THE MEDITERRANEAN DIET: Fostering a Common Vision Through a Multidisciplinary Approach

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This document will be made available in printed format and in digital format. The latter will supply direct hyperlinks to online resources.

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THE PROJECT

Inscribed in the UN's Representative List of the Intangible Cultural Heritage of Humanity, the Mediterranean Diet (MD) is intrinsic to the Mediterranean identity. It involves a set of skills, knowledge, rituals, symbols and traditions related to cultures, landscape and lifestyle. Nevertheless, some Mediterranean rural regions seem to have natural and demographic handicaps resulting from ignorance of the economic potential of the Mediterranean cultural identity. The MD.net Project addressed the problems of currently neglected and undeveloped opportunities of the Mediterranean Diet concept. The main objective of the project was to improve the valuation of this concept according to the United Nations Educational, Scientific and Cultural Organization (UNESCO) Mediterranean Diet Convention, blending comprehensive Mediterranean Diet concepts with innovative tools. The project used both traditional and creative actions, underpinned in the quadruple helix methodology[1] that aims at bringing together stakeholders (government, industry, academia and civil society) in open innovation generation processes, in order to drive structural changes in favour of regional development, far beyond what any single organization could do, thus lifting the MD economy to new quality levels.

The main objectives of the project were the following:

1. Strengthen the use of the Mediterranean Diet (MD) according to the UNESCO Mediterranean Diet Convention, blending comprehensive MD concepts with innovative tools, and to recognise the MD as an opportunity for smart economic growth of remote rural areas;
2. Strengthen the implementation of the MD across the UNESCO MD regions and expand the territories subscribing the UNESCO Mediterranean Diet Convention;
3. Promote the Mediterranean Diet in the international market by addressing the distinctive features of MD products (rooted in cultural and natural assets) around which to build an innovative integrated branding for marketing and hi-tech networked complementary services;
4. Couple the MD with offers targeting specific communities through slow tourism;
5. Create an enduring network between users, local communities, companies, scientists and public administrations to promote new opportunities for MD products and services for younger generations.

[1] More information on the quadruple helix and open innovation can be found in Cavallini *et al.* (2016).

With thirteen partners from the Mediterranean area, the MD.net project's approach consisted of different blocks of activities never previously attempted for the Mediterranean Diet sectors:

MD.Data: Sharing scientific knowledge and research on the Mediterranean Diet by means of a transnational network platform.

MD.Brand: Strengthening Mediterranean Diet identity and steady cooperation between regions to apply common methodologies to foster competitiveness of SMEs in international markets.

MD.InC: Encouraging innovation and creativity of products and services through a permanent platform.

MD.Brain: Sharing methodology of courses and workshops for information and co-creation of Mediterranean Diet professionals.

MD.GOV: Strengthening partnerships among quadruple-helix actors.

MD.TN.net: Enlarging MD.net transnational capitalization, through effective transfer and capitalisation of MD tools, achievements and knowledge to Mediterranean regions.

This book is part of the MD.TN. net approach that aims to develop and transfer a common vision of the Mediterranean Diet, through its multidisciplinary approach.

THE PARTNERSHIP

1. Leader Partner- Campania Region
Naples, Italy

2. Universidade do Algarve
Faro, Portugal

3. RERA S.D. for Coordination and Development of Split Dalmatia County
Split, Croatia

4. Region of Crete
Heraklion, Greece

5. University of Mostar - Faculty of Agriculture and Food Technology
Mostar, Bosnia and Herzegovina

6. Mediterranean Diet Foundation
Barcelona, Spain

7. PRODECA - Catalan Agrifood Exports Promotion Agency. Department of Agriculture, livestock, fisheries and food.
Barcelona, Spain

8. Official Chamber of Commerce - Industry and Shipping of Seville
Seville, Spain

9. Emilia Romagna Region
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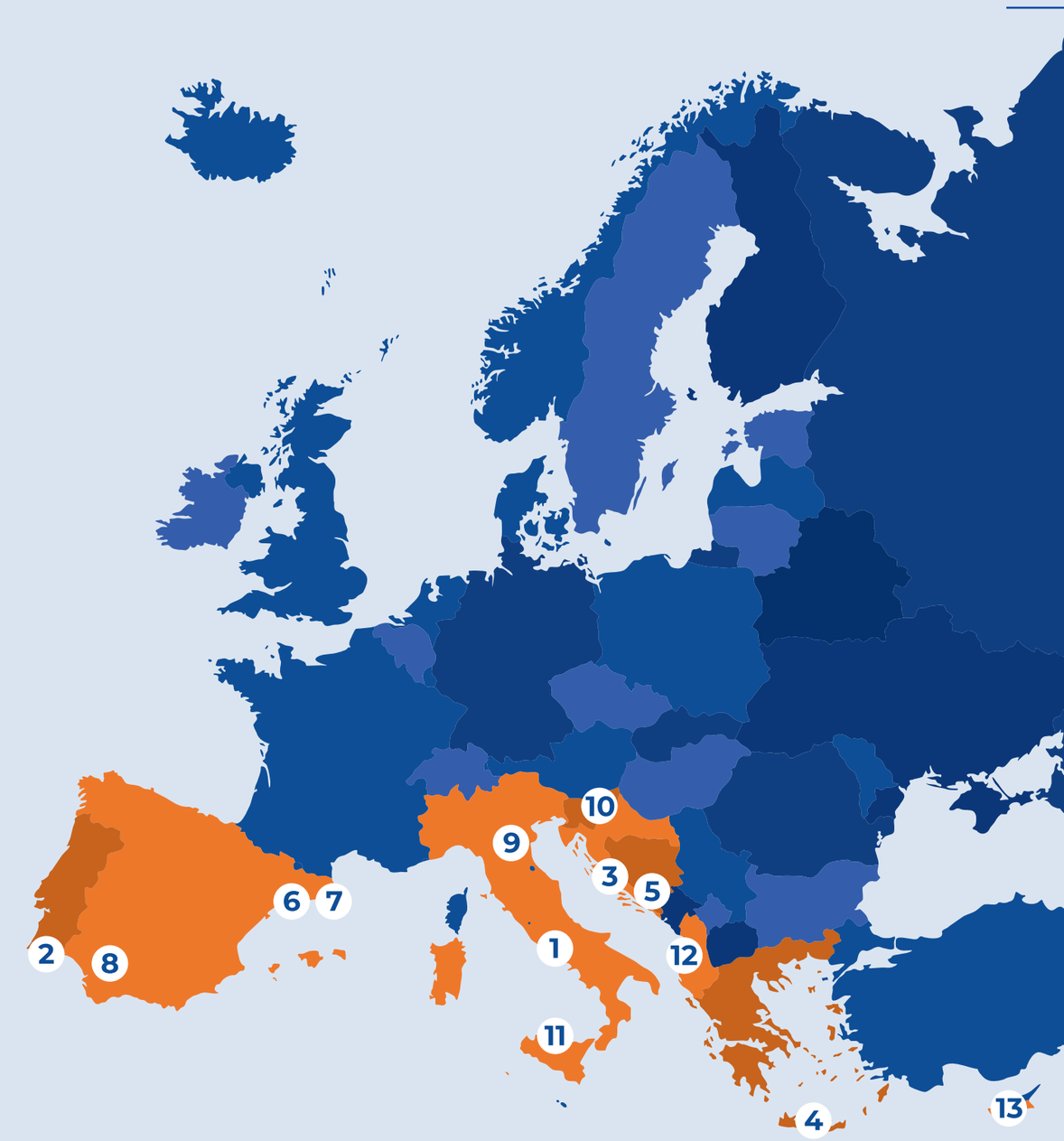
10. Institute for Comprehensive Development Solutions – eZAVOD
Podravska, Slovenia

11. Standing Committee for the Euromediterranean Partnership of Local and Regional Authorities
Palermo, Italy

12. Association of Albanian Municipalities
Tirana, Albania

13. Troodos Development Company Ltd
Troodos, Cyprus



INTRODUCTION

The Mediterranean Diet (MD) is herein presented as a multidisciplinary concept which, in its broadest sense, does not apply outside the Mediterranean Basin, as it embodies elements of geography and climate, agriculture, food habits, history, sociological aspects, culture, architecture and others.

In the first chapter, some historical background is provided, highlighting the roots of the Mediterranean Diet, its strong links with agriculture and the contribution of several civilizations to it. Then, the Cultural Landscapes of the Mediterranean Diet are defined and acknowledged. The orography, climate features and biodiversity of the Mediterranean region are briefly described, stressing their association with Culture and History, namely the Mediterranean ways of coping with nature. Current challenges, including climate change and the Information Era, are discussed and illustrated with actual examples, whenever adequate. Preserving the fragile equilibrium between natural and cultural assets and economic activities depends on raising awareness of the realities of local agricultural and fishery sectors, as well as on inviting urban populations to reconnect with the pace of nature and to choose local products of the season, thus addressing several Sustainable Development Goals, mainly SDG2 (zero hunger), SGD13 (climate action), SDG14 (life below water), and SGD15 (life on land) (United Nations [UN], 2020). The first chapter presents the necessary context to help the reader understand the interdependency of the various dimensions of the Mediterranean Diet, thus valuing existing knowledge, skills and millenary wisdom.

The second chapter focuses on one of the most prominent dimensions of the Mediterranean Diet: the food pattern, which has been used as an example of healthy and sustainable diet, and as a worldwide inspiration for dietary guidelines and recently designed diets. The MD, as a whole, is a unique feature of the Mediterranean and if, on one hand, it is necessary to preserve the fragile equilibrium of the true MD inherent to each territory, on the other hand, some features (such as the eating pattern, or the reconnection of urban populations with the paces of nature) can be implemented elsewhere with benefits for all. In chapter 2, the Mediterranean food pattern is presented together with its benefits for human health and the environment, among others that have attracted so much attention from outside the region. The food pattern and lifestyle are reviewed, from various perspectives: health and nutrition, highlighting the balance and frugality of Mediterranean eating habits; environment, highlighting the variety and biodiversity of foods; and, finally, the gastronomy, for the wide spectrum of flavours, textures and colours of Mediterranean dishes.

The information provided on the Mediterranean food pattern aims

to encourage educated choices on eating habits and lifestyle, beneficial for health and the environment. Moreover, it is stressed that the pleasure of good food and convivial meals is very compatible with a healthy and sustainable lifestyle.

In order to distinguish the overall multidisciplinary concept (classified as Intangible Heritage of humankind by UNESCO) from the corresponding food habits, and for the sake of simplicity, the Mediterranean food pattern will be abbreviated to "Med diet", and the Mediterranean Diet concept will be abbreviated as "MD" along the text.

In chapter 3, the cultural richness of the Mediterranean is described, presenting and highlighting the most prominent features of the regions participating in the MD.net project, according to criteria recognized by International organizations and relevant to the Mediterranean Diet concept. The "unity in diversity", revealed in chapters 1 and 2, is again evident when examining the natural and cultural assets, from the tourism point of view. The conventions, treaties and organizations relevant to the tourism sector are listed, with corresponding links.

Every region displays outstanding features, from impressive volcanoes, caves and marshes full of wildlife, to magnificent monuments and breath-taking landscapes. The list of famous Natural Sites, Outstanding Geoparks, Cultural Landscapes and Intangible Heritage elements is lengthy, and had to be restricted by tight criteria for presentation in this book. Some descriptions of natural and cultural assets are included to show the connection between tourism and MD, with examples of touristic sites (e.g., natural parks, rural landscapes or monumental cities) as well as some festivities, local markets and celebrations from the regions participating in the MD.net project.

Ancient customs are found all over the Mediterranean and may contribute to reinforce local peoples' pride in their culture, while showcasing it. Traditional festivities, based on the celebration of harvest seasons, might help reconnecting urban populations to the pace of nature, while some reinvented festivals revamp ancient culinary arts and crafts. Only by raising awareness of such assets will it be possible to reinforce the Mediterranean sense of belonging, to improve the adherence scores[2] to the Mediterranean dietary pattern, to revive traditions, and to create value from sustainable innovations built on the Mediterranean Diet concept.

Chapter 4 approaches the challenges and opportunities common to the whole Mediterranean region, concerning environmental, economic and social aspects. The Mediterranean area is a complex mosaic of landscapes, cultures and territories, all interlinked and based on a balanced human/nature interaction. Such a fragile equilibrium faces serious threats, such as climate change, the deviation of Mediterranean peoples from their traditional food pattern and sustainable practices, and tendency to adopt global habits. In addition, mass tourism has been enhancing these negative impacts contributing to the erosion of MD, which can in turn be used as a valuable asset to support local stakeholders in developing unique and profitable products and services.

According to the perceptions of the participants in the MD.net project, the general public associates MD with culinary aspects only, ignoring the real meaning of the concept and the MD status of Intangible Heritage of Humankind granted by UNESCO. As a consequence, and in order to promote a real and sustainable valuation of MD assets, it will first be necessary to undertake effective awareness campaigns and dissemination actions. Secondly, current challenges in the region call for collaboration between diverse Mediterranean stakeholders to find innovative forms of tourism that may allow visitors to experience the Mediterranean lifestyle, under the motto: GLOCAL - THINK GLOBAL TO ACT LOCAL.

[2] The adherence to a dietary pattern refers to the inspection of food habits (type, diversity, and portions of foods) as compared to a given model; the higher the score (based on a composite index), the closer food habits are to the model and *vice versa*.

CHAPTER 1. THE MEDITERRANEAN DIET - NATURAL AND CULTURAL LANDSCAPE

1.1. NATURAL AND CULTURAL LANDSCAPES OF THE MEDITERRANEAN: HISTORY AND TERMINOLOGY

A journey through time

With the advent of agriculture, humankind started to shape nature in its favour, domesticating plants and animals, creating new species with suitable traits, such as cereals richer in starch, and sheep that provided more wool, milk and meat. Agriculture developed from itinerant farming, which consisted in burning the existing vegetation in order to sow chosen edible plants. After harvest, the human community moved to another suitable location where the same procedure was repeated. Such practices lasted until productivity and agricultural techniques – including the selection of species varieties that offered the best yield and/or nutritional value – improved sufficiently to ensure the food security of the populations.

The domestication of cereals, namely wheat, was of primary importance because the seeds could be stored for many months (under suitable conditions). It is noteworthy that wheat bread (obtained from the grains milled into flour, and baked), besides carbohydrates [3], supplies some protein, B vitamins, and minerals, in easily digestible forms, and soon became a staple food, and one of the pillars of the Mediterranean Diet.

By the Neolithic epoch, European agricultural techniques diverged: in northern Europe, with cold winters and warm summers, the melted snow from the mountains was enough to keep the large valleys watered and fertile during warmer times. Populations specialised in raising cattle to use all their products (milk, meat, leather and even blood), and the genetic evolution that allowed humans to use lactose (a sugar present in ruminant's milk) was crucial for population growth. Ruminant's milk and dairy became important sources of protein and vitamin D. In these northern regions, the short summer with long daylight periods allowed growth of enough cereals (namely barley and rye) to prepare bread for humans, and silage to feed cattle during the long winters.

Peoples from the Mediterranean south were apparently blessed with a milder climate. However, the irregularity of the terrain and the scarcity of water during summer proved otherwise, as valleys with abundant fresh water are rare in southern Europe and in the Maghreb. Mediterranean peoples adapted to this environment by carefully choosing crops and trees

[3] Carbohydrates are food constituents primarily responsible for supplying energy for metabolic functions; they encompass simple sugars (monosaccharides), oligosaccharides (consisting of a few sugar molecules attached to one another), starches (polysaccharides, with many sugar molecules attached to one another) and fibres (sugar polymers that are beneficial to bowl functions, namely to gut's microbiota, relevant bacterial symbionts mainly living in the colon).

with reduced water demand and devising agricultural techniques and crafts to use every patch of fertile soil, on steep hills, among rocks, or just by the coast where sea waters quietly enter land, forming brackish wetlands (e.g. large estuaries, marshes). Instead of horses and cattle, they preferred small ruminants (such as goats and sheep) and donkeys, which were able to find their own food.

These two approaches to agriculture in early times were probably the root of the divergent lifestyles and of later constraints to the economic growth in the Mediterranean regions: the northern peoples, more prone to standardization and massive production *vs*. the southern peoples, more resourceful, resilient and able to take advantage of biodiversity.

For many centuries, the skills of the Mediterranean peoples and the milder climate were more favourable to population growth and development. Mediterranean societies increased in complexity as food security improved, allowing for task specialization that greatly increased efficacy. Food was so valued that it was offered to the Gods and the association between certain foods (e.g., bread), religious rituals and symbolism persists until today. Food preservation techniques that are still used, such as fermentation (e.g., bread, wine and dairy, notably cheese and yogurt), and drying and salting of fish and meat, originated in the Mediterranean region during the agricultural revolution. Nowadays, salt is mostly discussed in terms of its abuse and the associated health issues, but it was once of capital importance for food preservation and for supply of microelements to the diet.

As a result of the increased food security provided by agriculture, cities soon became centres of civilizations, flourishing under collective beliefs and commonly accepted social organization, as in Mesopotamia and Egypt, where prosperity was grounded in efficient agricultural techniques (e.g., plant and animal domestication, water management). Specialization and trade enabled the growth of civilizations such as the Phoenicians, who travelled and settled along and across the Mediterranean, first leveraging the Mediterranean culture by disseminating goods (e.g., cereals, salt, dyes) and skills between both shores of the Mediterranean Sea.

The use of metals and written language were important technical progresses although social cohesion was ensured by religious beliefs that motivated the peoples to transcend themselves, as can be witnessed by the colossal art pieces and buildings, which were meant to last forever. Modern societies still rely on unique human traits, such as imagination and abstract thinking that, when verbalised, allow assembling intersubjective constructs (ideals, concepts, stories), which are reinforced through collective belief. Politics, Money, Philosophy and Religions soon became pillars of civilizations, and such concepts still rule western culture, which is deeply rooted in Mediterranean civilizations.

A short summary of the main events and civilizations that sequentially impacted the Mediterranean Diet is shown in Figure 1.1.

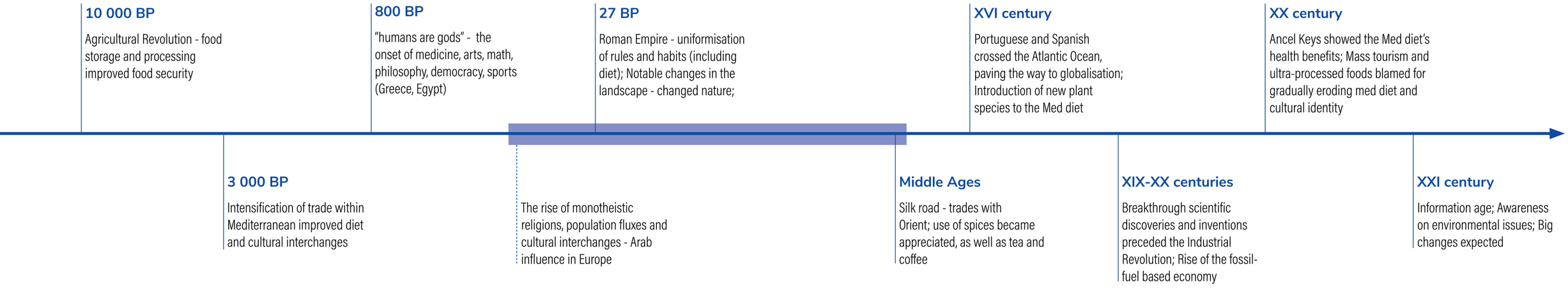


Figure 1.1. *Timeline of main Historical milestones that have been shaping the Mediterranean Diet, from the Agricultural Revolution to the present day (created for this work by Amélia Delgado).*

The Ancient Greek and Roman civilizations were the foundations of western culture. Ancient Greeks developed democracy, philosophy, mathematics and other sciences, as well as arts. They established the link between mind and body, and Hippocrates, the father of medicine, first separated the discipline of medicine from religion, arguing that disease was not a punishment from the Gods but rather caused by environmental factors, diet, and living habits. The phrases "*Let food be your medicine, and medicine be your food*" and "*Walking is man's best medicine*" are attributed to him, and his arguments are in line with the Greek word "Diaita", encompassing diet and lifestyle, which best describes the Mediterranean Diet concept.

In turn, the Roman Empire dominated the Mediterranean Basin and surroundings for centuries, as illustrated by Figure 1.2. It was the most extensive political and social structure in western civilization and its lasting contributions are found in virtually every aspect of western culture.

The first Roman emperors expanded the empire by implementing effective political, economic and military systems in all provinces. Such governance relied, namely, on a set of laws (e.g., land property), on the construction of roads and bridges, aqueducts and reservoirs (to manage

Figure 1.2. *The Roman Empire, which greatly contributed to the expansion of the Mediterranean Diet. At its greatest extent, it occupied the territories shown in this map. (source: Andrei Nacu, 2015)*

and distribute water), and on ensuring food security (e.g., by planting olive trees and vineyards).

Augustus, by the end of his life, boasted that he "*found Rome as city of clay but left it as city of marble*." A period of peace, known as "Pax Augusta" or "Pax Romana" allowed for great prosperity and advancement of knowledge during about 200 years. Romans were adept at incremental innovation, adjusting and improving any invention, tool or concept they found useful among the colonised peoples. Slowly, they imprinted the cultural landscape of the Mediterranean Basin by disseminating common crops and food preserves, as well as architecture and crafts. In other words, the Romans implemented a homogenous culture, law and order over a vast territory.

The Romans standardized food habits in all their provinces, ensuring food availability throughout the year by developing and improving food preservation methods, such as drying fruits, fermenting olives, and improving cheesemaking. Fresh meat and fish were less common, but their preserves were appreciated delicacies, for example "garum" (fish preserve), *chouriço/ chorizo*, ham/*prosciutto*, and salami (meat preserves). The Romans also introduced fish farming, in brackish water tanks. Food supplies were carefully controlled by the state and, in times of peace, wide access to cereals, pulses, olive oil, pork and wine was granted to all (Cartwright, 2014). Attention was given to cooking, and recipes used condiments to create tasty and unique foods and sauces (Figure 1.3).

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Figure 1.3. "Açorda" and "Gaspacho/ Gazpacho" is a type of meal likely to have been inspired by Roman food recipes. It contains bread, olive oil, aromatic herbs and, whenever available, some fish or meat preserves were used as seasoning. (source: photo by Vasco Célio)

After about AD 476, the western part of the Roman Empire collapsed, and the barbarian peoples (as they were called in ancient Rome) took over, soon forming several kingdoms. The eastern part, however, persisted as the Byzantine Empire, centred in Constantinople, where a quite tolerant and advanced civilization prospered until 1452, when it was conquered by the Ottomans. In the West, some of the Roman legacy was kept within the Catholic Church, which used Roman structural organization to disseminate information and habits. During the Middle Ages, European religious orders became proprietors of vineyards, olive orchards and other important crops. Later, in the Renaissance and with the support of the Church, such a cultural legacy extended beyond the strict religious dimension.

The diet in the Mediterranean area has been enriched over time by new crops and foreign spices brought to the region, firstly by Phoenicians and Venetian merchants, and spread by the Roman empire and the Arab Caliphates. From the 15th century onwards, Portuguese and Spanish sailors crossed the Atlantic Ocean and in the 16th century dramatic changes in the Mediterranean food landscape could be perceived, due to the introduction of crops from the Americas (that evolved into many different varieties by adapting to specific Mediterranean pedoclimatic conditions) and the improved availability of spices from the Orient. The Portuguese and Spanish expeditions to the Americas, Africa and India, not only enriched the diet in the region, but also exported the Mediterranean culture to new lands, which now consume olive oil and other Mediterranean delicacies.

Despite the diversity of crops in the Mediterranean Basin, for many centuries food scarcity prevailed for common peoples who lived in uncertainty, worried about hunger, epidemics and wars. To all those who followed the ethical codes of conduct, religion offered guidance, consolation and rewards in the form of happiness and promise of wellbeing in the afterlife. Similar concepts and ethical principles apply to all three Abrahamic religions, with minor differences. Notably they share: the same God, many sacred texts and ethical rules, the same symbolisms related to crops and foods (e.g., olive tree and olive oil, bread), and celebrations related to harvests and aligned with the pace of nature, often involving communal events where food and socialisation play central roles. Therefore, one cannot dissociate the Mediterranean Diet from the influence of those religions, as they are part of the Mediterranean cultural landscapes (defined below) and are still very much alive in the area. However, the human individual is now the central figure and religions have been adapting narratives to cope with the new individual aspirations for happiness, as well as for a long and prosperous life, and even for environmental protection.

Science and beliefs may coexist harmoniously, the former proposing technological advancements (science and technology), and the latter assessing their ethics (religions and ideals), that is, the impact of adopting new practises and technologies on the wellbeing of humankind. Science provides recipes for longer life (recommended lifestyles, medicines), while beliefs[4] (ideals or religions) provide the guidelines to happiness (ethics, behavioural rules).

A common Mediterranean identity and lifestyle emerged from all these common layers of History, of cultural exchanges and population fluxes. Migrations within the Mediterranean region and successive settlements refined similar ways of life, aligned with the rhythms of nature, encompassing convivial meals and food patterns, as well as similar architecture and materials (e.g., the same dyes), all grounded on similar natural resources, climate and orography, as well as similar codes of social conduct. However, this model allows and embraces regional specificities, as based on the optimization of local resources and the reinforcement of social bonds. Such skills and lifestyles helped face the harsh life conditions and food insecurity that persisted in the region until long after the industrial revolution, aggravated by the Second World War (WWII) and the Spanish Civil War. In the 1950s and 1960s, while North and Central Europe and the USA prospered, much of the Mediterranean world did not experience economic growth.

For many reasons, including the lack of indigenous fossil fuels, the Mediterranean region was slow to accompany the industrial revolution. After WWII, major changes in agriculture and food industry took place in the countries that had led the industrial revolution, boosted by the post-war aid mechanism – the Marshall plan – that encouraged productivity and mass production, and favoured major industrial powers in Europe. Even with later investment and strategies prescribed from outside, most of the Mediterranean region seemed to resist progress, and did not experience significant economic growth. The main underlying reason was probably the inadequacy of the imposed model, not considering the geomorphology of the territories and marine environments and disregarding biodiversity. The modern large agricultural machinery was inadequate for most fields, due to the irregularity of terrains, with more stones than nutrients, and water scarcity during summer was an additional problem. The so called “Green Revolution” aimed (and greatly succeeded) at tackling famine in the world, and in the Mediterranean region agricultural production has been intensified whenever possible by replacing autochthonous plants and animal breeds by standard and (allegedly) “improved” ones. The food industry experienced unprecedented growth post-war, although important collateral damage remains unresolved, along with the rise of obesity, non-communicable diseases, and nutritional deficiencies.

Moreover, in such a model of industrialization, which is still mainstream, Mediterranean foods,

[4] Beliefs, notably Ideals and Religions are herein viewed as constructs linked to ethics and to other philosophical disciplines.

such as fresh vegetable salads, soups and stews (including a large variety of seasonal plants and herbs) were considered inadequate for large scale production mainly due to the lack of scientific knowledge to support large scale manufacturing and to the reduced availability of raw materials (e.g., specific autochthonous plants). However, some attempts to globalise Mediterranean foods were economically and industrially successful. That is the case of pizza, globally known as a fast-food nowadays, which is nutritionally poor, deleterious to health and to the environment, contrasting with the original balanced food, which is nutricious, healthy and sustainable[5]. Pressures to embrace global processed foods in the Mediterranean region still persist, in contrast to the call for paradigm change.

In short, while the needed economic development pushed widespread expansion of intensive agriculture, relying on a few homogenous seed varieties and heavy use of agrochemicals, fertilizers, water and energy, the food industry evolved to produce high calorie-dense foods of poor nutritional content, with few natural ingredients. The result has been the disruption of balanced ecosystems, the loss of biodiversity, climate change, and the rise of obesity worldwide, that by 2019 had surpassed malnutrition, including across the Mediterranean Basin. The peculiarities and the intrinsic value of the Mediterranean Diet and Mediterranean ecosystems have finally been acknowledged (Food and Agricultural Organization of the United Nations [FAO], 2020a; International Union for Conservation of Nature [IUCN], 2017), creating opportunities for the sustainable exploitation of agrobiodiversity and for the revamping and updating of old Mediterranean techniques, as discussed in chapter 4. It is noteworthy, though, that the Mediterranean Diet is a holistic concept, and its definition calls for the dialogue between experts from different fields, from humanities to the exact sciences, who have different approaches to the same reality. Common awareness of some relevant concepts that are built on the definition of the Mediterranean Diet itself may facilitate such a dialogue and further action.

The concept of the Mediterranean Diet

According to the United National Educational Scientific and Cultural Organization (UNESCO, 2013), "*The Mediterranean Diet involves a set of skills, knowledge, rituals, symbols and traditions concerning crops, harvesting, fishing, animal husbandry, conservation, processing, cooking, and particularly the sharing and consumption of food. Eating together is the foundation of the cultural identity and continuity of communities throughout the Mediterranean Basin. It is a moment of social exchange and communication, an affirmation and renewal of family, group or community identity. The Mediterranean diet emphasizes values of hospitality, neighbourliness, intercultural dialogue and creativity, and a way of life guided by respect for diversity. It plays a vital role in cultural spaces, festivals and celebrations, bringing together people of all ages, conditions and social classes. It includes the craftsmanship and production of traditional receptacles for the transport, preservation and consumption of food, including ceramic plates and glasses. Women play an important role in transmitting knowledge of the Mediterranean diet: they safeguard its techniques, respect seasonal rhythms and festive events, and transmit the values of the element to new generations. Markets also play a key role as spaces for cultivating and transmitting the Mediterranean diet during the daily practice of exchange, agreement and mutual respect.*"

The Mediterranean Diet was first inscribed in UNESCO's Representative List of the Intangible Cultural Heritage of Humanity in 2010, and then again in 2013, to extend the number of countries covered, which by 2020 included Cyprus, Croatia, Spain, Greece, Italy, Morocco and Portugal. Each one of these countries has a representative community that demonstrates and safeguards the Mediterranean Diet material and intangible elements. Representative or emblematic communities from the listed countries are respectively: Agros (Cyprus), Hvar (Croatia), Soria (Spain), Koroni (Greece), Pollica-Cilento (Italy), Chefchaouen (Morocco) and Tavira (Portugal).

The members of the representative list agreed that the concept of Mediterranean Diet is multidisciplinary, encompassing geography and climate, agriculture, food habits, history, sociological aspects, culture, architecture and others.

It is worth noting that the above-mentioned list does not include all the Mediterranean regions, and that the fact that a region has a coastline bordering the Mediterranean Sea does not imply that it has a Mediterranean identity and culture. In fact, the Mediterranean Basin includes the territories of southern Europe, northern Africa and the westernmost Asia. The regions where the so-called Mediterranean civilizations developed and succeeded reflect a largely common culture, above and beyond deep political and religious differences. The Mediterranean Diet results from millenary accumulated knowledge and beliefs, translated into Material Heritage (e.g., temples, vernacular architecture) deeply entangled with Intangible Heritage (e.g., food habits, festivities). The Mediterranean Intangible Heritage of Humanity responds and clearly demonstrates the complexity of food, its social and symbolic significance, and the links to the environment.

Still according to UNESCO (2013), such intangible cultural heritage is "traditional, contemporary and alive, at the same time". The Mediterranean Diet concept is inclusive, as it aims at preserving the Mediterranean identity, from one generation to the next, sometimes influenced by migratory flows and by the inclusion of non-native elements.

[5] see, for example, *pizza napoletana* ⊕.

The concept is representative, because it encompasses the historical background, knowledge of the community rituals and behaviours and their adoption by other communities; it is community-based, because of the conscious awareness of community members. In addition to those features, the sustainable dimension of the Mediterranean Diet has been stressed by FAO, raising awareness of its sustainable character and calling for action to safeguard it (Food and Agricultural Organization of the United Nations [FAO], 2015, 2019a,b, 2020a; United Nations [UN], 2020).

It is significant that food systems have been referred to by the United Nations (UN Environment, 2019; United Nations Environment Programme [UNEP], 2020a) as a crosscutting issue, due to their broader impact on land use, water requirements and greenhouse gases emissions (ecological footprint). Encouragement of dietary changes towards plant-rich diets with less meat consumption, reduction of food waste, as well as supporting sustainable agriculture and sustainable food processing have all been advocated.

In addition to the above short historical context, a better understanding of the Mediterranean Diet (MD) calls for some concepts that will be introduced below, thus enabling the reader to address the question:

Will Mediterranean Diet (rooted in its millenary wisdom) be able to address the urgent and demanding 12th sustainable development goal (SDG), of responsible consumption and production, in addition to other SDG?

The concept of Natural Landscape

Ideally, a natural landscape would be made by Nature and untouched by humankind, that is, nature in its pure state, which is rare and most probably non-existent in the Mediterranean region, for the historical reasons summarised above. The term "natural landscape" originates from the Dutch "landschap", a term that geographers borrowed from painting, meaning "shaped lands", as some geographers (as Otto Schluter[6]) claim that geography is the science of landscape. In this view, a natural landscape consists of a collection of landforms, such as mountains, hills, plains, streams, as well as soils, and natural vegetation (Jones, 2003).

Neither of the two principal online dictionaries (Collins Online English Dictionary, 2020; Merriam-Webster Dictionary online, 2020) display entries for the expression "Natural Landscape". However, "Natural Area" is defined as "*a geographical area (as in a city) having a physical and cultural individuality developed through natural growth rather than design or planning*" (Merriam-Webster Dictionary online, 2020) with examples for "natural landscape" such as "*As far as possible the new buildings will be made to fit in the natural landscape*" (Collins Online English Dictionary, 2020). In fact, truly natural landscapes no longer exist, because humans are driving major changes to the planet's ecosystems (Jones, 2003; Cutlip, 2015). Geologists and other scientists consensually agree that these changes are so noticeable at a global scale that we are living in a new epoch, the "Anthropocene" (Cavicchioli et *al*., 2019; Laurance, 2019; Tortell, 2020; Turney et *al*., 2018).

Back in the 1990s, and concerning World Heritage Sites, UNESCO stated that:

"*A natural area is one where bio-physical processes and landform features are still relatively intact and where a primary management goal of the area is to ensure that natural values are protected. The term "natural" is a relative one. It is recognized that no area is totally pristine and that all-natural areas are in a dynamic state. Human activities in natural areas often occur and when sustainable may complement the natural values of the area*" (UNESCO, 1996).

Currently, Natural Areas are viewed from a conservation point of view, translated into the UN Sustainable Development Goals, notably SDG14 - Life Below Water and SDG15 - Life on Land.

In short, across the Mediterranean Basin, birthplace of remarkable ancient human civilizations (Figure 1.1), nature has been shaped by humankind for millennia, so that natural landscapes have become cultural landscapes (defined below). This is one of the reasons why the Mediterranean Diet cannot be understood separately from human action, although MD may enclose the wisdom needed to find new ways of restoring the balance between nature preservation and the progress of human societies.

The concept of Cultural Landscape

According to UNESCO (1996, 2003, 2019), Cultural Landscapes are combined works of nature and humankind, expressing a long and intimate relationship between peoples and their natural environment. Cultural landscapes encompass sites that reflect specific land use techniques, which are sustainable and support biodiversity, as well as sites that express a spiritual relationship of people with nature, associated with powerful community beliefs and/or artistic and traditional practices and rituals.

As the term embraces a diversity of manifestations of the interaction between humankind and natural environment, many "cultural landscapes" exist worldwide. 114 are inscribed in the world's heritage list of UNESCO, and a substantial number of them are located in the Mediterranean Basin (UN, 2020).

The Mediterranean Basin has been strongly changed by humankind over many centuries, diplaying many of the ancient's world wonders, including some good examples of

[6] German geographer (1872-1959)

cooperation between humankind and nature. Several of these cultural landscapes may inspire modern forms of sustainable land use, which is one of the reasons for their safeguarding by UNESCO; more recently, the FAO has listed sites of Globally Important Agricultural Heritage Systems, GIAHS (Food and Agricultural Organization of the United Nations [FAO], 2020b). The protection of traditional cultural landscapes is also helpful in maintaining biodiversity, namely of traditional crops, and the number of Mediterranean GIAHS sites is growing.

"Cultural landscapes testify to the creative genius, social development and the imaginative and spiritual vitality of humanity. They are part of our collective identity" (UNESCO, 2019)*"*. In other words, as *"Combined works of nature and humankind, they express a long and intimate relationship between peoples and their natural environment"* (UNESCO, 2020).

To better explain the concept, we present the structure outlined by UNESCO (2019), which classifies the cultural landscapes into three categories:

1. **Landscapes designed and created intentionally by man** encompass gardens and parklands, which were built for aesthetic reasons, often (but not always) associated with religious or other monumental buildings (e.g., botanical gardens, meant to preserve a wide variety of plant species, including from distant locations);

2. **Organically evolved landscape,** resulting from an initial interaction of social, economic, administrative, and/or religious imperative, and has evolved to its present form in association with nature and in response to the natural environment. Two sub-categories are considered by UNESCO (2019):

   a. **A relict (or fossil) landscape** is one in which an evolutionary process came to an end at some time in the past, either abruptly or over a period of time. Its significant distinguishing features are, however, still visible in material form. Monuments that are preserved to keep the testimony of historical times fall into this category (e.g., ruins of Phoenician settlements, monasteries);

   b. **A continuing landscape** is one that retains an active social role in contemporary society, and it is closely associated with the traditional way of life. Typically, an evolutionary process is still ongoing and material evidence of its evolution over time can be observed. Temples in use, historic urban landscape, vineyards in terraces, and cultural landscapes of agro-pastoralism are examples in this subcategory;

3. **Associative cultural landscapes** are those associated to the natural element in any indirect way, since material evidence of such association may be insignificant or absent. These cultural landscapes are of religious, artistic or cultural nature, and valued for the interaction between humans and nature, in other words, they are recognised for their meaning to the communities.

Figure 1.4 represents the set of factors in bidirectional interaction between indigenous communities of a given site, and their surrounding natural element. On one hand, humans change nature to serve their purposes, by implementing management systems according to their cultural values. On the other hand, nature influences human communities through association with beliefs (legends, stories) or religion (e.g., pilgrimage sites) and by transmitting a sense of belonging, which is vital in building a cultural identity. A deeper analysis of cultural landscapes, their types and evolution can be found in Chatterjee (2013).

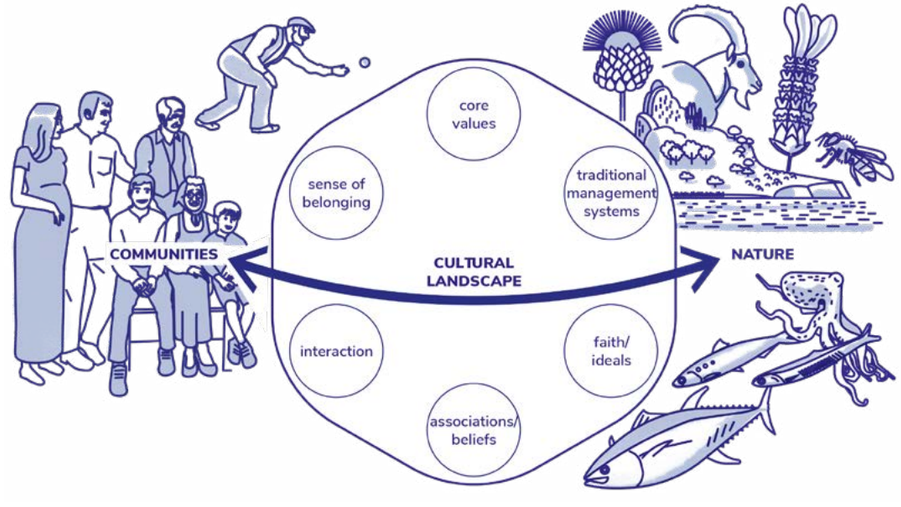

Figure 1.4. *The interaction between humans and nature often involves cultural aspects, thus resulting in different types of cultural landscapes. Human communities act on the environment according to their values, faith and associations. Nature is changed by the interaction of human communities, and human communities are, in turn, conditioned by Nature, which may strongly influence their identity and sense of belonging (created for this work by Amélia Delgado and illustrated by João Tavares).*

To summarize, in UNESCO's view, cultural landscapes are cultural assets representing "*the combined works of nature and of man*" and "*they are illustrative of the evolution of human society and settlement over time, under the influence of the physical constraints and/or opportunities presented by their natural environment and of successive social, economic and cultural forces, both external and internal.*" (UNESCO, 1996, 2019).

The concept of vernacular architecture

Common peoples of the Mediterranean generally had no formal education but developed the resourcefulness and wisdom necessary to take advantage of the surrounding environment by adapting to it. Vernacular architecture is such a manifestation, and is mainly characterised by the use of local materials, skills and knowledge, usually without the supervision of experts.

Vernacular buildings are typically simple and practical and may encompass residential houses, sheds, storehouses, small churches and others. Most of the built heritage can be considered as vernacular architecture, however, it tends to be overlooked in the history of architecture and design, despite its excellent integration in the landscape.

Vernacular buildings have specific purposes and are considered part of a regional culture due to the strong influence of the climate, environment, and availability of construction materials.

1.2. MEDITERRANEAN NATURAL LANDSCAPES

The Mediterranean Diet is a central pillar of the cultural, historical, social, territorial and environmental heritage of the Mediterranean countries, and a legacy to all humankind. Its territory, the Mediterranean Basin, includes the Mediterranean Sea, part of the Atlantic Ocean near the strait of Gibraltar, and the surrounding lands. Its identity and borders have been a subject of discussion (Braudel, 1987; Bethemont, 2000, 2001; Ribeiro, 1968; Ruiz-Domènec, 2004) and the Mediterranean area is consensually accepted as delimited by the habitat of the olive tree. In the words of Braudel (1987), "*It stretches from the first olive tree you see when you come down from the North to the first group of palm trees that appear in the desert*", which roughly corresponds to the Csa and Csb areas of the Köppen-Geiger climate classification concerning the Mediterranean Basin (Kottek et *al*., 2006), which are shown in light green in Figure 1.5.

The Mediterranean Sea is almost enclosed by lands of irregular orography, including many islands and islets of varied geological origin. The coastal areas are very diverse, encompassing marshlands, sandy beaches and cliffs. Small bays hidden by cliffs and protected by rocks were used as fishing harbours, but frequent pirate activity until the 19th century often forced coastal populations to seek protection in the inlands, only occasionally returning to fishing activities. This is the reason why ancestral sustainable fishing practices can still be found (e.g. cast-nest fishing in small boats). To enable trade, large harbours were protected by forts that also ensured the surveillance and the protection of coastal cities (Bethemont, 2000, 2001; Queiroz, 2015; Valagão et *al*., 2018).

The Mediterranean region is limited and surrounded by high mountains – for example, the Alps, the Atlas mountains and the Balkans –, and it faces the Atlantic Ocean to the west. Thus, the Mediterranean Basin includes the territories of southern Europe, northern Africa and the westernmost area of Asia. It is in these areas that the so-called Mediterranean civilizations flourished, whose continuity in time remains until today through a widely common culture, above and beyond political and religious differences (Lozato-Giotart, 2001; Queiroz, 2015; Ribeiro, 1968). In this ancient world, the rise and fall of civilizations and population flows have been accompanied by bold interventions in nature, changing biomes, shaping landscapes and exploring natural resources. However, these Mediterranean ways of dealing with nature followed a logic from the pre-industrial era, to which the concepts of sustainability and resilience were inherent, thus resulting in balanced combined works of mankind and nature that are nowadays a source of inspiration for sustainable development models.

Climate and geomorphology

The Mediterranean Basin is located between about 30° and 45° latitude north of the Equator where three continents (Europe, Africa and Asia) converge, and it is known for its mild climate (Bearman, 1991; Kottek et *al*., 2006; Ribeiro, 1968).

When speaking of the Mediterranean, and as with other topics, also the climate is a mosaic, encompassing different subzones, corresponding to areas of different sizes, as shown in Figure 1.5, which represents the Köppen climate classification[7]. In summary, the mediterranean is characterized mainly by warm to hot dry summers and cool rainy winters, with moderate temperature ranges.

[7] The Köppen climate classification is widely used and was developed by the German botanist-climatologist Wladimir Köppen. It is a vegetation-based, empirical climate classification system to define climatic boundaries so as to correspond to those of the vegetation zones (biomes).

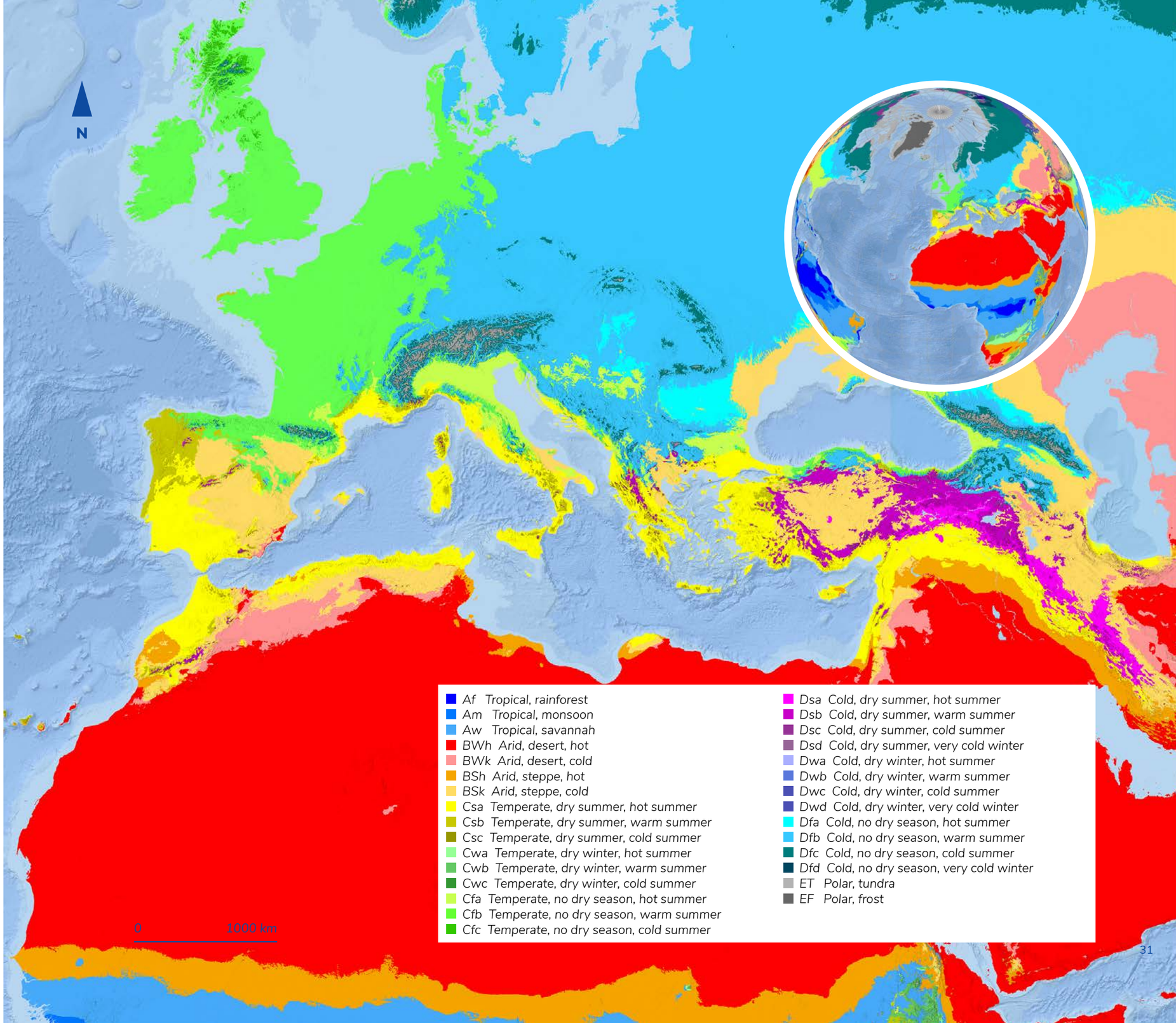

***Figure 1.5**. Koppen--Geiger climate classification in the Mediterranean Basin. The smaller map shows the full range of this classification around various regions of the globe (adapted from Kottek et al., 2006; updated according to Beck et al., 2018).*

As a consequence of the above-described features, the Mediterranean is known by its blue sky and luminosity, and its climatic originality is due to the balance between the influence of sub-tropical anti-cyclones and the westerlies. During winter, frontal cyclones cause rather irregular precipitation, sometimes quite heavy rainfalls. In summer, the region is covered by stable dry air masses (Lionello, 2012; Ribeiro, 1968).

According to Köppen and other authors (Kottek *et al*., 2006; Lionello, 2012; Peel *et al*., 2007; Ribeiro, 1968), in the Mediterranean region the precipitation in the driest month of summer (half of the year) is typically less than 30 mm and temperature of warmest month is 22 °C or higher, with annual temperature ranges that tend to be small. Since the western part of the Mediterranean Basin is not well positioned to receive the coldest polar air (which develops over land rather than over the ocean), fogs are not typical to the Mediterranean climate, which tends to be dry. Although snow can be observed at the summits of the highest Mediterranean mountains, it is not a component of the Mediterranean climate, nor is the night frost ocasionally observed in some inlands. However, the climate can be very capricious, with sudden heavy rain or bouts of high winds such as the Sirocco and the Mistral.

In short, Mediterranean hot dry summers and humid cool winters profoundly influence the vegetation and wildlife of the region, which also depend on the orography. The irregular terrain includes mountains and rocky shores, thick scrub and semi-arid steppes, sandy beaches and coastal wetlands (Figures 1.6 and 1.7) as well as partially submerged rocks and caves and a myriad of islands, of very diverse sizes (Lionello, 2012).

Figure 1.6. *A golden sandy beach of warm waters and blue sky – a top rated destination for mass tourism, particularly during July and August. Such mass tourism is a seasonal source of income for locals but also a source of high anthropogenic pressure on coastal areas' ecosystems and geomorphology. (source: photo by Nick Karvounis/ Unsplash).*

Limestone and clay, as well as marble and volcanic rocks, can be found in Mediterranean landscapes, which are profoundly shaped by man (Lionello, 2012; Ribeiro, 1968). Along with the movement of tectonic plates (African Plate, Eurasian Plate, Aegean-Adriatic Plate), volcanic eruptions and earthquakes are part of the geological dynamics that also shaped the region; Vesuvius, Etna and Stromboli volcanoes are some famous examples, as well as other climatic and geomorphological phenomena (Figure 3.5, in chapter 3).

From the perspective of mainstream agriculture, many soils are poor and fertile valleys are rare. However, the region harbours a huge number of endemic plant and animal species; some of them are crops, introduced long ago, that evolved to adapt to particular niches, thus exhibiting specific features.

Coastal wetlands of brackish water are often used for salt extraction or to farm bivalves and fishes (Figure 1.7). Wetlands and river estuaries are important biodiversity spots. Distances between wetlands or marshes and lands where droughts are common can be short due to the irregular geomorphology. Consequently, controlled irrigation and traditional water management systems are key features of southern European and North African agriculture.

Figure 1.7. *Mediterranean landscapes cannot be interpreted or understood without the presence of man, since they have been shaped by humankind trough many centuries, and the way of life and culture of the peoples are shaped by the harsh natural geomorphology of their regions. Wetlands and rocky hills are abundant in the area and are often located nearby (source: photo by Kirstudio Films/ Shutterstock).*

The natural landscape is mainly an agricultural landscape and if, on the one hand, the Mediterranean Basin is as an important biodiversity spot, on the other hand, its many endangered species need more protection (Figure 1.8).

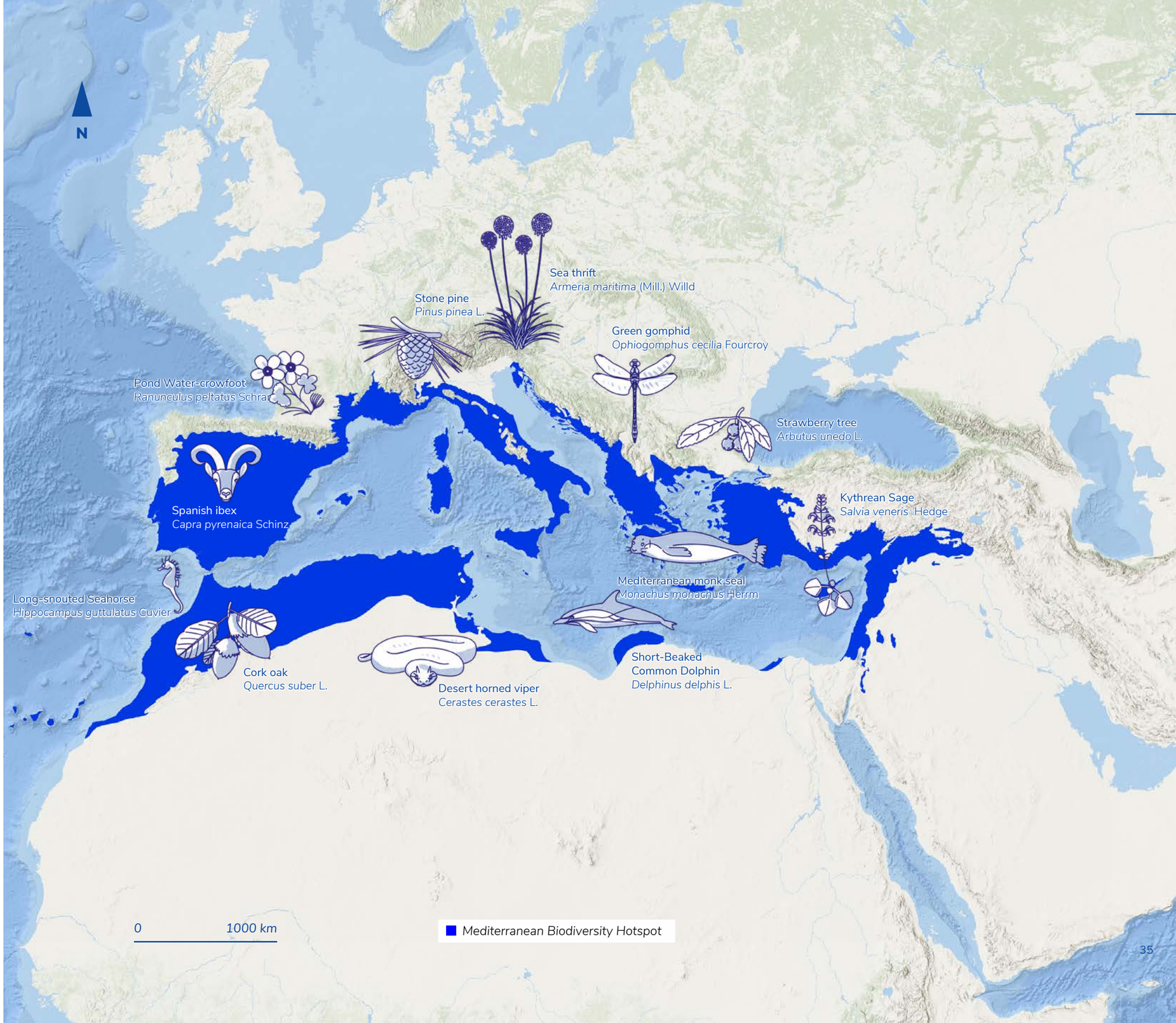

Figure 1.8.
Mediterranean biodiversity hotspot: key biodiversity areas for plants were identified in the south and east Mediterranean. Most of these sites are also vital for other species such as mammals, birds, freshwater fish and amphibians (data: IUCN, 2017).

Vegetation and terrestrial life

Mediterranean wildlife and habitats are very specific, as the region was not affected by the last Ice Age. The rate of endemism[8] is exceptionally high and the Mediterranean region is recognized as the second largest Global Biodiversity Hotspot, encompassing major terrestrial habitats such as forests, maquis, garrigue, wetlands, coastal areas and grasslands and/or transitional areas to desert zones. These terms will be briefly explained below, and comprehensive descriptions can be found in the literature (Loidi *et al*., 2007; Médail, 2008; Rudner, 2011; Torrent, 2005).

Although the Mediterranean Basin covers only 1% of the Earth's surface, 10% of the world's plant species are found there. Such richness was shaped by human action over the centuries, but the anthropogenic pressure is now a major cause of imbalances: 32 Mediterranean species are already known to be globally extinct, or extinct in the wild, of which four are plants (IUCN, 2017, 2020a). According to the International Union of Conservation of Nature, the main threat to terrestrial species comes from agriculture and aquaculture, which have evolved towards intensive monoculture systems (International Union for Conservation of Nature [IUCN], 2020b).

The Mediterranean region is poor in forests and woods, however, according to the descriptions in Natura 2000 - Mediterranean biogeographical region (European Commission [EC], 2020a), while most central and northern European forests are dominated by about a dozen tree species, Mediterranean forests are much more diverse, harbouring up to 100 different tree species. Coniferous forests are common and consist of *Pinus pinea* and *Pinus pinaster*, two species endemic to the region and commercially exploited; the former produces highly valued nuts (pine kernels), while the latter is mainly used for timber. Forests of the non-native *Eucalyptus* sp. are also widespread and feed the paper industries. Coniferous forests can be found near the coastlines, where they help to control the encroachment of sand inland, or in mountain areas. Mediterranean forest ecosystems have access to either underground aquifers or freshwater streams that help create suitable environments to harbour many relevant endemic species, some of them rare. Mosses, lichens, and animals (from insects to birds) are also noteworthy.

In the Mediterranean region, the vegetation reflects the diverse topography and climate. The most emblematic vegetation is the *maquis*, from the Italian "machia" – a term of Latin origin used to describe the typical vegetation occurring in the lower slopes of mountains bordering the Mediterranean Sea[9]. In areas of more arid and stony soils, the vegetation is less vigorous, and it is known as *garrigue*; Grassland is the poorest form, typical of arid soils. In all of these cases, the constant trait is the high biodiversity, adapted to the mild climate described above (Figure 1.5). Figure 1.9 shows a transition of *garrigue* to *maquis*, with *garrigue*, the lower shrub vegetation, dominating the drier hills, and the taller vegetation (including small trees) located near the watercourse (maquis) (Médail, 2008; Rudner, 2011; Torrent, 2005).

Maquis is a scrubland vegetation primarily composed of leathery, broad-leaved evergreen shrubs and small trees less than 2.5 m tall. Many of the shrubs are aromatic, such as mints, laurels, and myrtles. Olives, figs, and other small trees are scattered throughout the areas, often linked with human activities (traditional and/or sustainable agriculture).

One example is the "Barrocal" in the Algarve (Portugal), a biodiversity hotspot with a well-documented flora of 1001 taxa, 461 genera and 101 botanical families. The area runs along the Algarve from Cape St Vincent to Castro Marim, and comprises an extensive range of mesozoic carbonated soils, located in the Central part of the Algarve coast, between the Serra and the coastal strip[10]. Mediterranean vegetation here has been studied and described by several authors (Romano & Gonçalves, 2015; Blamey & Grey-Wilson, 2006).

Garrigue is a poorer version of *maquis*, typical on soils that are more arid. It mainly consists of evergreen shrubs,

[8] Endemism is the condition of being restricted to a geographical location – additional information can be found here.

[9] Further information on Mediterranean maquis can be found here.

[10] Data from MGAP, Mediterranean Gardening Association-Portugal, an association that is safeguarding plant species in its Barrocal botanical garden.

Figure 1.9. *Typical Mediterranean vegetation with little exploitation by man. The diversity of shrubs and other plants can be deduced from the observed range of colours and forms of vegetation. (source: DbDo/Shutterstock)*

as well as scrub of many flowers and aromatic plants. It is often the direct result of centuries of human activities (livestock grazing, forest fires), where nature has evolved into complex and intricate habitats, hosting a rich biodiversity (Médail, 2008; Torrent, 2005).

Grasslands are even poorer than *garrigues*, consisting of terrains too dry to support trees, commonly semi-arid steppic areas, however harbouring appreciable levels of plant diversity and home to ground-nesting birds, such as the pin-tailed sandgrouse (*Pteroclids alchata*). Their plant species are highly resilient to grazing, despite some impact on species' composition. The distribution of water in these areas is critical for the maintenance and survival of vegetation patches. Typically, these semi-arid Mediterranean grasslands are located in transition zones to the desert, namely in North Africa and the Middle East (Loidi *et al*., 2007; Médail, 2008).

By the sea, various types of coastal areas can be found depending on topography: from cliffs that harbour vegetation and birds' nests, to fishing villages carved in the rocks, caves and golden sandy beaches, to quite preserved dune ecosystems (mainly located west of the Strait of Gibraltar, in the Mediterranean to Atlantic transition zone).

Dunes typically consist of three subsystems under permanent dynamic interchanges, due to many environmental factors: the submerged beach, the emerged beach and the dune itself. The dune is stabilized by a rich vegetation that supports the establishment of insects, reptiles, and birds. Besides human activities, also the variability of the wind, both in direction and speed can play an important role in the mobilization and landward transport of sediment, supporting or destroying the dunes.

The Mediterranean coastline is a top tourist destination and, as a result, much of it has disappeared under concrete, as local peoples exchanged their traditional occupations for seasonal jobs in the mass tourism industry. Some regions now experience chronic water shortages and are under constant threat of forest fires. However, some examples of good practices of sustainable tourism do exist and they will be presented in the third chapter. Efforts to mitigate the anthropogenic impact on coasts and seas are underway.

Wetlands are important coastal ecosystems, ranging from tiny coastal lagoons to vast river deltas, and including small islands. They harbour hundreds of species of endemic fish, amphibians and insects, which in turn attract various species of birds, including ducks, especially during the migration season. Up to two billion birds migrate to, or through, the Mediterranean region every year. Some stop over for only a few days to refuel before crossing the Sahara, but others spend the entire winter there to escape the cold weather further north. Given their importance in preserving threatened species, many wetlands are nature reserves under Natura 2000 (EC, 2020a; Loidi et al., 2007; Médail, 2008; Rudner, 2011; Torrent, 2005).

Noteworthy examples of the co-existence of human activities with preserved wildlife and the environment are shown in Figure 1.10 and will be commented on in later chapters.

The European Union list of Sites of Community Importance (SCI) of the Mediterranean biogeographical region, updating the Natura 2000 network, includes sites that significantly contribute to the maintenance or restoration, at a favourable conservation status, of a natural habitat type in a certain region (EC, 2020a).

***Figure 1.10**. Human exploited wetlands. The co-existence of wild vegetation and animal life with man-made ponds can be observed in the photo; the human action on the Mediterranean landscape has existed for many centuries and it is entangled with cultural aspects; for these reasons, most Mediterranean landscapes can be classified as cultural landscapes. (source: photo by Henry Oude Egberink/ Shutterstock)*

Coastal zone and marine life

The word Mediterranean originates from the Latin “Mare medi terraneum” meaning “sea in the middle of the land” because it is almost enclosed by land; it connects to the Atlantic Ocean to the west through the Strait of Gibraltar, to the Sea of Marmara and the Black Sea to the north-east, near Turkey, through the Dardanelles, and to the Red Sea and the Indian Ocean, to the south-east, through the Suez Canal.

The sea’s geological history is curious, including isolation from the world ocean during the Messinian crisis (5.96 million years ago), which led to its near drying out, and other drastic changes in climate, sea level, and salinity. Nowadays, cool, lower salinity water flows from the Atlantic into the more saline Mediterranean Sea. It warms up to the east, where it becomes saltier and then sinks. The annual mean sea surface temperature is highly seasonal and important gradients are formed, from west to east and north to south. The marine biota of the Mediterranean Sea is primarily derived from the Atlantic Ocean, but the wide ranges of climate and hydrology have contributed to the co-occurrence and survival of both temperate-like and subtropical-like organisms, with high levels of endemism.

The marine environment is also peculiar and complex. Despite representing only 0.7% of the total ocean surface, it is home to 7.5% of the world’s marine fauna and 18% of the global marine flora. Coastal ecosystems include many sensitive habitats, including about 150 wetlands of international importance for marine and migrating birds, and some 5 000 islands and islets.

The Mediterranean is the main spawning ground of bluefin tuna (*Thunnus thynnus*), home to sea turtles, sharks and rays, as well as a variety of shellfish, molluscs, and schools of pelagic fish, such as anchovies (*Engraulis encrasicolus*) and sardines (*Sardina pilchardus* and others). Many of the lesser-known sponges, sea squirts and crustaceans can also be found. Taxonomical inventories started with Aristotle, and efforts continue to provide datasets of taxonomic groups for the entire Basin. However, the marine biodiversity of the Mediterranean Sea is known to a lesser extent than its terrestrial counterpart. Freely available databases for macro-organisms are provided by FAO and others (Bariche, 2012; iNaturalist, 2020; Palomares & Pauly, 2019).

Coll and co-workers (2010) distributed the Mediterranean Sea’s biodiversity as follows: within the Animalia, the greater proportion of species are from *subphylum* Crustacea (13.2%) and *phyla* Mollusca (12.4%), Annelida (6.6%), Platyhelminthes (5.9%), Cnidaria (4.5%); the *subphylum* Vertebrata represents 4.1%, and Echinodermata only 0.9%. Other invertebrate groups encompass 14% of the species, while Plantae include 5%. These figures only refer to the Mediterranean Sea and do not include the Atlantic Ocean basin of southern Spain, Portugal, and Morocco.

The exploitation of marine bioresources began with the Phoenicians, who produced Tyrian purple, a highly valued dye, from several species of sea snails, using an ancillary production facility in the Maghreb. Coastal Roman villas commonly had fish farms to enrich their diet and to manufacture *garum* (an appreciated fish sauce) as well as salted fish.

Traditional fishing activities supported coastal peoples sustainably: most of the catch was sold locally or preserved by salting and drying (e.g., octopus, tuna and sardines). In the 20th century, canning fish industries, allied to large-scale fishing, flourished for some decades and are still important for Morocco’s economy.

Combined natural and anthropogenic events shaped the biodiversity of the Mediterranean Sea in the past, but the negative impacts of mankind reached incredible levels in the last few decades[11]. The already over-populated coastal areas received about 200 million tourists per year in the first decades of the 21st century, causing a huge pressure on ecosystems. Besides the widely disseminated information about the quantities and ubiquity of plastics in the Mediterranean Sea, in 2017 at least 90 marine species were threatened, mainly by overfishing and climate change (Coll *et al.*, 2010; IUCN, 2017; 2020a).

Fish stocks in the Mediterranean Sea are alarmingly low. According to the European Environment Agency, more than 65% of all fish stocks in the region are beyond safe biological limits (European Environment Agency [EEA], 2019a), and the FAO has stated that some of the most important fish stocks (albacore, bluefin tuna, marlin, swordfish, red mullet and sea bream) are threatened. Encouragement of sustainable aquaculture may improve fish stocks and help them to better cope with extreme weather events caused by climate change (Food and Agricultural Organization of the United Nations [FAO], 2020c).

[11] see *Plastics in the Mediterranean* ⊕.

1.3. MEDITERRANEAN CULTURAL LANDSCAPES

Cultural landscapes can be classified as Urban, Rural and Maritime.

Urban landscapes of the Mediterranean are among the most visited places in the world, for their cultural and historical relevance. Most Mediterranean cities grew from ancient small human settlements in places chosen for their natural characteristics: proximity to fresh water (rivers, lakes) and land that could be cultivated, proximity to the shore, allowing fishing or maritime commerce, or good observation points to alert against invaders. Layers of History have been added by the various civilizations that successively occupied them – the Roman Empire being common to all Mediterranean cities. After the fall of the Roman Empire, south-western Europe was strongly influenced by the Arabs (*Al-Andalus*) and entered the Middle Ages earlier than south-eastern Europe, where the Byzantine Empire retained the legacy of the Roman Empire for several centuries.

Rural landscapes encompass villages, fields, equipment and constructions related to agriculture and rural life. Similarly to cities, rural landscapes are also marked by the influence of past cultures, integrating their elements in the local traditions and crafts. South European rural landscapes are characterized by small churches on steep hills (often pilgrimage sites) and religious symbols along trails and routes. Summer religious celebrations, mostly in August and often associated to such sites, are organized every year by local peoples. Many abbeys are found in the countryside, since many agricultural properties were run by the Catholic Church in the Middle Ages, particularly in the western countries.

Maritime Landscapes include some top mass tourism sites, such as the old picturesque small fishing villages of Italy, islands and islets of Greece, sunny coastal beaches with warm waters and golden fine sand (Figure 1.6), as well as popular recreational diving sites.

The influence of the maritime environment on two Mediterranean cities is clear in satellite views of the trade port of Knossos and Faro, a coastal city with an economy based on local fishing and agricultural activities (Figure 1.11).

Knossos developed as a trading port while Faro's coast is nowadays used for recreational maritime activities and shellfish harvesting. In the Mediterranean, sea-related activities and agriculture are most often combined, and Faro provides a good example of such an integration, with sea and fishing activities, as well as the inland production of vegetables and fruits.

Traditional Mediterranean maritime landscapes include fishing boathouses as well as maritime facilities, such as ports and harbours, and lighthouses. They also encompass coastal cities and small communities, and seaside tourism destinations such as beaches and underwater landscapes

Next page:

***Figure 1.11**. Satellite views and photos of the coastal cities of Knossos, Crete (Greece) and Faro (Portugal). Both have a densely populated centre flanked by a protected access from the sea. In the Heraklion port in Knossos (upper image), the cliffs and the inland hills probably influenced the choice of the location for settlement; a port and fortifications have been built. In Faro (lower image), the natural barrier of mazy wetlands probably defended access from the sea. (source: Sentinel-2 cloudless - https://s2maps.eu by EOX IT Services GmbH -contains modified Copernicus Sentinel data 2017 & 2018); upper inset photo by juli kosolapova/ Unsplash; lower inset photo: Sergio Sergo/ Shutterstock)*

(recreational diving sites).

Alexander the Great built the first lighthouse on the island of Pharos, near the Nile delta, by 332 BC According to Arab historians, it was taller than 100 m and used a mirror during the day and a fire during the night, to guide ships to the port, which was an intense trading site. The construction of lighthouses then expanded across the Mediterranean coasts. Lighthouses are placed in capes, peninsulas or small islands, varying in form and height, and often painted with coloured stripes. Although some lighthouses are still active, their function of ship guidance has been replaced by other methods. They remain as elements of the maritime cultural landscape and potential points of touristic interest.

Another recent touristic trend is scuba diving, which consists of observing underwater landscapes, ideally with no interaction with the sea floor, wrecks, or marine life. Noteworthy Mediterranean diving sites can be found in Croatia, Italy and the Greek islands, offering very good water visibility and historic shipwrecks (namely from WWII), and in Malta and Portugal, where the biodiversity of protected marine areas is the main attraction. Recreational diving may help raising awareness about the accumulation of litter underwater and the need to safeguard marine biodiversity.

Vernacular architecture and cultural manifestations

As stated above, typical Mediterranean urban landscapes embody several layers of history, to a greater or lesser extent. Particularly during the Middle Ages, there was not much respect for preceding societies and cultures, and old constructions were preserved only when they were useful (e.g., roman bridges), otherwise they were changed or destroyed.

Remarkable changes and adaptations are described in chapter 3, and a good example is the architectural and decorative adaptation of mosques (built during Arab occupation) into churches (after Christian conquest), as in the case of the impressive Great Mosque of Córdoba. Less noteworthy buildings were adapted as residences, warehouses, etc. The stones and other materials from unused constructions were often removed and employed for other purposes. Another common practice was to include an existing wall (for example, from a fortress) as part of a new house, thus saving labour and materials.

Commonly, a prominent visible element in a Mediterranean city is a castle or fortress (a legacy from the Middle Ages) on the top of the highest hill or near the sea, for lookout and defence. Converging on a castle, historical city centres are generally small and intricate, yet harmoniously blending the architectural styles of different epochs and cultures. In a way, the city itself includes the surrounding natural environment, by respecting its topography and by incorporating elements such as house gardens and orchards. Narrow winding streets and dead ends still denote an Arab influence in the southern European countries. Striking buildings, such as palaces and noble houses, sometimes merge elements of styles from different epochs or origins, and archaeological sites with variable degrees of preservation can also be found, now mostly under the supervision of museums (Bethemon, 2001; Edmiston et *al*., 2014; Lozato-Giotart, 2001; Queiroz, 2015).

A cathedral and several small churches, catholic or orthodox, are typical elements of south European cities. Small gardens with flowers, trees and other perennial plants are found in corners and in city squares. The Roman influence (often retrieved in the Renaissance) is reflected in parallel and perpendicular streets which, together with winding narrow streets of Arab inspiration, surround or converge on a main square where institutional buildings are located; such streets were once dedicated to workshops of specific crafts, and are now named after them (goldsmith, blacksmith, tinsmith, shoemaker, tailor) (Braudel 1987; Edmiston et *al*., 2014; Freitas, 2015; Queiroz, 2015; Ribeiro, 1968).

A common feature that contributes to the beauty and harmony of Mediterranean cities is the use of locally available resources and the vernacular architecture; common houses have terraces or large balconies, clay tile roofs, and wooden window shutters to protect against the sun during the hot summer. Houses evolve uphill in exquisite combinations of rectangular forms, many of them facing the sea or the river and having a small backyard with a kitchen garden and at least a couple of fruit trees (Figure 1.12) (Braudel, 1987; Freitas, 2015; Queiroz, 2015; Ribeiro, 1968).

Lessons learned from vernacular heritage encompass a wide number of strategies that contribute to sustainable contemporary architecture, while respecting underlying cultural conformity (Tawayha et *al*., 2019).

Emblematic examples of preserved History and interaction with the surrounding environments are present in the cities of Ferrara, Ravenna and Modena, in the Emilia-Romagna Region (Italy), classified as World Heritage sites (see chapter 3 for more information).

Before the transformation of Mediterranean cities into uncharacteristic suburbs, the countryside was nearby and even encompassed by them, and local fresh foods and crafts were sold in open-air markets at specific dedicated locations (an Arab legacy).

There is no doubt about the marked and long-lasting influence of the Mediterranean elites on the foundations of western civilization, from science to art. Mediterranean cities are themselves monumental. However, the Mediterranean Diet is grounded rurally, since it evolved from rural civilizations, triggered by the agricultural revolution (Braudel, 1987;

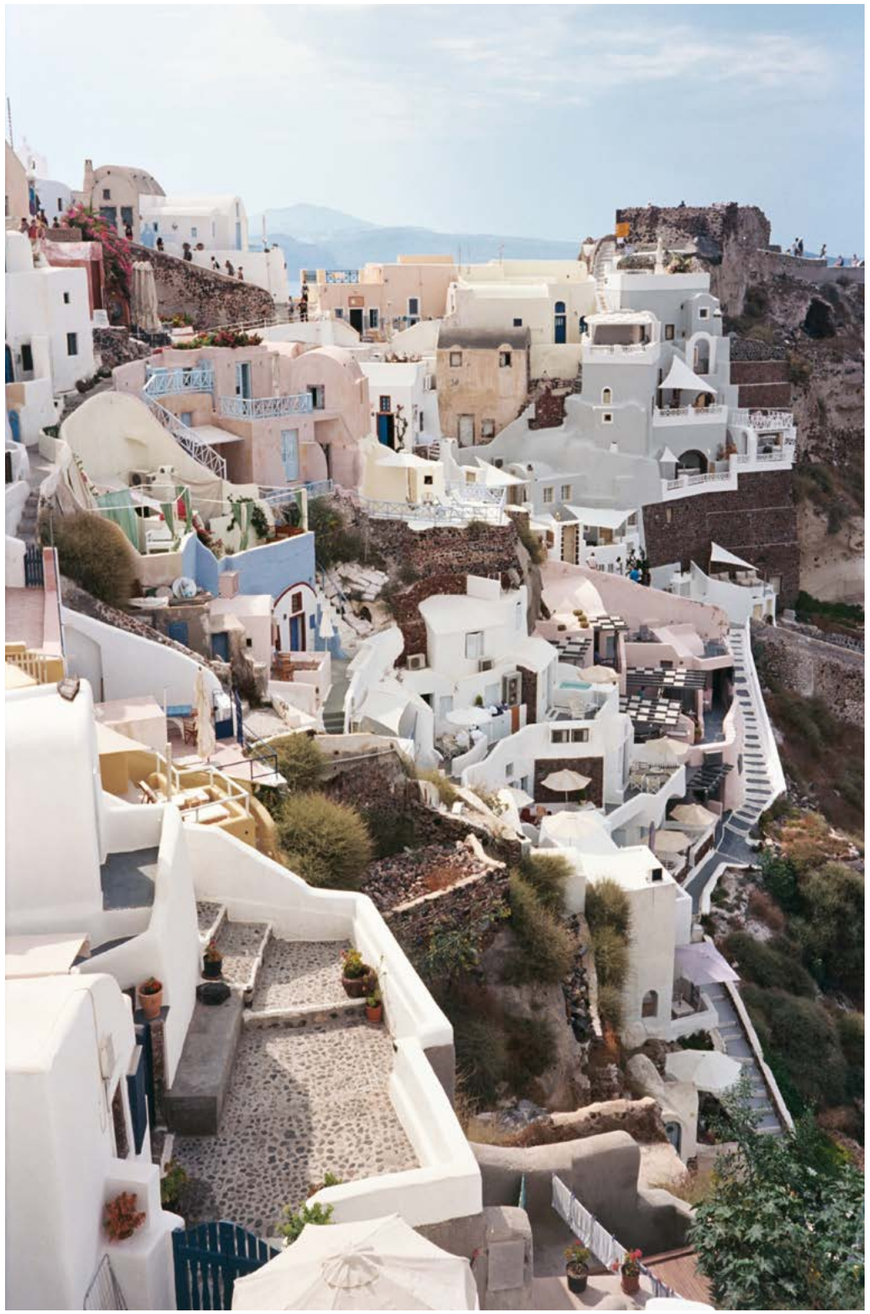

Figure 1.12. *Santorini, Greece. The houses evolve down the cliff, with their terraces, in an exquisite geometrical organisation. Small trees and other plants can be observed close to the buildings. (source: photo by Jason Zeis / Unsplash)*

Freitas, 2015; Queiroz, 2015).

The villages[12] of southern Europe have a church for centre, in a square where communal celebrations and festivities take place. Traditional houses, mostly built from locally available materials, are generally whitewashed and with colour strips bordering doors and windows of indigo blue, ochre or purple (dyes that were firstly introduced in the area by the Phoenicians). The resemblances with the Mediterranean small towns of North Africa are enormous: it is difficult to tell whether the photo in Figure 1.13 was taken in Greece, Portugal or Morocco.

The optimized use of local materials and resources to achieve a practical purpose is significant in agricultural structures and tools, for example windmills for cereals, which are thought to have originated in the Middle East and spread throughout Europe from the Aegean Sea, to the East, and from the Iberian Peninsula, to the West (introduced during the *Al-Andalus* period) (Bethemon, 2000, 2001; Queiroz, 2015). Iberian windmills (made famous in the novel "Don Quixote" by Cervantes) took advantage of climate features such as the absence of rainfall in summer and the dominance of winds of fixed direction. They were simple and quite grotesque, built using commonly available materials (wood, clay and limestone), sometimes finished with whitewash and bearing strong white fabric sails. Windmills blend their impressive yet simple beauty with the countryside landscape (usually windy arid hills).

In southern Europe, some well-preserved traditional olive mills (for the production of olive oil) can be

[12] The Spanish word "pueblos" translates well the strong communal character of Mediterranean villages.

Figure 1.13. *A street in Chefchaouen, Morocco. The resemblances to the villages of Southern Europe can be perceived in the narrow streets and mats of natural fibres, to protect against the summer sun, in the houses with clay tiles and whitewash with blue strips (source: photo by Sergey Pesterev / Unsplash).*

found side-by-side with modern automatic stainless-steel equipment, as museum sites and important cultural spaces. Operational traditional olive mills with their heavy stones, mechanical presses and mats can still be found in the Maghreb (Issaoui & Delgado, 2019).

In Portugal, the abundance of limestone and black basalt resulted in an emblematic example of vernacular architecture, created a few centuries ago. Such an art, marked by the craftsman with a personal sign or signature, can be appreciated in many pavements (Figure 1.14).

In short, vernacular architecture is most often observed in rural settlements and in small cities, and is nowadays considered as a source of inspiration due to the excellent integration with the landscape and local culture, in addition to its intrinsic sustainable character (Edmiston et *al*., 2014; Tawayha et *al*., 2019). It comprises houses, warehouses, grain stores, and little chapels that are pilgrimage sites, and decorated religious symbols along rural roads (as the sign that indicates "Camiño de Santiago"). The common features (frequently found across the Mediterranean Basin) include:

- Simple construction from local materials, namely limestone, clay, wood and natural fibres;
- Fulfils a specific purpose;
- Integration in the landscape, taking advantage of its peculiarities (high insolation, dominant winds, and slope);
- Complementary painting of fishing boats and whitewashed buildings with indigo blue, ochre and purple;
- Small kitchen gardens with predominance of perennial xerophytic plants, and fruit trees close to the houses.

The Mediterranean is thus a man-made landscape, "a civilization of stone": from the stones used to build cities, palaces, monasteries and fortresses, to the stones collected from the ground and used to divide ruralproperties and to sustain the terraces that allow hillside agriculture and avoid soil erosion (Barros, 2014; Bearman, 1991; Freitas 2015; Queiroz, 2015; Ribeiro, 1968; Ruiz-Domènec, 2004; Valagão et *al*., 2018). Vineyards and low-water-demanding fruit trees, such as olive, carob, almond and fig, as well as cork and holm oaks, are often found scattered on poor soils, with the underlying scrub playing a key role in feeding the wandering small ruminants and pigs (Figures 1.15 and 1.16).

Despite the predominance of evergreen plants, such rural landscapes change with the season, becoming splendidly colourful in the spring, when many trees and shrubs flourish (Figure 1.16). Large scrubland areas are believed to be the result of centuries of human activities (cycles of forest fires and clearances for cultivation, and livestock grazing), which evolved into a complex and intricate dynamic patchwork of habitats, nowadays home to an exceptionally rich biodiversity (Loidi et *al*., 2007; Médail, 2008; Rudner, 2011). Some of these landscapes are inscribed in UNESCO's list of cultural landscapes or safeguarded at national level.

Mediterranean agricultural landscapes have also received attention from FAO, highlighting their beauty and sustainability, grounded on the resilience of the ecosystems and safeguarding of their agrobiodiversity. From 2017 to 2020, two sites in Italy, four in Spain and one in Portugal were

Figure 1.14. *"Calçada Portuguesa". The craftship of pavement with limestone and black basalt cobblestones of probable Roman inspiration is widespread in Portugal. Although the wave motif dominates in both photos, many other motifs and details can be found. On the left, a street at Lagos, Algarve (source: photo by Alex Paganelli / Unsplash) and on the right, an old litograph from Rossio, Lisbon (source: unknown author/Museu de Lisboa).*

Figure 1.15. *Elements of rural Mediterranean landscapes. Above, evergreen fruit trees and other xerophyte vegetation can be observed. Terraces were built on hillsides to allow cultivation and grazing. A communal passage can be observed adjacent to the wall. Such paths often cross private lands and the rules of passage are rooted in mutual respect. (source: photo by Ygor/Shutterstock) Below, an element of vernacular architecture and wine grapes illustrate the link between natural and cultural features of rural Mediterranean landscapes. (source: photo by Wjarek/ Shutterstock)*

Figure 1.16. Poor soils have traditionally been used to cultivate robust and drought resistant fruit trees. In addition, either another crop was planted under the trees (e.g., chickpeas, lupine, cabbage) or wild plants were allowed to cover the soil, to feed sheep and goats; some wild plant species are gathered to use in foods or in folk medicine. Large stones found in the ground were used to sustain terraces that help retain water and avoid soil erosion caused by heavy winter rainfalls. (source: photo by Vasco Célio)

distinguished by FAO as Globally Important Agricultural Heritage Sites (GIAHS)[13] because their ancestral agricultural systems are the base of current and future sustainable innovations, besides supporting smallholders and communities.

Artisanal fishing still provides support for some coastal communities although it was much more important until the mid-20th century. Nowadays, it consists mostly of near shore activities, using small boats and simple practices like the use of nets, the harvest of shellfish in rocky or sandy beaches, or the trapping of octopuses. A few decades ago, the use of traps and ingenious techniques of Arab origin could still be observed in the Algarve, Portugal (Braz, 2015; Freitas, 2015; Valagão et *al*., 2018).

Fish preservation by drying and salting was a common practice that persists for some species. Salted codfish (*bacalhau/bacalao*) is common in Portuguese and Spanish cuisines. and can also be found in other Mediterranean locations. Other fish preserves are now rare delicacies, as are "Muxama" from Algarve (described below) and salted sardines from Croatia (Figure 1.17).

Markets (generally open air) allowed trade between fishermen and peasants, diversifying the diet of populations. They are still an important means of connection between rural and urban worlds through direct contact between producer (farmer, fisherman or artisan) and consumer, providing a much richer interaction than supermarkets or online shopping platforms,

[13] Information about GIAHS in the Mediterranean is available here.

Figure 1.17. *Artisanal techniques of fish preservation, such as salting and drying, were once very important to ensure food security, by providing the necessary animal protein for several months. The photo shows a typical process of preserving sardines by salting, in Croatia. (source: photo by Howard Sayer/Shutterstock)*

Figure 1.18. *Mediterranean towns and villages maintain traditional open-air markets, where small producers sell local fruit and vegetables from autochthonous plants. (source: top photo by Bnetto/ Shutterstock; lower photo by Tomas Anton Escobar on Unsplash)*

allowing the consumer to learn much more about the local products, their variability, agrobiodiversity and seasonality, increasing the trust of consumers and helping them to make educated choices. In short, such markets (Figure 1.18) facilitate direct sales of small productions of fruits and vegetables from autochthonous[14] plant varieties, fresh seafood and fish and meat preserves, through proximity circuits (*i.e.*, only a few kilometers separate production and consumption sites) decreasing food miles, improving the food sovereignty of the region, and lowering the carbon footprint of food supply chains.

Currently, some markets embrace new and traditional businesses, side by side.

Besides the similarities in agricultural and fishing techniques, other relevant common natural elements of the Mediterranean are the climate and the reduced tidal variation, which both influence biodiversity. Plants and animals from diverse environments have been successfully introduced and spread in the area, creating dietary similarities.

In the Mediterranean, the spirit of a place encompasses the location (climate, natural environment, geomorphology), culture, and the interactions between them and the surrounding environments. Many Mediterranean cities maintain links to the rural world, through festivities, aligned with the pace of nature and rural work, marked by solstices and equinoxes. In southern European Mediterranean countries, most celebrations occur outdoors and involve neighbouring communities, strengthening social bonds (Figure 1.19).

Braudel's definition of the Mediterranean is worth remembering here: "*... A thousand things at the same time. It is not one landscape but numerous landscapes. It is not one sea, but a complex of seas. It is not one civilization, but a number of civilizations, piled one above the other.*" (Braudel, 1987).

[14] Autochthonous: indigenous, formed or originating in the place where found.

***Figure 1.19**. Preparations for religious celebrations involve the community by distribution of tasks for the rituals, decorations, processions, and the non-religious program, generally including music, small marketplaces and communal meals. These occasions are important to tighten social bonds and strengthen the sense of belonging (photo on the left). Next page: opportunities to share experiences and to cooperate may arise outside of the religious context (e.g., tasting new wine with the neighbours or celebrating a good harvest). (source: photo by Vasco Célio)*

1.4. NATURAL RESOURCES' MANAGEMENT, COPING WITH NATURE

The impacts of climate change on the Mediterranean Basin are predicted to be significant (European Parliament, 2018; United Nations [UN], 2019b), and can be summarized as follows [15]:

- Annual mean and maximum summer temperatures are likely to increase more in the Mediterranean area than the global averages;
- Annual precipitation is very likely to decrease in most of the Mediterranean area;
- The risk of summer drought is likely to increase in the Mediterranean area.

The United Nations General Secretary, António Guterres, has called for global action to tackle climate change as a global threat, since UN reports (UN 2019 a,b) show that:

"*All countries are affected by global warming. But the impacts tend to fall disproportionately on the poor and vulnerable, as well as those least responsible for the problem*";

"*There are clear benefits to limiting warming to 1.5 °C compared to 2 °C: 420 million fewer people being exposed to severe heat waves, survival of some tropical coral reefs, loss of fewer plants and animal species, and the protection of forests and wetland habitats*";

"*Transitioning to a low-carbon, sustainable growth path could deliver a direct economic gain of US$26 trillion through to 2030 compared to business-as-usual*".

Nutrition transition, climate change and standardization of behaviours are threats not only to the Mediterranean Diet but also to the health, well-being, social organization and ultimately survival of our species, as noted by many researchers and acknowledged by international organizations, including the United Nations and the World Meteorological Organization (WMO, 2019; UN, 2019a,b). The UN's Sustainable Development Goals are meant to ensure the sustainable wellness of human societies, while minimising the anthropogenic negative impacts on our planet (UN, 2020; United Nations Environment Programme [UNEP], 2020a). Inspiration to drive change may require the MD's wisdom concerning the sustainable use of resources, resilience and keeping pace with nature.

In fact, the food habits of old Mediterranean peoples, aligned with the pace of nature and making the most out of the scarce local resources, with parsimony and millenary wisdom, are no less rich than all the cultural legacy of ancient civilizations. However, these very same peoples are now diverging from the rural world and from everything that is linked to that way of life, while the MD has been receiving increasing attention from outsiders. Agricultural systems evolved in this mild climate through the combined actions of humans and nature, namely by the introduction of new crops and animals that adapted and slowly changed the ecosystems.

[15] Data sets and Interactive maps are available here.

The irregular terrain, the harshness of soils, and the lack of freshwater, especially in summer, led to the adoption of agricultural systems that are now recognised as sustainable and regarded as Globally Important Agricultural Heritage Systems (FAO, 2020b), detailed below. For example, multi-crop systems of well-adapted and drought resistant plant varieties were meant to ensure food security, by replacing one resource by another (Ribeiro, 1968). Thus, across the Mediterranean, a myriad of plant cultivars exist, each with unique traits (developed adapting to their niches), including distinct colours and flavours. Nevertheless, there is a unity in this agrobiodiversity, the big picture of this mosaic resulting from the overall aim of obtaining enough adequate food in each season. A fragile equilibrium has endured in this densely populated area which still harbours a wide biodiversity of domesticated and wild plants, as well as local animal breeds, a richness that may now leverage local economies, in line with the UN 2030 agenda.

Several common features can be observed across the Mediterranean Basin. Firstly, from North Africa to Croatia, the landscape is shaped by olive cultivation, while olives and olive oil are used ubiquitously (from culinary use to traditional medicine). Many olive preparation styles can still be found, most of which involving the same steps and condiments.

Secondly, the presence of cereals, the bread, a sacred food, mostly made from (coarsely milled) wheat with long fermentation and often baked in communal ovens. The sharing of the oven in a village relies on simple rules and mutual respect.

Thirdly, vineyards create beautiful landscapes, some of which are classified as UNESCO's world heritage sites, namely in Italy, Spain and Portugal.

Small ruminants (goats and sheep), poultry and pigs (in southern Europe), as well as fish (often salted and dried) traditionally ensured the necessary and adequate (small) portions of animal protein year-round. Sheep also provide wool for the weaving of textiles, such as blankets and carpets. Across the Mediterranean, identical natural fibres (wicker, stubble straws) have been used in basketry and other crafts.

The presence of fruit trees near houses and a kitchen garden ensured the necessary supply of fruits and vegetables of the season. Some fruits, such as figs and dates, were preserved by sun drying on terraces. Jams and liquors were made from fruits not suitable for drying.

Traditional agricultural techniques were developed to save water, by selecting indigenous crop varieties resistant to drought. Freshwater has always been a scarce resource in the Mediterranean region, where private wells, deposits and tanks coexist with systems for collective water management. Arab and Roman techniques for water extraction and transport resulted in a set of habits, crafts and artefacts, later improved and adapted by Mediterranean peoples. In many villages, communal

water management for agricultural purposes is serious: farmers agree on timescales and rules, which are strictly followed. In Spain, some “pueblos” deal with such matters in popular courts (e.g., near Valencia), where any dispute is summarily judged by people elected from the community and whose decision is respected and immediately applied without objection. The historical irrigation system at “l’Horta de València” is of Arab origin and evolved from an open model of water circulation to a dense network of water channels, rural roads and traditional buildings which enable cultivation of rice, vegetables and fruits. According to the FAO (2020b), this site “reflects a culture of adaptation to the climate conditions so that it could be considered a potential sustainable solution to modern problems”, justifying its award of GIAHS status.

Figure 1.20. *Artisanal fishing and collection of shellfish has ensured the survival of coastal peoples. Fishing boats are customized with colourful decorations, and frequently named after a religious motif. (source: photo by Vasco Célio)*

A less evident element concerns the cultural relationship with the sea. In the olden days, artisanal fishing was an occupation of peaceful times and its expansion largely occurred from the 19th century onwards, after piracy and invasions had ended (Bethemon, 2001; Queiroz, 2015). Since then, coastal peoples found livelihoods catching an abundant variety of school fish (e.g., sardines), large migratory fish (e.g., tuna fish), cephalopods, and shellfish, and their catches were traded with farmers inland in periodical markets, thus enriching the diet of both fishermen and inland farmers (Figures 1.18 and 1.20) (Freitas, 2015; Valagão *et al*., 2018). Fishing entails many associated crafts, such as net repair and trap building. Some of these were introduced by the Arabs and later improved, for example tuna traps and the preparation of dry tuna fish, known as “muxama”, in the Algarve, Portugal (Braz, 2015).

The climate is changing and several model scenarios have been studied by the scientific community and acknowledged by international organizations (WMO, 2019; UN, 2019 a,b). The degree of uncertainty of such predictions is believed to be low, as current modelling tools rely on up-to-date technologies, including a wide range of factors/variables and corresponding measurements over time.

The aforementioned Mediterranean ways of coping with the environment and developing its niches, in vernacular architecture, food systems, culture, crafts, and the use of renewable energies, can now be a source of inspiration for innovative and sustainable farming, fishing and manufacturing, addressing multiple SGD, namely: 2 - Zero Hunger; 12 – responsible production and consumption, and 15 – Life on Land.

CHAPTER 2. THE MEDITERRANEAN DIET - FOOD HERITAGE AND GASTRONOMY

2.1. THE ROOTS OF MEDITERRANEAN FOOD HABITS AND LIFESTYLE

As explained in chapter 1, the MD is a multidisciplinary concept, directly related with the geoclimatic features of the Mediterranean region, prevalent agricultural and fishing activities, and historical influences. Of all the elements of the MD – culture, architecture, landscape and others –, the Mediterranean food pattern and lifestyle (Med diet) is probably that which has attracted most attention. The Med diet – referring to the implicit food culture –, is an empirical dynamic concept, dependent on nature (hence linked to the sustainability of traditional Mediterranean agricultural systems) and normalised by common cultural and historical features. Chapter 1 explained how several consecutive civilizations slowly shaped a common Mediterranean identity and way of life. In this respect, it is noteworthy that the linkage between food and well-being was established by the ancient Greeks, the standardization of food habits and crops was promoted under the Roman Empire, and the Med diet was further enriched with animal and plant species brought from the Americas by the Portuguese and the Spanish.

MD *stands for the "**M**editerranean **D**iet concept", which is multidisciplinary and encompasses a nutritional model, related cultural aspects, landscape, practices and traditions found in regions of the Mediterranean Basin. The MD concept is best translated by the greek word "díaita", way of life;*

"Med diet" is herein used to refer to the nutritional model (or dietary pattern) only, and is just one of the aspects of MD, i.e., "Med diet" is contained in the definition of MD.

During millennia, a wide variety of crops proliferated in the Mediterranean to meet agricultural and nutritional needs, exploiting local resources. Many species that are nowadays ubiquitous were disseminated within the Mediterranean area (e.g., olive and carob trees, respectively, *Olea europaea* and *Ceratonia siliqua*), while others were introduced from distant locations, for example corn (*Zea mays*), native to the Americas. The introduced new species had to adapt to the geoclimatic features of very restricted areas, resulting in a vast intraspecific agrobiodiversity

(European Commission [EC], 2017, 2020a). In other words, the wide variety of sensorial features (e.g., colours, textures, flavours, compositions) found in wheats, olives, grapes, citruses, tomatoes, potatoes, carrots and so on, is mostly the result of the combined efforts of nature and humankind (Figure 2.1).

As described in chapter 1, the Mediterranean region is a biodiversity hotspot, with a high level of endemism (EC, 2020a; FAO, 2015; IUCN, 2017), and despite the efforts to implement large scale mass production, also in agriculture (e.g., monocropping) during the 20th century, a rich agrobiodiversity still prevails. Such richness translates into local specificities, namely at the culinary level; although the food groups are common and well balanced in the diet (e.g., cereals, fruits, vegetables, fish, nuts), each region or area has its own unique olive oils, citruses, cheeses, breeds of small ruminants, and so on. However, there is a "unity in diversity" also where food habits are concerned, and agrobiodiversity can be viewed as a local "customization" contributing to the development of many regional Mediterranean cuisines – a mosaic of common ingredients and culinary methods, where the pieces are "glued together" by socializing.

Figure 2.1. *Citrus fruits (Citrus sp.) from Algarve, Portugal, showing some of the genetic variety within the genus Citrus, which can be found in that region. Such variety of colours, sizes and forms results from combined works of man and nature in adapting and selecting plants to best fit specific environmental conditions, thus improving agrobiodiversity, which is a valuable asset, both nutritionally and in coping with climate change (source: photo by Direção Regional de Agricultura do Algarve, DRAPAlgarve).*

Agrobiodiversity and the sustainable use of resources are nowadays recognised as being of primary importance to reactivate the Mediterranean agricultural systems. Traditional varieties (as well as autochthonous animal breeds) are the best ambassadors of their landscapes, improving social and cultural resilience, as well as food and nutritional security (EC, 2017, 2020a).

In the words of Trichopoulou & Lagiou (1997),

"*The Mediterranean Diet and lifestyle were shaped by climatic condition, poverty and hardship rather than by intellectual insight or wisdom. Nevertheless, results from methodological superior nutritional investigations have provided strong support for the dramatic ecologic evidence represented by the Mediterranean natural experiment*".

Such a "natural experiment" was first reported in the 1950s by an American doctor, Ancel Keys, when the USA and northern Europe were experiencing considerable economic growth and food industries were on the rise. Keys observed a very different reality in southern Europe, which he approached from a public health perspective. In the famous "Seven Countries Study", Keys and co-workers demonstrated an inverse correlation between the degree of adoption of the Med diet (the adherence scores) and the incidence of coronary heart disease (Keys, 1980).

Keys (1975, 1980) described the diet and lifestyle he observed in southern Europe shortly after the second world war: frugal meals with wheat, wine and olive oil as key elements. He further noted that such meals were communal events that included many vegetables and herbs and only small amounts of meat and fish, with pulses and cheeses as the preferred sources of protein. Cooking methods were simple, despite the resulting variety of flavours and colours. Seasonal fruits were the preferred desserts, and nuts and olives were eaten as snacks. Coffee and tea played an important role in these communal meals, and sweet desserts were reserved for festivities, when the consumption of meat and fish also increased.

The mounting evidence for the direct correlation between these eating habits and health is presented and discussed below.

The Mediterranean Food pattern (Figures 2.2 and 2.3) follows common basic features, though leaving room for regional specificities:

- Strong difference between everyday and festivity meals. Frugality is the rule, although everyday meals are varied and tasty;
- Daily meals are convivial moments, during work breaks with colleagues or at home, with all the family gathered around the table;
- Olive oil is the main fat and a key food ingredient, with daily intakes of about 20 mL/capita/day;
- Abundant consumption of seasonal vegetables and fruits from local orchards, kitchen

gardens and markets;
- Animal-based products are used primarily to enhance the flavour of dishes, instead of being the main ingredients.

In the "good mediterranean diet", thus named by Ancel Keys (1975), scarcity was the rule and abundance was the exception. Only during festivities did people indulge in eating larger amounts of fish, meat and sweet desserts. Everyday meals, however, included a large variety of ingredients and seasonings, resulting in complex flavours and nutritional richness. In addition, during the 1950-1960s, Mediterranean peoples often engaged in physically demanding occupations, in contrast to more recent sedentarian lifestyles.

From the 1990s onwards, and for a variety of reasons, this healthy and sustainable eating pattern has been declining in the Mediterranean region, where obesity and nutritional deficiencies, as well as threats such as the environmental impact of contemporary food systems and associated global supply chains, are now being faced (FAO, 2015, 2019b, 2020a; FAO & WHO, 2019).

The generalization of the so-called western diet is to blame; the prevalence of ultra-processed foods[16] ("junk foods"), available and massively advertised worldwide, promotes children's obesity through effective marketing campaigns targeting children and young people. This cause-effect relationship, and marketing of unhealthy foods (in tv, social media and packages) have been shown to negatively impact children's food preferences, dietary habits and health (Elliot, 2019; Sadeghirad et *al*., 2016). Rauber et *al.* (2021) studied the food habits of UK teenagers and found that junk foods contribute about 67% to their daily energy intake.

These types of food products were developed to take advantage of technological and sensorial properties of fat (particularly of palm oil derivatives, mostly non-sustainable and rich in industrial trans-fats, or i-TFA[17]) which, combined with simple sugars and salt, convey the soft textures and basic flavours so well accepted by many consumers. As a result, the combinations fat and salt, or fat and sugar, are widespread in bread, yogurt, ready-to-eat and ready-to-cook meals, etc., accounting for the so-called "hidden calories" and many adverse effects on health. It should also be noted that several studies have implicated corn syrup, a cheap fructose-rich industrial sweetener, in health issues (Sadowska & Rygielska, 2019; Spagnuolo et *al*., 2020).

The role of food industries is crucial to ensure food safety and security, namely by preserving and transforming fresh produce that would otherwise be wasted (e.g., making juice from excess orange production, transforming tomato, or freezing green vegetables). However, the current global food system is not sustainable, in both environmental and public health terms, and must change under the commitment of the UN SDG 2030 agenda (UN, 2020; UNEP, 2020a). For this reason, food scientists have been making efforts to produce nutritionally balanced and safe foods, while tackling food loss and waste and other environmental impacts. Sustainable, safe and healthy foods (either fresh or processed) are as available to the consumer as junk food is. Considerations about the definition and categorisation of ultra-processed foods can be found in Fardet (2018), Fardet & Rock (2020), Knorr & Watzke (2019) and Monteiro et *al.* (2019). Only by improving the consumers' food literacy will they be able to make educated choices.

While other aspects of the Mediterranean culture have marked the western civilization for a long time, only recently has the Med diet come under the spotlight; its balance has been noted outside the Mediterranean region, especially the health benefits that come along with the low environmental impacts and social benefits, thus serving as inspiration for recently formulated diets (e.g., Nordic, flexitarian) and for science-based guidelines (Dembska et *al*., 2021).

To overcome current issues, we will need to analyse the food habits and traditions of rural communities (in the olive-growing areas of the Mediterranean Basin) before the transformation of food industries into global corporations, and before the dissemination of the fast-food culture. The food habits of 20th century rural communities may be worth analysing to find the way to comply with SDGs and the motivations to increase the adoption of the Med diet especially by Mediterranean peoples. It should be noted that such communities experienced economic difficulties and consequently developed skills and techniques to optimize the use of all available resources, while minimizing food waste. Many more inherently sustainable skills and know-how are part of the millenary wisdom of the MD which might help to leverage the relationship between man and nature, as noted by FAO when supporting the initiative "Mediterranean Diet's Principles for Agenda 2030"[18]. The Mediterranean dietary pattern will be analysed below: its features and benefits, traditions, gastronomy, and associated motivations.

[16] Ultra-processed foods are industrial products containing more than 4 or 5 (non-natural) ingredients that may include additives, hydrolysed proteins, modified starches, emulsifiers, hydrolysed fats (and trans-fats) and flavour enhancers. Such products, also known as "junk foods", are generally presented as ready-to-eat or ready-to-cook, and are generally dense in calories, nutritionally poor and with excessive levels of simple sugars (e.g., glucose, fructose, sucrose), fats, salt and other health-deleterious compounds.

[17] Trans-Fatty Acids of industrial origin (i-TFA), do not occur in nature, in contrast with TFA of natural origin, and impact biological systems differently. According to the World Health Organization (WHO), diets rich in trans-fats (of natural and of industrial origin) increase heart disease risk by 21% and deaths by 28% (information available here).

[18] "A call from the past: ancient knowledge for a sustainable management of land and water resources".

2.2. THE MEDITERRANEAN FOOD PATTERN

It has been noted that the Med diet has been undergoing erosion, with the fast decline of adherence in the Mediterranean Basin, particularly among younger people and since 2000 (Fiore et *al.*, 2015; Garcia-Meseguer et *al.*, 2014; Saulle et *al.*, 2016). This points to a nutrition transition period involving considerable changes in diet and physical activity patterns which lead to an increased incidence of chronic and degenerative diseases (Vaz-Almeida et *al.*, 2017a,b). In other words, it is worrying that obesity and related non-communicable diseases have been rising, despite the evolution of medical science and of the improved generalised access to healthcare (FAO & WHO, 2019). The prevalence of obesity is a burden to healthcare systems, to the life quality of individuals, and to the environment.

A reversal of the decreasing adherence to the Med diet is urgent and will require an approach at various levels and in a wide range of settings. To revamp the Med diet among urban populations and younger people using today's technologies requires bridging the old traditions with nowadays' issues, maybe rethinking communication and motivation strategies. The pride in traditions and the sense of belonging are perhaps less important to younger generations than actions to minimize environmental impacts and climate change. Maybe showing the sustainability of the Mediterranean dietary model, along with the adoption of healthy food habits from childhood and the development of cooking skills, will contribute to the long-term implementation of the Mediterranean Diet.

It has been argued that the Med diet is an ideal model, a utopia, because there are many Mediterranean dietary patterns. In fact, as explained above, the Med diet encompasses a myriad of local variations with a "unity in diversity" under a single purpose – making the best out of local agrobiodiversity in each season. This rich diversity is the beauty of the concept, grounded on a few common pillars, summarized below. Cultural aspects and emotional features are embodied in countless regional dishes, customs, and typical food products that can be found across the Mediterranean Basin (as further detailed in section 2.4). Common habits can also be easily identified: the pleasure of the table, the sharing of the food, hospitality; a meal as an event, a multisensorial experience creating and revisiting memories. However, although food plays such a central role, the frugality of food habits, and the intrinsic concern for avoiding food waste, stands out when examining traditional foods and recipes from various Mediterranean locations. Lunch time is uncommon around the world, and even family dinners, as occasions for dialogue and sharing of daily experiences are nowadays rare. So, daily convivial meals is a healthy Mediterranean habit, not well understood by other

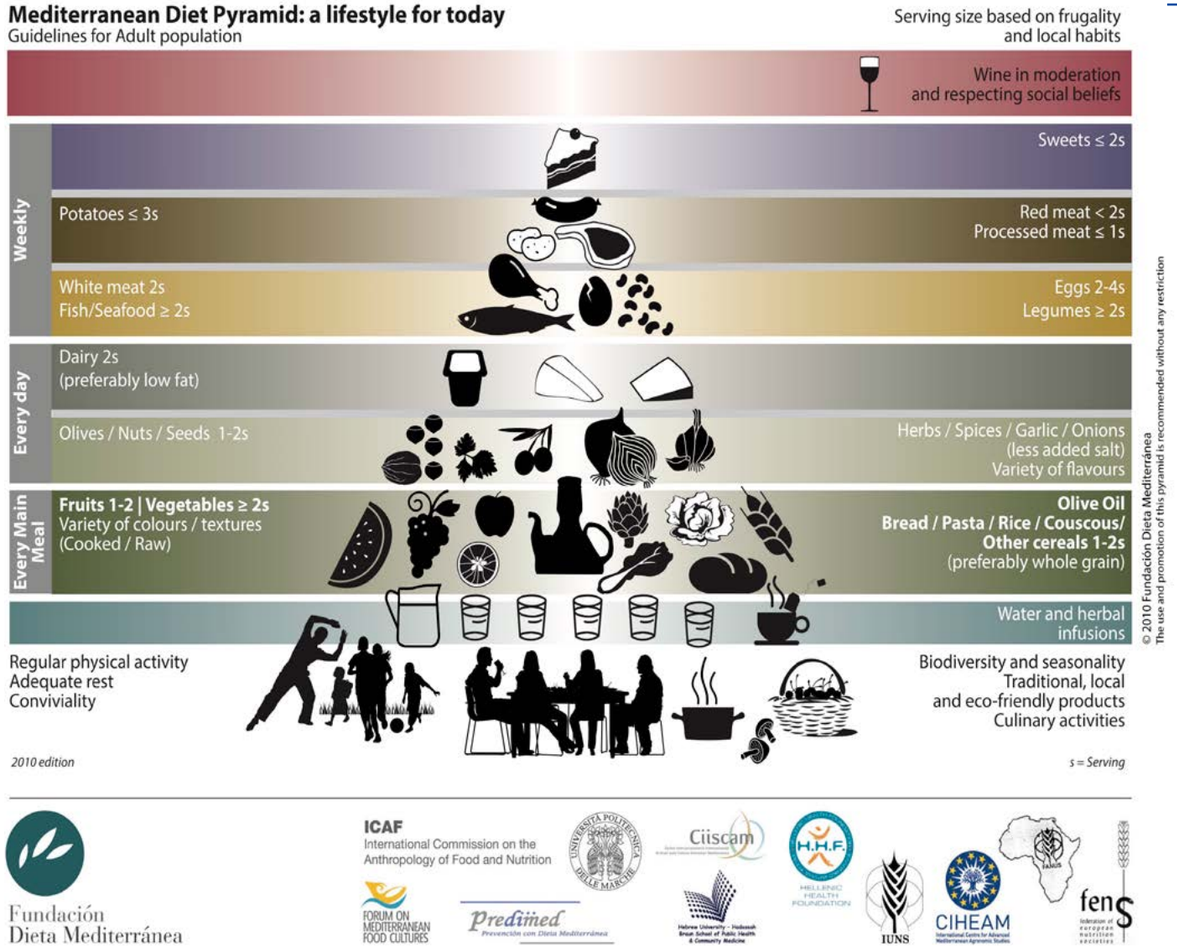

Figure 2.2. *Food selection guidelines for the adult population, based on the Med diet (source: Fundacíon Dieta Mediterránea, the Pyramid).*

peoples who often consider them as a waste of time, in the least. Mounting evidence has been stressing the importance of socialising and eating slowly, during balanced meals, as explained below.

Dietary guidelines for a moderately active healthy adult (with a normal body mass index, BMI)[19], are summarized in Figures 2.2 and 2.3. Such guidelines are being prescribed worldwide for weight control and prevention of non-communicable diseases. The Med diet has also been used as a case-study and an inspiration to develop dietary models to apply elsewhere, including improving the environmental performance of currently disrupted food systems (Willett *et al.*, 2019).

As indicated above, adherence to the Med diet in the Mediterranean region is decreasing – a situation requiring urgent reversal. Whatever the strategy to accomplish that, it is of utmost importance to get familiar with, disseminate and raise awareness about this food consumption pattern; the health and environmental benefits of the Med diet will be addressed below, in section 2.3.

Firstly, a Med diet implies eating with parsimony, observing a simple rule of thumb: the intake of energy should not exceed its expenditure, thus limiting the amount of food ingested and keeping an active lifestyle (human energy requirements depend on many factors, from age to physical activity, but for general purposes the mean value of 2000 Kcal/day has been used as reference for a healthy adult).

Secondly, the Med diet is a vegetable-based food pattern, so the intake of vegetables should be much higher than the intake of animal-based foods – noting that the plant-based foods occupy the two lower levels of the pyramid (Figure 2.2) and more than 3/4 of the wheel (Figure 2.3).

Thirdly, whereas the so-called western diet derives mainly from the same 12 plants and 5 animals year-round (Food and Agricultural Organization of the United Nations [FAO], 2004; Panko, 2017), variety is the rule in the Mediterranean dietary model: the wide range of available fish, shellfish, fruits, herbs, vegetables, etc., seems to present endless options. Such a variety is well illustrated in the Mediterranean food's wheel (Figure 2.3) which is supported by the great agrobiodiversity that is still harboured in the Mediterranean Basin. However, this agrobiodiversity is at risk and its sustainable exploitation may help to safeguard the biodiversity of this region, in general (Attwood *et al.*, 2017; FAO 2004).

As can be observed in Figure 2.3, almost half of the daily ingested food should consist of fresh fruits and vegetables, and a fair amount of starchy foods should ensure most of the energy supply; complex carbohydrates (starch, oligosaccharides and fibres) should be preferred to simple sugars (such as sucrose or glucose). Pulses should provide a significant part of the protein requirements and dairy products are a complementary sustainable source of animal protein, allowing to reduce the intake of fresh meat and fish (Clark & Tilman, 2017; Drewnowski, 2018). Finally, olive oil (preferably of extra-virgin grade) should be the main source of lipids.

The daily intake of nutrients, about 2000 Kcal/day/person, is detailed in Table 2.1, discriminating food sources of macronutrients, phytochemicals and fibre, as well as the energy contents corresponding to the shares illustrated in Figures 2.2 and 2.3.

***Figure 2.3**. The Mediterranean dietary pattern exhibited in the wheel/plate format, highlighting the diversity of food items within each food group. The social dimension should be added, namely the socialisation around the table. (source: DGS - portuguese Directorate-General of Health ⊕).*

[19] BMI stands for Body Mass Index, which is a measure of the body fat obtained from a numerical expression relating the mass and height of a person.

Table 2.1 – Main nutritional features of the Mediterranean food pattern

Nutrient	Relevant food sources	% Energy intake	Energy intake (Kcal)	Comments
Carbohydrates	Wheat and other cereals	60-70	1200-1400	> 50% starch
Protein	Pulses, cereals and other plants, dairy, eggs, fish and meat	10	200	High biological value from animal and plant sources
Lipids	Olive oil, fish, nuts	20-32	400-640	Predominantly mono-unsaturated and poly-unsaturated fatty acids with n3:n6 ratio of approx. 2:1; modest intake of saturated fats from meat and dairy
Dietary phytochemicals[20]	Wine	4-7	80-140	Alcoholic drinks are forbidden by Islam, but green tea, which is a staple drink in north Africa, also contains high level of tannins; abundant use of a large variety of culinary herbs and spices
	Tea, coffee Spices and herbs	Not applicable		
Fibre	Fresh and dry fruits, grains, nuts, fresh vegetables	Not applicable	Not applicable	The high proportion of vegetables in the diet also provides vitamins and phytochemicals

(Adapted from Vaz-Almeida et al., 2017b)

Examples of Mediterranean food products (namely with geographical indications like Protected Designation of Origin -PDO- and Protected Geographical Indication -PGI) as well as culinary recipes, easily and rapidly reproducible, are presented in sections 2.4 and 2.6; meanwhile it is important to stress that the Med diet has no place for:

- Ultra-processed/junk foods (detrimental to health and generally non-sustainable);
- Fast-food (rich in calories and in substances detrimental to health; nutritionally poor);
- Sodas and artificial candy (high content of simple sugars and/or artificial colorants, nutritionally not relevant and even detrimental to health);
- Chips and other calorie-dense and nutrient-low foods not included in the above categories.

[20] Dietary phytochemicals (also known as phytonutrients) are plant secondary metabolites that may beneficially affect human health, encompassing polyphenols, carotenoids and other compounds, which are characteristic of plant foods.

Pleasure of the senses and conviviality

Associating "healthy food" with copiousness and pleasant taste appears a difficult equation to many. However, this association is already one of the pillars of the Med diet, due to its potential to stimulate the senses through a wide range of colours, flavours, and scents, which are mainly conveyed by the large quantities and varieties of plant-based foods (Delgado *et al.*, 2019; Issaoui *et al.*, 2020).

Mediterranean cuisine is colourful, flavourful, contains a multitude of ingredients, and yet, meals are rapid and easy to prepare, as illustrated by the photos below, of a hypothetical lunch including: a seasonal vegetable soup (potato, onion, carrot, pumpkin, coriander and olive oil, for instance), a pasta dish garnished with pesto-sauce[21], accompanied with a glass of red wine, and grapes for dessert (Figure 2.4).

A Mediterranean meal still offers the traditional opportunity to strengthen social bonds, with colleagues at work and with friends and family at home. Everyday meals are abundant in ingredients and seasonings[22], chosen by their availability in the season and in the region, can be prepared within minutes, and do not require particular skills.

For soup preparation (Figure 2.4) all that is needed is to boil the vegetables in water with salt and to add olive oil at the end. The main course (second photo, Figure 2.4) just requires boiling pasta in water (seasoned with salt, oregano, basil and olive oil) for a few minutes, while preparing *Pesto alla Genovese* by mashing and blending the ingredients (basil, pine nuts, olive oil, garlic, salt and cheese - Parmigiano Reggiano and Pecorino) with a mortar and pestle (see footnote 21 for details); the grapes just need to be washed, and finally, the red wine bottle should be opened a while before serving.

Flavours are enhanced by the generous amounts of herbs and spices, as well as onion and garlic, rather than excessive salt. A zoom into the wheel/plate of Figure 2.3 will reveal the meaning of the keywords "variety of colour", "texture", "variety of flavours", "biodiversity and seasonality", as nutritional and sensory qualities are inseparable, and the Mediterranean dishes offer a mouthful for health, and another for pleasure[23]. More information on these aspects can be found in Romano (2015), Romano & Gonçalves (2015) and Valagão *et al.* (2015).

In the Med diet, the components conveying the nutritional and health benefits are those responsible for the flavours and colours. Returning to Figure 2.4: starting the meal with the sweet, warm creamy soup will probably bring a certain sensation of fullness. The main course (pasta) will provide the necessary energy, along with some animal protein from the cheese (in the pesto sauce), which notably transmits umami flavour. Traces of many aromas and smells can be perceived, given the high

21 Relevant information about "Pesto alla Genovese", including the genuine recipe, can be found here.

22 Mainly herbs and spices, fresh or dried, without additives.

23 Recipes (in English) for Mediterranean meals can be found here.

number of plant-based ingredients, with a modest yet relevant contribution of an animal-based food (cheese). The variety of colours and textures, and the complexity of flavours, enhanced by the wine, topped up by the socialisation around the table will certainly add a delightful experience to such a modest and simple meal.

At the molecular level, the vegetable pigments are responsible for the colour, and some of them also act as provitamins. Molecules that convey aroma (e.g., aliphatic and triterpenic alcohols) are often also bioactive; fibres and polyphenols, significant for food texture, include important health-promoting compounds (Issaoui et *al*., 2020).

In the so-called western diet (poorly varied and mostly relying on industrially processed foods and soft drinks), coffee is the major and one of the few dietary sources of polyphenols. Conversely, polyphenols are prominent in the Med diet, and many contribute in variable degrees of intensity, to the colour, bitterness, astringency, and oxidative stability of food matrices. Many of the intense organoleptic properties of plant foods depend on their phenolic profile: for example, the bitterness of the bread is due to polyphenols from the grain, present when unrefined flour is used; fruits change their colour, astringency and texture when ripe, resulting in an appealing balance of colour and aromas, thus conveying health and pleasure. Formerly considered as either toxins or anti-nutrients, many polyphenols are nowadays acknowledged for their contribution to disease prevention (Amarowicz & Pegg, 2017; Issaoui et *al*., 2020; Teissedre & Waterhouse, 2000).

Figure 2.4.
Elements of a Mediterranean daily meal, showing the dominance and variety of vegetables, as well as the social perspective of sharing food. From up left to down right: a vegetable soup (source: photo by Sandie Clarke on Unsplash), some pasta with pesto sauce (source: photo by Eaters Collective on Unsplash), wine and grapes (source: photo by Roberta Sorge on Unsplash), friends in a convivial meal (source: photo by Johanna Dahlberg on Unsplash).

2.3. HEALTH AND ENVIRONMENTAL BENEFITS

The global food system is blamed for contributing to climate change, because it involves activities that are responsible for important global GHG emissions[24], namely the energy sector, industry, transportation, and agriculture. In the EU, in 2017, agriculture contributed 8.72% of GHG emissions, 2/3 of which were from livestock (European Parliament, 2019a). Also, intensive agricultural systems contribute to the depletion of drinking water, pollution and eutrophication, and threaten biodiversity, as indigenous crops and livestock breeds are replaced by standardized ones. It is important to note that agrobiodiversity (dependent on agricultural activities) is interlinked with wildlife (Attwood et *al*., 2017), especially in the Mediterranean region, where landscape mostly results from human-nature interactions (see chapter 1). Moreover, the impact of climate change is expected in regions that are not major contributors to global GHG emissions, such as the Mediterranean Basin (European Parliament 2018, 2019a).

Diet and related aspects have an enormous impact on meeting Sustainable Development Goals (SDG), and bottom-up actions can be effective drivers for change in this regard. The much advertised global diet, the western diet (encompassing fast food and ultra-processed foods), is deleterious for human health and for the environment (FAO, 2004).

[24] GHG are Greenhouse gases, including CO_2, NO_2, CH_4 and others, expressed in mass of CO_2 eq., and hence also called carbon footprint.

Among other negative impacts, it contributes to nutritional deficiencies that co-exist with overweight and obesity, in addition to food loss (e.g., at the production level, food thrown away because it is considered of insufficient quality) and waste (e.g., in the preparation of meals or in food processing) that account for 1/3 of the global food supply. In 2016, for the first time in human History, obesity became a much larger burden than undernourishment, with 38% of adults and 18% of children obese or overweight, against 10.7% of undernourished (World Health Organization [WHO], 2020).

Realigning the food system with nature is an urgent requirement for humankind and the planet. Again, by changing the current food system's paradigm, the millenary wisdom enclosed in the MD may contribute to improve health, and also add a sustainability dimension to the food system, by embracing biodiversity and reducing food waste. In fact, a sustainable diet should encompass health benefits, as well as social, economic and environmental benefits, in order to address SDG (Burlingame & Dernini, 2012; Drewnowski, 2018; FAO, 2020a; Johnston et *al*., 2014; Ruini et *al*., 2015; Willett et *al*., 2019).

Health benefits

According to FAO (2004) and reinforced by Panko (2017), the western diet model is mostly based on only 12 plant and 5 animal species, in contrasting to the richness and variety of the Med diet. Powerful marketing for junk food and sodas targeting children are most probably causing their drift from the Med diet pattern and negatively impacting their health (Elliot, 2019; Sadeghirad et *al*., 2016). Food industries aim at meeting the demands of global consumers who allegedly want more sugar, salt, fats (including trans-fats[17]) and animal protein, largely exceeding the recommendations of WHO. Thus, revamping the Med diet is important and urgent.

Following the pioneering work of Ancel Keys, many other studies provided explanations and further evidence to either corroborate or dismantle his arguments. One, known as the "French paradox", first presented in 1992 (Renaud & de Lorgeril, 1992), showed the mortality rate for Coronary Heart Disease (CHD) in France to be unexpectedly lower than in countries such as the USA and the UK, with similar patterns of high intake of saturated fats. The explanation for such a paradox was mostly attributed to a differentiating factor: while beer and sodas were heavily consumed in the UK and the USA, French people preferred wine, moderately consumed during meals. Thus, the wine antagonises the deleterious effects of the ingested saturated fats, in addition to the moderate food habits (the French generally eat smaller doses and more varied foods). Further investigation highlighted the role of resveratrol – one of the countless phenols present in red wine – to counteract the negative consequences of fats.

Since then, many scientific studies (mechanistic and epidemiological studies, as well as meta-analyses) have reinforced evidence and explained the health benefits of the Med diet. Several epidemiological studies show that diets high in animal-based and ultra-processed foods are associated with a higher risk of non-communicable diseases (NCD), mainly obesity, type 2 diabetes, coronary and heart diseases, and certain types of cancer, while higher adherence scores to the Med diet (and Mediterranean-like diets) correlate with lower risks of NCD (Agnoli et *al*., 2018; Bonaccio et *al*., 2018; Castro-Barquero et *al*., 2020; Franquesa et *al*., 2019; Issaoui & Delgado, 2019; Issaoui et *al*., 2020; Kargin et *al*., 2019; Nishida et *al*., 2018; Palomeras-Vilches et *al*., 2019; Serra-Majem et *al*., 2019; Strandwitz, 2018; Teissedre & Waterhouse, 2000; Vaz-Almeida et *al*., 2017a,b)

Such mounting evidence on the health benefits of the Med diet is recognized by international organizations such as FAO and WHO, highlighting it as one of the healthiest diets in the world, inspiring national dietary guidelines in several countries (CIHEAM/FAO, 2015; FAO & WHO, 2019; FAO 2019b).

Numerous recent papers reveal the continued interest in the overall health benefits conveyed by the Med diet, as well as the mechanism of action of individual components. The case of olive oil is paradigmatic, since it is one of the few edible oils that can be extracted by only mechanical means, at ambient temperature, and does not require any refining or further processing to become edible (Issaoui & Delgado, 2019). Olive oil has a balanced fatty acid composition (n-6:n-3 ratio[25]); moreover, it contains the essential fatty acids[26] and eicosanoids precursors, linoleic and alfa-linolenic acids (ALA), and supplies vitamins E and K, thus complying with several nutritional claims of Reg (EC) No 1924/2006, contributing to maintain normal blood cholesterol levels.

What makes virgin olive oil unique among edible oils and fats, is the simple way to obtain it – just by squeezing fresh ripe olives, at ambient temperature, and decanting the water. The resulting liquid contains a so-called non-saponifiable fraction, 2%, which contains 230 compounds identified thus far. This fraction is eliminated in the processing of other oils as well as in olive oil refining. Such compounds are of primary importance to the flavour and health benefits of the virgin olive oil. Hence, the cause-effect relationship between "protection of blood lipids against oxidative stress" and "intake of an adequate amount of hydroxytyrosol and derivatives" was examined by the European Food Safety Agency (EFSA), resulting in a

[25] n3 and n6 are commonly known as omega 3 and omega 6 fatty acids; the notation refers to the position of double bonds (C=C) in the fatty acid molecules.

[26] Essential fatty acids cannot be synthesised by the human body, so they must be consumed.

qualified health claim, which applies to some olive oils (most particularly of extra-virgin grade) if containing at least 5 mg of hydroxytyrosol and its derivatives (e.g., oleuropein complex and tyrosol) per 20 mg of olive oil (which is the recommended daily intake, corresponding to about one tablespoon) (European Food Safety Agency [EFSA], 2012a). Extra virgin olive oil, which is the most valued type, exhibits higher quality features and offers better nutritional and health benefits (see Issaoui & Delgado, 2019, for further details). The above reasons alone would certainly be sufficient to justify the central role of olive products (olive oil and table olives) in the Mediterranean Diet.

In addition to wine and olive oil, the complex carbohydrates (from wheat), fruits and vegetables, pulses, culinary herbs and spices, etc. in the Med diet also have health benefits. Moreover, some evidence suggests that foods are not just a sum of nutrients, but rather complex matrices, the synergies of which should be considered (Fardet & Rock, 2015, 2020).

Wheat is one of the world's major cereal crops, with demand increasing in tropical and Asian countries, while slowly declining in some wealthy economies. As explained in chapter 1, wheat domestication was a major achievement of the agricultural revolution because the grain could be stored and thus provide to food security. Current products from most bakery industries can hardly be called "bread", because white wheat flour is frequently used (bran is removed) together with multiple ingredients and additives. In contrast, traditional bread is made from different local wheat cultivars, using darker and coarsely ground flours (containing bran and dietary fibres). Only water, salt and yeast are added to the flour, and the fermentation is long, resulting in a more complex aroma profile, from yeast secondary metabolites and polyphenols in the bran. Demand for "long fermentation bread" is high among some urban consumers due to their perception of enhanced sensorial and health-related aspects. Moreover, dietary fibres, complex starches, and oligosaccharides, abundant in whole or coarsely ground flours, are of primary importance for gut's health; this includes favouring beneficial microbial populations of gut microbiota that influence body responses, from immunity to mood (Nishida et *al*., 2018; Strandwitz, 2018). Health benefits related with gut microbiota are associated with dietary fibres and oligosaccharides (prebiotics), dietary phytochemicals, such as non-vitamin carotenoids (e.g., xanthophyll and lycopene) and polyphenols, from plant-based foods. Also relevant are the short-chain fatty acids and other microbial metabolites from fermented foods, such as cheeses and yogurts, as well as the probiotics (beneficial live microorganisms) they may contain.

It cannot be overemphasised that one of the main features of the Med diet is the abundant intake of a wide variety of fruits and vegetables, nuts, herbs and spices, of well-established benefits, detailed in works by Custódio et *al*. (2011), Diniz et *al*. (2017), Issaoui et *al*. (2020) and Pereira et *al*. (2013), among others.

Table 2.2 presents the potential health benefits associated with spices and culinary herbs, used in the Mediterranean cuisine, mostly native or endemic to the Mediterranean.

In Mediterranean cuisine, seasonings contribute to the flavour of dishes by building up a complex "bouquet" of simple foods, while allowing the salt and sugar to be decreased, and their contribution of dietary phytochemicals should not be neglected. In some cases (e.g., basil), the amount used in cooking is such that it is difficult to categorize it as a seasoning or as an ingredient; in other cases (e.g., cloves), the concentration of active phytochemicals is so high that a fair supply of bioactive compounds to the diet is ensured, even if the spice is used sparingly. As shown in Table 2.2, antioxidant properties are reported for all the listed herbs and spices, due to the presence of polyphenols (Delgado et *al*., 2019; Diniz et *al*., 2017).

At the molecular level, polyphenols stand out for their variety, as well as sensorial and health-promoting properties (Table 2.2); this class of compounds includes a wide range of plant secondary metabolites, from small molecules to large polymers. All sub-classes of polyphenols share "in vitro" anti-oxidant activities as well as other demonstrated "in vivo" effects, for example plant sterols and stanols lower cholesterol levels in blood (European Food Safety Agency [EFSA], 2012b). Plant sterols (or phytosterols) are abundant in nuts (e.g., pistachio, almond), seeds, fruits (e.g., berries) and greens (e.g., broccoli), etc. Health claims related to polyphenols from olive oil are indicated above, and it is worth mentioning that nuts also comply with the same European framework of nutritional and health claims (Article 13(1) of Regulation (EC) No 1924/2006) as is the case of walnuts (*Juglans regia*), that help to maintain normal blood cholesterol levels (European Food Safety Agency [EFSA], 2011).

Table 2.2 – Health benefits of common seasonings used in the Mediterranean cuisine

Spice/Culinary herb	Main active compound(s)	Reported health benefits	Particularities
Cloves (flower buds of *Syzygium aromaticum*)	Eugenol	Antioxidant, neuroprotective, antipyretic, anti-inflammatory, antifungal and with analgesic properties.	One of the foods with a higher concentration of total polyphenols, including gallic acid.
Bayleaf / laurel (leaves of *Laurus nobilis*)	1,8-Cineole	Antioxidant, anti-microbial, anti-diabetic, anti-inflammatory, and anti-carcinogenic activities.	A wide range of aromatic compounds and polyphenols have been identified, encompassing alkaloids, simple phenols, flavonoids and pro-anthocyanidins.
Saffron (from the flower of *Crocus sativus*)	Safranal, Kaempferol	Antioxidant, anti-carcinogenic, antidepressant, anti-microbial, and anti-convulsant activities.	The colour is due to the carotenoid pigment crocin.
Coriander (fresh leaves of *Coriandrum sativum*)	Linalool, Quercetin	Antioxidant, anti-carcinogenic, anti-microbial, anti-thrombogenic, and neuroprotective activities.	Contains relevant quantities of vitamin C and carotenoids, as well as many polyphenols.
Cumin (seeds of *Cuminum cyminum*)	Cuminaldehyde	Antioxidant, anti-allergenic, anti-platelet aggregation and hypoglycaemic properties.	The polyphenol fraction is dominated by kaempferol and caffeic acid.
Oregano (mostly dry leaves of *Origanum vulgare*)	Naringenin	Antioxidant, anti-microbial, anti-carcinogenic anti-inflammatory, and immunomodulator properties.	Rich in terpenes, phylloquinone and carotenoids, in addition to a relevant polyphenol fraction.
Rosemary (leaves of *Salvia, Rosmarinus* and *Lavandula* species)	Rosmarinic acid	Antioxidant, anti-carcinogenic, lowers blood lipid levels and acts as neuroprotective agent.	Phenolic fraction dominated by flavonoids and phenolic acids.
Thyme (mainly leaves of *Thymus vulgaris*)	Thymol, Rosmarinic acid, Caffeic acid	Antioxidant, anti-bacterial and anti-fungic activities, prevents atherosclerosis and shows some anti-neoplastic action.	Rich in terpenes and flavonoids.
Spearmint (*Mentha spicata*) and peppermint (*Mentha piperita*)	Menthol	Antioxidant, antimicrobial and anti-inflammatory actions. It is also neuroprotective, and shows cardiovascular and antitumor preventive properties.	The genus *Mentha* comprises 61 species, differing in composition, but all rich in polyphenols.
Lemon balm (*Mellissa officinallis* and related species)	Citronellal, Bergamol	Antioxidant, anti-inflammatory, analgesic, anti-pyretic and platelet-inhibitory actions.	Rich in aldehydes, terpenes and phenols.
Basil (leaves of *Ocimum basilicum* and related species)	Eugenol, Linalool	Antioxidant, direct influence on vision, lowering the risk of age-related cataracts.	Rich in carotenoids and xanthophylls; fairly rich in polyphenols.
Phennel (whole plant *Foeniculum vulgare*)	p-Anisic acid	Antioxidant, anti-microbial and anti-diabetic properties.	Camphor and limonene are relevant terpenoids, while rosmarinic acid and luteolin are representative phenols.
Chilli-pepper (fruits of *Capsicum annuum*)	Capsaicin	Antioxidant, potentially beneficial in rheumatoid arthritis; analgesic and anti-inflammatory properties.	Various subspecies exist, in red, green and yellow colours; rich in the flavonoids luteolin and quercetin. Capsaicin is the pungent compound (ranging from 0. 1 to 1%) and it is also a bioactive molecule.
Cinnamon (from *Cinnamomum verum*)	Cinnamaldehyde	Antioxidant, anti-microbial, vasodilation and hypoglycaemic actions; helps control type 2 diabetes and hypertension.	Phenolic acids predominate in the phenolic fraction.

This summarises the information retrieved from scientific literature (peer-review journals from 2000 onwards) and databases (such as NCBI. PubChem Database, and Phenol-Explorer 3.6) about the health benefits from herbs and spices and the associated main compounds. Table created for this work by Amélia Delgado.

Regarding Mediterranean cuisine, it should be noted that cooking many traditional dishes commences with heating chopped onion and garlic in a little amount of olive oil, to which tomato is often added. Chemically, olive oil's constituents (not only oleic acid) synergistically act to release and enhance the bioavailability of allicin (from onion and garlic) and lycopene (from tomato), which are health-promoting phytochemicals[27]. That basic step, which also releases flavours, can originate a sauce, a *risotto* or a stew, depending on the following ingredients and seasonings; in a few minutes, a balanced, colourful and aromatic meal will be ready.

Reviewing the health benefits of all components of the Med diet would be too lengthy and maybe tiresome for the reader, as would be the detail of cooking methods and related chemical processes. Moreover, culinary habits are interlinked with cultural factors such as social habits, rituals and traditions that bring cohesion and motivation to follow the Med diet, certainly contributing to individual wellness as well as to regional wealth.

Social and environmental benefits

The Mediterranean Diet is a multidimensional, dynamic concept, considered to be a case-study of a sustainable diet, according to FAO and WHO, "*those diets with low environmental impacts which contribute to food and nutrition security and to healthy life for present and future generations. Sustainable diets are protective and respectful of biodiversity and ecosystems, culturally acceptable, accessible, economically fair and affordable; nutritionally adequate, safe and healthy; while optimizing natural and human resources*" (Burlingame & Dernini, 2012; FAO & WHO, 2019).

The MD has a strong cultural dimension rooted in the optimization of natural and human resources, it is respectful of the environment by embracing biodiversity and by privileging sustainable production systems. It is recognised as one of the healthiest diets in the world, providing a wide range of nutrients and other health-promoting compounds, affordably. It is also beneficial to local economies by preferring seasonably available local cultivars and breeds and short distribution circuits, resulting in lower environmental impacts than most other diets (namely by saving energy in transportation and refrigeration). Revamping the Med diet encourages the consumption of seasonal foods and the consequent revival of culinary traditions, mostly plant-based recipes matching harvesting seasons – soups and stews, rich in cabagge and W during winter, dishes based on fresh harvested pulses, in spring, *gaspacho* and fresh vegetable salads in summer – each meal ending with ripe fruits of the season.

In order to meet the SDGs and to guide the necessary changes in the food systems, methodologies and metrics have been developed to assess environmental impacts, for example GHG emissions[24] (from human activities) as carbon dioxide mass - CO_2 eq., known as Carbon footprint. Some other metrics (either simple or composite) are available and/or under development.

One consensual methodology to assess the environmental impact of a product (food, crafts, tools) is the Life Cycle Assessment methodology (LCA), an internationally recognized way to account for the inputs, outputs and environmental impacts of a production chain, including food products. Many indicators are examined along the production, processing, and distribution of a food, when assessing its sustainability. LCA is thus a holistic approach, using phases and units standardised by the International Standards Organization (ISO). When applied to foods, the boundaries of the system are clearly defined, and the inventory phase includes the processing steps, raw materials, mass balances, transportation, etc. The analysis combines multiple indicators, such as energy and water consumption, GHG emissions, as well as eutrophication and acidification potentials (Clark &Tilman, 2017; Finnegan *et al.*, 2018; Poore & Nemecek, 2018). This tool is currently used in France to guide product eco-design[28], and a similar approach may be of use in the Mediterranean area, to guide innovation in the framework of the MD (whose traditional products evolved to make the best use of resources).

Harmonized indicators of the sustainability of diets and food systems have been consensually adopted. Such indicators are of three categories:

a) Nutritional and Health indicators (encompassing diet-related morbidity / mortality, nutrient adequacy ratios, nutritional anthropometry, etc.);
b) Environmental indicators (carbon footprint, proportion of foods locally produced and seasonality, agrobiodiversity, land use, etc.);
c) Socio-Economic Indicators (income, wealth and equality).

Researchers and thinktanks are currently focused on indicators of perfection and aptness, using the Med diet as a case-study, aiming at addressing SDGs and the 2030 agenda (in this respect, and for further information, please see FAO, 2019b; FAO & WHO, 2019; UNEP, 2020a).

It is consensual that the current paradigm must change, and that the Med diet is an adequate model to follow, but ongoing studies show the complex reality regarding choices and challenges as noted by several authors (Dernini *et al.*, 2017; Donini *et al.*, 2016; Lacirignola *et al.*, 2012; Tilman & Clark, 2014) and as shown by the double pyramid model for the Mediterranean region (Dembska *et al.*, 2021). The joint team from the Barilla Foundation and the University of Naples Federico II proposes the adaptation of the double pyramid to local contexts, especially where traditional food cultures other than the Med diet are concerned. The resulting pyramids are surprisingly similar in their essence but given the

[27] Lycopene is a carotenoid to which health benefits are associated (more information here).

[28] For more details about eco-design and sustainable processing, please see here.

scope of the current publication, only the Mediterranean Double pyramid is herein discussed. This model (Figure 2.5) shows that fruits and vegetables are simultaneously good for health and for the environment, as they are placed at the base of both pyramids while red meat is placed on the top of both pyramids, meaning that its excess is deleterious for both health and environment, and that it should be consumed in very small amounts. The intermediate levels of the pyramids may slightly diverge but, essentially, environmental impacts and health benefits of foods are hand in hand, as can be easily observed in Figure 2.5, which is based on state-of-the-art knowledge (Dembska et *al.*, 2021). The strong correlation with the nutritional models displayed in Figures 2.2 and 2.3 is noteworthy, showing once more the value of the ancient wisdom enclosed in the MD.

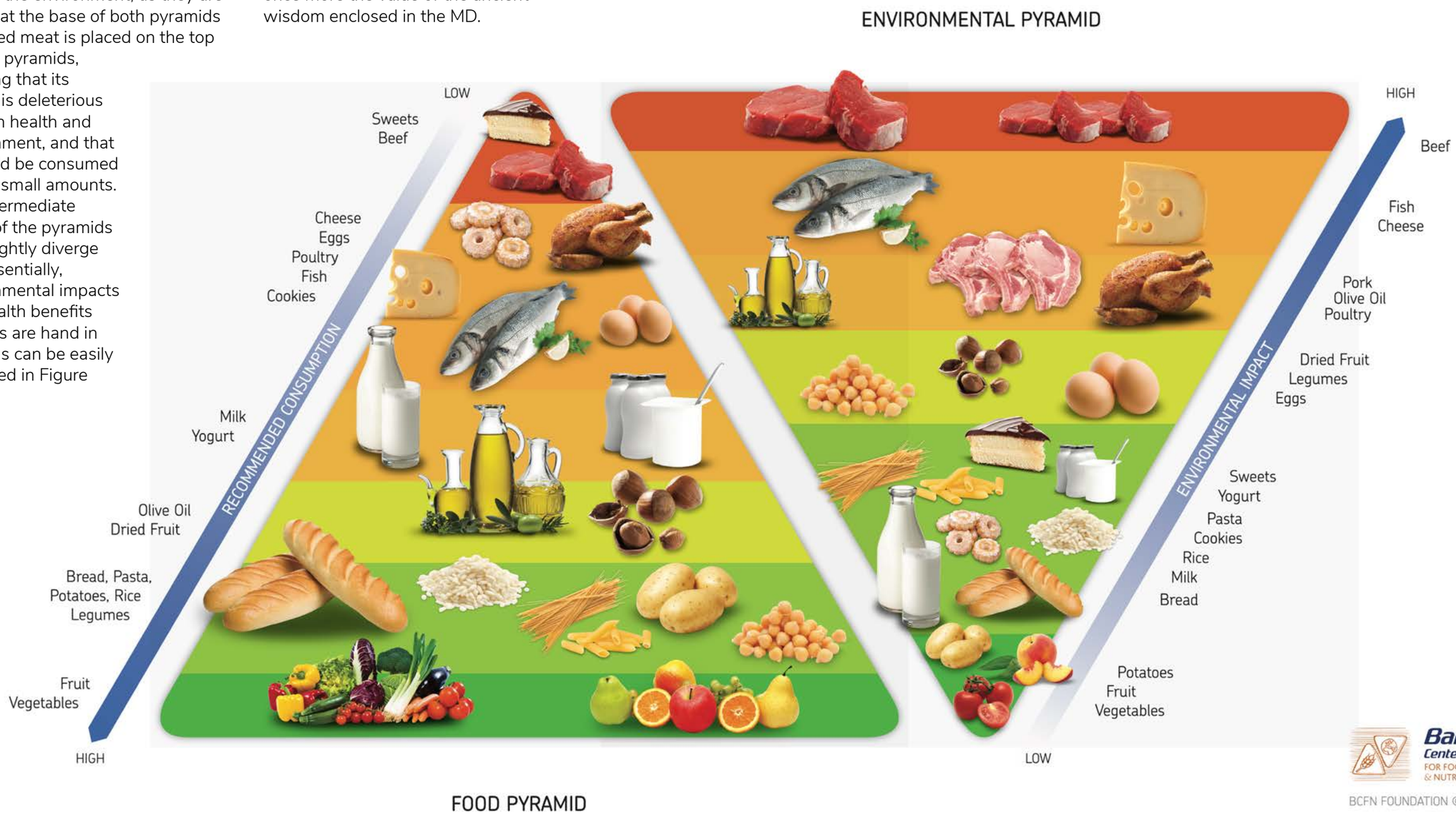

Figure 2.5. *The Double Pyramid model for the Mediterranean region, highlighting the desired nutritional balance of foods, in parallel with their environmental impact, showing that healthier foods have lower environmental impact and vice versa. (source: Barilla Foundation & Research Unit on Nutrition, Diabetes and Metabolism, University of Naples Federico II, 2021. A one health approach to food, the Double Pyramid connecting food culture, health and climate)*

Sustainable food systems are of capital importance to adequately feed a growing human population, as translated in SDG 2. On the other hand, the energy and transportation sectors have the worst environmental performances and hence the greatest impact on climate change, highly above that of cattle (European Parliament, 2019a). However, food production makes use of energy and transportation, which means that less energy-demanding food production should be targeted (e.g., by stimulating seasonality, GHG emissions will decrease due to lower needs of refrigerated storage), as well as local consumption, reducing food miles whenever possible, thus cutting costs and GHG emissions from transportation and refrigeration. These aspects may become more relevant during crises, when food sovereignty and resilience can make a real difference.

Producing enough food to meet the nutritional requirements of a growing population in a sustainable manner will also reduce environmental impacts (as deduced from the alignment of both pyramids in Figure 2.5). Changing food habits with the sole aim of decreasing environmental impacts may not be as effective as expected, because current state-of-the-art metrics still lack precision, and the risk of nutrition insecurity/inadequate diets can be high.

It is worth highlighting that the Med diet is a benchmark for nutrition and sustainability because traditional Mediterranean foods are healthy and respectful of the biodiversity and the environment, in accordance with FAO's definition of sustainable diets presented at the top of this section. Thus, adoption of the Med diet allows for the individual contribution to sustainable food consumption, as most Mediterranean dishes are simultaneously easy to cook, delicious, good for the planet, and good for human health.

As far as sustainable food production is concerned, the MD has the potential to improve well-being and regional growth through sustainable innovation, especially nowadays, when IT technologies (namely AI and IOT[29]) are accessible. Requirements for high quality standards, proximity circuits, food traceability, and good working conditions for the producers, as well as reduced environmental impact should all be closely observed when creating innovative foods within the MD framework, namely by using appropriate eco-design methodology and tools.

[29] AI stands for Artificial Intelligence (or machine learning algorithms) and IOT stands for Internet Of Things (autonomous and/or remotely controlled devices).

2.4. FLAGSHIP MEDITERRANEAN FOODS

Despite the geographical and religious differences, the Med diet has the same features on both sides of the Mediterranean Basin, rooted in resilience and optimization of resources through millenary wisdom. The common products that shape the Med diet are presented in this section, with complementary information in the next one.

Olive oil is the main fat used for cooking (in almost every dish, including some desserts) as well as dressing for salads (Figure 2.6). There is much more in olive oil than the right balance of fatty acids, described in section 2.3, and additional information on the grading and designations of olive oils is available from the International Olive Council (IOC, 2020).

Olive oil has been regarded as the cement of the Med diet and it is thus pertinent to snapshot its current situation in the Mediterranean countries, in terms of intakes. According to the IOC (International Olive Council [IOC], 2015; 2018), the global demand for olive oil has almost doubled since 1990 and the per capita consumption in 2015 was led by Greece, with an average daily intake of about 46 mL/capita. Spain came second, with around 30 mL/day, then Italy with 27 mL/day and Portugal with about 21 mL/day. Cyprus' national average per capita consumption was about 16 mL/day (slightly below the level that may be beneficial for health, as referred in section 2.3). Croatia's per capita average consumption was much lower (4–5 mL/day) but higher than Slovenia's (about 2 mL/day), although in both countries food habits in coastal regions may drastically differ from those in inlands. In Romania, Bulgaria and Bosnia-Herzegovina, the average national consumption of olive oil was negligible (less than 1 mL/capita/day), indicating that even in the coastal regions, use of olive oil to cook and seasoning is probably less than modest (Issaoui & Delgado, 2019).

Another product, sometimes forgotten, is the ***table olive***, obtained from olive varieties poorer in oil (but rich in fibre, vitamins, minerals and anti-oxidants), prepared according to many traditional preparation styles and recipes. The processing of table olives generally involves a fermentation step, resulting in a nutritious and versatile food. Many table olive cultivars have been abandoned and risk extinction, although such trees are able to thrive on poor soils, under drought and other harsh conditions while producing edible fruits (table olives are shown in Figure 2.6). This is a good example of the above-mentioned interdependency between agricultural and wild biodiversities, a trait enclosed in the Mediterranean Diet concept (Attwood *et al.*, 2017; Burlingame & Dernini, 2012; Dernini *et al.*, 2017; FAO & WHO, 2019).

Cereals, namely wheat (coarsely milled) are another pillar of the

Figure 2.6. *Olive oil bottle with mature and unripe olives (source: photo by Roberta Sorge / Unsplash).*

Med diet. The selection of the most suitable wheat varieties for the local conditions, and in terms of robustness and productivity, and the ability to make bread (involving fermenting and baking the dough) were key for early human population growth, because wheat bread supplied some protein, namely gluten (about 8%), and B vitamins, in addition to energy from carbohydrates (starch and fibre). This complex composition dramatically improved the quality of human diet and, probably, our civilization would not have thrived without the steady availability of bread, including the necessary protein intake, to ensure survival. Besides bread, wheat is also used to make pasta and couscous, leading to the selection of different crop varieties that best suit each application, thus contributing to increase agrobiodiversity. Mediterranean peoples also use other cereals to make bread, namely corn and rye (alone or blended with wheat).

The introduction and adaptation of rice, namely in wetlands of Portugal, Spain, Greece and Italy, should also be noted, as rice is the base for many traditional Mediterranean dishes, such as *risotto* and *paella*.

In times of scarcity, other starchy plants were also used to supply energy, for example corn, used to prepare a porridge to which olive oil and other ingredients are added. Another example is the flour made from carob pods (which are dry and hence easy to grind) and blended with wheat flour to make carob bread, which was once viewed as a famine food but is nowadays successfully revamped in bakery with increasing demand.

Still regarding sustainability, the Med diet (that is, the Mediterranean food culture as argued by Trichopoulou & Lagiou, 1997) results from the wisdom to cleverly mitigate food insecurity, and this is reflected in the many recipes which reduce food waste; for example, dry bread is ideal to make delicious dishes such as *gazpacho* and *açorda*.

Vegetables and fruits of the season consumed in large quantities and great variety are a key feature of the Med diet, once again linked to agrobiodiversity. The Mediterranean Basin harbours a wide variety of fruits and vegetables, whose maturation occurs throughout the year. As mentioned before, fruit trees have been cultivated in marginal lands and near houses, thus greatly favouring genetic variation, as pointed out in Figures 1.16, 2.1 and 2.7.

Formerly encouraged towards standardization, which led to the abandonment of many (or even all) local cultivars, the food industry has nowadays an opportunity to embrace a new paradigm through innovation and reduction of food waste while ensuring healthy and nutritional foods for all, in compliance with SDGs 2 and 13 (UN, 2020; UNEP, 2020a).

Herbs and spices used abundantly for seasoning dishes are not only tasty but also healthy, by allowing reduction of the salt content of food and by supplying important phytochemicals (as detailed in Table 2.2). Given

Figure 2.7. *Grapes, a ubiquitous fruit in the Mediterranean region where a myriad of cultivars can be found. (source: photo from Andrew Hagen/ Shutterstock)*

the quantities used, it is sometimes difficult to distinguish whether a herb is used as a condiment or as an ingredient. Such culinary herbs and spices include several types of mints, parsley, coriander, oregano, rosemary, basil, chilli-pepper, and many others, some of which are still collected from the wild (Romano & Gonçalves, 2015). The biodiversity of culinary herbs is huge, so that many distinct species and subspecies are known by the same English name (e.g., basil, mint and rosemary). In most Mediterranean regions, aromatic herbs can be easily at hand in kitchen gardens, and they are generally available in the retail market, where spices such as cloves, cumin, saffron, pepper and nutmeg can also be found. Each local cuisine can be distinguished by the aromas conveyed by locally available herbs and spices, which vary from region to region (even if classified as the same species). Since most aromas are secondary plant metabolites, they vary with factors such as the soil, climate, agricultural practices, season, etc.

Table 2.2 lists common botanical species of herbs and spices typical of the Med diet that contribute to the overall health benefits described in section 2.3. At a lower scale level, *i.e.*, when speaking of local cuisines within a region, intra-species differences can be found, probably resulting from local preferences and niche adaptation; these variations, impacting the aroma of dishes, result in a multitude of "Mediterranean regional cuisines" –, again the "unity in diversity" applied to the Med diet.

Pulses are leguminous crops that are harvested solely for the dry seed. Legumes are plants of the *Fabaceae* family and produce their seeds in pods; such seeds and/or pods may be of three types: those richer in complex carbohydrates (e.g., carob), those richer in oil (e.g., soybean) and those richer in protein (e.g., bean, chickpea). Pulses are in this latter category and are important in sustainable agricultural systems for their ability to fix nitrogen from the atmosphere into the soil and as a sustainable source of protein in human diet.

Carob pods' flour has been a valuable contribution to the diet, namely by supplying fibres and complex carbohydrates, and its use in bakery was recently successfully revamped in Algarve, Portugal. On the other hand, pulses (edible protein-rich seeds of *Fabaceae*) are of great interest: the UN declared 2016 the International Year of Pulses and the FAO raised awareness on their use in multiple campaigns. Pulses play a significant role as protein sources In the Med diet, being included in many traditional dishes. Such seeds have a low moisture content, excellent preservation characteristics and high levels of protein and fibres. Besides the protein (20-25% dry weight of the edible portion), pulses supply fibres and complex carbohydrates (10-25%) as well as oligosaccharides (3-5%) beneficial for gut health, in addition to vitamins and minerals. Pulses are rich in a variety of polyphenols with anti-inflammatory, anti-diabetic, and anti-carcinogenic properties. Moreover, some phytosterols present in pulses (namely in lentils and chickpeas) have been reported to lower cholesterol levels in blood (Delgado et *al.*, 2019). An enormous agrobiodiversity of beans, broad beans, chickpeas, peas and lentils can be found in the region and some Mediterranean pulses are valued by geographical quality logos, namely Protected Designation of Origin (e.g., Fesols de Santa Pau PDO, Fava Santorinis PDO).

Animal protein sources were once scarce and hence consumed in very small amounts, except in festivities, for example grilled sardines, associated with summer outdoor festivities, in Portugal (Figure 2.8).

It is noteworthy that the high consumption of red meat, namely beef, is not a traditional feature of the Med diet because small ruminants, chicken and pigs (in sustainable extensive systems) are better suited to the Mediterranean region. Bovines in southern Europe, and camels in North Africa were traditionally mainly used for labour (transportation of loads and/or for tillage, etc.).

In southern Europe, especially in isolated villages in the hills, pork and chicken were the preferred types of meat, as well as goat and lamb, although consumed with parsimony. Pork is forbidden by Islam but, for Christians, it was regarded as a valuable resource in rural isolated communities: one pig could support a large family through the year, supplemented with a few eggs, a couple of chickens and some fish preserves.

Pork is easily preserved – in some

regions, pork legs are submitted to a curing procedure to manufacture "ham", and some of them hold quality seals attesting their regional features. Chopped meats from other parts of the animal, seasoned with abundant paprika, herbs and spices, are packed in the intestines of the animal and smoke-cured to result in a diversity of *chouriço/chorizo*, salami and other pork preserves. Even the blood is preserved by blending it with some minced meat and fat and adding other ingredients and seasonings, following ancient regional recipes; instead being wasted, sensorially and nutritionally distinct foodstuffs are obtained (Figure 2.9A). Some of these preserves are famous worldwide, often taking the English designation of sausages and ham, which may be misleading, as Mediterranean pork preserves are much drier and contain many more seasonings and spices than the commonly recognised sausages and hams. Although Mediterranean pork preserves are categorized as processed meats, they should not represent a health risk when consumed in small amounts (European Parliament, 2015) but rather a valuable nutritional resource, since they are mainly used as a seasoning, conveying flavours to plant-based dishes, namely the "umami" flavour.

In many southern European villages, when the pig was killed, at a chosen timing according to the season and to the phases of the moon, it was an occasion for a communal celebration, an occasion to taste the fresh meat, while preparing the rest of the carcass for preservation, in a minimum-waste approach.

When fresh meat and fish are consumed, white meat (e.g., poultry) and fish such as sardines and tuna, rich in n-3 poly-unsaturated fatty acids (commonly known as omega-3 fats) are preferred. Figure 2.8 shows grilled sardines, a traditional summer delicacy in Portugal, typical of June celebrations. Nowadays, sardines have been included in the list of endangered species due to overfishing (IUCN, 2020a). The issue of severe sardine fishing restrictions will be hopefully soon overcome, since the developments in sardine farming at Algarve are encouraging.

In coastal areas, a wide array of fish and seafood is available throughout the year, the fishing of each species being also seasonal and depending on the weather conditions at sea.

Pork preserves ensure the availability of meat throughout the year inland; in coastal areas, animal protein is provided year-round by fish that is preserved by salting and drying. Some of these fish preserves are nowadays regional delicacies – salted sardines in Croatia, salted anchovies in Italy, dry salted fish in the Iberian Peninsula, and other regions of the Mediterranean, or tuna preserves, notably "Muxama" and "Estupeta" from Algarve, Portugal. With no place for waste in the Mediterranean way of life, any tuna meat unsuitable for "Muxama" is used to prepare "Estupeta" (Figure 2.9 B).

Figure 2.9 shows two traditional products made of marginal meat

Figure 2.8. *Grilled sardines, a fish that is rich in n-3 fatty acids, typically consumed during summertime, especially in Portugal. (source: photo by Sopotnicki/ Shutterstock)*

(small pieces of muscle, organs, blood) allowing the minimization of food waste, while ensuring (just) the necessary supply of animal-based protein. In fact, although plants are excellent sources of protein, they often lack or contain minimal amounts of some essential amino acids, which are best obtained from animal protein sources due to their higher bioavailability (Vaz-Almeida *et al.*, 2017b).

It is also significant that wild snails (nowadays farmed) have been a valuable food resource for Mediterranean peoples, and are now an appreciated delicacy, cooked as a snack (e.g., "caracóis à Algarvia", Portugal) or as part of a dish, namely in Spain and Greece, where many different snails' recipes exist.

Two of the most appreciated dairy products worldwide, cheese and yogurt, originate from the Mediterranean region, where they have been manufactured with the milk of small ruminants, whose composition may significantly differ from that of bovine milk (Halima et *al.*, 2015). Milk from goats, sheep, buffalos and camels (pseudo-ruminants) has been traditionally consumed in the Mediterranean Basin and primarily used for cheese making. Most traditional processes have been maintained In the case of cheeses, while the manufacture of yogurt was adapted to cows' milk, for which the process was optimized and standardized; yogurt is nowadays known as a global product produced by food corporations. The main driver to preserve local breeds of small ruminants is now the manufacture of

valuable cheeses with their milk.

Yogurt and cheese are interesting protein sources because, in addition to their high nutritional value, they may convey probiotics and other health benefits (common to fermented foods). Furthermore, the environmental impact of dairy products, when calculated by comprehensive consensual methodologies (such as LCA, introduced above), can be surprisingly low. The explanation may rely in the fact that most of the environmental burden is charged to the animal (e.g., direct GHG emissions and feed) and cannot be charged twice. In addition, a ruminant produces many litres of milk during its lifetime, and only the factors intrinsic to the dairy products are counted.

Many simple ancient recipes are based on the flavouring of dishes with traditional fish or meat preserves, and their seasoning with aromatic herbs and spices, thus dramatically reducing the use of fresh fish or meat, in an enjoyable way. Salads with cheese are part of the Mediterranean menu, as well as many vegetarian (lacto-ovo) recipes; in this case, plant-based proteins (e.g., beans or peas) compensate for the reduced intake of fresh meat and fish, or alternatively, sustainable animal proteins (e.g., cheese and eggs) may replace fresh meat and fish.

Nuts and dry fruits are favourite snacks, providing a wide range of nutrients and providing satiety in small portions, in contrast to the common industrial snacks that are high in calories, high in salt/sugar and usually contain flavour enhancers to stimulate the appetite. Nuts are fruits comprising a hard shell and a seed, and can be found in a wide variety of genera. Herein, the term 'nut' should be taken in the culinary sense, since it includes both fruits and seeds, according to the botanical classification. Native nuts from the Mediterranean region include walnuts (from *Juglans regia*), hazelnuts (from *Corylus avellana*), chestnuts (from *Castanea sativa*), almonds (from *Prunus dulcis*), pistachio (from *Pistacia vera*) and pine nuts (from *Pinus pinea*). The edible portion is usually the seed kernel. Across the Mediterranean Basin, nuts have traditionally been consumed raw or used to stuff dried figs or dates, appreciated appetizers and snacks. Nuts convey important health benefits, some of them officially recognized.

Various nuts are important ingredients in traditional desserts and pastries (Figure 2.10), along with dried figs and dates.

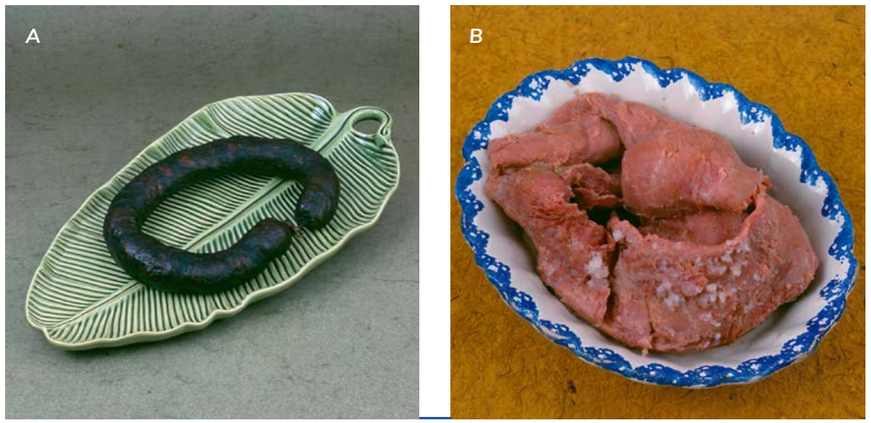

Figure 2.9*. Examples of a meat preserve (A) and a fish preserve (B) from the Mediterranean region, obtained by traditional methods. A, on the left: "morcela de carne de Monchique" (main ingredients are pork blood, minced meat and lard): an example of a meat preserve manufactured with side products of traditional pork killing. On the right, B: "estupeta" refers to an analogue situation for a fish preserve – the parts of the tuna fish not suitable for other purposes are washed, salt-dried and brined. Both of these preserves aims to be consumed in small quantities in stews and salads. In the case of salted products, a previous soaking step is observed before use (source: photos from Directorate-General for Agriculture and Rural Development, Portugal, DGADR, 2020).*

Figure 2.10. *Examples of a traditional pastry and a sweet snack (from Algarve, Portugal) both including almonds; once typically reserved for festivities, they can be easily found nowadays (although of widely variable quality). (source: photo by Amélia Delgado, on the left, and by DRAPAlgarve, on the right)*

2.5. INTERNATIONAL QUALITY CERTIFICATION SCHEMES AND OTHER CLAIMS

The concept of food quality is closely related to food safety, but for the purpose of the current section quality certification schemes will be explained assuming previous compliance with mandatory food safety and other legal requirements. Discussions on food safety and on food fraud are not here addressed.

Food quality is a subjective concept that generally combines sensorial, nutritional and environmental traits of foods as well as other attributes valued by the consumer; as a consequence, food quality relates with marketing. Quality can be associated to a brand and, for product grading/ classification, the consumer trusts the manufacturer only. Alternatively, quality evaluation can be obtained by verifying the compliance to pre-established standards, upon regular inspection by a given organisation. Several independent organizations – e.g., WWF (World Wildlife Fund), ISO (International Organization for Standardization) or the European Commission (EC) – deal with quality certification schemes. Producers' organisations may also support certification schemes for their associates, but the reliability of such processes can be highly variable.

In short, quality certification schemes are not the same as brand names, and they should be verified by independent organisations. Moreover, a quality certification scheme should apply to a class of food products that share certain attributes rather than to specific manufacturers or brands.

Official and private organizations may issue product certifications, often with a corresponding seal of quality, generally intended to inform the consumer of some appraisal about the superior quality or ethics-related features of the product. Today's consumer is exposed to a panoply of labels on food packages that he/she glances at quickly, as advertising (Grunert et *al.*, 2014). It is thus important to raise awareness of existing quality seals and schemes, namely those granted by the European Community as certifications for Geographical Indications (GI) and Organic/Bio foods[30].

The first European quality seals – GI (Geographical Indications) – linked traditional manufacture with biodiversity and the particularities of a given territory. Such labels are geographical indications of origin recognized as intellectual property, and they play an important role in trade. The GI, the Protected Designation of Origin (PDO), and the Protected Geographical Indication (PGI), protect the name of a product from a specific region and follows a specific traditional production process (European Commission [EC], 2020b).

These EU quality schemes are granted by the European Commission's Food, Farming and Fisheries department. Preparation of the application and quality supervision is the responsibility of local organizations, observing European legislation, which also defines how to use the logos in relation to each scheme, how the schemes should be applied, and provide the labelling guidelines for agri-food products which use PDOs or PGIs products as ingredients (EC, 2020b).

Food products, identified by specific names, and registered as *Protected Designation of Origin* (PDO) have the strongest links to the place where they are made and, to hold the logo A (Figure 2.11), every step of the production, processing and preparation process must take place in the specified region.

Product names registered as *Protected Geographical Indication* (PGI) show a particular quality, reputation or other characteristic that is essentially attributable to its geographical origin, and to hold the logo B, (Figure 2.11), at least one of the stages of production, processing or preparation must take place in the region.

Traditional Specialty Guaranteed (TSG, Figure 2.11) signifies that traditional know-how related to the product is protected, e.g., the way the product is made or its composition, without being linked to a specific geographical area. The product can be manufactured outside the region given its characteristics are guaranteed. TSG protects the product against falsification and misuse.

A search for registered EU geographical indications in the EC database of food quality labels (EC, 2020c) was undertaken in late 2019, to track quality logos of traditional Mediterranean foods in the regions participating in the MD.net project and belonging to the following countries: Italy, Portugal, Spain, Greece, Croatia, Cyprus, Slovenia, Albania and Bosnia-Herzegovina. The traditional items "olive oil", "endemic plant crops", "pork preserves" and "cheeses from small ruminants' milk" were searched for in the food categories of the database (wine was not considered because, in 2019, it followed different quality schemes).

Olive oil and wine are produced in all the studied countries, although to different extents. Also, the above-mentioned quality schemes and intellectual property protections have been applied to traditional Mediterranean products to different extents by different countries. Thus, the more distinct the foods within a category in each country, the higher the probability of retrieving

Figure 2.11. *Logos of EU Quality Schemes: Protected Designation of Origin: A-PDO, Protected Geographical Indication; B – PGI; and C, Traditional Specialty Guaranteed - TSG, which are considered as Intellectual property under a specific legal framework. The GI recognition enables consumers to trust and to distinguish quality foods while helping producers to better market their products (adapted from European Commission [EC], 2020b).*

[30] More information on concepts and applications of certification schemes and related claims can be found here.

GI registries. The opposite is also possible: if the number of foods from a given category is low or inexistent, then an absence of GI registries for that food category is most probable.

As shown in Table 2.3, in 2019, Spain, Italy and Portugal had records in the database corresponding to the targeted traditional foods from all searched categories, with long lists from Spain and Italy (data not shown).

The list of Greek olive oils and table olives holding geographical indications was remarkably long, denoting the preservation of agrobiodiversity in this sector. Italy also had a high number of GI entries protecting its outstanding olive oil varieties.

GI registries for endemic cultivars of fruits and vegetables were retrieved from Spain, Greece, Croatia, Italy and Portugal, as well as from Cyprus and Slovenia. In this category, the more numerous entries were from Italy and Greece, and the fewest were from Croatia. Greece apparently does not have any GI for pork preserves, which does not match the relevance of pork in Greece's food balance. An identical situation is observed for goat's cheeses from Cyprus, whose names and indications of origin do not seem to be protected. No GI registry was found for Croatian cheese from small ruminants, although goat and sheep cheeses from Croatia are reported. Finally, no Geographical Indications were found for any of the selected traditional Mediterranean foods (olive oil, endemic fruits and vegetables, pork preserves or cheese

Table 2.3 – Existing (X) and Non-existing (-) typical Mediterranean food products with an EC Geographical Indication label (PDO or PGI), from each MED.net participating country

	Country								
Foods granted with GI (EC)	AL	BA	CY	ES	GR/EL	HR	IT	PT	SI
Olive oil (oils and fats)	-	-	-	X	X	X	X	X	X
Endemic fruits or vegetables (fruits, vegetables and cereals)	-	-	X*	X	X	X	X	X	X*
Pork preserves (animal products)	-	-	X	X	-	X	X	X	X
Cheeses from small ruminants (cheeses)	-	-	-	X	X	-	X	X	X

Country names are abbreviated according to ISO 3166 alpha 2 country code.
Source: retrieved from European Commission [EC] (2020c).
In the first column, typical foods are indicated, followed by the corresponding food categories between brackets.
**not typically Mediterranean (unique and restricted to a small area).*

from small ruminants) from Albania (AL) or Bosnia-Herzegovina (BA), in contrast to the other Balkan countries represented in the MD.net project, Croatia (HR) and Slovenia (SL).

Another important certification scheme, in line with the Mediterranean Diet, is the Organic Food Certification. European (EU) food organic production and supply chain require a sustainable agricultural system, respectful of the environment and animal welfare. In order to display the label shown in Figure 2.12, farmers and food processors must comply with a set of rules, encompassing: crop rotation for an efficient use of resources; no chemical pesticides or synthetic fertilizers; very strict limits on livestock antibiotics; no genetically modified organisms (GMOs); use of on-site resources for natural fertilizers and animal feed; raising livestock in a free-range, open-air environment and the use of organic feed; tailored animal husbandry practices.

To use the logo shown in Figure 2.12, producers must ensure compliance with EU rules on organic production, but they also receive financial and technical support, including access to ongoing R&D efforts aiming at increasing productivity and quality of European (EU) organic food products (EC, 2019; 2020c).

The market for organic foods is expanding, both within the EU (main consumer countries are France and Germany) and elsewhere (USA, Canada and China). From 2012 to 2016, sales of EU's organic foods

Figure 2.12. *EU organic logo. (source: European Commission [EC] , 2019).*

increased by 47.7% and organic farmland increased by 18.7%. Spain and Italy are among the top producers of organic food in EU, with 14 and 8.5% of organic agricultural land, respectively, in 2016. In the same year, the fraction of agricultural land used for organic food production was 6.8% in Portugal, 9.1% in Slovenia, 6.1% in Croatia, 6.5% in Greece, 4.9% in Cyprus, 3.2% in Bulgaria and 1.7% in Romania (European Parliament, 2019b).

Other common logos, mainly displayed on packed processed foods, are related to fair trade, to the protection of rainforests, sustainable fishing, protection of dolphins, etc.

Relevant information on food labels includes nutritional claims (e.g., "light") and warnings of allergens, in addition to information on storage conditions, eat-by dates, lists of ingredients, and nutritional declaration – which highlights the composition in macronutrients, and other potentially beneficial (e.g., fibres) or potentially harmful (e.g., trans-fats) constituents, as well as recommended daily intakes (RDA)[31].

Food labels may also include a colour scale (ranging from red to green)

[31] At the EU level, food labelling is mainly regulated by Reg. (EU) No 1169/2011.

aiming to help consumers make healthier choices. A broad study from EUFIC (the European Food Information Council) involving self-reported food choices, sales data and national intake surveys, as well as behavioural measurements found that most consumers read food labels very rapidly, and pay most attention to price, eat-by dates, and marketing messages (including some "free of" claims targeting market niches) (European Food Information Council [EUFIC], 2016).

Researchers observed that the nutritional information was mostly disregarded by potential purchasers, with the nutriscore/nutritional facts and list of nutrients being most appreciated by consumers already following a healthy eating pattern. The study found no evidence that changes in food labelling may prompt consumers to make healthier food choices. Researchers suggested giving the consumers a task instead (e.g., "reduce your salt intake") (Hieke *et al.*, 2016, 2018; Hung & Verbeke, 2019), thus highlighting the importance of educating consumers to make healthier food choices – in this case, educating Mediterranean natives to increase their adherence to the Med diet.

2.6. FOOD TRADITIONS AND GASTRONOMY IN THE MEDITERRANEAN BASIN

Traditional Mediterranean festivities are aligned with the pace of nature, according to solstices, equinoxes and lunar cycles. Some festivities are of a religious nature; others blend religious roots with non-religious practices or are based on ancient pagan celebrations. Recently, some contemporary festivals have emerged.

In spring, Easter is the most prominent and common celebration in the Christian part of the Mediterranean region. It may involve processions along the streets and elaborated meals starring the lamb dishes – for their biblical symbolism –, ending-up with egg-based desserts, an expression of nature's rebirth and blossoming. Orthodox Easter is celebrated in Greece and Cyprus in slightly different dates from the catholic Easter, while in the Balkans both dates may be celebrated. Each country blends the common religious rituals with its own secular customs, from lighting bonfires in Croatia, to spraying young girls with perfume in Serbia, to passing under the table in Romania. The common cultural aspects of ancient practices are closely linked with convivial meals involving the enlarged family.

In Morocco, the Festival of Roses in May marks the rose harvesting season. It is held at a place known as Valley of Roses, where most of the Moroccan rose water is produced, a staple in Middle Eastern cooking and folk medicine.

Still in May, "Kataklysmos"(meaning flood) is a popular festival in Cyprus and Greece and carries religious undertones, as it comes from the Biblical tale of Noah's flood. It is nowadays celebrated with water games, folklore dances and traditional arts. Elsewhere, namely in the Algarve, Portugal, ancient pagan celebrations related to harvest abundance have been revamped into attractive local cultural festivals.

In summertime, festivities occur in open air, the streets are often decorated, and people enjoy the warm weather, music and dancing, as well as specialty foods of the season – a splendid variety of fruits, vegetables and seafood. Markets showcasing traditional foods and crafts, and communal meals are frequent elements at these festivities.

In June, all over the Iberian Peninsula and Italy, celebrations in honour of Christian saints, also integrating other cultural elements, invade the plazas and patios with music, decorations and lights, fairs and carnivals, bringing the people outside until late at night, and attracting tourists. Again, foods of the season are an essential part of such celebrations.

In August, at the peak of summer, each Christian community, from the small fishermen communities to the isolated villages in the hills, has its own festivities, in honour of Our Lady. Such celebrations probably originated from *Feriae Augusti*, the festival of the emperor Augustus, meant as a period of rest after the hard-labour season in the agricultural sector, and later merged with religious celebrations (Grant, 2019). Again, processions, markets, outdoor festivals, and communal events and meals, mark the dates. The culinary traditions highlight the products of the season and special cakes and desserts (Freitas, 2015; Queiroz, 2015).

Christmas is the dominant celebration in winter, a festivity that takes place mainly indoors with the (enlarged) family, as the weather is generally rainy and colder. Christmas culinary traditions vary hugely in the details, from region to region, although the common features are the richness, abundance and laborious preparation of dishes, contrasting with the simplicity of regular daily cuisine. Even in poorer homes, Christmas meals are richer than usual. The enlarged family gathers to prepare special traditional dishes that include abundant meat, dry fruits and nuts, and special desserts.

As with other cultural features, the culinary is also part of the common heritage of the Mediterranean peoples, and although varied across the Mediterranean region, it is rooted in the same historical influences, population fluxes and trades. In other words, it is worth stressing that Mediterranean cuisine is widely diversified, with room for regional variations that optimize endemism and seasonality, yet grounded on common principles and sharing relevant culinary features and ingredients. It is simple yet exquisite, rooted in the balance of nutritional

excellence while respectful of nature.

When broadly examined, Mediterranean culinary heritage shares the features presented in section 2.2 while making use of the products presented in section 2.4, and showing regional features, when analysed in more detail. The local cuisines are most often balanced with ingredients from the sea and from inland, exchanged in local markets where farmers and urban consumers meet. Such revamped local fresh food trades may become important to ensure independence from external markets during crises and in improving sustainability (by reducing food miles), while observing international rules, namely those concerning food safety.

CHAPTER 3. THE MEDITERRANEAN DIET – NATURAL AND CULTURAL HERITAGE AND TOURISM

As the reader may recall from chapter 1, the strategic location of the Mediterranean Basin, where three continents converge, allowed population fluxes that were conditioned by geological features (mountain boundaries) and settlements were favoured by the mild climate of the lands bordering the Mediterranean Sea. The identity and commonalities of such lands were first noted in the mid 20th century by geographers such as Orlando Ribeiro[32], historians such as Fernand Braudel[33], and medical doctors such as Ancel Keys[34]. Each described the Mediterranean from a different perspective. More recently, these different perspectives were brought together in the Mediterranean Diet concept, classified as Intangible Heritage of Humankind (UNESCO, 2013), as detailed in chapter 1.

Having prospered following the agricultural revolution (about 10 000 BC), the Mediterranean region became a destination for summer vacations, and a source of cheap labour for the leaders of the industrial revolution (Ribeiro, 1968), during the 20th century. Mass tourism, defined by standardisation and large scale, grew on the Mediterranean coastlines over several decades and triggered changes that are now recognised as deleterious from various viewpoints. In times of rising importance of Information and Communication Technologies (ICT) and of increased concern for the environment, mass tourism is gradually being replaced by new sustainable and creative forms of showcasing the natural, historical and cultural richness of the Mediterranean. Such forms apply to urban tourism, in historical cities, as well as to environmentally sensitive areas, helping to raise awareness about them, by engaging visitors in creative cultural activities that may encompass enhanced use of ICT, and e-tourism.

[32] Orlando Ribeiro, a Portuguese geographer (1911-1997) who deepened the concepts of Atlantic Europe and Mediterranean Europe.

[33] Fernand Braudel, a French historian (1902-1985) who carried out research about the Mediterranean region and emphasised the role of large-scale socioeconomic factors in History.

[34] Ancel Keys, an American Medical doctor (1904-2004) who first noticed and documented the health benefits of the Mediterranean dietary pattern and lifestyle.

3.1. INVENTORY, CLASSIFICATION AND SAFEGUARDING OF RESOURCES

The concepts of Natural and Cultural landscapes, dealt with in chapter 1, are herein analysed as tourism assets. It cannot be overstressed that natural sites have been intervened by humans in some form, due to the long and dense human occupation of the Mediterranean territories, thus associating cultural elements and interlinking cultural landscapes. Tourism has been finding new ways to help preserving and raising awareness on Mediterranean natural beauties and cultural richness, while contributing to regional development. Keeping such a balance is crucial, as the environmental degradation and biodiversity loss from the Mediterranean Sea and surrounding lands are now important concerns. Remediation and conservation actions are prioritised by international organisations such as the World Wild Fund and the International Union for Conservation of Nature. Many of such actions include guidance for ecotourism (World Wide Fund For Nature [WWF], 2020; International Union for Conservation of Nature [IUCN], 2020b).

The equilibrium between human action and the environment is particularly evident in traditional Mediterranean agriculture, which has created distinctive rural landscapes, some of which are recognised by the FAO as Globally Important Agricultural Heritage Systems (GIAHS): olive groves, vineyards, agro-silvo-pastoral systems and historical irrigation systems, from Portugal, Spain and Italy (FAO, 2020b). Traditional Mediterranean agricultural systems are now recognized internationally as sources of inspiration for revamped models of regenerative and sustainable agriculture and forestry, adapted to the territory.

Chapter 1 emphasised the role of the Roman Empire in uniformising societies and landscapes (from crops to constructions), showing how such influence still prevails in its territory. Figure 3.1 illustrates how the Roman Empire spread common agricultural crops across the Mediterranean which slowly evolved into different plant varieties depending on the new ecological niche. It is noteworthy that the vast agrobiodiversity of the common widespread species (e.g., countless cultivars of *Olea europaea* or *Vitis vinifera*) can explain most of the variety of local Mediterranean cuisines and the common ground they share.

The Mediterranean Basin is a densely populated area with landscapes strongly shaped by humans, through the replacement of many original forests by alien species (including from the Americas). This resulted in a variety of landscapes with rich ecosystems and diverse habitats harbouring unique plants and animals (known as endemic species[8]) inventoried and now safeguarded by international, national and regional frameworks.

Figure 3.1. *Picture of a woman with a wreath of olive leaves on her head, decorating the floor of Roman thermae at Stolac, Herzegovina. (source: photo by Maja Lopin)*

Mediterranean Natural Landscapes encompass:

- Under UNESCO: **Biosphere reserves,** sites with a balanced management of culture and biodiversity; **Global Geoparks,** intended to protect geodiversity by engaging local communities; and **World Natural Heritage Sites** that aim to promote the conservation of natural sites of outstanding universal value (UNESCO, 2017; 2020);
- Under the European Union: the **Natura 2000** network (European Commission [EC], 2020d), a system for management of natural sites, with an approach to conservation centred on people working with nature, aiming to halt biodiversity loss and comply with the 2010 International Convention on Biological Diversity; the European Environment Agency provides an information system useful for the management of protected natural areas, through environmental indicators, monitoring and reporting (European Environment Agency [EEA], 2019b);
- At an International level: **Ramsar sites**, wetlands under the framework of the International convention of the wetlands (Ramsar, 2014) and of particular relevance to the Mediterranean region, in ecological and economic terms; the conservation of Mediterranean wetlands is

challenged by climate change as well as by anthropogenic pressures and other threats;

- At a National level: countries manage and protect their relevant natural sites in **National Natural Parks** which, despite differences in national regulations, have conservation objectives, generally under the IUCN's guidance (IUCN, 2017, 2020b);
- At a Regional level: governmental organizations may regulate additional natural protected areas, with "regional" or "local" qualifiers and may encompass private protected areas (e.g., Local Protected Landscape of Rocha da Pena[35], Loulé, Algarve, Portugal).

In addition to the richness and variety of natural assets, the Mediterranean region's cultural wealth is well-known and well-established, encompassing magnificent archaeological sites, monumental buildings and famous artworks, as well as handcrafts, vernacular architecture, singing, culinary arts and other regional expressions of popular culture, which should all be considered in the context of MD.

Cultural assets are generally divided into two main categories which are often interlinked: Material and Immaterial Heritage. Since cultural associations between natural sites, structures and socio-cultural features are common in the Mediterranean, the interdependences between material and immaterial heritage are the rule, and a huge number of "cultural hotspots" can be found across the relatively small Mediterranean region.

Concerning Intangible Heritage, UNESCO's lists of the 2003 convention (UNESCO, 2003, 2019) are organized in five domains[36], as follows:

- Traditional craftsmanship;
- Oral traditions and expressions;
- Performing arts;
- Social practices, rituals and festive events;
- Knowledge and practices concerning nature and the universe.

It is worth recalling that the MD falls into most of the above domains, and that UNESCO states that "*The Mediterranean diet involves a set of skills, knowledge, rituals, symbols and traditions concerning crops, harvesting, fishing, animal husbandry, conservation, processing, cooking, and particularly the sharing and consumption of food*" (UNESCO, 2013).

Each region of the Mediterranean generally has an assortment of unique cultural assets related in some way to the MD, which is useful to organize innovative tourism offers. Further information on such MD-related cultural assets is presented below and illustrated with selected examples, from the MD.net project's participating regions, to show their connection with the Mediterranean Diet from the tourism point of view.

[35] Example of a *Natural protected area under a regional framework* 🌐.

[36] Interactive map of the *five intangible heritage remains* 🌐 of UNESCO.

Natural parks, Geoparks and other protected areas

An exhaustive inventory of the relevant natural assets of the Mediterranean region would be too long, therefore a short list based on categorisation and sampled examples will be here presented instead. Some concepts about natural areas are introduced, as well as aspects related with the tourism approach, and actual examples from the MD.net project's regions are given.

In the spirit of the Project MD.net – strengthening the exploitation of the Mediterranean Diet (MD) by establishing transnational networks–, the rich Mediterranean heritage is herein sampled with criteria that prioritise the world heritage legacy recognized by UNESCO as related with the MD, and then go to lower levels of importance, stressing regional features, whenever appropriate.

The current inventory first presents a multinational reserve, rooted in current Mediterranean habitats, which are the result of many centuries of interactions between humans and nature.

The Ancient and Primeval Beech Forests of the Carpathians and Other Regions of Europe[37] stand in the world heritage list of UNESCO as a large transboundary Biosphere Reserve. The site includes ten separate massifs extending from Ukraine to Slovakia, encompassing 12 countries, including Albania, Croatia, Slovenia, Italy and Spain. Seventy per cent of these forests are in Ukraine, including large "buffer" zones and only a small part of them is accessible to visitors. The relevance of this reserve, according to UNESCO (2017, 2020), is that "(...) Since the end of the last Ice Age, European Beech spread from a few isolated refuge areas in the Alps, Carpathians, Dinarides, Mediterranean and Pyrenees over a short period of a few thousand years in a process that is still ongoing. The successful expansion across a whole continent is related to the tree's adaptability and tolerance of different climatic, geographical and physical conditions". Such forest types were in the origin of the Mediterranean landscapes, which have been heavily shaped by humans along millennia.

In ***Albania***, the *Butrint National Park* stands out for its relationship with the monuments classified as UNESCO's World Heritage (UNESCO, 2020). This cultural landscape is a remarkable example of the close link between material and immaterial aspects of cultural heritage, highlighting the interactions between humankind and nature over times. Butrint National Park was inscribed in the National Heritage List of Protected Monuments in 1948. The natural values of the Butrint Wetlands were recognized by the Ramsar Convention in 2002. In 2005, based on the Law on Protected Areas, Butrint was declared a National Park, covering 86 km². The National Park acts as a buffer zone for the World Heritage property (Ramsar, 2014, UNESCO 2020). The *Divjakë-*

[37] Almost pristine transboundary property which is related to Mediterranean habitats – *UNESCO list* 🌐.

Karavasta National Park is also noteworthy, namely for the presence of Mediterranean elements – olive orchards and vineyards (possibly of cultivars adapted to colder weather), which are somewhat reflected in the local cuisine.

Herzegovina is a southern region of Bosnia and Herzegovina and it belongs to the Mediterranean world mainly due to its geographical position. Its Mediterranean ambience results from its climate, flora and fauna, local mentality, tradition, food, lifestyle and working habits. The region has a National Park that is an important wetland, *Hutovo Blato*, Ramsar site 1105 (Ramsar, 2014), located near the estuary[38] of the river Neretva, 30 km from the city of Mostar. The park comprises swamps, lakes, wet meadows and riverine forest, and provides favourable natural conditions for many wetland species, particularly birds and fish, several of which are endangered. The wetlands primarily consist of marshlands fed by the underground aquifer system of the Krupa River. Nearby, wild Mediterranean plants such as sage, thyme, and heather can be found and convey their scents to locally produced honey.

The Split-Dalmatia region (Croatia), comprises the landscape of *Stari Grad Plain* on the island of Hvar. This is inscribed as a UNESCO World Heritage site, a cultural landscape that has remained practically intact since it was first colonized by Ionian Greeks from Paros, in the 4th century BC, and where the human built structures are, generally in their original forms. The ancient layout has been preserved by careful maintenance of the stone walls over 24 centuries, along with the stone shelters, and the water collection system (UNESCO, 2020). Also according to the information in the world heritage list (UNESCO, 2020), the same crops, mainly grapes and olives, are still grown, and the site is also a nature reserve and a valuable example of the ancient Greek system of agriculture, with its geometrical arrangement of land division, the "chora", which has remained virtually intact. The site is of great importance for MD as it shows the functioning of initial agrarian civilizations, since Dionysius of Syracuse (Sicily) established Paros (now Stari Grad) as a Greek colony in 385 BC, intended to provide a base for further colonization, when Pharos was an agrarian economy. It remained important as a maritime and agricultural centre until the Middle Ages. The site has remained practically unchanged, although the original crops have been augmented with wheat, carob and fig, and the name changed over the centuries. The Greeks called it "Chora Pharu" and the Romans "Ager Pharensis"; in medieval times the site was known as "Campus Sancti Stephani" (the Field of St. Stephen). This landscape is linked to two inscriptions in the UNESCO's list of Intangible Cultural Heritage: one related to the craft of lacemaking, with which a festival is associated, and another one related to a religious celebration of the Christian Easter (on a variable date in spring).

On the mainland, two wetland areas are noteworthy, the Vransko Lake and Neretva River Delta[39]. The *Vransko Lake* is the only brackish natural lake on the coast of Croatia and is inscribed in the Ramsar list (Ramsar, 2014). It is situated on a shallow karst[40] bed, separated from the Adriatic Sea by a narrow karst ridge. Significant seasonal variations in water level and salinity, due to the intrusion of sea water through the permeable karst, have created conditions for the development of very specific habitats, including seasonally flooded arable land, and typical Mediterranean scrubland in the hills. Some of these areas are included in the EU Natura 2000 list of protected habitats (EC, 2020d). The site is a nesting, wintering and resting area for many threatened waterbirds, also providing habitat to the critically endangered European eel (*Anguilla anguilla*) (EEA, 2019b; IUCN 2020a). Considerable threats to the site, such as reed burning, illegal fishing and hunting, have been significantly mitigated since the establishment of the protected area, and continue to be addressed through local education and implementation of the management plan.

The *Neretva River Delta* is a protected wetland (Ramsar Site 585) and an important Bird Area, Protected Ornithological Reserve, Wilderness Area, and Protected Landscape, part of the Natura 2000 network (EC, 2020d; Ramsar, 2014). The Neretva is the largest river of the eastern Adriatic watershed, crossing Bosnia and Herzegovina and Croatia, and its final section in Croatian territory forms an extensive delta with large reedbeds, lakes, wet meadows, lagoons, sandbanks, sandflats and saltmarshes. The area is an important stopover site for migratory birds and is exceptionally rich in fish species. The delta plays a very important role in flood control and sediment trapping. Besides the traditional agriculture landscape, there are large complexes of intensively managed agricultural land with plantations of tangerines and greenhouses with vegetables. The delta is also rich in cultural and historical heritage. The largest threats relate to water management issues and agriculture overexploitation (eutrophication, fertilizer pollution, land reclamation, and habitat fragmentation).

In **Cyprus,** the *Troodos Geopark* (UNESCO, 2017; 2020) is of capital importance for many reasons, firstly because the formation of Cyprus is directly linked to the creation of the Troodos mountain range. This is a ophiolite complex, resulting from a series of unique and complex geological processes that took place 90 million years ago, 8000 metres below sea level. The Troodos Geopark is located in the central part of Cyprus and it is a World Heritage Site hosting 10 UNESCO's listed Byzantine Monuments, in addition to many more archaeological sites and inhabited villages (Figure 3.2).

[38] According to Encyclopaedia Britannica, the term "estuary" derives from the Latin words aestus ("the tide") and aestuo ("boil"), indicating the effect generated when tidal flow and river flow meet, at the river mouth; an estuary is thus a partly enclosed coastal body of water in which river water is mixed with seawater (brackish water). In a general sense, the estuarine environment is defined by salinity boundaries rather than by geographic boundaries, namely in species selection.

[39] According to Encyclopaedia Britannica, a river delta refers to the landform produced when a river enters a body of standing water and involves the deposition of sediments from the river flow. The Greek letter "Ω" was used by Herodotus, an historian from ancient Greece, to describe the Nile river at its mouth, since the seaward-diverging distributary branches of the Nile and the sea.

[40] Karst is a terrain of rocky ground, caves, sinkholes and underground rivers that results from the excavating effects of underground water on massive soluble limestone. The term was originally applied to the Karst (or Kras) physiographic region, northeast of the Gulf of Trieste in Slovenia, and now extends to other locations around the globe, sharing similar features.

In **Crete (Greece),** there are two main geoparks of the Global Geopark Network of UNESCO (2017): the *Psiloritis* and *Sitia Natural Parks*.

Psiloritis is a cultural landscape comprising the Psiloritis mountains and its northern coastal zone in central Crete. The park is remarkable for the associated ancient Greek mythology, encompassing the area where Zeus, the king of gods, grew up, the Idaion Andro cave (in Nida plateau), the most important religious site of the Minoan period in Crete, as well as the classical town of Eleytherna. The Park combines the unique Natural Environment (part of the area belongs to the Nature 2000 network) with a long and important history, distinctive customs and traditions, and relevant geological features. The Geopark itself is subdivided into sub-parks, each presenting a major geological feature. In the Psiloritis mountains, mythology, folklore, tradition, and natural environment meet to claim that it is the mountain of gods and humans, of nature and tradition, and of the real Cretan spirit.

The *Sitia Geopark* is also listed in the Global Geoparks Network (GGN) of UNESCO (2017). The limestone environment contains abundant mammal fossils and karstic structures,

Figure 3.2*. A landscape view of Troodos Geopark in Cyprus. (source: photo by Argus II/ Shutterstock)*

its most relevant characteristic, as well as more than 170 caves and many gorges (UNESCO, 2017; EC, 2020d).

Italy is extremely rich in MD related-heritage sites encompassing outstanding Geoparks, Biosphere reserves, Natural parks, as well as many outstanding cultural sites, recognised as World Heritage sites by UNESCO (2020).

In the ***Campania region,*** the *Parco Nazionale del Cilento e Vallo di Diano* is a National park and a geopark of the Global Geoparks Network (UNESCO, 2017), peculiar for its diverse geomorphology, encompassing carbonate massifs characterized by karst features including caves. The size and geodiversity of the territory are matched by the variety of important ecosystems. A large part of the territory coincides with Biosphere Reserves, such as the *National Park of the Cilento and Vallo di Diano* which is included in the UNESCO list of World Heritage Sites since 1998 (EC 2020d, UNESCO 2017, 2020). Of no less importance as a natural area is the *Oasi del Sele-Serre Persano*, a Ramsar site, also of community importance under EU Natura 2000 (EC, 2020d; Ramsar, 2014) and protected as a National Nature Reserve. According to Ramsar (2014), the *Oasis of Persano* contains mostly wetlands and the surrounding landscape consists of inundated meadows, riparian woodland, flooded forest, fens and swamps. The dominant vegetation and habitat types are typical and emblematic of the Mediterranean region. Another important area is the *Oasi di Castelvolturno o Variconi*, a wetland part of the larger "*Volturno Costa Licola Delta*". This Nature Reserve is one of the areas with the largest numbers of aquatic bird species on the Tyrrhenian coast. Hundreds of species and thousands of birds pass through the delta and/or spend the winter by the ponds (EC, 2020d; IUCN, 2020a,b; Ramsar, 2014).

The **Emilia-Romagna region** has 13 UNESCO world heritage sites, 9 of which are natural spots that, together with many Natural parks in the Natura 2000 network, are worth visiting. The *Po river delta* is particularly relevant as an emblematic example of a landscape that fully blends the natural, cultural and social dimensions of the MD. It is integrated in the cultural landscape of Ferrara, a UNESCO's World Heritage Site. The valley of the *Po River delta* has been occupied by human settlements for millennia and includes dunes, wetlands, woodlands and pine woods, such as "Bosco della Mesola" and "San Vitale pinewood", as well as many important monuments including abbeys, historical town centres, and the "chiaviche" (monumental water locks). Other relevant wetlands in the Emilia-Romagna region are "Punte Alberete", "Sacca di Bellocchio", "Ortazzo e Ortazzino" and "Piallassa della Baiona and Risega" (EC, 2020d; UNESCO, 2020; Ramsar, 2014).

The ***Sicily region*** offers the magnificence of the natural forces at *Isole Eolie* (Aeolian Islands), a UNESCO World Heritage site. This

volcanic archipelago is located to the north of Sicily (Figure 3.3).

According to UNESCO (2020), *The Aeolian Islands (Isole Eolie)* provide an outstanding record of volcanic island-building and destruction, and of ongoing volcanic phenomena, with examples of two types of eruption(Vulcanian and Strombolian), and thus have featured prominently in geology teaching for more than 200 years.

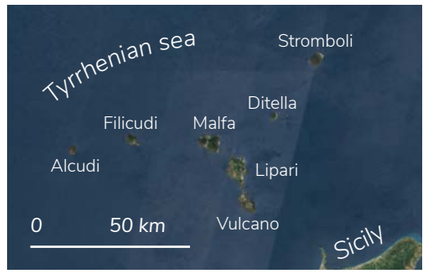

Figure 3.3. *Isole Eolie (Aeolian Islands) is an outstanding volcanic archipelago recognised by UNESCO as a world heritage site for its natural and cultural relevance. Upper image: Map of the Aeolian Islands, named according to the belief that they were home to the ancient Greek divinity "Aeolus". (source: s - https://s2maps.eu by EOX IT Services GmbH -contains modified Copernicus Sentinel data 2017 & 2018) Lower image: A view of Stromboli island with a pyroclastic flow down the volcano's flank. (source: photo by Vladimirat/ Shutterstock)*

Another prominent volcanic landscape in Sicily, *Mount Etna* is an iconic site encompassing 19 237 uninhabited hectares on the eastern coast, and is also on UNESCO's world heritage list. It is the highest Mediterranean island mountain and the most active stratovolcano in the world. It supports important terrestrial ecosystems including endemic flora and fauna, and its volcanic activity makes it a natural laboratory for the study of ecological and biological processes (IUCN, 2017; UNESCO, 2020).

Sicily's Nature Reserves include the *National Park Isola di Pantelleria*, and the *Regional Parks of Etna*, *Fiume Alcantara*, *Madonie*, *Nebrodi* and *Monti Sicani*. The marine protected areas encompass *Isole Egadi*, *Isole Pelagir*, *Plemmirio*, *Capo Gallo - Isola delle Femmine*, *Capo Milazzo*, *Isola di Ustica* and *Isole Ciclopi*. The long list of Regional Nature Reserves include some World Heritage sites and surrounding areas, such as *Isola di Alicudi*, *Isola di Stromboli e Strombolicchio*, *Isola di Volcano*, *Trapani and Paceco Salt Ponds*, and *Vendicari*.

The **Algarve region** (Portugal) contains several wetland ecosystems and habitats protected by the Ramsar protocol (Ramsar, 2014) and included in the Natura 2000 network (EC, 2020d), some of which are under special protection:

- *Ria de Alvor*, Ramsar site 827, a National Ecological Reserve consisting of a coastal lagoon and an estuarine wetland system, separated from the sea by sand spits. The site includes stable and mobile dunes with characteristic vegetation, intertidal sand and mudflats, tidal saltmarshes, and salt pans. It is an important stopover site for many trans-saharan

Figure 3.4. *Porphyrio porphyrio (commonly called "camão" in Portuguese, meaning "eating with the hand") is a symbol of Ria Formosa Natural Park, in Algarve, Portugal. (source: photo by Tiago Guerreiro)*

passerines, with nationally important numbers of several species of avifauna breeding at the site. The area is valued for its aquatic life, which includes commercial shellfish production. A field station and bird-ringing station are located at the site;

- *Ria Formosa* is under Special Protection as part of the Natura 2000 network, as a National Natural Park, as well as by the Ramsar convention. It is a complex of coastal saltwater lagoons and barrier islands, with extensive mudflats, sand banks, dune systems, saltmarshes, and others. The area is important for birds, harbouring numerous species of breeding, wintering and staging waterbirds, including egrets, ibis and others (Figure 3.4). The site is also of botanical importance, supporting several endemic plants, and is a major fish nursery (EEA, 2019b);

- *Sapais de Castro Marim*, is a protected area as a Ramsar site 829 and as a Nature Reserve in the Natura 2000 network. It is a complex estuarine system of creeks, alluvial plains, saltmarshes and artificial salt pans ("salinas"), subject to fluctuations in tidal amplitudes and salinity levels. The wetland is noteworthy for its halophytic saltmarsh communities and distinctive shrubby vegetation adapted to a hot, dry and saline environment, and resilient to changes caused by tidal effects. The site supports several species of breeding waterbirds and a small heronry, and is crucial for large numbers of non-breeding flamingos (*Phoenicopterus ruber*) and spoonbills (*Platalea leucorodia*) (EEA, 2019b). The wetland plays a crucial role in maintaining water tables and flood attenuation, and serves as a freshwater reservoir in one of the driest areas of Portugal. The site is also noteworthy for its historic Roman and Arab settlements.

The main features of the ***Vzhodna region*** In south-western Slovenia are the flysch[41] and limestone rocks, the relatively warm sub-Mediterranean climate and its coastal location.

The Mediterranean area in Slovenia merges the Karst[40] and the Istrian coast. Typical Mediterranean towns are closely related to the green Istrian areas, the home of an original cuisine with olive oil and wild plants. The Karst originated caves which are among the most visited ones in Europe, revealing the magnificent Škocjan Caves, a protected World Heritage site (UNESCO, 2020) (Figure 3.5).

To the interior of Slovenia, the border between the markedly coastal Mediterranean and the predominantly continental Dinaric regions is not clear, but it rests primarily on the edges of high karst plateaus with a typical Dinaric direction from the northwest to the southwest.

The *Secoveljske Soline* (Ramsar 2014) is a remarkable coastal wetland. This Nature Reserve, in the Krajinski park, is an area of tidal mudflats, salt pans, and saltmarshes supporting reedbeds and salt-resistant vegetation at the mouth of a channelled river. The site is important for various species of breeding, wintering

[41] A layered sedimentary rock found in mountain ranges such as the Carpathians across eastern Europe.

Upper image:

Figure 3.5. *Underground water stream and cave at Skocjan Caves Park, in the region of Vzhodna, Slovenia. (source: photo by Andywand / Shutterstick)*

Lower image:

Figure 3.6. *Salt pans and artisanal salt extraction at "Krajinski park Sečoveljske soline", in the region of Vzhodna, Slovenia (source: photo by I. Škornik).*

and large numbers of staging waterbirds. Numerous nationally rare invertebrates and halophytic plants[42] occur at the site, and the area is important for conservation education, outdoor recreation, and scientific research. Salt pans have been operating in the delta for hundreds of years, with 40% of the site consisting of operational salt pans, which are commonly used across the Mediterranean Basin to produce "fleur de sel" and other valued non-refined forms of salt (Figure 3.6).

In the ***Andalusia region (Spain)***, the *Tabernas Desert* is an outstanding biosphere reserve with various types of sub-climates, located between the "Sierra de los Filabres" and the "Sierra de Alhamilla" in an area with little rainfall known as "Levante" (EC, 2020d; IUCN, 2020b). It is home to rare plants, such as sea lavender (*Limonium insignis*), reptiles and amphibians, birds and some mammals (EEA, 2019b). The Natural Park is located in the Almeria province.

On the Atlantic coast of the Mediterranean Basin, *Doñana National Park* ("Coto Doñana"), near Huelva, is a biosphere reserve supported by the World Wildlife Fund (WWF, 2020). It is also a World Heritage site, a UNESCO Biosphere Reserve, Ramsar site 234, and a Natura 2000 Special Protection Area (EC, 2020d; Ramsar, 2014; UNESCO, 2020). Doñana National Park occupies the right bank of the Guadalquivir estuary. It is noteworthy for the great diversity of biotopes, especially lagoons, marshlands, fixed and mobile dunes, scrub woodland and *maquis* and for hosting five threatened bird species (EEA, 2019b). The vast coastal marshland complex is separated from the ocean by an extensive dune system and subject to seasonal variations in water level and salinity. Vegetation includes aquatic species, salt-tolerant plants, *Pinus pinea* forest, and grasslands.

Another relevant wetland in the region is *Bahía de Cádiz*, protected as a Natural Park, Ramsar site 1265, and Special Protection Area and proposed Site of Community Importance (EC, 2020d; Ramsar, 2014). The Bay of Cadiz is an outstanding example of Atlantic tidal marshes in the Iberian Peninsula; some salt marshes were transformed into salt pans, whereas others reverted to more natural habitats or were transformed for aquaculture. Natural habitats also include sandy beaches and rocky islets. Considering the current high rates of species extinction, the Bay of Cadiz is crucial for migrating and wintering waterbirds, and it also harbours more than 1% of the breeding populations of five different shorebirds (EEA, 2019b; IUCN, 2020b).

Cabo de Gata-Níjar Geopark is one of the few sub-desertic areas in continental Europe and was the first maritime and terrestrial Protected Area in Andalusia (UNESCO, 2017). This Global Geopark has received different international awards for its natural values.

[42] Halophytic plants encompass botanical species which can grow in saline environments (e.g., in brackish waters), due to its resistance to high salt concentrations.

The **Catalonia region (Spain)** has the *Central Catalonia Geopark* (UNESCO, 2017), of great geodiversity and with outstanding examples of stratigraphy, sedimentology, tectonics, karst systems, palaeontology, and palaeoanthropology. The faunal content of its sedimentary rocks shows multiple examples of highly diverse life forms from past geological eras. The best known and most abundant fossils are of marine origin, from organisms living in warm shallow seas which covered the region 55 million years ago. The Catalan Potassic Basin, one of the largest potassium salt mining areas in Europe, gathers excellent examples of geodynamics and of historical mining activities.

A noteworthy wetland in Catalonia is *Delta del Ebro*, protected as Ramsar site 593, a fragile habitat which is also a Special Protection Area EC Directive, Natural Park, Natural Reserve, and National Hunting Refuge. As a fluvial delta, it includes shallow coastal waters, beaches, dunes, saline lagoons, freshwater marshes, and freshwater pools fed by groundwater springs. The site supports internationally important numbers of numerous species of waterbirds. Up to 30 000 pairs of waterbirds nest, and 180 000 individuals winter at the site every year (EC, 2020d; EEA, 2019b; Ramsar, 2014).

Catalonia harbours rich and diverse habitats ranging from the Pyrenees to peninsulas such as *Cap de Creus*, marshlands and sandy beaches. The varied and impressive nature has influenced the local cuisine, which is flavoured and colourful.

Built heritage and other MD-related Intangible Heritage

The most prominent monumental and archaeological sites in the Mediterranean regions participating in the MD.net project are listed in this section, highlighting those with a Mediterranean character and recognized as World Heritage by UNESCO; the inventory is not exhaustive. At these sites, the anthropogenic pressure is minimised, and tourism helps raising awareness and provides resources to preserve them. Additional information on the listed world heritage can be found on the UNESCO website (UNESCO, 2020) and footnotes.

The cultural landscape of *Butrint*, in ***Albania***, already described above, stands out as World Heritage (UNESCO, 2020; Ramsar, 2014). The present archaeological site is a repository of ruins representing each period of the city's development. While encompassing an important marshland, *Butrint National Park* also acts as a buffer zone to the monuments. The World Heritage Historic Centres of Berat and Gjirokastra are remarkably well preserved, including their vernacular buildings, although they have been continuously inhabited since ancient times (Figure 3.7). Situated in southern Albania, these fortified city centres bear witness to the wealth and diversity of the urban and architectural heritage of this Balkan region. According to

UNESCO (UNESCO, 2020), Berat and Gjirokastra are rare examples of an architectural character typical of the Ottoman period. Berat bears witness to the coexistence of various religious and cultural communities over the centuries. It features a castle, locally known as the Kala, most of which was built in the 13th century, although its origins date back to the 4th century BC. In the citadel area there are several Byzantine churches, mainly from the 13th century, as well as several mosques built under Ottoman rule.

The **Herzegovina *region (Bosnia-Herzegovina)*** includes the city of Mostar, where *the Old Bridge Area of the Old City of Mostar* is classified as World Heritage (UNESCO, 2020), as an outstanding example of a multicultural urban settlement. The historic town of Mostar, in a deep valley of the Neretva River, developed in the 15th and 16th centuries as an Ottoman frontier town and, later, during the Austro-Hungarian period in the 19th and 20th centuries. Mostar has long been known for its old Turkish houses and Old Bridge, *Stari Most*, after which it was named. During the 1990s conflict, however, most of the historic town and the Old Bridge, designed by the renowned architect Sinan were destroyed. The Old Bridge was recently rebuilt and many of the buildings in the Old Town have been restored or rebuilt with the contribution of an international scientific committee established by UNESCO. The Old Bridge area, with its pre-Ottoman, eastern Ottoman, Mediterranean and west European architectural features is a symbol of reconciliation, international co-operation and coexistence of diverse cultural, ethnic and religious communities. In these borderlands of the Mediterranean Basin, the Mediterranean influence on architecture is still visible, for example, in the sahat-tower and on decorations of particular sacred objects or buildings such as the indoors of Tabačica Mosk in Mostar (Figure 3.8), decorated with Mediterranean motifs such as grapes and pomegranates.

Figure 3.7. *Late medieval building of Mediterranean style, an example of Albanian vernacular architecture. (source: photo by RossHelen/ Shutterstock)*

The **Split-Dalmatia region (Croatia)** has several inscriptions in the World Heritage list that are relevant to the MD. The *Historical Complex of Split with the Palace of Diocletian* encompasses the historical centre of Split with the ruins of Diocletian's Palace, built between the late 3rd and the early 4th centuries. The cathedral was built in the Middle Ages, reusing materials from an ancient mausoleum. Twelfth and 13th century Romanesque churches, medieval fortifications, 15th century Gothic palaces, and other palaces in Renaissance and Baroque styles are also part of the protected area (UNESCO, 2020). The *old city of Dubrovnic*, known as the "pearl of the Adriatic", on the Dalmatian coast, became an important Mediterranean Sea power from the 13th century onwards. Although severely damaged by an earthquake in 1667, its beautiful Gothic, Renaissance and Baroque churches, monasteries, palaces and fountains were preserved. On the other hand, the *Historic City of Trogir* is a remarkable example of urban continuity (UNESCO, 2020). The orthogonal street plan of this island settlement dates to the Hellenistic period and it

Figure 3.8. *View of the interior of the Tabačica Mosque at Mostar, Herzegovina, and its rich decoration of Mediterranean influence with natural elements such as the grapevines below the windows. (source: photo by Reija Satokangas)*

was embellished by successive rulers with many fine public and domestic buildings and fortifications. Their beautiful Romanesque churches are complemented by outstanding Renaissance and Baroque buildings from the Venetian period.

Cyprus possesses three sites related to MD on the UNESCO world heritage list (UNESCO, 2020), in addition to many other sites of interest (namely the villages that showcase local culture). Those three sites are from different epochs and have outstanding universal value, when considering the MD-related patrimony. The oldest is *Choirokoitia*, a Neolithic settlement from the 7th to the 4th millennium BC that is one of the most important prehistoric sites in the eastern Mediterranean. It represents the Aceramic Neolithic period of Cyprus at its peak, that is, the success of the first human occupation of the island by farmers coming from the Near East mainland by the beginning of the 9th millennium BC. *Paphos* stands out as a centre for the cult of Aphrodite and of pre-Hellenic fertility deities, and the associated mythology. The legendary birthplace of Aphrodite was in the island of Cyprus, where her temple was erected by the Mycenaeans, in the 12th century BC, and continued to be used until the Roman period. The site encompasses the remains of ancient Nea Paphos (Aphrodite's Sacred City), the remains of the Temple of Aphrodite (Aphrodite's Sanctuary) and Palaepaphos (Old Paphos). Finally, the *Painted Churches* in the Troodos Region (an important geopark) are highlighted because they bear witness to the period when the Byzantine empire dominated the Island.

Greece is undoubtedly of capital importance to the MD concept, not only for its vital historical and cultural imprint on western civilization and Mediterranean culture, but also for its higher senior health levels and longevity, with a high number of centenarians[43], as compared with the world averages. The interlinking of several dimensions (environment, agriculture, customs) with food habits, described by the Greek word "Diaita", is patent in places such as the island of Crete (Figure 3.9).

With respect to heritage, the **region of Crete** (one of the participants of the project MD.net), is noted for the archaeological site of *Knossos*, submitted to UNESCO as a World Heritage[44]. Knossos is the largest Bronze Age archaeological site on Crete, having been the ceremonial and political centre of the Minoan civilization and culture. At its peak, shortly after 1 700 BC, the palace of Knossos and surrounding city hosted a population of 100 000, and it is therefore considered Europe's oldest city. The palace is also remarkable for its water management system, consisting of at least three sub-systems: one for supply, one for drainage of runoff, and one for drainage of wastewater. Aqueducts brought fresh water to the Kephala hill from springs at Archanes, about 10 km away, branching to the palace and to the town. Water was distributed in the palace by gravity through terracotta pipes to fountains and spigots. Also noteworthy, in the context of this section, is *Heraklion* (Ηράκλειο), the largest city on Crete, with a vast and rich History, influenced by the successive occupations by Arabs and Venetians, as well as by the Byzantine and Ottoman epochs. Heraklion has been an important port since antiquity, attested to by its still imposing fortifications.

Italy is represented in the MD.net project by three regions: Campania, Emilia-Romagna and Sicily.

In the **Campania region**, the city of Naples is a prominent Mediterranean urban landscape, whose historic city centre is listed as a World Heritage site (UNESCO, 2020). Since the city of "Neapolis" was founded by the Greeks in 470 BC, it has retained the imprint of the successive cultures that emerged across the Mediterranean Basin, and has many outstanding monuments such as the Royal Palace,

Figure 3.9. *Cooking outdoors, at a community event on Crete, which involves intense social interactions. The enjoyment of food or the "pleasure of the table" is an historical feature rooted in balanced habits, strongly dependent on climate, on the pace of nature, local resources and customs. (source: photo by Region of Crete)*

[43] Longevity is at least partially attributed to *MD lifestyle*.

[44] Knossos world heritage, *tentative list*.

the "Monte dei Poveri Vergognosi", the convent of "Sant'Agostino degli Scalzi", and the Jesuit College on Capodimonte. Another world heritage site near Naples is also noteworthy: the 18th century Royal Palace at Caserta, with its Park, the Aqueduct of Vanvitelli, and the San Leucio Complex (UNESCO, 2020). *Costiera Amalfitana* is described by UNESCO (2020) as an outstanding example of Mediterranean landscape, with exceptional cultural and natural scenic values resulting from its dramatic topography and historical evolution. Also in Campania, the cultural site of *Archaeological Areas of Pompeii, Herculaneum and Torre Annunziata* is of remarkable significance, due to the geological interest of Mount Vesuvius and the historical value of the archaeological remains. The contrast between the commercial town of Pompeii and the smaller, but better-preserved, remains of the holiday resort of Herculaneum, vividly reveals the opulent lifestyle enjoyed by the wealthier citizens of the Early Roman Empire. Italy's representative community on the Mediterranean Diet's UNESCO list is Pollica-Cilento, in Campania, close to the World Heritage site and geopark of *Cilento, Vallo di Diano and Alburny global Geopark* (UNESCO, 2013, 2017). Moreover, this Park harbours the *Archaeological Sites of Paestum and Velia*, and the *Certosa di Padula* (UNESCO, 2020). This National Park is a mountainous region crossed by several river valleys, and the dramatic groups of sanctuaries and settlements along its three east–west mountain ridges vividly portray the area's historical evolution. It was a major route not only for trade, but also for cultural and political interaction during the prehistoric and medieval periods.

Among the vast patrimonial richness of the **Emilia-Romagna region,** *Ferrara* stands out as a Renaissance city harmoniously blended with the surrounding environment (UNESCO, 2020). The World Heritage area, designated *Ferrara, City of the Renaissance, and its Po Delta*, comprises the urban centre of Ferrara and bordering agricultural lands within the ancient Po River delta. The city has extended outside the walls encircling the medieval urban centre in a series of urban planning schemes that were implemented from the 14th to the 16th centuries, turning Ferrara into the first Renaissance city developed according to a complex urban plan. The best known of these schemes, the *Addizione Erculea* (by Biagio Rossetti) balanced humanist principles, relating to form and volume in architecture, with open space, the needs of the city, and local traditions (Bethemon, 2000, 2001). In turn, *Ravenna* stands out for its role as the seat of the Roman Empire after AD 402, and afterwards a prominent Ostrogothic, then Byzantine capital until the 8th century. The Early Christian buildings of Ravenna are exceptional testimonies to artistic contacts and developments in a highly significant period of European cultural development. These religious monuments (from the 5th and 6th centuries) blend Graeco-Roman tradition, Christian iconography and oriental and western styles. They are decorated with precious marble, stuccos and mosaics (UNESCO, 2020). In short, this site reflects the major historical, political and religious events that took place in Ravenna. Another important world heritage site in the region is the Cathedral, *Torre Civica and Piazza Grande* of Modena.

The island of **Sicily** is remarkable for its historical and cultural heritage as well as for the richness of its geomorphology. The *Archaeological Area of Agrigento* (UNESCO, 2020) encompasses the archaeological ruins and surrounding park area of the city of Agrigento, founded as a Greek colony in the 6th century BC, becoming one of the leading cities in the Mediterranean world. Its supremacy and pride are demonstrated by the remains of the magnificent Doric temples which dominate the ancient town, much of which still lies intact under today's fields and orchards. Another Sicilian world cultural heritage site, of a later epoch, is *Syracuse and the Rocky Necropolis of Pantalica* (UNESCO, 2020), consisting of the Necropolis of Pantalica (dating from the 13th to 7th centuries BC) with vestiges of the Byzantine era, and Ancient Syracuse, a city founded as Ortygia by Greeks from Corinth in the 8th century BC which shows the development of Mediterranean civilization over three millennia. The World cultural Heritage site of *Arab-Norman Palermo and the Cathedral Churches of Cefalù and Monreale* (UNESCO, 2020) is important for MD, as its cultural elements bear witness to the many successive influences on the Island, and the site is an example of a social-cultural syncretism between Western, Islamic and Byzantine cultures, which gave rise to new concepts of space, structure and decoration. Such cultural elements also reflect the fruitful coexistence of peoples from different origins and religions (Muslim, Byzantine, Latin, Jewish, Lombard and French) in the island. Finally, *Villa Romana del Casale* and the *Late Baroque Towns of the Val di Noto* (UNESCO, 2020) are culturally important in the context of MD influences.

Algarve (Portugal), encompassing the MD representative community of Tavira (UNESCO, 2013), shares the blending of many cultural influences (e.g., Phoenician, Roman, Arab) with other Mediterranean regions. The *Ummayad*, *Almoravide* and *Al-Mutamid* routes, connecting regions, from the Algarve, in the far west, across Andalusia and Sicily, to the middle east. Such cultural tourism routes emphasize the link between the north and the south of the Mediterranean Basin, and the Arab presence in Europe. This heritage is proudly shown in Algarve, highlighting the importance of cultural tourism to promote the dialogue between cultures, while positively impacting local development. The *Sites of Globalization Route* is an ongoing application to the UNESCO heritage list, concerning the heritage associated with the Portuguese expansion of the 15th century and

the new commercial and cultural connections established during that period between Portugal, Mauritania and Cape Verde. The Portuguese were in fact pioneers in long ocean travels and were the catalysts of a new era of continental exchanges and globalization, deeply contributing to the enrichment of the Mediterranean Diet, as explained in previous chapters. The first real global international trade, started in Lagos (in the Algarve), expanded to Lisbon, and was carried on also in Seville.

The **Vzhodna region of Slovenia** shares some historical background with neighbouring countries and regions, namely Italy and the Slovenian Istria (Figure 3.10).

The region's typical Mediterranean towns are closely related with the green Istrian areas, home to an original cuisine using olive oil and wild plants. The coastal region includes the typical Mediterranean medieval towns of Piran and Koper, and the modern cosmopolitan resorts of Portorož and Izola, with their fishing traditions. The lives of peoples along the coast are still very closely related to the sea, though tourism and maritime transport have overtaken fishing and salt production in importance. The Vzhodna region shares a Cultural World Heritage with Spain, the *Heritage of Mercury-Almadén and Idrija* (UNESCO, 2020).

Figure 3.10. *Influences of neighbouring countries and cultures can be perceived in this image of the Ferrari Garden at Štanjel, a typical Karst village in Slovenia. (source: photo by Visitkras)*

Spain is represented in the MD.net project by the autonomous regions of **Andalusia** and **Catalonia**.

Andalusia has several World Heritage sites dating from the Arab presence, which included the establishment of caliphates, one of them at Granada (the *Alhambra*, *Generalife* and *Albayzín* cultural site). The residential district of the Albayzín is a rich repository of Moorish vernacular architecture, with which the traditional Andalusian architecture blends harmoniously. The Alhambra and the Albayzín occupy two adjacent hills, forming the medieval part of Granada, while the Generalife to the east of the Alhambra fortress was the rural residence (with magnificent gardens) of the emirs who ruled this part of Spain in the 13th and 14th centuries (UNESCO, 2020). Other World Heritage sites related to the Islamic presence in Andalusia are located in Cordoba and encompass the historic city centre as well as the archaeological remains of the Cordoba's caliphate. The *Historic Centre of Cordoba* (UNESCO, 2020) reflects the caliphate at its peak, around the 8th century. In the 13th century, Cordoba's Great Mosque was turned into a cathedral and new defensive structures, namely the *Alcázar de los Reyes Cristianos* and the *Torre Fortaleza de la Calahorra*, were erected. An outstanding demonstration of the *Al-Andalus* domination period in southern Europe can be perceived in the *Madinat al-Zahra Archaeological Site* (ruins of Cordoba's caliphate), a complete urban complex including infrastructure, buildings, decoration and everyday objects.

Still in Andalusia, the *Cathedral* (with its tower, the Giralda), the *Real Alcázar and Archivo de Indias* monuments in the centre of Seville form a World Heritage site which embodies Moorish and Christian influences, as well as the participation of Spain in the discoveries of the New World. The *Real Alcázar* and its gardens, as well as the cathedral (a former mosque) show the integration of Moorish influence. The *Giralda minaret* is the masterpiece of Almohad architecture, standing next to the cathedral, which is the largest gothic building in Europe and houses the tomb of Christopher Columbus (UNESCO, 2020).

Catalonia has several MD-related world heritage sites, namely the *Archaeological Ensemble of Tárraco*, one of the first Roman settlements in the Iberian Peninsula, and a major administrative and mercantile city of the Roman Empire (UNESCO, 2020). Tárraco is remarkable for its singular planning: the town's plan was adapted to the terrain by means of a series of artificial terraces, which can be seen around the provincial forum as well as in the residential area of the Roman city. The system of defensive walls is one of the earliest examples of Roman military engineering in the Iberian Peninsula, and one of the most important symbols of the town. Another important World Heritage site is the 12th century majestic *Poblet Monastery* (UNESCO, 2020), also

a fortified residence of the kings of Catalonia and Aragon. It is one of the largest and most complete Cistercian abbeys, and it is extraordinarily important in terms of art, culture, history and spirituality. After the fall of the Roman Empire, such monasteries safeguarded Mediterranean crops and culinary traditions, namely olive oil and winemaking, thus representing one of the many linkages between built heritage and the MD gastronomic culture.

3.2. ORGANIZATION AND ADMINISTRATION OF CULTURAL ASSETS AND TOURISM

This section introduces the global, international and regional regulatory frameworks which are relevant to the Mediterranean Basin, specifically to the regions participating in the MD-net project. Laws, conventions, regulations and other instruments that are too broad (e.g., successive international agreements on climate change) or focused on ecosystems that are not present in the Mediterranean region (e.g., rainforests, glaciers), are outside the scope of this book.

Natural sites

In the Mediterranean region, nature conservation is ensured at an international level by various conventions and programmes based on the cooperation between organizations and states. Besides the institutional bodies, countless non-governmental organizations, associations, and activist groups have been acting and raising awareness on important issues related with the safeguarding of natural resources and the environment, some of which have gained prominence. The present list, although not exhaustive, includes those international organizations with more impact and visibility in the region. The international conventions regarding the protection of natural resources are also presented.

At the international level, the United Nations Environment Programme (UNEP, 2020a,b) is the leading global authority setting the global environmental agenda. It promotes the coherent implementation of the environmental dimension of sustainable development within the United Nations system, and serves as an authoritative advocate for the global environment. UNEP's mission is to provide leadership and to encourage partnerships in caring for the environment by inspiring, informing, and enabling nations and peoples to improve their quality of life without compromising that of future generations. UNEP acts in multiple areas, including Ecosystems, Resource efficiency, Oceans and seas, Environmental Rights and Governance and Sustainable Development Goals.

Under the auspices of the UNEP (2020b), the Convention on Biological Diversity encompasses convention protocols, convention bodies, a strategic plan for biodiversity, mechanisms for implementation, and cooperation as well as partnerships. All countries represented in the MD.net project are parties to the convention on biological diversity, which is related to the International Treaty on Plant Genetic Resources for Food and Agriculture (under the auspices of the Food and Agriculture Organization of the United Nations, FAO). Other UN international conventions which apply to Nature Reserves are the Convention on the Protection of Underwater Cultural Heritage, and the Convention on Migratory Species. Also at the level of the UN, UNESCO has several measures and action plans to raise awareness of, value and preserve natural sites, through World Heritage lists that encompass Geoparks, Biosphere reserves and World Heritage sites (UNESCO, 2017, 2019, 2020). Biosphere Reserves focus on the harmonised management of biological and cultural diversity, World Heritage Sites promote the conservation of natural and cultural sites of outstanding universal value, and the Global Geoparks Network (GGN) recognises sites of geological heritage of international value, protecting geodiversity by actively engaging with the local communities (UNESCO, 2017).

Of special interest to the Mediterranean, particularly in times of climate change, is the Ramsar Convention on Wetlands and associated action plans. With 171 parties covering 2372 sites, Ramsar is a non-UN intergovernmental treaty that provides the framework for national action and international cooperation for the conservation and wise use of wetlands and their resources (Ramsar, 2014).

The International Union for Conservation of Nature (IUCN, 2020b) works for conservation and sustainable use of natural resources through data gathering and analysis, research, field projects, advocacy, and education. Its mission is to influence, encourage and assist societies in preserving nature and ensuring that natural resources are used equitably and sustainably (IUCN, 2017, 2020a,b).

The World Wildlife Fund (WWF) is a not-for-profit international organization whose mission is to conserve nature by reducing the most pressing threats to biodiversity. In the Mediterranean region it cooperates with other international and national organizations to attempt to preserve forests, parks, the oceans and other protected areas (WWF, 2020).

The protection of the environment has been gaining relevance in the European Union under the Environment Directorate General of the European Commission (EC, 2020a), regarding Natural Capital, the Green Economy, Health, EU Law, Global Challenges and Knowledge. Nature Conservation includes action plans such as Natura 2000, a network of natural sites protected by law enforcement and national supervision, which recognises that humans and nature work best in partnership, when economic activities are compatible with safeguarding valuable species and habitats (EC, 2020d). Moreover, the EU is committed to becoming climate neutral in 2050 under its European Green Deal Strategy intended to stimulate the circular economy, a more efficient use of resources and the restoration of biodiversity, measures that are in line with the MD. The inherent sustainability wisdom of MD reflects, for example, on the traditional practices that cope with nature instead of acting against it (e.g. GIAHS[45] sites), and on a lifestyle aligned with the seasons.

[45]Globally Important Agricultural Heritage Systems (see section 1.1).

Cultural Sites and Intangible Heritage

Protection and safeguarding of monuments, archaeological remains, relics and other elements of archaeological interest, as well as intangible elements, such as cultural manifestations, that relate to the Mediterranean Diet and include the Mediterranean Diet concept (as Intangible Heritage) are regulated by the following International Conventions, all except the first being under UN:

- The 1954 Hague Convention for the Protection of Cultural Property in the Event of Armed Conflict, complemented by the 1977 Additional Protocols now enshrined in international law;
- The Convention on the Means of Prohibiting and Preventing the Illicit Import, Export and Transfer of Ownership of Cultural Property (UNESCO);
- UNESCO's 1972 World Heritage Convention, which encourages nature conservation and the preservation of cultural properties, recognizing the way in which people interact with nature, and the fundamental need to preserve the balance between the two (UNESCO, 1996, 2019);
- The Convention for the Safeguarding of the Intangible Cultural Heritage (UNESCO, 2003);
- UNESCO's Convention on the Protection and Promotion of the Diversity of Cultural Expressions;
- UNESCO's 2001 Convention on the Protection of the Underwater Cultural Heritage.

Some countries have developed specific laws to safeguard and classify cultural heritage, but not all have defined a specific management system to enable the inventory, classification and safeguard of such cultural heritage, in the form of an online database and as a «National Inventory of Cultural Heritage».

3.3. CULTURAL HERITAGE ENHANCEMENT, INTERPRETATION AND PROMOTION

Tourism operators are increasingly being called upon to tackle social, cultural, economic, and environmental challenges. Anthropogenic pressure is not only negative for Nature, it also seriously affects archaeological sites, monuments and other heritage. As explained in chapter 1, natural areas (such as geoparks, marine reserves and wetlands), built heritage, and cultural elements (intangible heritage) in the Mediterranean region are most often associated and coexisting. Vivid examples can be observed along pilgrimage routes where the natural sites and the related communal celebrations are spatially and culturally associated.

Tourism is an important economic activity in the Mediterranean Basin, and ensuring its sustainability will help preserve the territories and cultures, while fuelling local economies. Contemporary and traditional festivals help to raise awareness of MD-related culture, while publicising traditional products and crafts, together with new and revamped businesses in line with MD values. As will be explained in the next chapter, MD values should be clearly disseminated and well understood, especially by small and medium-sized enterprises (SME), from tourism and related sectors.

Concerning nature parks, geoparks and other protected areas, the

inventory lists sites in the countries that participate in the MD.net project and are recognised as world heritage (UNESCO, 2017, 2020), integrated in the Natura 2000 network (EC, 2020d), and/or protected under other frameworks, including those at national and regional levels.

As emphasized in the text that defined the MD as intangible heritage of humanity (UNESCO, 2013), the territories, the past influencing civilizations, and the balanced relationship between humans and nature, determine the food products, the crafts and the cultural manifestations that shape the MD concept. Each country is unique, and each region is distinctive, even within the same country, yet all share the common key elements of the MD. The uniqueness and diversity within the Mediterranean Basin are culturally enriching, and the regions are actually complementary in the MD mosaic, rather than competitors, namely as touristic destinations. In this sense, the framework of each country/region is provided below, with a focus on natural and cultural assets of touristic interest. Some of the information was retrieved from European, National and/or Regional organizations and curated by the MD.net project partners.

Figure 3.11. *Marinated sardines, a traditional Albanian recipe that shows the Mediterranean influence in some local cuisine. (source: photo by Rezart Xhelo, Association of Albanian Municipalities)*

Albania

The country has been a party to the Convention on Biological Diversity (CBC) since 1994, and has signed the CBC's Cartagena and Nagoya protocols, as well as the Nagoya-Kuala Lumpur supplementary protocol. It has been a party to the Ramsar Convention since 1996, but is not a member of the Global Geopark Network (GGN). The country has several sites and intangible heritage elements recognized as World Heritage by UNESCO. Forests cover about 36% of the territory, which comprises maritime ecosystems, coastal zones, lakes, rivers, evergreen and broadleaf shrublands, broadleaf forests, pine forests, alpine and sub-alpine pastures and meadows, and high mountain ecosystems. Two biogeographical regions are recognised in Albania: Mediterranean and Alpine. A major part of the country belongs to the former, which is a biodiversity hotspot. In Albania, 3200 taxa of higher plants, 800 of fungi, 1200 of diatoms, 313 of fishes, 323 of birds, 36 of reptiles, 70 of mammals and 520 of molluscs have been identified, and a total of 27 plant species, with 150 sub-species, are endemic to the country (EEA, 2019b; UNEP, 2020b). A national action plan supports the implementation of the CBC convention. The management and safeguarding of natural areas are among the missions of the Albanian Agency of Environment and Forest. Aquaculture and family farms, at small and non-intensive scales, produce Mediterranean food products whose traditional culinary use can be enhanced (Figure 3.11).

An important religious festival celebrated by the Muslim community is Eid Al Adha, which involves a family meal in which lamb is the main dish. Tourism and cultural assets, as well as information for visitors are available from the website of the Albanian National Tourism Agency.

Bosnia-Herzegovina

The country[46] is a party to the Convention on Biological Diversity since 2002 including the Cartagena protocol, but is not a party to the Nagoya protocol and the Nagoya-Kuala Lumpur supplementary protocol (UNEP, 2020b). Bosnia-Herzegovina is a party to the Ramsar Convention (Ramsar, 2014), but not a member of the Global Geopark Network (UNESCO, 2017). The country has sites and intangible heritage assets recognized as World Heritage by UNESCO (2020). However, it lacks an inventory of species diversity, and the status and trends of biodiversity are difficult to assess. Red Lists have been recently produced for each of the country's two autonomous entities: Republika Srpska and the Federation of Bosnia and Herzegovina. From the former, 818

[46] Tourism and cultural assets, as well as information for visitors are available from the *Tourism Association of Federation of BH*.

Figure 3.12. *A food exhibition showing traditional products from Bosnia-Herzegovina, including cheese, and ladies wearing traditional costumes. (source: photo by University of Mostar, Faculty of Agriculture and Food Technology)*

species of vascular plants, 304 of birds, 46 of fishes, 57 of mammals, 20 of amphibians, 25 of reptiles and 273 of insects are included in the Red List (EEA, 2019b; IUCN, 2020a). From the latter, 658 plant species, 27 mammal species, 40 bird species, 6 reptile species, 4 amphibian species, 36 fish species, and a large number of invertebrate species are Red-Listed (EEA 2019b; IUCN, 2020a; UNEP, 2020b). It should be noted that these lists have not been harmonised and that no single national list yet exists. The implementation of the Biological Diversity convention is supported by Laws on Environmental Protection for each autonomous entity – the Federation of Bosnia and Herzegovina (adopted in 2013) and the Law on Nature Protection for the Republika Srpska (2014) –, both of which are harmonised with the EU Directives on Habitats and Birds (EC, 2020a,d); however an adequate biodiversity monitoring system is lacking. Olive oil production, greenhouse production of fruits and vegetables, animal husbandry (including the autochthonous sheep breed "Herzegovinian Pramenka"), and wine are important agricultural products. The Mediterranean Day at Neum promotes domestic agricultural products of the Mediterranean (Figure 3.12).

Croatia

Since 1997, Croatia has been a party to the Convention on Biological Diversity, including the Cartagena and Nagoya protocols as well as the Nagoya-Kuala Lumpur supplementary protocol. It is also a party to the Ramsar Convention since 1991, and a member of GGN (UNESCO, 2017). The country has sites and intangible heritage assets recognized as World Heritage (UNESCO, 2020). The Republic of Croatia has a great wealth of biological and landscape diversity, and a very high level of conservation, with forests covering 44% of the land surface, approximately 95% of which are in a well preserved and almost natural state, which is rare and extremely valuable at both European and global levels. Croatia has been divided into 16 distinct landscape units, which include features such as karst fields and rivers, mountain chains and limestone plateaus. Wetlands have the highest level of biological and landscape diversity and are the most threatened of Croatia's ecosystems. Meadows of marine sea grass (*Posidona oceanica*) are common along the Croatian coast and are considered among the most representative and important Mediterranean coastal ecosystems. The number of known taxa is almost 40 000, although it is suspected that the total number of species is considerably higher (maybe over 100 000). In the last five years, more than 200 new species of land invertebrates, around 220 species of freshwater invertebrates and around 20 species of marine invertebrates have been identified, and more than 10 new species of freshwater fishes have been described. About 3% of the taxa are endemic. The largest share of endemics (approx. 70%) is found in Croatian cave fauna (EEA, 2019b; IUCN, 2020b; UNEP, 2020b).

The traditional *Klapa multipart singing* of Split was inscribed in the Representative List of the Intangible Cultural Heritage of Humanity in 2012 (UNESCO, 2020). "Klapa" singers express their mood by means of open guttural, nasal sotto voce and falsetto singing, usually in high-pitched tessitura. Another intangible cultural heritage asset of Split-Dalmatia is the *lacemaking* of Hvar, originally used to make ecclesiastical garments, tablecloths and ornaments for clothing (UNESCO, 2020). Rural women adapted the refined ecclesiastic techniques and developed a wide variety of lacemaking based on a spider web pattern with geometrical motifs. It is an important component of traditional clothing and testifies a living cultural tradition. The sale of lace products represents an additional income, and the craft has been passed between generations by older women who offer year-long courses, leaving a permanent mark on the regional culture (Figure 3.13).

Finally, a religious celebration of the catholic Easter in Hvar, the *Za Krizen Procession* is a recognised Intangible cultural heritage which involves a communal organization of celebrations respecting old traditions and rituals (UNESCO, 2020). A long-established and inalienable part of Hvar religious and cultural identity,

Figure 3.13. *Lacemaking in Croatia, a handcraft recognized as Intangible Cultural Heritage by UNESCO, typical of the island of Hvar, in the Split-Dalmatia region of Croatia. (source: photo by the Ministry of Culture of Croatia from UNESCO's website)*

[47] Information for visitors is available from the website of the Split-Dalmatia County Tourist.

the procession bonds the island communities to each other and to the wider Catholic community, namely within the Mediterranean Basin where Easter rituals often take daring and spectacular forms. Regarding the Mediterranean natural landscapes, there is a National Strategy and Action Plan for the Protection of Biological and Landscape Diversity, to ensure the implementation of the biological diversity protocols, while inventorying and monitoring actions are overseen by the national Institute for Nature Protection[47].

Cyprus

Cyprus is a party to the Convention on Biological Diversity, including the Cartagena protocol, but not to the Nagoya protocol nor to the Nagoya-Kuala Lumpur supplementary protocol (UNEP, 2020b). Cyprus is a party to the Ramsar Convention since 2001 (Ramsar, 2014), and a member of GGN (UNESCO, 2017). The country has several sites and intangible heritage elements recognized as World Heritage by UNESCO (2020). Cyprus is the third largest island in the Mediterranean, with diversified sub-climates, heterogeneous geology combined with its insular character, which have resulted in a wide variety of natural, semi-natural and anthropogenic habitats. Of the 48 terrestrial habitats identified in Cyprus, 4 are endemic habitat types: Serpentinophilous Grasslands of Cyprus, Peat Grasslands of Troodos, Scrub Forest of *Quercus alnifolia*, and *Cedrus brevifolia* forests (EC, 2020d; IUCN, 2020b). Located near three continents, the island of Cyprus is on one of the major bird migration routes and is the only centre of bird endemism in Europe. Cyprus possesses 1738 species of flora, 143 of which are endemic (the highest level of plant endemism in Europe), 385 bird species, of which 2 are endemic, 22 reptiles, including 2 endemic species, 3 amphibian species, and over 80 species of marine fish, in addition to 11 wild mammals, 6 of which are endemic and sub-endemic; Cyprus is also considered a European centre of insect endemism (EC, 2020d; EEA, 2019b; IUCN, 2020b). Nineteen per cent of the country is included in the protected area system, but conflicting and competitive demands for space, and pressure on scarce land resources are taking their toll on habitats and species. Cyprus has not yet prepared a comprehensive Biodiversity Action Plan, but has related national policies, such as the Sustainable Development Strategy, Forest Policy, Agriculture Policy, Water Policy, Fisheries Policy, which help to safeguard the island's biodiversity. However, the current trend of biodiversity is showing improvements, largely as a result of coordinated efforts taken by government departments and non-governmental organizations, mainly regarding the establishment of the Natura 2000 network (EC, 2020d). Poultry, aquaculture and agriculture (olives, fruits, grapes) are reported economic activities in these areas.

Regarding cultural heritage, the Zivania Festival takes place in the picturesque villages of Alona and Pelendri and offers the opportunity to taste zivania brandy and delicacies. Several other festivals are related to typical harvests, including the Rose festival (Figure 3.14), organized every year at Agros, where visitors have the chance to visit the local workshops and attend the distillation of roses, as well as engage in folk dancing, music performances and a showcase of traditional products and crafts, and other activities. Another culturally interesting festival is the "Tsiattista poetic duelling", where the lively, impromptu oral poetry, known as Tsiattista, is performed to the sound of violin or lute in 'jousts' in which one poet-singer attempts to outdo another with clever verses of rhyming couplets (UNESCO 2017; 2020).

Figure 3.14. *Harvesting Roses at Agros, Cyprus (source: photo by Michalis Georgiades, Cyprus Tourism Organization Archive).*

Information for visitors on cultural assets, including the Troodos region – in GGN (UNESCO, 2017), is available from the website of the Deputy Ministry of Tourism.

Greece

Since 1994, Greece has been a party to the Convention on Biological Diversity, including the Cartagena protocol, but not to the Nagoya protocol nor to the Nagoya-Kuala Lumpur supplementary protocol (UNEP, 2020b). The country is a party to the Ramsar Convention since 1975 (Ramsar, 2014), and a member of GGN (UNESCO, 2017). It has several sites and intangible heritage elements recognized as World Heritage by UNESCO (2020) among many more non-classified sites of undoubted relevance.

Land cover in Greece has been relatively stable until the last notable expansion of irrigated agricultural land and the establishment of animal farms in lowlands, which took place mostly during the 1980s. An increasing rate of urbanisation in several coastal areas, and an extension of transport networks in the whole of the territory, peaked during the 1990s and continued until 2000 (EEA, 2019b; IUCN, 2020b). In 40 years (1925-1965), approximately 67% of the surface area of Greek wetlands was drained, due to demand for housing and agricultural land, resulting in the loss of most marshes and a few lakes and rivers (Ramsar, 2014). Greece is home to 85 habitat types of European importance and hosts many species

of European importance (IUCN, 2020b). The conservation status of these species and habitat types was assessed in 2007, revealing a mixed picture, including several knowledge gaps, which prevented assessment of several habitat types and species. Greece's red data book for plants (2009 edition) includes 258 threatened species of plants and two considered extinct, as well as 468 species of animals that are threatened (171 vertebrates and 297 invertebrates) (IUCN, 2020a; WWF, 2020). Important protected species, such as the Mediterranean monk seal (*Monachus monachus*) and the Loggerhead sea turtle (*Caretta caretta*), have been the focus of action plans and LIFE-Nature projects which have achieved good outcomes (EC, 2020d; IUCN 2017; WWF 2020). Studies on genetic erosion during the latter part of the 20th century have shown intense and rapid trends of loss of cultivated cereals, vegetable crops, tree crops and grapevines. Domesticated animal breeds have also been lost at an alarming speed in recent years, with very few remaining. A National Strategy and Action Plan for the Protection of Biological and Landscape Diversity does exist, but the Implementation of the new "Green Growth" Strategy requires close cooperation among all relevant ministerial and government agencies, as well as the engagement of the private sector and social stakeholders. The Ministry of Environment, Energy and Climate Change ensures the implementation of the protocol and the revision of the action plan.

In Crete[48], the region participating in the MD.net project, several festivals are worth mentioning as MD-related cultural assets since of them are related to crops and seasonal activities, such as the "Efrazimo" Bread Festival and the Shepherd and Cheese Festival (Figure 3.15). Other relevant festivals are the Thrapsano pottery festival, the Sardine festival and the "Tsikoudia" - Raki Festival (or "Kazanemata"), which celebrates a typical Cretan spirit drink.

Italy

Italy is a party to the Convention on Biological Diversity since 1994, including the Cartagena protocol; it is also a party to the Nagoya-Kuala Lumpur supplementary protocol since 2019 (UNEP, 2020b). The country is a party to the Ramsar Convention since 1977 (Ramsar, 2014), and a member of the GGN (UNESCO, 2017). The country has numerous sites and intangible heritage elements recognised as World Heritage by UNESCO (2020).

Italy is extremely rich in biodiversity, with the highest number and density of both animal and plant species in the European Union, and a high rate of endemism (EC, 2020d; EEA, 2019b). The country is estimated to include over 58 000 faunal species, of which 1268 (2%) are vertebrates, 1812 (3%) are protozoans, and the remaining 95% are invertebrates. Recent studies on certain groups of insects suggest that the number of Italian fauna species is at least 15% higher, which is very significant, considering the observed global trend of species extinction. The estimated number of species is more than 65 000. There are over 6700 vascular plant species, 1156 recorded species of bryophytes, and around 20 000 known fungi species, including 2328 taxa of lichens, and at least 20 new species are reported in Italy every year. The country has a high incidence of endemism: around 30% of the animal species and 15% of the vascular plant species. Sicily and Sardinia are particularly important in this respect (their indigenous flora accounts for 11% of all Italian flora, of which 15% are endemic) (EC, 2020d; IUCN, 2020b; WWF, 2020). This rich biodiversity is largely due to its range of biogeographic regions, Alpine, Continental and Mediterranean, and to the associated heterogeneity of climate, topography and geology. An IUCN red list national program/ initiative on Italy's animal and plant species was recently launched (IUCN, 2020a). Furthermore, a National Biodiversity Strategy (NBS) aims to merge and integrate biodiversity conservation targets and sustainable use of natural resources in sectorial policies. The NBS is structured around three key issues (biodiversity and ecosystem services; biodiversity and climate change; biodiversity and

Figure 3.15. *Cheese making in Crete, Greece. (source: photos by the Region of Crete)*

[48] Information for visitors is available at the website of the *Region of Crete* ⊕.

economic policies). At the national level, the strategic management and conservation of Nature Reserves and Parks depend on the ministries in charge of the environment and agriculture. At the operational level, the coordination is by the Italian Federation of Parks and Nature Reserves. Information for visitors is provided by the Agenzia Nazionale di Turismo.

The Campania region is important for production of wine, olive oil, pasta, and dairy, namely the buffalo mozzarella DOP, in relation to Mediterranean Diet landscapes, in addition to the nature parks and cultural landscapes referred above. As with other regions, many festivals celebrate harvests. The “Palio of wheat” is an example of a traditional festival celebrating the values of the peasant culture. There are numerous religious celebrations with associated communal festivals, a common cultural element in southern Europe. The feast of killing the pig is another element shared with many southern European villages.

The Emilia-Romagna region produces fruit, vegetables, meat, seafood and dairy, namely the Parmigiano Reggiano DOP cheese, in relation to MD-related landscapes, in addition to the nature parks and cultural landscapes referred above. Cultural assets include the GUSTI.A.MO18, a three-day event dedicated to showcase the excellent flavours of Modena, namely the Traditional Balsamic Vinegar from Modena PDO (Figure 3.16), the Parmigiano-Reggiano PDO, the Prosciutto from Modena PDO, and the Modena Lambrusco PDO wines.

Figure 3.16. *Assessing and tasting balsamic vinegar in the Emilia Romagna region, Italy. (source: photo by Museo del balsamico tradizionale Emilia_ Romagna)*

The Grape and Lambrusco Grasparossa di Castelvetro Festival enhances and champions the farming vocation of the Castelvetro area, promoting its wine and food delicacies and history. Tourism information about the Emilia-Romagna region is available at the website of Agenzia Nazionale Turismo.

In Sicily, the festivals are mainly of a religious nature or related to celebrations of the harvests. The couscous festival of San Vito lo Capo, a village of Arab architecture and traditions, is noteworthy for its ancient cultural roots. It takes place in September and is an exceptional opportunity to taste all the cous cous-based specialties. Tourism information (including cultural assets) is available at the website of Agenzia Nazionale Turismo.

Portugal

Portugal is a party to the Convention on Biological Diversity since 1994, including the Cartagena and Nagoya protocols but is not a party to the Nagoya-Kuala Lumpur supplementary protocol (UNEP, 2020b). It is a party to the Ramsar Convention since 1981 (Ramsar, 2014), and the GGN (UNESCO, 2017). The country has sites and intangible heritage elements recognized as World Heritage by UNESCO (2020) and under national legislation the Cultural Intangible Heritage covers oral traditions and expressions, artistic expressions and performative manifestations, social practices, rituals and festive events, knowledge and practices related to nature and the universe, and competences in traditional processes and techniques. The “National Inventory of Intangible Cultural Heritage” results from the active involvement of the communities, groups and individuals who constitute themselves as their “owners”.

Portugal possesses a very diverse natural heritage thanks to its geographical location and geophysical conditions. The Portuguese islands are unique and of undeniable environmental importance, but it is on the mainland that key Mediterranean habitats such as dunes, rocky cliffs, and marshes in estuary and lagoon systems are particularly noteworthy, namely in the Algarve, the region participating in the MD.net project.

The Algarve harbours diversified habitats in a variety of geographic conditions, which range from smooth hills to marshes and islets. The estuaries provide shelter for numerous bird populations which use them as migratory stations, wintering areas or breeding grounds. Some of the main threats to Portuguese biodiversity include alteration or destruction of habitats, pollution, overexploitation, invasive alien species, urbanisation and fires (EC, 2020d; IUCN, 2020b). Portugal has a National Biodiversity Strategy and an associated Action Plan. Implementation of the protocols for biodiversity conservation, as well as inventorying and monitoring actions are supervised by the Institute for Nature Conservation and Forests (ICNF). Turismo de Portugal is the competent authority concerning

tourism, and *Direção Regional de Cultura do Algarve* is responsible for the cultural assets of the Algarve region.

Concerning crops, and in addition to the common categories (found all over the Mediterranean), Algarve has been revamping carob products, aromatic herbs, unrefined traditional salt, among others. Renowned GI products include citruses, sweet potato and strawberry-tree (arbutus) berry brandy, as well as craftworks (Figure 3.17).

Festivities are dominated by the harvests and by the catholic religious celebrations (namely Easter). The Mediterranean Diet Fair in Tavira in September is a relatively recent yet successful annual event which showcases MD foods and crafts, music, conferences, workshops, etc. Also significant is the habit of singing "Fado" in the streets and restaurants, namely by amateur musicians. "Fado" is an Intangible Cultural Heritage of popular origin (UNESCO, 2020).

Slovenia

Since 1996 Slovenia is a party to the Convention on Biological Diversity, including the Cartagena protocol, and the Nagoya-Kuala Lumpur supplementary protocol (UNEP, 2020b). It is also a party to the Ramsar Convention since 1991 (Ramsar, 2014), and a member of the GGN (UNESCO, 2017). Slovenia[49] has sites and intangible heritage elements recognized as World Heritage by UNESCO (2020). It is situated in the southern part of central Europe where four biogeographic regions meet (the Alps, the Pannonian Plain, the Dinaric Mountains and the Mediterranean), forming a wide variety of eco-regions and habitats, where forests cover about 60% of the land. To date, around 15 000 animal species, 6000 plant species and 5000 species of fungi have been identified and documented, and the degree of endemism is considerably high. Among vascular plants, there are 40 endemic taxa with predominant distributions in Slovenia. There are 850 endemic taxa of fauna, including cave animals (EEA, 2019b; IUCN, 2020b). Approximately 10% of species of ferns and higher plants and 56% of vertebrates are endangered, including 64% of the 81 species of indigenous freshwater fishes. 36% of mammal species, 49% of birds, 73% of amphibians and 48% of fishes and hagfishes are threatened (EC, 2020d; IUCN, 2020a). At least nine breeds of indigenous domestic animals have also been classified as endangered (EEA, 2019b).

In situ conservation is restricted to small areas, with most biodiversity conservation goals achieved through sustainable land use, such as low-intensity farming. After agriculture, forestry is the principal land use activity of significant economic importance affecting biodiversity. EU environmental legislation, such as the Habitats Directive and the Birds Directive, plays a considerable part in supporting national implementation of the Ramsar and biological diversity conventions in Slovenia, as well as in providing monitoring mechanisms for species conservation (EC, 2020a,b; Ramsar 2014). Three ministries are involved in the development, protection and management of landscapes: Ministry of the Environment and Spatial Planning, Ministry of Culture and Ministry of Agriculture, Forestry and Food.

Meat, dairy and herbs are among the most important agricultural products in the Mediterranean areas of the country. There are festivals related to crops and traditional products, including the Saltpans Feast in Piran which recreates the everyday life of the past. Visitors are able to learn traditions of salt production, which is over 700 years-old in the region and has been an important source of income for the town.

[49] Tourism information can be found at the website of the *Slovenian Tourist Board*.

Figure 3.17. Traditional and contemporary artisanal crafts at Algarve, Portugal. (source: photos by Tertúlia Algarvia)

Spain

Since 1994, Spain has been a party to the Convention on Biological Diversity, including the Cartagena and Nagoya protocols, as well as the Nagoya-Kuala Lumpur supplementary protocol (UNEP, 2020b). It is also party to the Ramsar Convention (Ramsar, 2014), and a member of the GGN (UNESCO; 2017). The country has many sites and intangible heritage elements recognized as World Heritage by UNESCO (2020)[50].

Spain is one of the 25 biodiversity hotspots in the world and is considered one of the most biodiverse countries in the European Union (IUCN, 2020b; Ramsar, 2014). Spanish coastal waters possess a high level of biological diversity, with the southern Iberian Peninsula being especially important in terms of endemic species (WWF, 2020).

The country's geographical diversity is extremely wide, consisting of landscapes and ecosystems that include intertidal zones, beaches, cliffs, dune systems, salt marshes, saline steppes, etc. Four biogeographical regions are found in Spain (Mediterranean, Atlantic, Alpine, Macaronesian), comprising habitats that favoured the development of a great assortment of vegetation types, with which a variety of fauna communities is associated. The country is also rich in freshwater habitats. Although generally small, wetlands are very important centres of biological diversity, and forests and wooded zones cover 32% of the country. Spain has the highest number of species of vascular plants (8000-9000) among European and Mediterranean countries, with a rate of endemism between 20-25% (EC, 2020d; IUCN, 2017, 2020b; Ramsar, 2014). In recent decades, Spanish biodiversity has significantly decreased, with 40-60% of assessed species included in a threat category. However, not all taxonomic groups have the same threat level: 15% of vascular plant species are endangered; for vertebrates, the figure increases to 31%; 55% of continental fishes and 31% of amphibians are endangered (EC, 2020d; IUCN, 2020a).

A Strategic Plan on Natural Heritage and Biodiversity is under implementation since 2011 and significant progress has been made in response to the objectives set out by the Law on Natural Heritage and Biodiversity 42/2007. The State Council on Natural Heritage and Biodiversity is the public participatory body for nature conservation and biodiversity. The Ministry of Agriculture, Food and Environment is responsible for monitoring international initiatives on environment and biodiversity, as well as the adoption of basic legislation and environmental policies with a territorial dimension (e.g., water, coasts, biodiversity). A Spanish Biodiversity Monitoring System to assess trends of biodiversity at the state level is being developed. The Environmental Sector Conference exists as the high-level political body which links and promotes cooperation among the environmental departments of the central and autonomous governments.

Andalusia produces wine, olive products and shepherding in relation with MD landscapes and foods. The most prominent cultural manifestations are, perhaps, the "Flamenco", which is a UNESCO Intangible Heritage (UNESCO, 2020), the Easter celebrations of "Semana Santa", and the "Virgen del Rocio" Pilgrimage.

In Catalonia, traditional gastronomic meetings are supported by the Palafrugell Municipal Tourist Board, the Garoinada, since 1992. The region's agricultural produce is varied, and agrobiodiversity is an asset used to enhance local gastronomy. Besides fruits, pulses, wines, and others, local breeds of small ruminants are noteworthy (Figure 3.18).

In addition to the many traditional and renewed celebrations related to harvests, one custom excels in originality: "Els Castells" (The Castles), human towers erected generally for the celebration of annual festivals by amateur groups, the "castellers", forming human towers of six to ten levels. The performance is accompanied by a band that plays various popular melodies, with a *dulzaina* called "gralla", accompanying the rhythm of construction of the tower as it rises (UNESCO, 2010).

To conclude this chapter, it should be recalled that the Mediterranean Basin is a top tourist destination, for its landscapes, history and foods, all highly appreciated by foreign visitors. Tourism has been crucial to the regional economies but also blamed for many problems, from gentrification to the abandonment of traditional sustainable activities. The dietary patterns, agriculture and food production must follow more sustainable paths – and so must

Figure 3.18. *Shepherding in Spain is common to the various regions. The breed in this picture is "El Serradet de Barneres", whose milk is used to produce the cheese of the same name in Catalonia. (source: photo by Prodeca, Catalonia, Spain)*

[50] Information for visitors can be found in *Spain's Official Tourism website*.

tourism.

It is noteworthy that, in the European framework and because tourist destinations are increasingly called upon to measure their performance in relation to sustainability, the European Commission has developed a simple European Tourism Indicators System (ETIS) as a simple method to measure sustainability performance; ETIS includes a management tool, a monitoring system, and an information tool, which can be downloaded.

It has been recognised that nature reserves can and should coexist with human activities, and certain tourism niches can be very beneficial in raising awareness about the environment, for example. Tourism can also be a catalyst of good change and the stimulus for development of other sectors of local activities related with the Mediterranean Diet, such as traditional foods, aromatic herbs, crafts or festivities and celebrations.

In short, the Mediterranean communities share common features, despite the specificities of each. Creating and strengthening the linkages between the Mediterranean Communities will enhance showcasing of the common Mediterranean Cultural Heritage, while noting the richness of their subtle differences.

CHAPTER 4. COMMON CHALLENGES IN THE MEDITERRANEAN REGION

4.1. MAIN ASSETS

We are living through extraordinary events that call for actions other than "business as usual". The ancient wisdom of MD offers guidelines to build resilience and to resume synchrony with nature, in order to face the big challenges of our times.

It is well known that the Mediterranean region is a top tourist destination, and tourism has been a major driver of economic growth, employment and enhanced social development, also engaging other regional sectors. For some time, local actors have been conscious of the urgent need to implement changes, and examples of sustainable and creative forms of tourism already exist. In 2020, the tourism sector was severely hit by the Covid 19 pandemic crisis but although the threat could not have been anticipated by the participants in the MD.net project, the following analysis, based on many of their thoughts, remains valid. Its purpose was to capture the essence of the Mediterranean's challenges, and to enrich and safeguard the MD as an asset to implement actions and to program regional strategies.

Concerning natural and cultural assets, the UNESCO's status of the Mediterranean Diet stands out. Nowadays, the Mediterranean is appreciated for fashion and arts, for its fantastic landscapes, for the mild climate and luminosity, for the splendid cuisine, and for the catching ambiances.

The Mediterranean region's richness rests on its diversity of environments, landscapes, genetic resources, cultures. Such a mosaic is at the core of the Mediterranean Diet concept, a blend of ancient wisdom on how to cope with nature. Such a way of life, hardly compatible with mass production, uniformity, and the fast pace of human life in the industrial era, is now regarded differently when considering the need to meet sustainable development goals.

During the 20th century, as noted by Orlando Ribeiro (Ribeiro, 1968), the Mediterranean regions mostly failed to engage in the specialization and massification required by the industrial revolution, therefore remaining poor while supplying cheap labour and destinations with sunny beaches to the countries in central and northern Europe (EU, 2017; Tarsitano , 2019). However, the inability to follow such a development model (which is still mainstream) and the ability to retrieve and sustainably exploit the rich and vast autochthonous genetic resources, natural landscapes, cultural assets and the prime food system are tools for sustainable development (FAO, 2004; UN 2020; UNEP, 2020a).

As disclosed in chapter 2, the immensity, richness and magnitude of

local cuisines are mingled with local produce and folk culture, building a cultural heritage that characterises the diversity of the Med diet. There is no "Mediterranean cuisine" but a myriad of "local culinary traditions"; there are no "traditional Mediterranean festivals" but a myriad of folk traditions, as each small town or village has its own peculiarities. The richness of the Mediterranean Diet results from the blending of all these local traits, sharing the same key features that result in a healthy and sustainable lifestyle, a cornerstone of MD.

Such "unity in diversity" can be detected even within a certain region, comparing local recipes and habits from the coast to inland, from village to village, with variations of the same magnitudes as those observed between different countries. The opposite is also true: some peculiarities are shared by distant regions (e.g., snails are delicacies in Crete as well as in the Algarve, on opposite sides of the Mediterranean Basin). A common ground is the simplicity of daily cooking (requiring no special skills), yet including a long list of ingredients and seasonings, and most particularly, the balance of food items (see Figures 2.2 and 2.3), the valuation of agrobiodiversity and seasonality, and the innumerable options to tackle food waste.

Natural environment and built heritage

The Natural Heritage of the Mediterranean region is acknowledged to include vast terrestrial and marine biodiversities and its high degree of endemisms. Botanical species (such as aromatic herbs) have been highlighted as assets for sustainable economic activities contributing to environmental preservation, by UNESCO, Natura 2000 and other protection schemes. These sites are assets to the niche market of nature tourism (bird watching, trekking, scuba diving, etc.) and often support environmentally-friendly businesses, such as traditional salt ponds, which provide refuge for migrating birds and habitat for halophyte plants, or eco-agro-tourism units which take advantage of the surrounding natural environment. These kinds of businesses contribute to safeguarding important habitats while revamping traditional and ecological lifestyles. This trend is in line with the increasing demand for natural and sustainable environments and products. Troodos Geopark can be viewed as an example of using the status and visibility of natural assets (the geopark) to generate increased demand for local foods and crafts, thereby ensuring the sustainable exploitation of resources and the well-being of local populations.

The existence of preserved, semi-natural environments in rural areas is also viewed as a valuable advantage, and demand for organic agriculture is growing. Such agriculture generally allows for a more effective preservation of the surrounding nature and for a sustainable exploitation of soils, while delivering tastier and healthier foods, and is compatible with the revitalisation of autochthonous crops and animal breeds.

The high diversity of foods found in the Mediterranean area results from the variety of landscapes, and has given rise to rich regional gastronomies, whose excellence and added value have been developed by European quality schemes (intellectual property associated with geographical indications). The sustainable exploitation of natural resources is successful and reflects on the high demand for certain foods (olive oil, wine, cheeses) and the growing list of Mediterranean foods covered by European quality schemes concerning geographical origin, organic foods and traditional crafts. Entrepreneurs have recovered traditional seeds, crops, techniques and successfully revamped the manufacture of Med products (e.g., carob bread and pastries, packed fresh salad mixes, traditionally seasoned table olives, quality wines), stimulating the creativity and meeting demand from renowned Chefs.

Eco-agro-tourism units in some rural areas demonstrate how traditional knowledge in culinary arts and crafts, combined with some literacy in new technologies and business, can be key for the sustainable development of the regions.

Cultural and intangible heritage

The Mediterranean Basin is a major tourism destination, with a huge quantity of high-quality material and immaterial cultural assets, including many of the most remarkable monuments in the world, many of the most appreciated landscapes, and a wide range of cultural events in which MD plays a key role, such as festivals, fairs and religious celebrations. MD is transversal to various sectors of activity, interlinking areas such as health, education, culture and tourism.

However, the general public is not well aware of the meaning and values of the holistic MD concept, and at best have heard about some gastronomic features. Even in this respect, public discourse is flooded with misinformation about diet and impacts on health and the environment.

Too much conflicting information has been conveyed to the general public about the benefits and disadvantages of certain diets, by marketing machines working through mass media and social media influencers. These messages originate mostly from global corporations that aim to attract consumers to a myriad of alternative foods (mainly ultra-processed foodstuffs which have been shown to be deleterious to both human health and environment) targeting vegans and followers of fashionable diets. Such marketing campaigns may well have contributed to the observed decrease in adherence to the Med diet by the young and reported increases in

eating disorders (e.g., *orthorexia nervosa*), as discussed in chapter 2.

It is important to stress that international organizations, such as FAO and WHO, acknowledge the main issues regarding global food systems and have drawn attention to the Med diet. Globally, consumers' demand is pushing towards change, as individuals from wealthy economies focus on healthy, high quality and sustainable food (organic, zero miles, etc.). Such changes and needs are well addressed by the Med diet, which is viewed as a model (Figure 2.5).

As detailed in UNESCO's world heritage list, the Mediterranean Diet encompasses knowledge (e.g., craft, techniques, singing, dancing), rituals and traditions, and represents an asset to local peoples in many ways, including tourism. Examples of the successful use of such assets in tourism experiences are the niche marketing of traditional cheese-making in the mountains of Vzhodna (Mediterranean Slovenia) and the increasing relevance of gastronomic and wine tourism routes in Catalonia and the Algarve. Such activities often involve successful agro-tourism units which showcase the Mediterranean culture and lifestyle to tourists.

4.2. CHALLENGES AND PROSPECTS

Identified issues and proposed approaches

The main identified threats or externalities to the use of MD's assets for regional development are climate change and poor management of natural sites and rural areas, which may aggravate the fragility of ecosystems and territorial vulnerability, including the probability of severe droughts, accelerated biodiversity loss on land as well as in the ocean. Aggravated water shortages and coastal pollution are deleterious to the public image of the regions. These problems occur all over the Mediterranean Basin and need to be addressed to enable the safeguarding and exploitation of the MD.

The excessive bureaucracy of local authorities, poor cooperation and coordination between stakeholders, and lack of a coherent strategic plan to exploit the potential of the territory are transversal difficulties. Poor planning and inadequate or incoherent policies have been leading to the abandonment of lands and to the degradation of landscapes. Also detrimental is the low quality of entrepreneurship in rural areas, often coincident with relevant natural sites. Conversely, urban and/or coastal areas are heavily populated, also contributing to the degradation of natural and cultural landscapes. Improving the coordination and involvement of SME, public administration, and Universities to develop strategic planning and to disseminate and raise awareness on MD should mitigate such weaknesses.

Another important issue, independent of governments and local administrations, is mindset. Many local actors are not proud of their MD heritage and do not value the available resources; in turn, investors avoid primary and secondary sectors because of longer payoff periods and higher risk than the service sector (e.g., app-based businesses). Although successful cases of knowledge transfer from academia to market do exist, most SME are family businesses with no expertise in modern sales techniques, based on the use of data and social media. In these companies, imitative behaviour prevails, eroding MD values and hampering innovation. Moreover, in general, Mediterranean SME face high fixed costs, high interest rates and taxes, as well as bureaucracy, difficult access to useful financial instruments, complex regulations and low accountability of public institutions. According to the report on SME taxation in Europe presented to the EC (VVA & ZEW, 2015), there are large disparities in fiscal policies and incentives to small businesses within the EU, as well between EU member states and other countries. This report confirms the above-described issues and shows that only a few EU countries seem to favour small businesses, in terms of tax burdens. In addition, the most penalised SME are hotels, restaurants and manufacturing units. Another report (European Union [EU] & Organisation for Economic Co-operation and Development [OECD], 2015) reveals that the size of informal economy as percentage of national GDP is decreasing; however, it was about 20% or higher in southern European countries (e.g., Greece, Italy, Spain, Portugal), more than twice the value reported for Austria or the Netherlands. Taxation and business regulation issues are pointed as drivers of informal entrepreneurship (EU & OECD, 2015).

The mindset of most entrepreneurs does not seem to be aligned with the current needs and opportunities to innovate in line with the goals of the European Green Deal, and the so-called "European Climate Law"[51]. Food systems may require new technologies to revamp ancient techniques and wisdom, namely to restore biodiversity and thus become sustainable. Agrobiodiversity needs to be regarded as an asset, and resilient plant varieties and locally adapted animal breeds should be preferred and managed in a knowledge-based manner, "working with nature" instead of "working against nature". However, local actors complain that shortages of autochthonous raw materials limit mass production, displaying ignorance of the value of agrobiodiversity, and a lack of knowledge about the circular economy model, as well as lack of will or ability to change from their "business as usual" activities to business models based on new ways of using natural capital, by-products,

[51] Reg. (EU) 2018/1999 (European Climate Law)

and more.

Revisiting ancient MD wisdom with the eyes and tools of our digital society may be the gateway to the sustainable innovation and development of the Mediterranean region. The need to better exploit the potential of the territory is also referred to by local actors, namely in bringing consumers closer to seasonal and local products, *i.e.*, from a distance that is sustainable in terms of transportation and storage, shortening the food value chain and making such foods readily available in open air markets and neighborhood shops or even home-delivered, fostering the direct relationship between producer and consumer. Typically Mediterranean-like interactions are being stimulated in France and Switzerland by reinforcing short food supply chains, in contrast to the long and complex mainstream food value chains. The Mediterranean Diet already has such mechanisms, in the form of periodical open-air markets, in some regions to be revamped, which bring together the rural and urban worlds. Such open-air markets allow direct interactions between producers and consumers, and the sale of organic produce and recovered varieties of local produce. These autochthonous plant crops are generally more robust than globally distributed and standardized plant varieties, and often richer in aroma and health-promoting compounds. Local land-use planning and smart use of resources should favour sustainable agriculture practices and autochthonous climate-resilient crops. Actions to deal with water shortages are required in view of the known scenarios of climate change.

The second big issue is mass tourism. Development in the second half of the 20th century allowed the masses from industrialised countries to spend vacations abroad, and travelling was further encouraged by low cost flights and accommodation. The mild climate, peacefulness and social stability in the Mediterranean region attracted more and more tourists (Institute for Economics & Peace [IEP], 2020). Tourism business models have been disregarding the fact that territories and cities (and all tourism attraction spots, in general) reflect the historical and cultural influences in ways that were not meant to comply with the mainstream model of mass tourism. Mass tourism also impedes residents' mobility and parking near touristic sites and stimulates bad practices by entrepreneurs, who offer low quality and non-authentic services and products to meet low price expectations by misinformed mass tourists; adequate measures to ensure sustainable mobility and safeguarding of heritage are lacking.

Mass tourism is also a driver for the continuous urbanisation in coastal areas, aggravating their environmental and societal problems, including the safeguarding of water resources and fragile ecosystems, as well as gentrification. Uncontrolled mass tourism negatively affects local economies in the long term, by masking the region's unique features, which are ultimately what visitors want to find and enjoy.

The tourism industry is undeniably a major employer and the only source of income for many families. However, its uncontrolled growth depletes resources (e.g., sport fishing), increases pollution and leads to abandonment of traditional activities in rural areas where only a small elderly population remains. Thus, the MD is eroded in exchange for short-term profits and seasonal jobs, through the standardisation of architecture, landscapes, practices and foods. Even when owned by locals, businesses targeting summer tourists tend to disregard local culture and resources, adopting imitative behaviours by reproducing global standards for foods and souvenirs. In addition, the high demand for accommodation by tourists increases the prices of housing, essential goods and services for local populations; this problem is particularly serious on islands because of the faster depletion of resources and the increased cost of living that locals cannot afford.

There are concerns about the public image of the MD-related cultural heritage, including the lack of awareness of MD values, and consequent inappropriate hospitality practices and catering services for tourists (e.g., offering non-local foods), selling non-genuine products (such as bad quality copies of local crafts manufactured elsewhere with non-sustainable materials), etc.; Mediterranean experiences can be further undermined by underpaid, unprepared and under-motivated staff.

The general public and tourism operators associate MD with only culinary aspects, ignoring the deeper, holistic meaning of the concept. This situation should be reversed, through targeted awareness campaigns for the general public and training for workers in the sector. The erosion of the Mediterranean dietary model (by replacement of local non-processed food with worse, cheaper, ultra-processed food) has been noted by national surveys and scientific studies. The lowest adherence scores to the MD dietary pattern are found among the young and those on lower incomes.

Some project participants stressed that in low-income households (which generally adhere less to the Med diet, and have higher incidences of obesity and nutritional deficiencies) there is a perception that good quality Med food is expensive, and its cooking is complicated, while low-quality ultra-processed foods are cheaper and quicker to prepare, or ready-to-eat. It is thus necessary to demonstrate that by following the Mediterranean dietary pattern, eating well is not necessarily more expensive, but leading these population segments to do this may be hard due to their low educational level and literacy.

Besides the health and environmental burdens of moving away from the MD and associated traditions, it is acknowledged that this also leads to cultural losses with negative economic impact. Low involvement of SME and the media is an obstacle to the safeguarding of the MD, especially when they favour globalised behaviours and fast foods. It is urgent

that this damaging trend be reversed. Some ongoing actions by Public Administrations in this direction have been effective in some regions, for example by stimulating sustainable agriculture, kitchen gardens, educational programs in elementary and basic schools, and increased efforts to promote and disseminate the Med diet (canteen meals, use of social media and apps).

There has been a brain drain of younger generations out of the Mediterranean region, as well as a reduction in living standards of those who have stayed. Lifestyle in low-income households is based on the excessive use (and misuse) of technologies (e.g., mobile phones), sedentary habits, low food literacy and wrong food habits. The underlying reasons are transversal to many areas and it is urgent to address them, to avoid compromising the safeguarding of MD cultural values, the exchange of knowledge between MD-related stakeholders from different sectors and knowledge spill-overs, thus also avoiding limiting sustainable innovation and the creation of wealth in the regions. That approach could be accomplished by motivating young people to understand and embrace the MD lifestyle, and by stimulating MD-based entrepreneurship by younger generations.

Opportunities and possible scenarios

Agriculture in the Mediterranean region is mainly characterised by its high agrobiodiversity and widespread use of techniques to cope with harsh conditions (e.g., poor soils, irregular terrains, chronic water shortage and occasional drought). Such resilience is reflected in the numerous distinct products integrating the Mediterranean diet and the fact that they can now help cope with climate change and meet SDGs. Many Mediterranean products are highly valued, for example olive oil, wine, cork, and certain cheeses. Moreover, implemented food quality schemes, such as the geographical indication (e.g., PDO, PGI) and organic certification, link food habits to local economies. Several regions already have a long list of PDO and PGI that are valuable assets. These quality schemes may be drivers for the recovery and further sustainable exploitation of autochthonous plant varieties and animal breeds, thus enhancing local culinary arts and cultures, reinforcing adherence to the Med diet and positively impacting local economies. Exports from various regions are rising, as is demand for gastronomy tourism.

A possible move towards a recognition/certification of the Med gastronomic culture (e.g., branding, quality/authenticity seal) is a current opportunity for local businesses.

Awareness of the nutritional benefits of the Mediterranean diet stills needs to be improved in the region, and pride in MD culture needs to be restored, since they can be important driving forces for local development. Such pride can increase adherence to the Med diet, revamp traditional products (retrieving biodiversity and improving quality specifications) and enhance innovation.

Chefs play a crucial role in valorising particular features of foods, especially by promoting GI foods and others that depend on specific geoclimatic conditions, thus highlighting the intrinsic value of Mediterranean agrobiodiversity. When such foods can be presented as exquisite and rare, this raises public interest, so their reputation and market potential rise, a development which can be facilitated by academic support for health claims. Moreover, as experienced in Catalonia, MD-linked gastronomic tourism routes may contribute to sustainable development, by calling for agriculture, food processing, livestock farming and related practices in line with MD principles. In some regions, young, educated professionals with business skills collaborate with older holders of ancient traditions to bring innovation to markets, by revamping and leveraging rural products, activities and traditions. Such professionals can operate without a physical office, since they master remote work, as well as the use of big data and social media tools. Society is increasingly interested in authentic traditional cuisine, based on sustainable and healthy produce from local circuits, favouring the reinforcement of the Mediterranean Diet. Moreover, the interest of young entrepreneurs in MD-related businesses has had a positive impact on youth employment, acting as a catalyst for regional development.

Some internationally successful MD-based businesses can drive the development of others, by stimulating cooperation networks and enhancing the national and international prestige of the Mediterranean Diet concept. Such success stories show that thematic tourism products are of economical and social interest. The territorial arrangement of the Mediterranean region offers monuments and vines, sea and mountains, salt ponds and historical villages, beaches and volcanoes, all close to each another. In other words, tourism spots (castles, museums, beaches) and productive spots (orchards, manufacture facilities) are generally separated by only a few km, so a wide range of rich and sustainable touristic activities can be created as based on immersive experiences in the Mediterranean culture.

The multidisciplinary nature of the MD must again be emphasised, since the concept is rooted in a common ground of geography and climate, wild vegetation and plantations, sea, architecture, eating habits, history, sociological aspects and others, contributing to a Mediterranean identity.

There is sufficient know-how and experience to protect Mediterranean heritage, namely scientific support for health and nutritional claims,

the valuing of traditional foods and lifestyles as well as an eco-sustainable approach to innovation. Important universities in the Mediterranean region benefit such protection, strengthen the link between academia and SME and facilitate access by industry (for example agriculture, food processing and packaging) to know-how and high-level support. On the other hand, important stakeholders in food systems are located in the Mediterranean region (e.g., PRIMA[52], EFSA[53]), potentiating their involvement in regional high-tech networks.

Finally, a pragmatic and practical definition of the MD concept, in its multiple dimensions and linked to the territories, was suggested by the participants of the MD.net project (see section 2.1); this had the purpose to define clear criteria to build a robust and comprehensive communication strategy to promote the MD, linking the cultural sector with the primary production and the tourism sector. Such unified definition should be applied at the country level, as well as at the level of organizations, avoiding commercial banalisation and misuse of the MD concept, which will be reinforced by the interlinkage along the axis food-health-environment-culture.

In other words, a common and consistent "story" should be disseminated, cross-linking and relating the transversal elements of the MD – history, heritage, territory, gastronomy, traditions –, thus allowing to effectively address and halt MD cultural erosion, while enhancing regional sustainable development. The proponents of such strategy believe that it will greatly benefit from improving the management and international promotion of brands and recognitions, coordinating different agents and initiatives. A reference framework and roadmap will be valuable tools in obtaining international recognition, ensuring that different intervening agents and initiatives are well coordinated.

[52] PRIMA: Partnership for Research and Innovation in the Mediterranean Area is an European program dedicated to the Mediterranean, managed from Barcelona, Spain.

[53] EFSA: European Food Safety Authority is responsible for scientific advise and risk management, shaping food safety regulations in the EU. The headquarters are located in Parma, Italy.

CONCLUDING REMARKS

Examples of trends encouraging the smart use of resources and of renewable energies, cherishing biodiversity and tackling waste, can all be found in MD. An illustration of the smart use the natural surrounding environment can be deduced from the historical records of water management systems and fish farming used by ancient civilizations (see chapter 1) and by vernacular architecture elements, as shown in Figures 1.12, 1.14 or 1.15. It is also noteworthy that renewable energy sources, such as tides, wind and sun, were used in the Mediterranean region many centuries ago (as detailed in chapter 1 and further mentioned in chapter 2), as well as mechanisms to facilitate some works, by amplifying the displacement obtained by a given force, as was the case of extracting water from wells with animal traction or human labour.

The agrobiodiversity resulted from adapting plants and animals to harsh environments, sometimes called marginal lands, which along with fishing and gathering in the wild aimed at ensuring food security year-round; such efforts resulted in a varied diet of replaceable items where seasonality and resourcefulness play key roles (as shown in Figures 1.3, 1.16, 1.17, 1.18, 1.20 and 1.21). Such old wisdom has still much to be revisited and further studied to eventually promote new applications, namely through the fusion with digital technologies that are expected to help promote and value the MD concept and related products.

Creativity is relevant to unlock models other than "business as usual", as required in these times of big changes. The dynamic and social character of the MD heritage often threatens its survival, and two important dangers were identified: the tendency to neglect quality and to trivialise MD, and the potential competition between tourism operators from different regions within the Mediterranean area. Measures should be taken to avoid both, as well as to minimise the high seasonality of tourism markets.

A market competition with other specific gastronomic destinations has been noted. The negative impact of such trend on the Mediterranean tourism businesses can be important if offers only focus on the food and health aspects, ignoring the holistic nature of the MD. Still in relation to the cultural heritage aspects, the need to unify and review the criteria that define the MD, including clarifying the territorial scope, is relevant to devise a strategy to enhance the cooperation among Mediterranean stakeholders and SME operating in distinct MD sectors. After agreeing on a common ground, the share of information will be crucial to unify the conveyed messages to tourists, for the benefit of all.

As mentioned before, there is a favourable context for the

promotion and safeguarding of MD, through educational activities, such as promoting food literacy and developing cooking skills (some well-recognized culinary schools are already training their future professionals in healthy eating). The stimulation of innovation, in the framework of MD, will certainly be in line with SDG and the European Green Deal, and its pioneering Climate law.

Moreover, young people are increasingly interested in agriculture and production of authentic food, which can be a driver for new economic models by young, educated entrepreneurs able to develop innovative businesses rooted in Med diet values.

The increased interest in MD from academic sectors, public administrations and local populations is certainly paving the way for prevention of further degradation of this intangible heritage.

Rising awareness of MD and stimulating pride in the Mediterranean identity will facilitate the revamping of sustainable food systems, rooted in MD values, traditions and techniques. It will also favour the development of sustainable and creative forms of tourism to best develop MD values and further value preserved nature and historical sites, local traditions and culture. ■

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