Assessing the impact of CC to ICH: a threat and an opportunity**

The Hellenic Ministry of Culture acknowledges the threats that CC poses to ICH elements, especially those related to stock-breeding and agriculture. It actively supports the work of various organizations aiming to raise awareness among bearers and scientists regarding these challenges. On the 15<sup>th</sup> of June 2022, the Hellenic Ministry of Culture and the Chinese Embassy organized a Symposium entitled "The 3<sup>rd</sup> Experts Forum on the Protection of ICH". This event featured a series of keynotes and a round table discussion that brought forward many ideas regarding CC and its impact on ICH. Interestingly, the discussion highlighted that ICH is not only threatened by CC. As a rich and dynamic body of experiential knowledge, ICH could also serve as a valuable resource for adaptive measures and solutions, given that many ICH



elements are inherently adaptive, resilient and sustainable. Consequently, the Symposium strongly emphasized that ICH should be recognized by officials and authorities as an important medium for addressing challenges deriving from CC.

This twofold approach is evident from our research as well. In the case of the mandras of Lemnos, the main threats of CC, as per the interviewees contacted for this research, are posed by the following elements: increase of temperature; increase of rainfall and destructions related to flooding; loss of local biodiversity and import of foreign species of animals and plants that do not adapt well to the natural environment and require more resources than those available on the island (for instance, more water); uncontrollable increase of the wild rabbit population which in turn affects both cultivations and biodiversity.

The bearers and practitioners seem very aware of the need to act for the protection of their heritage from the effects of climate change and environmental threats in general. During our interviews, they conveyed a deep awareness of the threats and a strong sense of responsibility to respond to them. All informants had personal experience of how the rise of temperature affects both their crops and their ways of working. With rising temperatures, people can no longer work in the fields as long as they used to and it is impossible to be outside after 11.00 am. This not only affects working practices, but also influences the decision of younger generations to continue working in the fields, putting the safeguarding of their heritage at risk. Furthermore, rising temperatures accelerate maturation of the crops; early maturation also reduces the time available for traditional collaborative practices: in mandras, the "kehaghias" and his family would support other "kehaghiades" during the harvest season and then they would celebrate collectively with a big feast: today the crops mature so fast that the "kehaghiades" can no longer take turns in the collection of their crops as they used to. As a result, both collaboration and social relationships are affected, along with the celebrations associated with the harvest.

The yearly calendar is also affected by the temperature rise: many celebrations and religious practices of "kehaghiades" are related to the annual agricultural cycle: for instance, the religious celebration of Panagia Messochoritissa used to mark the new planting season at the beginning of the yearly cycle; however, due to CC the time of the celebration does not coincide any longer with the actual planting as the rise of temperature means that the planting has to happen later in the year than in the past. Consequently, the meaning and significance of religious celebrations is also reconfigured.

Furthermore, the rise of temperature affects the relation with water resources, which are crucial for sustaining a "mandra". Cur-

rently, rainfall has become less frequent, but when it does rain, it is often heavy. This affects local plants, which adapt better to lower water levels. Therefore, the excess in watering because of the heavy rainfall affects them in a negative way. On the other hand, new plants and animal species (like European species of sheep) are imported to the island, as they are more productive and therefore financially viable. However, as they are not suited to the climate of the island, these species require much more water and food to survive. To meet these needs and increase production, the owners of these new species of animals and plants are drilling deep wells, a fact which disrupts the balance of water resources and availability for the "kehaghiades" and the overall production cycle. Additionally, these practices lead to dryness of natural water reserves which in turn means that wild animals, like migratory birds, cannot find water that they need in order to continue their journeys.

The above may also be related to the uncontrolled growth of the population of wild rabbits; in the absence of natural predators, their numbers are increasing, and this affects both pastureland and cultivations.

On the other hand, in the case studies from Crete the emphasis seems to be elsewhere. Interestingly wild edible plants in Crete should not be characterized as a species at risk but rather as a solution to threats posed by CC. The wide occurrence and availability of edible wild plants in Crete is related to the island's rich topography. The rocky landscape forced local inhabitants to rely on nature for their food supply throughout the island's history. During the interviews, it was repeatedly stressed for instance, that during the Second World War, Crete did not "experience hunger" (as other parts of Greece) precisely because of the wide abundance of edible wild plants in the Cretan landscape.

Observing the annual cycle of vegetation in relation to the changing seasons, specific locations, and microclimate led local inhabitants (particularly older generations) to a deep experiential knowledge of the natural economy, the properties of a wide spectrum of edible plants as well as the specific conditions of their growth. Today, in the wake of concerns regarding CC, this experiential knowledge may act as an impetus for overcoming (i) climate warming and unpredictability, (ii) drought, and (iii) temperature rise. In other words, the use of wild edible plants may be an effective and sustainable strategy for counterbalancing/overcoming the effects of CC.

During the interviews, local inhabitants/farmers mentioned numerous varieties/types of wild plants, emphasizing mainly how they were consumed and/or cooked (raw, boiled, fried). When they were asked about the effect of CC to wild flora on the island, they mentioned that these plants are not affected by changes in

weather conditions and/or climate. It is indicative, they argued, that regardless of when rainfall occurred (“premature/out-of-season”, “unexpected” and/or “delayed”), soon after its occurrence, wild plants would make their appearance. For them, wild plants are therefore “constantly available”.

As in the case of wild edible plants, carobs may be related to CC not as a species at risk but rather as a solution to environmental restructuring. They are one of the most useful trees in the Mediterranean basin, representing resilience and self-sufficiency. They have deep roots and find their own way of natural irrigation. Carob helped the villages of Crete survive the famine during the German occupation. Rich in nutrients, it is considered a superfood and has a long shelf life without requiring special storage conditions. The carob tree, a plant that withstands drought, can also provide solutions for reforestation programs in coastal areas endangered by erosion and serve as a key factor in preserving the ecosystem. It can also be utilized in fire-prone zones due to its fire resistance. In fact, according to a recent announcement from the Greek authorities, the reforestation of the part of Attica that has been burned due to the forest fires in the summer of 2024 will consist of carob trees.

### **Conclusions and future directions**

So far, all research on ICH increasingly underscores its inextricable link with the changes occurring in nature and the environment. The case studies reviewed in this article have highlighted a very interesting pattern: while some elements of intangible cultural heritage are indeed threatened by CC, other elements offer valuable solutions for mitigating these impacts. This article seeks to highlight the profound interconnectedness between ICH and CC, but also proposes a framework for identifying both the risks and opportunities that are emerging from this interplay. The ultimate aim is therefore to adopt a more holistic perspective on how ICH can be under threat but also contribute to addressing the challenges posed by CC.

Throughout our research and interviews, bearers/practitioners have expressed a need for additional support (financial and/or political), namely policies and measures that will (a) support their sustainability efforts and (b) raise awareness about local biodiversity and natural resource management.

Therefore, it is of crucial importance to integrate ICH into climate policy at local, national, and international levels, as well as the promotion of community-based adaptation strategies and approaches that could ensure that such strategies are culturally relevant and sustainable in the long term. Further research and

documentation are required in order to enhance awareness and mobilize resources for ICH preservation. Finally, education and public awareness programs are essential tools for fostering a greater appreciation of ICH safeguarding practices (particularly against CC) and for encouraging broader community engagement in safeguarding efforts.