# EXPOSITION OF ASPIRATION:

# SHIPBUILDING JOURNEY THROUGH DESIGN

## Patiya, Chittagong

By

Tasnima Zahan

12108010

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**Abstract**

Shipping industry is the driving force behind communication and trade from the earliest of time and presently shipbuilding industry is becoming the largest foreign exchange earning sector for maritime countries worldwide. As a result, this sector is another motivating force for socio-economic uplift in Bangladesh resulting into job opportunities for workers who are unemployed despite having the skills and knowledge to carry out the work. Unfortunately, worker safety, health and environmental factors in Bangladesh are currently challenged, creating a need to resolve them through design and awareness amongst people. In addition to this, people are unaware of the incredible journey of the birth of a ship and the hardship and aspirations that the workers go through in the process of building ships. Hence, the aim of this project is to exhibit the shipbuilding process for the people to observe and acquire knowledge, which highlights the importance of spaces for workers relaxation, without compromising the compliance and regulations of an industry.

Keywords: Shipbuilding, Shipyard, Bangladesh

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**List of Abbreviations:**

IMO International Maritime Organization

UN United Nation

ILO International Labor Organization

ETO Engineer-to-order

OECD The Organization of Economic Co-operation and Development

LCA Lifetime Cost Assessment

OSHA Occupational Safety and Health Act

CDA Chittagong Development Administration

# Chapter 1: Introduction

## 1.1 Background of the project

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## 1.1 Background of the project

Shipbuilding is an ancient assembling industry that produces tailored products and has the largest human input per unit of manufacture and a specialized facility called a shipyard. On the other hand, shipyards also provide for the facilities needed for ship breaking for the process of recycling and reusing the body parts of the ships. However, the occurrence of ship breaking usually takes place in developing countries, in unhealthy and dangerous conditions. Shipyards consist of a complex and well-organized system that involves high quality management from raw material, to storage, fabrication and compilation. (Bari, 2010) Thus, shipbuilding is a positive way of developing countries to develop. Shipyards facilitates the industrial functions as well as in-house department for the naval architects and engineers, that involves the requirement of spaces for inspiration where they can think, express and exhibit their design to client which is essential in the exchange of crucial ideas and formation of construction drawings required for the process of shipbuilding.

On the other hand, this shipbuilding process is a part of the Blue Economy concept that conceptualizes oceans as development spaces to integrate conservation, sustainable energy production, mineral wealth extraction and marine transport. Presently, South Asia is in the process of realizing the importance of Blue Economy that involves the systematic utilization of ocean resource management to bring economic viability and sustainability, shifting the pressure on the Green Economy that these countries majorly depend on. (Manikarachchim, 2014). Hence, major shipbuilding countries that are utilizing this concept are Korea, China, Japan, Vietnam and Bangladesh. Currently, the dominion of shipbuilding globally is dominated by South Korea which is considered the

largest shipbuilding nation because of its strong work ethic of labor force, efficient process of work flow, shipyard design and competent shipbuilders. (Ahmed, 2010) Therefore, shipbuilding industries in Bangladesh plays an important role in providing the standard that can compete with the global market to bring economic sustainability for the country to alleviate poverty and create job opportunities.

However, Bangladesh is notoriously well-known for the poor country where ships are sent for breakage, exposing extremely hazardous substances to the workers and the environment endangering marine life. This ship-breaking phenomenon takes place due to the availability of abundance of cheap labor that this developing country can provide and are unfairly used to do work that would have been expensive in other developed countries. (Lipman, 2002) It is a dangerous work that these workers risk their lives for in order to meet their daily needs where no monitoring takes place. Hence, shipbuilding stands as a contrast to the process of shipbuilding because there are policies regarding shipbuilding that ensures worker safety and takes into account environmental impacts. These policies are strictly followed to maintain business and reputation globally. As a result, hard-working workers, with skills, living in Bangladesh can work in better jobs that shipbuilding industries can provide and shift the trading business from ship breaking industries. This brings forth the need for a well-designed shipyard that ensures an efficient work flow to increase productivity which in turn provides for profitability, worker safety and welfare and reduction of the negative environmental impact.

## 1.2 Project Brief

- Project Title: Exposition Of Aspiration: Shipbuilding Journey Through Design

- Project Client: Western Marine Shipyard, Approved by the Government of the People's Republic of Bangladesh.

- Project Site: The location of the site is at Kolagao, No.4, Kolagaon Union, Patiya, Chittagong. The site is located outside the city, beside the Karnafuli river on the northern side of Shikalbaha power plant.

-Site area: 23 acres

## 1.3 Project introduction

Western Marine Shipyard is a leading shipbuilding industry that turning into a global brand for shipbuilding in Bangladesh. With the increase in profit and demand of building ships, the company aspires for a New Western Marine shipyard that can take the challenges of building large vessels. Furthermore, the aim for a better working environment for the workers and the ability to reduce the harmful effects on the environment is a crucial issue in shipbuilding industry that the company wants to address.

## 1.4 Aims and Objectives of the project

The most important aspect of building the shipyard is addressing the worker safety and comfortable working environment. Furthermore, an industry's success depends on the profit it makes and hence designing a better solution to the work process through design can enable profits to take place. Another important aspect is to

increase curiosity and knowledge amongst the people to know more about the incredible journey that shipbuilding requires.

**1.5 Given Programs:**

1. Admin block

2. Design house (for naval architects)

3. I.T section

4. Engineer's office block

5. Training facilities

6. Conference office block

7. Cafeteria for workers and admin

8. Showroom and display centre

Shipyard work:

9. CNC Shop

10. Mechanical Shop

11. Blasting Shop

12. Slipway

13. Fabrication Shed

14. Fabrication yard

15. Storage for raw material

16. Storage for lifting and welding equipment

17. Ships accommodation design

18. Power unit and security

# Chapter 2: Literature Review

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## 2.1 Conceptual Framework

The conceptual framework for this paper is based on establishing the importance of shipyards globally by highlighting the shipbuilding history and process. Public awareness of the life of workers and process of shipbuilding is also an important factor that can draw attention to the hard work put into shipbuilding. Furthermore, shipbuilding in the context of Bangladesh provides for an understanding of the scope of design implementation in the betterment of shipbuilding industry to bring about economic growth for Bangladesh.

## 2.2 History of shipbuilding and shipyards

Although ships were the main mode of transportation between countries before airplanes were discovered, World war II (1946-1956) witnessed the technological advancement of shipbuilding. World War ii was a crucial time in history where many scientific invention and technological advancements took place. Colton suggests that for the war in Europe, merchant ships were used to carry forces and equipment from Atlantic to Britain. Moreover, the United States and Japan also used sea-routes for transportation. Later on, Germany contradicted the allied shipping by building warships for battling in the Atlantic. As a defense the allies in Europe replaced their merchant ships to build war ships. (Colton, 2002) Hence, shipbuilding and ship design became an important part of maritime industry over the years. Gradually the focus from European countries has shifted to the Eastern part of the world.

Mickeviciene's documentation states that wood was replaced by steel in the spurt of development that took place and the shipbuilding leadership exchanged hands from the western part of the world to the eastern. The leadership went for the Great Britain to Japan, the to South Korea and finally to China. Table 1 shows the duration of leadership, country, stage of business cycle and causes to briefly understand historical changes of shipbuilding industry. (Mickeviciene, 2011)

| **Duration Of the leadership** | **Country** | **Stage of Business cycles** | **Causes to brief** |
|---|---|---|---|
| 1860s-1950s | Great Britain | Lost Leadership | Failure to modernize shipbuilding industry |
| Mid 1950s-mid1990s | Japan | Post-maturity, weakening of competitive power | Ageing and high cost human resources. Reduced by shipyards R&D budget to less than 1%. The gap between the demand and supply for steel, increased prices of steel. |
| From mid 1990s | South Korea | Post-growth, maintenance of competitive power | High cost human resources. The gap between steel demand and domestic supply increased steel prices. The appreciation of Korean Won has worsened the competitiveness of Korean shipbuilding. |
| Since 2010, earlier than it was planned | China | Acceleration of growth | The lowest labor cost. Ambitious State programs for the development, growing shipyards capacity, governmental subsidies. |

Table 1 (Source:Rima Mickeviciene (2011). Global Shipbuilding Competition: Trends and Challenges for Europe, The Economic Geography of Globalization)

On the other hand, Bangladesh with 22,155km long coast line along Bay of Bengal and more than 200 rivers, was once the centre of building ocean going vessels in Asia between 15th and 17th centuries. In the research by Zakaria, Rahaman and Hossain, it is mentioned that Chittagong port in Bangladesh played a significant role in building ocean going vessels in the middle of 15th and 17th century when the fleet ships of Sultan of Turkey was built here. In addition to that, in 1805, British Navy built ships in Chittagong for the famous battle of Trafalgar. ( Zakaria, Rahaman, and Hossain, 2010) This suggests the historical importance of shipbuilding in Bangladesh that eventually faded away over time. Although, Bangladesh has a rich history and heritage as a shipbuilding nation since ancient time, it has gained importance only from recent years. This positive rise in industrial success was brought by a few local entrepreneurs who brought name and fame to Bangladesh as a country with soaring potentials in shipbuilding and handing over ocean-going vessels to overseas buyers. According to Ethirajan, since the beginning of 2008, shipyards in Bangladesh have exported small and medium-sized ships for the highly competitive European Market that involved countries such as Denmark, Germany and Finland. Ferries, cargo vessels and ocean-going multi-purpose ships were exported that are worth more than $500 million. (Ethirajan, 2012) This shows the significance of shipbuilding industry and the emergence of a glorious future in shipbuilding. Other than the historical significance, there are other important aspects of shipbuilding and shipyards that is discussed in the next sections.

## 2.3 Importance of Shipbuilding

Shipbuilding is considered a community world-wide, that consists of technologically advanced ships, a good communication system, specialized labor force and enhanced world trade. Hence, shipyards play an important role in this community and the economic factors and job opportunities are the major reasons that emphasizes on the role of shipyards. Furthermore, since communication is vital in business, it is an imperative factor in shipbuilding industry that establishes trading relationships and adds to the goodwill in the market for Bangladesh.

### 2.3.1 Economic Factor

Shipyards play an important role in the economic factor associated with the national and global markets. In the shipping practice, the knowledge of the operating and capital costs of vessels in the maritime country is essential.(Roberts, 1947)

According to Taylor, the world economic trends and social factors have an influence on the world trade affected by the presence of shipyards and shipping. As a result, an investment on modernization of existing shipyards take place in Western Europe while in Japan they increase the number of shipyards to be built as this contribute to the economic market globally. (Taylor, 1980)  To compare this notion, Stopford suggests that, presently, the sea trade is 7 times bigger than in 1950. This is due to the increase in seaborne trade at 5% per annum between 2000 to 2008. Furthermore, it is forecasted that with the increase in world population and materialization of new economies, the sea trade will reach 23 billion in 2060 (Stopford,2010).Thus, to accomplish this target, better

ships are required to increase economic viability. This establishes the need for well-designed shipyards to attract clients and earn goodwill in the global markets.

With this continuation of the current trend, shipbuilding will become the largest foreign exchange earning sector in Bangladesh, increasing the country's GDP by at least 3% by 2020. (Khaled, 2013) Since 2005, Bangladesh has been building and exporting ships to owners from Denmark, Mozambique, Germany, Netherlands and New Zealand. Germanischer Lloyd has declared in September 2008, Bangladesh as a shipbuilding nation of international standards because of the rising high-tech competency of the industry. (Bari, 2010) Establishing a shipbuilding industry creates positive impact on the financial status of the country and also it creates job opportunities for people resulting better livelihood. Hence, Bangladesh is a nation which is capable of being one of the major shipbuilding nation in globe. This nation is also capable of competing against other shipbuilding nations.

### 2.3.2 International trading relationships

Trading relationships have brought together more nations, people and cultures because community, diplomats, politicians and representatives meet to establish a deal. As a result, the countries needs and limitations are taken into account that adds to the development of the entire nation.(Carlsnaes, Risse, and Simmons, 2013) Hossain agrees to this concept and adding the fact that trade can promote development if it is environmentally sustainable and respects human and labor rights. (Hossain, 2013) Therefore, a well-designed shipyard that addresses worker safety and environmental

hazards is valued by potential clients globally to establish an international trading relationship.

On the other hand, in Bangladesh, presently, shipbreaking industries have managed to establish international trading relationships but at the cost of environmental hazard and worker safety. (Islam and Hossain, 2006)In 2000 a report was prepared by Ronning that provided an account for ship breaking with terrible working environment and lack of working security, poor wages and negative impact on the environment. Even though internationally trading took place, it was a breach of human rights measure and established a very negative impression of Bangladesh. (Ronning, 2000) However, with the increase in shipbuilding industries, the need for worker safety and reduction of environmental hazard became an important factor to maintain a good reputation to attract foreign clients. Thus, a better shipyard that follows efficient workflow and rules and regulation is an asset in the process of ascertaining business and commerce for the benefit of the country.

## 2.4 The process of shipbuilding

Shipbuilding involves complex processes and requires an organized workflow within the shipyard to take place. These processes can be categorized into the following three main processes:

- pre-production
- production
- post-production

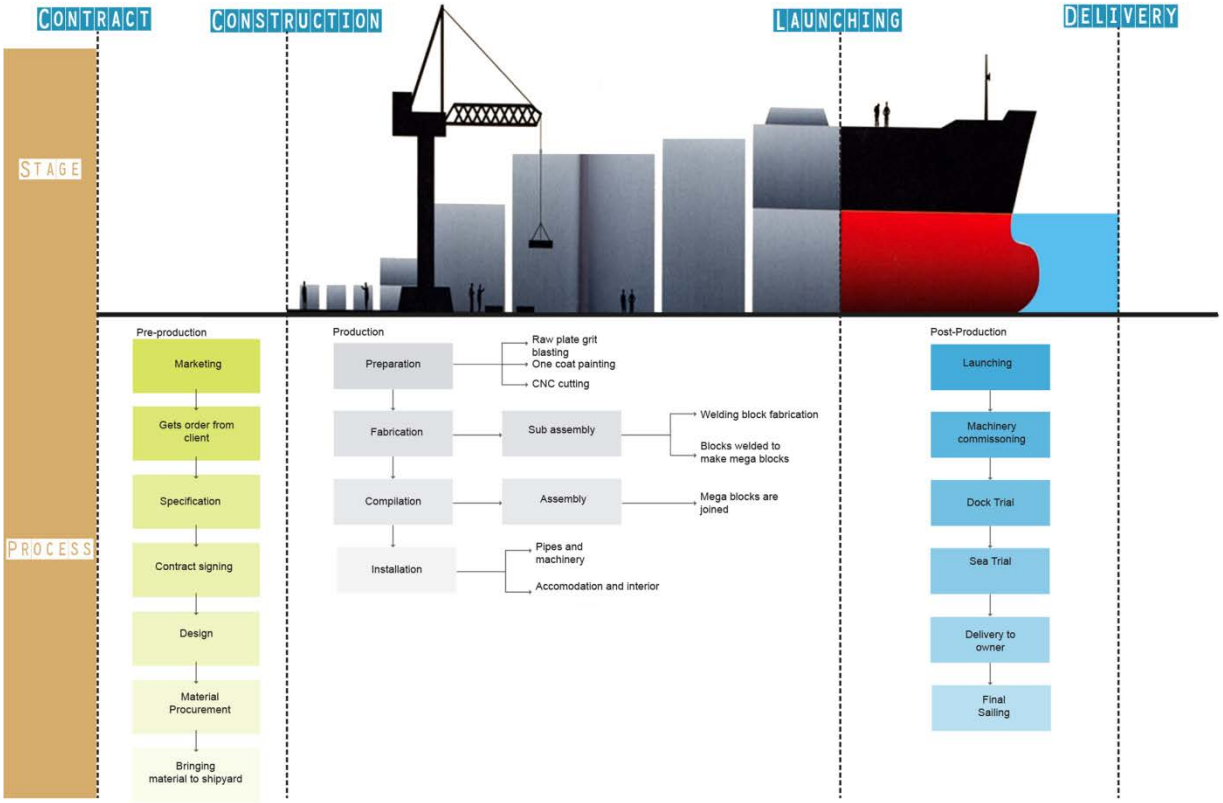


Fig.1 The Shipbuilding Process (Source: Author)

The shipbuilding process includes facilities in the shipyards such as wet and dry docks, marine railways, design yards and slipways that fabricates or dismantles vessels for inland and marine use. The major inputs required in the building of ships are steel plate, energy and labor. Large number of steel plates are stacked before shot blasting to remove oxidized layers and apply primer coat. In addition to that there could be presence of workshops and building docks where large sections of the hulls are assembled. These activities mostly take place in the seaward side of the yard. The remaining area supports functions such as manufacturing and maintenance shops, a galvanizing operation, waste water treatment, paint shop, storage, boiler house, compressors and gas production.

## 2.5 Parameters for shipyard design

### 2.5.1 Typology of shipyards

The typology of shipyards is done by the functions of the ships and types of ownership.

There is a wide variety of shipyards around the world. There are three types of shipyards according to the purpose they serve are:

- shipbuilding shipyards
- repair yards
- dismantling shipyards

On the other hand, according to Haartveit, Semini and Alfnes, shipyards can be classified according to the ship designer and shipyard integration process. Their research suggest thatthese classifications are:

Ownership: This implies that the ship designer and shipyards are part of the same company with the highest level of collaboration. Thus, a vertical integration of the functions can be done through joint ventures.

Partnership: This involves the long-term and contractual agreements between the ship designer and the shipyard owner. Thus, the ship owner will collaborate with the shipyard owner several times.

Market Yard: This implies to the no long-term relationship where the focus is to have a one-project-at-the-time between the ship owner and the shipyard owner. (Haartveit, Semini and Alfnes, 2012)

### 2.5.2 Categorization of shipyard facilities

There are various facilities required in a shipyard and the arrangement of these facilities should be done in a systematic way to handle the complex system of shipbuilding. The facilities of shipyards include:

1. Floating and/dry docks

2. Shipbuilding piers

3. Docks and anchorages

4. Workshops/Laboratories Floating docks are floating vessels that hold the ability to submerse in order to lift the ships out of the water surface.

(Papaioannou,2004)

These three types of shipyards help establish the layout that is required for the design of the shipyard.

### 2.5.3 Location of Shipyards

Shipyards work more efficiently when it covers these three important aspects:

- Connectivity: The equipments of the ship are heavy that needs to be connected by highway, railway connectivity and waterway.
- Sheltered Location: The shipyard should be located in such a place where the water is calm. Hence, many shipyards are placed near the river mouths or creeks so that minimum interference of waves take place unlike the sea. In addition to that, the water depth at these areas should be minimum at low tide.

- Accessibility to the ports: Both the airports and seaports should be located near a shipyard to ensure quick access to container and reduces logistic costs of bringing steel and equipment.

Hence, Zakaria explains the distribution of shipyards and that the shipyards in Bangladesh are mostly privately owned and approximately 70% are located within the proximity of Dhaka and Narayangonj because of the presence of Buriganga, Shitalakkha and Meghna rivers. An estimated 20% of the shipyards are present in Chittagong region, along the banks of the river Karnafuli. About 6% of the shipyards can be located near the Poshur river in Khulna and the remaining 4% can be found in Barishal region. (Zakaria, 2011) These examples of the location of the shipyards suggest that the three factors are the main reasons to ensure efficiency and ease of work.

### 2.5.4 Users of the Shipyards

The users of the shipyard is a network of geographically dispersed users who are always interlinked.(Haartveit, Semini and Alfnes, 2012) Hence, the co-ordination and interrelationship is an important characteristics of shipbuilding. The following diagram represents the users of the shipyard and how they are interrelated

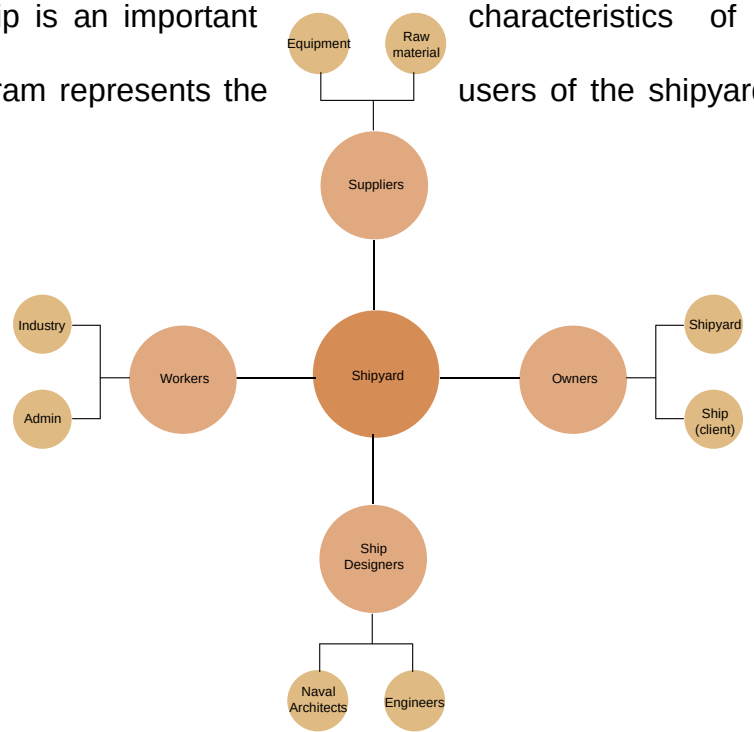

Fig. 2 The users of a Shipyard (Source: Author)

### 2.5.4 Availability of raw materials

Cost is a key factor in this industry as a way to reduce overall cost of the shipbuilding process. Therefore, cheap raw materials drive the input cost and mainly the price of the vessel. (Ahmed, 2014)

Drawing from this notion, Chowdhury reports that, in Bangladesh, the entire steel used as raw material is imported from a different country due to the fact that very few local companies are available to supply the steel required in the ship making process. Whereas in China, being the cheapest steel manufacturer in the world, helps its yards to reduce the costs and lower their shipbuilding prices in the global market. (Chowdhury, 2015)

### 2.5.5 Environmental and climatic changes in shipbuilding industry

Environmental impacts from shipbuilding is mostly incurred in the shipyards due to the activities taking place that involves a complex system.According to the report OECD Council Working Party on Shipbuilding, ships are made to last for a long time (almost 30 years) and as a result of which the process to build it and dismantle it causes a negative impact on the environment if the actions are not carried out under supervision. The report also suggests that the industry causes maximum environmental impacts in areas such as:

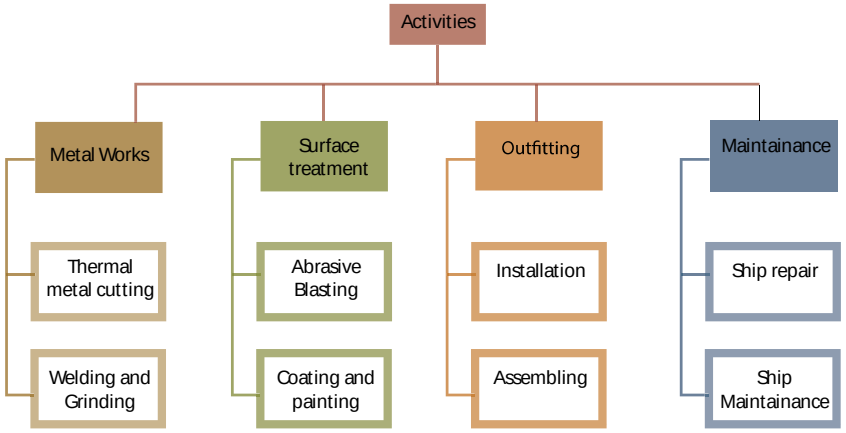


Fig. 3 Activities having negative impact on the environment

These activities generates pollutants that contaminate the air, water and land. Finding out the sources and contaminants can help reduct thenegative environmental impact.Some of the contaminants and causes of pollution are listed in the table below:

| Source | Potential air contaminants |
|---|---|
| Base Material: (e.g. steel, stainless steel, galvanized steel, aluminium, copper-nickel and other copper alloys) | Aluminium, cadmium, chromium, copper, iron, lead, manganese, nickel, and zinc |
| Surface Coatings: (e.g. pre-construction primers, anticorrosive and antifouling paints) | Copper, barium, cadmium, chromium, lead, tributyl tin compounds, zinc |
| Abrasive blasting materials: metallic (e.g. steel grit, steel shot, etc.); slag (e.g. coal slag, copper slag, nickel slag); synthetic (e.g. aluminium oxide, silicon carbide); and natural oxides (e.g. silica sand) | Arsenic, beryllium, amorphous silica, cadmium, chromium, cobalt, crystalline, silica, lead, manganese, nickel, silver, titanium, and vanadium |

Table 2. Sources of potential air contaminants. (Source: (Kurat et. al., 2006 ; OSHA, (2006))

Presently, the government and public attention is focusing on the environmental and climatic change and green growths concerning shipyards. However, according to Hossain and Islam, the awareness regarding the environmental aspect in shipbuilding industry is significantly low. (Hossain and Islam, 2006) As a result, the environmental impacts are not controlled properly which is causing harm to the marine life and workers.

## 2.6 Current trends in Shipyard design

### 2.6.1 Green shipbuilding industry and sustainability

Shipbuilding industry produces harsh chemicals and hazardous material in during the process of welding, painting and blasting. With the large amount of exposure to these contaminants the workers suffer and leave a negative impact on the environment. However, Karim and Rahman suggests that sustainable and green construction of shipbuilding can reduce the disastrous effects that it poses. (Karim and Rahman, 2014)

Green shipbuilding includes "green ship" and "green ship yard" that include the 3 Rs:

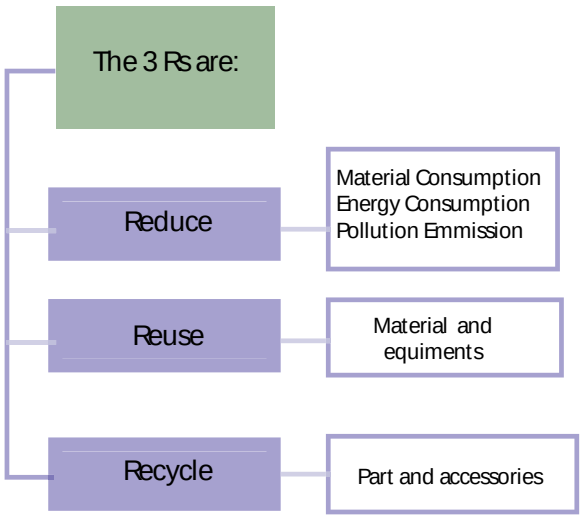


Fig.4 The 3R's of "Green" Ship and Shipyard. (Source: Author) (Information: Karim and Rahman, 2014)

As a result, the environmental impacts have reduced exponentially due to these interventions. Shipyards are accommodating facilities that can reduce the harmful effects. Some of these are:

Waste-water treatment plant:

A huge amount of water is consumed in the process of shipbuilding. As a result, trace and a huge amount of contaminants are exposed to marine life and people. Thus, water treatment is an import issue that is currently being implemented in the industries. The treatment process includes:

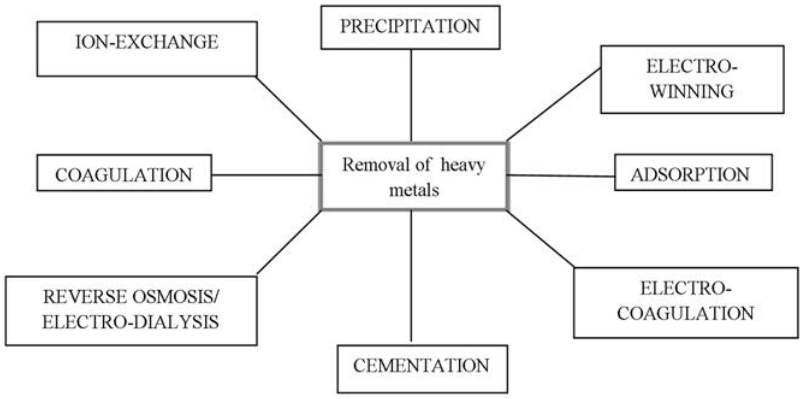


Fig. 5 Removal of heavy metals in water treatment process (Source: Baysal et.al.(2013))

### 2.6.2 Life-Cycle Assessment

Life-cycle assessment or LCA is the process of evaluating the impact of a product and process in its total lifespan. (OECD, 2010)

As a result, usage and wastage of the entire process can be calculated. This in turn provides for a reduced cost as the entire process is calculated without compromising on the efficiency of the shipyard.

Furthermore, itcan help predict the environmental hazards so that prevention can be taken or completely avoided. Thus, workers can prepare themselves according the hazard they are being exposed to.

## 2.7 Policies and protocols in Shipyards

## 2.7.1 Worker safety and health

Due to the usage of heavy machineries and intensive work-hours in the ship building industries, it is crucial to ensure worker-safety and comfortable work environment for labors. Furthermore, hazards due to exposure to pollutants and accidents while working needs to be addressed at all times. According to Occupational Safety and Health Act (OSHA), the basic elements that must be addressed for an effective workplace and health condition are:

- management and leadership commitment
- the participation of employee in conducting work and following rules and regulations
- Hazard identification is important to assess the accident and threat to take necessity action immediately
- Investigation and training program must be present to educate the workers on the safe-handling of machineries and react to accidents and threat.
- At a multi-employer workplace, the recordkeeping procedures must be maintained thoroughly.

(OSHA, 2014)

These guidelines are followed internationally to ensure risk management and occupational safety. This ensures the efficiency of the shipyards and works as a guarantee to the clients that approach these shipyards. Therefore, to build new shipyards it is vital to know these rules and apply them when designing the shipyards.

### 2.7.2 Policies regarding the environmental impacts

There are policies regarding the environmental impacts that needs to be strictly followed and can lead to fines if they are not followed. According to OECD, the major issues that needs to be followed are:

- Training facilities for workers and admin
- Operational procedures that facilitate management of environmental risks
- Monitoring of the programs including regular check and audits
- Emergency plans
- Legal requirements and improvement strategies

  (OECD,2010)

These policies help establish a proper management of the shipbuilding process and maintain the worker health and safety at all times. Since working in an industry is a tedious work that involves a lot of risks, the policies should be strictly followed at all times. However, with the increase in industries and technological advancements, the policies need to be revised at all times to cope with the new challenges faced. These challenges should be focused on the environmental impacts that is impacting the welfare of the biodiversity and creating a massive biological imbalance. Thus, through proper design following policies can help promote sustainable industrial facilities.

## Chapter 3: Site Appraisal and Analysis

### 3.1 Background of the site:

### 3.1.1 Geographic

### 3.1.2 Climate

### 3.1.3 History

## 3.2 Site At A Glance

### 3.2.1 Location of the site and neighborhood

### 3.2.2 Relationship between site and surroundings

### 3.2.3 Distances and travelling time between the site and locations of other related functions in the city.

### 3.3 Legal description of the property

### 3.4 SWOT analysis

### 3.4.1 Strengths

### 3.4.2 Weaknesses

### 3.4.3 Opportunities

### 3.4.4 Threats

## 3.1 Background of the site:

### 3.1.1 Geographic

Chittagong, the Port City, is the most important trade and commerce centre for Bangladesh, which lies at 22°22′0″N 91°48′0″E. The Karnaphuli River runs along the southern banks of the city, which includes the central business district. The river enters the Bay of Bengal in an estuary located 12 km west of downtown Chittagong. Mount Sitakunda is the highest peak in Chittagong District, with an elevation of 1,152 feet above sea level while the highest peak in the city is Batali Hill at 280 feet. (Yusuff, 2015)

Furthermore, this division is bounded by Tripura state of India on the North, Cox's Bazaar on the South, Khagrachari, Rangamati and Bandarban zilas on the east and Bay of Bengal and Feni and Noakhali is present. The total area of land is about 528292 sq.km (2039.00 sq miles) and out of which 1700 sq. km (456.37 sq. miles)

The total area of the zila is 5282.92 sq. km. (2039.00 sq. miles) of which 1700 sq. km. (456.37 sq. miles) including coastal area. The Chittagong district provides a unique natural beauty characterized by hills, rivers, sea, forest and valleys. In addition to that, the main seaport of Bangladesh is located at the estuary of the Karnafuli river.

### 3.1.2 Climate

The weather of Chittagong is characterized by tropical monsoon climate. The dry and cool season is from November to March; pre-monsoon season is from April to May which is very hot. The sunny and the monsoon season is from June to October, which is warm, cloudy and wet.

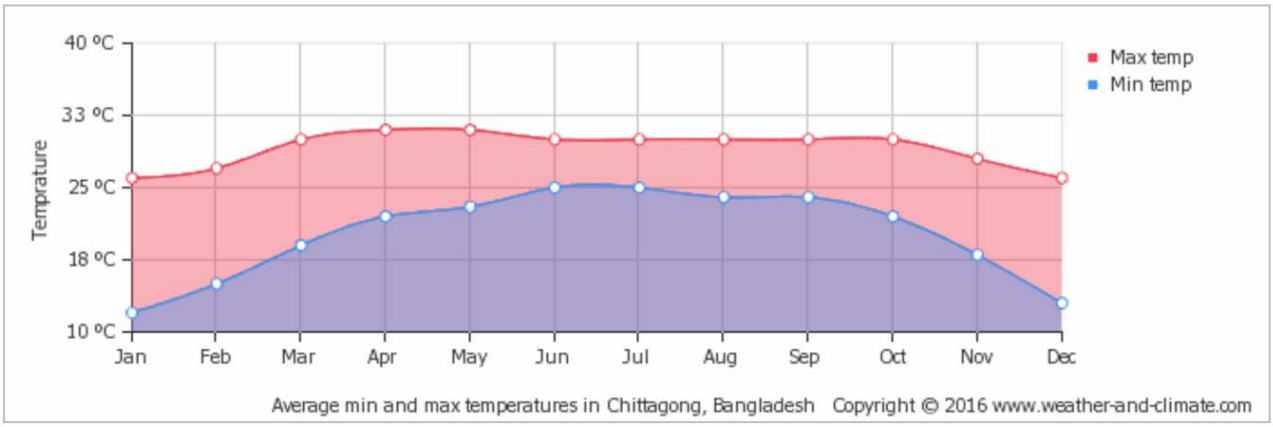


Fig. 6 Average minimum and maximum temperatures in Chittagong (Source: www.weather-and-climate.com)

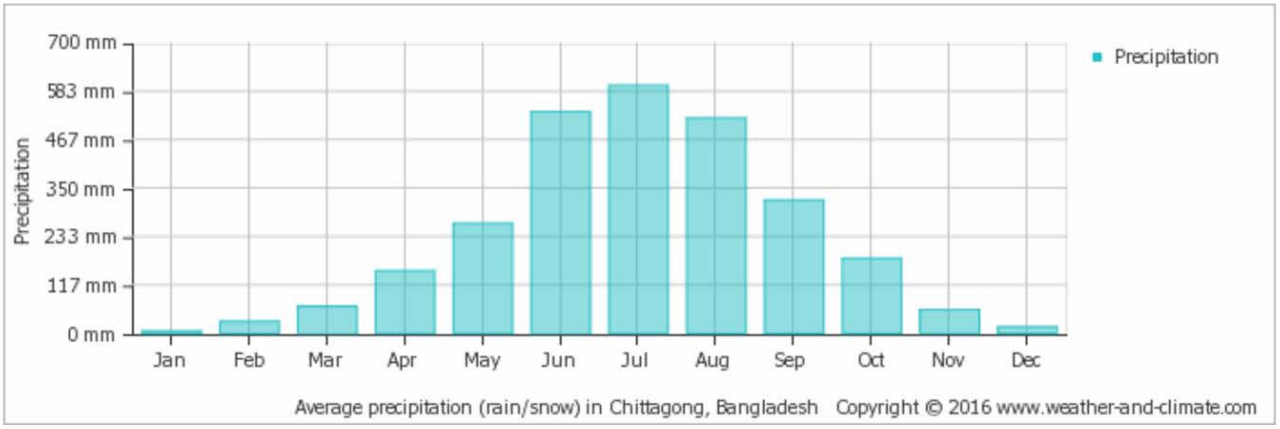


Fig. 7 Average precipitation in Chittagong (Source: www.weather-and-climate.com)

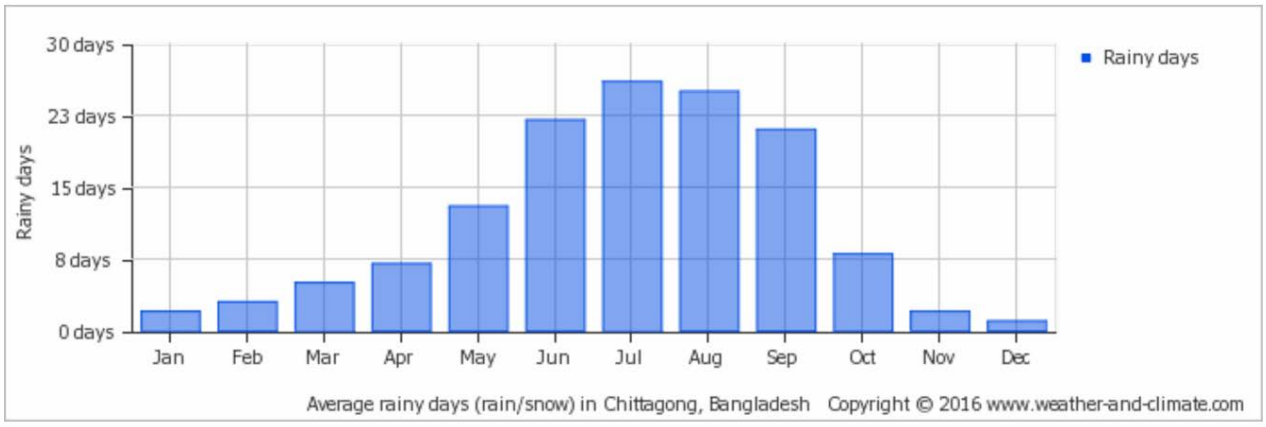


Fig. 8 Average rainy days in Chittagong (Source: www.weather-and-climate.com)

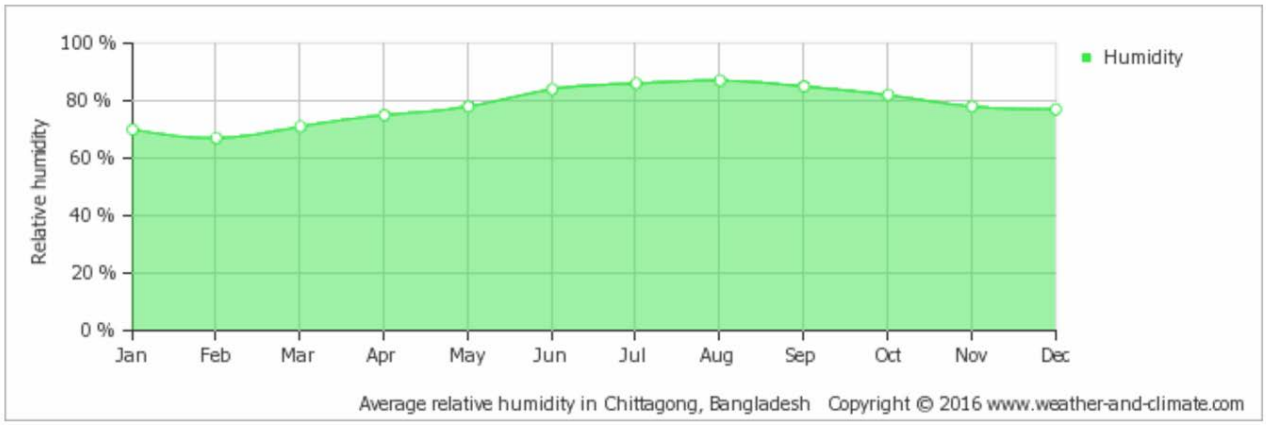


Fig.9 Average Relative Humidity in Chittagong (Source: www.weather-and-climate.com)

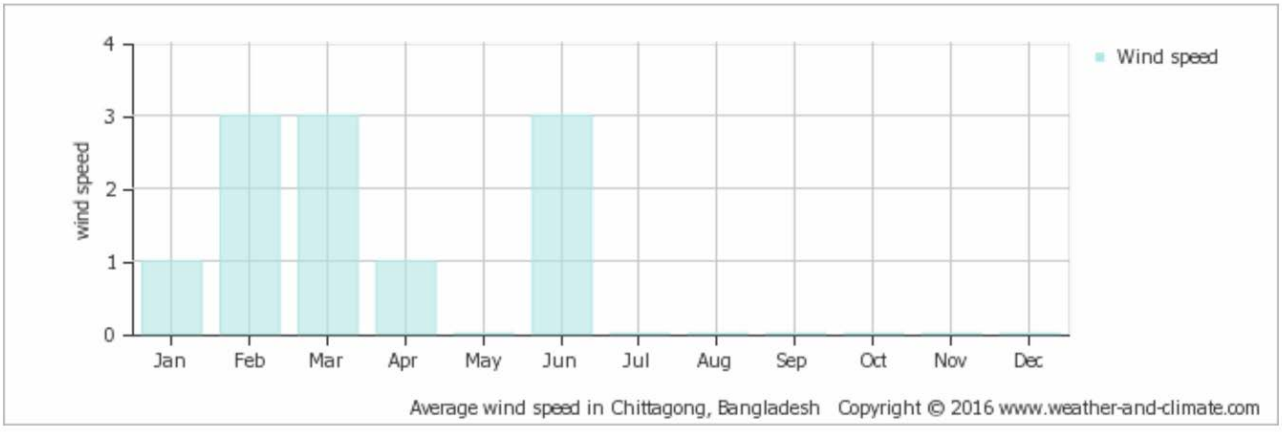


Fig. 10 Average wind speed in Chittagong (Source: www.weather-and-climate.com)

### 3.1.3 History

Since the ancient times, Chittagong has been a port. Due to the spread of Islam as early as the 8th century, by the missionaries travelling via silk road, Arab and Persian merchants placed trading ports in Chittagong. Hence, there were businesses and trading taking place since 9th century AD. Arab historians named the port as Shetgang and described it as the gateway of Bengal. The region was an important trading centre of pearls, rice, silk, muslin, spices and ivory. (Miah, et.al, 2015)

On the other hand, The Chittagong Development Authority (CDA) was established in 1959 and was responsible for the master plans of the city due to the urban expansion. However, the Pakistani Central government did not pay attention to the East Pakistan's development , even though it was producing the largest amount in the foreign exchange earnings.

## 3.2 Site At A Glance

### 3.2.1 Location of the site and neighborhood

The site is on the outskirts of the Chittagong city, near the Karnafuli river mouth. From the city, Shah Amanat Bridge connects the site to Chittagong and Dhaka as it is the Dhaka-Chittagong highway. The road gets branched out from the bridge to Shantir haat, a road that leads to the site. Furthermore, the site is mostly accessed by the river road from Shadarghat. The existing shipyard and is located in an industrial zone, on the outskirts of the city, near the Karnafuli river.

- District : Chittagong.
- Upozila: Patiya
- Union/Mouja: Kolagaon
- Village:Kolagaon

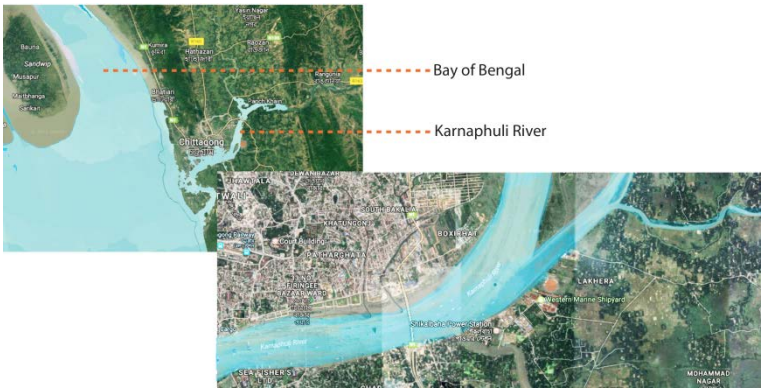


Fig. 11 Location of the site (Source: Google Map)

### 3.2.2 Relationship between site and surroundings

- North: River passage of Karnafuli.
- South and East: Lakhera village.
- West: Small ship repair yard and the Shikal Baha power plant present, along with Colony buildings of about 40 years old exist.


Fig.12 Site and surroundings (Image source: Author)


Fig.13 Skyline showing site and surroundings (Image source: Author)

Fig. 14 The tertiary road leading to the site and around it (Image source: Author)

Fig. 15 Entry via road to the site from the tertiary road (Image source: Author)

Fig. 16 Scraps of material are temporarily placed in the site (Image source: Author)

Fig. 17 There is a growth of grass and the presence of different types of trees planted on the site. (Image source: Author)

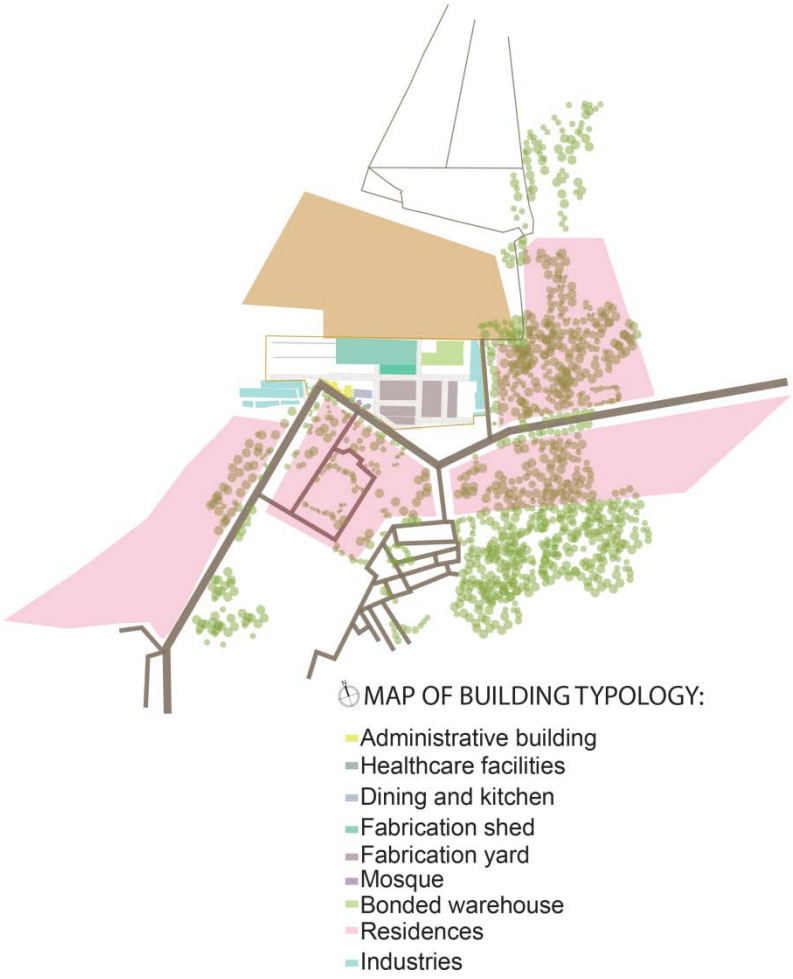


Fig.18 Map of Building Typology (Source: Author)

From the map, it can be noted that the existing shipyard has primary health care facilities that is beneficial for the workers in the existing western marine shipyard. In addition to that, internal connection with the academic zones in both the sides can enhance communication in both the shipyards. The workers live near the site in the surrounding village and settlements. Thus, most of the transportation cost is reduced.

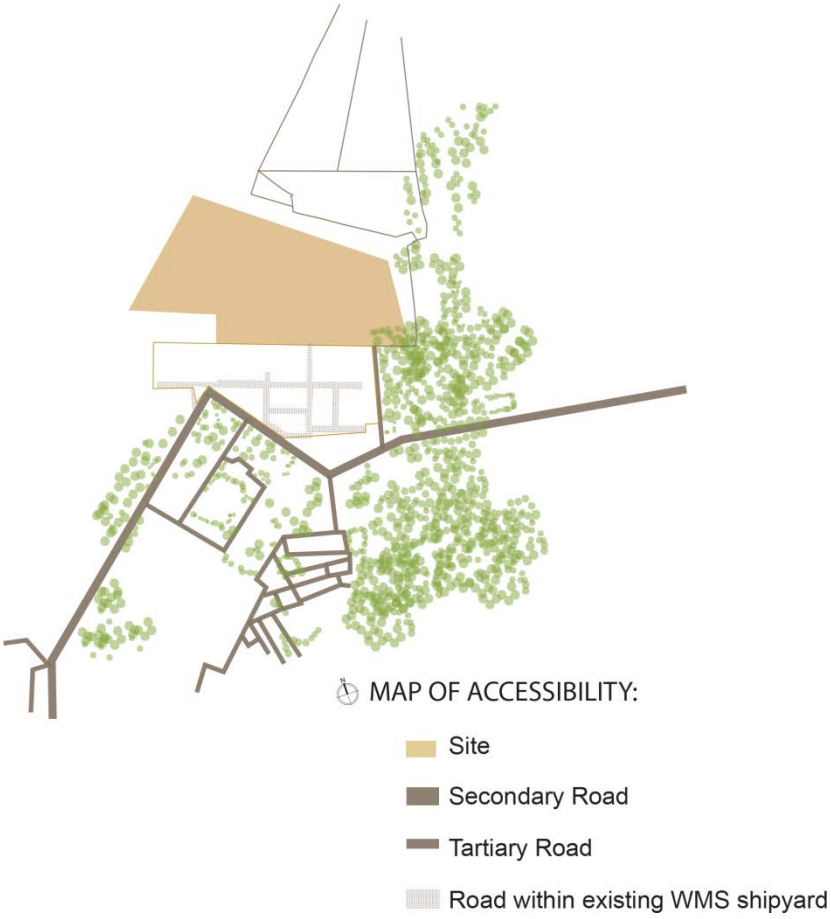


Fig. 19 Map of Accessibility (Source: Author)

The site is accessed from the river and the road. A secondary road reaches the site from the main road and provides external accessibility. In addition to that, there is an internal access from the existing site to the new site.

### 3.2.3 Distances and travelling time between the site and locations of other related functions in the city

The main routes for travelling are river and road path. As a result, pedestrian and transportation occur through the same pathways into the site. The distances and times are listed down:

- The distance from the city is about 25 Km.
- The river route covers a distance of 5km from the Sadarghat to the site.
- The site is 15km from the Chittagong Port.
- The distance from Singapore to Bangladesh (site) is at a distance of 1510 Nautical miles. It takes 4 to 5 days by ships and 8 to 10 hours by plane.
- The distance from Colombo is at a distance of 1300 Nautical miles. It takes 3 to 4 days by ship and 5 to 6 hours by plane.
- Singapore and Colombo main cargo transport hub from Far east and Europe. (for Raw materials.
- From Karnafuli river mouth to shipyard, it takes about 15 nautical miles. It takes one hour to reach the site from the city centre in Chittagong. (G.E.C circle) by road.

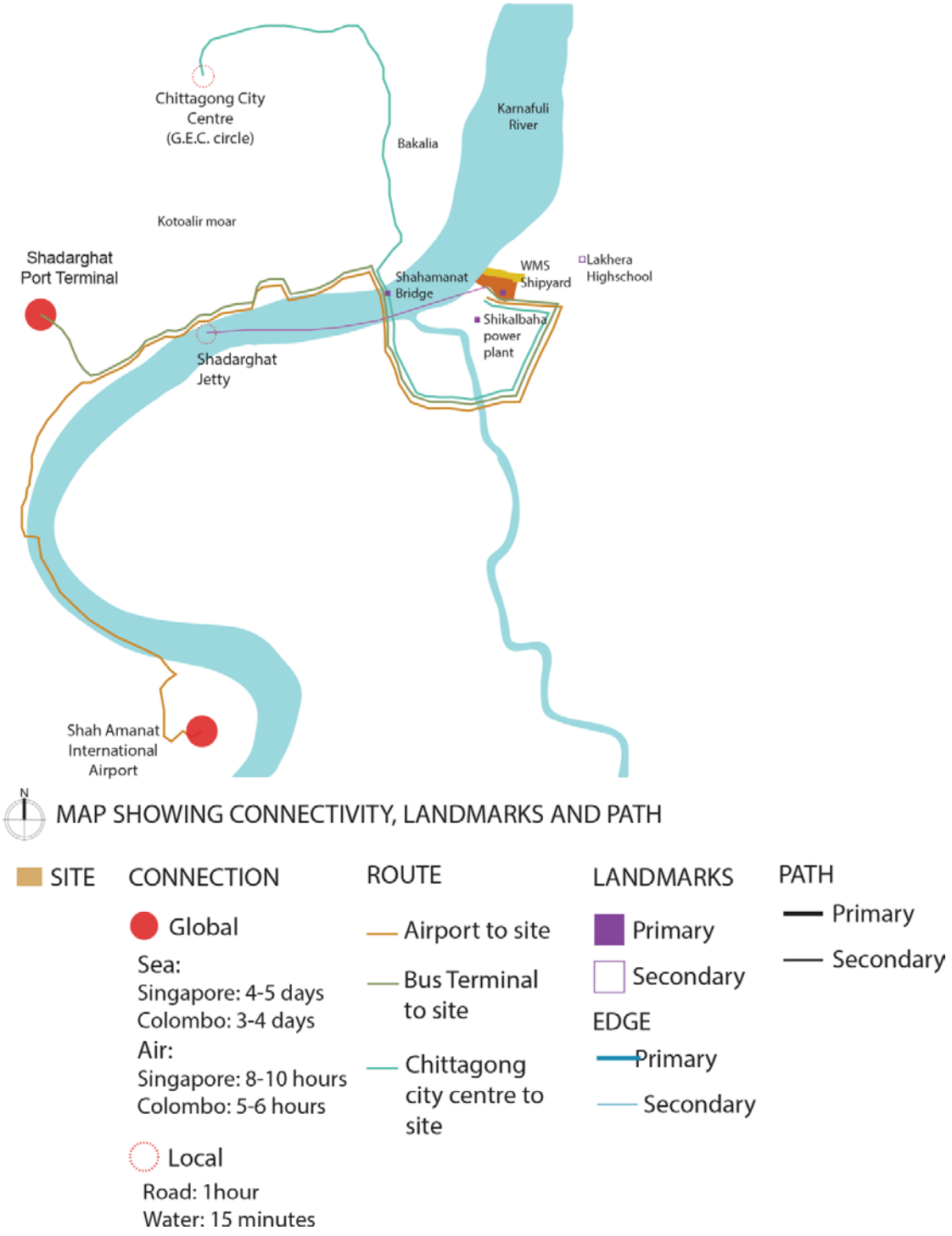


Fig. 20 Mapping of the connections with the site (Source: Author)

## 3.3 Legal description of the property:

Legal Owner: Property owned by the directors of Western Marine Shipyards.

Name of the property owner: A.B.M Fazle Rabbi

## 3.4 SWOT analysis:

### 3.4.1 Strength

- The site is away from main urban settlements and this seclusion enables the workers to work without disturbance
- There are no traffic congestion
- Separated from mainstream political agenda.
- Neighboring workers can easily access site and their transportation cost is reduced.
- Combination of residential and industrial zone.
- Greenery and water body can provide for peaceful work
- environment and scenic beauty

### 3.4.2 Weakness

- Difficult to transport heavy equipments because the roads are not proper
- Mass transportation is costly as it is near the river bank.
- During water surge/ flood/ cyclone might get inundated by the river.
- Emergency healthcare facility is difficult to provide due to the remoteness of the site

- Clients may find it unsatisfactory to stay on the site
- Availability of super shops or markets are not available nearby. Small shops in the settlements are present

### 3.4.3 Opportunities:

- Internal connectivity with the existing western marine shipyard can allow the health-care facilities to be achieved.
- Foreign clients can access it easily as it is nearer to the airport

### 3.4.4 Threat:

- Cyclone can affect the people working in the worker zone
- Remoteness of the site can cause access to hospitals difficult.

# Chapter 4: Contextual Analysis

## 4.1 Physical Context

4.1.1 River and site

## 4.2 Social Contexts concerning shipyards and shipbuilding

4.2.1 Weaknesses of shipbuilding in Bangladesh

4.2.2 Opportunities of shipbuilding in Bangladesh

## 4.1 Physical Context

The shipyards in Chittagong are easier to access because they are places on the mouth of the river, close to the sea. Thus, raw materials can be easily transported from the port to the shipyards.

### 4.1.1 River and site

The site is located beside the river Karnafuli which is one of the largest and most important river in Chittagong. This river and the Bay of Bengal make the Chittagong division the seaside seaport city. Therefore, the site provides easy accessibility.

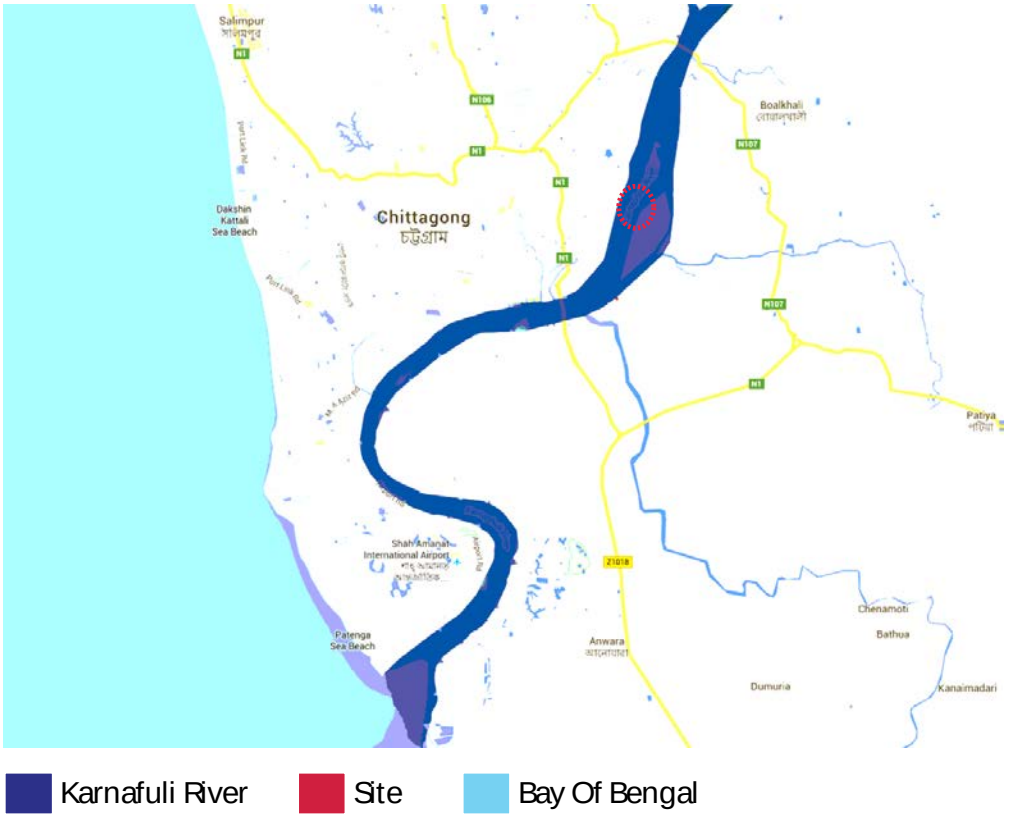


Fig. 21 Map of Chittagong division (Source: Google images)

## 4.2 Social Contexts concerning shipyards and shipbuilding

### 4.2.1 Weaknesses of shipbuilding in Bangladesh

Due to the shipbuilding industry in Bangladesh being a labor intensive industry a lot of costs are involved that the local commercial banks are not capable of investing in this industry. Moreover, the ship's insurance is insured after keel laying and the value increases gradually over the building period. (Zakaria, Ali, and Hossain,2011)

As a result, both local and foreign banks need to provide for financial security which is difficult to achieve. Chowdhury agrees to this notion adding that, the lack of capital involved and high financial cost to carry out the process is a downfall for the shipbuilding process. (Chowdhury,2015)

On the other hand, there are technical issues that involves the inadequate supply of electricity and backward technology. Some shipyards lack the capabilities to build ships due to the absence of machines and the quality control measures are not strong in all shipyards. (Chowdhury,2015) Bangladesh is still new to the emergence of shipbuilding compared to the global context. Therefore, there are weaknesses that needs to be looked into to overcome and strengthen this sector.

### 4.2.2 Opportunities of shipbuilding in Bangladesh

Establishing a potential shipbuilding industry, especially in Bangladesh, can create job opportunities for about three hundred thousand people including both mass level and also the skilful. With the help of the Government and also the private NGOs, Bangladesh is capable of making thirty five thousand marine expertises. (Ahmed, 2014)

Therefore by increasing the investment made to this field, economic situation of the state can be improved on a massive scale.

A field survey by Chowdhury, has shown that the current capacity of shipbuilding is about 0.184 million GT in 2008 that is considered below satisfactory according to the world. However, shipbuilding is flourishing in Bangladesh. There are many factors playing role in this process:

- IMO regulations result into the construction of double hull vessels for safety.
- World economy is being globalized all over the countries.
- The shipbuilding trading is improving.
- Low-energy consumptions are being developed.

(Chowdhury, 2015)

Agreeing with this perception, Zakaria states that, there has been a gap between demand and supply in the recent times. Large nations are not keen in building small ships anymore as it is an extra burden for them thus this demand is met by small countries like Bangladesh, Vietnam, India, etc. Due to the growing demand and increasing orders, there has been development in this sector. This involves expanding export capabilities. (Zakaria, Ali, and Hossain, 2011) Thus, the opportunities of shipbuilding industries is increasing in the years that are to come in the future.

# CHAPTER 05: CASE STUDIES

## 5.1 Introduction

## 5.2 Local Case Studies

### 5.2.1 Western Marine Shipyard, Chittagong, Bangladesh

## 5.3 International Case Studies

### 5.3.1 Philadelphia Navy Yard

# CHAPTER 05: CASE STUDIES

## 5.1 Introduction

Industrialization has brought social and economic changes that causes transformation from an agrarian society. Thus, the main difference is in the organization, structured process and precision in workflow that determines efficiency in workflow. Hence, the case studies were done to understand the facilities required in a shipbuilding industry, the safety protocols that needs to be maintained and how it can contribute to the society. Therefore, this section focuses on the local context of shipbuilding industry in Bangladesh and an international case study that contributes in understanding the importance of shipbuilding in a country.

## 5.2 Local Case Studies

### 5.2.1 Western Marine Shipyard, Chittagong, Bangladesh

**Location:** Kolagaon, Patiya, Chittagong

**Site Area:** 42 acres

Western Marine services, the mother company was initially formed by a group of Mariners who were professionals in ship repairing and export of marine supplies. Gradually the company developed as a shipbuilder with its own shipyard in the eastern side of the Karnaphully river. It started on a land area of 1.5 acre and eventually grew to a massive 42 acre land and still growing. (The Light House, East Side Stories, Western

Marine Shipyard) They have built more than 60 ships and currently more ships are under progress.

The facilities in the shipyard includes:

Bonded Warehouse:

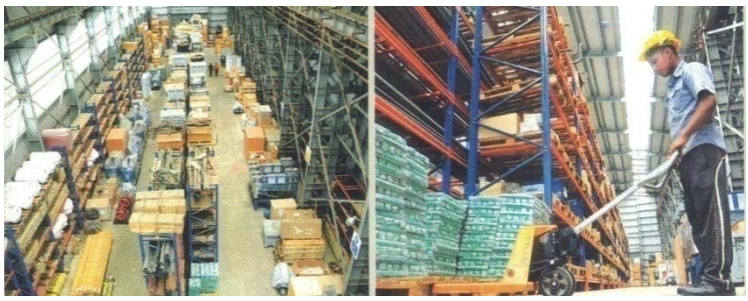

Fig. 22 Bonded Warehouse of WMS (Source: East Side Stories)

- The bonded warehouse comprises of raw materials that needs to be under controlled environment to prevent destruction.
- The storage of materials is database controlled.
- The structure consists of steel columns and bracing with a height of 60 feet and the heavy machineries are distributed using an overhead crane.
- Corrugated sheet is used to cover the shed and exhaust fans are used to keep the internal space cool to control heat so that the equipments are not damaged.
- In addition to that, circulation for forklifts and trolleys are kept to distribute the smaller items throughout the shed.
- The shelves are detachable so that the space can be utilized according to the raw materials present

Fig. 23 Detachable steel shelves to store raw material(Source: Author)

Fig. 24 Overhead crane to carry heavy equipments and machinery throughout the warehouse. (Source: Author)

Fig. 25 Storage of equipments and machineries in the shelves according to size and number. (Source: Author)

Fig. 26 Storage of paint and construction equipments required on a daily basis. (Source: Author)

Stack Yard

- The stack yard is where metal plates are stored.
- These plates are then stacked according to their thickness and size.
- These plates are loaded and unloaded using cranes.


Fig. 27 Storage of plates according to thickness is numbered (Source: Author)

Fig. 28 Storage of plates stacked (Source: Author)

Blasting Shop:

Fig. 29 Shot blasting workshop (Source: East Side Stories)

- Blasting workshop is where the rust on the plates are cleaned by applying continuous mechanical operations.
- Next a primary coat of paint is sprayed on the metal sheets to protect it from rusting and damage.

Fig. 30 Placement of plates on the machine (Source: Author)

Fig. 31 Shot blasting machine and circulation space (Source: Author)

CNC Shop

Fig. 32 Computer Numeral Cutting (CNC) Workshop (Source: East Side Stories)

- The steel plates are automatically cut based upon production design information provided from the design department.
- Overhead cranes carry the steel plates and lay them on the machine.
- The cut-parts are collected and sent for assembling

Fig. 33 Cutting of plates done automatically by the machine (Source: Author)

Fig. 34 Cut parts are being stored (Source: Author)

Mechanical and Carpentry Shop

Fig. 35 Types of work done in the Mechanical Shop (Source: East Side Stories)

- The mechanical work done here are pipe bending, making interior body parts and electrical wiring systems.
- Carpentry work involve the wood-work needed for the interior of the ships

Fig. 36 Machineries required for pipe bending (Source: Author)

Fig. 37 Welding taking place that could cause harm to the users (Source: Author)

Fabrication Yard

These are space where small parts are assembled to form a block. There are three types of fabrication yard:

- Plate Assembly
- Sub-block Assembly
- Block Assembly

Fig.38 Plate Assembly in the fabrication yard (Source: Author)

Fig. 39 Plate Assembly in the fabrication yard (Source: Author)

Slipway

- A slipway is the location from which the ship is launched into the river.
- A railway track is present on which the ship is assembled and finally pulled into the ship.
- It is mildly sloped towards the river to allow the ship to be released into the river.
- An overhead Gantry Crane carries the heavy blocks to be welded into place
- The gates in front of the slipway holds the water out during construction of the ships and are opened during launching.

Fig. 40 Assembling of ships take place on the slipway before it is released into the river.

Fig. 41 Slipway showing the gateway that holds the water out during construction (Source: Author)

Administration

The administration consisted of different departments that help run the functions in the shipyard:

- Executive Body
- Design Department
- Engineering Department

Fig. 42 The Administrative Department (Source: East Side Stories)

Healthcare Facilities

There is a primary health-care facility that is present that not only serves the workers, it helps the families of the workers and the local people in the surrounding.

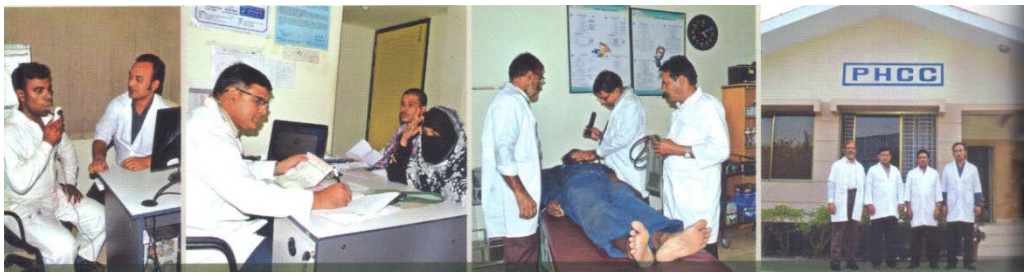


Fig. 43 Primary Health-care Facilities (Source: East Side Stories)

### 5.2.2 Project Analysis

The facilities provided are of international standard and have high-tech machineries that has enabled the process to be efficient. However, there are scopes of improvement that can improve the worker environment and provide for a better work environment for workers. These areas include:

- The sheds do not have proper ventilation system that can allow for the harmful gases to be treated in a away that does to hamper the workers.
- The interior of the sheds should have been designed in a way that allow light to enter without heating up the environment.
- Workers do not have a space to relax and take their mind off of the tedious work in the heat. It is very important to focus on a healthy mind as it results to positive outcomes in the workforce.

Fig. 44 Lack of spaces for workers to relax (Source: Author)

- Waste control is also an important factor as it hampers the environment and marine life when harmful substances are released to the sea.

Fig. 45 Lack of waste management (Source: Author)

On the whole, visiting this Shipyard has deepened the understanding regarding the process and workflow that a shipbuilding requires. In addition to that, observing and interacting with the workers have enabled to create scopes of design criteria that can improve their work environment.

## 5.3 International Case Studies

### 5.3.1 Philadelphia Navy Yard

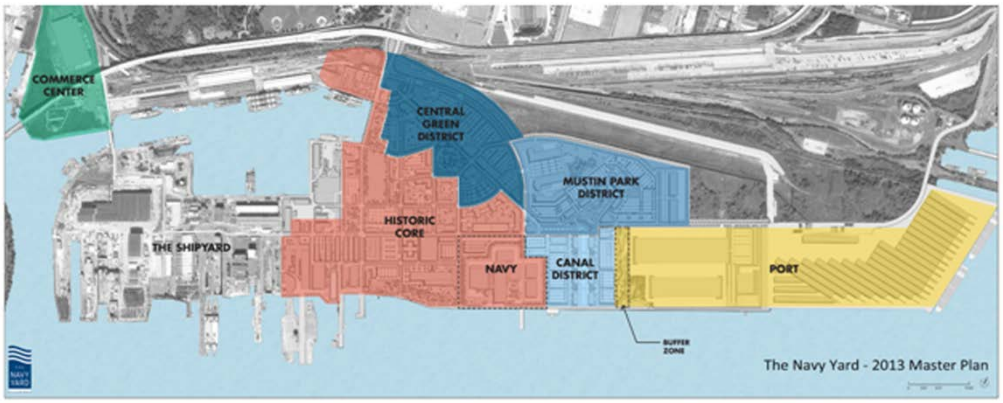


Fig. 46 Masterplan of Philadelphia Navy Yard (Source: PIDC, Robert A.M. Stern Architects)

Philadelphia is known throughout the world as the birthplace of American democracy and the Philadelphia Navy Yard holds a strong historical background. It has began to operate from the year 1996 and constructed almost 53 warships and repaired 1218 of them during World War II. Over the years, the Navy Yard has undergone a notable transformation. Currently, there is 1,1200 acre business campus, industrial and research development space. In addition to that, the Navy Yard has revived the former shipyard and historic buildings that allows for the old and new to work together.

This case study helped understand the journey visitors go through in the yard to understand the shipbuilding process that allows them to enjoy.

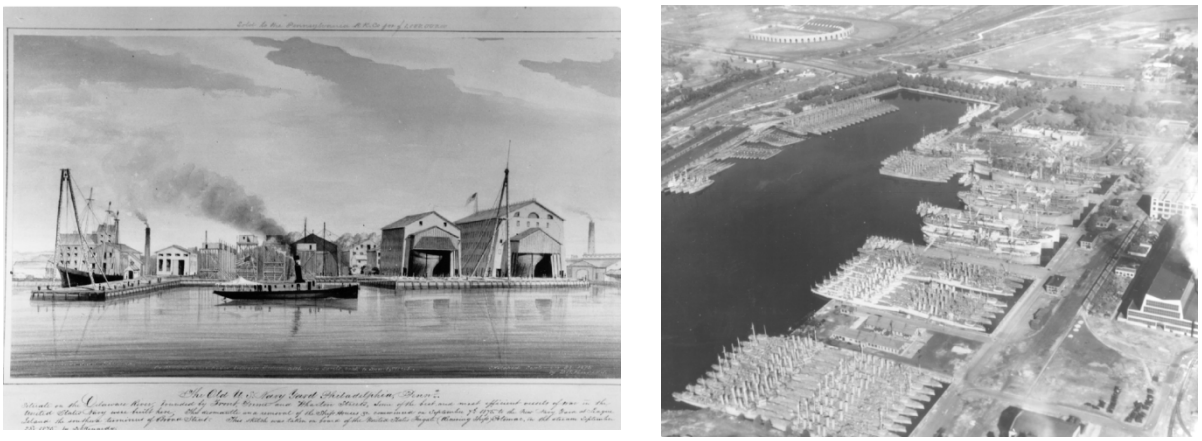

Fig. 47 During WW II (Source: The Navy Yard: Walking tours and visitors guide)

Since the Navy Yard is located at the convergence of Delaware and Schuylkill Rivers, The Navy Yard is easily accessible. Thus, visitors can use any transportation to reach it or even walk on foot to reach the destination.

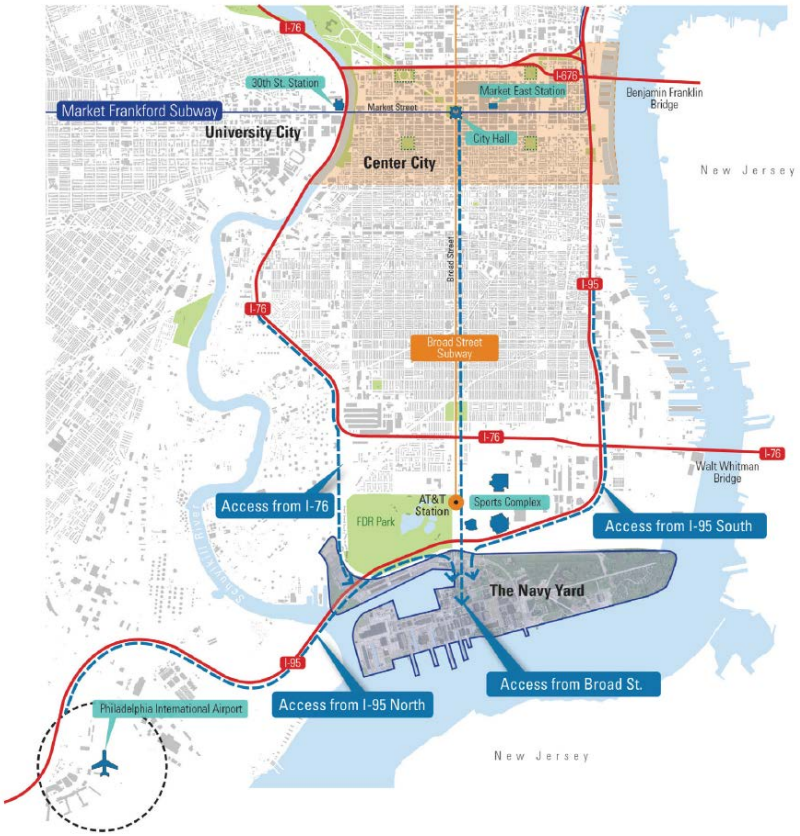


Fig. 48 The pathway taken for the journey (Source: The Navy Yard: Walking tours and visitors guide)

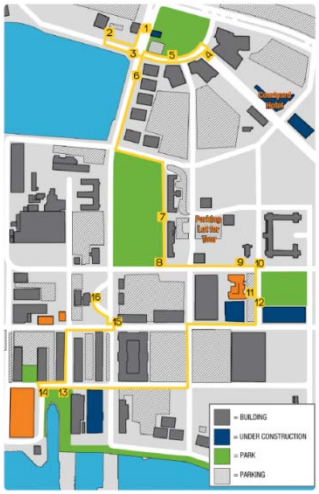


Fig. 49 The districts and building typology (Source: The Navy Yard: Walking tours and visitors guide)

The journey of the Yard is mapped out for visitors and this directs people to travel. People tend to sit across the dry dock and look at the ships tied to the yard. In addition to that the Yard is also used as a location for shooting films for directors and producers.

Fig. 50 The public facilities against the dockyard in the background. (Source: Sumaiya Saifee)

On the whole this case study helped in understanding the amenities needed to make a journey interesting for the visitors without hampering the work in progress.

# Chapter 06: Programmes and Development

## 6.1 Developed Programmes

## 6.1 Developed Programme

| | Program | No. of Users | Quantity | Area Required | Total Area |
|---|---|---|---|---|---|
| Industrial Zone | Fabrication Shed | 100 | 2 | 19,875 | 39, 750 |
| | Fabrication Yard | 200 | 3 | 21, 730 | 65, 190 |
| | Blasting and CNC Shop | 10 | 1 | 18,000 | 18,000 |
| | Mechanical Shop | 10 | 1 | 3,375 | 3,375 |
| | Carpentry Shop | 10 | 1 | 2,000 | 2,000 |
| | Utility, boiler and compressor | 2 | 1 | 3,000 | 3,000 |
| | Slipway | 100 | 2 | 21, 000 | 42, 000 |
| | Bonded Warehouse | 10 | 1 | 18,000 | 18,000 |
| | Locker room | 500 | 1 | 11,000 | 11,000 |
| | Total Area | | | | 2,02,315 |

| | Program | No. of Users | Quantity | Area Required | Total Area |
|---|---|---|---|---|---|
| Admin And Health and Safety | CEO | 1 | 1 | 200 | 200 |
| | Departments | 30 | 8 | 800 | 6,400 |
| | Conference Room | 15 | 1 | 1000 | 1,000 |
| | Meeting Room | 5 | 2 | 500 | 1000 |

| | | | | | |
|---|---|---|---|---|---|
| | Medical Facilities | 5 | 1 | 3,000 | 3,000 |
| | Day-care | 15 | 1 | 4,000 | 4,000 |
| | Prayer Space | 15 | 2 | 500 | 1,000 |
| | Total Area | | | | 15,600 |

| | Program | No. Of Users | Quantity | Area Required | Total Area |
|---|---|---|---|---|---|
| Exhibition and Display | Exhibition Space | 200 | 1 | 30,000 | 30,000 |
| | Cafe | 100 | 1 | 8,000 | 8,000 |
| | Total Area | | | | 38, 000 |

| | Program | No. of Users | Total Area |
|---|---|---|---|
| Grand Total | Industrial Zone | 500 | 2,02,315 |
| | Admin and health and safety | 86 | 15,600 |
| | Exhibition and Display | 200 | 38,000 |
| | Total Area | 786 | 2,55,915 |

# Chapter 07: Concept and Development

**7.1 Introduction**

**7.2 Design Framework**

7.2.1 Topographic Changes

7.2.2 Development of zones7.2.3 Development of Green and Buffer Spaces

7.2.3 Development of Green and Buffer Spaces

7.2.4. Development of Connectivity

**7.3 Programmatic Layout**

**7.4 Concept Development**

**7.5 Design Development Phases**

**7.6 Final Design Drawings**

**7.7 Final Rendered Images**

**7.8 Final Model Images**

## 7.1 Introduction

The project aims to organize the workflow to increase efficiency. In addition to that, the worker condition is taken into account and alleviated in the shipbuilding industry because it requires heavy-duty work.

## 7.2 Design Framework

### 7.2.1 Topographical Changes:

There are two tidal height range:

- High-water
- Low-water

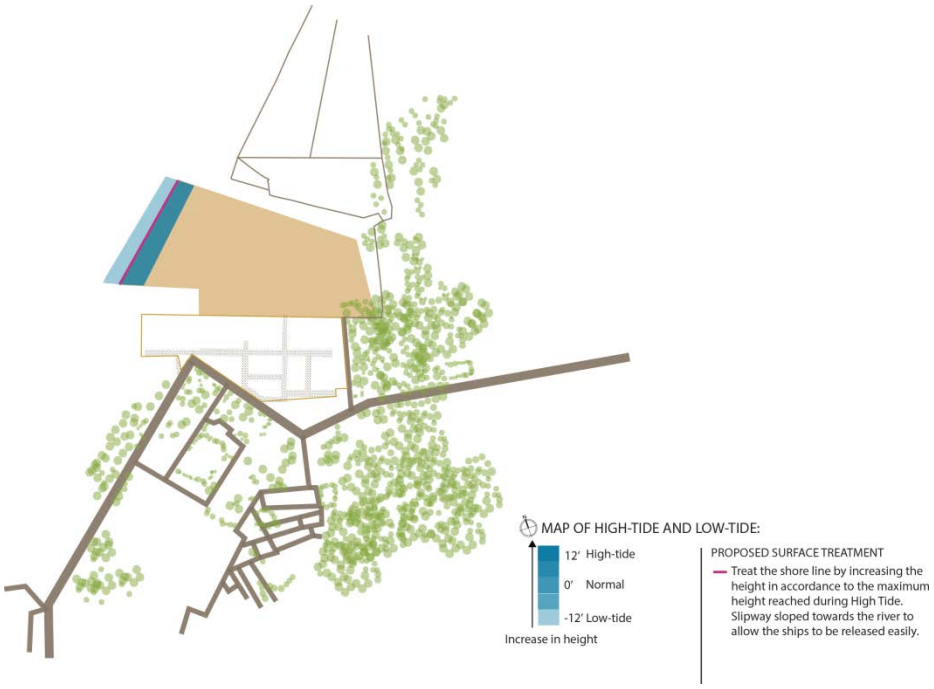


Fig. 51 Map of High and Low tide (Source : author)

The tidal range of rise and fall of water varies between 4 to 5 meters during winter and monsoon. Drainage of water takes place into the river, as the land is sloped downwards

towards the river. Hence, built forms placed near the river should accommodate a height of 12 feet for tidal waves.

### 7.2.2 Development of zones

The site is can be divided into three distinct zones:

- Industrial
- Academic and Medical
- Recreational Zone


Fig. 52 Development of zones (Source: Author)

As the ship needs to be released into the river, the industrial zone is placed next to the river. On the other hand, the administrative and medical zone needs to be away from the industrial zone and needs to be placed in a silent zone. Thus, between these two zones, the recreational zone works as a buffer space where the users and visitors can access.

### 7.2.3 Development of Green and Buffer Spaces

The existing Western Marine Shipyard and the new site has a narrow channel of waterbody in between them.

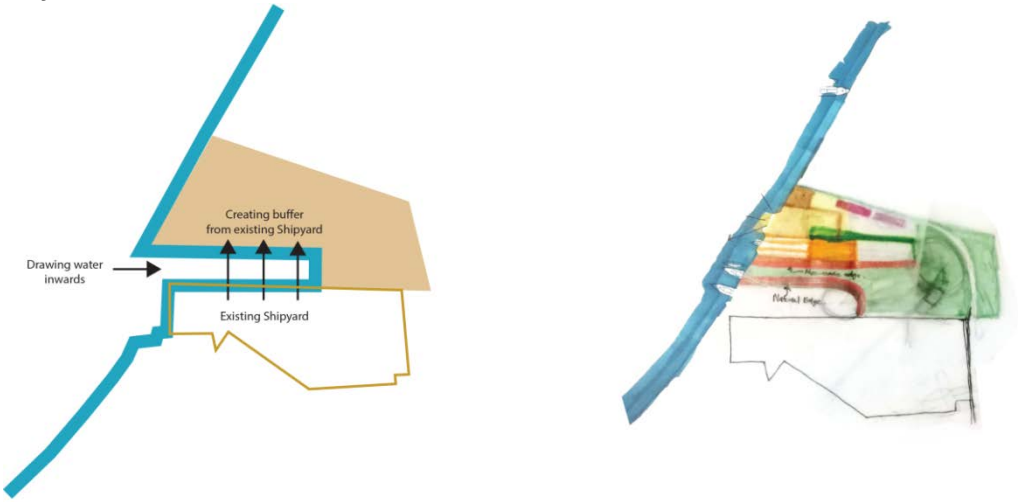


Fig. 53 Development of Buffer Zones (Source: Author)

Therefore, the narrow channel of water creates a scope for a buffer zone to be created between the existing industry and the site. In addition to that, a green belt is required to welcome people to the location as well as maintain security.

### 7.2.4. Development of Connectivity

Since the site is one the outskirts of the city, transportation to the site should be provided. There are two connections:

- External: Road and River connection
- Internal: Between the existing site and the new site.

In addition to that, the connectivity is developed within the site by analysis of the maximum gathering of people generating nodes:

- External node that attracts attention of the people
- Internal node that accepts people to the site
- Assembly space that serves as a node that holds people during fire and incase of emergency.

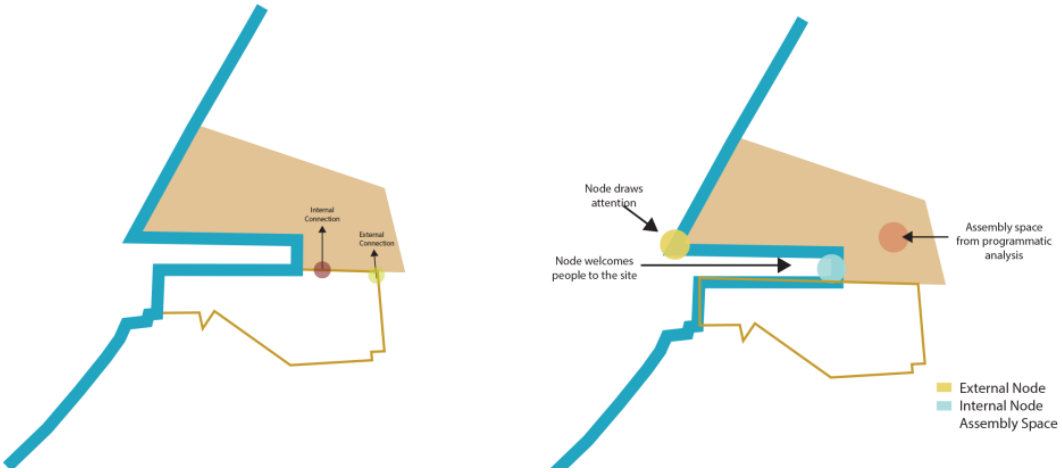


Fig. 54 Development of Connectivity (Source: Author)

Therefore, connecting these three nodes generates a pathway for people to access and go through a journey. Moreover, in case of an emergency during fire, people can be easily evacuated from the site following the pathway which is a crucial and important factor of an industry.

### 7.3 Programmatic Layout Development

According to the functional and site analysis, built forms are placed in the site.

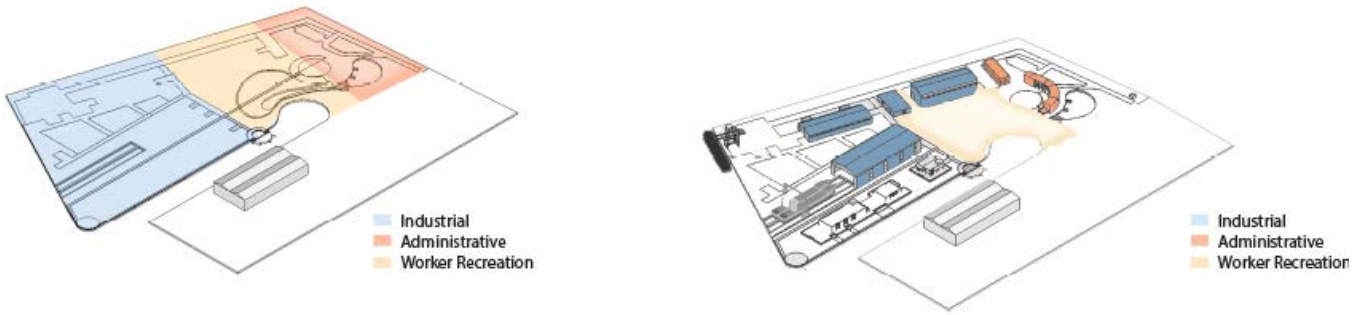


Fig. 55 Placement of Built forms according to zones (Source: Author)

Presently, industries lack the green areas in them because of cautious design decisions that do not hamper the work flow. Hence, more green areas are introduced that increases the oxygen control and overall air pollution is reduced. In addition to that, green spaces create a natural barrier in between zones that does not create visual obstruction.

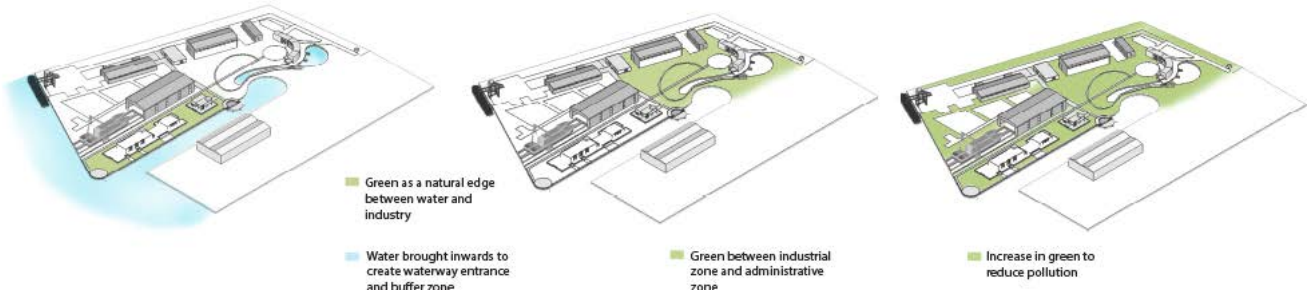


Fig. 56 Increase in buffer zones and green areas

The three nodes, when connected creates a pathway for the users and visitors. This pathway is more systematic in the industrial zone and free-flowing in the non-industrial zone.

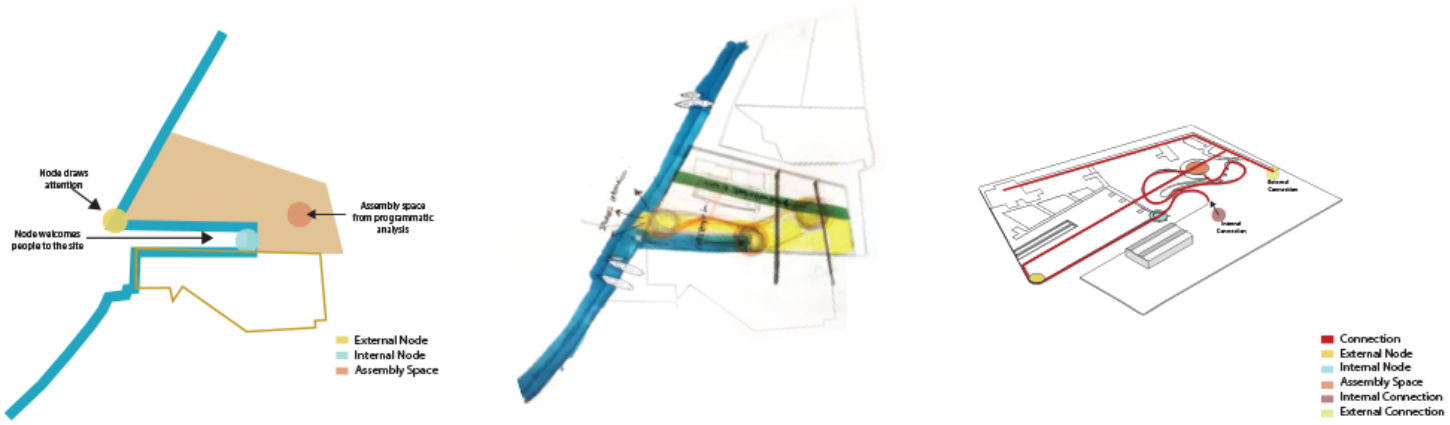


Fig. 57 Increase in buffer zones and green areas

### 7.4 Concept Development

**"Exposition of Aspiration- Shipbuilding journey through design"** is the concept of the project that highlights from the idea that exhibits this extraordinary process of building ships. It is derived from the historical significance of the shipbuilding, worker emotions and value throughout the process and the client requirements.

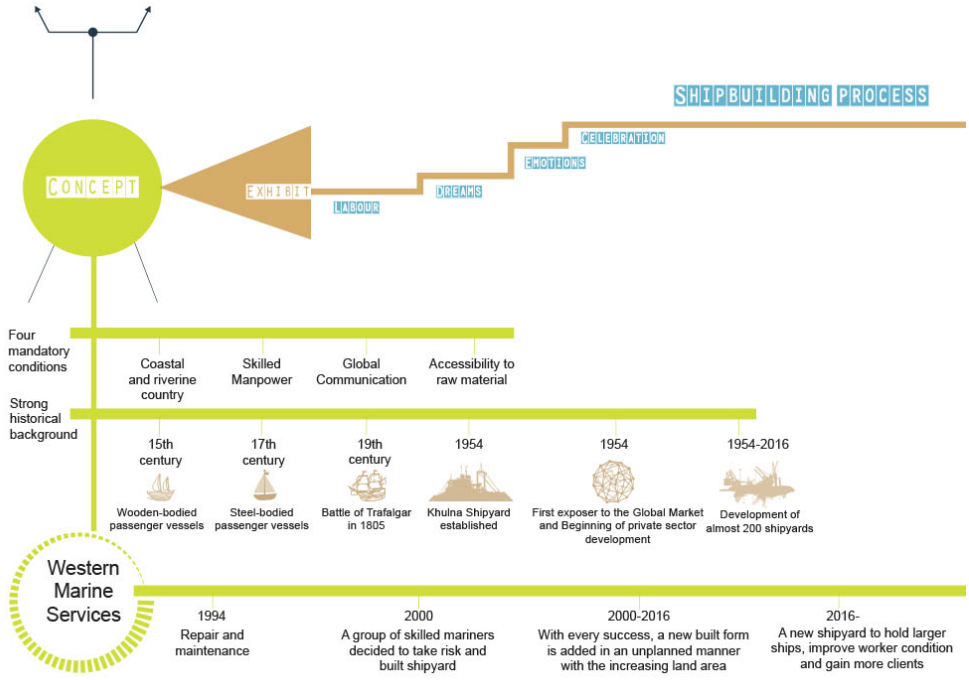


Fig. 58 Conceptual Development (Source: author)

## 7.5 PHASES OF DEVELOPMENT

| INDUSTRIAL ZONE | | |
|---|---|---|
| Process | Location | Description |
| Storage | Stack yard | Stacking steel plates according to size and |
| | Bonded Warehouse | This is the shed where materials are stored in a controlled environment |
| Blasting | Blastings Workshop | The rust coating on steel and leakage is removed in this shed |
| Primary paint | Painting Workshop | Primary painting is done here |
| CNC cutting | CNC cutting Workshop | Large steel plates are cut according to the requirements |
| Assembling | Fabrication Yard | Open-air/ temporary shading assembling of cut parts take place |
| | Fabrication Shed | Large blocks are compiled and made into ships |
| Launching | Slipway | Ships are released into the sea from this sloped surface |

Table: 3 Process of Shipbuilding (Source: author)

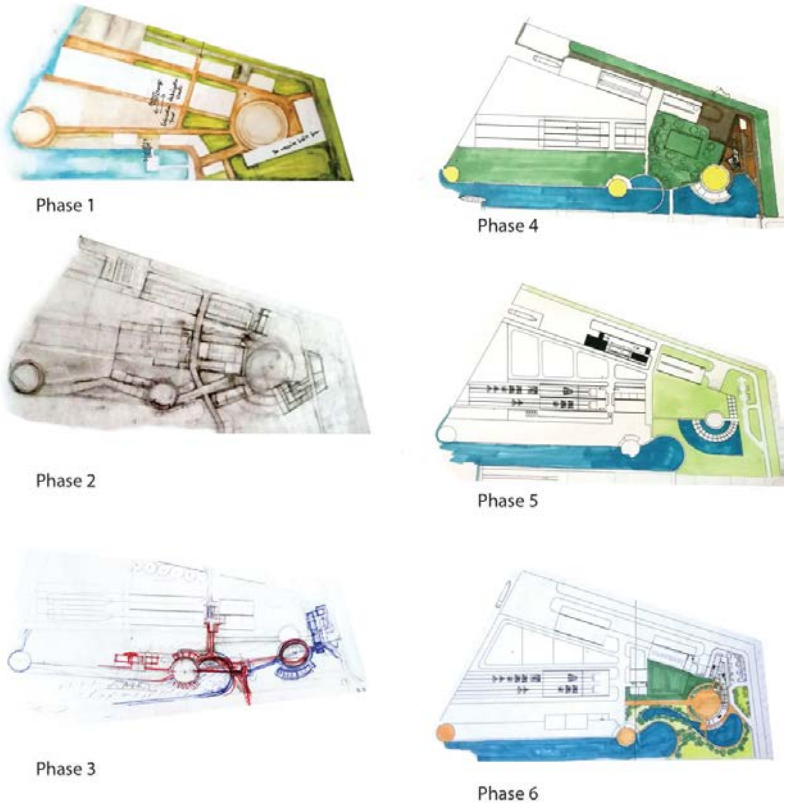


Fig. 60 Development Phases (Source: author)

## 7.6 Final Design Drawings

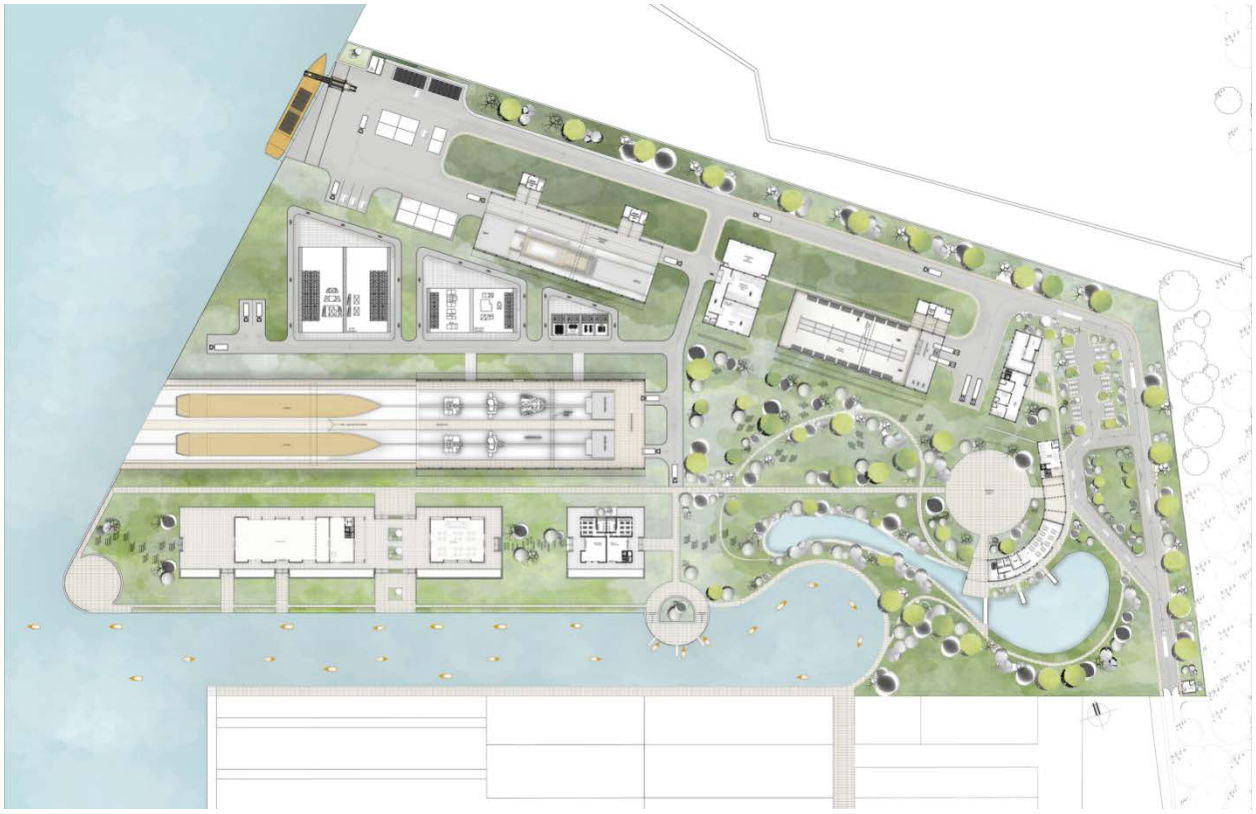

Fig. 61 Masterplan showing Groundfloor Plan (Source: Author)

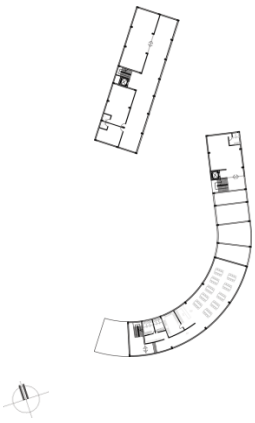

Fig. 62 First Floor Plan of Administrative and residential block (Source: Author)

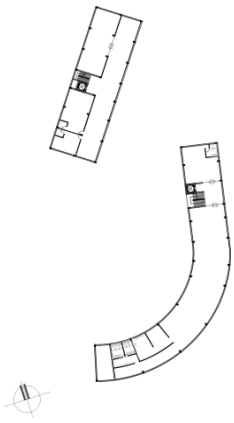

Fig. 63 Second Floor Plan of Administrative and residential block (Source: Author)

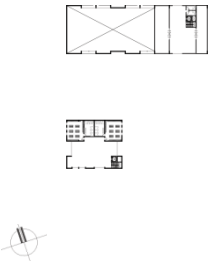

Fig. 64 First Floor Plan of Exhibition Space and locker rooms (Source: Author)

Fig. 65 Section AA' (Source: Author)

Fig. 66 Section BB' (Source: Author)

Fig. 67 Section CC' (Source: Author)

### 7.7 Final Rendered Images

Fig. 68 Image showing the entrance to the site in-between the existing shipyard and new site (Source: Author)

Fig. 69 Image showing the shipyard and the exhibition space (Source: Author)

Fig. 70 Image showing the node welcoming people to the site (Source: Author)

Fig. 71 Image giving an overview of the industrial and zone and buffer space (Source: Author)

Fig. 72 Image showing the nigh view of the shipyard (Source: Author)

## 7.8 Final Model Images

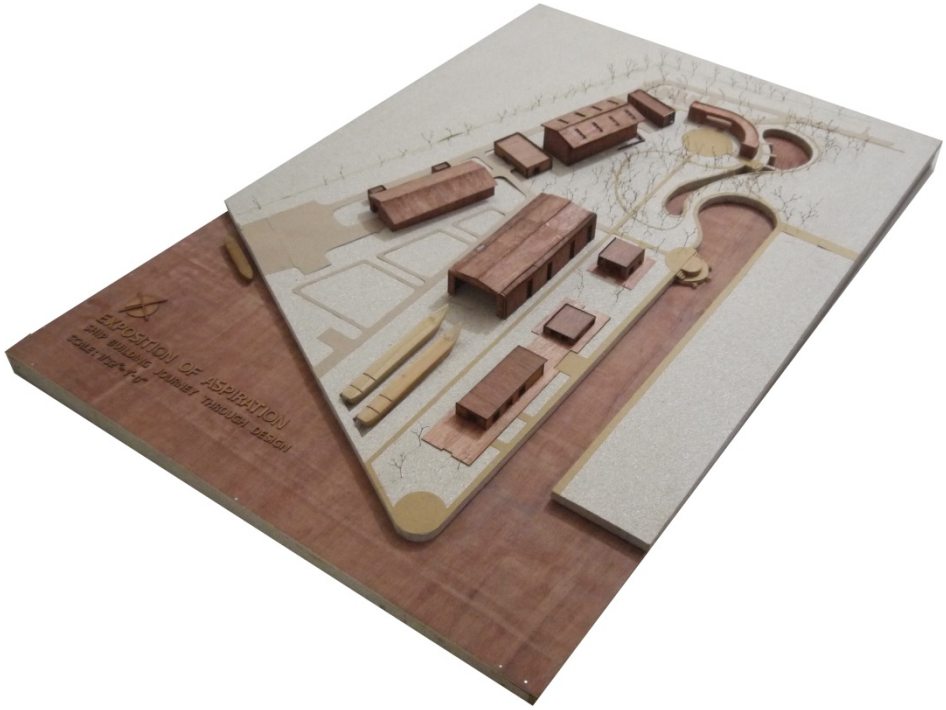


Fig. 73 Model Image (Source: Author)

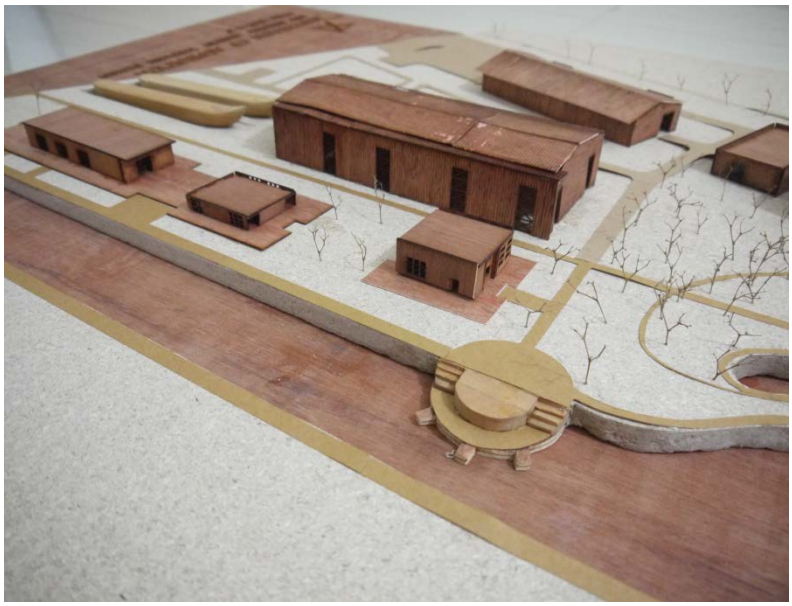

Fig. 74 Model Image (Source: Author)

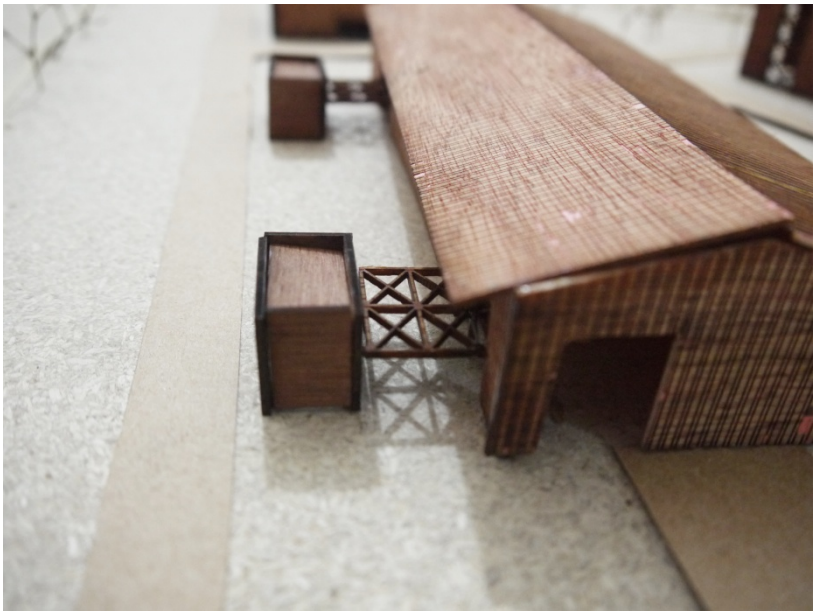

Fig. 75 Model Image (Source: Author)

Fig. 76 Model Image (Source: Author)

# Chapter 08: Conclusion

## Chapter 08: Conclusion

Shipbuilding is an incredible journey that involves the extraordinary construction process of ships. When the ship built in the shipyard is released to the sea, workers and people involved celebrate and go through an emotional expedition because of their hard work and involvement being brought to life and finally reach a destination. Unfortunately, people are unaware of this journey and the aim of this project is to showcase the delirious work process and the celebration of releasing the ship to the sea. As a result of which, awareness of this wonderful process taking place in Bangladesh is generated and can proudly be represented globally to establish Bangladesh's identity world-wide.

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