



Section **D**  
Coastline Site Study

# Chapter 4 - Coastline Site Study

## 4. INTRODUCTION TO EILAT'S COASTLINE

Eilat's coastline, stretching approximately 12 kilometres along the northern tip of the

Red Sea, plays a pivotal role in defining the city's character and economic profile. This region is not only a geographical marvel but also an ecological treasure, supporting diverse marine and desert biosystems. The coastline's coral reefs and

### Eilat's coastline

Introduction



### Two main characters for the city



The coastline of the city has an important role for the city economy. It mainly characterizes in two parts, Vibrant in the north vs relaxed in the south.

associated marine life make it a critical area for biodiversity conservation, while its natural beauty drives the city's tourism and recreation industries, making it a cornerstone of Eilat's economy.

## 4.2 HISTORICAL OVERVIEW OF EILAT'S COASTLINE

Eilat's coastline has a rich history that traces back to its early days as a strategic outpost due to its prime location along the



Figure 358. Figure 4-1-1 Ariel view, 1949, Source: Eilat's Archive

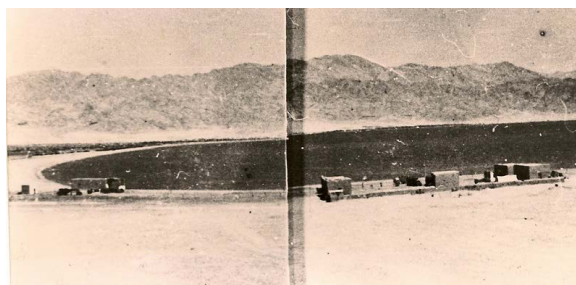


Figure 357. Eilat coastline, with Umm Rashrash buildings. With the mountains of Aqaba (Jordan) in the background, 1949, Source: Eilat's Archive

northern edge of the Red Sea. Originally, the area served as a critical port for both military and trade purposes, linking maritime routes from the Red Sea to the broader Middle East and beyond. The natural deep waters and shelter provided by the surrounding geography made it an ideal location for ship docking and goods transfer, establishing it as a crucial economic node in the region.

As global maritime technology and trade routes evolved, so did the strategic importance of Eilat's port. However, the discovery and subsequent appreciation of the region's remarkable natural resources, particularly its coral reefs and diverse marine life, marked a turning point in the area's focus. By the mid-20th century, the increasing ecological awareness and the burgeoning field of marine biology highlighted the need to study and preserve these unique ecosystems. This was further propelled by the growing global movement towards environmental conservation, which recognized the intrinsic value of maintaining biodiversity for ecological stability.

The latter part of the 20th century saw a significant shift towards a commercial port to a premier destination for ecotourism and scientific research. The establishment of marine parks and research facilities, such as the Coral Beach Nature Reserve, signalled a commitment



Figure 360. Eilat's seaport, 1951, Source: Eilat's Archive

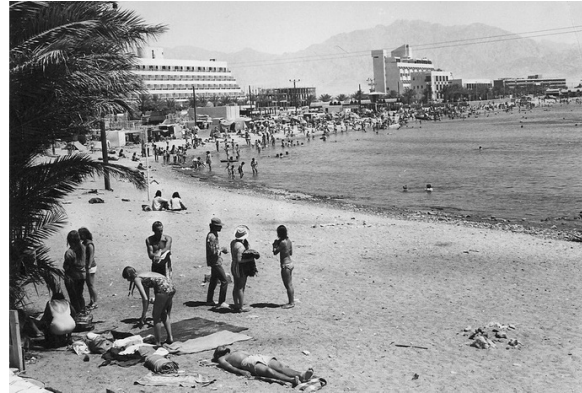


Figure 361. Eilat's Western coastline, 1978, Source: Eilat's Archive



Figure 359. Eilat's seaport, 1951, Source: Eilat's Archive

to integrating conservation with economic development. These efforts were aimed not only at protecting the delicate coral reefs and their marine inhabitants but also at offering educational experiences to tourists and locals alike, fostering a deeper understanding and appreciation of marine ecosystems.

This transition has been supported by both national policies and international cooperation, focusing on sustainable development practices that accommodate both environmental and economic goals. Today, Eilat's coastline is celebrated as a model for how ecological research and responsible tourism can coexist. Ongoing studies and conservation efforts continue to enhance our knowledge and protection of this unique natural heritage, ensuring that it remains a vibrant part of the local culture and economy for future generations.

#### 4.2.1 HISTORICAL COASTLINE URBAN AND ARCHITECTURAL DEVELOPMENT

The architectural and urban development of Eilat's coastline can be traced through several distinct phases, each reflecting broader trends in design, functionality, and environmental awareness.

In its early days, Eilat's coastline was sparsely developed, with infrastructure primarily serving the shipping and fishing industries. The architecture was highly utilitarian, designed to withstand the harsh marine and desert conditions. Buildings and facilities were minimalistic, focusing on functionality without extensive aesthetic considerations.

The discovery of Eilat as a tourist destination in the mid-20th century marked the beginning of significant changes along the coastline. The Israeli government, recognizing the potential of Eilat's unique marine environment and year-round warm weather, began to promote it as a tourism hub. This led to the first wave of major architectural developments, including the construction of seafront hotels and resorts. These structures were designed to maximize views of the Red Sea and provide direct beach access, featuring large balconies, expansive glass fronts, and open-air designs that blended indoor and outdoor spaces.

As tourism increased, so did the scale and complexity of coastline development. The 1980s and 1990s saw a more diversified architectural approach as Eilat's coastline began to attract international architects and developers. During this period, the architectural style became more eclectic, with luxury hotels and entertainment complexes that incorporated elements of postmodernism and Mediterranean influences. This era focused on creating a distinctive skyline that could compete with other global tourist destinations, emphasizing unique designs that stood out against the natural backdrop of the Red Sea and desert landscapes.

The late 1990s and early 21st century brought a new awareness of the environmental impact of coastal development. Architectural and urban planning practices began to incorporate principles of sustainability. New projects



**Figure 362.** Eilat Hotel (The first hotel in the city), 1967, Source: Eilat's Archive

along Eilat's coastline were increasingly designed with ecological sensitivity, using materials and techniques that minimized environmental disruption. This included the integration of green technologies such as solar energy and water recycling systems, as well as designs that aimed to preserve the natural coastline and marine habitats.

Contemporary developments along Eilat's coastline emphasize sustainable tourism and broad public access. Urban planning and architectural practices continue to focus on minimizing ecological impacts while enhancing visitor experiences. This includes the improvement of public amenities, integration of sustainable technologies, and design practices that respect and highlight the natural beauty of the Red Sea and surrounding desert. Recent studies, such as those on underwater coral reef classification, indirectly relate to these efforts by highlighting the importance of preserving Eilat's marine environment through sustainable practices (S. Raveendran, MD Patil, 2023).

### 4.3 PHYSICAL AND ECOLOGICAL CHARACTERISTICS OF EILAT COASTLINE

The Coral Beach Nature Reserve and other key ecological areas along Eilat's coastline are home to some of the world's most northern coral reefs. These reefs provide critical habitats for diverse marine species and are vital



*Figure 363. The Red Sea and the Gulf of Eilat (Aqaba), Source: Eilat's Archive*

for global biodiversity conservation. The juxtaposition of marine and desert ecosystems in such proximity creates a rare ecological phenomenon that offers unique opportunities for ecological studies and conservation efforts (Eyal et al., 2019).

Recent studies highlight the Red Sea as a region of significant ecological importance, housing some of the most resilient coral reefs against climate



Figure 365. The Red Sea and the Gulf of Eilat (Aqaba), Source: Eilat's Archive

change-induced stressors like ocean acidification and seawater warming. The coral reefs in northern sections, including those near Eilat, are considered potential refuges from global warming, providing a hopeful perspective for coral conservation in changing climates (Fine et al., 2019). Additionally, Eilat's coastline is characterized by its sandy beaches and the dramatic backdrop of the desert, which offers sweeping vistas and contributes to the region's natural appeal. These landscapes not only provide critical habitats for wildlife but also enhance the area's attractiveness to tourists and nature enthusiasts, promoting environmental appreciation and recreational activities.

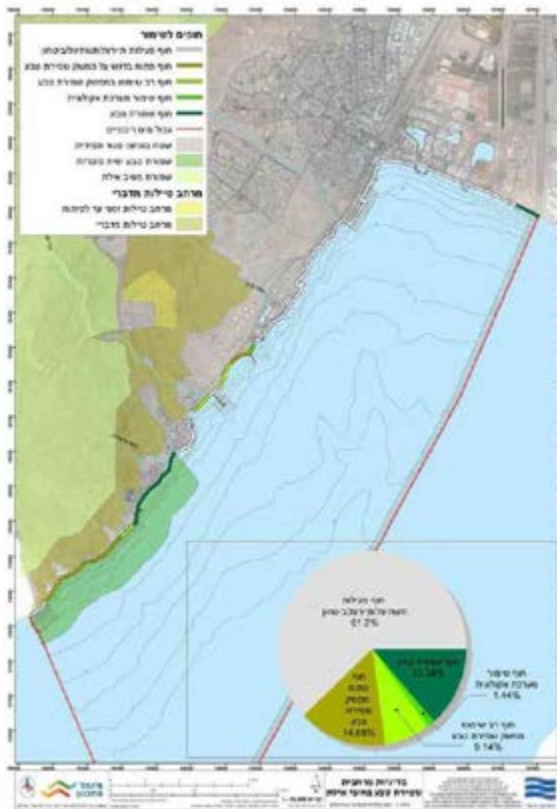


Figure 364. The Red Sea and the Gulf of Eilat (Aqaba), Source: Eilat's Archive

#### 4.4 HUMAN USAGE AND IMPACT

Eilat's economic development is heavily reliant on its tourism infrastructure. The construction of hotels, resorts, and other tourist facilities along the coastline has been instrumental in shaping the city's economic landscape. While these developments have made the coastline accessible to a broader audience and catalysed economic growth, they require careful management to mitigate impacts on the natural environment (Raphael et al., 2020).

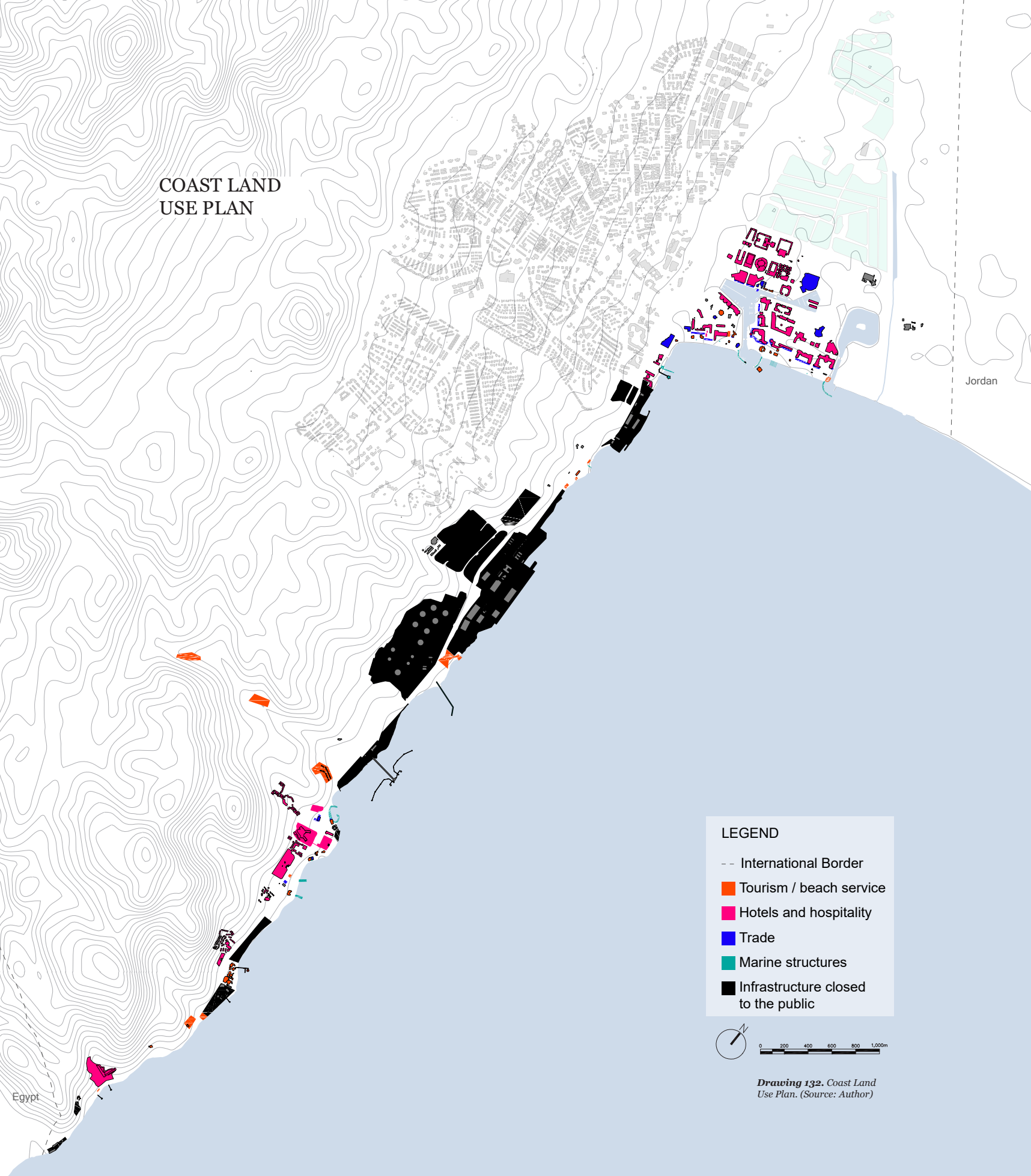
Conservation efforts in Eilat include the establishment of marine protected areas and stringent regulations on coastal construction to preserve the natural habitat. These initiatives aim to sustain the ecological balance and ensure that tourism growth does not detrimentally affect the marine and terrestrial environments.

Despite ongoing conservation efforts, Eilat's coastline faces several environmental threats, such as pollution, overfishing, and the impacts of climate change, particularly on its coral reefs. The coastline's configuration also presents issues with connectivity and public access, complicating efforts to manage and protect these valuable ecosystems effectively. Balancing development with

environmental conservation remains a critical challenge for stakeholders in the region.



# COAST LAND USE PLAN

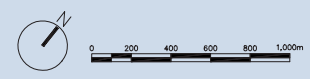


Jordan

Egypt

## LEGEND

- International Border
- Tourism / beach service
- Hotels and hospitality
- Trade
- Marine structures
- Infrastructure closed to the public



*Drawing 132. Coast Land  
Use Plan. (Source: Author)*

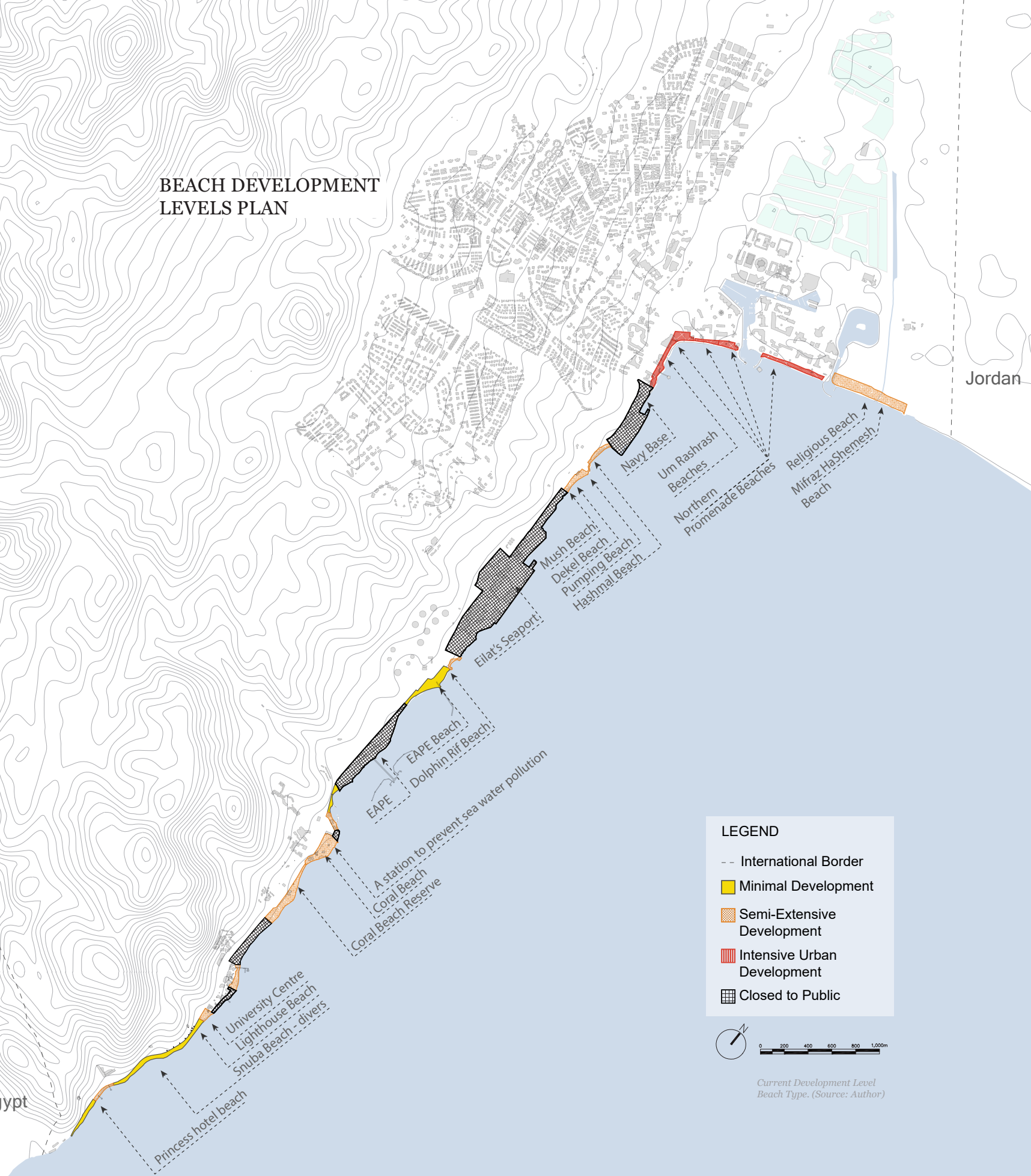
#### 4.4 COASTLINE LAND USE PLAN

Mapping of land uses and stakeholders along the coastline reveals a significant concentration of tourism hubs, commercial establishments, and hotels along the northern beachfront, with an additional concentration in the area of Almog Beach.

It is evident that the public infrastructure occupies a significant portion of the coastline, disrupting the continuity of the beaches and the accompanying tourist activities.

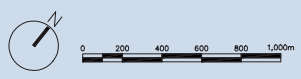
The proliferation of stakeholders along the coastline indicates the potential for an interesting and diverse mosaic that can be nurtured and developed for the benefit of the public and the environment through thoughtful planning and coordination among the various stakeholders.

# BEACH DEVELOPMENT LEVELS PLAN



**LEGEND**

- International Border
- Minimal Development
- ▨ Semi-Extensive Development
- ▤ Intensive Urban Development
- ▧ Closed to Public



Current Development Level  
Beach Type. (Source: Author)

## 4.5 PHYSICAL EXISTING ANALYSIS

### 4.5.1 CURRENT DEVELOPMENT LEVEL BEACH TYPE

The development level of Eilat's coastal area reflects a wide variety of urban plans and combinations, catering to the diverse requirements and needs of the wide-ranging audience that enjoys the beaches stretching along it.

The intensively developed urban beaches, situated in the northern coastal strip near the hotels, primarily cater to tourists and a broad audience of visitors. They offer a complete beach experience with a variety of services and activities, including restaurants and shops, seamlessly integrated in an urban and impressive manner.

In contrast, the extensively developed beaches, located at both ends of the coastal strip in the south and east, provide a beach experience in conditions of tranquillity and natural beauty. However, they lack basic beach services and are primarily suitable for those seeking peace and serenity.

The semi-extensive beaches combine organized beach services with a sense of naturalness and tranquillity. They allow for a more expected integration between the local population and tourists, creating an authentic and diverse beach experience.

#### MINIMAL DEVELOPMENT



*Figure 366. Coastal space with Minimal - Extensive development. Natural beach in the southern coast strip. Source: Author*

#### SEMI-EXTENSIVE DEVELOPMENT



*Figure 367. Coastal space used for coastal tourism - Semi-extensive. This is the Dolphin Reef beach. Source: Author*

#### INTENSIVE URBAN DEVELOPMENT



*Figure 368. Coastal space used for coastal tourism - Semi-extensive. This is the Dolphin Reef beach. Source: Author*

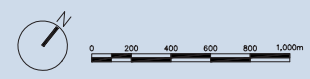
# BEACH WIDTH TYPE PLAN



Jordan

**LEGEND**

- International Border
- Beaches (< 30m wide)
- Beaches (30–50m wide)
- Beaches (50–100m wide)
- ▨ Closed to Public
- ⊘ No public access



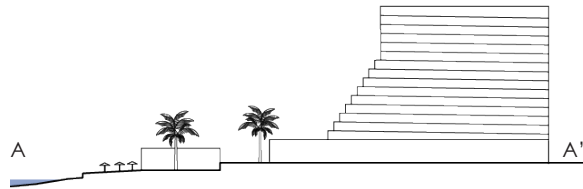
**Drawing 133.** Beach Width Categories Plan. (Source: Author)

#### 4.5.2 BEACH WIDTH CATEGORIES

The coastline exhibits three distinct types of beach widths. The majority of the beaches are less than 50 meters wide, with many even narrower than 30 meters. This limited width is particularly noticeable in the highly touristed northern strip, where the proximity of hotel constructions to the waterline has left minimal space for regulated seating and free passage. The high density in this area complicates the effective arrangement of beach services. Conversely, many of the expansive and attractive beaches are located in the southern part of the coastline. Unfortunately, most of these are either closed to the public or require an entry fee for access. The beaches that are open to the public without charge tend to be narrower and more constrained. Additionally, in the southernmost areas, the beaches are impacted by the road that runs adjacent to them due to the local topography, further affecting their accessibility and use.

#### BEACHES (< 30M WIDE)

##### SECTION AA'



*Drawing 135. Nine Beach Section. Source: Author*

##### SECTION AA' KEY PLAN



*Drawing 134. Nine Beach Key plan. Source: Author*

#### BEACHES (< 30M WIDE)



*Figure 369. Beaches that are smaller than 30m in width. In the photo is Nine Beach which is located in the northern coast . Source: Author*

# BEACH WIDTH TYPE PLAN



Jordan

## LEGEND

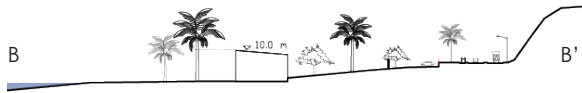
- International Border
- Beaches (< 30m wide)
- Beaches (30–50m wide)
- Beaches (50–100m wide)
- /// Closed to Public
- ⊘ No public access



0 200 400 600 800 1,000m

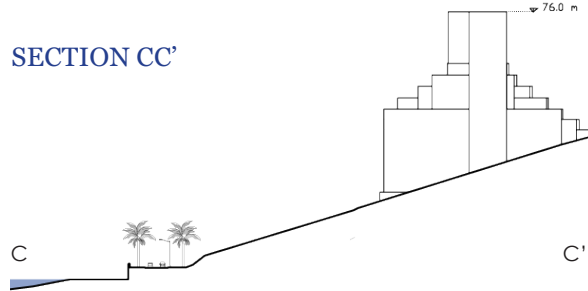
**Drawing 136.** Beach Width  
Categories Plan. (Source:  
Author)

SECTION BB'



Drawing 140. Dekel Beach Section. Source: Author

SECTION CC'



Drawing 139. Princess Beach Section. Source: Author

SECTION BB' KEY PLAN



Drawing 138. Dekel Beach Section key Map. Source: Author

SECTION CC' KEY PLAN



Drawing 137. Princess Beach Section key map. Source: Author

BEACHES OF 50-100M IN WIDTH



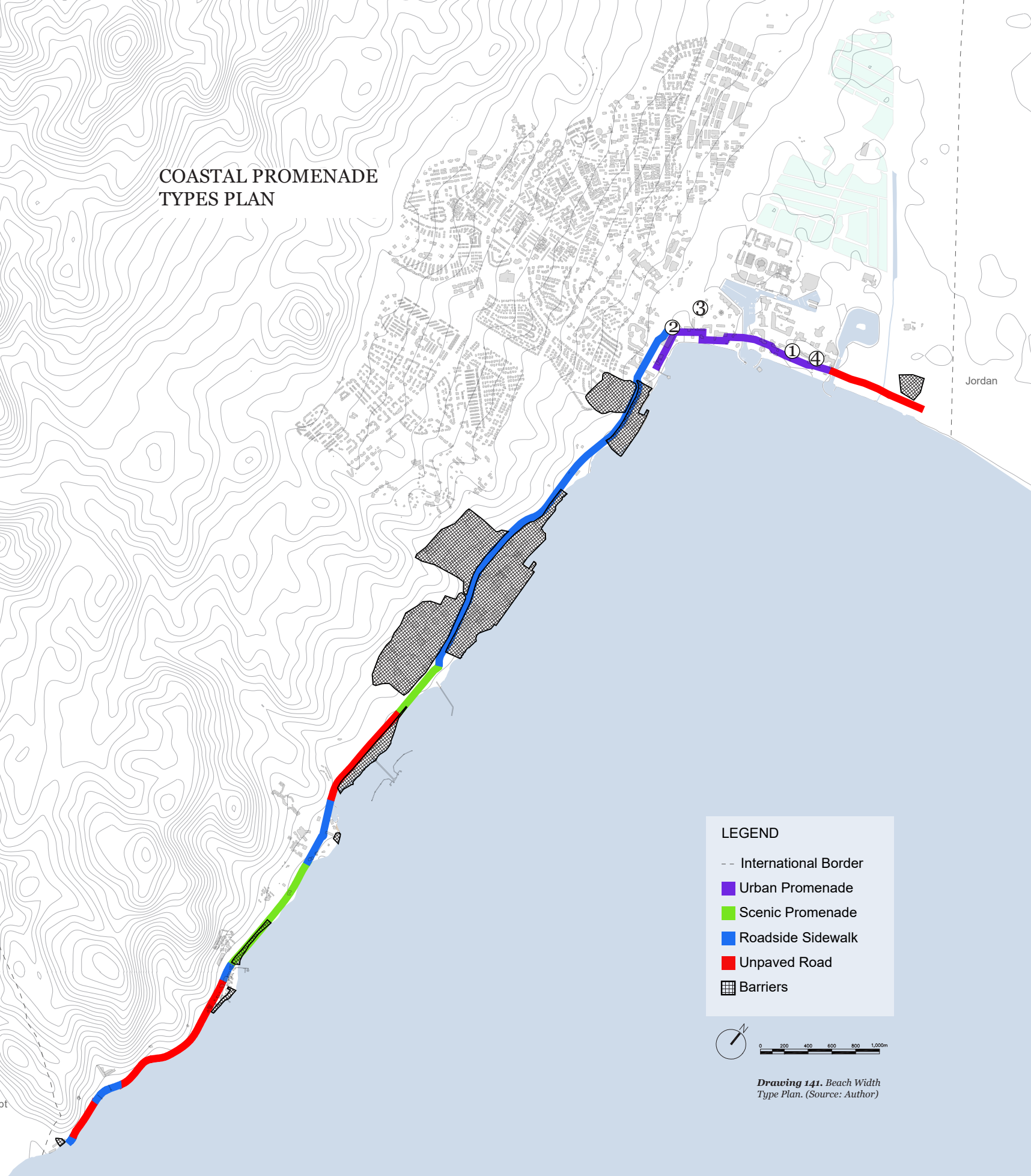
Figure 371. Beaches of 50-100m in width. In the photo is Dekel Beach which is located in the Southern coast. Source: Author

BEACHES (30-50M WIDE)



Figure 370. Beaches of 30-50m in width. In the photo is Princess Beach which is located in the Southern coast. Source: Author

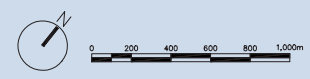
# COASTAL PROMENADE TYPES PLAN



Jordan

**LEGEND**

- International Border
- Urban Promenade
- Scenic Promenade
- Roadside Sidewalk
- Unpaved Road
- Barriers



*Drawing 141. Beach Width  
Type Plan. (Source: Author)*

### 4.5.3 COASTAL PROMENADE TYPES

The promenade sequence unfolds in distinct tracks, offering varied experiences along the coastal stretch. Divided into four main pathways, it encompasses a developed urban promenade, a scenic

promenade, a pathway adjacent to the road, and dirt trails.

A predominant portion of the potential promenade route follows alongside the road and includes stretches of dirt trails. This design choice ensures accessibility and connectivity while embracing the

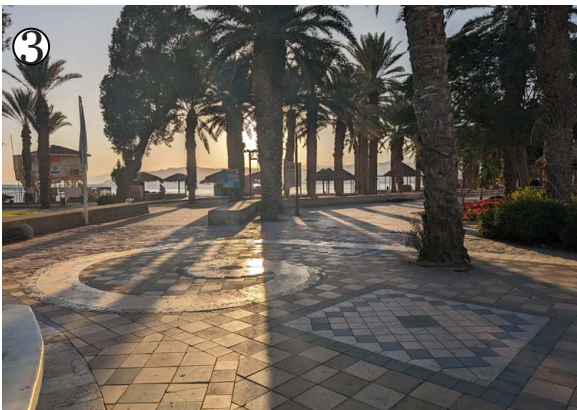
#### URBAN PROMENADE



**Figure 372.** Developed urban promenade. This is located in the northern part of the coast. It has shops, restaurants and hotels. (Source: Author)



**Figure 373.** Developed urban promenade next to a shopping centre. (Source: Author)

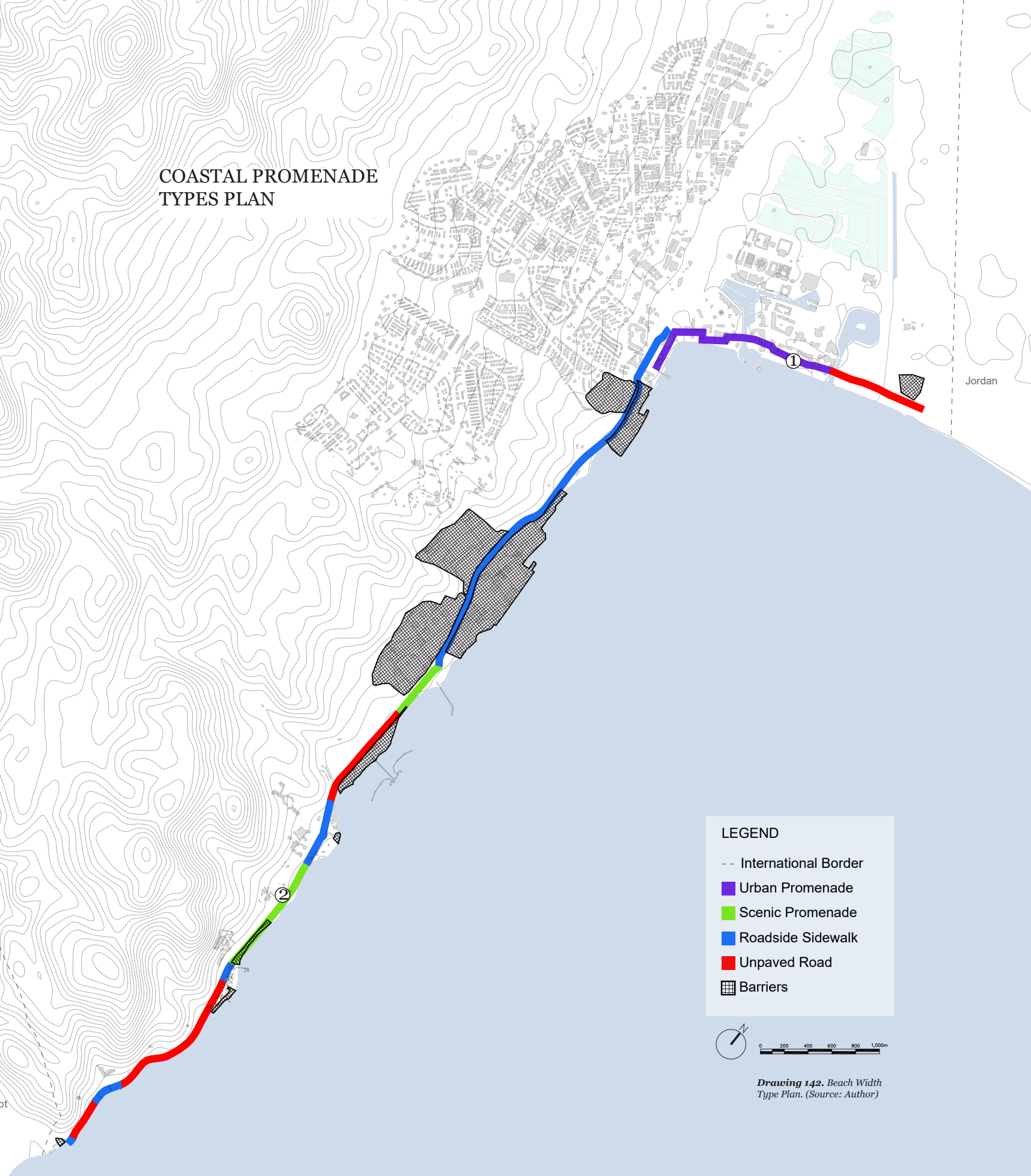


**Figure 374.** Developed urban promenade. (Source: Author)



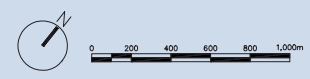
**Figure 375.** Developed urban promenade. (Source: Author)

# COASTAL PROMENADE TYPES PLAN



**LEGEND**

- International Border
- Urban Promenade
- Scenic Promenade
- Roadside Sidewalk
- Unpaved Road
- Barriers



*Drawing 142. Beach Width  
Type Plan. (Source: Author)*

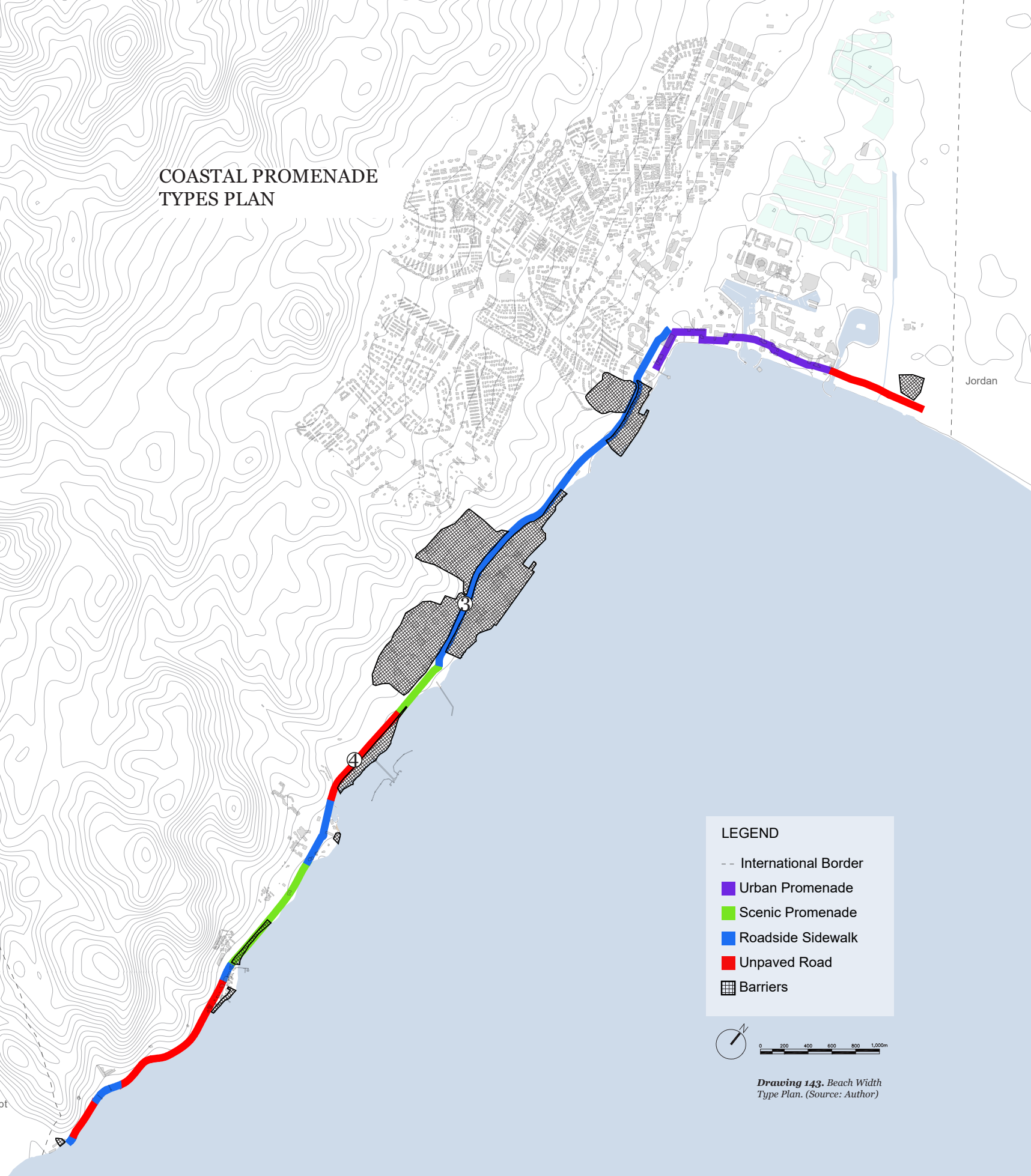
SCENIC PROMENADE



*Figure 376. Developed scenic walkway. This is located in the southern part of the coast. It has paved walkway, trees and plants. There is no access to the beach but the sea visible. Source: Author*



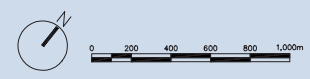
# COASTAL PROMENADE TYPES PLAN



Jordan

**LEGEND**

- International Border
- Urban Promenade
- Scenic Promenade
- Roadside Sidewalk
- Unpaved Road
- Barriers



*Drawing 143. Beach Width  
Type Plan. (Source: Author)*

natural landscape.

The developed urban promenade, located on the northern shore, provides a continuous walkway along its length. However, it requires redevelopment to

meet modern standards and create a high-quality public space.

In the southern region, scenic promenades offer picturesque views but lack a uniform sequence. Interrupted by

### ROADSIDE SIDEWALK



**Figure 377.** Sidewalk next to a road. This is located behind the seaport. There is no access to the sea but there is view to the sea. Source: Author



**Figure 378.** Sidewalk aside the seaport. This is located behind the seaport. There is no access to the sea but there is view to the sea. Source: Author

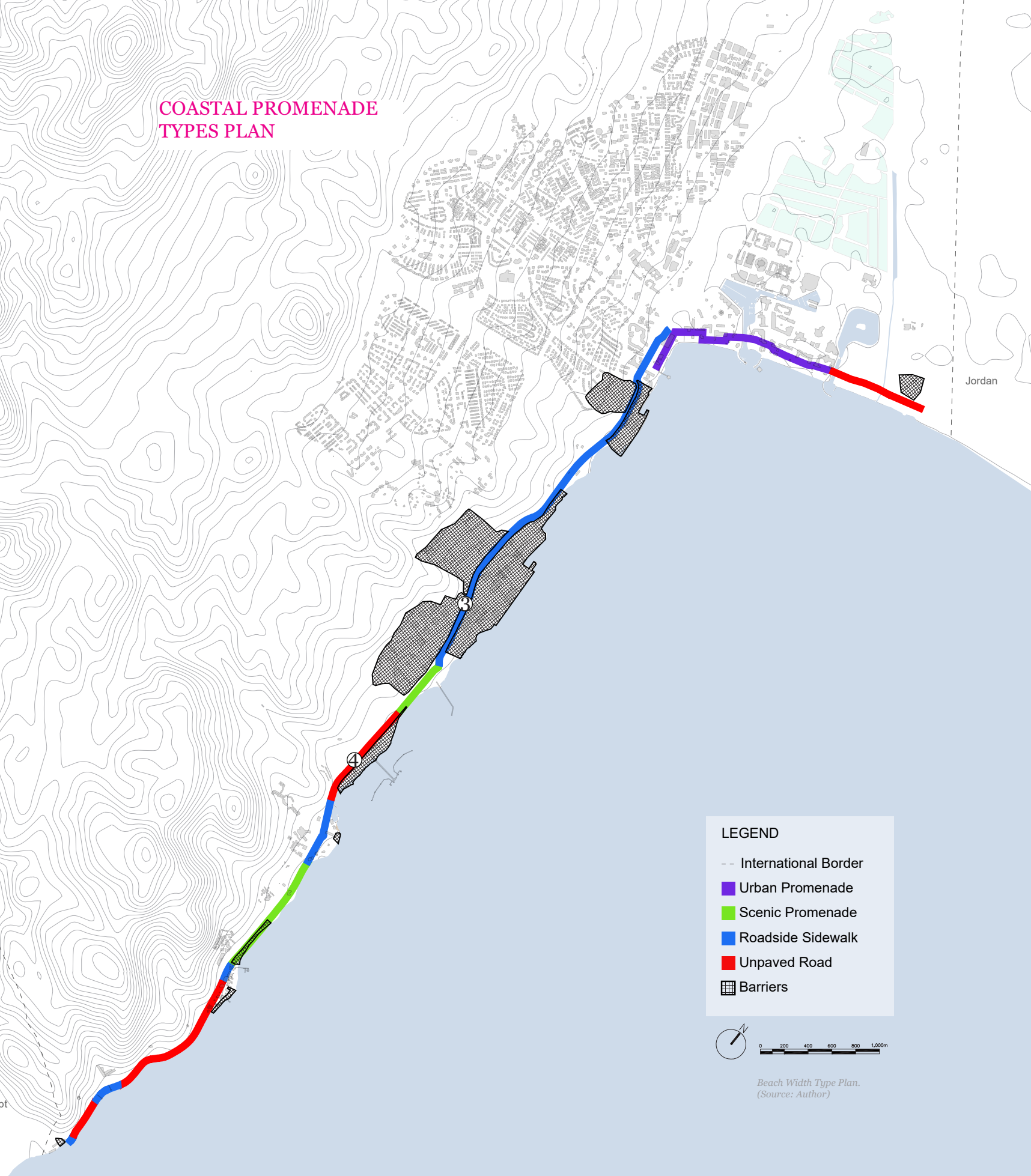


**Figure 379.** Sidewalk next to a road. In front there is the oil port. There is no access to the sea but there is view to the sea. Source: Author



**Figure 380.** Sidewalk with access to the beach. Source: Author

# COASTAL PROMENADE TYPES PLAN



Jordan

## LEGEND

- International Border
- Urban Promenade
- Scenic Promenade
- Roadside Sidewalk
- Unpaved Road
- Barriers



0 200 400 600 800 1,000m

Beach Width Type Plan.  
(Source: Author)

segments of dirt trails or pathways, they do not facilitate seamless passage, unlike the primary promenade that accompanies the beach front.

## UNPAVED ROAD



**Figure 381.** Dirt road. This is located in the southern part of the coast. There is no access to the sea but there is view to the sea. There is no trees of shading which makes unpleasant walking in the hot messes of the summer. Source: Author



**Figure 382.** . Source: Author

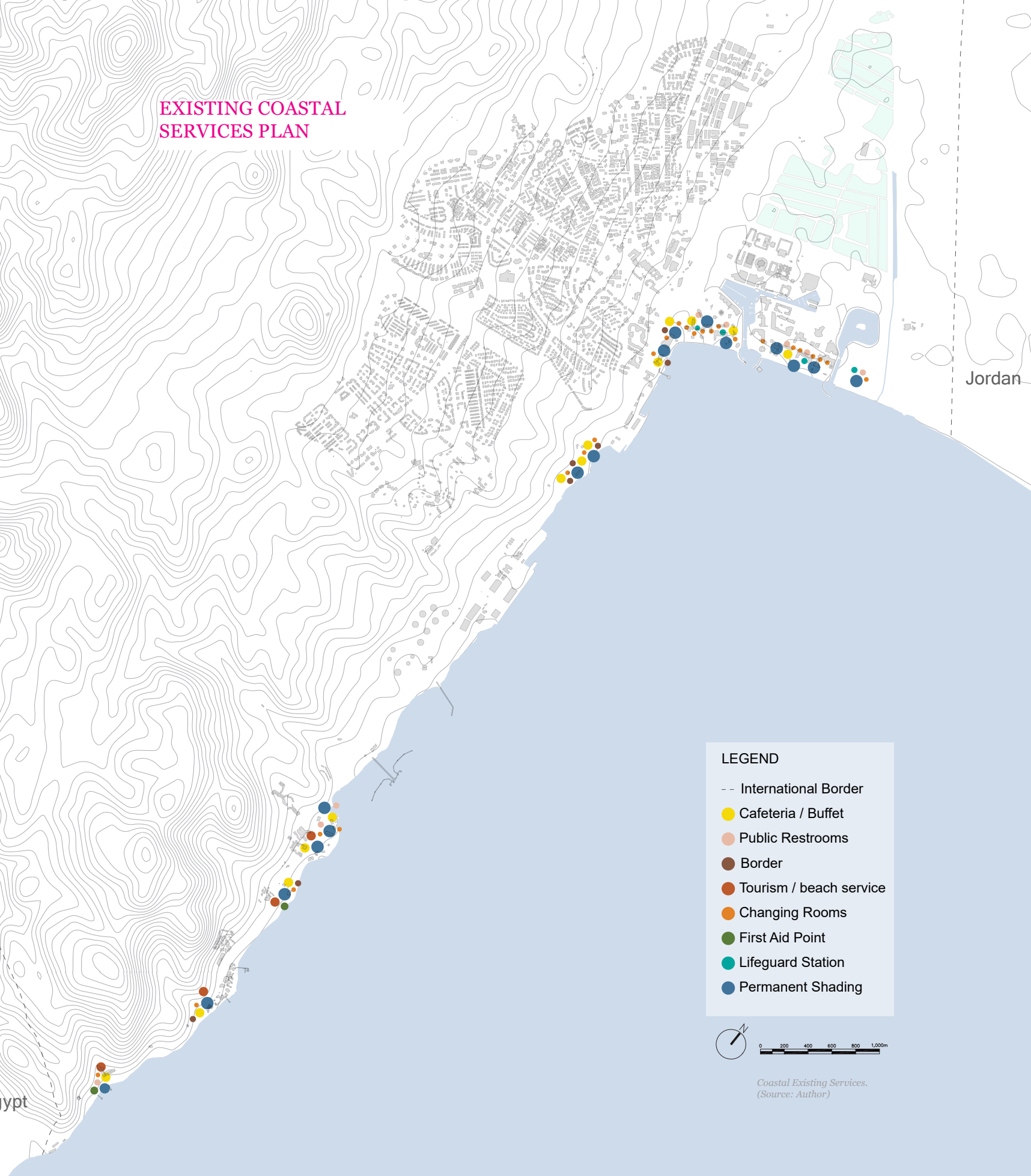


**Figure 383.** . Source: Author



**Figure 384.** . Source: Author

# EXISTING COASTAL SERVICES PLAN



Jordan

gypt

## LEGEND

- International Border
- Cafeteria / Buffet
- Public Restrooms
- Border
- Tourism / beach service
- Changing Rooms
- First Aid Point
- Lifeguard Station
- Permanent Shading



0 200 400 600 800 1,000m

Coastal Existing Services.  
(Source: Author)

#### 4.5.4 EXISTING COASTAL SERVICES

The various beach services are mainly concentrated in the northern beaches and scattered in the southern ones, providing tourism amenities. Designated bathing beaches are only found in the northern part, indicating a lack of designated bathing areas with lifeguard services in the southern beaches. There's a noticeable shortage of public facilities and showers on the different public beaches. Additionally, on the open-to-the-public beaches that lack development and comprehensive beach services, there's a scarcity of permanent sunshades or shelters.

● Cafeteria- buffet



○ Public toilet



● Beach Shadings



▶ Lifeguard stations and first aid



● Beach showers



## 4.6 NORTH COASTLINE ROAD ANALYSIS

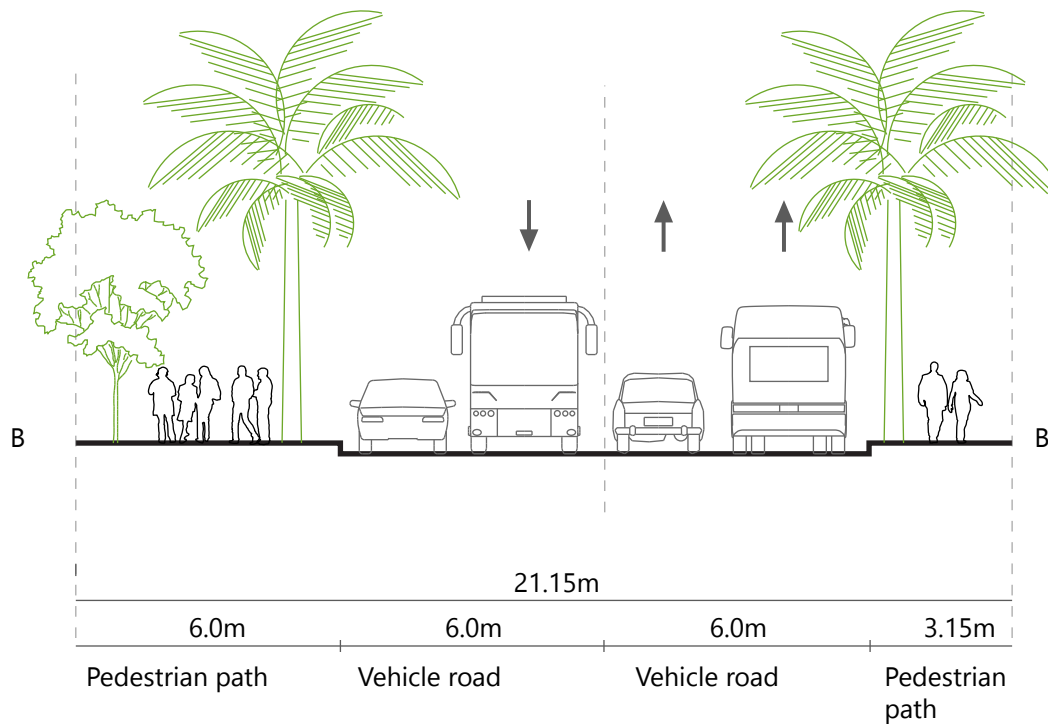
### 4.6.1 EILAT'S ROADS- NORTH COAST

Highway 90, which runs from the north to the centre of the city, has two lanes going in each direction. As it goes along the southern coast, from the city centre to Almog Beach, it stays as a two-lane road. Some parts have two lanes on each side, while others have only one.



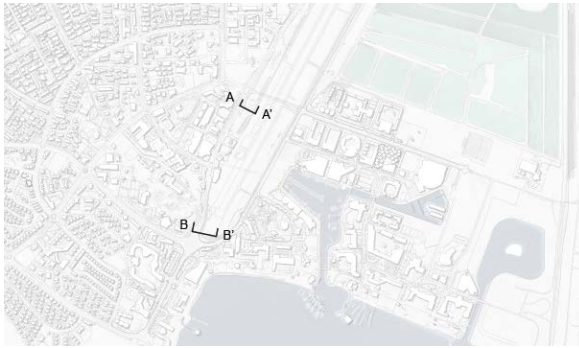
Figure 385. 90 Road- Ha'arava road, Source: Author

### 90 ROAD - HA'ARAVA ROAD



Drawing 144. 90 Road- Ha'arava road Section Scheme, Source: Author

KEY MAP

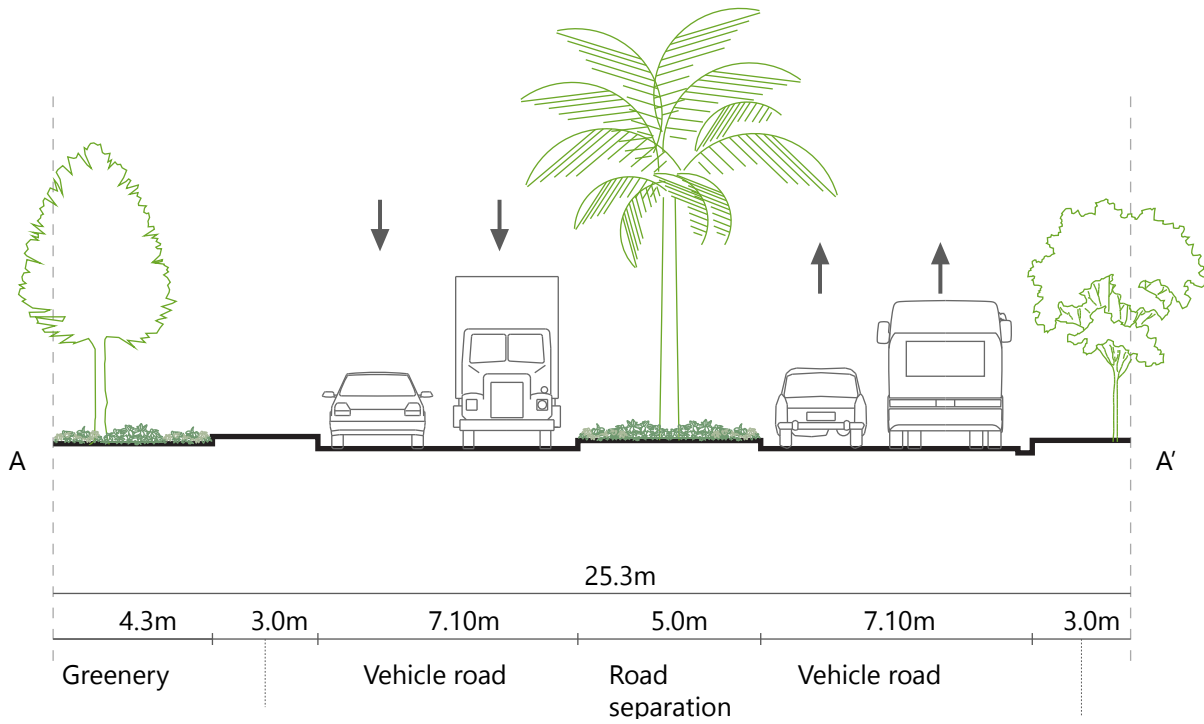


*Drawing 145. Key map, Source: Author*



*Figure 386. 90 Road- Ha'arava road, Source: Author*

90 ROAD - HA'ARAVA ROAD



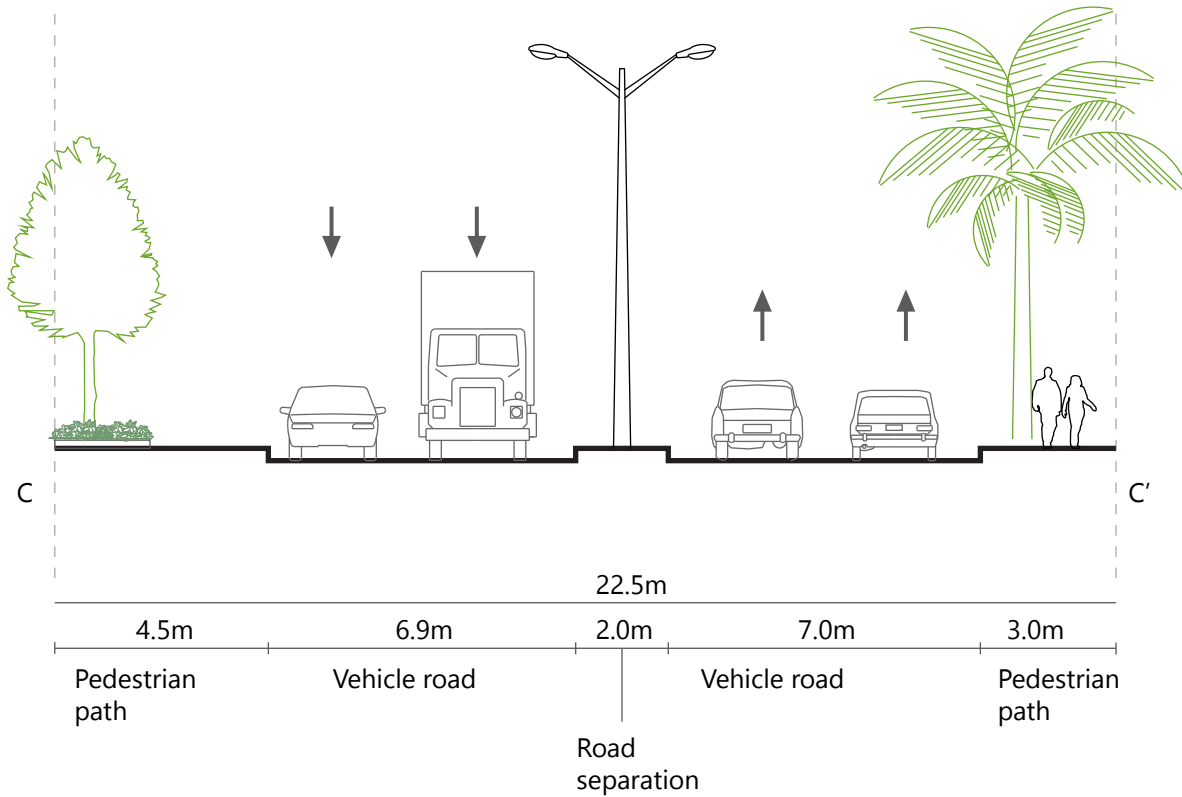
*Drawing 146. 90 Road- Ha'arava road Section Scheme, Source: Author*

There are sidewalks for pedestrians and lanes for bicycles, although they are not continuous, especially in the northern part. Also, there are places along the road where you can park your car.



Figure 387. 90 Road- Aria Hotel, Source: Author

90 ROAD - HOTEL AREA



Drawing 147. 90 Road- Navy Section Scheme, Source: Author

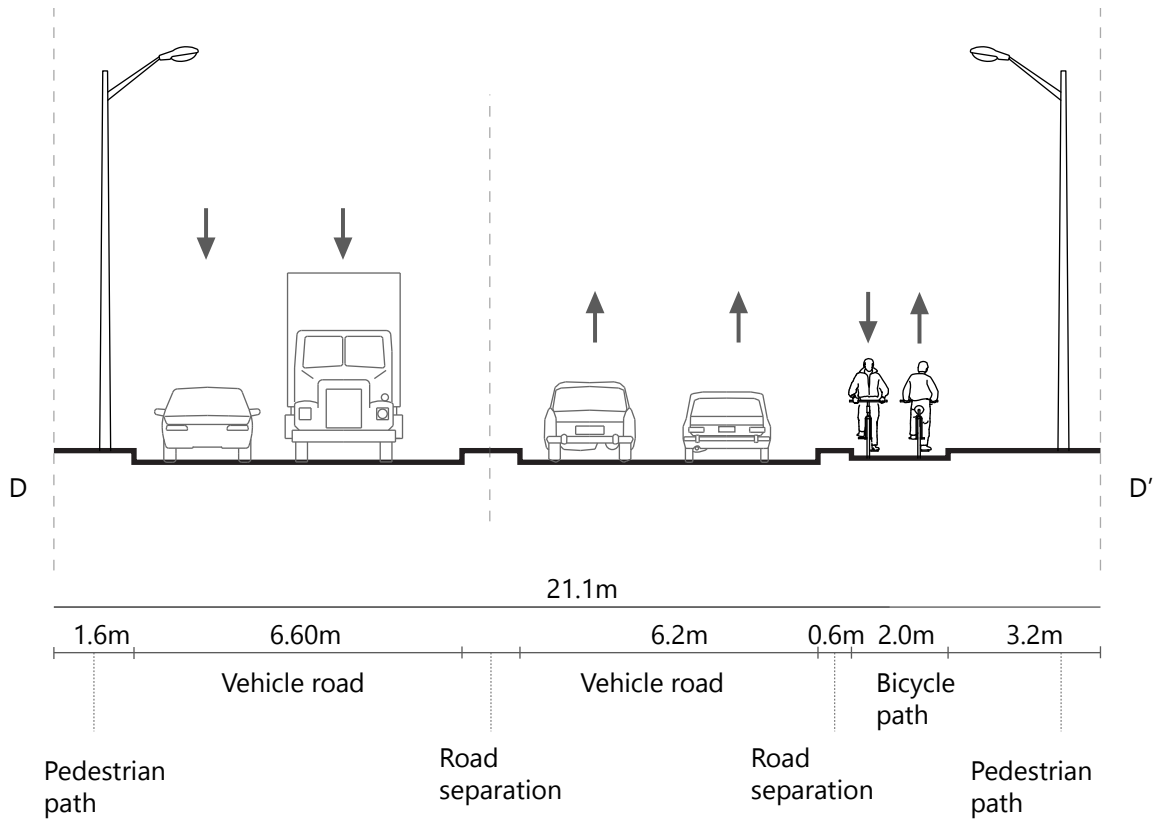
KEY MAP



*Drawing 148. Key map, Source: Author*

*Figure 388. 90 Road-Navy, Source: Author*

90 ROAD - NAVY



*Drawing 149. 90 Road- Aria Hotel Section Scheme, Source: Author*

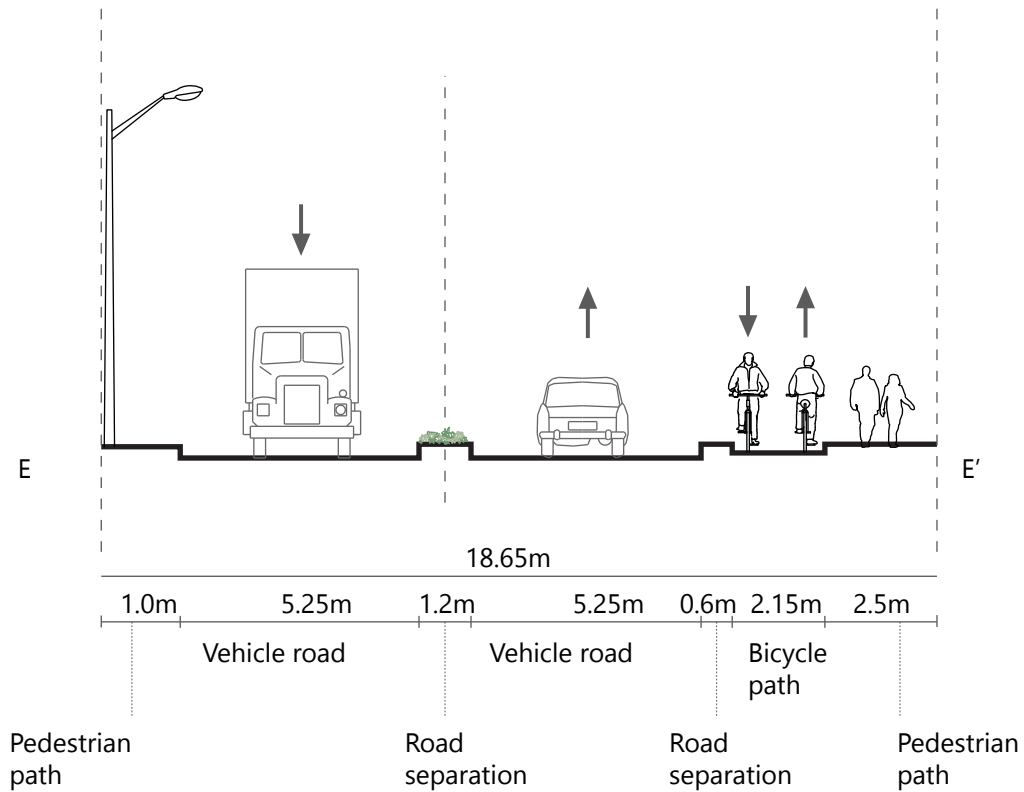
### 4.6.2 EILAT COASTLINE ROADS-ROAD SECTIONS

Southward from Almog Beach, the road becomes a narrow two-lane path without a designated sidewalk. This means there's limited space on either side of the road, making it challenging for pedestrians. Unfortunately, there are no proper walking paths or parking arrangements along this stretch of Highway 90. Pedestrian crossings are also lacking,



Figure 389. 90 Road- Dekel beach, Source: Author

### 90 ROAD - DEKEL BEACH



Drawing 150. 90 Road- Dekel beach Section scheme, Source: Author

KEY MAP

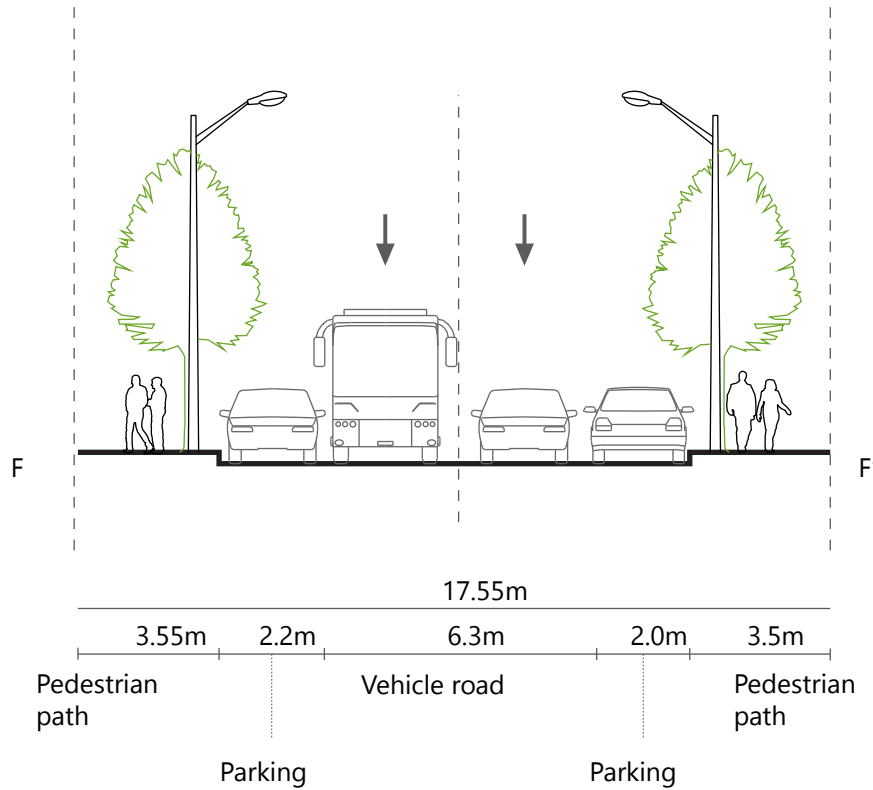


*Drawing 152. Key map, Source: Author*



*Figure 390. Hayam St. (Hotel zone), Source: Author*

90 ROAD - HA'YAM ST. HOTEL ZONE



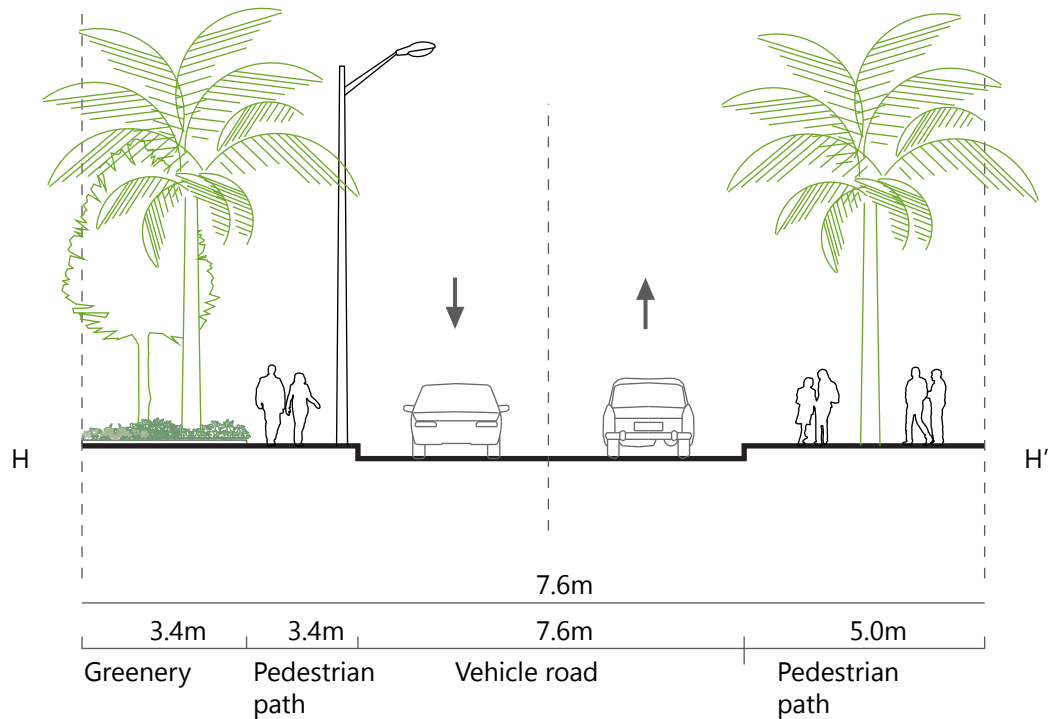
*Drawing 151. Hayam St. (Hotel zone) Section Scheme, Source: Author*

making it difficult for people on foot or cyclists to navigate safely. Currently, the primary mode of reaching the southern coastal area is by private car.



Figure 391. 90 Road- Princess beach, Source: Author

### 90 ROAD - PRINCESS BEACH



Drawing 153. 90 Road- Princess beach Section Scheme, Source: Author

KEY MAP

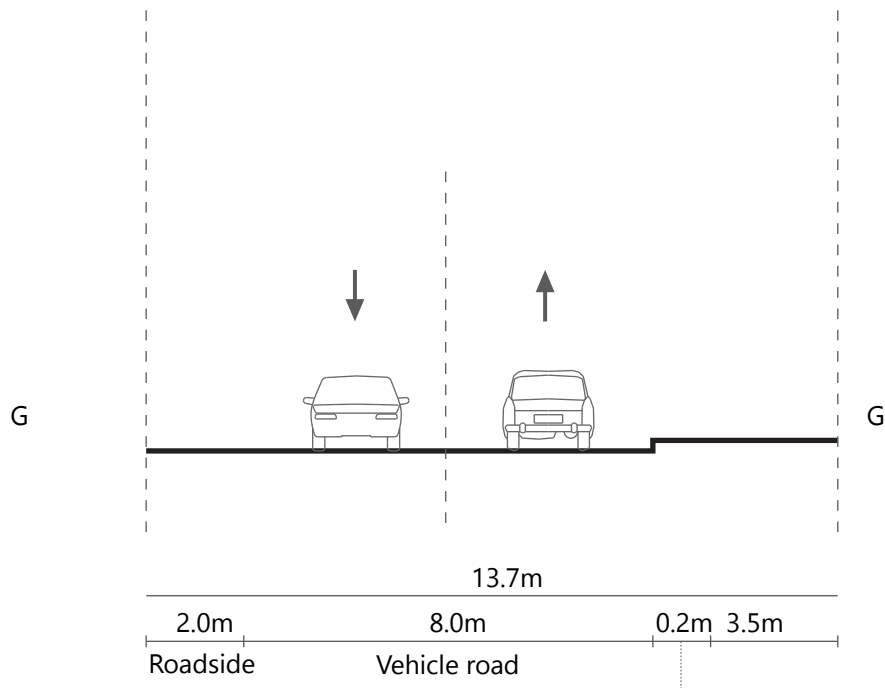


*Drawing 155.* Key map, Source: Author



*Figure 392.* 90 Road- Migdalor beach, Source: Author

90 ROAD - MIGDALOR BEACH



*Drawing 154.* 90 Road- Migdalor beach Section Scheme, Source: Author

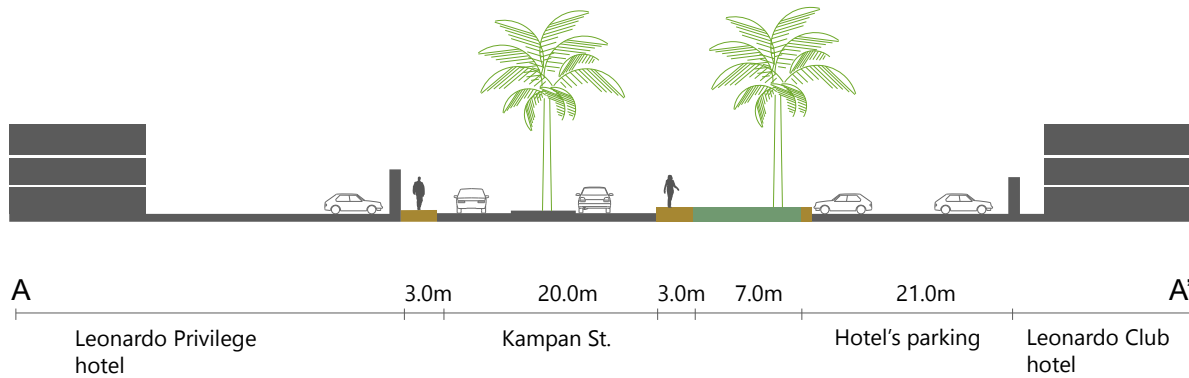
### 4.6.3 NORTH COAST SECTIONS-TOURIST AREA

The sections above of the north coast tourist area illustrate the problematic aspects contributing to the low quality of the walking space within the hotel complex. One can observe the buildings' confinement towards the street, the separate entrances of the hotels, the narrow width of the sidewalks, and the



Key map Section Scheme A-A'. Source: Author

#### KAMOAN ST.



Drawing 156. Kamoan St. Section Scheme. Source: Author



- Pedestrian
- Hotel visitor
- Commerce
- Pedestrian path
- Greenery

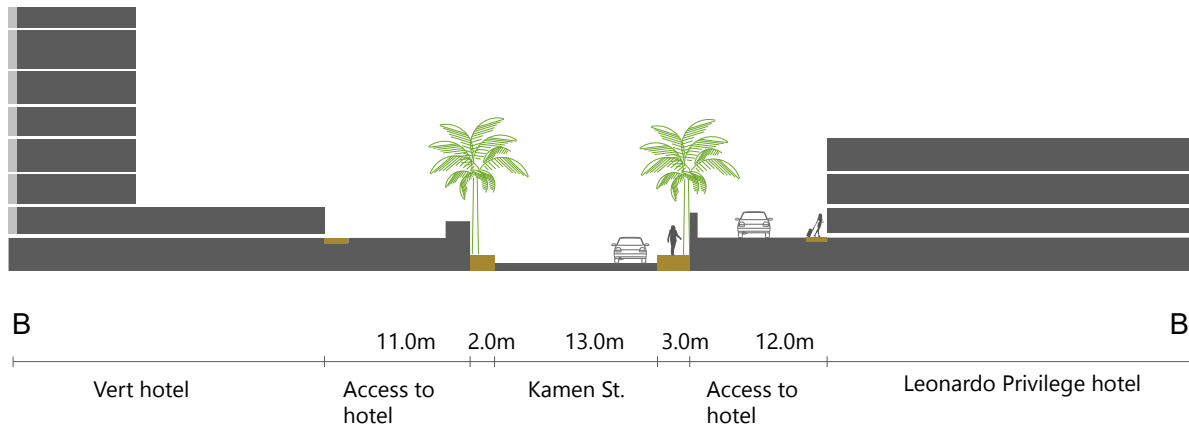
Figure 393. Kamoan St. 2024. Source: Author

NORTH COAST SECTIONS-  
TOURIST AREA



Key map Section Scheme B-B' .Source: Author

KAMEN ST.



Drawing 157. Kamen St. Section Scheme. Source: Author

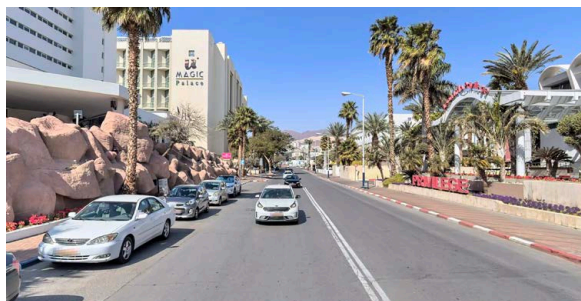







Figure 394. Kamen St., 2024. Source: Author

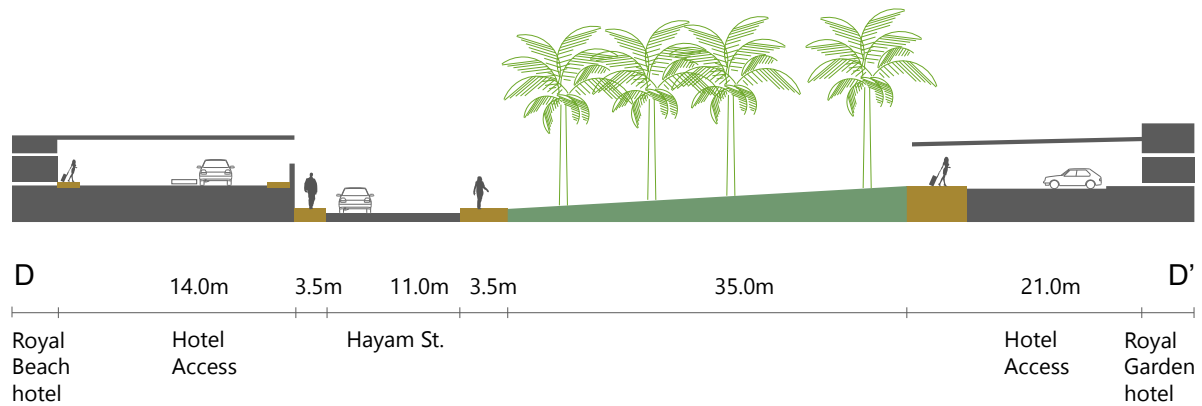
-  Pedestrian
-  Hotel visitor
-  Commerce
-  Pedestrian path
-  Greenery

NORTH COAST SECTIONS-  
TOURIST AREA



Key map Section Scheme D-D' .Source: Author






HAYAM ST.



Drawing 158. Hayam St. Section Scheme. Source: Author



Figure 395. Hayam St. 2024. Source: Author

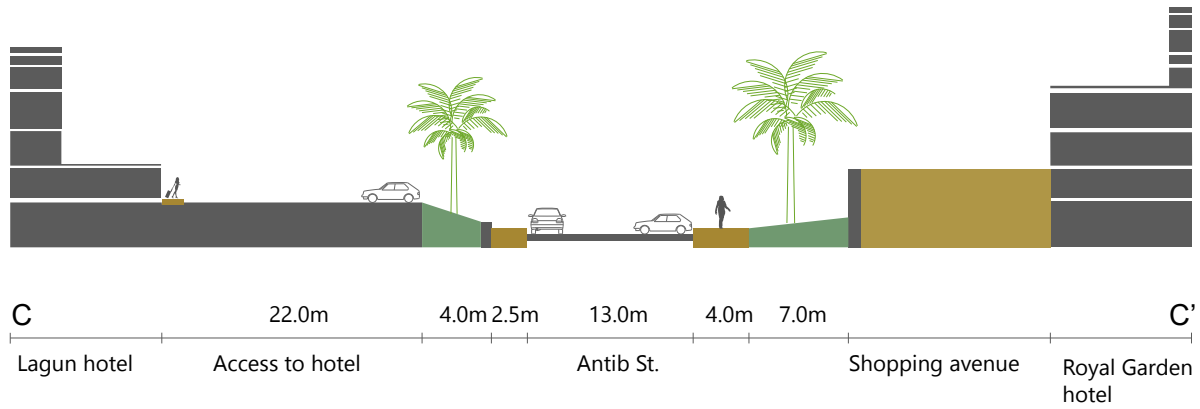
-  Pedestrian
-  Hotel visitor
-  Commerce
-  Pedestrian path
-  Greenery

NORTH COAST SECTIONS-  
TOURIST AREA



Key map Section Scheme C-C'. Source: Author






ANTIB ST.



Drawing 159. Antib St. Section Scheme. Source: Author



Figure 396. Antib St. 2024. Source: Author

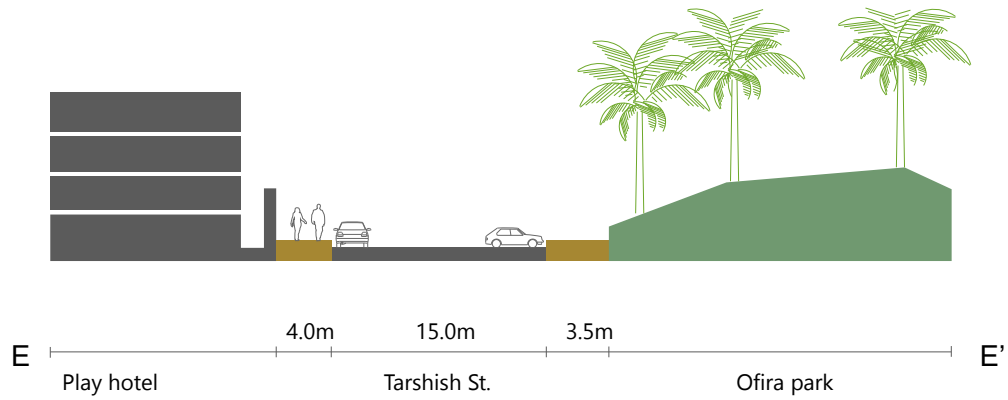
-  Pedestrian
-  Hotel visitor
-  Commerce
-  Pedestrian path
-  Greenery

NORTH COAST SECTIONS-  
TOURIST AREA



Drawing 161. Key map, Source: Author

TARSHISH ST.



Drawing 160. Tarshish St. Section Scheme. Source: Author

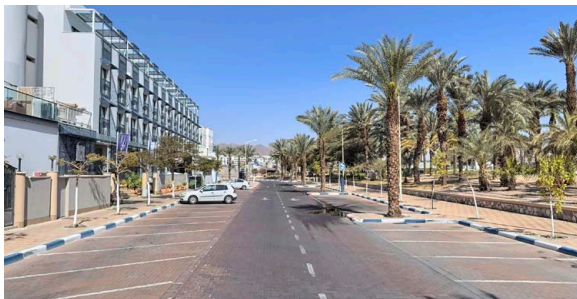







Figure 397. Tarshish St. 2024. Source: Author

-  Pedestrian
-  Hotel visitor
-  Commerce
-  Pedestrian path
-  Greenery

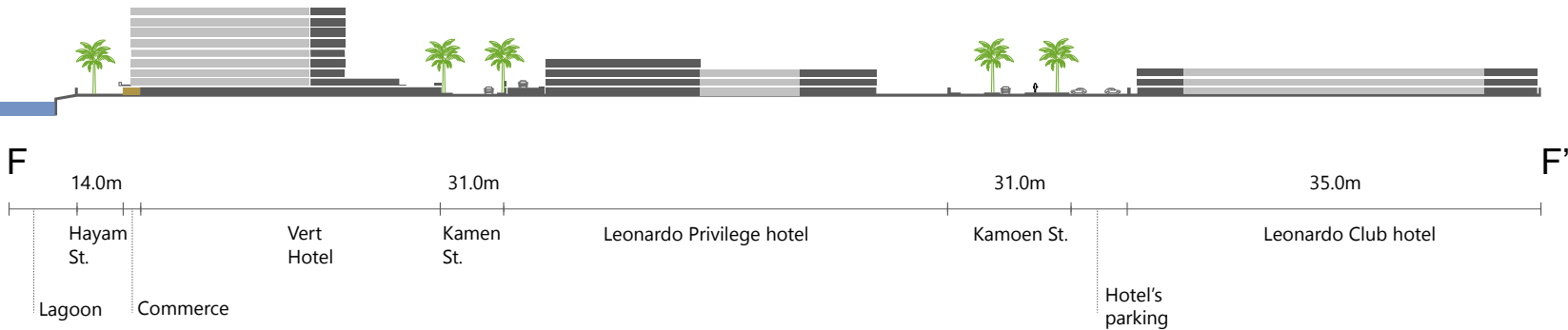


lack of shading for the walking space. In these sections, one can observe the expansive asphalt spaces stretching along the street, the problematic street section creating a barrier and dividing between the hotel buildings and the adjacent public space. Additionally, it's evident how the main masses are constructed along the waterfront, obstructing the sea view, and hindering access to the beachfront.



Drawing 163. Key map- Section Scheme F. Source: Author

NORTH COAST SECTION



Drawing 162. Section Scheme FF'. Source: Author

KAMEN ST.



Figure 399. Karmoen St.. Source: Author

KARMOEN ST.

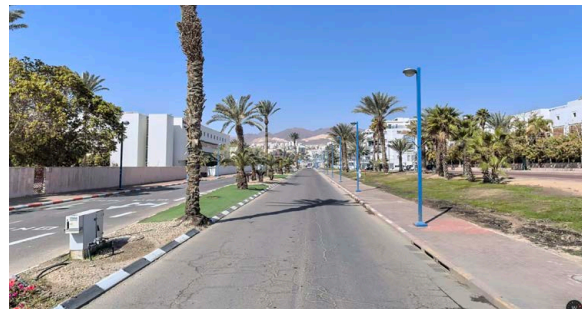
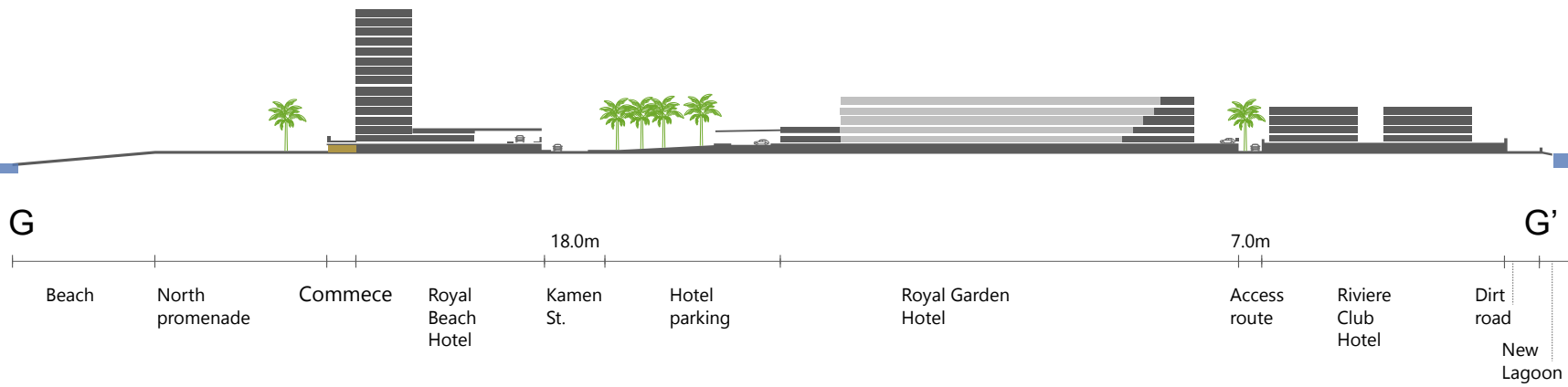


Figure 398. Karmoen St.. Source: Author



Key map- Section Scheme G, Source: Author



Section Scheme GG'. Source: Author

KAMEN ST.



Figure 401. Karmoen St.. Source: Author

ACCESS ROUTE

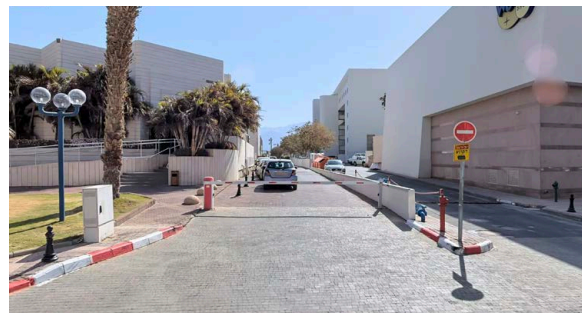


Figure 400. Access Route. Source: Author

## 4.7 NORTH COASTLINE ANALYSIS

### 4.7.1 NORTH COASTLINE LAND USE PLAN

The land use plan of the northern side of the coastline of Eilat, designated as the tourist area, is depicted in the mapping. The plan underscores the prevalent uniformity of hotel establishments throughout this region, indicating a deliberate clustering of commercial activities at specified focal points rather than dispersed along the thoroughfares. Notably, the absence of residential zones within this area suggests a distinct emphasis on catering to the needs of visitors and tourists.

Apart from a specific project situated at the western edge, there are no residential developments apparent in this space. Moreover, the scarcity of designated areas for public infrastructure, except for the conference centre site, further highlights the commercial-centric nature of this tourist zone. This strategic concentration of commercial enterprises amidst the absence of residential and public spaces signifies the unique urban fabric and land use pattern characteristic of Eilat's northern coastline, tailored specifically to accommodate the tourism industry.

# NORTH COASTLINE LAND USE PLAN

-  Tourism / Beach Services
-  Hospitality & Accommodation
-  Commerce
-  Residential



Drawing 164. North Coastline Land Use Plan. Source: Author

#### 4.7.1 DEFINITION OF THE PUBLIC SPACE

The mapping of the northern tourist area along the coastline of Eilat reveals expansive public spaces within the complex. This illustration highlights a significant issue: the level of activity within these public areas is disproportionately low relative to their considerable size. This imbalance suggests that the potential of these spaces to serve as vibrant hubs of social and recreational activity is not being fully realized.

Additionally, the mapping identifies several undeveloped open plots within the area. These vacant plots exacerbate the sense of neglect, giving the impression that the development of this part of the coastline has stalled. The presence of these undeveloped areas not only detracts from the aesthetic appeal of the coastline but also represents missed opportunities for enhancing community engagement and tourist satisfaction.

The underutilization of such a prime urban area calls for strategic planning to invigorate these public spaces. By implementing targeted improvements

and development projects, there is a potential to transform these underactive areas into thriving centres of activity that could significantly enhance the overall attractiveness and functionality of Eilat's northern coastline.

# DEFINITION OF THE PUBLIC SPACE PLAN



Public Space

Open Space

Public spaces and open area plan, Source: Author



### 4.7.3 PEDESTRIAN AREA

The pedestrian space within the tourist area on the northern coastline of Eilat represents a significantly smaller and more restricted component of the overall public space, impacting its functionality and quality, particularly when contrasted with the expansive recreational zones. This area is characterized by fragmented pathways along the streets, suffering from notable disconnects not only between the streets themselves but also between hotel accommodation complexes and the coastline. These gaps create a challenging environment for seamless pedestrian flow, undermining the area's connectivity and coherence.

Furthermore, the pedestrian space's limited integration with the marina promenade along the waterfront further detracts from its appeal. This weak connection diminishes its role and significance within this hotel-focused area, impacting the overall visitor experience. The lack of a well-integrated walking environment fails to support a cohesive tourist experience, which is essential in a region characterized by high visitor traffic.

Additionally, the pedestrian area lacks sufficient greenery, which could integrate naturally with the urban environment to enhance aesthetic appeal and environmental quality. The absence




*Sidewalks, waterfront promenade and vegetation, Source: Eilat's Municipality*

of substantial green spaces within this pedestrian area not only affects its visual attractiveness but also reduces its ecological benefits, such as improving air quality and reducing urban heat.

Addressing these issues could involve redesigning the pedestrian pathways to enhance direct access to key attractions and streamline the flow between hotels and coastal activities. Incorporating more greenery could transform the space into a more inviting and sustainable environment. Improving this infrastructure is crucial for elevating the area's attractiveness and functionality, ensuring that it serves as an inviting and efficient space for both leisure and transit.

# PEDESTRIAN AREA PLAN

-  Sidewalks & Pedestrian Plazas
-  Sidewalks & Pedestrian Plazas
-  Vegetation & Planting Beds

*Drawing 165. Public Space Functionality – Pedestrian Area, Source: Author*



#### 4.7.4 SHADOW IN THE WALKING SPACE

The mapping of shaded open areas within the tourist zone along the northern coastline, resulting from the heights of existing buildings and trees casting shadows, highlights the vast pedestrian spaces exposed to sunlight. In Eilat's desert environment and hot, dry climate, it's essential to introduce shading and cooling solutions to promote walking and enrich the pedestrian experience.

The pedestrian spaces' quality, especially along specific streets and narrower pathways is significantly compromised due to the lack of shade. This deficiency reduces comfort and usability, particularly during periods of intense heat.





Integrating shading elements such as pergolas, trellises, or shaded seating areas can offer relief from the sun and create more pleasant walking environments. Additionally, strategically placing vegetation like drought-resistant trees and shrubs can help cool the urban microclimate and enhance overall pedestrian comfort.

Implementing these shading and cooling measures is crucial for improving Eilat's pedestrian infrastructure, ensuring it remains attractive and functional for residents and visitors alike.



*Figure 402. Shadow in the Walking Space, Source: Eilat's Municipality*

# SHADOW IN THE WALKING SPACE PLAN

-  Pedestrian Area
-  Roads and Parking
-  Shade Trees
-  Shade from Buildings



*Drawing 166. Shadow in the Walking Space, Source: Eilat's Municipality*

#### 4.7.5 ACCESS TO THE COASTAL STRIP AND MARINA PROMENADE

An overview of the existing connections and access routes for pedestrians from the hotel area to the coastline indicates a scarcity of designated and clear pedestrian access paths.

The connections from the hotel area to the coastline are often not inviting or clearly marked; many are parking lots or access roads to operational areas. Even the pedestrian-access routes often lead to parking areas and from there to the coastline. The passages between hotels are narrow service passages, fronting either sealed facades or facades with openings, with truck exits and garbage collection points. All these factors contribute to an unpleasant and unsafe walking experience.



**Figure 403.** Access to the beach strip and the marina promenade, Source: Eilat's Municipality

# ACCESS TO THE COASTAL STRIP AND MARINA PROMENADE PLAN

- Opaque Facades
- Service Facades
- Waterfront Promenades
- Service Road / Parking
- Sidewalk



0 10 50 100 m

*Drawing 167. Access to the Coastal Strip and Marina Promenade plan,  
Source: Eilat's Municipality*

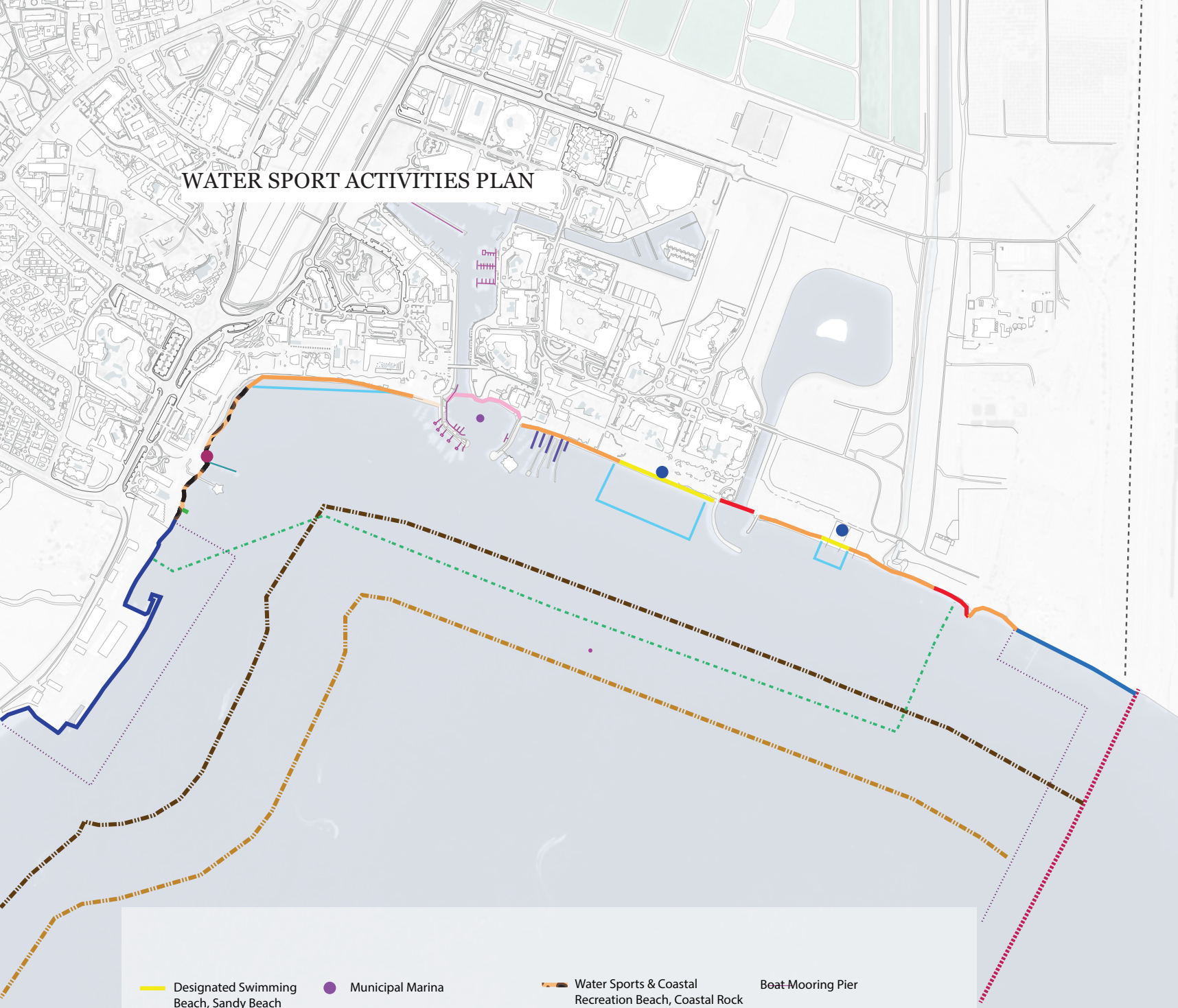
#### 4.7.6 WATER SPORT ACTIVITIES

The Gulf of Eilat is renowned for its array of advantages that make it an ideal destination for water sports enthusiasts. Throughout most of the year, the sea remains calm, complemented by the area's unique natural marine values, which enhance the overall experience. The climate in this region further supports a variety of water sports, including windsurfing and kite surfing, by providing consistently favourable conditions.

In addition to the natural attributes, the Gulf of Eilat benefits from a robust tourism infrastructure. Local businesses are well-equipped to support a wide

range of water sports activities. These services include the rental of necessary equipment and gear tailored for water sports, alongside offering numerous attractions. Training services are readily available, providing both beginners and experienced enthusiasts with the opportunity to improve their skills. Moreover, operators specialise in a variety of water attractions, ensuring a comprehensive and enriching experience for all visitors.

# WATER SPORT ACTIVITIES PLAN



- |  |  |   |                           |
|--|--|---|---------------------------|
| Designated Swimming Beach, Sandy Beach | Municipal Marina   | Water Sports & Coastal Recreation Beach, Coastal Rock | Boat-Mooring Pier         |
| Beach declared for bathing             | Blue Flag Beach  | Security Zone, Sandy Beach                            | Sovereign Waters Boundary |
| No-Fishing Zone for Vessels            | Mooring for Water Sports                                     | Swimming Pier   | Local-Net Boundary        |
| Infrastructure Beach, Sandy Beach      | Infrastructure Beach, Built Beach – Sea Wall / Marina / Pier | Water Sports & Coastal Recreation Beach, Sandy Beach  |                           |
| Water Sports Pier                      | Boat Rental Pier   | Security Zone, Built Beach – Sea Wall / Marina / Pier |                           |
| Restricted Sailing Area                | Restricted Sailing Area                                      |   |                           |

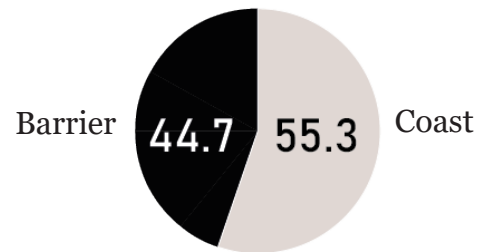


*Drawing 168. Water Sport Activities, Source: Eilat's Municipality*

## 4.8 COASTLINE BARRIERS- CREATES DISCONTINUITY

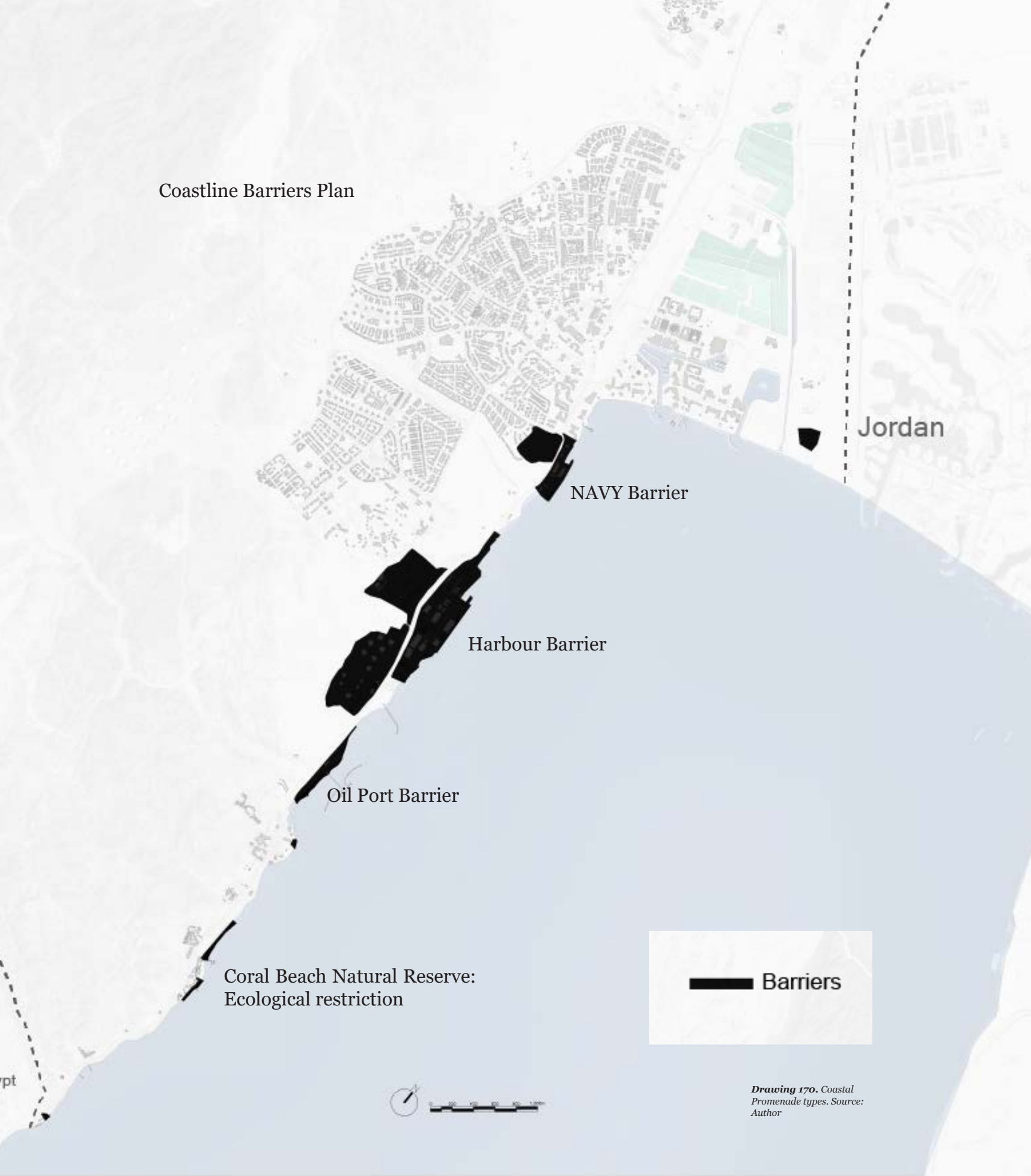
One of the primary challenges facing Eilat's coastline is the lack of continuity along its 11km stretch. This disruption is caused by four main areas that are occupied by various infrastructures, segmenting the coastline, and creating barriers that prevent a seamless flow along the shore. These barriers result in approximately 44.7% of the coastline, nearly 5km, being occupied, leading to various access and visibility issues.

These obstructions manifest in different scenarios: some areas offer no public access or views of the sea; others allow views of the sea but no public access; some permit access to the sea without a view; and there are areas where access to the sea is possible but restricted to certain times or subject to a fee. These varied conditions pose significant hurdles in maintaining a unified and accessible coastline for public enjoyment and ecological continuity.



**Drawing 169.** The coastline has four main barriers that occupy 44.7% of the entire strip, equating to nearly 5 km out of the total 11 km of the coastline.,  
Source: Author

Coastline Barriers Plan



Jordan

NAVY Barrier

Harbour Barrier

Oil Port Barrier

Coral Beach Natural Reserve:  
Ecological restriction

Barriers



*Drawing 170. Coastal Promenade types. Source: Author*

#### 4.8.1 CORAL BEACH NATURAL RESERVE: ECOLOGICAL RESTRICTION (RESTRICTED ACCESS/FEE-BASED)

The Coral Beach Natural Reserve stretches across 1850 meters of coastline, comprising 16.8% of Eilat's coastal area where public access is highly restricted. In many parts, access is completely denied, and there are spots where even the sea is not visible. Notably, the Marine Science Institute and the Underwater Observatory are located in the southern part of this zone. While the observatory is accessible to the public for a fee, it does not provide beach access, and there is no direct sea view from the adjacent road,

which appears unkempt and neglected. Additionally, the lack of trees and shade makes it challenging to traverse this area during the hotter months.

To the north, on the opposite side of the road, sits a luxury hotel perched atop a mountain. In the middle of this restricted zone lies the Coral Beach Natural Reserve, which is only open to the public at certain hours and charges an entry fee. Although the beach is fenced, visibility to the sea is maintained. The area features a walkable promenade lined with palm



**Drawing 171.** Coral Beach Natural Reserve Hotels, Underwater Observatory, water sport centre area. Source: .

CORAL BEACH NATURAL RESERVE PLAN

Hotel Area

Water Sport  
Centre

Coral Beach  
Natural reserve  
(Entrance by fee)

Underwater  
Observatory  
Park

Marine  
Sciences'  
Institute

1850 m



- ■ ■ ■ No Public access
- ■ ■ ■ No Direct access
- ■ ■ ■ Access by fee



Drawing 172. Coral Beach Natural Reserve area plan. Source: Author.

trees, desert vegetation, and shaded shelters with benches, offering a pleasant environment for walking. However, the promenade ends abruptly on both sides, limiting its use and connectivity with other coastal areas. The fencing could also be improved to better harmonize with the desert landscape. Moreover, the promenade itself is in a state of neglect and requires enhancement.

The water sports centre at the northern end provides water access, but reaching the beach itself involves a walk. Behind the centre, a hotel area offers direct beach access via a bridge connecting the hotels to the shore. This northern section feels more urban, with a hotel on one side and a parking lot for the water sports centre on the other, making it less appealing for leisurely walks. The lack of shade in this area exacerbates the discomfort during the intense summer heat of Eilat. Furthermore, apart from the promenade near the Coral Beach Natural Reserve's fence, there is no dedicated bicycle path, adding to the area's inaccessibility.

Opposite the sea, the landscape is dominated by mountains. In the southern part of this barrier, the mountains loom close to the road, while in the northern sections, they retreat further away, creating varied vistas along this coastal stretch.

The area could be significantly more successful if these issues were addressed.

The Coral Beach Natural Reserve and its surroundings boast natural beauty, but the current conditions considerably hinder the enjoyment of this picturesque environment. By resolving access restrictions, improving the infrastructure such as the promenade, and enhancing the overall maintenance and aesthetic integration with the natural desert landscape, the area could become not only more accessible but also more appealing for both locals and tourists. These enhancements would allow visitors to fully appreciate and enjoy the unique natural beauty that Eilat's coastline has to offer.

Coral Beach  
Natural Reserve

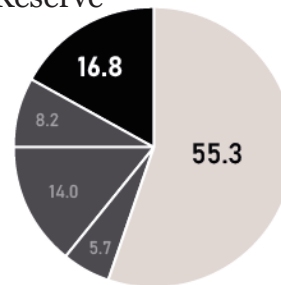


Figure 4-5-3-1 The Coral Beach Nature Reserve extends 1,850 meters along the coastline, forming a barrier that covers 16.8% of Eilat's coastal area.



**WATER SPORT CENTRE - NOT PLEASANT FOR PEDESTRIAN**

No Direct access- the buildings create a barrier to the beach. you need to pass through the buildings to get to the beach. there is no promenade aside the beach

**NO VIEW TO THE SEA**



**Figure 404.** This area is behind the water sport centre. There is no view to the water but there is access to the beach. Behind the buildings there are water sport clubs and restaurants. There is no shading for pedestrians. Source: Author

**NO SHADINGS**



**Figure 406.** Sidewalk without shading . Source: Author

**NO SHADINGS**

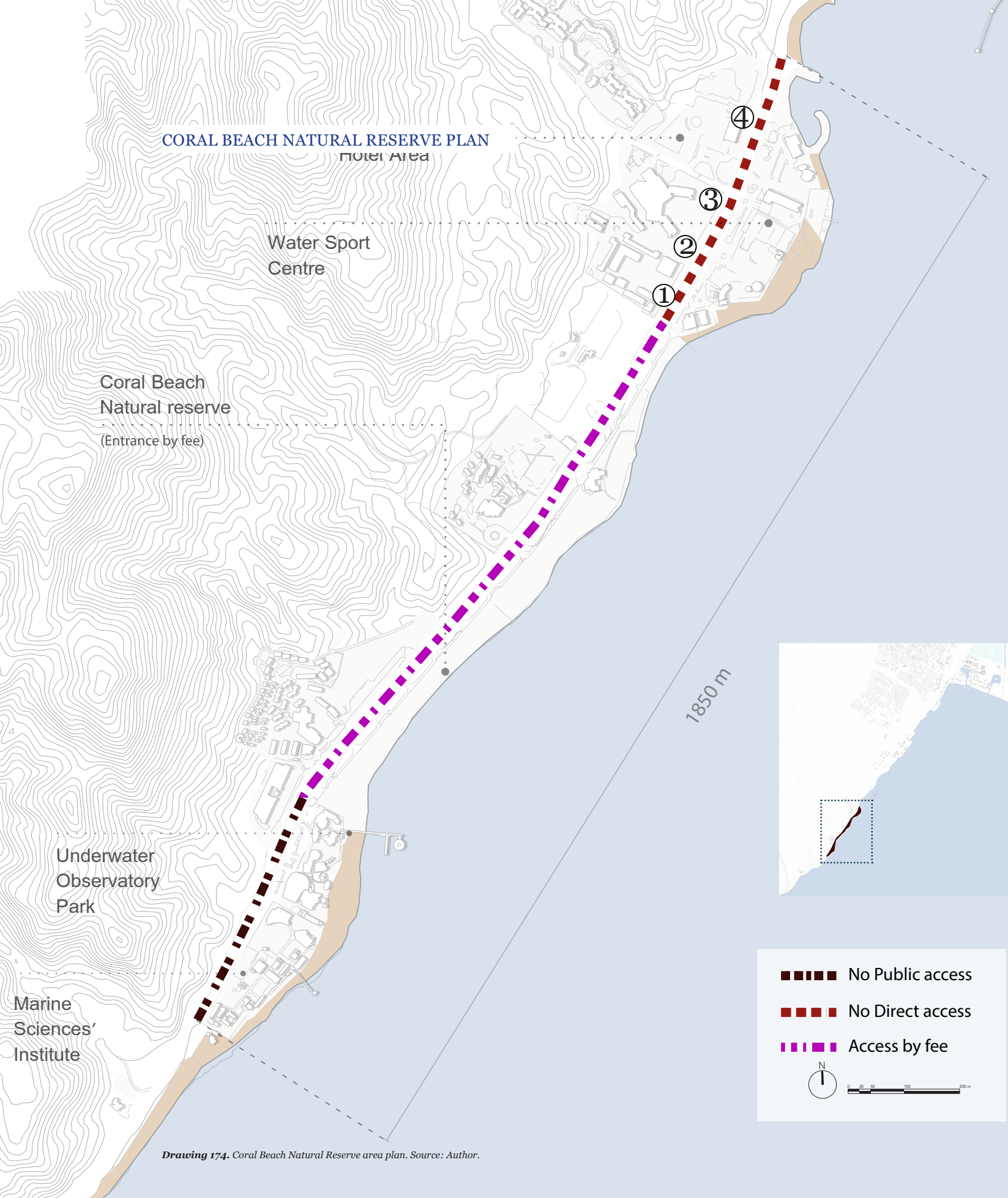


**Figure 405.** Walking path with bicycle path. Source: Author

**NO PLEASANT WALKING PATH**



**Figure 407.** . Source: Author



**CORAL BEACH NATURAL RESERVE PLAN**

Hotel Area

Water Sport Centre

Coral Beach Natural reserve  
(Entrance by fee)

Underwater Observatory Park

Marine Sciences' Institute

1850 m



- ■ ■ ■ No Public access
- ■ ■ ■ No Direct access
- ■ ■ ■ Access by fee



Drawing 174. Coral Beach Natural Reserve area plan. Source: Author.

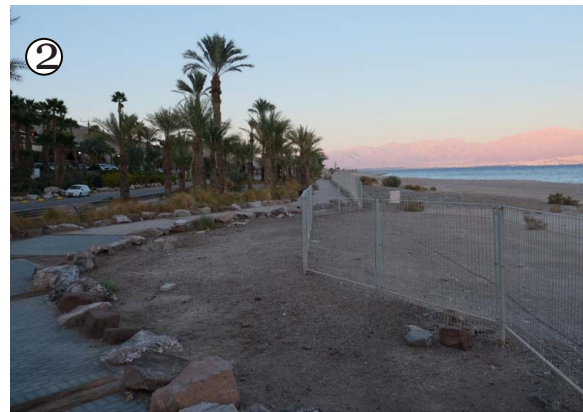
**CORAL BEACH NATURAL RESERVE  
-LIMITED ACCESS**

No Access to the beach



**Figure 408.** A built-up fence allows visibility of the view but restricts access to the beach. Adjacent to the fence, there is a constructed promenade lined with palm trees, occasionally featuring benches for seating. However, there are no large trees providing shade. , Source: Author

No access to the beach



**Figure 410.** This area is aside the Coral Beach Natural Reserve. It has a view of the beach but no access to it. There is a promenade, but no bicycle path. The promenade features desert vegetation and palm trees. Source: Author

Neglected promenade

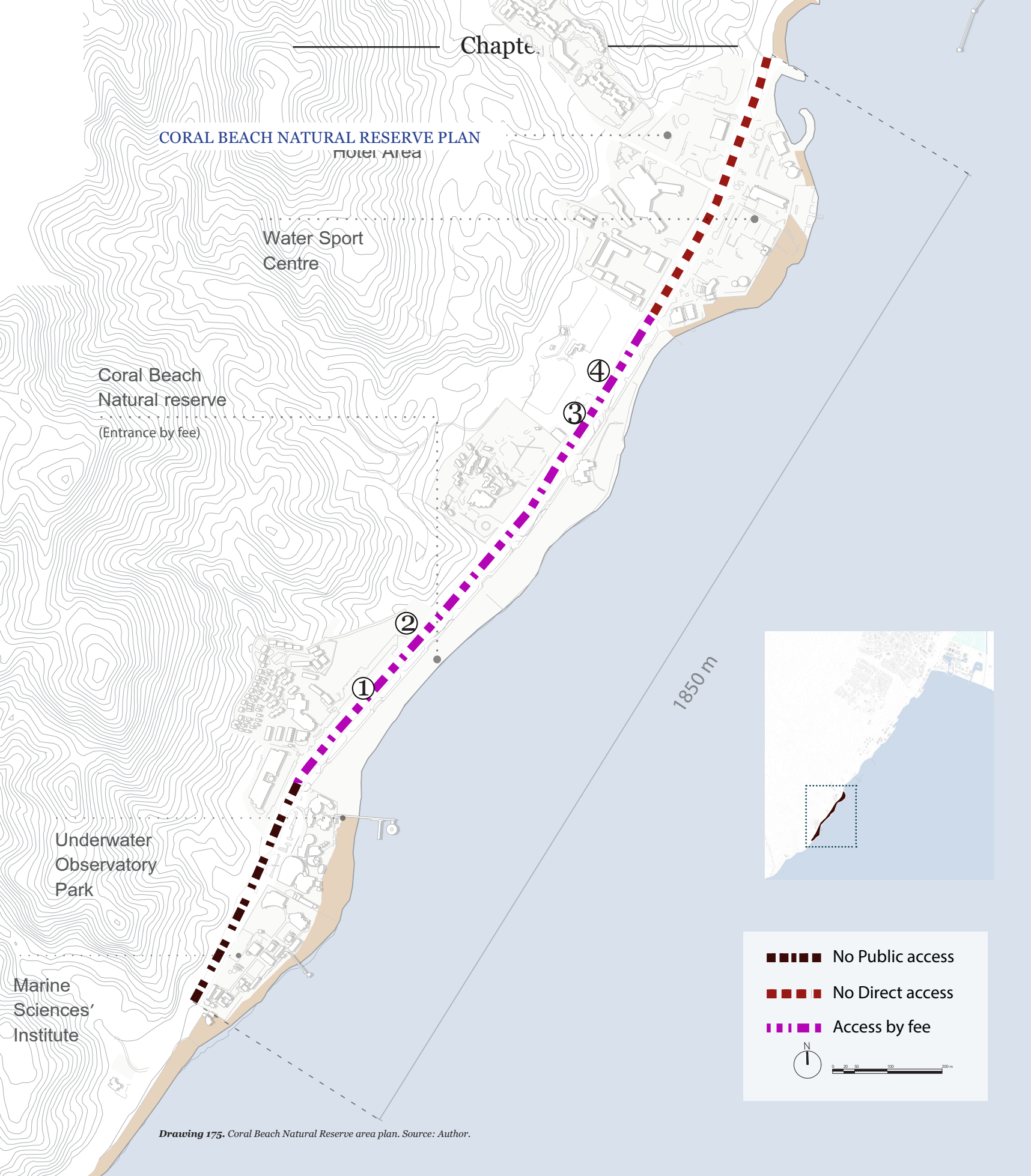


**Figure 409.** Shadings at the south coast promenade Source: Author



**Figure 411.** There is a fans between the promenade and the beach. The promenade is neglected. Source: Author.

CORAL BEACH NATURAL RESERVE PLAN



Legend for access types:

- Black dashed line: No Public access
- Red dashed line: No Direct access
- Purple dashed line: Access by fee

Scale bar: 0, 25, 50, 100, 200 m

North arrow: N

Drawing 175. Coral Beach Natural Reserve area plan. Source: Author.

## UNDERWATER OBSERVATORY AND THE MARINE SCIENCE INSTITUTE AREA - NO ACCESS TO THE BEACH

NO PRESENT SIDEWALK



**Figure 413.** No Side walk on the right side of the road. Source: Author.

NO BICYCLE PATH



**Figure 412.** This area is aside the Marine Sciences' Institute. It has neither visual nor physical access to the beach. There is no sidewalk, promenade, or bicycle path, and no source of shading. Source: Author

THE MARINE SCIENCES' INSTITUTE



**Figure 414.** The Marine Sciences' Institute. Source: Author.

NO VIEW TO THE BEACH



**Figure 415.** Road next to the Underwater Observatory Park. Source: Author.

# CORAL BEACH NATURAL RESERVE PLAN

Hotel Area

Water Sport  
Centre

Coral Beach  
Natural reserve  
(Entrance by fee)

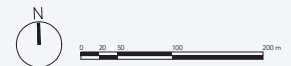
Underwater  
Observatory  
Park

Marine  
Sciences'  
Institute

1850 m



- ■ ■ ■ No Public access
- ■ ■ ■ No Direct access
- ■ ■ ■ Access by fee



Drawing 176. Coral Beach Natural Reserve area plan. Source: Author.

4.8.2 THE OIL PORT (KATZA):  
INDUSTRIAL/ENERGY  
INFRASTRUCTURE - NO PUBLIC  
ACCESS

The oil port in Eilat, also known as the Eilat Oil Terminal, was established in 1968 and is a critical infrastructure for the import and export of oil. This facility is connected via pipelines to the Mediterranean coast, allowing oil to be

NO SHADING AND ACCESS TO THE BEACH



**Figure 416.** There is no access to the beach, no trees or vegetation, no walkway, and no bicycle path. These conditions make walking challenging, especially during the hot summer months. Source: Author

WALKWAY AND BICYCLE PATH END



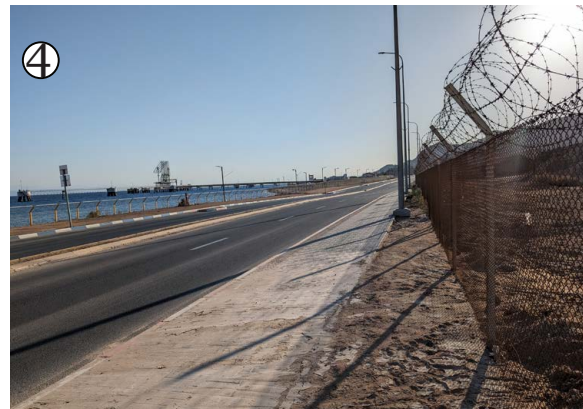
**Figure 417.** There is no access to the beach. Some trees and desert vegetation are present, but there are no shading trees. There is no designated walkway, and the bicycle path ends at the entrance to the oil port area. Source: Author

NO ACCESS TO THE BEACH

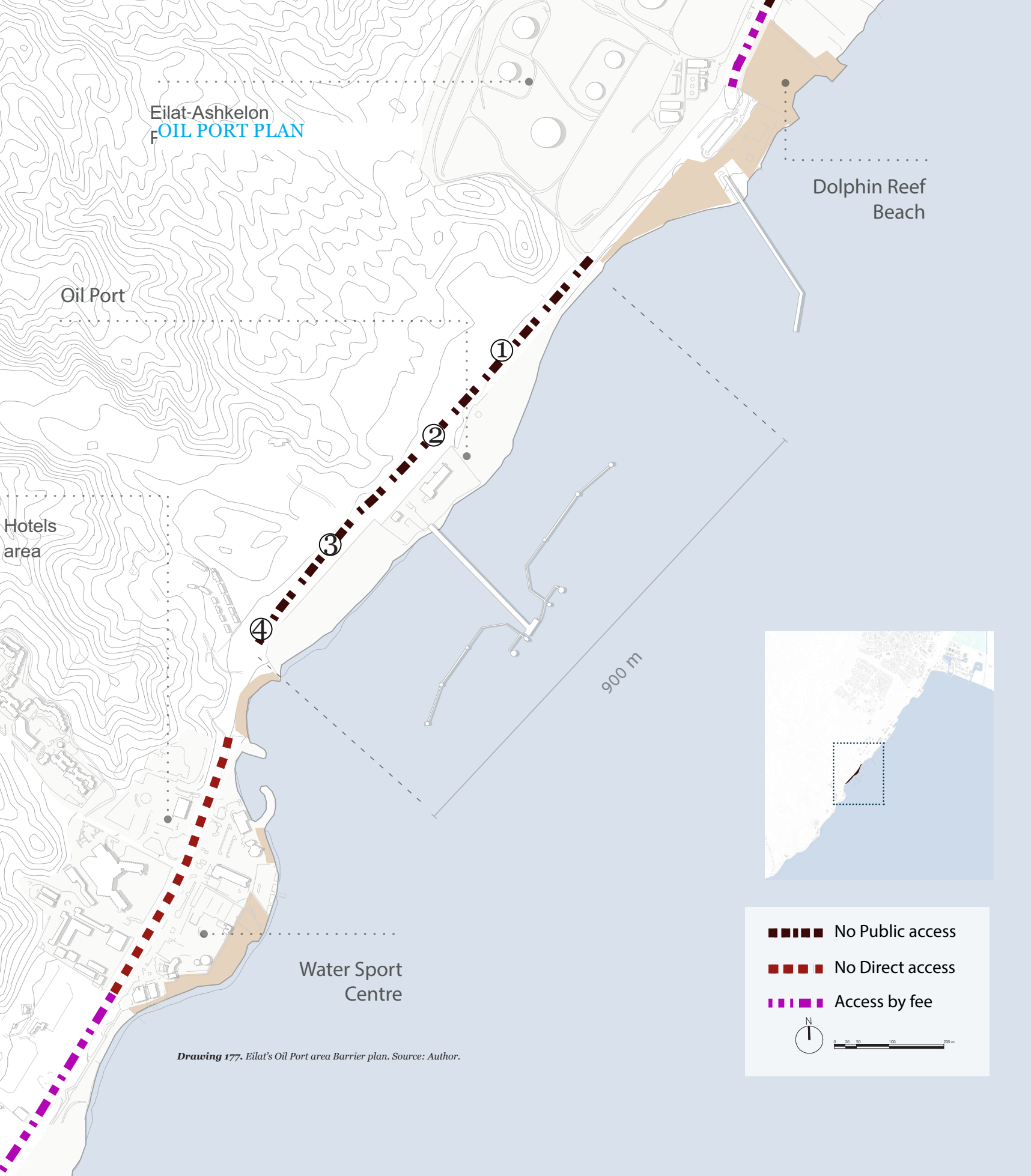


**Figure 418.** Fans of the oil port area. There is no access to public. Source: Author

NEGLECTED FANS AND NO SHADINGS



**Figure 419.** Sidewalk of the opposite side of the oil port. Source: Author



Eilat-Ashkelon  
OIL PORT PLAN

Dolphin Reef Beach

Oil Port

Hotels area

900 m

Water Sport Centre

- No Public access
- No Direct access
- Access by fee



Drawing 177. Eilat's Oil Port area Barrier plan. Source: Author.

transported between the Red Sea and the Mediterranean through the Suez Canal. This is particularly important for geopolitical and economic reasons, offering an alternative route during regional instability or issues with Suez Canal navigation.

The Eilat Oil Terminal is part of a broader network of energy infrastructure in Israel that includes refineries, storage facilities, and distribution networks. The facility's strategic location not only serves Israel's domestic needs but also enhances its position as a player in the global oil market, offering a transit point for Asian markets accessing Europe and vice versa. However, the Eilat Oil Terminal occupies a substantial part of Eilat's coastline. It covers 8.2% of the coastline waterfront and extends approximately 900 meters in length, significantly restricting public access to this part of the seaside. This limitation on access has raised concerns among local residents and environmental groups, as it impacts public enjoyment and the natural coastal environment of Eilat, which is also a major tourist destination.

Such a large industrial presence on the coast contrasts with environmental and recreational interests, highlighting a contentious balance between industrial benefits and public and environmental welfare.

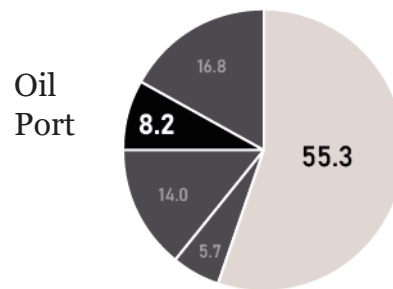


Figure 4-5-3-1 The Oil port area extends 900 meters along the coastline, forming a barrier that covers 8.2% of Eilat's coastal area.



### 4.8.3 EILAT'S HARBOUR & DOLPHIN REEF BEACH

#### Eilat's Harbour

Eilat's harbour, occupying 1540m or about 14% of the coastline, significantly challenges public accessibility and visual integration with the surrounding

environment. As a critical industrial hub, the harbour is primarily used for shipping and related industrial activities, which completely restrict public access within the harbour premises itself.



**Figure 420.** The walking area here is located behind the harbour, with no access to the sea, though the sea is occasionally visible. There is a bicycle path, but no shading .Source: Author

#### No View to the beach



**Figure 421.** This area has a view of the sea, along with a walking path and a bicycle path, but no direct access to the water. Between the harbour and the sidewalk, there is a section with some small trees, though it lacks shading. With available space for additional vegetation, this area has the potential to provide a better walking experience. Source: Author

#### Far from the beach

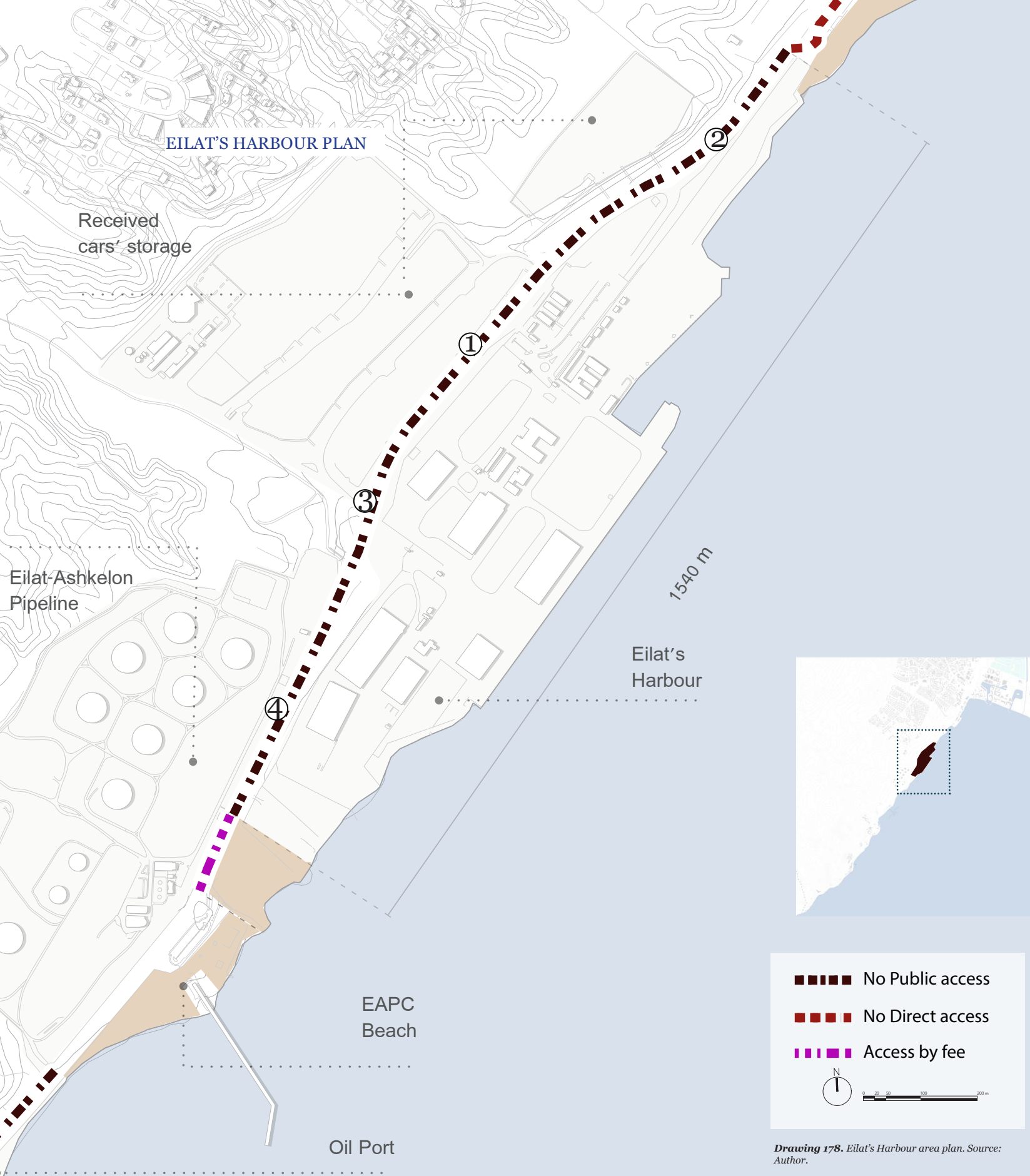


**Figure 422.** Here, the walkway is elevated, providing visibility of both the harbour and the sea, as well as a large area where imported cars are stored. There is a sidewalk and a bicycle path, but no trees or any source of shading. Source: Author

#### No Shading



**Figure 423.** There is a sidewalk and a bicycle path, but no trees or any source of shading. While there is no access to the sea, the sea and the harbour remain visible. Between the harbour and the walkway, there is an open area covered only with bare ground. Source: Author



**EILAT'S HARBOUR PLAN**

Received cars' storage

Eilat-Ashkelon Pipeline

Eilat's Harbour

1540 m

EAPC Beach

Oil Port

- ■ ■ ■ No Public access
- ■ ■ ■ No Direct access
- ■ ■ ■ Access by fee



**Drawing 178.** Eilat's Harbour area plan. Source: Author.

The only pedestrian access available near the harbour is a single pathway along a side road adjacent to the industrial area. This path provides limited views of the sea at certain points, offering a slight visual connection to the maritime environment. However, the industrial nature of the harbour and the placement of infrastructure largely obstruct comprehensive views, limiting the enjoyment of the scenic coastal landscape. The lack of natural shade and amenities along this path also makes it less appealing for pedestrians, especially during the warmer months. Moreover, the visual and physical presence of a large parking lot for newly imported cars further impacts the attractiveness and continuity of the walkway, emphasizing the industrial character of the area over recreational or aesthetic considerations. To improve the situation, strategies could be implemented to enhance the pedestrian experience along this side road. Potential enhancements might include strategic placement of viewing platforms or landscaped areas that allow better views of the sea, installation of shade structures, and the integration of seating areas to create a more welcoming environment. These changes would help balance the industrial functionality of the harbour with the public's right to access

and enjoy the coastal environment, fostering a greater sense of connection to the sea despite the industrial backdrop.

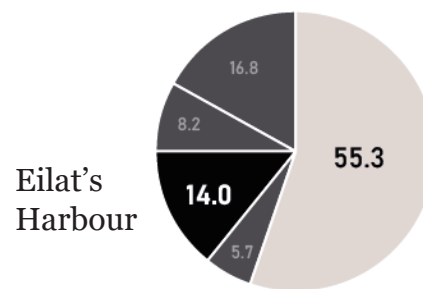


Figure 4-5-3-1 The Eilat's Harbour area extends 1,540 meters along the coastline, forming a barrier that covers 14% of Eilat's coastal area.



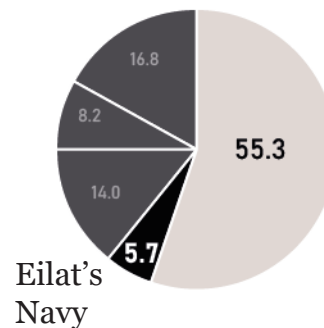
#### 4.8.4 THE NAVY BASE: MILITARY RESTRICTION.

The navy base, covering 630 meters or 5.7% of Eilat's coastline, distinctly marks the division between the north and south coasts. This military presence extends over both sides of the nearby car road and the path that serves both pedestrians and cyclists.

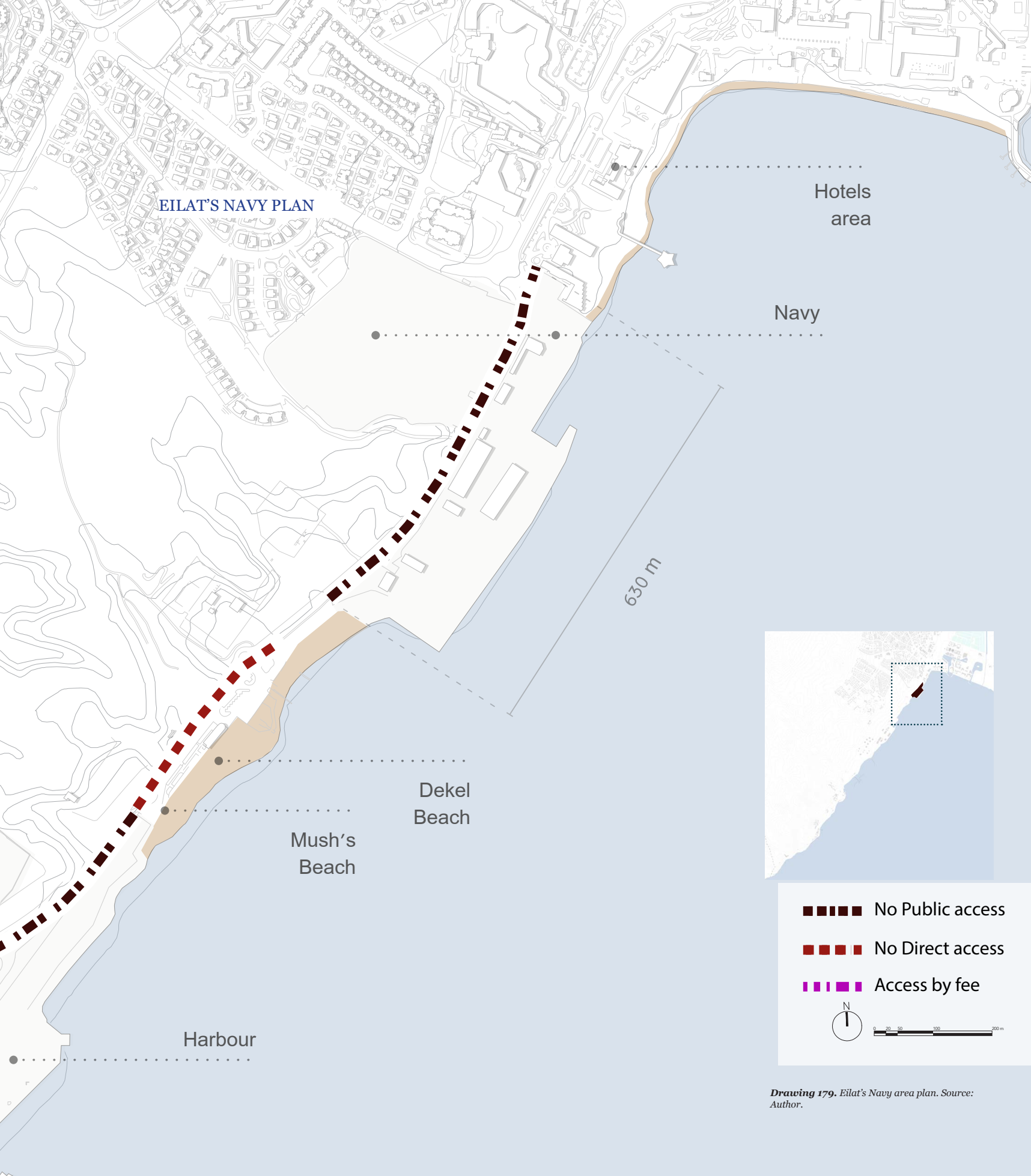
As a military facility, the base restricts public access and blocks views of the sea, prioritizing security but significantly reducing recreational and visual enjoyment for the public along this segment of the coastline. Additionally, the path alongside the base lacks natural shade or amenities, making it less inviting, especially in the warmer months.

The base's presence disrupts the continuity of Eilat's coastline, creating a visual and physical barrier. On the walls of the base, there is an artistic depiction of the sea, but it is old, and the colours have faded over time due to sun exposure, reducing its visual impact. Enhancements to the adjacent public pathway could include the installation of shaded rest areas and improved landscaping to make the walkway more appealing. Furthermore, refreshing the existing murals or adding

new artistic elements that reflect the naval and maritime heritage might enrich the environment, helping to balance the military functionality with improved public aesthetic and engagement.



**Figure 424.** The navy area extends 630 meters along the coastline, forming a barrier that covers 5.7% of Eilat's coastal area.



EILAT'S NAVY PLAN

Hotels area

Navy

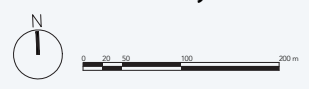
630 m

Dekel Beach

Mush's Beach

Harbour

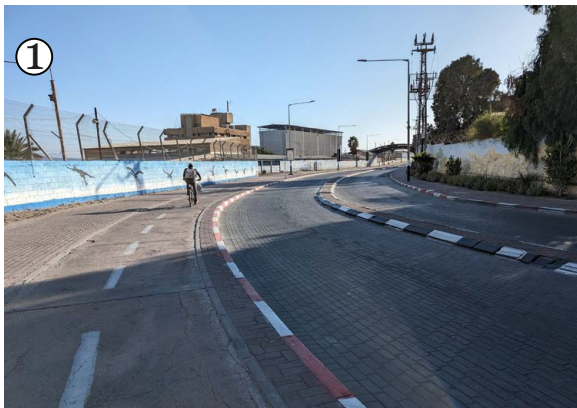
- ■ ■ ■ No Public access
- ■ ■ ■ No Direct access
- ■ ■ ■ Access by fee



*Drawing 179. Eilat's Navy area plan. Source: Author.*

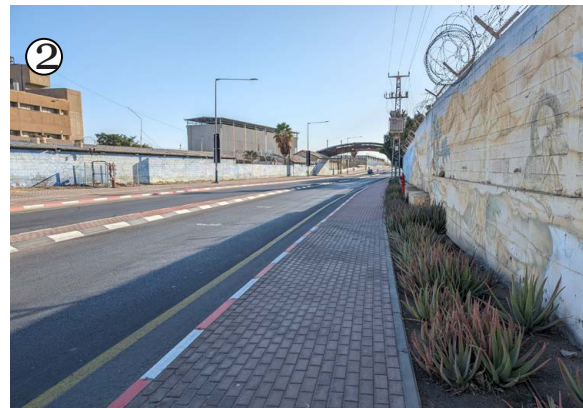
NAVY

NO VIEW TO THE BEACH



**Figure 426.** This area is located behind the navy base fence, with no visual access to the sea and no access to the beach. While there is a sidewalk and a bicycle path, there is no shading, trees, or vegetation. As a result, the walking experience in this area is poor. Source: Author

WALLS FROM BOAT SIDE OF THE ROAD



**Figure 427.** After a few minutes of walking alongside the navy base, the bicycle path ends. There is no shading and no trees. Source: Author

NO SHADINGS

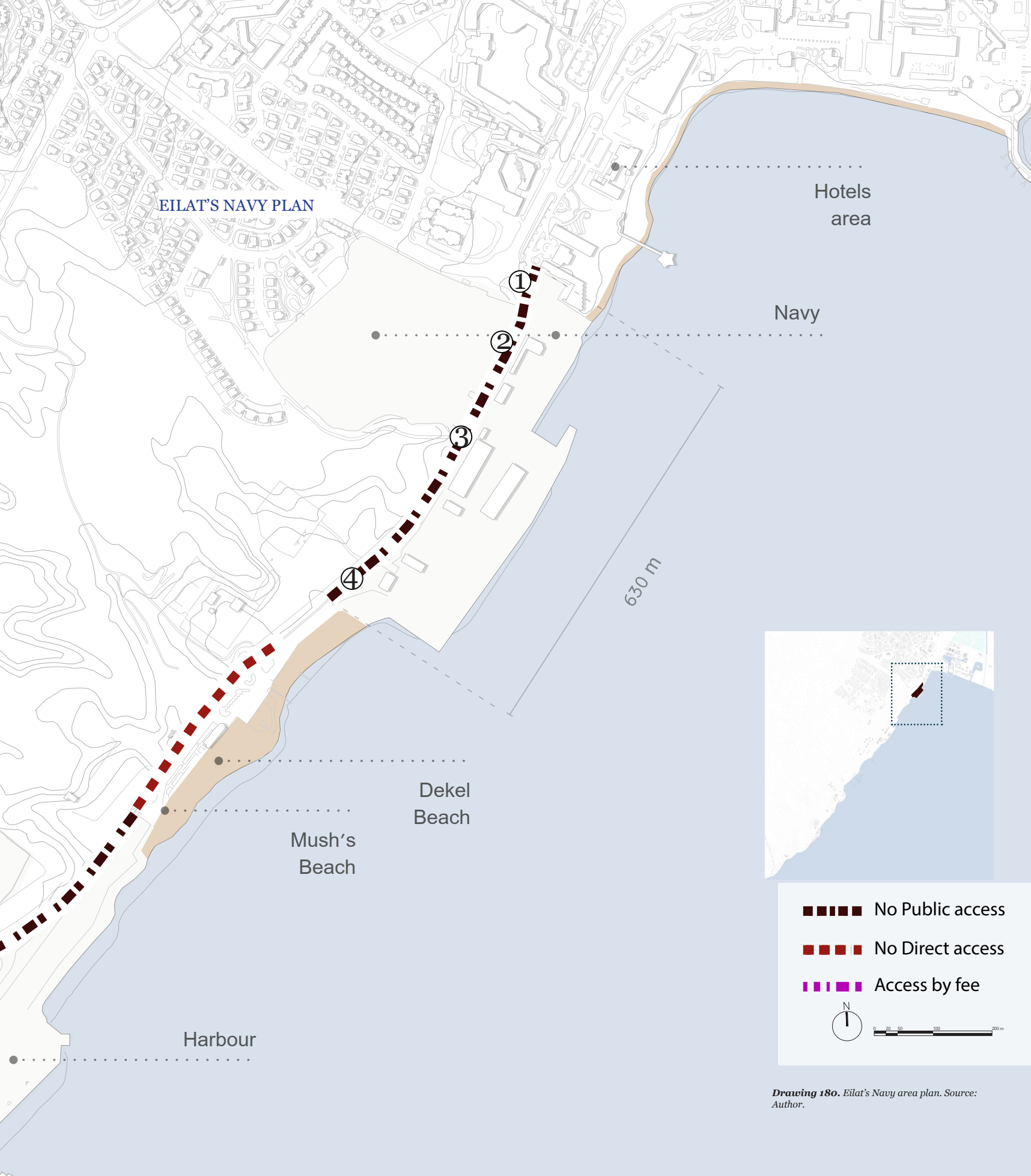


**Figure 425.** The road passes between two sections of the navy base, with navy base walls on both sides, making the area less inviting for pedestrians. There is some desert vegetation on one side of the road. Walkways exist on both sides of the road, but there is no shading or trees. Source: Author

NO ACCESS TO THE BEACH



**Figure 428.** The road passes between two sections of the navy base, with navy base walls on both sides, making the area less inviting for pedestrians. There is some desert vegetation on one side of the road. Walkways exist on both sides of the road, but there is no shading or trees. Source: Author



EILAT'S NAVY PLAN

Hotels area

Navy

630 m

Dekel Beach

Mush's Beach

Harbour

- No Public access
- No Direct access
- Access by fee

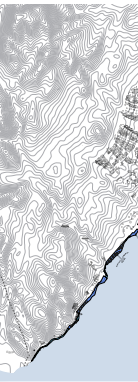
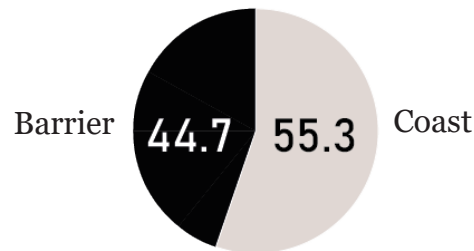


*Drawing 180. Eilat's Navy area plan. Source: Author.*

## MAIN ISSUES

The territorial analysis conducted through the mapping of the Eilat Atlas identifies three fundamental conflicts that currently define the state of the coastal fringe. This diagnostic framework reveals a condition of infrastructural saturation, where the rigid limits of the

city's historical development choke the natural potential of the coast. Dealing with these systemic issues is the primary objective of the strategic plan, aiming at restoring ecological continuity and public accessibility.



### LINEAR FRAGMENTATION: INFRASTRUCTURAL SATURATION OF THE WATERFRONT

Nearly 44.7% (approx. 5km) of the 11km coastline is occupied by industrial, military, and private barriers. This creates a “chronic fracture” that prevents linear public continuity and segments the ecological corridor.

### TOPOGRAPHICAL S COMPRESSION AN CON

The primary traffic axis (Highway 90) has compressed the beach, destroying the natural transition between the mountain and the sea.





## RESILIENCE: LIMINAL AND STRATIGRAPHIC CONFLICT

... (by 90) acts as an impassable rigid barrier between the land and the sea. This infrastructural barrier pushes the city into a thin margin (often <30m), eroding the "natural beach" character of the city.

## ANTHROPOGENIC EXPANSION: THE ENCROACHMENT ON THE ECOLOGICAL MARGIN

Historical urban growth has followed a pattern of "concentric circles" and "added volume" that ignores the desert's morphological roots. This unchecked expansion places extreme pressure on the fragile desert ecosystem, requiring a shift from **additive growth** to **resilient preservation**.



Section **E**  
Case Studies

## E

# Chapter 5 - Case Studies

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## 5.1 CASE STUDIES REVIEW

### 5.1.1 CASE STUDY 1- NATURBAD RIEHEN NATURAL SWIMMING POOL BY HERZOG & DE MEURON

The Naturbad Riehen, designed by the renowned Swiss architectural firm Herzog & De Meuron, represents a pinnacle of sustainable and ecological design in the architectural field. Located in Riehen, near Basel, Switzerland, this natural swimming pool was completed and opened to the public in 2014. It exemplifies innovative architecture by seamlessly integrating ecological systems into the landscape while prioritizing community engagement and environmental sustainability.

The architects embarked on this project with a vision to offer a sustainable alternative to traditional swimming pools. By utilizing natural filtration systems, the pool avoids chemicals by employing a regeneration zone filled with aquatic plants to purify the water. This method not only meets health standards without the use of chemicals but also enhances local biodiversity by creating

new habitats.

Herzog & De Meuron embarked on this project with a vision to create a pool that harmonizes with the natural environment, fostering a sustainable model for urban recreational spaces. Their objective was



*Figure 430. Naturbad Riehen Natural Swimming Pool Source: Herzog & De Meuron*

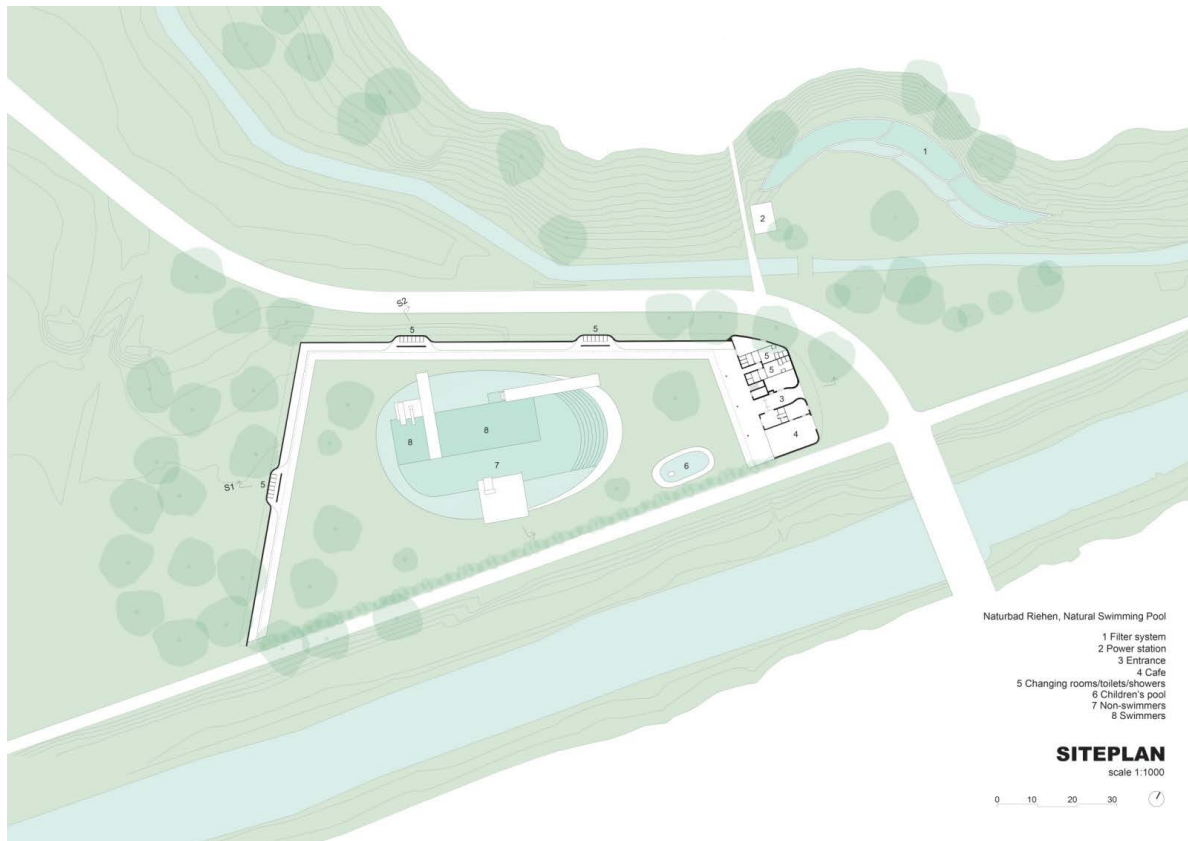


*Figure 431. Naturbad Riehen Natural Swimming Pool Source: Herzog & De Meuron*

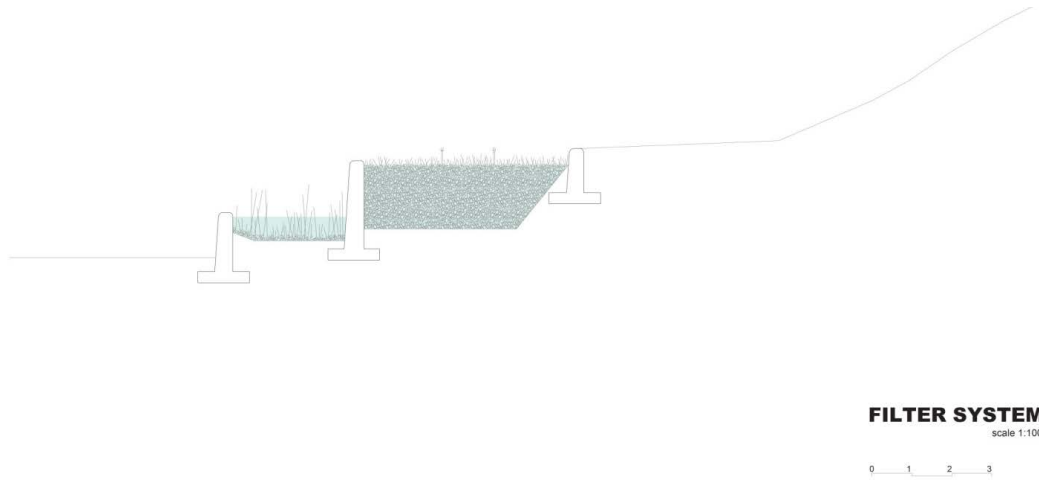
to challenge the conventional chlorine-based pools by utilizing natural filtration processes, thereby promoting ecological balance and enhancing local biodiversity. Balancing aesthetic, ecological, and functional requirements posed significant design and engineering challenges. However, through innovative thinking and sustainable design principles,

Herzog & De Meuron successfully integrated the swimming facility into the local ecosystem. The pool comprises a swimming zone and a regeneration zone, where water undergoes natural filtration through biological processes.

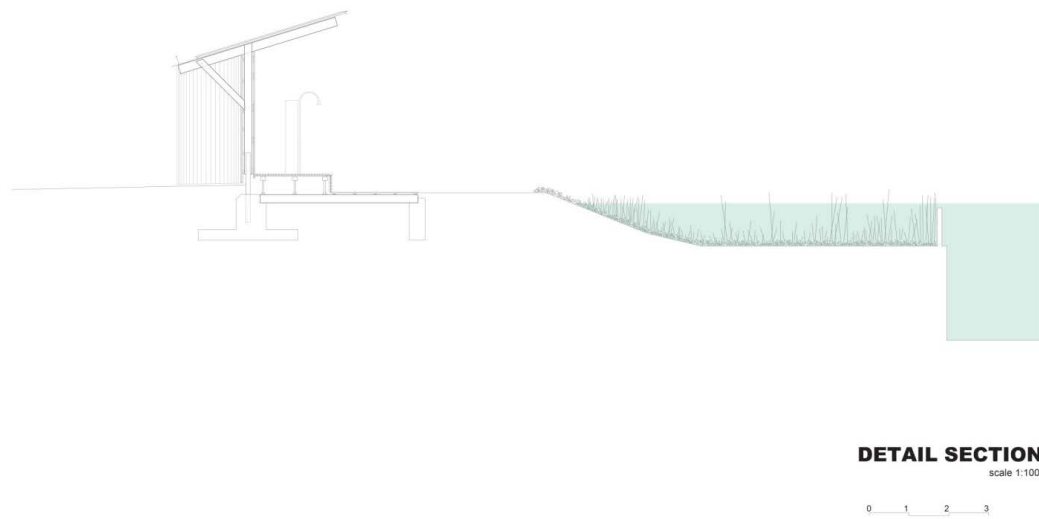
The Naturbad Riehen comprises two main zones: the swimming zone for visitors and the regeneration zone,



**Figure 432.** Naturbad Riehen Natural Swimming Pool Plan. Source: Herzog & De Meuron



**Figure 433.** Naturbad Riehen Natural Swimming Pool Filter System. Source: Herzog & De Meuron



**Figure 434.** Naturbad Riehen Natural Swimming Pool Detail section. Source: Herzog & De Meuron

which is pivotal for the natural filtration system. This system uses aquatic plants to purify the water, ensuring a clean and chemical-free swimming environment through a continuous circulation process between these zones. This design not only supports local flora and fauna but also provides a healthier swimming option for the community.

The construction of Naturbad Riehen was marked by a commitment to research and innovation, taking several years from conception to completion. One of the primary challenges was integrating a natural filtration system that complied with health standards while maintaining the project's aesthetic and functional integrity.

The Naturbad Riehen has had a profound impact on the community and the environment. It has reduced environmental impact compared to traditional pools, offering a chemical-free swimming environment. This project has become a cherished public space in Riehen, promoting community health and well-being and serving as an educational resource on sustainable living.

The reaction from the Riehen community has been overwhelmingly positive. The pool provides recreational opportunities and serves as a model for sustainable architecture. The benefits of this project extend beyond environmental impact,

including the promotion of community engagement and the enhancement of public well-being.

Considering Eilat's environmental context, a project akin to Naturbad Riehen could significantly contribute to sustainable tourism and conservation efforts. Such an initiative would align with global sustainability trends, attracting eco-conscious visitors and reinforcing community engagement with the natural environment.

### 5.2.2 CASE STUDY 2 – BORDEN PARK NATURAL SWIMMING POOL BY GH3

In the bustling city of Barcelona, the Ronda de Dalt highway stands as a vital urban artery, facilitating the movement of people and goods around the city's periphery. However, like many urban highways, its presence introduced a swath of grey infrastructure that fragmented local ecosystems and communities. Recognizing the need to reconcile this essential infrastructure with the city's environmental and social fabric, Batlleiroig embarked on the ambitious Green Coverage project. This case study delves into the project's conception, execution, and the broader implications for urban design and sustainability.

At the outset, GH3 was propelled by a vision to meld functional public space with environmental consciousness. Straying from conventional chlorinated pools, the design leverages a natural filtration process, setting a precedent for sustainable public infrastructure. The firm's ambition was twofold: to furnish the community with a healthful recreational facility and to foster biodiversity through eco-friendly design practices. The pool not only serves as a recreational haven but also embodies a living, breathing educational tool on the virtues of sustainability.

The architectural narrative of the Borden Park Natural Swimming Pool is one of



Figure 438. Figure 2-3-2-1 Borden Park Natural Swimming. Source: 3hg

harmony between man-made structures and natural landscapes. GH3's design eloquently navigates the balance between aesthetic appeal and environmental ethics. The use of natural materials and the thoughtful spatial arrangement encourages interaction between the pool and its verdant surroundings. Central to the pool's operation is an ingeniously conceived natural filtration system. This system, a network of regeneration basins teeming with aquatic flora, purifies the water naturally, ensuring a safe and chemical-free swimming environment for Edmonton's populace.

The Borden Park Natural Swimming Pool project has yielded valuable insights into the integration of sustainable practices in public infrastructure. It has demonstrated the feasibility of natural filtration systems in urban settings, challenging preconceived notions about public pool design. Moreover, the project



Figure 436. Figure 2-3-2-1 Borden Park Natural Swimming. Source: 3hg



Figure 437. Figure 2-3-2-1 Borden Park Natural Swimming. Source: 3hg

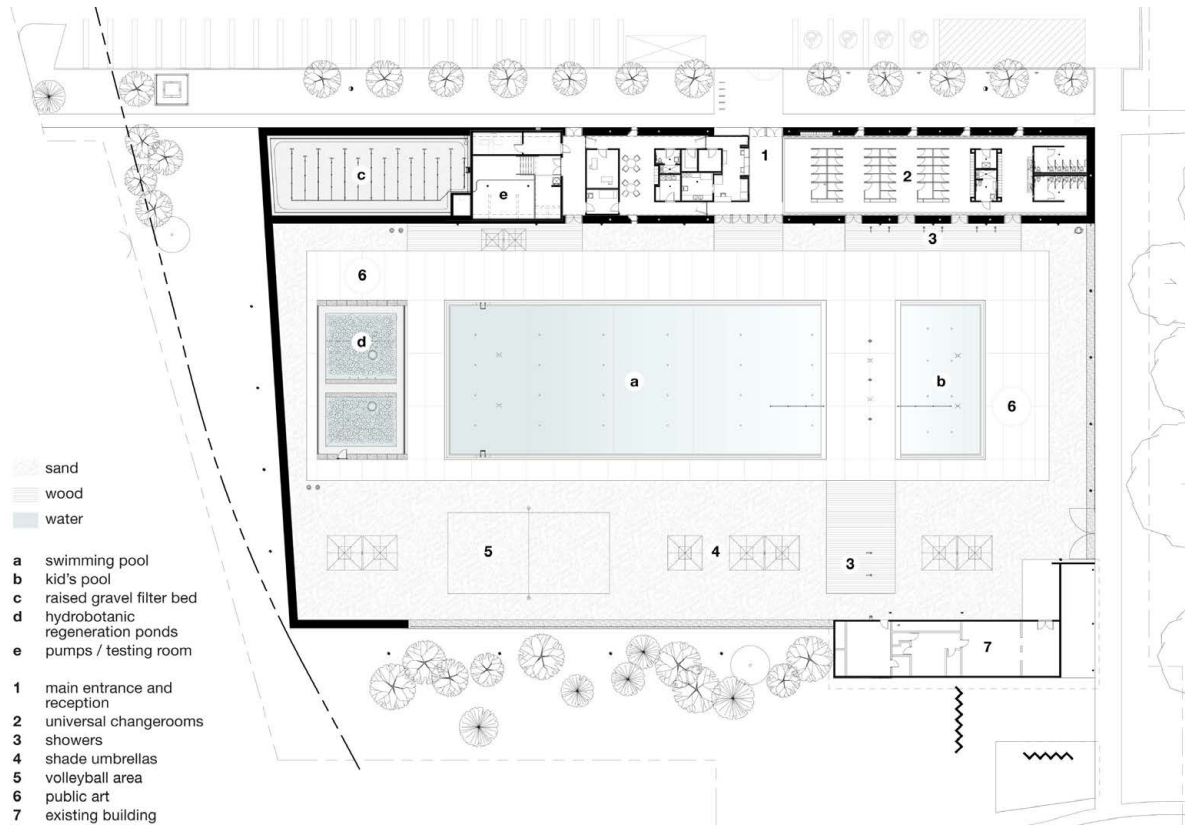


Figure 439. Borden Park Natural Swimming. Source: 3hg

highlights the importance of community involvement and education in fostering environmental stewardship, lessons that are transferable to future endeavours in sustainable architecture.

The journey from blueprint to reality spanned several years, marked by meticulous planning and phased execution. The construction phase was not without its challenges; Edmonton's harsh climatic conditions posed significant logistical hurdles, while regulatory

bodies necessitated stringent compliance to health and safety standards. GH3, in collaboration with environmental engineers, devised innovative solutions to meet these challenges head-on, ensuring the integrity of the natural filtration system was uncompromised and that the project aligned with its sustainable ethos. Since its inauguration, the Borden Park Natural Swimming Pool has become a beacon of community engagement, drawing visitors from all walks of life.

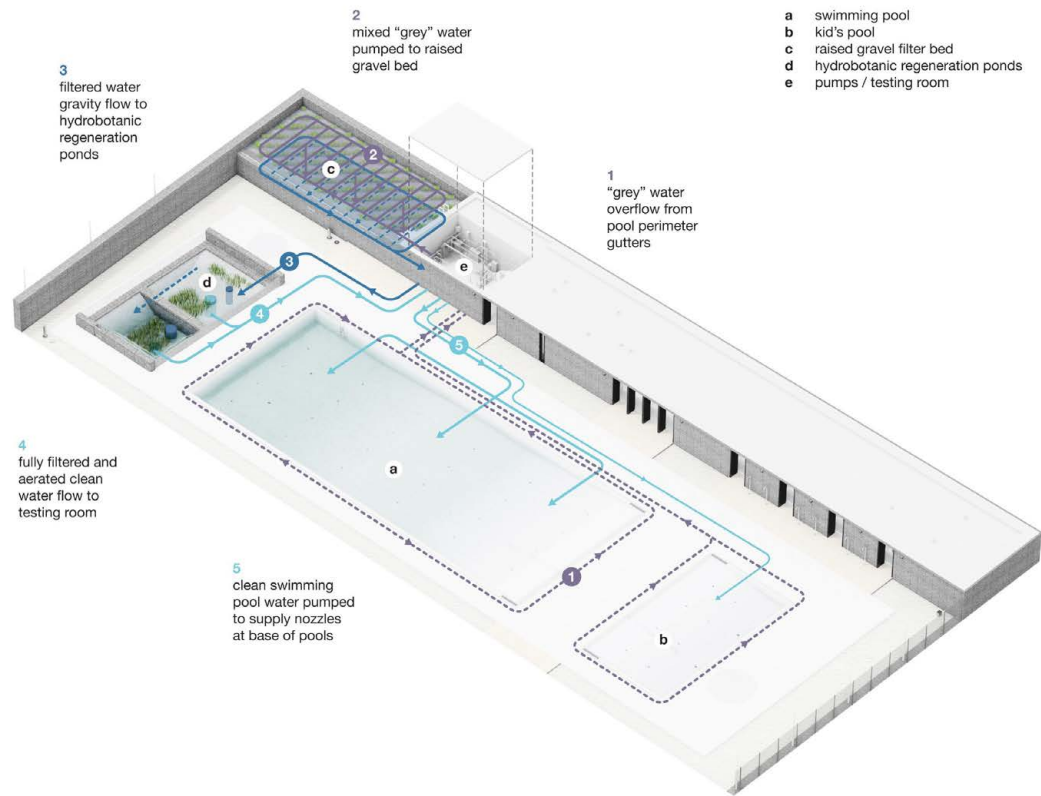


Figure 440. Figure 2-3-2-1 Borden Park Natural Swimming. Source: 3hg

It has catalyzed a broader discourse on sustainable living practices among Edmontonians, underscoring the potential for public infrastructure to coexist with the natural environment. The project has garnered acclaim within architectural circles, earning accolades for its innovative design and contribution to the field of sustainable architecture. The Borden Park Natural Swimming Pool distinguishes itself through its adherence to a holistic, environmentally sustainable

design philosophy, which is particularly evident in its natural filtration system. Unlike conventional pools reliant on chemical treatments for purification, Borden Park's facility employs a symbiotic relationship with nature to maintain water cleanliness, providing a model for ecological stewardship within urban recreational spaces.

At the core of its operation lies the regeneration zone, a carefully designed ecosystem comprising aquatic plants

and a gravel substrate. This zone is instrumental in purifying the pool water through biological filtration. Beneficial bacteria colonize this substrate, breaking down organic matter such as skin cells and sunscreen residue. This process naturally detoxifies the water, eliminating the need for synthetic chemicals and highlighting the pool's commitment to a chemical-free swimming environment.

The plants within the regeneration zone perform a dual function. They act as a natural filtration system, absorbing nutrients like phosphates and nitrates, which are byproducts of organic decomposition. This absorption process is critical in preventing algae blooms, thereby maintaining the water's clarity and cleanliness. Additionally, the roots of these plants offer a habitat for the beneficial bacteria, further enhancing the purification process.

Physical filtration complements the biological mechanisms, with water passing through layers of sand and gravel to remove finer particulate matter. This stage is crucial for trapping debris and particles too small for the biological processes to catch, ensuring the water remains crystal clear. To bolster the pool's purification process, water is also subjected to ultraviolet (UV) light treatment. This step serves as an additional safeguard, neutralizing potentially harmful pathogens that

may have eluded the primary filtration processes. It underscores the pool's comprehensive approach to ensuring the highest water quality and swimmer safety.

Circulation and aeration are pivotal to the filtration system's efficacy. Pumps facilitate the constant movement of water between the swimming and regeneration zones, while aeration techniques oxygenate the water. This oxygenation is vital for sustaining the aquatic plants and bacteria that purify the water, illustrating the intricate balance of natural processes harnessed by the pool's design.

The Borden Park Natural Swimming Pool thus stands as a testament to innovative, sustainable design in public infrastructure. By eschewing chemical treatments in favour of natural filtration, the pool offers a model for environmentally responsible design, marrying functionality with ecological integrity. Its existence not only enhances the community's recreational options but also serves as an educational platform on sustainable living practices, demonstrating the viability and benefits of living in harmony with nature.

The innovative approach of the Borden Park Natural Swimming Pool offers valuable insights for environmentally conscious developments in locales like Eilat, Israel, a city known for its commitment to ecological preservation amidst tourism growth. Eilat's unique

desert climate and sensitive marine ecosystems could benefit from adopting Borden Park's model, particularly its natural filtration system that eschews chemicals in favor of biological purification, aligning with efforts to protect local biodiversity and marine life. Such an initiative could also serve an educational purpose, raising awareness among residents and tourists alike about sustainable practices and the importance of coexisting with natural habitats. Moreover, the challenges and solutions encountered in Edmonton's climate and regulatory environment provide a blueprint for Eilat, demonstrating the feasibility of adapting this model to different climates and regulatory contexts. Integrating natural swimming pools into Eilat's urban fabric could thus bolster its environmental leadership

#### 5.2.4 CASE STUDY 4 - A RESORT HIDDEN WITHIN THE ROCK DWELLINGS OF ALULA, SAUDI ARABIA BY JEAN NOUVEL

The Sharaan Resort, designed by Jean Nouvel in AlUla, Saudi Arabia, is a quintessential example of contemporary architecture's ability to integrate seamlessly within an ancient and dramatic desert landscape. This project showcases modern design techniques

and demonstrates a deep commitment to sustainability and respect for the region's delicate desert ecosystem.

Inspired by AlUla's geological and cultural landscape, Jean Nouvel designed Sharaan to mirror the ancient Nabatean architecture, which harmoniously blends with the natural surroundings. The resort aims to minimize environmental impact while enhancing the site's historical context. Nouvel emphasizes the importance of the desert's mystery and eternity, guiding an architectural approach that respects this "cradle of humanity" (Thearchmagazine, 2020). The goal is to create a luxurious destination that maintains the ecological and archaeological integrity of AlUla.

The resort utilizes the natural rock formations of AlUla, carving the architecture directly into the rock to minimize visual and environmental disruptions. This cave-like architecture not only preserves the landscape's integrity but also enhances the buildings'



Figure 441. Figure 2-3-4-1 Water System Diagram Source: Archdaily

thermal efficiency—drawing from ancient techniques to meet modern needs. Nouvel describes this integration as a “true cultural act,” which uses natural colours, light, and forms to create a series of luxurious spaces that feel intrinsic to the desert itself (Royal Commission for AlUla, 2020).

Nouvel’s design for Sharaan is meticulously crafted to harmonize with the desert landscape. The resort’s structures are designed to blend into the sandstone cliffs, utilizing natural colours and forms that echo the surrounding desert and rock formations. This integration is achieved through both form and materiality, with the resort appearing as an inherent part of the landscape rather than an imposition upon it. Such architectural sensitivity ensures that the resort enhances rather than detracts from the visual and environmental character of AlUla.



Figure 442. Figure 2-3-4-1 Water System Diagram Source: Archdaily

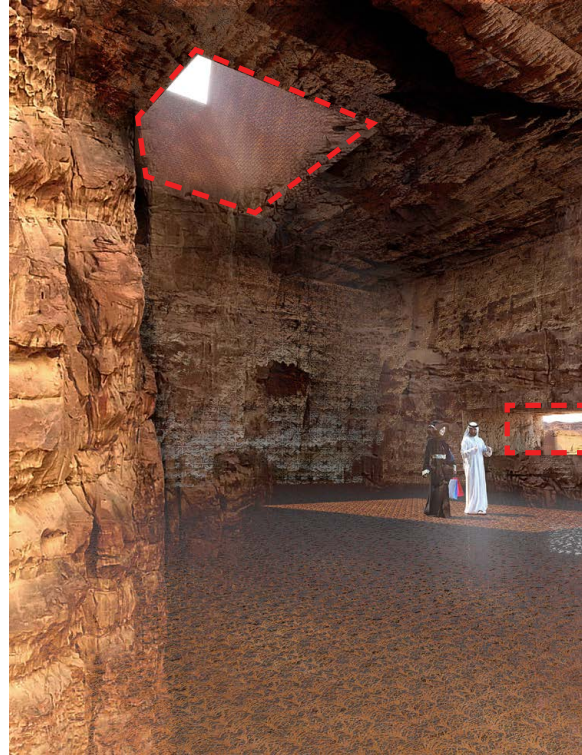


Figure 443. Figure 2-3-4-1 Water System Diagram Source: Archdaily

The design principles showcased at Sharaan are particularly relevant for Eilat, another city set in a desert landscape and looking to expand its tourism sustainably. By adopting cave architecture, Eilat could enhance its distinctive tourism offerings, providing visitors with an experience that is both environmentally sustainable and culturally enriching. This strategy not only positions Eilat as a destination that values ecological and historical preservation but also leverages its uniqueness, which is crucial for attracting



Figure 444. Water System Diagram Source: Archdaily



Figure 446. Water System Diagram Source: Archdaily



Figure 447. Water System Diagram Source: Archdaily



Figure 445. Water System Diagram Source: Archdaily

international tourists seeking unique and memorable experiences.

Jean Nouvel's Sharaan Resort in AlUla exemplifies an advanced paradigm of sustainable architectural design that respects and enhances its ancient desert setting. This project serves as a benchmark for future development in heritage-rich and environmentally sensitive regions, demonstrating the potential of architecture to contribute positively to both cultural preservation and modern hospitality.

#### 5.4.4.1 CASE STUDY 4 - DESERT ROCK BY OPPENHEIM ARCHITECTURE

Desert Rock, meticulously designed by Oppenheim Architecture and situated in the majestic Wadi Rum, Jordan, represents an innovative blend of architecture with the natural desert landscape. This project showcases a commitment to integrating luxury with sustainability within ecologically sensitive areas (Oppenheim Architecture, 2021).

The objective of Desert Rock is to minimize environmental impact while enhancing the visual and experiential aspects of the desert landscape. The resort is crafted to embody sustainable design principles that not only respect but enhance the ecological integrity of Wadi

Rum, emphasizing the ancient beauty of the landscape (Oppenheim Architecture, 2021).

The resort's design features architectural elements that mirror and blend with natural rock formations, utilizing materials that complement the desert's hues. Each structural element is designed with sustainability and energy efficiency at its core, maintaining the ecological continuity of the landscape. Moreover, the innovative integration of structures into the rock formations employs both modern architectural methods and ancient building techniques (ArchDaily, 2021).

The design philosophy behind Desert Rock prioritizes a deep respect for the natural environment, embedding structures within the terrain to minimize visual impact and preserve the natural beauty. This approach ensures that the resort harmonizes with the landscape, fostering a symbiotic relationship with the surrounding environment (Designboom, 2023).

Since its introduction, Desert Rock has garnered international acclaim for its eco-friendly design approach within a sensitive archaeological area. It is celebrated for its innovative fusion of luxury tourism with ecological preservation, serving as a benchmark for future developments (ArchDaily, 2021).

Desert Rock offers a model for sustainable

development in arid environments, providing insights into how architectural practices can enhance rather than detract from natural settings. Its principles are applicable to similar tourism initiatives worldwide, promoting sustainable development in the hospitality industry (Designboom, 2023).

The architectural principles demonstrated at Desert Rock are particularly relevant to Eilat, given its similar arid climate and natural landscape. Adopting these strategies could significantly enhance Eilat's commitment to environmental preservation and sustainable development. The design approach used at Desert Rock, which emphasizes harmony with the natural terrain and minimizes visual impact, provides a valuable model for Eilat. This method could be instrumental in developing new projects that integrate seamlessly with the desert environment, supporting ecological preservation while promoting tourism. The use of materials and techniques that enhance energy efficiency and reduce environmental impact is especially pertinent for Eilat, helping to set a standard for sustainable construction in the region. By applying these principles, Eilat could strengthen its position as a destination that values ecological and aesthetic sensitivity alongside its growth in tourism and recreation.

Desert Rock by Oppenheim Architecture

exemplifies how innovative design can align with stringent environmental goals to create a space that is both luxurious and sustainable. This project underscores the potential of contemporary architecture to contribute positively to the conservation of natural landscapes while providing premium amenities.

#### 5.4.5 CASE STUDY 5 - N-CAVED HOUSE BY MOLD ARCHITECTS

Located on Serifos Island, Greece, the “N-Caved” house, designed by Mold Architects, exemplifies an innovative approach to architectural design that respects and integrates seamlessly with its natural environment. This project leverages the unique topographical features of its location, offering a sustainable solution that blends aesthetically and functionally with the

rugged landscape.

Mold Architects meticulously planned “N-Caved” to minimize its visual and environmental impact while maximizing the panoramic views of the Aegean Sea. The strategic embedding of the house within the hillside ensures a minimal visual profile and maintains the integrity of the natural terrain. This design approach not only harmonizes the structure with its surroundings but also leverages local materials such as stone and concrete to achieve thermal efficiency and ecological



Figure 450. N cave by Mold Architects. Source: N Cave



Figure 448. N cave by Mold Architects. Source: N Cave



Figure 449. N cave by Mold Architects. Source: N Cave

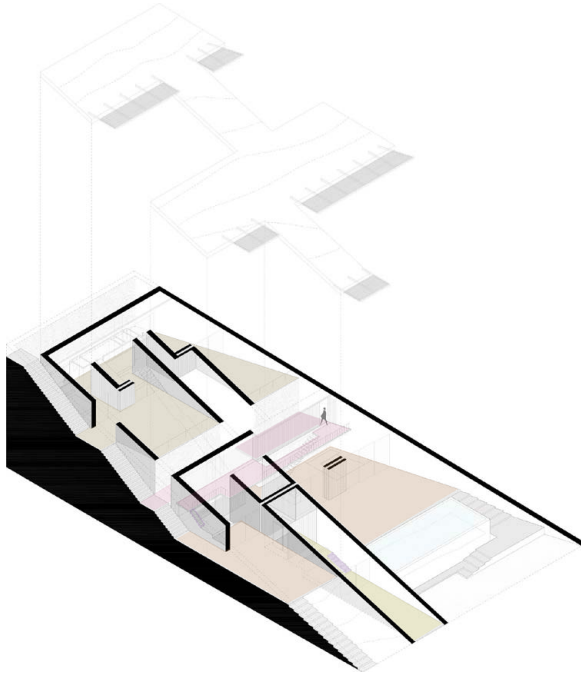


Figure 451. N cave by Mold Architects. Source: N Cave

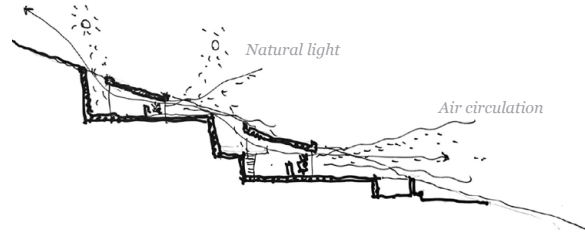


Figure 453. N cave by Mold Architects. Source: N Cave



Figure 452. N cave by Mold Architects. Source: N Cave

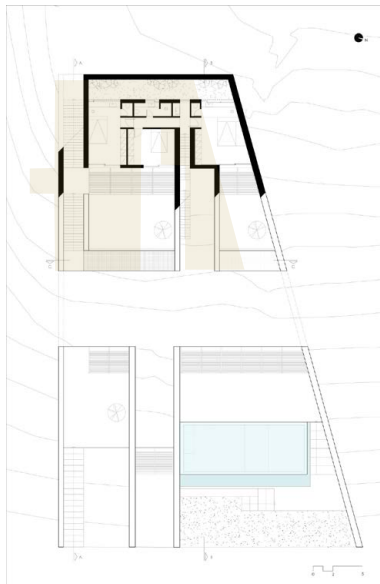


Figure 456. 2nd Floor

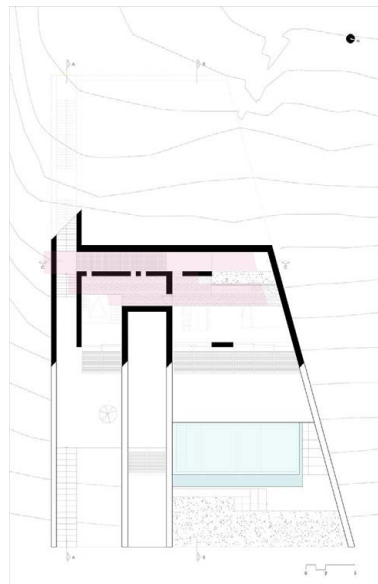


Figure 455. 1st Floor

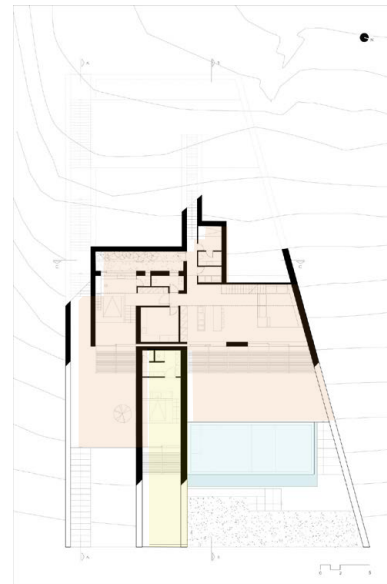


Figure 454. Floor 0

sensitivity (Mold Architects, n.d.).

The layout of “N-Caved” is ingeniously aligned with the natural contours of the terrain, reflecting a deep understanding of the landscape’s inherent properties. The use of local stone and concrete serves dual purposes: it complements the geological context and provides substantial thermal mass, effectively keeping the interiors cool. The architectural integration of large sliding glass doors and strategically placed skylights maximizes natural lighting, which reduces the dependency on artificial lighting and enhances the energy efficiency of the residence (ArchDaily, 2021).

The design philosophy behind “N-Caved” emphasizes a symbiotic relationship with the landscape, adopting a cave-like architecture that not only protects against the harsh marine climate but also mimics the natural erosion processes of the surrounding rocks. This methodology underscores a commitment to environmental preservation and aesthetic fidelity, ensuring that the project enhances rather than detracts from the site’s ecological and visual qualities (Fuorisalone, 2020).

Since its completion, “N-Caved” by Mold Architects has been recognized for its innovative approach to integrating architecture with a sensitive environmental site. The project exemplifies how thoughtful design

can achieve harmony with the natural landscape, providing both functional benefits and aesthetic appeal. The architectural strategies used in “N-Caved” emphasize sustainability and minimal environmental disruption, making them particularly relevant for application in similarly challenging environments like Eilat. In these areas, the approach taken by Mold Architects could inspire new developments to adopt sustainable and harmonious design practices, thereby enhancing both ecological and visual experiences.

The “N-Caved” house by Mold Architects stands as a paradigm of how contemporary

#### 5.4.6 CASE STUDY 6 - AYL A GOLF CLUBHOUSE BY OPPENHEIM ARCHITECTURE

The Ayla Golf Clubhouse, situated in Aqaba, Jordan, is a hallmark project by Oppenheim Architecture, distinguished by its harmonious integration with the natural desert environment. This innovative development is part of the Ayla Oasis, a comprehensive resort aiming to fuse luxury with sustainability. Reflecting the contours of the surrounding dunes, the clubhouse is celebrated for its organic design that resonates with the natural landscape and the cultural heritage of Jordan.

The clubhouse was designed to echo the natural dunescapes and the majestic mountains of the Jordanian desert, as well as to pay homage to the architectural legacy of the ancient Bedouins. The overarching aim of this project was to create a landmark that not only serves its functional purpose as a golf clubhouse but also embeds itself into the environmental and cultural narratives of Aqaba. The structure forms an iconic core within the Ayla Oasis mixed-use development, which spans a significant area dedicated to residential, hotel, and commercial spaces centred around an 18-hole signature golf course (Oppenheim Architecture, 2019).

The design of the clubhouse features a distinctive architectural form, a massive concrete shell that drapes over the functional areas, uniting interior and exterior walls under a single continuous surface. This method, using shotcrete technology taught to local builders, was not only innovative but also fostered skill development among the local workforce. The design incorporates elements such as sunlight filtering through perforated corten steel screens that resemble the traditional Arabic 'Mashrabiya', providing natural light while maintaining privacy and adding aesthetic value. These features

demonstrate a blend of traditional elements with modern techniques, suitable for the desert climate and reflective of local aesthetics (Oppenheim Architecture, 2019).

The Ayla Golf Clubhouse by Oppenheim Architecture not only showcases sustainable building practices but also emphasizes the integration of native desert vegetation and trees within its landscape design. These plant species, specifically chosen for their ability to thrive in arid conditions, contribute to the area's ecological integrity (Oppenheim Architecture, 2019). The incorporation of native vegetation enhances the site's biodiversity and provides essential habitat



Figure 457. Ayla Golf Clubhouse Area Plan. Source: Oppenheim Architecture

for local wildlife, while also stabilizing the soil and minimizing water usage. This thoughtful landscaping approach extends the sustainability efforts of the clubhouse by ensuring that the outdoor spaces are both beautiful and resilient, mirroring the natural desert environment surrounding Aqaba. The use of indigenous plants and trees reinforces the project's commitment to environmental stewardship and serves as a model for harmonious architectural development in desert regions. Since its completion in 2018, the Ayla Golf Clubhouse has significantly

influenced both the local community and the broader architectural world. It has been recognized for its environmental sensitivity and innovative design, earning accolades in architectural circles and becoming a model for similar developments in the region. The clubhouse has elevated the standard for sustainable and culturally integrated design in luxury resort developments. The sustainable architectural strategies employed in the Ayla Golf Clubhouse by Oppenheim Architecture, situated near the natural landscapes surrounding



**Figure 458.** Ayla Golf Clubhouse Area Plan. Source: Oppenheim Architecture



**Figure 459.** Ayla Golf Clubhouse's design details. Source: Oppenheim Architecture



**Figure 461.** Ayla Golf Clubhouse's vegetation Source: Oppenheim Architecture



**Figure 460.** Ayla Golf Clubhouse Source: Oppenheim Architecture

Aqaba, offer valuable insights for similar developments in arid regions, particularly in the neighbouring city of Eilat. Eilat and Aqaba, which directly border each other and are visually connected, share similar environmental conditions and challenges. The clubhouse's approach—emphasizing local materials, energy-efficient design, and culturally integrated architectural elements—is ideally suited for adaptation in Eilat's similar landscape. Implementing these sustainable practices would respect and enhance the local heritage and ecosystem while promoting sustainability beyond typical urban settings. The geographical proximity of Eilat and Aqaba not only highlights the potential for shared architectural strategies but also encourages cross-border cooperation in sustainable development initiatives, fostering environmentally friendly growth that respects their shared desert environment.

The Ayla Golf Clubhouse by Oppenheim Architecture exemplifies the synthesis of sustainable practices with architectural innovation, setting a precedent for future development in environmentally and culturally sensitive areas. Its success underscores the potential of thoughtful architectural practice to achieve a balance between functionality, aesthetics, and sustainability.



Figure 464. Ayla Golf Clubhouse's vegetation Source: Oppenheim Architecture

#### 5.4.8 CASE STUDY 8 - GREEN COVERAGE OF THE RONDA DE DALT IN BARCELONA BY BATLLEIROIG

The Green Coverage of the Ronda de Dalt, designed and implemented by Batlleiroig, serves as a transformative approach to urban infrastructure within Barcelona, Spain. This innovative project integrates extensive green spaces into the fabric of a major urban highway, significantly enhancing both ecological functionality and aesthetic appeal. Such an initiative is particularly relevant as urban areas globally grapple with challenges related to pollution and spatial constraints, positioning this project as a pioneering model for sustainable urban

development.

Initiated to mitigate the environmental impact associated with the Ronda de Dalt highway—which encircles Barcelona—Batlleiroig’s design fosters a ‘green lung’ within the urban environment. This design enhances air quality and creates communal spaces that reconnect urban areas previously divided by this infrastructure. Consequently, these spaces promote pedestrian-friendly environments and enhance local interactions, revitalizing urban streets and promoting a community-focused urban environment, according to Batlleiroig (2021).

Central to the project’s implementation are large-scale productive pergolas equipped with photovoltaic panels. These structures mitigate the urban heat island effect by providing shade and generating sustainable energy. Constructed from environmentally

sustainable and locally sourced materials such as wood and Catalan stone, the pergolas ensure durability and minimize environmental impact from material transport and processing. The strategic choice of materials integrates seamlessly with the local landscape, fostering social interaction within the newly created winding pathways and communal spaces. The impact of the Green Coverage project since its completion has been substantial. It has garnered acclaim for its innovative design and commitment to sustainability principles, transforming a previously utilitarian space into a productive and recreational environment. This transformation has substantially enhanced the quality of life for Barcelona’s residents and established a new benchmark for urban redevelopment projects worldwide.

Adapting the sustainable innovations from the Green Coverage project to Eilat could



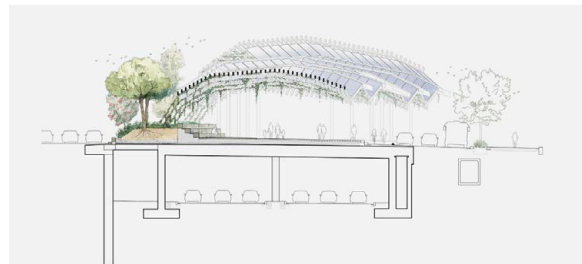
**Figure 465.** Figure 2-3-8-2 Green Coverage of the Ronda de Dalt’s Section.  
Source: batlleiroig

profoundly impact this environmentally sensitive region. The strategy of integrating green infrastructure, particularly the productive pergolas with photovoltaic panels used in Barcelona, is highly applicable to Eilat, which, much like Barcelona, experiences high solar exposure. Implementing these pergolas in Eilat could offer significant benefits, such as reducing energy consumption and providing shade in public spaces, which is crucial in Eilat's arid climate. Furthermore, the holistic approach taken by Batlleiroig in Barcelona to enhance connectivity between divided zones via green spaces could be tailored for Eilat to improve its urban cohesion, promoting sustainable urban mobility and fostering a stronger sense of community among residents.

In conclusion, the Green Coverage of the Ronda de Dalt by Batlleiroig not only showcases the potential of architectural creativity in enhancing urban resilience but also serves as an exemplar of how thoughtful design can contribute to broader sustainability goals. This project underscores the viability of integrating green infrastructure into urban planning, providing a valuable blueprint for future sustainable urban design initiatives, including potential adaptations in diverse environments like Eilat.



**Figure 466.** Figure 2-3-8-2 Green Coverage of the Ronda de Dalt's Plan.  
Source: Landezine



**Figure 467.** Figure 2-3-8-2 Green Coverage of the Ronda de Dalt's Section.  
Source: Landezine



**Figure 468.** Figure 2-3-8-2 Green Coverage of the Ronda de Dalt's Section.  
Source: batlleiroig

#### 5.4.9 CASE STUDY 8 - EARTHSHIP BY ARCHITECT MICHAEL REYNOLDS

An Earthship is a type of passive solar house that is made of both natural and upcycled materials such as earth-packed tires, pioneered by architect Michael Reynolds in the 1970s. The concept emerged from a desire to create a home that would operate independently from the utility grid, be environmentally sustainable, and make use of materials that are typically considered waste. The idea has evolved into a globally recognized ecological movement, with Earthships appearing in various climates and settings worldwide (Freney, 2009).

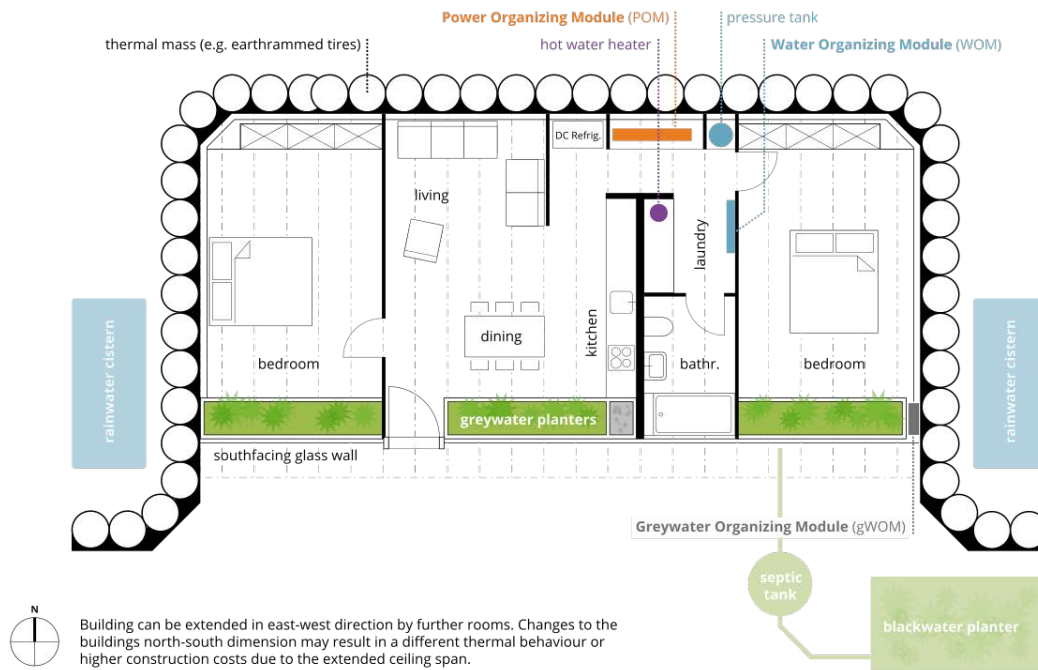
Arid climates present unique challenges for sustainable building, requiring innovative approaches to manage extreme heat and scarce water resources. Earthships address these challenges through a combination of architectural ingenuity and ecological principles:

**Thermal Mass Construction:** Earthships use thick walls made from materials with high thermal mass, such as rammed earth, adobe, and tires filled with compacted soil. These materials absorb heat during the peak sunlight hours and release it slowly during cooler nights. This natural process helps to maintain a consistent internal temperature without the need for active heating or cooling systems.

In arid climates, where temperature fluctuations between day and night are significant, this principle is crucial for creating a liveable environment that remains cool during the day and warm at night (Samardžioska et al., 2019).

**Passive Solar Design:** The orientation and design of Earthships are strategically planned to harness the sun's energy efficiently. Large, south-facing windows (in the Northern Hemisphere) allow for maximum sunlight exposure during the winter months when the sun is lower in the sky. These windows are typically covered with high-efficiency glazing that admits solar radiation while preventing heat escape. Overhangs and shading elements are also critical, designed to block the high summer sun, thus keeping the interior cool during the hottest part of the year. This thoughtful orientation and window design minimize the reliance on artificial heating and cooling, making the most of natural energy sources (Denzer, 2013).

**Natural and Mechanical Ventilation:** Ventilation is vital in arid environments to manage interior temperatures and ensure a supply of fresh air. Earthships incorporate features such as skylights and strategically placed vents that facilitate natural convection currents. These currents draw cooler air in from the lower parts of the building while allowing hot air to escape from the top, creating a



**Figure 469.** Earthship with vertically glazed southern wall. Exterior and interior. Source: Earthship Biotechnology

continuous air movement that helps cool the space naturally. Some Earthships also include earth tubes—underground tunnels that pre-cool the air before it enters the home, leveraging the lower temperatures of the earth around them (Booth et al., 2022).

**Water Harvesting and Reuse:** Water scarcity is a defining feature of arid climates. Earthships tackle this issue by integrating robust water harvesting systems that collect rainwater from the roof, which is then channelled into

cisterns and filtered for domestic use. After initial use, greywater from sinks and showers is purified through botanical cells—planted areas that naturally treat the water and make it suitable for irrigation. This system minimizes water waste and reduces the demand on local water resources (Booth et al., 2021).

**Energy Production and Management:** Energy production in Earthships is designed to be sustainable and autonomous, utilizing solar panels and wind turbines to generate electricity. This

is particularly effective in arid climates, which often experience high levels of sunlight and consistent wind patterns. The energy is stored in batteries, providing a reliable power supply throughout the day and night. The integration of renewable energy sources reduces dependence on fossil fuels and enhances the building's self-sufficiency (Ralegaonkar & Gupta, 2010).

**Use of Local and Sustainable Materials:** The construction of Earthships often involves local materials that are abundant and sustainable, reducing the environmental impact associated with transportation and production. In arid areas, materials like local earth, stone, and recycled components such as tires and cans are commonly used. These materials not only promote sustainability but also typically perform well in harsh climates, providing essential insulation and durability (Freney, 2009).

Earthships provide a plethora of benefits such as environmental sustainability through the use of recycled materials and renewable energy, which significantly reduces their ecological footprint. Their design optimizes natural heating and cooling, which not only conserves energy but also reduces costs. Moreover, Earthships integrate water conservation practices like rainwater harvesting and greywater recycling, essential in regions with limited water availability. They

are also designed to be self-sufficient, providing their own water, power, and food, which proves invaluable in remote or underserved areas.



Figure 471. Exterior and interior. Source: Earthship Biotechnology

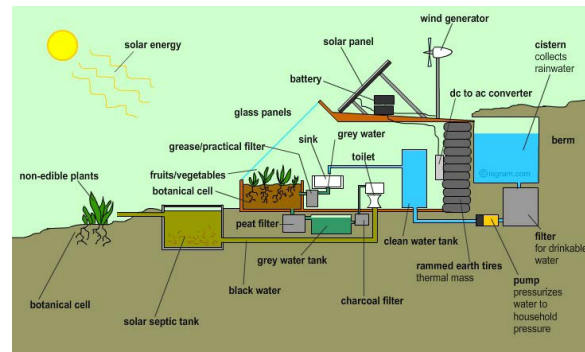


Figure 470. Exterior and interior. Source: Earthship Biotechnology

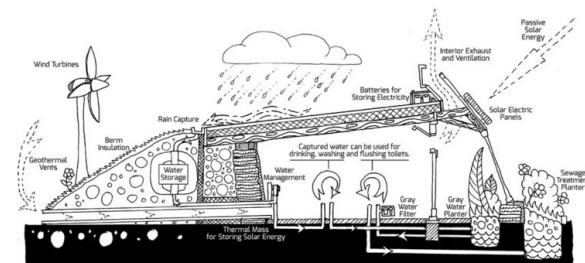


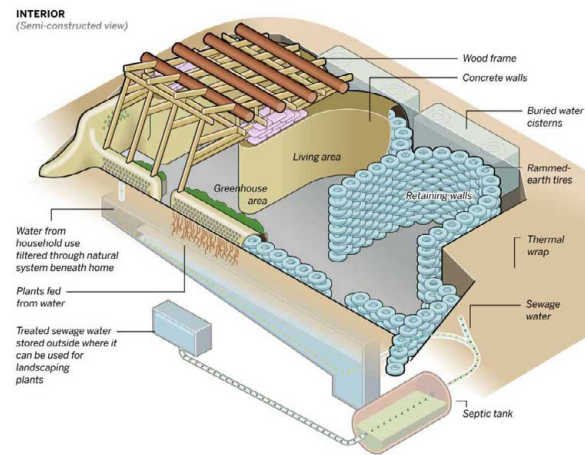
Figure 472. Exterior and interior. Source: Typical Earthship section. Source: Earthship Biotechnology

However, Earthships also face several challenges. Adhering to local building codes and regulations can be problematic, as these may not always accommodate the unique design and construction methods of Earthships. The initial costs for building an Earthship can be steep, especially when incorporating advanced systems for full self-sufficiency in water and energy. Additionally, adapting Earthship designs to various climates may require significant modifications, adding to the complexity and cost. Lastly, maintaining the integrated systems of an Earthship requires a certain level of technical knowledge and commitment, which might be challenging for some residents.

In the context of Eilat, a city characterized by its arid desert climate, Earthships offer intriguing possibilities. The principles of Earthship design align well with the environmental conditions of Eilat, where managing heat and conserving water are paramount. The use of thermal mass construction and passive solar design could significantly reduce the need for air conditioning, which is a major energy consumer in such climates. Moreover, the integrated water harvesting systems would provide a valuable resource in an area where water scarcity is a constant challenge. The sustainable practices demonstrated by Earthships could inspire broader community

initiatives towards sustainability and environmental resilience in Eilat, making them a compelling model for eco-friendly development in arid urban landscapes.

Earthships are self-sustaining homes constructed from as much locally-sourced, reclaimed material as possible.



BRICK HALL / POSTMEDIA NEWS

Figure 473. Figure 2-3-9-3 California Earthship Biotechture. Source: Earthship Builders



Figure 474. Figure 2-3-3-2 Earthship in Israel. Source: Author

#### 5.4.10 CASE STUDY 10 - JINYUN QUARRIES – THE QUARRY AS STAGE BY XU TIAN TIAN / DNA DESIGN AND ARCHITECTURE

##### 1. From Extraction to Culture:

The Jinyun Quarries project represents a distinct approach to adaptive reuse, characterized by “subtractive” rather than “additive” spatial qualities. The site comprises over 3,000 abandoned stone quarries, excavated manually and mechanically over decades (ArchDaily, 2022). The architectural intervention, described by Xu Tiantian as “Architectural Acupuncture,” seeks to reactivate these dormant industrial scars through minimal, precise insertions. Rather than filling the voids, the design



Figure 476. Figure x Aerial View of Quarries 8, 9, and 10. Source: DNA Design and Architecture

inhabits them, converting the negative space of extraction into containers for public and cultural life (DnA\_Design and Architecture, 2022).



Figure 475. Figure x Quarry 8 and Quarry 9 master plan. Source: DNA Design and Architecture

##### 2. Quarry No. 8: Book Mountain (Shushan)

Verticality and Ritual Architectural Problem: Activating a deep vertical shaft (approx. 50m depth, 40m height).

The quarry is a result of top-down mining, leaving a high, cathedral-like volume. The architect addresses the challenging verticality by introducing a series of lateral stone terraces that climb 12 meters up the rock face (ArchDaily, 2022). This circulation strategy transforms the physical effort of ascent into a spatial

narrative.

The design references the Tang Dynasty poet Han Yu and the concept that “the path through the Mountain of Knowledge is only made possible through diligence” (DnA\_Design and Architecture, 2022). By placing study platforms on ascending levels, the architecture enforces a ritualistic climb to access knowledge.

**Light and Topography:** The terraces are positioned on “faulty rock” ledges that were historically abandoned by miners. This opportunistic use of the existing topography allows the new function to nest within the old scars. The stepped section ensures that natural light from the upper clerestory opening penetrates down to the lower platforms, preventing the deep space from feeling like a dark basement (ArchDaily, 2022).



Figure 477. Figure x Quarry No. 8 plan. Source: DNA Design and Architecture



Figure 479. Figure x Quarry No. 8 A clear visual distinction is made between the “found” context (rough, hand-hewn stone walls) and the “inserted” architecture (precise, warm bamboo shelving and steel railings). Source: DNA Design and Architecture

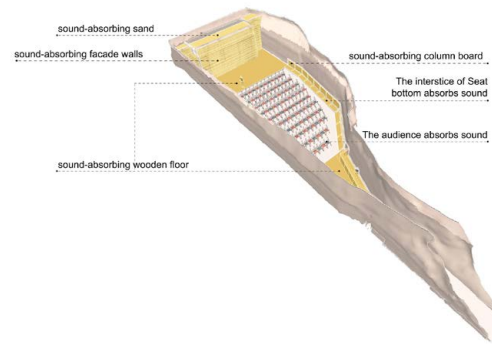


Figure 478. Figure x Quarry No. 8 Section. Source: DNA Design and Architecture

### 3. Quarry No. 9: The Stage Space

**Material Stratigraphy and Acoustics**  
**Architectural Problem:** Managing the sensory environment of a rock enclosure.  
**Reading the Walls:** The interior reveals a clear “stratigraphy of labor.” The upper, conical section of the quarry displays the irregular marks of manual quarrying, while the lower, vertical walls show the precise cuts of machine excavation (DnA\_Design and Architecture, 2022).  
**The lighting design** highlights these cracked surfaces, treating the geological history as the primary aesthetic element.  
**Acoustic Function:** The space capitalizes on the natural acoustic properties of the porous volcanic rock, which absorbs sound and reduces echoes. This allows the quarry to function as a high-quality performance venue for traditional Wuju opera without extensive acoustic treatment (ArchDaily, 2022).

The design embraces the semi-outdoor nature of the cave. The floor is slightly recessed to collect rainwater, creating a reflection pool that mirrors the ceiling. This introduces the sound of dripping water as an ambient layer, blurring the boundary between the controlled architectural space and the uncontrolled natural elements (DnA\_Design and Architecture, 2022).



**Figure 480.** Figure x Quarry No. 9 Acoustic function diagram. Source: DNA Design and Architecture



**Figure 481.** Figure x Quarry No. 9 The performance space utilizes the porous volcanic rock walls as natural acoustic absorbers, eliminating the need for artificial soundproofing materials.. Source: DNA Design and Architecture

### 4. Quarry No. 10: Live Performance

**The Museum of Labor Architectural Problem:** Framing industrial history within a visitor context.

Unlike the other quarries which introduce new functions (library, stage), Quarry No. 10 acts as a living museum. It is an

open-air amphitheater dedicated to demonstrating the act of stone quarrying itself (DnA\_Design and Architecture, 2022).

The architectural intervention is minimal, a ramp and a circular spectator stand finished in local stone. These elements serve strictly to frame the central “stage” where stonemasons perform the region’s traditional labor.

This approach validates the history of the site. It does not hide the industrial past but elevates the act of manual labor to a performance art, creating a direct visual link between the viewer and the source of the architecture (ArchDaily, 2022).

The Jinyun Quarries demonstrate that subterranean architecture does not require the concealment of the site’s rugged nature. Through the strategies of topographic opportunism (using existing ledges), material contrast (highlighting tool marks), and passive environmental control (using the thermal mass and acoustic properties of rock), the project successfully transforms industrial voids into civic spaces.



**Figure 482.** Figure x Quarry No. 9 The recessed floor collects rainwater to create a mirror pool, visually doubling the height of the cave and dissolving the boundary between the ground and the sky.. Source: DNA Design and Architecture



**Figure 483.** Figure x Quarry No. 10 An aerial view revealing the scale of the “negative space.” The architecture is not an object sitting on the land, but a void carved into it. Source: DNA Design and Architecture

### 5.4.11 CASE STUDY 11 - CAVEA ARCARI BY DAVID CHIPPERFIELD ARCHITECTS

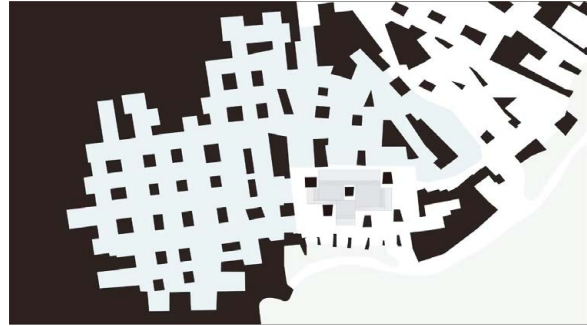
#### 1. Context: The “Room and Pillar” Void

The Cava Arcari is not a natural geological formation but a man-made void resulting from 60 years of quarrying “Pietra di Vicenza” (soft white stone). The excavation method used was the “Room and Pillar” technique, which leaves massive, irregular columns of rock to support the mountain above (David Chipperfield Architects, n.d.).

**Typological Relevance:** Unlike open-pit mines, this space is entirely subterranean, defined by a grid of irregular piers and flooded chambers. The project demonstrates how to inhabit a “service” void, originally designed for extraction, not habitation, by treating the structural necessities (the pillars) as the primary aesthetic feature (Uni.xyz, 2025).

#### 2. Architectural Concept: “The Cavea”

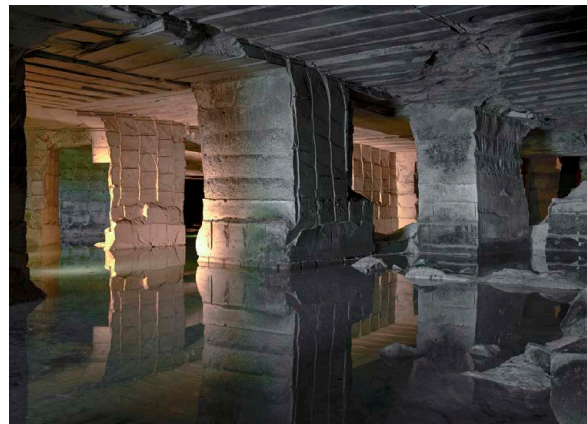
The architectural intervention is defined by Material Continuity. The architect chose to use only one material, the local White Vicenza Stone, for all new interventions, creating a seamless visual link between the ancient quarry walls and the modern additions (Thisispaper, 2023).



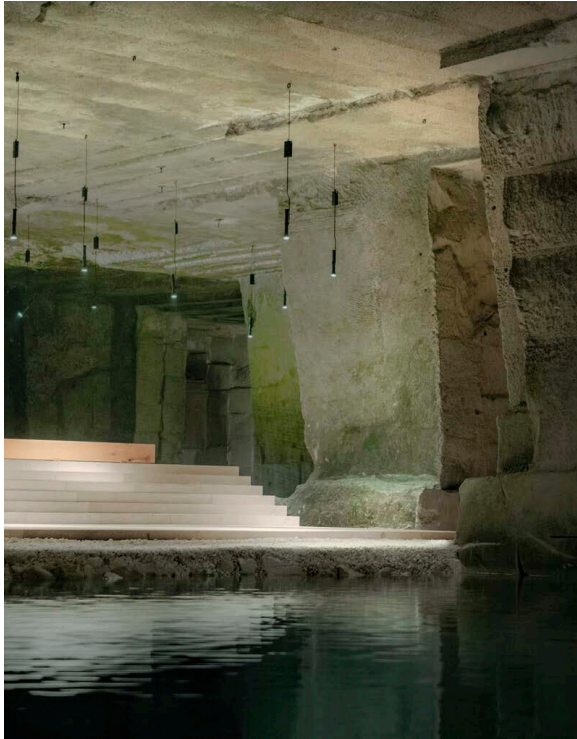
**Figure 486.** Figure x The diagram illustrates the “Room and Pillar” excavation method, where massive irregular piers (black) are left to support the mountain. Chipperfield’s intervention (white geometry) nests within these existing voids, turning the industrial grid into a structured performance landscape. Source: David Chipperfield Architects



**Figure 485.** Figure x The project is an example of “Subtractive Architecture” that is almost invisible from the exterior. The entrances are simple cuts into the wooded hillside, reinforcing the concept that the architecture exists entirely within the earth. Source: David Chipperfield Architects



**Figure 484.** Figure x Lacking natural skylights, the project utilizes submerged lighting in the flooded side chambers. This casts dynamic, rippling water reflections onto the rough stone ceiling, visually dematerializing the heavy rock roof. Source: David Chipperfield Architects



**Figure 492.** Figure x The design explicitly references Adolphe Appia's rhythmic stage sets. The new tiered seating is constructed from the same White Vicenza Stone as the cave itself, creating total material continuity between the "natural" container and the "architectural" content. Source: David Chipperfield Architects

The "Cavea" Strategy: The design inserts a series of platforms, steps, and ramps that mimic the tiered seating of ancient Roman theaters (known as cavea). These platforms are not arranged in a traditional proscenium layout but are distributed as abstract "islands" between the massive pillars (David Chipperfield Architects, n.d.).

Theatrical Reference: The design explicitly references the stage sets of Swiss theorist Adolphe Appia, utilizing rhythmic, abstract staircases to create a "landscape" for performance rather than a static building (Uni.xyz, 2025). This transforms the entire cave into a stage, where the movement of people becomes part of the performance.

### 3. Solving the "Darkness" (Lighting Strategy)

Because the Cava Arcari is a deep underground space with no direct access to skylights, the lighting strategy is critical for preventing a claustrophobic atmosphere.

Hydro-Luminescence: The lighting design, developed by Viabizzuno, avoids standard ceiling downlights which would be difficult to install on the rough rock roof. Instead, the primary ambient light



**Figure 493.** Figure x The juxtaposition of the human figure against the raw quarry walls highlights the monumental nature of the excavation. The lighting strategy washes the lower walls to define the perimeter while leaving the upper void in mystery. Source: David Chipperfield Architects

comes from submerged fixtures placed underwater in the flooded side chambers (Viabizzuno, n.d.).

Visual Effect: The light shines upward through the water, casting rippling, dynamic reflections onto the stone ceiling. This “liquid light” dematerializes the heavy rock roof, making the space feel taller and more breathable (Elle Decor, 2023).

Application: This strategy effectively turns the “hazard” of the cave (flooded voids) into its primary light source, a technique applicable to underground spaces where humidity or water presence is high.

#### 4. Solving the “Scale” (Humanizing the Void)

The industrial scale of the quarry presents a challenge for human intimacy.

Occupying the Void: Chipperfield breaks down the immense volume by creating “clusters” of intimacy. The platforms are split into distinct levels, some for seating, some for standing, connected by short flights of stairs (Uni.xyz, 2025).

Result: This terracing creates human-scaled zones within the monumental void, allowing small groups to feel comfortable without walls or partitions. The architecture negotiates between the geological scale of the pillars and the ergonomic scale of the visitor.

#### 5.4.12 CASE STUDY 12 - GANSU GUAZHOU YULIN GROTTOS VISITOR RECEPTION CENTER BY 9-TOWN DESIGN STUDIO FOR URBAN ARCHITECTURE

Context and Preservation Strategy The Yulin Grottoes, a system of Buddhist cave temples carved into steep cliffs and separated by a river canyon, presents a landscape defined by its desolate, ancient character. The introduction of a 4,200 square meter modern facility into this protected heritage zone required a design approach prioritizing “maximum preservation.” The primary architectural challenge was to accommodate significant tourist infrastructure without disrupting the visual silence of the Gobi Desert or competing with the historic cliff carvings (Goood, 2024).

Topographic Extension and Invisibility The design strategy rejects the notion of the building as an autonomous object sitting on the landscape. Instead, the architects treated the structure as an “earthwork,” positioning it at the very edge of the cliff plateau. By sinking the building volume so that its roof aligns with the horizon of the plateau, the architecture effectively disappears from the primary approach. It functions not as an addition to the site, but as a “topographic extension” of the cliff

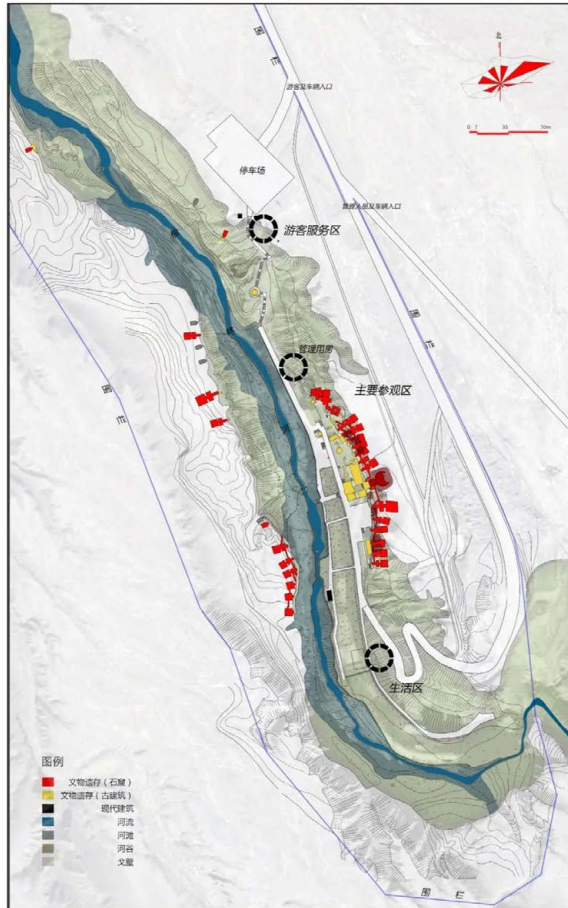


Figure 494. Figure x General Layout Plan. Source: Goood

edge, blurring the distinction between the natural geology and the man-made enclosure (Goood, 2024).

**Materiality and Textural Mimicry** To ensure the building's visual integration with the surrounding desert, the project moves beyond simple color matching

to achieve “textural mimicry.” The exterior walls and roof cladding utilize a composite of “dry-clayed gravel” and raw sandstone, materials directly derived from the local geology. This application replicates the stratification and granular quality of the Gobi terrain. Consequently, the boundary between the constructed wall and the natural rock dissolves, allowing the massive concrete structure to camouflage itself against the harsh desert light (Goood, 2024).

**Hydro-Management as Form** The architectural form is driven by the environmental constraints of the site, specifically the risk of erosion from surface runoff. Rather than blocking the natural flow of water, the building is integrated into the site's hydrological system. The structure is engineered to function as a stabilized flood channel, organizing and discharging rainwater from the plateau away from the fragile grottoes below. This synthesis of form and function turns the architecture into a protective infrastructure that stabilizes the cliff face rather than burdening it (Goood, 2024).

**The Visual Axis** While the exterior attempts invisibility, the interior experience is curated to emphasize the site's history. The building mass is split by a central void—a deliberate “crack” in

the architecture—that creates a powerful visual axis. This framing device aligns the visitor’s view directly toward the historic pagoda located on the opposite hill. By strictly controlling the line of sight, the architecture acts as a lens, redirecting the user’s attention away from the modern facility and focusing it entirely on the cultural heritage of the Yulin Grottoes (Goood, 2024).



Figure 495. Figure x General Layout Plan. Source: Goood



Figure 496. Figure x General Layout Plan. Source: Goood

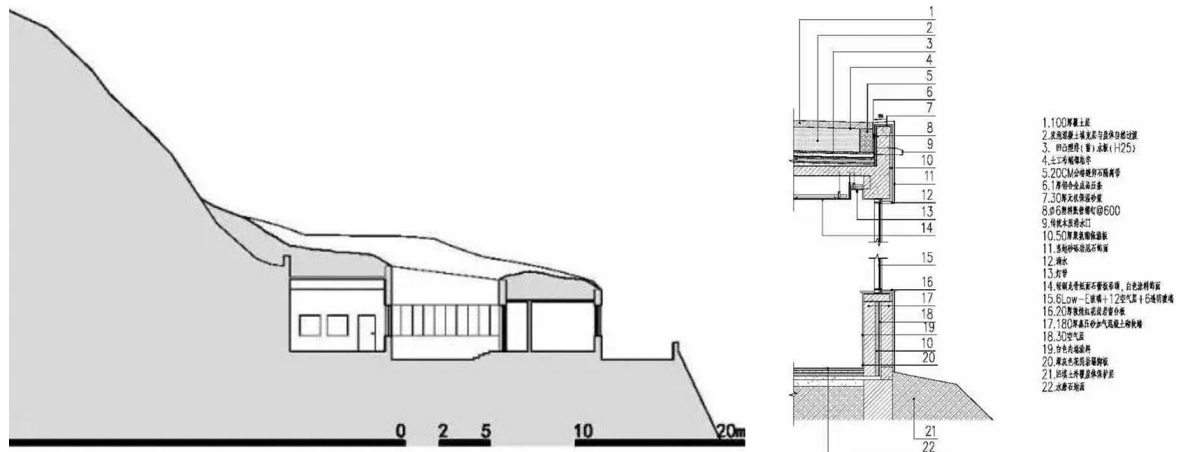


Figure 497. Figure x Section. Source: Goood

