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changing economies

urban restructuring of the city of Mumbai in the context of changing economic conditions

Graduation Project Report
May 2009

image: courtesy Jehangir Sorabjee; Ganesh festival celebrations at Chowpatty Beach Mumbai

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Special thanks to the Complex City Studio teachers and to all my friends for sharing in this experience. I also wish to express my love and gratitude to my beloved family; for their understanding, endless love & support. More importantly, I would like to thank God for seeing me through this process.

“... cities are powerful, dynamic, ever-changing entities made up of myriad gestures big and small. The real notion is to build in a way that honors and nurtures complexity. And that’s an idea impossible to outgrow.”

-Karrie Jacobs, an urban critic

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Thesis Abstract

C h a n g i n g E c o n o m i e s
Urban restructuring of the city of Mumbai in the context of changing economic conditions

The term “changing economies” or “economic restructuring” refers to the shift from a manufacturing to a predominantly service based economy. The study case is the city of Mumbai in India.

With economic restructuring, the spatial structure of cities have been altered. Given the transformation to a more service based economy and the exponential growth of cities both in size and in population, regionalization of economy and suburbanization seems to be a dominant spatial trend in most global cities. The objective of these planning measures is to decongest inner city areas by adopting a spatially dispersed economic growth in the region. However, in Mumbai, suburbanisation has hardly succeeded in achieving its objective of decongesting inner cities. The planning measures adopted are primarily aimed at increasing urban competitiveness of the new economic nodes while less has been done to deal with local problems and potentials.

With this in mind, the graduation project is aimed at restructuring the metropolis of Mumbai by dealing with problems related to accessibility of business districts and realisation of local qualities.

The key research questions that are addressed in the project include:
- What is the transformation in the spatial structure of cities as a result of economic restructuring?
- How can Mumbai and its metropolitan area be restructured in a more integral manner?

project definition

section i


Images Courtesy: Humayunn N A Peerzaada


PHILIPS
idea

1.1. City Profile

a. Location and context:

Greater Mumbai is located along the western coast of India in the state of Maharashtra *(Refer Fig. 1.1a.1)*. The city has grown both in size and population and is today one of the megacities of the world with a population of 11.91 million inhabitants in 468 sq. km. of area. The Mumbai Metropolitan Region has an area of 4355 sq. km. with a population of 17.91 million inhabitants. *(Census India, 2001)*

What is essentially called Greater Mumbai includes the island city of Mumbai together with the suburbs to the North. Greater Mumbai along with the extended suburbs to the East forms the Metropolitan Region. *(Refer Fig. 1.1a.2)*

At the regional scale, Mumbai forms a “golden triangle” with two important cities in the state of Maharashtra called Nashik and Pune *(Refer Fig. 1.1a.3)*. Mumbai is linked to both these cities by road and railways. The city of Mumbai is also connected to the state of Gujarat in the north and Goa in the south.

To get a sense of scale, Greater Mumbai has been compared to Greater London. In less than 1/3rd of the area, Mumbai has a population density of more than six times that of London. *(Refer Fig. 1.1a.4)*

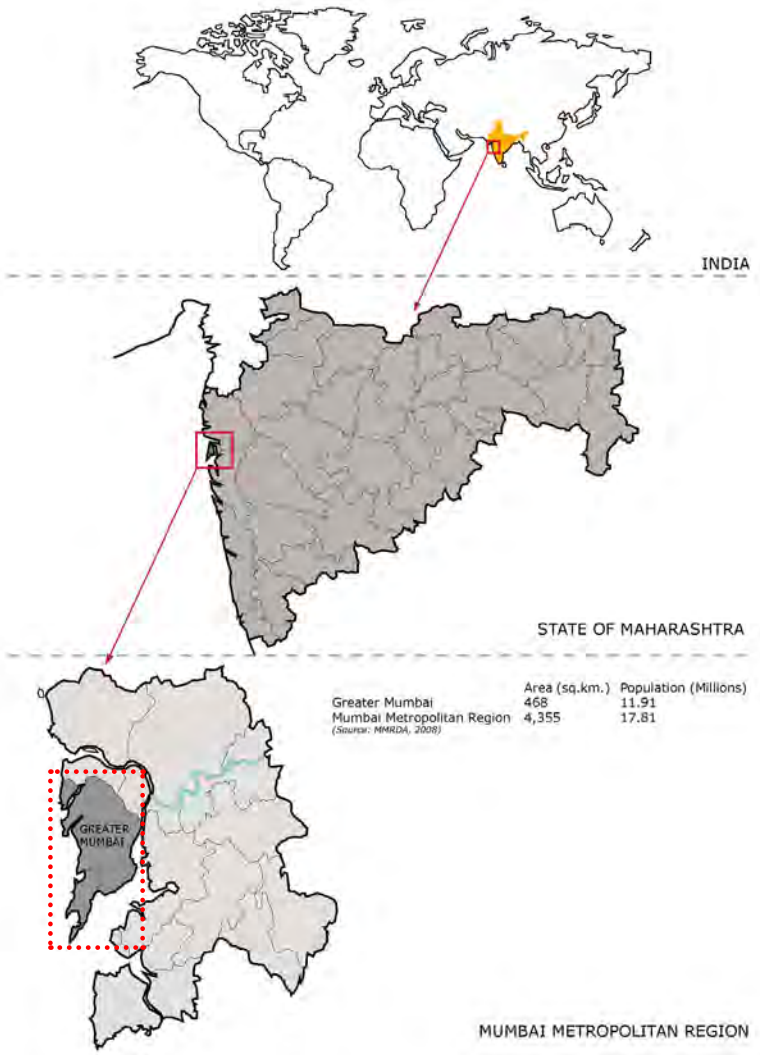


Figure: 1.1a.1
Location & Context

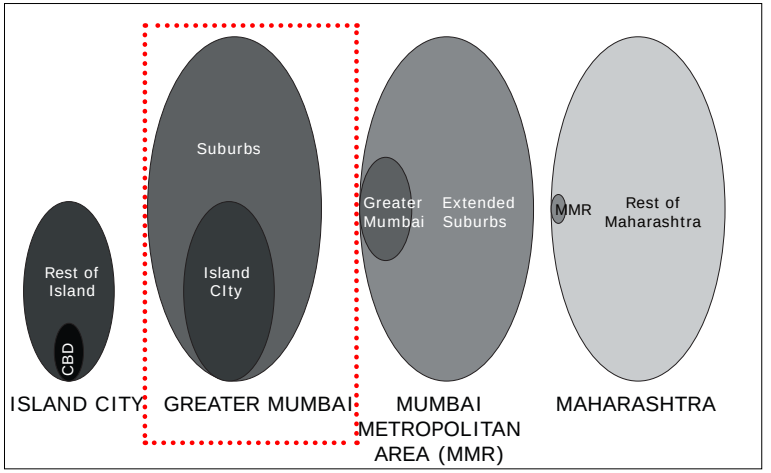


Figure: 1.1a.2
City Structure

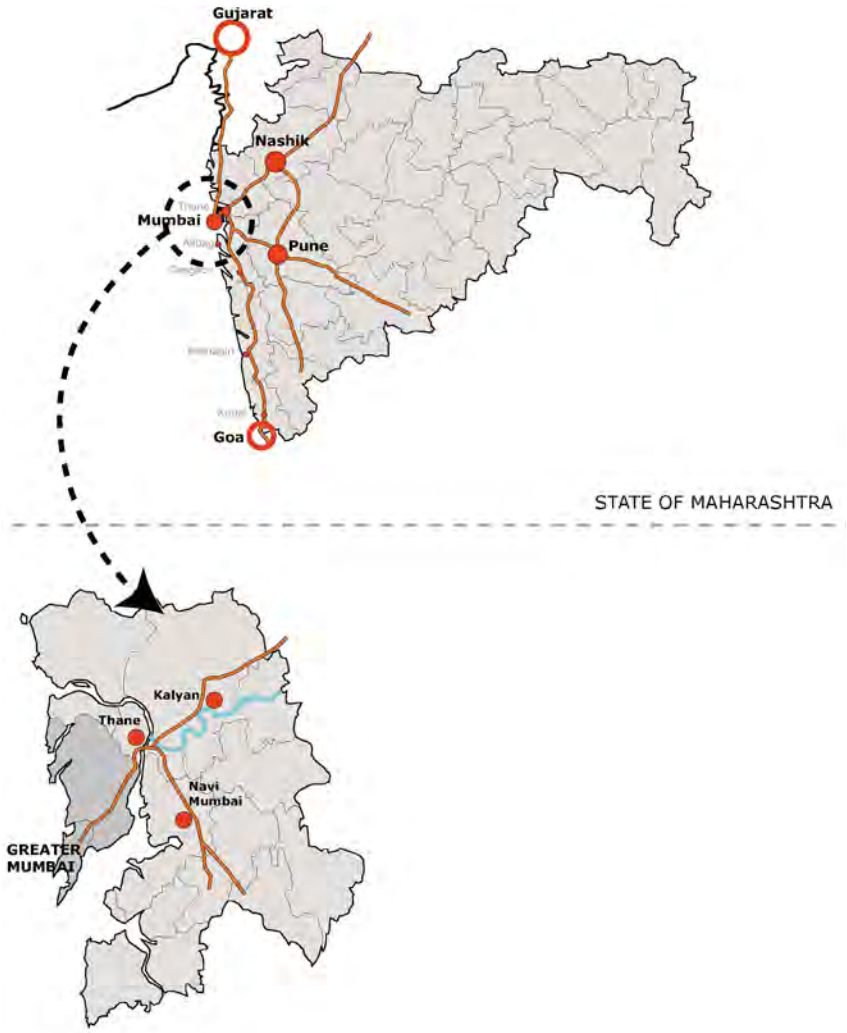
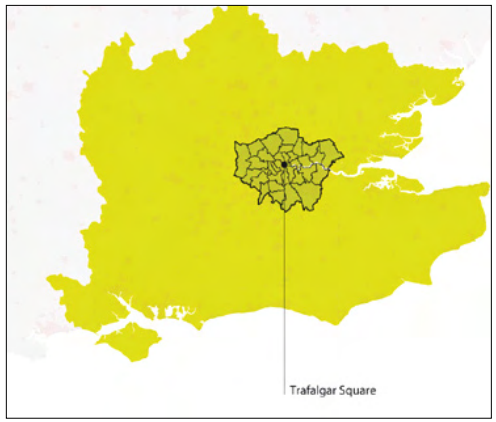
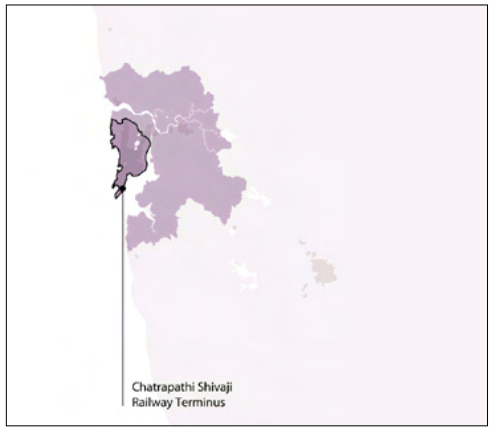


Figure: 1.1a.3
Regional Scale_Mumbai



Greater London:
Population: 7,538,440 people
Pop density: 4,800 pp sq. km.
Area: 1600 sq. km.

South East of England:
Population: 19,030,000 people



Greater Mumbai:
Population: 11,978,450 people
Pop density: 27,346 pp sq. km.
Area: 468 sq. km.

Mumbai Metropolitan Region:
17,768,993 people

Figure: 1.1a.4
Comparison of Scales
(Image Source: www.urbanage.net)

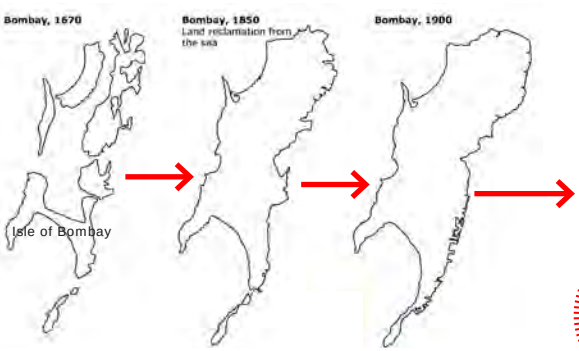


Figure: 1.1b.1
Reclamations of Bombay

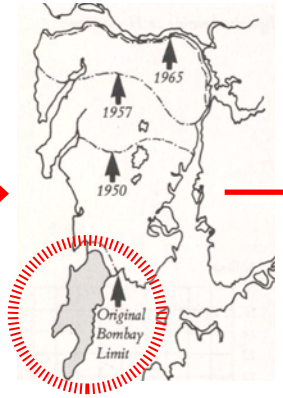


Figure: 1.1c.1
Municipal Extensions to the North

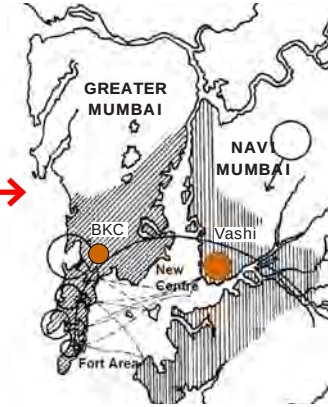
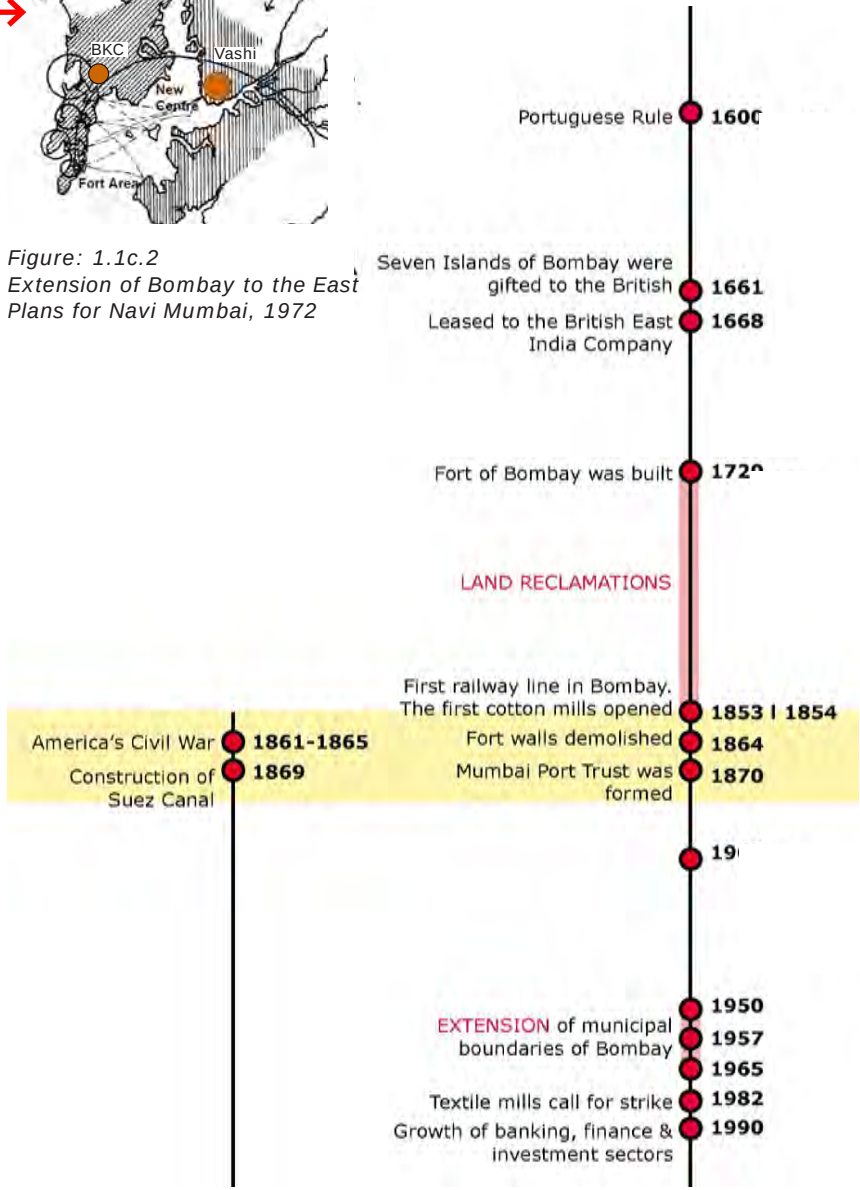


Figure: 1.1c.2
Extension of Bombay to the East Plans for Navi Mumbai, 1972

b. Historical Analysis:
To understand the exponential growth of the city and its spatial structure, it is necessary to look back in time to the period when the city was under colonial rule.

Mumbai was formerly known as Bombay. Until the 16th century, the island city of Bombay was an agglomeration of seven islands- Isle of Bombay, Colaba, Old Woman's Island (Little Colaba), Mahim, Mazagaon, Parel, Worli *(Refer Fig. 1.1b.1)*. The original isle of Bombay was only about 24 km long and 4 km wide. Bombay was then was under the Portuguese rule.

In 1661, the seven islands were gifted to the British and later in 1668 it was leased over to a trading company called East India Company from Britain. Seeing the opportunity to develop the islands for commerce and trade, the then governor of Bombay (of British origin) offered incentives for skilled workers and traders to move into the islands form the surrounding villages. The population of Bombay increased from 10,000 in 1661 to 60,000 in 1675. As soon East India Company took control of the islands they started developing Bombay for purposes of trade. A fort wall was built around the city and the fort of Bombay was established in 1720. These fort walls were later torn down in the year 1864.



By 1730, the demand for land steadily increased with the increasing population. A series of land reclamations were carried out from 1700 to 1850 to join the islands together *(Refer Fig 1.1b.1)*. In 1853 the first railway line was constructed establishing Bombay's connections to its rural hinterland. The following year the first cotton mills were opened in Bombay. Until this time Bombay used to export raw cotton to Britain and re-import textile. Bombay's black cotton soil was well suited for cultivating cotton. The British leased the lands to the Indian entrepreneurs to run cotton mills.

During the period of American civil war from 1861-1865, when the supplies from the USA declined, Bombay's cotton industries flourished and cotton exports grew. With the construction of the Suez Canal in 1869, Bombay's importance as a seaport grew and the Mumbai port trust was established in 1870. These are the two significant world events, which had an effect on the early economic growth of the city *(Source: Dwivedi.S & Mehrotra.R, 1995).*

The mills and the port were the dominant economy of Bombay until the 1980's when the first textile mills called for a strike. This was followed by a rapid decline in the textile industries. In the 1990's Mumbai also experienced a boom in banking, finance and investment sector, making the service sector the dominant economy of the city. Manufacturing declined in central city areas and was rapidly replaced by spatially dispersed capital intensive production. This was also the period when the city experienced a high rate of migration which caused an explosive population growth and increased urbanisation.

c. Extensions of the effective city limits:

Historically, the city of Mumbai has followed a linear growth model with the nerve centre at the Southern tip. Increasing population resulted in increased urbanisation of the land. Suburban areas developed to the North of the island city due to the linear structure of the city & the presence of the railways.

In order to accommodate the growing population, it became essential to extend the effective limits of the city of Bombay. Three extensions were carried out to the North- the first in 1950, the second in 1957 and the third in 1965 *(Refer Fig. 1.1c.1).*

Around 1972, regional plans were drawn up for Bombay, which aimed at an E- W orientation as against the predominant N-S orientation. New economic growth cores were planned in the Bombay Metropolitan Region so as to account for a more spatially balanced economic growth. According to literature on globalizing cities, this has been a dominant trend in planning in many world cities, particularly in the United States.

A new city called Navi Mumbai (New Bombay)was developed in the mainland to the east of Mumbai in order to reduce the congestion in the North- South axis of the island city *(Refer Fig. 1.1c.2)*. It has an area of 344km2 and is commonly described as the twin city of Mumbai. Navi Mumbai's population was expected to grow to 2 million in 2001; but according to the 2001 census the population of the city was only 703,947 persons. The key economic nodes in Navi Mumbai are Vashi, Nerul, Belapur, Panvel among many others *(Source: NMMC, 2008).*

A new business district was also planned in the suburbs within Greater Mumbai and to the North of the island city. This business district is called the Bandra Kurla Complex (BKC) and is in close proximity to the international airport *(Refer fig. 1.1d.2)*. The business district of BKC together with the twin city of Navi Mumbai were aimed at taking some of the pressure of the historical CBD in South Mumbai.

d. Urban Structure

The city of Mumbai can be best described with respect to its railways, which are also considered the lifeline of the city. The railway systems have been in place for the last 150 years, ever since the colonial rule. At peak hours the trains operate at four times their carrying capacity. Every day about 6.6 million people of the 11.9 Million population commute using the trains in Mumbai. There is a predominant movement of people from North to South during the day and from South to the North at night. This causes increased pressure on the transportation arteries, particularly the railways.

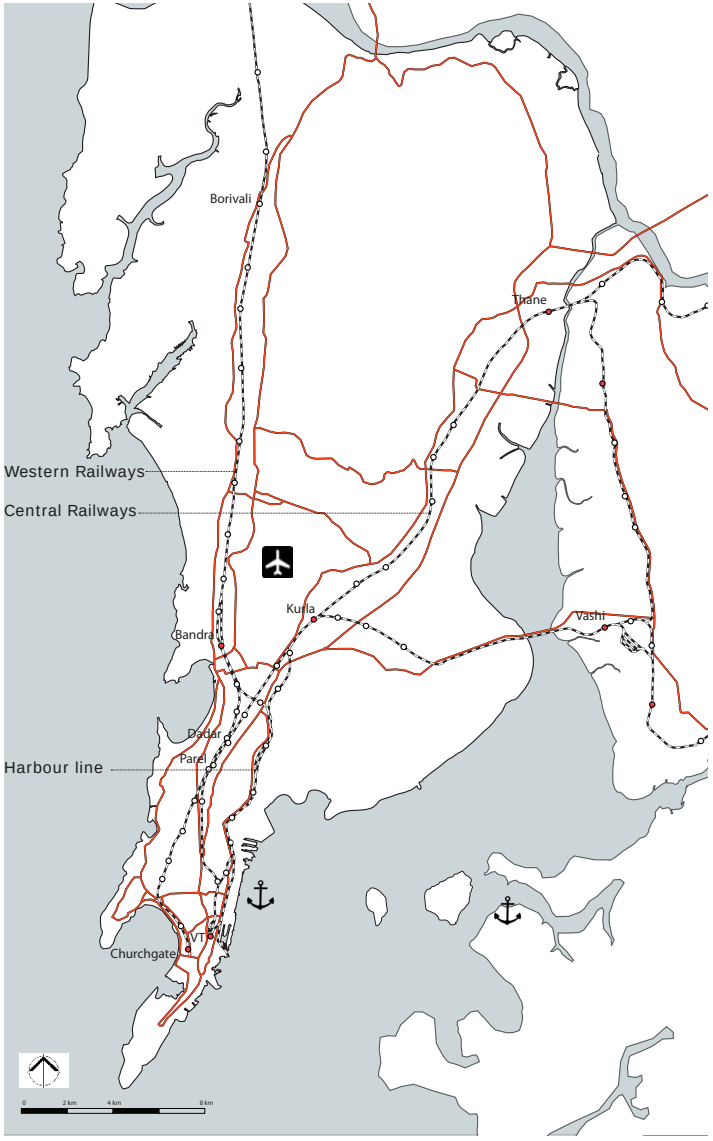


Figure: 1.1d.1
Rail Infrastructure & Arterial Roads

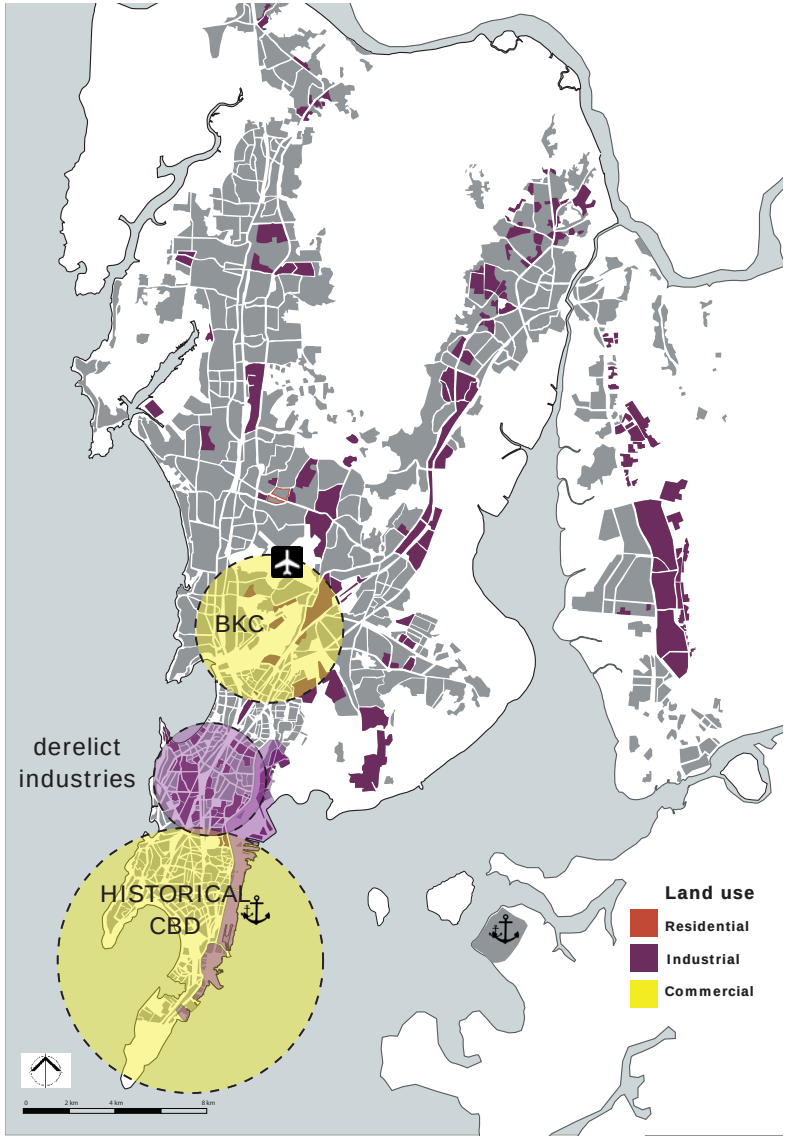


Figure: 1.1d.2
Urban development
Distribution of industries & commerce

There are two railways that run in a North-South direction in Bombay, namely, the Western Railways and the Central Railways. The Western Railways is the line that starts at Churchgate railway Station in the South and continues North through the suburbs and into Gujarat. The Central Railways starts at the Chatrapathi Shivaji Terminus (CST) or Victoria Terminus (VT) in the South and heads North-East towards the mainland. There is also the harbour line that runs parallel to the Central Railways for most of the stretch *(Refer Fig 1.1d.1)*.

The Harbour Line of the railways meant for dedicated port traffic now runs suburban trains at a low frequency and also at slow speed until Mankhurd. Beyond Mankhurd, a new bridge has been constructed and the Harbour Line continues to link Mumbai with Vashi, an important economic centre in the new city of Navi Mumbai.

The Mumbai railways unite not just the physical mass of the city, but also the people. There are few alternative modes of transport available from some of the suburban areas to the CBD, especially for the middle and lower income groups in the city. The complete dependency on the railways can also be considered as its biggest weakness.

Mumbai's infrastructure link to Gujarat and to the North has remained strong historically. However, in the 1960's, there was a structural change in the city. Bombay became part of the state of Maharashtra to the East, when the Indian states were re-organised as linguistic provinces. Despite the institutional and political forces which favoured this E-W orientation, Bombay still remains largely disconnected to the mainland partly because of its unique land geograohy and also in part because of the Sahyadri mountain ranges (Western Ghats) form a physical barrier between Bombay and the rest of the State *(Refer Fig 1.1d.3)*.

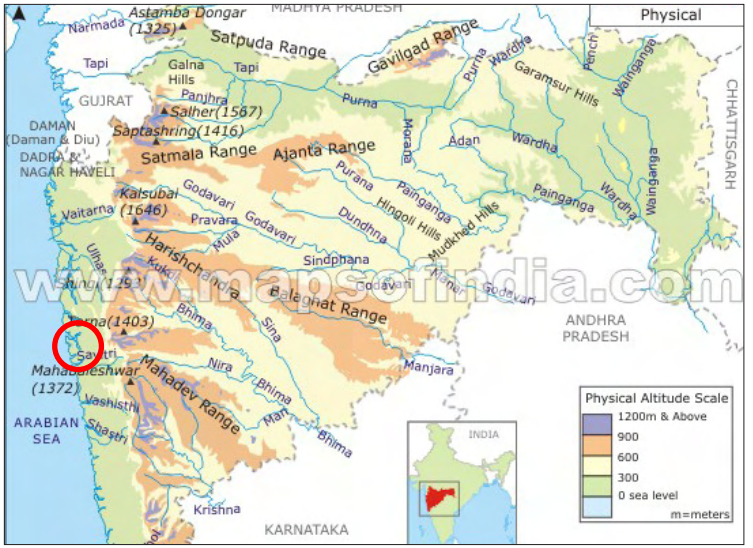


Figure: 1.1d.3
Physical Map of Maharastra
Source: www.mapsofindia.com

e. Mumbai as a regional gateway:

As a regional gateway, Mumbai's ports and railways play an important role in the transfer of goods and people, and in the more recent years, the transfer of knowledge and information. The seaport and the railways have defined the urban development and the spatial distribution of the city in the past. More recently, a second sea port is being developed in Navi Mumbai (called JNPT) and a second airport for the region is also in the pipeline at Panvel in Navi Mumbai.

1.2. Economic Restructuring

Shift from manufacturing to Service Based Economy
During colonial times, the textile industries were established in the periphery of the fort city. But, with increased urbanisation of Mumbai to the North, these areas soon became the geographical heart of the city. With the decline in these industries, valuable land resources to the tune of 600 acres became derelict in the central city making it a prime piece of real estate. New industries, which required capital and more skilled labour like engineering, healthcare, diamond polishing and IT, were established in the suburbs. *(Refer Fig 1.2.b)*.

Port activities in Mumbai have also taken a hit because of issues related to congestion of traffic arteries and problems of connectivity to the mainland. Moreover, privatisation of newly developed ports such as the JNPT in the mainland allowed for more competitive advantages in trade over the Mumbai Port Trust (MPT). Large tracts of the land owned by the Mumbai Port Trust (about 1800 acres) is now dotted with open spaces, underused warehouses and infrastructure and encroachments in the form of slums.

Service sector jobs are concentrated more in South Mumbai. 92% of the jobs here are in the Tertiary Sector *(Refer Fig 1.2.c)*. There has been a significant growth over the last 20 years in wholesale & retail trades, restaurants, hotels, transportation, finance, insurance, real estate, business services and telecommunication among others. Mumbai is primarily the financial capital of India. The island city on the whole accounts for 56% of the total jobs, of which 30% is located in the business district of South Mumbai.

However, it can be observed that there is a decline in the employment growth rate in the island city. The decline is greater in the rest of the island city as compared to the CBD. The suburbs show a considerable increase in the employment growth rate. This indicates an increasing trend towards suburbanisation of job supply.

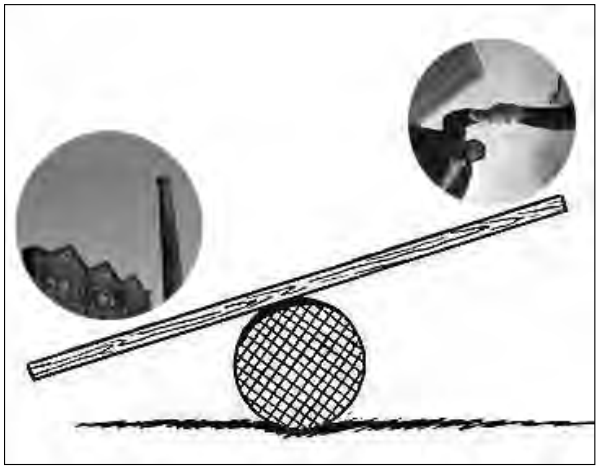


Figure: 1.2.a
Services take an upper hand over manufacturing

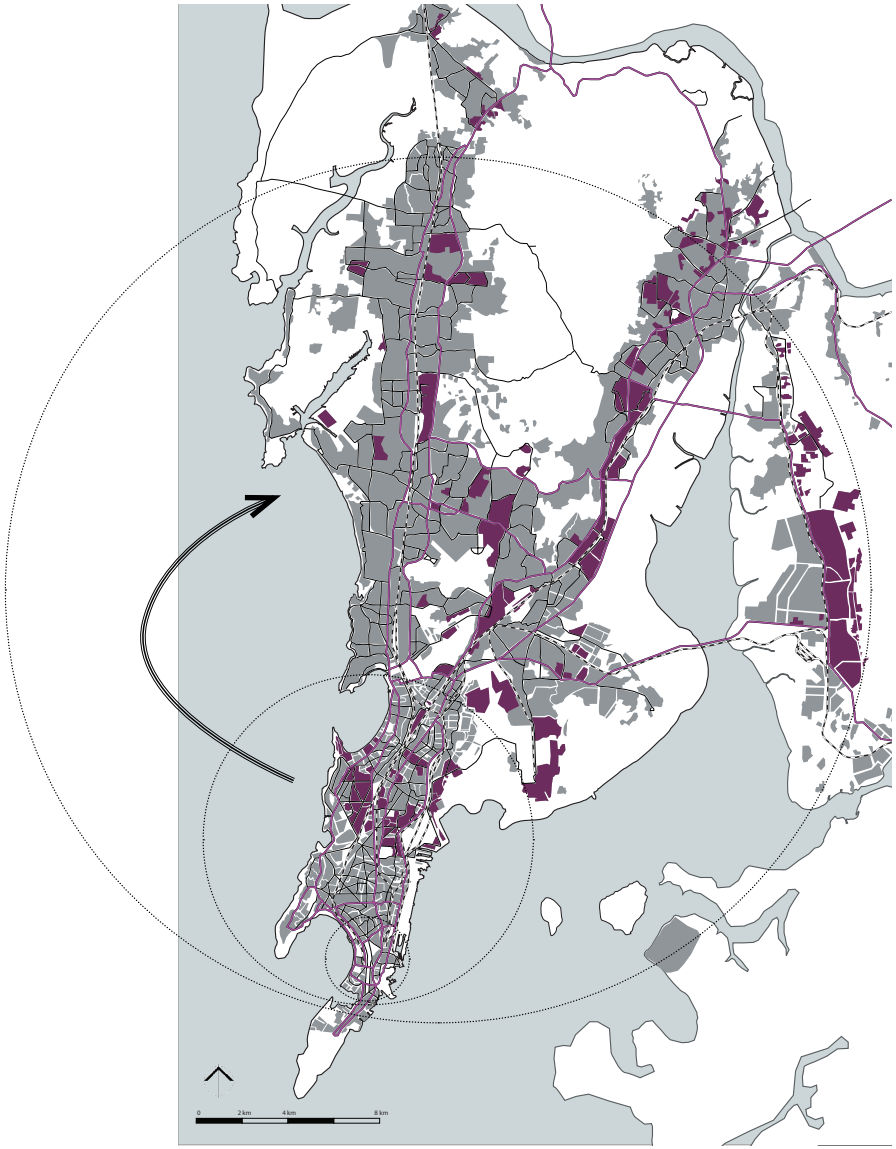


Figure: 1.2.b
Spatial effects of Economic Restructuring
Shift of industries to suburbs

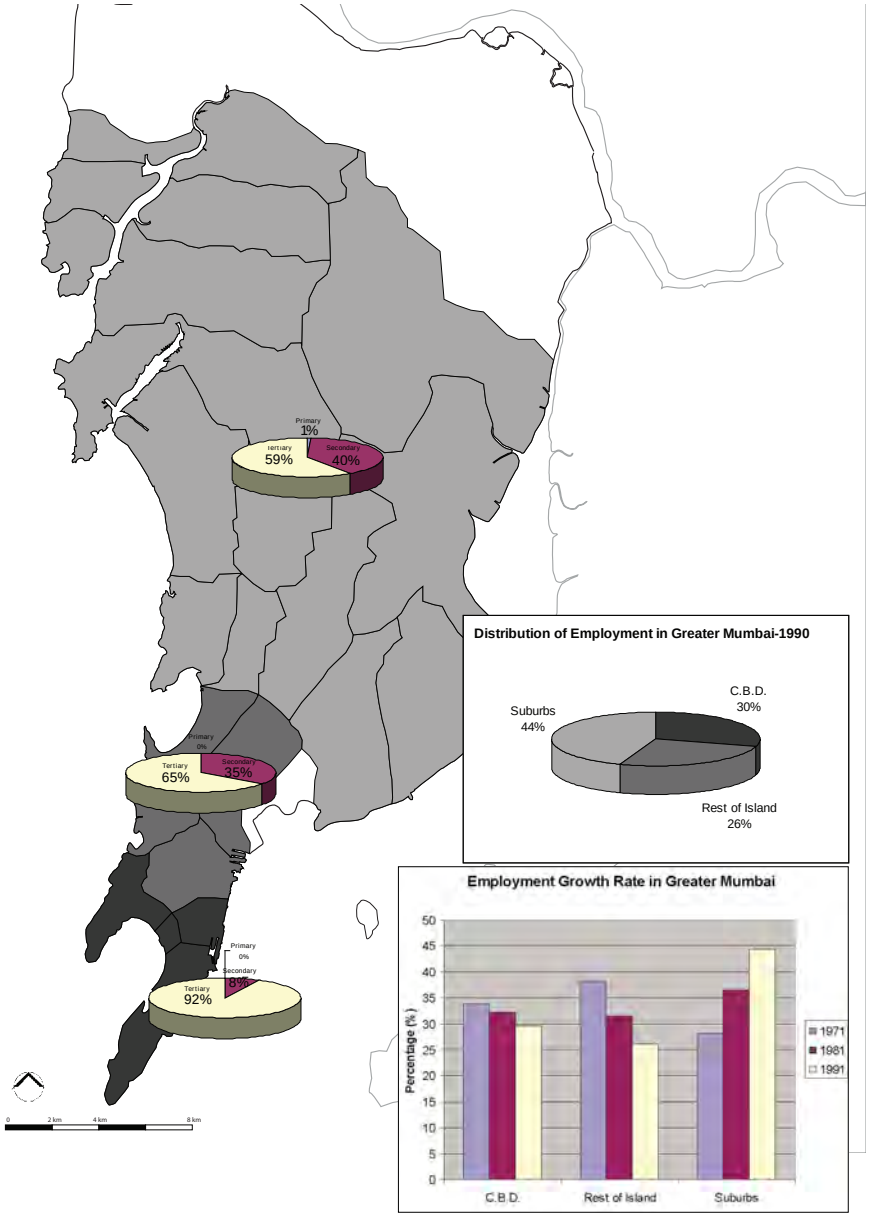


Figure: 1.2.c
Employment Growth and Distribution

1.3. Problem Field

The phenomenon of transforming economies is exemplary in the case of Mumbai. The city has evolved from being a trading town and textile manufacturing centre in the mid 19th century to being the the centre of India's commerce and finance in the recent decades.

The changes in the economic structure have brought with it important transformations in the city and its metropolitan area. The influx of migrants and the resultant increase in urbanization can be perceived as the most important challenge that the city is facing. In an effort to counter this urbanization process in the inner city areas, a more regionally balanced economic growth is being planned for, indicating a shift from a mono-centric city model to a multi-nodal metropolis.

The linear geography of the city of Mumbai coupled with the location of the business district at the tail end of the infrastructure in the South has contributed to its poor accessibility and increased pressure on the traffic arteries. Planning measures adopted by the government, such as developing a new business district of BKC mid-way along the North-South artery and the planning of the new city of Navi Mumbai across the Bay to the East are all aimed at relieving some of this pressure.

However, planning ambitions in the city seem to have a one sided economic focus while less has been done about realising the local concerns and realities. The new economic cores in the suburbs are aimed at providing the space and infrastructure required for global businesses to operate. With the loss of businesses, the CBD of South Mumbai stands threatenned in its positon as a dominant economic node for global businesses.

Interestingly however, the island city of Mumbai and particularly the CBD in South Mumbai is still the hub of all activities. It has an extremely complex urban and economic structure where several levels of economy and social groups co-exist. It is possible for a common man irrespective of his skill set, education level, or social status to be able to earn a means of livelihood in the city. The island city, despite its complexity and the associated urban problems of accessibility, congestion and quality of life, still works. This is what Bombay is to the common man.

As a result of the recent planning measures, the NS stretch between the two business districts of South Mumbai and Bandra Kurla Complex have now become an extremely contested piece of real estate with increasing land values. The derelict textile mill sites which are located along this stretch, are under threat of being developed in a piecemeal manner to satisfy interests of the elite or the private developers. What it has resulted in is the isolated developments of high rise structures, malls and multiplexes, with little or no thought given to integral city planning. With the decline in the port industry, the stretch of land along the Eastern Waterfront belonging to the Mumbai Port Trust, also faces a similar threat.

1.4. Research Questions

The key research question that the project addresses are:-
- What is the change in the spatial structure of the city of Mumbai as a result of transforming economies?
- How can the island city be developed in a more integral manner taking into account the soft locations in the city, which are strategically placed between the two business districts in question?
- How to improve the accessibility of the CBD?
- How can you realize local qualities, realities and identities while satisfying global interests?

1.5. Objective of the graduation project

Given the changing trend to a more service based economy and the exponential growth of the city both in size and population over the last few decades, the objective of my graduation project is to develop a strategic plan for the organisation of the city and the metropolis which has its relevance across the different urban scales.

- Improving the accessibility of the CBD to the region
- Reducing the pressure on the urban fabric of the island city by spreading urbanisation across the metropolis
- Realising local qualities, realities and identities while planning for the region

framework & planning

section ii

2.1. Methodology and Framework of Planning

The choice of methods used in the project are discussed below:

a. Literature Review:
The theoretical framework forms a starting point in the graduation project. The spatial transformations that occur in globalizing cities are studied making a relation to the parallel changes in the economic conditions of the cities. The city of Mumbai is examined as a specific case (a case based approach).

b. Urban Contextual Analysis:
An urban contextual analysis on the scale of the city, which will include:
- Location & Context
- Land Use & Geography
- Population & employment
- Infrastructure & connectivity
- Spatial Analysis
- Visual Image & local qualities
- Public Spaces

An urban contextual analysis on the scale of the region which examines connectivity and its position on a regional scale

Diagrams and spatial models will be used as tools or as a means of abstraction of reality

Statistics and pre conducted surveys will also be used as tools in the urban analysis.

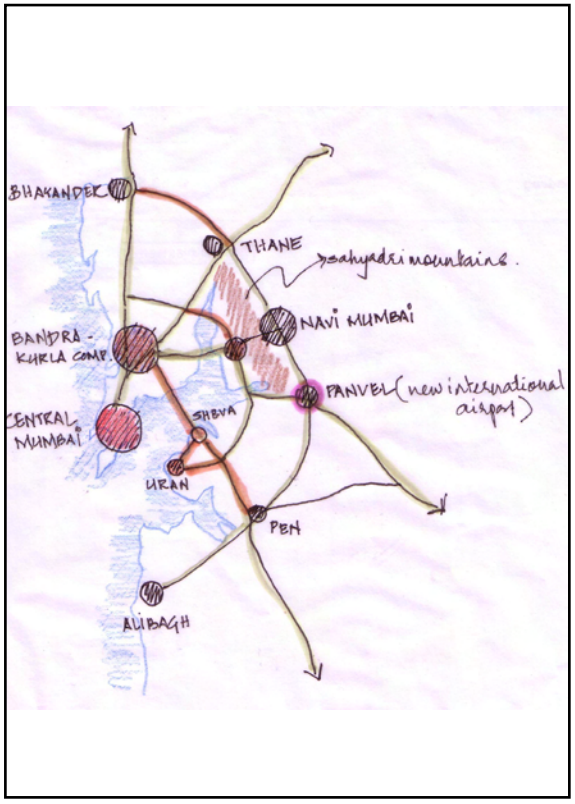
c. Lessons from History:
Analysis of the urban development history of Bombay in relation to infrastructure and economy
Historical analysis of Bombay as a seaport- at the national scale and the international scale

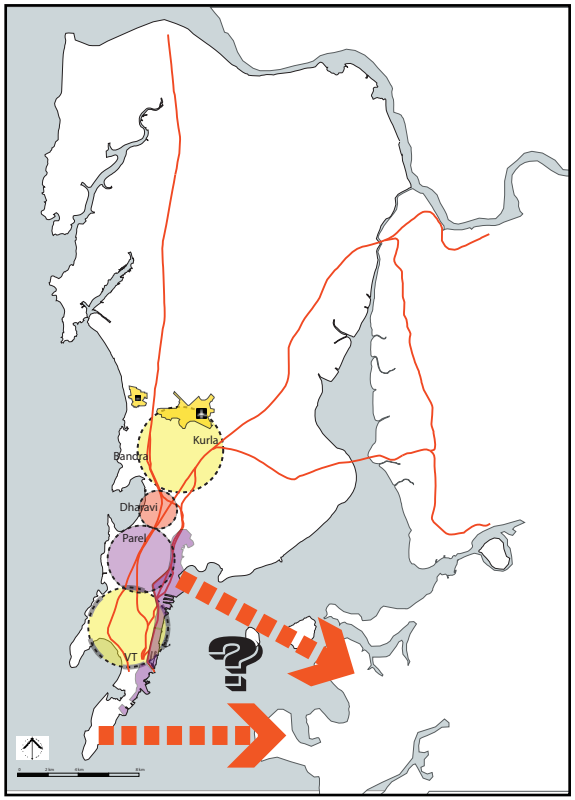
2.2. Products

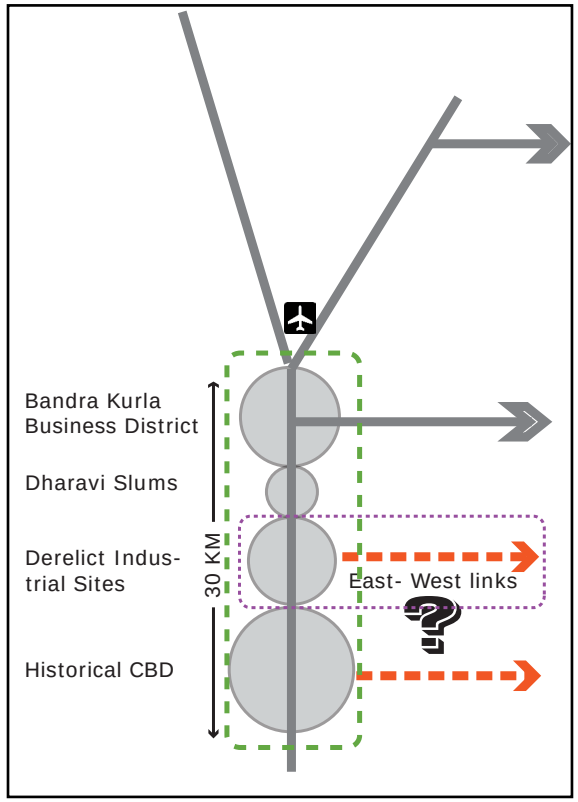
If city can be described as a process and not a state, then city planning should also be about planning a process and less of a product. The first step in the process is to have a vision/ objective. The second step would be to initiate the process.

The vision would involve developing a tool for the organization of the polycentric metropolis. It aims at making developments that are inclusive of local qualities, realities and identities. The strategic project will be aimed at triggering a certain process of transformation within the city.

Elements in the planning & design will include infrastructure, land use, urban density, street pattern and architectural form.







- Mumbai's changed relation on a regional scale
- A strategic project at the Eatern Waterfront aimed at opening up of the city of Mumbai to the Mainland.

The three scale levels of intervention:

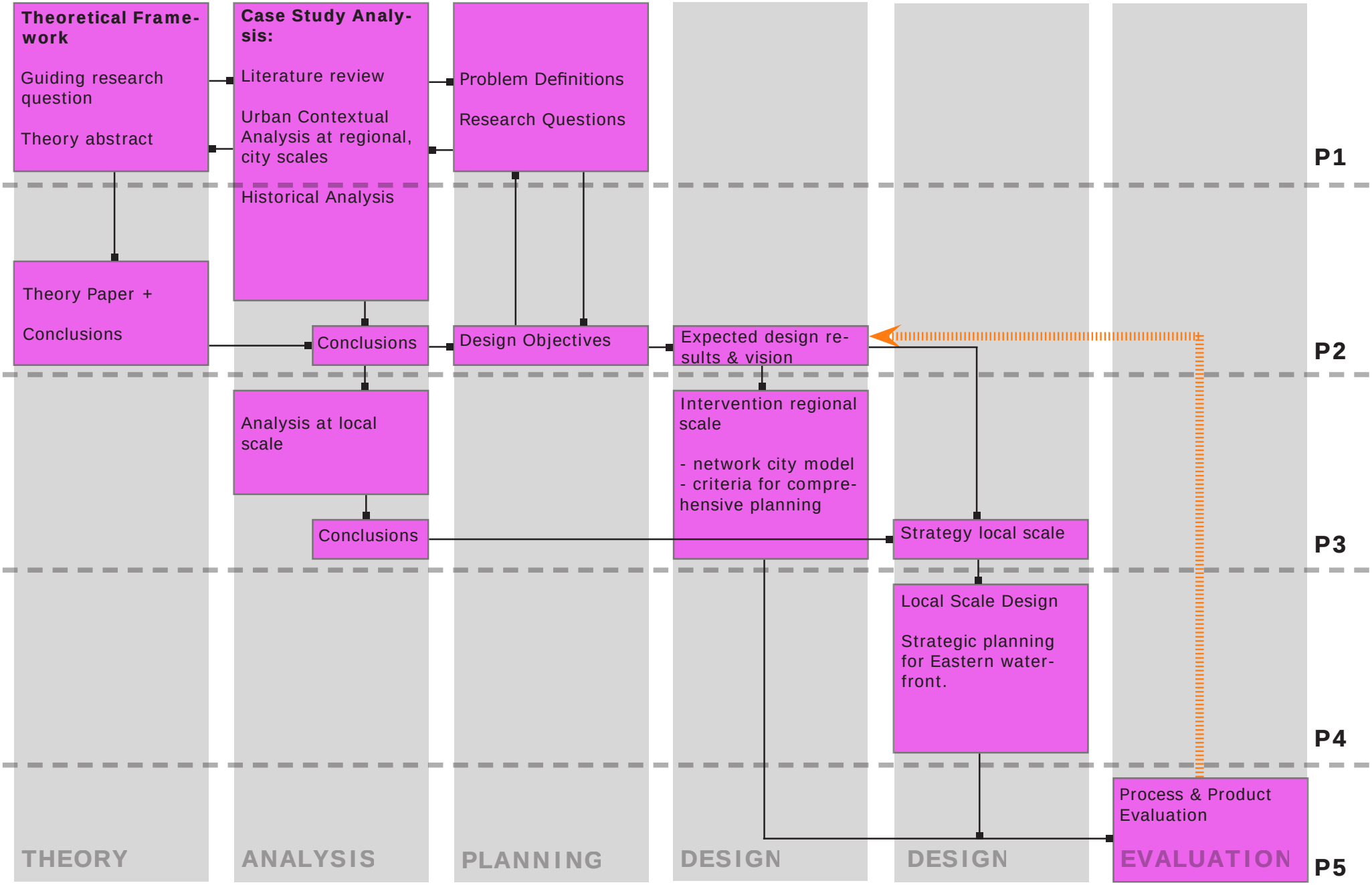
East West link from Island city to Mainland

30 km stretch from airport to historical CBD- marked by 4 centralities of different urban character and different levels of accessibility from the mainland

Derelict industrial sites with the East-West connection

Figure: 2.2
First sketches and impressions of the expected products

2.3. Phasing and Time Planning



2.4. Relevance

a. Societal Relevance:
In the wake of the urban problems that the city of Mumbai is facing, there are government undertaken visions to transform the city into a world class city like Shanghai. These visions are clearly targeted towards the economic growth of the city, while ignoring other pressing urban problems *(Source: Vision Mumbai, 2003)*. These plans are being opposed by concerned citizens and planners in the city.

The redevelopment of the derelict industrial sites of the mills and port, the protection of the ecological footprints along the Eastern waterfront and the rehabilitation of the slums at Dharavi are some of the main topics at the heart of all planning discussions in the city. All of the locations listed above are key "soft locations" in the city of Mumbai, which are under threat in the absence of comprehensive planning. If regulatory measures and a comprehensive planning vision are not adopted, then the city is bound to add to its many urban problems.

The project aims at addressing this very objective by taking note of the key spatial transformations in the city and by planning the soft locations in a more comprehensive and integral manner.

b. Scientific Relevance:
There is considerable scientific research being done in the field of economic restructuring having social, spatial and institutional impacts on the city. Some authors like Marcuse and Kempen focus on the spatial transformations that result from this. But these are usually generalizations based on Western countries. And Indian planning literature tends to be very specific to local conditions with lesser references made to global forces which affect local institutions.

The theoretical part of the project aims at filling this gap by drawing parallels between literature on globalising cities and the study of the case of Mumbai.

2.5. Personal motivation

My personal motivation for choosing Mumbai involves familiarity with the Indian context and my fascination towards COMPLEX CITIES of which Mumbai with its dynamic urban environment is exemplary.

Image Coutesy: Humayunn N A Peerzaada

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3.2. Bibliography

literature review

section iii

3.1. Literature Review_Theory Paper:

Spatial Transformations as a result of economic restructuring in the city of Mumbai

"Societal processes –like economic restructuring on a global level- have their impact on local institutions and developments" *Sassen.S, 1990.*
Globalization is causing a dramatic transformation in the world economy. In all probability spatial transformation on a local level can be the result of economic changes that happen globally. A global phenomenon of economic restructuring is the declining importance of manufacturing and the increasing importance of services. *"An important reason to expect spatial changes within cities is the changing nature of economic activities and the concomitant shift in locationof components of the production process" (Marcuse.P & van Kempen.R, 2000)* The theoretical research focuses on first examining the spatial effects of economic restructuring as a general process and then examining these effects in the context of the city of Mumbai.

The research questions that the paper focuses on are:
- What is economic restructuring?
- What are the key changes in the spatial structure of global cities?
- What are the other forces or processes that influences these changes?

The theory that is being studied for the graduation project is the theory on "Globalising Cities". Several key authors like Peter Marcuse, Ronald van Kempen, Robert A. Beauregard, Anne Haila to name a few have debated on the spatial transformations in cities and if they can be directly attributed to the phenomenon of economic restructuring.

As Rocco (2007) has rightly pointed out the literature on global cities is exhaustive but it often limits itself to examining the role of cities in a global system. "Less has been said about how the spatial structure and form of cities in contemporary capitalism have been affected by globalising forces." He makes a differentiation between a convergent spatial transformation which is common to most global cities due to common economic, social and cultural trends and some which emerges from very particular historic, political and social processes.

The paper aims at drawing parallels between literature and the study of the case of Mumbai. It starts with the assumption that global forces like economic restructuring indeed shape the spatial structure of cities. However, it focuses less on proving the relationship between economic restructuring and spatial transformations. While taking Mumbai as a case study to overcome generalizations in theory, the paper aims at examining the new spatial phenomenon in cities so as to comprehend the objective for development and the forces that have shaped them.

a. The phenomenon of economic restructuring

The term economic restructuring has been popularly used by authors like Saskia Sassen (1990) to describe the shift from a predominantly manufacturing to a more service based economy. The automation of the manufacturing sector had made certain types of jobs and production processes obsolete. Technological innovations have reduced the need for space and manual labour. Production processes changed giving rise to a more specialised production. A shift was observed from labour intensive production like garment industries to more capital intensive production such as steel, petrochemicals and automotive industries. Investors were willing to invest in the suburban areas where capital was less, and, space and labour were available in plenty. Industries declined in the central city areas and capital intensive industries developed in the urban periphery.

The decrease in industries in the central city areas are accompanied by an increase in service sector economy. Higher order services, which required high skilled labour, such as management, finance, law and politics are spatially concentrated in the central city. Lower order services, which needs unskilled and semi skilled labour, such as catering, surveillance and cleaning (Rocco, 2000) are found to be spatially distributed in places where there is a concentration of people.

In addition, the global age saw the emergence of free market, developments in ICT and transport as well as the growth of the informal sector. Moreover the service sector made possible flexible forms of employment.

Economic restructuring of Mumbai:

In Bombay, textile mills were the dominant industry from the mid 19th to 20th century. The urban extent during that period was limited to the early colonial city. The mills were established in the urban periphery of the then colonial city. The textile industries flourished for more than a century and were responsible for the initial economic growth of the city. With prosperity came increased urbanisation and the urban limits of the city had to be extended. The suburbs, where the textile industries were once located, soon became the geographic heart of the city.

After 1950, when India ceased to be under colonial rule, the profits from the textile industry were reinvested in capital intensive industries such as automobiles, diamond polishing and healthcare. They were spatially dispersed in the suburbs of the island city where land was cheap.

The textile mills started declining in importance and many mills had to be closed down after the labour strike in the early 1980's. There was also a decline in port activities in the island city. The Bombay shipping industry became more spatially concentrated (pre- loaded containers as against manual loading). The people who once worked in the mills and the shipping industry lost their jobs. The former industrial sites in the island city were left derelict. Private developers have capitalised on the situation and have started developing the derelict industrial sites for commercial benefits.

Over the last few decades, the service sector has gained dominance in the island city with a steady growth in banking, finance, trading, real estate and investment sectors. The historical CBD now has a higher concentration of jobs in the service sector economy while the suburbs show a rise in employment in the manufacturing sector.

Changing patterns of employment and mobility in Mumbai:

The changing patterns of employment from the manufacturing to the service economy caused a change in the nature of migration. The service sector attracted many young professionals to the city to serve in the global businesses. The increasing migration of people resulted in an increased demand for housing. This led to competition for houses, overcrowding and inflation of property prices. Middle income households migrated from central city to suburban areas in search of affordable and better quality housing.

With the advent of the service economy new types of jobs were realised. The economic restructuring of the city has made possible a greater flexibility in the choice and location of jobs. There were increased mobility rates accompanied by changes in residential patterns. A shift in jobs was often accompanied by a shift in residences- sometimes within the city itself and at other times necessitating movement to the suburbs. The service economy, although led to an increase in employment, did not cater to the same sections of the society employed in the low-skilled manufacturing jobs. Many resorted to the informal economy as a means of survival.

b. The changes in the spatial structure of cities

"Indeed, internal spatial patterns seem to play a very different role in cities today, and a very variable one: service-adapted patterns are different from manufacturing based patterns…
"(Marcuse and Kempen, 2000;1)

Economic restructuring implies a shift in the production process and a spatial transformation that has resulted from it. The most significant spatial change can be identified in soft locations in the city (such as transformed waterfronts, derelict industrial sites, etc.) and the regionalization of economy (of which edge cities is an important component). Increased socio-spatial fragmentation and physical boundaries between divisions can also be viewed as a key outcome of the service oriented economy.

i. Soft Locations

Soft locations according to Marcuse and Kempen (2000) are those particular sets of locations in cities where socio-spatial changes produced by market forces in the service economy manifest themselves. The key examples of soft locations which will be dealt with in this paper are:

- The transformed waterfronts
- Former industrial sites also referred to as "hollowed-out manufacturing zones" (Beauregard and Haila, 2000) or brownfield sites

Going by the definition, edge cities can also be considered as soft locations. But, simply because of the difference in magnitude of the transformation involved it will be dealt with separately.

Transformed Waterfronts

"…the restructuring of shipping that led to this spatial transformation was the consequence of forces that have operated in capitalist societies for some time, the most obvious being technological innovations and foreign competition."

Going by the arguments of Beauregard and Haila (2000), waterfronts have been historically used for shipping functions and port activities. Since the 1950's, with the restructuring of the economy the port activities have reduced, making it spatially more concentrated. Technological advancements have made possible the modernisation of ports. The reduced port activities can also be attributed in part to the development of new ports in the region.

In Mumbai, for instance, the Mumbai Port Trust (MPT) located on the Eastern waterfront of the city become more spatially concentrated leaving behind a landscape characterised with warehouses, underused infrastructure and encroachments in the form of slums. Moreover, a new seaport has been established in the mainland to the East, called Jawaharlal Nehru Port Trust (JNPT), which now handles most of the container traffic. In addition, the rise of the neighbouring ports in the region such as Kandla has resulted in reduced port activities at the Mumbai Port Trust (MPT).

With the current process of globalisation in cities, waterfront areas have now become the new locations for gentry and have been transformed into "landscapes of consumption" (Zukin, 1991). They have the advantage of being favourably located and often well connected by infrastructure. Waterfront areas suit the "world- class" image of the new service dominant cities. They are often located in close proximity to the Central Business Districts (CBD's), making it an attractive location for development.

In Mumbai, there exists 1800 acres of land with 28 Km of practically inaccessible waterfront along the Eastern edge of the city from Colaba to Wadala. Interestingly, only 50% of the MPT area (836 acres) is used for port activities. The transformation of the Eastern waterfront area in the city has been the topic of discussion among the main stake holders. The availability of land presents an unique opportunity in a city starved for space.

Former Industrial Sites

Brownfields or former industrial sites are those areas in central cities where there has been a decline in manufacturing. Labour intensive industries formerly located in central city areas have declined because they haven't been able to cope with technological advancements. Congestion of inner city areas coupled with contestation for space have caused the gentrification of

former industrial sites. Derelict urban areas can be seen as a potential for development.

In Mumbai, this opportunity presents itself in the form of abandoned sites of the once flourishing textile industry. The robust industrial buildings have either been cleared or adapted to new uses such as shopping, retail malls and restaurants. The sheer of magnitude of change is what makes it a new spatial phenomenon.

"Partially because of the difficulty of adapting the massive built form of outdated industrial plants to other uses… such sites often find no re-use: hence "hollowed out"…. The pace of the process of industrial abandonment seems to be remarkably accelerated today." (Marcuse & Kempen, 2000)

ii. Edge City Development

The appearance of edge cities have been debated as the most significant phenomenon of spatial change in the US and West-European cities. The literature on global cities is exhaustive but rarely takes into account the situation in countries other than the cities in the west. However, it is possible to draw parallel ties to cities all over the world. According to an article in The Economist, 2008, "Saudi Arabia is spending billions on new super cities to ease the growth of Jeddah and Riyadh. Egypt is building 20 new cities to divert people away from Cairo. It plans 45 more." Beauregard and Haila (2000) refer to edge cities as the multiple nuclei that have come to characterize metropolitan regions, indicative of a shift from a mono centric to a multi-nodal metropolis.

"The centre of cities decline or change form and functions, and new business districts spring up… new forms of cities are created at the edge of metropolitan areas; suburbanisation never seems to end." Marcuse & Kempen (2000; 1,2)

Edge cities, super cities, new towns, new economic growth cores or regionalization of economy are all the different terms given to the same concept. It is a trend that is indicative of suburbanization as a measure to counter the increasing urbanization in cities. The pioneers of this trend have been the US and European cities. New towns can be observed in Britain and France as early as 1950's.

Beauregard and Haila (2000), among many others authors like Keil and Ronneberger (2000), make a critical differentiation between edge cities and suburbanization. While suburbanization or urban sprawl has been identified as a trend since the early 19th century, edge cities are a fairly recent phenomenon prevalent since the early 1970's. The difference is that edge cities have an increased concentration of higher order services and business apart from residences, retail, commerce and industries common to most suburban areas. The growth of edge cities have been facilitated by corresponding developments in ICT, transport, as well as the demand for businesses in the suburbs.

There is also debate on whether central cities are under the threat of being replaced by edge cities. However, according to Marcuse & Kempen (2000) edge cities are not competitive but are instead planned for the "downplaying of dependence" on the central city. They may have functions similar to central cities, such as offices, housing, entertainment, etc, but on a lower scale. Some studies also show that businesses in the edge cities are still highly dependent on certain professional and financial services offered by the core city. (citation)

High real estate prices in inner city areas coupled with reduced lending by banks has made investors and developers look at alternative locations in the suburbs for property development. This explains in part why developments take place in suburban areas. It is proof to the fact that there are complex forces that actually shape a city and it is very difficult to draw a direct relationship between spatial changes and economic restructuring.

The social composition of edge cities leads one to believe that it contributes to social segregation. The affluent classes of the society indeed chose to relocate to the suburbs as they provide an attractive alternative for a life free of all problems common to central city areas such as poor quality housing, infrastructure and congestion.

The Anti-Urban Bias:
Edge cities can be viewed as an outcome of the anti-urban bias prevailing in cities today. The aim has been to slow urban growth in the central city areas and to tackle congestion by decentralising the city. World Bank argues that "slowing urbanisation down (in third world cities), or pushing it towards places not linked with world markets, is costly and futile".

Most critics view slums as a more serious spatial outcome of increasing urbanisation. According to the Census India, 2001, the slum population in Greater Mumbai is 6.4 million, which is 54% of the population of the city. Slums are an all important physical manifestation of poverty, characterised by sub-standard living conditions and low incomes. This lack of affordable housing and jobs can be seen as a direct or indirect consequence of the economic restructuring in the city.

"Anti-urban" views shared by planners and the government alike see the slums as an outcome of explosive urban growth. It is no wonder that all public policy and planning measures adopted aim at countering this urbanisation process. The aim is to decongest the cities by spatially dispersing the economic functions, so as to make economic growth more spatially balanced. But what the city probably needs is a more socially balanced economic growth. The slum dwellers need to be given the opportunity to improve their living conditions and to sustain themselves. The capital invested in making this feasible is a more sustainable alternative than re-housing them in outskirts and away from potential job opportunities. The World Bank Development Report (2008) argues that economic growth will be unbalanced, but development can still be inclusive.

Regionalisation of economy in Mumbai:
In Mumbai, the edge city concept is based on a spatial dispersion of economic activities to thwart urban growth. New economic growth cores were planned outside the city limit in 1972 so as to account for a spatially balanced economic growth in order to decongest the island city.

Three trends can be observed in the city- that of suburbanisation, followed by regionalisation of economy and the development of an edge city. The trend in suburbanisation has existed from colonial times to accommodate the increased population due to migration. However, this paper will focus on examining the suburbanisation process in the city from 1950 onwards. As mentioned earlier in this paper, after the Second World War, Mumbai started investing in capital intensive industries in the suburbs. These were located along important infrastructure corridors, the railways, and this triggered the suburbanisation process. Three municipal extensions had to be carried out in the city- the first in 1950, the second in 1957 and the third in 1965.

But the concentration of economic functions, particularly in the service sector continued to remain in the island city, clearly showing the dominance of the mono-centric city model. Except, in this case owing to the linear geography of the city and the location of the port, the central business district was at the South and suburbs developed to the North of the island city. In 1965, there was a restructuring of states in India based on linguistic barriers and Bombay became a part of Maharashtra. There were political forces at play, which desired Bombay to develop in an East-West direction and not towards the North. In 1972, plans were drawn up for the region which catered to this E-W growth, extending Bombay into the mainland of Maharashtra by developing new economic growth cores. This is the first instance of regionalisation of economy. However, it is interesting to note that these plans were not successful. They were revised in 1996, to cater to the liberal economic reforms and have still failed. A third revision is due in 2011. (Source: Uma Adusumili, Urban Age India Conference, 2007)

Edge cities are an important component in regionalisation of economies. In Mumbai, a whole new city was planned out in the mainland to the East. It is considered the largest planned city in the world and is called Navi Mumbai (New Mumbai). It has an area of 344 sq. km., while Mumbai has an area of 468 sq.km. There were economic nodes which were developed in Navi Mumbai and in the rest of the metropolitan area of Mumbai. Special Economic Zones (SEZ's) were developed in the new city and incentives given for businesses to relocate here. Navi Mumbai's population was expected to grow to 2 million in 2001, but according to the 2001 census the population of the city was 703,947 persons. (Source: NMMC)

c. The forces that influence spatial changes

Beauregard and Haila (2000) claim that the processes that shape cities have changed and they also agree that cities today differ spatially from the cities of the early to mid-20th century. But, according to them, the spatial form of a city is never a clear and perfect reflection of urban processes. The "ever present continuities" of the city inhibit large spatial transformations.

"The form of the city has changed, but not enough to support claims for undiluted postmodern or even post-Fordist spatiality….we see a more rhetorical patterning of old and new, of continuing trends and new forces." (Beauregard and Haila, 2000)

Keil and Ronneberger (2000) go on to prove that there are also complex social and political processes also at play in shaping cities. Examining the case of Frankfurt they mention: "While the causes of urban growth… appear expressed in rather abstract terms at first sight (globalization, restructuring), it has become clear that the real globalized flows of capital and people moving into and out of the city are very concretely guided, fought over and facilitated by local actors."

In some cities, like for example in the Jin Mao project in Shanghai, Foreign Direct Investment in large development projects plays a major role in defining the spatial image and identity of cities. The lofty skylines and transformed waterfronts of most global cities are meant to attract inward investment and to increase the urban competitiveness of the city.

d. Conclusions

It is hard to argue that cities are undergoing a change in its spatial structure. By examining the particular locations of change in the city of Mumbai, we can conclude that economic transformations have indeed been the trigger for most changes. But, the spatial changes have largely been effected by local institutions like social, political or real estate interests. A parallel tie can also be drawn to the very nature of spatial changes in most global cities. This is an indication of the fact that the objective behind the spatial transformations in cities has become global- i.e., catering to the affluent class and increasing urban competitiveness of regions. The forces that shape the city may be local, but the objective is truly global. Therefore, it can be concluded that while catering to the "global city" image and satisfying global interests seems to be the trend in most global cities, development lacks inclusion of local concerns and fails to realize local qualities, realities and identities.

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analysis

section iv

Figure: 4.1a.1
Sea Trade- 1675 AD

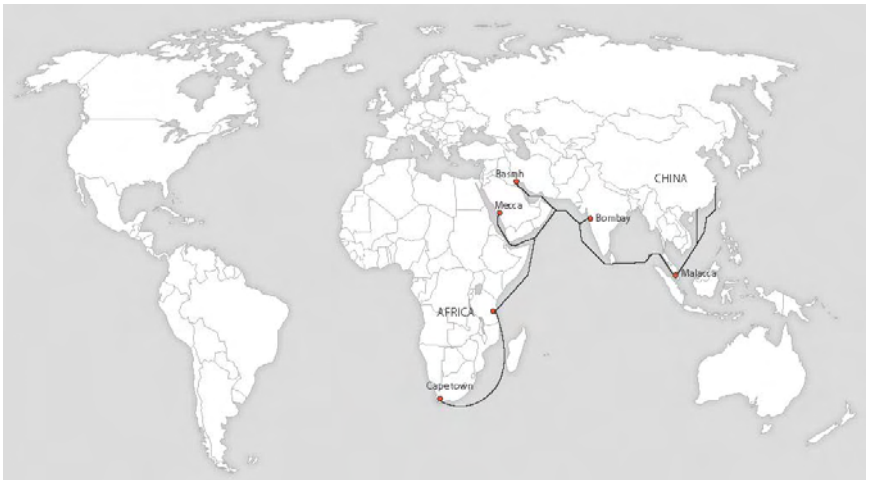


Figure: 4.1a.2
Sea Trade- 1767 AD

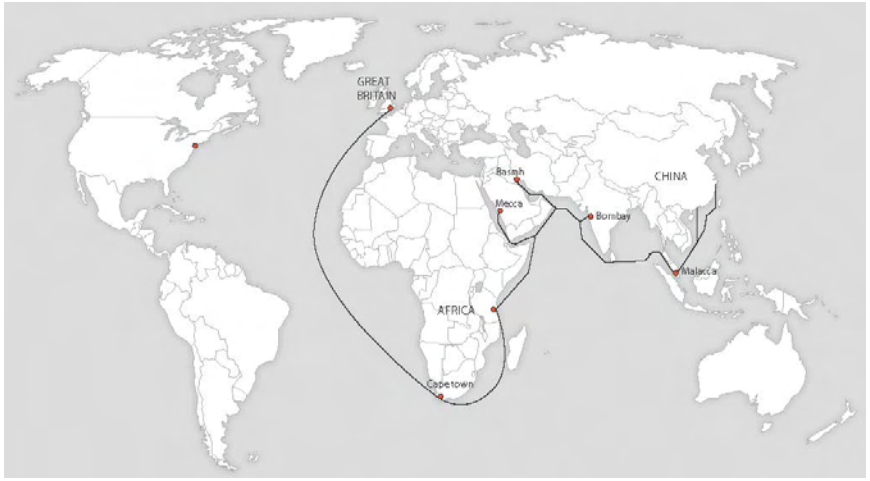


Figure: 4.1a.3
Sea Trade- 1869 AD
(Prior to the construction of the Suez Canal)

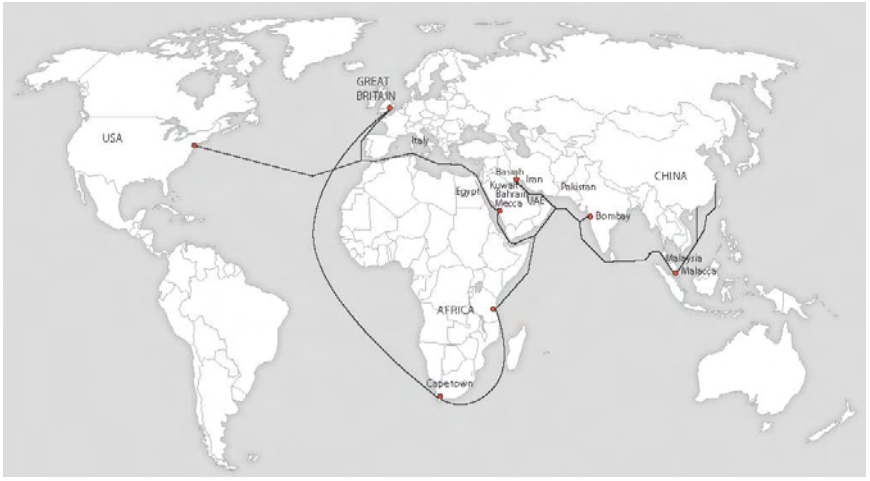


Figure: 4.1a.4
Sea Trade- Current Situation

4.1. Analysis_Regional Scale

a. Evolution of Bombay as a Seaport:

In 1675, the port of Bombay was one among the several ports along the Western Coast of India, which included- Surat, Broach, Cambay, Dabhul, Kelshi, Rajapur and Goa *(Refer fig. 4.1a)*. During this period, the colonial city of Bombay traded with the foreign ports of Basrah and Mecca. The volume of trade in Bombay progressed beyond coconuts and coir to include salt, betel nut, rice, ivory, broad-cloth, lead and sword blades. By 1767, trade included piece goods, cotton and pepper. *(Source: Dwivedi. S, Mehrotra. R., 1995)*

The second important milestone in the growth of the port was in 1813, when East India Company lost monopoly over foreign trade. There was an explosion of business and trade in the city following this.

The third important milestone was the opening of the Suez Canal for trade in 1869 AD. Bombay became the gateway city to the West.

Today Bombay's exports through the sea include textiles and furnishing, machinery, plastics, rubber, leather to name a few. *(Source: www.infodriveindia.com/Exim/Indian-Customs/Ports.aspx)*

Figure: 4.1a.5
Bombay's trade with local ports in India- 1675 AD

b. The seaports and its hinterlands:

"The patterns and processes of urbanisation in the developing world have been so strongly stamped by their colonial history that the contemporary reality cannot be properly understood without an analysis of the factors that were induced in the system during the colonial period to meet the requirements of imperialist exploitation."- (Raza. M & Habeeb. A, 1991)

While examining the position of the ports in the subcontinent of India, it can be seen that Bombay in the West, Calcutta in the East, and Madras in the South were the main colonial port cities (Refer fig. 4.1b). The railways were established by the colonial powers to link the port cities to its rural hinterlands in the

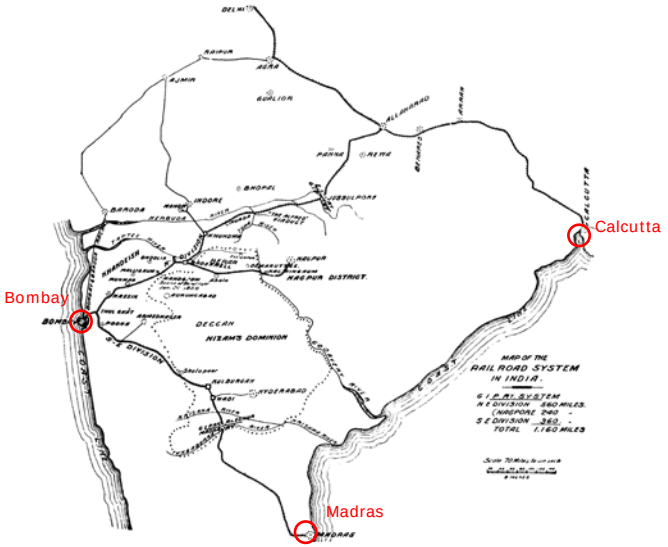


Figure: 4.1b
Extent of Great Indian Peninsular Railway network in 1870
Source: R.M.Brereton, 1907

region. This brought about distortions in the spatial structure of the country. The Indian subcontinent was virtually divided into hinterlands for the ports with the apices being the port cities themselves.

"...the centripetal pulls exerted by the inter-settlement linkages, which had evolved over time, were replaced by the centrifugal pulls generated by the metropolitan economy through the establishment of new port towns and orientation of internal commodity flows towards them." - (Raza. M & Habeeb. A, 1991)

The old ports were destroyed and Bombay, Calcutta and Chennai became the main ports for all export-import flows. According to Raza & Habeeb, smaller settlements in the hinterlands lost their function and there was a wave of migration from the rural areas to the large port cities.

The sea port and the railways are the 2 elements that have changed the underlying urban structure of the nation and the city of Bombay.

Figure: 4.1c.1
Main cities of India
Basemap Source: www.missionopportunity.com

c. Mumbai's position among the other major cities India: There are several other major cities in India today, which now compete with 4 main cities of India- namely Delhi, Mumbai, Calcutta and Chennai. *(Refer fig. 4.1c.1)*

Mumbai is the commercial and financial heart. The city is popularly called the "gateway city to the west".

Mumbai's international airport, the "Chhatrapati Shivaji International Airport" is India's largest and busiest hub and it primarily serves the city of Mumbai. *(Refer fig. 4.1c.2)* Two additional international airports are being planned out in the region at Navi Mumbai and Pune.

Figure: 4.1c.2
International airports of India
Source: www.mapsofindia.com

d. The Seaports of India:

On comparing the current situation of seaports in India, the number of major seaports in India has increased. The Mumbai Port Trust (MPT) now functions alongside two other major ports in the region- the Jawaharlal Nehru Port Trust (JNPT, also in Maharashtra) and Kandla (in Gujarat). *(Refer fig. 4.1d.1, 4.1d.2)*

With an increase in the number of competitive ports in the region, the hinterlands served by MPT have infact reduced. This explains in part the decrease in port activities at MPT. The JNPT now has the largest container traffic in the country. In the recent years, the decline in hinterlands of MPT coupled with technological advancements is threatening the future of the Mumabi port.

According to the Consolidated Port Development Plan for the Indian Ports Association prepared by the Rotterdam Port Authority (2007):

"Although it is obvious that the location of the port in the almost captive market of 15 million people is a strength of the port, it should be noted that adequate hinterland connectivity is an absolute condition. Traffic jams in Mumbai are notorious, therefore there will always be the threat that the cargo might go to another port in the vicinity….Severe competition is to be expected from minor ports and private ports in Gujarat. No synergy has been considered with Jawaharlal Nehru Port."

Figure: 4.1d.1
Major & intermediate seaports of India
Source: www.mapsofindia.com

Name	Cargo Handled (06-07) '000 tonnes	% Increase (over 05-06)	Vessel Traffic (05-06)	% Increase (over 04-05)	Container Traffic (05-06) '000 TEUs	% Increase (over 04-05)
Kolkata (Kolkata Dock System & Haldia Dock Complex)	55,050	3.59%	2,853	07.50%	313	09.06%
Paradip	38,517	16.33%	1,330	10.01%	3	50.00%
Visakhapatnam	56,386	1.05%	2,109	14.43%	47	04.44%
Chennai	53,798	13.05%	1,857	11.26%	735	19.12%
Tuticorin	18,001	05.03%	1,576	06.56%	321	04.56%
Cochin	15,314	10.28%	1,225	09.38%	203	09.73%
New Mangalore Port	32,042	-06.99%	1,087	01.87%	10	11.11%
Mormugao	34,241	08.06%	642	-03.31%	9	-10.00%
Mumbai	52,364	18.50%	2,153	14.34%	159	-27.40%
J.N.P.T.	44,818	18.45%	2,395	03.06%	2,267	-04.39%
Ennore	10,714	16.86%	173	01.17%		
Kandla	52,982	15.41%	2,124	09.48%	148	-18.23%
All Indian Ports	**463,843**	**9.51%**	**19,796**	**08.64%**	**4,744**	**12.07%**

Table: 4.1d.2
Comparison of seaports of India
Source: Indian Ports Association

e. Economy of Maharashtra:
The state of Maharashtra has the highest GDP, besides ranking the highest in per capita GDP *(Refer fig. 4.1e)*. It is the manufacturing and service sectors that contribute significantly to the state's Gross Domestic Product. These sectors provide nearly 80 per cent of the state's GDP, as compared with the national average of 65 per cent. Although manufacturing has declined in the central city of Mumbai due to the decline of the textile mills, there is a spatial dispersal and diversification of manufacturing functions in the region.

Maharashtra contributes almost 14.7 per cent of India's GDP and more than 15 per cent of the national income. The state also accounts for 40 per cent of the total tax collections in the country.

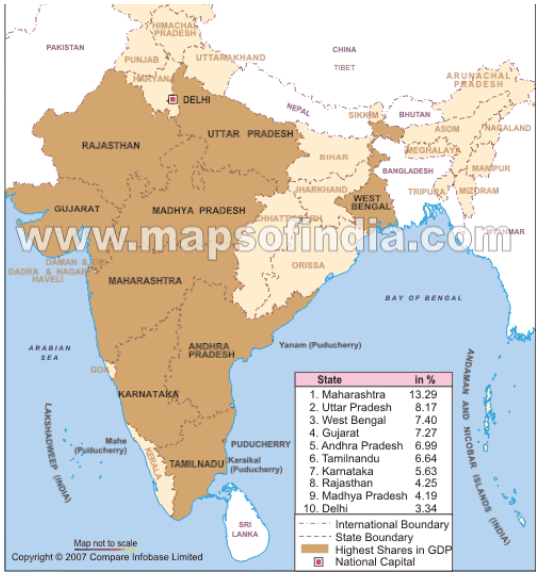


Figure: 4.1e
Highest share of GDP among Indian states
Source: www.mapsofindia.com)

About 70 per cent of India's stock transactions are in the capital city of Mumbai with the headquarters of the Reserve Bank of India and almost all central financial institutions and banks located here. Maharashtra has many specialised industrial estates for chemicals, textiles, leather, electronics and gems and jewellery at strategic locations. There is a Knowledge Corridor connecting Mumbai, Navi Mumbai and Pune with developments in IT industry. *(Source: Economic Research India Ltd., 2009)*

f. Mumbai on the regional network:
Maharashtra has a well integrated network of roads and railways with two international seaports (MPT and JNPT) and an international airport (in Mumbai).

While Mumbai seems to be located in a geographically favourable position along the west coast, an analysis of the infrastructure on the regional level shows that the business district in Mumbai is located at the tail end of the infrastructure. Thane and Navi Mumbai appear to be better connected regionally connected. *(Refer fig. 4.1f)*

g. Politics, Economics & Geographics:
Prior to 1960, parts of Western Maharashtra and Gujarat were part of the Bombay state. In 1960, there a political re-organisation of the states in India based on linguistic barriers, when the city of Bombay became part of Maharashtra.

Favourable economic policies in the 1970s led to Maharashtra becoming India's leading industrial state. However, regions within Maharashtra show wide disparity in development. Mumbai, Pune and western Maharashtra are the most urbanised areas. *(Ref fig. 4.1g.1; Image Source: Census Office, Mumbai)*

In 1970's, the Mumbai Metropolitan Region was delineated to included the Mumbai city, suburbs, parts of the districts of Thane and Raigad and the Mumbai Metropolitan Regional Development Authority (MMRDA) was established. The preparation of the Regional Development Plan (1970-1991) was undertaken.

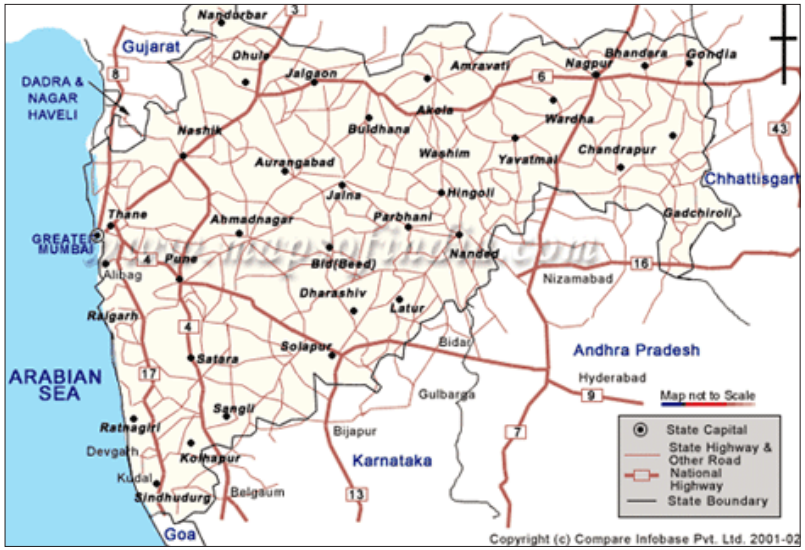


Figure: 4.1f.1
Road network of Maharastra
Source: www.mapsofindia.com

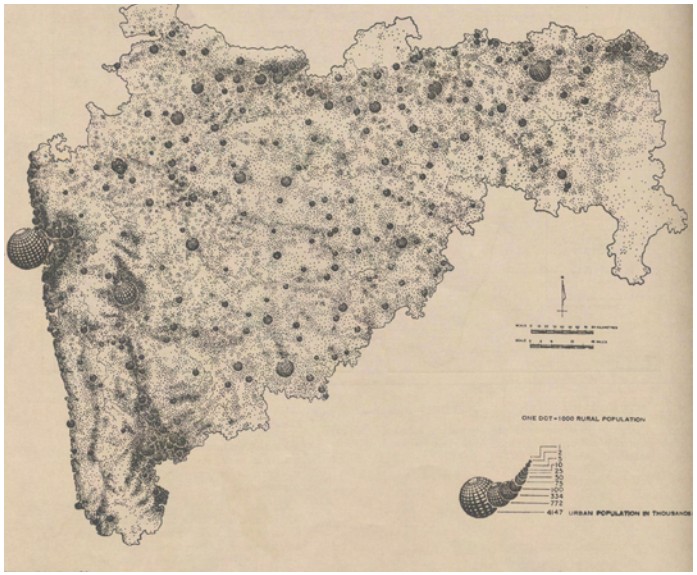


Figure: 4.g.1
Distribution of population in 1961 (1 dot=1000 population)
Source: Census Office, Mumbai

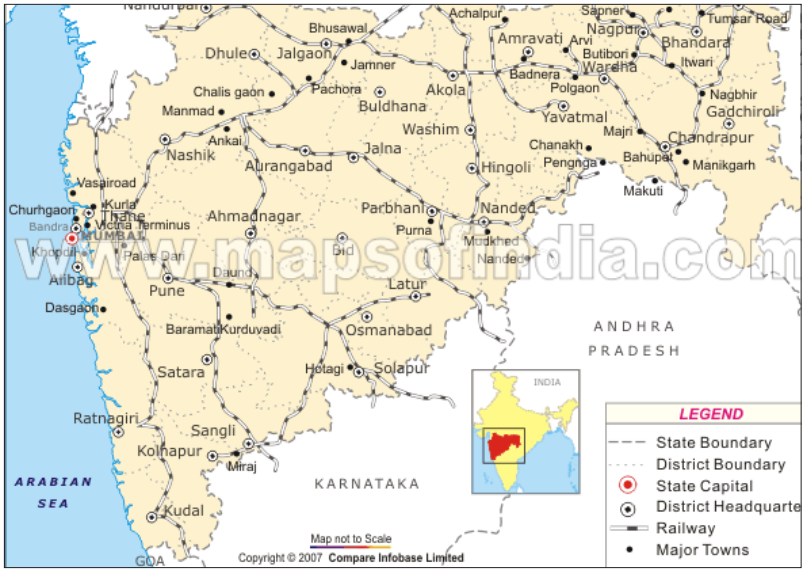


Figure: 4.1f.2
Railway network of Maharastra
Source: www.mapsofindia.com

In 1971, City and Industrial Development Corporation (CIDCO), was established to plan and develop Navi Mumbai with target population of 2 million. Decentralisation of economic activities and population by developing other parts of the Mumbai Metropolitan Region were the main planks of that strategy. MMR is a highly urbanised area with 13 Municipal Councils, 7 Municipal Corporations and a few non-municipal towns. In addition, there are more than 900 villages in this region.

(Source: Report on the population and employment profile of Mumbai Metropolitan Region, prepared by the Chief Planning Division, 2003)

4.2. Analysis_Greater Mumbai

a. Urban Development History of Bombay:
Bombay is one of the megacities of the world, with a growing urban population and a growing urban area.

The island city of Bombay has an area of approximately 76.8 sq. km. and the suburban district has an area of 405.9 sq. km. *(Source: www.demographia.com)*

The early Bombay was concentrated within the fort walls encircled in red *(Refer Fig: 4.2a.1)* with the European settlements to the South and the Indian settlements to the North

The succesive developments to the North have taken place along the rail infrastructure *(Refer Fig: 4.2a.2 & 4).*

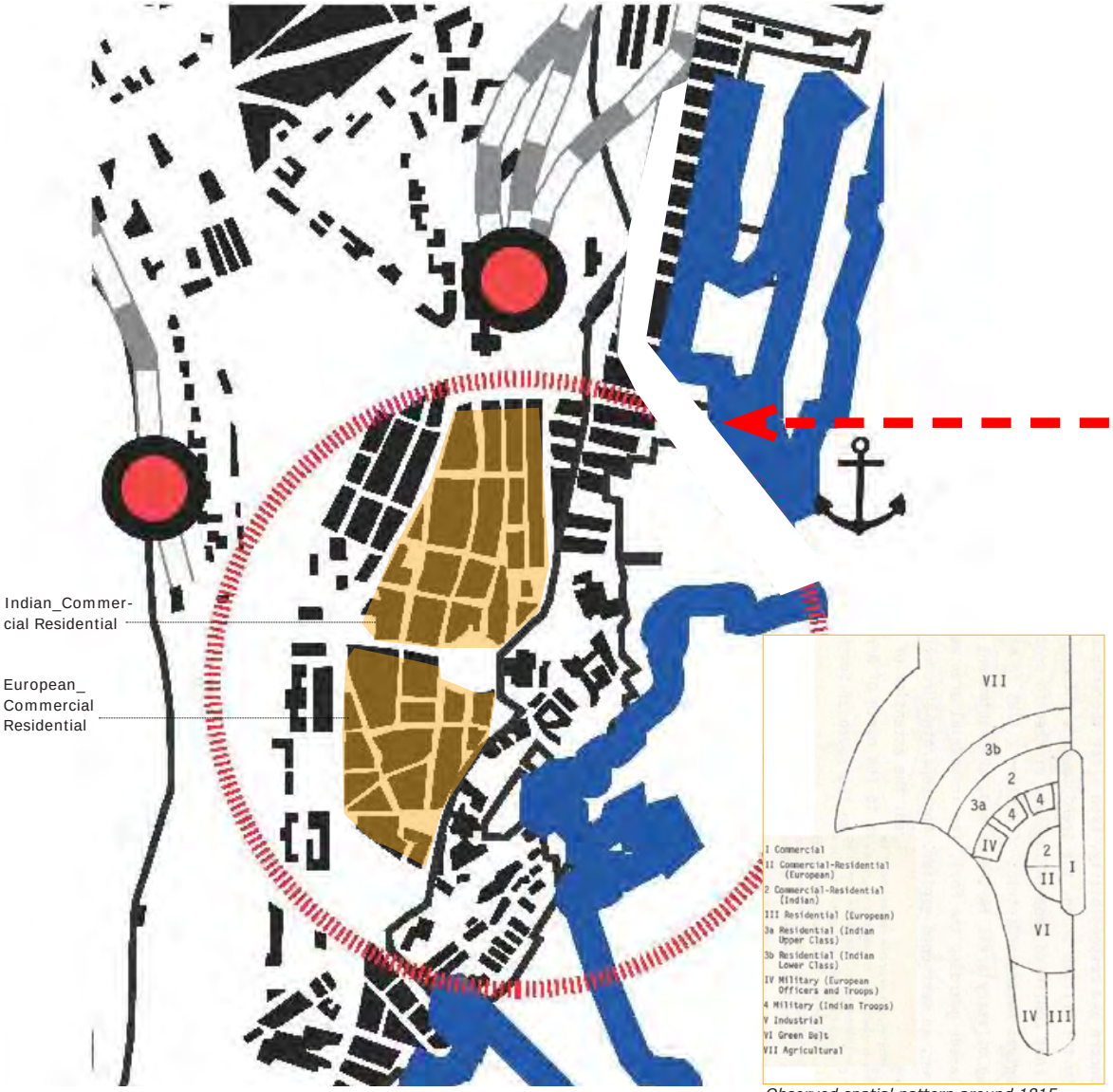


Figure: 4.2a.1
Fort Area of Bombay in 1868

Observed spatial pattern around 1815
Image Source:

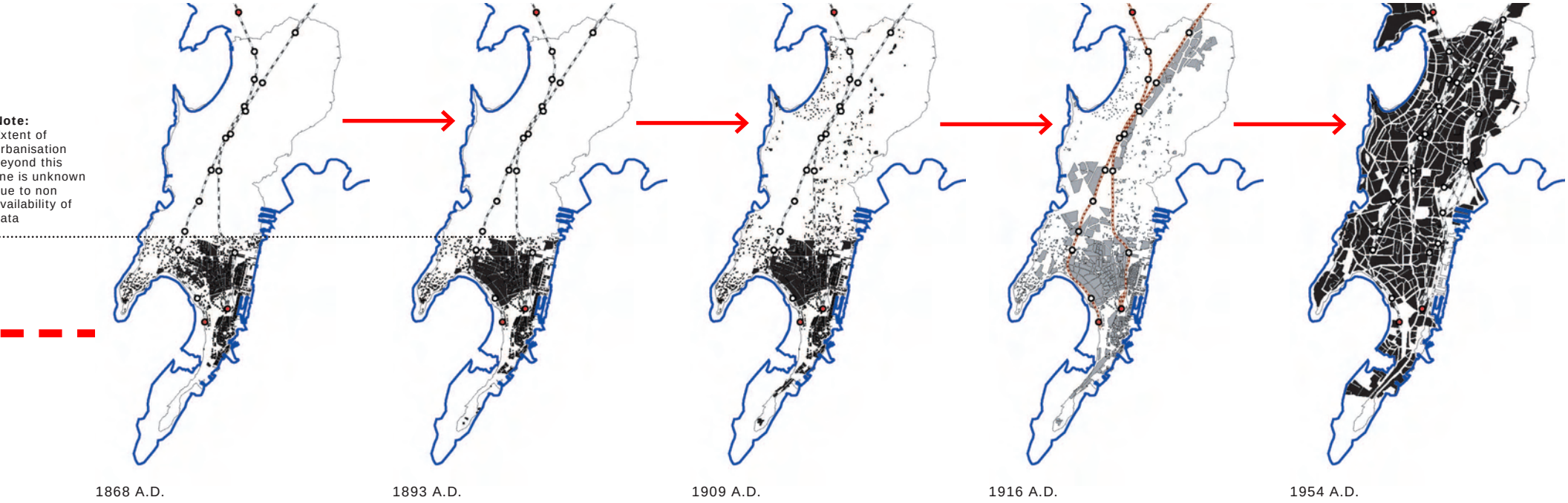


Figure: 4.2a.2
Urban Development History_Island City

Year	Island Population	Suburban Population	Total Population	Compound growth rate
1901	7.76	1.52	9.28	
1911	9.79	1.69	11.49	2.16%
1921	11.76	2.05	13.80	1.85%
1931	11.61	2.36	13.98	0.13%
1941	14.9	3.11	18.01	2.57%
1951	23.29	6.65	29.94	5.21%
1961	27.72	13.80	41.52	3.32%
1971	30.7	29.00	59.71	3.70%
1981	32.85	49.58	82.43	3.28%
1991	31.75	67.51	99.26	1.87%
2001	33.27	85.88	119.141	1.84%

Figure: 4.2a.3
Population Growth Table

1916 A.D.

1954 A.D.

2001 A.D.

Figure: 4.2a.4
Urban Development History_Greater Mumbai

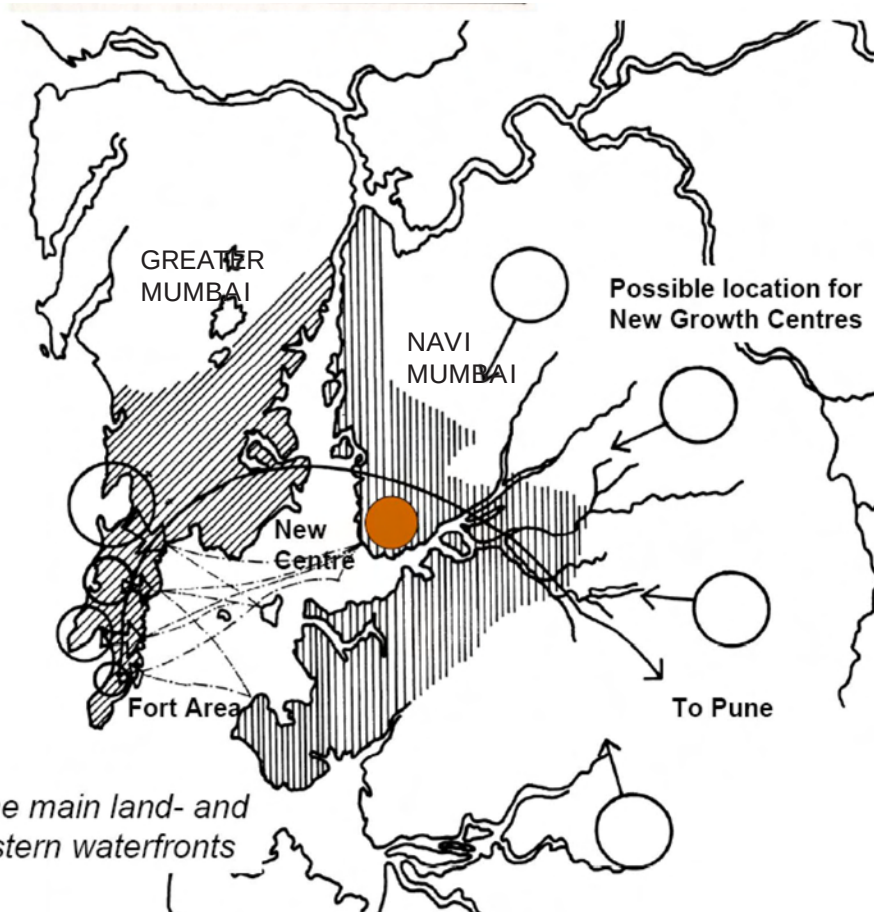
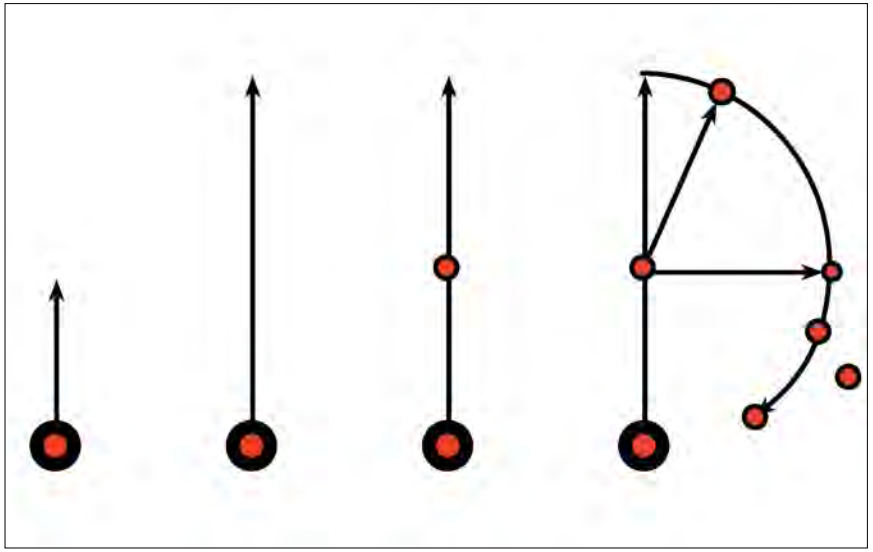


Figure: 4.2a.5
Diagram showing the Regional Deveopment Vision for Mumbai, 1972
Source: Charles Correa's Presentation at Urban Age India Conference , 2007



Historically the growth has been from South to North direction. Since 1972, East West has been favoured politically, resulting in the development of new economic growth cores in the region. A shift can be observed from a monocentric to a more multi-nodal metropolis.

The twin city of Navi Mumbai with its many economic centres have been planned in a phased development process *(Refer Fig: 4.2a.6)*. Stage 1 involved the construction of the Vashi bridge across the bay linking BKC business district to the mainland. Stage 2 & 3 involved the development of the commercial node of Vashi and the industrial node of Airoli respectively. Stage 4 involved development of nodes Nerul, Belapur and Panvel. The international airport project in pipeline will be located at Panvel. Stage 5 involved the development of the JNPT port at Nhava Sheva. Currently, the developemnts are at Stage 5, with Uran and (in the South) as a planned development node. Stage 6 of the planning also involves a new road bridge connection linking Sewree along the East Coast of Mumbai to Sheva in Navi Mumbai.

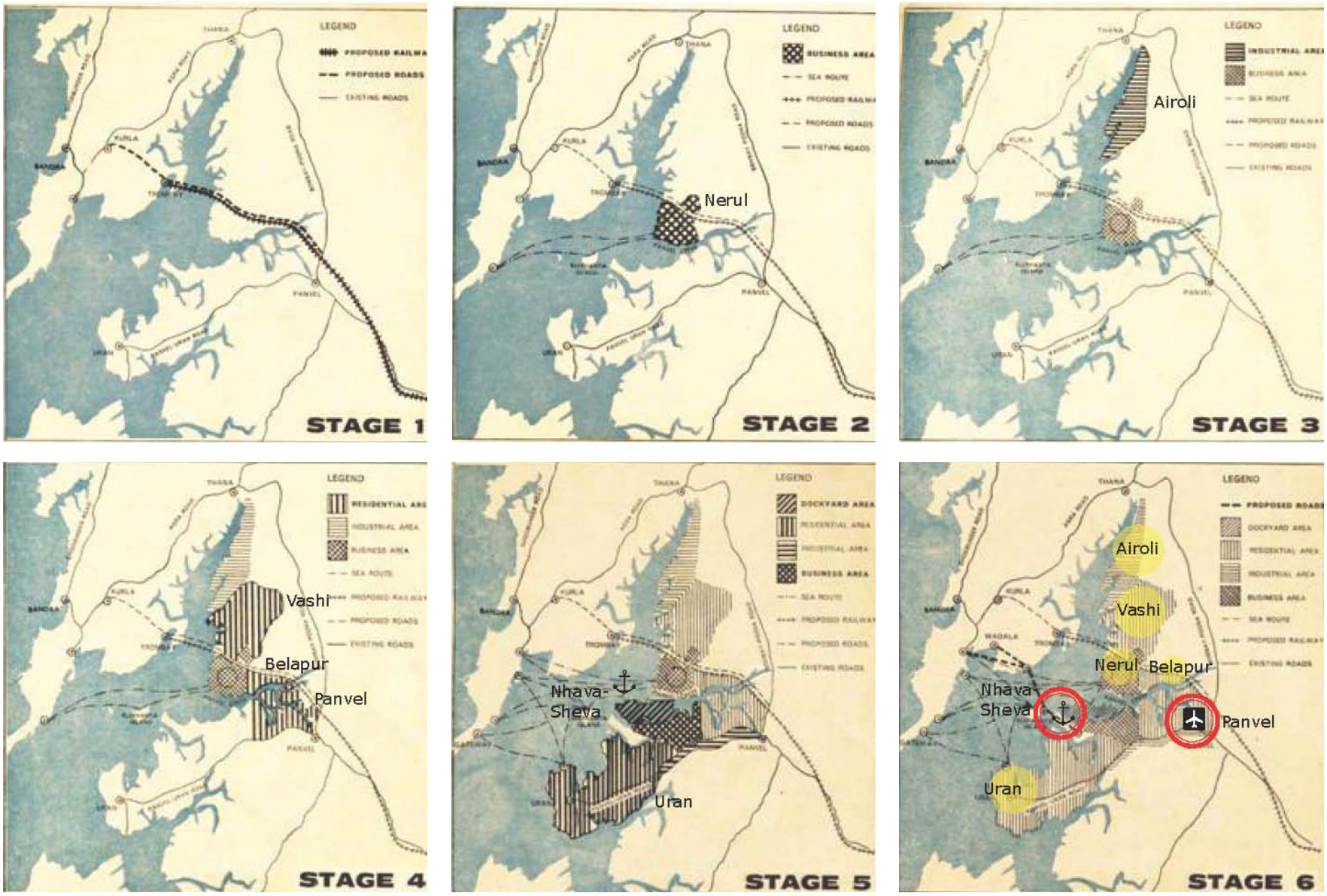


Figure: 4.2a.6
Planning of the twin city of Bombay; Navi Mumbai
Authors: Charles M. Correa, Pravina Mehta, Shirish B. Patel
Source: Bombay, Planning and Dreaming Marg, vol. XVIII No. 3 June 1985, pg. 29-56

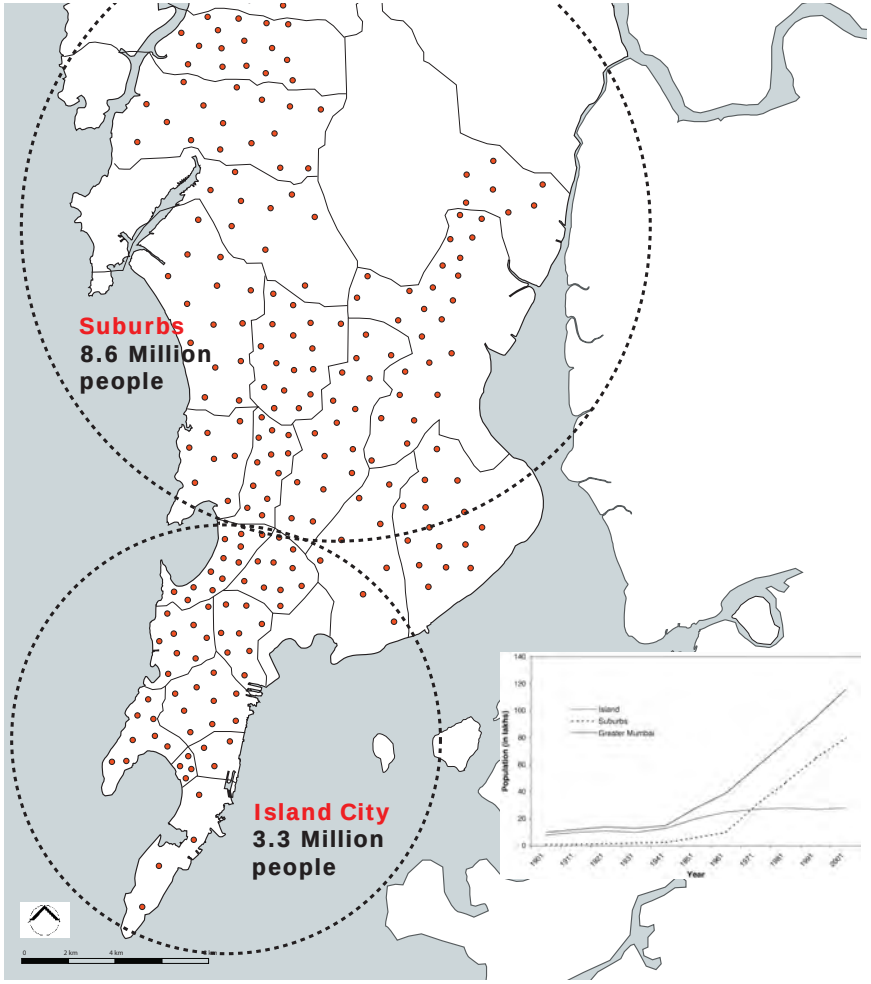


Figure: 4.2b.1
Mumbai_Population growth and distribution

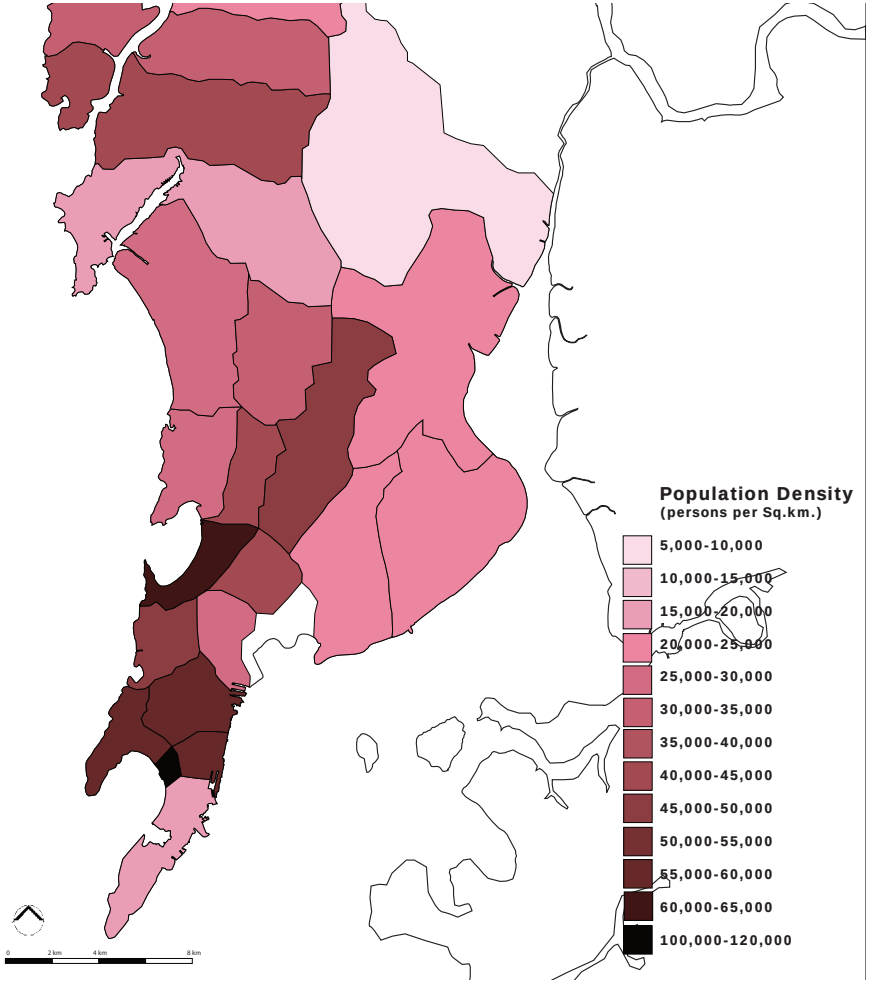


Figure: 4.2b.2
Mumbai_Populatin Density

b. Population growth & distribution:

Greater Mumbai is home to 11.9 million inhabitants, of which 3.3 M live in the island city and 8.6 M live in the suburbs *(Refer Fig. 4.2b.1)*. There is an increasing growth of population in the suburbs but population in the island city seems to have stabilised. Although the population of Greater Mumbai has been increasing, its growth rate has declined in the last two decades. Migrant population to the city is also showing a declining growth rate.

Population density is the highest in the island city, with an average of 43,000 persons per square kilometre. The Southern and the North- Western suburbs have an approximate population density of 25,000 persons per square kilometres. The North Eastern suburbs have the least population density with approximately 9000 persons per square kilometre. *(Refer Fig. 4.2b.2)*

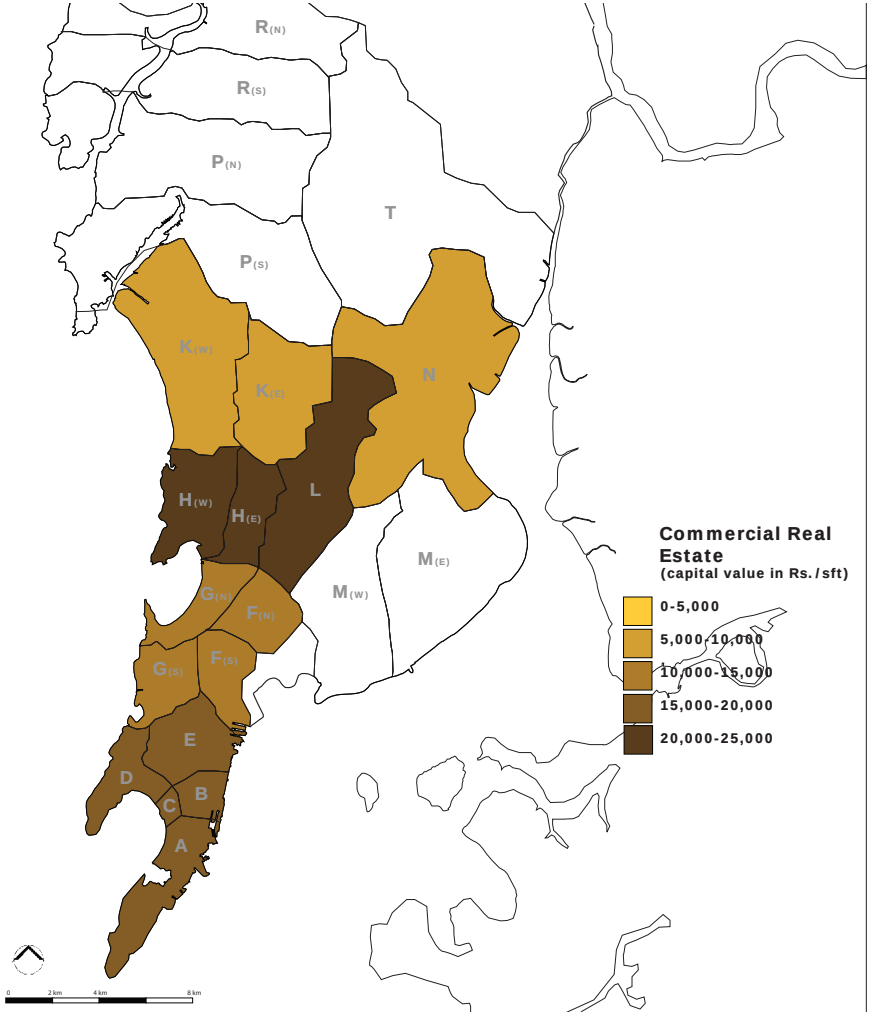


Figure: 4.2c.1
Mumbai_Commercial Real Estate

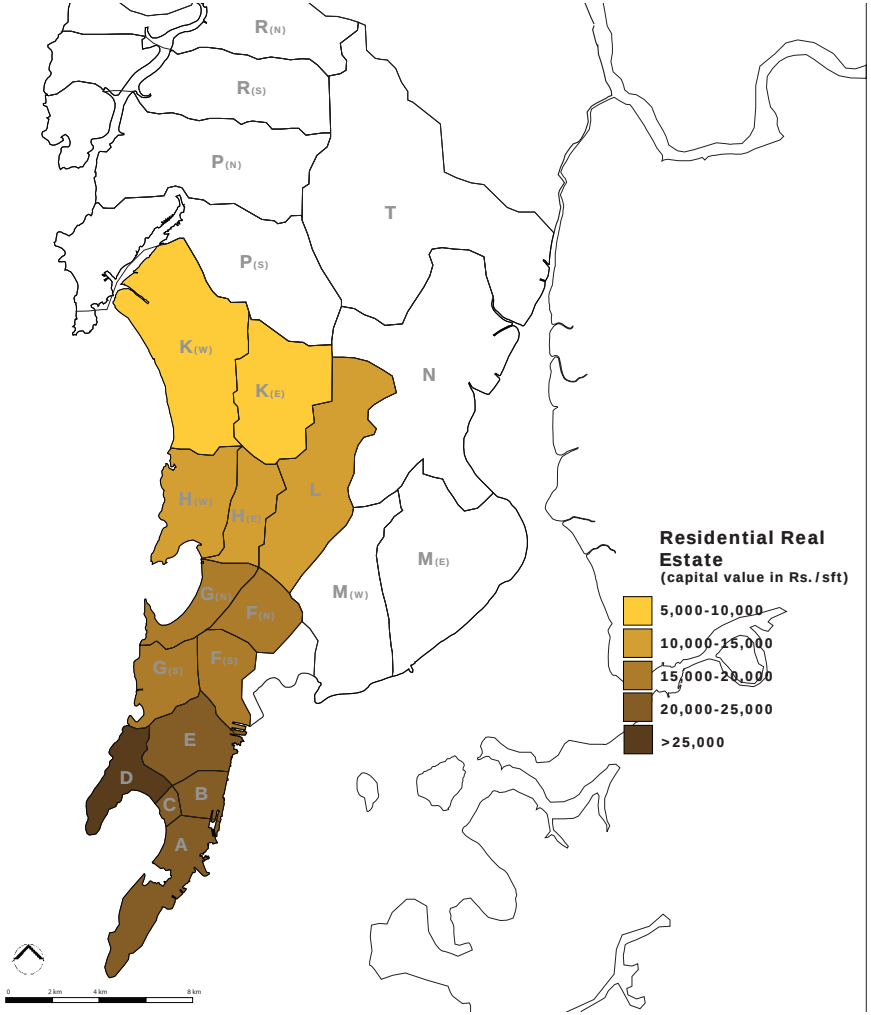


Figure: 4.2c.2
Mumbai_Residential Real Estate

c. Wards & Real Estate Value:

Mumbai is divided into 24 municipal wards. The residential real estate value is the highest in the CBD particularly at Nariman Point (a favourable location by the sea). This value seems to decrease as we move north into the suburbs *(Refer Fig. 4.2c.2)*.

However, the commercial real estate value seems to be the highest at the new business district of Bandra- Kurla complex *(Refer Fig. 4.2c.1)*. Developers are willing to pay the extra price for this increased connectivity and for more space than the historical congested CBD. Nevertheless, the CBD also has a very high commercial real estate value. The derelict industrial lands in the island city are regarded as prime commercial property as well because of its strategic location between the two business districts. *(Source of real estate data: Cushman & Wakefield)*

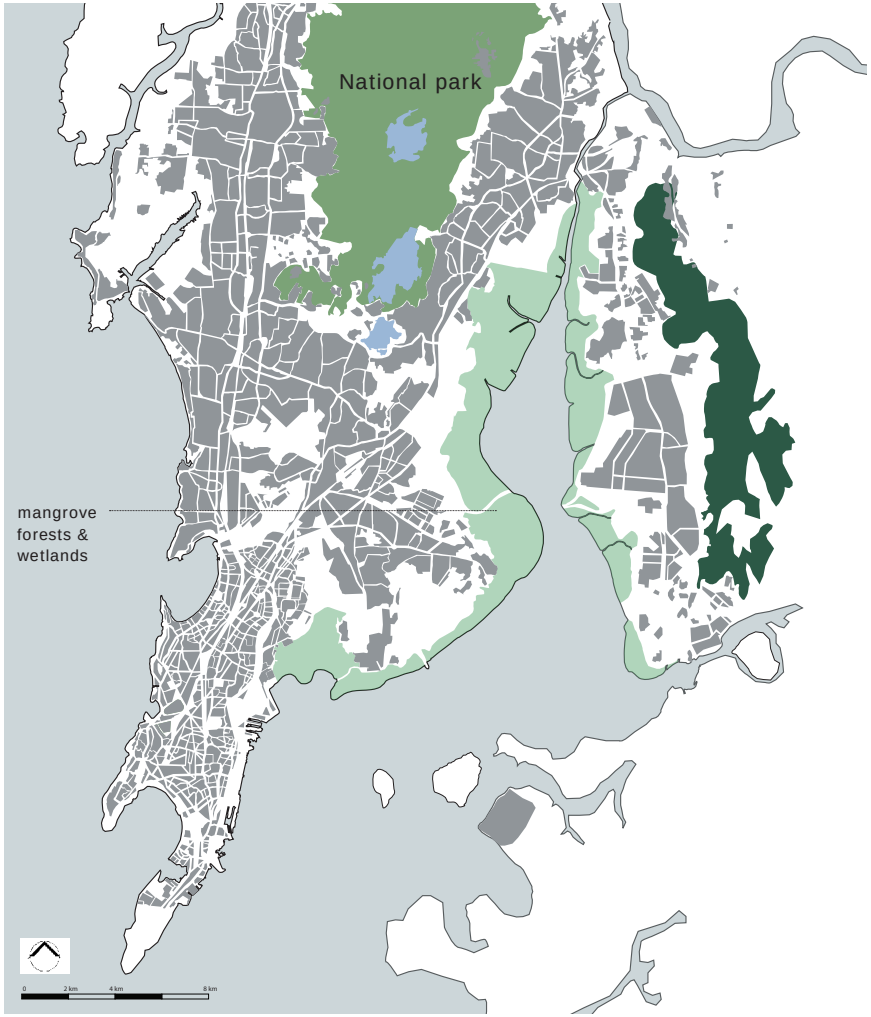


Figure: 4.2d.1
Mumbai_Urban Development & Green Spaces

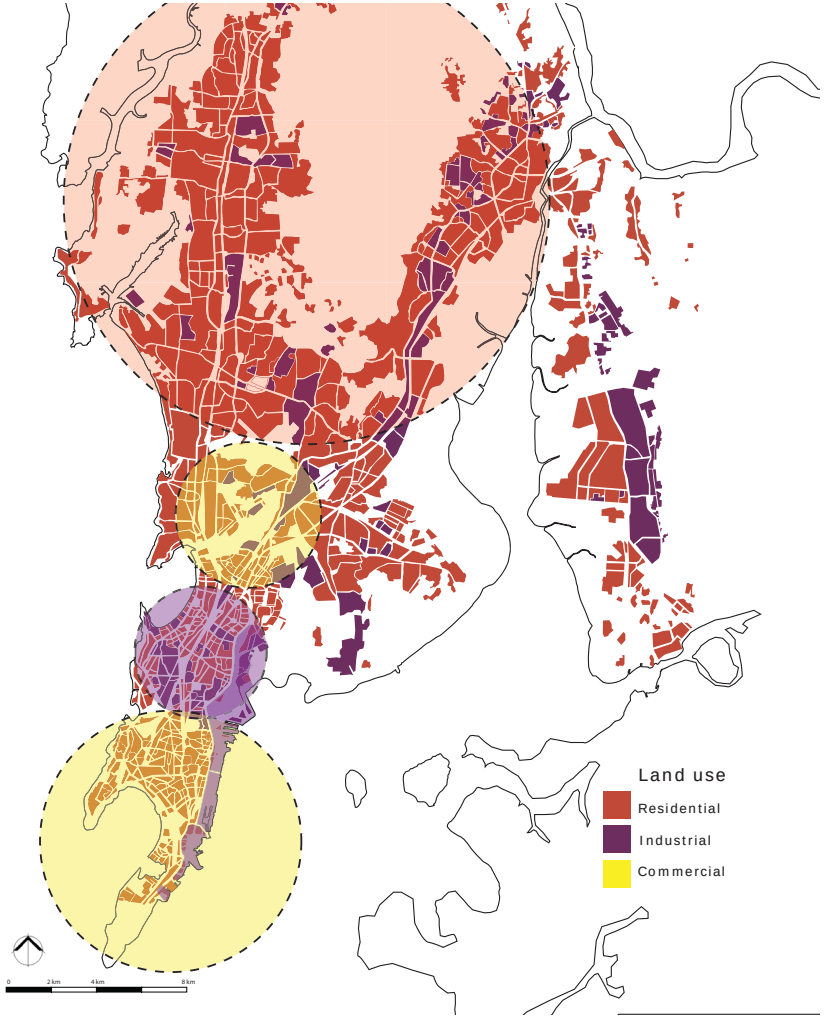


Figure: 4.2d.2
Mumbai_Land Use

d. Urban Development & Land Use:

The urban development in Mumbai shows a more linear growth along the infrastructure lines. It can also be noticed that less than half of Greater Mumbai (i.e. 48%) is covered by built up area and infrastructure (*Refer Fig. 4.2d.1*). Large parts of the land are occupied by a national park, coastal wetlands, mangrove forests, agricultural land and waterfront. Mumbai's east coast in particular has ecological value.

The central business district of South Mumbai consists of a mix of residential and commercial functions. This is also the historical centre for trade and commerce since the British rule. It can be observed that this part of the city has poor connectivity to the mainland and to Navi Mumbai.

To the north of the CBD is the industrial area. The cotton mills were the dominant industry here located in about 600 acres of land. These mills have declined in the recent years. They are now at the mercy of land sharks and private developers who have taken over the vacant lands for commercial benefits, with little thought given towards an integrated planning for the region as such.

There is also the 1800 acres of land of the Mumbai Port Trust (MPT) and harbour. The port has existed along the eastern coast of Mumbai as it was geographically more favourable and allowed for a protected harbour. In the recent years the port activities have reduced and some of these activities are being shifted to the mainland to the East of Greater Mumbai. The present landscape of the MPT is characterised mostly by abandoned warehouses, underused infrastructure and slum encroachments.

To the north of this industrial area and are large concentrations of slums like Dharavi.

To the north of the island city is the new business district of called Bandra- Kurla Complex. The emergence of this new business district to the north of the CBD can be explained in part by its better accessibility to the suburbs and to the mainland as well as its proximity to the international airport.

The rest of the suburbs are primarily residential areas. Industrial areas are spread out more to the North- Eastern suburbs. They include chemical, automobile and healthcare industries. *(Refer Fig. 4.2d.1 & 2)*

e. Functions:

A mapping of key distribution of functions such as hospitals, hotels and cinemas in Mumbai have been done *(Refer Fig. 4.2e)*. It can be observed that there is a huge concentration of cinemas & theatres (yellow dots) in the south. Mumbai is famous as the heart of Bollywood films and South Mumbai is like the entertainment capital of the country. The distribution of cinemas to the north is more dispersed.

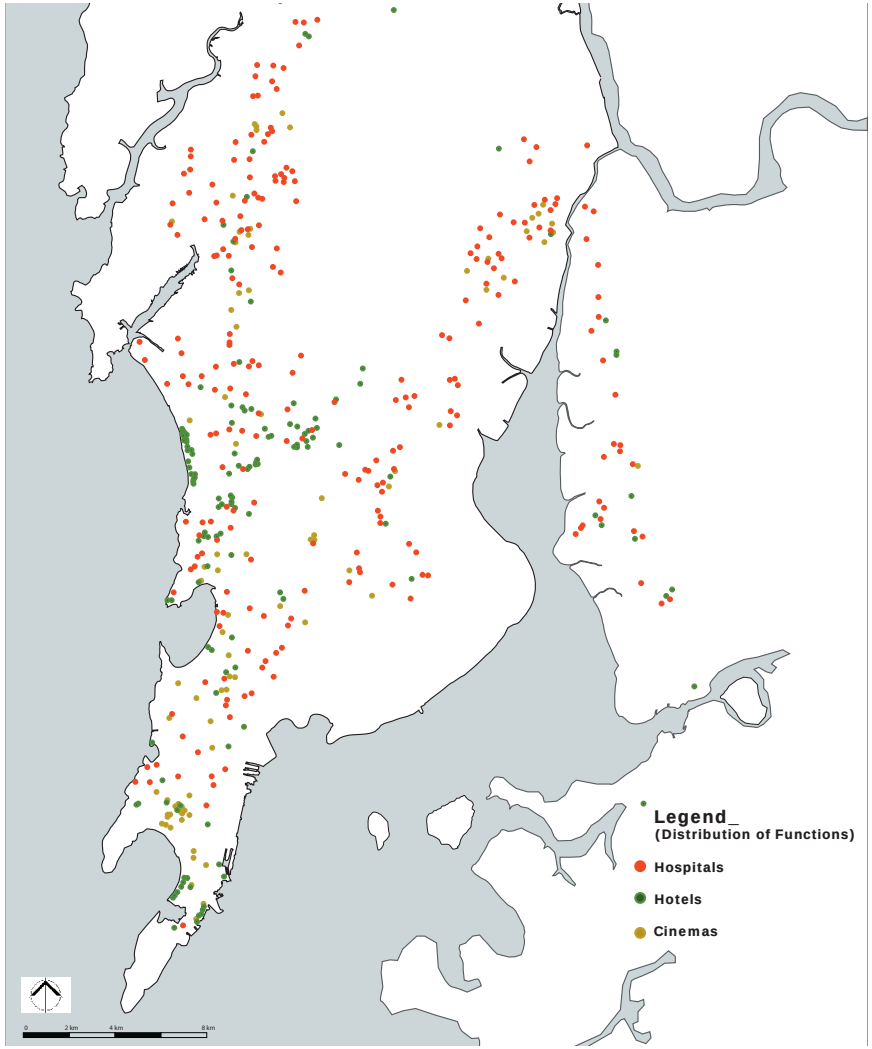


Figure: 4.2e
Mumbai_Distribution of functions

Moreover, the green dots indicate the concentrations and distribution of hotels. This concentration is highest in BKC region which has better connectivity to the mainland. There is also a concentration of hotels at Colaba to the south of the Fort area. this area is primarily an attractive choice because of its offers a view of the bay and the waterfront.

f. Infrastructure:

An analysis of the system of arterial roads indicates that the road system also follows the same North- South orientation with a denser configuration of pedestrian streets to the south. There exists few East- West road links through the city. Greater Mumbai is connected to the mainland at the North and also at the Vashi Bridge.

The underlying rail infrastructure, which existed since colonial times (1853 onwards) is under tremendous pressure. Today, Mumbai's suburban railways operate at 4 times its carrying capacity and transport 6.6 million passengers on a daily basis. In 1961 and in 1971, when the city was less extensive, the average commuting distances by train were 11.5 and 14.5 km respectively. In 1990, this average distance increased to 22 km. *(Masselos. J, 2003)*

According to Masselos, despite Bombay's spatial expansion to the North and the East, "the increased average distance of daily travel highlights continuance of the underlying pattern of movement from residence to work." More people are commuting, fewer people live close to their workplace and there is a continued reliance on public transport.

According to data available with Pay Scale, a US-based salary tracking firm, the average time spent in commuting by an employee in Mumbai is 47.26 minutes, which is more than 42.96, 37.91 and 36.08 spent by employees in Delhi, Bangalore and Chennai respectively. In Hyderabad and Pune, people spend about 33.82 and 30.87 minutes travelling. *(Source: The Financial Express, 2007)*

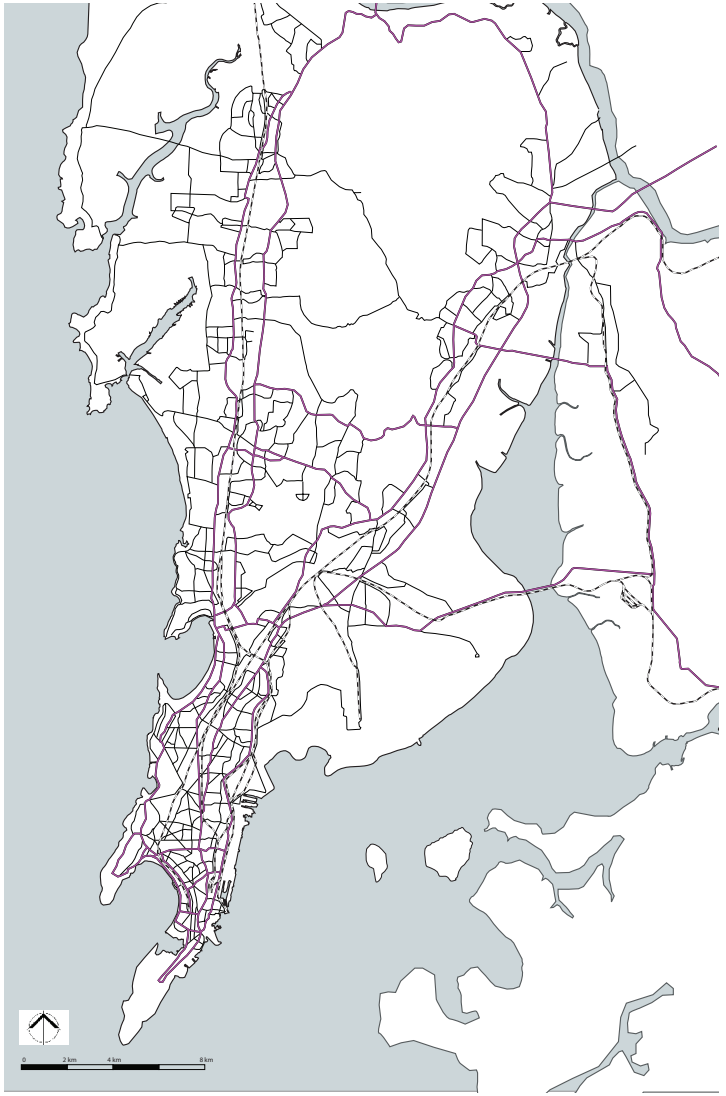
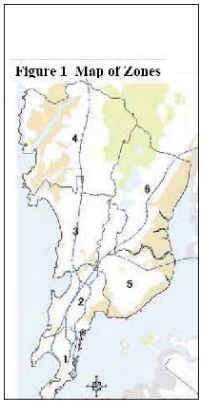


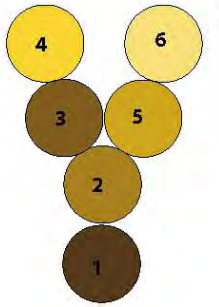
Figure: 4.2f
Mumbai_Infrastructure



Key map of Zones

	Work location								
Home	At home	Zone 1	Zone 2	Zone 3	Zone 4	Zone 5	Zone 6	Outside of GMR	Not fixed[c]
Zone 1	8.5	76.0	5.4	4.1	0.9	1.1	2.9	1.2	0.1
Zone 2	6.2	20.3	60.4	6.1	1.6	1.5	1.0	2.8	0.0
Zone 3	5.0	6.7	5.0	73.1	4.2	2.0	0.7	0.3	3.0
Zone 4	8.8	10.2	4.3	21.2	47.8	0.5	0.8	3.1	3.2
Zone 5	2.1	9.0	7.8	6.7	0.9	54.6	6.7	4.7	7.7
Zone 6	4.4	13.3	8.1	7.7	15.1	3.6	37.6	5.4	4.9
Average All Zones	5.8	19.5	15.1	22.3	13.4	9.3	8.5	2.9	3.2

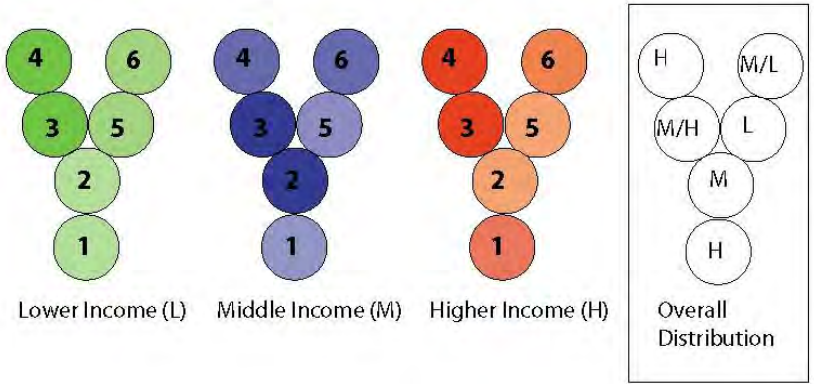
Figure: 4.2g.1
Percentage distribution of workers across job locations, by zone of residence
Table source: World bank survey, 2005



The darker the colour- the higher is the concentration

Zone	<5k	5k-7.5k	7.5k-10k	10k-20k	>20k	Avg. All HHs
1	9.9	9.5	11.5	16.8	15.3	11.7
2	12.7	18.0	19.0	18.6	11.0	16
3	21.2	18.6	20.1	24.4	24.7	21
4	19.8	18.3	16.5	17.0	28.3	18.7
5	19.1	17.0	14.5	7.1	7.5	14.7
6	17.4	18.7	18.3	16.0	13.3	17.5
Total	100	100	100	100	100	100

Figure: 4.2g.2
Percentage distribution of households across zones, by income category
Table source: World bank survey, 2005



The darker the colour- the higher is the concentration

g. Location and distribution of jobs and income groups:
A world bank survey was conducted was conducted in 2005 of 5000 random households in Mumbai. Some genral conclusions and derivative models have been derived based on the data collected from the survey.

For the purpose of the survey, the city was divided into six zones as indicated in the key map.

Table 4.2g.1 shows the distribution of job locations across the zones. The derivative model to the right is an indication that the number of people who live and work in the same zone is the highest in zone 1 and second highest in zone 3, followed by zone 2. The darker the colour. the higher is the concentration of people who live and work in the same zone. people who reside in zones 4 & 6 commute the most to work.

Table 4.2g.2 shows the distribution of households based on income category across the zones. The derivative models to the right show that the zone 1 and 3 have a greater concentration of higher income group. the middle income group are concentrated along zones 2,3 & 6. the lower income groups are mostly in the suburbs in zones 4,5 & 6.

Table 4.2g.3 shows that regardless of where they live, the poor, on an average, commute shorter distances to work than the higher income group, implying that they work closer to home. This could be due to commuting costs involved.

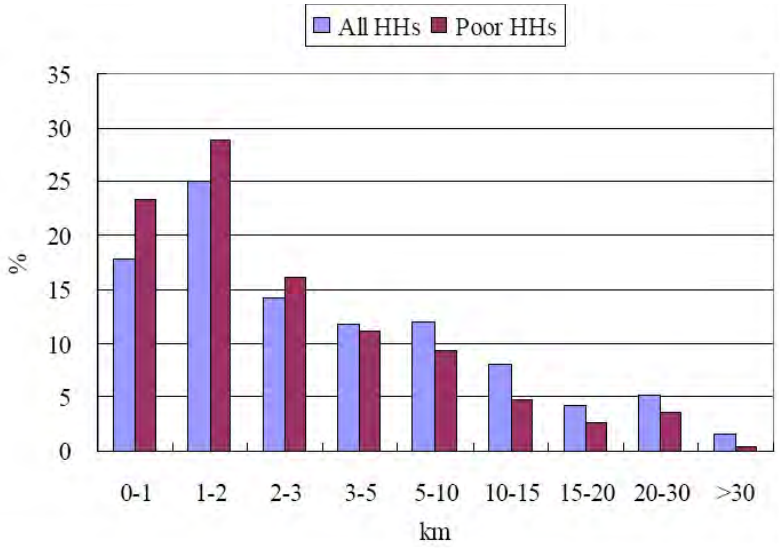


Figure: 4.2g.3
Distribution of one-way commute distances among High income and Poor Households
Table source: World bank survey, 2005

4.3. Analysis_ Island City

a. Public Places in Bombay:

Mumbai has the lowest per capita open space of less than 2 sq. m. There are two important aspects to consider when it comes to public space: the image and the dynamics.

"... it is the human angle that brings about the sense of place."- Jain, K., 1995

If we are to go by this definition then, the public spaces that the residents of Mumbai can identify with are of the following types: maidans or playgrounds, beaches, waterfront, streets, markets and the entrance to important station buildings.

Outdoor sports like cricket, hockey, horse riding, etc are very popular among the residents of the city. The large tracts of open ground that separate the fort area from the business district at Nariman point in South Mumbai is used as playgrounds and also as important cross-over points for pedestrians. Several Stadiums and sporting grounds are also found in South Mumbai. Moreover building block typologies have inner courts or play spaces where the neighborhood children can play.

Beaches are another all- important communal space in Mumbai where people from all segments of the society gather. Most of the Bombay's western coast is lined by rocky waterfronts. The Chowpatty beach is the most popular sandy beach in the island city.

Streets are the most important public spaces in Mumbai, a city that is considered to be constantly on the move. The 'bazaars' or the street markets are synonymous with the 'square' of the European planning concepts in their function. It is often the focus of the city itself. The mixed use functions and the dynamism add to its spatial quality. Examples of such street markets in Bombay are the following: Fashion Street (for export surplus garments at throwaway prices), the 'zaveri' bazaar (or jeweller's market), 'chor' bazaar (or the thieves market), etc.

Some streets in Mumbai sometimes double as processional routes for religious and political rallies. Streets are often lined by hawkers. Hawkers can also be found at the various other

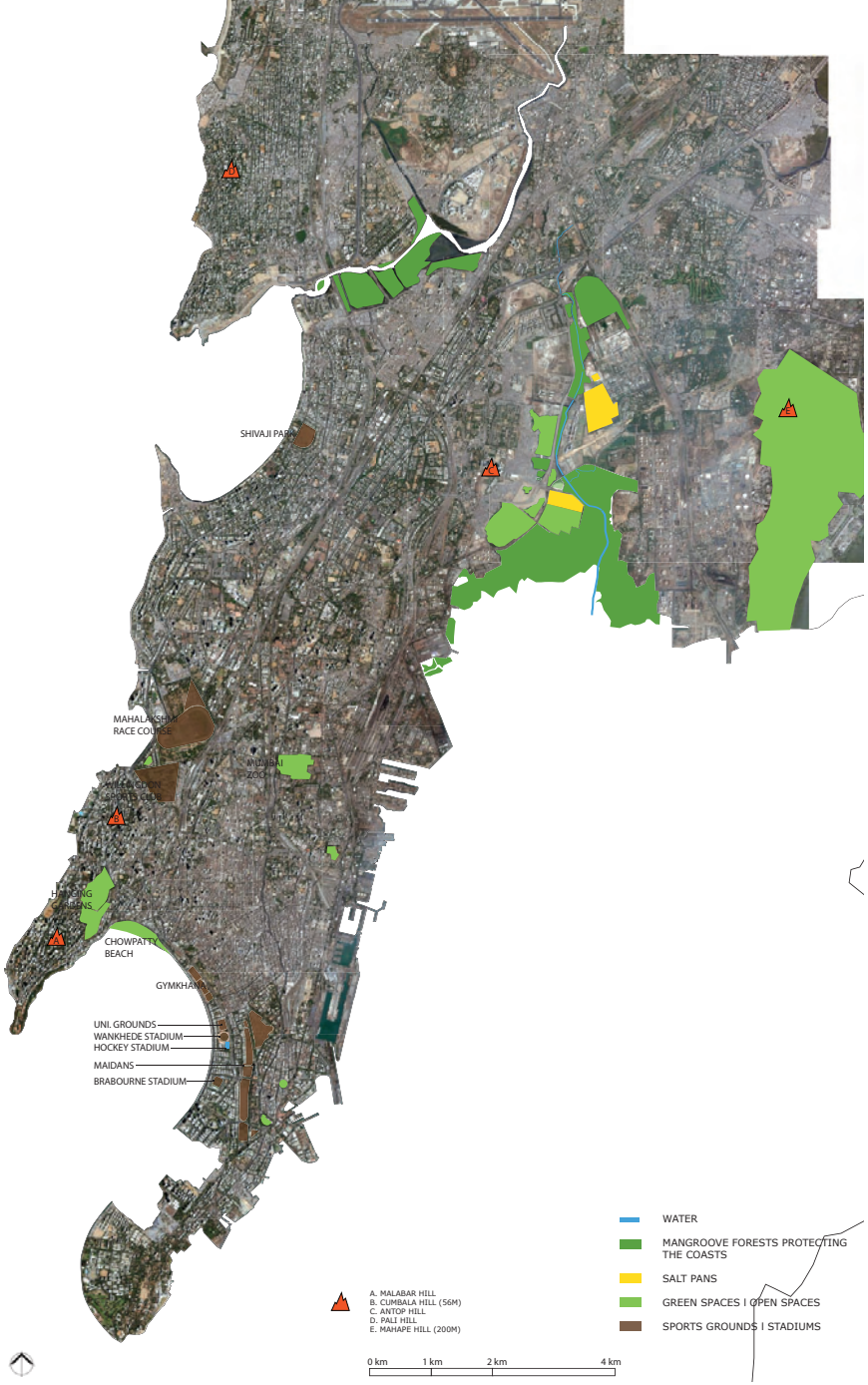
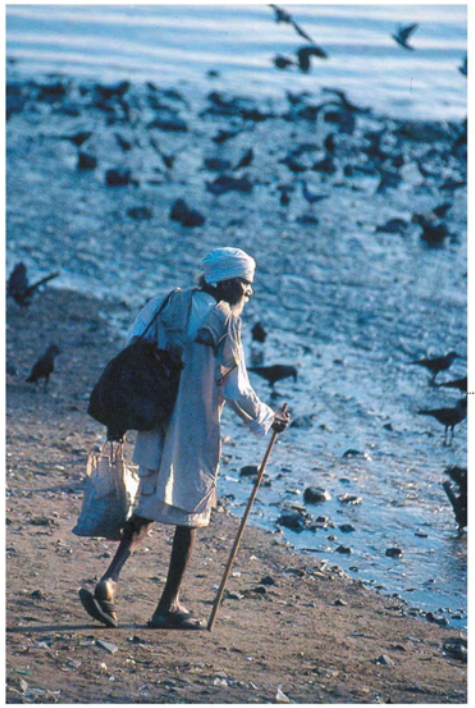


Figure: 4.3a.1
Green & Open spaces_Island City

Mangrove Forests

Coastal Wetlands

Beaches



Playgrounds

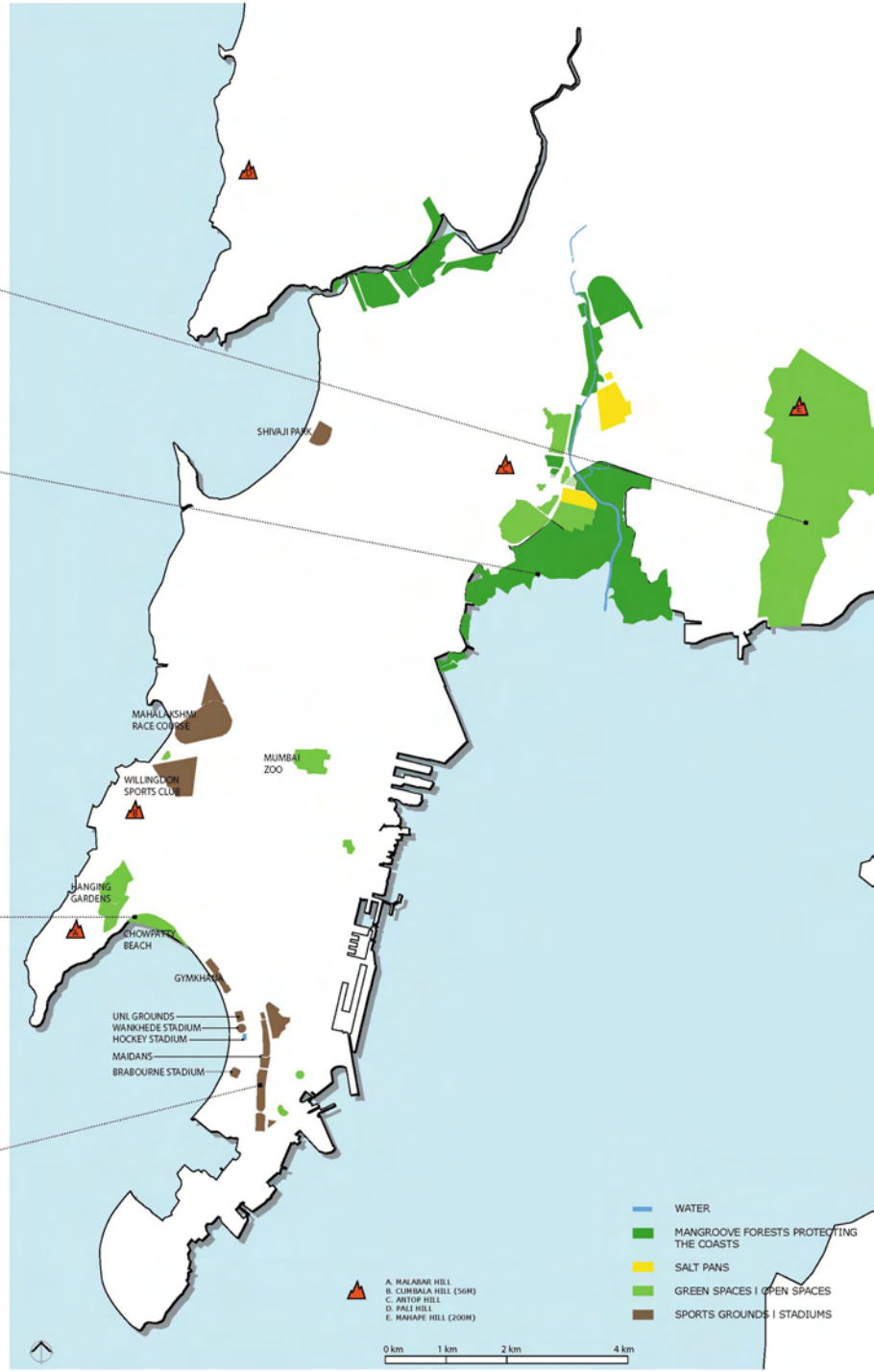


Figure: 4.3a.2
Green & Open spaces_Island City

public spaces in the city, like the beaches, traffic junctions and in front of railway stations. The stalls follow a haphazard organization with no adequate water supply, drainage or garbage collection, thereby adding to the chaos of the city streets.

b. Visual Image of the Island City

The island city of Mumbai can be essentially perceived as a fragmented urban fabric. South Mumbai consists of the historic centre and the business district at Nariman Point and can be described as the nerve centre of the city. To the North of this lie the vibrant street markets of Bhuleshwar. Further North, are the derelict industrial mill sites. And finally there are the large concentrations of slums at Dharavi to the North of the Island City. The Eastern Waterfront Area with the derelict port functions extends in a North-South direction through the length of the island city. It has the potential to be developed as a strategic project that can add coherence to the urban fabric of the island city.

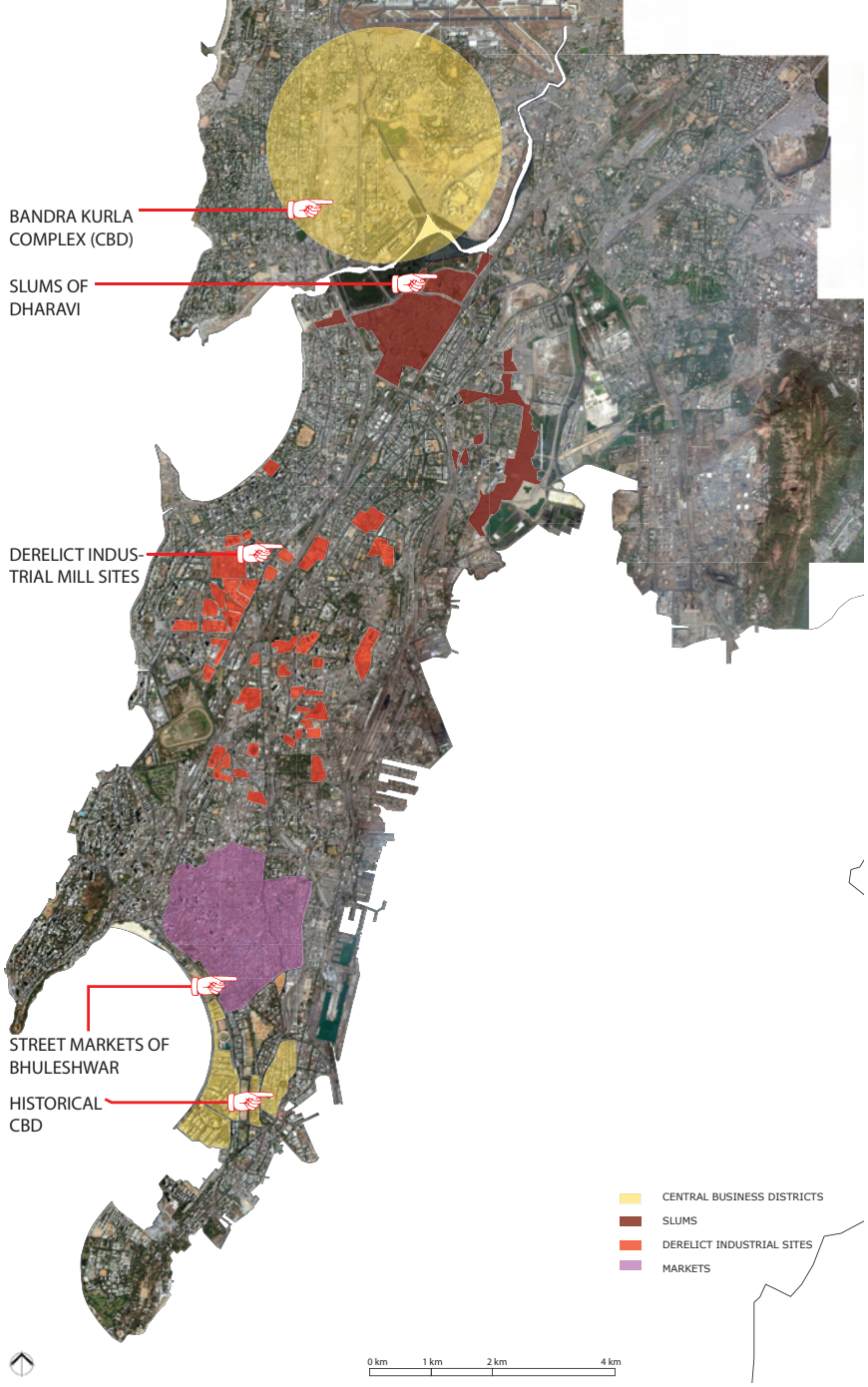


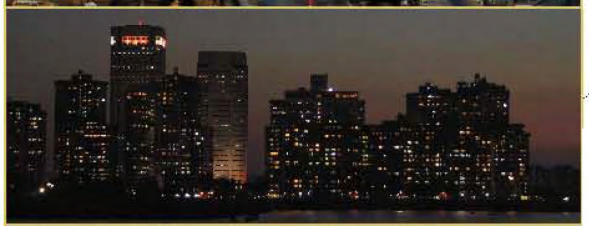
Figure: 4.3b.1
Visual Image_Island City

Dharavi Slums

Derelict Mill Sites

Street Markets of Bhuleshwar

Historic City



Nariman Point CBD

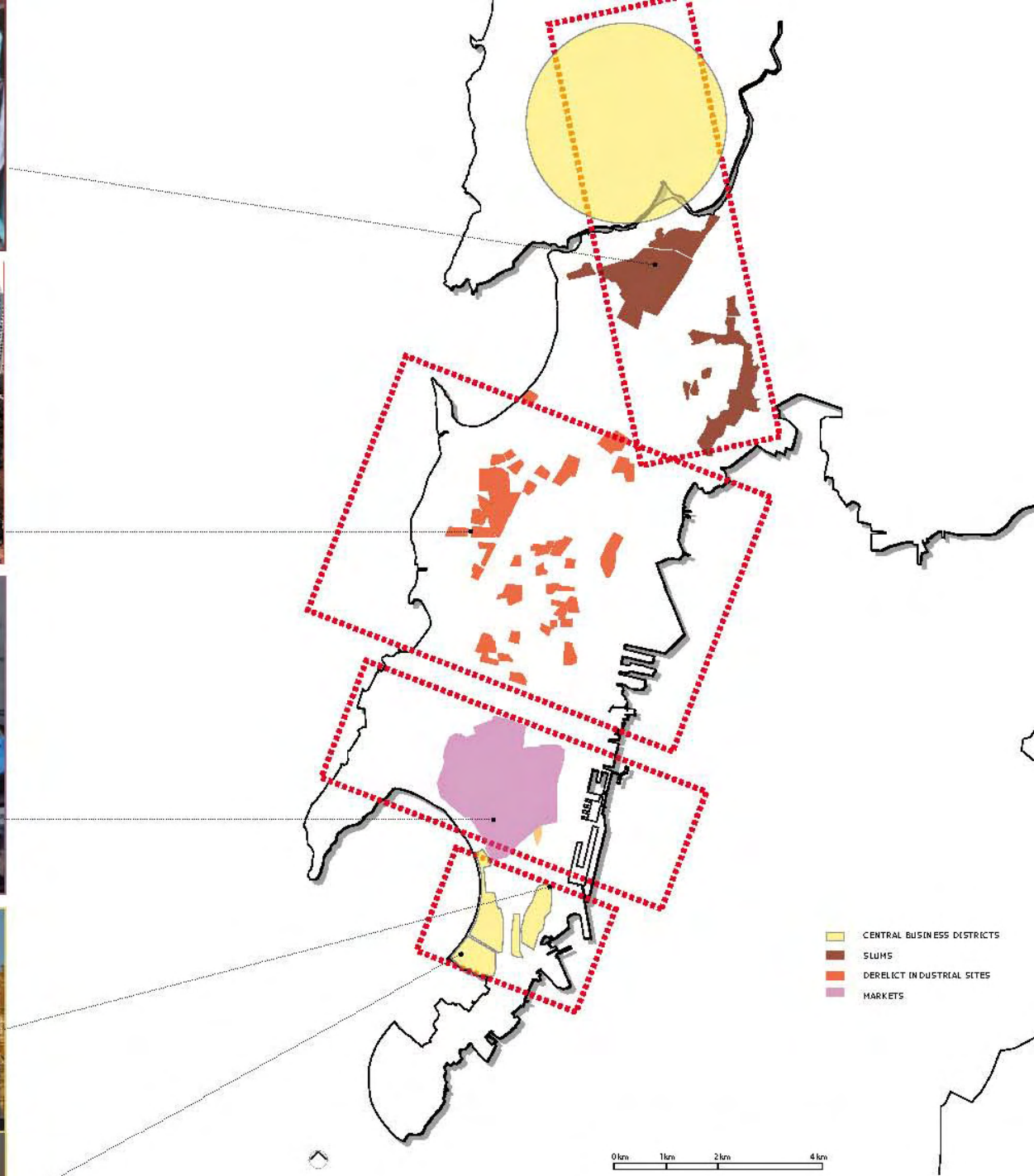


Figure: 4.3b.2
Visual Image_Island City

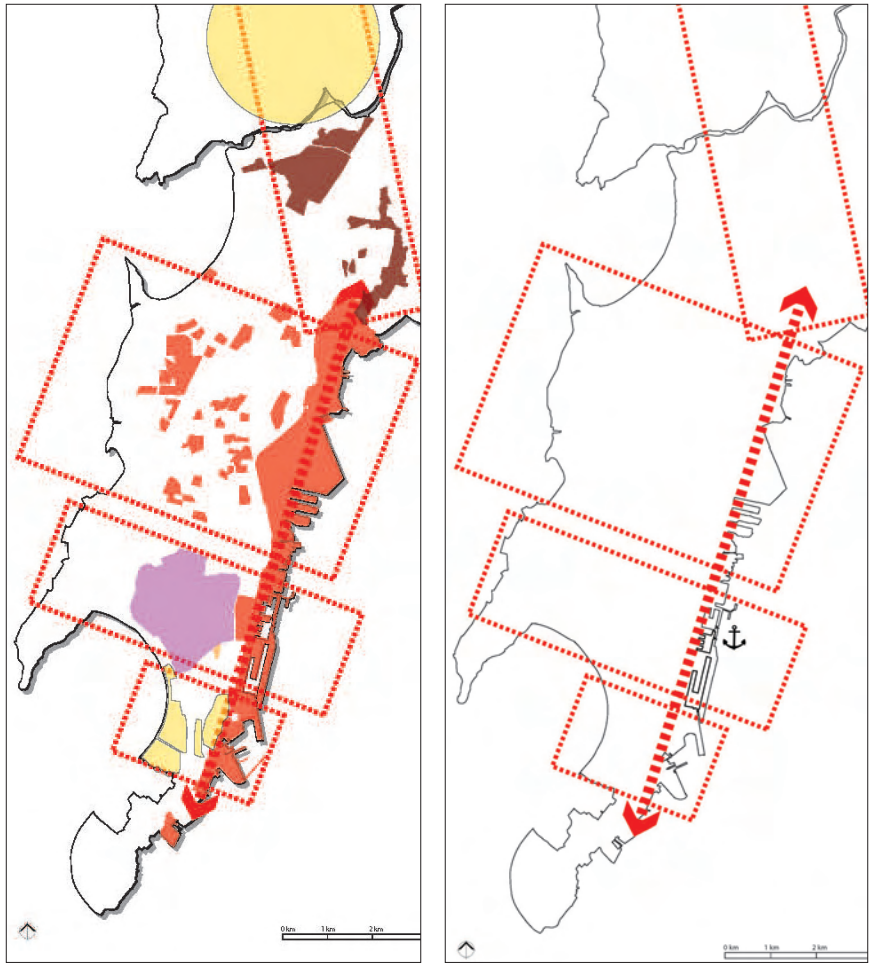


Figure: 4.3b.3
Visual Image_Eastern Waterfront with potential to integrate island city

c. Attractions:
The key attractions in the city are mostly concentrated in South Mumbai and include the following:

01. Monumental and historic buildings

02. Cultural and religious landmark structures-
Famous religious structures like Jama Masjid (one of the oldest mosques in the city) and the Mumbadevi temple (from which the city derives its name) are also located here.

03. Bazaars and Street markets-
- The busy bazaars or street markets of Bhuleshwar sell just about anything at bargain prices. The lanes are narrow and extremely congested during the day. Bhuleshwar houses the famous Zaveri Bazaar (Jeweller's Market) where gold and silver jewellery are sold. The Chor Bazaar is the famous Thieves Market located along Motton Street and is flanked by rows of little antique shops. Crawford market is the city's wholesale market for perishable foods which also sells foreign cheese and chocolates. The market itself is a blend of Victorian and local architecture.
- Readymade garments are one of Mumbai's chief exports and the surplus lands up at Fashion Street on Mahatma Gandhi Road. They are available at a fraction of the original price.

04. Dharavi Slums-
- Mumbai's Dharavi slum is the largest slum in Asia. There is often a negative stereotype associated with slums in cities, but beneath all this the place is alive with small scale industries and a strong community spirit.

05. Beaches-
- Chowpatty is the most popular beach in Mumbai. It is the place where all the action happens, particularly in the evenings. It is a common hangout for the cities population. You can find rows of small shops, hawkers, acrobats and small carnivals are held here.

06. Islands in the Bay Area-
- Elephanta caves, a popular tourist attractio with jetty service from the island city
- Butcher Island (Jawahar Dweep) is an island in the bay area

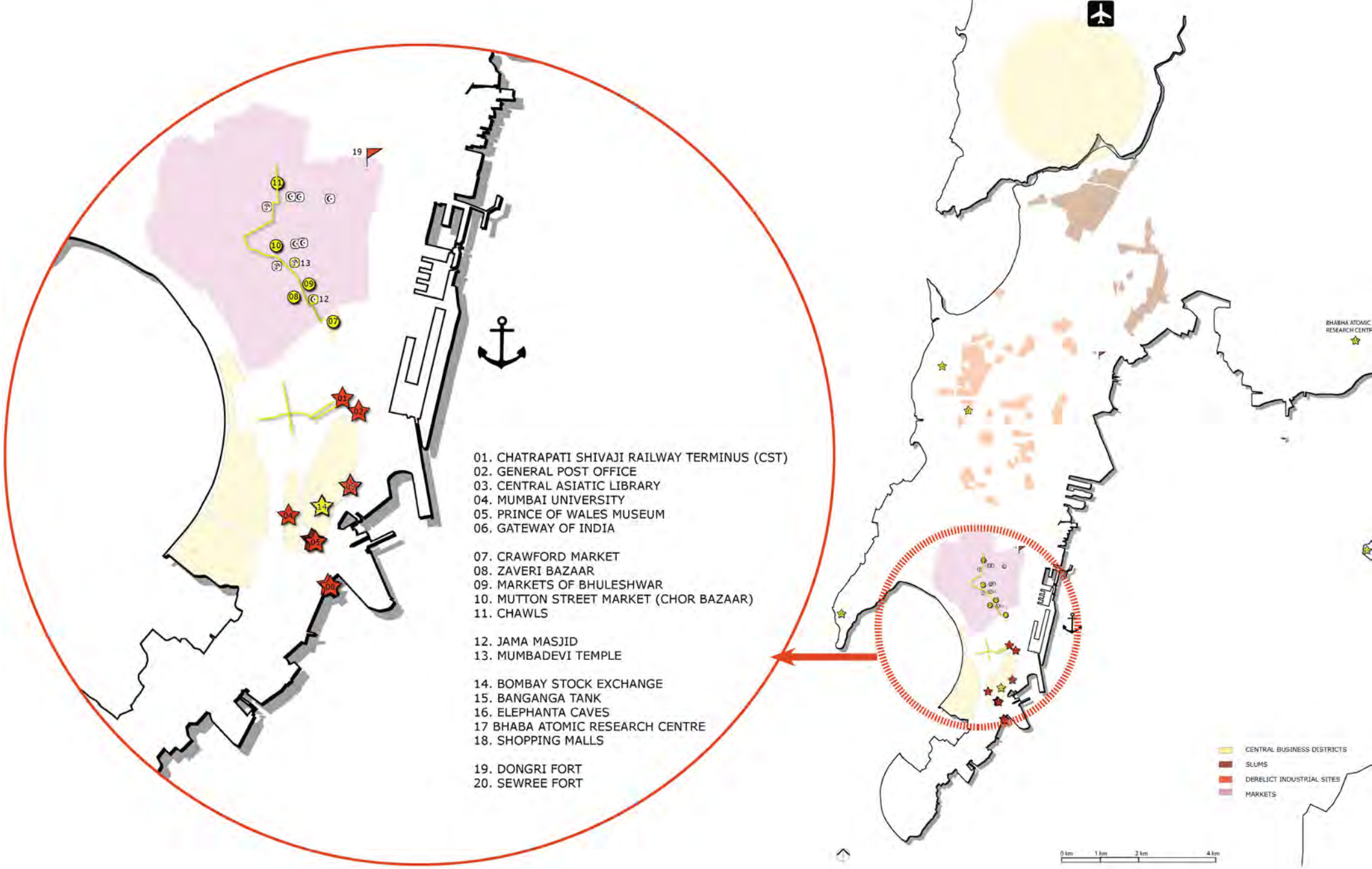


Figure: 4.3c
Attractions_Island City

of Mumbai. It has an oil terminal, where Oil Tankers from Gulf countries are docked to unload Crude Oil. The crude oil is stored in oil containers on the island. From there they are piped to BPCL and HPCL refineries at Wadala and Trombay where they are refined. This keeps the city relatively safe from a mishap. The island is a restricted area and is covered with dense vegetation and has a small hillock in its centre.

d. Accessibility to Coasts:

The Central Railways from Chatrapathi Shivaji Terminus (CST) to Wadala form an impenetrable barrier to the eastern water front. The waterfront and the port functions along this coast cannot be experienced and is mostly hidden from public view sometimes by physical barriers in the form of infrastructure and at other places by free standing walls.

The infrastructure in the island city runs in a North-South direction with hardly any East-West links that connects the coasts. Despite having several kilometres of coastline in Mumbai, one rarely gets to experience the coast. By strengthening these East- West links at strategic points perpendicular to the Eastern Waterfront, it will be possible to open the city to the bay area and to integrate the urban fabric of the city with the port.

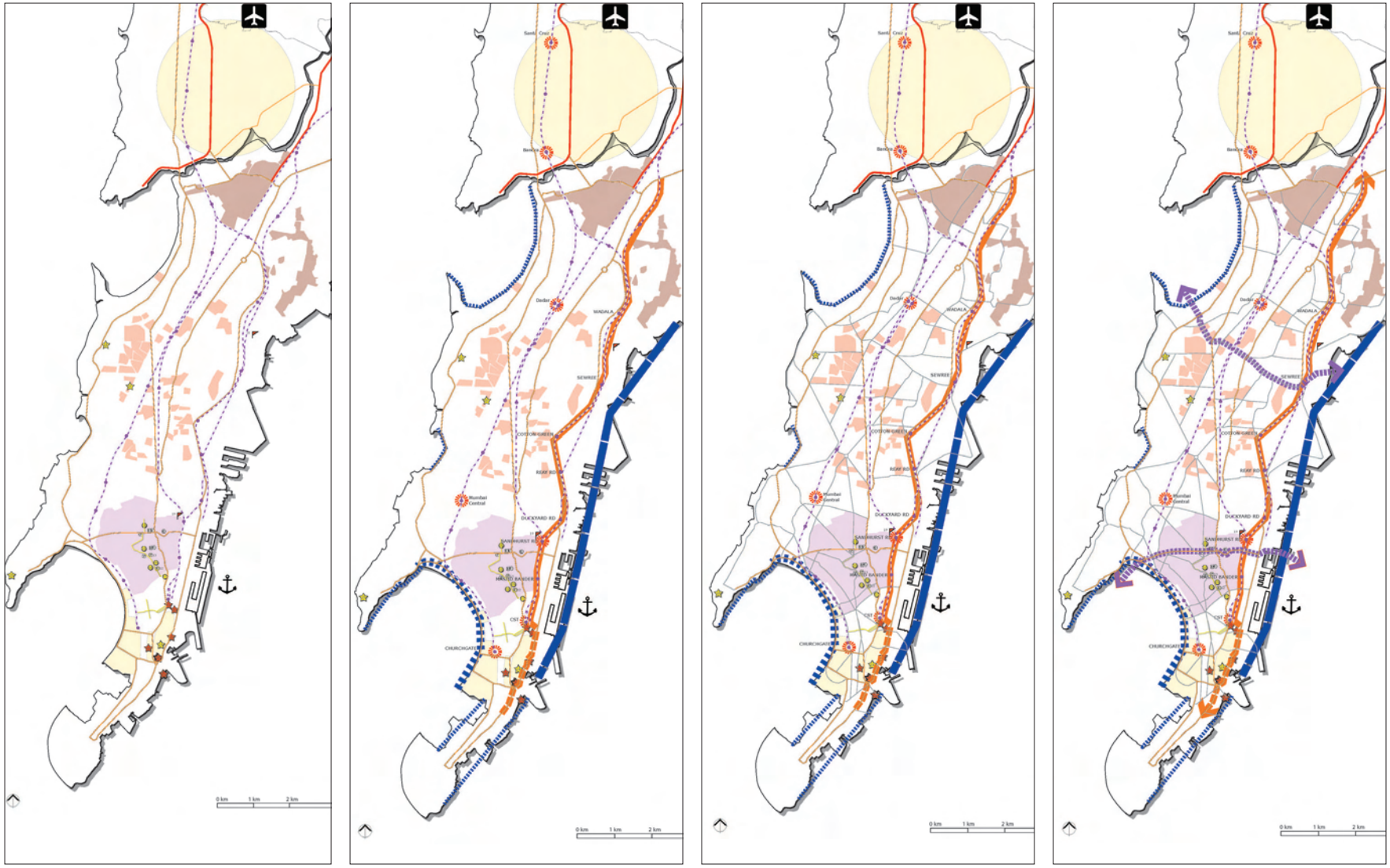


Figure: 4.3d
Accessibility to Coasts_Island City
North- South rail infrastructure acting as a barrier to accesing the coasts along the Easter waterfront.

4.4. Analysis_ Eastern Waterfront (EWF)

a. The Historical Development of the Port:
- In 1950, the city was handling 41% of India's imports and 38% of its exports.
- The chief import was crude oil. Oil refineries and petrochemical complexes in Trombay created a major stimulus for growth.
- After 1965, there has been a decline of port activities. There has been a fall in iron and steel and food grains import.
- In 1972, oil products constituted half of the port's imports. The Bombay Port accounted for 32000 jobs. The port also provided accommodation for 4500 residences.
- Since 1972, there has been a change in shipping activities caused mainly due to: greater physical size and deeper draught needed for modern ships, resistance to modern handling mechanisms, lack of back up space & storage space for containerisation, traffic congestion.
- In 1989 the MPT faced competition from the JNPT port at Nava Sheva across the bay. This port is planned in 2500 Ha of land. JNPT now handles two-thirds of the country's containerized cargo. The chief export is cars. Privatisation and corporatisation of the port allows for more competitive rates to Indian exporters and importers.

The port gave the initial impetus for growth of the city. However, in the last three decades there has been dereliction. In 1999, the MPT reported a 15% drop in its traffic.
By 2017, MPT is bound to handle cargo only meant for Mumbai and not to the hinterland.

"The world over, ports after giving birth to thriving Metropolises have had to move on. Polluting industries and a port have to give way to a cleaner service economy- an inevitable transition that polluting cities have to make" [Source:..]

b. The Eastern Waterfront Estates & Land Use:
The eastern waterfront forms an integral part of the city's land mass. It has an area of 1800 Hectares, which is 1/8th the area of the island city. About 445 Ha of this is reclaimed land. It has 13 estates from Wadala salt pans in the North to the Sasson's dock fishing village to the South. This stretch of land forms what Kevin Lynch describes as a "fragmented edge"- continuous in the abstract, but visualised at only discrete points.

01. Wadala Estate
It is occupied by oil companies with their oil tanks and filling points. It is located in close proximity to oil refineries and the Pir Pau terminal (Chemical Jetty of Mumbai). The Wadala salt pans to the North of this estate contain garbage dumps and slums.

02. Wadala-Sewree Estate
It is situated around the 16th century Sewree Fort. It is a container depot which is now mostly used as back up space for port activities.

03. Cotton Depot
This was used for the storage of cotton bales. It has been non-operational after the closure of the cotton mills in 1980

04. Charcoal and Grain Depot
This depot is sub-optimally used for charcoal and grain storage. It also includes functions like parking, repair of heavy vehicles and the presence of informal settlements.

05. Unit 5.
This estate is owned by private companies like Hindustan Lever, Modi Tyres, etc and is not optimally used.

06. Mazgaon Reclamation (Dharukhana)
This was established for the maritime trade in wood and coal. However, they have now lost their relevance. Current activities involve wholesale iron and steel storage, encroachments and ship breaking activity.

07. Mallet Bunder and Ferry Wharf
This consists of defence activities and related infrastructure, administrative offices of the Port, MPT warehouses and jetties for passenger boat services and fishing.

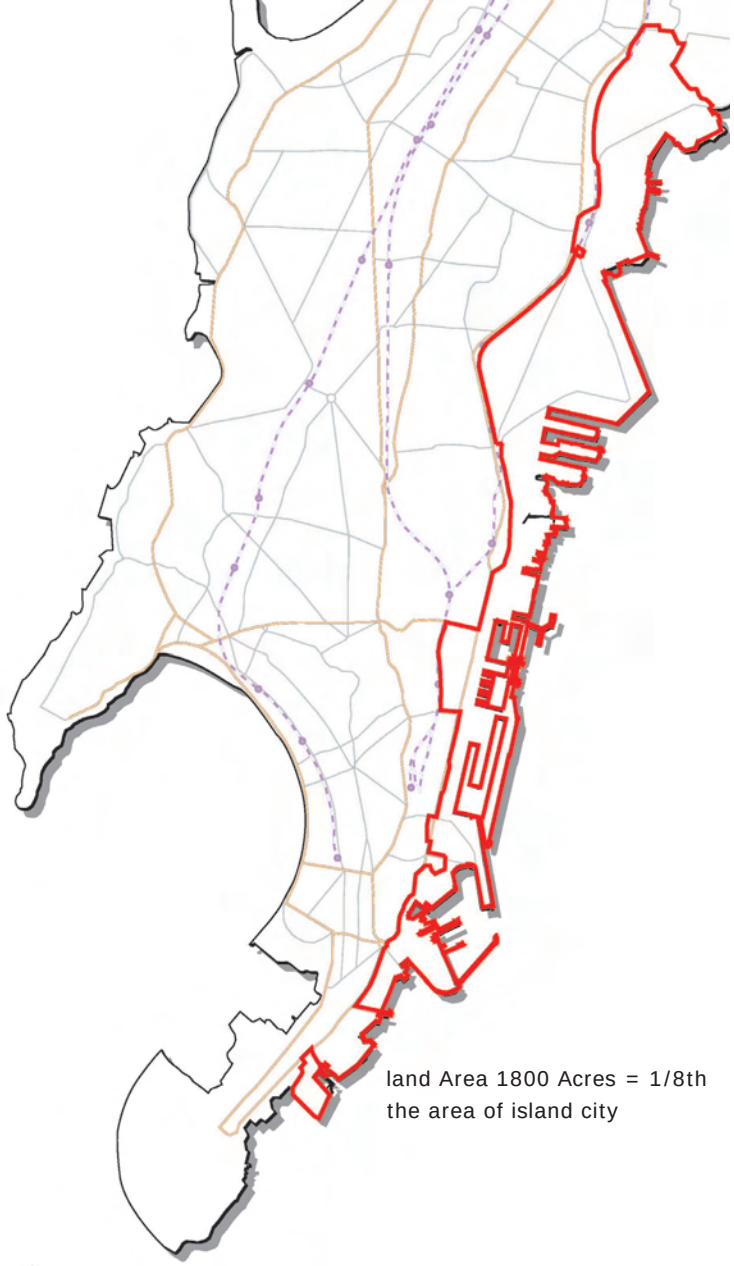


Figure: 4.4b.1
Eastern Waterfront extents

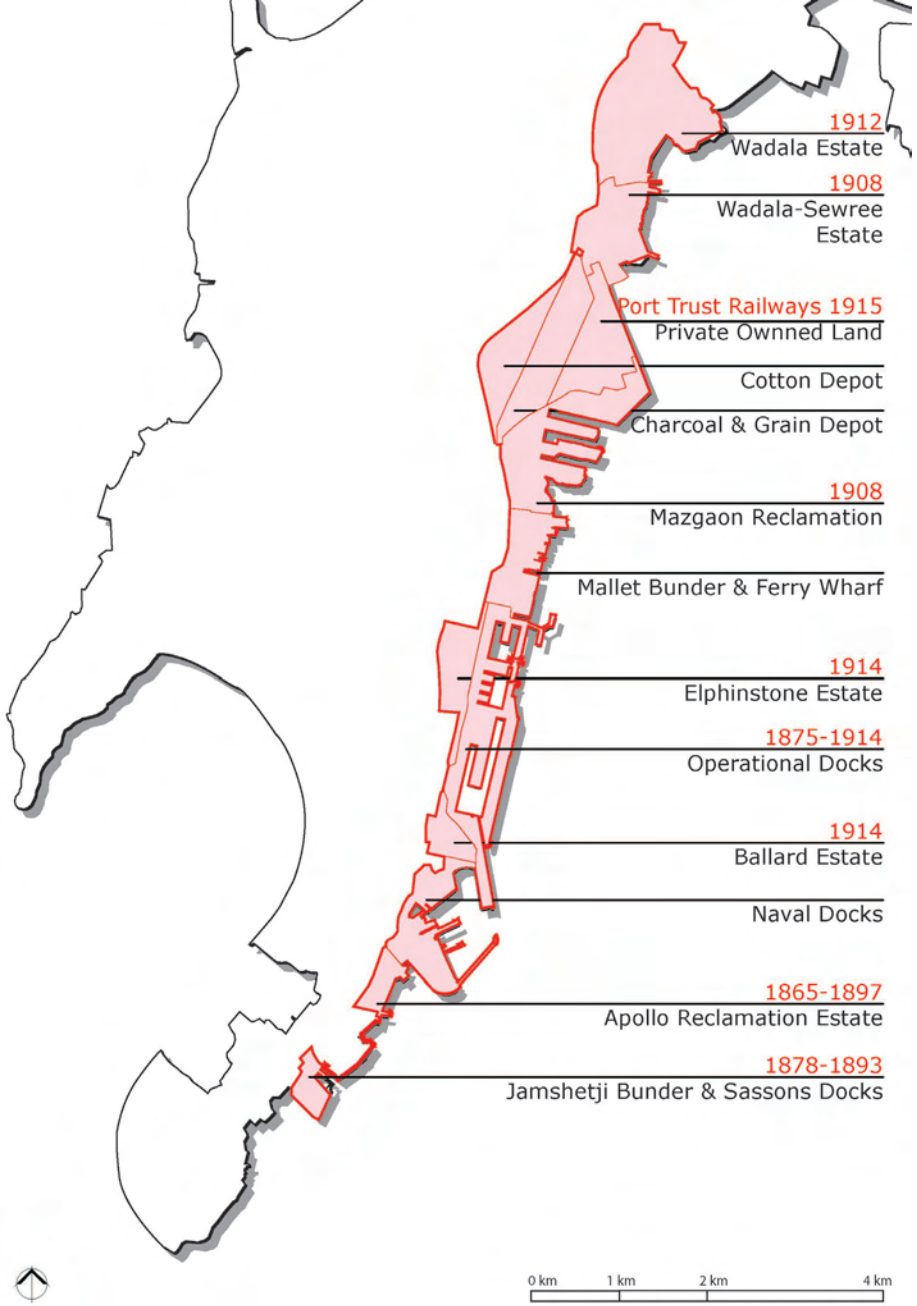


Figure: 4.4b.2
Eastern Waterfront_Estates

08. Elphinstone Estate
The Elphistone Estate consists of warehouses for short term tenure, iron and steel offices and transport offices, encroachments

09. Operational Docks (Source: Mumbai Port trust)
The operational docks consist of Indira Dock, Prince's Dock, Victoria Dock with a total quay length of 7.7 Km. Many operational docks are hidden from public sight. The deepest draught is at 10m.
Prince's dock constructed in 1880- area of 12 Ha- operates at 90% capacity
Victoria docks constructed in 1900- area of 10 Ha- operates at 80% capacity
Indira docks constructed in 1914- area of 24 Ha- operates at 55% capacity

10. Ballard Estate
The Ballard Estate is an efficiently planned twentieth century business district. This district houses corporate sector offices and includes BPT head offices, new customs office and the offices of clearing and forwarding agents and shipping companies.

11. Naval Docks
It contains defence activities and related infrastructure.

12. Apollo Reclamation Estate
This consists of housing (from late 19th and early 20th century) and prime public spaces in the city.

13. Jamshetji Bunder and Sasson Docks
It consists of fishing wharf and a settlement. Sasson's Dock consists of the fishing harbour, fishing related activities and MPT staff quarters. A part of the area is also occupied by non fishing based activities like garages and godowns

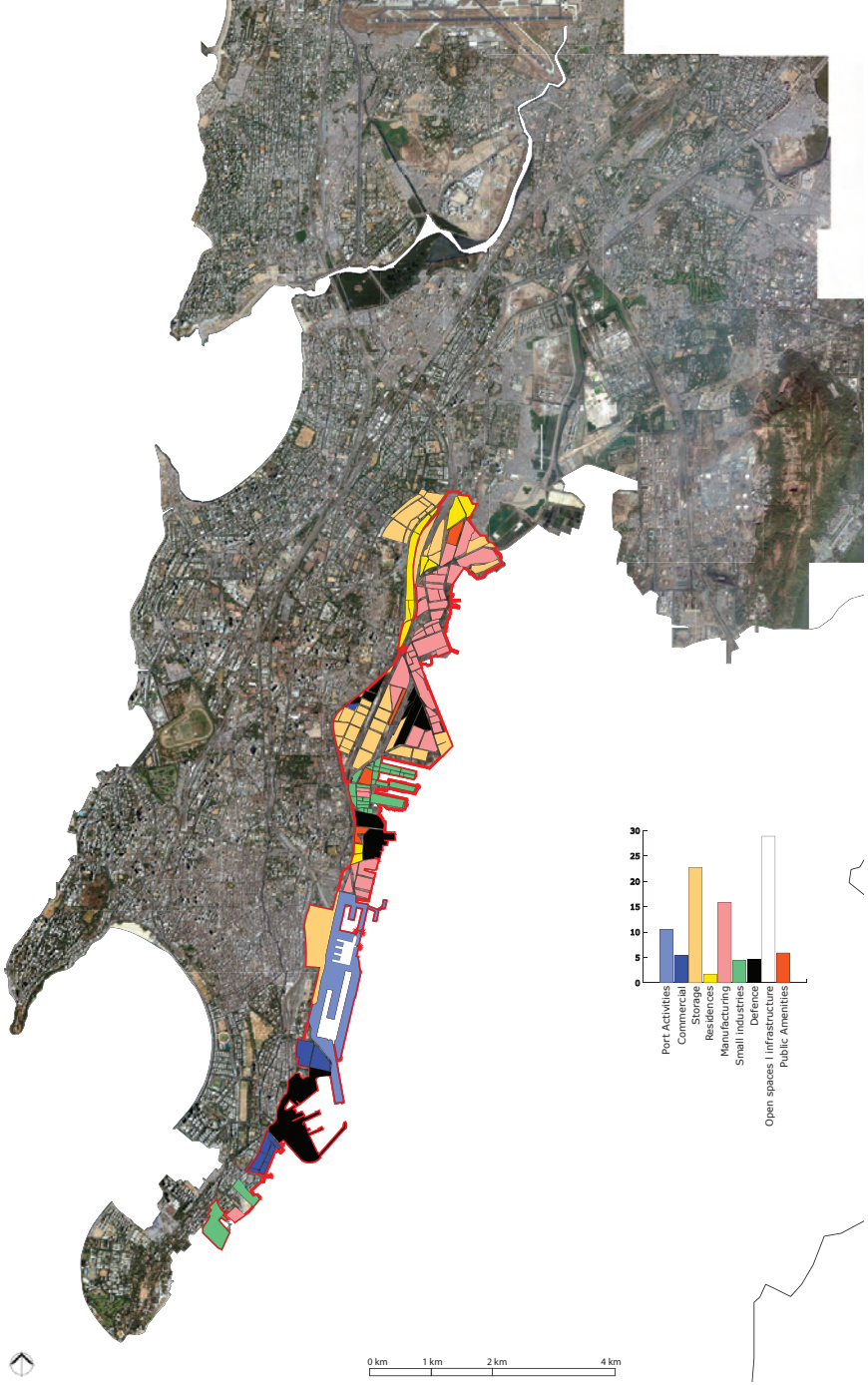


Figure: 4.4b.3
Eastern Waterfront_Land Use

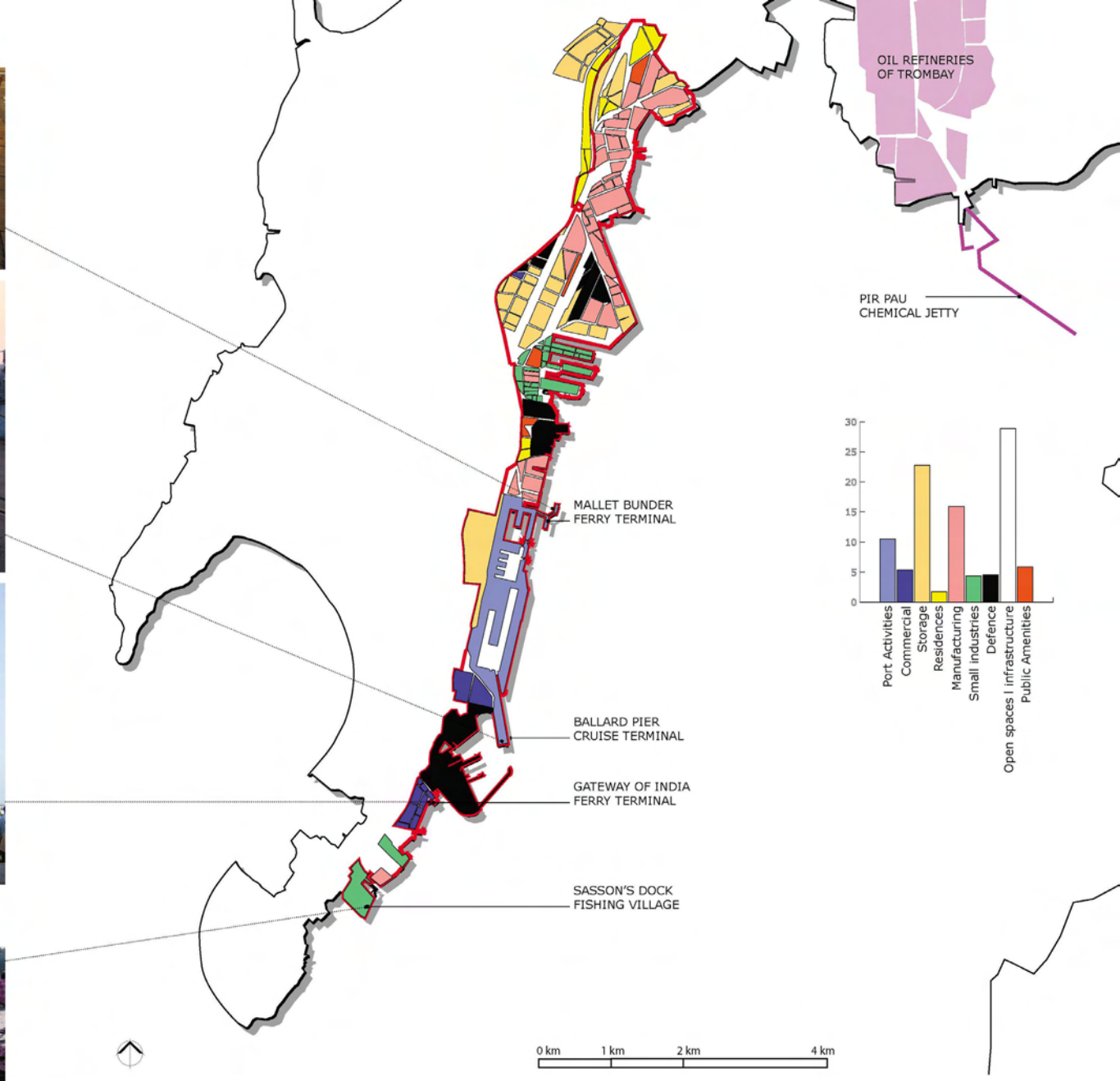


Figure: 4.4b.4
Eastern Waterfron_Land Use

c. The Stakeholders:
The MPT is the key stakeholder in the project. The Mumbai Port Trust (MPT) handles 30 million metric tonnes of cargo with a labour force of 10,000 plus.

Other stakeholders include:
- Businesses and Companies
- People involved in small scale business sector
- Informal sector
- Government
- Private developers
- St George Hospital & Campus
- Central Railways
- Companies which have leased the warehouses in the Elphinstone Estate over short and long term tenure

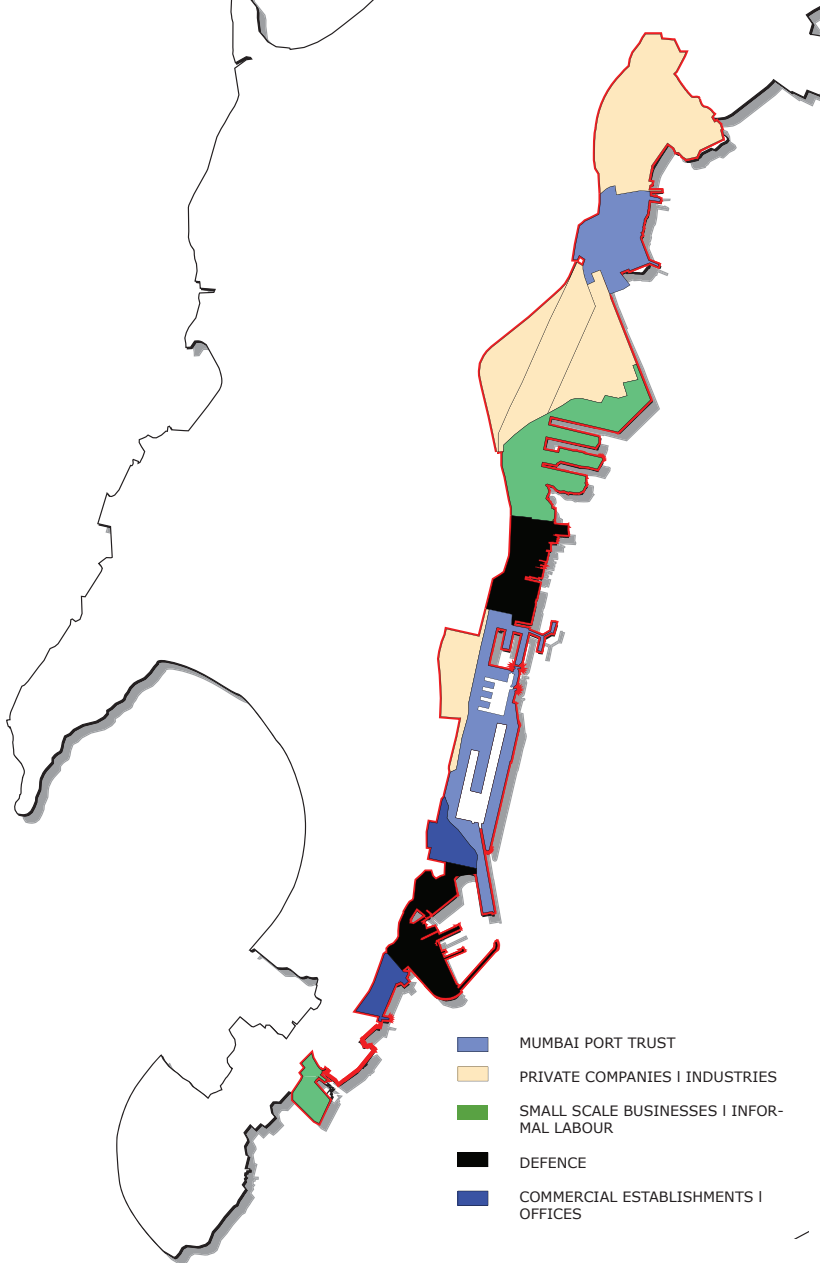


Figure: 4.4c
Eastern Waterfront_Stakeholders

d. Port Usage Statistics:

The state of Maharashtra is the primary hinterland for Mumbai Port. Nearly 44 % of its traffic originates within the state. Mumbai city itself accounts for nearly 28 % of the total traffic of Mumbai Port. Another main area is Gujarat which accounts for 14 % of total traffic. Delhi accounts for nearly 13 % of the traffic. Other states such as Madhya Pradesh, Rajasthan, Punjab, Haryana, Uttar Pradesh, West Bengal etc. account for the rest of the traffic. *(Source: www.indiacatalog.com)*

The three docks of Mumbai handle handle dry cargo and general cargo. Liquid cargo is handled further North at Sewree and container cargo is primarily handled at JNPT.

The chief exports by the Mumbai port are plastics, garments, automobile parts and medicinal products. The chief imports include automobile parts.

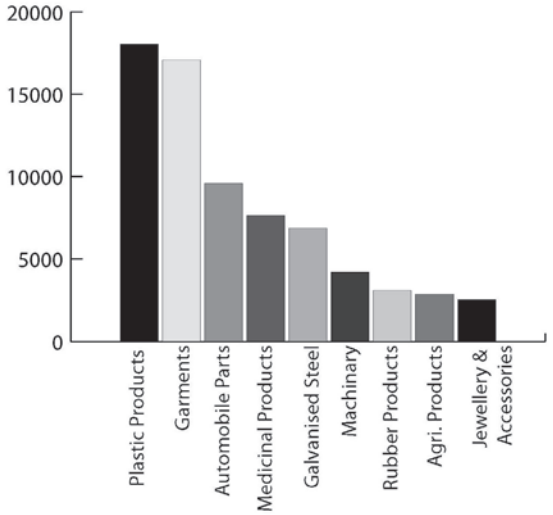


Figure: 4.4d.1
Mumbai Seaport export data in total value of USD
Data Source: Mumbai Port Trust

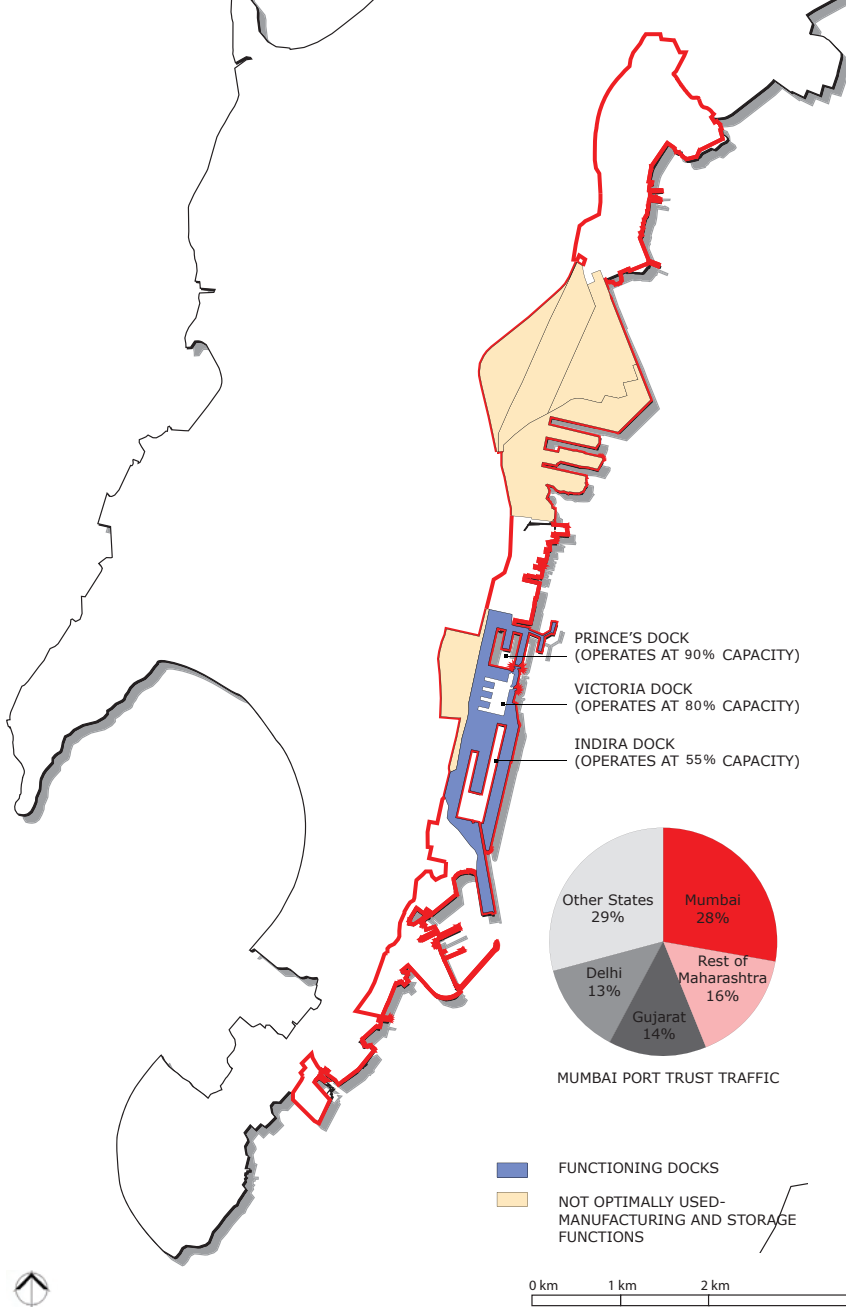


Figure: 4.4d.2
Eastern Waterfront_Port Usage statistics

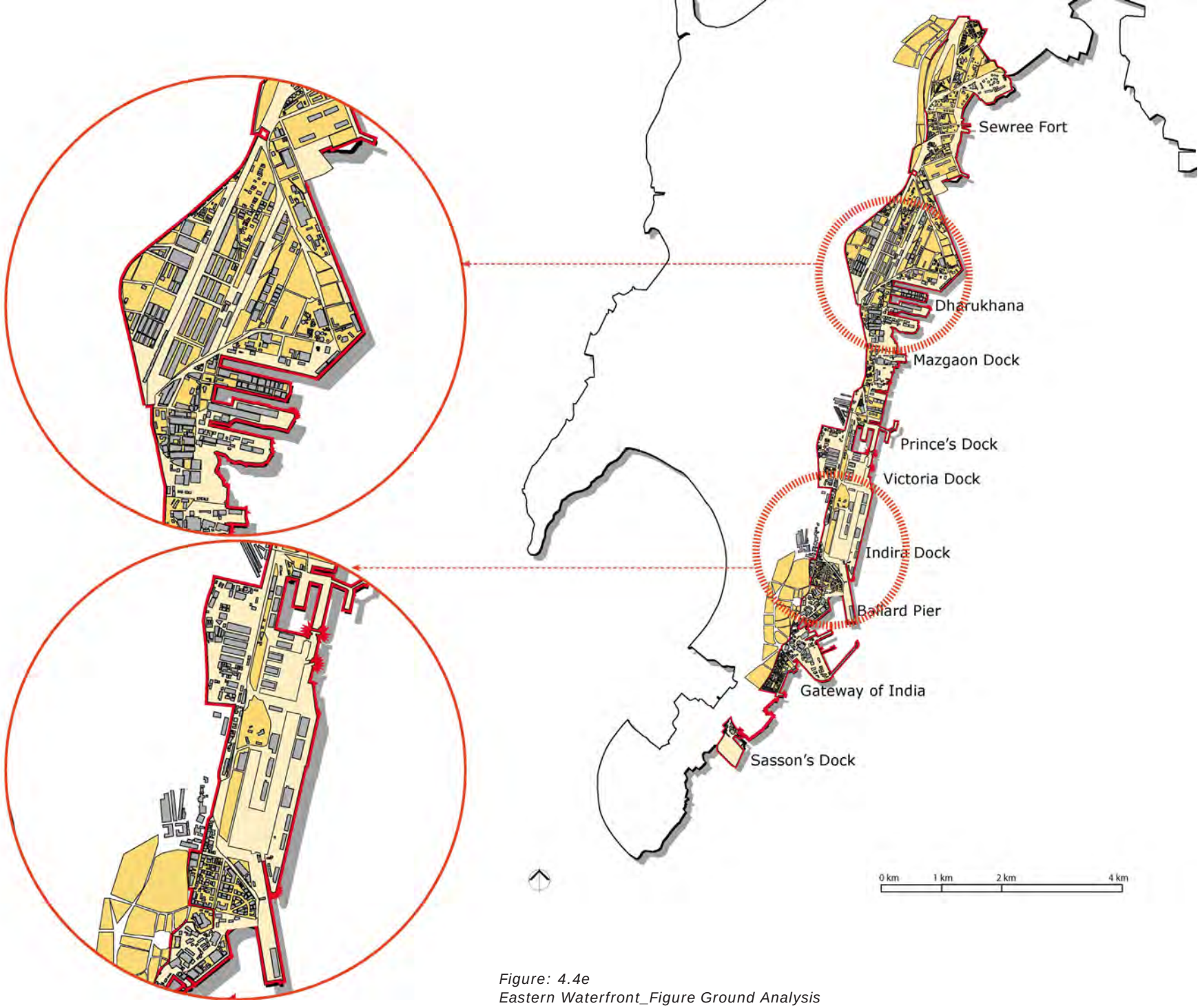


Figure: 4.4e
Eastern Waterfront_Figure Ground Analysis

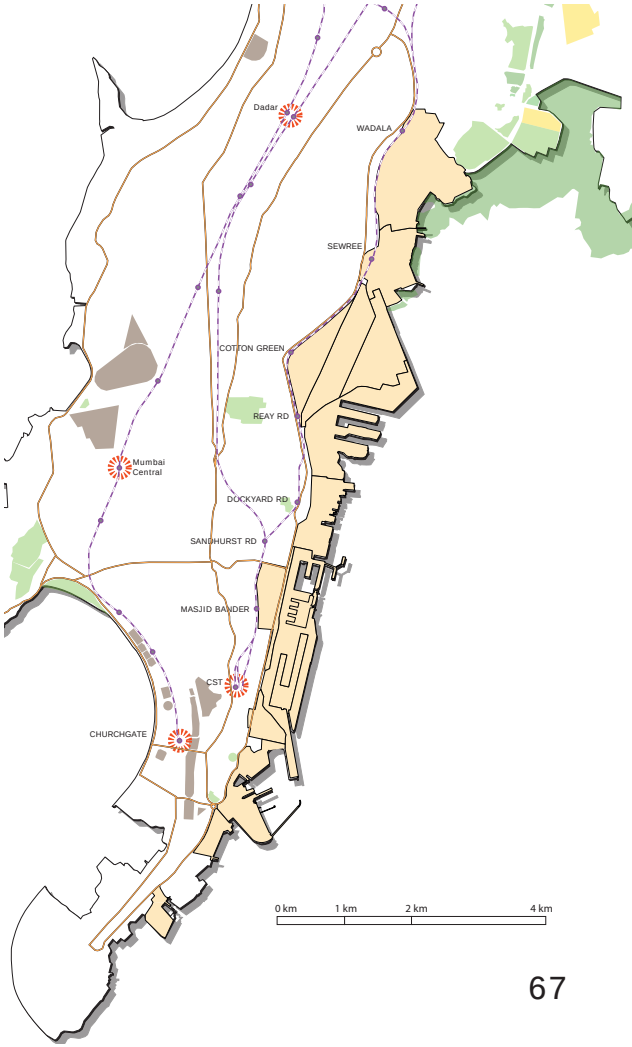
e. Figure Ground Analysis:
The figure ground analysis show a low density of structures like warehouses which have a large building footprint. Large parts of the EWF area consist of open spaces, derelict warehouses and under-used infrastructure. The land directly used for port functions is limited.

f. Harbour Line Railways
The Eastern Waterfront area of Mumbai is untouched by the development boom in the adjacent parts of the island city. It is now largely comprised of abandoned warehouses and vast areas of derelict sites which are used as unauthorized playgrounds by children. Travelling through the harbour line is reminiscent of the thriving bygone port industry.

Construction of the habour line started in 1906. Suburban railway services began on the Harbour line in 1925. Trains ply on this route at a slow speed from CST railway station in the south to Mankhurd railway station in the North. After Mankhurd this line picks up speed and crosses the bay along the newly built Vashi Bridge and continues all the way to Panvel (the potential site for the new international airport). This line stands elevated on stone bridges for about for 15% of its stretch.

The main railway stations along the harbour line running through the Eastern Waterfront are CST, Masjid Bunder, Sandhurst Road, Dockyard Road, Reay Road, Cotton Green, Sewri and Wadala Junction.

- CST is the main terminus building for Central railways in South Mumbai. This harbour line has two dedicated platforms here.
- The 2nd station in the up direction is Masjid Bunder. The volume of passengers on this station is very high due to different wholesale markets and street markets surrounding the station. Stockists from Reay Road iron market and diamond traders are known to make trades of millions of rupees each day in these markets. Moreover due to the docks, Masjid is a prominent area recognized as the hub of the larger shipping and maritime companies of India.
- Sandhurst road railway station is a split level railway station, where platforms 1&2 are elevated and platforms 3 & 4 are at ground level. The former caters to the harbour line and the later caters to the Central Railways. At this railway station, the central railway divides into two- the first one goes to Dadar and then to Kalyan; the second line runs parallel to the harbour line upto Wadala Junction and then deviates towards Andheri.
- The Dockyard Road station is famous for its proximity to the Mazgaon docks.
- Reay Road railway station is also a heritage structure. The iron merchants in the surrounding districts use the warehouses near the railway station to stock iron beams, rods, plates, etc. for trading. Ship breaking activities are also conducted here illegally and potentially harmful for the environment.
- The Cotton Green Railway Station got its name from the cotton and grain storage warehouses in the area, which are now derelict.
- Sewree is famous for its mangrove swamps that attract flamingos and also for its mud flats. To the north of Sewree, the hard boundaries of the port give way to soft and natural edges defined by protected swamps and mangrove forests.
- Wadala is best known for its prime residential area, its secular character and as an educational centre.
- The railway station complex at Vashi, on the opposite side of the bay, is a more contemporary structure. It is designed to have railway platforms at the ground level and offices and commercial spaces at the upper level.



4.5. Conclusions & Reflections

a. Through Literature:

- Spatially a shift can be observed from a mono-centric spatial model to a multi-nodal network model.
- There is a trend towards suburbanisation and regionalisation of economic growth
- Soft locations in the city like the derelict mill sites and water-fronts lack integral planning measures.

b. Research & Analysis:

- With the increased urbanisation and pressure on the urban fabric, the linear growth pattern of the city and the existing linear infrastructure model is no longer optimum.
- The island city poses limitations in urban development due to its unique geography.
- Location and concentration of jobs studied in relation with the population density suggest that people commute great distances to work.
- Concentration of economic functions in the region is not uniform and connectivity to the chief business district in the South poses a huge problem, thereby threatening the position of the historic CBD as the dominant economic node in the region.
- The development of the new sea port and the new airport in Navi Mumbai is bound to have further significant effects on the urban spatial structure of the region. Navi Mumbai has a lot of potential for development to the South.
- The decline in the activities of the Mumbai Port Trust (MPT) because of the new sea port (JNPT) and other ports in the region could mean that the eastern waterfront which was primarily used for port activities has potential for more integrated development with the rest of the city.
- There is a conflict between local interests (such as tackling pressing urban issues like traffic congestion) and global interests (such as improving the urban competitiveness of regions). The essence of the local has been lost in this transition from a colonial port city to a manufacturing and then service dominant city.
- Mumbai is in need of a comprehensive vision for its growth and development which addresses key issues in connectivity and the reorganisation of the metropolitan area.

design & strategy

section v

5.1. Strategy_ Regional Scale

At the regional scale, the city of Mumbai forms a golden triangle with the cities of Nashik (to the NE) and Pune (to the SE. About 75% of the State Domestic Product (SDP) originates in the Mumbai-Pune-Nashik triangle *(Source: www.projectsmonitor.com).*

The city of Mumbai is the financial heart in this triangle. The Mumbai- Nashik axis is an agro-based industrial corridor extending over a length of approximately 185 Km. Moreover, this corridor is an important stretch along the proposed 1400 km of industrial corridor development planned between the two main cities of India, namely Delhi and Mumbai. The axis from Mumbai to Pune is primarily a knowledge corridor with developments in IT, bio-tech, research and education, with Pune being the Knowledge city.

The historical CBD in South Mumbai, which is the heart of all commerce in the region lies at the tail end of a linear infrastructure. The economic nodes which are well connected re-

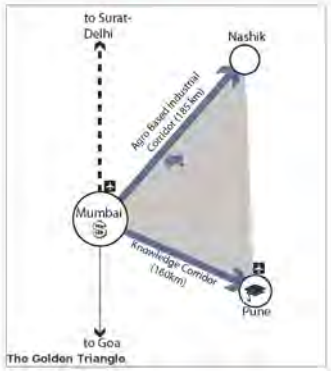


Figure: 5.1.1
Regional Scale: The Golden Triangle & Quadrilateral

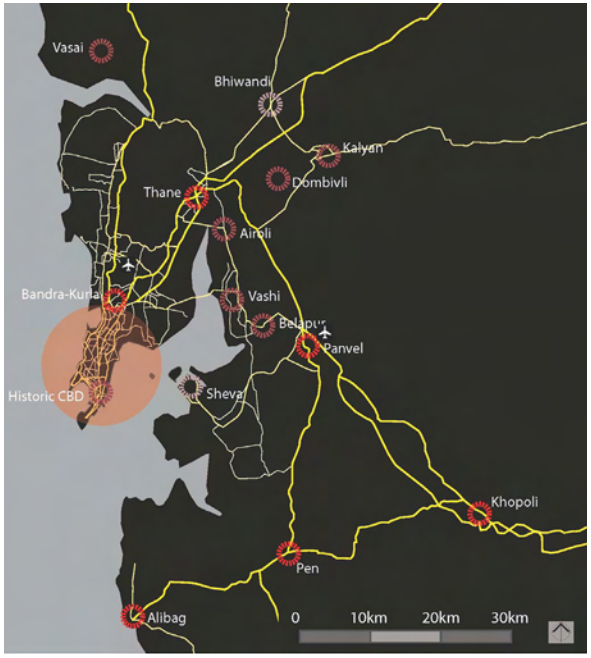


Figure: 5.1.2
Mumbai Regional Scale

gionally include Thane, Panvel and Pen. The new port of JNPT port located at Sheva (in the mainland) has a better connectivity to the region than the Mumbai port that has existed since colonial times in South Mumbai. Among the different economic centres in the metropolis, the nodes in the Southern region of the metropolis, namely Vashi, Belapur, Panvel, BKC and historic CBD are nodes of commerce. The Northern corridor extending from BKC to Thane and Airoli has a concentration of industries.

Two models for the organisation of the metropolis on the regional scale have been studied. The basic difference lies in the perception of the character of the dominant economic nodes and the connectivity between them.

a. The Network City Model:
In this model, the newly developed business district of BKC to the north of the island city takes dominance over the historical CBD in South Mumbai. With this model it is assumed that the centrality infact shifts from the historic centre in the South to BKC (which is in proximity to the international airport and is better connected to Navi Mumbai and the region). The strengthened connectivity of BKC to the region then becomes important. The CBD in the South takes a secondary position and is expected to assume the role of a more historic and cultural centre.

With this model, the pressure on the NS infrastructure axis can be expected to be reduced. Although, shifting the diminant economic node from the South to the centre of a linear axis seems to be the most logical solution to congestion, it is also the most difficult one to be implemented in this particular case. The regional development plan of MMR has a similar ambition, but what it has indeed succeeded in achieving is providing space and infrastrucure for higher order services and global businesses to operate in the suburbs.

The urban character and economic structure of the historic CBD is far more complex and continues to remain dominant and attract people. Only some global business have chosen to relocate to BKC and Navi Mumbai. As a result the stretch of linear urban fabric between BKC and the CBD in South have now ba-

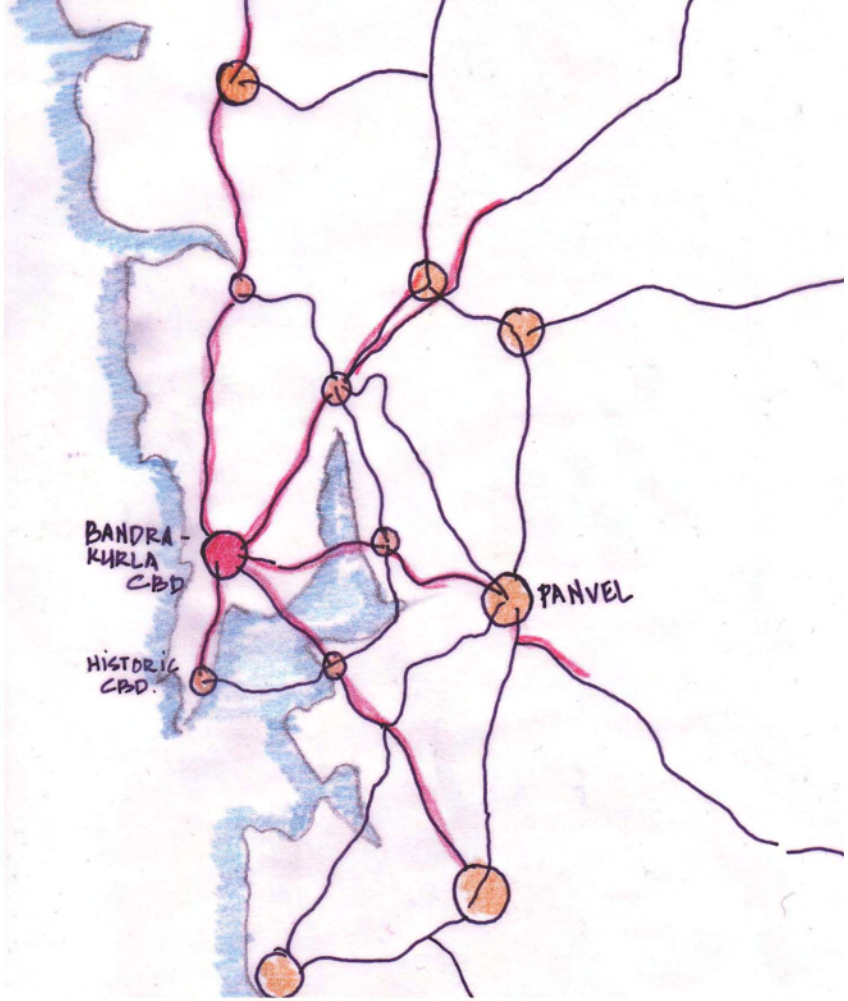


Figure: 5.1a
Network model for the re-organisation of the metropolis

come an extremely contested piece of real estate with increasing property values. The existence of the Dharavi Slums, derelict industrial mill sites and the Bhuleshwar wholesale markets stand threatened for this very reason that they fall along the percieved development axis between the two business districts, the historical CBD and BKC.

b. Ring Model

The historical CBD despite being a dominant centre clearly has a disadvantage with respect to its position in the metropolis, owing to the peculiar linear geography of the city. A new model of development for the metropolis is therefore proposed which aims at tackling this very problem.

The strategy is aimed at repositiong the historical CBD in the South from being at the tail end of a linear infrastructure axis to being positioned along a ring system that envelopes the important economic nodes in the region. This would reinstate the imporatnce of the historical business district and strengthen the position of the metropolis itself on the greater regional scale.

To realise this strategy it is essential to enclose the bay by providing an infrastructure link across the bay area so as to improve the connectivity of the historical CBD to the metropolitan region. This would also allow for potential development in the South of Navi Mumbai across the bay.

The other nodes along the ring would be defined by BKC (in North) at the intersection of the axis leading to Gujarat; Thane (in NE) along the axis leading towards Nashik; Panvel (in SE) along the axis leading to Pune; and a new node developed at the intersection of the proposed ring system and the southern axis.

An important segment of the ring is the North-South stretch between the two business ditricts. It is proposed to shift the development axis along this stretch further eastwards and along the derelict industrial sites of the Eastern Waterfront. This would aleviate some of the development pressure off the fabric of the island city and concentrate economic development along the Eastern Waterfront bordering the bay area.

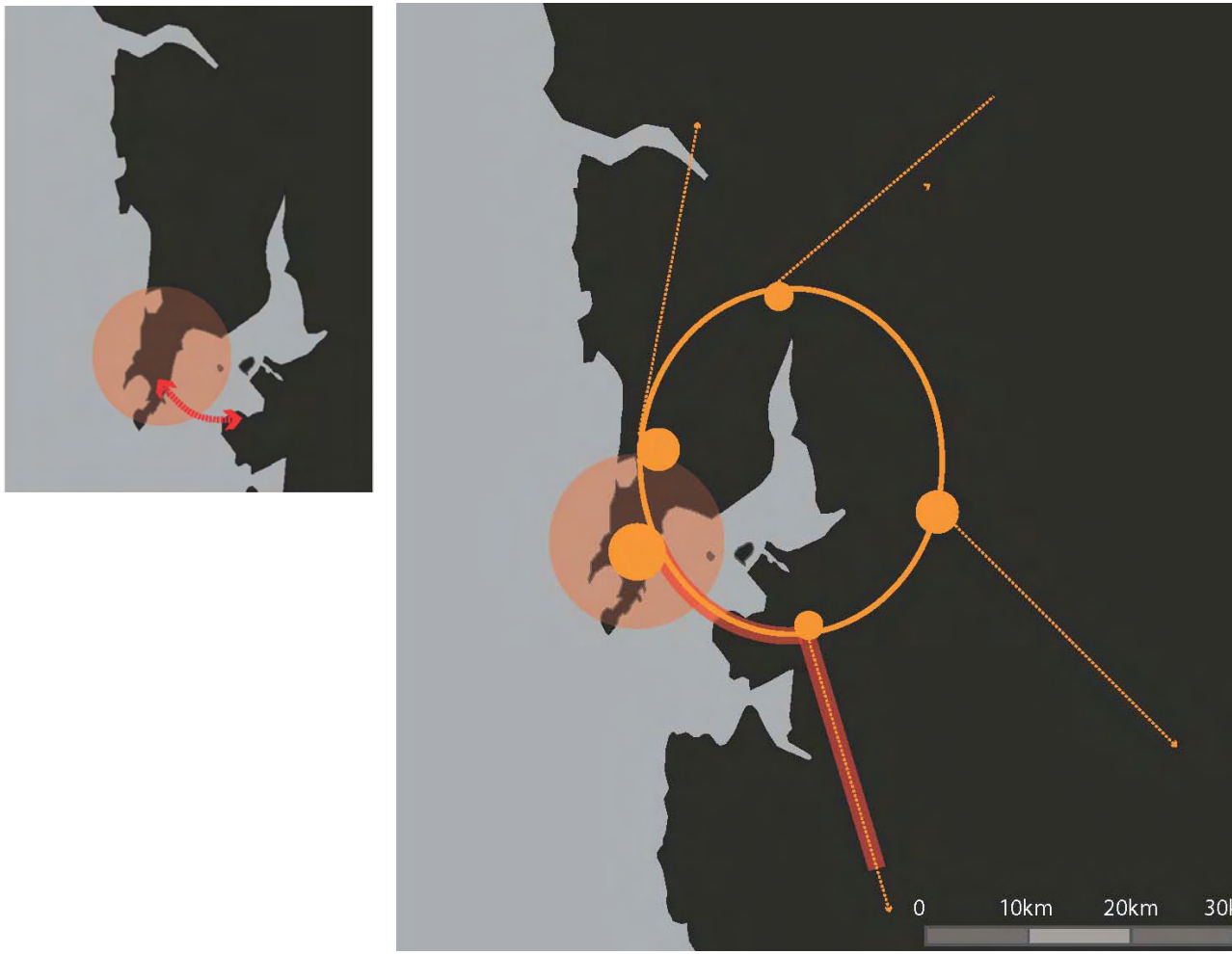
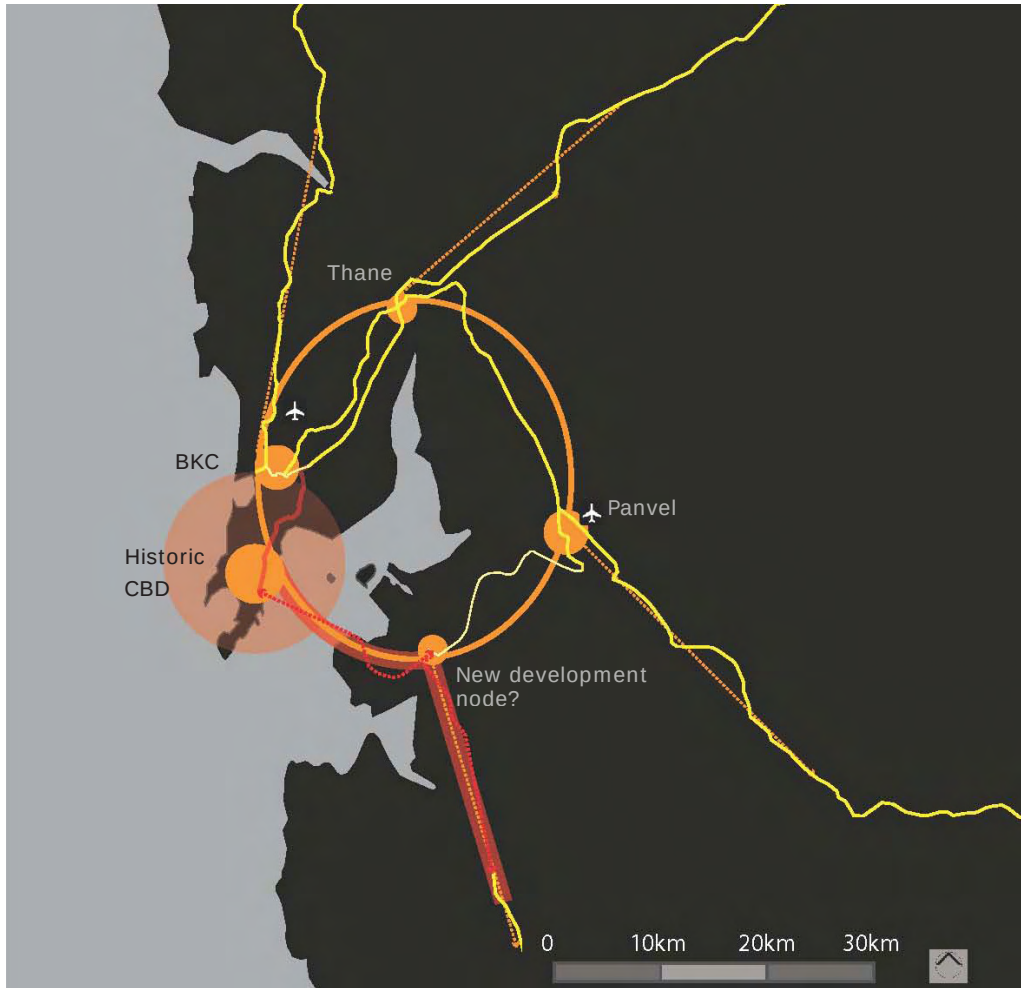


Figure: 5.1b
Ring model for the re-organisation of the metropolis


Thane
BKC
Panvel
Historic
CBD
New development
node?
0
10km
20km
30km


0
10km
20km
30km

5.2. Strategy_ Local Scale

a. Realisation of the Ring:
The key elements in the realisation of this ring concept therefore involves:
i. Creating an Infrastructure link over the bay area connecting the historic CBD to the mainland
ii. Strengthening of the N-S infrastructure axis in the island city along the Eastern Waterfront of Mumbai

i. Infrastructure link over the bay area:
The span across the bay area connecting the historical CBD to Uran is approximately 10 km. The infrastructure link creates tremendous potential for development across the bay in the mainland. Moreover, the position of the historic CBD in the region is strengthened.

Some examples of bridges spanning across bay areas have been studied. For example, the iconic bridges of San Francisco bay Area; the technological marvels of the Tokyo Bay aqua line and the Oresund Bridge at Copenhagen where a part of the bridge goes below sea level; and also Kenzo Tange's proposal for a habitable bridge in the Tokyo bay area.

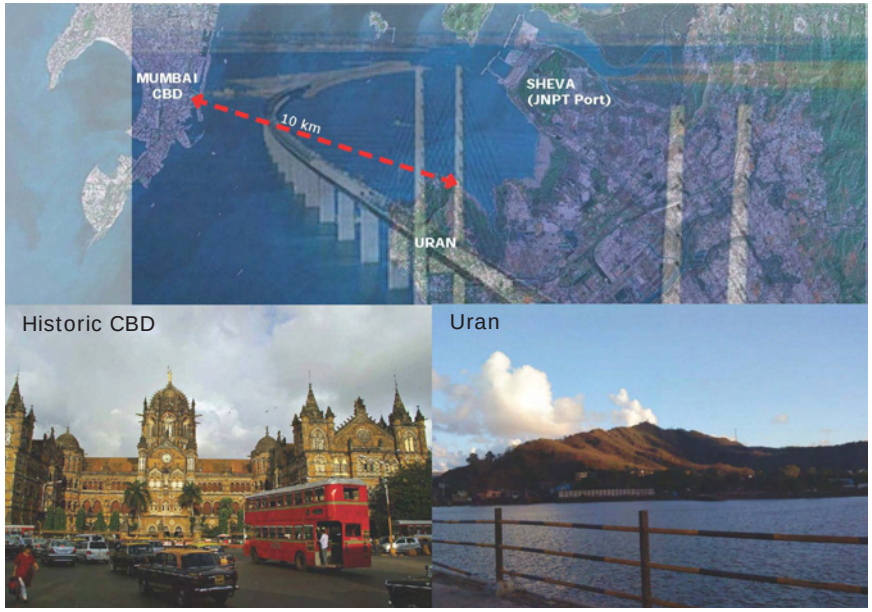


Figure: 5.2a.1
East- West link linking historical city of Mumbai with Uran across the bay area

Figure: 5.2a.2
Examples of bridges spanning bay areas

ii. Strengthened North-South infrastructure in island city:
Strengthening of the North-South infrastructure axis along the Eastern Waterfront for the realisation of the ring concept has tremendous potential to add coherence to the perceived fragmented urban fabric of the island city. The new and strengthened NS infrastructure connections throws open the entire Eastern Waterfront for more integrated development with the rest of the island city.

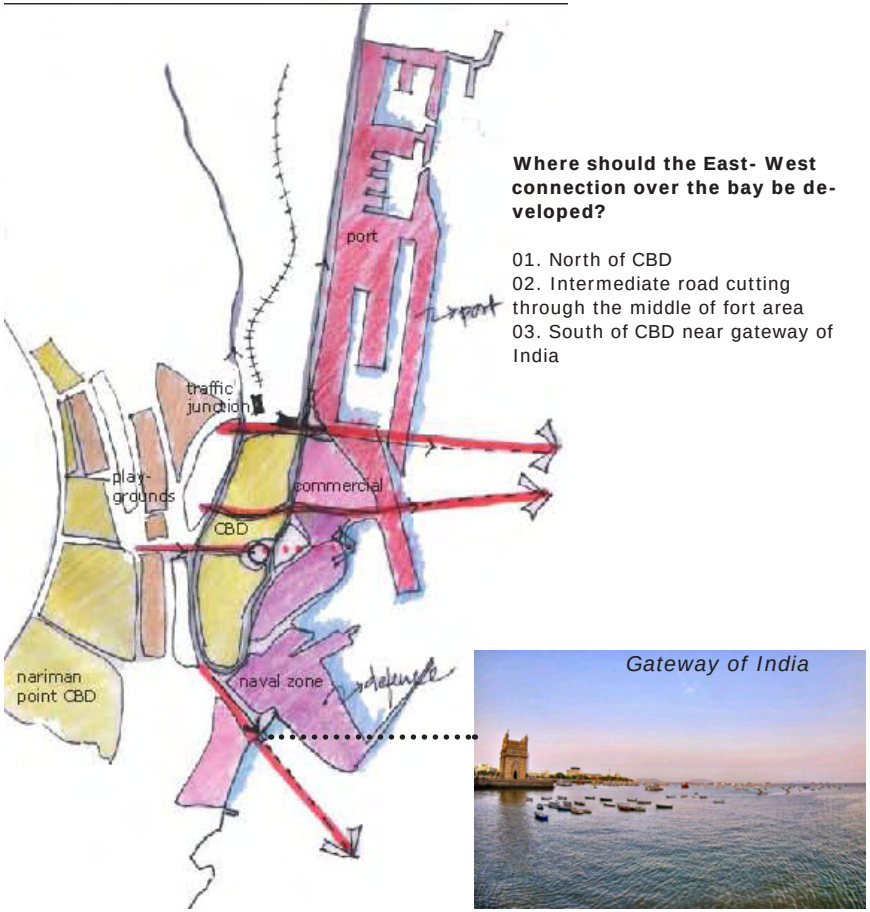
It could also be used to alleviate some of the pressure off the island city by strengthening the transport arteries from North to South. Moreover, opening up of the Eastern Waterfront area for development will also open up the port, the bay area and fragile ecological wetlands along the East Coast to public experience and public eye.

It can perhaps be assumed that the outcome of the ring model would be that the mirror of the phenomenon that occurs in Greater Mumbai will take place in the twin city of Navi Mumbai with Uran in the SOuth of navi mumbai developing as a significant commercial node. The problem associated with the predominant North South movement in the city can be hoped to be solved to an extent by the ring development.

Figure: 5.2a.3
Strengthenning of the North- South Infrastructure at the Eastern Waterfront of the island city

b. Point of Entry

Historically, the structure of the 'gateway of India', which is located to the South of the Fort Area symbolized the entry into the city from the sea. Now the CBD of South Mumbai primarily consists of three zones: the Fort Area, the offices of Ballard Estate, and the Nariman Point business district along the West Coast, The existing suburban railway terminates to the North of this CBD. This forms an ideal location for developing an infrastructure link to the East. The new connection over the bay will define a new point of entry into the city from the bay.



Where should the East- West connection over the bay be developed?

01. North of CBD
02. Intermediate road cutting through the middle of fort area
03. South of CBD near gateway of India

Fig 5.2b.1
Point of Entry of East- West connection over bay

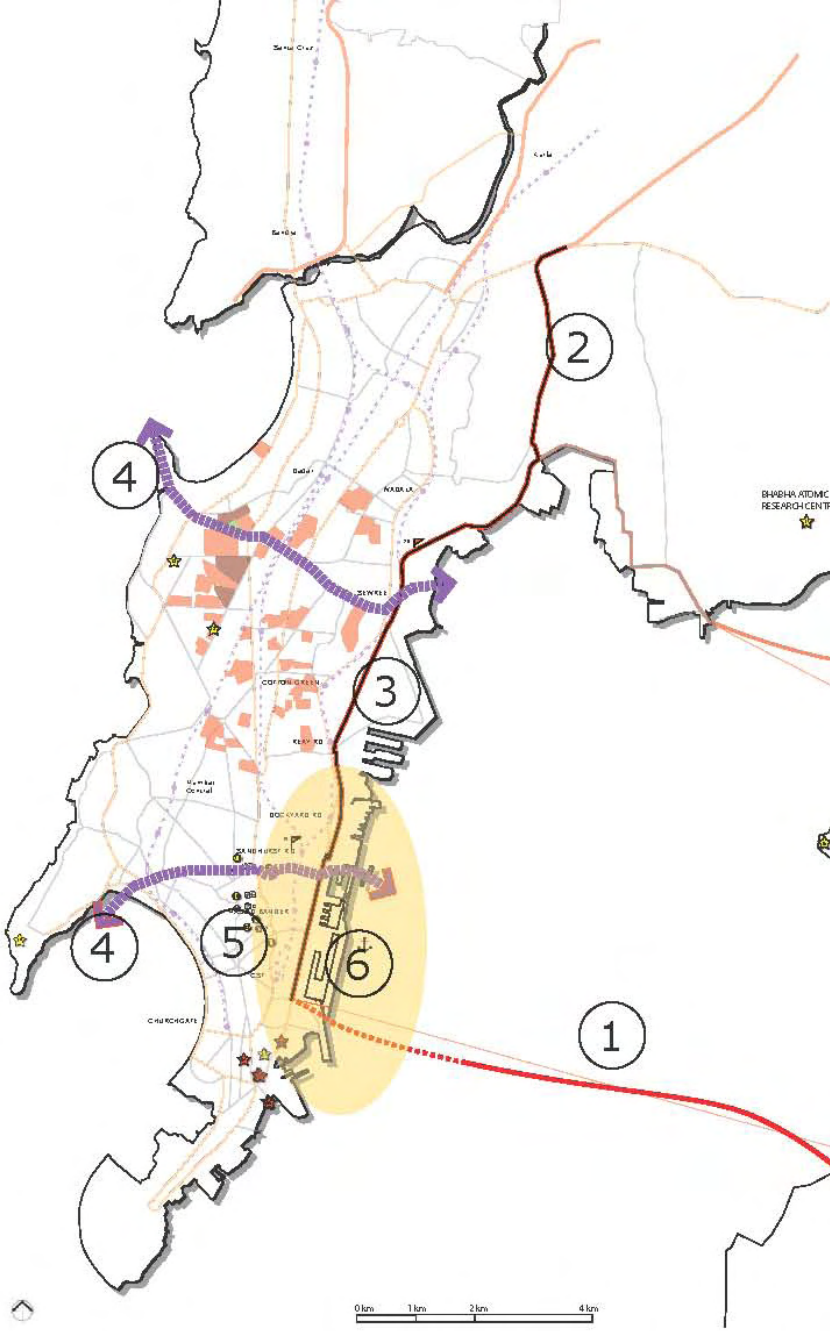


Fig 5.2b.2
Key Projects

c. Key Projects:

The key projects that are essential for making this strategy work include:

01. East- West infrastructure link over the bay.
02. Enhancement of the North South axis from CST to Wadala
03. Integrated development of the Eastern Waterfront Area
04. Key East- West thoroughfares through the Island City along critical lines and perpendicular to the North South axis which are aimed at integrating the Urb.

i. Linking Chowpatty beach, markets of Bhuleshwar, Sandhurst road railway station, port functions and ferry terminal.

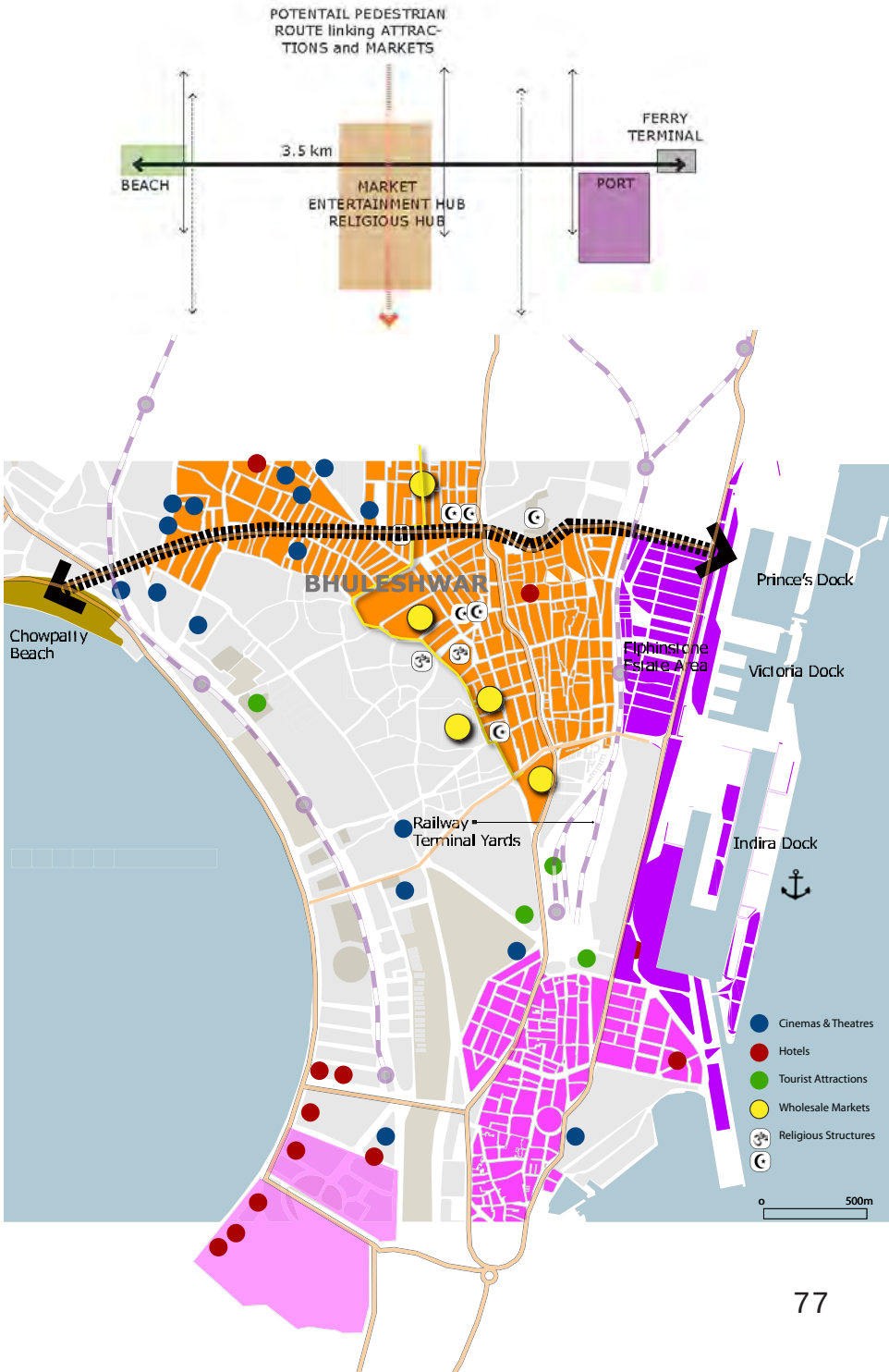
ii. Linking Bandra, Worli, Parel Bus Depot, Sewree fort and railway station.n fabric of the island city with the Eastern waterfront.

05. Enhancement of the pedestrian and public space realm in South Mumbai
06. Project to overcome the physical barrier of the rail infrastructure separating the city from the port and making the EWF accessible
07. Development of the new economic node at Uran across the bay area

i. East- West thoroughfares in Zone 1:

The East- West thoroughfare in South Mumbai is an existing 3.5Km stretch that links the popular Chowpatty beach with the vibrant markets of Bhuleshwar and continues further east to the Port. This axis runs perpendicular to the many street markets in the area and is also home to several religious structures. It has therefore the potential to develop as a cultural axis. However, the port largely remains inaccessible and is physically barricaded from access by the presence of walls.

Fig 5.2c.1
Photographs depicitng the streets of Bhuleshwar



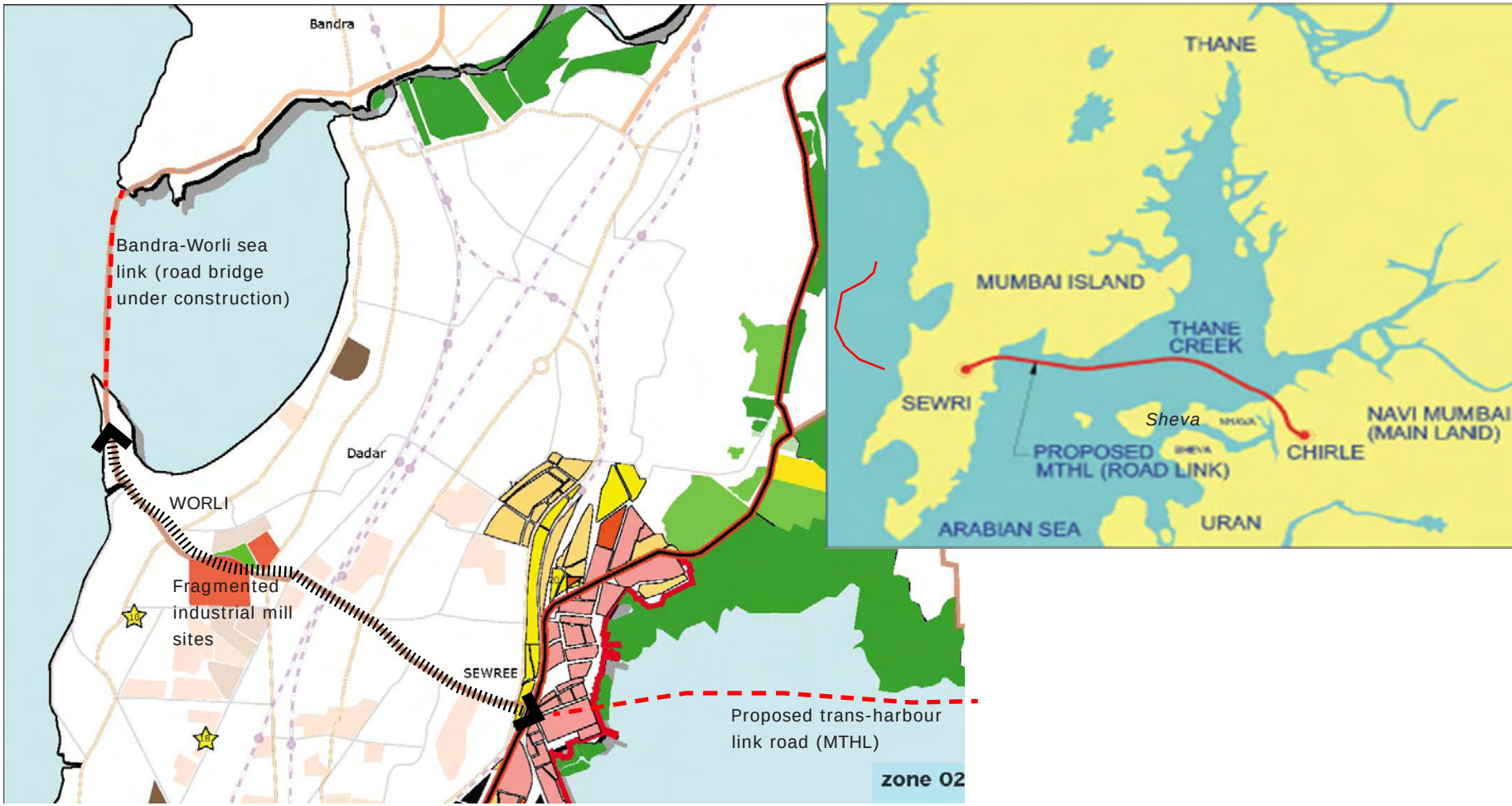

Nariman Point
Business district
Fort Area Offices
Ballard Estate +
Naval Docks
CST Railway
terminus
Bhuleshwar
Port of Mumbai

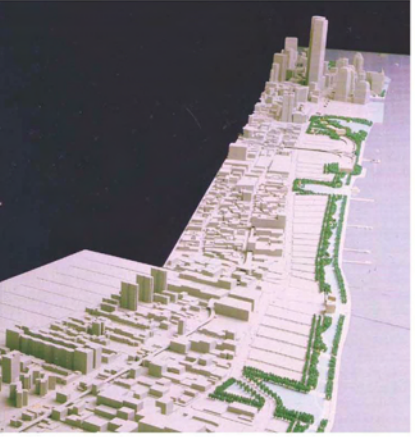
This road is particularly popular for religious festivals and for political rallies.

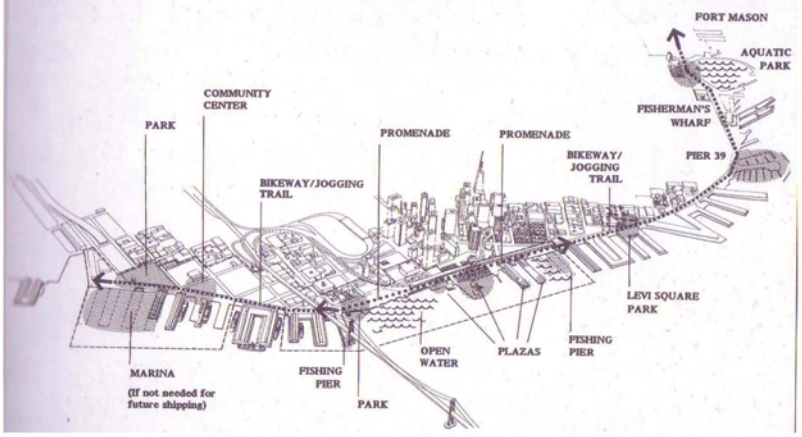
ii. East- West thoroughfares in Zone 2:
The East- West thoroughfare in Central Mumbai is proposed to link the Bandra-Worli sea link road bridge (under construction) with the North- South axis at the Eatsern Waterfront so as to provide an effective bypass through the congested urban fabric of the island city.

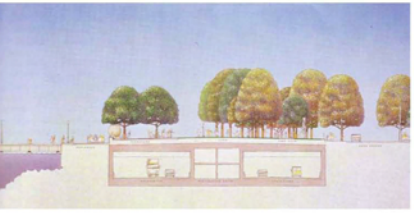
This axis also passes through the fragmented derelict industrial mill sites allowing for a more integral development of the same.

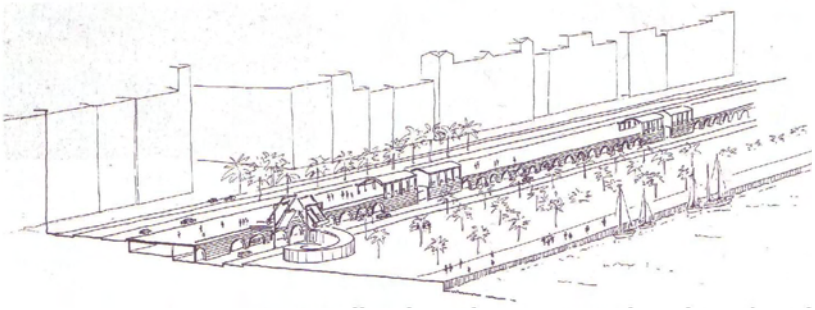
It meets the North- South Axis at Sewree. Another road bridge across the bay is planned at Sewree (under planning stages) which is proposed to link Sewree with Sheva across the harbour.











d. Restructuring of the urban fabric along the Eastern Waterfront:
The port and the industrial lanscape along the Eastern Waterfront which is sub-optimally used at the moment, could be restructured to inject vital public spaces and design elements that could form a coherent design language along the strip.

The key prolem involves overcoming the infrastructure barrier of the railways and creating an access to the coast. New developments along this stretch will then form the new skyline of Mumbai as seen from across the bay in the twin city of Navi Mumbai. Thus the integral development of this stretch is also vital to the proposed strategy.

Figure: 5.2d
Case Examples_ New York, San francisco & Barcelona
Images coutesy: City & Port by Han Meyer

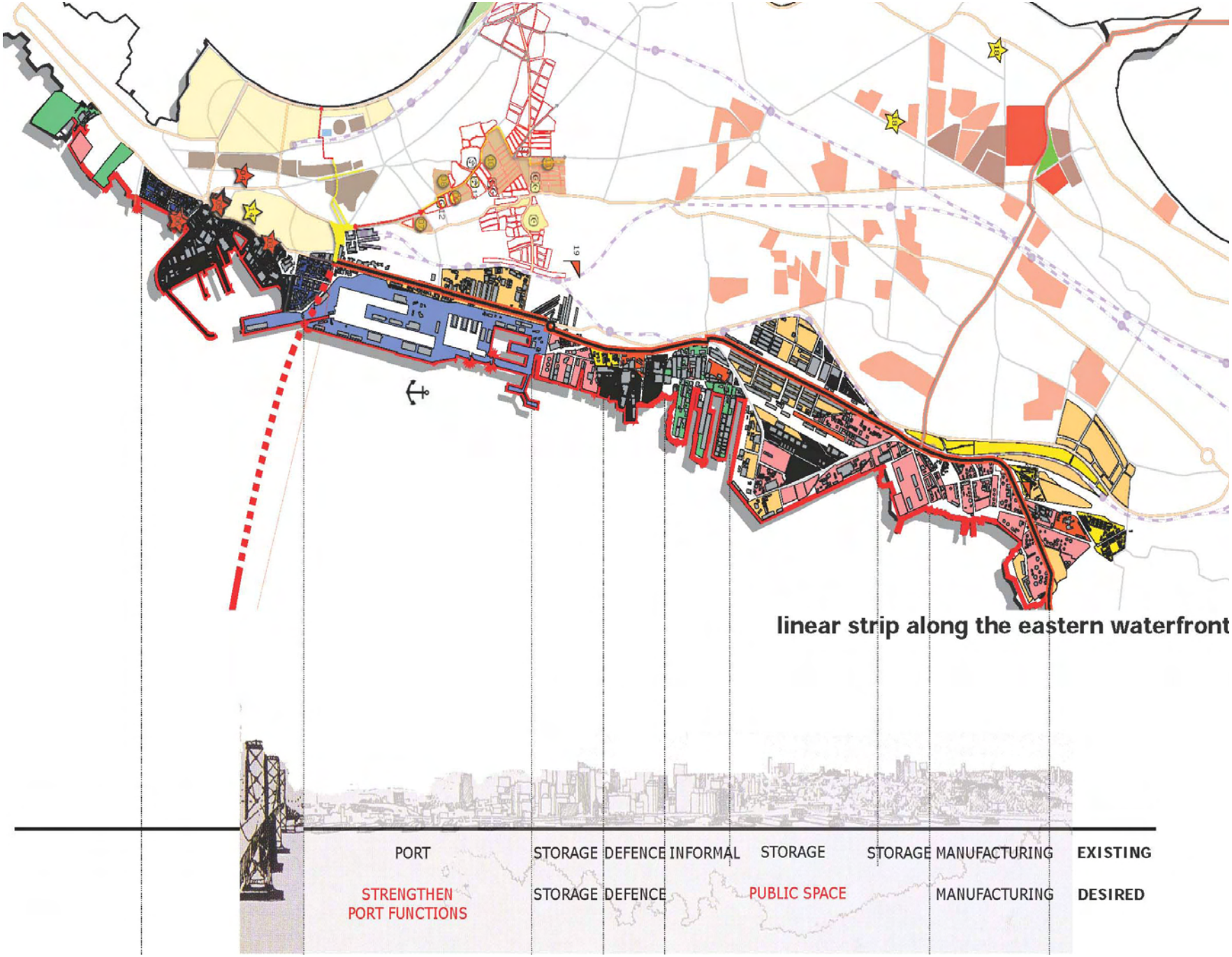

linear strip along the eastern waterfront
PORT
STORAGE
DEFENCE
INFORMAL
STORAGE
STORAGE
MANUFACTURING
EXISTING
STRENGTHEN
PORT FUNCTIONS
STORAGE
DEFENCE
PUBLIC SPACE
MANUFACTURING
DESIRED

Figure: 5.2e.1
Existing railway network_Mumbai

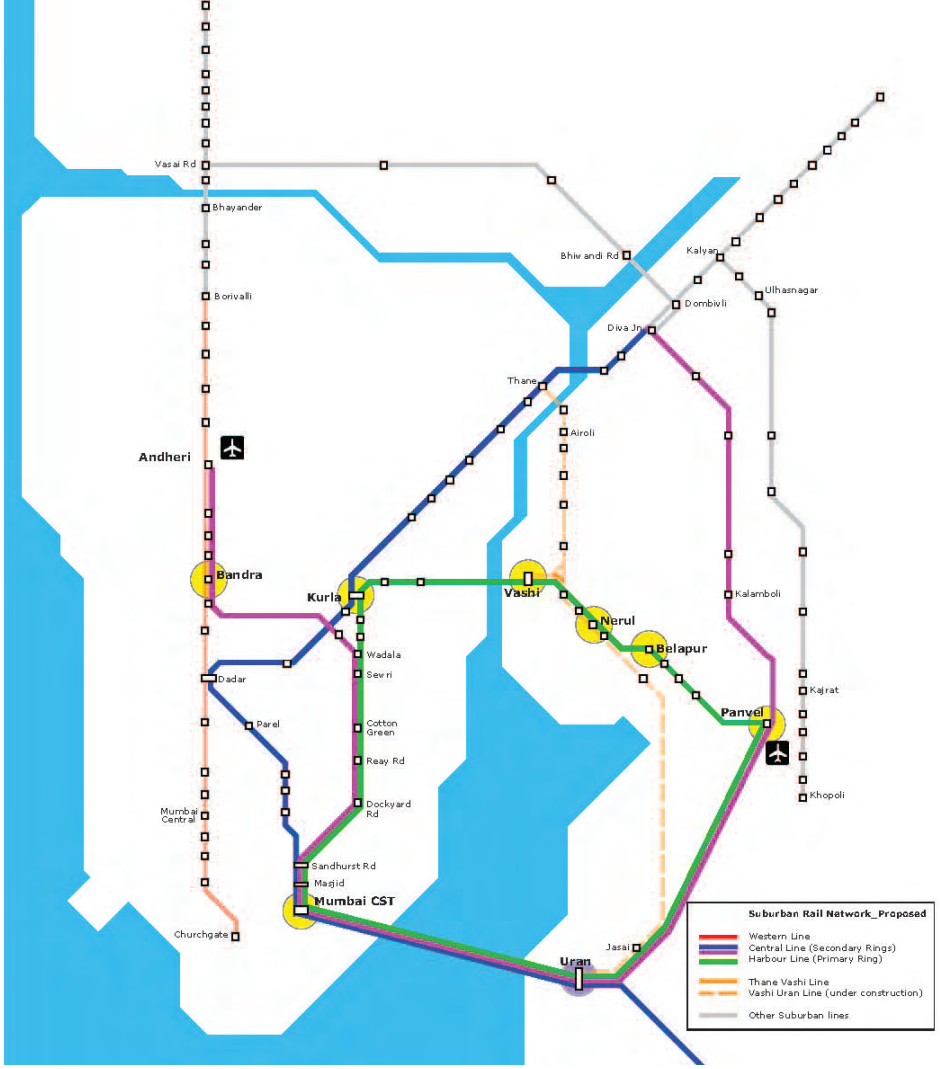


Figure: 5.2e.2
Proposed railway network_Mumbai

e. Restructuring of the metropolitan area using the railways as a tool:

The rail infrastructure of Mumbai is its lifeline. For a growing metropolis like Mumbai with over 6.6 million daily commuters on railways, it becomes vital to use the railways and public transport as an effective tool to re-organise the metropolis into a ring system. The suburban railways operate at 4 times its carrying capacity during peak hours. With the projected population increase to 34 Million in the next 20 years, it can be anticipated that the demand for public transport and connectivity will also increase. Mumbai currently has the advantage of having relatively low energy consumption as compared to Delhi (60% less) due to efficiency of the railways and lesser use of private vehicles.

A mass transportation network of railways- surface trains, elevated metros and underground tubes is proposed to define the ring. A great percentage of people in Mumbai walk to work. The public transport system should therefore be integrated with the public space network. The existing railway stations in Mumbai are located at an approximate interval of 1km.

f. Elaboration of Strategy at local scale:

Although an orbital route is proposed to connect the major economic nodes in the metropolis, it must be noted that not all segments of this ring is homogenous in the flow of people as well as in the concentration of activities. The North-South axis from CST to Wadala holds the maximum flows.

An analysis of the suburban rail network also indicates that between CST and the Sandhurst Road railway station there are three major railway lines that run parallel to each other and forms the biggest barrier to accessing the coast and port functions *(Refer Fig 5.2f)*. The barrier posed by the rail infrastructure can be overcome by either adopting an elevated or below ground rail system. The advantage with using a tunnel is that it would reduce noise and air pollution.

Moreover, the shifting of railways to the East and underground will open up large tracts of land for development. The open grounds of the rail terminal facility at CST together with the Elphinstone estate area with its under-used warehouses form a kind of landlock, preventing access to the coast. At certain places physical barriers in the form of walls prevent the port functions and the Eastern coast from being visible to the public eye. The realisation of the strategy at this scale involves the following:

i. CST_from a terminal buiding to a transit station

By shifting the railway line to the East and in alignment to the P'Dmello road (a main North_South axis in the city, there is potential to change CST from a terminal building to a transit building, thereby allowing for a rail connection across the bay. New typology of station buildings with mixed functions and improved public space could be realised along this stretch.

The rail infra can be continued underground and across the bay in a tunnel and re-emerge in an artificial island mid way in the bay area. Part of the reason to take the tunnel is not to obstruct the movement of ships close to the coast of Bombay and to keep the skyline near the historical city inobtrusive.

ii. Widenning roads and Stacking infrastructure:

The stretch of infrastructure along the Demello road needs to be widenned to allow for a stacking of infrastructure- road & railways and through public spaces. This 2.2km long stretch connects the historical city and meets the EW cultural axis north of Bhuleshwar. Widening of this road creates potential for higher density development and the realisation of new kind of public spaces and green areas.

iii. Port & city:
Should the port be retained within the island city or should it shift to the mainland?

The strategy has been worked out taking into account that the port functions or atleast a part of it would still be retained within the island city despite the perceived decline in the activities of the port. The reasons for this are multi-fold. The port has been the economic backbone of the city through history and is vital in contributing to the image of the city. Despite this, port activities have been barred off from public access and public view for centuries. What is essentially and potentially the pride of the city lies hidden from the human sight and mind.

The strategy then aims at strengthening this very relationship between the city and port by opening up the Eastern waterfront and the bay area for public access. This is further made possible by drawing key East- West links through the fabric of the island city leading towards the ports.

Parts of the western coast of Mumbai are accessible to the public. But the East coast and bay area if opened up could generate a new kind of an experience, that of a thriving shipping industry and port activities.

Moreover, the Mumbai port is known for its versatility in handling different types of cargo. In recent years containerised cargo, which requires modern handling equipments, greater draught and better regional connectivity, have shifted out to the JNPT port in the mainland. But the MPT is still operational and about 1/3rd of its traffic are catered within Greater Mumbai. The recommendation would therefore be to retain the port functions atleast in part, modernise port facilities and concentrate port activities so that a great part of the 1800 acres of port trust land can be developed in a more integral manner with the rest of the island city of Mumbai.

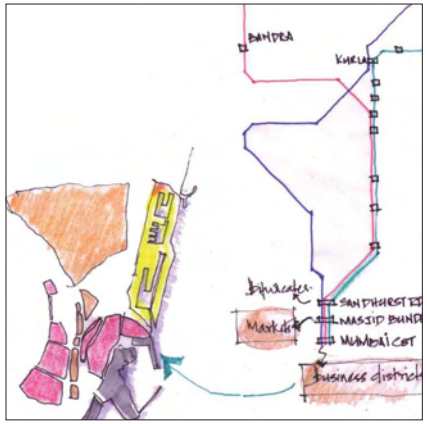
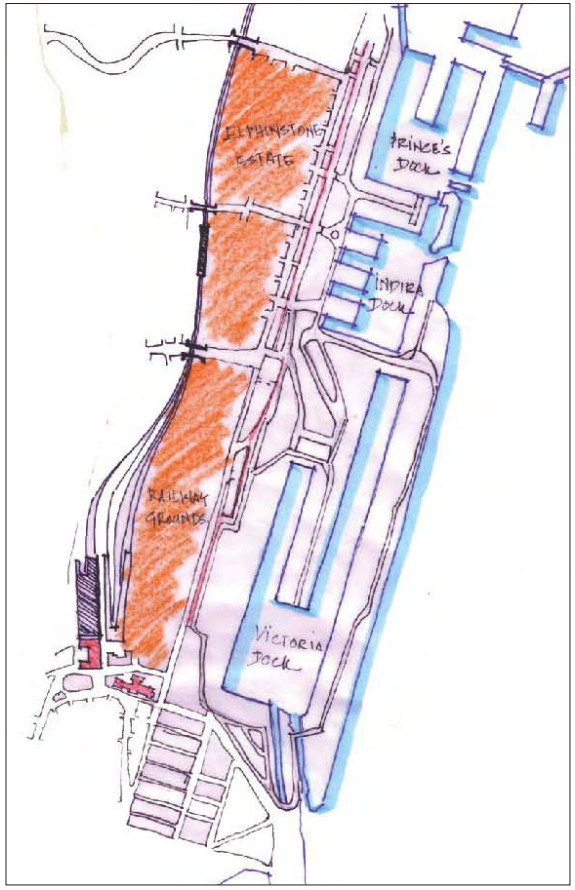


Fig 5.2f.1
Rail infrastructure_Central railways & Harbour line



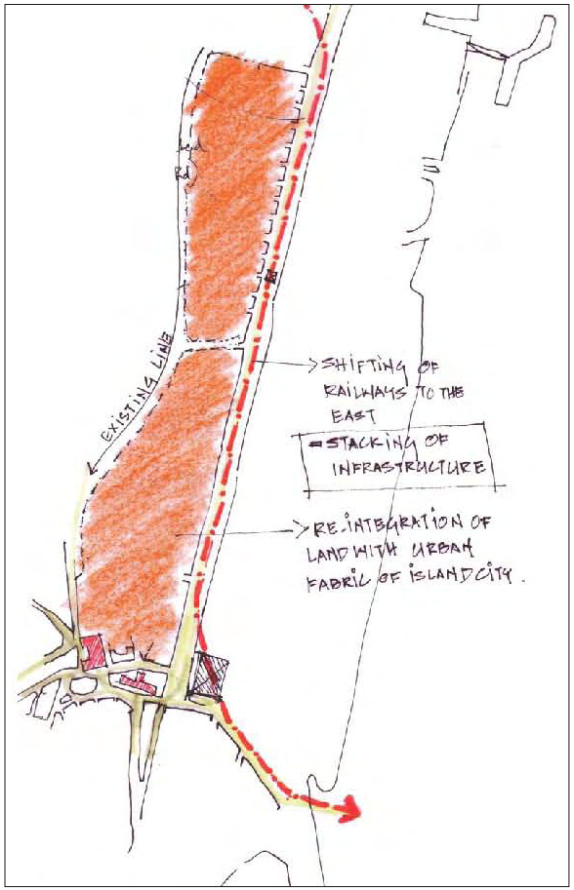


Figure: 5.2f.2
Infrastructure barrier posed by railways and overcoming of the same

The port is located in proximity to the vibrant market areas of Bhuleshwar and the commercial districts- i.e. Fort Area, Ballard Estate offices and Nariman Point CBD. The strategy is therefore aimed at establishing a relationship between the vibrant market areas and the port functions located parallel to each other.

This necessitates the shifting of the rail infrastructure underground as indicated in the diagram and the relocation of station buildings to the intersection points of the key E-W axes with the N-S road alongside the port (P D'mello Rd).

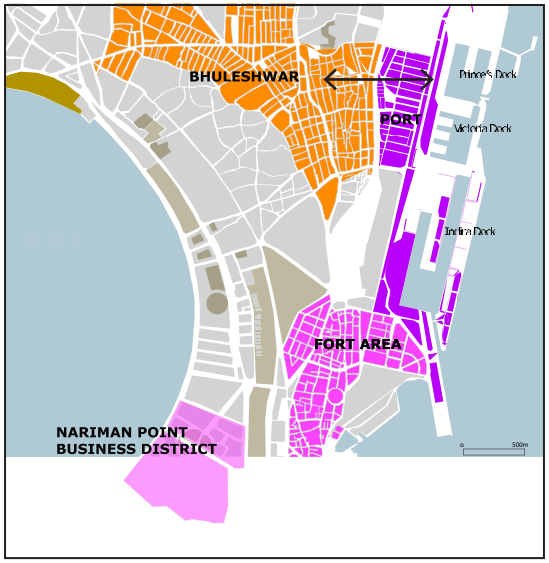


Figure: 5.2f.3
Establishing the relationship between Bhuleshwar & Port

Figure: 5.2f.4
Shifting of station buildings

Figure: 5.2f.5
Existing Urban Fabric

The heritage structures of the CST and the post office building at the terminal point of the existing railway line is preserved by the shifting of the railways. But, a number of other structures and the rail terminal yard at CST needs to be demolished to enable the widenning of the road and to allow for new building types.

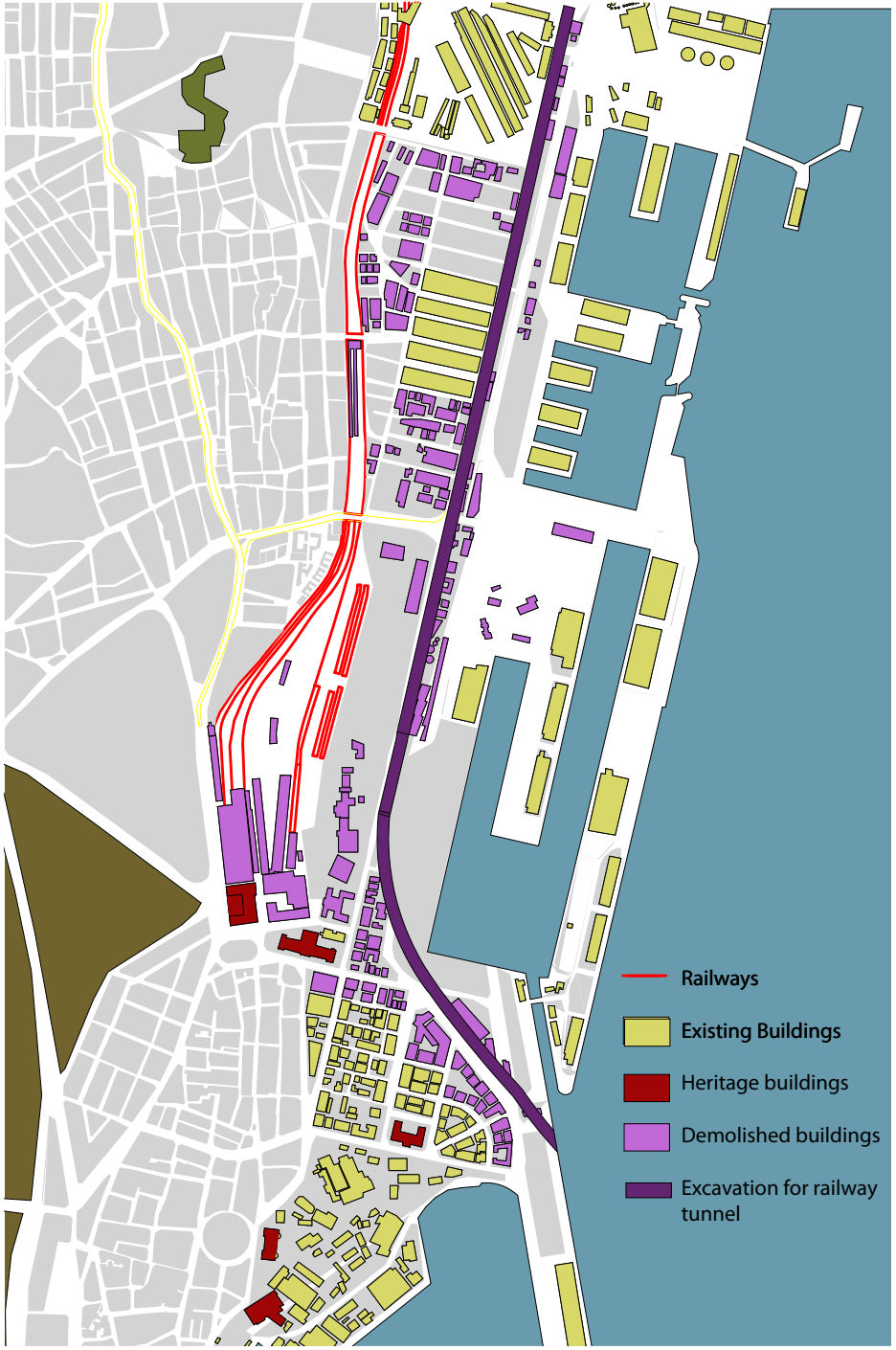


Figure: 5.2f.6
Urban Fabric_Demolitions & Tunnel excavation for railways

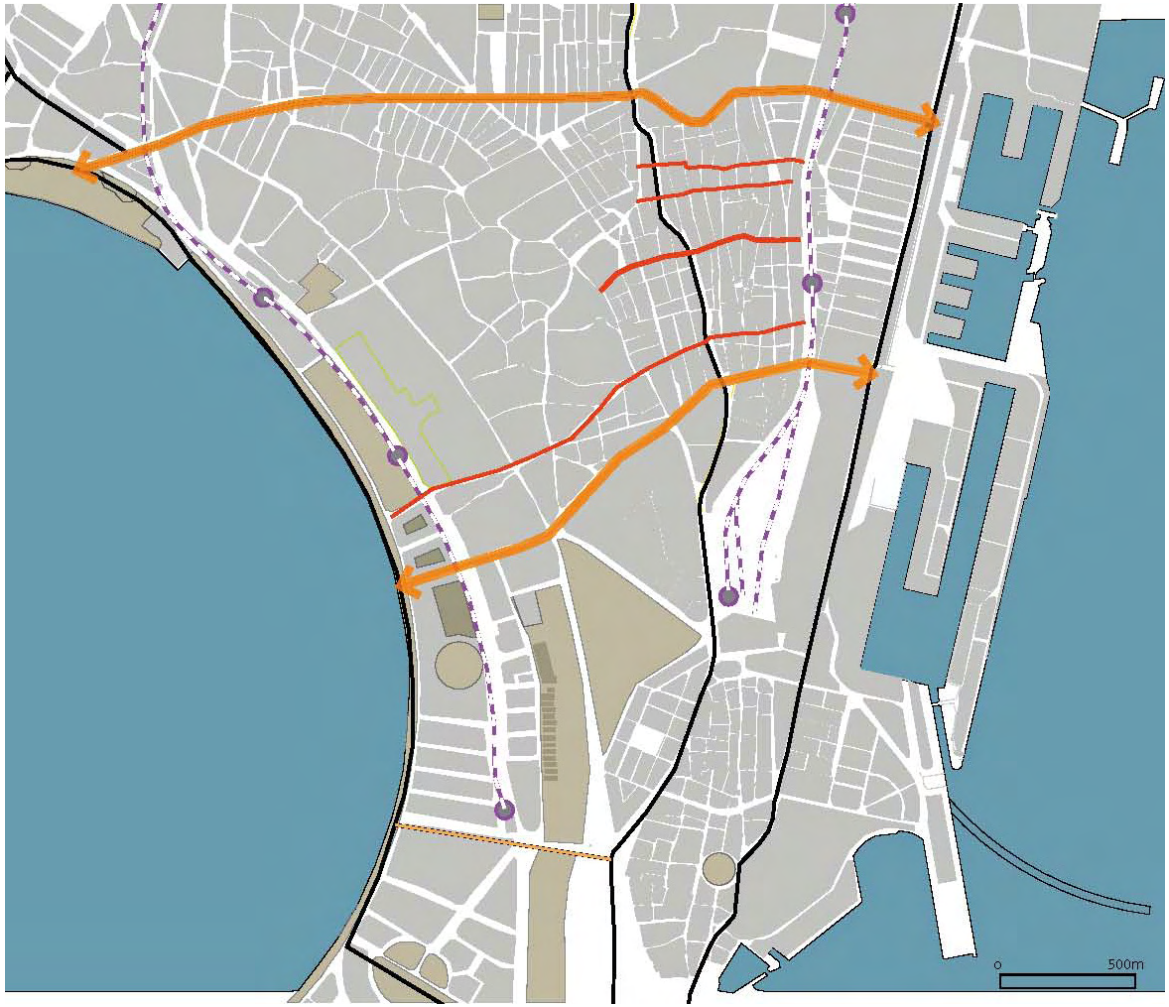
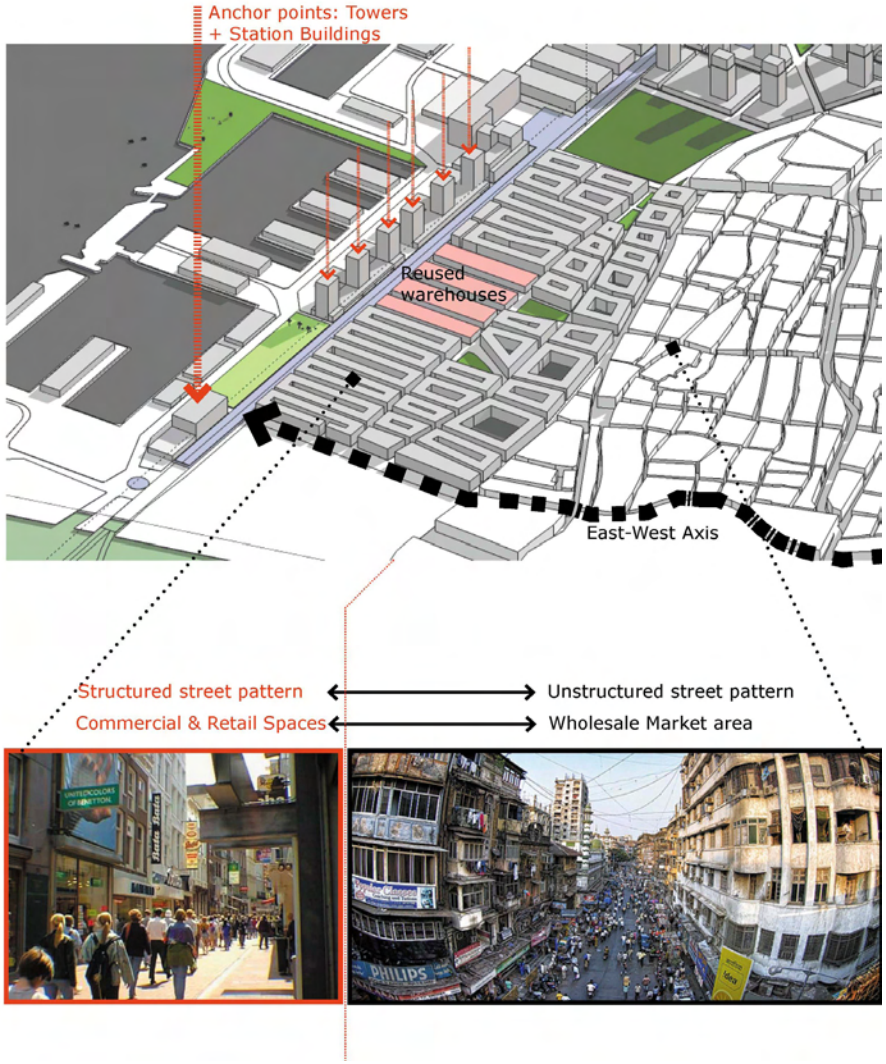


Figure: 5.2f.7
Railway, Road & Street Configuration_Before

Figure: 5.2f.8
Railway, Road & Street Configuration_After

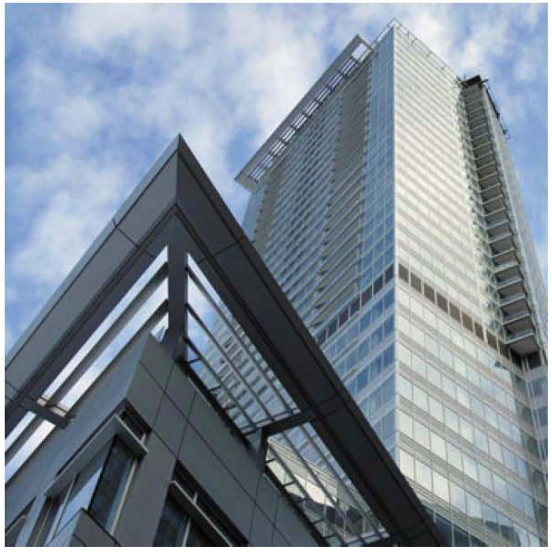
The pedestrianised streets of the market area of Bhuleshwar continue in an E-W orientation, but are stopped short by the presence of the existing tracks. The shifting of the tracks will help establish the continutity of the urban fabric all the way to the new development axis.

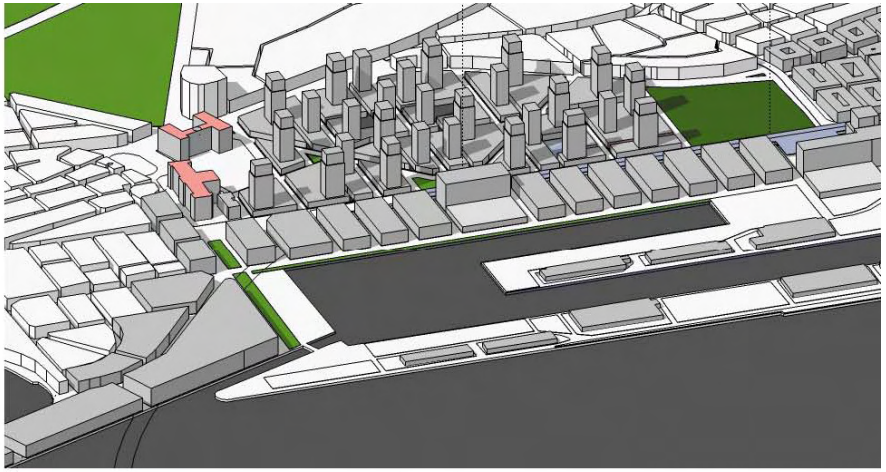

Position of new station buildings as important anchor points to draw people and flows from market towards the waterfront
Commercial/ residential use
Reused warehouses
Landmark tower structures as anchor points to waterfront
Main station building for the market areas & also a central bus depot facility
Typology of buildings and block configurations to allow visual sight lines to waterfront
Block size of 120mx 50m
Ease of access from existing to new station building
Widenned street profile from CST railway station building to the waterfront so as to be able to percieve the port & activities of the bay from the city
Underground railways which is continued under water along the sea bed to an artificial island midway in the bay.
1 KM
0.75 KM

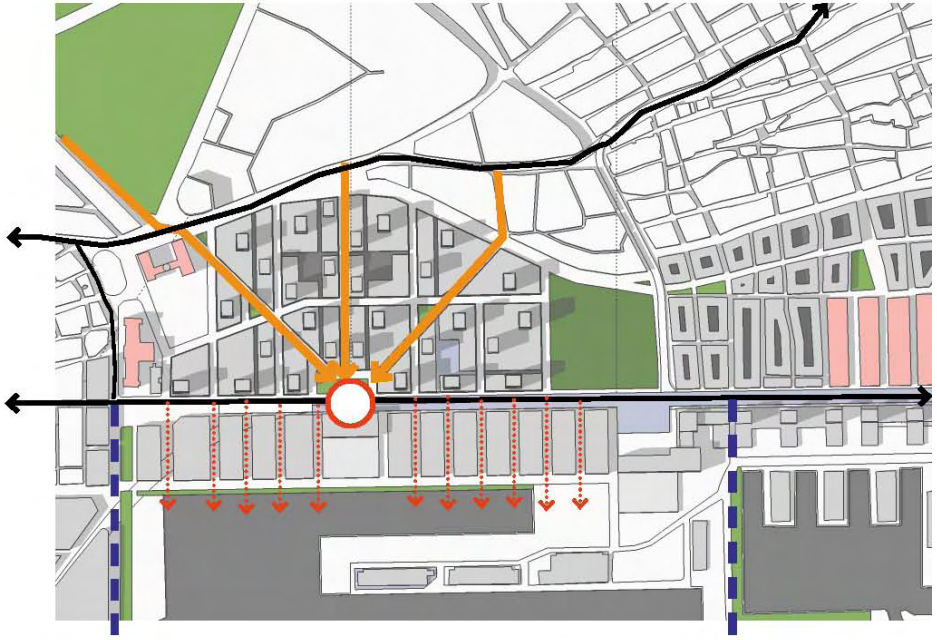


The 3 new station buildings along this 2.2km long development stretch serves as potential anchor points to attract people and flows towards the eastern waterfront. Moreover, landmark tower buildings with continuous sight lines to the water at ground level serve as the other pull factor towards the waterfront.

This section of the proposed fabric is developed as a more pedestrianised stretch with a gradual transition from an unstructured to a more structured street pattern, which tries to retain the existing street configurations. The new layout allows for the reuse of certain warehouses along this stretch. This block typology falls immediately south of the cultural axis and is adjacent to the wholesale market area. Hence a mixed use retail, commercial & residential functions will serve to complement the surrounding land use and attract a more diverse social mix of people to the development axis.







The second block typology has been designed for vehicular traffic as it has a very strategic location between two key North-South road infrastructure in the city. The blocks have been designed using a podium and tower typology so as to maintain an intimate street scale, while allowing for a higher FSI to be reached. The above design has been worked out to an FSI of 6, which is higher than even Nariman Point business district to the South which stands at 4.5.

Currently, development control rules in the island city have maintained the maximum FSI for all future developments in the city to be 1.33. However, the older parts of the city were built to a much higher FSI. With the new rules, it becomes non-profitable to renovate and rebuild because of the loss in floor space in key central city areas. This is the case with Bhuleshwar. Moreover, transfer of development rights (TDR) which allows the right to build to a requisite FSI to be transferred to another plot has resulted in isolated tower developments in the city. In most cases, such high rises are located on narrow roads and in areas which cannot handle such high density.

Therefore the proposal, is to earmark certain areas along this development axis at the Eastern Waterfront, where it is feasible to increase the FSI considerably. This would be a better alternative to the existing building rules in the island city. Moreover, the strenthenned infrastructure along this axis can accomodate such high density. It would also take some pressure off the existing fabric of the island city, which could then be planned in a more integral manner, addressing problems related to improving the quality of the urban environment and the quality of life.

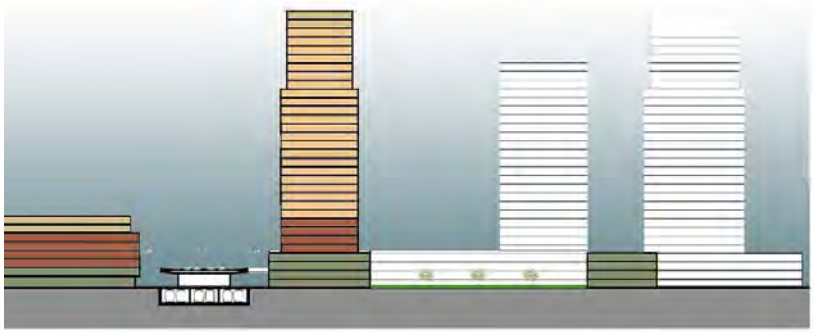
The podium level is designed to be 4 storeys high with a green roof on top. The podiums can also be constructed with thorough pedestrianised semi public spaces. The footprint, the height of the tower buildings and land coverage of the podium could all be controlled by strict development rules and by fixing a maximum FSI.

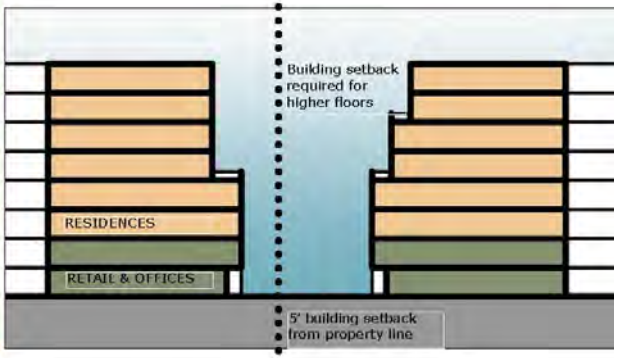
All the vehicular roads here are oriented towards the new station building, which then becomes the main station building for these office blocks. The building lining the waterfront area are designed to retain as many visual sightlines to the water and are deliberately kept at a lower height of 8 stories.

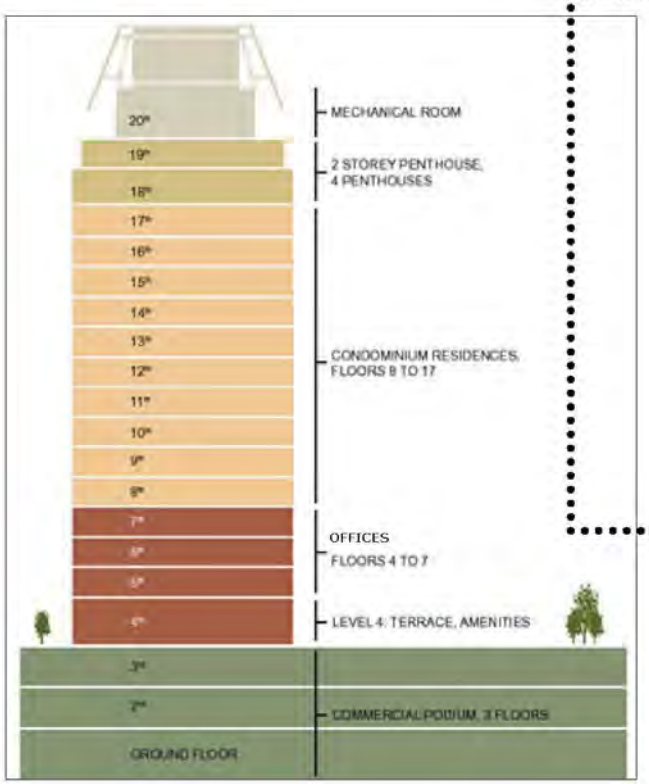
At some critical points along the development axis, it is possible to generate a pedestriansed access all the way to the waterfront without obstructing the port traffic.

The building program along this stretch is primarily mixed use as in the rest of the island city. This will ensure that the stretch remains vibrant and alive at all times of the day and night. The station buildings with the underground railways will serve to make this stretch an important axis for developemnt.

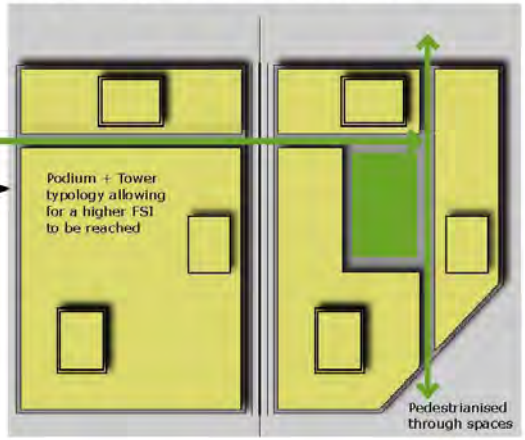
It is possible to even legitimise informal economy and street hawkers along the stretch of public space here, by providing them with the necessary infrastructure such as stalls, adequate water supply, drainage and garbage collection. Hawkers all over the city are currently facing the threat of eviction by local police or collection of bribes so as to operate their businesses. This could be a way of dealing with the problem and also it is a key to making this 2.2 km stretch with its new mixed use developments as a very vital public space in the city. The versatility in the design of the public space is important. It should at the same time act as a recreational space and at other times serve the purpose of a religious or a political rally for instance.



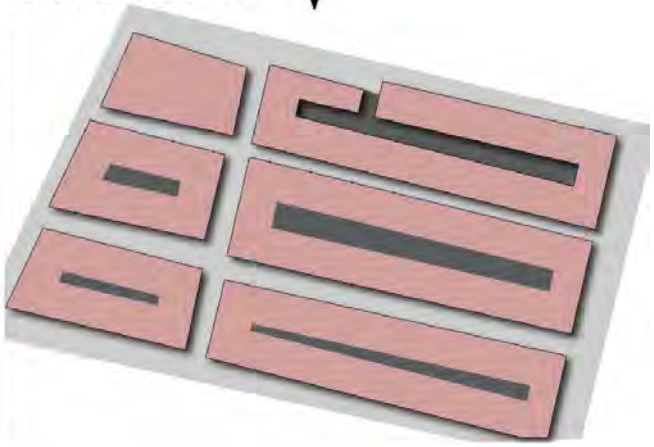




BLOCK TYPOLOGY B
Larger footprint for vehicular traffic

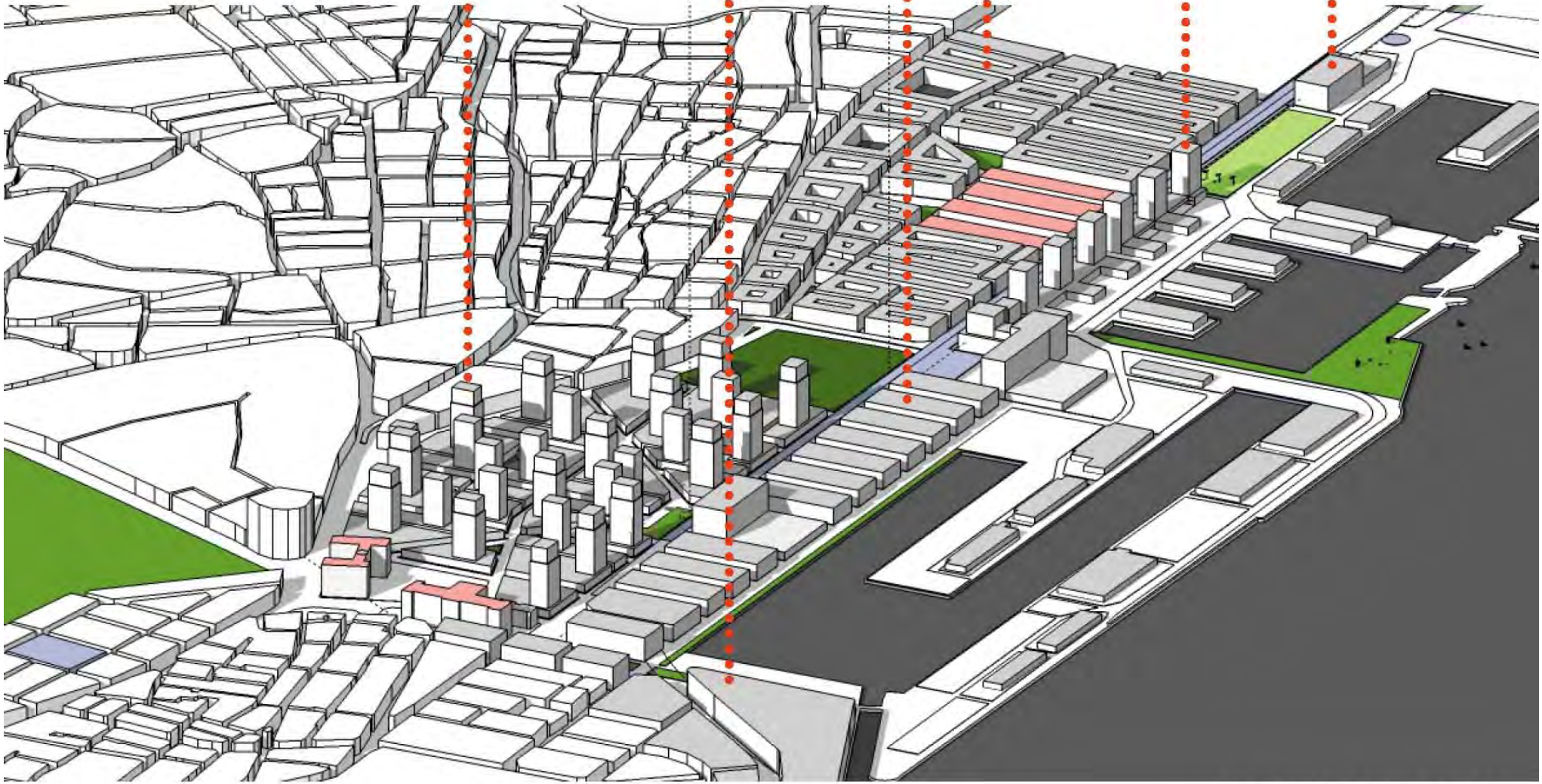


BLOCK TYPOLOGY A
Pedestriansed blocks

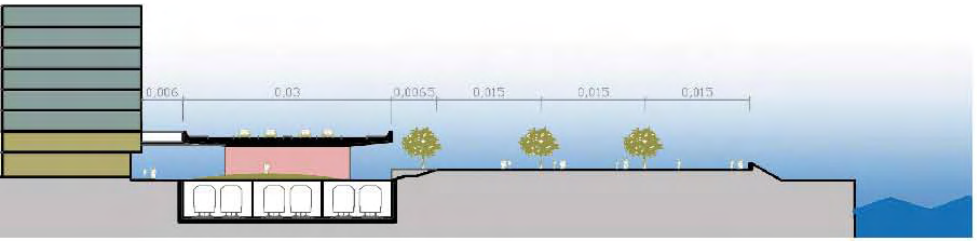


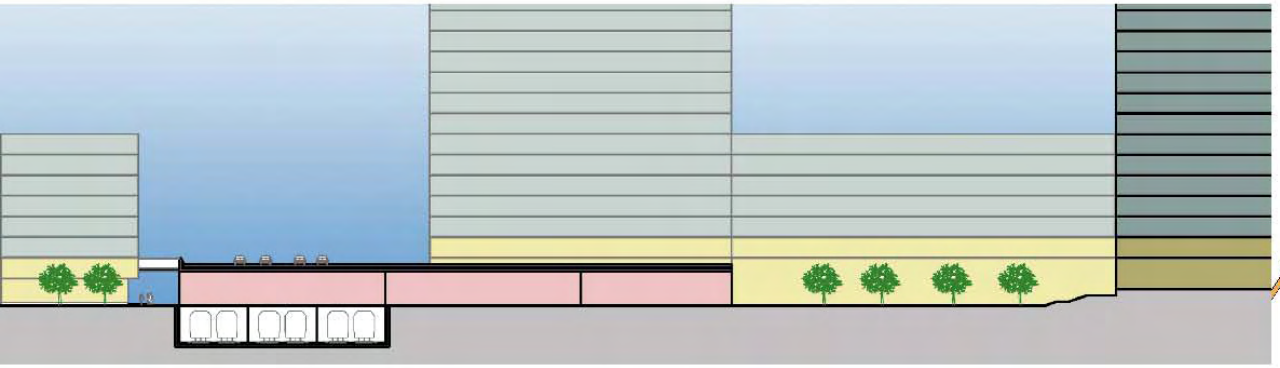
NEW PROGRAM !.. mixed use

Offices	: 10,07,800 sq.m.
Commercial	: 7,21,420 sq.m.
Residential	: 16,87,800 sq.m.
Hotel	
Recreational Spaces	



BUILDING PROGRAM





CULTURAL AXIS

Typology of Public space 2: At the termination point of cultural axis- elevated by 1.5m- shaded by rows of trees- hard landscape- & seats

Typology of Public space 4: Below road bridge. Space for hawkers?

Typology of Public space 1: In front of station buildings- park landscape

Green axes- tree lined leading to the new CST station building

Typology of Public space 3: Lining Waterfront- semi private

Figure: 5.2f.9
Existing vs. Proposed

5.3. Refections & Evaluations

An intervention like developing a ring model and transforming the CST railway station from being a terminal building to a transit station with train services across the bay area could have tremendous effects on developments not just in the historical city but across the bay as well. Navi Mumbai will start to develop more to the South. In time, the pressure of development in the island city can be expected to spread along the ring, thereby, controlling the development in the metropolis.

The key project, which aims at restructuring the positioning of the historical CBD to fall on the ring system and improving its accessibility, will allow for new kinds of development in South Mumbai with increased FSI. Although these developments cater more to the requirements of a service oriented city, it helps to nurture and sustain the existing urban fabric by allowing it to co-exist. It also establishes a strong relationship of the existing urban fabric to the new development axis the port and the bay area.

The critical parts of the island city where the lower order services and economy operate, such as Dharavi slums, derelict textile industrial sites and the Bhuleshwar currently stand threatenned because of its position between the two business districts of South Mumbai and Bandra Kurla Complex. The shifitng of the development axis to the East will not only take the development pressure of these critical segments of the urban fabric but will also allow for the derelict eastern waterfront areas to be developed in a more integral manner with the region. This North- South stretch forms an integral part of the ring. Each of the railway stations along this stretch has tremendous potential to develop into key economic development nodes.

Therefore, the ring model of development using railways can be seen as an effective strategy to improve accessibility to the CBD, to reduce the pressure on the urban fabric of the island city, to control the development of the metropolis and to develop the derelict industrial sites of the eastern waterfront in a more integral manner.

Figure: 5.2f.10
Changed bay area with bridges and new development across the bay

section vi

6.2. References

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