

An aerial photograph of a wetland landscape. A river flows from the left towards the center, where it branches out into a complex network of channels and smaller water bodies. The surrounding land is covered in dense, dark green vegetation, likely reeds or marsh grasses. The water bodies have a light, milky green color, suggesting sediment or algae. The overall scene depicts a natural, undisturbed ecosystem.

A dialog between people and landscape:

the Alikí Wetland Ecosystem as a starting point to
explore Naxos Island, Greece

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Landscape Architecture MSc
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Aknowlegment

I would like to express my heartfelt gratitude to everyone who has contributed to the completion of my studies and made my journey at TU Delft truly remarkable.

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Thank you all!



Figure 1: Naxos Town aerial view

Abstract

This thesis investigates the environmental challenges facing Naxos Island and the Cyclades, with a focus on the ongoing degradation of Aliko Lagoon. Aliko Lagoon, the largest natural coastal wetland in the Cyclades and a vital habitat for avifauna in the South Aegean Region, faces imminent extinction due to shifts in land use and spatial management. Historical attempts to drain the lagoon, airport construction, and unregulated logging have contributed to its deterioration, highlighting the urgent need for sustainable practices and local engagement. This pressing issue served as the starting point for research conducted in the Circular Water Stories (CWS) lab under the guidance of Inge Bobbink, Head of the Landscape Department at TU Delft. The study examines the role of water in landscapes and its connection to human narratives, aiming to restore the wetland landscape of Naxos Island through alternative approaches to tourism. The resulting design interventions prioritize connectivity, sustainable development, and immersive spatial experiences, underscoring the lagoon's ecological and cultural significance in the modern era.



Figure 2: Aerial view of the Aliko lagoon, airport and on the background, Naxos Town

Design Assignment

The design assignment aims to enhance Naxos Island's existing wetland ecosystem while addressing the threats of uncontrolled tourism and fostering a profound connection between individuals and the landscape. The goal is to establish a network connecting the island's wetlands, offering visitors a novel way to engage with Naxos's natural beauty and cultural tapestry. Beginning with Aliko as a prototype, strategies for wetland conservation and sustainable tourism development will be developed and refined, with a focus on integration into the surrounding environment and showcasing wetlands as green corridors that enhance biodiversity and provide recreational opportunities. This approach extends to integrating wetlands into broader ecological and cultural networks to create immersive experiences highlighting Naxos's unique natural and cultural heritage. Ultimately, the assignment promotes a sustainable tourism model that spreads tourist activity throughout the year, prioritizes conservation and community engagement, and ensures Naxos remains a vibrant and resilient destination for generations to come.



Figure 3: Laguna Coast

Regional scale

On a regional scale, my goal is to highlight the importance of connectivity among the wetland natural paradises, promoting a networked system that enhances interaction between humans and nature. Seasonality will play a vital role in designing these connections, incorporating various types of mobility such as walking paths, cycling paths, and boats. Along these connections, visitors can experience different conditions of the coastal landscape, enjoy panoramic views, explore cultural and natural sites, and even stay overnight in designated camping areas. While the focus is on the Alikiki wetland as the starting point of the narrative, the overall experience centers around the interconnected hydro-paradises.

Local scale

For the local scale, I am looking into the largest wetland of the island and the Cyclades known as Alikiki, covering an area of 170 hectares. Chosen for its historical and contemporary importance, Alikiki plays a vital role in supporting diverse flora and fauna.

My vision for this area is to establish a new center for people approaching Naxos Island. The airplane, a different but still a 'bird' of the area, rises above the lake, attracting tourists. The view from above will be the first challenge to achieve, capturing people's interest to explore more of the site. The airport, an existing 'threat' to the site in terms of environmental impact, will be the key point of the story and the starting point of the experience.

So, by incorporating both human-made and natural elements, my goal is to integrate an alternative tourist model focused on the relationship between humans and nature. I aim to highlight the island's natural beauty, which attracts people for firsthand experiences. Creating paths, bird observatories - crucial for the wetland area -, camping areas for overnight stays, integrating sports in the surrounding areas, and educating people through experiential and educational methods are essential parts of my design.

This not only strengthens the bond between humans and nature but also involves the creation of eco-friendly infrastructures, ensuring safe mobility within the area while preserving the environment.

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Figure 4: Cyclades view from the peak of Zas Mountain

Part I

The Cyclades complex | Introduction

The Cyclades archipelago, a prominent group within the Greek island complex, is situated in the southern Aegean Sea. Comprising 30 principal islands and numerous smaller islets, the Cyclades boast a rich diversity in geography, geology, architecture, and history. Among these islands, Naxos and Andros stand out as the largest.

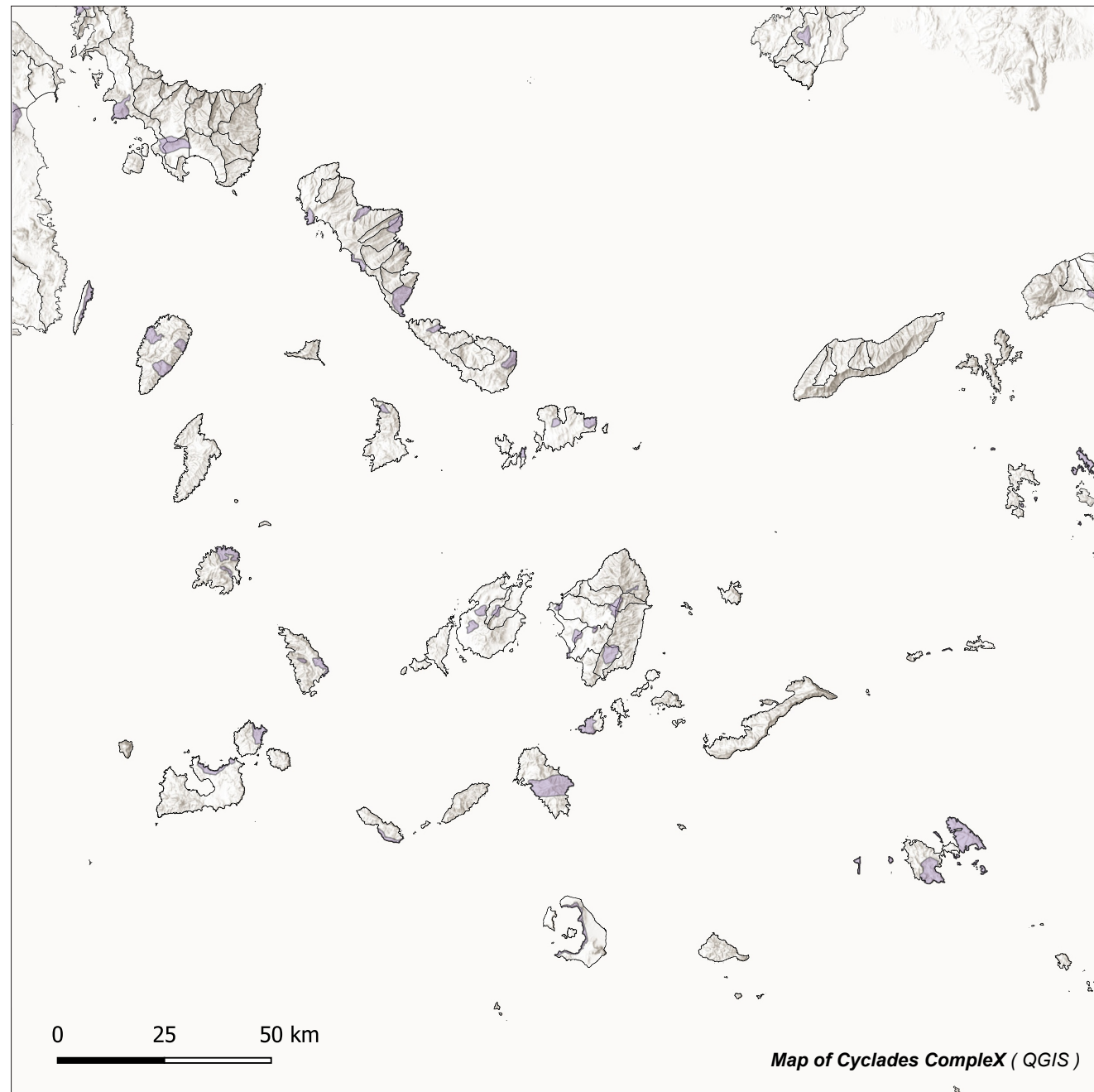
The Cycladic Civilization, which dates back to as early as 4000 BC, left behind a legacy of remarkable cultural achievements. This heritage is evident in the intricate white marble statuettes, utilitarian artifacts, and architectural remnants such as theatres, churches, and castles that can still be found across the islands.

Each island in the Cyclades has its own unique character, attracting a dedicated following of enthusiasts. The landscape is predominantly rugged and arid, with scant vegetation, except for the more lush environments of Naxos and Andros. Despite the apparent lack of greenery, the mountainous terrains of the Cyclades are rich in precious freshwater resources, serving as hidden reservoirs.

Geologically, the Cyclades are characterized by their varied and dramatic terrain, shaped by tectonic activity and erosion over millennia. This geomorphology has given rise to distinctive landscapes, including striking cliffs, serene beaches, and fertile valleys. The name “Cyclades” (Κυκλάδες νήσοι, *Kykládes nísoi*), meaning “encircling islands,” refers to the archipelago’s formation around the sacred island of Delos.

Today, the Cyclades maintain their unique identity while adapting to contemporary challenges and opportunities. The islands continue to thrive, balancing tourism with the preservation of their natural and cultural heritage. The rugged beauty and historical significance of the Cyclades make them a captivating destination, embodying a harmonious blend of ancient traditions and modern life.²

¹ Roussos, K. (2017), *Reconstructing the settled landscape of the Cyclades*, Leiden University Press
²Wikipedia(2024), *Cyclades*



The Cyclades Complex, South Aegean Sea

Despite its small total surface area of 131,940 km², Greece possesses a diverse natural environment, particularly highlighted by its numerous islands and islets, most notably in the Aegean Archipelago. Among these, the Cyclades stand out as a captivating maritime region. Historically, from the 15th to the early 19th centuries, the Cyclades experienced flourishing population and economy. However, until the mid-20th century, they maintained a traditional economic structure focused on rural, pastoral, and fishing activities. Subsequently, from the latter half of the 20th century to the early 21st century, the Cycladic islands underwent significant prosperity, emerging as popular international destinations for summer vacations. The advent of mass tourism during this period brought about notable changes to the Cycladic communities, impacting their economy, environment, and socio-cultural dynamics. This transformation, marked by shifts in economic structures and intensive development, altered not only landscape patterns but also the mentality of the islanders, showcasing the complex interaction between island communities and the external world.³

Geography and Geomorphology

The Cyclades, situated in the south-central Aegean, consist of over a hundred islands, 25 of which are inhabited. With a total surface area of 2,572 km², the largest islands include Naxos, Andros, Paros, and Tenos. Geomorphologically, the Cyclades are the peaks of submerged mountains, forming a rugged landscape with sparse vegetation and limited arable land. Each island exhibits unique topographical features, ranging from plains and coastal areas to mountains and plateaus. Naxos is the greenest and most mountainous, while Thera boasts impressive volcanic landscapes. The geological substrate varies across the islands, with some rich in metamorphic rocks like granite and schist, while others, like Melos and Thera, are volcanic. Mineral deposits such as copper, emery, and marble are found throughout the islands. The Cyclades have a typical Mediterranean climate with hot, dry summers and milder winters, although rainfall and freshwater sources vary by island. The region is subject to strong winds, especially in summer, and archaeological evidence suggests sea-level changes over time.⁴

³ Roussos, K. *Reconstructing the settled landscape of the Cyclades*, Leiden University Press, 2017

⁴ Gaki-Papanastassiou, K., Vassilopoulos, A., Evelpidou, N., & Maroukian, H., *Quaternary morphological evolution of the Cyclades Islands (Greece)*. University of Athens, n.d.

Palaeogeographical evolution of Cyclades Complex

Changes in sea level, climate change and anthropogenic interference are recorded in the sediments of coastal marshes and wetlands. Coastal marshes and lagoons are particularly sensitive to local environmental changes, consisting a powerful tool for studying the palaeogeographical evolution of the coastal zone over the last thousands of years.⁵

“18.000 years ago, sea level was 120 m lower than today”

18.000 years ago, when the sea-level was 120 m lower than today, the eastern Cyclades were united into a large island, while between Naxos and Mykonos, there was a lake.

“14.500 years ago, sea level was 82 m lower than today”

14.500 years ago, when the sea level was 82 m lower than today, Naxos, Paros, Antiparos, Koufonissia and Iraklia were united into a single island.

“13.000 years ago, sea level was 60 m lower than today”

13.000 years ago, when the sea level was 60 m lower than today, the islands Naxos, Paros, Antiparos, Koufonissia and Iraklia remain united, covering less land.

12.500 years ago, sea level was 43 m lower than today

12.500 years ago, when the sea level was 43 m lower than today, Naxos, Paros and Antiparos were united.

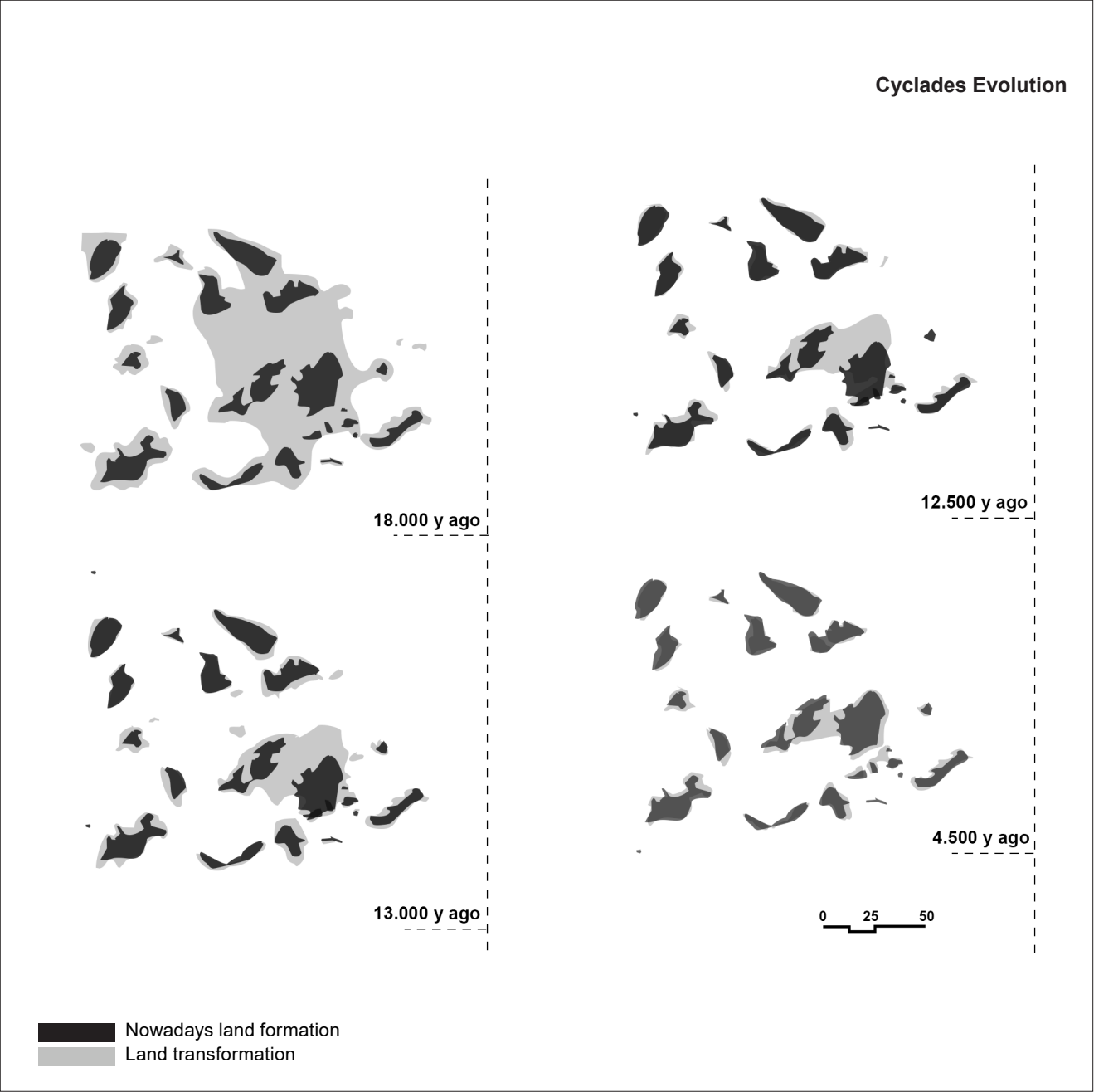
Present sea level

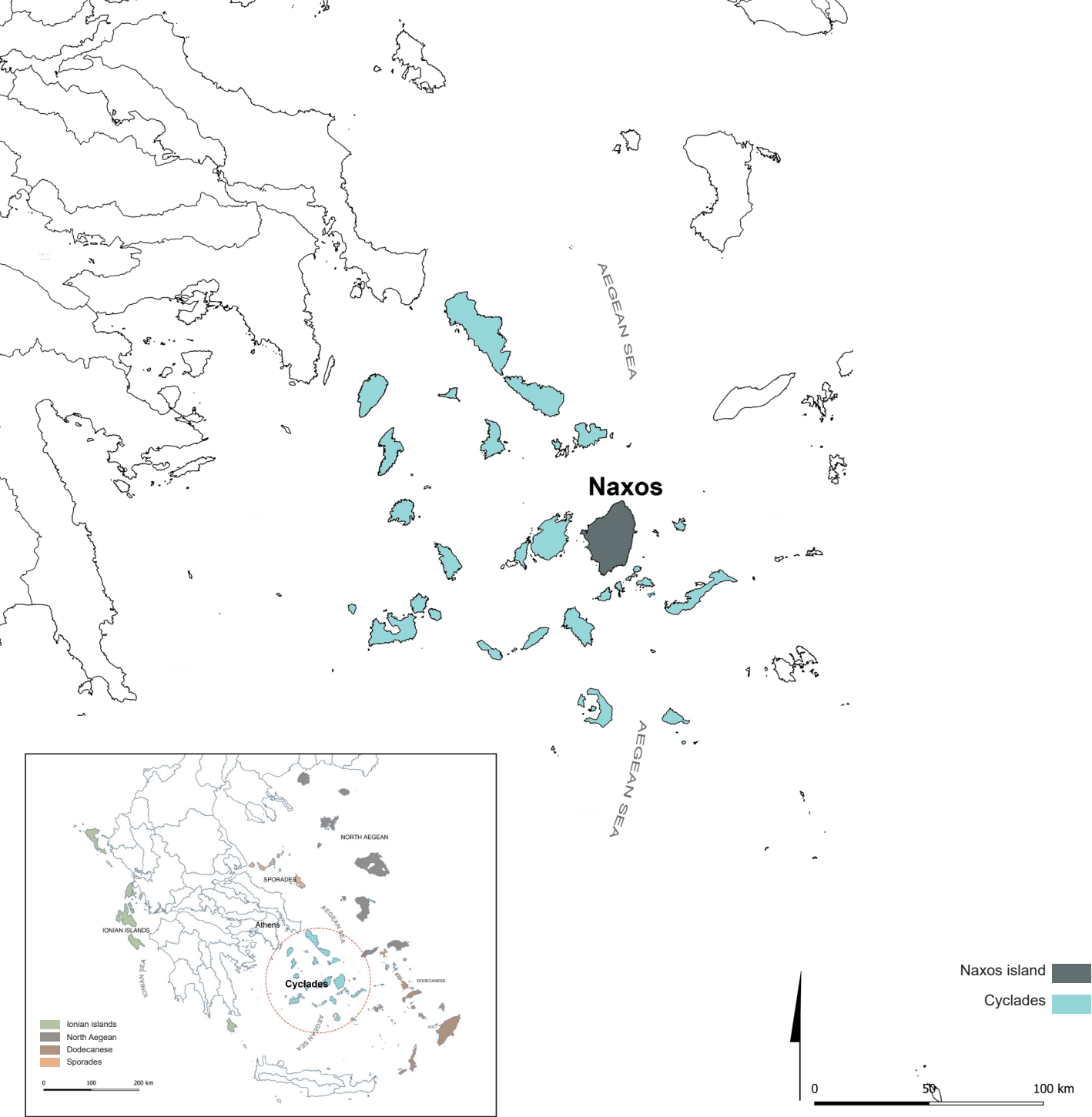
It is obvious how the topography and the geography of the area have changed during these periods.

The paleogeographic evolution of the coastal zone has been extensively studied by Evelpidou et al. (2010, 2012a), by conducting 6 shallow boreholes up to 6 m deep in lagoons in western Naxos. In total, about 28 m of cores were collected, which allowed the stratigraphic analysis of the sediments. The cores were opened and studied for their stratigraphy and granulometry, while plant residues, shell and peat were collected from the stratigraphic sequence for radiocarbon dating.

The lithology of Naxos comprises various formations with differing erosion resistance, shaping its current morphology through hydrographic action and tectonics (Evelpidou 2001). Erosion, primarily runoff erosion, exploits these differences, accentuating existing discontinuities and creating diverse landscapes. Coastal areas feature deposition processes, including coastal dunes, lagoons, tombolos, and beachrocks, predominantly on the west coast. Biological erosion forms tidal notches along the submarine part of the coast.

⁵ Evelpidou, N.; Karkani, A.;Tzouxanioti, M.; Spyrou, E.;Petroopoulos, A.; Lakidi, L. *Inventory and Assessment of the Geomorphosites in Central Cyclades, Greece: The Case of Paros and Naxos Islands. Geosciences*, 2021





Naxos island : General information

The island of Naxos, situated in the east-central Cyclades in the southern Aegean, holds a strategic location equidistant from mainland Greece, Asia Minor, and Crete. Positioned to the east of Paros, it lies approximately 103 nautical miles southeast of Piraeus, the port of Athens. Naxos's central geographic position provides a panoramic view encompassing neighboring islands such as Paros, Iraklia, Schinoussa, Koufonissia, Keros, Antikeri, and Donousa, as well as distant islands ranging from Ikaria to Amorgos, and Andros to Melos. With a total area of approximately 430 km², Naxos ranks as the largest island in the Cyclades. Its ellipsoidal shape stretches 33 km along its longest axis (NE-SW) and 25 km along its narrower axis (NW-SE). Renowned for its mountainous terrain, Naxos boasts a diverse landscape featuring towering peaks, rugged slopes, rocky coastlines, lush river valleys, fertile plateaus, sandy beaches, and shallow bays. Despite the typically arid climate of the region, Naxos benefits from a reliable water supply, a rarity among Aegean islands.⁶

Climate

Naxos experiences a Mediterranean climate characterized by wet winters and hot, dry summers. Its mountainous terrain contributes to higher rainfall compared to other Aegean Islands. The diverse geological formations, extensive fertile lands, and favorable climate have historically influenced residents' occupations, primarily in agriculture and livestock farming, making Naxos the most productive island in the Cyclades.⁷

⁶ Roussos, K. *Reconstructing the settled landscape of the Cyclades*, Leiden University Press, 2017

⁷ Zogaris, S., Vlami, V., & Probonas, N., *Preliminary Study of Environmental Assessment and Management*. Greek Poultry Society, 1996

Figure 5: Peak of Zas Mountain

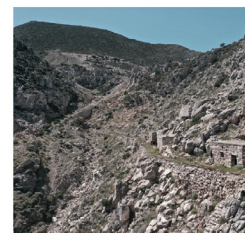
Figure 6: Routsouna Waterfalls

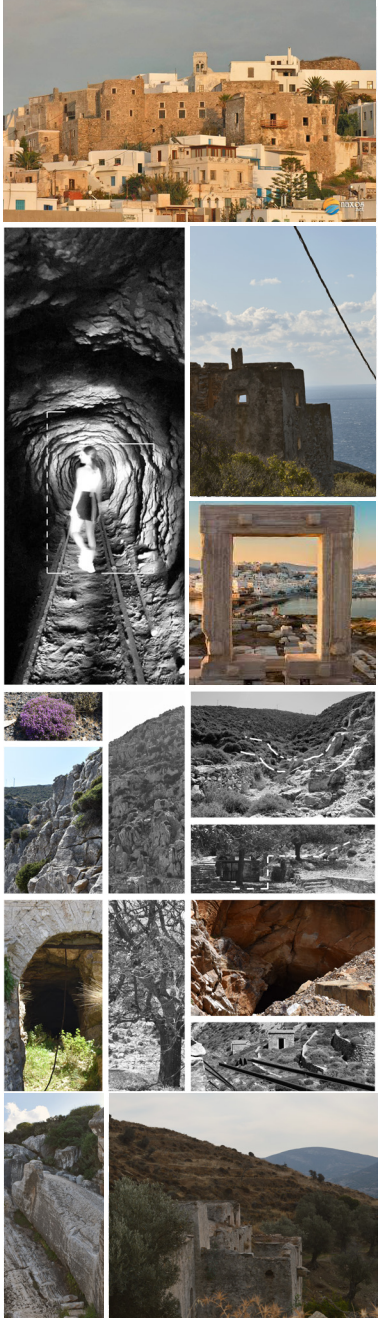
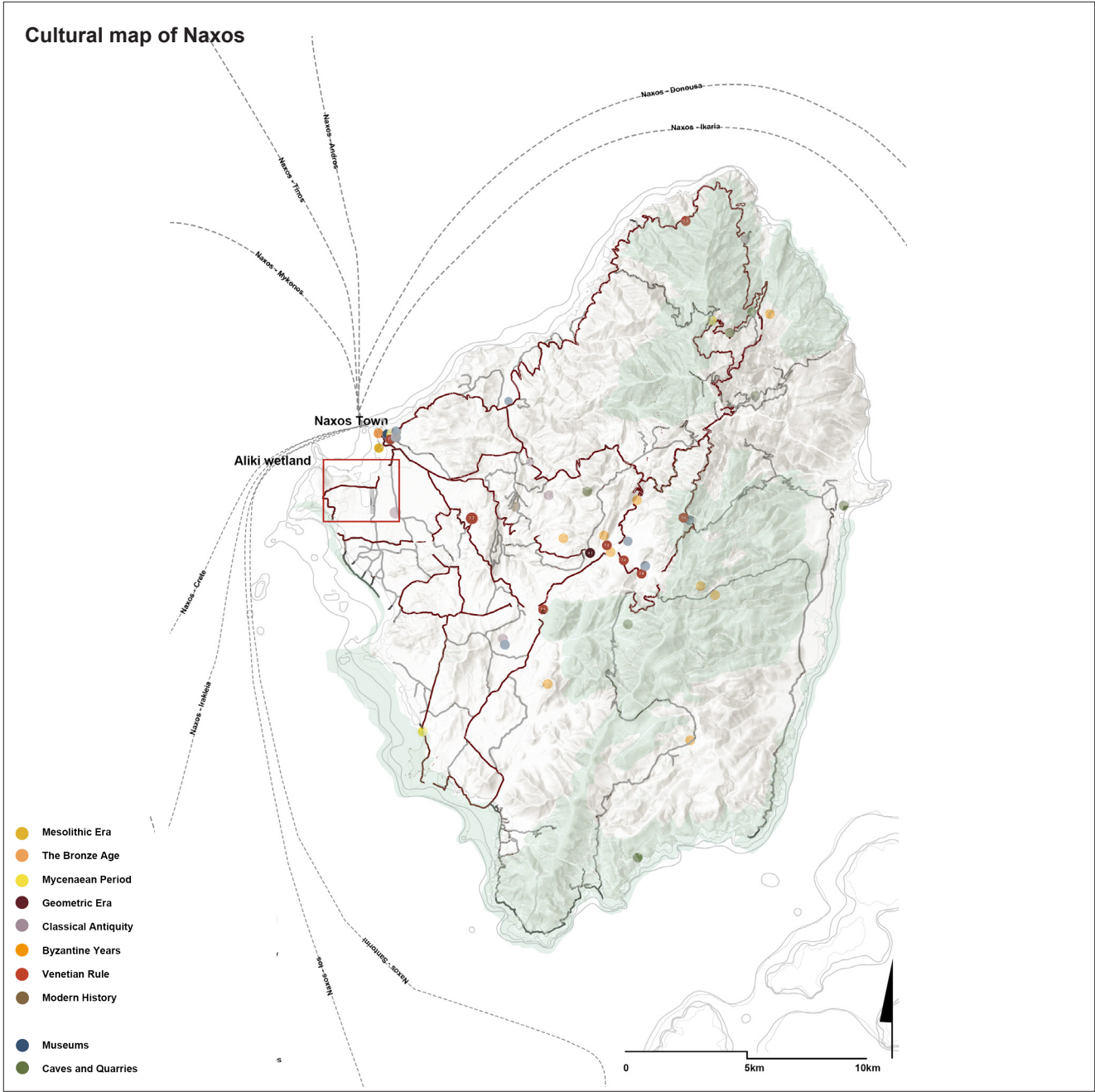
Figure 7: Kalandos beach

Figure 8: Streams from the peak of Zas

Figure 9: Traditional houses of emery mine workers

Figure 10: Industrial heritage in the North-East areas of Naxos





The Tourism Situation and the Cultural Environment

Naxos, the largest and most historically, culturally, and ecologically rich island in the Cyclades group in the Aegean Sea, Greece, offers immense potential for ecotourism. With a history spanning over 30,000 years, Naxos boasts prehistoric settlements, ancient Greek temples like the Temple of Apollo, Byzantine churches, and Venetian architectural marvels such as the castle of Naxos and numerous towers scattered across the island. Despite significant human alteration through agriculture and terracing, Naxos remains a global biodiversity hotspot with over 12,500 endemic species. Today, visitors can enjoy sandy beaches, crystal-clear waters, and picturesque villages, alongside an abundance of archaeological, historical, and cultural sites. Ecotourism opportunities are plentiful, with attractions including Paleolithic cave sites, submerged Minoan settlements, Classical Era temples, Hellenistic fortresses, Byzantine chapels, Turkish baths, and neoclassical buildings. Naxos's rich cultural and natural environment makes it a prime destination for sustainable tourism.

While remaining a premier tourism destination, the Cycladic Islands, including Naxos, have faced the adverse impacts of mass tourism and livestock overgrazing in recent decades. On Naxos, tourism is heavily concentrated on the western part of the island, leading to increased environmental pressures due to the rapid expansion of accommodations, dining, and entertainment facilities. This growth has strained coastal habitats and increased demand for fresh water and land resources, causing significant damage to several island ecosystems and depleting limited water reserves, exacerbating aridity problems across the Cyclades.

The focus on tourism in Naxos' capital, Chora, has left other island areas impoverished and relatively unknown to tourists. Mountainous villages suffer from poor infrastructure and rely on traditional agriculture and livestock grazing, which is conducted in an environmentally detrimental manner. Overpopulation of sheep and goats is leading to vegetation loss, soil erosion, and progressive desertification.⁸

⁸ Kleaveland, D., Noel, J., Villarreal, J., Parrish, M., Mallet, R., & Kaushik, S. (Year). *Trails of history and nature: Developing ecological & cultural materials for an ecotourism network on the Aegean Island of Naxos*. School of Environment and Sustainability, University of Michigan.

Figure 11: Collage of photos representing the Natural and Cultural landscape of Naxos island

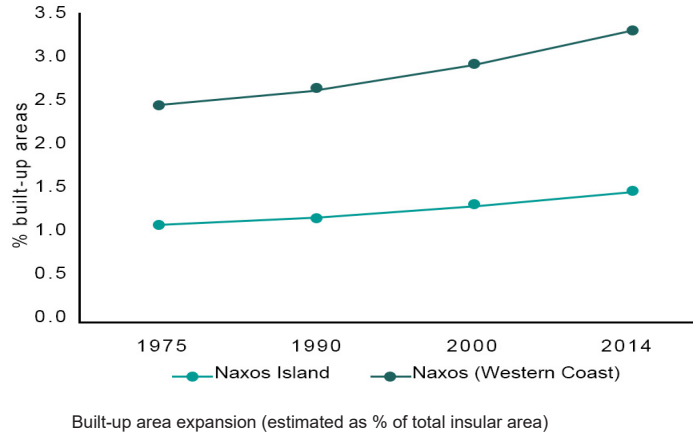
Evolving coastalization and urban sprawl patterns in the island of Naxos

Naxos, as it mentioned before, is the largest island of the Cyclades complex in the Aegean Sea, with a surface of 429.79 km2 and a coastline of 133 km. It counts for 17,970 inhabitants (2011 Census), a number that witnesses escalating trends. Population is unevenly distributed across the island, with the city of Naxos being the main urban area (7070 inhabitants) and the western coastal settlements gaining strength to the detriment of the mountainous ones.

This phenomenon is closely related to the intensification of the tourist development pattern of this part of the island that leads to the expansion of accommodation and transport infrastructures. Traditional economic sectors – i.e. agriculture/livestock husbandry and processing of primary agricultural products –, have been showing signs of decay

during the last decade; while a gradual transition towards a tertiarized local economic structure is taking place, with tourist accommodation and catering industry constituting the prevailing sectors. Such a transition, however, increases environmental pressures due to the overconcentration of population (inhabitants and visitors)and the rapid expansion of the built-up environment. This holds true especially for the western part of the island during the peak season. This part is the focus of this section

Mass tourism development in coastal insular areas in Greece has been the prevailing model for several decades and the cornerstone of local socio-economic development of lagging-behind insular economies. Its role in the national economy is also critical, taking into consideration that



Until 2000
Inhabitants income based on:
Farming, Agriculture,
Dairy products, Mining

Greece hosts almost half (50.7%) of the island complexes, located in the Mediterranean Sea and ranks among the top four tourism destinations of the Mediterranean EU territory (Eurostat, 2019).

Despite the pivotal role of tourism as a pillar of the insular and state economies in Greece, tourist flows in most cases exceed the carrying capacity of coastal ecosystems in respective islands' parts.

The island of Naxos is endowed with remarkable natural and cultural resources, which remain mostly unexploited, despite that they are dispersed throughout its territory. Conversely, the mass tourist development of the western coastal part guides the spatial concentration of population

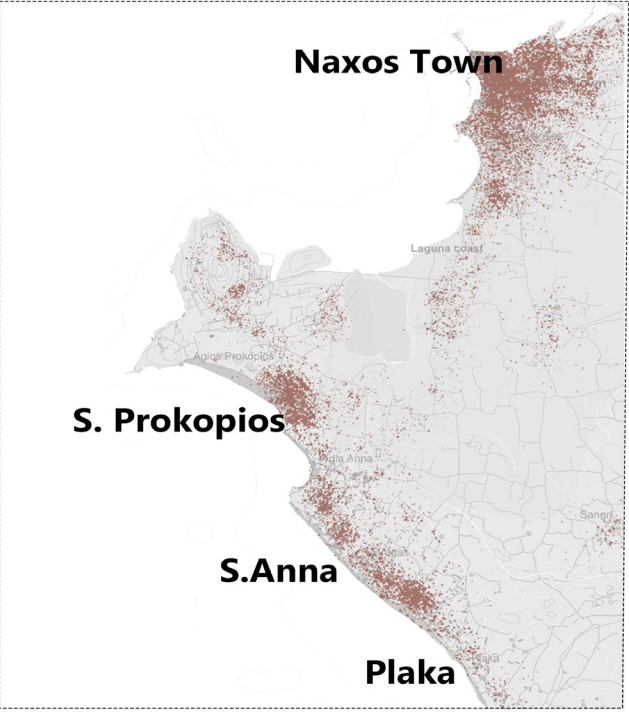
(13,233 inhabitants reside in this part, i.e. almost 74% of the local population in 2011) and the location of the bulk of tourism accommodation infrastructures. Based on the type of the infrastructures, it is inferred that Naxos Island hosts mainly low budget tourist flows.

This polarized socio-economic and spatial model creates an unbalanced development pattern that undermines social, economic and territorial cohesion. Furthermore, the overcrowded western part already shows signs of degradation. The study of the island's current state unveils that considerable pressure is placed on the micro-climate of coastal part due to landscape changes (expansion of built-up areas); as well as on water and land resources owing to the rapidly evolving tourism development trend.⁹



2005- 2015
Naxos gradually started getting known as a touristic destination mainly for families

2015 - Today
Rapid development of massive tourism, the main income of inhabitants is based on tourism during the summer period



⁹Leka, A., Lagarias, A., Panagiotopoulou, M., & Stratigea, A. (2021). *Development of a Tourism Carrying Capacity Index (TCCI) for sustainable management of coastal areas in Mediterranean islands – Case study Naxos, Greece*. School of Rural, Surveying and Geoinformatics Engineering, National Technical University of Athens (NTUA), Greece.

Geology map of Naxos



Geology and Geomorphology

Naxos belongs geologically to the Cycladic complex and is characterized by intense morphology and altitude reaching up to 1,004 meters. The differentiated geographic units of Naxos are also characterized by the different terrain relief. In the western plain zone, representing 30% of the island's total area, the terrain is mild with small slopes, around 5%. In the remaining 70% of the area, in the central and eastern parts of the island, there are slopes ranging from 10% to 30%, which descend to the coasts in areas with slopes of 5% to 10%. Scattered throughout, primarily towards the northwest tip, there are areas with slopes exceeding 30%.

¹⁰

In terms of composition, the soil of Naxos is characterized as rich in potassium and poor in organic matter. Generally, the subsoil of Naxos consists of:

Migmatite, a type of granite gneiss – in the central part (as longitudinal anticlines).
Granite, intrusive masses – in the western part (with longitudinal development).
Various types of schists alternating with marbles – forming a mantle around the above formations.
Tertiary conglomerates with layers of marls.
Alluvial deposits of valleys.

The minerals that have made Naxos famous are emery and marble. Emery is found in the northeastern part of the island on Mount Ammomaxi, in the former communities of Koronos and Apeiranthos.

The soils of Naxos are classified into groups according to their parent rocks and degree of weathering:

In mountainous areas, there are shallow, skeletal, very rocky to rocky soils on carbonate rocks (marbles, dolomites, or limestone), schist lithologies (marble schists and hail veins), and on granites or/and gneisses. Only in areas with favorable topography are Mediterranean red soils (“Terra Rossa”) observed on carbonate rocks or spots of undulating Mediterranean soils on schist and granitic rocks.

In valleys, there are clayey soils on marbles, sandy-clayey soils generally of shallow depth on marble schists, soils on sandy-clayey colluviums, and soils on sandy colluviums.

In the plains of the island, there are soils on sandy and sandy-clayey colluviums, which are the most productive and are mainly found in the large alluvial plain “N” of the town of Naxos.

Finally, in coastal sandy areas, there are more or less stabilized sand dunes, sandy patches, or saline soils consisting of marine sands to clayey deposits with characteristic white efflorescences.

From a tectonic point of view, Naxos consists of various lithological formations of different resistance to weathering, a fact that, in combination with the action of the hydrographic network, has created impressive landforms.

Erosion in Naxos mainly occurs through rainfall, which, in combination with transported material, widens pre-existing discontinuities, creating a variety of landforms. Differential erosion is evident mainly through steep topographic slopes. Through fieldwork and photointerpretation, the boundaries of steep topographic bends were mapped. Their correlation with the geological and lithological formations of the area showed that the boundaries of steep topographic bends appear mainly in eastern Naxos, in the lithological unit of “Marbles-Schists,” although their presence is noticeable in western Naxos as well, particularly on both sides of the large plain “Livadi.”

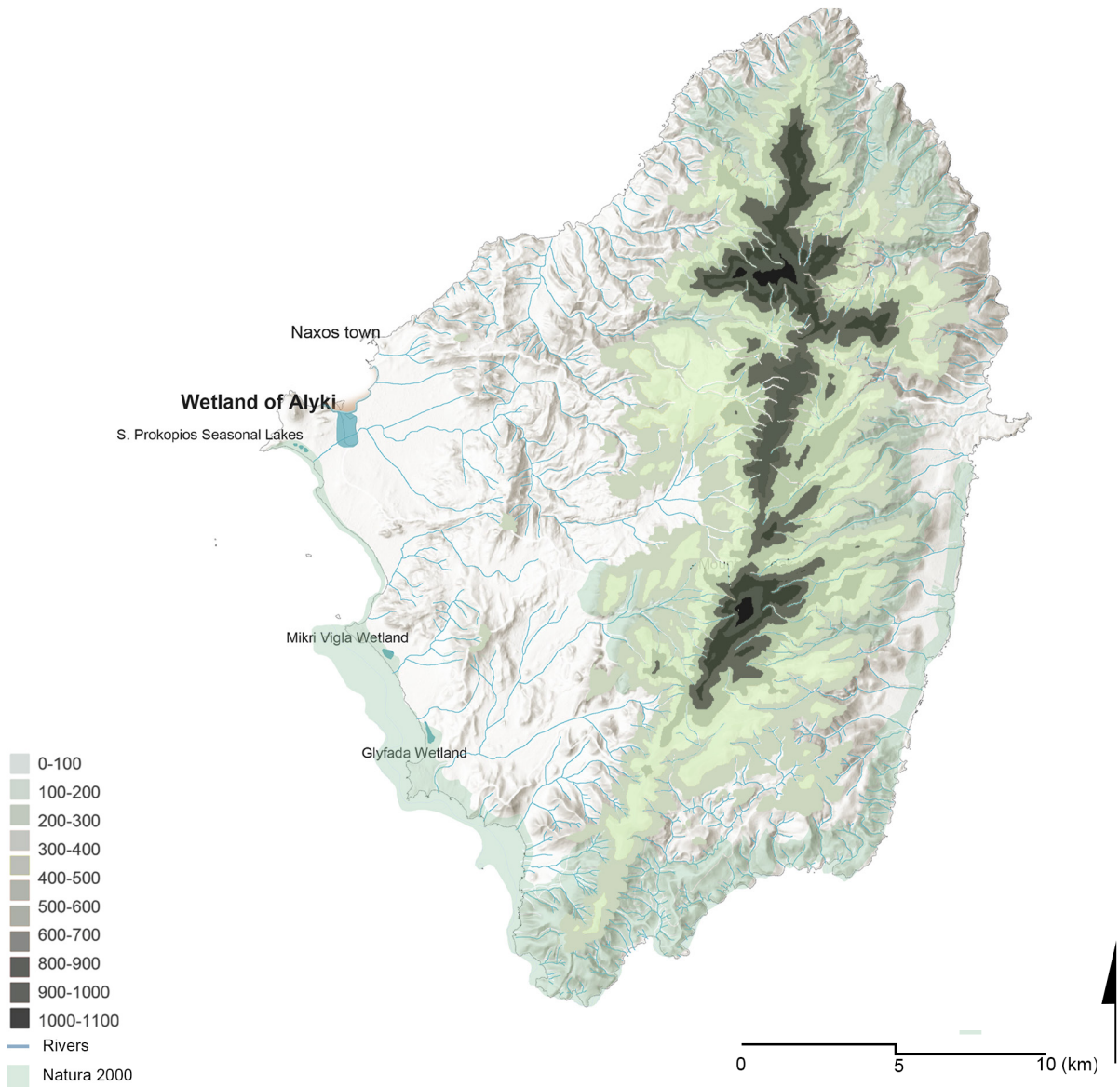
Furthermore, abrupt changes in topography are observed between different lithological formations, such as between the migmatite lithological unit and the marbles-schists and gneisses, and are related to the faults of the area.

Nevertheless, the multitude of topographic bends is between marbles and marble schists & gneisses due to the differential weathering of these rocks, a phenomenon that is intense throughout their extent. The map in the following image shows the boundaries of steep topographic changes in relation to the geological formations and the rift zones of the island.¹¹

¹⁰ Evelpiidou N. (2001) - *Geomorphological and environmental observations on the island of Naxos, using remote sensing and GIS methods. (PhD thesis)*, Department of Geography and Climatology, Department of Geology, National and Kapodistrian University

¹¹ Evelpidou, N., Giannikopoulou, A., Komi, A., Tzouxanioti, M., & Lykouroupolos, M., *Exploring the geoenvironment of Naxos*, 2020

Natural map of Naxos



Naxos island : Hydrology

The terrain of Naxos can be distinguished as follows regarding its hydrogeological behavior:

Hydro-permeable formations include marbles in the eastern mountainous region, which feed springs in Ano Potamia, Flerio, and Korono, as well as the contributions of the plateaus covering schistolithic rocks like Vivlos, Chalki, and Kynidaros.

Water-impermeable formations consist of schistoliths in the eastern part of the island.

Migmatites in the central part and granites in the west, due to inclinations, allow for the formation of discontinuous aquifers (small springs). Surface waters are available only a few days after heavy winter rains, and water needs are met by underground waters. In total, there are 43 springs, 21 streams, and 1 river in the Lygna area.

The most significant intermittent rivers enriching the island’s underground horizon are:

- “Platis” or “Peritsis” River (from east to west), approximately 15 km long, originating from Mount Zeus Fanari and emptying at the location of Alyki in Naxos Town. From the “Paratrechos” area to the sea, there is no stable riverbed, resulting in floods in the flat part of Livadi.
- Philotio River, approximately 10 km long, flowing from north to south, with its mouth at the location of “Kalandos.”
- “Rema Chimarou” River of the Apeirathos area, approximately 10 km long, flowing from west to east and ending 1000 meters from the “Psili Ammos” bay.

However, underground reserves are limited due to natural reasons and have been further restricted in recent years due to human interventions in the island’s fragile ecosystem. Natural reasons include low annual rainfall, low hydro-porosity of rocks, type of rainfall, island morphology (steep slopes), and low vegetation cover facilitating rapid surface runoff towards the sea. Human-induced factors include overpopulation, abandonment of terraced cultivation in mountainous areas, increased water needs for irrigation (intensification of potato and cereal crops), pollution of hydrophilic horizons in inhabited areas, and depletion or salinization (wells in the Naxos plain) of underground aquifers due to poorly planned or illegal drilling at great depths.¹²

Hydrology and Basins



¹² General Directorate of Regional Agricultural Economy and Veterinary Services, *Operational Plan for Rural Development 2014-2020*, South Aegean Region, 2014

Differentiations in topography



Figure 12: Mountains in the central island



Figure 13: Dry stones in the mountainous Naxos

Naxos Economy

Primary Sector

In the flat area, many families are employed in full-time and part-time agriculture. The total irrigated land on the island of Naxos is approximately 18,000 hectares, with non-irrigated land covering around 126,000 hectares. Most cultivable lands are found in the area of Livadi, and secondly in the mountainous and semi-mountainous regions of the island.

For the Naxos Municipality, the total irrigated land is about 7,000 hectares, while non-irrigated land covers 14,000 hectares. Non-irrigated lands are almost double the irrigated ones. In the Drymalia Municipality, the total irrigated land is approximately 11,000 hectares, with non-irrigated land covering about 110,000 hectares.

In the mountainous area, predominant activities include small livestock farming, viticulture, and olive cultivation. Livestock farming dominates in eastern Naxos, accounting for 40% to 45% of total agricultural (farming and livestock) production. Sheep and goats are concentrated in mountainous areas, while cattle and pigs are found in flatlands. In recent years, dairy farming has seen significant growth. The most characteristic dairyv product in Naxos, besides local cheeses, is Naxos gruyere (PDO), produced in large quantities and known throughout Greece. Additionally, traditional local cheeses such as head cheese, anthotyros, sour milk, butter, and cream are produced. ¹³

Secondary Sector

The processing sector is limited and mainly involves agricultural processing (primarily cheese and other dairy products, as well as wine, raki, and Naxos citron). About 40% of industrial employment is concentrated in the food sector, while approximately 10% is in the mineral sector

(emery - marble processing) and a significant portion in wood product manufacturing.

In terms of business activity on the island, according to data from the Chamber of Commerce of the Cyclades, there is a distribution among professionals, artisans, traders, and tourism-related professions. Traditional crafts still exist on the island, mainly in northeastern Naxos, including weaving, pottery, and wood carving. Other traditional crafts, however, are in decline, such as basket weaving, practiced mainly by retirees in some villages (e.g., Kera-moti), and the construction of traditional musical instruments in Koronos, Filoti, and other villages. ¹⁴

Tertiary Sector

The tertiary sector is well-developed across the entire island of Naxos. This sector employs 47.49% of the island's active population (ELSTAT 2001), with the majority of activities revolving around tourism and related sectors. ¹⁵

Tourism:

Due to Naxos being the most agricultural island in the Cyclades, tourism development began later compared to other tourist destinations like Paros, Mykonos, and Santorini, starting around the 1980s.

Tourism development on the island is not evenly distributed, with a high concentration in the municipal unit of Naxos (Chora) and along the coastal zone of the western part of the island. Additionally, the concentration of tourist facilities in the plain areas and their expansion without spatial planning studies has limited the space available for agricultural installations. The main sectors supporting tourism are hotels-restaurants and wholesale-retail trade.

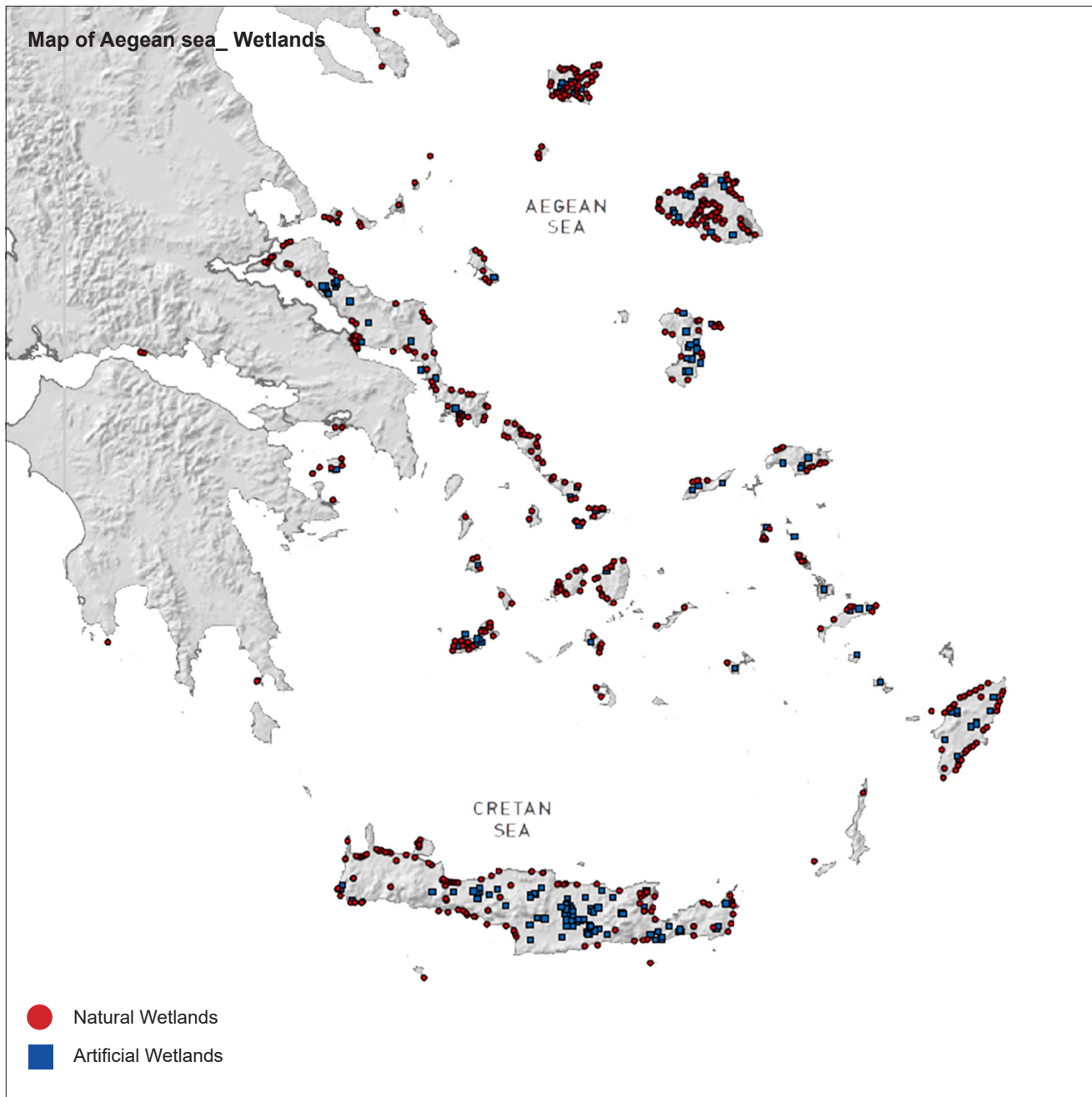
¹³ Moustakis N., *Naxos economy: Current situation and prospects. In Proceedings of the 1st Panhellenic Conference on “Naxos through the ages,”* 1994. edited by I.K. Prombonas & S.E. Psarras, September 3-6, 1992, Filoti Community of Naxos, Athens
¹⁴ Moustakis N., *Naxos economy: Current situation and prospects. In Proceedings of the 1st Panhellenic Conference on “Naxos through the ages,”* 1994. edited by I.K. Prombonas & S.E. Psarras, September 3-6, 1992, Filoti Community of Naxos, Athens
¹⁵ Korres, M.D. (2003). *The villages of Naxos and their earliest mention of names.* In Proceedings of the 2nd Panhellenic Conference on “Naxos through the ages,” edited by I.K. Prombonas & S.E. Psarras, September 4-7, 1997

Summary Part I

Naxos, the largest island in the Cyclades archipelago, boasts a rich tapestry of history, geography, and economy deeply intertwined with its geological and geomorphological features. Throughout its millennia-spanning existence, Naxos has relied on its fertile soil, shaped by its geological composition, to sustain a thriving agricultural and livestock industry. The exportation of Valued assets like emery and marble further reinforced its economic prosperity, distinguishing it from other islands in the region that leaned heavily on tourism. However, in recent years, a rapid influx of tourism has reshaped Naxos's economic landscape, leading to significant environmental repercussions due to inadequate planning and regulation.

The topography and geological attributes of Naxos, particularly in its western region, have endowed it with alluvial deposits and wetlands of vital ecological importance. Despite their significance for biodiversity and ecosystem health, these natural landscapes often fall victim to misuse and neglect in the pursuit of tourism development. Although tourists and locals alike admire Naxos's picturesque mountains and pristine beaches, there remains a pervasive lack of awareness regarding the importance of preserving wetlands. This ignorance has resulted in severe environmental degradation, undermining the very ecosystems that sustain Naxos's natural beauty.

Today, Naxos's economy revolves around agriculture, dairy farming, and limited industrial activities, with tourism emerging as a dominant force in the tertiary sector. While tourism has brought economic prosperity, its uncontrolled expansion threatens Naxos's fragile ecosystem and traditional way of life. The island stands at a crossroads, balancing the allure of tourism revenue with the imperative to preserve its natural heritage for future generations. In navigating this delicate balance, Naxos faces the challenge of reconciling economic development with environmental sustainability, ensuring that its geological treasures endure as a testament to its enduring legacy.



Part II

Wetlands in the Aegean Sea

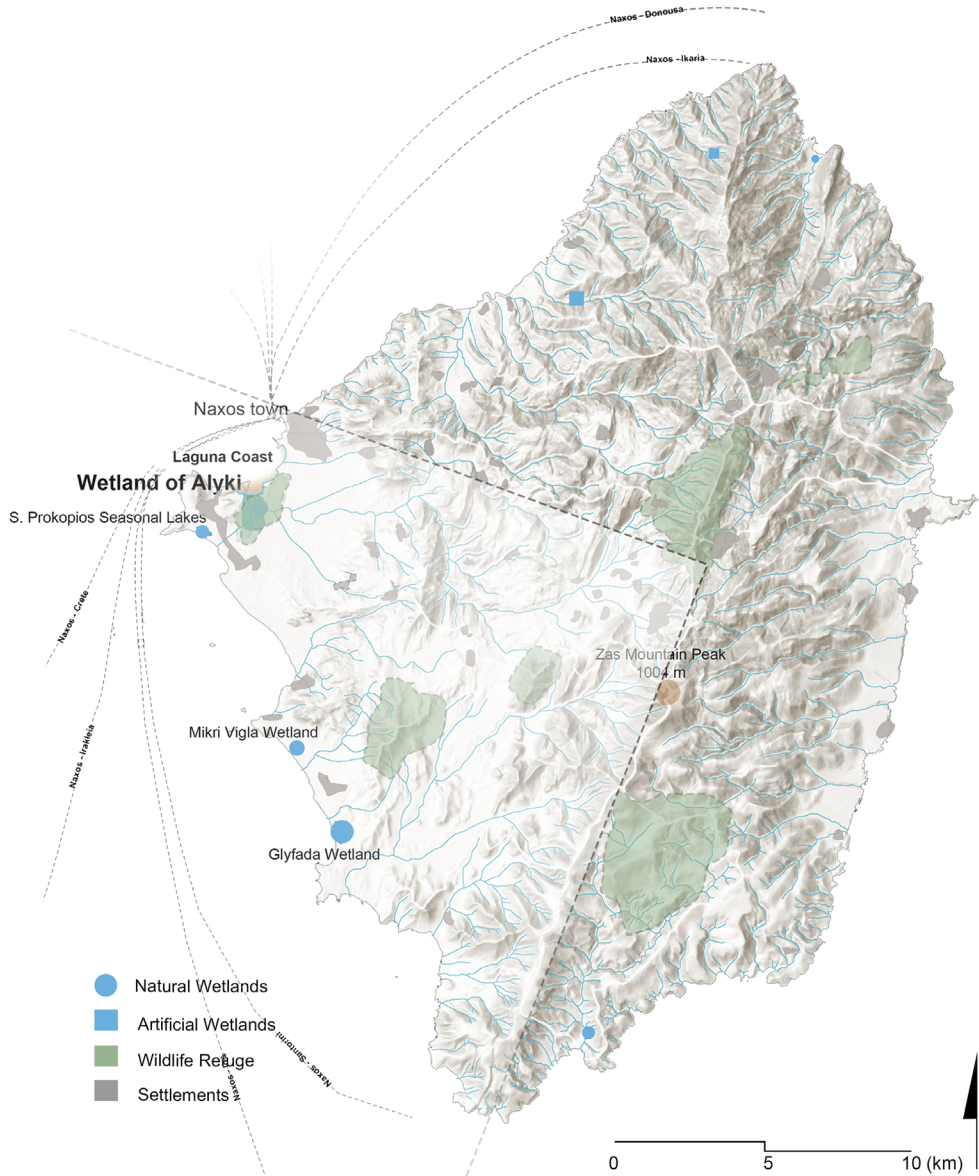
The wetlands of the Aegean islands are vital natural habitats, playing a crucial role in the islands' hydrological cycle and supporting a diverse array of flora and fauna. These wetlands are home to rare habitats and host endemic and endangered species, serving as essential stopovers for millions of migratory birds. They support hundreds of aquatic invertebrate and vertebrate species, including unique species like *Ladigesocypris ghigii* in Rhodes and *Rana cerigensis* in Karpathos. Over 20 species of waterfowl, such as *Charadrius dubius* and *Gallinula chloropus*, breed in these wetlands, showcasing their ecological significance.¹⁶

However, the growing tourism industry has significantly impacted these delicate ecosystems. The increasing influx of tourists has led to intensified human activities, such as excavation, embankment, pollution, and urban development, which have accelerated the degradation of many wetlands. Despite being situated within protected areas, only a few wetlands receive adequate protection and environmental management.

Islands at the heart of this tourism boom are facing similar challenges, with wetlands deteriorating rapidly. Urgent action is needed to preserve these threatened ecosystems. The loss of these wetlands would have dire consequences for water resources, agriculture, tourism, and biodiversity in Greece. Their preservation is essential not only for maintaining ecological balance but also for supporting sustainable development and the well-being of local communities.

¹⁶ Catsadorakis, G., & Paragamian, K. (2007). *Inventory of the wetlands of the Aegean Islands: Identity, ecological status and threats*

Map of Naxos_ Wetlands



Wetlands of West Naxos

Figure 14&15: Aliko Wetland
Figure 16&17: Saint Prokopios Sals pits
Figure 18&19: Mikri Vigla Wetland
Figure 20&21: Glyfada Wetland



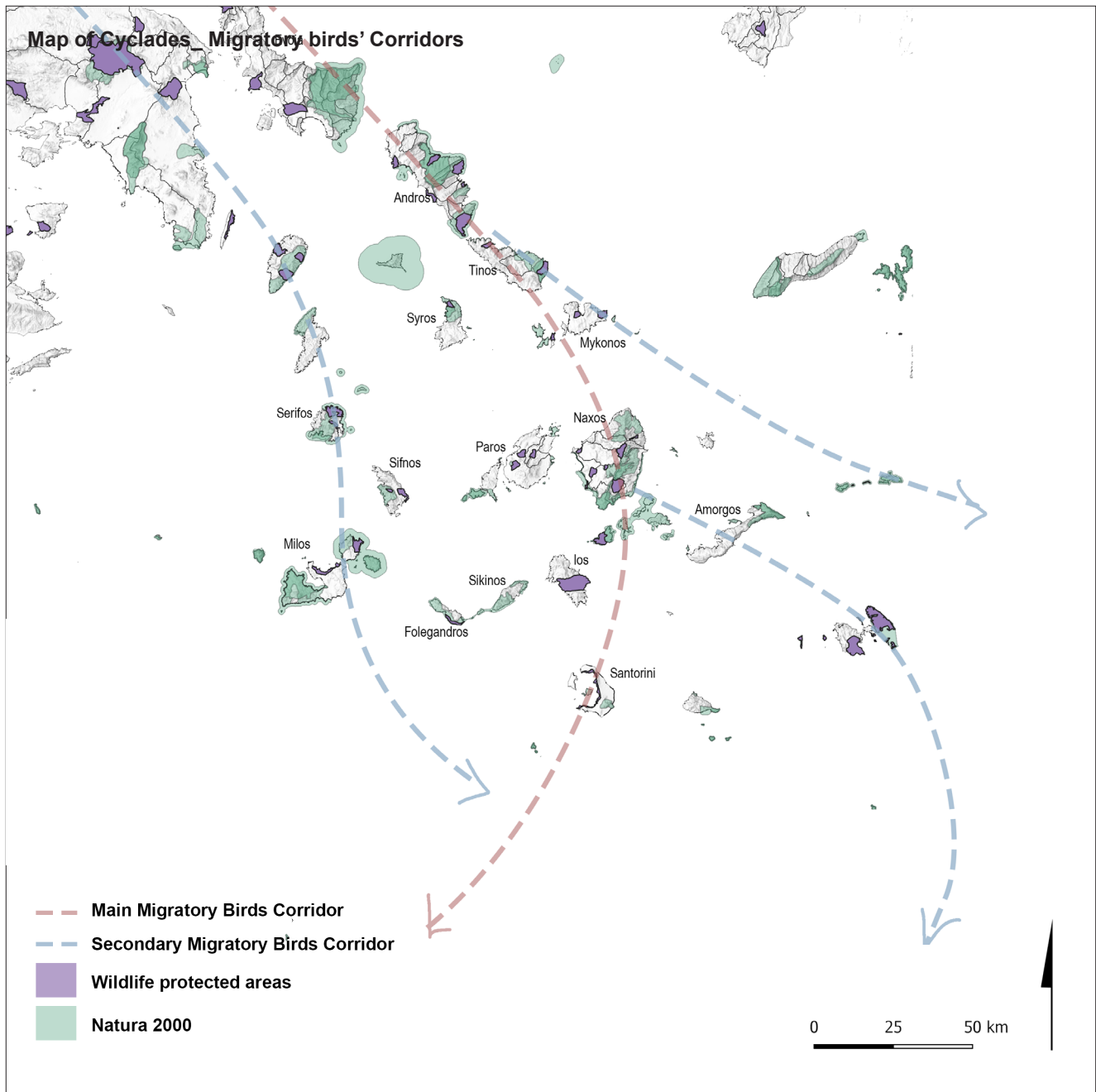
The western coast of Naxos Island, located in the Aegean Sea within the Cyclades Island group, features a variety of distinctive natural formations shaped over the past 10,000 years. This area, with its sandy coastline, low-lying sand dunes, lagoons, and expansive alluvial plain, is particularly notable for its wetlands. These ecosystems are crucial for sustaining local biodiversity and protecting the coastal area from threats such as sea level rise and storms.

In Naxos, wetlands include both natural types, like coastal lagoons and salt marshes, and artificial ones in the island's northern part, which supply water to Naxos town and nearby villages. Despite their importance for flora and fauna in Greece, these wetlands are among the most threatened ecosystems, facing degradation from various sources.

Human interference, tourism infrastructure, and wave intensity disrupt sediment input, escalating risks to the wetlands' integrity. Severe weather events and rising sea levels contribute to dune erosion, endangering beaches, adjoining lagoons, and extensive land areas, including rural and residential zones.

The wetlands on Naxos Island exemplify the complex interaction between geological forces and environmental conservation. Their preservation is critical for sustainable development and the protection of natural and economic resources, highlighting the need for dedicated efforts to safeguard these vital ecosystems.¹⁷

¹⁷ Evelpidou, N., Petropoulos, A., Karkani, A., and Saitis, G.: Coastal changes through time is the only constant: Case study of west coast of Naxos Island, Cyclades, Greece, 2021



Importance of the wetlands for migratory birds

The wetlands of the Cyclades hold immense ecological significance, serving as crucial habitats for both endemic bird species and a diverse array of migratory birds. These areas act as vital stopovers for birds traveling between their southern and northern habitats, providing necessary rest and nourishment during their long journeys. Naxos, in particular, is strategically located along a major migratory route, making its wetlands essential for avian biodiversity.

Aliki, one of these vital wetlands, performs three essential functions for avian species:

The wetlands of the Aegean, particularly Naxos, are vital for migratory birds, providing a unique environment along a major migratory route. Aliki, a crucial wetland on Naxos, fulfills three key functions for avian species:

Migratory Station: Aliki is a critical stopover during the “Spring Migration” (late February to May) and the “Autumn Migration” (July to October). In spring, it supports over 70% of observed bird species, offering a productive, water-filled wetland. Autumn sees fewer species due to seasonal drying. Birds migrating through Aliki often travel from tropical Africa, crossing vast distances and formidable barriers like the Sahara and Mediterranean. Adverse weather can increase the number of birds stopping to rest and feed.

Wintering Place: From November to March, Aliki provides refuge for aquatic and waterfowl species from Central and Northern Europe, serving as a temporary haven in the eastern Mediterranean during the winter months.

Nesting Site: Aliki is a rare nesting site for small numbers of waterfowl and other birds with specialized habitat needs, uncommon in the South Aegean region. In spring 1995, five species, including mallards, coots, and water hens, nested in Aliki. Additionally, species like grebes and plovers may have nested there, highlighting Aliki’s importance for breeding.

Bird reproduction is crucial for assessing a wetland’s ecological health, with nesting species indicating habitat quality and diversity. Aliki’s role in supporting breeding, migrating, and wintering birds underscores the need for its protection.¹⁸

¹⁸ Zogaris, S., Vlami, V., & Probonas, N. (1996). *Preliminary Study of Environmental Assessment and Management*. Greek Poultry Society.



Figure 22: Aiki Wetland, Flamingo arrival in spring

Naxos Wetlands Characteristics

The small wetlands, salt marshes, and dunes scattered across Naxos form vital ecosystems, offering refuge to a diverse array of birdlife, fish, and reptiles. Among these, Alyki stands out as a paramount wetland, situated southwest of the airport runway. Boasting the title of the largest salt lake in the Cyclades, Alyki retains sufficient water to sustain its rich biodiversity. Here, reeds, aquatic plants, and clusters of cedar trees flourish, creating a thriving habitat for numerous species.

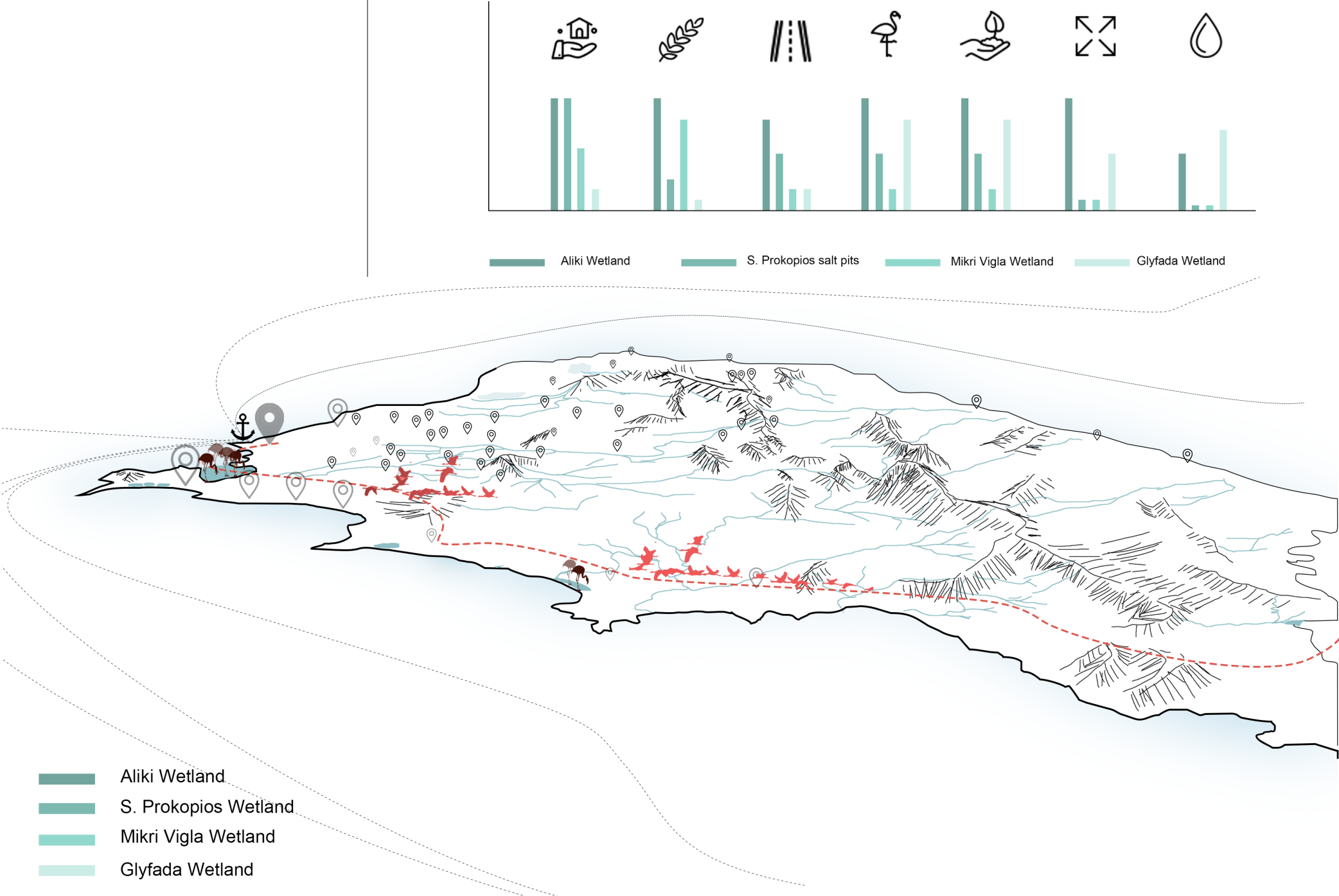
Alyki is not alone in its ecological significance. Other notable wetlands on the island include Saint Prokopis, Mikri Vigla, and Glyfada. These wetlands, situated predominantly in the western part of Naxos, owe their existence to the island's geological formations and the streams originating from its mountains. Together, they form interconnected systems that support a plethora of life forms, contributing to the island's ecological diversity.

With 166 bird species documented within Alyki alone, these wetlands play a vital role not only in supporting local flora and fauna but also in preserving biodiversity on a larger scale. As integral components of Naxos' natural landscape, their protection and sustainable management are essential for the island's continued ecological health and resilience.¹⁹

In order to gain a deeper understanding of the structure and function of these specific coastal lagoons, I conducted an analysis of their surrounding environments. This analysis took into consideration several factors, including whether the area surrounding the lagoon is undergoing urban development, characterized by agricultural activities, linked to existing infrastructure such as roads, serves as a sanctuary for migratory birds and flamingos, possesses adequate size for biodiversity enhancement, and is sustained by flowing water or other water sources.

In summary, the findings suggest that as we journey southward on the island and venture away from urban centers, the density of urban development diminishes. Consequently, each lagoon is less influenced by human activities that could potentially disrupt its hydrology or disturb its flora and fauna, thereby preserving its ecological integrity and preventing degradation.

¹⁹ Naxos Wildlife Protection ,(n.d), *Lagoon - The Wildlife Refuge*. Retrieved from <https://naxoswildlifeProtection.com/lagoon-the-wildlife-refuge/>



Wetland Overview and Pressures

To effectively manage the wetlands of Naxos, it is essential to analyze their surrounding environments and specific characteristics, understanding each wetland’s transformation conditions and needs. This comprehensive approach will guide us towards sustainable management practices.

Aliki and Agios Prokopios:

Urban Pressure: Both are under significant urban pressure due to high urban density. Agios Prokopios salt lakes face considerable human interaction because of their accessibility and better infrastructure.

Ecological Importance: Aliki, the largest wetland, and Agios Prokopios are critical stop-overs for migratory birds, offering essential habitats for various species during their migrations.

Accessibility: Due to better infrastructure, these wetlands experience higher visitor numbers, increasing human impact on their ecosystems.

Glyfada:

Natural State: Glyfada is the most natural and least disturbed wetland, providing a pristine environment that is crucial for migratory birds.

Accessibility: Its remoteness and limited infrastructure result in fewer visitors, helping to maintain its natural state.

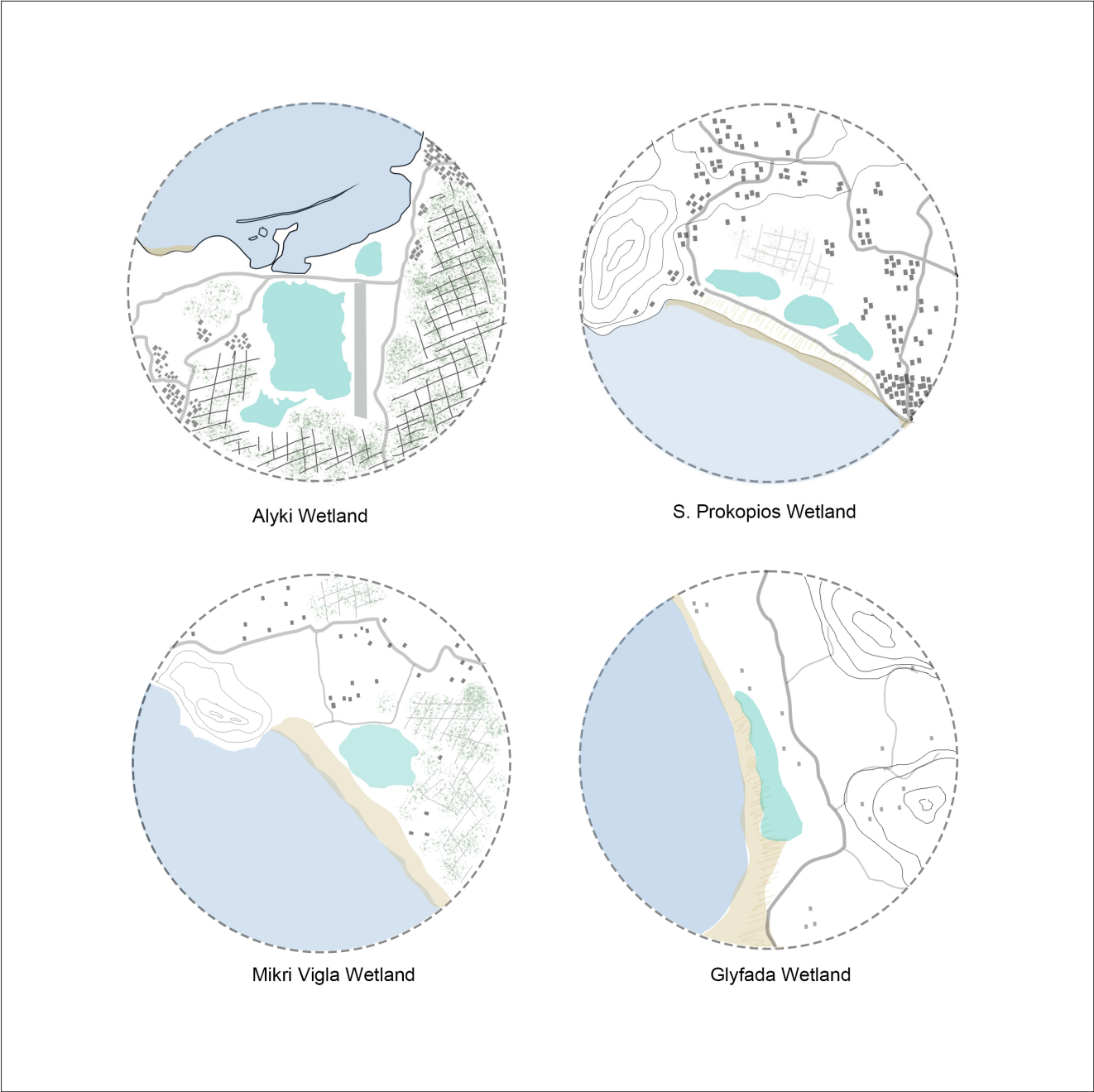
Mikri Vigla:

Size and Location: The smallest wetland, Mikri Vigla, is situated adjacent to agricultural lands but is less urbanized compared to Aliki and Agios Prokopios.

Visitor Impact: Its remote location leads to fewer visitors, reducing direct human impact.

Holistic Approach

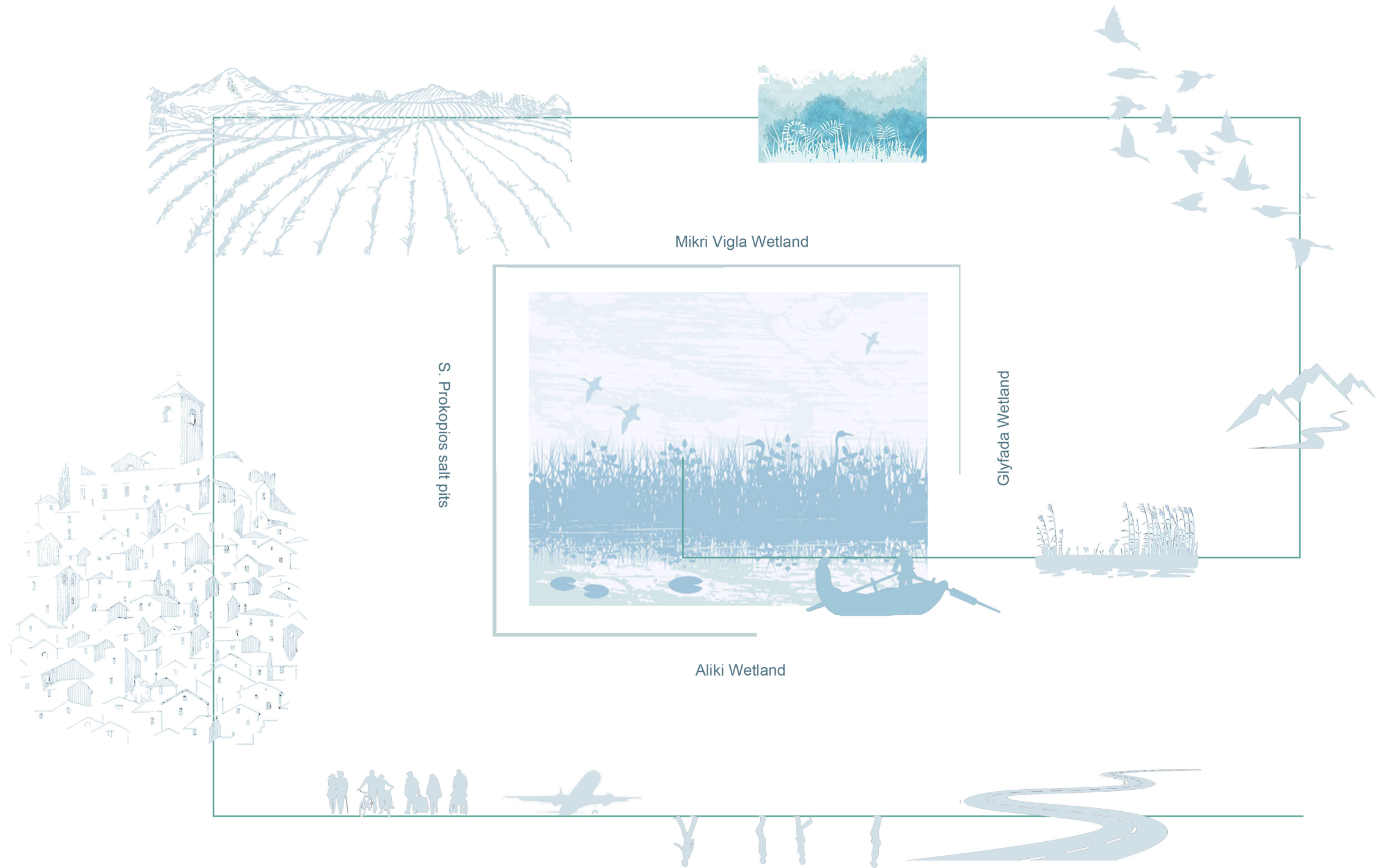
A holistic management approach considers each wetland’s unique needs and pressures. By balancing conservation efforts with sustainable development, we can preserve these vital ecosystems. Effective management will ensure that Naxos’s wetlands continue to support migratory birds, maintain biodiversity, and provide essential ecological services for future generations.





The transition from agricultural land to the natural wetland, rich with hydrophilic vegetation, then to sandy dunes, and finally to the sea.

Figure 23: Glyfada Wetland, Aerial View



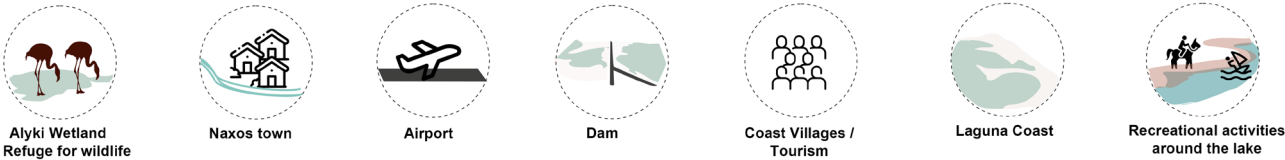
This diagram illustrates that starting from Aliko and moving towards Glyfada, we begin by observing a multitude of infrastructures, human activities, gateways to Naxos, settlements, and agricultural fields. As we approach Glyfada, the environment becomes more natural and untouched.

As it is represented in this diagram, Aliko is the case of the wetland that challenges the most parameters. By solving the most complex example and being aware of its threats, we can use this typology for the others.

Part III

From the regional scale to the single wetland scale

Aliki lagoon - Introduction



Nestled just 2.5 kilometers south of Naxos Town, Aliki stands as the largest and most significant wetland in the Cyclades. Officially designated as a Wildlife Refuge since 2004 under Greek legislation Φ.Ε.Κ. 652/Β/04-05-04, it spans an expansive area of 170 hectares. This natural treasure serves as a vital sanctuary for a diverse array of flora and fauna.²⁰

For centuries, Aliki Lagoon has been a prominent natural feature, as evidenced by historical aerial photographs. Despite the presence of an artificial dam, the lagoon maintains a narrow channel that connects it to the sea, allowing marine organisms to enter. The lagoon’s salinity fluctuates due to influences from both rainwater and seawater, supporting a diverse range of vegetation and marine fauna indicative of brackish environments (Peristerakis, 1986). Aliki is officially recognized as a lagoon by several scientific and governmental bodies, including the Hellenic Center for Wetlands and Biotopes, the Ministry of Marine Fisheries, and universities such as those in Thessaloniki and Athens. It is also mapped as a lagoon by the National Institute of Geological and Mineral Research. Historical toponyms like “Taliani” and “Alykes” reflect the lagoon’s longstanding presence and value to the community, underscoring its recognized status both scientifically and culturally. Beyond its identification as a natural geographical unit, the crucial issue of effectively demarcating the wetland area remains.

Aliki’s geographical location along the island’s western coast makes it a haven for diverse species and habitats. To the north lies the picturesque Laguna Beach, characterized by sandy expanses adorned with sand dunes, tamarisks, and sea daffodils. This coastal gem is a bustling hub of avian life, providing nesting grounds for Kentish plovers and Crested larks, while attracting a myriad of waders and

marine birds that feed on small fish and benthic invertebrates. The surrounding area of Alyki, part of the wider Livadi pre-inclusion basin, is predominantly composed of lagoon deposits, featuring fine sands intermingled with layers of gypsum and calcareous-magnesian-chloride salts. These formations give rise to a weak aquifer horizon, integral to the unified aquifer horizon spanning the pre-inclusion basin. Particularly in the narrow stretch of Alykes, the salinity level of this aquifer horizon is notably high due to the dissolution of salts deposited before the construction of protective embankments against seawater inflow and flooding.²¹

Aliki is included in the CORINE network areas (AG0060027) and NATURA 2000 (GR4220015), including a vast salt flat situated in the southwest of the island, merely two kilometers from the capital. This 1500-hectare salt flat hosts a diverse array of hydrophilic, halophilic, and psammophilic vegetation, thriving primarily on alluvial deposits, salt flat formations, and sand dunes. Submerged vegetation adds to its ecological richness, while clusters of trees and shrubs, including Tamarisks, Cedars, Phoenician Junipers, Lentisks, Kermes Oaks, and Thyme, dot the landscape.

Despite facing challenges such as human interventions—including the construction of an airport in 1992 after draining and filling a portion of the salt flat in 1985—Aliki remains a crucial habitat for migratory birds. Its significance as a stopping point on a major migratory route in the central Aegean is underscored by the large numbers of bird species and populations it attracts during the spring migration, including herons, ducks, waders, gulls, terns, raptors, and passerines. The area’s diverse habitats also support a remarkable variety of amphibians, reptiles, and invertebrates, including some endemic species.

²⁰ Naxos Wildlife Protection, (n.d), *Lagoon - The Wildlife Refuge*. Retrieved from <https://naxoswildlife.protection.com/lagoon-the-wildlife-refuge/>
²¹ Evelpidou, N., Karkani, A., & Giannikopoulou, K., Land rehabilitation in Mediterranean environments, Athens, 2017

However, uncontrolled exploitation has significantly altered the lagoon. Construction of dikes, groundwater pumping, landfilling for crops and later for the airport, illegal road construction, hunting, illegal recreational fishing, parking and camping activities, garbage and sewage pollution, nuisance, encroachment on vegetation, destruction of sand dunes, trampling of bird nests, and other activities have degraded the lagoon. Some of these illegal activities continue, threatening the lagoon's future as a wetland and wildlife sanctuary.

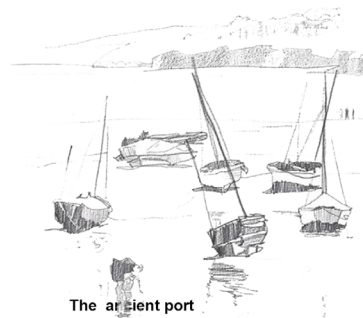
In essence, Alikí and Alykes exemplify the ecological wealth and biodiversity of the Cyclades, highlighting the importance of preserving these invaluable wetland ecosystems for future generations.²²

Figure 24: Alikí Wetland, Collage of misuse of the area

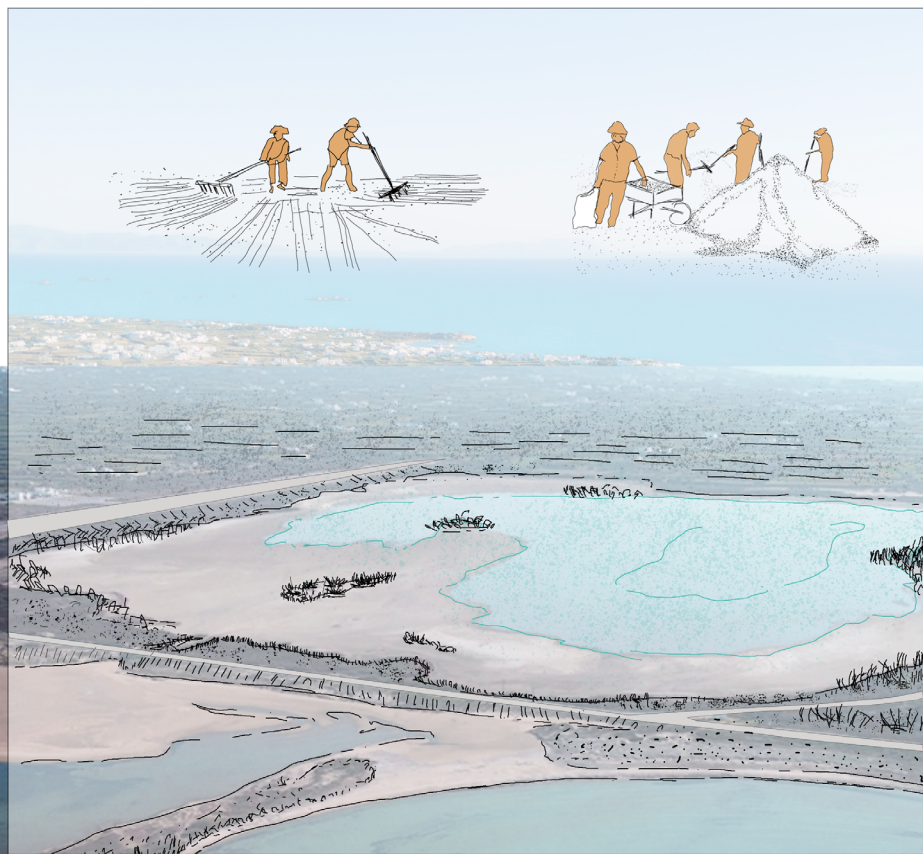
²² Zogaris, S., Vlami, V., & Probonas, N. (1996). *Preliminary Study of Environmental Assessment and Management*. Greek Poultry Society.



Cultural significance



Huge size hosts many different habitats



Fauna : Ornithological Significance

73 species are directly dependent on the Alik wetland, they are completely specialized in wetland habitats, and would not respond regularly in the area without the presence of the wetland

60 species have been observed by members of EU to use the wetland for resources and foliage

34 species are dependent on the wetland but can also be observed in other terrestrial or marine habitats

The ecological importance of the Alik Wetland extends beyond its role as a habitat for wildlife. It offers a multitude of values and services to both the local community and the environment. Here are some key categories highlighting its significance:

Environmental Value:

Alik plays a crucial role in maintaining the hydrological balance of the Livadi plain. The wetland receives water from seasonal streams originating from Naxos's highest mountains. Attempts to drain the lagoon in the past aimed to prevent soil salinization and mitigate flooding. However, these efforts proved ineffective, and the wetland remains integral to regulating floodwaters and preserving soil quality.

Biological Diversity:

Alik boasts high biological diversity, evident in its rich array of plant and animal species. The wetland supports various ecosystems, each characterized by distinct vegetation communities. These ecosystems sustain intricate food webs, contributing to the wetland's ecological resilience and providing recreational, educational, and aesthetic value to society.

Habitat and Plant Community Value:

The ecological diversity of Alik is underscored by its varied plant communities, which define different habitats for fauna. These habitats support diverse animal populations and intricate food chains, enhancing the wetland's ecological integrity and overall biodiversity.

In summary, the Alik Wetland serves as a vital ecological asset, offering invaluable environmental services, supporting diverse flora and fauna, and providing recreational and aesthetic benefits to the local community. Efforts to protect and preserve this unique ecosystem are imperative to safeguarding its ecological and cultural heritage for future generations. challenges, Alik Naxos remains a beacon of ecological resilience, where efforts to preserve and restore its natural splendor are paramount to safeguarding its invaluable biodiversity for generations to come.²³

²³ Zogaris, S., Vlami, V., & Probonas, N. (1996). *Preliminary Study of Environmental Assessment and Management*. Greek Poultry Society.

AUTUMN
52 Bird species



SUMMER
36 Bird species



WINTER
60 Bird species



SPRING
114 Bird species



Ornithological Significance of Alikí Wetland

Alikí Wetland serves as a crucial habitat for birdlife in the Greek islands, despite recent changes. Over the past decade, 122 bird species have been recorded in Alikí, with at least 110 appearing regularly each year. The wetland hosts numerous rare and endangered bird species, making it a vital sanctuary within the South Aegean region.

Key Factors:

Large Area: Alikí’s expansive wetland area provides refuge for diverse bird species requiring extensive habitats free from human disturbance. Additionally, the presence of nearby wetlands on Naxos’s west coast offers alternative habitats for birds when disturbances occur.

Rarity of Habitats: Wetlands like Alikí are scarce in the South Aegean, with many coastal wetlands in Greece destroyed in recent years. The rarity of such habitats increases the importance of remaining wetlands for aquatic and migratory birds.

Habitat Diversity: Alikí’s diverse habitats, ranging from rocky hills to meadows, islets, and the sea, attract a wide variety of bird species with different ecological needs.

High Biological Productivity: The shallow waters of Alikí support high biological productivity, with nutrient-rich sediments brought in by rainwater fostering the growth of algae and plankton, vital food sources for numerous bird species.

Refuge and Migration Route: Situated in a favorable geographical position, Alikí serves as a crucial stop-over for migratory birds, providing essential rest and refueling opportunities during long-distance migrations over the Aegean.

Species Dependence:

A significant number of threatened or protected bird species, totaling 26, are exclusively dependent on Alikí’s wetland habitats, with an additional 8 species partially reliant on these habitats. In total, 55 threatened or protected species observed in Alikí benefit directly from the wetland. Additionally, 48 bird species are entirely dependent on the wetland, while 15 species are partially reliant on it. Overall, at least 72% of bird species observed in Alikí utilize and benefit from its wetland habitats, highlighting its crucial importance for avian biodiversity in the area.²⁴

²⁴ Zogaris, S., Vlami, V., & Probonas, N. (1996). *Preliminary Study of Environmental Assessment and Management*. Greek Poultry Society.

Cultural Importance of Alikí Wetland

Alikí held significant cultural significance in the lives of Chora Naxos and Agios Arsenios inhabitants before drainage efforts in the 1960s. Dating back to the Venetian era, the lagoon served as a vital part of the Venetian Salt Trade and operated as a fish farm for generations.

Referred to as “taliani” during the Turkish occupation, the lagoon was a hub for fishing, particularly for red crabs, clams, and small red shrimps, which were cherished delicacies in Naxos. Locals fondly recall trading agricultural goods for the lagoon’s bounty. However, with the lagoon’s decline, these traditions have faded, leading residents to lament its loss as a “paradise lost.”

Alikí also boasts rich folklore, including legends about the Virgin Mary icon on the islet of the same name, and intriguing toponyms in the area. Moreover, the presence of the ancient Herata archaeological site nearby adds to its cultural allure, inviting further exploration of its historical significance.

²⁵ Zogaris, S., Vlami, V., & Probonas, N. (1996). *Preliminary Study of Environmental Assessment and Management*. Greek Poultry Society.

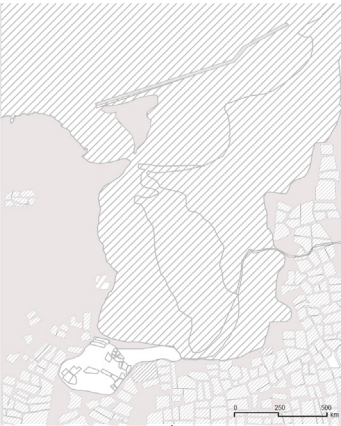
Educational and Scientific Value

Environmental education plays a crucial role in fostering an understanding and appreciation of natural ecosystems. However, in Naxos, there has been a lack of significant efforts in environmental education within schools, leading to relatively low environmental literacy among both citizens and public administrators.

Alikí presents a unique opportunity for environmental education due to its rich biodiversity and easily accessible wetland ecosystem. The diverse array of bird species and vegetation makes Alikí an engaging outdoor classroom for studying ecological interactions. Its proximity to Naxos Town allows for convenient access, making it an ideal destination for educational tours not only for local residents but also for visitors from urban centers like Athens.

With proper management and promotion, Alikí has the potential to serve as a nationally significant site for environmental education, offering valuable insights into the preservation and appreciation of natural environments.²⁵

Time Line



1638

13th-16th century
Alyki was a station of
the Venetian salt trade
(Petanidou, 1987)

1940

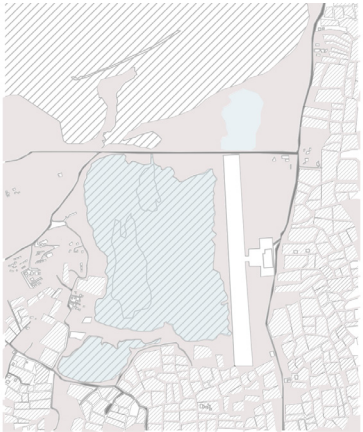
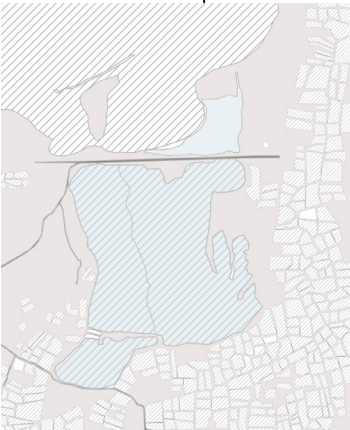
The lagoon was
an important
natural fish farm

1950s

They stopped
operating salt the
1950s, as economically
unprofitable
(Petanidou, 1987)

1960s

A high embankment
was created that
blocked the free entry
of the sea into the
lagoon



1984

The eastern side of
the lagoon marshes
was reclaimed, to
start the construction
of the airport

1996

The only connec-
tion with the sea
are the "doors", the
embankment
blocks it invasion
of the sea

2000-2023

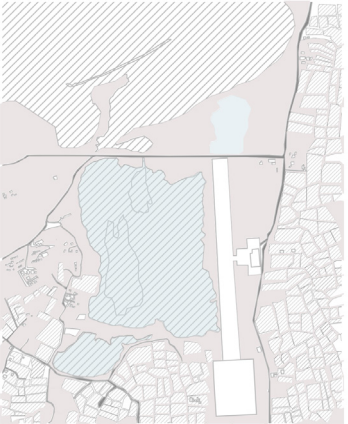
The tourism is
growing really fast,
The area around
the Alyki is becom-
ing very urbanised

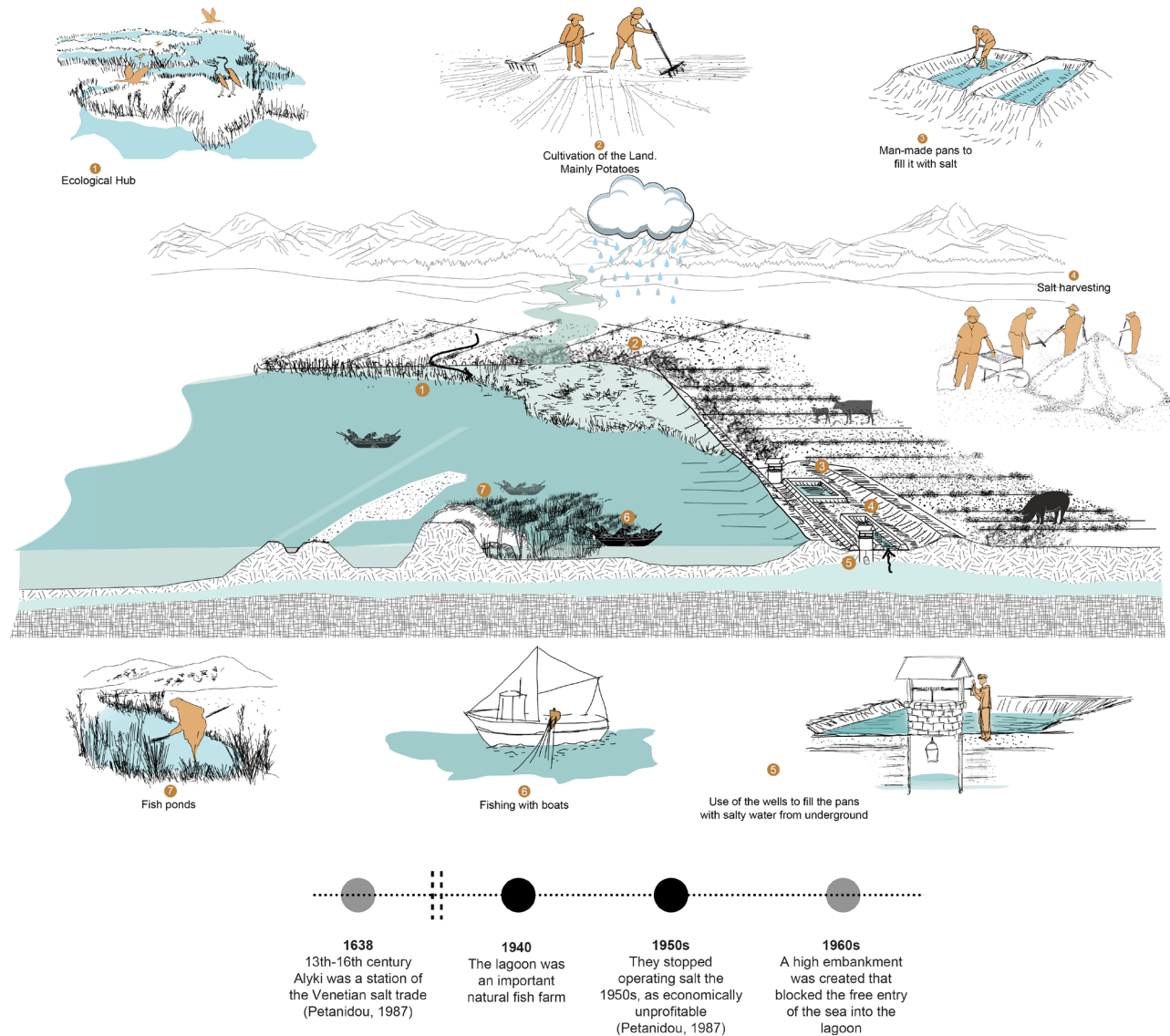
2022

The proposal for
the airport exten-
sion is being ap-
proved

Current situation

The Lagoon is sea-
sonally wet, mean-
ing it goes through
a period covered
with water and a
period when it is
completely dry.





The history of the area

The Alikí Lagoon boasts a captivating geomorphological structure and a rich geological history, tracing back to its evolution from an open lagoonal basin to its present form.

Prior to 1950, the lagoon of Alikí maintained an open connection to the sea. To its east, the Petritsis River flowed from the mountains, supplying the area with fresh water, and significantly contributing to its biodiversity. To the northwest, a fishmarm had formed, while to the southwest of the lake, there was a section dedicated to salt production. For this production, people had wells from which they drew water from the aquifer and filled the “pans,” as they called them, letting them evaporate until salt production began.



GYS (1945)
orinosaxotis.blogspot(2017)
orinosaxotis.blogspot(2017)
vidarchives(n.d.)

The salt production and the fish farm

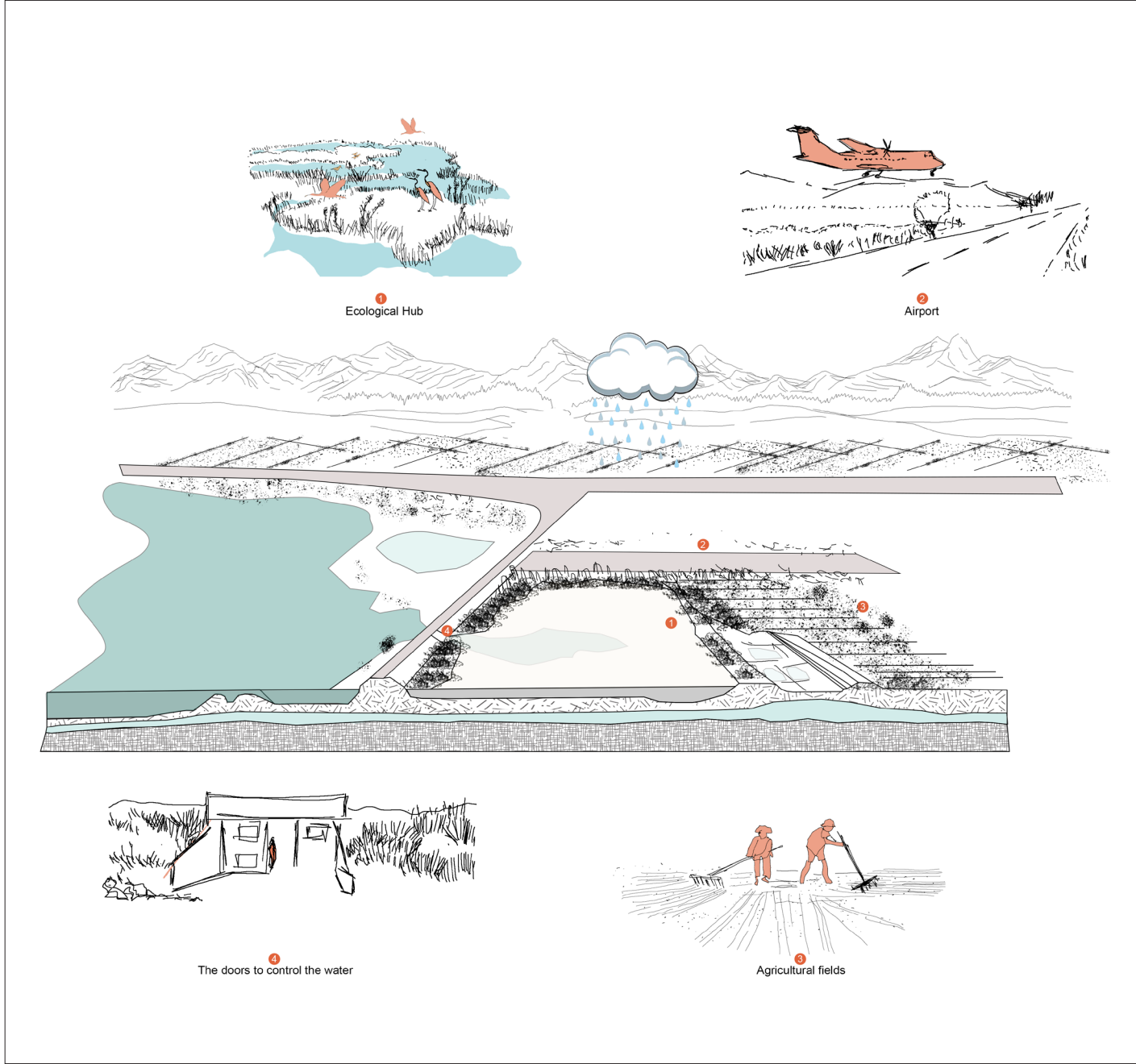
The lagoon area of Alikí has a rich history of salt production, dating back centuries. During the Venetian rule from the 13th to the 16th centuries, Naxos served as a significant station in the Venetian salt trade. The salt pans, covering about 100 acres in the region, were integral to the island’s economy, providing a substantial source of income for the residents of Agios Arsenios.

The salt production process involved dividing the land into small plots called “courtyards,” each separated by low walls. Seawater was channeled into these courtyards, where it underwent evaporation, leaving behind salt deposits. Workers, including people of all ages, engaged in the demanding task of harvesting the salt, which was then transported to various locations in Chora for packaging and distribution.

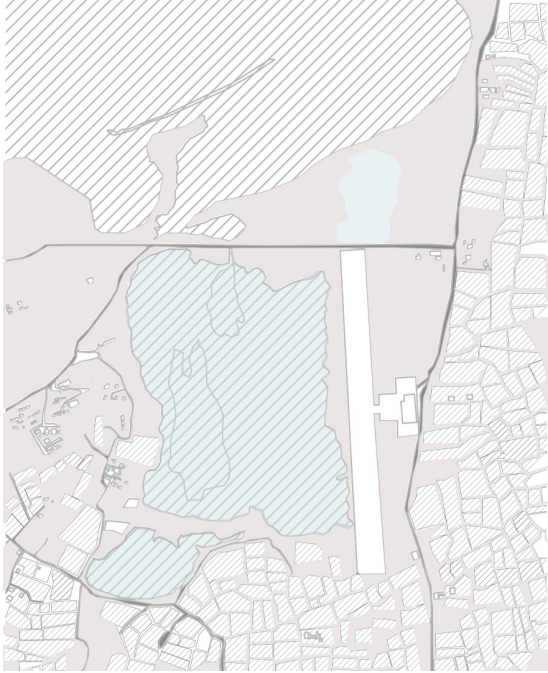
However, by the 1950s, the salt production in Alikí became economically unviable due to advancements in refrigeration technology and the intensification of larger salt mines elsewhere. Consequently, the salt flats were abandoned, marking the end of an era in Naxos’ salt production history.

Additionally, before the war, the Alikí Lagoon served as a renowned natural fish farm, known locally as “the taliani.” Managed by the state and rented through auctions, the fish farm boasted a maze of reed passages and traps at its opening to the sea, facilitating the capture of migrating fish. The fish farm’s production was significant, contributing to local delicacies that have since disappeared.²⁶

²⁶ Zogaris, S., Vlami, V., & Probonas, N. (1996). *Preliminary Study of Environmental Assessment and Management*. Greek Poultry Society.



GYS (2000)
orinosaxotis.blogspot(2017)
Zogaris (1996)
Zogaris (1996)



²⁷ Zogaris, S., Vlami, V., & Probonas, N. (1996). *Preliminary Study of Environmental Assessment and Management*. Greek Poultry Society.

After the dam construction - 1960

However, due to concerns about the potential harm salty water could inflict on the surrounding agricultural fields, a decision was made to partition the lagoon from the sea using a narrow strip, effectively creating a dam. This initiative was further reinforced in 1960 with the construction of a road atop the dam. To regulate the flow of water into the lagoon, two openings with doors were incorporated into the structure. A designated individual was tasked with the responsibility of managing these doors, thus exerting control over the volume of water permitted to enter and fill the lake.

Aerial photographs from the 1960s vividly depict its previous state, where it served as a narrow inlet nestled between the Stellida peninsula and the Livadi plain.

This metamorphosis has shaped Aliko into a complex ecosystem, influenced by its geological evolution, coastal dynamics, and the interplay of alluvial deposits from streams. Seasonal rainfall, although modest in the Livadi region, concentrates runoff from the western slopes of the Naxian mountains, replenishing the lagoon with freshwater from October through March. However, the construction of an artificial embankment, colloquially known as the “dam,” has limited the intrusion of seawater, maintaining a brackish environment within the lagoon.

Moreover, the surrounding plain of Livadi, endowed with ample underground water resources, nurtures marshes around the lagoon basin, creating conducive wetland conditions. Geological diversity further characterizes the lagoon, with sandy deposits dominating its core, interspersed with layers of minerals like chert and gypsum. Alluvial soils cloak its shores, while clay deposits accentuate the southwestern quadrant, merging seamlessly with the rocky terrain of the Stellida Peninsula.

The establishment of the Naxos airport adjacent to the lagoon further reshaped the landscape, initiating in 1984 with the reclamation of marshy areas on the eastern periphery. This endeavor, while facilitating transportation and tourism, altered the ecological dynamics of the wetland, prompting concerns about environmental conservation and sustainable land use.²⁷

The values of Aliki today

Aliki, a landscape of unique beauty and significance, holds enduring value today. Situated near one of the island's main entrances—the airport—within its busiest area, Aliki attracts numerous visitors, serving as a gateway and focal point for tourism. Despite suffering from environmental degradation due to misuse and neglect, it remains a crucial habitat for unique species of flora and fauna in the Cyclades.

Currently, Aliki exemplifies the tension between traditional livelihoods, tourism development, and environmental conservation. While tourism has brought economic benefits, it has also led to ecological damage and cultural shifts. Protecting Aliki's ecological integrity is vital, requiring efforts to balance competing interests and preserve its natural heritage.

Aliki's intrinsic value endures, emphasizing the need for informed stewardship and collective action. The lagoon's resilience and cultural significance call for a holistic approach to land management, harmonizing human activities with ecological sustainability and heritage preservation. Aliki's importance as a natural habitat and touristic asset, along with its strategic location, underscores the necessity for sustainable tourism practices and balanced strategies. This approach will ensure Aliki remains a vital landscape for future generations.

Figure 25: Aerial view of the Aliki lagoon, airport and on the background, Naxos Town



Naxos International Airport

Naxos Island National Airport, located on the largest of the Cyclades islands in Greece, is a modest yet essential transportation hub that connects the picturesque island with the mainland. Despite its small size and limited capacity, the airport plays a vital role in facilitating the flow of tourists and residents to and from this popular destination, especially during the busy summer months when tourism peaks.

Location and Access

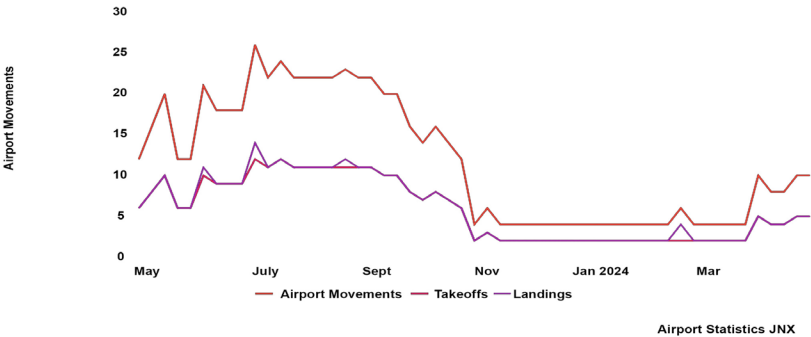
The airport is situated just a few kilometers from Naxos Town (Chora), making it easily accessible for travelers. However, its presence is rather understated. The main road from Naxos Town to the coastal villages like Agios Prokopios, Agia Anna, and Plaka passes right by the airport, but you might not realize it due to the lack of prominent signage. The only indication of the airport’s location is a solitary traffic light, which serves as a subtle yet critical signal to motorists about the potential overhead passage of aircraft during takeoff or landing.

Infrastructure and Facilities

Naxos Airport covers an area of 19 hectares and features a single runway, which accommodates the modest number of flights it handles daily. The runway’s orientation and proximity to the road create a unique scenario where planes take off and land just above the highway, offering a dramatic and somewhat unnerving spectacle for both drivers and passengers.

The airport primarily handles domestic flights, with regular services to and from Athens and Thessaloniki. These flights are crucial for maintaining the island’s connectivity with the rest of Greece, particularly during the winter months when ferry services are less frequent. The terminal facilities are basic, reflecting the airport’s small scale and the short duration of the flights it accommodates. Despite this, the airport staff are known for their friendliness and efficiency, ensuring a smooth travel experience for passengers. ²⁸

²⁸ Gavras, D. (2021). *Marketing research in tourism during a pandemic period: The case of Naxos*. University of Piraeus, Department of Business Administration, Graduate Program in Business Administration - Tourism Management.



Existing Situation



WET SEASON
November to March

DRY SEASON
June to September

The wetland, once a thriving ecosystem, has experienced significant changes over the years due to various human activities and the impacts of climate change. Extended droughts have transformed it into a seasonal lake, holding water for only a brief period during the winter and suffering prolonged dry spells for the remainder of the year.

Water enters the lake from multiple sources: the sea, through a small opening beneath a dam; rainfall; and a relatively high aquifer. These varying sources contribute to the lake's water being either salty or brackish, depending on the season. This fluctuating salinity reflects the complex interplay between natural forces and human influence, highlighting the challenges faced by the wetland in maintaining its ecological balance.

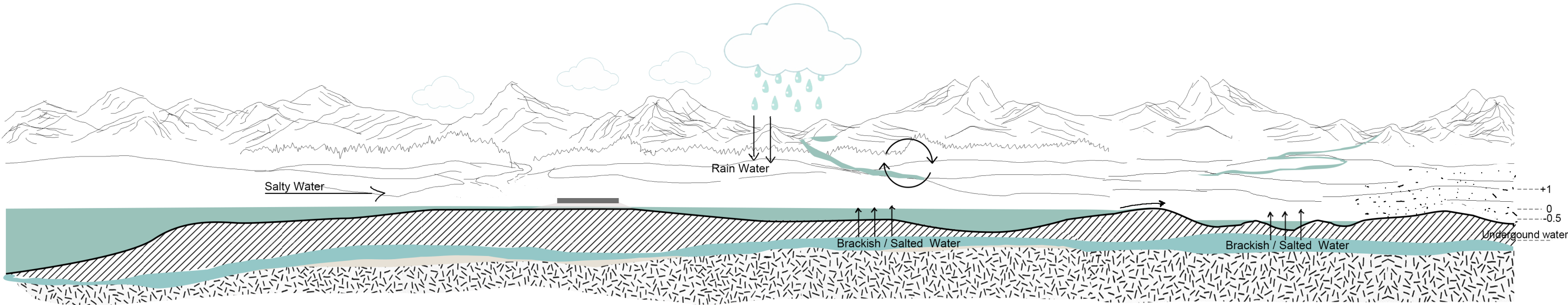




Figure 29: Aerial view of the laguna coast and Aliko wetland

Summary Part II-III

The wetlands of Naxos play a critical role in the island’s ecosystem, supporting a diverse range of flora and fauna while providing essential services such as water filtration and flood control. These wetlands face numerous threats, including human activities like excavation, pollution, and urban development, leading to their rapid degradation. Despite being located within protected areas, many wetlands lack adequate environmental management and protection.

Among these wetlands, Alikí stands out as the largest and most significant in the Cyclades, serving as a vital sanctuary for a plethora of plant and animal species. Despite facing challenges such as the construction of the Naxos airport and illegal activities like hunting and pollution, Alikí remains a beacon of ecological resilience. Its geographical location, nestled just south of Naxos Town, juxtaposes its natural splendor with urban development, making it a unique site for investigation and restoration.

Alikí’s ecological importance extends beyond its role as a habitat for wildlife; it offers valuable environmental services, supports diverse flora and fauna, and provides recreational and aesthetic benefits to the local

community. Efforts to protect and preserve Alikí are crucial for safeguarding its ecological and cultural heritage for future generations. Its significance as a stopping point on major migratory routes in the central Aegean underscores its importance for avian biodiversity in the region. Moreover, Alikí’s rich history, from its role in the Venetian salt trade to its significance as a natural fish farm, adds to its cultural allure and educational value.

In conclusion, Alikí Wetland stands as a testament to the intricate interplay between environmental conservation, economic progress, and cultural heritage preservation. Its restoration and harmonious integration with the contemporary challenges facing Naxos offer a compelling opportunity for proactive stewardship and collaborative initiatives. The strategic location of Alikí, prominently visible to travelers arriving at Naxos airport, underscores its potential as a gateway to a new network of wetlands across the island. Establishing Alikí as the starting point for this network not only highlights its ecological significance but also enhances its role as a focal point for environmental education, ecotourism, and sustainable development.



Figure 30: Aliko Wetland in winter, Aerial View



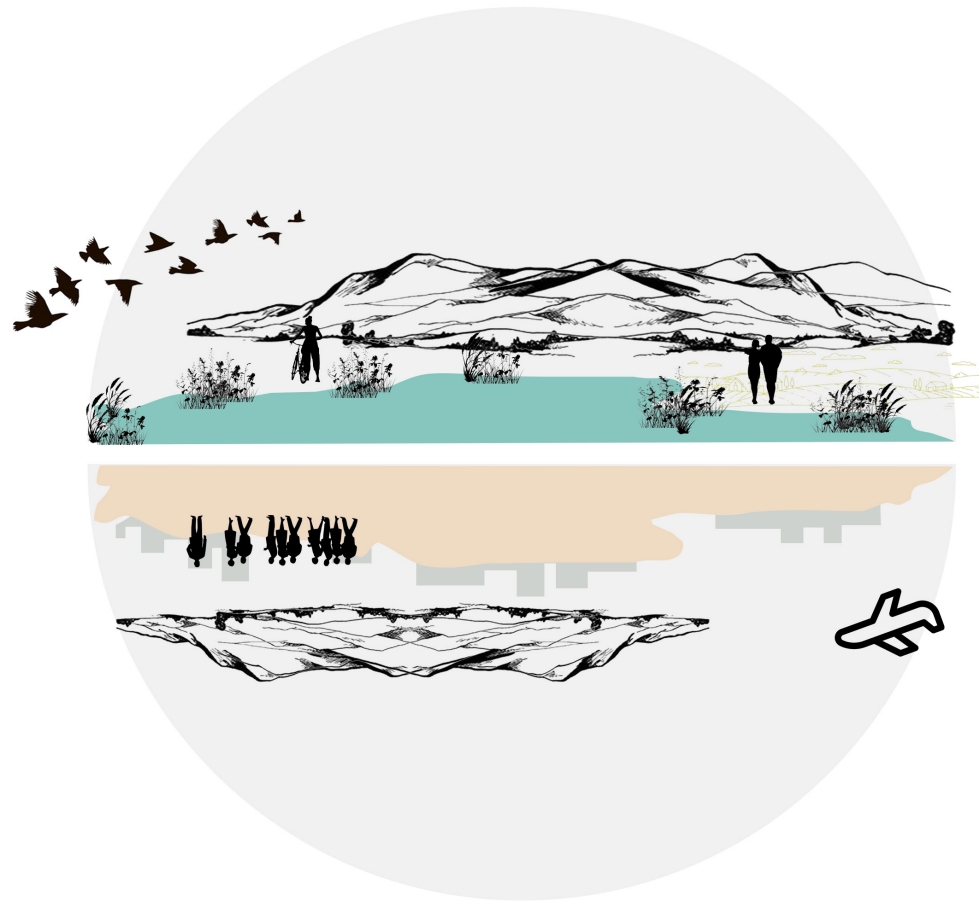
Figure 31: Aliko Wetland in summer, Aerial View

Figure 32: Plot next to Aliko wetland used as a garbage dump
Figure 33: Wetlands of S. Prokopis used as parking areas



Problem Statement

The environmental challenges confronting Naxos, akin to other Cyclades Islands, are intricately linked to shifts in land use and spatial management. A particularly urgent issue is the continuous degradation of Aliko Lagoon, the largest natural coastal wetland in the Cyclades and a vital habitat for avifauna in the South Aegean Region. Covering approximately 924 hectares, this wetland faces imminent extinction, exacerbated by state projects and insufficient recognition of its ecological significance by the local community. Despite its potential for environmental education, nature tourism, and recreation, Aliko has suffered from misguided attempts to drain it in the 1960s and subsequent degradation due to the construction of Naxos Airport and unregulated logging in the 1980s. The pressing problem statement revolves around the imperative to address and reverse the ongoing deterioration of Aliko Lagoon, emphasizing the crucial role of informed local engagement and sustainable practices in preserving this essential natural ecosystem. Moreover, with the majority of the island's population and tourist activity concentrated in specific areas, including Naxos Town and S. Prokopis, there exists a pressing need to shift perspectives on wetlands from neglected areas to valued ecological and recreational assets. By focusing on Aliko as a prototype for sustainable development, this thesis aims to create a network of interconnected wetlands that offer visitors a new and enriching experience of the island while preserving biodiversity and integrating cultural and natural elements.



After extensive analysis and problem formulation, the following research question emerges:

*How can **landscape architectonic principles** be employed to create a more **resilient synergy and spatial integration** between **modern developments** and **nature preservation** in the Alikí Wetland in Naxos?*

Methodology

The **literature review** extensively explored various aspects of the Aegean archipelago and Cyclades complex, with a particular emphasis on Naxos, encompassing both cultural and natural dimensions. Wetland types prevalent in these islands were analyzed thoroughly for their ecological significance. Additionally, the study delved into ongoing urbanization trends, contemporary tourist approaches, and alternative tourism forms as potential solutions to emerging challenges. Ornithological and ecological studies provided valuable insights into bird migratory patterns, thereby contributing to a broader understanding of biodiversity. Furthermore, a critical investigation into coastal transformations due to climate change in the Aegean archipelago and a study on water management in the Cyclades islands were undertaken.

Alongside this comprehensive literature review, **fieldwork** was conducted, focusing on exploring the Alikí wetland, its surrounding landscape fea-

tures, and other wetlands on the west side of the island across different seasons. Summer visits involved thorough exploration and the collection of aerial photographs, showcasing diverse vegetation. Winter revisits captured a distinct period marked by off-season tourism, illustrating the site's transformation into a crucial migratory bird stopover. Interviews were conducted across various age groups to gain insights into past experiences, interactions, and current perspectives on the Alikí lagoon. Additionally, meetings were held with individuals managing non-profit organizations and with municipal representatives to understand their perspectives on the site through discussions.

The research also drew significant inspiration from the **broader concept of an archipelago** and similar proposals originating from preserved wetland sites. Unfortunately, such sites often go unrecognized by municipalities and are consis-

tently degraded by indifferent individuals. Therefore, for the proposed design at both regional and local scales, careful consideration was given to several factors:

- Analyzing the existing terrain of the region to establish experiential connections.
- Examining the existing tourism model to propose activities that maintain interest throughout the year, mitigating the stark contrast between peak and off-peak periods.
- Understanding the hydrology of the wetlands to create suitable conditions for water restoration.
- Considering the seasonality of flora and fauna, as well as bird migratory periods, to incorporate bird-watching activities.
- Examining spatial characteristics to design areas for overnight stays or gathering places that do not disrupt wildlife.

Implementing measures to address threats from external factors, such as airport noise, in a manner that minimizes disruption to the area's wildlife.

The design process involved significant consideration of various scales, ranging from the broader context of the Archipelago down to the specific scale of a single wetland. This **multi-scale approach** was crucial in developing a comprehensive understanding of the landscape and its dynamics. By working across different scales, landscape architects can appreciate the interconnectedness of various elements within the landscape, identify overarching patterns and challenges, and tailor interventions that are contextually appropriate and sustainable. Additionally, it allows for the development of holistic solutions that address both local needs and broader environmental concerns, ensuring the long-term resilience and vitality of the landscape.

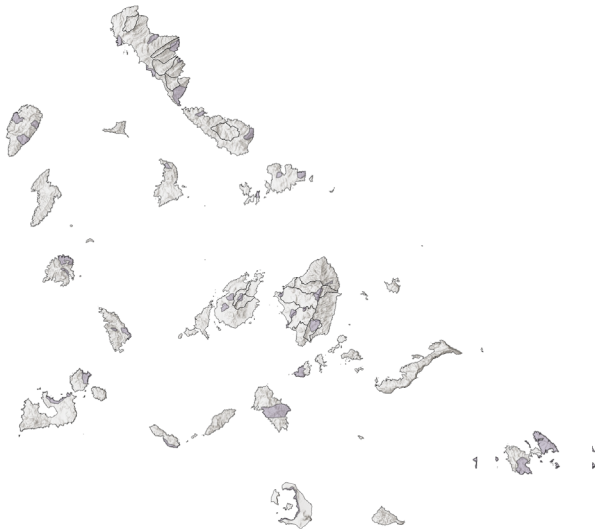
Part IV
The Proposal

The different scales of the design process

For the current thesis, a comprehensive theoretical study has been conducted. This study clarifies all the parameters necessary for a thorough understanding of the design background. It delves into the historical overview of the area and the chronology of landscape changes, as well as highlights the role of humans in landscape shaping throughout historical periods. Moreover, it proposes measures for the protection of the area based on its specific characteristics and the broader environmental context. Furthermore, it suggests a holistic plan derived from the inherent needs of the area. Finally, it recommends a design for the specific area where most of the aforementioned parameters and challenges are encountered, aiming to resolve them.

Thus, to formulate the proposals, I have worked on four scales: the broader scale of the Archipelago, to comprehend the broader context to which Naxos island belongs; the scale of the island, to understand the broader framework influencing the specific characteristics and to develop a framework inspiring multiple proposals; the regional scale, for the development of the wetland network and the proposal of cognitive and realistic connectivity; and finally, the scale of a single wetland, where, apart from analysis and strategies, the design proposal will be meticulously studied.

Archipelago Scale



ANALYSIS AND
STRATEGY

Island Scale



ANALYSIS AND
STRATEGY

Regional Scale



ANALYSIS,
STRATEGY AND
PRINCIPLES

Wetland Scale



ANALYSIS,
STRATEGY, AND
PRINCIPLES

Design Concept

The primary objective of my thesis is to advocate for sustainable development on Naxos Island, both in terms of its natural environment and cultural heritage. This entails fostering a harmonious relationship between human activity and the island's ecosystems while enhancing the visitor experience. My design goal is to establish a network connecting the island's wetlands, offering visitors a novel way to engage with Naxos's natural beauty and cultural tapestry.

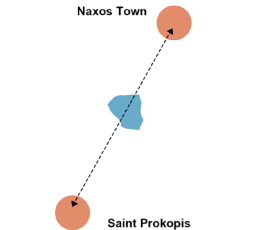
To achieve this, my approach begins with Aliki, a wetland of significant ecological and cultural value. By prioritizing the protection and restoration of Aliki as a prototype, we can develop and refine strategies that can be applied to other wetlands across the island. This initial focus allows us to tackle challenges head-on and establish best practices for wetland conservation and sustainable tourism development.

At the scale of the individual wetland, my design emphasizes integration into the surrounding environment. Aliki serves as a connector between urban areas, showcasing how wetlands can function as green corridors that enhance biodiversity, mitigate pollution, and provide recreational opportunities. This approach not only protects the wetland but also enhances its ecological functions while improving the quality of life for local communities.

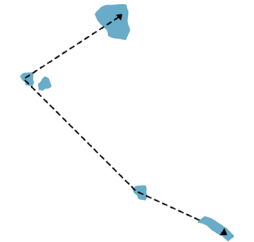
Moving beyond the individual wetland, my thesis explores how Aliki and other wetlands can be integrated into a larger system that transforms the way people experience life on the island. By incorporating wetlands into broader ecological and cultural networks, we can create immersive experiences that highlight Naxos's unique natural and cultural heritage. This holistic approach ensures that wetlands become integral components of the island's identity and tourism offerings.

Finally, this plan is part of a larger framework that embraces Naxos's scale eco-touristic approach. By promoting sustainable tourism practices and preserving the island's natural and cultural assets, we can safeguard Naxos's future while providing meaningful experiences for visitors. This framework encompasses initiatives that prioritize conservation, community engagement, and responsible tourism development, ensuring that Naxos remains a vibrant and resilient destination for generations to come.

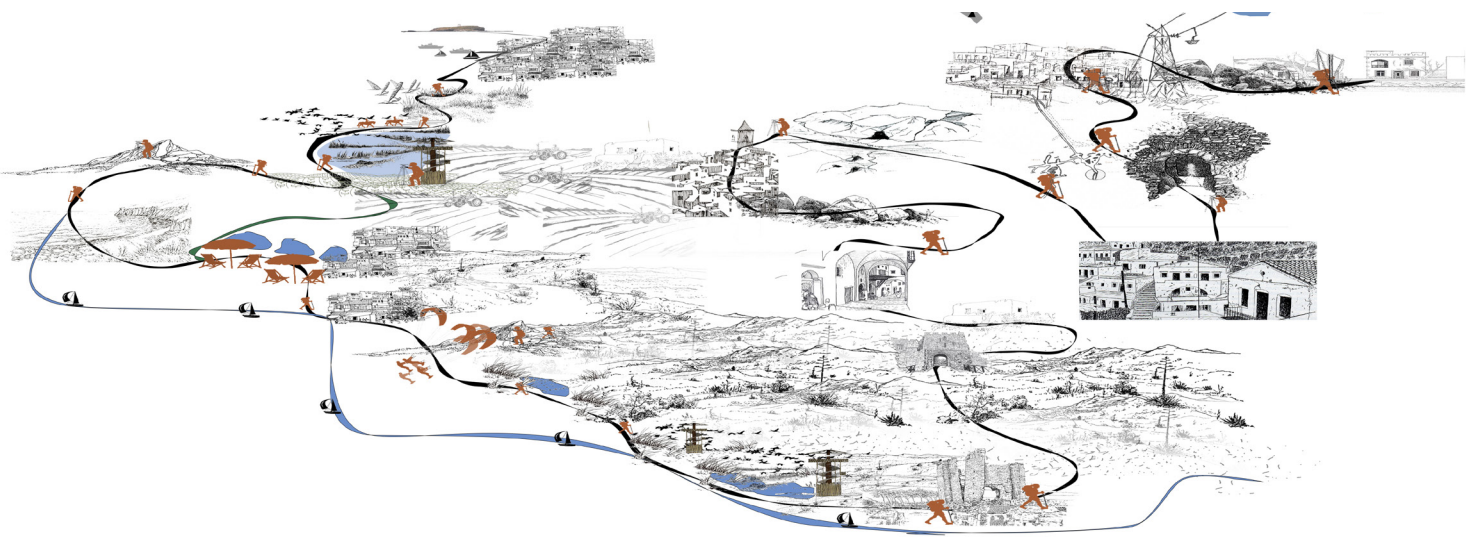
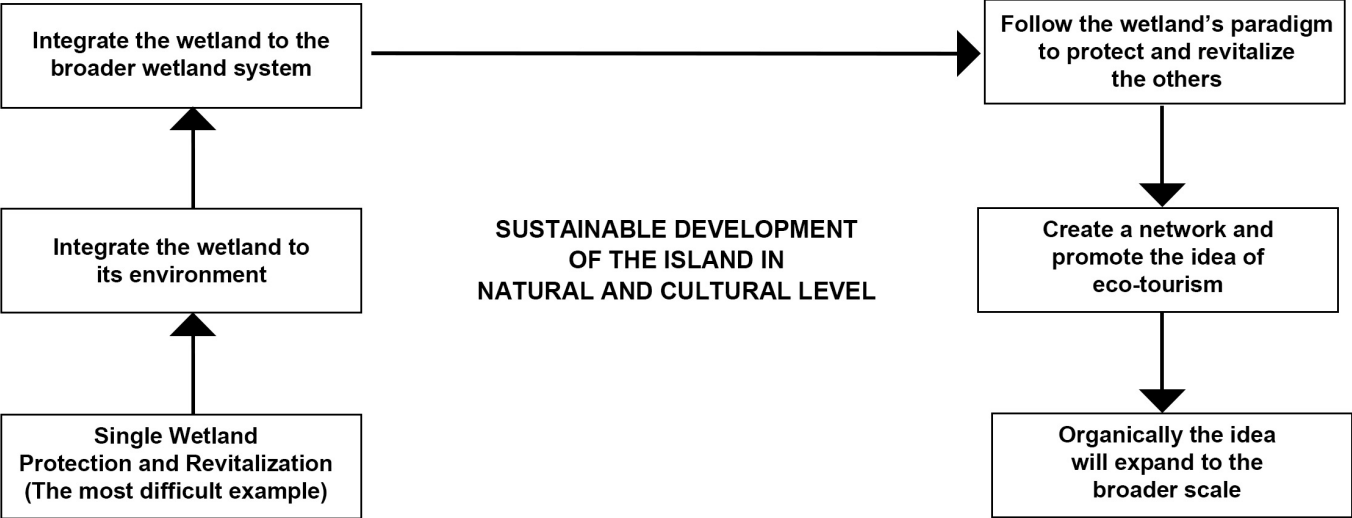
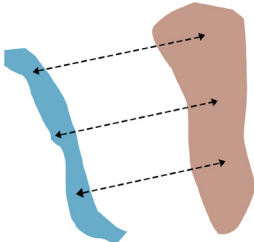
Landscape Transformaitons
in and around the Aliki Lagoon



Recreational Seasonal Connections
Wetland Networks



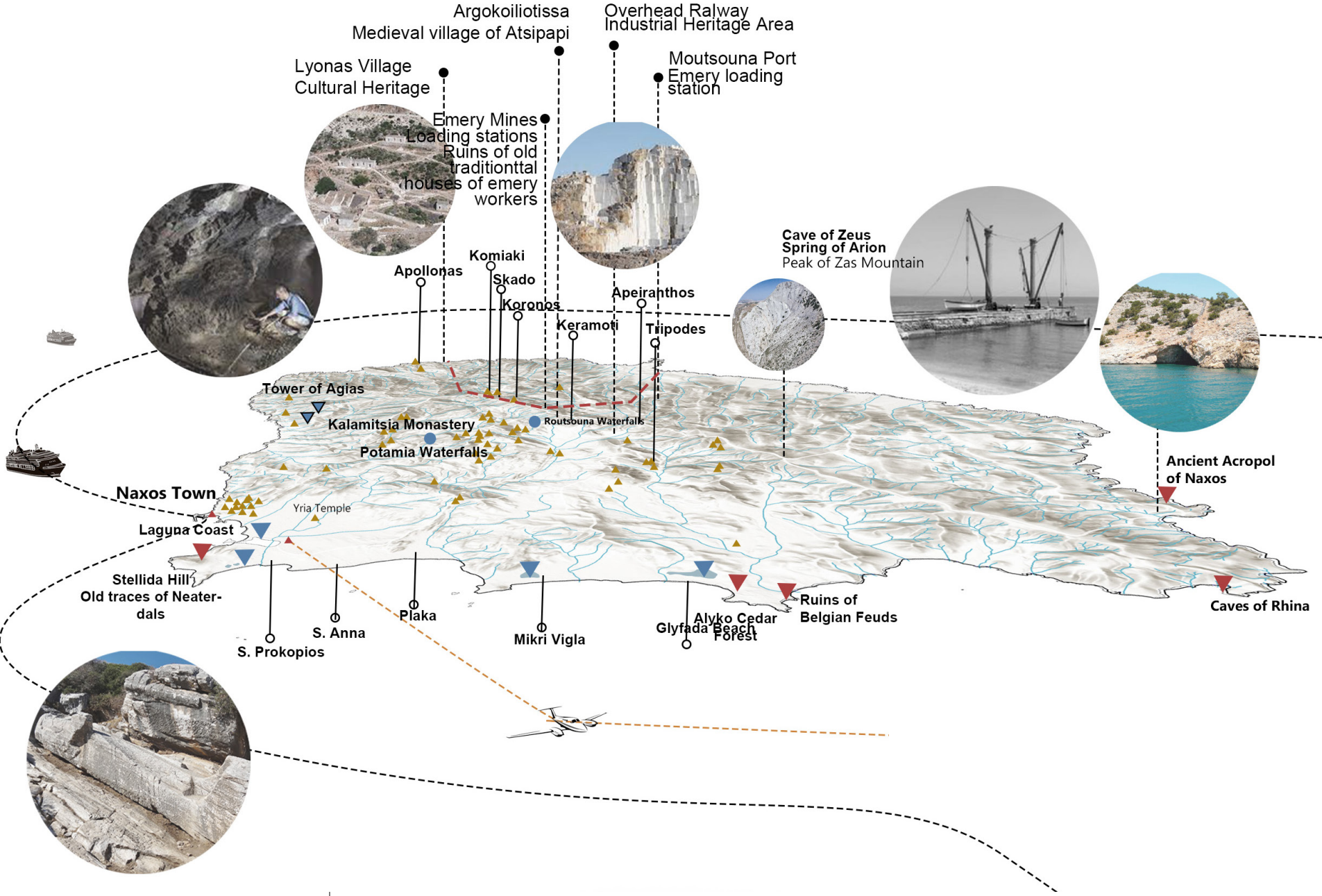
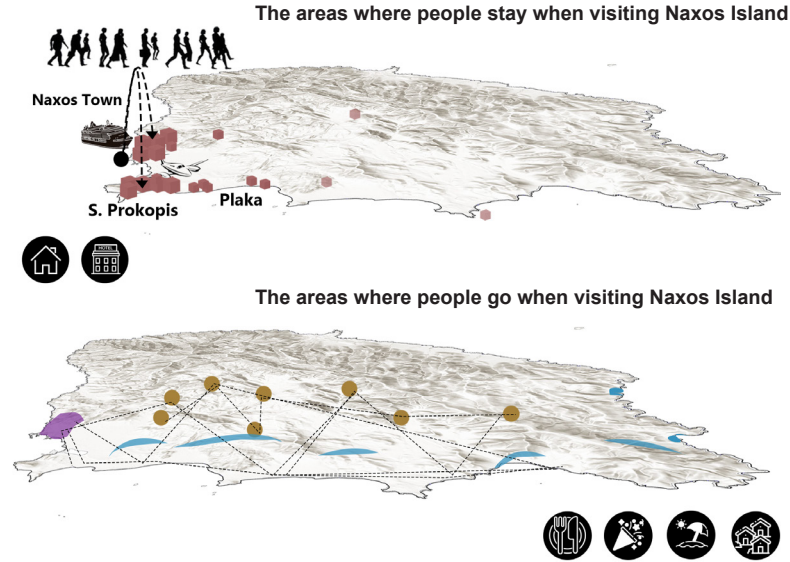
Recreational Seasonal Connections
Eco-touristic Approach



Resilient touristic model promoting eco tourism
Framework for Naxos island

As the analysis indicates, Naxos Island offers a distinctive blend of cultural heritage and natural landscapes, presenting numerous hidden treasures across its varied terrain. From the historic mining sites dotting the mountainous regions to the picturesque traditional villages nestled amid lush greenery, each locale tells a rich story of the island's past. The prominent marble quarries stand as testaments to the island's industrial heritage, while the expanses of agricultural fields reflect its agricultural traditions. Further exploration reveals hidden caves, like the famous cave of Zas, providing insights into the island's both geological history and mythology. Along the coastlines, an array of sea sports activities serve enthusiasts seeking adventure against the background of stunning seascapes. In essence, Naxos provides a diverse array of experiences, awaiting discovery by discerning travelers.

Therefore, the combination of the rich cultural environment within the inner island, the diverse natural sites in the mountainous areas and along the coastlines, as well as the presence of traditional elements scattered throughout, forms a unique system that possesses all the essential components to develop a robust eco-tourism concept.



Eco-tourism Development

Landscape Contribution

As a landscape architect, through the proposal for the redevelopment of the western side of the island focusing on showcasing its natural wealth, specifically the wetlands, I aim to develop an ecotourism model. This model intends to alleviate the enormous burden of tourists who visit the island each year during the months of July and August.

Thus, the framework includes, beyond the design of infrastructure connections and activities, specific landscape interventions, and certain actions that address the **social aspect**, ensuring that the community embraces and supports the project through **cultural initiatives**.

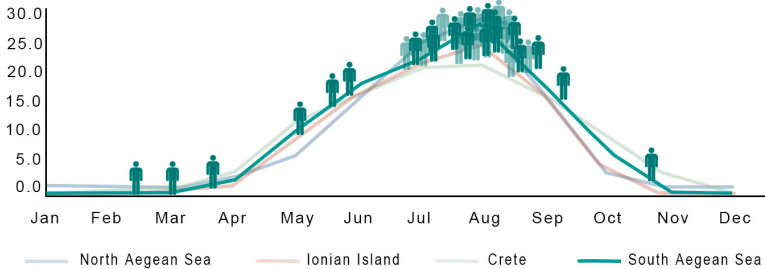


Flattening the Tourism Curve through eco-tourism
Sustainable Approach to Year-Round Ecotourism

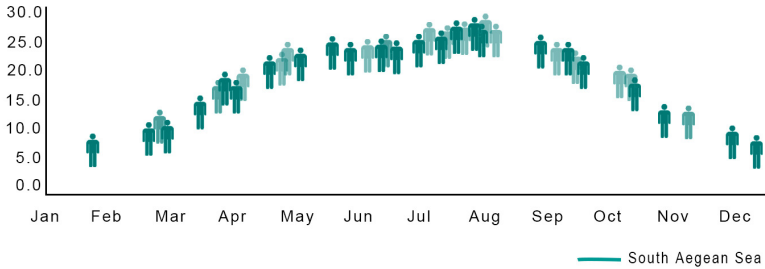
Alternative tourism can flatten the tourism curve by extending attractions beyond peak summer months, distributing visitors more evenly throughout the year. Developing off-season activities like eco-tourism, cultural events, and wellness retreats will draw diverse tourists seeking varied experiences. Supported by targeted marketing, community engagement, and improved infrastructure, this strategy will boost off-season revenue and reduce the strain of seasonal overcrowding, fostering a more sustainable tourism industry

Diagram (1) depicts the current situation in the Cyclades islands (southern Aegean), as well as in some other indicative clusters such as the Ionian Islands, the northern Aegean islands, and Crete. We observe that, with small variations, the pressure on these islands during July and August is significantly higher compared to the rest of the year. This uneven distribution, which is somewhat natural and desirable since islands are globally recognized summer destinations, has, over the years, resulted in immense pressure on these islands, which lack the infrastructure to support it. Consequently, there is significant degradation of coastal areas, with continuous new constructions without planning and pre-study, encroaching on the natural landscape and exhausting every natural resource to meet the demands.

The proposed plan (2) aims to smooth out this phenomenon, striving for a more even distribution of the population throughout the year, thereby easing, or at least not worsening, the peak of tourist activity during the summer months. The goal is to highlight aspects of the islands that flourish in other seasons, such as spring and autumn, seeking to attract additional tourism in the coming years without further burdening the existing summer peak but rather balancing the demand curve. This approach would eliminate the need for further infrastructure, such as hotels, by utilizing existing ones, thus also offering an extended work period for locals employed in the tourism sector.



Monthly concentration of overnights in island sample (2008-2018), Ruggieri, G.; Platania, M. Islands' Tourism Seasonality: A Data Analysis of Mediterranean Islands' Tourism Comparing Seasonality Indicators (2008-2018). Sustainability 2024, 16, 3674.



Proposed monthly concentration of overnights in Naxos

Sustainable Approach to Mitigate Potential Negative Impacts

Enhance Infrastructure

- Accommodation: Encourage hotels and resorts to offer off-season packages and deals.
- Transportation: Ensure convenient transportation options are available year-round.

Season-Specific

- Highlight Off-Season Benefits: Emphasize the unique wildlife phenomena that occur specifically during the off-peak seasons, such as bird migrations in the spring and fall, and the presence of certain marine species during cooler months

Timed Infrastructure Development

- Seasonal Availability: Design infrastructure such as observation decks, guided tours, and educational programs to be most accessible and prominent during off-peak seasons.

Organize Special Events and Festivals

- Off-Season Events: Organize wildlife festivals, seasonal photography workshops, workshops, conservation volunteer opportunities that are not available during the summer.

Collaboration with Tour Operators

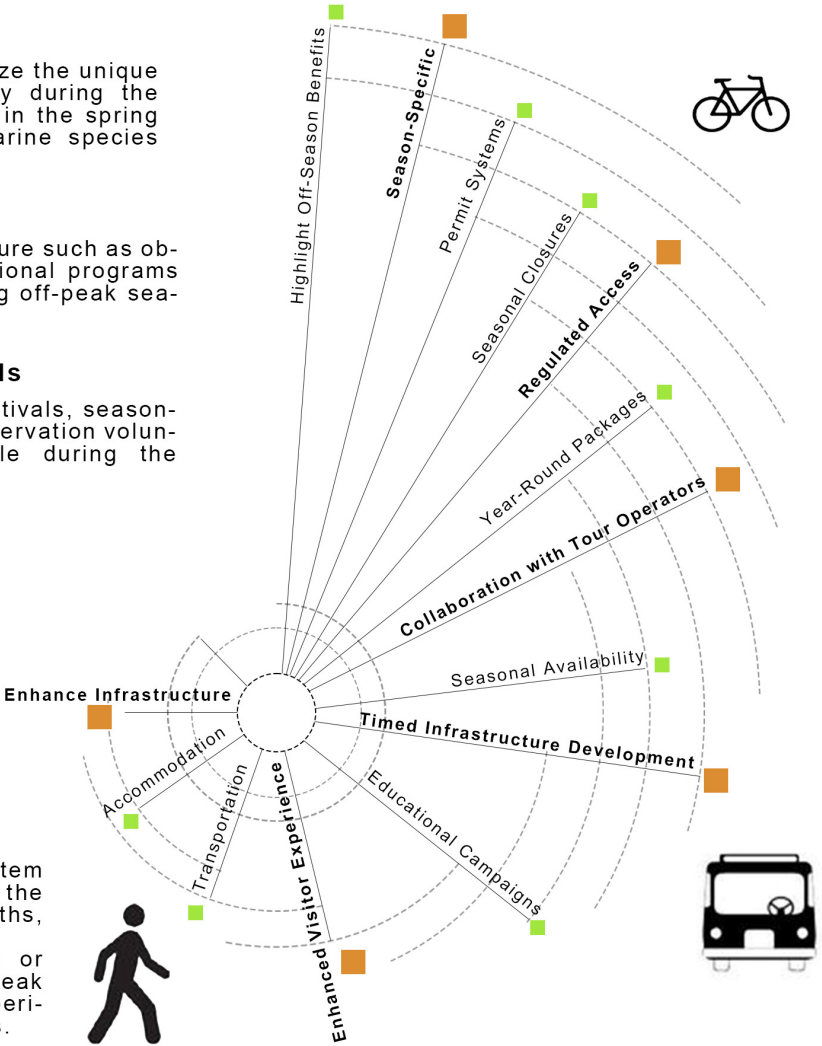
- Year-Round Packages: Work with tour operators to create attractive year-round travel packages.

Enhanced Visitor Experience

- Educational Campaigns: Educate potential visitors about the benefits of visiting during off-peak times

Regulated Access

- Permit Systems: Implement a permit system for certain wildlife attractions that limits the number of visitors during peak summer months, redirecting demand to off-peak seasons.
- Seasonal Closures: Temporarily close or limit access to some wildlife sites during peak summer months, ensuring that the full experience is available only during off-peak times.



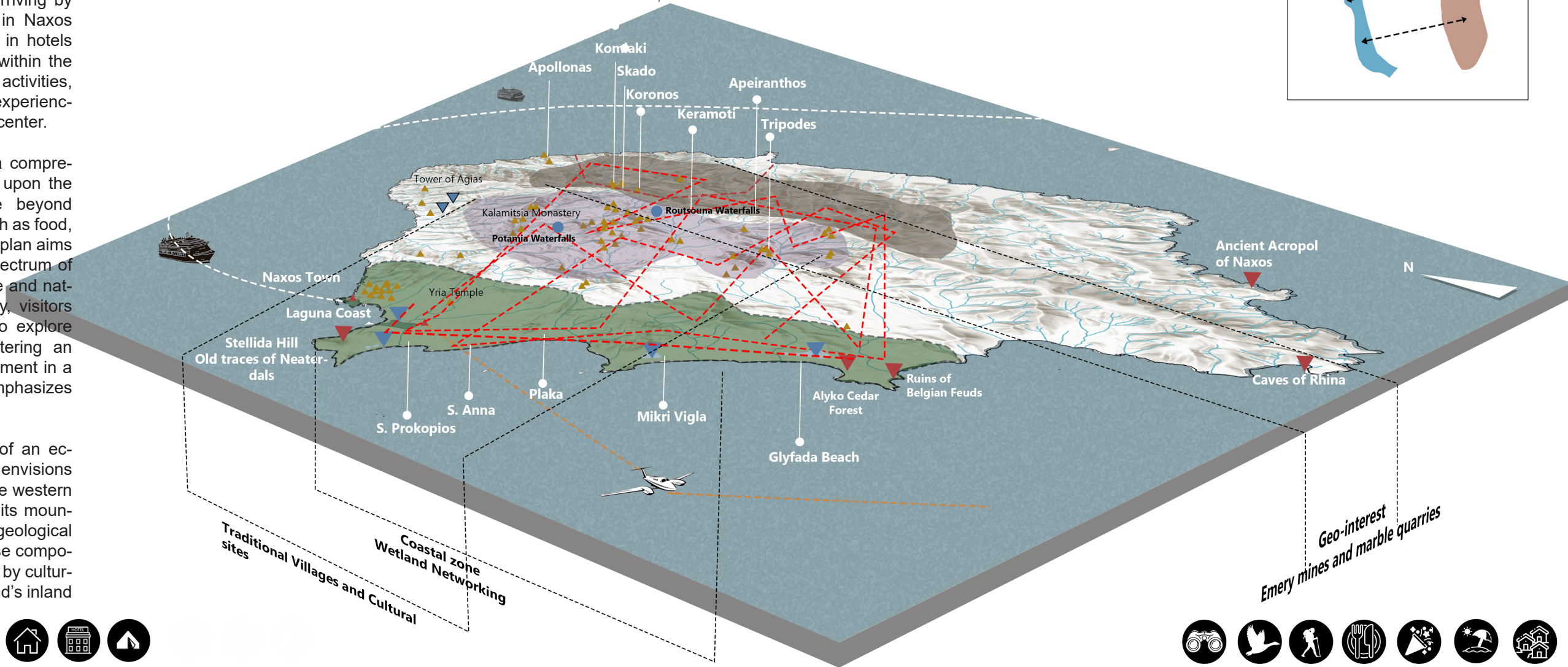
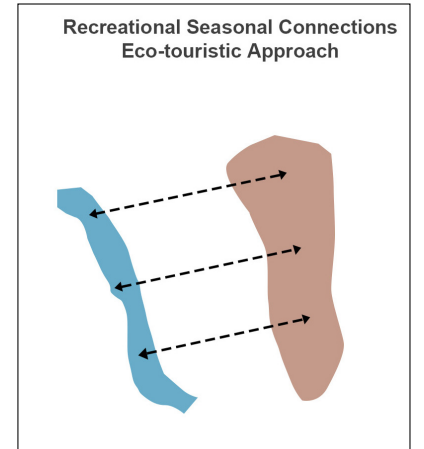
Resilient touristic model promoting eco tourism

How can this ecotouristic model can evolve?

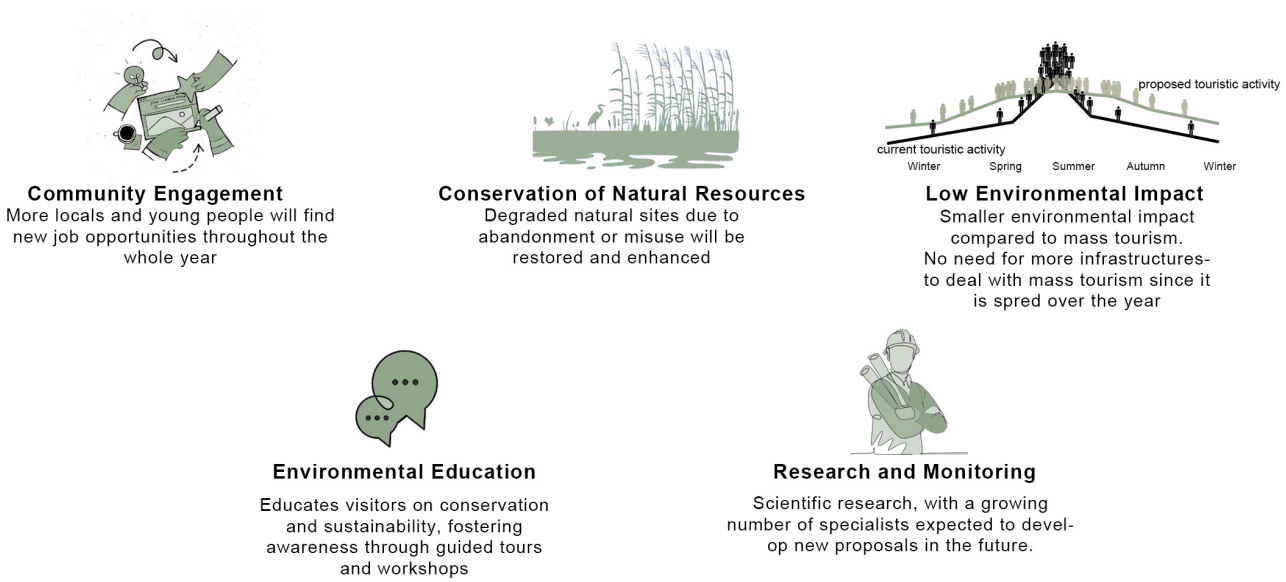
The current scenario on Naxos Island primarily involves visitors arriving by boats or planes stationed in Naxos Town. They typically lodge in hotels or rental accommodations within the town and engage in beach activities, dining in local villages, and experiencing the nightlife in the town center.

My objective is to devise a comprehensive plan that expands upon the island's visitor experience beyond conventional attractions such as food, beaches, and nightlife. This plan aims to incorporate a broader spectrum of the island's cultural heritage and natural wonders. Consequently, visitors will have the opportunity to explore pristine natural areas, fostering an appreciation for the environment in a sustainable manner that emphasizes conservation.

Through the development of an ecotourism model, the plan envisions the organic integration of the western coast of Naxos Island with its mountainous natural sites of geological significance. Moreover, these components will be interconnected by cultural routes traversing the island's inland areas.



Positive Natural and Cultural effects of the ecotouristic plan



Negative Natural and Cultural effects of the ecotouristic plan



The eco-tourism plan for Naxos Island presents a nuanced array of **positive** impacts.

Beginning with the positives, community engagement stands out prominently. The initiative is poised to create numerous job opportunities for locals and youth, ensuring sustained employment throughout the year rather than the seasonal spikes typical of traditional tourism. Furthermore, the plan entails the restoration and enhancement of natural sites, addressing years of degradation due to abandonment and misuse. This restoration not only preserves the island’s beauty but also provides visitors with the opportunity to intimately connect with nature.

Moreover, eco-tourism boasts a significantly reduced environmental footprint compared to mass tourism. By dispersing tourists across the year instead of congregating them solely during peak seasons like August, Naxos can mitigate the need for excessive infrastructure expansion. Additionally, the emphasis on education and awareness, facilitated through guided tours and workshops, promises to instill a culture of conservation and sustainability among both visitors and locals.

Lastly, the eco-tourism plan offers a platform for scientific exploration, fostering opportunities for specialized research and the development of innovative proposals in the future.

However, the eco-touristic plan also carries some **negative natural** and cultural implications.

Firstly, while the plan aims to attract a varied influx of tourists, the unpredictability of visitor numbers may result in periods of high tourism activity. Without effective management, these peaks could strain local resources and infrastructure.

Moreover, the unveiling of hidden natural sites poses a risk of pollution and misuse if not carefully monitored and maintained by responsible authorities.

Effective cooperation among local communities is crucial to maximize the benefits of the plan and ensure the overall prosperity of the island.

Lastly, it’s imperative to prioritize the collective wealth and well-being of the community and the island over individual prosperity. This approach fosters sustainable development and long-term resilience.

The approach of the design at the South-West Naxos

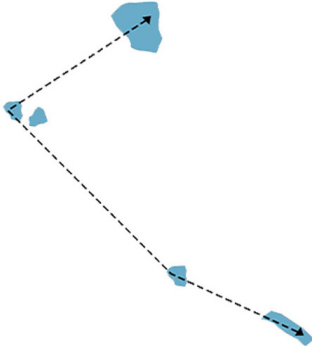
The Wetlands seasonal networking

A pivotal aspect of the design approach revolves around the development of a comprehensive plan focused on ecotourism, deeply rooted in the distinctive cultural essence that underpins the broader spectrum of tourism. At the core of this approach lies the creation of a prototype design model that intricately links together the various wetlands scattered across the centralwestern to southwestern expanse of Naxos Island.

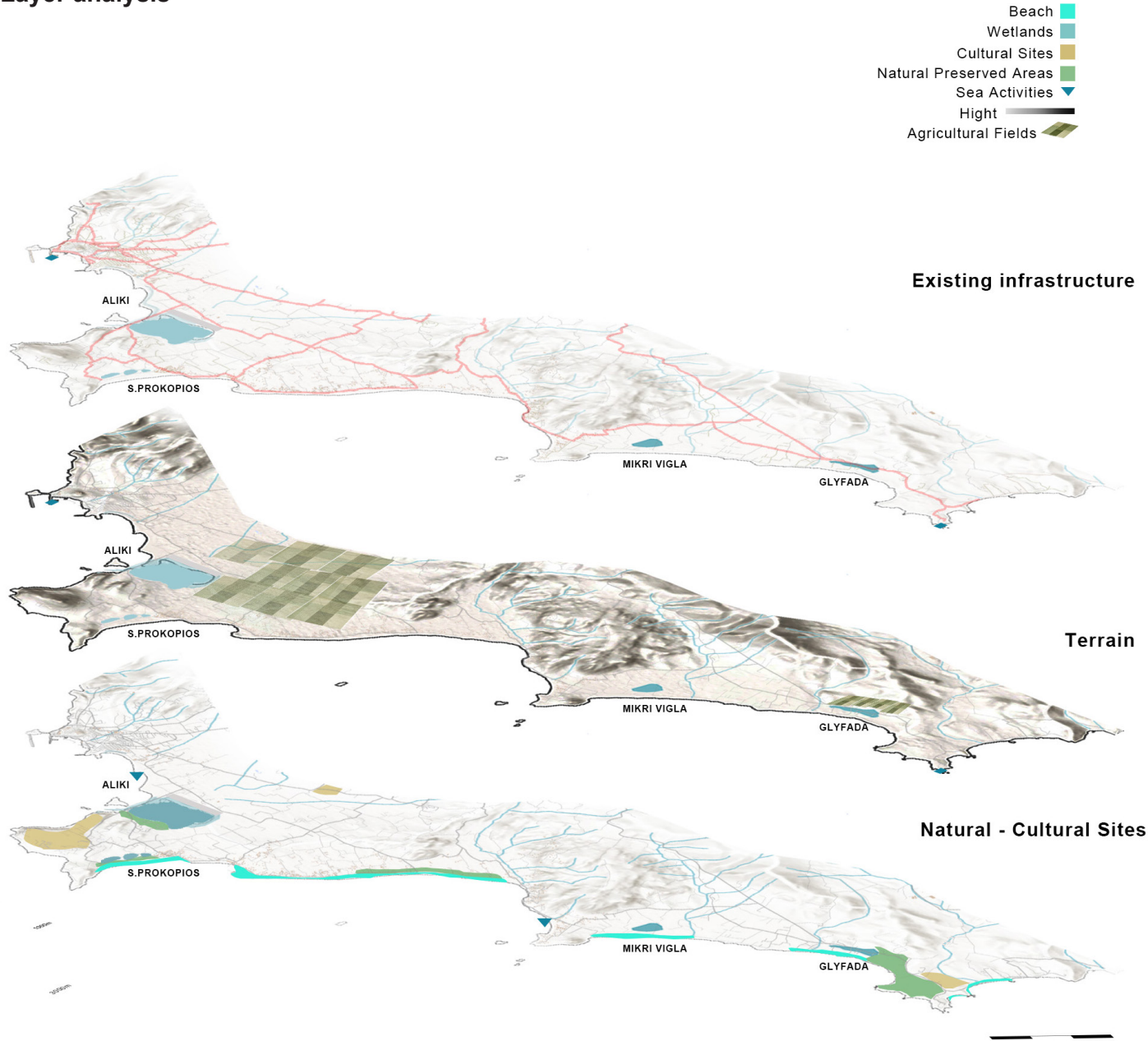
In formulating and subsequently refining this concept, my focus is on crafting a narrative that seamlessly integrates the natural landscape, facilitates universal accessibility, combines the natural charm of the environment with the rich cultural heritage of the local, and creates a setting that encourages visitors to interact with landscapes of unique beauty and importance. To achieve this, I carefully consider a multitude of factors, including the existing state of infrastructure linking the diverse wetland areas, the intricate topography characterized by various elevations, the diverse land utilization patterns widespread in the surrounding area, encompassing agricultural activities, tourist attractions, and more, as well as the intrinsic natural and cultural attributes defining the region.

Drawing insights from the dominant conditions, the interventions and the proposals are thoughtfully designed to each specific context, ensuring that they organically arise from the landscape itself, effectively address existing unmet needs, and strengthen the distinctive character of each area while guiding visitors through a myriad of immersive experiences tailored to their location within the island.

Central to the design endeavors is the overarching objective of crafting a cohesive narrative that celebrates the intrinsic value of wetlands, not merely as isolated protected entities, but as integral components of the wider ecosystem, thereby affording visitors the opportunity to comprehend and appreciate their significance through firsthand experiential encounters.



Layer analysis



The map shows numbers corresponding to images on the adjacent page. These depict various landscapes, experiences, activities, features of the area, and cultural elements one may encounter in the proposed region.

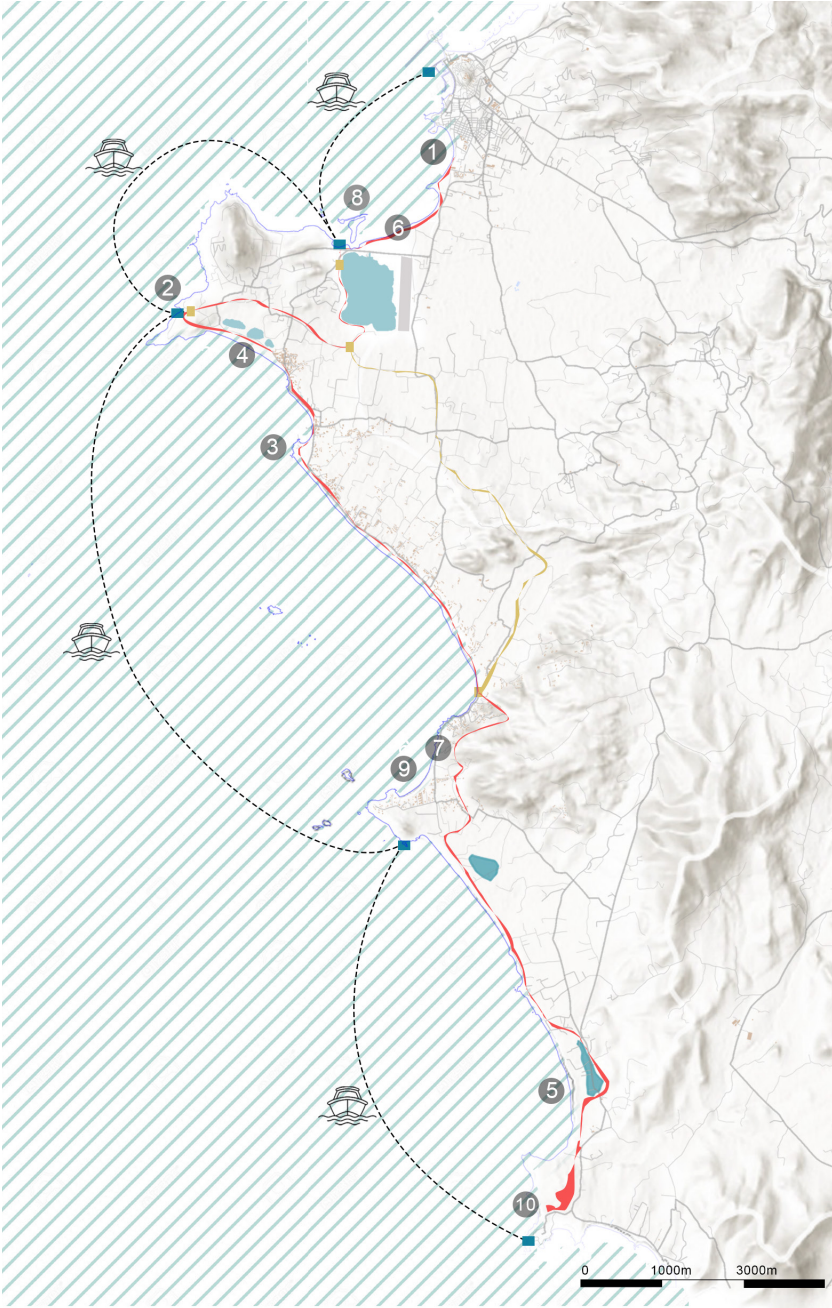


Figure 34: Naxos Town aerial view
Figure 35: Stelida Hill, Saint Prokopios
Figure 36: Saint Anna, Traditional tavern
Figure 37: Saint Prokopios beach
Figure 38: Glyfada Wetland
Figure 39: Laguna Beach
Figure 40: Sandy dunes, Laguna beach
Figure 41: Traditional building, Laguna coast
Figure 42: Mikri Vigla, Kite surf area
Figure 43: Alyko Wildlife refuge area



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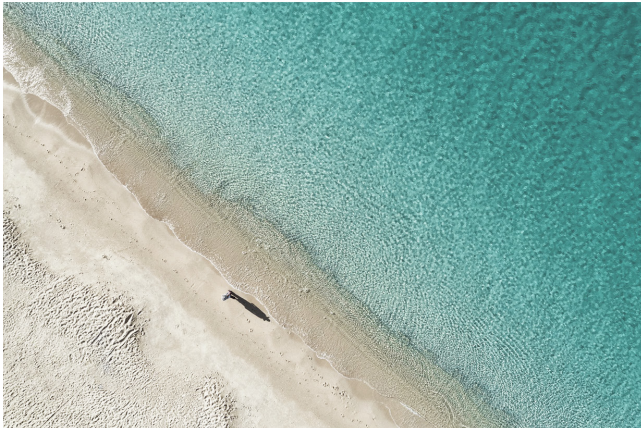


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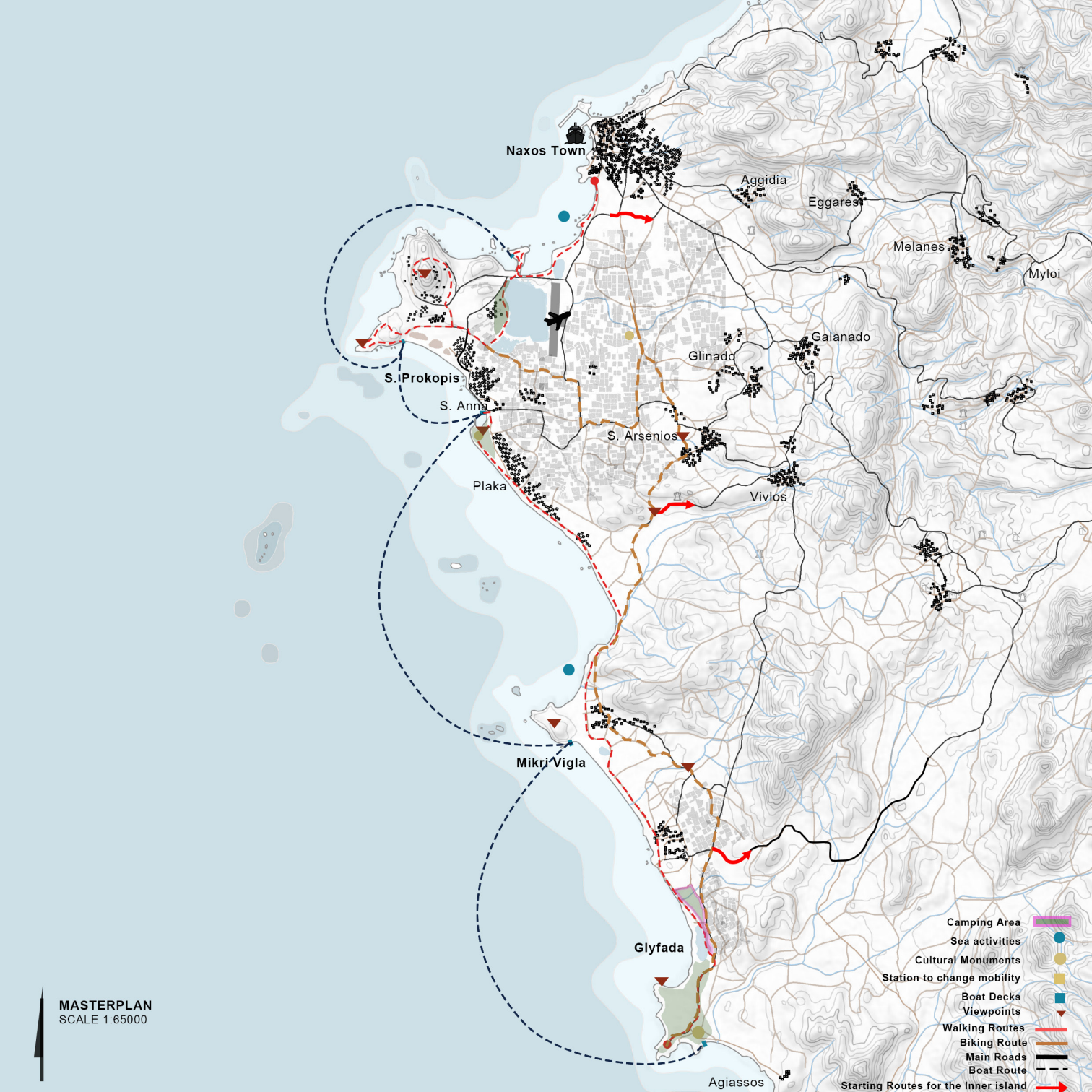
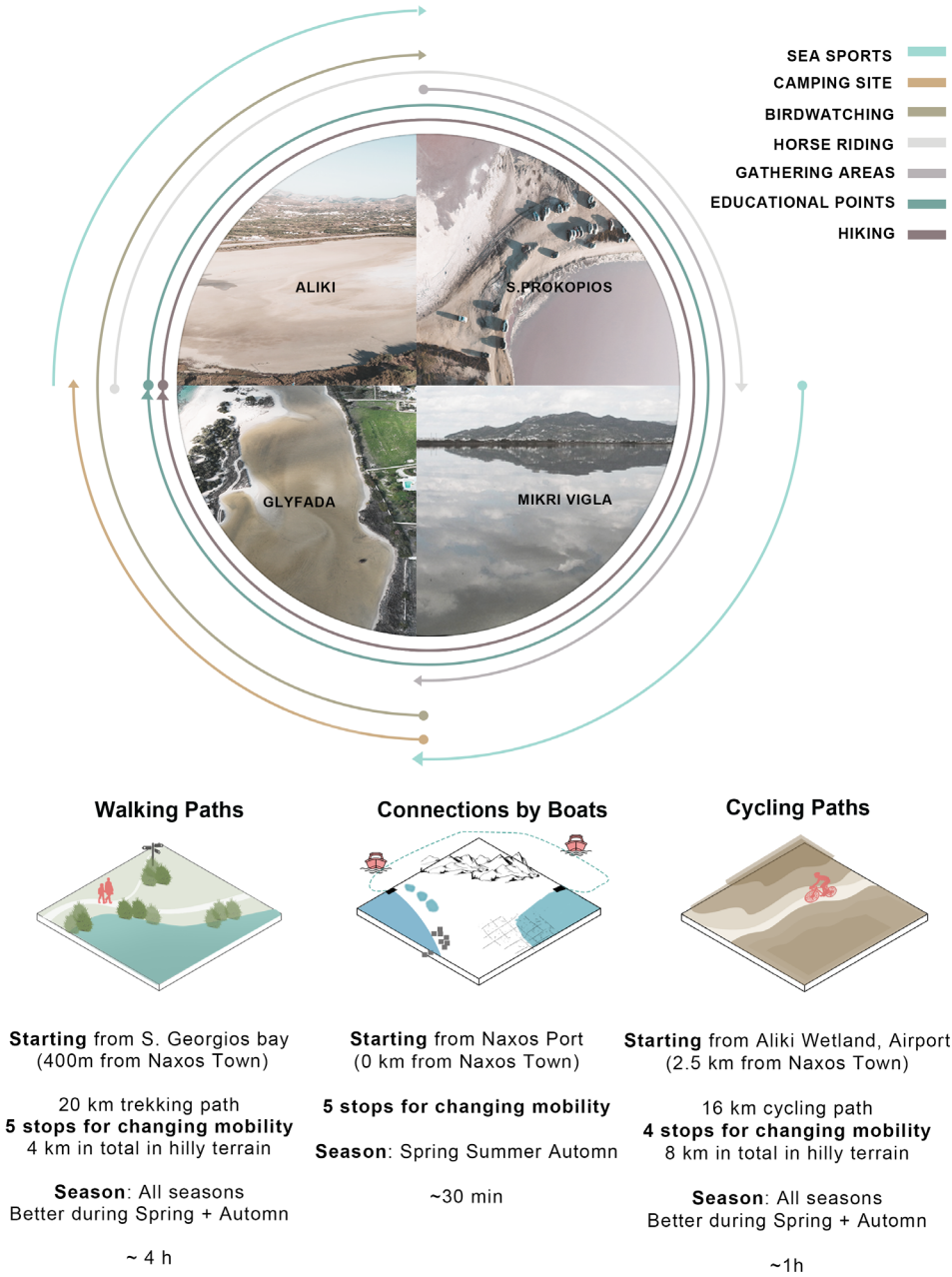


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All activities organized within the wetlands stem from their unique characteristics and exhibit seasonality in their appearance.

For example, the wetlands of Aliko and Mikri Vigla, due to their geographical location, are ideal for water sports, especially during the summer months. The Aliko and Glyfada wetlands are the ones that attract the most migratory birds every spring - including flamingos - thus, visitors to these areas can enjoy this experience from observatories while engaging in birdwatching. In the Glyfada wetland, which is the most serene area of the four, the establishment of camping spaces is proposed, while in the Aliko area, redesigning the existing camping facilities is suggested. In the area of the Saint Prokopios wetland, horse riding routes connecting it to the Lagouna area are recommended due to the accessible and open dirt roads, as well as the orientation of the area, from which one can enjoy magnificent sunsets.

The master plan (page 95) depicts all these routes, connections, cultural and natural sites, settlements, wetlands, existing networks, and activities.

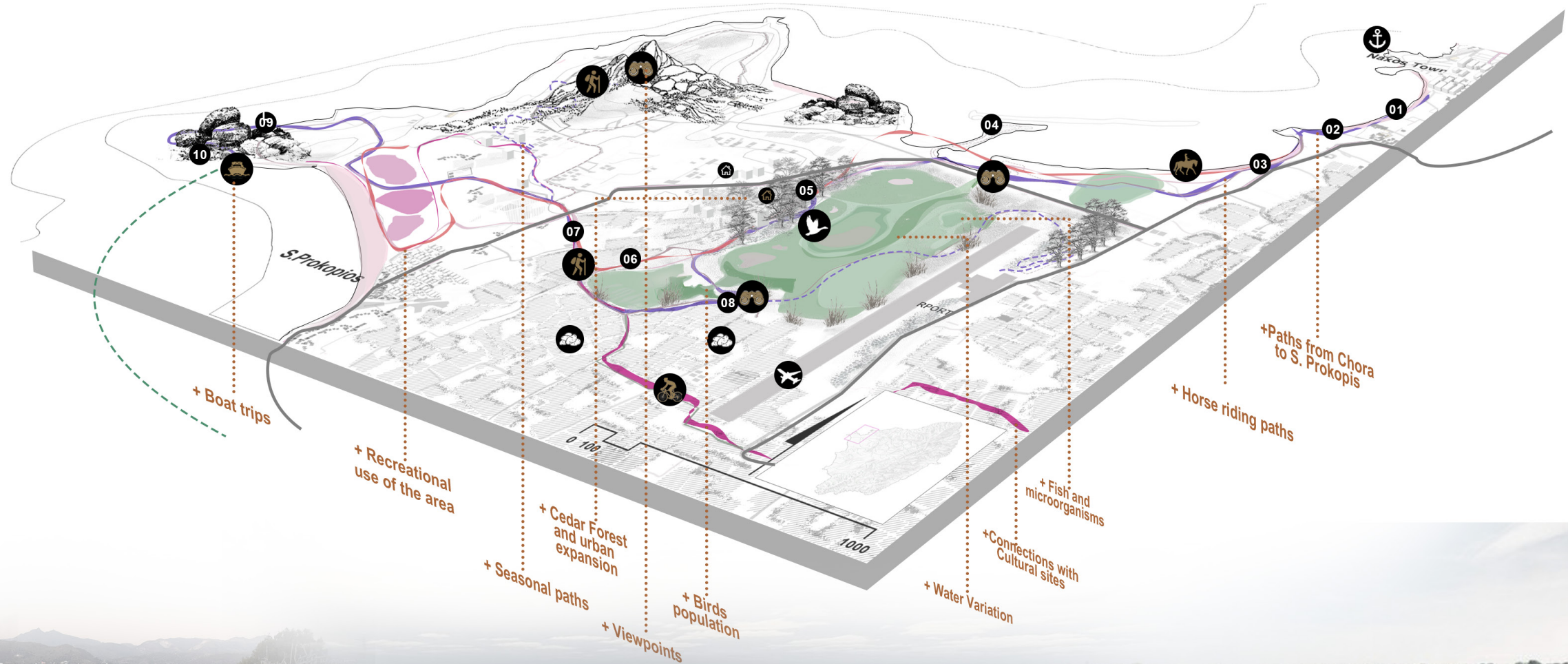


The middle scale of intervention

Diagram and Collage

An important scale of the planning encompasses the wetland of Alyki and its surrounding environment within a radius extending to the town of Naxos and the settlement of Agios Prokopios. At this scale, the initial focus lies on how the design of Alyki will serve as a pivotal connecting link between the aforementioned areas, the town of Naxos, and the settlement, which are currently only connected by a roadway.

In the diagram, we observe the various activities evolving around this area, including horse-riding paths, water sports, hiking trails, cycling paths, viewpoints, observation decks, parking areas, and docks for transportation by small boats along the coastline.



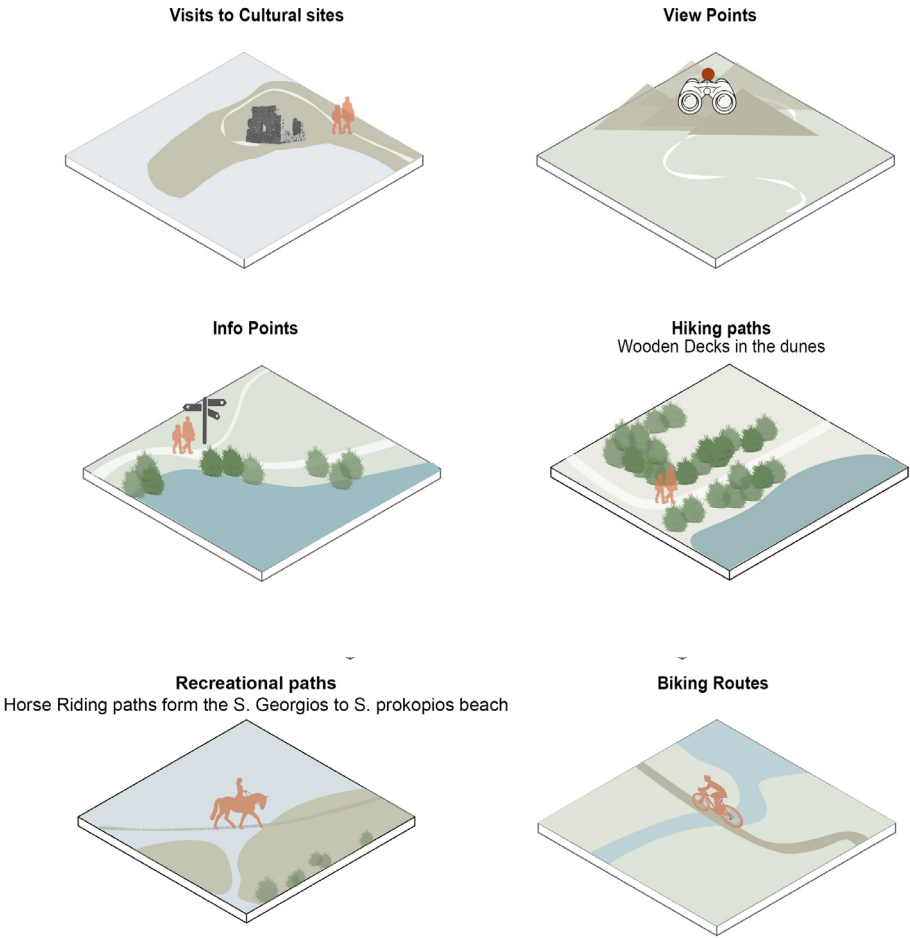
Photographs around the area

The following photographs were taken during the site visit, depicting the existing dirt paths that originate from the bay of Agios Georgios (1), traverse the sand dunes, continue around the area of the Alyki wetland, and conclude at the hill of Agios Prokopios beach, offering visitors a panoramic view (10).

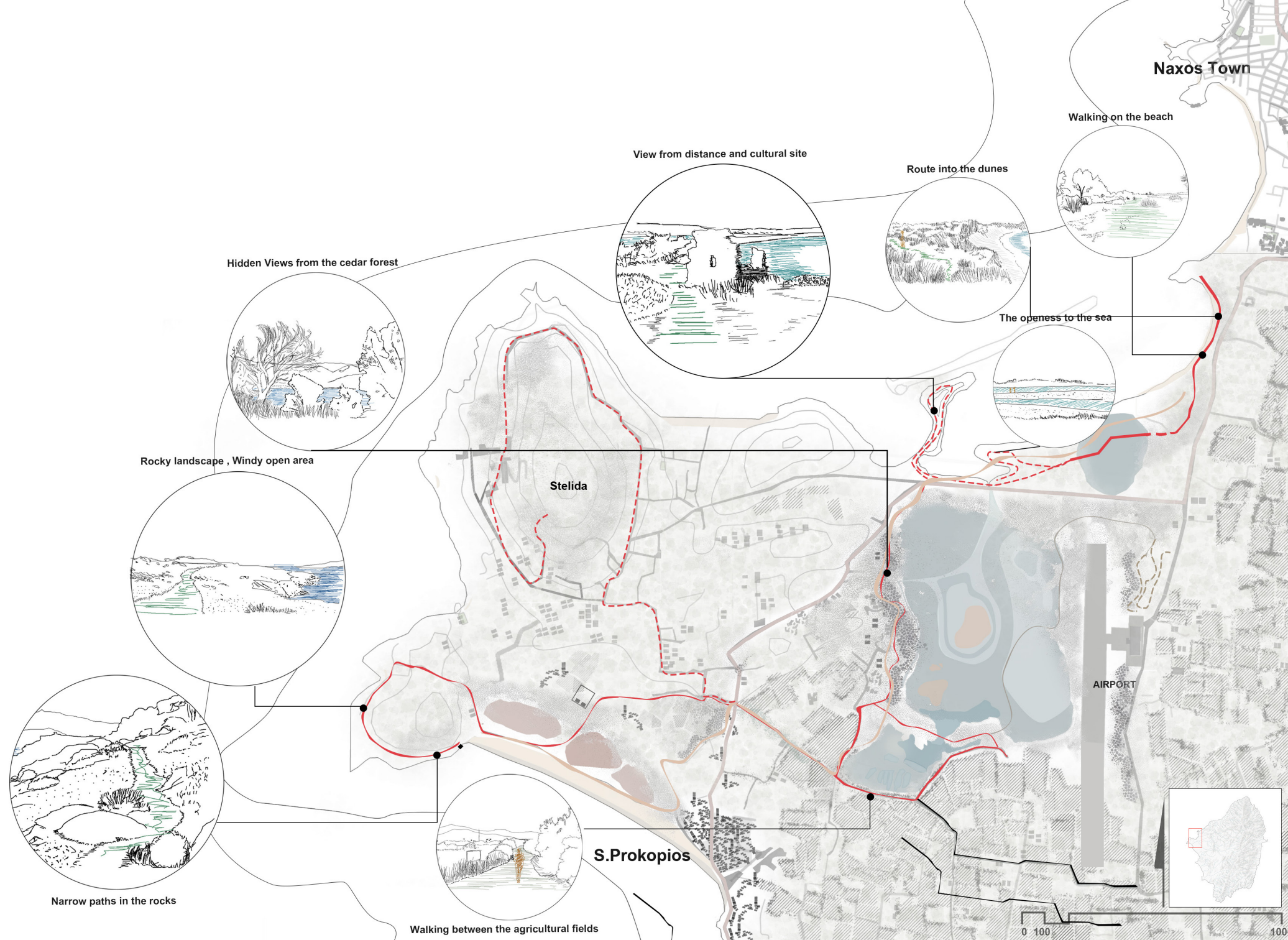
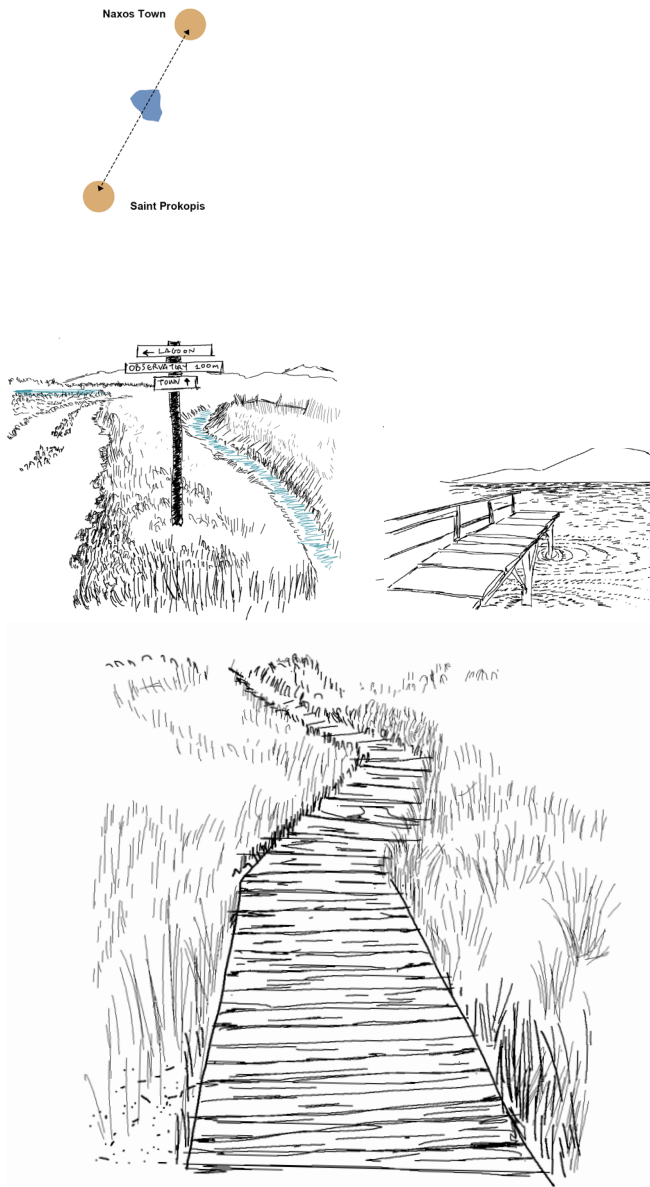


Figure 44-53: Photos from the paths around the Aliko Wetland

Toolbox



MASTERPLAN THE ENVIRONMENT AROUND ALIKI AND S. PROKOPIS WETLANDS

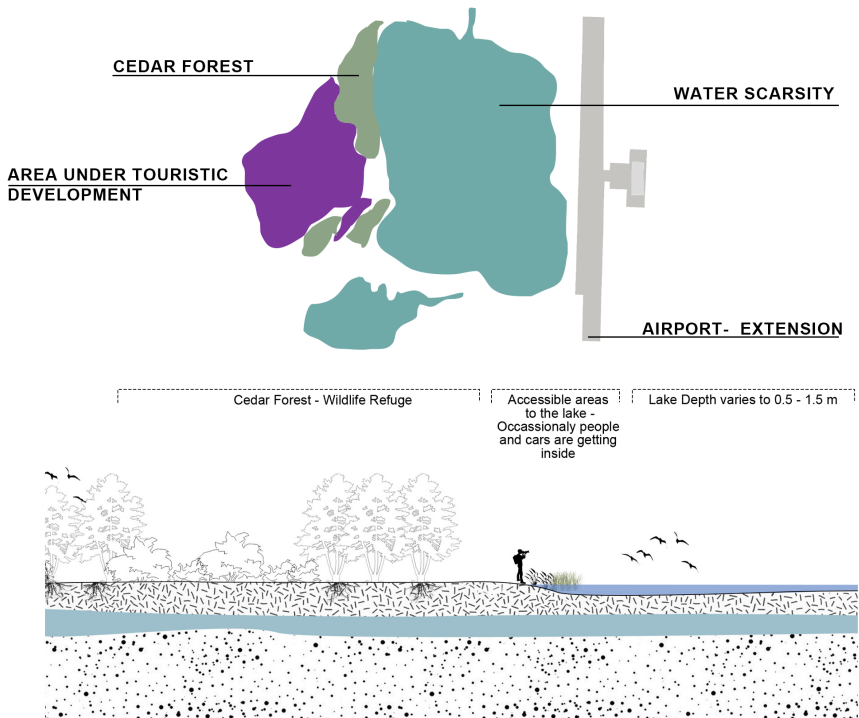


Flying to Naxos Airport

View of the Aliko Wetland



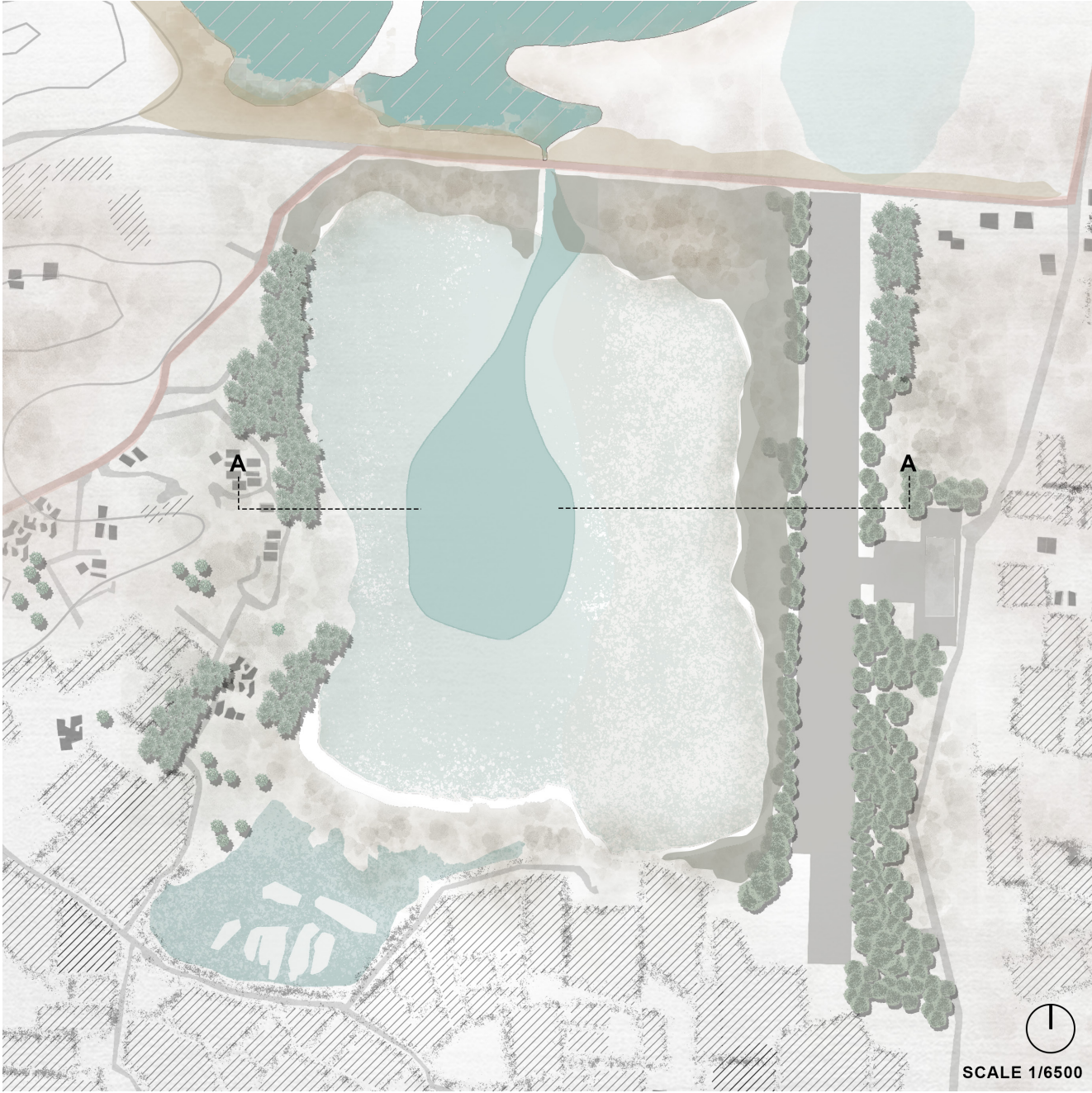
MASTERPLAN
Aliki wetland - Existing situation



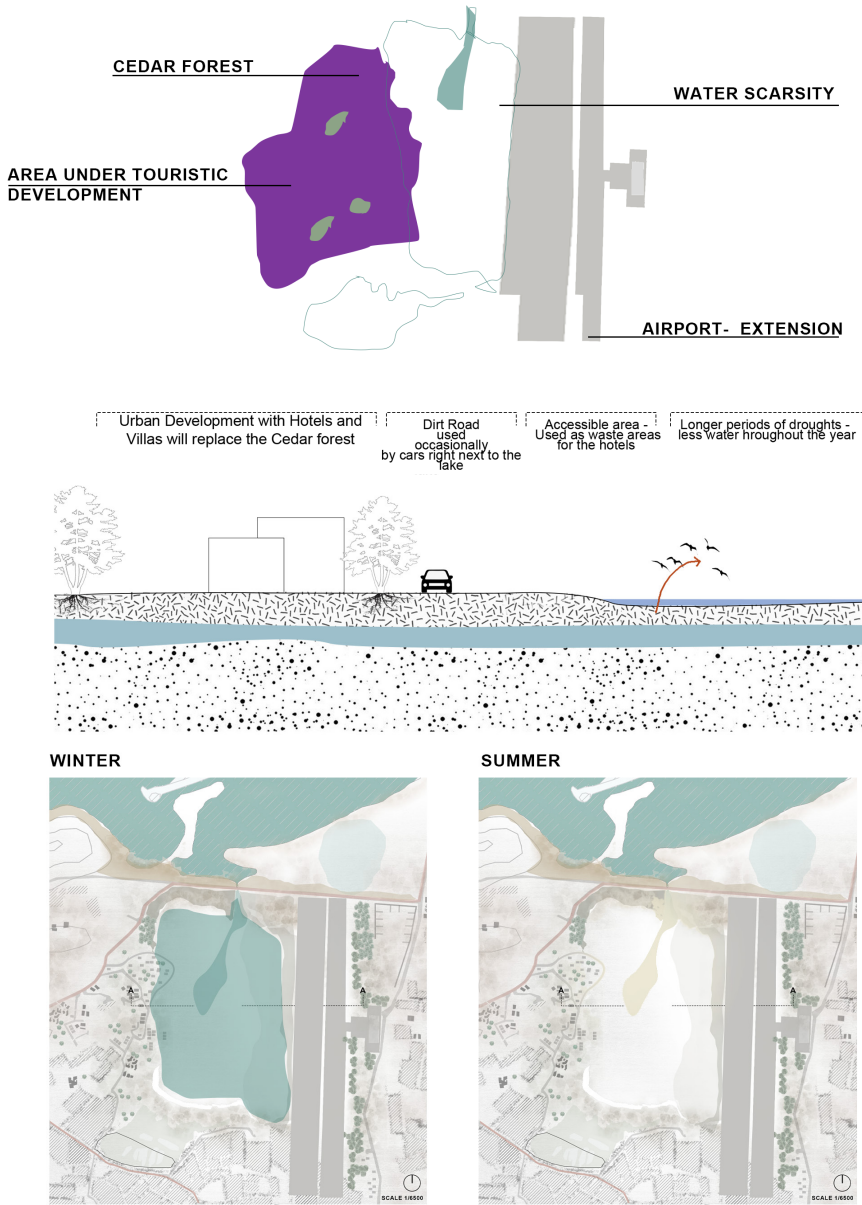
In the current situation, the salt lake of Alyki displays seasonal variations. It remains dry for the majority of the summer season, while it becomes filled with water during the winter months, replenished by both groundwater sources and wave action, entering the lake area through a narrow passage beneath the road dam to the north of the lake.

To the west of the lagoon lies a small juniper forest (*Juniperus macrocarpa*). This tree, known for its drought and salt tolerance, is native to the Mediterranean and classified as a priority habitat (FEK 3723/B/12-08-2021, code 2250). Junipers can reach up to 10 meters in height and once covered the entire southwestern coast of Naxos. However, coastal development and tourism (private homes and hotels) have destroyed much of this forest and its dunes. However, in recent years, intensive tourism activity has been observed in the same area, deeming it an ideal landscape for the development of tourist accommodations. Its proximity to the town and to Agios Prokopios, coupled with its serene natural surroundings, make it an attractive destination. Nevertheless, due to lack of organization and management, a considerable portion of the natural cedar forest is being destroyed, warranting protection measures.

Simultaneously, to the right of the salt lake, lies the international airport of the island, serving as the entry point for a large number of tourists. Recently, the expansion of the airport was approved, foreseeing development along its length and width to ensure peripheral safety zones. However, the protection of the natural landscape was not adequately addressed in the plan, leading to potential disturbances such as increased noise pollution and concrete structures. To the north of the salt lake, the road connecting the town with coastal villages is crucial, offering pivotal views of the lake for visitors. From a northern perspective looking southward, agricultural fields, mainly cultivating potatoes and vegetables, add another layer of interest to the landscape's composition.



MASTERPLAN Alyki wetland - With no interventions in 10 years



Given the current state of Alyki, the risks it faces due to mismanagement and neglect, the prospects of the island, and how the locals choose to transform it to secure personal interests as well as addressing environmental concerns such as climate change, we can speculate on how the landscape will evolve over the next 10 years if no protective measures are taken and no plans for redevelopment and utilization of this unique natural landscape are proposed.

The cedar forest to the left of the salt lake will have nearly disappeared, replaced by luxurious facilities catering to tourism, with only minimal remnants of trees preserved for aesthetic reasons in private constructions. The expanded airport, both in width and length, will have encroached further onto the salt lake, which, now dry, will be considered an irredeemable void space available for ancillary uses such as parking lots, waste disposal areas, and unrestricted construction zones.

As a consequence, the hydrology of Alyki will not only fail to recover but will deteriorate further, with even more prolonged periods of drought. However, instances of flooding may occur in areas where constructions are located within the former lakebed, causing water to cover spaces that would have been dry under normal circumstances.

The ecological devastation will be immeasurable, as the area will no longer be considered a wildlife refuge. Migratory birds will have no space to roost or nest, and endemic species will struggle to find food or protection in the Alyki area, resulting in a gradual decline in biodiversity over time. Additionally, noise from the airport, pollution from tourist accommodations, and the accumulation of waste, including vehicle emissions, will render the area incapable of supporting any form of flora and fauna as we know it today.



Sections
Cedar forest and wetland transition

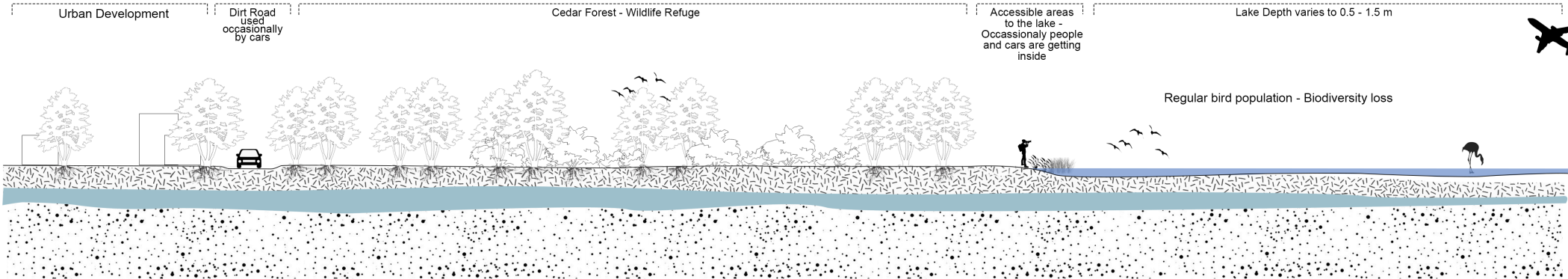
In the section, the area with the cedar forest is represented, at the point where we also encounter reconstruction activity, with direct contact with the lake-sea.

In the first section, the current situation is depicted, where we have the cedar forest, some existing structures, and dirt roads accessible even by heavy vehicles serving transportation. The wetland is seasonal, with water mainly during the winter months, and migratory birds visiting the area during their journey from north to south and vice versa.

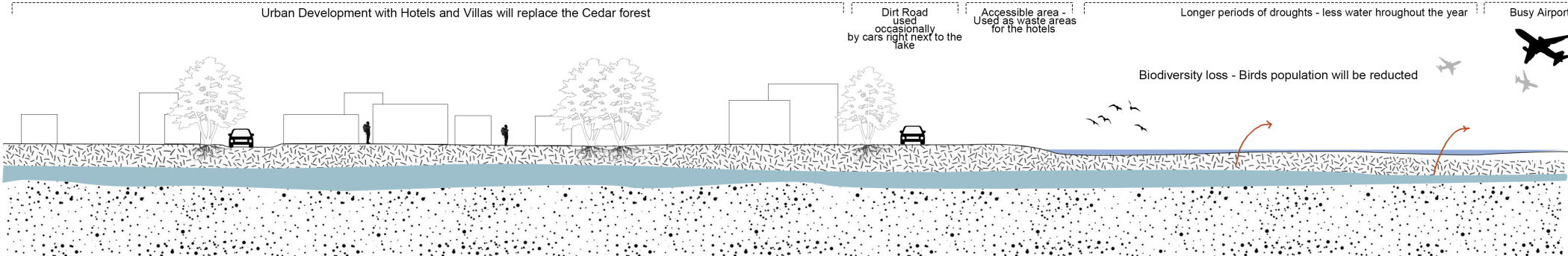
In the following section, the same area is represented, but with the cedar forest significantly degraded and replaced by constructions serving tourism. The roads for heavy vehicles have become more numerous and much closer to the wetland, and the birds have stopped nesting in this area as airplane traffic is more frequent and much noisier.

Finally, the proposed scenario is presented, in which initially the integration of tourist development with the cedar forest is proposed, suggesting a design that foresees these two coexisting with the priority of preserving the protected areas and highlighting them. As we will see in the proposal later on, topographic changes are proposed to protect and restore the hydrology of the lake-sea, aiming to retain water for a larger part of the year within the lake-sea. Furthermore, in order for visitors and locals to discover the significance and uniqueness of this particular natural landscape, activities such as bird watching from designed observation points and the utilization of dirt roads for horseback riding and cycling are proposed.

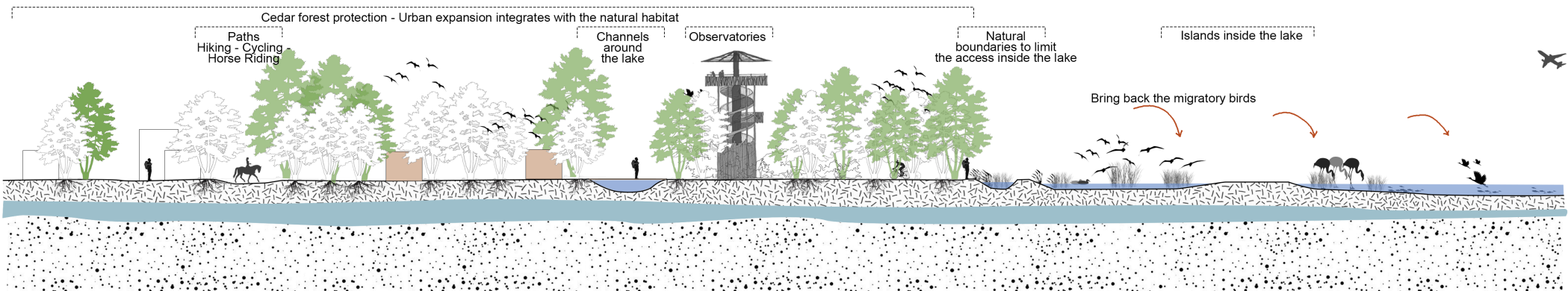
Existing situation



10 years without intervention



10 years with intervention



The Goals and the Phases of the Design

The proposed plan aims initially to restore the hydrology of the wetland. By this, it is meant the proposal of a design that, taking into account the current topographical distribution, the intensification of climate change exacerbating dry periods, and considering the necessity of having some islands exclusively for use by birds, which remain dry at all times, focuses on the restoration and enhancement of the flora and fauna of the area.

Thus, deeper points are designed to retain water primarily sourced from the aquifer and are brackish. Plants thriving on gentle slopes prevent the evaporation of this water, thus maintaining a hydrated environment even during dry months such as August and July.

Simultaneously, the goal of the design is to protect the natural environment and highlight it in a way that preserves and enhances it, while simultaneously bolstering the species of flora and fauna it hosts. Therefore, initially, the planting of cedars is proposed in areas that have been destroyed, and the delineation of protection zones where all kinds of constructions and activities such as hunting will be prohibited. Additionally, the dense and delineated planting zones, including cedars, tamarisks, shrubs, and lavenders, which will mark pathways to wildlife protection areas, will be a fundamental stage in the protection and promotion of the natural landscape.

Finally, of course, we cannot overlook the tourism development of the area, which cannot and should not be interrupted, as it constitutes a fundamental source of income for the island, and locals consider it of vital importance. Therefore, the inclusion of reconstruction is crucial for the acceptance of the plan by local authorities and to merge the two worlds that

currently seem separate and are thus addressed in this way. Thus, it is important to incorporate into the natural environment a planned scheme for new residences and tourist accommodations, from which visitors can admire and firsthand experience the unique natural beauty of the area.

Finally, the integration of the lagoon with the surrounding environment is a pivotal element of the proposed solution. As a landscape architect, I consider it very important for the proposal to have an impact on the culture of the environment, to respect and understand the rhythms and needs of the place, and to encourage people's interaction with the landscape.

The first phase for this integration, therefore, is the design with - not against - the airport located right next to the lagoon. Taking into account the prospects of such a design, the inevitable expansion of this project, and the implications if it is not included in the design and considered an organic part of it, design solutions are proposed for the expansion of the airport itself, the application of technical means for the management of environmental noise pollution, and - very importantly - its integration into the history created for the exploration and alternative tourist approach of the wetlands of Naxos.

Furthermore, the integration of activities around and within the wetland offers visitors an experiential journey during which they can appreciate and explore the unique elements of nature hidden in this place. By providing activities and alternative means of approaching the place, offering designed routes that include hiking, cycling, and horseback riding, people will have the opportunity to learn about the history of the place in multiple ways, which is deeply connected to that of the island and the culture of the place they have visited.

GOALS OF THE DESIGN

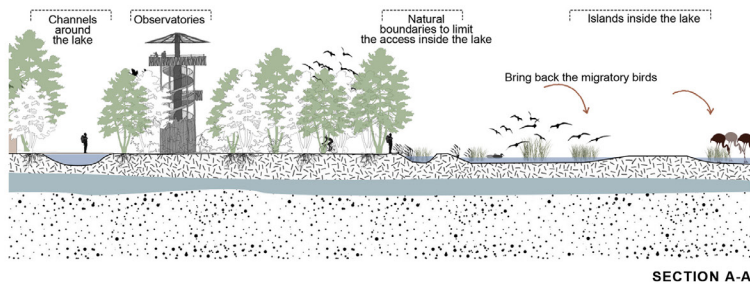


PHASES OF THE DESIGN





MASTERPLAN Aliki wetland - Proposal

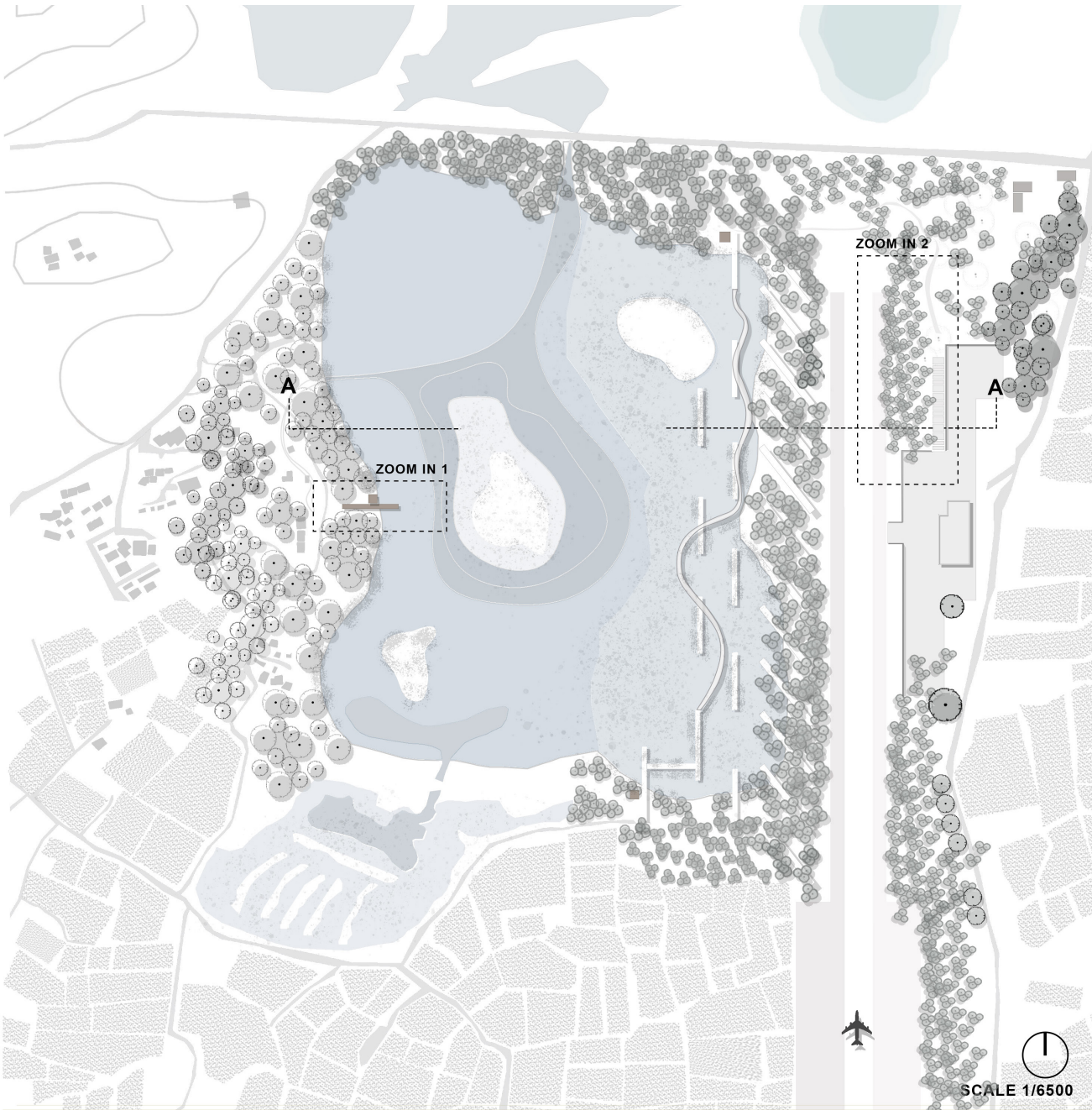


Following the principles described earlier and after a series of carefully conducted works that minimally disrupted the system during the period they were carried out, the proposed master plan, depicted on the right, envisions the transformation of the Alyki wetland. Centrally located, the wetland is shaped to provide deeper water zones for water retention and features several inaccessible islands, specifically designed for bird habitation. On the left side, we have the cedar forest, where the reconstruction of some accommodations is planned, while simultaneously, three bird observatories, wooden structures, are established to the north, west, and south of the lagoon. A passage is opened in the land strip between the lagoon and the old salt pans to allow water entry into this area.

The perimeter path around Alyki provides the opportunity for continuation both inside and outside through initially constructed wooden walkways, which later connect to the embankments designed to absorb a significant portion of the airport's noise pollution. The re-design of the airport area is proposed, freeing up the northern section and transforming it into an open space with low vegetation where visitors can move between spaces during air-plane-free hours.

Additionally, a designated parking area is planned within the airport premises, and the former camping site to the northeast of the airport is to be reinforced with the aim of re-opening it.

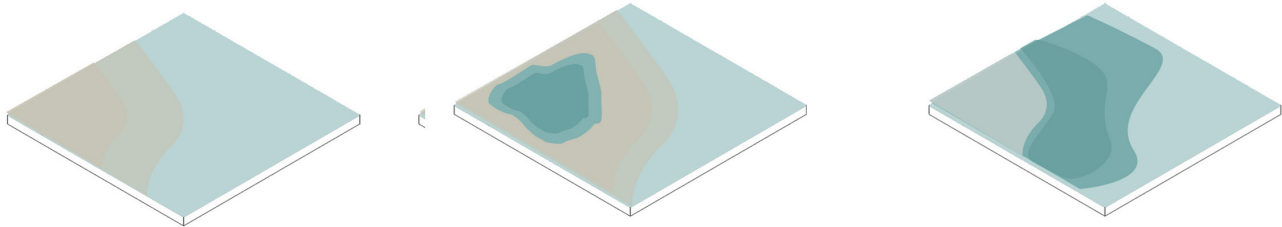
This integrated approach ensures the harmonious coexistence of the wetland ecosystem, recreational facilities, and transportation infrastructure, thereby enhancing the overall experience for visitors while preserving the natural beauty and ecological integrity of the area.



01 RESTORATION OF HYDROLOGY

Initially, in the first phase of the design, the priority is to manage the topography in a way that allows the water element to be retained for a longer period within the lake. Therefore, certain sections are excavated with a slight depth variation, around 1 meter difference from the zero level at the deepest point.

Additionally, a crucial aspect of water management is the separation of rainwater from the saltwater that enters from the sea or the groundwater. Consequently, some islands are created within the lake, primarily to ensure some dry areas, isolated and inaccessible for use by birds, and for the development of wetland areas. Within these islands, deeper points are created to retain rainwater. This approach fosters different conditions for the development of the area’s flora and fauna, significantly contributing to biodiversity.

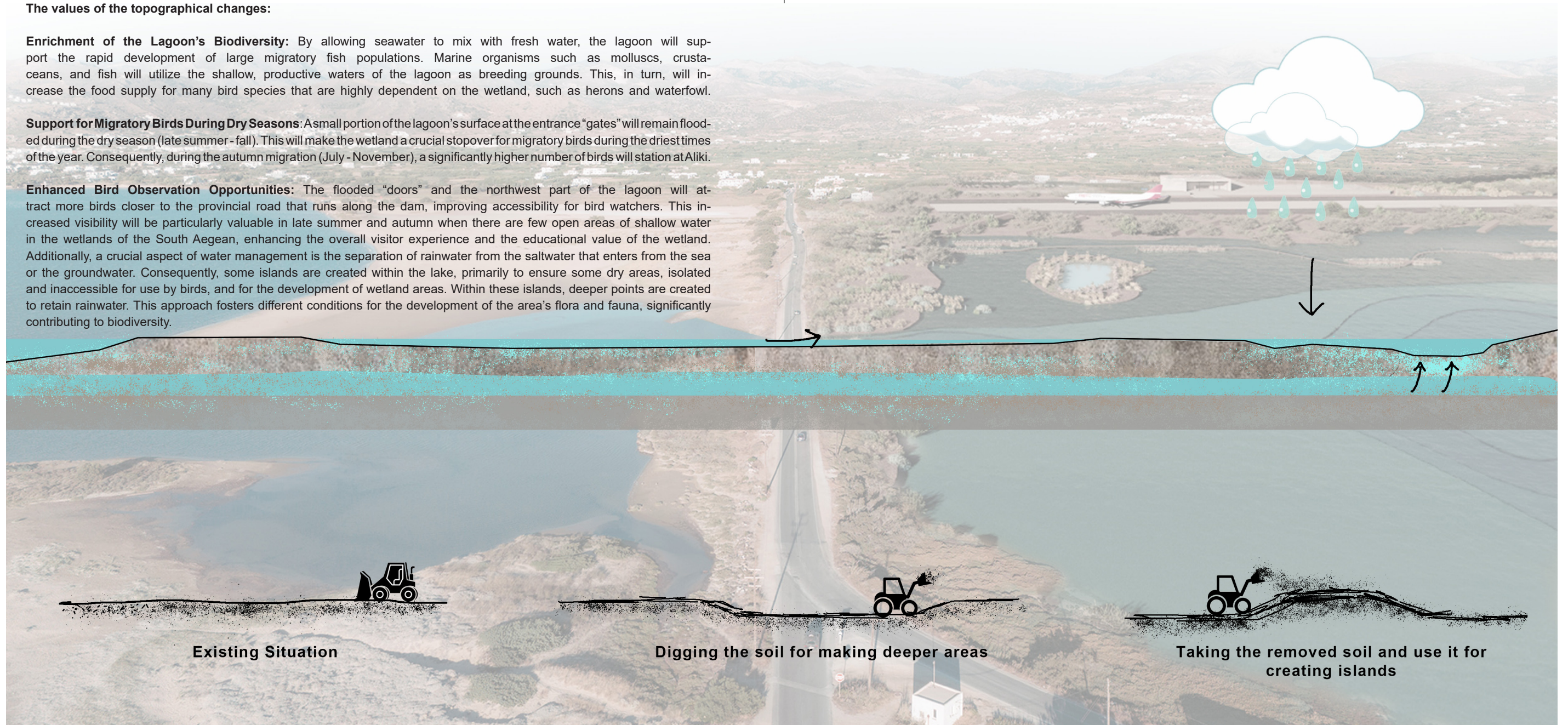


The values of the topographical changes:

Enrichment of the Lagoon's Biodiversity: By allowing seawater to mix with fresh water, the lagoon will support the rapid development of large migratory fish populations. Marine organisms such as molluscs, crustaceans, and fish will utilize the shallow, productive waters of the lagoon as breeding grounds. This, in turn, will increase the food supply for many bird species that are highly dependent on the wetland, such as herons and waterfowl.

Support for Migratory Birds During Dry Seasons: A small portion of the lagoon's surface at the entrance "gates" will remain flooded during the dry season (late summer - fall). This will make the wetland a crucial stopover for migratory birds during the driest times of the year. Consequently, during the autumn migration (July - November), a significantly higher number of birds will station at Alikı.

Enhanced Bird Observation Opportunities: The flooded "doors" and the northwest part of the lagoon will attract more birds closer to the provincial road that runs along the dam, improving accessibility for bird watchers. This increased visibility will be particularly valuable in late summer and autumn when there are few open areas of shallow water in the wetlands of the South Aegean, enhancing the overall visitor experience and the educational value of the wetland. Additionally, a crucial aspect of water management is the separation of rainwater from the saltwater that enters from the sea or the groundwater. Consequently, some islands are created within the lake, primarily to ensure some dry areas, isolated and inaccessible for use by birds, and for the development of wetland areas. Within these islands, deeper points are created to retain rainwater. This approach fosters different conditions for the development of the area's flora and fauna, significantly contributing to biodiversity.



Seasonal changes
Deeper areas with water

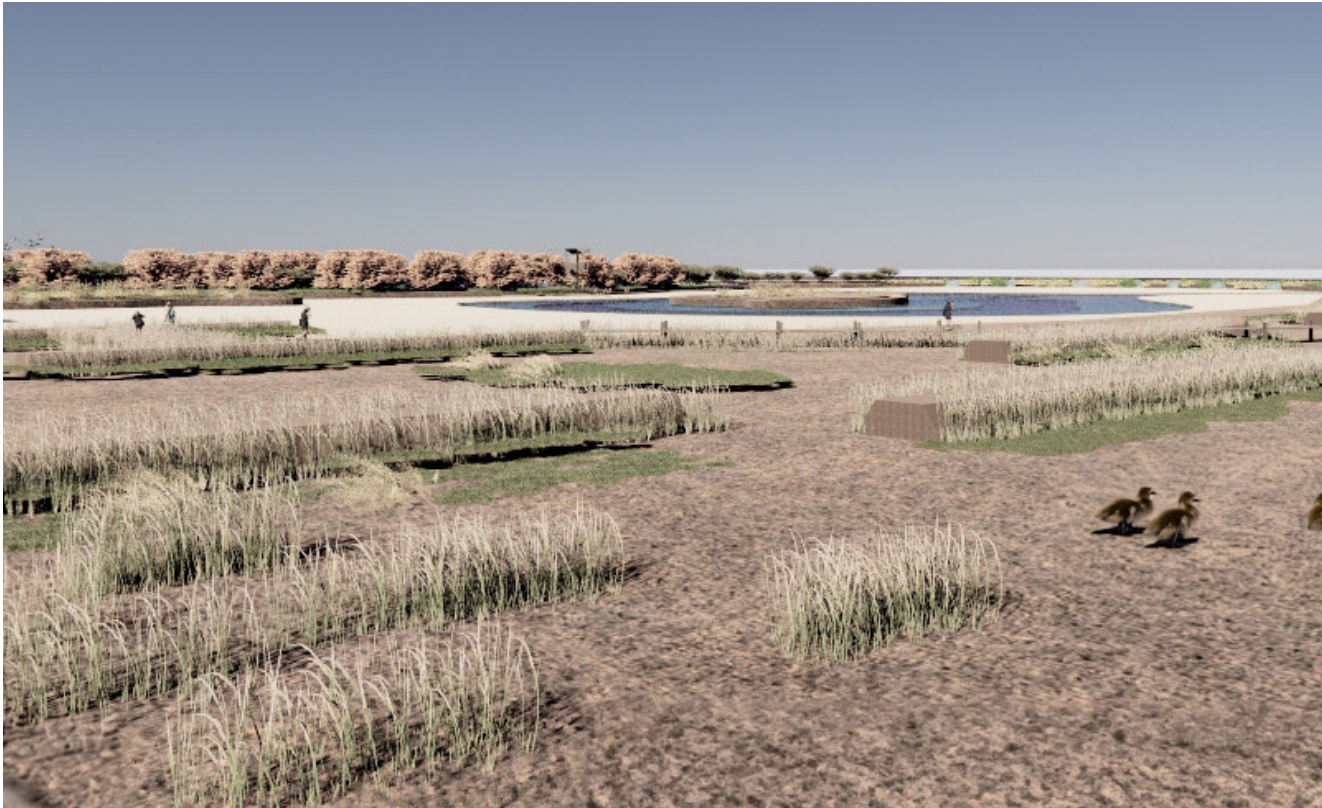


The lagoon of Aliko, as we already know from the analysis, is a seasonal lake that, due to climate change, faces extensive periods of drought.

With the proposed design, the goal is not only to restore the hydrology by allowing seawater to enter more easily through passages under the dam that separates the lagoon from the sea and collecting rainwater at specific points where islands will be created, but also to manage the topography so that water can remain in deeper parts of the la-

goon for extended periods, even during the summer months. In this representation, we see a view of the lake during the winter months, filled with water across its entire expanse.

Reeds are the most common plant found here, but there are also many native species that vary depending on the area. The reeds, due to the shallow part of the lake we are in at the eastern section, do not require any maintenance. They grow naturally in random spots, creating diverse environments for fish and birds.



Conversely, during the summer months, characterized by extended drought and high temperatures, water remains in the deeper parts of the lake, particularly at its center. This retention of water is crucial for the growth and maintenance of the local flora and fauna, creating diverse habitats where birds and other species can nest and reproduce. Additionally, it fosters a sense of protection around the islands, which are isolated from the rest of the area.

Moreover, the presence of water plays a significant role in

regulating the temperature of the region and enhancing the atmosphere for visitors, while also adding to the aesthetic value and natural beauty of the wetland.

02 PROTECTION OF THE NATURAL PRESERVED AREAS

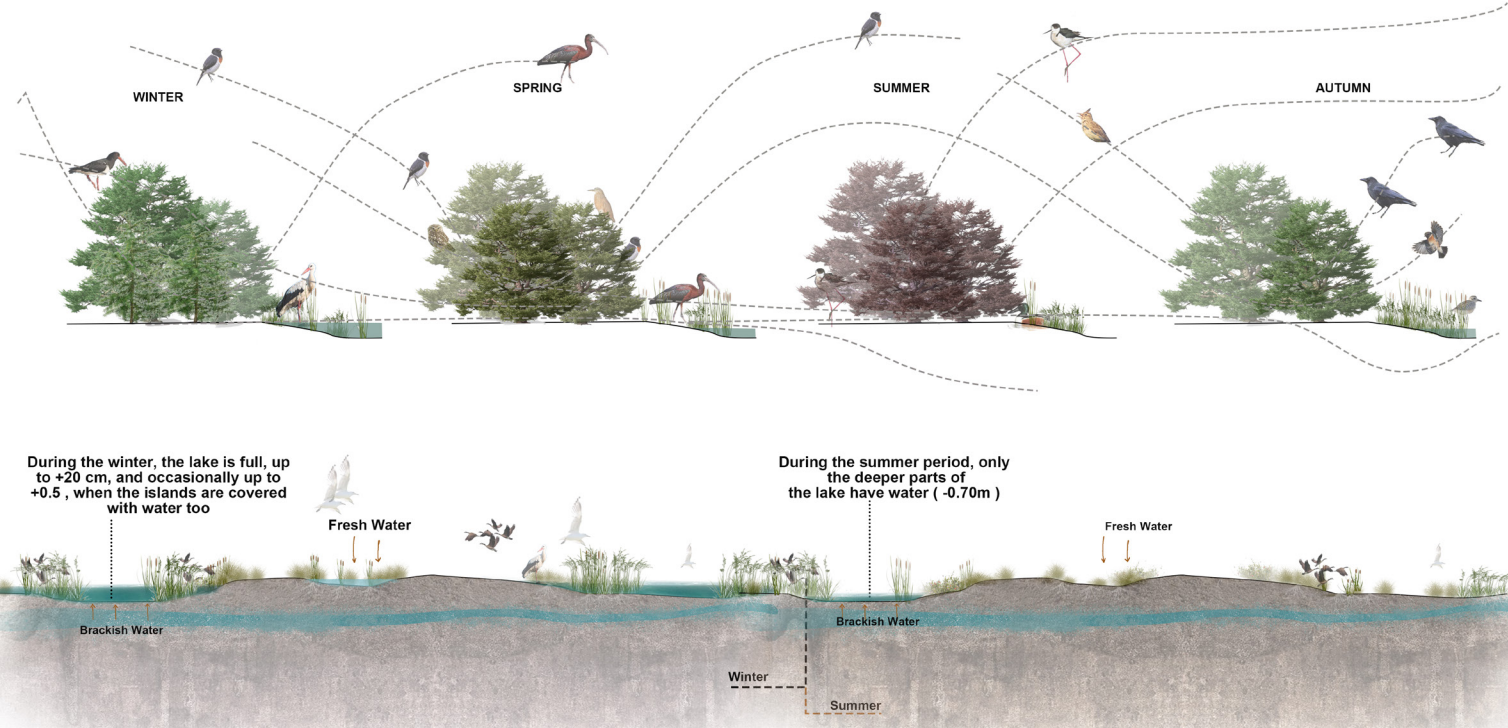
MASTERPLAN Aliki wetland - Protect the Natural Cedar Forest

To the west of the lagoon lies a small cedar forest (*Juniperus macrocarpa*). This tree, which is drought-tolerant and thrives in high salinity soils, is native to the Mediterranean and classified as a priority habitat (FEK 3723/B/12-08-2021, code 2250). Junipers can reach up to 10 meters in height and once covered the entire southwestern coast of Naxos, but coastal development and tourism (private homes and hotels) have destroyed much of this forest and its dunes.

A key element of the design proposal for the lagoon area is the protection and enhancement of this juniper forest. To achieve this goal, new junipers will be planted, and areas will be designated for natural growth at random locations. Additionally, to protect the forest and prevent encroachment, it is proposed to establish boundaries for the developed areas based on laws that prohibit further degradation of the forest and its replacement with tourist accommodations.

For selecting these zones, the initial focus is on areas planned for pathways (utilizing existing ones) and the addition of observatories. In these areas (marked in dark green on the map), controlled planting will take place. In contrast, in the more open areas dedicated exclusively to the natural landscape (marked in light green on the map), boundaries will be set to protect and allow the junipers to grow naturally.

Ecological impact of the Design



The cedar forest and Aliko Wetland with and without intervention in the next 15 years

Existing



10 years - No intervention



10 years - With intervention



03 INTEGRATION WITH THE SURROUNDING ENVIRONMENT

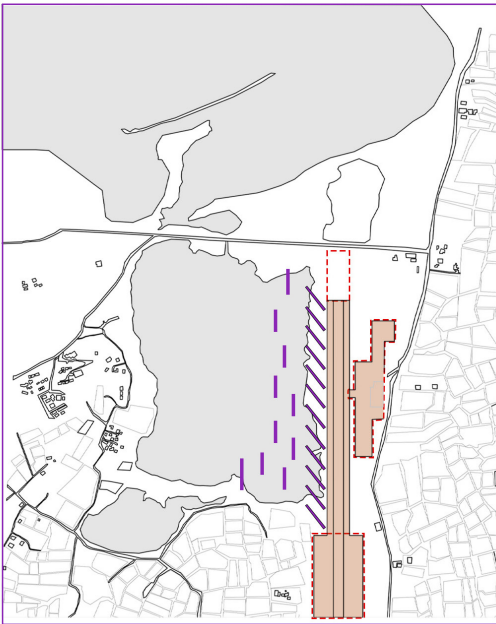
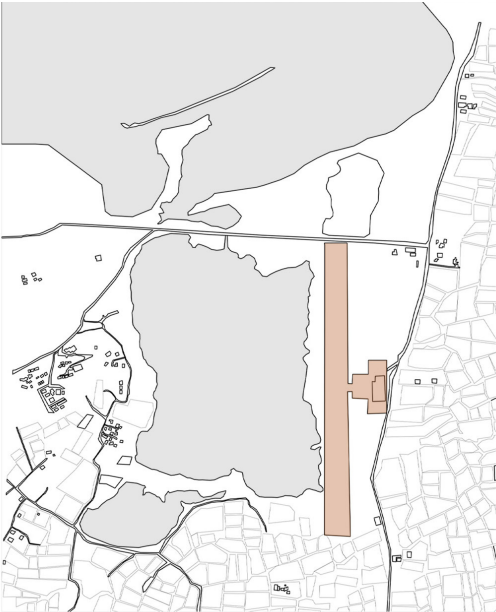
Naxos International Airport
The co-existence with the Wildlife Refuge

The creation of the airport in the sensitive area surrounding the lagoon marshes undoubtedly caused significant environmental damage. However, acknowledging the circumstances that led to its establishment, it's crucial to assess the current situation pragmatically. Despite its controversial inception, the airport now serves as a vital gateway to Naxos, catering to the island's growing tourism industry.

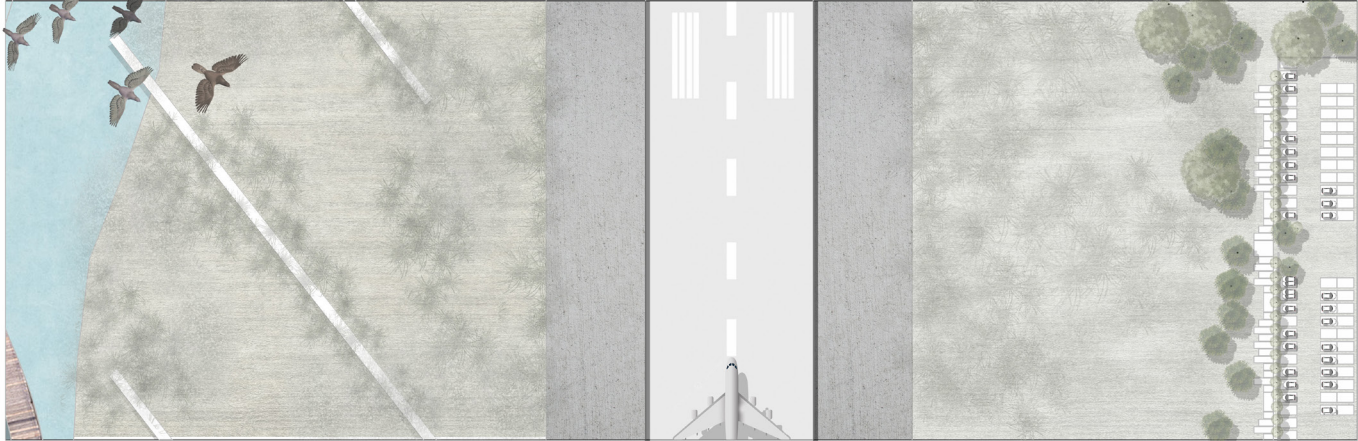
Moving forward, the focus should be on embracing the reality of the airport's presence and planning for its extension to meet increasing tourism demands. The key objective is to integrate the airport harmoniously with its natural surroundings, embracing sustainable design principles.

This entails implementing strategies to mitigate environmental impact, particularly concerning noise pollution, which can disrupt the delicate ecosystem of the protected fauna in the area. By employing innovative methods such as soundproofing measures and flight path optimization, we can minimize disturbances to wildlife while ensuring the airport's functionality and efficiency.

Ultimately, the aim is to transform this controversial area into a model of sustainable coexistence, where the airport serves as an integral part of the ecosystem, facilitating tourism while preserving the natural beauty and biodiversity of Naxos.



ZOOM IN AREA 2
PLAN AND VISUALISATIONS | SCALE 1/1000



Naxos Island National Airport is a domestic airport serving flights from Athens and Thessaloniki. Currently, it operates with small airplanes from two airlines on a 19-hectare property, averaging about 5 flights per day.

To enhance its capabilities and accommodate future needs, a comprehensive expansion and redesign plan is underway:

Runway Extension: The runway will be extended to the south by 300 meters to accommodate larger aircraft and improve operational efficiency.

Airstrip Reduction: To the north, the airstrip will be reduced by 150 meters to optimize space usage and ensure safety standards.

Infrastructure for Pedestrian Access: Adjacent to the reduced airstrip area, pathways will be designed leading to the camping site and airport entrance, facilitating pedestrian access.

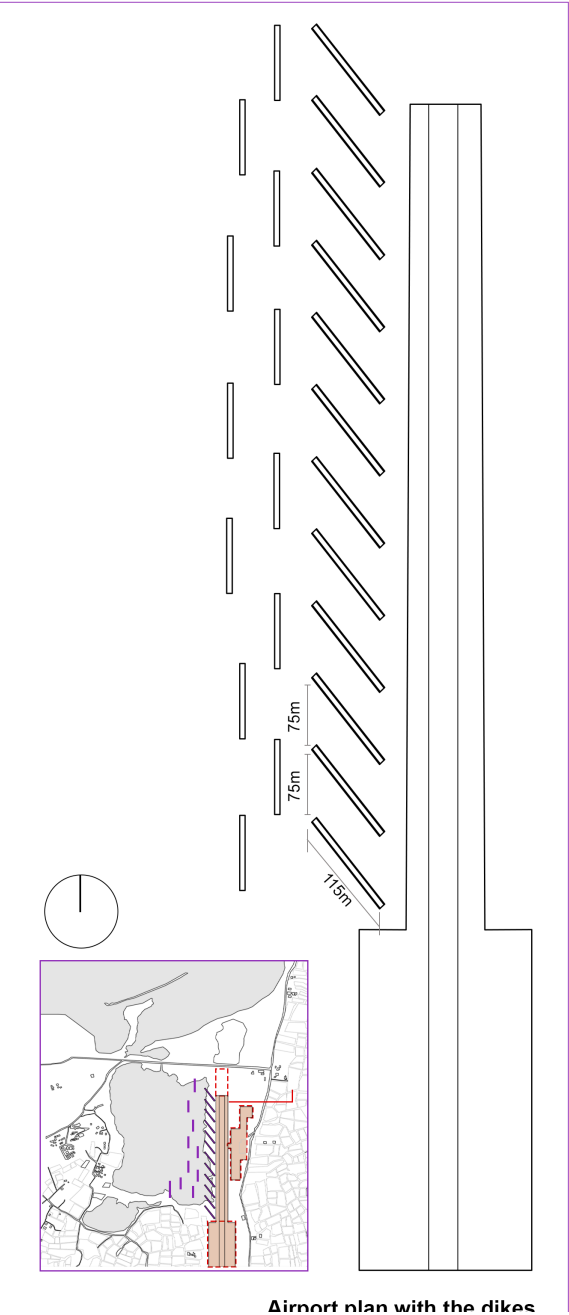
Lateral Safety Zones: Along the extended section of the runway, 40-meter wide safety zones will be established on both sides, ensuring additional safety measures for aircraft operations.

Parking Area Expansion: A new parking area covering 25,000 square meters will be constructed to accommodate increased passenger and staff vehicles.

Buffer Zone Creation: On the east side of the airport, a buffer zone will be established using dikes to mitigate noise reflection within the adjacent wildlife refuge, preserving the tranquility of the lake and cedar forest area.

These planned enhancements aim to modernize the airport infrastructure, improve safety standards, and enhance the overall passenger experience while also considering environmental conservation measures.





Noise Reduction - Protection of the Wildlife

The present airport stands on a portion of the lagoon, underscoring the big contrast between these two environments.

As mentioned earlier, the airport functions as a local, modest-scale facility catering exclusively to domestic flights. Its operational aircraft are notably small, averaging just six flights per day.

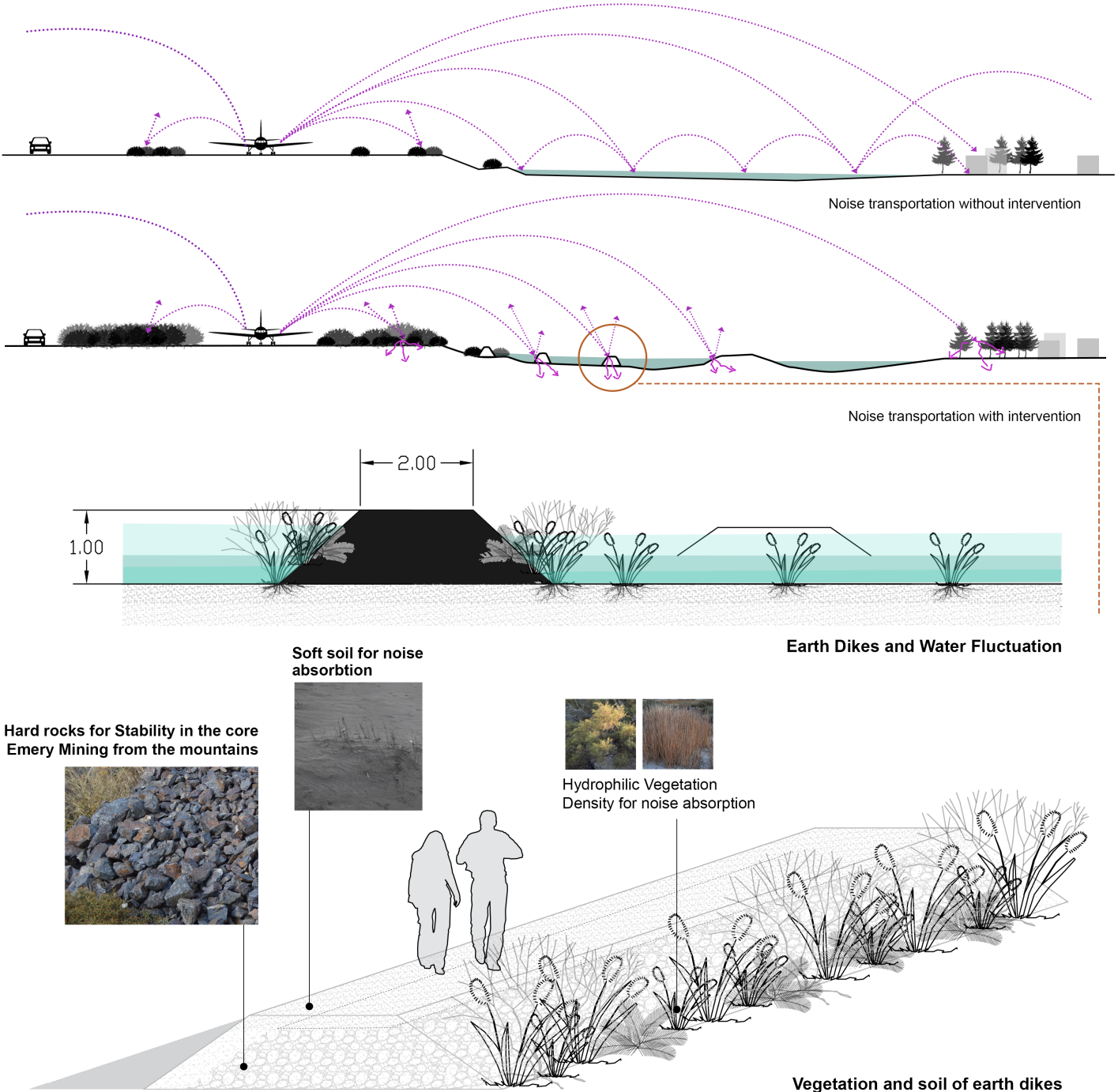
The proximity of water to the runway facilitates the propagation of sound across the entire lagoon expanse. Alik, renowned as a majow refuge for migratory birds, is strategically positioned to be shielded from noise pollution, particularly arising from ground activities during aircraft departures and arrivals.

A pivotal aspect of the design entails the deliberate reduction of the runway by 150 meters to the north, coupled with a 300-meter extension to the south, thereby ensuring landings occur in areas characterised by agricultural fields.

A notable addition comprises dikes, spanning approximately 100-115 meters, positioned either vertically or at 45-degree angles from the runway. Strategically situated to deflect aircraft noise, these embankments, rising to a meter in height with 0.50 meters submerged in water, boast a 2-meter width atop, facilitating pedestrian access where they intersect with wooden walkways.

The gentle slope of these embankments fosters the growth of aquatic flora such as reeds, rushes, macia, Almyrica and sea lavender.

The composition of the embankment soil comprises a blend of gravel at the base and soft, compacted earth, effectively mitigating surface noise.



Seasonal Differences



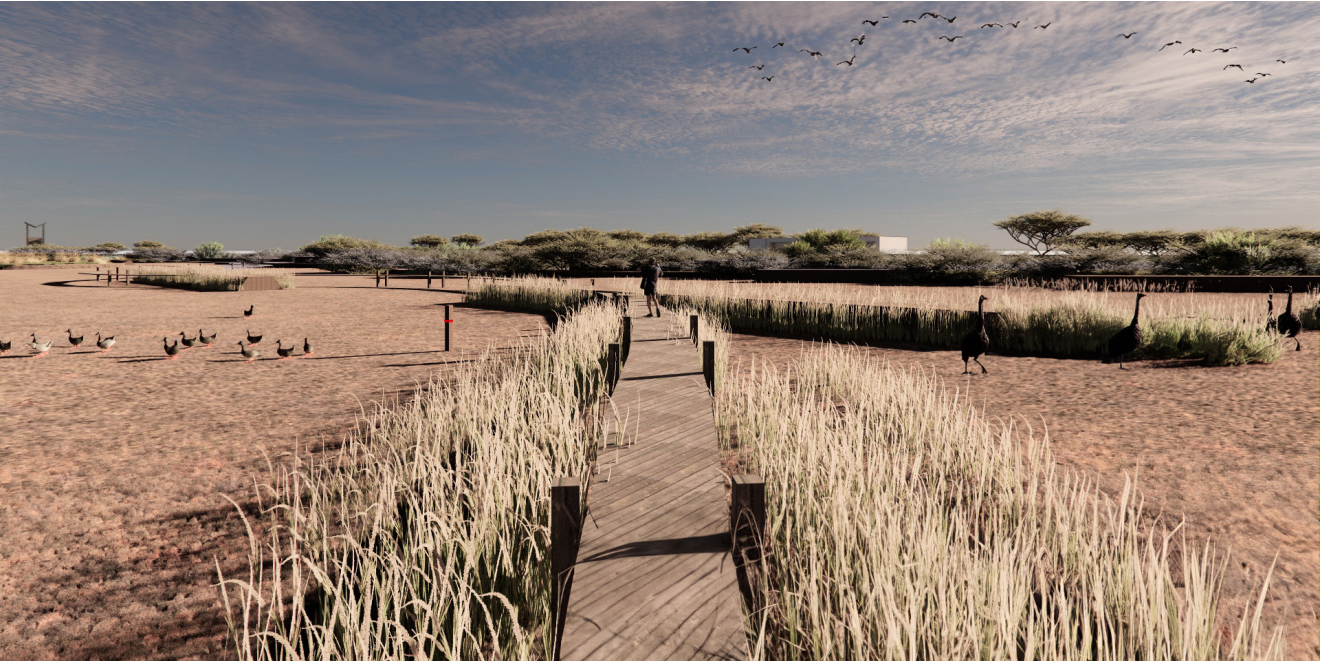
Summer

The lagoon of Alik, as we already know from the analysis, is a seasonal lake that, due to climate change, faces extensive periods of drought.

With the proposed design, the goal is not only to restore the hydrology by allowing seawater to enter more easily through passages under the dam that separates the lagoon from the sea and collecting rainwater at specific points where islands will be created, but also to achieve topographic management where water can remain in deeper parts of the lagoon for extended periods, even during the summer months. The proposed design goes beyond mere topographic al-

terations geared towards hydrological restoration; it endeavors to cultivate varied experiences and atmospheres year-round.

For instance, integrating sound-diffusion techniques into protective embankments, occasionally accessible for walking, these structures intertwine with wooden boardwalks, ingeniously crafting pathways amidst the lagoon. In this manner, visitors will have the opportunity to experience the ecosystem in a vastly different way, observing changes in the flora and fauna of the area or exploring the diverse bird species that visit the lake and nest in its various environments



Winter



Halophytic plants



Cedar Forest



Salicornia species



Mediterranean beard
grass and reeds



Seagrass meadow



Caroxylon cyclophyllum



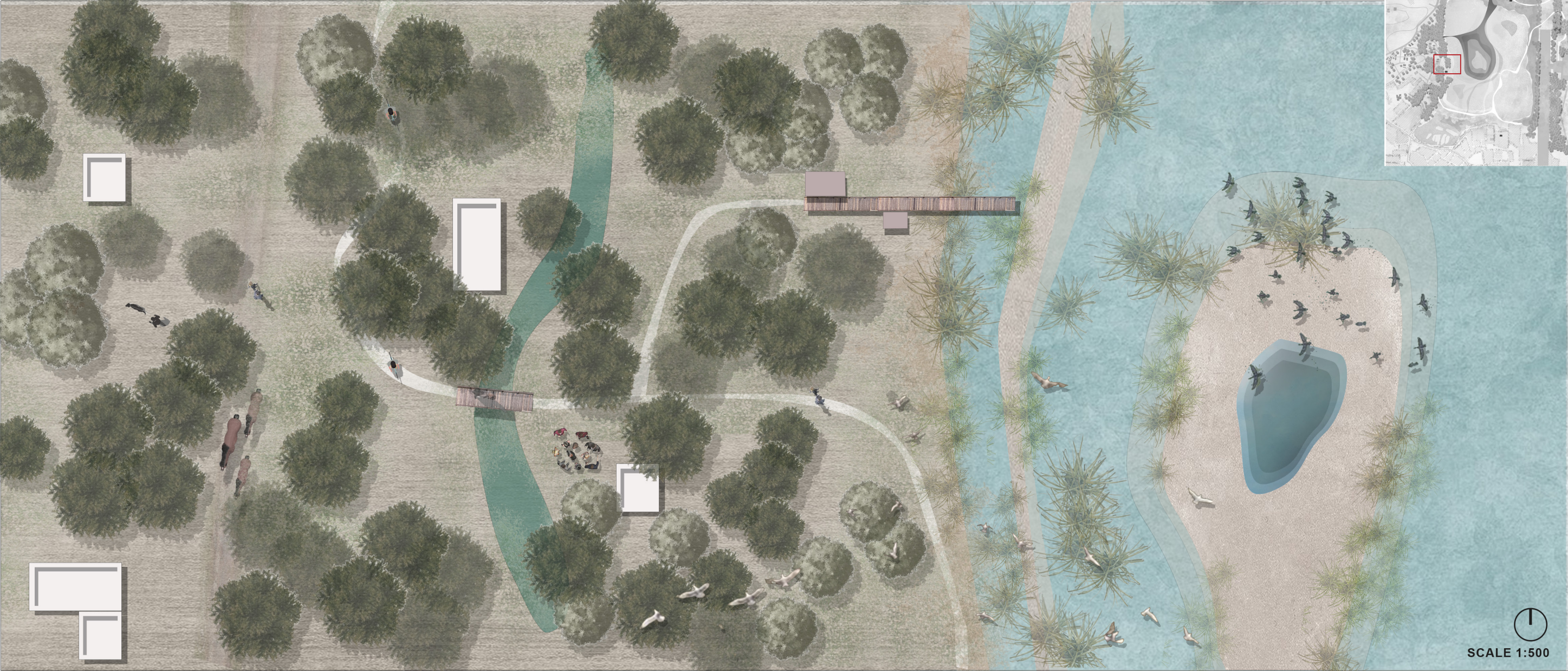
Olearia lanuginosa



The slope of the embankments is designed to allow the growth of native plant species. Such species include Mediterranean beard grass and reeds, which can thrive throughout the designated area due to the mixed depth, requiring no maintenance. In contrast, their growth is not successful in the center of the lake where the depth exceeds 0.50 meters.

Additionally, on the sides of the wetland, Caroxylon cyclophyllum and species like Olearia lanuginosa grow abundantly, along with numerous cedars. Between the habitat and the sea, seagrass meadows and succulents such as sea figs are observed.

ZOOM IN AREA
PLAN AND SECTION | SCALE 1/500



SCALE 1:500

In this representation, we are looking at the Aliko wetland from the west, from the bird observatory located on the cedar forest shore. It's a sunny day in early April when the flamingos make their appearance to rest, recuperate, and feed before continuing their journey.



Observatories- Design Element

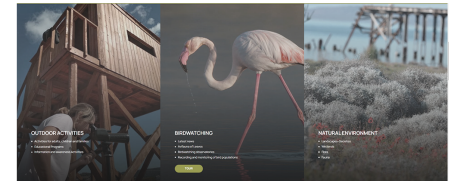


Inspiration



Kalloni Environmental
Information
Center

Lesvos Island,
Aegean Sea

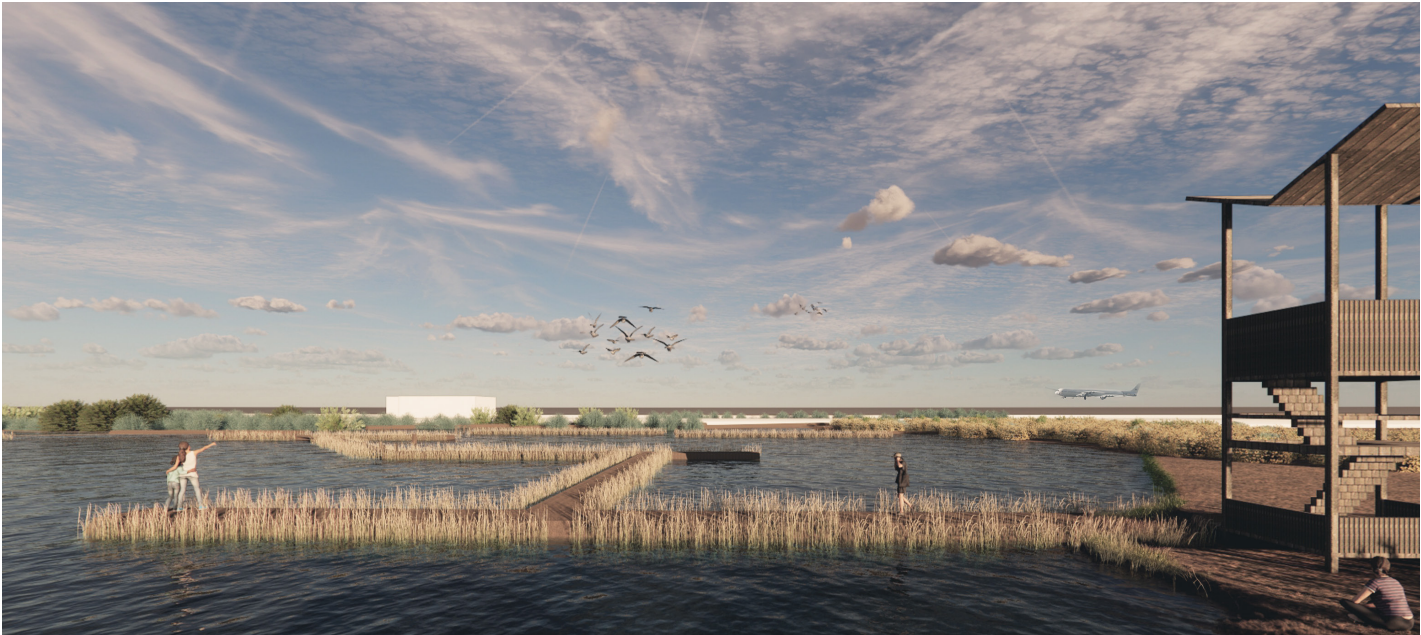




Observatories- Design Element

The designed observatories, beyond being aesthetic elements that facilitate birdwatching and provide resting spots along the path, also serve as distinctive features of the area. They play a crucial role in guiding visitors through the lake and the cedar forest. These observatories significantly enhance the visitor experience by aiding navigation. At one moment, a visitor may feel lost in the dense forest with limited visibility, but the next moment, they can orient themselves using these wayfinding elements, which provide direction and mark the path continuously.





Climate Change and the possitive impacts of wetlands’ restoration and ecotourism development

Wetlands restoration on islands offers a multifaceted approach to addressing climate change. It not only helps mitigate the effects by capturing carbon but also enhances resilience against climate impacts, supports biodiversity, improves water quality, and provides socio-economic benefits to local communities.

1. Carbon Sequestration

Soil Carbon Preservation: Healthy wetlands prevent the release of stored carbon from soil. When wetlands are drained or degraded, the stored carbon can be released back into the atmosphere, contributing to greenhouse gas emissions.

2.Biodiversity Support

- Habitat Restoration: Wetlands restoration supports biodiversity by providing habitats for a wide range of species. Healthy ecosystems are more resilient to climate change and can better support the species that rely on them.

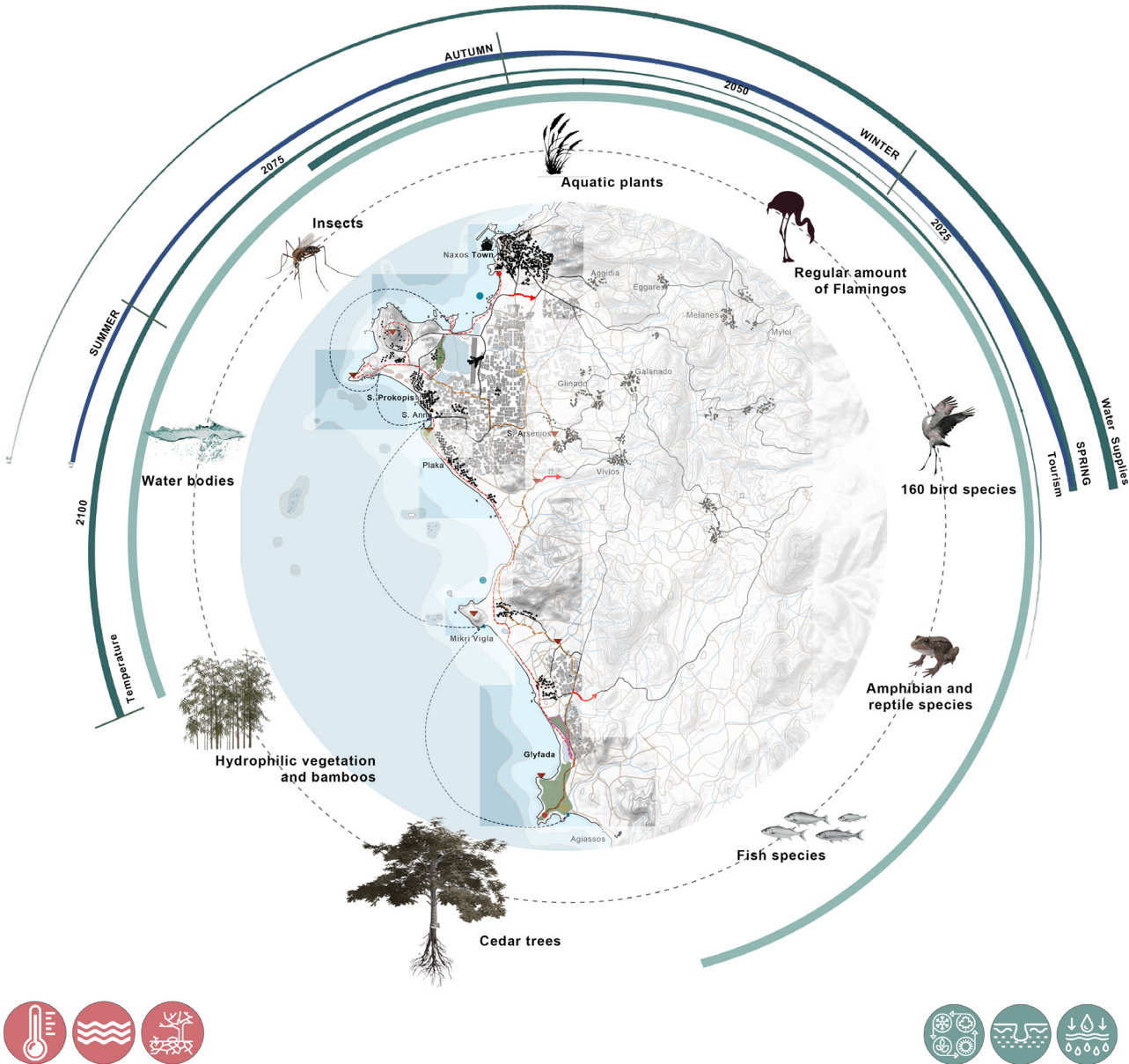
-Ecological Balance: Biodiverse ecosystems are more stable and can adapt better to changing conditions. This resilience helps to maintain ecological functions and services, such as pollination and pest control.

3.Climate Resilience for Communities

Sustainable Livelihoods: Restored wetlands can support sustainable livelihoods, such as fisheries and ecotourism, which are less vulnerable to the impacts of climate change compared to other forms of land use.

4.Temperature Regulation

Microclimate Stabilization: Wetlands help in stabilizing local temperatures by retaining moisture and releasing it slowly, contributing to cooler and more stable microclimates, which can be particularly beneficial for island ecosystems facing increasing temperatures.



Stages of the Design

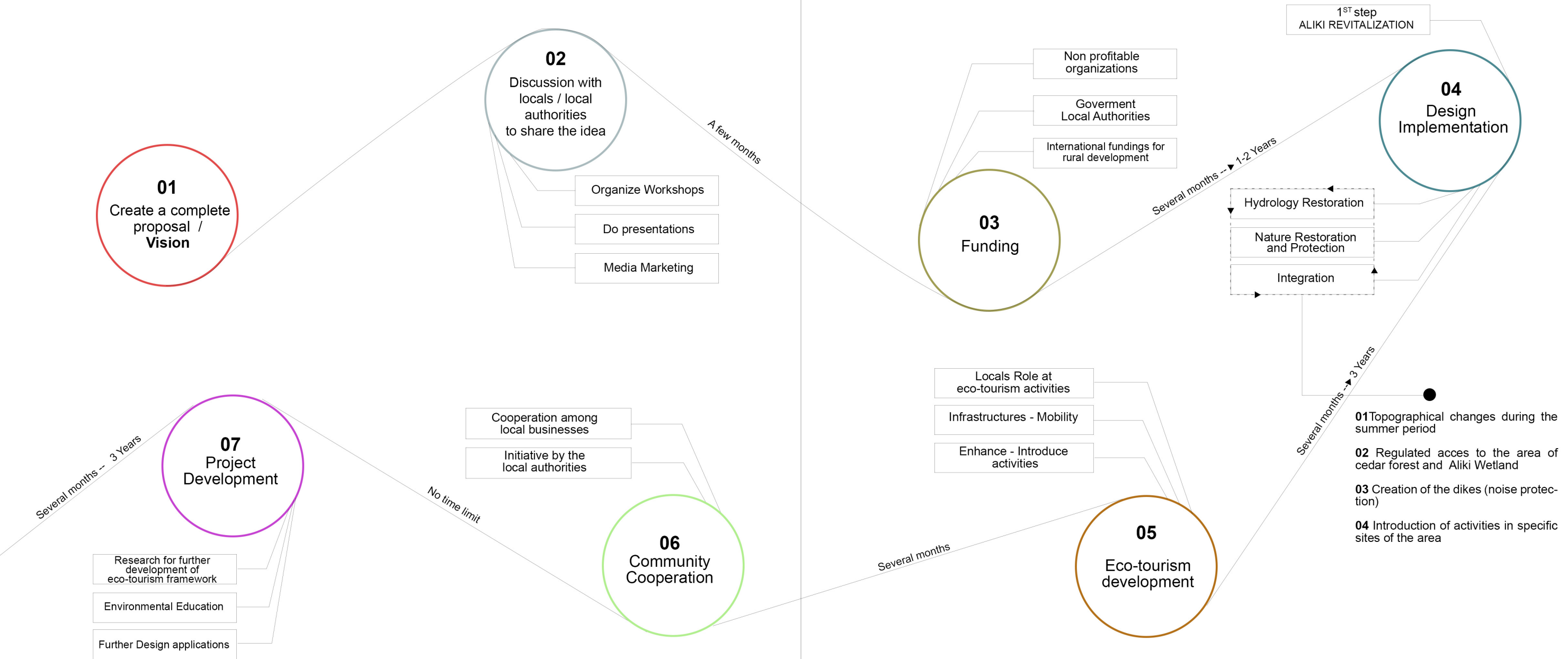
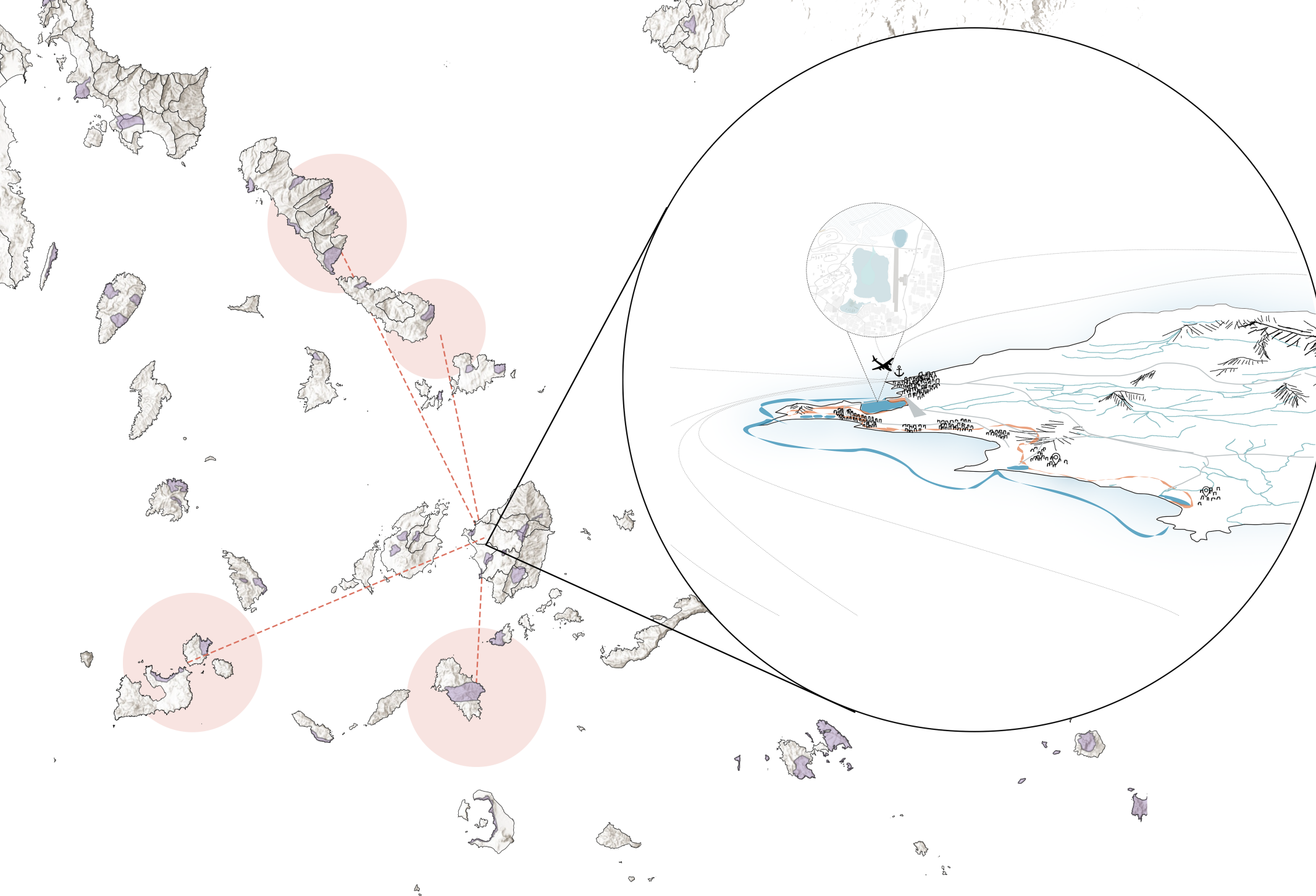




Figure 34: Aliko Wetland, Aerial View



Reflection on the larger social, professional and scientific context

The project is designed to elevate public awareness regarding the natural habitat and water, prompting a re-evaluation of the human-environment relationship. By proposing the creation of high-quality spaces for people to interact with nature and water throughout the seasons, the work addresses a crucial aspect of social consciousness. Furthermore, the project acknowledges the socio-economic challenges of the island, particularly the predominant focus on tourism for development. By spreading tourism more evenly throughout the year, preventing the insane peak of summer months, a balance can be achieved between modern needs, development, and the flourishing of nature. This, in my view, could be a key solution not only for the sustainability of the entire island but also for many other similar cases suffering from over-touristic activity.

From a scientific perspective, the landscape architecture principles embedded in the project offer a valuable framework for understanding and addressing the complexities involved. These principles enable the seamless integration of modern interventions into the environment without compromising its integrity. By emphasizing the relationship between people and their surroundings, the project aligns with the scientific goal of finding sustainable solutions for vulnerable areas.

In conclusion, graduation work contributes to the larger social context by fostering awareness, addresses professional challenges through a balanced tourism approach, and aligns with scientific principles for sustainable environmental solutions. It stands as a potential model not only for the island in focus but also for similar cases grappling with the impacts of over-touristic activities and water scarcity in a broader context.

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Appendix 1

Birds’ Catalogue

This list of bird species found in the Aliki area of Naxos is the result of re- search conducted by several ornithologists over different periods. The prima- ry sources include Nikos Probonas, whose work between 1992-1996 contrib- uted significantly, along with observations by Stamatīs Zogaris, Vasso Vlamis, and others during visits in October 1995. Additional insights come from Brog- gi and Willi’s observations in 1984. Compiled from these sources, the list aims to serve as a foundational database for future comprehensive studies on the avifauna of Alikī, acknowledging the preliminary nature of the current findings and the ongoing need for further ornithological research in the area.

Seasons are defined as follows:

A. (Spring) = March to May

K (Summer) – June to July

Θ (Autumn) = August to November (extended due to autumn migration)

X. (Winter) = December to February

Nesting Mode:

Φ = nests in Alikis Wetland Φ’ = probably nests or has nested in the past (not proven nesting)

(Φ) = nests in the wider area of the wetland

(Φ’) = probably nests in the wider area of the wetland

Nesting Status:

Φ = nests in the Alikis Wetland

Φ? = possibly nesting or has nested in the past (nesting not proven)

(Φ) = nests in the wider area of the wetland

(Φ?) = probably nests in the wider area of the wetland.

Dependence of Species on the Wetland (EX).

The following list also shows the degree of dependence of the species for the wetland habitats of Alikī. The “wetland of Alikī”. in this ornithological approach it is limited to the boundaries of the primordial lagoon, and the shallow sea area, islets and dunes are not included in this area. The following categories of depen- dence of the species on the wetlands of Alikī are as follows:

A: These species are directly dependent on the Alikī wetland, they are completely specialized in wetland habitats, and would not occur regularly in the area without the presence of the wetland.

B: These species are wetland dependent but have been observed to use other terrestrial or marine habitats of the wider area.

+. These species have been observed by members of the E.O.E. to use the wet- land (as a place to find food, cover, etc.). They are not necessarily dependent, but visit and use the resources and ecological conditions of the wetland. It is emphasized here that many more species may use the wetland but may have not yet been observed.

Because this list is based on a limited number of ornithological records, question marks are indicated where there is uncertainty about the dependency status of some species.

Bird Species		Seasonality	Dependence	
1.	Podiceps cristatus	X,A	B	
2.	Podiceps nigricollis	X,A	B	
3.	Tachybaptus ruficollis	X,K,A,Φ?	A	
4.	Calonectris diomedea	K		
5.	Phalacrocorax carbo	X,A	;	
6.	Phalacrocorax aristotelis	A,X,Θ		
7.	Nycticorax nycticorax	A	A	
8.	Ardeola ralloides	A	A	
9.	Egretta alba	A	A	
10.	Egretta garzetta	A,K,Θ	A	
11.	Ardea cinerea	A,K,Θ	A	
12.	Ardea purpurea	A	A	
13.	Ixobrychus minutus	A	A	
14.	Botaurus stellaris	A	A	
15.	Plegadis falcinellus	A	A	
16.	Phoenicopterus ruber	A	A	
17.	Cygnus olor	X	A	
18.	Anas querquedula	A	A	
19.	Anas platyrhynchos	A,K,X,Φ	A	
20.	Anas strepera	A	A	
21.	Anas acuta	A	A	
22.	Anas crecca	A	A	
23.	Anas penelope	A	A	
24.	Anas clypeata	A,K	A	
25.	Aythya nyroca	A	A	
26.	Aythya ferina	K	A	
27.	Mergus serrator	X		
28.	Circus aeruginosus	A	B	
29.	Circus cyaneus	X,A	B?	
30.	Circus pygargus	A	+	
31.	Buteo rufinus	Θ,X	+	
32.	Buteo buteo	X,A,K,Θ	+	
33.	Falco tinnunculus	X,A,K,Θ,(Φ)	+	
34.	Falco eleonorae	A,K,Θ	+	
35.	Porzana sp.	A	A	
36.	Gallinula chloropus	A,K,Φ	A	
37.	Fulica atra	A,K,Φ	A	
38.	Haematopus ostralegus	A	B	
39.	Himantopus himantopus	A,K,Φ	A	
40.	Glareola pratincola	A	A	
41.	Burhinus oedicephalus	K,Θ,Φ?	B;	

42.	Charadrius dubius	A,K,Θ,Φ	A
43.	Charadrius hiaticula	A,Θ	A
44.	Charadrius alexandrinus	X	A
45.	Charadrius leschenaultii	Θ	A
46.	Vanellus vanellus	X	B
47.	Pluvialis squatarola	Θ	A
48.	Calidris temminckii	Θ	A
49.	Calidris ferruginea	A	A
50.	Calidris alba	A	A
51.	Calidris minuta	X	A
52.	Philomachus pugnax	A,K,Θ	A
53.	Actitis hypoleucos	A	A
54.	Tringa ochropus	A,K,Θ	A
55.	Tringa glareola	A,K,X	A
56.	Tringa stagnatilis	A,K	A
57.	Tringa nebularia	A,K,X	A
58.	Tringa totanus	A,K	A
59.	Tringa erythropus	A,K	A
60.	Gallinago gallinago	X,A	A
61.	Gallinago media	X,A	A
62.	Limosa limosa	X,A,K,Θ	+
63.	Limosa lapponica	A	+
64.	Larus genei	X	+
65.	Larus ridibundus	X,A	B;
66.	Larus melanocephalus	A	+
67.	Larus minutus	A	
68.	Sterna sandvicensis	X	
69.	Sterna hirundo	K	B;
70.	Sterna albifrons	A	B;
71.	Gelochelidon nilotica	A	A
72.	Chlidonias leucopterus	A	
73.	Streptopelia decaocto	X	
74.	Apus apus	A,K	
75.	Caprimulgus europaeus	A	B;
76.	Alcedo atthis	X,A	
77.	Upupa epops	A	
78.	Merops apiaster	A	
79.	Alauda arvensis	X	+
80.	Galerida cristata	X,A,K,Θ,Φ	
81.	Delichon urbica	A	+
82.	Riparia riparia	A,Θ	

83.	Hirundo daurica	A,Θ	
84.	Hirundo rustica	A,Θ	+
85.	Motacilla cinerea	A,K,Θ,(Φ)	+
86.	Motacilla flava feldegg	X,A,Θ	B;
87.	Motacilla alba	X,A,K,Θ,Φ?	B;
88.	Anthus trivialis	Θ	
89.	Anthus campestris	A,K	
90.	Anthus pratensis	X,A	+
91.	Troglodytes troglodytes	X	
92.	Saxicola rubetra	A	
93.	Saxicola torquata	A	+
94.	Erithacus rubecula	X	
95.	Phoenicurus ochruros	X,A	
96.	Oenanthe oenanthe	A	+
97.	Oenanthe hispanica	A,K,(Φ)	+
98.	Turdus philomelos	A	
99.	Turdus pilaris	A	
100.	Cercotrichas galactotes	A	
101.	Cisticola juncidis	A,Φ?	B;
102.	Cettia cetti	A	B;
103.	Acrocephalus scirpaceus	A	A
104.	Acrocephalus arundinaceus	A	A
105.	Hippolais pallida	K,(Φ)	+
106.	Sylvia melanocephala	X,A,K,Θ,Φ?	+
107.	Phylloscopus trochilus	Θ	+
108.	Phylloscopus collybita	X	+
109.	Muscicapa striata	Θ	
110.	Muscicapa dauurica	Θ	
111.	Lanius senator	K,Θ,(Φ)	
112.	Lanius collurio	Θ	+
113.	Lanius minor	X,A,K,Θ,(Φ)	+
114.	Corvus corax	Θ	
115.	Passer domesticus	X,A,K,Θ,(Φ)	+
116.	Fringilla coelebs	Θ,X	
117.	Serinus serinus	X	
118.	Carduelis cannabina	Θ;,X	
119.	Carduelis carduelis	A,K,Θ,X,(Φ?)	
120.	Carduelis chloris	K,Θ,X,A	
121.	Emberiza cirrus	A,(Φ?)	
122.	Emberiza melanocephala	A,K,(Φ)	
123.	Miliaria calandra	A,X	

Appendix 2

PHOTOGRAPHIC ARCHIVE

The photographic archive presented here is a collection of images that capture all the elements that make the landscape of Naxos a unique tapestry of hidden—and sometimes not so hidden—gems, comprising diverse and uniquely beautiful and significant landscapes.

These photographs aim to showcase the variety of different landscape types, from mountainous to lowland areas, from the southern to the northern parts, and from the eastern to the western regions of the island which are all, completely different from site to site. Each landscape is distinct, influenced by human activities or left entirely to the passage of time, revealing the multifaceted geological, geographical, and cultural value of the place.

Many images were taken during my personal hikes, such as those from the summit of Mount Zas, where one can have a panoramic view of the island and all the Cycladic islands, revealing the puzzle-like formation of the islands together and separately. Other photos include the hidden waterfalls of Routsouna, nestled in the slopes of central Naxos, and the traditional mountain villages of Koronos and Skado. These villages, despite facing abandonment in recent years, retain their unique traditional character completely integrated with the mountainous landscape.

Lastly, the archive includes photos of Naxos' wetlands, particularly those of Aliki, Agios Prokopios, and Glyfada. Beyond showcasing natural features, elements of flora, and surrounding natural structures, these images also depict how these areas are currently used and the neglect shown by local authorities in terms of protection and preservation. These wetlands are often used as dumping grounds and parking areas for the numerous vehicles that occupy protected zones to meet tourist demands and the influx of visitors.

In conclusion, this photographic collection not only highlights the immense natural beauty and diversity of Naxos but also underscores the urgent need for better management and protection of its unique landscapes. It calls for a renewed commitment to preserving these precious environments for future generations while balancing the demands of tourism and development.



Figure 54: Streams from the mountain of Zas



Figure 55: Steep Slopes in the Central Naxos



Figure 56: Paths to the Cave of Zas Mountain



Figure 57: Areal Railway , Industrial Heritage Monument for emery transportation



Figure 58: Dry stones for cultivation in the mountainous areas

Figure 59: Emery mine

Figure 60: Traditional buildings for emery mine workers



Figure 61: Skado Village, North-Eastern Naxos



Figure 62: Routsouna Waterfalls



Figure 63: Mountainous areas in the central island



Figure 64: Aliko Wetland, Summer Season



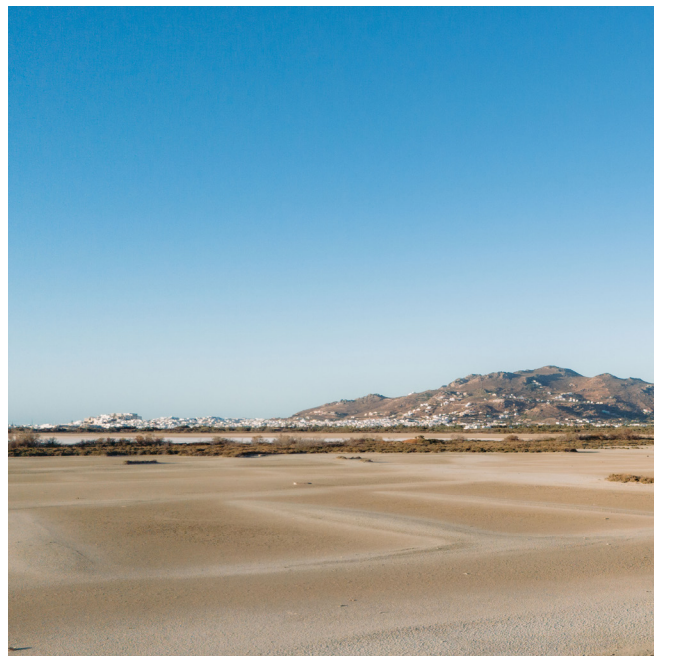
Figure 65: Aliko Wetland, Summer Season



Figure 66: Airport next to Aliko Wetland



*Figure 67,68,69: Salt Pans, South-West area of Aliko Wetland
Figure 70: Laguna Coast, North to Aliko Wetland*



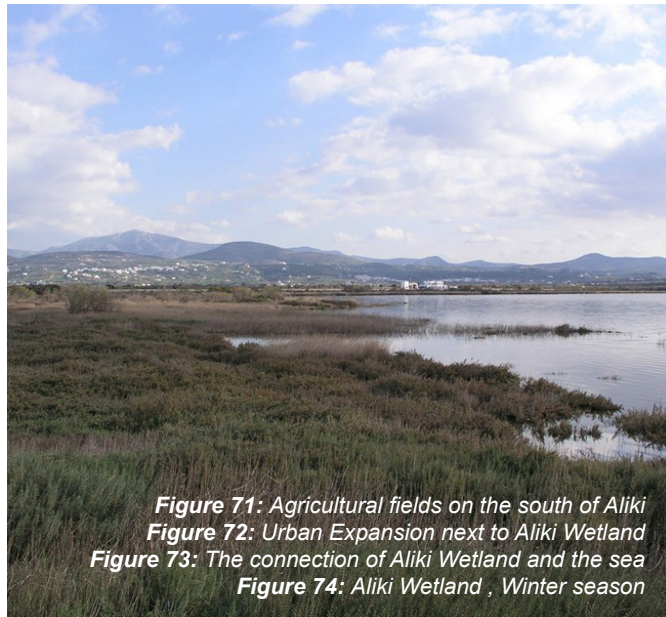


Figure 71: Agricultural fields on the south of Alik
 Figure 72: Urban Expansion next to Alik Wetland
 Figure 73: The connection of Alik Wetland and the sea
 Figure 74: Alik Wetland , Winter season



Figure 75: Agricultural fields on the south of Alik
 Figure 76: The Salt pans-on the south of Alik



Figure 77: The Salt pans of Saint Prokopis



Figure 78: Glyfada Wetland



Figure 79: The Salt pans of Saint Prokopis



Figure 80: Glyfada Wetland
Figure 81:



Figure 82-85: NATural Characteristics around Aliko Wetland

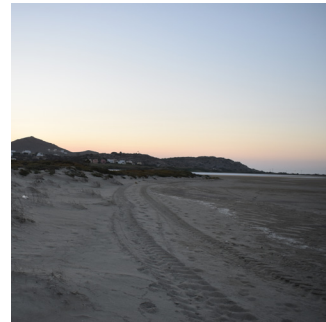
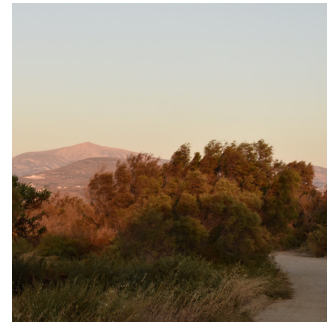


Figure 85-90: NATural Characteristics around Aliko Wetland



Figure 91: Traffic light next to the airport
Figure 92: Reeds in Laguna Coast
Figure 93: Saint Prokopios and Saint Anna

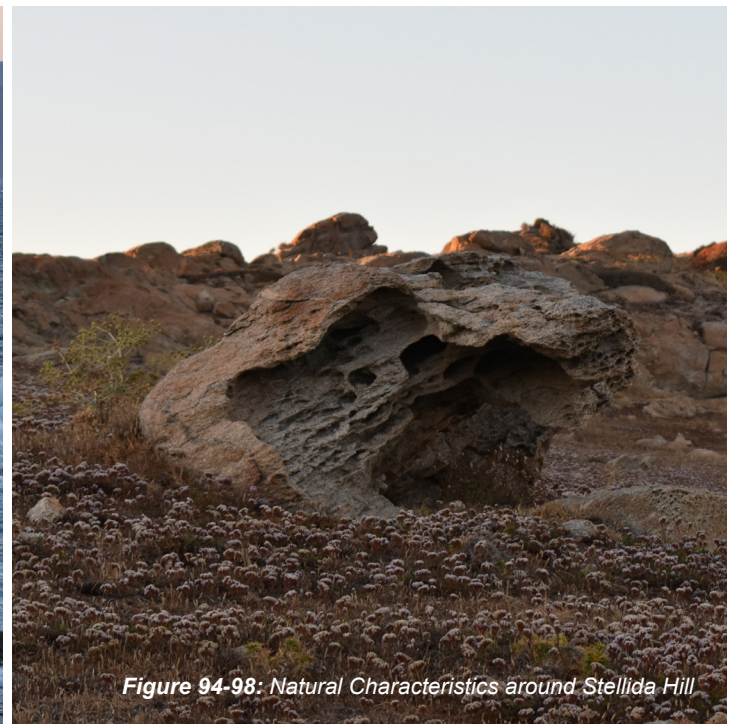


Figure 94-98: Natural Characteristics around Stellida Hill

Photo References

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Figure 2: Vasilis Tsakoniatis, 2023
Figure 3: Vasilis Tsakoniatis, 2023
Figure 4: Personal Archive, 2023
Figure 5: Personal Archive, 2023
Figure 6: Personal Archive, 2023
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Figure 9: Personal Archive, 2023
Figure 10: Personal Archive, 2023
Figure 11: Personal Archive, 2023
Figure 12: Personal Archive, 2023
Figure 13: Personal Archive, 2023
Figure 14: naxostimes.gr. (2022, August 21)
Figure 15: Vasilis Tsakoniatis, 2023
Figure 16: Lagoon, the wildlife “Refuge.”, 2022
Figure 17: Lagoon, the wildlife “Refuge.” , 2022
Figure 18: Personal Archive, 2023
Figure 19: Lagoon, the wildlife “Refuge.” (2022, September 15)
Figure 20: Vasilis Tsakoniatis, 2023
Figure 21: Niki Evelpidou, 2017
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Figure 33: Vasilis Tsakoniatis, 2024
Figure 34: Vasilis Tsakoniatis, 2023
Figure 35: Personal Archive, 2023
Figure 36: Personal Archive, 2023
Figure 37: LagosMare (n.d.)
Figure 38: Michalis Fragouloupoulos, 2024
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Figure 60: Vasilis Tsakoniatis, 2023
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Figure 73: Lagoon, the wildlife “Refuge.” (2022, September 15)
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Figure 79: Vasilis Tsakoniatis, 2023
Figure 80: Vasilis Tsakoniatis, 2023
Figure 81: Facebook, "Save the Beaches of Naxos NOW!"
Figure 82: Personal Archive, 2023
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Figure 93: Michalis Frangolas,2020
Figure 94: Personal Archive, 2023
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Figure 97: Personal Archive, 2023
Figure 98: Personal Archive, 2023

