Cofinancé par le programme Erasmus+ de l'Union européenne

UNIVERSIDADE DE ÉVORA

Mestrado em Gestão e Valorização do Património Histórico e Cultural - Master Erasmus Mundus TPTI

(Techniques, Patrimoine, Territoires de l'Industrie : Histoire, Valorisation, Didactique)

Wine production in rural area of Bekaa - Lebanon

Joseph Tannous

Orientador / Sous la direction de : **Rute Sousa Matos**

Évora, agosto de 2020 | Évora, août 2020

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Abstract

Although wine production has an extremely long history across Lebanon, it is relatively suffering from a loss of identity due to globalization, and the huge rupture that occurred during the Islamic era. A development of a collective strategy that focuses on brand identity and territorial promotion is a must for an identity development. Luckily the rich history and culture of Lebanon, make them great assets to build upon them this identity. Accordingly, in this thesis we are going to seek the current vineyard landscapes, vineyards and the cultural potentials that the wine industry has, having the Bekaa region as our framework, and propose upon these potentials and characteristics a touristic map which could be used in a collective development strategy to guide landscape valorisation and wine identity development.

Keywords: Bekaa, Vineyard, Landscape, Cultural Landscape, Cultural Route

Résumé

Bien que la production de vin ait une histoire extrêmement longue au Liban, elle souffre relativement d'une perte d'identité due à la mondialisation et à l'énorme rupture qui s'est produite pendant l'ère islamique. L'élaboration d'une stratégie collective axée sur l'identité de marque et la promotion territoriale est indispensable au développement de l'identité. Heureusement, la richesse de l'histoire et de la culture du Liban en font de grands atouts pour construire sur eux cette identité. Par conséquent, dans cette thèse, nous allons rechercher les paysages viticoles actuels, les vignobles et les potentiels culturels dont dispose l'industrie du vin, en ayant la région de la Bekaa comme cadre, et proposer sur ces potentiels et caractéristiques une carte touristique qui pourrait être utilisée dans une stratégie de développement collectif pour guider la valorisation des paysages et le développement de l'identité du vin.

Mots-clés : Bekaa, Vignoble, Paysage, Paysage culturel, Itinéraire culturel

Resumo

Produção de vinho na zona rural de Bekaa - Líbano

Embora a produção de vinho tenha uma história extremamente longa em todo o Líbano, sofre relativamente de uma perda de identidade devido à globalização, e à enorme ruptura que ocorreu durante a era islâmica. O desenvolvimento de uma estratégia colectiva centrada na identidade da marca e na promoção territorial é um imperativo para o desenvolvimento de uma identidade. Felizmente, a rica história e cultura do Líbano, fazem deles grandes trunfos para construir sobre eles esta identidade. Assim, nesta tese, vamos procurar as actuais paisagens vitícolas, vinhas e potenciais culturais que a indústria vinícola tem, tendo a região de Bekaa como quadro, e propor sobre estes potenciais e características um mapa turístico que poderia ser utilizado numa estratégia de desenvolvimento colectivo para orientar a valorização da paisagem e o desenvolvimento da identidade do vinho.

Palavras-chave: Bekaa, Vinha, Paisagem, Paisagem Cultural, Rota Cultural

Acknoledgment

I wish to express my sincere gratitude to my professors Anna Cardoso de Matos and Rute Sousa Matos and all the professors of the TPTI Masters.

A special thanks to the secretaries Evelyn Berrebi and Helena Espadaneira.

I also thank all my classmates for this exceptional experience. And my family for the endless support.

"They that dwell under his shadow shall return; they shall revive as the grain, and grow as the vine: the scent thereof shall be as the wine of Lebanon."

Hosea 14:7

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Acronyms

AMPV	Associação de Municípios Portugueses do Vinho
AOC	Appellation d'origine contrôlée
CIIC	Comité scientifique international des itinéraires culturels
CIVC	Comité Interprofessionel du Vin de Champagne
GIS	Geographic Information System
Ha	Hectare
ICOMOS	International Council on Monuments and Sites
LARI	Lebanese Agricultural Research Institute
NGO	Non-governmental organization
OIV	Organisation of Vines and Wine
ONIVINS	l'Office National Interprofessionnel des Vins
PDO	Protected Designation of Origin
UNESCO	United Nations Educational, Scientific and Cultural Organization
UVL	Union Vinicole du Liban

Introduction

Wine production has an extremely long history across Lebanon. This country belongs to the Eastern Mediterranean basin that historians locate the production of the first wines and where wine culture developed for thousand years ago. The Lebanese industrialization of wine production has its origins in the Bekaa region, in which Jesuit in 1857 founded the first modern winery in Lebanon. After a relatively slow development for about a century, the industry recognized a spectacular dynamism after the end of the civil war in 1990. Despite all the difficulties, resulted from the continuous instability, the wine industry has been expanding over the last few decades in Lebanon, bringing significant changes to the economy and landscape. Today, the sector brings together around forty producers, half of whom are located in the Bekaa and most importantly about 70% of the vineyards are located in this region[1]. The great diversity of the territories and the possibility of cultivating allowed the presence of a wide range of grape varieties. Moreover, the wine industry is a dynamic force in the area concerned, which is reflected in the diversification of economic activities in the region. The remarkable growth of wine activity in the Bekaa, has inspired this research to go and find the factors that are at the origin of this success. Thus in this thesis we are going to seek the natural and cultural potentials that the wine industry has, and propose upon these potentials a touristic map which could be used in a collective development project to guide landscape valorisation and local development based on the local productive culture.

The work in this thesis will be divided into four main chapters:

The first part chapter generally is a context presentation, it deals with the historical aspect of wine production in Lebanon, and geographical characteristics of Bekaa.

[1] Résultats globaux du module de base du recensement de l'agriculture 2010. Projet « Observatoire Libanais de Développement Agricole »..

The Second part is related to the literature review in order to better understand the main concepts that make up our research work: Vineyard cultural landscapes, Territorial branding, and Wine tourism.

The third part sheds light on wine-related infrastructure present in Lebanon; A look on Organizational structures and how it is possible to build upon these structures the proposed project.

The fourth part is the project proposal of the touristic map and justifying its main elements.

Problematic

Despite the fact that wine production has an extremely long history across Lebanon, it is relatively suffering from a loss of identity; random production, uncontrolled expansion, and absence of strategic policies and legislations all these factors resulted in not having a clear wine identity that distinguishes it from world wines.

This loss is characterised by two main historical reasons:

- **The Islamic era:** during this era there was a huge rupture in the wine production. Where no links were left between the ancient production and the modern history production since this era was present more than a thousand years. Reaching the 19th century where the French with of their priests revived this production with implementing their own know-how and techniques of production.
- **The Globalization era:** While the French started to create their own identity of wine production in Lebanon. First by the Jesuit priests in the 19th century, then followed by the French mandate in the beginning of the 20th century. After the Lebanese civil war this identity was not preserved, and got mixed by the globalized context. The introduction of new varieties, different ways of growing the grapes are compared to other models in order to find

the best adequacies in the production of quality wine. Which lead in harming and increasing the loss of identity.

Methodology

It is very important to mention that the current thesis objective is different than the originally proposed one. Several events and incidents that are out of control led to the modification of the state of art of this thesis and to the methodology used. Principally the state of art concerning the mentioned problematic was to create a landscape plan of the vineyard landscape classifying them according to their characteristics; Type, age, size …

For such landscape plan, an updated statistical data should be owned in order to classify the Bekaa territories and propose the valorisation of the vineyard landscape accordingly. Due to erupt of the political and financial crisis in Lebanon and all the instability it is living during the time of the research adding to that the traveling restrictions related to the break out of the Covid-19 virus, a deep fieldwork and data collection was impossible in these conditions, resulting to the modification of the thesis and proposing instead a touristic map that can be part in a collective development project to guide landscape valorisation and local development. Such map could be achieved without the necessity of updated statistical data.

So in Summary the methodology was based on literature review and collection and analysing of available data. That was made on the basis of related books, reports, press articles, other theses, and by consulting online sources.

The literature research allowed us to make an inventory of the issue and refine future research. That is an approach that allows to summarize and cross-checking the various documents that are part of our study to raise relevant questions about the problematic.

Concerning the proposed map: The research was carried out in several stages: First correlating the data collected from various sources; creating the database of GIS, which divides the maps administratively. Adding the commercial wineries on the database which are around 30, assessment of the parameters and the main factors of the vineyards determining the territorial distribution of viticulture and oenology in the Bekaa region. Showing the territorial distribution of these vineyards. The last stage was adding the main cultural elements of the region for creating a well-structured collective vine oriented touristic map. Such approach revealed a wider and clear picture and gives the opportunity to determine a set of territorial distinctiveness of the Bekaa region.

1. Context Presentation

In this chapter, we are having a closer look on the context of our project from two perspectives: The Geographical and the Historical. This presentation justifies more the selection of the framework and shows the characteristics within this framework. A chronological history telling about the wine industry and its evolution in the one part. While the other part tackles the geographical aspects of the project.

1.1. Geographic Overview:

Lebanon is a Sovereign country in western Asia. It is bordered by Syria to the north and east and Israel to the south, while Cyprus is west across the Mediterranean Sea. Lebanon's location at the crossroads of the Mediterranean Sea and the Arabian Peninsula accumulated its rich history and shaped a cultural identity of religious and ethnic diversity. Lebanon is considered the smallest recognized country on the entire mainland Asian continent at just 10,452 km^2.[2] Despite its small size, Lebanon is rich in its regional distinctions geographical wise. Among these regions, the Bekaa has its own characteristics which allows it to be clearly differentiated from the rest of the Lebanese territories.

[2] www.britannica.com

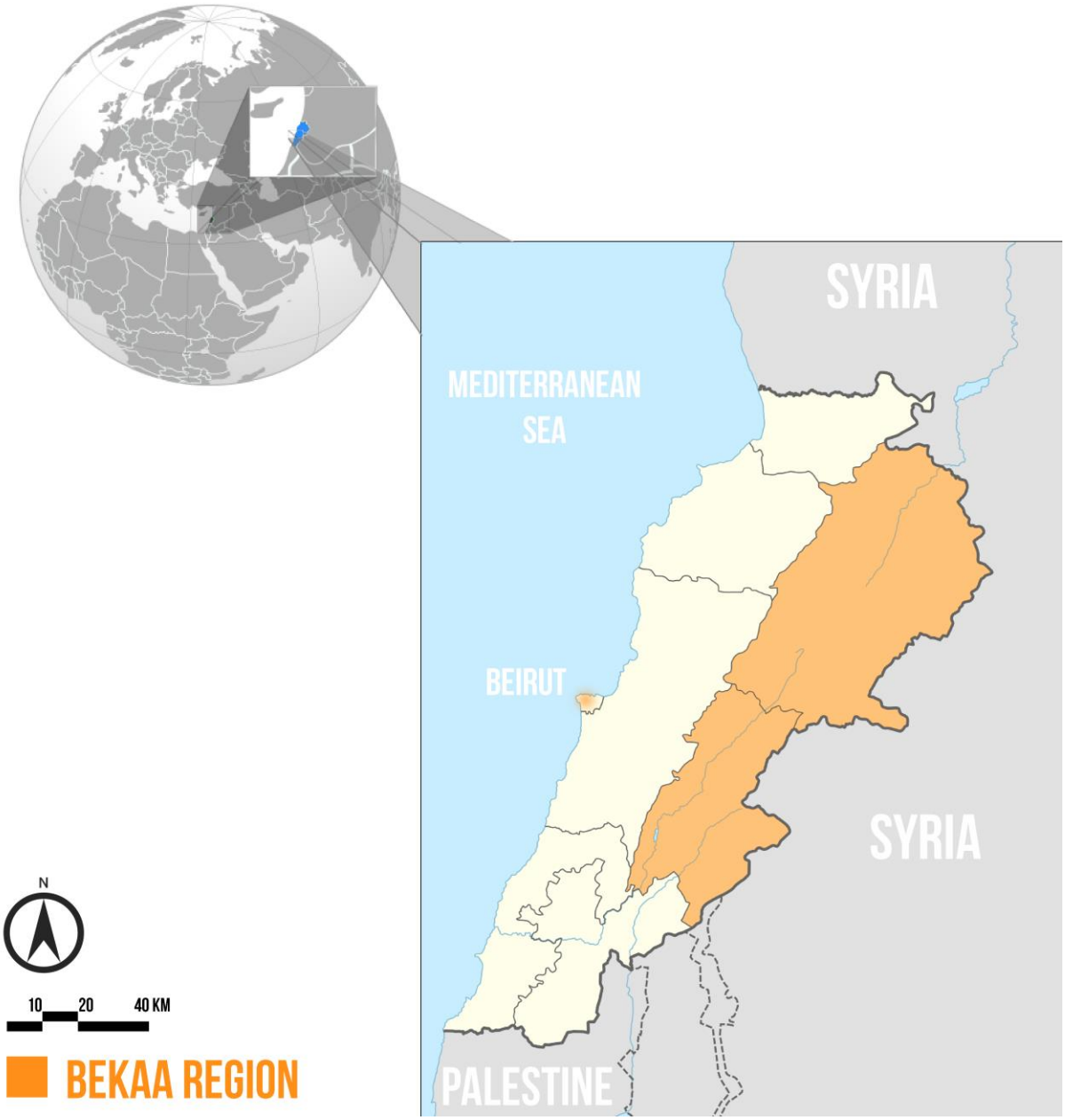


Figure 1 Localization of Lebanon and the Bekaa region - Source: Author

Mainly Lebanon has a Mediterranean climate, however the two mountain chains that Lebanon has adjacent to its coastline creates different micro-climates regions that is unique by its characteristics that can be divide as the following:[3]

[3] (Lelay G. and Roger T. (2003). La filière viticole au Liban : Analyse et propositions pour une évolution, Ecole Nationale d'ingénieurs des travaux Agricoles de Bordeaux, Ministère d'agriculture et de la pêche, p. 120.)

- Coastal region : Facing the Mediterranean sea, mainly humid, having annual precipitation amount between 750 and 800 mm
- Mount-Lebanon Chain : Mountainous region with variable altitudes. , having annual precipitation around 1300 mm mainly on the west side which is facing the Mediterranean sea
- Central and South Bekaa valley : Interior Plain with dry climate, having annual precipitation around 650 mm
- North Bekaa: Also part of the interior plain with Semi-arid Climate. having annual precipitation around 300 mm
- Anti-Lebanon Chain : Interior Mountainous region, having arid climate with low precipitation.

These various geographic characteristics that Lebanon has with different landforms and soil types gave the Lebanese viniculture a big asset and variety with its winegrowing practices.

Clearly, the current wine-growing landscape was a product of moderate development, it was sufficient to review the last decade how this landscape was constructed and developed. Not to mention the historical legacy that the Bekaa has concerning wine. Thanks to the French by their three pillars (Religious “Jesuits”, Military and Laic) they shaped the wine industry in Lebanon for around 150 years.

The Bekaa is one of the essential components of Lebanon. it is a territory that has been devoted for centuries to agriculture. Having natural resources and aiming for self-sufficient agriculture these reasons were the major for which the Bekaa was added to Mount-Lebanon during the establishment of the state of Great Lebanon in 1920. Beside the Bekaa, the region of Jabal Amil, Tripoli and the plain of Akkar were added to the new established state.

Figure 2 Map of the Centenary of the Proclamation of the State of Greater Lebanon, 1920

Source: https://lebanonpostcard.com/shop/souvenirs/notebooks-pens-maps-bookmarks/map-state-ofgreater-lebanon/

From an administrative point of view, Beqaa is a governorate in Lebanon, a peripheral region bordering Syria, located about 30 km east of Beirut (Capital) having an area of 4,439 km² that lies at about 1,000 metres above sea level. Its administrative center is in the city of Zahle. The Bekaa governorate was split into two in 2003. The Baalbek-Hermel governorate is made up of two caza which are Baalbek and Hermel. The Bekaa governorate includes the caza of the West Bekaa, Zahle, and Rachaya.

Choosing the Bekaa valley for my case of study, is due to the major presence of the vineyards in it. It contains the major percentage of the total vineyards in Lebanon, adding to that over 20 wineries that varies from small family business to large industries with great production.

Figure 3 Administrative map of Lebanon with the location of Bekaa.

Source: https://mappemonde-archive.mgm.fr/num9/lieux/lieux06101.html/ (2018)

1.1.1. Administrative division

In order to understand the administrative division of the Bekaa, it's good to know the administrative division of Lebanon in advance. Lebanon is a country whose national territory is organized on the basis of a four-level division. Going from the largest to the smallest administrative entity, we have: State – Mouhafazat – Caza – Municipality

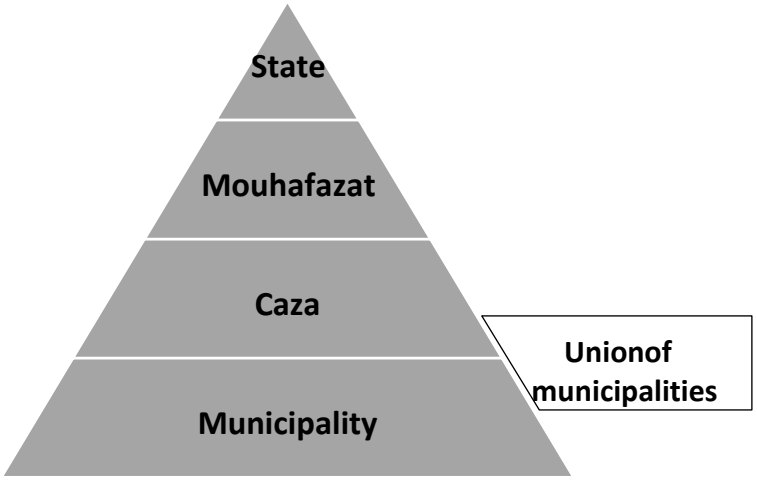


Diagram showing the hierarchy of the administrative division in Lebanon / Source: Author

Mohafazat (Governorate):

Lebanon is divided into eight large governorates, called mohafazat "محافظة". Before the administrative reform of 2003, there were six which formed two more. The Bekaa constituted a single mohafazat prior to this reform which was the largest. This reformation and division was intended to represent more the governorates in order diminish the obvious imbalance development between them. The formation of the northern part of the Baalbek-Hermel district (3,009 km2) and the southern part retained the Bekaa's name (1,430 km2). With the exception of Beirut and Akkar, all Mohafazats are divided into several smaller administrative entity called Caza "قضاء" Lebanon has eight governorates (mohafazats): Akkar, Baalbek-Hermel, Bekaa, Beirut, North Lebanon, South Lebanon, Mount Lebanon and Nabatiyeh

Caza (District):

This is an administrative division of the Mohafazat, mainly it is used for election divisions in Lebanon

Union of Municipalities and Municipalities:

The municipality is a local government practicing the authorities granted to it by law within the limits of its territory. It is endowed with legal personality, financial autonomy and the power of self-management of local interests. Among the main authorities that the municipality has: Rural/Urban planning, construction, street cleaning, waste management…

Table 1 Table Showing the administrative division of the Bekaa and the relative area

Mohafazat	Caza	Number of Unions	Number of municipalities	Area (km2)
Baalbek-Hermel	Baalbek	4	82	2,278
	Hermel	1	73	731
Bekaa	West-Bekaa	2	41	470
	Rachaya	-	26	542
	Zahlé	3	47	418
Total		10	269	4,439

Data collected from: www.localiban.org

From a geographical point of view, The Bekaa has several characteristics favourable to the development of agriculture. It forms an entity that covers 44% of Lebanese territory. This portion of the Lebanese territory is well outlined and stands out very well from the other territories. It is located in the dug that separates the mountains of Mount Lebanon and Anti Lebanon, this valley has a great fertility due to the presence of the two most important rivers of Lebanon (Al-Litani River and Al-Aassi River) which cross it. For example, the nature of the soils, their organic matter and acidity content, their depth, their low slope, etc... Large areas of the plain are suitable for cultivation. Similarly, the climate and the richness of water resources constitute considerable advantages for the plain.

The land in the Bekaa is perfect for vine growing as it doesn't require huge amounts of water and the climate is ideal with high temperatures in the summer, a freezing snowy winter, just what it takes to grow grapes.

Agriculture occupies almost the entire Bekaa territory. Since Roman times, it has been considered as a granary for cereals, thanks in particular to favourable soils. As for the composition of the soil, it presents a clayey-limestone mixture with little gravel, prolonged by red soils, ideal for agriculture. The particular geography of the plain gives it diverse physical characteristics from south to north. Being sometimes mountainous and sometimes flat adding the temperature variations and the difference in rainfall enrich the diverse agricultural landscape of the plain.

1.1.2. Climate:

Since Lebanon is a country in the eastern Mediterranean region, at first sight its climate is close to that of a Mediterranean country. A more sophisticated approach enables the excessively rapid observation to be clarified and the pattern is changed, particularly due to the above described strong mountainous presence. The seasons are well characterized by a hot and dry summer that compares with a cold and rainy winter.

As for the Bekaa climate itself, this can be illustrated with the below figure:

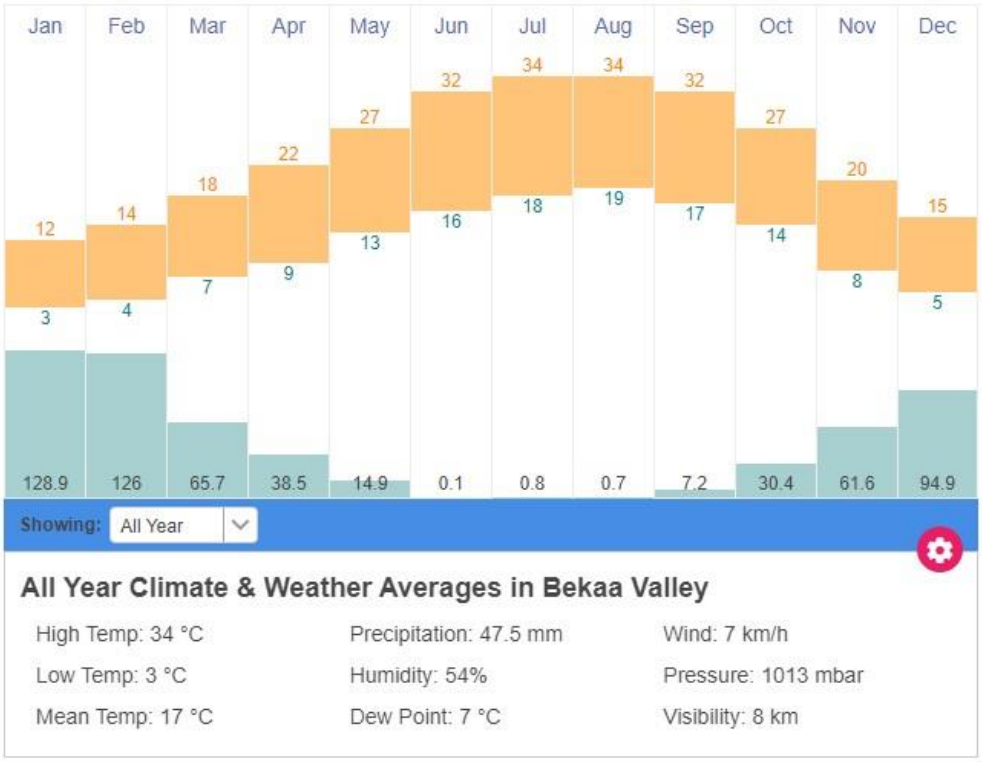


Figure 4 Annual Weather Averages Near Bekaa Valley based on weather reports collected during 2005–2015

Source: https://www.timeanddate.com/weather/@280281/climate

1.1.3. Physical characteristics:

Being one of the few completely flat areas in Lebanon, the Bekaa is the main plain of the country. The Mediterranean coastline is generally narrow, limited by the Mount-Lebanon chain. Mountains are indeed omnipresent in Lebanon and this country is composed of two parallel mountainous chains. As soon as the narrow coastal plains finishes, Mount Lebanon appears. Its orientation is south-southwest - north-northeast and it follows more or less the direction of the coastline. This chain stretches over a length of 170 kilometres, with a variable width of between 10 and 15 kilometres. Its altitude rises gradually from south to

north to reach more than 3000 meters at Qurnat as Sawdā (“The Black Peak” in Arabic) it is the highest point in Lebanon and the Levant, at 3,088 meters above sea level.

Facing Mount Lebanon stands the Anti-Lebanon Mountain, a chain with lower average altitude. Its crest line forms the political border with Syria. It extends in its southern part to Mount Hermon.

The Bekaa Plain is wedged between these two mountain ranges. It is therefore an interior plain. Having an average altitude of 900 meters. This flat region, with very gentle slopes, is extended by the foothills of the two mountains, with those of Mount Lebanon to the east and those of the Anti-Lebanon to the west. (Figure 6)

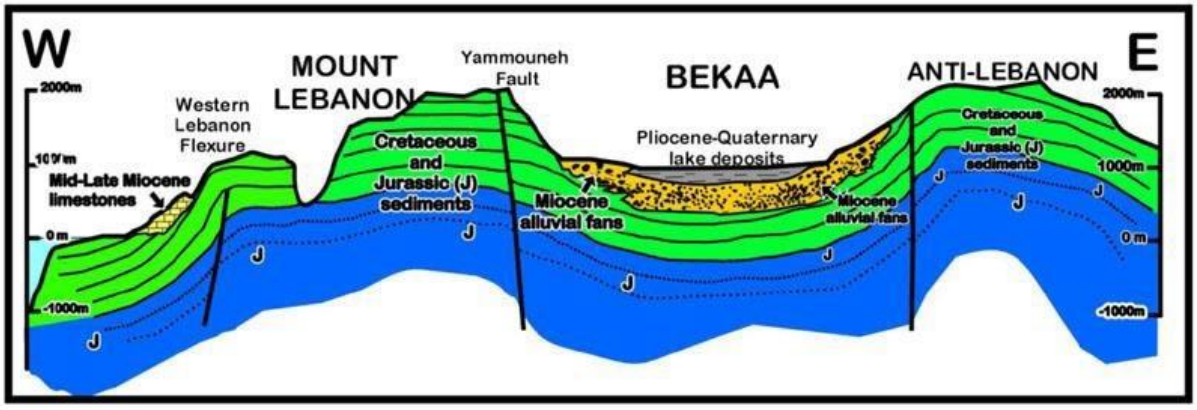


Figure 5 Schematic cross section across Lebanon

Source: http://almashriq.hiof.no/ddc/projects/geology/geology-of-lebanon/fig3.html/ (2018)

All in all, this brief overview of the Bekaa has made it possible to highlight its physical and historical characteristics by revealing the main attributes that make it a special region within the Lebanese territory. The geographical aspects are extremely favourable for the creation of a vineyard which led the winegrowers to be attracted and concentrate their efforts in this region of Lebanon. The great diversity of the territories and the possibility of cultivating

vines between 900 and 1800m of altitude, allow the cultivation of a wide range of grape varieties.

Nonetheless it should not be forgotten that the Bekaa is not just a suitable production region, it is additionally a significant location from a geostrategic perspective, and has been so for some centuries[4] It is also a privileged place of transit for commercial transactions, and a stake in the links between Lebanon and its neighbours. It is one of the reasons that it has always drawn the covetousness of surrounding regions throughout history to describe its importance.

We can deduce, Bekaa is in this perfectly circumscribed region, where agriculture occupy a significant part of the inhabitants, and considered Lebanon's largest wine-growing field. The Bekaa is the cradle of modern wine growing, and its privileged place of development. The concentration of the main wineries is at the origin of the creation of an active wine industry in the heart of the Near East, with its particular wine-growing landscapes[5].

1.2. Historical Overview

Found inside the region where historians locate the production of the first wines, around 6000 BC, between the Caucasus (today Armenia and Georgia) and the Levant, Lebanon is one of the initial of winegrowing. Around 3000 BC, the Phoenicians exported their wine, spreading Lebanese wine throughout the world[6].

Even though Lebanon's wines, and particularly those of the Bekaa, are becoming increasingly popular, the vineyard landscape itself remains unknown today, as it was in the

[4] «La Bekaa, une zone libanaise stratégique au voisinage de la Syrie », in Franck Mermier et Elizabeth Picard, Liban, une guerre de 33 jours, La Découverte, 2007
[5] Les Paysages viticoles de la Bekaa (Liban) -Jean-Pierre BEL. Page : 41
[6] Rozelier, Zawaq 2012

past centuries. Even if many points of view meet in highlighting its origins back to ancient times, a huge part of its history remains mysterious.

Bekaa plain is a historical winemaking land. According to local winegrowers, the reference to Bacchus' remarkable Roman temple in Baalbeck City is often mentioned for the aim to legitimize their work by giving them a prestigious historical reference. Yet aside from a few distinct vine-related elements, there is no evidence that shows it was really dedicated to the Roman god of wine. Without minimizing its significance, Baalbeck's temple is only one era in Lebanon's vine history, the traces of which are sometimes lost throughout the course of the centuries[7].

It was not until the end of the ottoman era, during nineteenth century, that wine-developing movement recovered genuine momentum, after centuries of inactivity during the Islamic era. This momentum was catalysed in the twentieth century by the political changes that was undergoing in the region by that time.

1.2.1. Jesuits – The Renaissance

Staring their settlements on the Levantine coast by the seventeenth century, The Jesuits took up residence in the Bekaa in 1857. This arrival in the interior was linked to a 25-hectare donation of land to Ksara, a town situated a few kilometers from the town of Zahle, which is already considered the main town of the plain[8]. They use their land for agricultural purposes as do other clergymen. They take great care to reserve a special place for the vineyard from which they produced wine, for their personal consumption as well as for liturgical usage. Even though the wine related activities wasn’t always entirely private, the

[7] Les Paysages viticoles de la Bekaa (Liban) -Jean-Pierre BEL. Page : 41
[8] Les Paysages viticoles de la Bekaa (Liban) -Jean-Pierre BEL. Page : 42

Ottomans turned a blind eye and tolerated these activities for political reason related with France.

Although it was the Jesuits, whom revived the modern viticulture activity in the Bekaa, wine production for commercial use was introduced by François Eugène Brun. He was a French engineer working in Lebanon, and after finishing his work, he decided to start making wine for commercial use in the Bekaa, by establishing "*Domaine des Tourelles"* winery, that was found in Chtaura in 1868. He started by the vinification of few vines he planted, using even grapes purchased from different producers. The majority of the vinification process was intended primarily to make Arak (Lebanon's national alcoholic drink) which locals favoured using indigenous grapes.

Jean-Pierre BEL(2009) mentioned in his book that a hypothesis concerning the shift of the Jesuits in the Bekaa to larger and more complex production of wine is due to need of the income in order to fund their activities. Such as, construction and building maintenance, beside the establishment of orphanages and schools. That need was supplied from the income realized by the wine selling[9].

By the new approaches of the adaptation of vineyard in their cultivation, the Jesuits whom were in charge of viticulture, found that the indigenous grape varieties that were not preferred for such cultivation, so they decided to import others from Algeria to replace the local vines.

This move was attributed to the fact that they are more fertile and offer a superior wine compared to the indigenous grape varieties[10].

[9] Jean-Pierre BEL, Les Paysages viticoles de la Bekaa (Liban) -. p. : 43
[10] Michel JULLIEN , La nouvelle mission de la Compagnie de Jésus en Syrie, vol. 2, op. cit. p. 217

According to Michel Karam the grape varieties that were imported from Algeria were most probably *Cinsault* and *Grenache Rouge* Which they were the most dominant during that time[11]

The choice of vines from Algeria by the Jesuits, was due to their good knowledge and potentials of the Bekaa region that is considered a fertile land for these varieties. Not to forget that the people that were in charge of all the wine related jobs were French people that most probably were coming from Algeria, bringing with them their expertise and know-how related to field of wine-making.

At a time when Phylloxera was devastating vineyards all around Europe, It wasn't easy for wine-growers in Bekaa to accept new grape varieties. However Jesuit responsible succeeded on forcing the new varieties on the wine-growers. Nevetheless Phylloxera still arrived the Bekaa plain in 1910[12]. All grape varieties were affected during the Phyloxera invasion even if some indigenous varieties had better resistance than others like Obeideh.

1.2.2. Phylloxera

Phylloxera is a disease that marks the history of viticulture all around the world. Lebanese vineyard landscape was as well affected Phylloxera and was one of the main elements that shaped the current landscape in the Bekaa[13]. Eventually the current landscape found in Bekaa is considered as "Post-Phylloxera" period, since the treatment against the Phylloxera was by traditional forms with uprooting and development of rootstocks. The latter sometimes were poorly adapted to very calcareous soil conditions, which prevents the development of the parasite without completely destroying it. Obviously, links with the

[11] Karam, Micheal, Chateau Ksara: 150 Years of Wine Making 1957-2007 VHM, Beirut, 2007, p. 24
[12] Jean Hage CHAHINE, La vigne au Liban. Etude ampélographique, 1955., p. 77
[13] Rita Mohasseb , State Of Viniculture In Lebanon ,2019, page 53

ancient wines no longer exist due to the change of the varieties, which makes it hard to study preceding period.

It wasn't until the 1930 that the danger of Phylloxera was totally overcame.

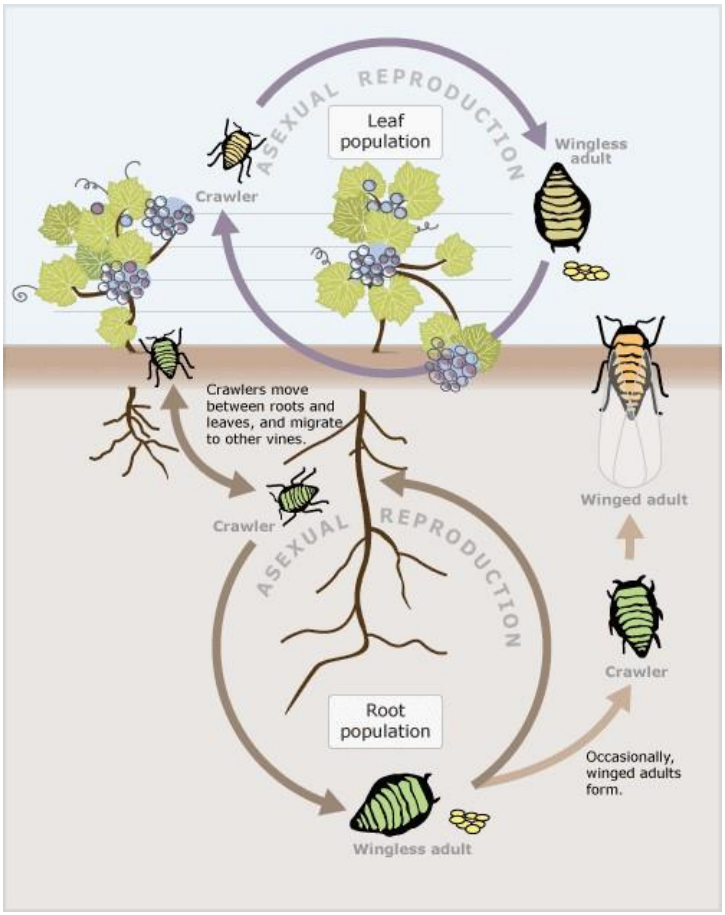


Figure 6 Phylloxera aphid life cycle

Source :(Maggy Wassilieff, 'Viticulture - Pests and diseases', Te Ara - the Encyclopedia of New Zealand, http://www.TeAra.govt.nz/en/diagram/18318/phylloxera-aphid-life-cycle)

Phylloxera is a microscopic, sap-sucking insects, related to aphids, feed on the roots and leaves of grapevines. The increased number of sea travel between Europe and America in 1857 has resulted accidentally transfer of this aphid, native to the Mississippi Valley of the eastern United States, practically destroyed all the world's vineyards once freed from its

homeland[14] . The traditional solution was back then was to burn all the vines to limit the development and propagation of the disease and to import resistant rootstocks from the American continent where natural evolution has allowed the vine to fight this disease.

This insect has resulted in The Remaking of the World of Wine, it is almost impossible to find any vineyard that survived this insect invasion. This resulted in shaping the new vineyard landscapes that are present in our days[15].

1.2.3. The French Mandate

The fall of the Ottoman Empire led to substantial changes its land after the First World War that led to the formation of a mandate delegated to France, in the area of Lebanon and Syria. By the arrival of the French troops and civil servants, wine production bloomed and experienced a significant turning point. The production had already shifted from being artisanal targeted for the consumption of the Jesuits and began to have a larger scale. Due to the unprecedented demand, winegrowers saw a great potential by the new arrivals that shouldn't be missed. The new dynamism has led for more commercialization of the wine and led to many changes in the wine related practices, by introducing new grape varieties (Muscat, Carignan and Ugni Blanc) offering more diversity for the market[16]

1.2.4. Sustained growth (1943 - 1975)

Lebanon gained its independence from France in 1943, by the end of during the Second World War. Without any doubt the deployment of the French troops affected the market of the Lebanese wine since they were the major consumers, conversely the development of this industry continued its development after the independence. Multiple vineyards began to

[14] www.guildsomm.com
[15] http://www.tenzingws.com/blog/2015/5/26/maps-of-the-spread-of-phylloxera-in-19th-century
[16] Micheal Karam, Chateau Ksara: 150 Years of Wine Making 1957-2007 VHM, Beirut, 2007, p.32

be built up and been structured. This period faced a huge growth, which represents the climax power of the Jesuits in the wine industry in the Bekaa that was estimated to produce around 85% of Lebanon's wine[17].

The period between the Independence the civil war, was considered as the golden age of

Lebanon winemaking success of the enterprise exceeded expectations to the point that the Vatican authorities were so moved by the situation that it threatened to divert the Jesuit Fathers from their primary spiritual vocation. The Second Vatican Council then asked religious congregations around the world to sell their business activities[18] . The Ksara domain and its vineyards were sold in 1973 to a group of investors, since then and up to our day, Ksara is considered the main wine company in Lebanon. It is important to mention that even many vineyard were being developed and structured, but the number of wineries remained the same with the dominance of Chateaux Ksara during that period.

1.2.5. The multifaceted war (1975-1990)

Lebanon experienced 15 years of civil war on its territories lasting from 1975 to 1990 and resulting in an estimated death toll of 120,000 person[19].

Mainly the most shattering clashes were in the capital Beirut, but affecting the whole economy and the agricultural sector as well. Some vineyards were partially damaged by shells (projectile), nevertheless the winegrowers have adapted to the consequences of the war and also development the vineyards especially in Bekaa.

[17] Michael KARAM, Wines of Lebanon, SAQI, London, 2005, p. 80
[18] https://www.vatican.va/archive/hist_councils/ii_vatican_council/documents/vatii_const_19651207_gaudium-et-spes_en.html
[19] United nations, Report of the Commission of Inquiry on Lebanon pursuant to Human Rights Council resolution

It is important to mention that as the consequences of the civil war, many illegal agricultural practices erupted such as the plantation of cannabis.

The general structure of the vineyards was evoked by their dynamics, can be observed with different parameters. A study that was made of the variety of grapes also indicates the very Mediterranean quality of the Bekaa vine.

Table 2 Table Showing the area and percentage of each grape variety in Bekaa (1976-1990)

Grape Varieties	**Area of Plantation (in Hecatares)**	**Percentage of total varieties %**
Cinsault	97.6	62.2
Ugni Blanc	10.0	6.4
Syrah	9.2	5.9
Grenache Rouge	8.0	5.1
Cabernet — Sauvignon	7.9	5.0
Clairette	7.8	4.9
Bourboulenc	6.7	4.3
Sauvignon Blanc	3.5	2.3
Carignan	2.9	1.8
Mourvèdre	2.7	1.7
Muscat Blanc	0.6	0.4
Total	156.9	100.0

Source: Survey made by Jean-Pierre BEL

As we can analyse from this table, the majority of the vineyard back then was Cinsault, that were mainly imported by the Jesuits. This proves that the Jesuits has introduced a vineyard landscape character in the Bekaa valley giving it an identity mainly dominated by the Cinsault grape variety. This domination of the variety on the landscape, emphasized the landscape identity which is considered Mediterranean, not to forget that most of the grape varieties were imported from Algeria. We realize that other "Non-Mediterranean" grape varieties, like Clairette, planted areas were limited by that time (1976-1990). It is obvious the absence of the indigenous grape varieties in this survey, which can show us the absence of their usage in the commercial wine production.

1.2.6. The Flourishment (1990 - Present)

By the end of the civil war, several progressive winemakers and winegrowers were aware of the urgent need to adapt to the international context in order to be competitive. This implies a significant change of the method of producing wine and the elimination of all the obstacles towards vineyard modernisation. This significant transformation is taking place in the face of a few wineries, turning their back on the viticulture of the pioneers of the nineteenth century, while vitally preserving the acquired heritage. There were 8 wineries in the 90s and the number expanded to 41 in 2010[20]

This expansion in the number of wineries, however, was random, each making its own wine in the way feels suitable. Lebanese wine industry lack organisation. The absence of legislations that guides and identifies wine production explains the absence of Lebanese wine identity, resulting in a style that reproduce other foreign wines.

[20] Murielle Rozelier. «L'embellie du vignoble libanais.» Le commerce du levant, n° 5623 (2011)

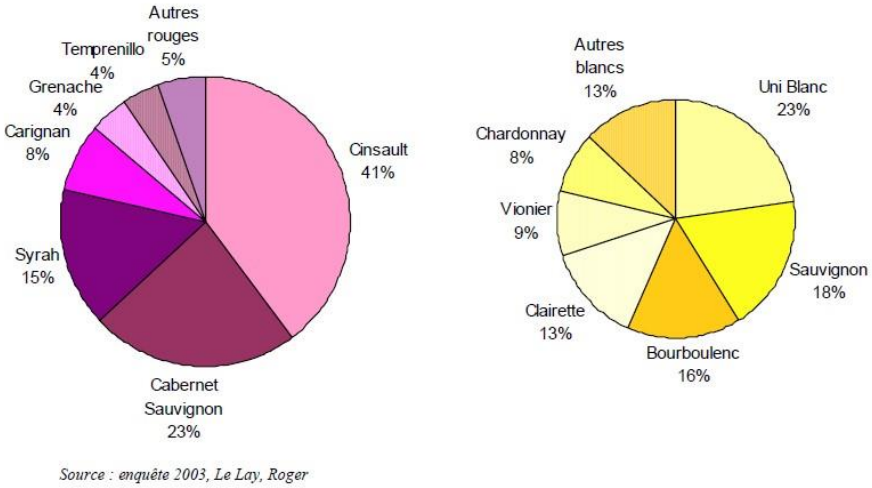


Figure 7 The distribution of grape varieties in 2003

The figure above shows the percentage of the grape varieties after the civil war. This diversity in the varieties remains unjustified, especially since there is no link between these varieties and the Lebanese terroirs. Comparing this survey by the one during the previous one during the 70s and 80s, we can obviously see the Cinsault lost its dominance on the Lebanese vineyard landscape. Even though it is not indigenous, however it was giving a specific Mediterranean identity to the vineyard landscape. Contrarily, and according to the latter survey, certainly this shows that viticulture is random and uncontrolled but this does not mean a lack of quality. In contrast, the use of noble grape varieties demonstrate the passion of Lebanese winemakers, and their intention to make a worldwide recognizable wine but unfortunately the absence of guidance remains a problem.

2 – Literature Review

The chapter seeks to shed light on literature review in order to better understand the main concepts that make up our research work; Vineyard cultural landscapes, Territorial branding, and Wine tourism. These three pillars help to understand deeply the guidelines and potentials that can guide for the formation of the map in the last chapter.

2.1. Cultural Landscape:

It is believed that the American geographer Carl O. Sauer was the pioneer in developing the term cultural landscape. The definition that he stated is:

> *"The cultural landscape is fashioned from a natural landscape by a cultural group. Culture is the agent, the natural area is the medium, the cultural landscape is the result"* [21]

It is obvious that Sauer has enhanced the natural and the physical environment as the medium of all the human activity, and linking this activity in physically shaping a determined area.
This definition was the major influence that UNESCO implemented in its convention concerning the protection of the world cultural and natural heritage, in which it didn't separate the human activities and their results from the natural and physical context.

The UNESCO have defined the cultural landscapes as the following[22]:

> *"Cultural landscapes are cultural properties and represent the "combined works of nature and of man" designated in Article 1 of the Convention. 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.*

[21] K. Bharatdwaj (2009). Physical Geography: a Landscape Appreciations. Discovery Publishing House. p. 6.
[22] This text was prepared by an Expert Group on Cultural Landscapes (La Petite Pierre, France, 24 – 26 October 1992) (document WHC-92/CONF.202/10/Add). The text was subsequently approved for inclusion in the Operational Guidelines by the World Heritage Committee at its 16th session (Santa Fe 1992) (document WHC-92/CONF.002/12). https://whc.unesco.org/archive/opguide08-en.pdf

They should be selected on the basis both of their outstanding universal value and of their representativity in terms of a clearly defined geo-cultural region and also for their capacity to illustrate the essential and distinct cultural elements of such regions.

The term "cultural landscape" embraces a diversity of manifestations of the interaction between humankind and its natural environment.

Cultural landscapes often reflect specific techniques of sustainable land-use, considering the characteristics and limits of the natural environment they are established in, and a specific spiritual relation to nature. Protection of cultural landscapes can contribute to modern techniques of sustainable land-use and can maintain or enhance natural values in the landscape. The continued existence of traditional forms of land-use supports biological diversity in many regions of the world. The protection of traditional cultural landscapes is therefore helpful in maintaining biological diversity."

Besides the UNESCO corpus of conventions, the European Landscape Convention[23], also known as the Florence Convention[24], recognises that landscape is an essential feature of human surroundings, that it contributes to the formation of local cultures and that it is a basic component of the European natural and cultural heritage, contributing to human wellbeing and consolidation of the European identity[25].

The convention recommends extending the symbolic capacity of landscape, interpreting it from its naturalistic values to its capacity as an economic resource to contribute to the association of local cultures and social well-being.

[23] https://www.coe.int/en/web/landscape/
[24] adopted in Florence in October 2000 by the Council of Europe
[25] EUROPEAN GUIDELINES FOR WINE CULTURAL LANDSCAPE PRESERVATION AND ENHANCEMENT Edited by Giuliana Biagioli, Michèle Prats and Joachim Bender

Starting here on, the landscape acquires its value from an administrative perspective. This is a significant advance in the objective vision of landscape, since it is the first international treaty devoted exclusively to the protection, management and registration of European landscapes, giving it the legitimate character it lacks and promoting European cooperation.

Therefore, this convention is a framework for concerting strategies that has brought new models of economic and educational development through actions for the evaluation, recognition, management, protection and planning of landscapes and heritage in general.

2.2. Cultural routes

As we have seen in the first chapter, in the historical overview, the wine industry in Lebanon faced many changes throughout history. Similarly, numerous examples all over the world have faced same changes in the economic structure. Adaptation to change can lead in terms of the resilience when there is a try to compensate for these losses. However each economic activity has its traces, and these traces could be great assets for any cultural route projects.
The development of a cultural route project as a link between the different elements and traces that make up the heritage is possible thanks to its scientific study and the implementation of the figure of protection of the cultural landscape.

The term “cultural routes” firstly appeared during the nomination process of the "Routes of Santiago de Compostela: Camino Francés and Routes of Northern Spain" to the UNESCO World Heritage List in 1993. It was nominated as an extraordinary cultural complex property. The interest aroused by this nomination led to the meeting on "Routes as Part of our Cultural

Heritage [26]" in 1994, by ICOMOS and UNESCO, where the first approaches to a possible new approach of heritage were carried out.

The main concept of a cultural route was discussed and defined in this meeting. Adding to that its study methodology, identification criteria, authenticity, and tools for its management and conservation.

> « L'itinéraire cultural se révèle comme concept très fécond. Il offre un cadre privilégié pour une dynamique de compréhension mutuelle, de lecture plurielle de l'Histoire et d'une culture de paix. Il se fonde sur les mouvements de population, la rencontre et le dialogue, l'échange et l'inter-fécondation des cultures, dans l'espace et dans le temps. »[27]

The International Scientific Committee on Cultural Routes (CIIC) was created in 1994 at the fifteenth General Assembly of ICOMOS in 2006 and approved in 2008 at the sixteenth General Assembly of ICOMOS

The work carried out by the CIIC has led to substantial results in the understanding of case studies developing the existence of a new heritage categorization. The International Charter of Cultural Routes defines them as follows[28]:

> *"Any route of communication, be it land, water, or some other type, which is physically delimited and is also characterized by having its own specific*

[26] https://whc.unesco.org/archive/routes94.htm
[27] (Madrid - Spain, 1994) (WHC94/CONF.003/INF.13) https://whc.unesco.org/archive/1994/whc-94-conf003-inf13f.pdf
[28] https://www.icomos.org/images/DOCUMENTS/Charters/culturalroutes_e.pdf

dynamic and historic functionality to serve a specific and well determined purpose, which must fulfil the following conditions:

a) It must arise from and reflect interactive movements of people as well as multi-dimensional, continuous, and reciprocal exchanges of goods, ideas, knowledge and values between peoples, countries, regions or continents over significant periods of time;

b) It must have thereby promoted a cross-fertilization of the affected cultures in space and time, as reflected both in their tangible and intangible heritage;

c) It must have integrated into a dynamic system the historic relations and cultural properties associated with its existence"

2.2.1 Types of Cultural Routes can be classified as follows[29]:

- According to their territorial scope: local, national, regional, continental, or intercontinental.
- According to their cultural scope: within a given cultural region or extended across different geographical areas that have shared or continue to share a process of reciprocal influences in the formation or evolution of cultural values.
- According to their goal or function: social, economic, political, or cultural. These characteristics can be found shared across a multi-dimensional context.
- According to their duration in time: those that are no longer used versus those that continue to develop under the influence of socio-economic, political, and cultural exchanges.
- According to their structural configuration: linear, circular, cruciform, radial or network.

[29] ICOMOS Cultural Routes Charter
https://www.icomos.org/images/DOCUMENTS/Charters/culturalroutes_e.pdf

- According to their natural environment: land, aquatic, mixed, or other physical setting.

By applying the above classifications on the case of Bekka, we can classify:

- According to their territorial scope: **Regional**
- According to their cultural scope: **Bekaa Valley Plain**
- According to their goal or function: **Economic and Cultural**
- According to their duration in time: **Historical Sites** that are no longer used (as their original function), **Vineyards and Wineries** that continue to develop under the influence of socio-economic, political, and cultural exchanges.
- According to their structural configuration: **Network**
- According to their natural environment: **Land**

Although the term of Cultural Routes is considered relatively new, as a new concept it does not conflict the concept of cultural heritage and its known categories. On the contrary, it enriches their significance within a broad and collective framework. The concept of cultural route does not overlap with other cultural heritage categories (Built environment, natural environment…) that may be a part within the course of a Cultural Route. A cultural route contains these heritage categories within a combined system and creates new links among these elements by means of an innovative scientific perspective. Such approach develops cultural connections among different parties and also increases collaboration and broader work to preserve and valorise cultural heritage.

Cultural Routes signify dynamic and evolving practices of human intercultural links that shows how a cultural heritage is a result of accumulative and diverse activities throughout history. Within this context, the term of Cultural Routes constitutes a concept that

demonstrates the growing interest to approach cultural heritage from a broader and multifaceted perspectives.

For that reason, cultural routes became as an aid to the understanding of any heritage which presents shared roots. Cultural Routes have become an essential tool for understanding relationships between assemblies linked by a recognized cultural and historical features.

Since there was a confusion in the understanding of these two distinct concepts - Cultural Landscape and Cultural Route - Alberto Martorell Carreño a Professor in Cultural Law in the Universidad Nacional de Educación a Distancia - Madrid, Spain, has made a detailed table illustrating the difference between them

Table 3 showing the difference between Cultural Landscape and Cultural Route / Source: Alberto MARTORELL CARRENO

	Cultural Landscape	**Cultural Route**
By their origin	The work of man is determined by a natural environment that influences its basic features.	A cultural route is clearly the work of man designed as a means of communication and transport.
By their essence	Reveals (and is the result of) the relationship between man and a given natural environment.	It is a means and a testimony to the complex relationships of communication and exchange between distant cultural groups.
By their function	Explains the ecological and cultural functioning of a given environment, in which even the human component is understood in terms of the degree of its impact on the natural environment.	A cultural route is a historic route of communication.
By their extent	Even in the case of linear elements, cultural landscapes are understood within the context of an ecosystem	The extent of a cultural route is defined by historically-determined limits, which are independent of natural boundaries.

By their structure	It should be understood in terms of a model such as the "patch-corridor-matrix" model, Encompassing the cultural element. In the case of a linear landscape or corridor, natural connectivity is essential.	The structure of cultural routes Conforms to the multiple designs of a communication route. *The collection of heritage properties of diverse nature making up cultural routes was created by interactions and intense relationships, which have produced different structural configurations of the routes, such as linear, belts, corridors, cross shapes, networks, etc.*
By their importance	Although both concepts are equally important, cultural landscapes are ideal to explain the relationship between man and nature.	Cultural routes are important to understand the relationships, exchanges and inter-influences between two or more cultural groups linked by an established cultural route. From the point of view of the understanding of cultural heritage that has shared roots and influences, it is a key term.
By their constituent elements	The key element is an ecologically-determined natural environment. The works of man are confined to this environment and influence its main features.	The key element is the communication route itself. Many other manifestations of heritage related to the road and its function can be found along its path: inns, storage sites, ports, defensive constructions, urban centres, cultural landscapes, etc.
By their study	The key elements to understand a cultural landscape are its ecological features and the degree of human intervention on them*. Important elements include works of irrigation, constructions, ritual centres related to the values of the site, etc; in particular, elements related to the use of the environment, its transformation, protection, etc.	The key elements to understand a cultural route are the physical route itself, the properties associated with its function, the tangible and intangible manifestations of heritage related to the process of communication and dialogue between the peoples involved, etc.

By applicable indicators	Key indicators will include elements such as biodiversity, the presence of endangered species, biotic and abiotic flows and their changes, the impact of man on these changes, the impact of breeding of domestic animals, traditional patterns of land use, traditional activities, traditional building materials and constructions, water management, etc.	Key indicators will include: structure of the road network and its material substrate, historical data on its use, the existence of cultural manifestations of shared origin along (or at specific points) of the road, constructions associated with the function of the road, common linguistic or culinary uses, etc., inter-influences in activities such as music, communication elements, etc.
By their dynamics	The specific dynamics of a cultural landscape should be understood in terms of the life equations occurring within the interior of an ecosystem with a given matrix. The works of man have impact on these equations. This ecosystem has natural boundaries as soon as the elements of the matrix cease to be predominant in the territory. It obeys natural laws and human influence on them.	The dynamics of a cultural route are given by comings and goings of peoples and goods along its length. It is determined and delimited by historic research on this process. Even when environmental conditions have significant influence on certain routes (e.g., those related to maritime navigation), the dynamics of the route do not follow natural laws but clearly human processes and interests, and therefore are understandable only as cultural phenomena.

The Cultural Routes programme was launched by the Council of Europe in 1987. Its objective is to demonstrate the shared history and identity of the European countries' heritage and culture. The Cultural Routes play a major role in this objective, adding to that its importance as a source of economic, social and cultural development.

The Council of Europe promotes the development of routes with a common European theme in the dimensions of the heritage to meet the needs of its touristic usage. This distinction does not imply that the management of heritage through the creation of routes is not legitimate, but principally acheivable as a tool of regional integration and cooperation[30].

[30] MARTINEZ YAñEZ, Celia. "Los itinerarios culturales: caracterización y desafíos de una nueva categoría del patrimonio cultural mundial." APUNTES 23, no. 2 (2010): 194-209.

Such routes consist in different countries and in their historical journey. Therefore, cooperation among the concerned countries is needed especially for what is related to research, conservation and management. A list of priorities for action as development strategies should be drawn up, this requires multilateral cooperation agreements, as well as the creation of organizations dedicated to their research and development. It also requires the cooperation of philanthropic institutions and individuals who can contribute to this goal.

After discussing the concept of cultural route, we will review the case study of the route of vineyard "Iter Vitis", that have the same theme of our project. This case study has proved its success and managed to improve the local economy. This case is a perfect example to show that the realization of such projects is possible even though it trespasses different counties, cultures and administrative laws.

The case study presented below shows involvements carried out with relevant results in several European countries, emphasising as an element of unity that made it possible to achieve this project. The categorisation of the aspects that will be exposed in this case can be used as an influence or inspiration for our proposed project in the Bekaa region.

2.2.2. Iter Vitis Route – The route of vineyard

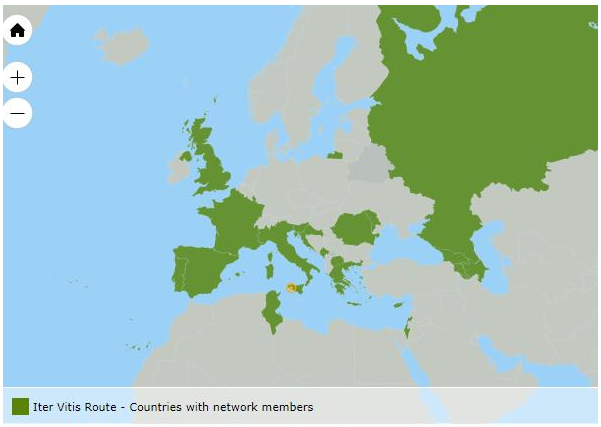


Figure 8 Countries with network members

Source: www.coe.int

The creation of this cultural route had a goal to offer new perspectives, which improves and promote the cultural landscapes related to the identity and the wine culture. These perspectives help to discover all the touristic potentials of the territory.

This route is a network of destinations, of experts in several domains of landscapes that bring together cultural, economic, touristic, and academic institutions that have a common aim in creating certain dynamism concerning the wine heritage. Iter Vitis[31] promotes the relationship between the history of wine and the people of the region in a process of active transmission.

For the reason of managing the Iter Vitis Cultural Route, an international association has been created that includes board members from eighteen partner countries. The network is moving towards a federal structure through national associations. The Route already has a wide range of members and has the potential to include more national associations, thus promoting wide-ranging collaboration.

A scientific advisory committee is present for the aim of quality and heritage enhancement. This committee includes representatives of ministries, institutions and local authorities,

[31] All data available on the official website: www.itervitis.fr

professional bodies, universities, companies, qualified individuals from various fields: science, communication, marketing and innovation, journalism, European members of the ICCE network. An annual general meeting is held every year which inspire many activities and events related to this route[32].

Inside this network, vineyard paths and thematic routes have been created. The goal of each point of the path is to diminish the trivialization of the wine routes, the members of the network wanted to create a framework that highlights the vineyards in their cultural dimension, the natural and historical heritage, the know-how, and the people who live there, rather than simply the finished product. In order to discover the vineyards in a different light, Iter Vitis highlights thematic routes that reflect the identity of the wine-growing terroirs. Along the way, to discover the richness of unique vineyards in terms of their history and landscape[33].

Iter Vitis Cultural Route aims to control, promote and assist the activities of its members with the following objectives[34]:

- Protection the European tangible and intangible rural landscape
- Defining the types of wine-growing landscape and the territories
- Validating how wine production has always been a symbol of identity and how the technical knowledge of this production has contributed to the construction of European citizenship, of regions, of peoples.

[32] DODD, Diane. "Iter Vitis Route." Council of Europe Cultural Routes Evaluation Cycle 2015-2016, Institue Europeen des Itineraires Culturels., 2016.
[33] Federazione Europea, Iter Vitis, 2005-2009. http://itervitis.eu/
[34] DODD, Diane. "Iter Vitis Route." Council of Europe Cultural Routes Evaluation Cycle 2015-2016, Institue Europeen des Itineraires Culturels., 2016

- Developing educational meetings and organizing cultural exchanges for a better understanding of the phenomenon and its importance in European culture.
- Developing research and studies to share cultural, social, economic … information between member countries,
- Developing activities that promote knowledge of wine-growing areas and a better dissemination of images and European cultural identity.
- Safeguarding the wine of biodiversity and proposing the quality of life of rural areas as a model for the future.
- Developing actions and methodologies for the improvement of the quality of the wine tourism

Visits, craft classes, cooking classes, wine tasting along with educational activities are included within the framework of the strategic plan. The partners Iter Vitis Cultural Route are also involved in a project to collect digital photos of the network's regional terroirs in order to build a "virtual journey" through Europe[35].

Cultural and educational exchanges of young Europeans; Its main activities are related to education, training, workshops and courses designed at local level to enable young Europeans to learn more about their heritage and to provide professional skills and training, including :

- Pedagogical training for schools focusing on: the history of the agricultural landscape, introduction to wine and grape growing, the importance of biodiversity…

- Education Award for high schools with a prize on the knowledge related to the route

- Wine steward courses for universities

- Workshops on wine along the Mediterranean coast, linked to a route through the vineyards of Europe, Asia and North Africa

[35] DODD, Diane. "Iter Vitis Route." Council of Europe Cultural Routes Evaluation Cycle 2015-2016, Institue Europeen des Itineraires Culturels., 2016

2.3. Territorial Branding

With the rise of globalisation the competition among territories is increasing, resulting in the formation of a unique images with the aim to market the place. Nowadays, the work on a strategy for territorial branding has a significant importance especially in our case where there is an absence of a significant identity. The procedure of branding involves in determining all the unique tangible and non-tangible characteristics that the territory has. These characteristics should supply a stable position during the completion for more sustainable and continuous development. Several approaches concerning the territorial branding are present. One of the approaches is centred on focusing with marketing tools, and another focusing on business technologies. A third approach is basing the brand on the cultural peculiarities[36]

2.3.1. Territorial Branding Theory

There is a rising of work on the subject of territorial branding, especially concerning the value it can provide to the wine industry. Region of origin is an established product indicator in the wine industry, which integrates many legal designations related to geography, such as Appellation d'Origine Contrôlée (AOC)

The concept of territorial branding exceeds this notion, so that the product is inseparably linked to that place. “These kind of brands tend to originate from a single place or territory from which it is impossible to separate them and which offers a group of competing

[36] Anton Vladimirovich Serikov and Elena Andreevna Ovechko - The Brand of Territory: Theoretical Approaches to Creation and Promotion - - Southern Federal University, Rostov-on-Don, Russia

organisations a collective, overarching brand identity"[37] It is clear that territorial branding can be an influential tool within the competitive marketplace for wine, helping differentiate wines from that region against competitors.

The importance of collective wine branding was first introduced by Michael Porter a University Professor at Harvard Porter refers for globalisation as creating an environment of increased competition, where brands must seek creative methods to develop competitive advantage. "Clusters are geographic concentrations of interconnected companies and institutions in a particular field"[38]. Clusters can achieve this by "competition and cooperation", combining resources emphasize competition encourages the industry to grow.

2.3.2. Stories and Myths

The fundamental advantage of a territorial brand is that it can focus the region under one brand helping in creating a story for the identity and deliver this identity to the customer. A great example of mythology and identity can be illustrated in France for the Champagne region. It offers itself as "a series of stories which emphasise the individual brand's integration into the territorial whole, and the evolutionary success of the brand"[39]. In this context the myth is true, rather than imaginary. To be effective it should emphasise the natural environment and expertise in that region; the consumer must believe there is a fit between the territory and the product for the brand to be effective.[40]

[37] Charters, S. & Spielmann, N. (2013) "The Characteristics of Strong Territorial Brands: The Case of Champagne" France, Journal of Business Research, Elsevier Inc. 67(7) 1461-1467
[38] Porter, M.E. (1998) "Clusters and the New Economics of Competition" America, Harvard Business Review Nov-Dec 77-90
[39] Charters, S. & Spielmann, N. (2013) "The Characteristics of Strong Territorial Brands: The Case of Champagne" France, Journal of Business Research, Elsevier Inc. 67(7) 1461-1467
[40] Van Ittersum, K. & Candel, J.J.M & Meulenberg, M.T.J. (2003) "The influence of the Image of a Product's Region of Origin on Product Evaluation" Journal of Business Research, Elsevier Science Inc. 56(3) 215-226

2.3.3. Brand Management

A brand manager is a necessity for territorial branding. Within the territorial brand there is a natural tension, given that there is both cooperation and competition between individual brands. The manager plays a role of diplomacy "so that all producers and growers feel that they benefit from the success of their collective product" and "ensure the shared mythology has transcended the differences of individual actors"[41]. An example of this would be the Comité interprofessionel du vin de Champagne (CIVC) in Champagne that controls production, coordinates marketing and research activity for the region.

A wider look on the responsibilities of a territorial brand manager, we can define the possible domains of interference as the following: [42]

- production process controller
- production volume controller – (relative to the market demand)
- collective marketing of the territorial brand manager
- marketing of private brands manager individually for producers within the territory

2.4. Involvement in Wine tourism

A simple definition about wine tourism can be mentioned for a better understanding "visitations to vineyards, wineries, wine festivals and wine shows for which grape wine

[41] Charters, S. Menival, D. Senaux, B. Serdukov, S. (2013) "Value in the Territorial Brand: The Case of Champagne", British Food Journal, Emerald Group Publishing 115(10) 1505-1517

[42] Charters, S., & Spielmann, N. (2014). Characteristics of strong territorial brands: The case of champagne. Journal of Business Research, 67(7), 1461–1467

tasting and/or experiencing the attributes of a grape wine region are the primary motivation factors for visitors" [43]

Inácio (2008)[44] stresses that wine tourism should be seen as a distinguished cultural product, which is carried out in wine-producing regions, principally in promoting vineyards, wines and their producers, supporting the "combination of culture, lifestyle and territory"

Wine routes formulates a fundamental part of the wine tourism industry. These routes are considered "highways" to the principal attraction in wine tourism and the winery production facility [45] prove that the key issue is to create enough awareness to get the consumer to visit the winery. Currently, the wineries become "Story-teller" structures able to communicate with the costumer about the tangible wine features and the intangibles as well; the history of winemaking throughout generations, a company philosophy. The winery is built following the experiential and emotional values concerning the product and the place. The winery can offer special experience to the visitors like watching the production process, and observing the vineyard landscapes around the winery. Visitors are attracted directly to the winery, allowing the producer to build loyalty customer relationships. It is a new relationship among landscape, winery and consumer, and the territory is the element of connection. For this reason wineries can be considered as cultural markers.

Symbolic benefits can be included in the brand. Market managers may choose to focus on them according to how they want the brand to be perceived, creating the brand identity.

[43] Woldarsky, V., & Geny-Denis, L. (2019). Development of a best practice manual in wine tourism in Portugal. In BIO Web of Conferences (Vol. 12, p. 03001). EDP Sciences.
[44] Inácio, A. I. (2008). O Enoturismo : da tradição à inovação , uma forma de desenvolvimento rural. Actas Do III Congresso de Estudos Rurais (III CER).
[45] Bruwer, J., 2003. South African Wine Routes: some perspective on the Wine Tourism Industry's Structural Dimensions and Wine Tourism Product, Tourism Management 24, p.423.

Jingxue Yuan and Jang (2007)[46] have mentioned in their paper that customers are more likely visit a winery after a visit to a wine festival. Such event helps in building a affecting relationship between potential visitors and wine destinations. Visiting such festival may lead into wineries visits. Therefore wine related events and festivals have a role in the wine tourism and promoting for it.

The European Wine Tourism Charter defines wine tourism as: "all touristic and leisure activities and resources related to the culture, both tangible and intangible, of wine and gastronomy native to their territories" (AMPV, 2006, p.1)[47] ,highlighting the genesis of their subsystems: territory, tourism and wine culture. The same document mentions three general properties for territories of this nature:

- "wine-growing territories must be involved, and give absolute priority, to the principles of sustainable development"

- "in order to achieve their objectives, wine-producing areas should promote effective cooperation among themselves and should not limit their actions only to their territories"

- "wine-producing territories must play a decisive role in the dissemination of a true wine culture, which consequently implies the need for an integrated management, correct and serious, a rational exploitation of wine-producing areas, from an ecological and social point of view".

[46] Jingxue Yuan, SooCheong Jang, 2008. The Effects of Quality and Satisfaction on Awareness and Behavioral Intentions: Exploring the Role of a Wine Festival, Journal of Travel Research 46, p.279.
[47] AMPV. (2017). Territórios Vinhateiros de Portugal. ISBN 978-989-20-7698-0. Obtido de Portugal https://issuu.com/ampv/docs/livro-ampv-br.,

3 - Organizational structures

The chapter seeks to shed light on examining the wine-related organizational structure present in Lebanon, and how these organizations have a major role in shaping the wine industry. These organizations can be considered as the infrastructure of the wine industry, and any proposed project concerning this industry should to build upon this infrastructure, and invest in its potentials.

3.1. Organisation of Vines and Wine (OIV)

The International Organisation of Vine and Wine is an intergovernmental organization which deals with technical and scientific aspects of viticulture and winemaking. The field of OIV includes grape production for all purposes, and not limited to wine, but also table grapes and raisin production. In 1996, the Lebanese wine industry joined the OIV. This joining was achieved by the efforts of the three largest wineries. These wineries represented by Charles Ghostine of Chateau Ksara, along with Serge Hochar of Chateau Musar and Michel De Bustros of Chateau Keyfraya, worked together to make this possible[48].

Hochar then represented Lebanon at the OIV for fifteen years. The joining of OIV that he played a major role in it, has as an important step to legitimise the wine trade. It was especially important for an emerging region trying to gain a position in the export market, since membership was a quality indicator for distributors and potential buyers.

Nevertheless, to benefit the maximum from the OIV membership, there is agreement among wineries that the intention was to use this as a stepping stone to create a national institution that would implement the recommended standards of the OIV. Otherwise this membership will be just for false-reputation.

3.2. Lebanese Wine Union

UVL (the Lebanese Wine Union), is an association which aims to organize the wine industry and the collective promotion of Lebanese wine abroad. It was found in 1997, by the three largest wineries: Chateau Ksara, Chateau Musar and Chateau Keyfraya. Till 2017, has

[48] Emma Dawson, 2017 How did Lebanese wine emerge as a territorial wine brand in the 25 years that followed the civil war ending in 1990? Mistakes made and lessons learnt"

twenty-two members representing 93% of production, an indication that the big three wineries still dominate the output of the industry.

Although it has succeeded in unifying the efforts of the winemakers (mostly in terms of the representation of Lebanese wine in international fairs) and although it was able to put pressure on the government to set up the Institute of Vine and Wine in 2012 (after 12 years of negotiations with the State), the role of the UVL remains a subject of controversy between winemakers and winegrowers : as wine grape prices are set by the UVL, winegrowers, especially those who work individually, consider it as a cartel of winemakers who get along with each other to the detriment of the winegrowers. In their opinion, it manipulates prices so that they are just above the cost of production, a means of ensuring a high profit margin for winemakers and a low one for winemakers. The latter consider this strategy to be harmful to the whole sector because it pushes them to look for alternatives to wine grape cultivation[49]

Even though not all the wineries are members of this union, but still there are a lot of potentials of the UVL to build on, starting from the control of the wine industry in Lebanon and ending at the focus on marketing strategy and identity promotion.

3.3. Controlled Designation of Origin

Legal designation that links products to their precise geographical entity are owned by many territorial brand. These specific areas of land with superior terroir offers a signpost of quality to the consumer and a unique marketing point to the producer.

[49] Saleh Elizabeth, Trade-marking Tradition: An Ethnographic Study of the Lebanese Wine Industry, London, 2014

In the case of Lebanon there is the question of whether such system would add credibility to the Lebanese wine or just another of avoidable obstacle.

As referenced in the geographical overview, the Lebanon has a Mediterranean climate, This climate accompanied with high altitude sites, plus rich limestone soils in the Bekaa valley, creates a unique combination. This combination, produces lively and rich tasting wines. The question is whether a geographical indication based on regions would further emphasise this quality potential.

In Lebanon only few wineries work with grapes from single terroir. The support an appellation system defining each region's terroir and those with superior quality could be possible from these wineries. However, other wineries are reticent and correctly reference that the majority of production takes place in the Bekaa Valley, therefore classifying multiple regions is of value to few producers. A generic "AOC Liban" would give the industry a clearer message to deliver to consumers, with production controls to enhance their credibility.

Regardless the type of classification, an implementation of an AOC is much needed in Lebanon. It is the only way to guarantee the authenticity and quality of the products and eventually implementing a collective strategy of territorial branding and identity promotion.

4 – Proposal

4.1. Main Elements of the proposed map

As referred before the main goal of this work was to valorise the vineyard landscape in the Bekaa region. This proposal is materialized in a map that includes all the elements related with wine and wine landscapes namely vineyards, its several types, wineries and historic and cultural heritage that can contribute to the qualification of a wine landscape route.

4.1.1. Vineyards

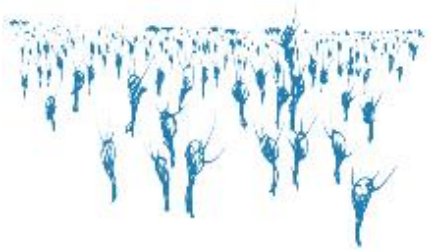
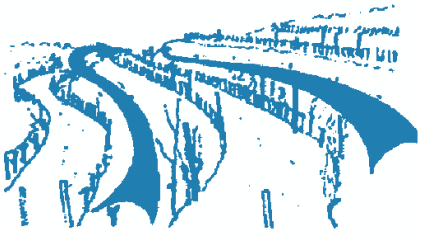
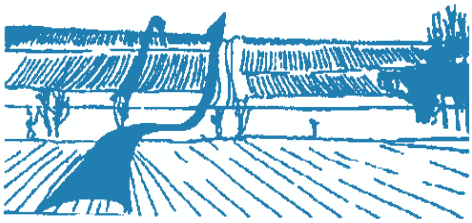
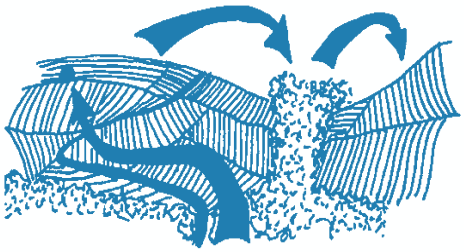
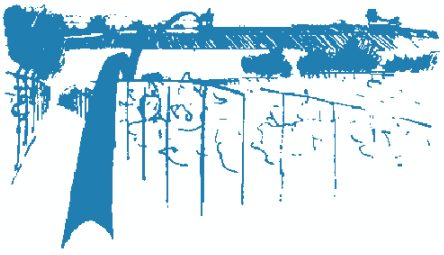
As mentioned in the first part of the thesis, the absence of updated statistical data lead to the change of the state of art. The usage of available data on the proposed map is not valid especially in the absence of the localisation of each of the following characteristics.
However it is important to shed light on the different characteristics of the vineyards in the Bekaa region, to deeply understand the studied vineyards.

Visual classification:

The vineyard architecture can modify the landscape in various ways, depending on the level of scale considered and the architecture itself. They constitute landmarks, and considered as tools for enhancing its originality and authenticity.
According to Fabienne Joliet [50] Vineyard typology has been elaborated from the crossing of two main criteria that influence the perception one can have of the vine landscape: density (its abundance) and relief (its visibility). Each type has been defined from these criteria and the analysis of secondary plastic characteristics.

[50] Fabienne Joliet, Stéphanie Oulès-Berton. LE PAYSAGE DE VIGNOBLE, UNE ANTITHESE DE NATURALITE ?. Historiens et géographes, Association des professeurs d'histoire et de géographie, 2008.

A table classifiying the vineyards in the Bekaa region upon he visual vineyard typology that Fabienne Joliet proposed:

 crowd of vineyards - « foule de vigne »	 ©Château Kefraya, Kefraya
 vineyard terraces - « terrasse de vigne »	 ©Domaine de baal, Zahle
 Wave of vineyards - « vague de vigne »	 ©Ixsir, Ainata
 Marquetry of vineyards – « marqueterie »	 ©Ixsir, Niha
 Polyculture - « vigne en timbre-poste »	 ©Coteaux d'Héliopolis, Deir el Ahmar

 sea of vineyards - « mer de vigne »	 ©Ixsir, Deir el Ahmar

Table 4Table Showing examples of the various visual vineyard typology in the Bekaa - Source: Author

Plot size classification in the Bekaa

Vineyard area	Plot Numbers	%
Vineyards ≤ 1 ha	194	72.39
Vineyards between 1 and 9 ha	52	19.40
Vineyards of between 10 and 19 ha	2	0.75
Vineyards between 20 and 100 ha	18	6.72
Vineyards > 100 ha	2	0.75
Total	268	100

Table 5Vineyard classification by plot size in the Bekaa - Source: Layal Bou Antoun

We can realize from the table that the major vineyard plots have a size less than 1 hectare, which can explains a lot the arbitrary in the vineyard landscape that are present in the Bekaa. This scatteredness of the vineyard plots makes it more difficult to be controlled and creates a homogeneous vineyard landscape. Thus, the need of territorial development strategy is a must to control this arbitrary in the landscape.

Owner	Number of plots	Area (ha)	% of total Area
Individual winegrowers	46 (17.5%)	360	23
Winegrowers belonging to the cooperative	200 (76%)	166	10
Association / NGO	1 (0.4%)	90	6
Wineries	16 (6.1%)	984	61
Total	263	1600	100

Table 6 Vineyard classification by ownership in the Bekaa - Source: Layal Bou Antoun

Wine grapes varieties

White varieties	Red varieties
Albarinhio	Alicante bouchet
Bourboulenc	Arinarnoa
Chardonnay	Barbera
Clairette	Cabernet franc
Gewurtzraminer	Cabernet sauvignon
Grenache blanc	Caladoc
Marsanne	Carignan
Meeseseh	Carmanere
Merwah	Cinsault
Moscow filero	Fienna
Muscat	Gamay
Obeidi	Grenache
Petit manseng	Malbek
Pinot gris	Marselan
Riesling	Merlot
Roussane	Mourvedre
Sauvignon blanc	Nebiolo
Semillon	Niellucio
Ugni blanc	Petit verdot
Verdejo	Pinot noir
Vermentino	Primitivo
Viognier	Sangiovese
Sobaghiyeh	
Syrah	
Temranillo	
Touriga nationale	

Table 7 List of wine grapes varieties planted in Lebanon - Source: Rita Mohasseb

The main grape varieties cultivated are of French or Italian origin, such as Cabernet Sauvignon, Syrah, Merlot, Chardonnay, Chardonnay Blanc, Muscat, Viognier, Pinot Noir and Tempranillo. However, the wine made from these grape varieties acquires particular characteristics linked to the specificities of the terroir.

In the last couple of years the interest in indigenous grapes, like Obedeih and Merwah, has remarkably grew. The growing interest is a good sign towards territorial branding, besides benefiting from its uniqueness and having such varieties as an asset, it is promoting the local varieties internationally and marketing them on a high level.

Figure 9 Chateau Ksara Merwah Promotion Campaign in UK - Source : Elie Maamari

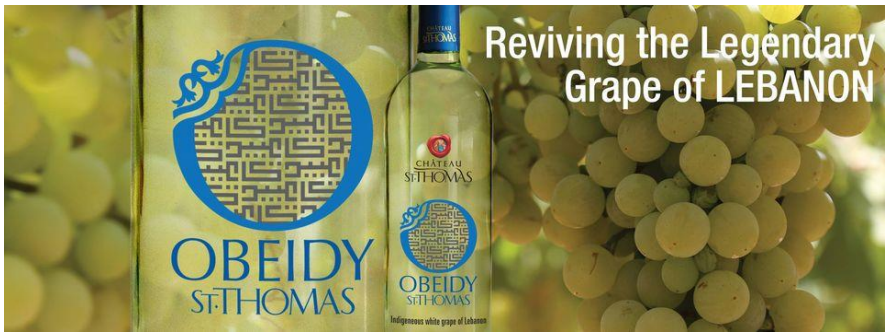


Figure 10 Chateau St Thomas Obeidy Advertisment - Source: Chateau St Thomas Facebook Page

4.1.2. Wineries

According to Layal bou Antoun[51], the Bekaa region underwent a three stages construction:

- Agglomeration
- Specialization
- Diversification

The stage of agglomeration began with the establishment of the first commercial winery, Château Ksara, in 1857, followed by the "Domaine des Tourelles" in 1868 and "Château Nakad" in 1923. The three wineries in the Bekaa with "Château Musar" – which is not located in the Bekaa region but with part of their vineyards spread out there - were a result to the growing demand stimulated by the presence of French troops in Lebanon.

Between 1923 and 1990, a single winery was created in the village of Kefraya in the Western Bekaa, "Château Kefraya" in 1979, which later played a key role in the growth of the wine industry in Lebanon. From 1990, the agglomeration accelerated in the Bekaa and 16 wineries were set up there within a period of twenty years.

The agglomeration of wineries has been complemented by an increase of vineyards landscapes owned by the winemakers themselves or by Bekaa winegrowers.

The increase in the competition and the number of wineries has led to a shift from agglomeration to specialisation. The wineries have recognised the resources and potentials of the territory. The diversification states the plan to increase the income and profits by

[51] Layal Bou Antoun L'activité vitivinicole comme base d'une dynamique territoriale: le cas de la Bekaa au Liban Economies et finances Université Grenoble Alpes, 2017 Français.NNT: 2017GREAE006

providing various services not necessarily directed to wine industry like accommodations and different activities that are developing there.

Winery	Date of Establishment	Website
Chateau Ksara	1857	www.chateauksara.com
Domaine des Tourelles	1868	www.domainedestourelles.com
Domaine Wardy	1891	www.domainewardy.com
Chateau Nakad	1923	www.chateaunakad.com
Chateau Kefraya	1979	www.chateaukefraya.com
Chateau Heritage	1997	www.chateauheritage.com
Chateau St Thomas	1997	www.chateaustthomas.com
Massaya	1998	www.massaya.com
Cave Kouroum	1998	www.cavekouroum.com
Coteaux du Liban	1999	www.coteauxduliban.com
Chateau Isaac	2000	www.chateauisaac.com
Coteaux les Cedres	2000	www.facebook.com/coteauxlescedres
Chateau Khoury	2004	www.chateaukhoury.com
Chateau Ka	2004	www.chateauka.com
Chateau Marsyas	2005	www.chateaumarsyas.com
Chateau Qanafar	2005	www.chateauqanafar.com
Domaine de Baal	2006	www.domainedebaal.com
Mas Helios	2007	www.closmashelios.com
Reserve Ammiq	2008	www.reserveammiq.com
Chateau Barka	2009	www.chateaubarka.com
Couvent Rouge	2010	www.couventrougewinery.com
Chateau St Celement	2010	www.facebook.com/stclementwinery
Syrah de Bechwat	2014	www.facebook.com/syrahdebechwat
Vertical 33	2014	www.vertical33.com
Latourba	2014	www.latourba.com
Chateau Trois Collines	2015	www.troiscollines.com
Chateau Rayak	2015	www.chateaurayak.com

Table 8Wineries in the bekaa region sorted by their date of establishment - Source: Author

4.1.3. Historical and cultural sites

Baalbek Temple

Baalbek temple is a complex which includes two of the largest and grandest Roman temple ruins: the Temple of Bacchus and the Temple of Jupiter. This site was inscribed in 1984 as an UNESCO World Heritage site under the Criteria: (i) and (iv) [52]

Throughout Roman times the city of Baalbek reached its peak. Its constructions are colossal built over a period of more than two centuries, which have made it one of the most famous sanctuaries of the Roman world and a model of Imperial Roman architecture

The Temple of Bacchus was one of the three main temples at a large complex in classical antiquity, at Baalbek in Lebanon. The temple was dedicated to Bacchus, the Roman god of wine [53]

Figure 11 Reliefs on the lintel and the sides of the portal of the Temple of Bacchus; this shows the decorations related to the vines

Source: https://www.romeartlover.it/Baalbek.html

[52] (Annex 1)
[53] George Taylor (1967), The Roman Temples of Baalbek. Beirut : Dar el Mashreq Publishers. Plates 42-47.

Figure 12Temple of Bacchus, Baalbek - Source: Ivan Reber

Anjar City

The city of Anjar is located southern the city of Zahle and belongs also to the Zahle district. It was founded by in the eighth century by Caliph Walid the first under the rule of Umayyad. The ruins reveal a very rectangular layout, indicative of the cities and palaces that was built in that era, and are a unique testimony to city planning under the Umayyads. It was inscribed in the UNESCO's world heritage list at 1984 under the criteria (iii) and (iv).

Anjar city was a major center of commerce and trade for the entire region. The city was built at a strategic location on the main caravan routes between the inland Umayyad capital of Damascus (Capital of actual Syria) and the Levantine coast, close to the rich agricultural valley of the Bekaa. The vestiges of small shops aligned to the boulevards of the ancient shopping arcade are still visible on the site. [54]

[54] (Annex 2)

Figure 13 Anjar ancient city surrounded by vineyards - Source: Toni Aoun

Niha Temples:

Located 8 kilometres southern the city of Zahle, Niha is a village in the Bekaa valley and precisely in the Zahle District. It is famous for its Roman archaeological ruins, and in particular two lower Roman temples that date back to the 1st century AD and one temple located above Niha, which was built during the 2nd and 3rd centuries AD and was apparently used for religious practices that spread during that era, similar to the temple of Bacchus in Baalbeck. The temple was also dedicated to the Hadaranes (god of rain and storm in the Canaanites religion) and Atargatis (goddess of fertility) [55]

[55] https://www.livius.org/articles/place/nihata-niha/

Figure 14 One of Niha's Temples Surrounded by Vineyards – Source: @domainewardy – twitter.com

Our Lady of Zahle and the Bekaa

Our Lady of Zahle and the Bekaa is a shrine to the Virgin Mary that was built in 1968, it is considered one of the highest structures in the Bekaa region. The shrine is constituted of two parts: the tower which is 54 meters high, and the statue which is around 10 meters high[56]. Besides its religious significance, the statue represents the cultural aspect as well. The culture of wine is present in the statue, in which the Virgin Mary holding Jesus on one hand while holding a spring of grapes in the other. The significance of the grapes reflects the wine culture of city.

[56] https://bekaa.com/detail/our-lady-of-zahle/

Figure 15 Statue of Our Lady of Zahle and Bekaa - Source: @manoul tripadviser.com

Figure 16 Our Lady of Zahle and Bekaa - Source: Clement Tannouri

4.2. The proposed Touristic map

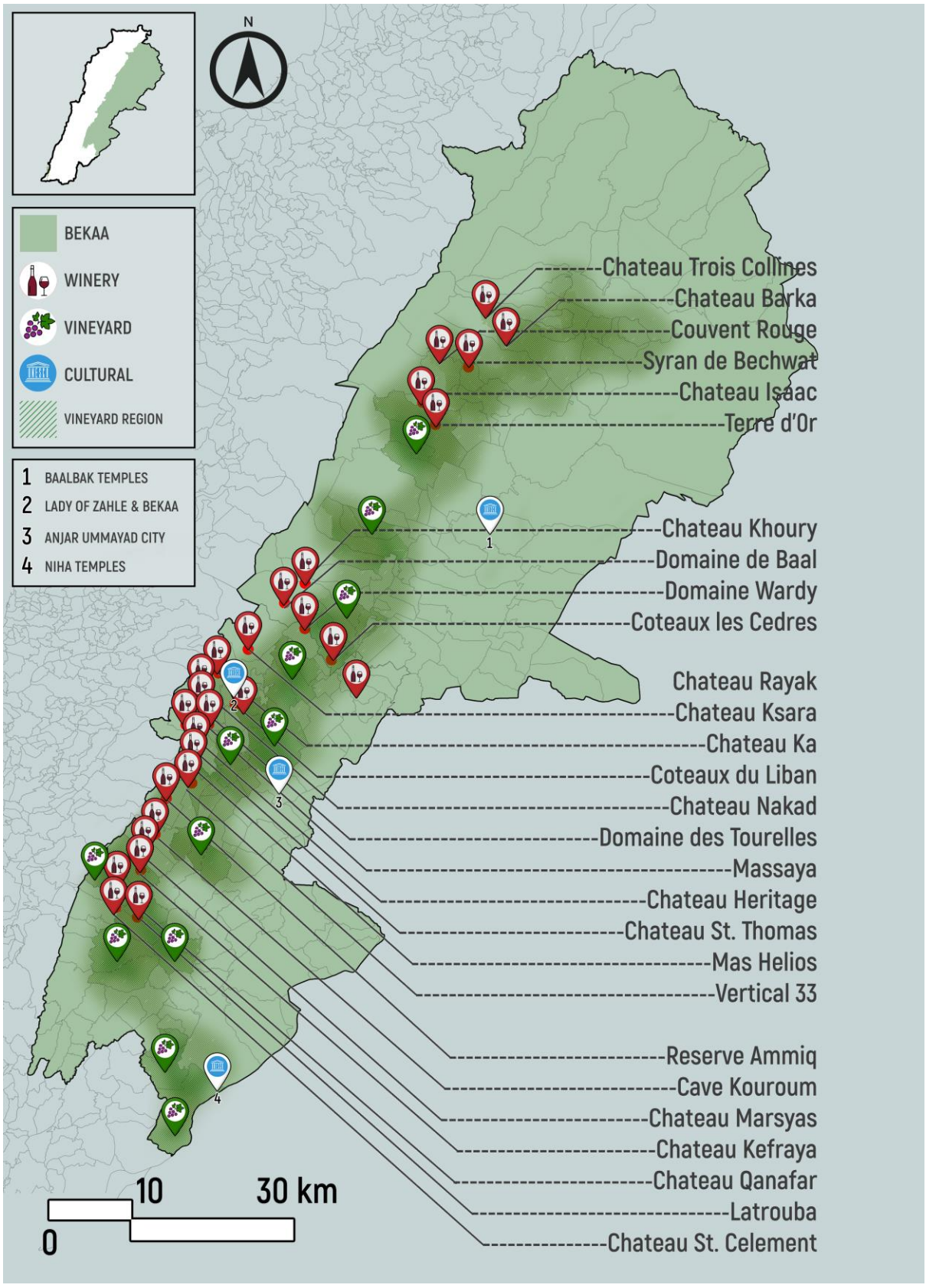


Figure 17Proposed Touristic Map for the Bekaa regiom - Source: Author

4.3. Proposed Activities:

Several actions can be organised for the good management of the project and complementary for the wine landscape routes:

- Building links with the different education systems of the territory to spread the knowledge gathered on the site.
- Raising awareness through campaigns lead by the mass media, about the culture and the heritage.
- Developing an identity brand and promoting the project to the specialized media as well as the designing of its communication plan.
- Designing of a comprehensive landscape signage plan. Preparation of orientation maps distributed at different points of the site, with images referenced on their heritage elements.
- The recommended path of the itinerary will be proposed for informative consistency. The preparation of files with the most relevant aspects of the site will be essential for the introduction before the physical insertion into the context.
- Training qualified personnel to make awaking campaigns of the importance of the landscape and the need to preserve it.
- Organizing cultural and traditional activities related to the wine culture. (Festivals, exhibitions, conferences …)

4.4. Expected results

- Liable on the results of its application, the potential route should be complemented and developed with package support of activities serving the cultural heritage of the region.
- The development of the territory should result directly for its conservation. The income generated by the activity and its relationship with tourism generates considerable income and a portion should be allocated to its development and conservation.
- The implementation of the route could also answer other specific questions such as: determining the social impact, economic and environmental feasibility of its progressive adaptation to a sustainable development model. This project is interesting not only because of the economic benefits it can generate, but also because it can be used to support the cultural sector, promoting the conservation of the rest of the cultural heritage of the territory.
- Evidently, the creation of the route would generate other needs, such as the availability of accommodation for the tourists, which could promote the openings of a hotel to the region and eventually creating new job offers.

Conclusion

The vineyard landscape in Bekaa has a rich historical value, being a result of changes and cultural practices that have taken place over centuries, and that find their ultimate expression in the historical sites and industrial activities of the wineries.

Although the Lebanese territorial brand is in its initial stages, it is showing a promising potentials of growing awareness. However, it needs to developed more to affirm a position on the competitive world market.

The richness in cultural elements and history of Lebanon in general, makes it a suitable place for cultural routes.

The success of wine industry in Lebanon depended mostly on personal efforts (Either wine growers or wineries). This individual work was independent in improving their own business. There is always an absence from the government in the development of this sector.

Recommendations

The Lebanese wine industry needs to develop a distinctive identity that reflects well its uniqueness. It is logical the use of heritage as a starting point thereby focusing on wine styles with a history. This will build their “authenticity” credentials, highlighted as a key purchasing sign in the literature review.

More collaboration and cooperation between the different parties of the wine production chain that results in extension of any technical support among each other and homogenize their practices.

Implement territorial strategy and strict zoning for land use taking into consideration the access to land; It is necessary to implement laws to limit the division of the plots. And on the other hand, implement laws to regroup the fragmented plots.

Enhancing the supervision of the sector either by private parties like special agencies and specialist on by public organizations related to the government like LARI (Lebanese Agricultural Research institute)

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ANNEX

Advisory Body Evaluation (ICOMOS) – Case of anjar

ICOMOS

INTERNATIONAL COUNCIL ON MONUMENTS AND SITES
CONSEIL INTERNATIONAL DES MONUMENTS ET DES SITES
CONSEJO INTERNACIONAL DE MONUMENTOS Y SITIOS
МЕЖДУНАРОДНЫЙ СОВЕТ ПО ВОПРОСАМ ПАМЯТНИКОВ И ДОСТОПРИМЕЧАТЕЛЬНЫХ МЕСТ

LISTE DU PATRIMOINE MONDIAL **WORLD HERITAGE LIST N° 293**

A) IDENTIFICATION	**A) IDENTIFICATION**
Bien proposé: Anjar **Lieu:** Beqaa **Etat partie:** Liban **Date:** 2 décembre 1983	**Nomination:** Anjar **Location:** Bekaa **State party:** Lebanon **Date:** December 2, 1983
B) RECOMMANDATION DE L'ICOMOS	**B) ICOMOS RECOMMENDATION**
Que ce bien culturel soit inscrit sur la Liste du Patrimoine Mondial et sur la Liste du Patrimoine Mondial en péril au titre des critères III et IV.	That the proposed cultural property be included on the World Heritage List and the World Heritage List in danger based on the criteria III and IV.
C) JUSTIFICATION	**C) JUSTIFICATION**
Aujourd'hui menacées du seul fait de leur position stratégique, les ruines d'Anjar, dans la Bekaa, non loin des routes qui relient Homs et Baalbek à Tibériade et le Mont Liban à Damas, sont connues depuis peu: l'exploration archéologique de cette cité n'a été entreprise qu'en 1949. Dans un site occupé depuis une époque reculée (des remplois d'édifices grecs, romains et paléochrétiens se rencontrent fréquemment dans les maçonneries), la ville d'Anjar (Ain al Jarr) a été fondée de toutes pièces au début du VIII ème siècle par le calife Walid I (705-715) comme l'attestent une chronique syriaque et diverses sources contemporaines. Cette surprenante création urbaine, d'ailleurs inachevée, n'eut qu'une brève existence: en 744, les partisans du calife Ibrahim, fils de Walid, furent défaits sous les	The ruins of Anjar, in the Bekaa, not far from the roads which link Homs and Baalbek to Tiberiade and Mount Lebanon to Damascus, and which are today threatened by their strategic position, were discovered not long ago : archaeological explorations of this city were only undertaken in 1949. Situated on a site which was occupied over a long period of time (re-employed elements of Greek, Roman and Early Christian buildings are frequently found in the masonry of its walls), the city of Anjar (Ain al Jarr) was founded, as attested to by a Syriac chronicle and by contemporary sources, at the beginning of the 8th century by Calinh Walid I (705-715). This surprising urban creation, which was never completed, had only a brief existence : in 744, the partisans of Calinh Ibrahim, son of Walid, were defeated outside the walls of Anjar by Marwan ben Mohammed

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murs d'Anjar par Marwan ben Mohammed qui devint le dernier calife omeyyade. Dès lors, Anjar, partiellement détruite, connaît l'abandon et la déchéance. Comme plus tard Abu al Fida, Guillaume de Tyr n'y vit que des ruines, enjeu de nombreuses batailles au XII ème siècle.

Les fouilles ont révélé une véritable ville forte enserrée dans une muraille flanquée de quarante tours où une inscription de 741 se voit toujours in situ. Cette enceinte rectangulaire (385-350 m) est strictement orientée. Commandés par des portes, bordés de portiques, un grand axe nord-sud et un petit axe est-ouest, superposés aux collecteurs principaux où se déversent les égouts, divisent l'espace en quatre quadrants égaux. Bâtiments publics et privés sont répartis en fonction d'une planification rigoureuse: palais principal et mosquée dans le quadrant sud-est, palais secondaire et bains dans les quadrants nord-est et nord-ouest, quartier d'habitation très dense desservi par un réseau de rues de plan orthogonal dans le quadrant sud-ouest. L'organisation de l'espace urbain, remarquablement concertée, évoque davantage celle des résidences impériales (dont la ville-palais de Dioclétien à Spalato reste le meilleur exemple) que celle des camps militaires et des villes coloniales romaines.

Les ruines sont dominées par les vestiges spectaculaires d'un tétrapyle monumental, à la croisée des deux axes principaux, ainsi que par les murs et les colonnades du palais omeyyade, conservés sur trois niveaux. Ces structures intègrent des sculptures de l'époque romaine, mais se signalent également par la qualité plastique exceptionnelle des éléments du décor contemporains de la construction.

L'ICOMOS recommande l'inscription d'Anjar sur la Liste du Patrimoine Mondial au titre des critères III et IV comme exemple éminent et parfaitement daté de l'urbanisme omeyyade (Ramla, Basra, Kufa et Wasit sont trop imparfaitement connus pour offrir de bons termes de comparaison).

L'ICOMOS souhaite qu'une protection intégrale s'exerce sur les vestiges intra-muros, mais encore sur l'édifice

who became the last Omayyad caliph. After this, Anjar, which was partially destroyed, was abandoned. As Abu al Fida after him, William of Tyre saw only ruins, the results of numerous battles of the 12th century.

Excavations have revealed a fortified city, enclosed by walls flanked by forty towers where an inscription from 741 may still be seen in situ. This rectangular fortified wall (385x350 m.) is precisely oriented. Dominated by gates flanked by porticos, an important North-South axis and a lesser East-West axis are superimposed above the main sewers and divide the city into four equal quadrants. Public and private buildings are laid out according to a strict plan : the principal palace and mosque in the south-east quadrant; the secondary palace and baths in the north-east and north-west quadrants; the densily inhabited south-west quadrant criss-crossed by a network of streets built on an orthogonal plan. The urban spatial organization, which is remarkably devised, is more reminiscent of that of a royal residence (of which the city-palace of Diocletian at Split remains the best example) than that of the Roman military camps and colonial cities.

The ruins are dominated by the spectacular vestiges of a monumental tetrapyle, at the crossing of the two principal axes, as well as by the walls and colonnades of the Omayyad palace, three levels of which have been preserved. These structures incorporate sculptures from the Roman period, but are notable as well for the exceptional plasticity of the elements of the contemporary decor within the construction.

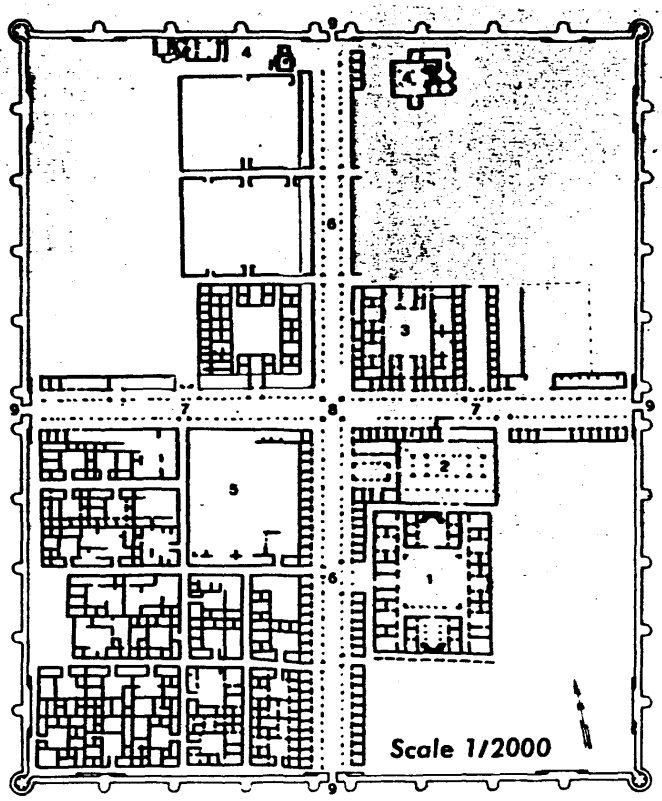
ICOMOS recommends the inclusion of Anjar on the World Heritage List based on criteria III and IV as an eminent and perfectly dated example of Omayyad urbanism (Ramla, Basra, Kufa and Wasit are not well enough known to form the basis of a valid comparison).

ICOMOS would suggest that an integral protection be extended not only to the intra-muros vestiges but also to the building with a central courtyard (a caravanserai?) which has been brought to light extra-muros.

à cour centrale (caravansérail?) dégagé extra-muros à l'est de l'enceinte. L'ICOMOS souhaite d'autre part un contrôle étroit des abords du site, où un village moderne s'est établi.

ICOMOS would suggest, as well, the strict control of the surroundings of the site, where a modern village is in the process of being developed.

ICOMOS, mai 1984



1. Palais I. - 2. Mosquée. - 3. Palais II. - 3 bis. Palais III. - 4. Bains. - 5. Quartier résidentiel. - 6 et 7. Voies principales à portiques. - 8. Tétrapyle. - 9. Portes de l'enceinte.

LIBAN - ANJAR

ICOMOS

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LISTE DU PATRIMOINE MONDIAL **WORLD HERITAGE LIST N°** 294

A) IDENTIFICATION	**A) IDENTIFICATION**
Bien proposé: Baalbek **Lieu:** Beqaa **Etat partie:** Liban **Date:** 2 décembre 1983	**Nomination:** Baalbek **Location:** Bekaa **State party:** Lebanon **Date:** December 2, 1983
B) RECOMMANDATION DE L'ICOMOS	**B) ICOMOS RECOMMENDATION**
Que ce bien culturel soit inscrit sur la Liste du Patrimoine Mondial et sur la Liste du Patrimoine Mondial en péril après acceptation par le gouvernement libanais du périmètre de protection défini par l'ICOMOS.	That the proposed cultural property be included on the World Heritage List and on the World Heritage List in danger once the Lebanese government accepts the perimeter of the protected area as defined by ICOMOS
C) JUSTIFICATION	**C) JUSTIFICATION**
La proposition d'inscription de Baalbek introduite par le Gouvernement libanais permet de combler une lacune évidente sur la Liste du Patrimoine Mondial: l'ensemble monumental d'Heliopolis est l'un des témoins les plus impressionnants - et sans doute aujourd'hui le plus célèbre - de l'architecture romaine impériale. Dans la plaine fertile, Baalbek (dont le nom signifie "maître de la Be-Kaa") n'est, à l'époque phénicienne qu' une bourgade agricole où l'on vénère une triade de dieux de la fertilité; nommée Héliopolis à l'époque hellénistique, la ville, modeste, connaît son apogée après l'arrivée des Romains en Phénicie en 64 av.J.C. et devient l'un des sanctuaires les plus célèbres du monde antique, progressivement couvert de constructions colossales qui s'édifièrent pendant	The proposal for the inclusion of Baalbek presented by the Lebanese government allows an evident lacuna on the World Heritage List to be filled : the monumental ensemble of Heliopolis is one of the most impressive testimonies -and doubtless the most celebrated- to the Roman architecture of the imperial period. Lying on fertile plains, Baalbek (which means "master of Bekaa") was, during the Phoenician period, no more than an agricultural village where a triad of fertility gods was worshiped; given the name Heliopolis during the Hellenistic period, the modest city saw its apogee after the arrival of the Romans in Phoenicia in 64 B.C. and became one of the most celebrated sanctuaries of the ancient world, progressively overlayed with colossal constructions which were built during more than two centuries.

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plus de deux siècles.

Les historiens prêtent aujourd'hui à Auguste lui-même, le dessein d'un sanctuaire impérial où se fût opérée, au bénéfice de Rome, une mutation cultuelle significative. Quoiqu'il en soit, la triade héliopolitaine romanisée (Jupiter, Vénus et Mercure) allait supplanter, dans la ferveur des pèlerins, la triade phénicienne (Baal-Shamash, Anat, Aliyan); d'autre part, les premiers travaux de construction, ceux du temple de Jupiter, débutèrent du temps d'Auguste, sur des substructions hellénistiques, pour s'achever, vers 60 ap.J.C. sous Néron. Dès lors, les travaux ne s'assoupirent jamais avant la réalisation du programme: construction du grand autel, vers 100; du temple dit de Bacchus, vers 120-125; de la grande cour, vers 150; du temple de Vénus, au début du III ème siècle; des Propylées, sous Caracalla; de la cour hexagonale, sous Philippe l'Arabe.

A Baalbek -Héliopolis, le phénomène du syncrétisme religieux, qui amalgame les vieilles croyances phéniciennes aux mythes du panthéon gréco-romain se prolonge par une incroyable métamorphose stylistique. Les formules syro-phéniciennes de l'époque séleucide fusionnent avec la grammaire décorative classique de l' Ara Pacis Augustae. Il en résulte une architecture d'une force expressive considérable combinant sans redondance les motifs ornementaux des colonnades, des niches, des exèdres, s'exprimant sans contrainte dans les frises décoratives, les plafonds à caissons sculptés, les chambranles des portes.

L'ICOMOS recommande l'inscription des monuments antiques de Baalbek sur la Liste du Patrimoine Mondial au titre des critères I et IV, à la fois comme réalisation artistique unique, et comme exemple éminent d'un sanctuaire de l'époque impériale romaine.

L'ICOMOS souhaite que la zone de protection à définir englobe, en outre, toute la ville à l'intérieur de l'enceinte arabe ainsi que le quartier sud-ouest extra-muros entre Bustan-al-Khan, la carrière romaine et la mosquée mamelouke de Ras-al-Ain.

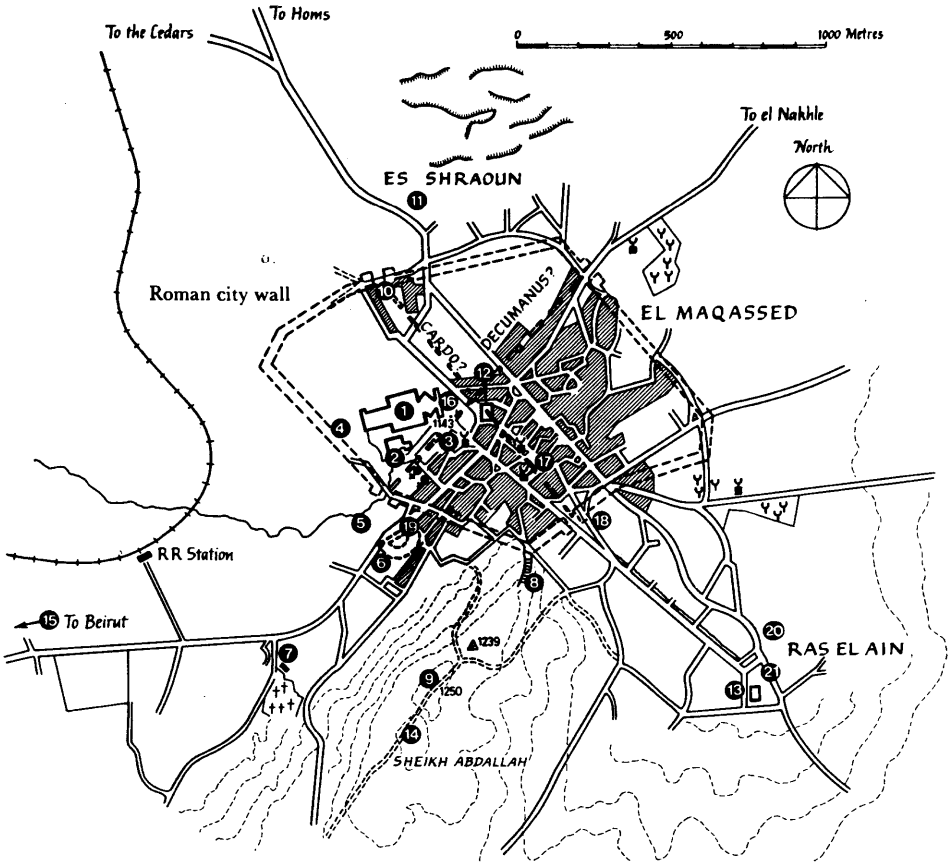
Today, historians attribute to Augustus himself the design of the imperial sanctuary where a significant religious transfer came about to the benefit of Rome. Whatever the case, the Romanized triad of Heliopolis (Jupiter, Venus and Mercury) came to replace in the favour of the pilgrims, the Phoenician triad (Baal-Shamash, Anat and Aliyan); further, the first construction work, that of the temple of Jupiter, was begun during the Augustan period, on Hellenistic foundations and was completed, ca. 60 A.D., under Nero. From that time, work did not abate until the completion of the program: construction of the great altar, ca. 100; of the so-called "temple of Bacchus", ca. 120-125; of the grand court, ca. 150; of the temple of Venus at the beginning of the 3rd century; of the Propylaea, und Caracalla; and the hexagonal court, under Philip the Arab.

At Baalbek-Heliopolis, the phenomenon of religious syncretism, which amalgamated the old Phoenician beliefs with the myths of the Greco-roman pantheon was prolonged by an amazing stylistic metamorphosis. The syro-phoenician formulas of the seleucid period were fused with the classic decorative grammar of the Ara Pacis Augustae. There resulted an architecture of a considerable expressive force which was combined, without redundancy, in the ornamental motives of the colonnades, the niches and the exedras and was freely expressed, as well, in the ceilings with sculpted coffered panels and the framework of the doorways.

ICOMOS recommends the inclusion of the antique monuments of Baalbek on the World Heritage List based on criteria I and IV; as at once a unique artistic creation and an eminent example of a sanctuary of the Imperial Roman period.

ICOMOS would suggest that the area of protection to be defined, encompass, in addition, all of the city within the Arab walls as well as the south-west quarter extramuros between Bustan-al-Khan, the Roman quarry and the Mameluk mosque of Ras-al-Ain.

ICOMOS, mai 1984



1 Temple of Jupiter Heliopolitan
2 Temple of Bacchus
3 Temple of Venus
4 Trilithon
5 Colonnade of a public building
6 Theatre (not excavated)
7 'Stone of the Pregnant Woman'
8 Stairs to the Temple of Mercury
9 Site of the Temple of Mercury
10 Roman city gate
11 Necropolis
12 Great Mosque
Built on the site of the Roman Forum, it dates from the Umayyad period and consists of three rows of columns carrying arches on which a wooden roof once rested. The irregular granite and limestone columns with their Corinthian capitals were taken from the Roman temples. In the north-west corner of the courtyard there are traces of an octagonal minaret placed on a square base.
13 Ruined Mosque
14 Qubbat Amjad.
On the top of Sheikh Abdallah hill are the remains of a mausoleum ascribed to Al Amjad Barhan Shah, grand nephew of Saladin. It is built of stones from the Temple of Mercury.
15 Qubbat Douris
On the outskirts of Baalbek, on the west side of the main road, are the remains of a simple octagonal mausoleum. It consists of eight red granite column shafts, taken from Baalbek and used as simple pillars without base or capital. Over the architrave blocks is a remarkably designed frieze, cut in such a way as to relieve the architrave of any additional weight. The monument was built in the thirteenth century. Nothing of the domed roof remains.
16 Tourist Bureau
17 District Government
18 Post Office
19 Hotel Palmyra
20 Hotel Khawam
21 Restaurant Ras el Ain

LIBAN - PLAN DE BAALBEK

UNIVERSIDADE DE ÉVORA

Master's degree in management and valorization of cultural heritage

Tutored Project Master Erasmus Mundus TPTI

(Techniques, Patrimoine, Territoires de l'Industrie)

Study of the costal dune systems: from morphogenetic and historical characteristics to protection projects of landscape and environmental heritage
Veneto, Italy
Costa Da Caparica, Portugal

Instructor: Ignacio Garcìa

Done by: Joseph Tannous

INDEX

The dune systems of the Venice lagoon: between history and preservation

Introduction

The subject of this work considers the anthropic and natural system of the Venice lagoon; from the most decisive transformations that have taken place over the centuries to the current situation of coastal protection through the Life Redune projects promoted by the Veneto Region. Particular emphasis will be placed on the characteristics of these environments, their history, the problems of their conservation and the projects in progress. The systemic vision of the Venice lagoon, which will be presented in the first part of the document, is of fundamental importance both from a historical and geographical/morphological point of view. The second part will focus more on specific cases of coastal conservation and on some ongoing projects. The objective is to provide an overview of the coastline of the Veneto lagoon, which presents unique characteristics due both to the nature of the places and to the complexity and succession of human interventions that have marked the most significant phases in the evolution of the lagoon and the coastal environment.

In many respects, the coasts of the Veneto are part of the general process of change that has affected the complex interior of the Italian coast over the last century, leading to a drastic reduction in natural coastal habitats and the fragmentation of dune belts.

While in classical antiquity the coastline remained substantially stable, it was with the advent of the Roman Empire and with the first land reclamation and deforestation works that determined the first widespread erosive actions that there was a significant progressive advance of sandy coasts due to the increased input of sediments. In the Middle Ages, due to the abandonment of many villages, there was the "reconquest" of nature of many areas that became the site of lagoons and coastal ponds, also due to marine infiltration phenomena caused by the reduction in the supply of sediment due to the recovery of forests. During the 18th century and for most of the 19th century, all the sandy coasts of Italy experienced considerable growth.

Since the nineteenth century, human intervention has been the main change affecting the Italian coasts: along the Italian coasts, the natural conditions for solid transport by sea and along the coasts have greatly changed. The development of agriculture is one of the main causes, with the construction of roads and railways, hydraulic and forestry works in the basins, the extraction of aggregates from river beds, the construction of dams and maritime works. The sedimentary balance became more and more deficient and increasingly marked erosion processes were triggered.

Since the second after the war, the direct impact of the development of the tourism industry has been very strong, with the systematic levelling of the dunes to make way for tourist and seaside establishments.

The challenge of coastal protection is a topical one and the measures implemented today are more decisive than ever. This short document aims to introduce the environmental issues related to coastal erosion, presenting one of the most decisive and complicated cases for safeguarding. The efforts of researchers and historians are very important in this field of research because the historical overlap of human interventions on the lagoon ecosystem has led to its change and evolution. It is believed that only by studying these causes in depth will it be possible to plan the future of the Venice lagoon, in the hope of restoring the balance between man and the environment of the lagoon that was present in the past and which has been gradually lost.

Fig. 1: la lagune de Venise actuellement sur une image satellite.

Tiré de : L. D'Alpaos, *L'evoluzione morfologica della Laguna di Venezia attraverso la lettura di alcune mappe storiche e delle sue carte idrografiche*, Istituzione Centro Previsioni e Segnalazioni Maree, Venise, 2010, p. 10.

I. The Venice lagoon: characteristics, current problems and causes

Main features. The Venetian basin has the shape of a circular sector, is the largest coastal lagoon environment in the Altoadriatico and seems to be criss-crossed by a dense network of channels that extend by capillarity towards the eaves with decreasing depths. The current lagoon is located between the mouth of the Piave River in the northeast and the Brenta River in the southwest, with a length of about 55,000 hectares and an average width of 10 to 12 km. The geography of this particular environment has an intrinsic value; there are different and unique wetland situations. The lagoon is produced by the interaction of rivers and the sea, and has been subject to continuous transformation by man since prehistoric times. It includes open lagoon mirrors, channels, ghebians, bumps, mounds, valleys, sandbanks, sails, banks, islands and artificial morphologies. (urban settlements, fishing valleys, floodplains, islands such as "octagons", etc.). The morphological structure of this territory is due to evolutionary processes of natural origin and their integration with human activity, the latter being particularly important since the 15th century.1

The marine waters enter the lagoon through three river mouths: Lido, Malamocco and Chioggia, which give their name to the respective water basins. The cyclical nature of the tidal currents is twice a day and they enter and leave the entrances of the lagoon extending towards the end of their respective basins through a dense network of canals that gradually branch and narrow inwards. The last and thinnest branches of the channels are called ghebi (tidal creek); thanks to them, the sea reaches even the innermost areas of the coast, which were once called "laguna morta" because if the mouths were not wide enough, they were affected in an extremely limited way by the action of the tide. The spread of the tide in the lagoon is in fact conditioned by the length and depth of the receding channels and by the extent and depth of the shallow inner areas fed by the channels. Typical environments of these submerged or semi-submerged inner areas are marshes and "velme" (marsh flat). Among the emerged areas are the "barene" (salt marsh), forms that characterize more than others the lagoon fabric, are periodically submerged and for this reason are covered with halophilic vegetation (Codego).

The sandbanks can be classified in different groups on the basis of the genetic processes that led to their formation:

1) The "barene" of ancient river banks or located on the banks of rivers form a characteristic morphological apparatus: the "punte dei lovi".

2) The "barene" constituted by the emerged part of the ancient coastal plain invaded by brackish waters, are located on the edge of the lagoon towards the mainland and in their sediments.

3) The residual swampy "barene", characterized by layers of peat in the sediments; they were formed by the deposition in the lagoon basin of river floods that, following the emersion,

Figs. 2 and 3 : images of the environment of the valley of the Venice lagoon made by Fulvio Roiter.
Above: water tables and sand banks inside Valle Figheri. Below: canals, sandbanks, "velme", shoals, "ghebi" and clear waters intermingle in Valle Dogà. The result is a complex and highly articulated morphology, functional to the local hydrodynamics, which can still be observed in some unregulated parts of the lagoon. However, unlike in the past, these areas are in progressive reduction.

were covered by swampy vegetation. 4) the "barene" of the lagoon channel; they are subject to sufficient sedimentation to compensate for the slow sinking. Their flank along the canal is generally steep while the other flank slopes gently down towards a swamp or veil. Today, these sandbanks are only found in the northern basin of the Lido and in the Chioggia basin, where some streams and drainage channels still have their mouths.
On a phytogeographic-naturalist basis, one can distinguish the middle lower lagoon from the northern lagoon; the latter presents typical landscape aspects that are due to the physico-chemical peculiarities of the environment, characterized by the presence of brackish and fresh water.2

Problems: The current situation of the lagoon is undergoing important changes that, in the last decades, bring some negative aspects that tend to become more and more evident. The lagoon is losing its original shape, characterized by shallow seabeds, brackish water basins connected by channels that go inland with successive and increasingly tiny ramifications, capable of bringing the beneficial effects of the periodic alternation of tides at the entrances to the lagoon and contributing substantially to the change of water. The negative aspects of these changes are mainly related to the phenomenon of intense erosion which is very accentuated in the central part of the basin within the perimeter formed by the large canals that originate in the mouths of the Lido and Malamocco rivers and the canals created during the 20th century by man to allow the passage of modern ships of greater draught inside the lagoon to reach the inland ports. Other causes of coastal erosion and sandbank areas can be found in the combined action of rising average sea level and land subsidence.
The current situation sees, in the area closest to the termination, called "laguna morta", a weaker presence of "barene" compared to the more recent past and consequently a substantial loss of the sandbank habitat, the small channel and the shallow sandbank which created the characteristic morphological tissue of the lagoon which may have favoured a better water exchange in the areas hydraulically more distant from the mouths. The phenomenon of erosion has not only affected the area of the "laguna morta". The dune system of the islands and the coast (e.g. the Lido) is also undergoing serious damage and changes due to the triggering of this process, which requires continuous and constant monitoring and replenishment of the beaches. Parallel to the gradual disappearance of the "barena" areas and coastal dune systems, there is also an increase in the depth of the "velme" and water areas along

the channels. In particular, the phenomenon of erosion is very accentuated in the central lagoon between the large navigable canals. In this region, the process of erosion is very widespread with undeniable effects at the height of the great curve of Porto S. Leonardo. The presence of the waterway once dug by man is the major cause of the erosion process in the area and bears witness to the anthropic impact on the precarious balance and morphology of the lagoon. The tendency of human action to further deepen the bottom of the entrance channels into the lagoon has led to a generalized deepening of the seabed and has nullified the former hydrodynamic role of the lagoon channels in controlling the spread of the tide, radically changing the regime of water currents in almost the entire lagoon. Many analyses agree in describing this abnormal evolution of the lagoon morphology. More controversial, however, is the identification of the causes of the observed processes.

1 Tiré de : M. Zanetti, *Laguna nord di Venezia*, Vérone, 1992.

Main causes: There are essentially two causes that give rise to the ongoing erosion process, both natural and anthropogenic. That of natural origin concerns the secular phenomena of rising average sea level and subsidence of the soil. At the same time, there have been some human interventions in the past (16th and 17th centuries) that led to the diversion of the great rivers that flowed into the lagoon, such as the Brenta, or that interfered with the lagoon itself during great floods, such as the Piave. The effect of these diversions was to displace the constant supply of large quantities of river sediments to the lagoon. Another fundamental cause of the erosion of the lagoon discovered by the researchers concerns the excavation work on the sea floor carried out by man from 1800 to allow the landing of large cargo ships related to the industrial activities that were gradually settling in the lagoon at that time.

Fig. 4: image des années 1920 pour la construction de la nouvelle zone industrielle. En particulier
: des dragues en action pour l'excavation des canaux desservant la zone industrielle.

Photo de: Archives photographiques Giacomelli.

I. The ancient history of the lagoon: from the Roman period to the first interventions to modify the territory (16th century).

From the Roman period until the 15th century. The origins of the lagoon as an eco-systemic and geographical unit date back about 6000 years. The origins of the anthropic evidence of the oldest settlements in the lagoon are pre-Roman: Paleo-Venetian and Etruscan. Since then, the lagoon has been the object of decisive anthropic interventions such as the construction of the first inhabited centers on the land that emerged on the coast (Metamauco) and inside the lagoon (Rivoalto, Torcello). Some archaeological, paleographic, paleobotanical and sedimentological research found in the writings of Procopius of Caesarea, Scimno da Chio, Titus Livy, Pliny and Strabo attest that during the Roman period the distribution of the islands in the lagoon must have been different from that of today; moreover, it would seem that in the first centuries AD the coast did not correspond to the present coastline but extended as far as Sant'Erasmo3. It is almost certain that already in Roman times, hydraulic engineering, land reclamation and agricultural parcelling in currently submerged sites were possible. Little is known about the period of the following centuries, apart from the hypothesis that many drainage channels and watercourses were reactivated to continue a summary and fragmentary work of taking land from the sea with the aim of making it fertile and agricultural (centuries V to XII). After the year 1000, the alluvial contributions provided by the rivers generated the progressive silting up and burial of large areas of the lagoon.

The Piave and Sile rivers contributed to the definition of the morphogenesis of the northern lagoon. For the south-middle section is the delta of the Brenta River, which determined the sediment deposition action until the 16th century, when the diversion of the mouth began.4

The Venetian Renaissance, the sixteenth - eighteenth centuries and the works of river diversion. It should be noted that from the origins of Venice and the first human settlements, the water-man-land relationship was contained in an inseparable symbiosis and until the 15th century, human interventions on the lagoon ecosystem were very limited: consolidation works, backfilling with modest excavations that supported natural processes. It was in the following centuries that a real change in the geography of the lagoon occurred through the detour of rivers and the forced stabilization of the lagoon and coastal margins. Thus, at the beginning of the 16th century, rivers such as the Brenta, Bacchiglione, Sile and Piave were gradually diverted towards the sea and no longer towards the lagoon. The interventions were not limited to the diversion of the rivers, but also involved the excavation of deep channels towards the sea which modified the salinity of the lagoon, increasing its marine character and bringing new flows and currents into the lagoon.

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2 Tiré de : E. Miozzi, *Venezia nei secoli*, Venise, 1968.

4 Travers : G. Favero, R. Parolini, M. Scattolin, *Morfologia storica della Laguna di Venezia*, “Collana ambiente Assessorato all’ecologia del Comune di Venezia”, 3, Venise, 1988; M. Zunica, *Le spiagge del Veneto*, C.N.R., Centro di Studi per la Geografia Fisica, Padue, 1971, pp. 12-24.

The Venetian Republic was concerned to guarantee the portality of its territory since its wealth and its domination in Adriatic Italy was based on trade. Thus, as a first step, in order to prevent river sedimentary deposits from compromising the functionality of the lagoon canals, a large-scale construction of palafittes and embankments extending both at the mouths of the ports and from the eaves towards the interior of the basin was launched. Subsequently, the mouths of the main rivers were diverted towards the sea in order to eliminate the sediment input into the lagoon and the resulting spontaneous formation of swampy areas. The reason for this was hygienic and medical: having fewer swampy areas prevented the spread of malaria epidemics, which were very dangerous at the time. This type of intervention affected both the southern area of the basin and the northern lagoon, where sediment deposits from the Sile and Piave rivers posed a serious threat to the port area of San Nicolò.5

As a result of the detour of the Brenta (1488), the waters of the Bottenigo and Marzenego canals were also introduced into the Canale dell'Orsellino (1507-1519). The Piave River foothills became towards Porto Santa Margherita (1644) and was ousted from the lagoon basin; near the final stretch of the watercourse so deviated, a wide lacustrine mirror was formed and in 1683 the river spontaneously opened a passage towards Cortellazzo (Landrona's route) reaching its present position. In the course of the XVIII century the waters of the Sile was forced to go to the lagoon to catch the Taglio del Sile and to convey in the ancient bed of the Piave Vecchia.6At the same time, the area behind the coasts has undergone a progressive lowering of the seabed that has not been compensated by adequate river inflows, while along the coastline, the detour of the main rivers has led to deep transformations that must be interpreted as a natural response to these anthropogenic actions.

As has been shown, it is the port function that has directed the great transformations of the territory and the coastline and, in historical times, the coastline has undergone continuous transformations and redefinitions according to the variable location of the sources of fluvial sedimentation. After the river diversions, these were located at the end of the lagoon basin and generated important growths along the coast of Cavallino and Chioggia. In addition, the dominant coastal current (from the northwest) has contributed significantly to orienting the deposits of the Sile, Piave and Tagliamento rivers and also towards the south bank of the Bacchiglione and Brenta rivers. Finally, the coasts of Pellestrina and Lido, which are very subject to erosive processes, have preserved thin sandbanks and since the 12th century transverse wooden defense structures were erected and later longitudinal embankments; until the 18th century, when the "murazzi" were built.7

5. *La laguna: origine ed evoluzione*, in G. Caniato, E. Turri, M. Zanatti (dir), *La Laguna di Venezia*, Vérone, 1995, pp.41-75; E. Miozzi, *Venezia nei secoli*, Venise, 1968.

6. Parolini, M. Scattolin, *Morfologia storica della Laguna di Venezia*, “Collana ambiente Assessorato all’ecologia del Comune di Venezia”, 3, Venise, 1988.

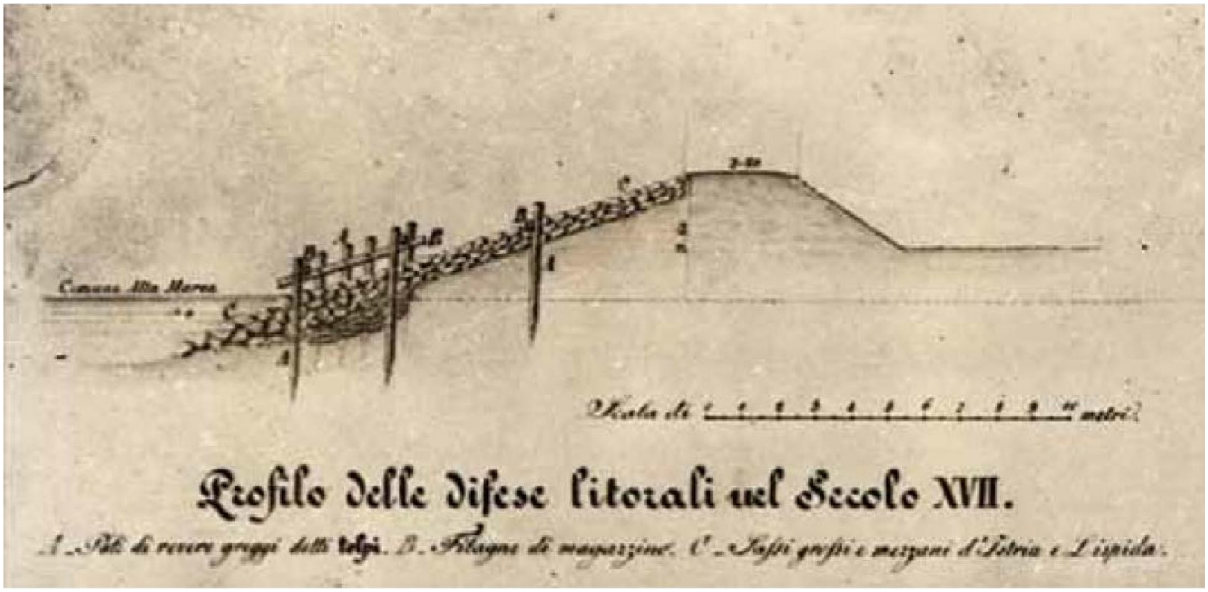

Fig. 5, above: schematic section of the grazing tusks used in the 16th century, but also until the first decades of the 17th century, to defend themselves against attacks from the movement of the waves of the shores separating the lagoon from the sea. The materials used, wood and stone, guarantee a limited duration of the work. The parts made of wooden elements, periodically submerged by water, required continuous maintenance to preserve the effectiveness of the defenses.

(Dipartimento IMAGE dell'Università di Padova)

Fig. 6 On the opposite page: Map of the Venice lagoon.

The map provides a global representation of the state of the Veneto territory between the mouth of the Adige River, at the southern limit, and the mouth of the Piave River, at the northern limit. Copied by Angelo Minorelli in 1695 on the basis of the original map prepared by Cristoforo Sabbadino in 1556, the map shows the salient features of the morphological structure of the lagoon. In addition to the bodies of water in the part closest to the mouths, the surfaces of the sandbanks, arranged near the living lagoon, and the adjacent shallow lands are also well represented and recognizable. The latter are identifiable by their hatching and darker color and are interspersed between many water areas, some of which are of considerable extent. (ASVE, S.E.A., disegni, Laguna, n. 13).

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7 de Tiré Gatto, *I processi costieri nel tratto antistante il litorale di Venezia*, C.N.R. Istituto per lo Sudio della Dinamica delle Grandi Masse, T.R. 109, Venise, 1980; E. Miozzi, *Venezia nei secoli*, Venise, 1968.


Laguna di Venezia. Disegno di angelo Minorelli, 1695, maggio 13. Savi ed esecutori alle acque, serie Laguna, dis.13.
Riproduzione vietata - Per ottenere il rilascio di riproduzioni ci si dovrà rivolgere direttamente alla Sezione di Fotoriproduzione dell'Archivio di Stato di Venezia
Atto di concessione numero 44/2011
M A R E D I V E N E T I A

I. The modern history of the lagoon: the morphological evolution reconstructed by the study of historical maps

The most important interventions in river detour. The study of historical maps of the Venice lagoon gives an overview of the morphological evolution due in large part to the succession of interventions by man who tried to control the balance between land and sea. Some maps by Cristoforo Sabbadino (1489-1560), the most famous and authoritative of the ancient plumbers who served the Republic of Venice, give crucial information, although with a certain inevitable inaccuracy from a cartographic point of view. The map (Fig. 7) of 1557 shows the deviation of the Brenta and Bacchiglione rivers, which used to flow into the lagoon at about the height of Chioggia, towards the sea through the smaller mouth of the Brondolo lagoon a few kilometers to the south.

Fig. 7 detail from a map by Cristoforo Sabbadino dated 1557 showing the mouth of the Brenta and Bacchiglione rivers in the Brondolo lagoon, after the departure from the common mouth in the Conche lagoon. The position of the parador, created to separate the lagoon of Brondolo from the lagoon of Chioggia in defense of the latter.

identified.(BNMVE, mss.it.IV, 485 [=5350])

To note the Parador of Brondolo, the artificial work was a feat of engineering realized by the experts in the sector and consisted of a series of: "fixed vertical poles, connected transversely to each other by horizontal poles, placed to support a system of grisiole trellises, waiting for a more stable division as a result of the phenomena of sediment deposition conveyed by the two rivers, which would be determined close to the structure".9

The motivations that led to such a drastic solution can be found in the problem of burying large areas of the lagoon mainly by the two rivers. The fourteenth century interventions that attempted to direct the waters of the Brenta, which flowed towards Fusina, towards the Bocca di Lama in the Malamocco basin, were useless. The diversion channels of Oriago and S. Bruson di Dolo of the 15th century, which channeled water into the Malamocco basin, far from the city, were also of little use. The eviction of the Brenta and Bacchiglione rivers marked the beginning of a reversal in the morphological evolution of the lagoon. It went from the phenomenon of river sediment deposition to a slow and progressive erosive action.

Fig. 8 : satellite map of the Venice lagoon in its southernmost part near Chioggia. Compared to the map of the Sabbadino of 1557, there are many differences: the greater presence of water in the lagoon of Chioggia, the increase of land near the mouths of Brenta and Bacchiglione, the ancient parador now Strada Statale 309.(source : Google Maps, 2019)

The morphology of the lidos that delimit the lagoon on the sea side and flank the mouths, bordering them, is well defined. With regard to the coastline for the defense of the lagoon, it must be considered that there were important protective works protruding from the shore in some parts of the coast that served as garrison of beaches and river mouths.

In the upper lagoon, almost opposite Venice, the presence of several mouths and fairly deep canals, which in the past had allowed the construction of the three ancient ports of the Venetian Republic, is of great importance (fig. 9; 10; 11). The port of San Niccolò was the real passage that allowed large ships to enter the basin of S. Marco directly from the sea. The mouth of S. Erasmo and its port allowed access to the waters between Murano and Burano. Finally, the port of Treporti allowed ships to sail towards Torcello, Mazzorbo and the upper lagoon.

The mouth of the Lido Maggiore is located between the three ports and the mouth of the Piave. At the time, it was a fundamental garrison for the maintenance of the passage through the inner ports of the lagoon. In fact:

"the contribution of sediments to the coastal cordons, intensively supported by the Piave river, not yet diverted from its outlet to the sea of Jesolo, created many problems at the lagoon mouths that fed the upper lagoon and a part of the central lagoon, favoring the formation of powerful sand deposits and the presence of shallow seabed in front of the mouths themselves".10

Fig. 9 : detail from a map by Cristoforo Sabbadino dated 1556 with the canals for the passage of boats in the lagoon and the constitution of the three ancient ports of Venice.
(ASVE, S.E.A., disegni, Laguna, n. 13).

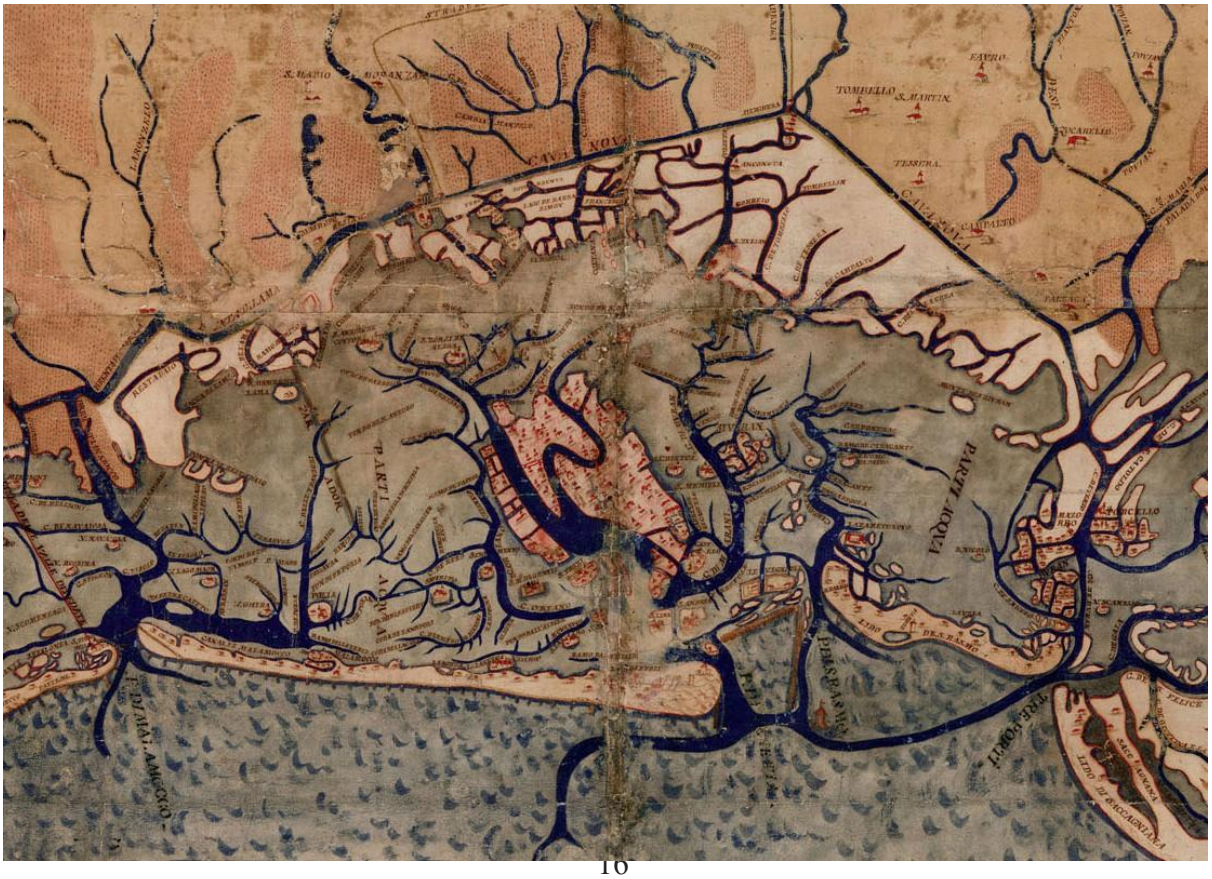
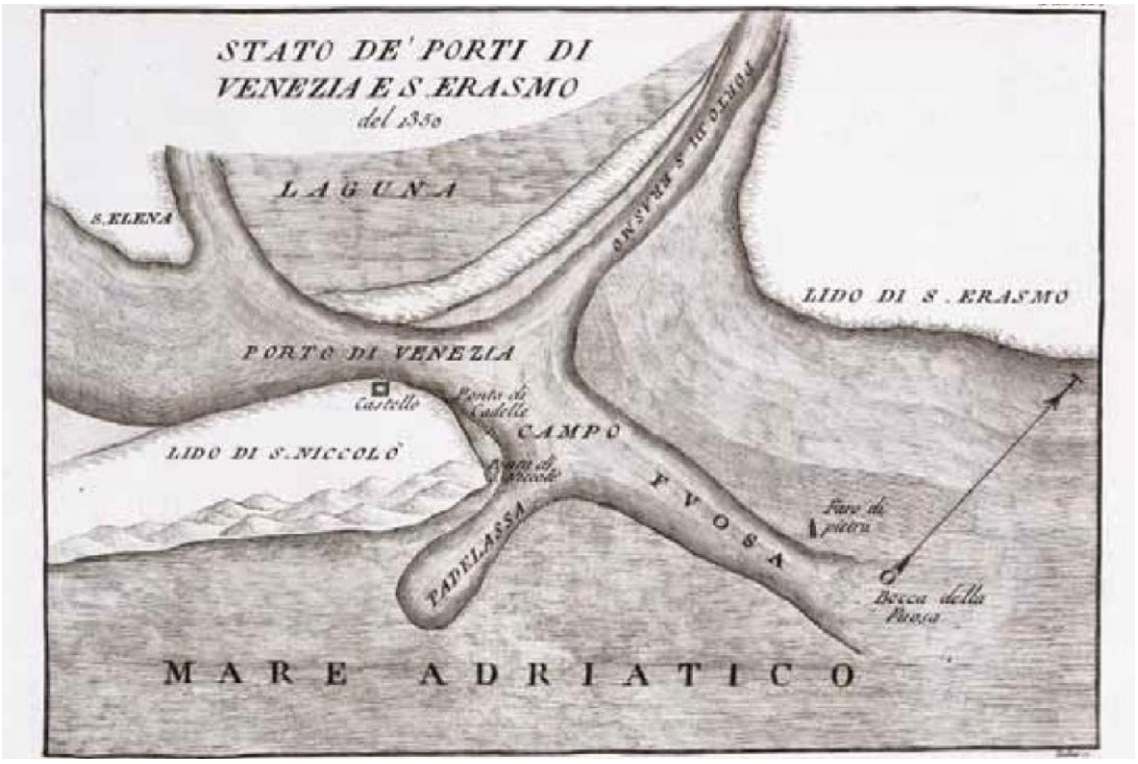
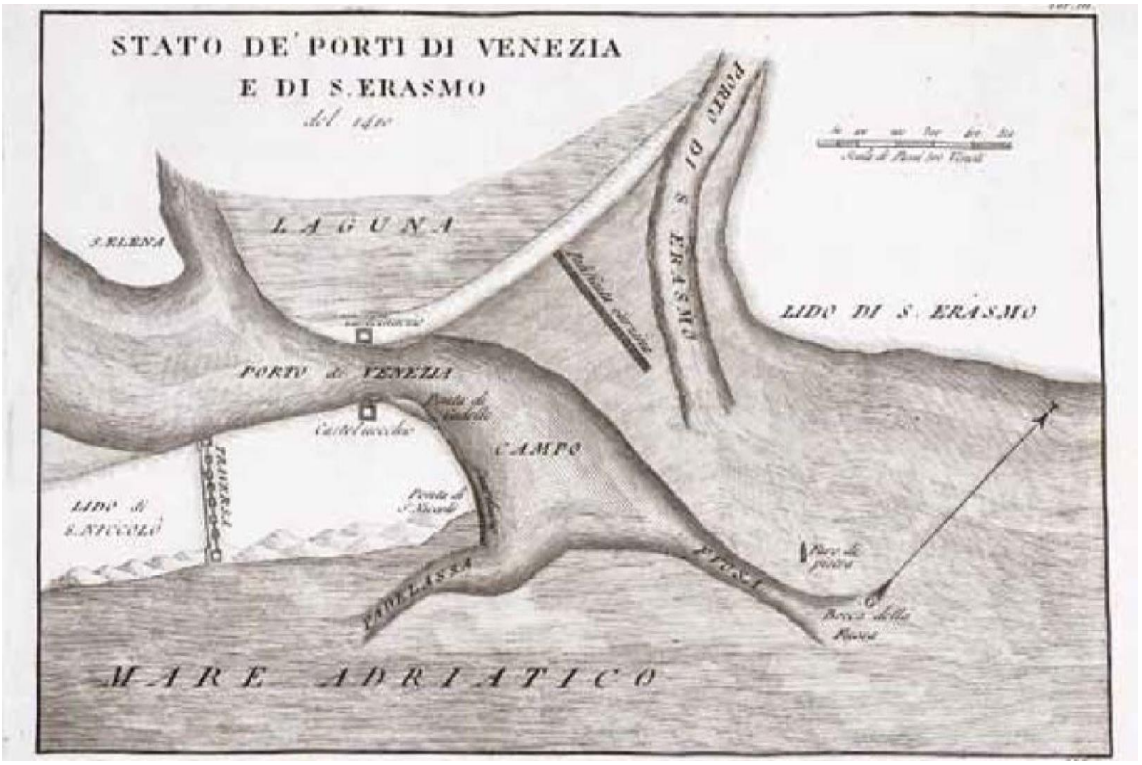


Fig. 10-11 : at the top; the ancient "three ports" of the upper lagoon in 1350. The port of S. Nicolò is resolutely oriented to the east, even though there is already a tendency for a branch of the mouth (the so-called Padelassa) to be close to the lido, leaning to the south.

Below: the old "three ports" in 1400. The tendency of the port of S. Nicolò to bend resolutely to the south, in its connecting stretch with the sea, developing a channel of access to the lagoon reintroduced between the mouth and the coast (Bernardino Zendrini, 1811 Biblioteca Centrale della Facoltà di Ingegneria dell'Università di Padova).





The Republic was confronted with the problem of the occlusion of the access channels to the lagoon, but the various measures taken to counter the deposition of river sediments in front of the "three ports" did not result in the hoped-for sites. An example of this is the various actions taken to maintain the port of S. Erasmo, closed in 1351 to allow excavation of the seabed and deepening of the mouth of S. Nicolò, was reopened after nine years, without achieving the objectives set.

Another example is the history of the famous garzina, located on the coast of S. Erasmo. This pier was built with a double row of posts filled with stones and reinforced on the outside by a pile of reefs. The purpose of the garzina was to combine the cleaning action of the tidal currents that came out of the mouth of S. Erasmo with that of the same currents that crossed the canal of S. Nicolò. The imposing construction did not have a significant effect on the solution of the problem of navigability of the mouth of S. Nicolò. The Republic of Venice was faced with the impossibility of maintaining the seabed at an adequate height in front of the "three ports", not so much because of the tidal currents, but because of the swells and coastal currents caused by the movement of waves near the coasts outside the lagoon.

Referring to the map of the Sabbadino of 1556 (Figs. 6 and 9), there is a canal on the edge of the lagoon, approximately at the height of Venice, which develops next to the slope of the Intestadura (Cava Nova), with the aim of intercepting the flows of minor streams that flowed into the lagoon in front of the city. The objective was to avoid numerous introductions of river water into the bodies of water adjacent to Venice, both to counter the development of the reed grove and consequently the flooding and for sanitary reasons. This problem was particularly felt in the 15th century, when the reeds developed as far as the limits of Venice.

The map does not provide any information on the valli da pesca, but it was supposed to be present. The testimony of these important lagoon realities is given by some documents relating to the famous monastery of Sant'Ilario. The possessions on the edge of the lagoon of certain bodies of water are in fact identified as Valli da pesca. It is therefore the written documents that give various testimonies and suggest that many valli da pesca, very different from today, were settled in the living lagoon, that is to say in the part of the lagoon basin that was more functional to an active regime of sea-lagoon exchanges. (Figure 12).

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10 L. D'Alpaos, *L'evoluzione morfologica della Laguna di Venezia attraverso la lettura di alcune mappe storiche e delle sue carte idrografiche*, Istituzione Centro Previsioni e Segnalazioni Maree, Venise, 2010, p. 21.

Fig. 12 : Planimetry of the fishing valley of Milixon in the 16th century. The valley, which occupies stretches of living lagoon water just in front of the mouth of Malamocco, is surrounded by trellises made up of clusters of swampy reeds, permeable to the flow of tidal currents. The tide could be overcome and the tide could extend into the valley area, although it could also resist movement.

(ASVE, S.E.A., disegni, Laguna, n.11).

I. The contemporary history of the lagoon: from large industry to coastal urbanization

Anthropic interventions between the 19th and 20th centuries. The detour of the Brenta River (1488) towards the sea, while helping to fight the flooding of the lagoon, continued to cause the flooding of the surrounding countryside. In the years of the last phase of the Republic of Venice (early 19th century), several projects to divert the river bed further upstream were proposed but never implemented. With the fall of the Republic, it was the Austrian administration that decided in the mid-nineteenth century to return the river to the Chioggia lagoon. The attempt was rather unsuccessful, to the point that more than 2000 hectares of marshland reappeared. The mouth was then brought back to the sea (1896) thanks to a different layout of the riverbed, which is still in use today.

However, the most characteristic interventions are those aimed at solving the problems related to the silting of the port entrances by coastal currents. Given the great commercial and industrial expansion of the time, it turned out that the three coves were not sufficient both for the needs of the new steam navigation and to ensure the replacement of lagoon waters already polluted by discharges from the first industrial plants. The section of the port coves had to be greatly enlarged to adapt to the extension of the three protected hydraulic basins delimited by breakwaters, capable of stopping the coastal sand migrations. The objective was to determine a new hydraulic-morphological device adapted to the needs of navigation, but also capable of stabilizing in time following a balance reached between the sea and the lagoon.

The other major engineering works of the 19th century concerned the construction of breakwaters at the mouth of the lagoon to increase and stabilize the seabed of the navigation and freight channels, with the consequent deepening of the seabed due to tidal currents. This introduction of salt water currents coming directly from the Adriatic and the simultaneous loss of river sediments have caused an imbalance that has triggered the slow but gradual process of erosion and deepening of the lagoon basin; a phenomenon that has accelerated further over the last thirty years. The process has manifested itself in the thinning of typical morphological elements, especially near the large navigation channels: shoals, sand banks and mudflats. The volume of sediment lost annually by the lagoon is equivalent to about 1,000,000 cubic meters. In addition, the simultaneous removal of the fishing valleys, as well as landfilling and backfilling interventions have considerably worsened the situation,

leading to an overall reduction in the size of the lagoon basin of about 32%, from 1800 to the present day.
To these problems, we must add the profound change in the logic of land management over the last century. Human activities and the transformation of the territory have affected the eaves of the lagoon and the coastal strip through important reclamation works and of artificial burials that led to the immediate disappearance of large areas of the lagoon. In addition, the ecological functionality of this unique and delicate environment has been further weakened by the introduction of pollutants due to production processes and of natural origin.

The next past of the lagoon: the second post-war period. This period is characterized by a strong increase in the establishment of impressive industries, especially the chemical industries that were located near the port of Marghera. Waste was accumulated at the bottom of the sea and the fumes produced could corrode the Venetian marbles. Parallel to the lowering of the bottom of the lagoon by excavating the seabed to accommodate the large oil tankers to the inner edges of the lagoon, the 1960s saw the deepening of the mouth of Malamocco and the imposing construction of the huge straight sectioned canal (Malamocco-Marghera), located just behind Venice. The canal was completed in 1968 and was called Canale dei Petroli. Thanks to its depth of 12 meters, it allowed supertankers to transit to the industrial pole of Marghera, but the consequences were irreversible: the continuous erosion of the seabed completely transformed this stretch of lagoon into a real inlet. Other interventions are those of closing the fishing valleys to the direct flow of tides, recovering the marshy areas of the mouth of the Brenta river in the Chioggia basin, embellishing the industrial area of Marghera, the Venice airport and the "sacche" (underground areas through the dumping of construction material waste) both on the Lido and in Venice and Murano. It is worth recalling the construction of the railway bridge with the subsequent widening for the roadway, the excavation of the Vittorio Emanuele canal for the industrial port and the construction of the viaduct for the Romea road in the Chioggia lagoon. The intensive extraction of water from artesian aquifers necessary from the 1950s for the industrial settlements of Marghera and the excavation area of the Canale di petroli.
The special law for Venice, passed in 1973, when the situation became critical and very important from the point of view of protecting the coastal environment. The law specified:

"the safeguarding of Venice and its lagoon is declared a problem of pre-eminent national interest. The Republic guarantees the protection of the landscape, historical, archaeological and artistic environment of the city of Venice and its lagoon, protects its hydraulic balance, preserves the environment from air and water pollution and ensures its socio-economic vitality [...]".11
The law was useful and effective at the beginning, but it was only partially operational: in those years, certain processes expressly harmful to the survival of the ecosystem of the coastal lagoon of Venice were stopped: the drainage of subsoil water and the construction of the new industrial zone. It was able to reduce the pollution from large industry, but nothing was done to contain pollution from urban and especially agricultural sources. The increased use of fertilizers for crops on the mainland has created another problem: rainfall containing chemical fertilizers. ended up fertilizing the lagoon water, altering and impoverishing its fragile but rich ecosystem.

With the flood that struck Venice in 1966, a new chapter opened for the lagoon, which manifested itself in imposing specific interventions and major engineering works. The dam project to preserve Venice from high waters foresaw the three entrances of the sea into the lagoon and did not take too much account of the possible consequences on coastal erosion and, for this and other reasons, gave rise to many doubts and criticisms. On the one hand because the interventions were judged not to respond to the complexity of the mechanisms that govern the lagoon ecosystem as a whole, and on the other hand because these systems are not capable of avoiding the frequent medium to high floods that continually undermine the foundations of Venetian buildings, but only work in exceptional cases of high water. Then the prototype MOSE (Experimental Electromechanical Model) was realized, whose usefulness in relation to the exorbitant costs remains to be verified.

11 Loi du 16 avril 1973, n. 171.

Understanding the present through the past. An example of geo-archaeological research in a lagoon environment. Archaeological research has proved to be indispensable for the chronological definition of the salient phases of the dynamics of the lagoon environment:

"The morphological dynamic has led to the progressive redefinition of the territorial organization, the latter also based on strategic and commercial needs: from the early centuries AD with the rise of large towns such as Ammiana, Torcello, Costanziaco we witness the continuous evolution of a 'geography of man' closely related to the port character of the lagoon environment and dominated after the seventh century by the progressive establishment of the urban settlement of Venice ".12An emblematic archaeological study that has allowed a better understanding of the morphology of the seabed and certain dynamics concerning the erosion actions of the last century concerns the site of S. Leonardo in Fossa Mala. The monastery was founded under the administration of the great abbey of S. Ilario, currently in the locality of Malcontenta. The name of the religious building comes from the nearby canal that once connected the corbola to the Mazor canal. Historical testimonies received tell that the religious congregation received some donations between 1178 and 1248 that were confiscated by the monastery priors. In 1348, because of the terrible plague, the site was used as a cemetery because of the serious losses suffered by the city of Venice. The complex of buildings (monastery and church) was abandoned during the 17th century and gradually disappeared.

Archaeological research carried out in the 1970s identified the structure of the building partially covered by the Cassa di Colmata and established a first general survey of the site, with a good probability of dating back to the 4th century BC. The disappearance of the site is due to the anthropic phenomena of the last century, a time when we are witnessing a progressive advance of the phenomenon of coastal erosion and the sudden dissolution of the monastery that resulted.

The phenomenon of erosion: "The excavation of the Malamocco-Marghera canal in the 60's and the construction of the Casse di Colmata caused a complex phenomenon of erosion, due to the passage of ships, and of sandy contribution linked, vice versa, to the progressive reduction of the beach of the Cassa itself. Because of this, it has often been found, near the coast line interrupted in the '60s of this century, a considerable sandy contribution in a secondary loose stone layer pertaining to the Cassa and often confused with the building materials of the medieval monastery. Proceeding towards

the canal this phenomenon tends to attenuate, to give way definitively to a powerful erosion of the sediment in situ, which has allowed the foundations to be highlighted in vertical piles and wooden rafts ".13

The seabed in its present state: "on a cursory reconnaissance, the seabed is currently inclined towards the canal, sandy or sandy-loamy in nature, studded in some places with building stones, sporadic bricks, human osteological remains and vertically fixed wooden poles".14

Fig. 7: the pious foundations of the monastery under the administration of the Abbey of Sant'Ilario.

Image taken from: A.A.V.V., Archeologia delle acque nella Laguna di Venezia, Edizioni all'Insegna del Giglio s.a.s., Florence, 1998, p. 188.

12, A.A.V 216. *Archeologia delle acque nella Laguna di Venezia*, Edizioni all'Insegna del Giglio s.a.s., Florence, 1998, pp. 183

3, A.A.V *Archeologia delle acque nella Laguna di Venezia*, Edizioni all'Insegna del Giglio s.a.s., Florence, 1998, p. 207.14 *Ibid*

I. The relationship between the lagoon and the coastal dune system: study of some specific cases

A very close relationship. The "barene" and the "velme" and the marshes constitute a very varied system of land and fresh and salt water, strongly characteristic of the innermost strip of the lagoon. Although river inflows near the river mouths were of considerable importance in the past for the morphology of the lagoons, today the situation has changed considerably. The system of the inner band of the lagoon also corresponds to an external protection system that has allowed the conservation of these "velme", "barene" and canal environments over the centuries. This outer belt is formed by the islands and dune systems that constitute the first natural barrier at the origin of the morphology of the lagoon. The problem of coastal erosion is linked to that of lagoon erosion and to the substantial transformation of a mixed environment of water and land into an increasingly humid and marine environment. In this sense, the dune and beach systems, which are highly subject to erosion, represent strategic bastions for the protection not only of the beaches, but also of the whole lagoon: man-land-water.

The phenomenon of erosion. The situation is currently worrying at the national level, with about 40% of the beaches in retreat (2006) and even the coastline of the Veneto has not been spared by significant erosion phenomena that have made recovery and compensation interventions indispensable.

As regards more specifically the Venetian lagoon: excluding the coasts entirely devoted to tourist and seaside activities and considering only those resorts with a high natural character, it can be seen, however, that in most of the sites there is a situation of equilibrium, in which the active phenomena of dune formation are not observable but there is no immediate risk of reduction of the habitat due to erosion. An exception is the mouth of the Tagliamento river where, for years, in the southernmost part, an erosion process has taken place which has led to the disappearance of the entire dune belt, so that the local pine forest is in direct contact with the sea with negative consequences on its vitality. Recently, a system of panels has been realized, which has led to an accumulation of sand particularly evident in the area closest to the mouth (2006).

The fragmentation of the coastline. The consequences of fragmentation are considerable and can threaten the very survival of habitats and species. The increase in margins, a direct consequence of fragmentation into small areas, favours invasion by exotic and/or ruderal species, alien to the original conditions, with a consequent

trivialisation of habitats. Conservation strategies, to be effective, must take into account the quality of the entire landscape, through the reconstruction of "tissues" and the opening of "openings",

in order to safeguard the continuity of natural and semi-natural territories, enabling the processes

normal ecological dynamics that are the basis of biodiversity.

The Venice lagoon is today, almost in its entirety, an anthropogenic ecological system: man has transformed the lagoon environment produced by the combined natural actions of the river and the sea, putting in crisis an increasingly fragile and precarious balance. Understanding the history of the Venice lagoon is the first indispensable method of investigation because only by fully understanding the human and natural transformations that have taken place over the centuries is it possible to put forward design hypotheses for the conservation and safeguarding of the coastline. A critical reading of past actions and changes on the coastline can provide a basis for experiential comparison for the promotion of sustainable development choices and for the stable maintenance of this weak human-water-coastal balance. As far as the Venetian lagoon is concerned, therefore, it is not possible to reduce the "Venice problem" to the sole issue of defense against "high waters", as often happens, it is too simplistic and leaves more urgent issues in the background.

From what has already been traced, it is clear that it is not possible to reduce the morphodynamic problems of the current coastal lagoon system, completely opposite to those that the Republic of Venice had to face when it was at the top of its economic and political hegemony, to causes that were born suddenly and present only in the present time. The truth is that the problems stem from a historical stratification of anthropic and natural interventions that have inexorably altered the lagoon balance between water and land over time. The challenge for times to come is not only to preserve what is lost from this ecosystem, but to revive it through the search for a new balance that preserves the particular and unique characteristics of this environment.

The Veneto coast between the mouths of the Tagliamento and Adige rivers: current characteristics and problems15. The coasts and coastline are characterized by a strong dynamism due to the action of modeling by the movement of waves and tides. In a non-humanized system, the advance or retreat of the coastline leads to new

forms of equilibrium formed in a natural way and which do not create any type of imbalance. In the case of the Veneto coast, between the mouth of the Tagliamento river and the Adige river, the presence of urban, tourist and industrial settlements has been strongly anthropized by the presence of a different phenomenon. The position of the coastline is more rigid in relation to a natural system, leading to conditions of imbalance with a consequent increase in the risk to human property, which tries to thwart the natural dynamics to defend itself. There are now few cases where intact dune and beach systems survive.

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15 : M. Ferla, F. Crosato, M. Ragazzo, *Litorali e Lagune del Nord Est*, Istituto Superiore per la Protezione e la Ricerca Ambientale, Mestre, 2013, pp. 85-131.

For several years, there has been constant erosion of the coastline with retreats of the coastline, sometimes of the order of a few hundred meters, caused by natural factors, but not only: the growth of the n.m.m. (average sea level), sea storms, natural and anthropic subsidence, drastic reduction of solid river transport (dams, excavations), uncontrolled urbanization of the coastline. The solutions to counter the phenomenon must be sought in actions to accommodate the processes in progress and it is in this perspective that interventions for beach nourishment and coastal protection must be considered. The first safeguard action concerns the implementation of a rational use of sandy materials that evaluates and integrates the availability of the deposits of the offshore platforms with those from the natural deposits still available under the coast, such as the mouth of the Tagliamento river or the mouth of Lignano in the Marano lagoon.
Grado.

The problem of storm tides and the defensive works of the past. Thanks to the elaboration of the Programma di Previsione e Protezione Civile della Provincia di Venezia[16], a series of research and protection activities have been promoted, which have made it possible to carry out the most recent analysis of the coastline and its classification in terms of vulnerability to storm risk. This analysis shows that the exposure to the risk of flooding by the sea of the Venetian coastal strip is largely due to the low altitude of the territory and the low dissipation capacity of the beaches, often compromised by massive urbanization. The vulnerability of the territory behind the coast is attested by the frequent sea storms, of which the disastrous storm of November 4, 1966 is emblematic, after which it was decided to build most of the existing defenses and to reinforce those already in existence. The tendency to erosion was contrasted with the carrying out of grazing or marshland works along certain stretches of the coast of Eraclea, Duna Verde and Jesolo.
Low degree of vulnerability. Here is the "Carta del Rischio idraulico e da mareggiate" on a scale of 1:100,000 (Fig. 8) as a summary of the analysis carried out. From this, it emerges that of the 69 km of coastline studied, only 78% are in a field of low vulnerability to marine storms due to the coastal protection works already historically present in the area, such as the walls along the coasts of the Lido, Pellestrina and Sottomarina, or as the one that is

found in front of the town of Caorle (Fig. 9).

It should also be considered that at the end of the last century there was a series of interventions by the Water Authority over large stretches of the coast in relation to the provisions of the Piano Generale degli Interventi per la Salvaguardia della Laguna di Venezia (General Intervention Plan for the Protection of the Venice Lagoon). The intervention technique consisted in nourishing the beach by draining about 7 million cubic metres of sand taken from a fossilised beach residue off the Venetian coast (Stura, 2004). Important works and interventions: the reconstruction of about 9 km of beach along the coast of Pellestrina with a closed-cell system offshore with a submerged berm (1.50 m); the protection of an 11 km stretch of the coast of Cavallino by means of projecting defenses consisting of 32 panels of stone blocks which is entrusted with the function of retaining the sand above the breakwater (fig. 11).

The work carried out in the case of Pellestrina counteracted the high level of vulnerability of the coast due to the strong erosive tendency caused by the poor morphological-environmental conditions such as the absence of a beach and the moderate/high slope of the seabed. In the case of Cavallino, the interventions have led to the extension of the beach and a reduction of significant flood risk.

16 F. Gastolan, A. Bezzi, S. Pillon, *Rischio da mareggiata*, dans "Atlante Geologico della Provincia di Venezia. Note illustrative", Provincia di Venezia, 2011, pp. 581-600.

Fig. 8 Maps of hydraulique and tempête risks. Image prise de : Table n.16 attached to "Geological Atlas of the Province of Venice" AA.VV. Province of Venice, 2011.

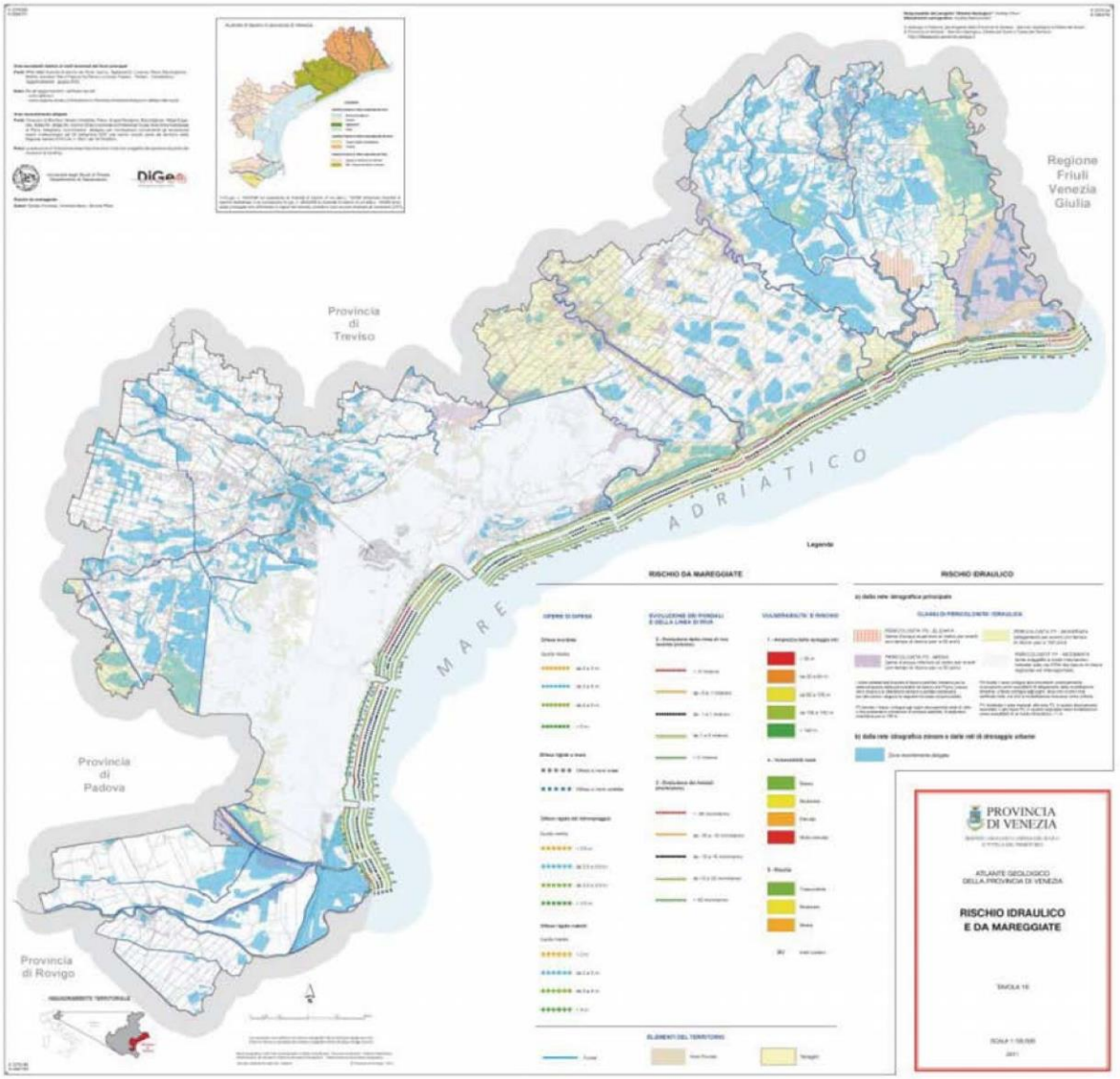


Fig. 9 : The murazzo of Caorle after the storm of November 1, 2012.

Image prise de : M. Ferla, F. Crosato, M. Ragazzo, Littorals and Lagoons of the Northeast, Institute for Environmental Protection and Research, Mestre, 2013, p.104. Source: L. Porciello.

Fig. 10 : A schematic section of the murazzi, a pasture defense structure built entirely of stone, unlike traditional wooden and stone structures. In the space of a few decades, the walls, after experimentation in the field, would have replaced the anti-pasture defense works used until then to protect the banks between Malamocco and Chioggia.

Image taken from : Department of IMAGE of the University of Padua.

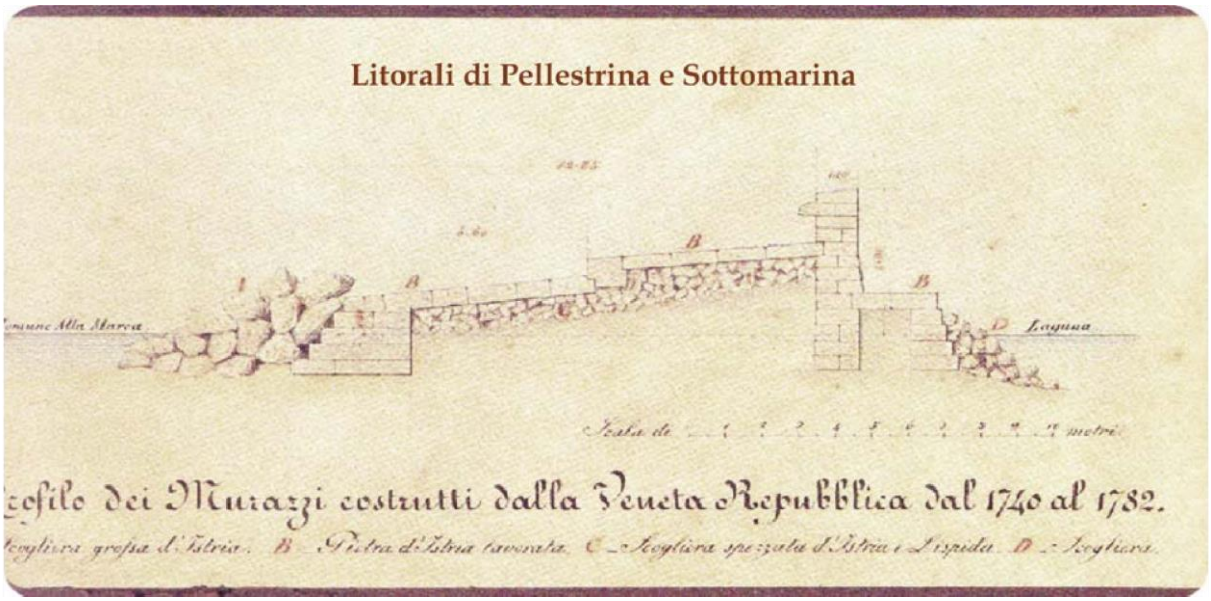


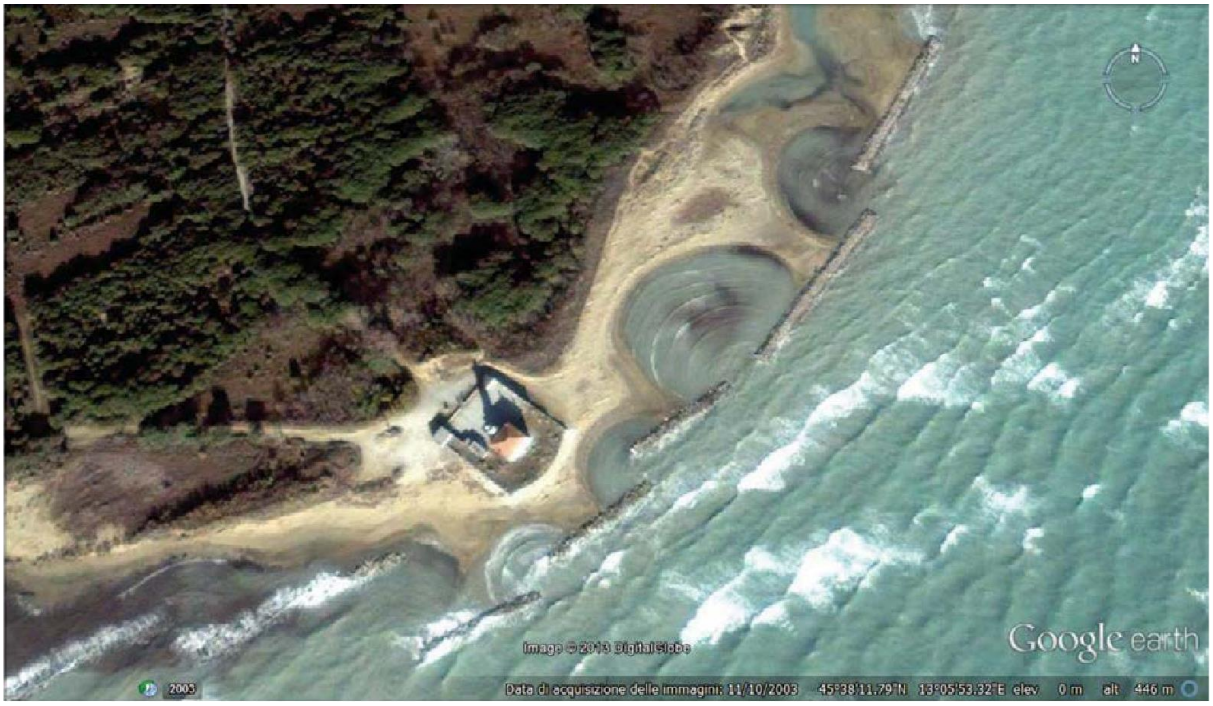
Fig. 11 : Examples of coastal reconstruction and protection carried out since the second half of the 90s of the 20th century.

Image from : ISPRA processing on Google Earth images.

In other regions, the tendency to erosion is countered by the presence of a high-altitude dune system. An example of this is the eastern part of the Bibione coast where there are also grazing works, consisting of cliffs parallel to the coastline, such as those protecting the lighthouse of Punta Tagliamento (Fig. 12). The stretches of the Bibione coast and part of the coast of Sottomarina, Lido and Caorle are characterized by residual dune systems, more or less anthropized, with quotas and efficiency characteristics capable of mitigating potential vulnerability. In many cases, there are also back beach defenses, not very high, which still compensate for the vulnerability of the coast. The degree of vulnerability is moderate.

Fig. 12 : the coast of Bibione (Ve). Punta Tagliamento lighthouse and rocks protecting the beach.

Image from : ISPRA processing on Google Earth images.



Approximately 18% of the coastline considered belongs to the moderate vulnerability class for a total extension of 16 km in which the morphological and evolutionary conditions, partially mitigated by possible defenses, establish conditions that are not yet critical. This category, defined as soft beach defence, includes a good part of the coastline of Isola Verde (Fig. 13), the coastline of Jesolo near the northern side of the mouth of the Piave (Fig. 14) and a short part near the mouth of the Brenta - Bacchiglione of the Sottomarina coastline.

Fig. 13 : The coast of Isola Verde is located between the mouths of the Adige and Brenta-Bacchiglione rivers. Effects of the

sea storm of November 11, 2012. Image taken from : G. Assalone.

Fig. 14 : The coast from Jesolo to the mouth of the Piave. Alternating between a stretch of low vulnerability (south side) and a stretch of moderate vulnerability (north side), with the effects of the sea storm of November 11, 2012.

Image taken from : G. Assalone.

In these cases, the gentle beach defence system is able to guarantee an effective contrast action against the effects of erosion from waves of normal intensity. The problem arises during exceptional events and storms of considerable intensity and significant duration, such as the storm of November 2012, which can increase the degree of vulnerability of these parts of the coastline.

Fig. 15 : coast of Valle Vecchia. Porto Baseleghe.

Image taken from : Google Earth, acquisition date July 2003.

Fig. 16 : coast of Bibione. Lama di Revellino.

Image taken from : Google Earth, acquisition date July 2003.

This category includes parts of the Jesolo coastline near Ca' Savio and the Bibione Pineda coastline, where the lack of residual dune management and excessive anthropization do not guarantee long-term safety. Within this category of moderate vulnerability there are also other erosion contexts for parts of the coast of Eraclea, Valle Vecchia (Fig. 15) and Bibione near Lama di Revellino (Fig. 16).
The remaining 4% of the coastline is in the high vulnerability category and covers an extension of about 3 km of coastline characterized by the absence of natural defenses or protective works. These contexts are moderately / strongly erosive and with a low dissipation capacity of the beaches. These highly eroding trends of the beach surface are mostly located near the mouths or mouths of rivers, areas where erosion dynamics are accentuated. Other cases are located on two stretches of the Jesolo coastline: the first one is about 1 km long, near the Ospedale a Mare and the second one, further east, near Jesolo Pineta. The first case is characterized by highly urbanized coastal areas, which leads to consider these areas as being at a medium level of risk. The lack of defense against the high waters of these areas makes the situation costly and critical, even during marine storms with a return time of only ten years. In the second case, the beach, even if it has been pushed back and widened, is only partially capable of compensating for the erosion phenomenon that involves it due to the acclivity of the seabed.
From a historical point of view, it is necessary to point out that the Jesolo coastline is exposed to significant risks of storms and marine erosion because it has been subjected in the past to an intensive expansion of construction which, in the 1950s, led to the occupation of the coastal area to the detriment of the dune barrier which was largely dismantled (Fig. 17). The storm of November 4, 1966 drew the attention of the public and the administration to the gravity of the situation, but the territory was already partly irreversibly compromised, to the point that others followed.
The most recent is that of November 2012. From an operational point of view, work began between 1998 and 2002, when the Water Authority, in agreement with the Veneto Region and the Municipality of Jesolo, carried out an important project to recharge the beaches on a stretch of about 10 km of coastline using 600. The work was completed by extending half of the pillars on the existing posts, building new pillars and a protective structure at the back of the beach, consisting of a wide flight of steps at an altitude of 2.50 m above sea level, and the reconstruction of about 2.5 km of dunes near the mouth of the river.

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17 Tiré de : V. Volpe, *Gli interventi del Magistrato alle Acque sui litorali veneti*, dans X Savi Sopra la X. Periodico trimestra- le di informazione del Magistrato delle Acque di Venezia, Anno 02, Numero 04, giugno 2008, pp. 4-25.

Fig. 17 : west end of the Jesolo coast. Example of urbanization with occupation of the coastal space for a maximum adhesion to the sea. Image taken from: G. Assalone

Fig. 18 the "barene" sand in the Venice lagoon. Image Taken from: G. La Penna.

THE CASE OF COSTA DA CAPARICA, IN PORTUGAL

INTRODUCTION

The dunes are a natural heritage and unique landscape. These hills of white and fine sands, which have the brilliance revealed by the sun and the shape shaped by the winds, represent a complex ecosystem that, through the interaction between nature and humans, shape this natural landscape in a unique way.

In addition to representing reservoirs of natural sediments that feed the beaches, the dunes are the environment for countless species of plants and animals of great importance for the environment. This set of elements generates a complex system where the interaction between wind, sand and vegetation makes the dunes gain distinct contours, which are defined through differentiations closely related to the direction of the dominant wind, to the conformation of the surface traversed by sediments from their availability, the action of winds on the beach and the location of these dunes within the coastal segment. (PINHEIRO, 2009).

Coastal dunes have very important environmental functions: they stabilize the coastline, protect the water table, and they also constitute a natural barrier against the surf of the sea.

> *They are considered important ecosystems because they have a unique biological diversity, composed of a flora rich in species and a fauna consisting of insects, reptiles, amphibians, small mammals and some species of sea birds that use the dunes to build their nests. (Moura 2009).*

Besides the importance already mentioned, the unique beauty of the dunes also make them a very strong tourist attraction. Coastal regions are very popular destinations, especially in the summer, for visitors motivated by the pursuit of leisure, scenic diversity and by contact with nature. Because it is a

1

fragile and dynamic system, dunes and beaches are susceptible to several changes in their morphological dynamics, which can be caused by both natural phenomena, such as fluctuations in the relative sea level and climate changes, as well as by human intervention, such as erosion due to the construction of fixed structures in the front dunes caused by the urbanization of the shore and occupation by the real estate sector, which obstruct the natural movement of replacement and transport of sand by wind and sea (PIANNA s.d.).

Making the preservation of the dune system and its biodiversity compatible with climate change, with the needs of urban areas and the use of the beaches on our coast is a challenge for the preservation of this natural heritage and many projects and participatory actions have been carried out with this aim, defining policies and strategies to solve these types of problems, as we will see below, in the case of Costa Caparica, in Portugal.

- **GENERAL CHARACTERISTICS**

Located in the small municipality of Almada, on the coast of Portugal, the parish Costa de Caparica occupies an area of 10.74 km2 between the sea and the escarpment. Stretched, narrow and with a diversity of physical and landscape characteristics, it is the largest continuous beach in the country, with an extension of approximately 30 km, between the left bank of the Tejo River and the Albufeira Lagoon (TRYP 2018).

Costa da Caparica is popularly known for its beaches and is easily accessible from Lisbon, which makes the region a vacation destination for many tourists, although the problem of land disorder and the steep decline of the coastline is a topic of daily discussion (OLIVEIRA 2015).

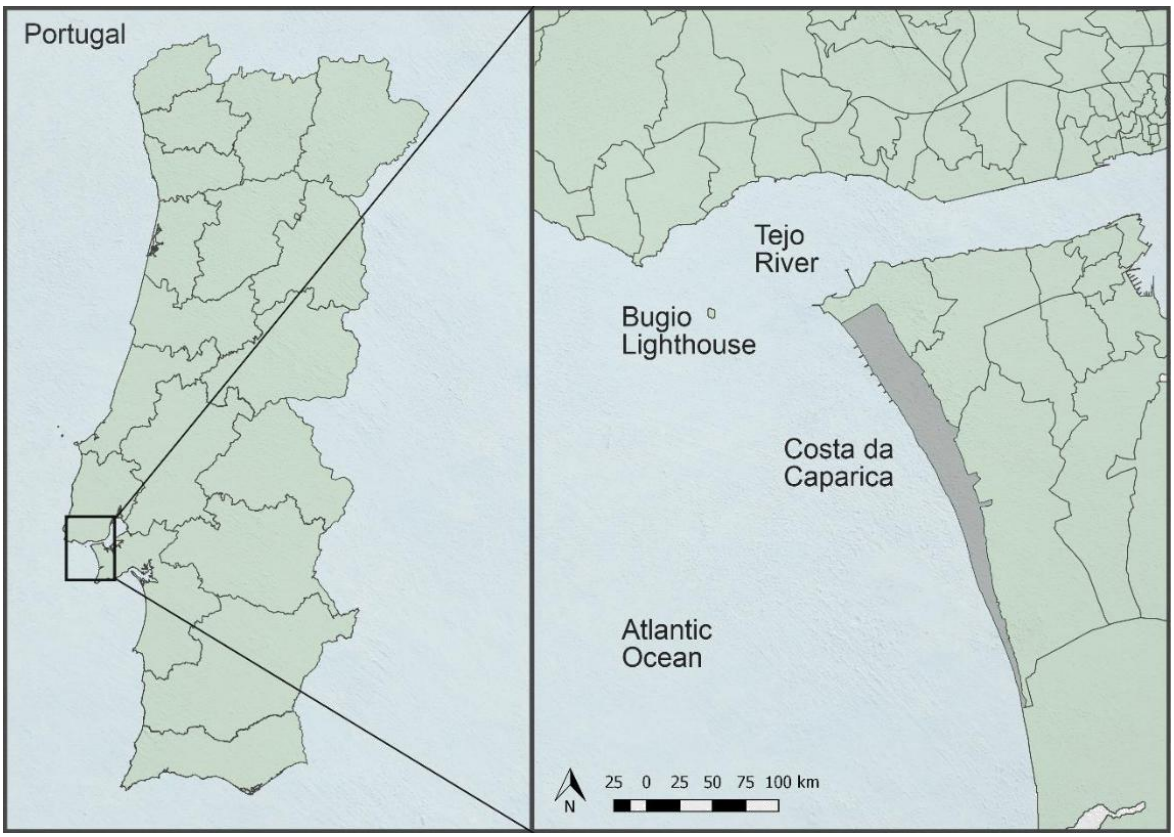

Figure 1 Location Map of Costa da Caparica (Author: Gabriela Procópio). 2020

Some of the beaches that constitute Costa da Caparica are: São João de Caparica: is the northernmost point of Costa de Caparica, just after the mouth of the Tagus which offers views of Lisbon and the mouth of the river; San João de Caparica Sur: is the continuation of the beach mentioned above, much frequented by those who stay in the campsites of the region; the beach of Vila da Costa: Near the urban center, with many bars and restaurants nearby, it is a small beach, very frequented for surfing; Beaches of the South Coast and Acacias North: they are more familiar beaches, with many children and with possibilities to practice sports like beach volley. Acacias and Acacias Sur Beaches: they are beaches that attract a younger public, with an environment where there are many bars and night parties. Playa dos Medos and Playa dos Medos Sur: which have a party and fun atmosphere of the beach nearby the north, but also brings together those who come to practice kitesurfing in Costa de Caparica ; Praia da Fonte da Telha: this is the end of the beach line known as Costa de Caparica and the gate of the Arrábida Mountain. Very familiar and accessible by public transportation and by car, with very blue waters and a large strip of sand (VOYALISBOA 2019).

Figure 2 : Costa de Caparica and its beaches. S.D. Source: https://lisbonlisboaportugal.com/images/costa-da-caparica/costa-da-caparica-summer-2.jpg. Acessed in 12/2019

This parish has historically, a strong connection to the sea, because it is a land built by fishermen, inculcated by a strong culture and tradition of fishing roots that give it its unique identity. But alongside the sea, its agricultural land is also fertile and also plays a major role in the Metropolitan Area of Lisbon. (CAPARICA 2020).

According to Fernandes (2012) and Oliveira (2015), it was around 1770 that the first fishermen from Ílhavo settled on a strip of sand that stretched between the ocean and an ancient cliff that reaches 70 to 100 meters at its highest points. Some began by settling on the site, always in humble thatched and wood huts, later joining Algarvian fishermen and another part came only for fishing during the summer. This first population that settled on the coast saw in fishing their survival, but to fill the winters with storms and little fish, agriculture also emerged as a complete activity.

Figure 3: The Trafaria and the Caparica Coast area. From El Atlas del Rey Planeta (detail), Pedro Teixeira, 1634. Source : https://almada-virtual-museum.blogspot.com/

Figure 4: Housing centers in Costa de Caparica, Military Charter of 1816. Source: http://fronteirasurbanas.ie.ul.pt/

Above, in figure 1, one can clearly see the growth of the sand in the area of Trafaria and Costa da Caparica. Also, in a military map of the Setúbal Peninsula dated 1816 (figure 2) two separate housing groups can already be seen, one to the north (Medo Inglez), with four masonry constructions and as many tents and another to the south (Cabanas da Costa), with only half a dozen boats.

According to Oliveira (2015), it was from a big fire in 1886 that fishermen stopped living in tents and began to live in new masonry constructions. From then on, new blocks began to appear and spread from the current Costa Pinto neighborhood to the fishermen's street. But soon, Costa de Caparica ceased to be just a village of humble fishermen. In the 20th century, Costa de Caparica was already classified as a tourist resort, attracting tourists who sought the sun and the sea.

Nowadays Costa de Caparica is still the vacation destination of many tourists for its beaches and sun, especially after 1966 with the construction of the 25 de Abril Bridge. Also, from the 60's on, the urban pressure accelerated, with the second habitation constructions shooting exponentially. In 1986 Costa de Caparica is elevated to Vila and in 2004 to Cidade. The growth of the region brought several problems related to the disorderly growth of the territory and the sharp retreat of the coastline, themes that today are widely discussed.

Figure 5 and 6: On the left, Caparica's Coast around 1962 and on the right, in the 80's. Source : Oliveira, 2015.

Figure 7, 8 and 9 : On the top left : Postcard from the « Sunset beach » in Costa da Caparica during the summer season (Photo by Dinis, n.d. apud Silva, 2012). On the top right: « Sunset beach », in Costa da Caparica n.d.(Source:https://retratosdeportugal.blogspot.com/2015/08/costa-da-caparica-praia-do-sol.html) and below, the same « sunset beach » recently, s.d (Source : https://www.tripadvisor.es/).

THE EVOLUTION OF THE COAST

The components that define a landscape are deeply dynamic and are in constant transformation, due to natural or anthropic causes. In the case of Costa da Caparica, there have been several changes in its coastline as well as interactions of tectonic movements and sea level oscillations (OLIVEIRA 2015). In the study area, the main changes in the coastline include the mouth of the Tagus River, namely the golada do Tejo or restinga do Bugio, i.e. a sandbank that connects the and Cova do Vapor. This goal has not always been closed, as can be seen in figure 5, and its closing/opening is responsible for important changes in the sand of Costa de Caparica and Cova do Vapor.

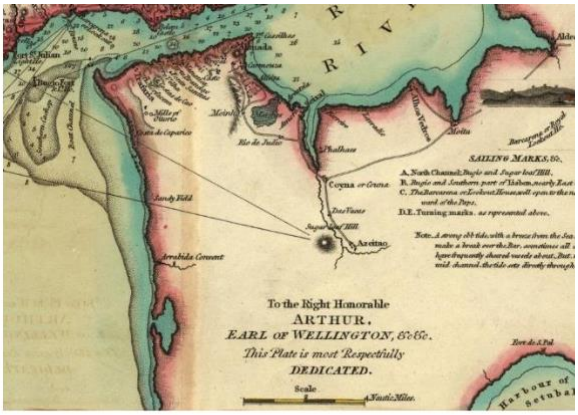

Figure 10 : Bugio Lighthouse and Cova do Vapor. Robert deVaugondy, Gies, 1751. Source: Oliveira (2015)

Figure 11 : Boat Channel (a golada), The environs and harbour of Lisbon, Laurie & James Whittle, 1812. Source: Lisbon Nacional Library

According to Oliveira (2015), in 1845 we see the beginning of a retreat of about 750 m from the free end of the Cova do Vapor sandbank towards the Bugio lighthouse. Between 1879 and 1893 this retreat is accentuated and the sandbank tip advances 400m towards the lighthouse. In the second half of the 19th century, the restinga do Bugio or golada do Tejo suffered an accentuated retreat, causing it to open. From the century on, the sandbank advances towards the Bugio Lighthouse, promoting its closure. Although there was a slight retreat of the coastline in 1929, it remained stable.

According to Rocha (2011), between 1929 and 1957 the sand tongue retreated about 3 km (figure 7), and during the 40s the Tagus goal broke. The free end of the sandbank (golada do Tejo) advances 750 m towards the fortress of Bugio and back about 200 m on the riverbank west of Trafaria. From the opening of this natural barrier the retreat of the coastline was evident and forced the execution of coastal defense works (spurs and walls). From 1940 onwards a process of erosion began and a sharp reduction of the sandbank that connected Cova do Vapor to Bugio, being possible to pass only at low tide. This reduction is a consequence of dredging carried out in this area and where the fate of the dredged materials remains unknown (OLIVEIRA 2015).

Figure 12: The evolution of the Costa line between 1870 and 1972, based on a satellite image from Google Earth 2015. Adapted from (Gomes, Costa da caparica Artificial Sand Nourishment and Costal Dynamics 2009, 679).

According to PINTO et al. (2012) and Oliveira (2015), from 1959 onwards, Costa de Caparica's evolution is based on the following events:

- 1959 to 1963: There was a 150m retreat of the beach line. Construction of 3 spurs and adherent work at Cova do Vapor;

- 1964 to 1972: In 1964 the Fossil cliff was artificially cut to cross the road that connected Costa de Caparica to downtown Almada, currently IC20 (COSTA, 2007 apud Oliveira, 2015). There was also the construction of the adherent work (1969) and 7 spurs (1971) in Costa da Caparica. In 1971 the first reference is made to artificial beach feeding at Costa de Caparica (PINTO et al., 2007 apud Oliveira, 2015).

- 1995 to 2007: Until 1995 the situation was stabilized, although with progressive loss of width and volume of the beach. From 1996, the erosion intensifies in SJC (> 30m) (reduction of beach width; retreat of the dune cord;

destruction of beach supports, galgamento/inundation episodes). Between 1999 and 2002 the coastline retreated on average about 14.6 m (PINTO et al., 2007 apud Oliveira, 2015).

- 2007 to 2009: beginning of the Costa Polis program works, namely the artificial feeding of beaches with 2.5 Mm3 of sand dredged from the Port of Lisbon navigation channel;

Figure 13: Intervention performed for the repair of spurs and adherent longitudinal work (2004 to 2006)

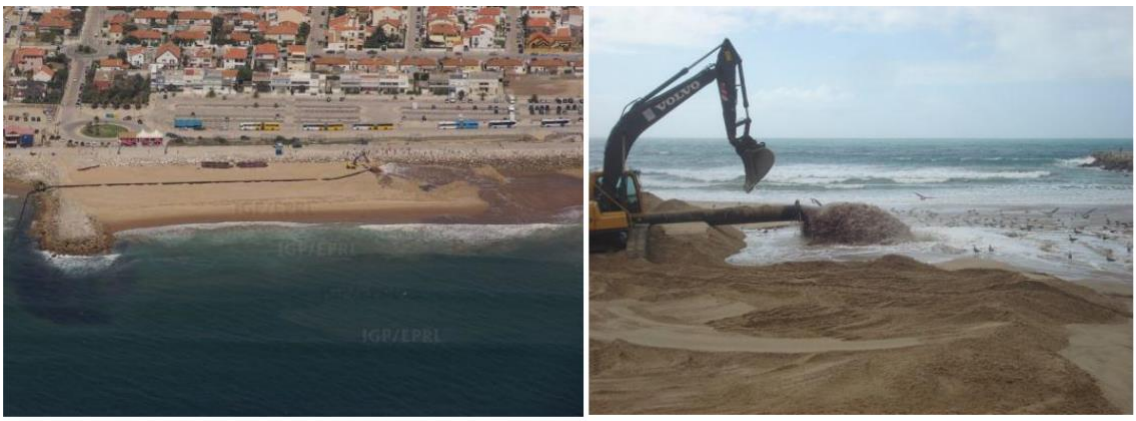

Figure 14: Artificial nourishment in 2007 (0.5 Mm3), 2008 (1 Mm3), 2009 (1 Mm3). Source: PINTO, 2012

- 2013 to 2014: numerous reports of intense erosion due to violent sea gullies, partial destruction of beach supports on the urban front of Costa de Caparica; artificial feeding of beaches with 1 Mm3 of sand dredged in the navigation channel of the Port of Lisbon (beginning in July 2014).

Figure 15: Views of the Costa da Caparica beach deprived of sand in 2006 (A; courtesy of Alveirinho Dias) and the beach and its marginal strip after the last major intervention in 2014 (B). This arrangement has remained substantially constant since 2010, with only some interventions in the support structures and the replacement of small amounts of sand that are lost annually (a few hundred thousand cubic metres per year from approximately 2 km of beach).

Complementing the authors' information, the following images show, from the same point of view, the various changes that have occurred in the Costa da Caparica region over the past centuries. These images are produced by integrating Quantum GIS technology (which allows the integration of recent orbital images, available in the Google Earth system) to historical or old maps of the region. For the realization of these images (figure

16) Laurie & James Whittle's letter (1812), provided by the Lisbon National Library; Gúerin Delamotte's (1821) chorographic chart of the outskirts of Lisbon, provided by the Harvard Library's map collection; José A's chorographic chart of Portugal, containing the administrative division by municipalities. F. de Madureira Beça (1901), made available by the Lisbon National Library; and images from Landsat 2,5,7 and 8 satellites obtained through the USGS Earth Explorer Portal database from 1977, 1989, 2000, 2007, 2011, 2012 and 2020.

Through these images it is possible to see, for example, the growth of urban areas, the marine dynamics caused by the proximity of the Tagus River and the Atlantic Ocean and the sharp retreat of the coastline of the region.

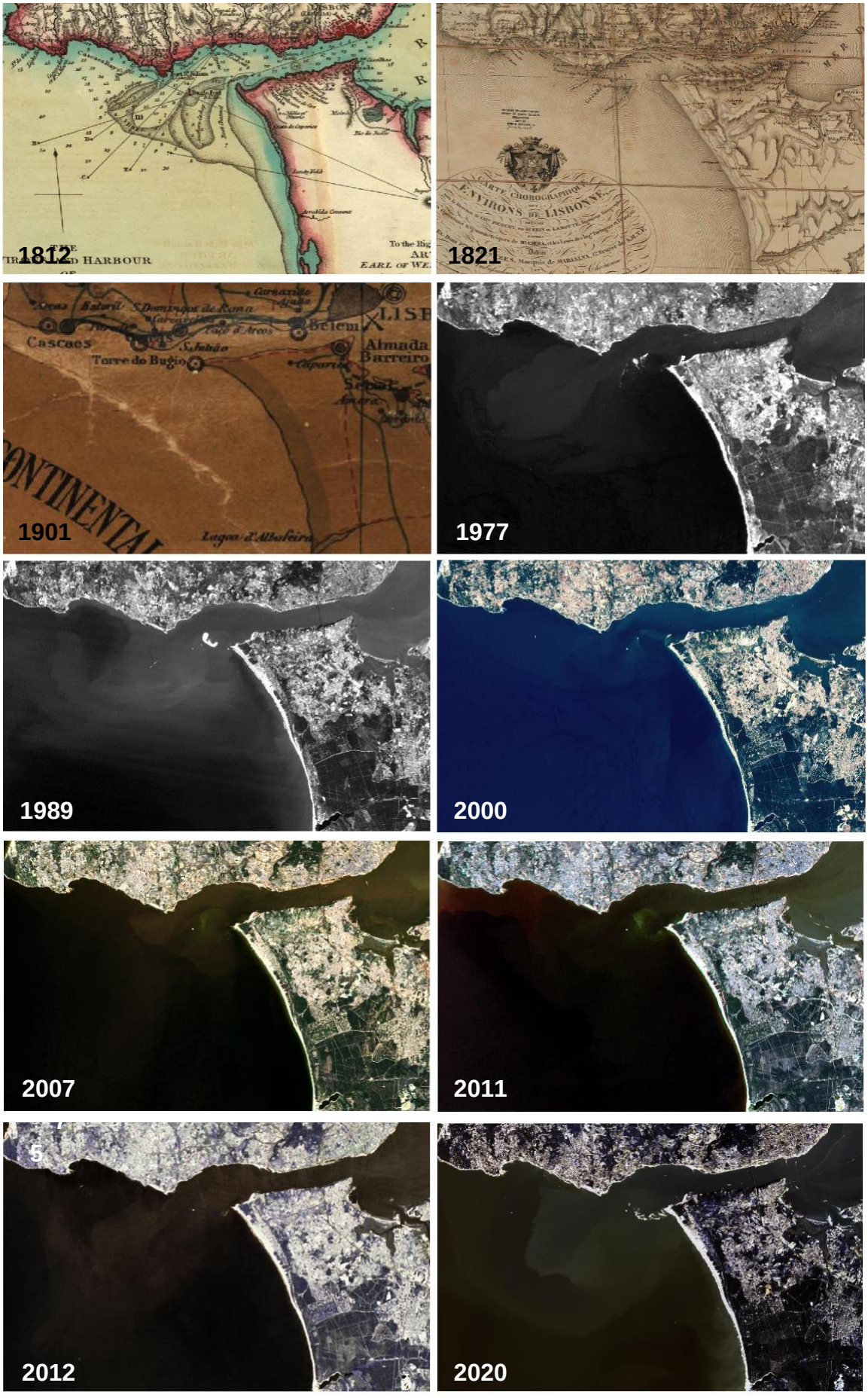

Figure 16: Maps from Costa da Caparica. from 1812 to 2020. Sources mentioned in the text.

PROBLEMS AND POSSIBLE CAUSES

Dunes, even stabilized, are very fragile systems that, due to several factors, are subject to actions that can unbalance their entire structure. According to Oliveira (2015), the main problems reported in Costa da Caparica are mainly related to the reuco of the coastline, the deodernization of the territory and the process of erosion. But all these factors are not isolated facts, they can be a consequence of each other, where each problem dislocates or aggravates the other.

With regard to the erosion process, there are three incompatible phenomena on the coast that, together or separately, have contributed to this problem in Costa de Caparica: human occupation, the strong reduction of sedimentary supply[1] and the eustatic rise in sea level (OLIVEIRA 2015).

In relation to the retreat of the coastline, the Tagus goal, for example, plays a fundamental role in retaining the sands that impede the advance of the sea. Although the situation of the goal has not been stable over the centuries - as confirmed by the cartography already presented, which in several periods of history the goal was open and in others it was closed, with variation of the coastline - it is known today that the rupture of this is also largely due to human action (ROCHA 2011).

After the erosion and retreat of the coastline, the disordering of the territory is the most serious problem that hits the study area and that has been dragging on for decades. In Costa da Caparica, the disordering of the territory

is characterized by a strong urban pressure that since the 1930's, with a strongly consolidated urban agglomeration and very close to the sea.

1 In Portugal, the structures that most affect the sediment supply of the coast are the construction of dams, which consequently reduce the influx of sediments to the coast (OLIVEIRA 2015).

BACKUP PLANS AND PROJECTS

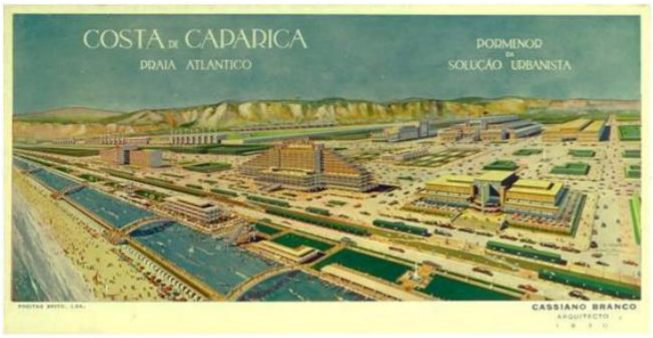

Figure 17 and 18on the left, the Costa da Caparica Urbanization Plan, 1930, by the architect Cassiano Branco. Where there's the beach complex with ample spaces for activities, as well as an artificial canal that extends parallel to the sea and separates the beach from the tourist complex. And on the right, the Faria Costa project, which proposed displacement of the population, works for satellite agglomerations, urbanization of the area adjacent to the beach and afforestation in neighborhoods and boulevards. Source: Oliveira, 2015.

The complexity of coastal areas makes them highly sensitive and vulnerable systems and, in order to mitigate the damage and guide their use and/or handling, several protection and replacement measures have been taken over the years for the beaches of Costa de Caparica. In the 20th century, two projects for the city stand out: the utopian plan of Cassino Branco, of 1930, where the architect proposed a transformation of Praia do Sol into an exuberant bathing complex (figure x) and the Urbanization Plan of architect Faria da Costa, of 1946, which was only partially executed and served as the basis for the consolidated urban nucleus of Costa de Caparica (OLIVEIRA 2015).

With the erosion and retreat of the coastline more and more constant, several coastal engineering works were carried out over the years to remedy the situation. According to Oliveira (2015), in 1959 the E1 spur was built and in 1962 and 1963 the E2 and E3 spurs were created, which would be later extended, in addition, there was the construction of the first longitudinal adherent defense (wall) between these spurs. Finally, in 1969, the spores EC1 to EC7 were created (figurex).

Figure 19: Spurs built in Costa da Caparica and Cova do Vapor. Image: Google Earth, 2015.

Among the most recent projects for the protection of the beaches of the Costa da Caparica, they stand out :

The Coastal Zone Plan (POOC), a plan with the capacity to hierarchically overlap the Municipal Plans, which establishes a programmatic basis for an intervention to rehabilitate the beaches along the Costa da Caparica and was created in order to control construction and urban growth, attract private entities in the tourist and hotel business to the area, preserve protected areas and encourage agricultural practice (MENDES 2013).

The Polis Program, a program that, through a strategic plan of actions, aimed to promote interventions in the urban and environmental aspects, for urban requalification and environmental enhancement of this parish in the municipality of Almada. (ALMADA 2009). In this program, the first works began in 2006, with the construction of the Urban Garden, inaugurated on June 1, 2008, and the program was extended until 2013. But the Costa Polis ended without the interventions initially proposed having been completed in full (OLIVEIRA 2015).

> *The Polis Program for Costa de Caparica started with very good intentions and was very well accepted by the population that was eager to see their city free of that disorder, but over the years the little that was done has revealed itself in a real failure, either by the absence of study of the intervention area and its natural and historical-social characteristics, or by the inadequacy of materials and sidewalks used, by the uncharacterization of the coastal front with the demolition of some haystacks and the construction of new beach supports (OLIVEIRA 2015).*

Also, to be discounted is the Project of Intervention of the Portuguese Environment Agency (APA), which began in August 2019, and which consisted of artificially feeding the urban beaches of Costa de Caparica and S. João de Caparica with 1 million cubic meters. The total investment, made in partnership with APL, is about 5.8 million euros and was financed by community funds from POSEUR - Programa Operacional Sustentabilidade e Eficiência no Uso de Recursos (APA s.d.).

Created by APA, the Reduna Project - Ecological Recovery and Restoration of the S. João da Caparica Dunar System - aimed at carrying out a set of integrated coastal protection actions, promoting ecological restoration and structuring the dune cordon at the S. João da Caparica beachfront. Actions were taken such as the installation of access conditioning and trampling control structures, the placement of informative signs and palisades, and the settlement of dunes with plants adapted to these ecosystems. Wicker palisades were installed over a length of 1 km, which have the function of retaining the sands carried by the wind. At the same time, dune species adapted to these ecosystems were planted, such as the reverse, the reel thistle, the harpsichord and the shrimp, essential to fix the sands and stimulate local biodiversity. In parallel, new accesses were defined and installed, with their own structures for this purpose, in order to limit trampling and circulation through the dunes. The whole process of ecological restoration of the dune is regularly monitored, in partnership with Research Centers and Universities (REDUNA s.d.).

Figure 20: Images of the interventions carried out by the project on the beach of São João da Caparica. S.d. Source: Almada City Council - Reduna Project. Available at: http://www.m-almada.pt.

In addition, there were also academic research projects, such as the Change Project, developed at the Institute of Social Sciences of the University of Lisbon, in collaboration with a research team from the Faculty of Sciences of the same university. Which ran until 2013 and was funded by the Foundation for Science and Technology. Within the work developed (CHANGE s.d.).

Figure 21: Site visit - Photo taken by author, 2019.

Figure 22: Site visit of the group - Photo taken by author, 2019.

Conclusions

Over the last twenty years, the Veneto Region has carried out several interventions for the conservation of its coasts, which have given rise to projects involving different actors in both institutional and technical disciplines. The project, born in 2004 at the initiative of Veneto Agriculture with the partnership of the region's forestry services (Padua and Treviso), took the name LIFE Natura ("Concerted actions to safeguard the Veneto coast "). The aim of the project was to promote a new management approach, aimed at the conservation of the great heritage of biodiversity that further enriches the coastal wind. These integrated actions led to the creation of a network platform on coastal dune management, linked to similar Italian and European experiences. The system set up has laid the foundations for more active collaboration and knowledge exchange between those working in these environments.

The main characteristic of the Veneto coasts is the presence of wide sandy beaches, many of which have been intensively used for tourism, leading to the destruction of many coastal ecosystems. Currently, a limited number of sites remain in the territory where it is still possible to observe dune habitats and their particularities. It is estimated that there are about 1500 hectares of habitats that can be related to coastal dune types, for a linear development of 40 kilometers (which also includes the dunes of the Po Delta).

The characteristics of the climate, the presence of numerous river mouths, the geographical situation have given the coastal system of the upper Adriatic unique characteristics that lead to the coexistence, in the same environments, of alpine, Mediterranean and eastern species, as well as many specific endemisms. The state of conservation of the sites is at a high level of naturalness, but there are some critical problems related to fragmentation which has led to a consequent increase in margins and the penetration of exotic species, anthropic disturbance leading to local phenomena of erosion and direct damage to habitats and coastal erosion which can lead to the physical and irreversible disappearance of dunes.

Most of the sites are actively managed in different forms and methods involving the Veneto region (Servizio Forestale Regionale per le Province di Treviso e Venezia, Servizio Forestale Regionale di Padova e Rovigo), by the Azienda Regionale Veneto Agricoltura and environmental associations (WWF and LIPU).

The main important sites from the naturalistic point of view of the Veneto coast are the following:

- La foce del Tagliamento.
- Vallevecchia.
- Litorale della Laguna del Mort.
- Penisola del Cavallino: Ca' Ballarin, Ca' Savio, Punta Sabbioni.
- Lidi di Venezia: Dune degli Alberoni, Ca' Roman di Pellestrina.
- Dune residue del Bacucco.
- Litorale di Caleri.
- Bosco Nordio.
- Bosco di S. Anna di Chioggia Ca' Nordio.
- Delta del Po: Porto Fossone, Giardino Botanico di Porto Caleri.
- Dune di Rosolina e Volto: Fenilone.
- Dune Fossili di Donada e Contarina: Pineta dei Fornaci.
- Dune fossili di Ariano Polesine.
- Rotta di S. Martino.

General Comment concerning the <Projet Tutoré.>

In conclusion of this brief work, it should be stressed out that the work didn't went out so smoothly. Several issues was fostered through the work as a group and the lack of coordination concerning the <Projet Tutoré.> was a main issue. However, this project shed light on an important subject that is rarely tackled and treated. Acknowledgements to my group mates who were willing to work but the lack of coordination was an obstacle in realizing a collective work.

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