

AQUAMARINE CENTER

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Abstract

This work proposes the development of an aquamarine center at Jeddah, Saudi Arabia. In this work, three case studies related to aquarium were analysed. The case studies analyzed included the New England Aquarium, the Vancouver Aquarium Marine Science Center and the Marine Research Center, Bali. Based on the analysed case studies, the estimated gross floor area for the proposed aquamarine center was 20000 m². The proposed aquamarine center is comprised of few zone such as entrance, administration, research and animal care center, aquarium exhibition, library and restaurant. Furthermore, three site were proposed for the development of the aquamarine center. Site evaluation was done to select the most suitable site for development. Based on the site evaluation analysis, site 2 was selected as it achieved the highest evaluation score of 67 compared to site 1 with a score of 50 and site 3 with a score of 49. Site 2 is located in Obhur AlShamliyah on the seafront. The development of this aquamarine center will benefit the Jeddah society as it will increase exposure and awareness of marine life and conservation of the environment. In addition, this aquamarine center will be a focal point of Jeddah's attraction and will contribute to Jeddah's overall economic status.

Keywords--aquarium, leisure, relaxing, tourism, architecture, design, Saudi Arabia

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INTRODUCTION

Contemporary aquariums strive to make a significant contribution to the sustainability and exploration of ecosystems [1]. Aquariums have enormous educational and community engagement capability because huge numbers of people visit the aquarium centers around the world every year [2]. The main aquarists realized were Sumerians who kept fish in fake lakes about 4500 years earlier. Individuals would often make their own lakes, containing fish and supplying it with crisp seawater [3]. The main fish to be brought inside in the Roman Empire was the ocean hand weight, which was held under visitor beds in small tanks made of marble. Presentation of glass sheets around the year 50 enabled Romans to replace one mass of marble tanks, improving their perspective on the fish [3]. Dr. Nathaniel Bagshaw Ward used his tanks for tropical creatures in 1841, but only with sea-going plants and toy fish [4]. Anne Thynne kept stony corals and ocean growth for about three years in 1846 and was credited as the maker of London's primary adjusted marine aquarium [5]. The primary large open aquarium opened in the London Zoo in 1853 and became known as the Fish House. Philip Henry Gosse was the primary individual to use the word "aquarium" [6].

Aquariums are now being created in large sizes to display various marine life varieties. Many of the modern aquariums and marine centers are built underwater to enable guests and researchers to have a closer encounter with different marine life in their natural habitat [7]. Educational aquamarine centres have been around the globe for a long time. Some have a primary educational purpose while others keep it as a centre of leisure and relaxation [8,9].

In this area, however, the Kingdom of Saudi Arabia (KSA) seems to be lagging behind. This lag makes people spend their time on unproductive activities. Jeddah and its vast community need such centers for people to develop a stirring society. This society is interactive with each other and, most importantly, their environment. The Red Sea has played a huge role in this city's formation. It is the means of Jeddah's initial economy. It therefore has a great attachment to the people. This area has the potential to stimulate the waterfront activities available to society while being educated about the diverse ecology they may not encounter in

their daily lives. Thus, this work presents the proposal on developing an aquamarine center at Jeddah, Saudi Arabia.

CASE STUDIES

In this work, three case studies were analyzed for the development of the new consulate. The case studies chosen are:

- New England Aquarium
- Vancouver Aquarium Marine Science Center
- Marine Research Center

New England Aquarium

New England Aquarium is located at Boston, Massachusetts, USA (Figure 1). It was designed at Cambridge Seven Associates by architect Peter Chermayeff. The area of this aquarium is 7000 m². The New England Aquarium is a world leader in ocean exploration and marine conservation. The Aquarium is one of Boston's top visitor attractions, with over 1.3 million tourists a year, and a significant resource for public education. The Aquarium redefines what it means to be an aquarium: integrating education, entertainment and action to tackle the ocean's most complex problems. The New England Aquarium has several zones such as lobby, Imax theatre, café, main exhibition, marine mammal center and terrace, and west wing. The lobby area serves as a reception area for individual or group visitors. It connects with the Main Exhibition. It has an information area, first aid room, coat room, male & female toilets and lockers. Level one of the West Wing contains a temporary or changing exhibit. It can be modified to hold events as part of the outside piazza. While on level 2 it includes the exhibition of seal and jelly as well as touch pools. The gift shop is located at level 1 of the café area. While on level 2, the café offers an extravagant view of the harbor area and the sea. The Main Exhibition is centered on the Giant Ocean Tank carrying the aquarium's most dramatic animals, swimming in 100,000 gallons of water. A ramp around the tank takes visitors up to three levels. With a final bridge overlooking the Giant Ocean Tank. The Marine Mammal Center is an amphitheater that shows the most playful mammals, sea lions and seals. Visitors can watch them play and learn about their flexibility, strength, intelligence and athletics. IMAX Theater is an audio-visual theater for conducting presentations, conferences and underwater 3D movies.



Figure 1. New England Aquarium

Vancouver Aquarium Marine Science Center

Vancouver Aquarium Marine Science Center is located at Vancouver, British Columbia, Canada (Figure 2). It was designed by architect MCM Partnership. The Vancouver Aquarium is not only a major tourist attraction for Vancouver, it is also a center for marine research, conservation and rehabilitation of marine animals. The Vancouver Aquarium was one of the first facilities to incorporate professional naturalists into the galleries to interpret animal behaviors. The Vancouver Aquarium has several zones such as entrance and admission, café, gift shop, exhibition area, research area and service area. The main entrance is a new addition to the existing building. A ticket booth allows visitors to be admitted. Once in the building, the entrance lobby leads to various types of exhibitions. The café has both an exterior and an interior sitting area. The sitting area outside, surrounded by greenery, is called the plaza café. The gift shop carries various aquatic theme items. The shop can be accessed directly from the outside as well as from inside the building. The exhibition area holds animal exhibits from Canada's various waters. This includes the Pacific, Arctic, Wild Coast, Amazon and Tropical Zone. Each one containing its unique animal species. Outdoor and underwater gallery add to the visitor's experience. The research area includes many labs and offices as well as a research pool where researchers can observe animal behavior closely. It also includes a multi-purpose auditorium to conduct presentations and meetings. This auditorium is also visitor accessible for a 4D experience of the wildlife creatures. The service area provides amenities to enhance user experience allowing them to spend more time in the aquarium. Such as rental lockers, ATM machines, on-loan wheelchairs and strollers, and parking for strollers. The park has a 14-mile shoreline, providing easy access to seawater, and it is easily accessible due to its location in an attractive location.



Figure 2. Vancouver Aquarium Marine Science Center

Marine Research Center

Marine Research Center is located at Bali Indonesia (Figure 3). It was designed by architect AVP. The aquarium has an area of 3000 m². The Marine Research Center has several zones such as

research area, viewing area, auditorium and library, and private area. The research area includes research laboratories as well as a pool of seawater to closely observe animal and water behaviour. The Viewing Area is an underwater corridor where researchers can have a direct view of the seawater. The auditorium extends over two floors. The library with a second floor overlooking the library's first floor is above the auditorium. The private area consists of research rooms, bar, terrace, gaming rooms and TV rooms. The building challenge was to maintain the island's tradition and geographical characteristics within the design. The Research Center also monitors seawater and it was placed in an ideal place inside the water as it compliments the island's own scenic beauty.



Figure 3. Marine Research Center

PROGRAM ASSUMPTION AND SPACE DETAILS

For the proposed aquamarine center, the estimated site gross floor area is 20000 m². Table 1 shows the division of the estimated area. The aquamarine center will have several zones such as entrance, administration, research and animal care center, aquarium exhibition, library and restaurant.

Table 1. Space details

Zone	Percentage (%)	Gross Area (m ²)	Net Area (m ²)	No. of Floors	Floorprint
Entrance	5	1000	741	1	741
Administration	10	2000	1482	2	741
Research and animal care center	25	5000	3704	2	1852
Aquarium	40	8000	5926	3	1975
Library	10	2000	1482	1	1482
Restaurant	10	2000	1482	1	1482
Total	100	20000	14817	-	-

PROPOSED SITE

Proposed site: Site 1

For Site 1 (Figure 4), This site is on Corniche Road. It is to be developed into an aquarium as part of the new Corniche plan. It is surrounded by parks on both sides, restaurants and hotels across the main street. This site has an estimated area of 30000 m².

Proposed site: Site 2

For Site 2 (Figure 5), it is located on the sea front in Obhur AlShamliah, this site is about 16 km from King Abdul Aziz University's Faculty of Marine Sciences. The use of the

surrounding land has considerable recreational importance. Adjacent to the site is Dive Village with a diving school for divers of all ages. This site has an area of 28000 m².

Proposed site: Site 3

For Site 3 (Figure 6), this site is located about 6 km from the city center (Al-Balad). The surrounding land use is abundant in government buildings, while King Fahad Costal City is a recreational club adjacent to the site. This site has an area of 26000 m².



FIGURE 4. Site 1



Figure 5. Site 2



Figure 6. Site 3

SITE EVALUATION AND ANALYSIS

For this work, 3 development sites were proposed. Thus, site evaluation was carried out on all 3 sites, to selected the most appropriate site for development. The site evaluation was done based on few criteria's such as accessibility, land use, landmark, parking capacity, view, future development, and service roads. For the site evaluation, weighting factors (WF) were used on all the criterias, where 1 = not very important, 2 = slightly more important, and 3 = important. Table 2 exhibits the results of site evaluation for site 1, site 2 and site 3. Based on Table 2, site 2 has exhibited the highest score of 67, compared to site 1 which attained score of 50 and site 2 showed score of 49. Hence, site 2 was selected as the proposed development site. The site has a good climate where it observes the pattern of sun movement and the prevailing wind direction will help to locate open and closed areas, entrances, and determine the shade and shadows needed. Furthermore, external access to the site is from the main Obhur Road. It intersects with the road of King Abdul Aziz. The site's main orientation towards the sea is therefore serving as the site's main view. There are no major landmarks on the site, but there is a fish monument seen across the water facing the sea. The site's existing topography is relatively flat with gradual slope. This gradual slope will help to descend naturally to the marina. The proposed zoning of the site is shown in Figure 7.

Table 2. Site evaluation

Site selection criteria	Site 1	Site 2	Site 3
Accessibility (WF=3)	5	5	5
Land use (WF=3)	4	5	3
Landmark (WF=1)	3	3	3
Parking capacity (WF=2)	2	4	4
View (WF=2)	3	4	2
Future (WF=2)	4	5	2
Service Roads (WF=2)	1	4	3
Total	50	67	49



- Aquarium
- Parking
- Second Road
- Research Center
- Marina
- Main Road
- Administration
- Common Areas

Figure 7. Site zoning

PROJECT DESIGN

The aquamarine center project is based on three attraction, conservation and education principles. It therefore, works on three levels-displaying the collection, educating the public, and researching the science. The entire complex aims to leave its users with a compelling experience with its aquarium, fishing marina, gift shops and other services. This combination of education and entertainment can lead to meaningful interaction between society. Figure 8 to Figure 10 shows the proposed design of the aquamarine center. The building was design to incorporate the following features of maximizing user-exhibition space

interaction, provision of hands-on experience and animal encounters, include multiple audiences and cultural interpretation, involving visitors in the action of science and conservation, use of technology such touch screens and digital information display, 360° view of fish tanks and low energy usage. The aquamarine center has several zone, such as administration, aquarium, research and animal care center, library, restaurant, café, outdoor area and parking spaces. Furthermore, the aquarium zone will have several exhibition area such as cold water gallery, tropical gallery, local fish gallery, fresh water gallery, edge of the sea gallery, coral reefs, salt water gallery, and inner touch pool.



Figure 8. Overall view of the proposed aquamarine center



Figure 9. Top view of the proposed aquamarine center

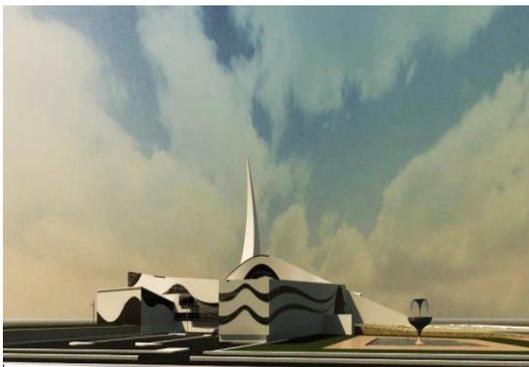


Figure 10. Side view of the proposed aquamarine center

development of this aquamarine center will ensure aquatic education and awareness research and development to conserve the nature and marine life. Furthermore, this aquamarine center will raise public awareness of the Red Sea and its inhabitants with special exhibits, public events and research, and will serve as a major attraction point in Jeddah, Saudi Arabia.

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CONCLUSION

This study has proposed the development of an aquamarine center at Jeddah, Saudi Arabia. The aquamarine center requires an estimated gross floor area of 20000 m². The aquamarine center zoning consists of entrance, administration, research and animal care center, aquarium exhibition, library and restaurant. The