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## Form and Function in The Pearl-Qatar Artificial Island Development

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### Abstract

The Pearl is an artificial island development in Doha, Qatar. Artificial island means land reclamation or landfill, creating new land from lakebeds, riverbeds, oceans, and seas. Doha grew rapidly over the last half-century due to urbanization and globalization. Most research focuses on (sub)urban expansion to the north, west, and south from its coastal origins on Doha Bay. However, urban growth also occurred eastward through land reclamation projects from the Arabian Gulf for Al Corniche, the West Bay business district, Hamad International Airport, large parts of Lusail City, and The Pearl-Qatar. We present a morphological study of urban form and function in The Pearl-Qatar. It includes well-established representations such as figure-ground analysis, pedestrian sheds, ground-level land uses, and active/inactive frontages mapping. We argue there is a clear formal and spatial logic in the planning, intimately tied to The Pearl-Qatar's socio-economic status as an exclusive residential area of Doha.

**Keywords:** Development; Land Use; Morphology; Reclamation; Urban.

### 1. Introduction

Qatar is a peninsular nation located in the Persian/Arabian Gulf with a total land area of 11,571 km<sup>2</sup> characterized by hot, humid summers and mild winters. Like other gulf cities, the country encountered rapid urbanization due to the rise of the oil and gas exporting industry leading to a shift in lifestyle and economy in the late 20<sup>th</sup> and early 21<sup>st</sup> centuries (Wiedmann, 2012). The country transformed from patches of fishing villages along the coastline in the 18<sup>th</sup> century to an oil-producing country after the 1950s, focused on the capital city of Doha (Scholz, 1999). The economic growth has evoked in parallel the increase in population and urban development in Doha, which increased nearly five times from 1970 to 1997. According to the latest census, the current population is over 2.8 million people. Two factors drove this increase in population. First, growth in life expectancy due to the enhanced healthcare system, so births exceeded the number of deaths. Secondly, many migrants moved to Qatar, either as long-term residents or short-term construction workers assigned for specific projects. Today, Qataris represent only 10% of that population. (Planning and Statistics Authority, 2022). The high percentage of expatriates and migrants (90%) influenced the planning strategies of the city to cater to varying cultures and diverse backgrounds. Since the beginning of the oil-production era, Qatar's development framework shifted from focusing on the local context and the surrounding region to the global context. City planning began to purposefully implement elements to attract people to live and work in Qatar. This planning approach also helped position Qatar within the spectrum of the global economy.

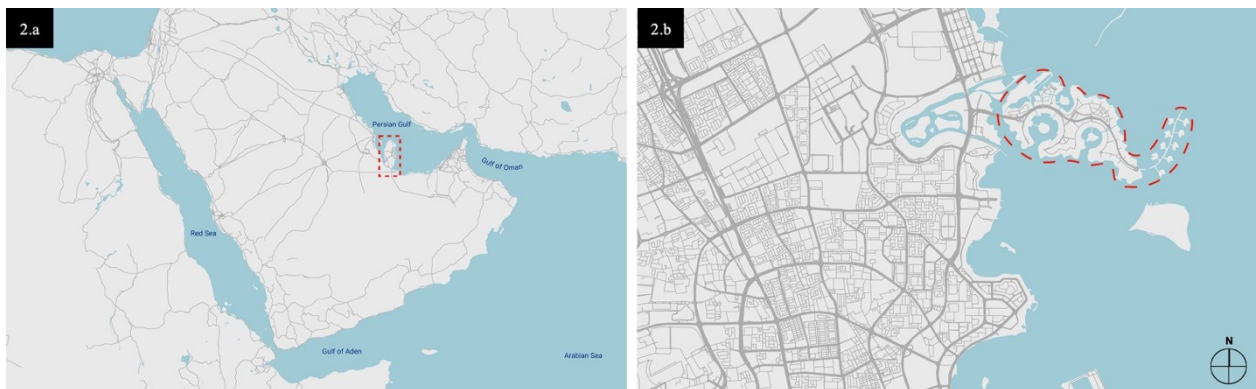
Initially, the approach to urbanization was slow and subtle, without a well-harmonized process. During the 1970s, British consultant Llewelyn Davis introduced the first masterplan and zoning maps of Doha. It established the ring road structure of Doha, where every ring road would define a specific type of zoning. This planning framework consequently laid the groundwork for the suburban sprawl of Doha (Wiedmann et al., 2012). The compounded effect of increased population and the continuous growth of the oil industry evoked an exponential rate of urban expansion from around 130 hectares in 1970 to more than 7,100 hectares by 1995 (Al-Buainain, 1999). Rapid urban growth between the 1970s and the 1990s included constructing mid- and high-rise buildings, road infrastructures, residential districts, and land reclamation along the coastline to develop new districts such as the West Bay business district. The early 21<sup>st</sup> century witnessed a thriving real estate sector, where Gross Domestic Product (GDP) growth averaged 24.6% between 2003 and 2006, tripling in only four years (Euromoney Institutional Investor, 2008). During this period, various investment opportunities arose intending to reduce the country's long-term dependence on oil and gas exportation, such as health care, housing, and education. These new industries shaped and facilitated continuous urban growth. Urban expansion in Doha occurred in all directions from its historical origins, focusing on high rise towers, iconic buildings and museums, highway structures, industrial cities, new districts such as Lusail City, and reclaiming more land along the coastline to develop new projects such as the Hamad International Airport, Hamad International Port to the extreme south, and The Pearl-Qatar island to the north

Doha is going through another development phase to host the FIFA World Cup 2022. This event aims to assert Qatar's image and economic status to the world after another chapter of urban intensive expansion and development. It includes the design and construction of eight new stadiums. It also includes supporting amenities to welcome visitors to the event,

such as accommodation facilities (hotels, apartment towers, and temporary structures), transportation infrastructure (highways and the metro), and urban design elements like pedestrian overpass bridges and cycling/pedestrian paths. According to an edition of the Lonely Planet (2008) guidebook, Doha was one of the dullest places on Earth (Alraouf, 2018; 62). In reaction to this perception, the country realized the value of promoting a brand image to gain a share of international consumers, businesses, and tourists, which relates the economic value of the city of Doha to its image in the world. As a result, the country sought to replace this negative impression by purposefully investing significant revenue from the oil-gas industry into the city's infrastructural expansion and developing new districts through private-public partnerships (Wiedmann, 2012). A 'plain' urbanscape arose from globalization, construction standardization, and rapid urbanization (Aziz Amen & Nia, 2017). Qatar consequently relied heavily on commissioning iconic, impressive architecture – competing skyscrapers in West Bay populated with 'star' architects' buildings – to rebrand its capital city. Another component was the construction of new areas for work and recreation catering to the global market (Adam, 2009). On a larger scale, the city also expanded its periphery eastward into the shallow coast to accommodate new districts with distinctive features to stand out compared to the rest of the city. One of the most notable is The Pearl-Qatar (Figure 1), an artificial island located 350 meters offshore in northeast Doha (Figure 2). The island consists of fourteen districts on 4 million square meters (m<sup>2</sup>) of reclaimed land in a medium-density residential zone mixed with retail/commercial land uses (The Pearl-Qatar, 2021).



**Figure 1:** a) aerial rendering of The Pearl-Qatar (Source: CallisonRTKL); Views of b) Viva Bahriya; c, d, e) Porto Arabia; f) Medina Centrale (Source: Authors).



**Figure 2:** a) Qatar location within the Gulf region and, b) The Pearl location within Qatar (Source: Google Maps/Edited by Authors).

The private real estate company, United Development Company (UDC), is the Pearl-Qatar master developer and management entity. UDC announced The Pearl-Qatar development in 2004 with an initial project cost of US \$2.5 billion and a construction build-out date of 2012, later revised to 2018. However, the project is still under construction today in 2022, with a projected final construction cost of US \$15 billion. The total land area of The Pearl-Qatar is about 4.0 km<sup>2</sup> (400 hectares or 4 million square meters and 988 acres). There are an estimated 27,000 residents in 2018, so it operates at about 60% capacity today. At construction build-out, it will have a capacity of 18,831 dwellings for 45,000 residents. It will possess a population density of 11,250 people per square kilometer (km<sup>2</sup>), like Lyon, France, in Europe and Washington, DC, in the USA. It will be 47 du/hectare or 20 du/acre in terms of housing density, which is the standard zoning definition of Medium Density Residential. The Pearl-Qatar utilizes residential pods involving zoned separation

between residential land and building types. These include apartment high-rises, above-shop apartments, and single-family residential villas. Because The Pearl-Qatar is an island, it possesses 32 kilometers of coastline.

Callison Architecture is the conceptual designer and master planner of The Pearl-Qatar. An objective of their design was to ensure this artificial island stood out in both Qatar and the Gulf Region to attract international visitors and investors. In parallel, the government changed land regulations to allow non-Qataris property ownership rights in the project (The Peninsula, 2020). Although the project seeks to address an international audience, the name serves as a symbolic link to the area's historical features as a pearling site in the Pre-Oil era, and parts of the island layout itself resemble a string of pearls (Rizzo, 2019). Middle- and higher-class communities are the market target of The Pearl-Qatar. According to CEO Ibrahim Alothman, an exclusive luxury experience is a design aim of The Pearl-Qatar, priced for a particular class of buyers, residents, and tenants (The Peninsula, 2021). The approach influenced the site location within Metropolitan Doha and the design and planning of the island itself.

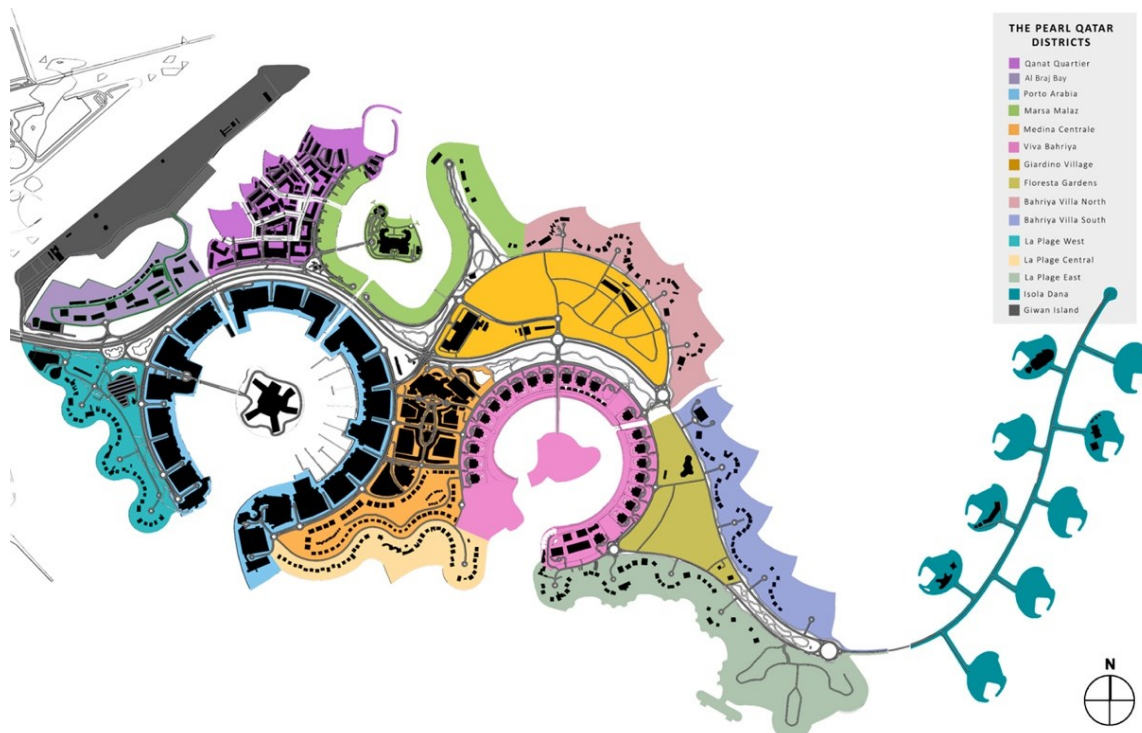


Figure 3: Map of The Pearl showing the districts (Source: Authors).

The Pearl officially includes 12 districts. However, it is effectively 15 districts organized around the only access road running the island's length from the mainland, i.e., Pearl Boulevard (Figure 3). Each of the fourteen districts has a distinctive architectural style. Marketed as "the Riviera of the Middle East" – a reference to the French Riviera towns of Côte d'Azur and Saint-Tropez - the architecture of The Pearl is more characteristic of Arabic and Italian culture. The most important in terms of land use mixture and public use (residents and visitors) are Porto Arabia (in blue) and Qanat Quartier (in purple) on either side of Pearl Boulevard on the west side of the island, and Medina Centrale or the town center in the central part of the island south of Pearl Boulevard. Al Braj Bay, to the west of Qanat Quartier, has a mixture of high-rise hotels and apartment buildings with some townhomes lining the coastline and a canal. Viva Bahriya (in pink) is to the immediate east of Medina Centrale. Giordano Village (in dark orange) will form another neighborhood center to the north of Pearl Boulevard/Medina Centrale when complete. It is under construction now during the later phases of development. There is a hotel island (Qiwan Island in grey) to the northwest of Qanat Quartier, which began construction in 2020. The other districts primarily consist of single-family residential uses (villas) of varying lot sizes, including Marsa Malaz (with the luxury Kempinski Hotel Island at its center to the east of Qanat Quartier) and the Floresta Gardens and various La Plage districts.

The largest, nearest district to the mainland is Porto Arabia. It has the most direct connection to the rest of the city of Doha. On the other hand, the district furthest from the mainland is Isola Dana ('rare pearl island') at the northeastern edge of the island, with nine villa islands reserved for the Al-Thani royal family. Hence, it is the most exclusive, inaccessible (due to security) residential area at The Pearl. Eleven of the 14 districts possess a direct connection to the waterfront, and the remaining three serve as internal transitional areas between each promenade. The town center, Medina Centrale (highlighted in orange in Figure 3), is at the island's center with the largest land area in two dimensions. It connects

significant parts of the island, serving as a critical locational connection and buffer between those parts to collect, contain, and distribute users. Once completed, there will be 4,700 apartments in 31 towers in Porto Arabia (+/-151 apartments in each tower), accounting for 25% of all housing in The Pearl-Qatar. There are 28 towers in Viva Bahriya with 1,780 apartments, accounting for 9.5% of all housing in The Pearl-Qatar. Porto Arabia and Viva Bahriya account for 35% of the housing in The Pearl-Qatar. There are another 538 above-shop residential units and 500 low-rise residential villas in Medina Centrale (1,038 in total). Medina Centrale, Porto Arabia, and Viva Bahriya account for 40% of all housing in The Pearl-Qatar. There will be 977 residential apartments in 31 buildings (32 per building) and 188 townhouses in the Qanat Quartier, 1,165 in total. The Qanat Quartier accounts for 6% of the housing in The Pearl. There is 322,000 m<sup>2</sup> of retail space in the Qanat Quartier. There are low-density residential, high-rise hotels, and community facilities in the other districts. The overall layout and individual districts carefully mediate between the public and private realms in each district, which we discuss in subsequent sections in more detail.

This paper aims to present the results of analysis of the urban morphology and functional characteristics of The Pearl-Qatar. We will identify its design and planning strategies as a contemporary urban development more clearly and how various socio-economic factors came into play to influence its spatial and functional logic in pursuit of residential exclusivity in Doha.

## 2. Methodology and Materials

The morphological study of the physical form and function of The Pearl in this paper utilizes highly accurate graphical mapping representations based on specific parameters such as ground-level land uses, pedestrian sheds, and active/inactive frontages. The authors compiled the data based on on-site surveys in Spring 2021. The purpose is to develop accurate data visualizations about design and planning in the layout of The Pearl, which we translate into quantitative numerical data in various manners. The purpose is to reach objective results about how these physical and functional parameters might relate to the socio-economic factors influencing the urban morphology of The Pearl.

Besides this data collection, we searched the literature as a resource for information about the historical process of urbanization in Qatar and its contextual influence leading to the creation and urban development of The Pearl. Due to its contemporary nature and a lack of significant studies about The Pearl to date, some literature review focuses on reporting in popular media outlets such as *The Peninsula* and Gulf Times newspapers. Based on satellite images and maps from Google Earth and Google Maps, we created detailed plans of the development to facilitate the data visualization presented in this research. These detailed plans were the basis for on-site surveys of physical and functional characteristics. We also review the historical emergence of The Pearl Island development from the Persian/Arabian Gulf coastline and its subsequent phasing. We also use extensive photographic documentation to verify on-site data collection regarding ground-level land uses and active/inactive frontages for each built structure on the island. We define an active frontage as any building façade utilizing windows and doors, enabling access or visual interaction between public spaces and the interior of buildings, including retail outlets and residential lobbies. Anything that operates as an effective blank wall with no or minimal opportunities for interactions at street level is an inactive frontage. The data visualization is the primary basis for our data analysis of form and function in The Pearl.

The first part of the analysis focuses on form, i.e., urban morphology of the physical attributes and layout of the built environment regardless of the functionality or zoning. We use the figure-ground representation to analyze block sizes, the street network, and building patterns in the spatial layout. The second part investigates function based on the pattern of ground-level land uses and active/inactive frontages on the island. This part also addresses the vertical dimension of the development by reviewing a building height survey of the island. The last part reviews quantitative information about socio-economic factors and how they might relate to the spatial logic and physical attributes of The Pearl. We achieve this by layering this analysis with the morphological and functional results in a qualitative manner.

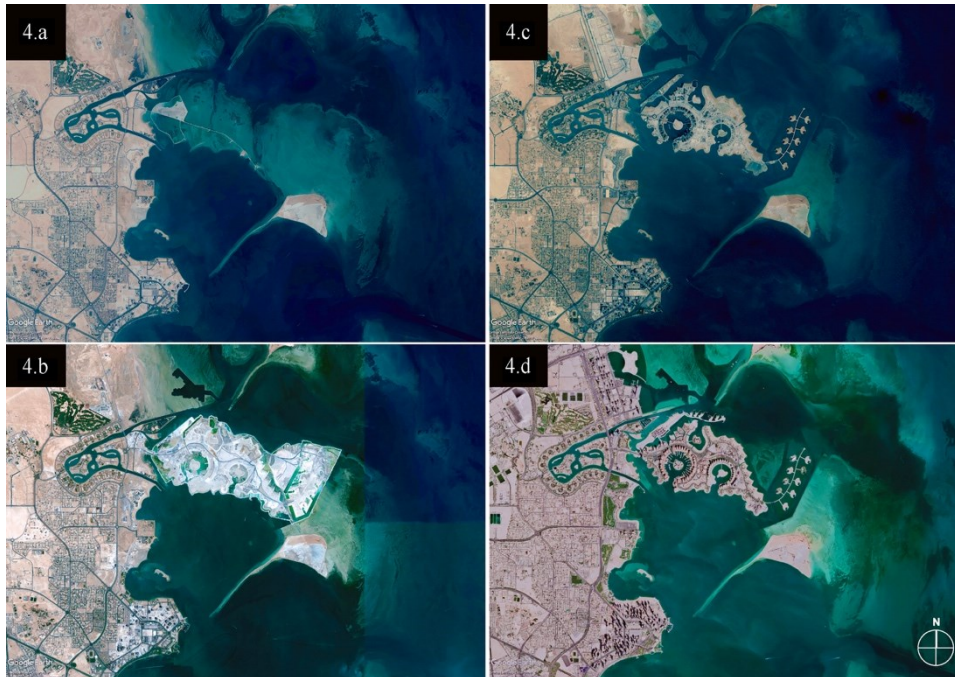
## 3. Data Analysis and Results

Land reclamation is one of the most popular development tools in the Gulf region for promoting a particular brand image of a city. According to de Lange (2014), urban projects with a land reclamation proposal in the Persian/Arab Gulf are highly economically and socially feasible despite rising global concerns about the environmental impacts and high risks of endangering marine life due to such projects. The land reclamation process is an affordable and economically efficient option for new urban development due to technological advances tied to the availability of the necessary financial assets. It is one of the reasons that such attractive opportunities exist for international investors in Qatar and the Gulf Region. Many vital locations in Doha along the Arabian/Persian Gulf coast were land reclamation projects, including Al Corniche, West Bay, the site of the Qatar National Museum, Hamad International Airport, and large parts of Lusail City.

The location for The Pearl development in northeast Doha was a shallow part of the Persian/Arab Gulf, which was a pearling location in the Pre-Oil Era (Adham, 2009). The reclamation process began in 2004, extending 350m eastward from the existing coastline (Figure 4). By 2006, the infill of the entire area was complete, and new lands emerged above the water levels, but without outlining the final edges of the masterplan. The next stage involved an excavation process



in defining the promenades of the island and creating the ‘string of pearls’ resemblance of the overall layout, including the single roadway connection (Pearl Boulevard) to the mainland, which was complete by 2007-2008. Consequently, construction of residential towers and retailers began in addition to more private elements such as waterfront villas.

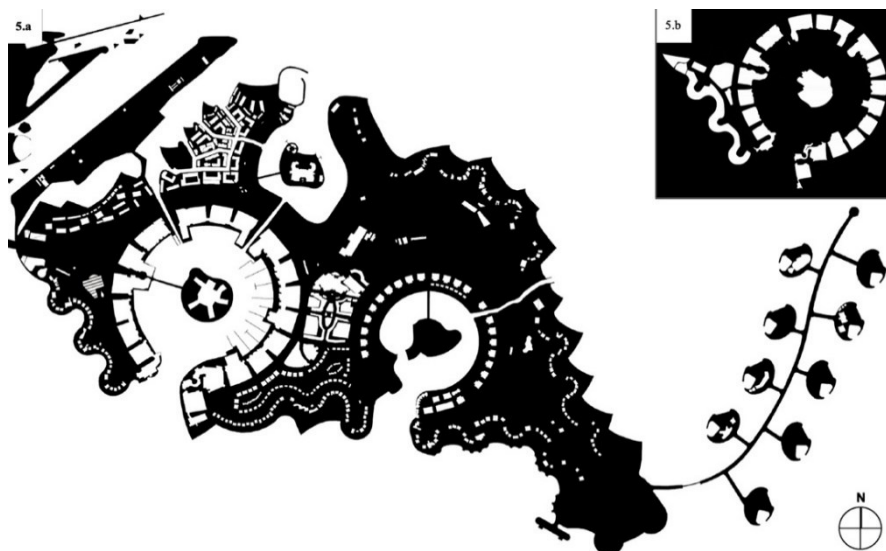


**Figure 4:** Satellite images of land reclamation process in The Pearl over time in a) 2004, b) 2006, c)2008, and d)2022 (Source: Google Earth).

Based on the satellite images, the Porto Arabia and Qanat Quartier districts were primarily complete by 2013. These two districts incorporate some of the most intensive mixed-use residential and commercial land-use patterns in the entire development. Porto Arabia and Qanat Quartier accommodated the inflow of the first users and residents of the island development. Since then, the remaining districts have been under construction. The promenade section of Porto Arabia opened in 2013. However, the construction of a new resort hotel on the central island of the Porto Arabia marina only began in 2019. The most recent satellite image (2022) demonstrates that much of the island has either completed or begun development and building construction. There are also a few vacant lands with construction timelines in later phases, including the last piece of land in Qanat Quartier and individual, privately-owned lots in the low-density residential districts.

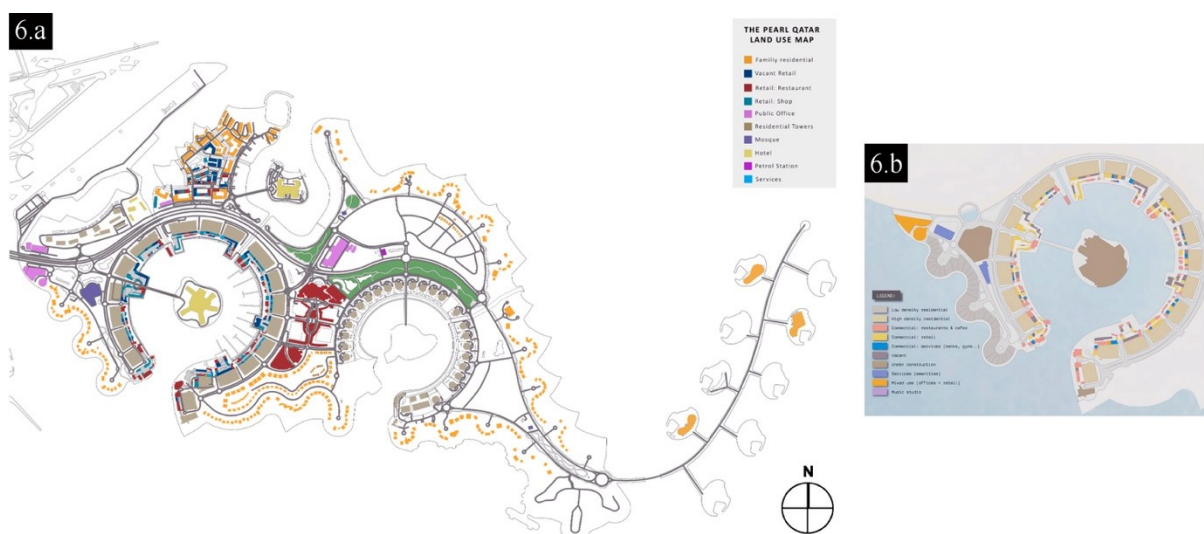
The contiguous area associated with Pearl Boulevard and frontage roads is about 0.5 km<sup>2</sup>. The primary role of Pearl Boulevard is to collect and distribute vehicular movement to the various districts on the island. Each of these districts possesses a similar metric size. Qanat Quartier is about 0.3 km<sup>2</sup>. Medina Centrale is about 0.2 km<sup>2</sup>. It is about 0.5 km<sup>2</sup> if we include the La Plage Villas Centrale area to the south. The area devoted to free-standing villas is 2 ½ times larger than Medina Centrale itself. The contiguous land area associated with Medina Centrale/La Plage Villa Centrale, west Porto Arabia, and east Viva Bahriya is about 1 km<sup>2</sup>. The metric area associated with Porto Arabia, including the marina, is about 1.1 km<sup>2</sup>. However, 40% of this area (0.46 km<sup>2</sup>) is water, and 60% is land. Central island equals 80,000 m<sup>2</sup>. It is 69% larger than the area of Viva Bahriya. The area associated with Viva Bahriya is smaller at about 0.65 km<sup>2</sup>. However, 35% of this area (0.23 km<sup>2</sup>) is water, and 65% is land. Its central island equals 60,000 m<sup>2</sup>. La Plage Villas West is 0.18 km<sup>2</sup>. The Al Abraj Bay to the immediate north is the same size (0.17 km<sup>2</sup>). Kempinski Island to the east of Qanat Quarter is 50,000 m<sup>2</sup>. The metric area of Bahri Villas North and Giardino Village to the island's east is 0.92 km<sup>2</sup>. The metric area of Florestra Gardens, La Plage Villas East/La Plage to the east of Viva Bahriya is 1 km<sup>2</sup>.

The Pearl is a contemporary zone in Doha, which does not contain any historical elements other than the historical importance of the location itself as a pearling site. The development progress went according to the phasing in the masterplan, unlike other parts of Doha. The city grew in a semi-organic manner over time where certain historical areas influenced the subsequent formation of the larger urban area, especially Msheireb and Souq Waqif. The latter underwent a restoration project in 2004-2008 to preserve and highlighted the city's historical identity (Ferwati, 2019; Tannous, 2020; Major & Tannous, 2020). Primarily, this meant that road infrastructure adapted to these older areas to maintain the historic importance of Old Doha.



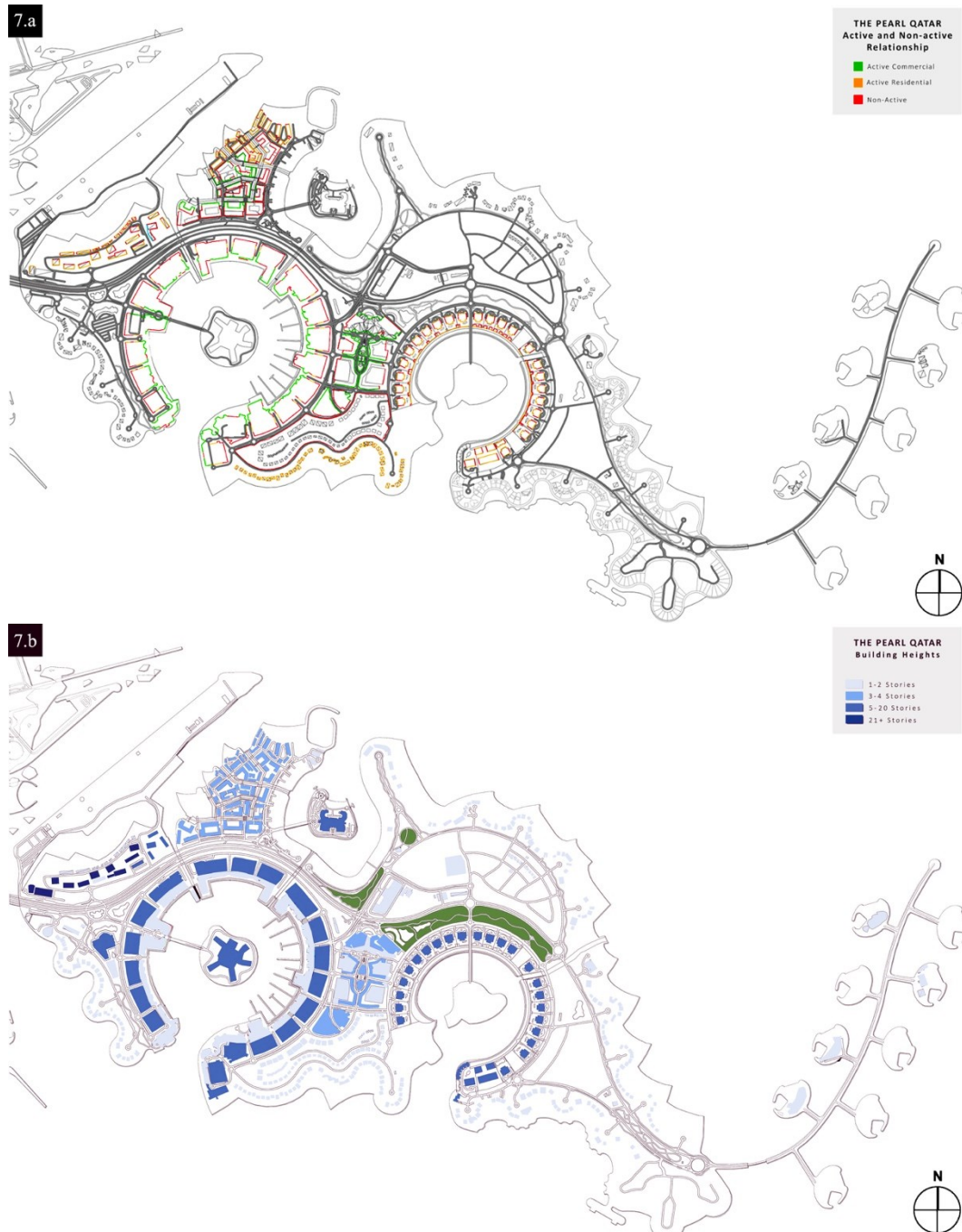
**Figure 5:** Figure-ground representation with space in black and built forms in white with the outline of the coastline for a) The Pearl and b) close-up view of the Porto Arabia district in 2021 (Source: Authors).

The planners created a new urban layout resulting in a highly formal and organized geometric composition for the Pearl. It utilizes both its 'string of pearls' concept and radial geometry to maximize the number of properties and buildings with waterfront views (Figure 5). Most free-standing buildings and urban blocks are rectangular in shape. Most articulate minor additions or subtractions from the rectangular shape as needed to form the constructed building footprint. For example, many towers in Porto Arabia extend outward towards the promenade to provide more space for retail land uses. By comparison, urban blocks in Medina Centrale utilize chamfered corners to locate retail entrances at the street corner to increase the chances of attracting passing customers. Some districts have continuous, elongated blocks due to compound walls for low-density single-family residences and villas, such as the Le Page districts. In this sense, these residences and villas orient to the waterfront with continuous fencing on the street side. The villas on the east side of the island have a more extensive beachfront than the villas' sizes, unlike those on the west side. Those on the west side have shorter shorelines and a higher floor-area ratio. The scale of urban blocks gradually decreases from the west to the east. Urban blocks in Porto Arabia are the largest. There are three ranges of block sizes between 11,000 m<sup>2</sup> and 20,000 m<sup>2</sup>. A few of these blocks include commercial activities at the ground level and extend outward to between 21,000 m<sup>2</sup> and 30,000 m<sup>2</sup>. The largest is 52,000 m<sup>2</sup>, i.e., is the hotel nearing completion at the center of the Porto Arabia marina. On the west side of Porto Arabia is a sizable mosque under construction. The western streets and this large block will operate as an additional barrier between the private villas to the west and the more public areas of Porto Arabia.



**Figure 6:** a) Ground-level land use map of The Pearl and b) close-up view of Porto Arabia ground-level land use map (Source: Authors).

The figure-ground representation of The Pearl also demonstrates the significant allocation of land for Pearl Boulevard and its associated frontage roads. It has the effect of making most districts extremely walkable on their own. However, the degree of space between each one – especially north-south due to Pearl Boulevard and frontage roads – makes walkability from district to district more problematic. It makes The Pearl very car dependent as a whole. From one degree to another, each district intentionally isolates itself from its neighboring district. Even when districts are relatively close, sidewalk provision (or the lack thereof) separates them from one another, for example, between Qanat Quartier and Al Abraj Bay. The inward-oriented nature of districts with commercial/retail land uses such as Porto Arabia, Medina Centrale, and Qanat Quartier to ensure residential privacy reinforces this district separation.



**Figure 7:** a) Active and non-active frontages and b) building heights at The Pearl (Source: Authors).

The dominant land use at The Pearl is residential, which varies in density from one district to another (Figure 6). High-density residential towers line the coastal promenades such as Viva Bahriya and Porto Arabia due to their waterfront views. These towers' ground-level and several stories (4-5 stories) contain parking garages. There are low-density residential units along many external edges of the island (in yellow in Figure 6). The remaining land uses include



commercial and retail spaces, a petrol station, hotels, restaurants, cafes, a grand mosque (under construction), and a smaller mosque on Pearl Boulevard at the eastern part of the island. There is a sizable portion of land still vacant or under construction on the island.

Porto Arabia relies heavily on a mix of internal (pedestrian) and external (vehicular) traffic to function since it is the largest district most approximate to the entry road (Pearl Boulevard). A close examination of ground-level land uses in Porto Arabia, especially along the promenade, reveals that public land uses comprise more functions than private spaces (53.4% of all activities) (refer to insert of Figure 6).

Of these, 26.9% consist of retail stores, 19.7% are cafes and restaurants, and 6.8% contain commercial services such as gyms, beauty salons, and banks. Although a large portion of the Porto Arabia area operates, 18.4% of its commercial/retail spaces remain vacant. Most vacancies occur at the southern edges of the promenade, which is further away from the entry points to the area and Medina Centrale itself. Cafes and restaurants almost exclusively occupy any urban block extensions towards the promenade, which pedestrians heavily use in most evenings and pleasant weather during the daytime. These cafes and restaurants further activate the promenade with outdoor seating using terraces or tables directly onto the promenade itself.

The active and inactive frontages pattern reflects the inward orientation of individual districts in The Pearl, especially in Porto Arabia, Viva Bahriya, Qanat Quartier, and Medina Centrale (Figure 7). Blank walls tend to orient outward to the edges of individual districts and frontage roads. It is an approach that provides an additional layer of privacy and exclusivity tailored to each district. It even occurs in the town center of Medina Centrale, where most active frontages project inward toward the central part of the area. Facades along with streets defining the edge of the district and its neighbors (Porto Arabia to the west and Viva Bahriya to the east) mainly consist of blank walls except for access points to parking garages. In some ways, it is uninviting when someone is 'outside' of the district.

The active/inactive strategy in Medina Centrale emphasizes compactness in the absence of any waterfront orientation. Each district tailors its attractions to a specific type of user, specifically altered to their needs. For example, Viva Bahriya is an exclusive residential zone catering to families in high-rise towers where the privacy is the main priority. All entrances to the Viva Bahriya towers are elevated well above typical street level with tower amenities facing inward toward the beach but completely out of view for any promenade users. The residential towers in Viva Bahriya also group closely together to create an additional visual barrier from the rest of The Pearl to its promenade. Pedestrian access to the Viva Bahriya promenade is extremely uninviting (through a narrow alleyway with high, blank walls) and restricted to residents-only during daytime hours. Security guards ensure only authorized persons access the Viva Bahriya promenade during the day. After dusk, anyone is free to visit that promenade and private beach. The pattern persists in Viva Bahriya, where street-level facades are entirely blank (except for landscaping) due to the elevated platform entry points to the towers. These entry points are far less accessible and invisible from the street level except for the entry road itself. The inward orientation of Viva Bahriya consists of cleverly positioned balconies and terraces of residential townhouses to overlook the promenade with active residential facades. It is a feature that contributes to a feeling on safety on the less-used Viva Bahriya promenade.

In contrast to Viva Bahriya, the Porto Arabia promenade is open 24 hours a day to anyone who might care to visit. A diverse mixture of residents and visitors always use this promenade, especially in the evening and pleasant weather months (December-April). Each tower in Porto Arabia contains commercial land uses at ground level with residential units on other floors in the twenty-story, high-rise buildings. Access points to the Porto Arabia promenade are wider, some allowing vehicle drop-offs. There are multi-story parking levels specifically available for the public. The lobby entrances to the Porto Arabia residential towers are also at street level, unlike the elevated access to the towers at Viva Bahriya. Of course, the Porto Arabia promenade is also significantly closer to the main road and 'gates' directly accessing the island, i.e., Pearl Boulevard. Viva Bahriya is comparatively deeper (in terms of metric distance) and most isolated on the other side of Medina Centrale. The overall effect is a more welcoming environment for visitors on the Porto Arabia promenade. Indeed, Tannous et al. (2020 & 2021) concluded that the Porto Arabia promenade was significantly oversized for its degree of accessibility in their study about green/blue spaces (parks and promenades) within Metropolitan Doha. They argue this by design because Porto Arabia with its array of commercial, retail, and restaurant/café land uses serves as the most significant attractor of The Pearl to draw visitors from further afar in north Doha (Tannous et al., 2020 & 2021).

The inactive frontage strategy in Porto Arabia is also clear, where all rear sides of the residential towns have blank walls on the first four or five stories for the parking garages. Nonetheless, at least one side of each residential tower is an active frontage where there are entrance lobbies to the residential building. There is usually a ground-level exit for the opposite tower's parking garage opposite the tower's drop-off area and lobby. Of course, all restaurants and cafes have active frontages on the promenade side, whereas there is more variation for retail stores, depending on their type of sold product. For example, some shops have adaptive frontages whereby curtains close during the day due to the harsh climate but open during the evening. It is especially true of furniture stores, which require some protection from sun exposure during the day.



The Porto Arabia and Viva Bahriya districts prioritize pedestrians only along their main organizing principles: promenades and internalized water bodies; a marina for Porto Arabia and a beach for Viva Bahriya (refer to Figure 1b and 1d). The circular layout focuses these residential districts inward to promote water views for many residential units. Peak activity occurs along the promenades with the outer part of the circular layout on the other side of the buildings characterized by vehicular access to the towers in both districts. In the residential villa districts of The Pearl, they are technically active residential due to the presence of front doors. However, their actual active frontages situate on the waterfront segment of the faces. The street side is primarily used for parking only.

Medina Centrale consists of medium-rise buildings (maximum of five stories) with a commercial retail/residential mix (housing units above shops) to generate a lively on-street experience for people living and visiting the town center (refer to Figure 7b). The tallest buildings in Medina Centrale are for residential uses, not commercial ones. The layout of Medina Centrale enables different transport modes including pedestrians and vehicles. However, the paving and elevated crosswalks significantly slows down vehicular traffic at the very center of the town center (refer to Figure 1f).

#### 4. Discussion

The Pearl came to the market as an opportunity to attract foreigners to invest and live in Qatar, thereby seeking to facilitate Doha's economic diversification. The architectural styles in the project's districts were a mixture of Mediterranean, European, and Arabic cultures designed to help achieve this attraction (Ferwati, 2019). The contrasting yet cohesive blend of styles created a strong visual impact that stood out from the rest of Doha. Promotion of The Pearl as an exclusive residential area of Doha was always prevalent, which means only a specific class of users could afford to live on this island. It is a socio-economic status directly influencing the design and planning of the island, sculpting every aspect of its physical form to fit this purpose.

The strict, formal segregation between low-density, private residential villas and public space fulfills this goal by separating commercial activities and residential access, even though the linear distance between districts might be less than 500m – a reasonable walking distance in the hot climatic conditions of Qatar – but actual travel distance might be more than three times the linear distance (1,700m) using the vehicle. Buffering zones between districts usually constitute four-lane roads with a central median and a generous green belt. Another element serving exclusivity and privacy in the project is the pattern of active and inactive frontages. When moving throughout The Pearl, all residential towers have blank frontages on the street side and the active ones on the waterfront side. It helps to ensure the separation of non-residents from low-density residential areas. Like most waterfront properties, villas will sea views in The Pearl possess a higher cost per m<sup>2</sup> than those with only land views and much higher prices than high- and mid-rise apartments. Most waterfront villas concentrate on the east and northeast portions of the island, furthest away from high-rise and mid-rise buildings with higher densities to maintain an additional degree of exclusivity. Another parameter intensifying this gap further is building heights. All high-rise towers are side-by-side to create a solid facade and block any visual connection from 'outside' into the promenades.

However, these socio-economic factors influencing the layout in the masterplan of The Pearl tend to fade at street level. It is especially true of those with active frontages like Medina Centrale, Porto Arabia, and the Qanat Quartier, all of which possess commercial and retail land uses relying on and catering to external and internal traffic flows, residents and non-residents alike. These districts contain everyday activities such as cafes and restaurants, which attract a variety of user groups, more often during the weekends than on weekdays and continuously during the evenings except in the harshest summer months. The master developer could implement a few actions to achieve even more street life and liveliness in The Pearl, including:

- Incrementally shift to more mixed-use districts instead of strictly separating the private residential and public, commercial realms. It would require more commercial activities in some districts to enhance the user experience of both residents and non-residents. Medina Centrale has several opportunities to implement more active frontages along its edges with the careful remodeling of parking garages at ground level to incorporate small retail units.
- Implement more medium density, mid-rise buildings that fit the human scale to improve social presence and potential street interactions. Newly constructed districts might not contain residential towers with 20+ floors preventing visual connectivity and increasing isolation between distinct parts of the district.
- Lastly, reducing car dominance to create more pedestrian-friendly streets would strengthen the connection between districts, especially by adding more pedestrians-only zones and, perhaps, implementing a local tram network to service to and between different districts of The Pearl. It would increase access through the island and have the added benefit of reducing traffic congestion on Pearl Boulevard itself.

The human-scale design of public spaces incorporating mixed uses and moderating vehicular traffic will help to create more lively spaces. Diverse cultures would interact, and people from different social backgrounds would co-exist in the urban areas of The Pearl (Muneerudeen et al., 2016). These recommendations could also significantly contribute to the economic value of the island's properties, where studies show that streets with people influence the wayfinding process of others, where they choose to move towards crowds, and after that, people themselves operate as the attractors and generators of public life (Peponis, 1990; Dalton, 2011).

## 5. Conclusion

Until the 1960s, Qatar consisted of traditional settlements responding to users' social and practical needs, which included protection from the harsh climatic conditions and the socio-cultural necessity of privacy. Many of the original cultural intent in urban form needs persist today as the design of the new neighborhoods increasingly relied on modern solutions conveniences since the late 1970s (Alraouf, 2018). After discovering oil in the late 1950s, Qatar witnessed major transformational activities that completely changed the urbanscape from dense low-rise settlements and fishing villages into a modern city with sizeable real estate mega-projects and extensive road infrastructures. Subsequently, decision-makers adopted a strategic plan for the city to elevate Qatar into the global economy by establishing a brand image for Doha designed to appeal to foreign investors and new residents (Salama and Wiedmann, 2013). The process began with intensive construction projects throughout the city, including a new airport, an expansive highway and ring-road system, the Doha Metro rail network, and more investment in architecturally iconic buildings and museums. Additionally, land reclamation extended the seashore in projects such as West Bay, Lusail City, and The Pearl.

The Pearl-Qatar is one of the most recognizable elements of the rebranding of Qatar as an international hub of business, tourism, and culture. It was one of the first areas offering foreigners freehold ownership of property in Qatar (The Peninsula, 2020). UDC advertised The Pearl as an exclusive luxury residential district in Doha catering to the population's middle- and upper-class segments, especially Qatari, Arab, and Western professionals. Its target audience of these constituencies is a crucial element in shaping the form and function of the individual districts and the whole of The Pearl. The island's designers and planners created a well-defined degree of separation between each district's public and private realms through the planned layout. It included several methods like implementing vast roads that are not pedestrian-friendly, separated by impenetrable vegetation. Another type of barrier occurs between districts in constructing some out-of-scale buildings in The Pearl-Qatar.

Moreover, almost all active frontages and functions face inward away from the main roads. In residential-only areas such as Viva Bahriya, access to the residential towers is above the ground level, with tightly situated residential towers forming a visual barrier in further accentuating exclusivity. It occurs throughout The Pearl to achieve high privacy and exclusivity for its residents. However, social barriers fade on the street level, especially in mixed-use, semi-public districts like Porto Arabia and Medina Centrale. Using The Pearl-Qatar as its principal case study, this study shed some light on city branding and the resulting consequences of this process (such as building entirely new neighborhoods by land reclamation). It also focused on the links between physical and intangible attributes found in a built environment, adding to our knowledge of Doha's most well-known, recent contemporary development.

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## Conflict of Interests

The authors declare no conflict of interest.

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