



# recentering mumbai

APPROPRIATION OF THANE CREEK

aarti c sharma

EUROPEAN POSTGRADUATE  
MASTERS IN URBANISM

GRADUATION PROJECT: MENTORED BY: PROF. V.J. HAN MEYER; PROF. BRUNO DE MEULDER  
READERS: PROF. ADOLF SOTOCA GARCIA; PROF. KELLY SHANNON; PROF. PAOLA VIGANO

TU Delft



KATHOLIEKE UNIVERSITEIT  
LEUVEN



EUROPEAN POSTGRADUATE MASTERS IN

**URBANISM**

ACKNOWLEDGEMENTS

I take this opportunity to sincerely thank my mentors - Prof. V. J. Han Meyer and Prof. Bruno De Meulder for their wonderful guidance, interest, support, encouragement (and patience!) throughout the duration of this thesis.

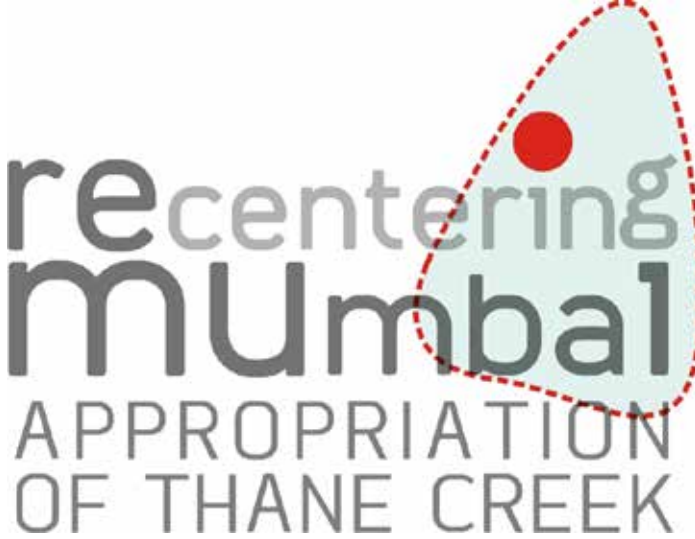
I also wish to express my appreciation to all the professionals across disciplines making remarkable, yet unseen efforts towards the betterment of Mumbai. A special thanks to the authors mentioned in the bibliography page. It is from this pool of collective knowledge that I could learn so much about this great city, and can believe in the purpose of this thesis.

I dedicate this thesis first and foremost to my father, who is my greatest friend, philosopher and guide. But I could not have made it this far without the love and support of my incredible family, friends, teachers and colleagues who have always selflessly shared their awesomeness, knowledge and happiness to take care of me and my devious inner child. Each one of them is legendary, and I’m fortunate that the list of these people is a bit too long for this acknowledgement.

And of course, I specially thank and dedicate this thesis to the person reading this right now. You made it worth the while.

Commoners here by thousands float  
And jostle one another down  
Each paddling in his leaky boat  
And here they fish for gold; or drown.’  
- Jonathan Swift

The thesis explores a strategic spatial proposal for a ‘Wetland Economic Zone’ in Mumbai’s salt-pan/ mangrove/ wetland area on Thane creek. The strategy questions the city’s blanket zoning attitude, and integrates primary sector economies like food production in sustainable practices but using the genius of the place, serving socio-economic classes which are excluded from the city’s economic sector development models. The project goal focuses on on flood resilience; East-West connectivity; small-scale economies with communities along the estuarine wetlands of Thane Creek (“spongy urbanism”) and concept corridors for water retention and public spaces creating a new network layer within the city.



CONTENTS:

INTRODUCTION AND BACKGROUND TO THE THESIS

- THE CONTEXT OF MUMBAI CITY
- ‘ReCentering MUMBAI’ - REASONING THE HYPOTHESIS
- THE CRITICAL URGENCY OF BRINGING THE ISSUE OF THE RECLAMATION OF THANE CREEK TO THE FOREFRONT

APPROACH, STRATEGY AND GOAL - SCALES OF RESEARCH, ANALYSIS AND INTERVENTION

SCALE 1: MUMBAI CONURBATION:

- 1. A DIACHRONIC STUDY OF SELECTED FACTORS AFFECTING THANE CREEK FROM THE EVOLUTION OF THE CONURBATION
- 2. STATE OF AFFAIRS AFFECTING THE URBAN DEVELOPMENT FUTURE OF THE CONURBATION:
  - A. “VISION MUMBAI”
    - STAKEHOLDERS/ OWNER OF THE NEW FUTURE
    - NEW CONNECTIVITY/ MOBILITY
    - ATTITUDE TO ECOLOGY
    - SOCIO-ECONOMIC EXCLUSION
    - NEED FOR A HOLISTIC APPROACH AND STRATEGY
  - B. WATER SUPPLY IN THE CONURBATION
  - C. FLOODING/ STORM WATER DRAINAGE
  - D. A RELATIONSHIP OF LAND TAKING OVER WATER

SCALE 2: THANE CREEK:

- INTRODUCTION AND MORPHOLOGY
- CLASH OF THE CLAIMANTS FOR THE SALT
- EFFECTS OF EXCLUSION FROM 3 ADMINISTRATIVE PLANS
- CURRENT STATUS OF COASTAL REGULATION ZONING + COUNTER RECOMMENDATIONS FOR IACM
- MANGROVE ECOSYSTEM OF THANE CREEK
- FISHERY IN THANE CREEK
- ALTER EGOS: FIGURE AND COUNTERFIGURE
- WHAT IF...

SCALE 3/4: PROPOSAL:

SPONGY URBANISM:- WETLAND ECONOMIC ZONE [W.E.Z.] and BRIDGING THANE CREEK:

- THE W.E.Z. MANIFESTO: PROPOSAL FOR A “WETLAND ECONOMIC ZONE”: ADDRESSING CITY SCALE ISSUES ON A DESIGN SCALE
- INCLUSIVE RESILIENT LIGHT URBANISM
- PRODUCTIVE LANDSCAPES
- TECHNOLOGIES FOR PRODUCTIVE SKIN LAYER AND MAINTAINING THE SPONGE CHARACTER
- LOCATING AND CONCEIVING W.E.Z. CORRIDORS
- PROPOSING INTEGRATION OF “W.E.Z.” CORRIDORS: WATER COLLECTION, REUSE, DISCHARGE AND LANDSCAPE PLAN AS FIXED INFRASTRUCTURE
- SPATIAL QUALITY OF W.E.Z.

SCALE 5: FRAMES OF W.E.Z. CORRIDOR:

1. LOCATION OF FRAMES

- FRAME 1: INTERVENTIONS IN PRATAP NAGAR SLUM
- FRAME 2: INTERVENTIONS IN THE OPEN SPACES OF NAVAL COMPOUND
- FRAME 3: REQUALIFYING DEFUNCT INDUSTRIAL COMPOUNDS TO NEW WETLAND ECONOMIC ZONE [W.E.Z.] ECONOMIES
- FRAME 4: HYDROPONIC AGRICULTURE + SELF-BUILT HOUSING [A NEW VERNACULAR?] - REQUALIFYING LATENT LAYERS OF AGRICULTURE
- FRAME 5 + 6: WETLAND ECONOMIC ZONE [W.E.Z.] CENTER + REQUALIFYING SALT-PANS AS AQUACULTURE FARMS
- FRAME 7: BRIDGING THANE CREEK: RECENTERING MUMBAI

2. WATER TRANSPORT NETWORK LAYER

REFLECTIONS AND CONCLUSIONS

BIBLIOGRAPHY



## INTRODUCTION AND BACKGROUND TO THE THESIS

- THE CONTEXT OF MUMBAI CITY
- 'ReCentering MUMBAI' - REASONING THE HYPOTHESIS
- THE CRITICAL URGENCY OF BRINGING THE ISSUE OF THE RECLAMATION OF THANE CREEK TO THE FOREFRONT



## THE CONTEXT OF MUMBAI CITY:

The context of the city of Mumbai was summed up succinctly in an article called “Maximum City” in 2007 by Suketu Mehta. This extract is quoted from the article, and sets the background tone of the thesis:

“On 27 July 2005, Mumbai experienced the highest recorded rainfall in its history – 939.8 mm of rain in one day. The flood showed the worst and the best of the city. Hundreds of people drowned. But unlike the situation after Katrina hit New Orleans, there was no widespread breakdown of civic order; even though the police were absent, the crime rate did not go up. That was because Mumbaikers were busy helping each other. Slum-dwellers went to the motorway and took stranded motorists into their homes and made room for one more person in shacks, where the average occupancy is seven adults to a room. Volunteers waded through waist-deep water to bring food to the 150,000 people stranded in train stations. Human chains were formed to get people out of the floods. Most of the government machinery was absent, but nobody expected otherwise. Mumbaikers helped each other, because they had lost faith in the government helping them. On a planet of city dwellers, this is how most human beings are going to live and cope in the twenty-first century. At 15 million people within its municipal limits, Mumbai is the biggest, fastest, richest city in India, a city simultaneously experiencing a boom and a civic emergency; an island-state of hope in a very old country. Because of the reach of Bollywood movies, Mumbai is also a mass dream for the peoples of India. If you take a walk around Mumbai you’ll see that everything – sex, death, trade, religion – are lived out on the pavement. It is a maximum city, maximum in its exigencies, maximum in its heart. India frustrates description because everything you can say about it is true and false simultaneously. Yes, it could soon have the world’s largest middle class. But it now has the world’s largest underclass.

And so with Mumbai. Everything is expanding exponentially: the call centres, the global reach of its film industry, its status as the financial gateway to India; as well as the slums, the numbers of absolutely destitute, the degradation of its infrastructure. The city’s planners have their eyes set firmly on Shanghai, as a model for Mumbai. The government approved a McKinsey-drafted document titled ‘Vision Mumbai’, which aims to turn Mumbai into ‘a world-class city by 2013’. As the architect Charles Correa noted of the plan, ‘There’s very little vision. They’re more like hallucinations.’”



## ‘ReCentering MUMBAI’ - REASONING THE HYPOTHESIS

Within the frame of the city’s economic desires, governmental politics, social exclusions, and drastic environmental backlashes to chaotic urbanization - there is yet potential for participation, innovation and possibly alternative futures in places lesser seen and lesser known in the discussions about Mumbai in urbanism. This thesis hopes to propose one such spatial alternative that could jog the debates about the future of the city, by shifting focus from the island city to Thane creek.

So why “ReCenter” Mumbai?

Think of slums, one thinks of Dharavi. Think of floods, you only see unrealised proposals about Mithi river. Discussions about post-industrial-sites kept focusing on the mill lands. Most Mumbai-based project studios in Urban Design universities focus on the Eastern waterfront to replace the older port area. Historic descriptions only seem to begin with reclamations of the 7 islands in 1600s. The study of urbanism about Mumbai has been purely island city centric, as that is what has been documented.

But slipping past the media radar, the areas surrounding Thane creek are undergoing tremendous changes of urbanization. All services are being designed to primarily serve Greater Mumbai and the Western coast. Whereas the logical growth pattern and higher connectivity lies between the island of Salsette and the mainland – between the Eastern coast of Mumbai, Thane and Navi Mumbai. And there is much history to be unearthed and to be learnt from further pasts. For instance from the vernacular of the Kanheri caves on Salsette which have more sustainable contemporary validity, than reclamations. There are a lot of undocumented traditions that are still ongoing in the gaothans (villages) area surrounding the creek, that utilise the genius of the geography.

It is about time the city realises that it is no more just an island with some suburbs on railroads. The organism exists far beyond the limits of Greater Mumbai. The limitations of the land, mobility, access and possibilities of the island city already took effect in the creation of the twin city of Navi Mumbai and Thane is not just a suburb anymore. The new reality spans across 3 cities and 3 administrations geographically connected by the waters of Thane creek. The developers and politicians are changing the urban-scape of the conurbation at an unprecedented rate, and it is going unnoticed. While the booming economy is appreciated, it ignores the basic geophysical and social makeup of this hill-wetland construct, and the backlashes have already started to take effect. The real center of the transforming Mumbai metropolitan region is, in fact, Thane creek.



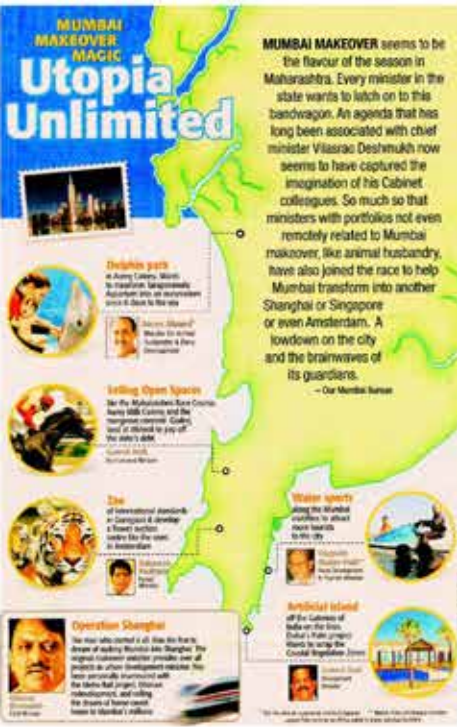
THE ISSUE OF THANE CREEK - PRESENT AND FUTURE

Mumbai ‘s last Development Plan (D.P.) was made in 1996. Due for a revision long ago this work has been postponed repeatedly and finally 2016 has been set as the target date for the next D.P. The local ward authorities are permitted to make temporary alterations to the last approved plans and this has led to a state of almost complete revision of earlier principles. The coordinating agencies, primarily MMRDA, will be dealing with one set of D.P.s whereas simultaneously another set of D.P.s would be used by the Maritime authorities. Most of Thane Creek and it’s environs are considering “No Development Zone” in these D.Ps now.

The edges of the creek on the Mumbai coast were used as salt-pan lands for almost 300 years. The legal tenureship, ownership and rights to those lands have been a complicated issue and are now due to be legally overridden by the government (state or central) for development puposes. The known area coverage of such salt-pan lands amount to almost 2200 hectares in Mumbai. The salt-panning does not yield good quantity or quality of salt now, due to siltation, reclamation and pollution of the Thane creek. In reality though, most of these lands have been bought up over time by developers, so they might come under private ownership which means the developer can build on the land as desired.

Salt pan lands has been a burning issue for a decades. Available as a buffer between the sea and the land this is being slowly allowed to erode as the developers are allowed to encroach under one guise or another. One of the State Government’s ever green idea is the developer’s dream – Slum Relocation. So when he builds tenements for slum developers here – under low cost- he is allowed to construct – at a very high cost – other commercial cum residential properties in prime locations so that he could make a handsome profit.

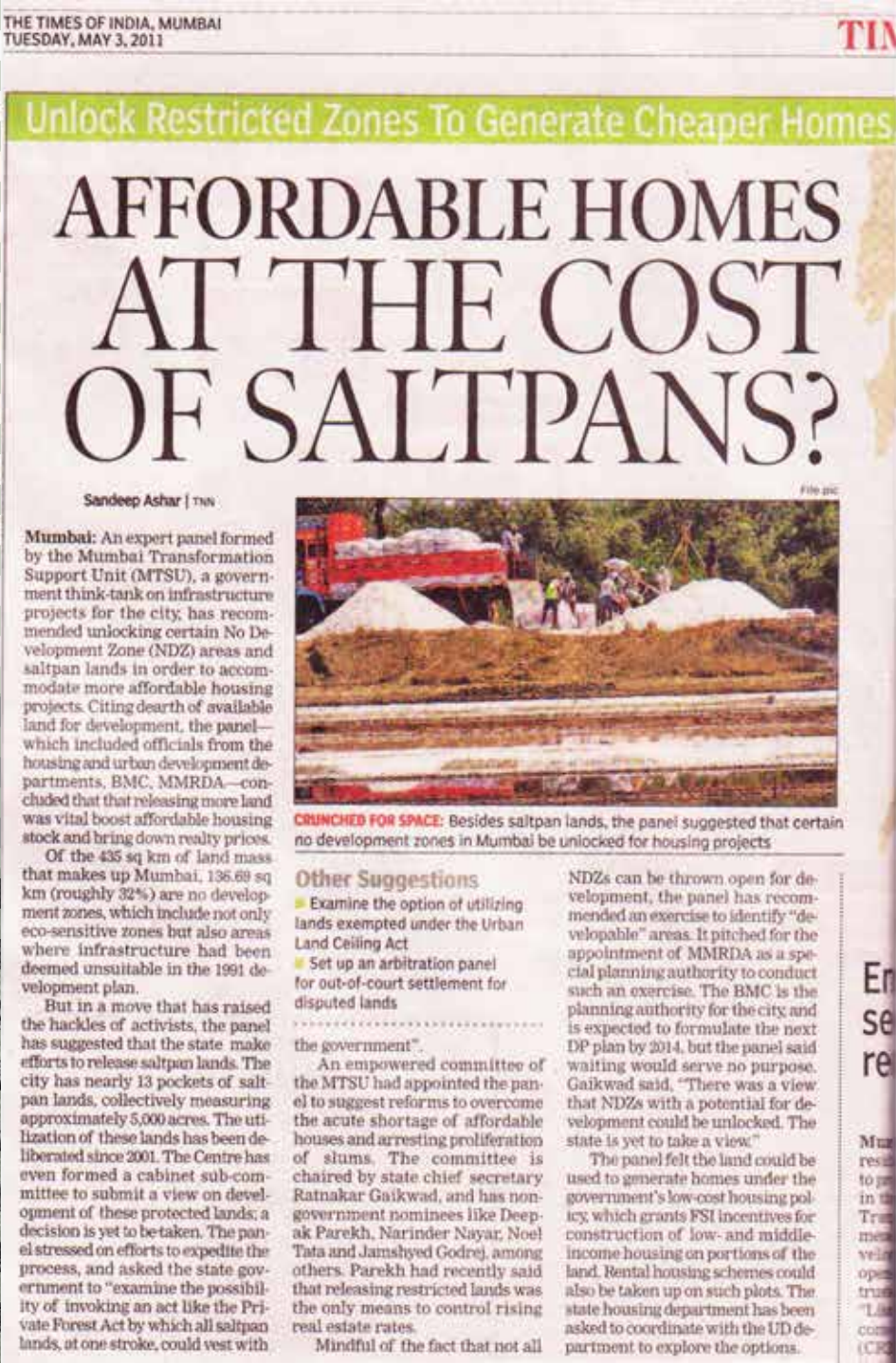
Coastal Regulatory Zone (CRZ) rules are for protection of coastal environment. The law basically presents a blanket “500 M from the tide line” as a non-buildable area. Unfortunately, this law already contains an exception for Mumbai, because of the burgeoning pressures, and everything from encroachments to airports and highways are within the CRZ limit and since the tide line is not fixed, this law is constantly twisted for required puposes.



Articles courtesy Times of India



Image of salt-pans in Bhayander on the Western coast of Mumbai, sold to private developer. Courtesy: <http://www.chinkyshukla.com/saltscapes.html>



THE CRITICAL URGENCY OF BRINGING THIS DISCUSSION TO THE FOREFRONT:

Mumbai’s problems have multiplied with the approach taken by various planning bodies. Democracy has its own bane – with the freedom given to civil bureaucracy and ever hungry redevelopers and builders. Combined with a greedy political class the former grows by itself into gargantuan proportions. And quite often no one really knows which are all the agencies working on all the various problems. Numerous coordinating agencies have been sprouting rapidly each independent of the other. The result has been utter chaos in development planning with little or no coordination amongst various government agencies.

Undoubtedly the most severe problem for Mumbai can be detailed as mushrooming population versus inadequate infrastructure – roads, water, power, communication, tenements etc. A blinkered approach to planning could be seen in that so far there has been a heavy concentration on Mumbai island city as the central area and trying to over saturate it and also make most of the developments there overlap – often contradicting the aims of each other. For example rarely do the aims of the environment planners ever coincide with the, say, road planners or air port planners. Grandiose schemes are announced with lot of fanfare only to be later on buried unceremoniously as they meet conflicting interest groups.

I am a ‘Mumbaikar’. Growing up here and seeing and studying the problem first hand as an architect as also from a distance I can see that the planners, architects and developers have always focused totally on main land Mumbai. Even a cursory look at the map would show that Mumbai main land is not the centre of the now Mumbai Metropolitan Region. It is, in fact, the Thane Creek bed. So it could be interesting to shift the focus of planning to this area and see what could be achieved in terms of a wider coverage of urban redevelopment taking into consideration the whole of Trans Mumbai Urban Area.

The premise of this thesis is thus to focus the attention of the Mumbai conurbation on these new coastal fronts of Thane creek, which are soon to be reclaimed for development puposes. The new development plan for 2016 would begin to show the ‘new land’. The salt-pans seem only to be the beginning. Investigating the further proposals for highways, infrastructure and connectivity show more windows of opportunity for the creation of more land, which, could become a further ecological disaster as well as a socially excluding tool by the developers and politicians.

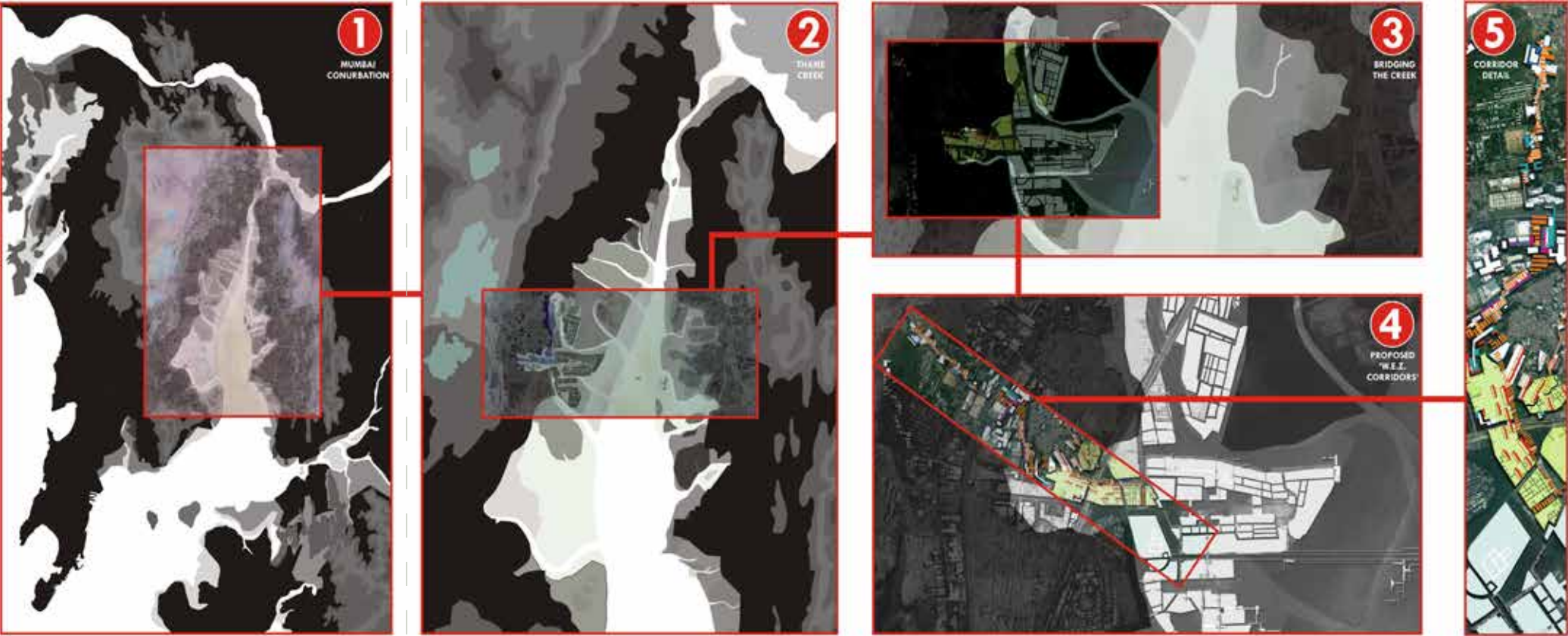


RECENTERING MUMBAI: APPROPRIATION OF THANE CREEK:

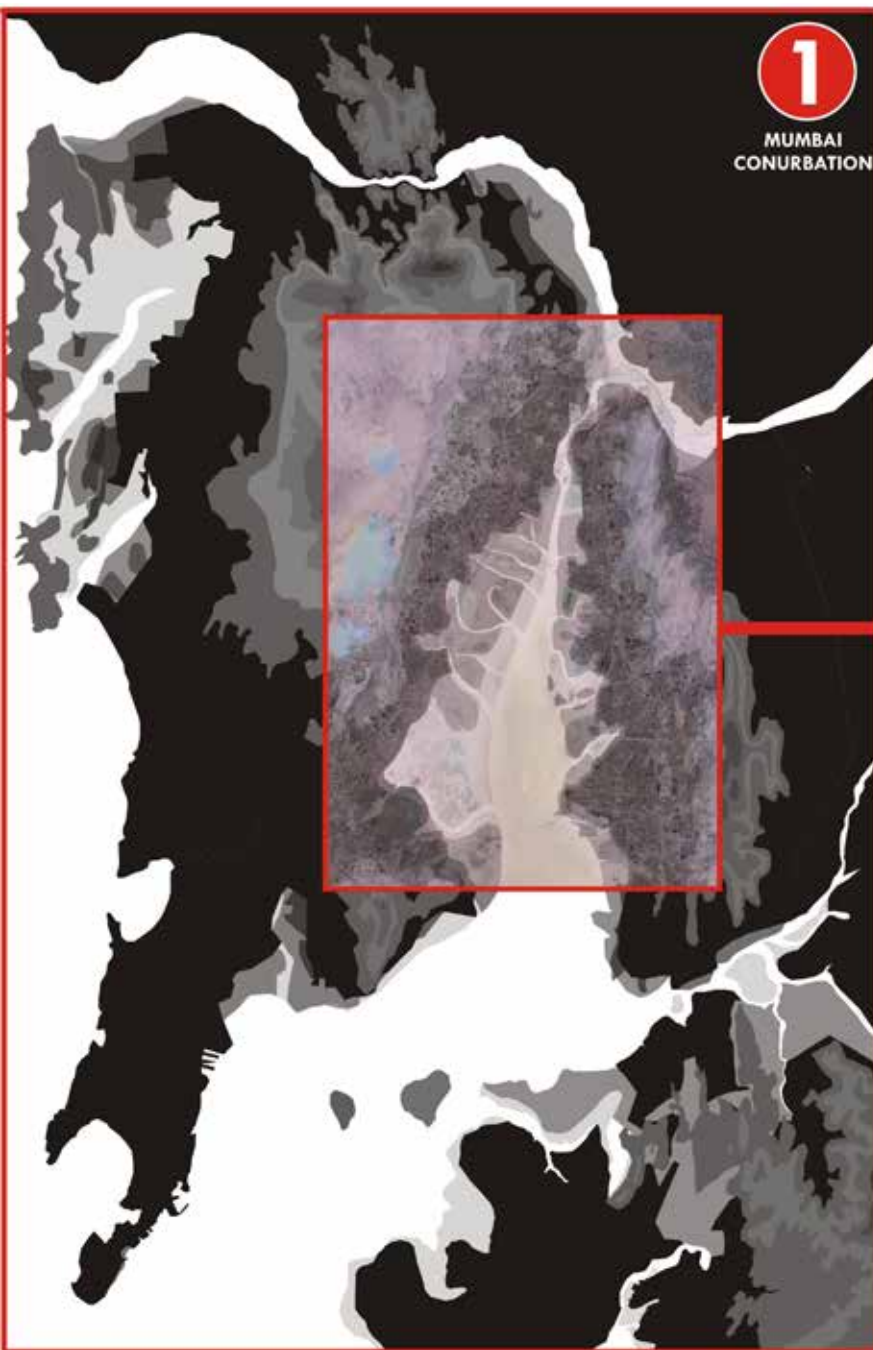
The thesis primarily posits that the conurbation of Mumbai has grown to the extent that it's impact reaches far beyond what was originally built to be the center - the island city of Bombay and this growth has had a large impact on the water body of Thane Creek, which is located in the center of the Mumbai Metropolitan Region, but is largely ignored by the 3 municipal administrations that surround it. The wetlands surrounding the creek, which have been used as salt-pan lands and fishing ponds, have been indiscriminately reclaimed in the 20th century either in planned or informally encroached processes, and are now going to be appropriated further. The thesis confronts the possible reality that real estate developers will further consume this land for profit purposes exclusively, and makes the argument that a spatial strategy of a different nature is required envisioned, given the geographical and social make-up of the region at that scale.

The approach of the study of the region is diachronic, and the proposal is multi-scaled and multi-disciplinary. It begins with the study of the morphogenesis of Mumbai as a 'whole' but in a framework of selected factors, and thus understanding the causes and effects of the present state of appropriation of this water body by land, within the contextual frame of the entire conurbation. The next scale frame examines Thane creek within the complete topography of the hills and urban areas on either side, which drain into the creek. It's environs are analysed as a state of 2 alter-egos. The 'figure' or 'urban city' vs. the 'counterfigure' or 'non-city'. Such a reading highlights the conflicts between the pressure of the anthropogenic needs fighting for the space as well as the space needed for monsoon and tidal water and estuarine ecosystems of nature which fight for this geography to breathe. This conflict gives rise to the concept of the spatial alternative for Thane creek region, which fundamentally seeks to become "spongy urbanism" - a term coined in this thesis to mean a distributed, inclusive, fine-grained lighter and resilient approach weaving the figure and counterfigure through each other in a way that allows both to coexist, breathe and harmonize, with the basic spinal function of retaining and harvesting monsoon water, while giving permeable space for inletting tidal water; alongside particular light forms of built function within skin-like productive landscapes. The next scale zooms into the proposed bridge across Thane creek. This scale shows latent residual social and geographical layers of the history of the region, which are requalified and integrated in the proposal. This becomes part of the proposal for a "Wetland Economic Zone", the goal for which is to reinstate and protect the sponge-like nature of the geography, while utilising the capacity of the topography to retain and harvest water for use. This strategy also seeks to be inclusive and absorptive of socio-economic classes which have been excluded from the economic sector development models of the city. The final scale explores the spatial quality of this proposal and design within a selected corridor and shows the designerly attempt to achieve the goals set out in the manifesto of the Wetland Economic Zone [W.E.Z] proposal.

In short, this thesis hopes to show the nature in which the fringes of Thane Creek have been usurped over time, and upon understanding why and how it is possibly going to be reclaimed and consumed further, it proposes a premeditated strategy of guiding an alternative, more 'resilient' form of appropriation.







#### **SCALE 1: MUMBAI CONURBATION:**

- **A DIACHRONIC STUDY OF SELECTED FACTORS AFFECTING THANE CREEK FROM THE EVOLUTION OF THE CONURBATION**
- **STATE OF AFFAIRS AFFECTING THE URBAN DEVELOPMENT FUTURE OF THE CONURBATION**



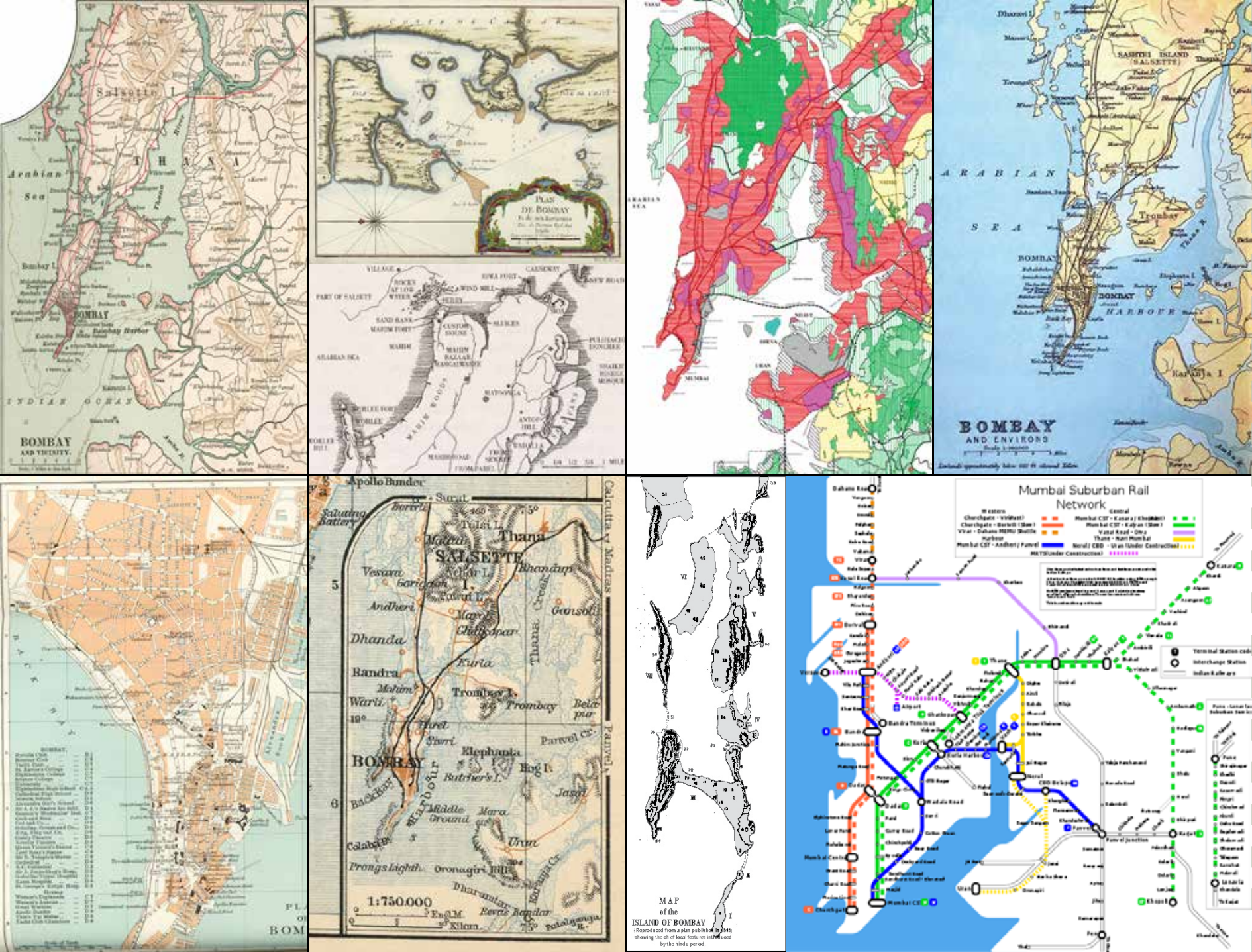
*An Elevated View of the ISLANDS of BOMBAY and SALSETTE, with the Surrounding Countryside*  
*To Sir Charles Warren & Master, West India Dock, this Print from the original & authentic map by J. S. Barth, and respectfully dedicated by his much obliged & obedient servant*  
*R. Cribb*

IMAGE: Islands of Bombay and Salsette, with the Surrounding Countryside: Engraved by J. S. Barth and aquatint published by R. Cribb in 1803 as part of King George III's Topographical Collection, with a view from above of the seven islands which initially made up the settlement of Bombay (now Mumbai), together with Salsette Island. The islands, located in the Arabian sea on the west coast of India, originally contained small fishing villages of the Koli community. The Sultans of Gujarat ceded the site to the Portuguese in 1534 and they established a trading post. Bombay was passed to the English Crown in 1661 as part of the dowry when Charles II married Catherine of Braganza. At first the settlement appeared unfavourable, with low lying marshes, a hot climate and heavy monsoon rains, but its natural harbour and strategic location led the English to embark on a programme of developing it. By 1708 it became the headquarters of the East India Company on the west coast. The town was centred around Bombay Fort which can be seen in the print. By the late 18th century it was prospering as a major centre of the cotton trade.

Image courtesy: <http://oldphotosbombay.blogspot.com/2010/07/islands-of-bombay-and-salsette-with.html>

**DIACHRONIC STUDY OF SELECTED FACTORS AFFECTING THANE CREEK FROM THE EVOLUTION OF THE CONURBATION**





SELECTED FACTORS FOR THE STUDY OF THE MORPHOGENETIC EVOLUTION

Based on the study of historical maps, analysis maps from consultant documents and possible new planning schemes, this diachronic study spans from approximately the 1600s (before the reclamation of the island of Bombay), then 1880s when the Bombay reclamation project and railways had been established by the British colonization, 1920s-30s when industrialization boomed, 1960s-80s after Independence, 2000s-10s or the present and possibly changes over the next few decades based on several documents. The selected factors were studied:

**ACCOMODATION OF NEED FOR SPACE:**

This factor represents the main reasons for the reclamation and consumption of this unique landscape. Fishing villages and indigenous settlements on separate islands connected by the waterways of Thane creek, became a fused land mass when the deep harbor was discovered. Industrial revolution and globalisation required way more land than available. The evolution of the reasons to accomodate the need for land space is studied over time.

**CONNECTIVITY/ MOBILITY:**

Waterways and roads were the predominant modes of connectivity. Railways were introduced to connect the island mass to the mainlands, and they were efficient. Their limitation to support the quantities of goods and people soon saw parallel introduction of highways, more railways, and now the use of metros, subways, monorails, mass transit etc., all catering to the same connection of connecting the Gateway of the South of Mumbai to the rest of the country, thus consuming more land.

**ECONOMICS 'DRIVERS':**

The island of Bombay was created for a port and industry. It was instituted for a purpose of profit, and entrepreneurship always flourished. Livelihood of almost every kind is followed in this city, and it all requires space. On a macro scale, it became reservations for economic purposes. Forts, mills, industrial areas, defence areas became reserved spaces for the production and security of this money making machine. The evolution of these purposes and needs which consumed land is studied.

**MANAGEMENT/ CONTROL OF SPATIAL ORDER:**

The urbanization of this city has always been a spatial reflection of the types of orders imposed by the political controlling force. The actions of consumption and use have been actions taken by the 'management' - during indigenous dynasties, village politics, Portuguese rule, British colonization planning projects, Independence bringing Nehruvian socialist planning, Free liberal trade policies/ globalization - every phase morphed the urbanization and land consumption according to need.

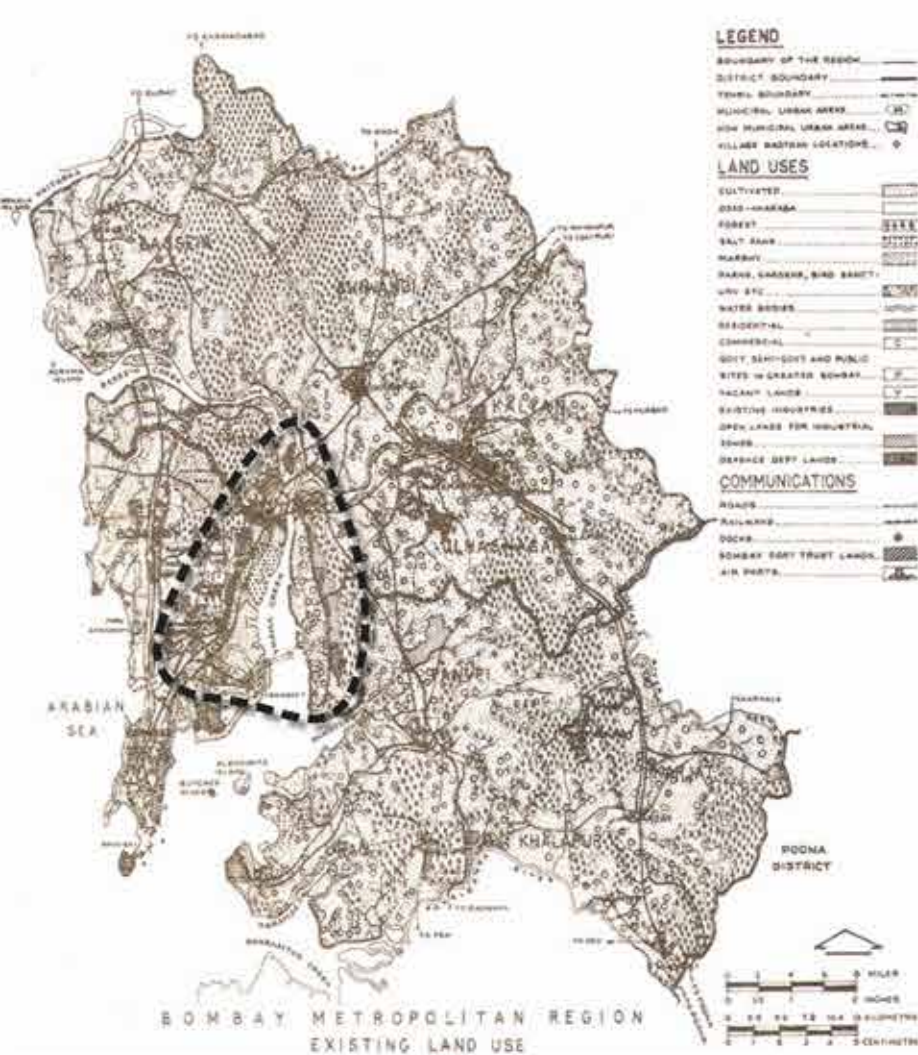
**FLOODING:**

Alongside human/ anthropogenic needs pressurizing this landscape, nature, too needs it's space. The trigger for this project has been the event of the floods on 26th July 2005 - which caused tremendous damage, proving that the need of water - in terms of tide and monsoon does not have the space it needs in the landscape. The study of this factor over time is to understand why only NOW flood damages have come to surface, which it was not a consideration before.

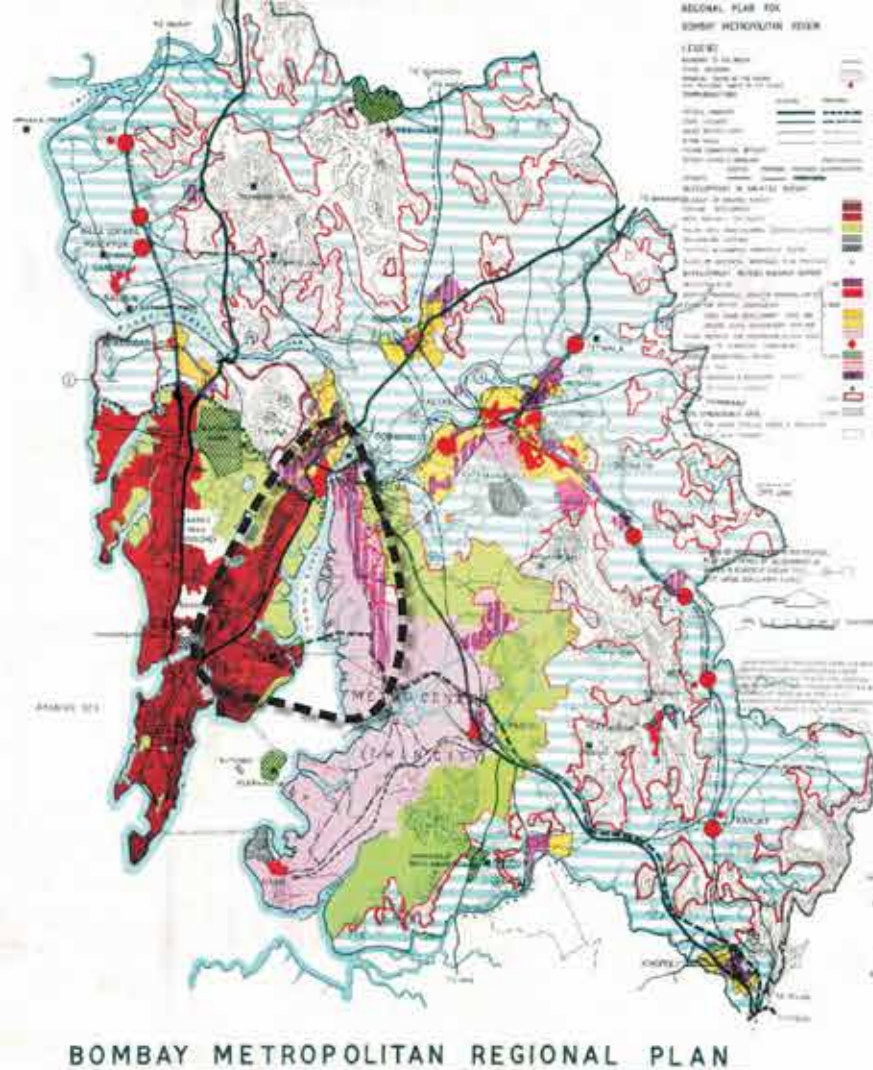
**POTABLE WATER:**

Drinking water supply has been insufficient for the populations of the city. The management now considers large damming projects and desalination plants to fulfil this lack of water. This factor is studied over time to understand how this basic human need was fulfilled in different ways before the advent of piped water, and to understand how the irony of lacking water while suffering torrential floods has come to be.

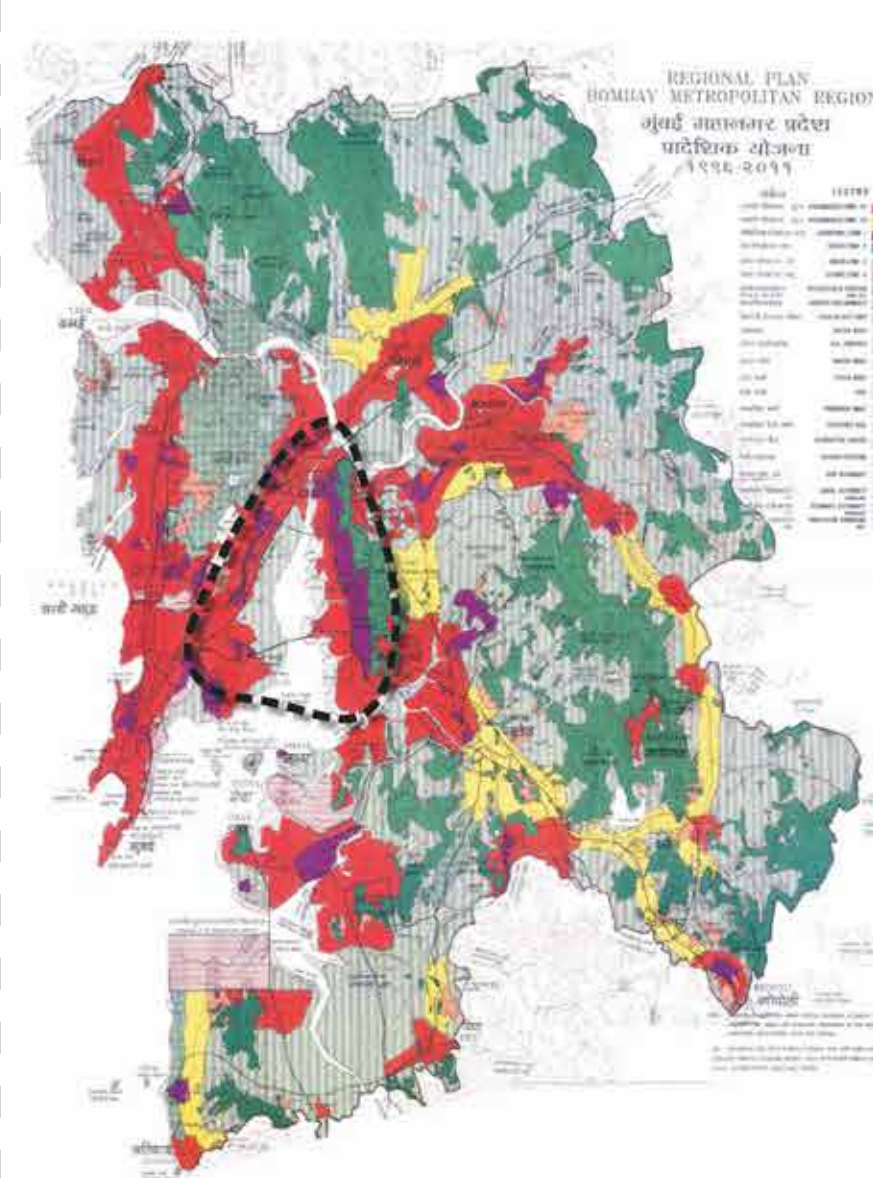




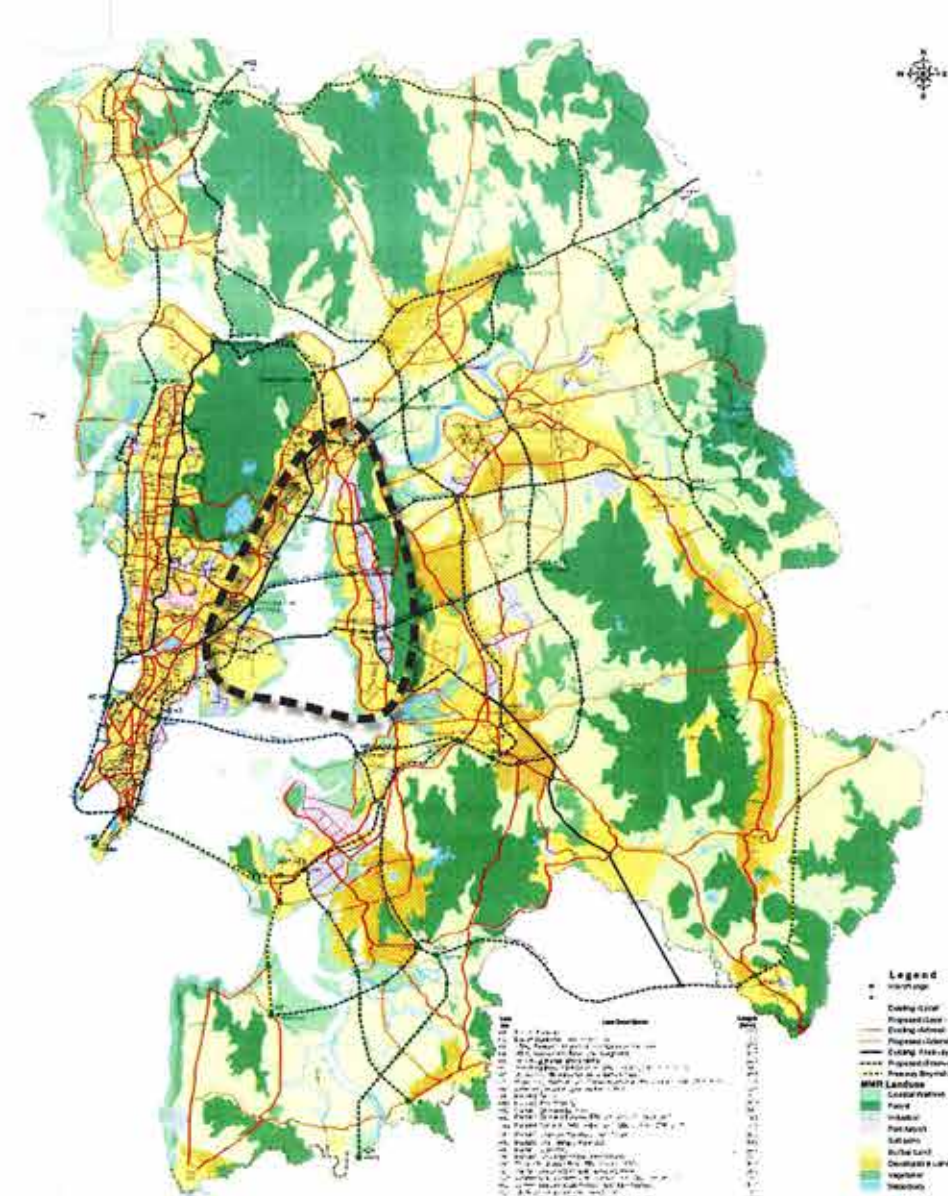
Source : Regional Plan for Mumbai Metropolitan Region (1966-67)



Source : Regional Plan for Mumbai Metropolitan Region (1966-67)



Source : Regional Plan for Mumbai Metropolitan Region (1996-2011)



REGIONAL DEVELOPMENT PLANS FOR FOR M.M.R - MUMBAI METROPOLITAN REGION (FORMERLY BOMBAY METROPOLITAN REGION)

THE HIGHLIGHTED PORTION SHOWS THANE CREEK LOCATION - THE TRANSFORMATION OF IT'S EDGES CAN BE SEEN IN THE PLANS. IT IS THE GEOGRAPHIC CENTER OF THE PRESENT OF MUMBAI CONURBATION



1600s

ACCOMMODATION OF NEED FOR SPACE

Gaothans, Fishing Villages by "Kolis". Landscape of caves, forts, factories

CONNECTIVITY

Waterways

ECONOMIC DRIVERS

Agriculture - rice, beans; Fishery, Trade, Coconuts & oil, spice routes

MANAGEMENT OF SPATIAL ORDER

Independent villages under Portuguese rule - previously under indigenous dynasties

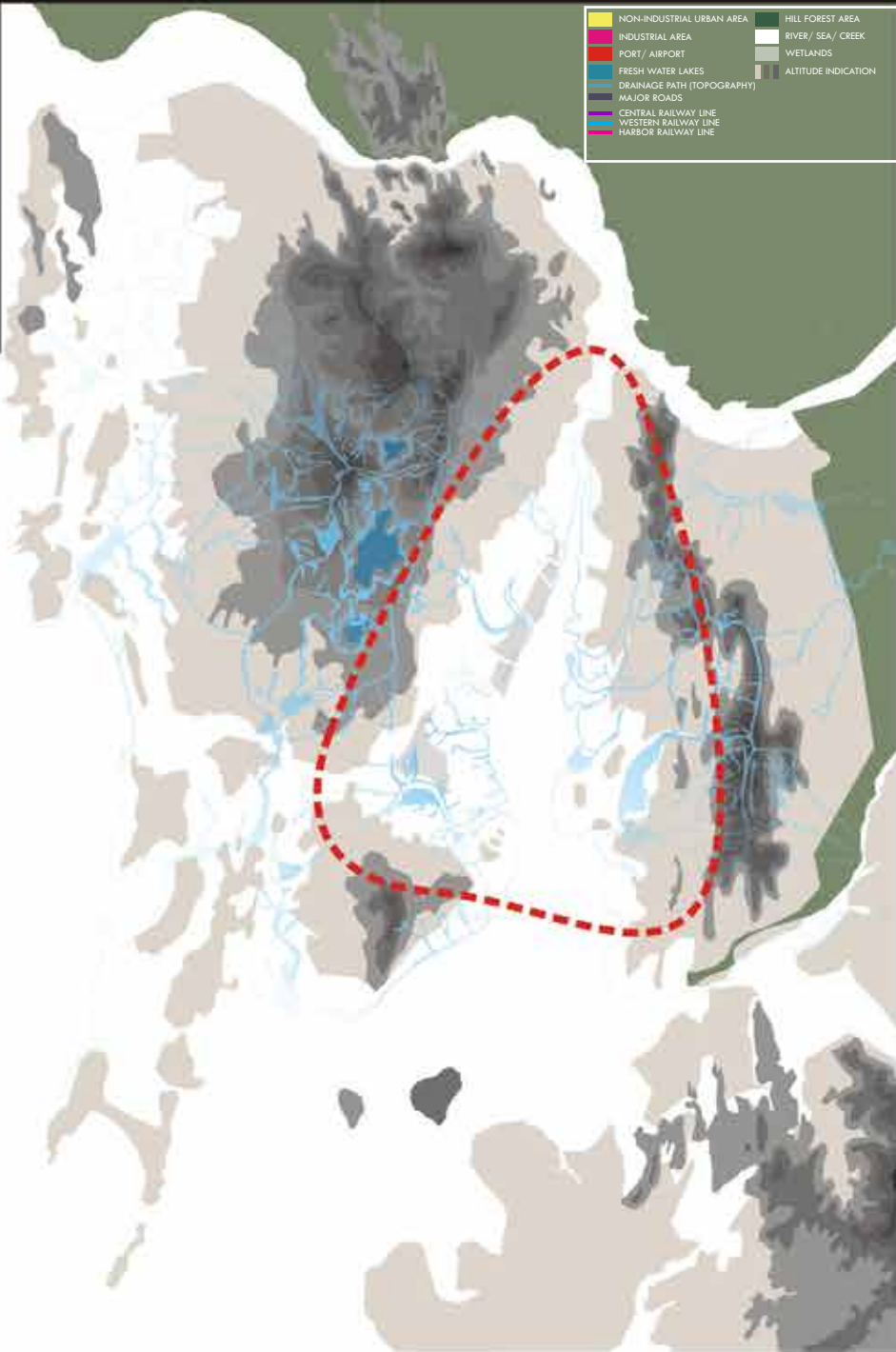
FLOODING

POTABLE WATER

Talaos (built lakes); harvested cisterns

POPULATION:

200,000 - indigenous villages of Kolis, and Agarika.



1700s - 1900s

ACCOMMODATION OF NEED FOR SPACE

Hornby Vellard reclamation fusing 7 islands forming Bombay Presidency -

CONNECTIVITY

Important Port and harbor docks. Causeways and road networks connecting Island city to the North across Salsette to Surat, Madras, Agra and other centers. RAILWAY line established connecting on the same line - North-South

ECONOMIC DRIVERS

Trading town - Maritime trade contracts with West; Bombay Mint, Port, Industries (cotton mills). Salt-pans established to the north, monopolised and taxed.

MANAGEMENT OF SPATIAL ORDER

British ruled Bombay Presidency. City regulated under appointed 'Governor' who undertook large reclamation and infrastructure projects to establish the prominent trading town.

FLOODING

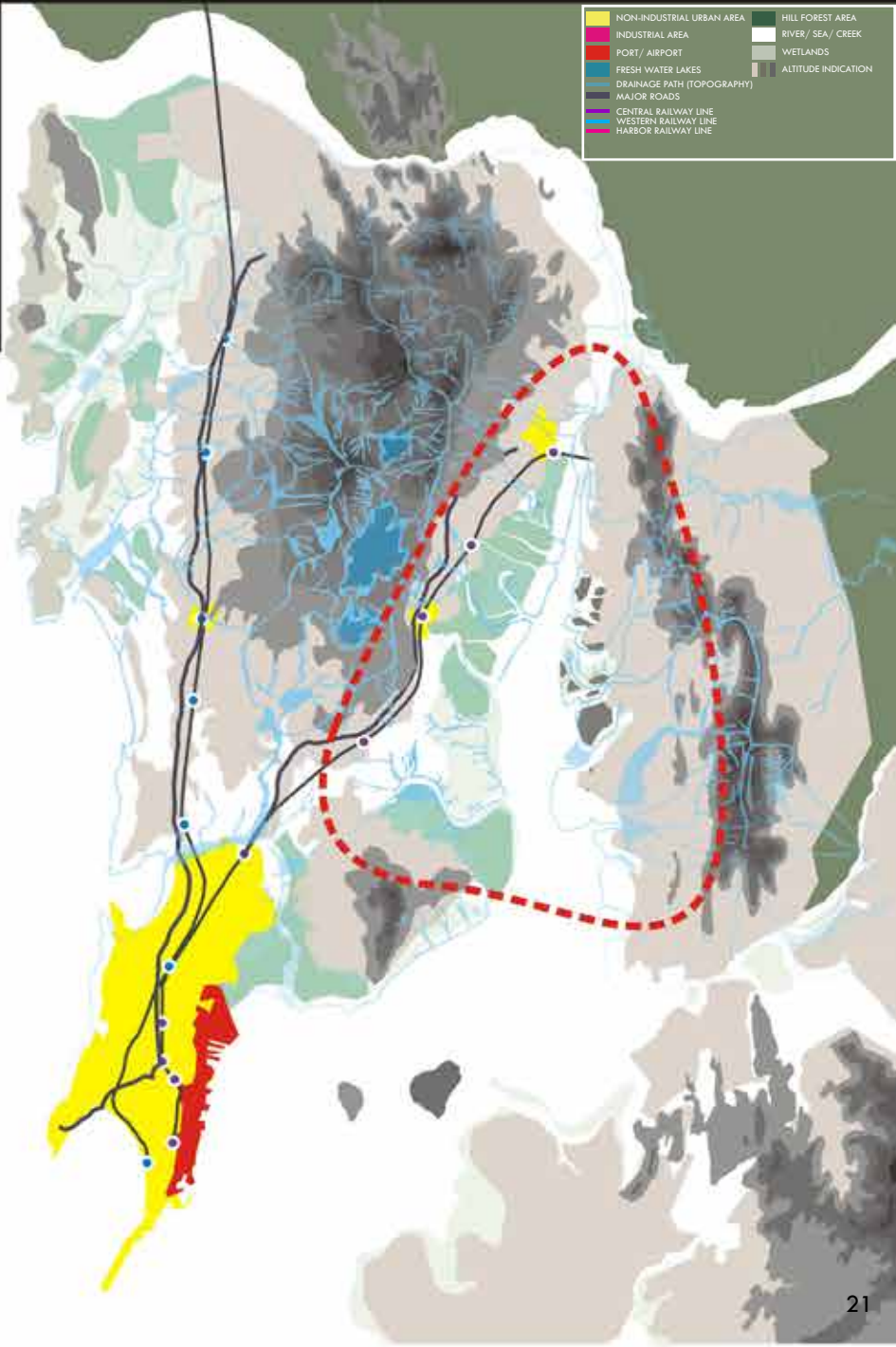
Storm water drainage laid out in island city. 3 important outfalls - Bandra, Worli, Colaba. Since Salsette had natural wetlands and salt-pans, drainage not required and infrastructure was at an altitude.

POTABLE WATER

Vihar + Tulsi lakes damming Mithi river yielding 36 MLD for supply to island city.

POPULATION:

700,000 - Kunbis, Parsis, Jews, etc etc





## 1920s -1930s

### ACCOMMODATION OF NEED FOR SPACE

Sion, Mahim, Matunga become residential suburbs - thus further reclaimed and connecting Trombay island - Mahim creek enclosed. Townships like Mulund were designed for working classes and industrialists. Industrial areas like mill compounds with worker housing (chawls); Army Navy and other institutional areas reserved

### CONNECTIVITY

Highways, along with Central and Western railway lines creating North-South profile. Civil aviation pioneered.

### ECONOMIC DRIVERS

Several industries established along with the large movements of troops, supplies, arms and goods for war. Textile mills boomed and then stagnated.

### MANAGEMENT OF SPATIAL ORDER

British rule was being challenged through civil disobedience and non-cooperation, thus spatial order was chaotic and highly charged with political motives. Industrialists were powerful drivers.

### FLOODING

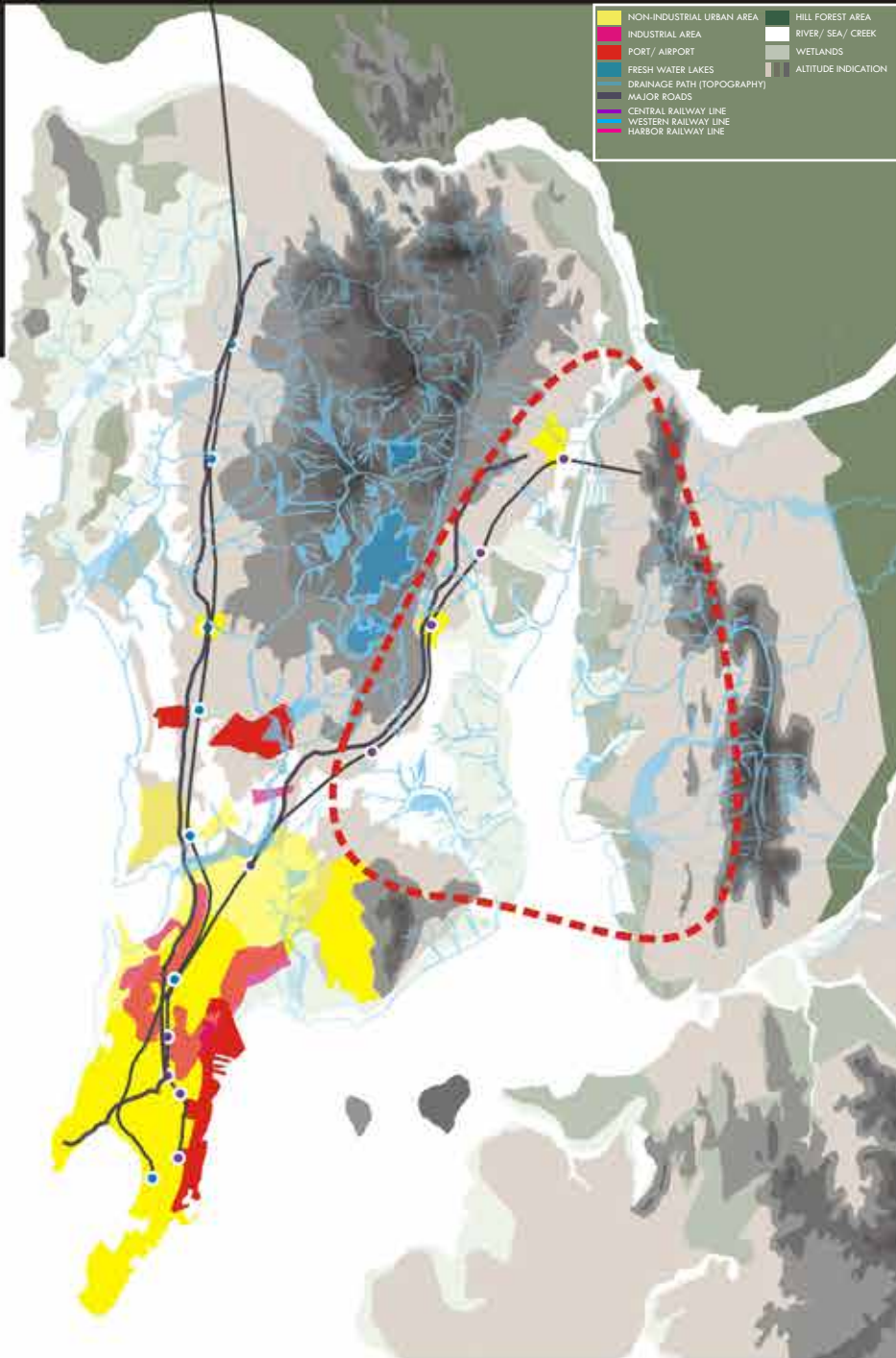
Industrial pockets emerge on the banks of the salt-pans around Thane creek. But runoffs and drainage remain unmanaged.

### POTABLE WATER

Tansa dam to add to water supply (200 MLD) - piped water along Bombay Agra Road (now L.B.S. Marg) - for island city, where reservoirs were increased.

### POPULATION:

—



## 1960s-1980s

### ACCOMMODATION OF NEED FOR SPACE

Bombay state establishes twin city - New Bombay along with Trans Thane Creek (TTC) industrial belt. Nariman Point reclaimed for CBD. Mithi river blocked for airport, and for Bandra-Kurla Complex CBD. All villages surrounded by real-estate developments and slums proliferate in left-over spaces of the city leading to more encroachments.

### CONNECTIVITY

Eastern express highway laid to connect North-South. Vashi bridge connects island to mainland across Thane creek, and further Harbor rail line connection is built.

### ECONOMIC DRIVERS

Industrial, Service and Trading full before liberalization bring globalization boom. Financial headquarters and service centers.

### MANAGEMENT OF SPATIAL ORDER

MCGM added BMC, PWD and CIDCO etc as governing bodies. Development Plans BMC and Regional development schemes by MMRDA.

### FLOODING

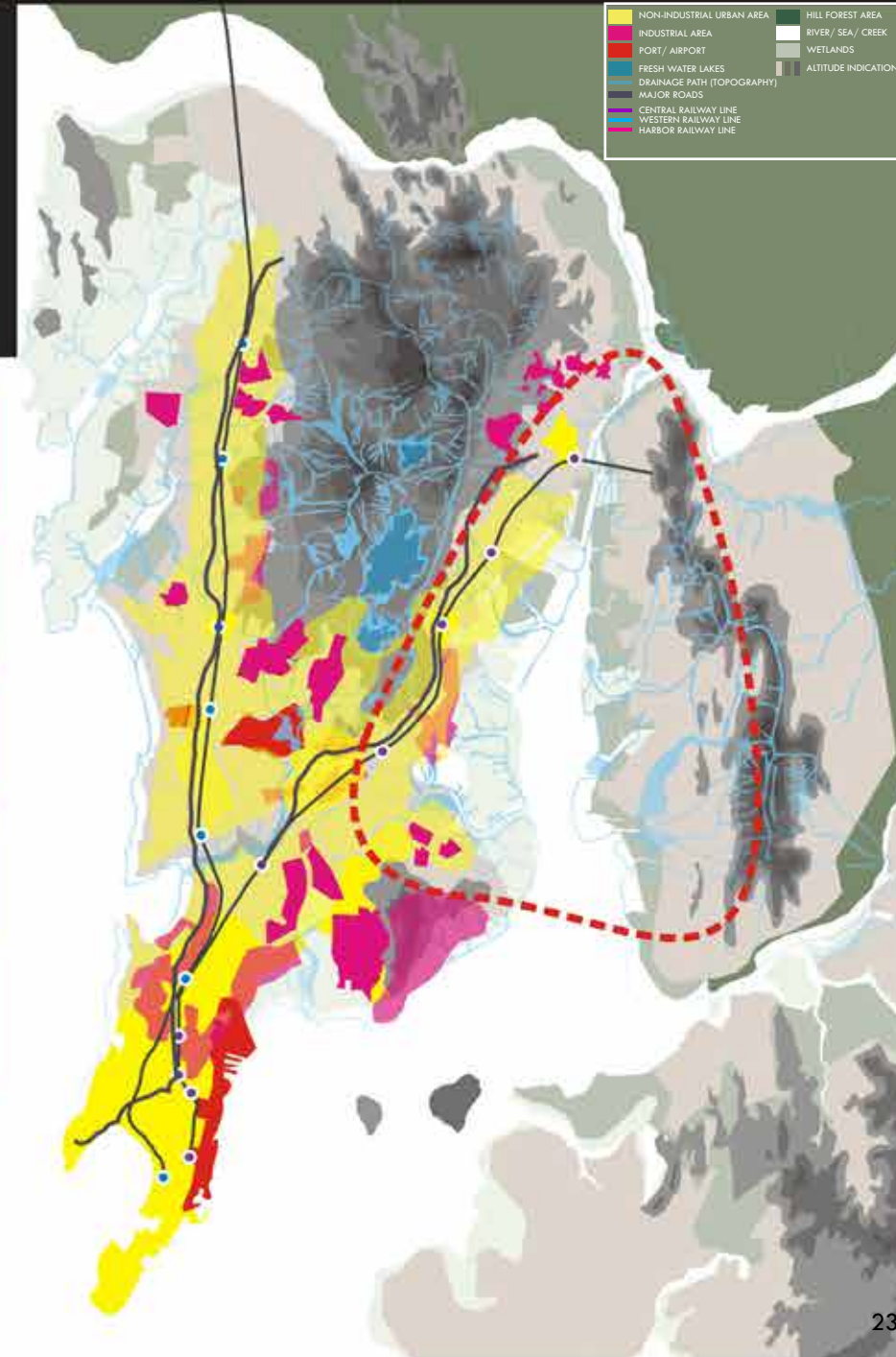
Ulhas river: damming causes further siltation in Thane creek and frequent flooding of choked areas occur in monsoon due to unplanned and unmanaged drainage system.

### POTABLE WATER

Valarna cum Tansa dam (tunneled); Ulhas dam; Bhatsa (1500 MLD). Bhandup hosts Asia's largest water filtration plant, but piped water still fails in equitable distribution and is mismanaged.

### POPULATION:

—





2000s

ACCOMMODATION OF NEED FOR SPACE

Mumbai is one of the highest priced real-estate, thus developer estates proliferate in all areas along protected hills, reclaimed areas, quarries, and encroaching water outlets even consuming post-industrial sites. Technology centers, malls, call centers claim every inch of space. Slums are more instated now than before.

CONNECTIVITY

Airoli bridge connects Salsette to mainland. Bandra-Worli Sealink encloses Mahim bay. Metros, monorails and Mass transit buses all connecting Greater Mumbai. North South links completely choked.

ECONOMIC DRIVERS

IT, finance, service sectors coexisting with informal sectors.

MANAGEMENT OF SPATIAL ORDER

Several institutions and stakeholders serving various needs of the city reaching a chaotic state, where loopholes serve the moneyholders whithin the unclear framework of CRZ and regional development plan by MMRDA. Yet Chief Minister undertakes responsibility of spatial order.

FLOODING

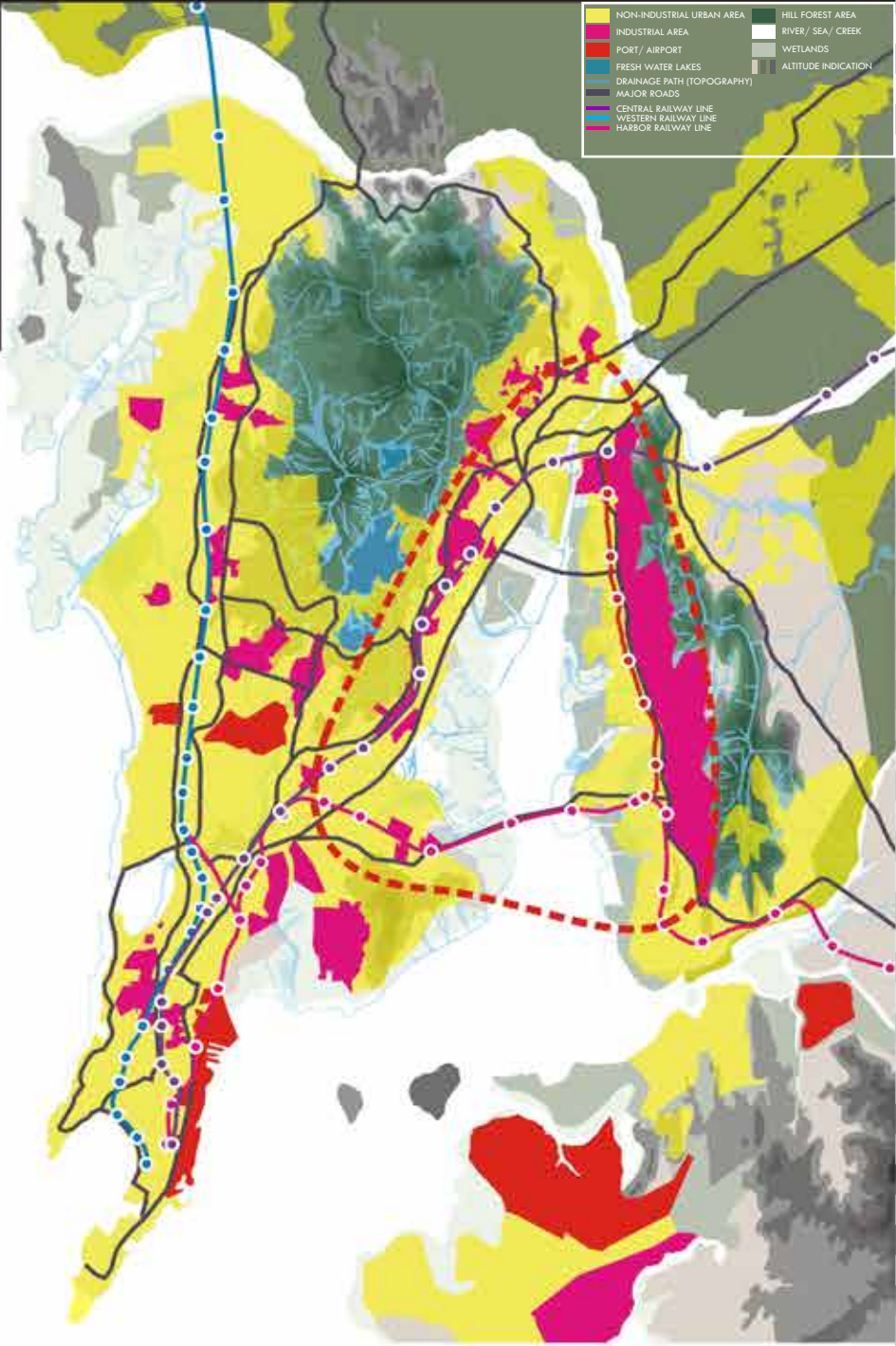
26/7/05: Torrential floods - complete standstill of city infrastructure and loss of lives, proving the state of asphyxiation of the urban chaos overpowering natural resources.

POTABLE WATER

2950 MLD from various piped sources of water schemes - Ulhas, Upper Vaitarna, Bhatsa I, II, III etc.

POPULATION:

—



2030s???

ACCOMMODATION OF NEED FOR SPACE

—

CONNECTIVITY

—

ECONOMIC DRIVERS

—

MANAGEMENT OF SPATIAL ORDER

—

FLOODING

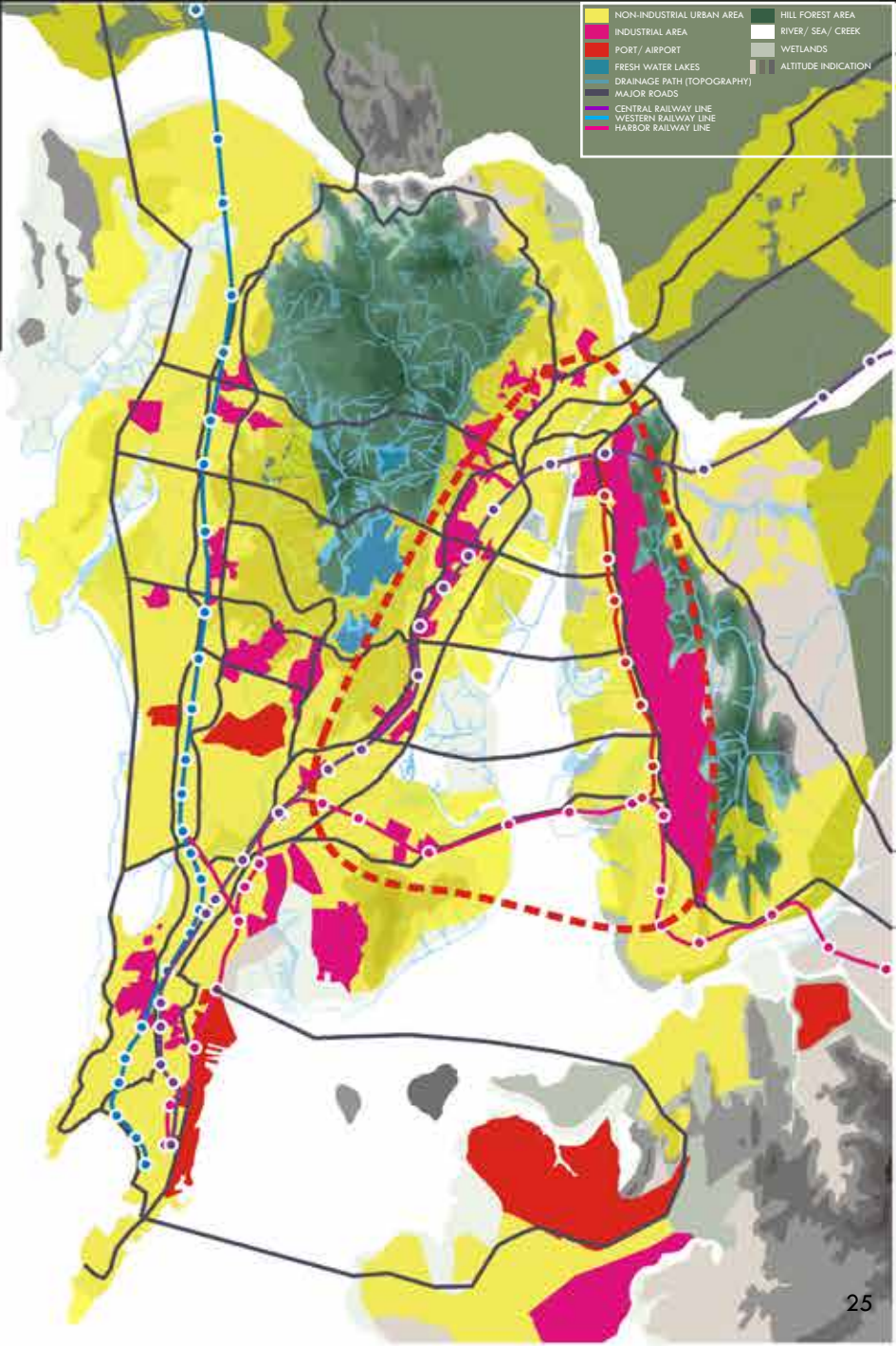
—

POTABLE WATER

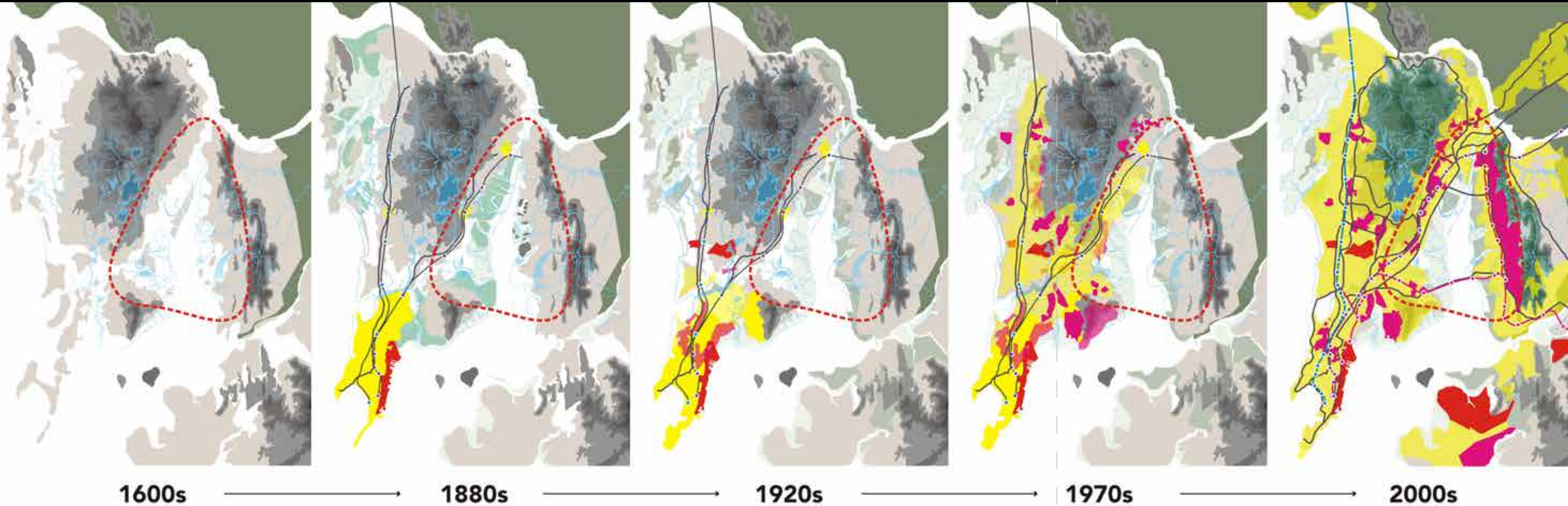
—

POPULATION:

—







The study shows a progressive growth in the North South direction, focussed with the connectivity with the island city. The urbanization around the Thane creek area is predominantly only after the 1950s, after India's independence and Bombay State was created. At that time the city's manufacturing sector diversified and it was the first state to allow free development of independent unionism in labor. The government also funded the development of the film industry and such factors attracted a lot of attention to Bombay as a place of freedom and chances for entrepreneurship and employment.

The Bombay Metropolitan Region Development Authority (BMRDA) was set up on 26 January 1975 by the Government of Maharashtra as an apex body for planning and co-ordination of development activities in the Bombay metropolitan region. This body was supposed to become responsible for making the development plans of the metropolitan region as a whole. In August 1979 the decision to create New Bombay was taken and the conurbation leaped across the Thane creek, along with the creation of Asia's largest industrial belt. This changed the urban profile of the conurbation, however all connectivity and employment opportunities were still concentrated in the island, so Thane and New Bombay started becoming almost dormitory towns.

However, the free liberal trade policies brought a change in the mindset of the city. Bigger meant better. The grains of decisions by the metropolitan regional development authority to place the largest industrial belt and largest planned city development, along with the large reclamation for Bandra Kurla Complex, a large new airport and sea port across the creek all meant overriding the geography that limited this landmass. These decisions remain very 'island oriented' bringing as much connectivity to the South of Mumbai as possible, where the real estate prices still soar high. But the limitations of the island city make possibilities bleak, and the obvious next reclamation are on the fringes of Thane creek, which now has the best connectivity for the conurbation also with the mainland. Bridging Thane creek will bring the airport to a 20 minute travel distance from Navi Mumbai, along with the ease of connection to Thane and the richer suburbs of Mumbai. This is going to put an incredible degree of pressure to legally allow the consumption of this land for real estate development.



# MAKING MUMBAI GLOBAL

A SYMPOSIUM ON THE CULTURE AND POLITICS OF URBAN TRANSFORMATION

## STATE OF AFFAIRS AFFECTING THE URBAN DEVELOPMENT FUTURE OF THE CONURBATION:

### A. "VISION MUMBAI"

1. STAKEHOLDERS/ OWNER OF THE NEW FUTURE
2. NEW CONNECTIVITY/ MOBILITY
3. ATTITUDE TO ECOLOGY
4. SOCIO-ECONOMIC EXCLUSION
5. NEED FOR A HOLISTIC APPROACH AND STRATEGY

### B. WATER SUPPLY IN THE CONURBATION

### C. FLOODING/ STORM WATER DRAINAGE

### D. A RELATIONSHIP OF LAND TAKING OVER WATER



A. A VISION FOR MUMBAI?

The thesis emphasises the need to cater to the needs of the common man in any redevelopment schemes. This thesis is not the first one attempting to study and submit a proposal to correct the ills of Mumbai – this also wont be the last. In its gargantuan proportion the city has gargantuan problems. And, of course, are doctors of every hue and color prescribing remedies of every hue and color. The government has over the years appointed many committees, spending huge amounts on them. To add flavor they have also called for foreign consultants to supplement the local talent. They have also appointed sub committees and sub-sub committees to study and see if the recommendations could be implemented. Unfortunately, often due to the time delay in the decision making process, by the time they come to a conclusion it has been time to appoint the next committee as the problems have now developed new ramifications.

Sharada Dwivedi says - ‘Several farsighted plans framed for the city by eminent economists and urban planners ended up gathering dust because our elected representatives continuously and unforgivably let the city down on all fronts, thwarting and interfering with all rational development plans.’

“The blatant nexus between builders and politicians which has denied the city affordable housing became evident and corruption became the norm.”

The last and most famous consultant appointed by Brihan Mumbai Municipal Corporation (BMC), MMRDA and the Government of Maharashtra (GOM) was the McKinsey Consultants. Their report submitted in 2003 is the current favorite ( and most disliked by some) with the government authorities and could form the bulwark of major development in Mumbai in the next decade or so. The catch word for Mumbai is to make it Shanghai.

MISSION MAKEOVER

Renewal Plan For 60 Cities Begins Today

Our Political Bureau  
MUMBAI 2 DECEMBER

THE Manmohan Singh government's most prestigious and much-talked about mission to revamp cities across the country will finally be launched on Saturday.

The Rs 1 lakh crore-mission, to be named after independent India's first prime minister, Jawaharlal Nehru, promises complete upliftment and integrated development of over 60 cities in the next seven years across the country. The mission lays special emphasis on providing basic services to the urban poor.

The National Urban Renewal Mission (NURM), to be rechristened tomorrow, was part of P Chidambaram's first UPA budget announced in February this year.

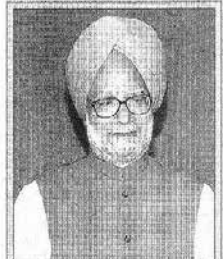
The mission will comprise two submissions — urban infrastructure and governance, to be administered by the ministry of urban development, and basic services to the urban poor — which will be undertaken by the ministry of urban employment and poverty alleviation.

Cities to be included under the mission have been categorised as megacities, those with a population in excess of a million, state capitals and cities of cultural and tourist importance.

The state of Uttar Pradesh, with six cities, tops the list of probable benefi-

claries followed by Maharashtra with four cities.

The mission will help states to spruce up cities in areas of housing, water supply, sanitation and slum im-



THE URBANATOR  
Rs 1 Lakh-Crore Scheme  
Will Also Cover Four  
Cities In Maharashtra

VISION



REALITY

ment official said. The completion of projects under the mission will bring in qualitative improvement to the lives of crores of people resident in cities," he added. A steering group headed by the urban development minister will guide the programme. In addition to the mission, the govern-

ment has also approved two other schemes — one for infrastructure development in small and medium towns and the other for integrated housing and slum development in places outside the national mission.

Prime Minister Manmohan Singh in his Independence Day speech had explained the finer points of these schemes. "My government would seek to make Indian cities better places to live in along with a grand

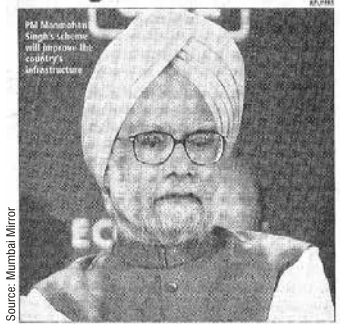
plan to breathe new life into the country's rural areas.

"Today, a third of our population live in urban areas and, keeping in mind the speed at which urbanisation is taking place, the day is not far off when over 50% of India's population will reside in urban areas. We taught the world the basic concepts of urban planning. But today our cities are often unable to meet the basic needs of their residents on many counts."



Source: The Economic Times

Big plans for big cities, says Prime Minister Singh



Source: Mumbai Mirror

The Urban Renewal Mission will cost Rs 1,00,000 crore; the idea was born when PM suggested turning Mumbai into Shanghai

SARJIT KUMAR

NEW DELHI The transformation of Mumbai to Shanghai doesn't seem like a lofty promise by PM Manmohan Singh after all, as the Center embarked on a new mission to improve infrastructure and the quality of living in cities with a focus on slum improvement and provision of housing for the urban poor.

With this objective, PM Manmohan Singh on Saturday launched a Rs one lakh crore Jawaharlal Nehru National Urban Renewal Mission and suggested the need to have "an integrated framework in which spatial development of cities goes hand-in-hand with improvement in the quality of living of ordinary people". This is the government's single largest initiative for planned development of cities. The novel mission will be based on improved urban infrastructure and urban basic services.

The seven-year mission would cover about 60 cities with a million plan population, state capitals and other cities considered important from religious, historical and tourist points of view. He hoped that the state governments and local authorities would draw up programmes that could attract financial support from outside governments as well.

"Cities, unfortunately with some exception, have not been enabled to look inward and build on their inherent capacities, both financial and technical, and instead are still being seen in many cases as 'waste of State Government's. This should change," Singh stated.

Overseeing that many cities like Bangalore, Mumbai and Thiruvananthapuram have come up with citizen initiatives for urban renewal, the PM said this process would be strengthened through the creation of Voluntary Technical Corps for each city as envisaged in the Mission.

Planning Commission Deputy Chairman, Montek Singh Ahluwalia said the mission was conceptualised when the PM suggested turning Mumbai into Shanghai, in a globalisation era, he said, development of infrastructure in at least major cities was important to attract investment.

HOW TO WIN THE mega city challenge



From the RINGSIDE  
N K SINGH

need in 1991-92 with an assistance of 714 crore covering Mumbai, Coimbatore, Chennai, Hyderabad and Bangalore.

These initiatives suffer from serious exclusion because their coverage was restricted to some cities with population of 4 million or above, or less than 20,000, leaving the huge middle-class, sprawling cities. The programme under JDA-2, for example, covered cities with 20,000 to 40,000 population including the more densely populated cities.

The Urban Renewal Mission, with a small corpus, expected more serious in relation to the scale of the problem.

Urban development will require large investments in infrastructure to carry roads, transport, electricity, water, sewerage and housing.

Major investments are needed, while enormous sums are required. The government's analysis of the risks and opportunities of urbanisation

Urban development will require large investments in infrastructure. Massive finances are needed. One estimate places long-term needs to be around 100 billion dollars annually for developing countries, with India alone needing 50 billion dollars a year

investments in real estate without developing a workable mechanism for financing. The success of the Urban Renewal Mission is critical to our future. If we get it right, these investments will become engines of growth. If not, they will deepen poverty and retard social transformation.

investments in real estate without developing a workable mechanism for financing. The success of the Urban Renewal Mission is critical to our future. If we get it right, these investments will become engines of growth. If not, they will deepen poverty and retard social transformation.

investments in real estate without developing a workable mechanism for financing. The success of the Urban Renewal Mission is critical to our future. If we get it right, these investments will become engines of growth. If not, they will deepen poverty and retard social transformation.

‘VISION MUMBAI - TRANSFORMING MUMBAI INTO A WORLD CLASS CITY’: SUMMARY OF RECOMMENDATIONS:

These are the highlights of McKinsey's recommendations on how they envision the future development of the city.

“To become a vibrant international metropolis, Mumbai must ensure that its economic growth is comparable to world-class levels while simultaneously upgrading the quality of life it provides to its citizens. At present it is slipping up on both dimensions. If it wants to achieve this status, the Government and the citizens need to undergo a change in mind-set rather than continuing to think incrementally. Specifically, Mumbai must invest \$40 billion (of which a fourth will come from public sources), over the next ten years, towards effecting this steep change.

I Boost economic growth to 8-10 per cent per annum by focusing on services (high- and low end), developing hinterland-based manufacturing and making Mumbai a consumption centre.

II. Improve and expand mass and private transport infrastructure, including linkages to the hinterland.

III. Dramatically increase low-income housing availability (1.1 million low-income houses) and affordability and drive upgradation of housing stock.

IV. Upgrade safety, air pollution control, water, sanitation, education and healthcare.

V. Create a dedicated “Mumbai Infrastructure Fund” with an annual funding of Rs.1,500 crore and attract debt and private financing.

VI. Make governance more effective, efficient and responsive by corporatising key departments and streamlining important processes such as building approvals.

VII. Generate momentum through more than 20 quick wins to show visible on-the-ground impact during the next 1-2 years.

VIII. Enable implementation through committed public-private resources, led by the Chief Minister and make key government organisations accountable for results.

Mumbai is currently at a critical juncture. It must implement the eight initiatives outlined above, and it must do so now. Otherwise it is in grave danger of collapsing completely.”

As can be seen from the above there is really nothing new or dramatic that the McKinsey report has said. What it has done is to precise all requirements into one comprehensive document and given it a direction. Mumbai should be made to resemble Shanghai. So that has been the goal – towards Shanghai!



A. 1. STAKEHOLDERS OF THE NEW ‘WORLD CLASS’ FUTURE:

The study questions who are the stakeholders benefitting from this new vision of a world class future. The desire to improve Mumbai is vehemently expressed by all the Government functionaries from all possible forums. Prime Minister Manmohan Singh has always been on the forefront in expressing a desire to see improvements not only in Mumbai but also in many other cities. It was Dr Singh who first made the mention that Mumbai should become a Shanghai and he promised to bring this turnaround about. In a similar vein he has declared 60 other cities as eligible for coverage under the Jawaharlal Nehru National Urban Mission (earlier called NURM-National Urban Renewal Mission) where integrated development is to be undertaken with an overall expenditure of Rs 1,00,000 crore. He believes in ‘an integrated framework in which spatial development of cities goes hand-in-hand with improvement in the quality of living of ordinary people.’ Many news papers including TOI reported on December 2nd 2010 this development.

The McKinsey Committee was, in fact, appointed by Bombay First a corporate lobby funded group for BMC, GOM and MMRDA. The first consists of elected representatives; the second too represents elected representatives and the third executives. Data inputs were given by many departments and Non-Government Organisations (NGOs).

Summarizing and paraphrasing the views of various critics here we find many opposing views to the Report. Referencing published articles by Sameera Khan, Sharada Dwivedi, Vidyadhar Date, Amita Bavisar etc. have raised some relevant issues. A few extracts express:

“A closer look would reveal that it is not a balanced mix which has led the study. The terms of reference itself is to make Mumbai a ‘world class city’ – a city where the rich and the powerful could get all the facilities easily, where everything is made out to their convenience.

Of the BMC officials, or the MMRDA officials or the GOM officials who represented the Mumbai end many did not really know the whole of Mumbai. Ensconced in their Colaba or Malabar hill flats, safely cocooned in their air conditioned cars with meetings held in air conditioned conference rooms or 5 Star Hotels they represent a very small percentage of Mumbai’s population.

The unspoken terms of reference is to create enough money to spend for flyovers, metros, air ports and luxury hotels which can spin money for the super rich. In all this US \$ 40 billion spending who is going to benefit most? The builders!”

Who owns Mumbai’s lands? In a survey conducted by Space & People Magazine’ India July 2005 it was found out that a handful of owners hold majority part of Mumbai’s lands.

|                       | Acres |
|-----------------------|-------|
| P.Godrej Foundation   | 9.300 |
| F.E.Dinshaw Charities | 550   |
| Ajmera Group          | 450   |
| Lok Group             | 289   |
| SF Engineer Group     | 240   |

**Godrej owns 3000 acres of Salt Pan land and Lok Group 180 acres.**

Plus you add the voracious builder lobby which is ever hand in glove with the politicians and the bureaucrats we can guess where the spending is going to end up with. And the prices are bound to go up.

And what is world class? Who defines world class? How does Shanghai or fit in the definition of world class? We hear of people complaining about the steel and glass spires of the big cities and the indifference of man towards man, we hear about the utter chaos in New York or London or Paris. Do we need further glass monstrosities spoiling our skylines or do we look for spreading out? Up to what heights are the Island city prepared to grow in its desire for ‘world class’? And having built the buildings do we have the capacity to provide the concomitant infra structure?

Although the Vision Report is at the behest of government bodies the criticism offered may not be far off the mark. Many other articles and newspaper reports have quite often mirrored these views.



An extract from the article - “Who owns Mumbai” by Nauzer Barucha for Times of India:

“They are the men with the keys to the kingdom. In a city where 60% live in hovels and another 30% work their backs off to afford that extremely modest roof over their heads, these men control vast tracts of land that their forefathers bought or were gifted decades ago. The identity of most isn’t common knowledge, but Times of India’s reporter Nauzer Barucha spent a fortnight tapping the real estate industry and the charity commissioner’s office to unearth it. While many of those who were gifted land by the British or acquired it at dirt-cheap rates haven’t reaped the harvest on account of factors like encroachment and lack of foresight, a few have held on to the land and made much money out of it.

So, who are Mumbai’s largest private landowners?

**On top of the A list is the Pirojsha Godrej Foundation that owns over 2,000 acres of mangroves in Vikhroli.**

Then there’s F E Dinshaw Charities with large parts of the western suburbs between Malad and Borivli under its belt. Nusli Wadi, who controls the trust, is another big landowner. The S F Engineer group at one time owned over 500 acres in Kandivli and Malad but has sold over half of it to different builders. Philanthropist Mohamed Yusuf has land in Powai, Kanjun Bhandup and south and central Mumbai while Byramjee Jeeieebhoy, who once reportedly owned large parts of Bandra, Andheri, Jogeshwari, Kandivli and Borivli, has very little left. The Rahejas, the Ajmeras and the Lok Group are among the city’s new landed gentry.”



## A. 2. MOBILITY AND CONNECTIVITY AS DRIVERS OF RECLAMATION

Transportation of people and goods is the life line of Mumbai. Mumbai boasts of the best bus service connecting all points of Mumbai in a criss-cross pattern so that it is easy for a person to commute from one point to another. The continuous flow of suburban trains gorge out 1,00,000 persons each day for their office/business. Innumerable flyovers are making the city more and easier to travel in. Plus an extremely busy domestic as also an International airport (to be supplemented by another in Nava Shewa). Taxis and autos and yes the pride of place to private cars. As per the McKinsey report the present average occupation per rail car is 550 which are proposed to be brought down to 220. This is by constructing Inner and Outer Rail Rings and by expanding the Rail Corridors in many areas. The Train/Road connectivity is proposed mainly in Bandra Kurla, Bandra – Dadar, Dadar- Colaba etc. Further, the number of buses per 1000 persons is to be increased by 25%, average speed of travel to airport to be increased from 25 kmph to 40 kmph, freeways from 2 to 6-8, and public parking slots from the current 2 per 1000 vehicles to 40-50.

To reduce congestion they recommend:

- Systematically developing 4-5 emerging Central Business Districts (CBDs) – Bandra-Kurla, Andheri-Kurla, Vashi/Belapur and Dronagiri – and improving their connectivity with each other and with key residential areas. This will reduce the current north-south pressure to and from the Nariman Point CBD; and
- Providing “end-to-end” north-south and east-west rail and road connectivity in the form of ring rails and ring freeways. All world-class cities have express ring freeways (6-8 lane roads with no signals) around the city such that a freeway can be accessed from any point in the city in less than ten minutes.

Here again when we study the various views offered by the critics, the gist is, once again that ‘the concentration of the plan is on the main land Mumbai - central Mumbai and on some parts of Nava Shewa and only a cursory glance has been given to the rest of the areas. Major beneficiaries in this drive are again the builders who now have a huge stake in getting this proposal through. Lands are to be gobbled up, people displaced, rules bent and often thrown overboard for their benefit.

# TIMES CITY

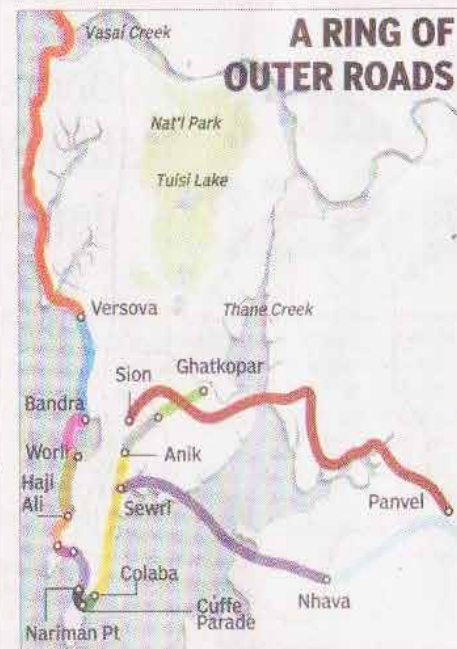
THE TIMES OF INDIA, MUMBAI | SATURDAY, APRIL 16, 2011

IMPLEMENTING TRAIN  
SYSTEM FOR PUNCTUALITY | 6

CRUCIAL COUNCIL BYPOLL FOR CHIEF MINISTER  
WILL NOW BE HELD ON MAY 4 | 8



## Roads To Come Up Faster & At A Cheaper Rate After Environment Min's Visit To Mumbai



## GARLAND OF CONCRETE & STEEL

STATE GOVERNMENT'S LONG-TERM PLAN FOR ROAD CONNECTIVITY IN THE REGION

**Virar-Versova | 54km**  
**TYPE:** Coastal road and bridges  
**STATUS:** Planning stage

**Versova-Bandra | 11km**  
**COST:** Rs 2,500 cr (est)  
**TYPE:** Coastal road plus small sea-link  
**STATUS:** Project report being prepared

**Bandra-Worli | 4.7km**  
**COST:** Rs 1,670 cr  
**TYPE:** Sea-link  
**STATUS:** Built; in operation

**Worli-Haji Ali | 3.6km**  
**COST:** Rs 2,900 (est)  
**TYPE:** Sea-link  
**STATUS:** Rinfra has contract; may start work in three months

**Haji Ali-Priyadarshini Park | 2.2 km\***  
**TYPE:** Coastal road  
**STATUS:** MSRDC sent proposal to state govt

**Priyadarshini Park-Girgaum Chowpatty | 1.2 km**  
**TYPE:** Tunnel  
**STATUS:** MSRDC sent proposal to state govt

**Girgaum Chowpatty-Nariman Point | 5km**  
**TYPE:** Coastal road  
**STATUS:** MSRDC sent proposal to state govt

**Nariman Point-Cuffe Parade | 1.3km**  
**TYPE:** Coastal road  
**STATUS:** MMRDA sent proposal to state govt

**Cuffe Parade-Colaba | 4km**  
**TYPE:** Internal road  
**STATUS:** Existing road

**Colaba to Anik (Wadala) | 11km\*\***  
**TYPE:** Major part is elevated  
**STATUS:** Widening, elevated work begun

**Anik to Panjarpol | 5 km**  
**TYPE:** Flyover & tunnel  
**STATUS:** Work has begun on the project

**Panjarpol to Ghatkopar-Mankhurd Link Road | 6 km**  
**TYPE:** Portions elevated  
**STATUS:** Work is on

**Sion-Panvel | 17 km**  
**COST:** Rs 1,000 cr (est)  
**TYPE:** H'way expansion (8 to 12 lanes)  
**STATUS:** Work to begin in few months

**Sewri-Nhava | 23 km +**  
**TYPE:** Trans-harbour link  
**STATUS:** MMRDA to float tender

**Nhava to Chirle (near Panvel) | 20 km**  
**TYPE:** Extension of trans-harbour link to expressway  
**STATUS:** MMRDA to float tender

## Estimated Cost To Build Roads

**Reclaimed land:** Rs 80 cr per kilometre

**Stilt:** Rs 300 cr per kilometre

**Sea-link:** Rs 400 cr per kilometre

**Tunnel:** Rs 1,000 cr per kilometre

\* From Haji Ali to Cuffe Parade, the combined estimate for four sections of road is Rs 4,000 cr

\*\* From Colaba to Mankhurd, the combined estimate for three sections of road is Rs 550 cr

+ From Sewri to Chirle, the combined estimate for two sections of road is Rs 8,000 cr

While proposing the roads and flyovers whether it is 100 families are 1 family which is displaced there is a human element involved. Was there an alternative to the proposed plan which would have given equal or better results and still kept these families in their abodes of many years? The many flyovers would benefit mainly the small percentage of privatized vehicle owners when 87% of the city's 12 million citizens use public transport (train/buses).

Who has drawn up the plans for the connectivity so far? Once again authorities from MMRDA, Mumbai Urban Transport Project (MUTP), Mumbai Urban Infrastructure Project (MUIP), GOM, BMC the same people who never travel in public transport, hardly ever move out of South Mumbai and work out of Air Conditioned offices.

And all the plans have so far been related to only the concerns of the driving public – how to reduce the driving time to Mumbai or Bandra, how to construct more flyovers so that traffic – meaning car traffic – is smooth. Provision of more parking lots would only allow the builders lobby to make profits.'

A report from the Times of India states:

- Mobility connections and their infrastructure investments become an excuse for the officials to ignore socio-economic classes and ecological criticalities.
- These highways and metros become a way to displace poorer classes along the way who have no voice, and develop more real estate which is expensive and for profit-making.
- This trend shows how the developer-politician lobby is actually what is determining the future of the city, by making large drastic decisions. Not the 'common man', who needs also to be dealt with in a different way and scale for benefit of all citizens.

It is a very 'island-city' centric trend, and not for the entire conurbation, thus still having a very north/south orientation.

Here again the necessity of more roads, better and more connectivity and the goals as set out in the report cannot all be questioned. But the moot point remains that the critics do score a valid point when they question the need to strengthen the flyovers or parking lots at the expense of the train or bus which is the mass transport. And, hence, the also the question of who drives the mobility in the city.



### A. 3. ATTITUDE TO ECOLOGY

One of the most sensitive issues in India is the ecological issue and the concern we all voice over the same. Environmental clearances for projects, particularly for projects of a big size, are critical. Placed under the Ministry of Forests and Environment we have a reasonably good watch dog. Rules relating to Coastal Regulatory Zones (CRZ) are defined clearly. Preservation of mangroves as an extremely important ecological buffer between the sea and the land surface is well emphasized. Importance of preservation and extension of forests is understood. We are well versed on the evils of global warming. We make all the right noises in all International conferences on Environment issues.

Yet Maharashtra happens to be the only state in which the area occupied by forests has diminished by over 2 hectares in the last decade. Mangroves disappear overnight. Constructions come up in CRZ areas with impunity and slowly but surely the CRZ rules are relaxed, bent, overlooked and scrapped to adjust our greed for further land expansion. In the guise of reclamations land has now abutted where there was coast earlier.

As Prasad Shetty says in his Mangroves – Environmental Consciousness, ‘Mumbai has been a city of 7 islands with paddy fields, and fishing villages and extensive forests. Since 17th Century there have been systematic changes in the topography of the city with successive reclamations by the local and the colonial administrations. These were not only for acquiring more lands, but also for reasons of clearing up of mosquitoes from marsh lands etc.’

Who are the drivers of this attitude towards ecology? Not definitely the common man. It can only be the man who benefits from all the rule bending under the guise of public good. The argument that a little deviation from the environmental norms for the benefit of public good has been slowly stretched to the extent that it covers blatant breaches.



Skyline of Navi Mumbai showing the rapid replacements of mangroves and wetlands.  
Courtesy: [http://en.wikipedia.org/wiki/File:Navi\\_Mumbai\\_Skyline.jpg](http://en.wikipedia.org/wiki/File:Navi_Mumbai_Skyline.jpg)

As Rahul Mehrotra says, in his essay Remaking of Mumbai, ‘By default the private sector is determining the emergent form of Mumbai. Today there is an incredible disjuncture in the city between existing and allocated land use and the positioning of new infrastructure - a condition where land use, transportation planning and urban form have no relationships with each other in the emergent landscape.’

The vast stretch of salt pan lands is a case in point. Ecologically necessary as a belt and economically necessary for the indigenous people every proposal for rebuilding of Mumbai relies very heavily on reusing this portion of land. We started with using this tract for the Slum Rehabilitation Development. Provision of Low Cost Housing to the displaced slum dwellers here would fetch a higher FSI to the builder. So waiver of CRZ and other environmental rules is taken here for granted because here we are talking of housing to slum dwellers. There are the proposals for bigger and glossier entertainment cities/areas – money spinners, tourist’s attractions - a Las Vegas in Mumbai! This is something special – equal to SEZ one might say and then one seeks waiver of CRZ rules. There is also a proposal of MMRDA on an extremely essential sea link.

The same thing applies to disappearing mangroves too. Despite the NGOs working in the area or private citizens in the area producing proof to the contrary the government authorities refuse to accept that there have been serious encroachments on mangroves. Everywhere greed takes priority over prudence. Repeated floods have not taught any lessons to the authorities on the need for proper preservation of the mangroves and for implementing the environmental rules implicitly.

Prasad Shetty’s paper is very informative in that it quotes specific cases of government indifference to the environment, mangroves etc and shows clearly how the powerful have tried to bend the rules in their favour. The case of the hot springs in Vajreshwari being turned into almost a private resort and the tribals being driven away is but one example of many.

Critics could be right when they say that tighter implementation of the environmental laws is necessary for a better Mumbai and safer Mumbai and drivers of environment and ecology should be more conscious of the damage that could be wrought by their plans.



A. 4. RESULTANT SOCIO-ECONOMIC EXCLUSION

McKinsey Report aims that in a decade the Slum population in Mumbai be reduced from 50%-60% to 10%-20% ideal being 4%.

Quoting from Mangroves – Environmental Consciousness – Prasad Shetty who himself has reproduced the following:

Bourgeois environmentalism – Amita Bhavisar – Politics of the City – www.india seminar.com

“The concern with an ordered environment, that is safe, hygienic, unpolluted, green and uncongested is in some ways an extension of the concern about bodily well being. Personal health, physical and mental is linked to ‘quality of life’ and the affluent are more able to address their anxieties about crime, disease, and other stressful urban characteristics. Parks for morning walkers, temples and ashrams where they can seek spiritual succor, the green magic bullet of ‘plant more trees’ are ingredients in imagining cities in ways that exclude basic concerns of shelter, sanitation, water and transport as they affect the lives of the working class. ...For the bourgeois environmentalist, the ugliness of production must be removed from the city. Smokestack industries, effluent producing manufacturing units and other aesthetically unpleasant sites that make the city a place of work for millions, should be discreetly tucked away out of sight, polluting some remote waste land. So must workers who labour in these industries be banished out of sight? Even people whose services are indispensable for the affluent to live comfortable lives – domestic workers, vendors and sundry service providers, should live where their homes do not offend the eyes, ears and noses of the well to do... For the bourgeois environmentalist, urban spaces should be reserved for white collar production and commerce, and consumption activities.”



Night image of the slums on the hills of Thane creek.  
Courtesy: <http://www.tamarindtours.in/view/destinationImages/Mumbai%20-%20Slums.jpg>

The Vision Report has recommended for implementation the following services for successful achievement of the targeted level of income:

“Target high-end services – Financial services, Healthcare services, IT/ ITES, Media/ Entertainment/ Telecom, Construction, Hotels/Tourism/ Recreation, Retail, Manufacturing, Transportation/Logistics: Focusing on these will add 2-3 per cent to Mumbai’s GDP growth and over 2 lakh additional jobs over the next ten years. In the hinterland create Special Economic Zones and undertake construction thru proper infrastructure.”

Unfortunately, none of the above suits a slum dweller that is basically uneducated and suitable only for manual labour. So what does he do? He does not fit in the scheme at all and, hence, becomes ineligible for participating in the economic benefits of the redevelopment. Once again, we have schemes drawn up by people who are totally cut off from 70% of the populace when they are formulating solutions.

Quoting Sameera Khan here ‘the poor are treated as “encroachers”. And by paying more attention to the illegality of the structures of the poor than to those of the rich, slum dwellers – who number 7 million and form 60% of Mumbai’s population- are constantly treated as being less than full citizens. According to Sharit Bhowmick, slums, which occupy less than 8% of the city’s land, are projected as the cost of most, if not all urban problems. Yet high-rise apartments cause greater strain on public utilities ( drainage, garbage, water and so on) as their consumption is much higher than in the slums.’

There is a constant conflict between social activism and the urban developers in terms of approach to the city’s development. It is inconceivable that we would let only the slums grow and not allow the city to see radical changes. Some upheavals must be accepted but perhaps in such a way that the slum dwellers are properly rehabilitated. In the scheme to be drawn up a pre-consultation with this section of the populace, a better understanding of possible economic inclusion which could integrate them into the society called Mumbai at large and also women who constitute a majority in many areas is necessary.



## A. 5. NEED FOR A HOLISTIC APPROACH AND STRATEGY

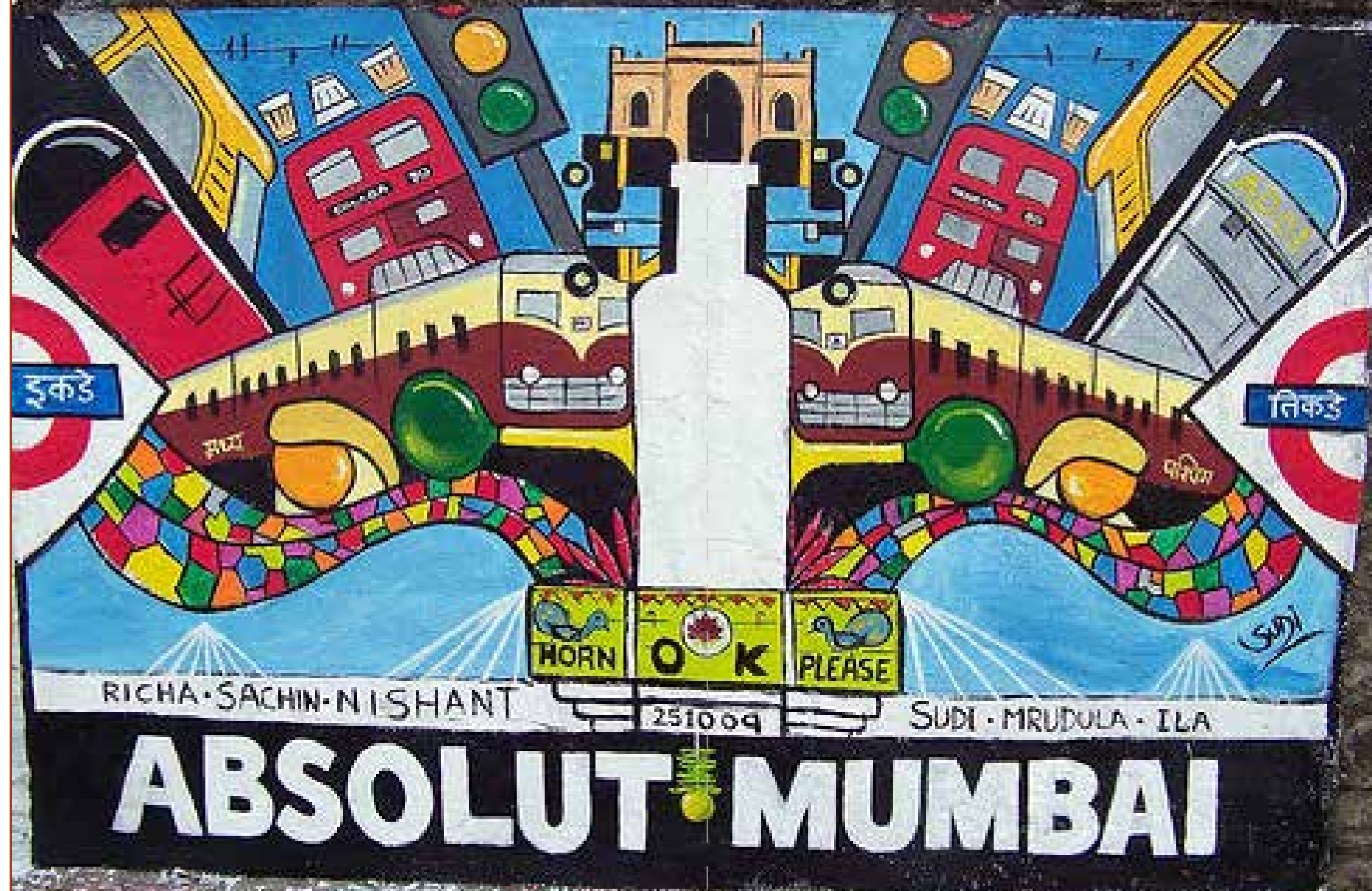
Visions of Mumbai makers:

1. Desire of city stakeholders (numerous) - to make Mumbai “world-class”
2. What is the definition of world class - Shanghai? New York?
3. But these visions are also blinkered and only serve the ‘rich’ and the politicians, through loopholes.
4. Clearly there is a socio-economic exclusion and an ecological exclusion, because these are completely ignored, OR dealt with in a profit-making way
5. Although economic sector development models serve IT, industries, etc etc - they don't take into consideration small entrepreneurs, a model that includes informal economies or primary sector like food production, which should always be a part of a sustainable lifestyle.
6. Again, through the post-industrial visions (like Mills Lands) or port transformation (like Eastern Waterfront proposals), the city stakeholders only focus on Mumbai Island, where the real estate price is high, so their policies are not holistic and always exclude the poorer north of the conurbation and exclude the lower socio-economic classes and exclude the ecology.
7. Chief Minister is always given highest power, thus leading to an almost monarchical city-state type of condition.
8. Spatial strategies for the city must find a way and scale which includes all the citizens.

Vidyadhar Date asks in ‘Mumbai as a World Class City’ - ‘Becoming internationally competitive is extremely expensive business, and sustaining the pace is even more challenging. Can we afford to expand capacity for costly infrastructure like airports and expressways while ignoring people's basic needs?’ Sameera Khan writing in ‘Architecture Time’ - Fantasy of 2050 – ‘High rise buildings and no slums! A distorted planning’ says

“If Mumbai's makeover is to set a positive example for urban renewal for other parts of the country then it must take every one from jhopadpatis to the wealthy, men and women, the young and the old for the ride.”

Graffiti from a wall in Mumbai showing the city's cultural relationship with public infrastructure: Iconic red buses, trains and train-stations, tiffin carriers, post offices, carrier trucks with painted signs, 'horns' of autorickshaws, 'chai' / road-side tea, yellow and black taxis, the lemon-chillies to ward off evil spirits all form the core of life in this mega-city.  
Courtesy: <http://www.pluggd.in/wp-content/uploads/2011/01/mumbai.jpg>



This is not to have an agenda against builders as a community or politicians or bureaucrats – they are needed for doing their jobs. It is the element of dishonesty, corruption and an utter disregard for the general public in their thought process which makes one cautious about their intentions. Even a small city like Thane could make progress due to the efforts of the new Municipal Commissioner, who used the government machinery effectively. In the normal circumstances, the politicians, bureaucrats and the builders have a tendency to have a blinkered approach to the problem – for example treat Mumbai only as main land Mumbai- and Mumbaikars to be only the motor car variety.

Rahul Mehrotra says in Urban Age Nov 2007 ‘despite being a vitally important and heavily publicized planning decision, no planning agency in Mumbai prepared a master plan or strategy to integrate these lands for the benefit of the city; and concerned citizens, environmentalists and planners just reacted too late to salvage whatever could be retrieved through Public Interest Litigation (PIL) within a set of legislative moves to divide this prime mill land. Today most infrastructure follows city growth rather than facilitating and opening up new growth centres within and outside the city's core. In contemporary Mumbai, planning happens systematically ‘posterior’, as a recuperative and securing action.’

As against this comment we now have a comprehensive Vision Report from McKinsey available to the decision makers which is anterior to the needs. So a systematic approach to its implementation would be a first step.

However, we should have a more holistic approach to the problem, more inclusive and the voice of the common man, the slum dweller and the women who would be the most affected must be heard before we take any major decisions. We also should look at Mumbai today as a bigger agglomeration/conurbation than a small island city.

The select analysis and design proposal of this thesis attempts to be, precisely, an alternative which could alleviate some of the problems highlighted above.



## B. WATER SUPPLY IN THE CONURBATION

The city's geographical area is 450 sq. km. Roughly 70% of the area is developed. Water supply situation in Mumbai is relatively less affected compared to sister cities in India, due to development of numerous water schemes to meet Mumbai's increased population demand. Still, numerous issues such as distribution losses, pilferage & wasteful use cause water shortages. Water supply from various schemes have reached 2.95 billion liters per day to supply 13 million people. The population is projected to grow to 16 million by 2021. New schemes have been proposed to increase water supply, including harnessing the Vaitarna river basin and Ulhas river basin. The proposal will help increase water supply to 6.4 billion liters per day. However, the proposal would require construction of dams, village displacements and submergence of harvestable lands. The proposals as such come with a considerable cost.

Prior to (and during the early regime of) the British Raj, water supply in the original villages of Mumbai depended on 'talaos' (lakes) or harvesting methods. The 2000 year old Kanheri caves, located in the current Sanjay Gandhi national park region, provides an example of rainwater harvesting techniques used during that era. During the earlier years, rainwater was the main source of water supply and it was collected in tanks. People used to measure the height of collected rainwater in the tank and accordingly decide how much to draw from it to make it last over the year.

Around 1845, the British administration, under pressure from local natives, investigated alternative sources. The Vihar lake dam on river Mithi in 1860 provided a water supply of 32 million liters per day of water to cover the needs of the then citizens. Subsequent developments, starting with rising the Vihar lake dam level, followed by dams on Tulsi lake (1879), Tansa river (1892) and additional engineering initiatives in terms of water piping development and floodgate installations, increased total water supply to 541 million liters per day by 1948 for Mumbai's 2 million population. Since that time, dams on lake Vaitarna (with a tunnel between Vaitarna and Tansa lake,) Ulhas river and Bhatsai scheme helped increase total water supply to 2,950 million barrels per day. The supply currently covers a population of 13 million. The piped supply however was only planned for the island city, and the rest of the city faced and still faces shortage. On an average, each household needs about 125 liters per day of water consumption. The current supply of water provides 90 liters per day requirement.



Detail of rain water harvesting in the rock-cut Kanheri caves on Salsette  
Courtesy: <http://www.wondermondo.com/Countries/As/India/Maharashtra/Kanheri.htm>



Waterfalls in the rock-cut Kanheri caves on Salsette  
Courtesy: <http://www.flickr.com/photos/sandev/1321431816/>

The situation is worse in poverty-ridden regions & slums, where average water supply barely reaches 25 liters per day. The inequitable water supply is even more glaring in some of the most elite suburbs of Mumbai such as Malabar Hills and Warden Road, where water availability is constrained to a maximum of 2 hours tap water availability. Mumbai's topography does not lend well to equitable water supply either. Originally assembled on seven islands in the Arabian sea, tracts of reclaimed land were later added to convert Mumbai into a whole landmass.

As Mumbai gets increasingly saturated in terms of ability to accommodate new businesses and residences, citizens and businesses are increasingly moving to outlying regions of Mumbai such as Thane district. Small industries, trade and commerce, banking, construction and manufacturing industries have flourished and contributed to many employment opportunities in Thane. Such opportunities promote further migration of population from surrounding rural areas compounding the ongoing exodus from Mumbai cities to Thane.

The rising levels of urbanization in regions such as Thane district contributes to gross inequality of drinking water supply in the region. Water supply is severely constrained. Current demand for drinking water ranges from 400 million liters per day for the Thane Municipal Corporation to 1.2 billion liters per day for all municipal corporations including Wagle estate, Kalyan Dombivli, Mira Bhayander and Bhiwandi Nizampur.

In order to satisfy the growing demand, district officials investigated alternative sources of supply. A 100 million liters of water per day capacity was realized through construction of the Bhatsa dam for Thane. Water began to flow into the city from this source in 2003. Several other regions started creating dams to meet their requirements, often from the same water source. New Mumbai region procured water from the Morbe dam, Kalyan-Dombivli region from the Ulhas and Kalu river dams while Ulhasnagar district procured supply from Shahad water works and Barvi dam.



B. SOURCES OF WATER SUPPLY IN THE CONURBATION

The decisions to identify and create water sources are typically made at a higher level and with macroscopic consequences. Often dams are the proposed solution to transfer water from source to supply distances over a 100 Kilometers. Alternatively, desalination plants are proposed. A special committee setup by the government of Maharashtra has decided to setup two desalination units that use reverse osmosis technology – one in the main city and other in the western suburbs. The first phase of construction is expected to be complete in 2013 and citizens can expect a supply of additional 25 million liters per day. Each unit is designed to provide supply of up to 100 million liters per day by end of construction. The proposed cost of the project is Rs. 6 Billion.

Such macroscopic decisions fail to consider that Mumbai has a beautiful water capturing topography. Mumbai peninsula has been surrounded the sea and is inhabited by ponds and rivers, wells and salt pans, mangrove swamps and rice fields that are flooded by water during rain. The island in its original state had a naturally good water supply and drainage. Wells provided a good source of sweet water. Natural drains (nalas) allowed excess rain water to run to the sea, so flooding was not an issue.

The topography of Mumbai has been drastically altered over a period of time from its pristine condition. In the course of land reclamation to provide further land for development, protective mangrove belts, salt pan lands and other open spaces that can form a buffer between the city and the sea continue to be stripped away. Numerous leveling, damming, de-silting, infilling and reclamation projects have blocked the natural drainage paths and have increased the probability of flooding especially when rain showers are erratic. Large scale concretization of grounds to support construction has exacerbated the problems further. Natural drains and nalas get blocked as a result of such construction. A recent flooding incident claimed over a 100 lives during a heavy monsoon shower.

Though Mumbai has a generally laid out water supply system there are numerous snags. The supply system is mismanaged and misused through un-metered and unaccounted for water supply. Low tariffs, subsidies and low recoveries compound the situation, in addition to metering errors and billing mistakes. People are in a mindset that water is a naturally available commodity and do not associate a cost with usage.

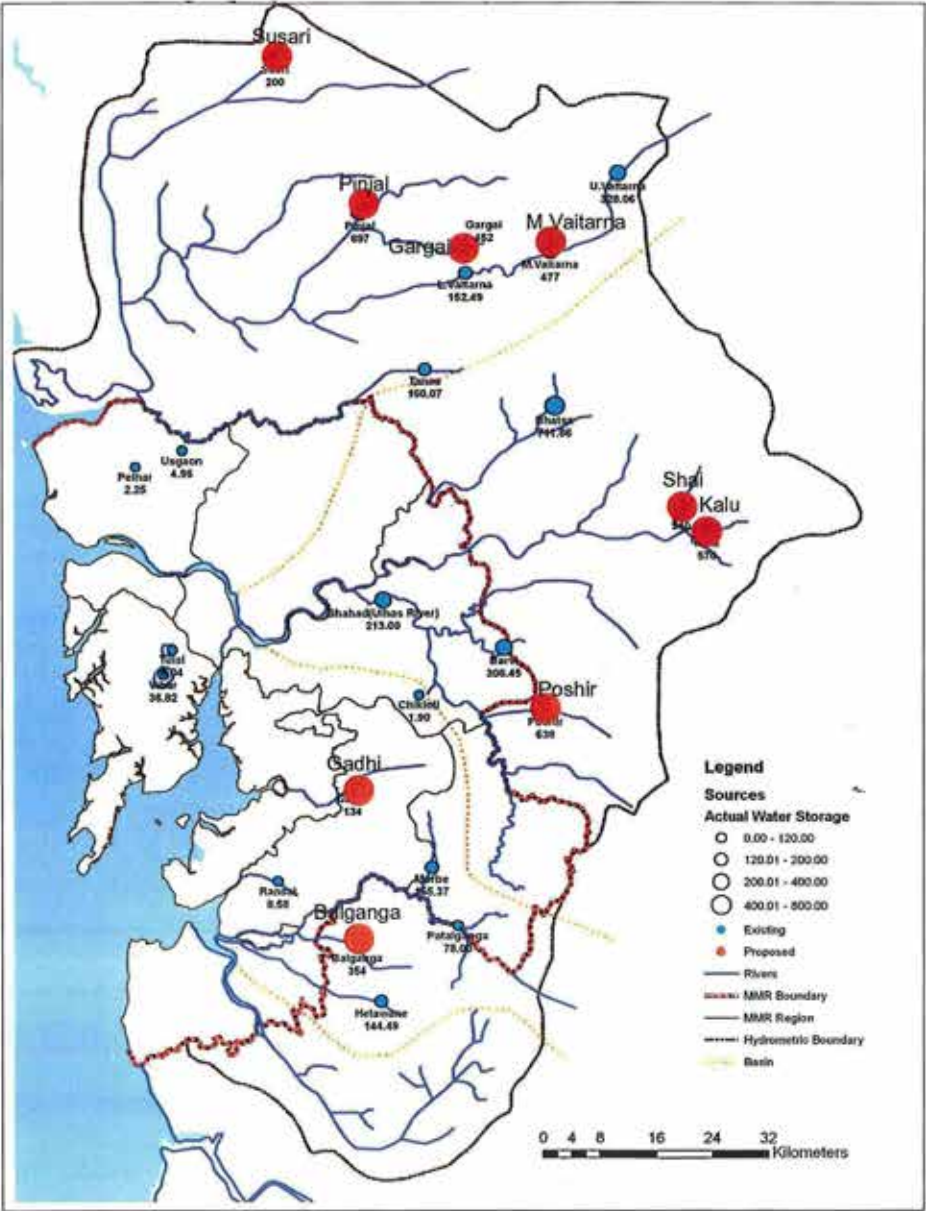
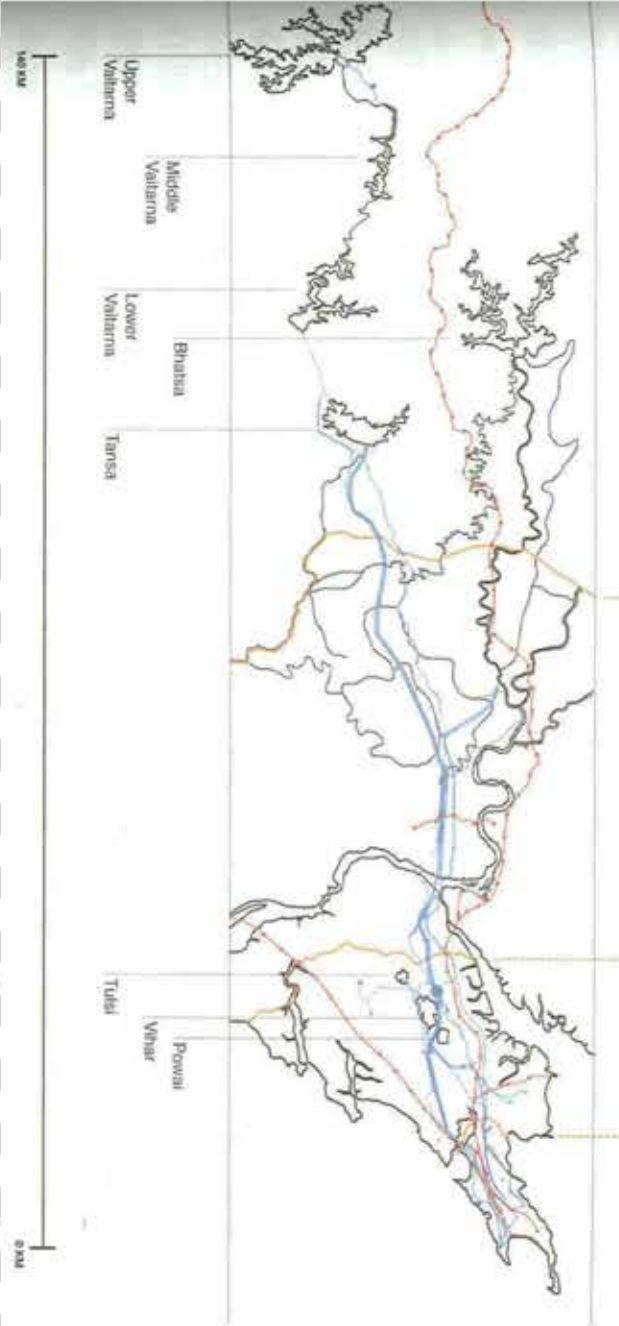


Figure 4-2: Map showing existing and potential water sources of MMR



### Watered down

**407** – Litres of water consumed by an average household in Mumbai daily

**115** – Litres of water used for bathing

**82** – Litres of water used for toilets

**76** – Litres of water used for washing clothes

**67** – Litres of water used for washing dishes

**30** – Litres of water used for cleaning house

**17** – Litres of water used for drinking

**12** – Litres of water used for cooking

**90** – Litres of water an average Mumbaikar consumes per day



**69%** Households in Mumbai face water shortage

**3,340 million** Litres of water currently supplied to Mumbai every day (demand estimates reach up to 4,300 million litres)

**25%** Water that is lost due to leakage and pilferage. This adds up to 835 million litres of water a day

**2.8 billion** People in 48 countries, mostly in Africa, the Middle East and the Indian subcontinent will face severe water shortages by the year 2025

Source: United Nations and the Tata Institute of Social Sciences.

The Water Utility Department is faced with challenges in terms of providing service. The planned and unplanned development of growing slums imposes additional burden over day to day maintenance and repair activities. Staffing is inadequate. Water networks in slums are dense and complicated and require a lot of time to resolve issues. Concretization of Mumbai roads, without accounting for maintenance requirements for water supply systems, leads to immense difficulties in fixing supply problems.

There are alternatives Mumbai citizens can avail of to circumvent water shortage issues and potentially avoid harnessing the Vaitarna and Ulhas river basins. Rainwater harvesting and ground water use pose viable alternatives. Reclaiming old sources of rain water such as harvesting tanks located in Mumba Devi, Manamala, Govalia, Gilder and others could help augment existing water supplies. Rainwater harvesting provides benefits - water tables will rise, water quality will improve, water salinity will reduce and cracks in buildings will be minimized.

Rainwater harvesting by capturing runoff from the rooftops / terraces and surrounding surface water will not only increase ground water recharge and stop ingress of sea water but will get Mumbai out of its monsoon floods problem. Water harvesting in Mumbai will reduce storm water discharge as well as reduce the load of sewerage treatment, thus controlling the dreadful monsoon floods. Rainwater can be stored in tanks or can be recharged into the groundwater.

Water recycling could act as a significant source of water supply given that roughly 80% of water is discharged as wastewater. Chatrapati Shivaji Terminus of the Central Railway has setup a water recycling plant of 0.2 million liters per day capacity. The recycled water is collected and treated for cleaning the concrete aprons of the railway platform.

Other common sense water conservation techniques such as using a glass of water to rinse teeth after brushing instead of using running tap water, aerating water showers, controlling running tap water during washing clothes and bathing, using sprinklers instead of hose pipes and using a bucket to wash the car instead of the hose, would go a long way in terms of relieving Mumbai of water resource constraints.

Ultimately, the city needs to acknowledge the need for strategic interventions and methods for addressing the very basic and fundamental human need.



C. FLOODING AND STORM WATER DRAINAGE

Mumbai’s drainage operation is analogous to that of a sponge. The region is porous in plan and section, that allows it to absorb and purge water. Improper drainage systems, shifting of natural river beds and depletion of much needed wetlands have opened the city up to severe flood risks.

On July 26, 2005, Mumbai received record rainfalls of 994 mm in a single day that wreaked havoc in the region. Estimated casualty toll reached 5000 and the region came to a standstill. Damages totaled over \$100 million as a result of the ensuing floods.

Following factors were attributed to the cause of the damage (quoted from Wikipedia article: [http://en.wikipedia.org/wiki/Maharashtra\\_floods\\_of\\_2005](http://en.wikipedia.org/wiki/Maharashtra_floods_of_2005))

1. Antiquated drainage system

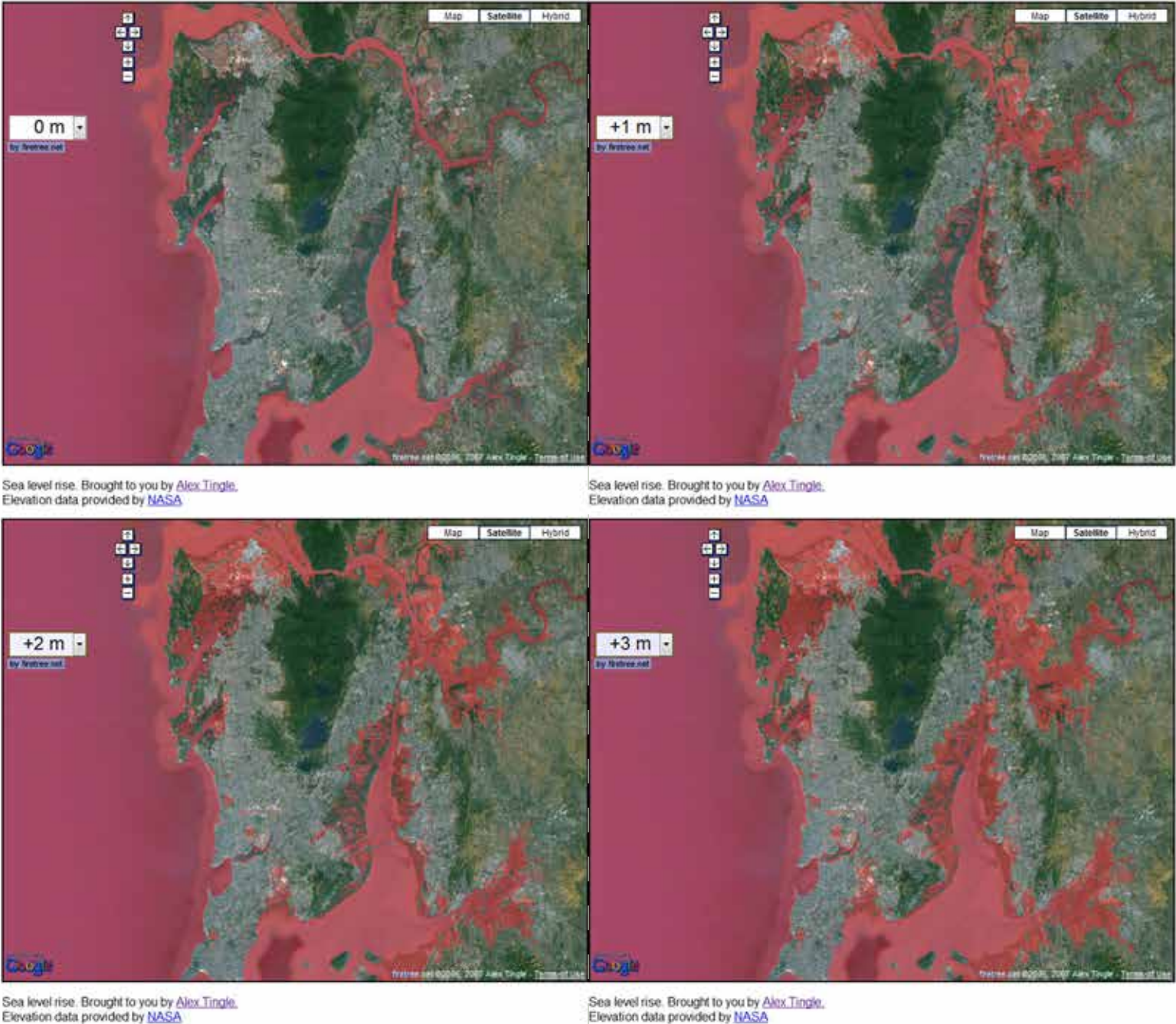
The present storm-water drainage system in Mumbai was put in place in the early 20th century and is capable of carrying only 25 millimetres of water per hour which was extremely inadequate on a day when 994 mm of rain fell in the city. The drainage system is also clogged at several places. Only 3 ‘outfalls’ (ways out to the sea) are equipped with floodgates whereas the remaining 102 open directly into the sea. As a result, there is no way to stop the seawater from rushing into the drainage system during high tide.

2. Uncontrolled, unplanned development in Northern Suburbs

Unlike South Mumbai, development in northern suburbs of Mumbai is haphazard and buildings are constructed without proper planning. The drainage plans in northern suburbs is chalked out as and when required in a particular area and not from an overall point of view. The Environment Ministry of the Government of India was informed in the early 1990s that sanctioning the Bandra-Kurla complex (a commercial complex in northern Mumbai) was leading to disaster. No environment clearance is mandatory for large urban construction projects in northern Mumbai. Officials in the environment ministry claimed that it was not practical to impose new guidelines with retrospective effect “as there are millions of buildings”.

EFFECTS OF SEA-LEVEL RISE BASED ON SATELLITE ELEVATION DATA

Courtesy: <http://flood.firetree.net/>



3. Destruction of mangrove ecosystems

Mangrove ecosystems which exist along the Mithi River and Mahim Creek are being destroyed and replaced with construction. Hundreds of acres of swamps in Mahim creek have been reclaimed and put to use for construction by builders. These ecosystems serve as a buffer between land and sea. It is estimated that Mumbai has lost about 40% of its mangroves between 1995 and 2005, some to builders and some to encroachment (slums). Sewage and garbage dumps have also destroyed mangroves. The Bandra-Kurla complex in particular was created by replacing such swamps. The most acclaimed Mindspace CBD (INORBIT MALL) in Goregaon & Malad (Mumbai Western suburbs) has been built by destroying a large patch of Mangroves in Maharashtra.”

There were major deficiencies in the storm water system which causes flooding

- Numerous flat gradient systems that were affected by high tides
- Inadequate capacities of existing drainage systems
- Large drain obstructions that were not cleaned in time

‘- Poor workmanship and lack of attention to proper repairs when the drains were punctured to construct utility services – many locations in a poor state of structural repair.

- Access for maintenance to drains restricted by development over the manholes.

- Interconnection of storm water and sewerage networks
- Encroachment on system reducing access for maintenance

Constructions such as the Bandra-Worli sea link, Bandra Kurla Complex and the Sewri Nhava Sheva link were carried out at the expense of significant amount of land (in excess of requirement) reclamation. The destruction of wetlands & mangroves that provide much needed sponging action created conditions favorable to flooding. Similar constructions were carried out in a number of regions in Mumbai. During high tide conditions, the active functioning of sponging action is especially crucial to relieve the high pressure conditions of the tide. Barring such action, excess water does not have the required pathways to drain into sea during high tide.

Mumbai property prices equal those of Manhattan, NY and command a substantial premium. Each square foot of reclaimed land provides an opportunity for significant revenue. Policies, both legal and tacit, aimed at exploiting the revenue potential fostered a climate rife for land reclamation. Large scale concretization of natural ground has lead to blockage of natural drainage systems.







D. A RELATIONSHIP OF LAND TAKING OVER WATER

SOIL AND LAND-USE:

The soils in the region are derived from Deccan trap basalt. Very little land is available for agriculture due to widespread urbanization in Greater Mumbai. Agriculture and forestry were important components of MMR. Both are under severe threat from developmental pressures as the demand for housing and construction keeps increasing with constant influx of people in MMR. The total agricultural area inMMR is reported to be around 1850km2 in 1989 of which 55%is fallow, 35% is cropland and the rest is plantation (MMRDA). A total of 1450km2 of area in MMR is covered by forests of which nearly 40% are dense evergreen forests and the rest are sparse forest and scrubland. Encroachment in forest land is common along the fringes of the forest area. Land filling operation is done with the sole objective of creating land for housing and industries, without adequate geo-hydrological considerations. A total area of nearly 90–100km2 is reclaimed in Thane and Mahim creeks resulting in the reduction of tidal flux. Environmental impact assessment studies using models have shown a reduction of tidal prism and reduced near shore currents due to the reclamation in Thane creek. The reclamation of land, indiscriminate sand mining and associated development exerts enormous pressure on the coastal marine ecosystem of the region.

WATER SUPPLY:

The annual rainfall in the region ranges from 180 to 248 cm mainly during southwest monsoon season (June–September). Due to decreased capacity of the ground water aquifers in the region, water level rises up to ground level after heavy initial rainfall. Further precipitation would not make any positive contribution to ground water aquifers, and it is lost as run off. Due to the huge demand for land, many low lying areas of the rivers flowing through MMR are reclaimed and this causes floods during monsoon season. This problem is aggravated by poor storm water drainage system of the city. Indiscriminate dumping of solid waste often clogs the combined storm water and municipal waste water drainage system resulting in coastal flooding and inundation during monsoon. Nearly 60% of the Greater Mumbai's population live in slums and squatter settlements. Around 3000 MLD of water is supplied to Mumbai city from six reservoirs after treating and disinfecting. Of the total piped supply, domestic supply accounts for 70% whereas commercial and institutional demand is about 10%. Rest of the water is wasted in leakage and thefts. Despite a very low water tariff several areas in MMR have severe water shortages. There is an unequal distribution of water supply. Ground water resources, wherever available, need to be harnessed for residential and agricultural uses. The ever increasing population, particularly in slum localities of MMR makes the task of equitable distribution of water supply very difficult for the authorities.

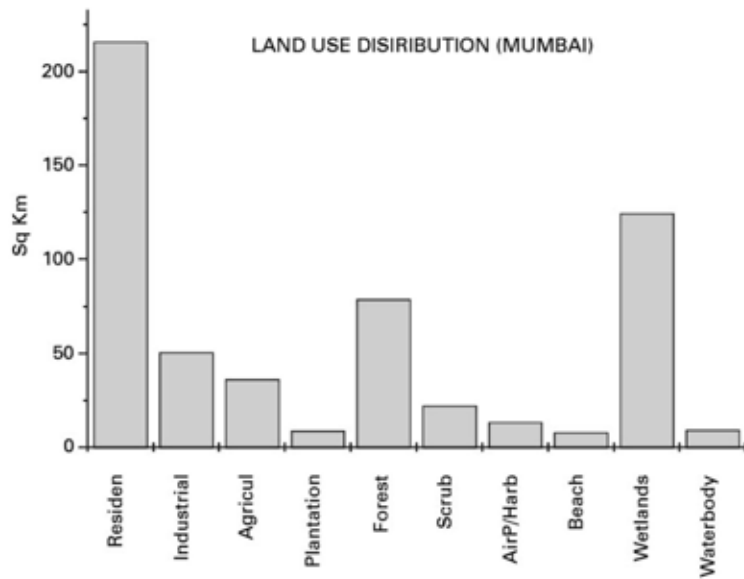


Fig. 4. Land use distribution (km<sup>2</sup>) in MMR.

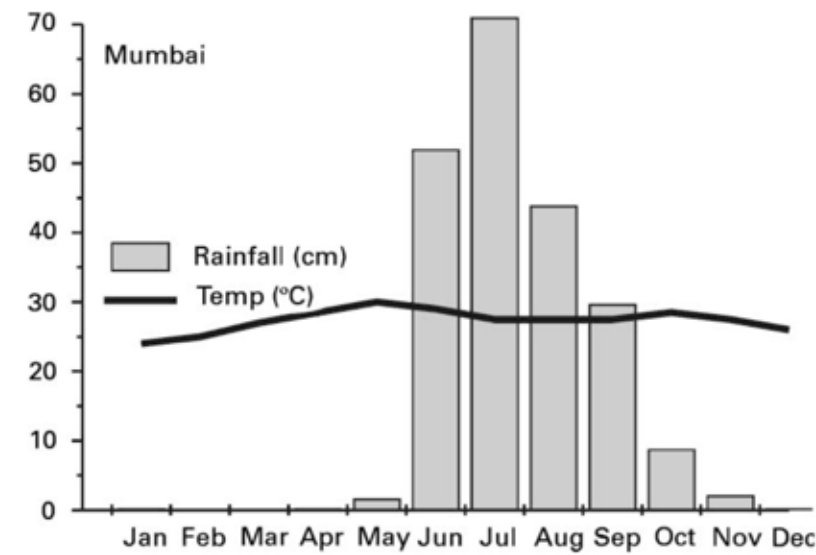
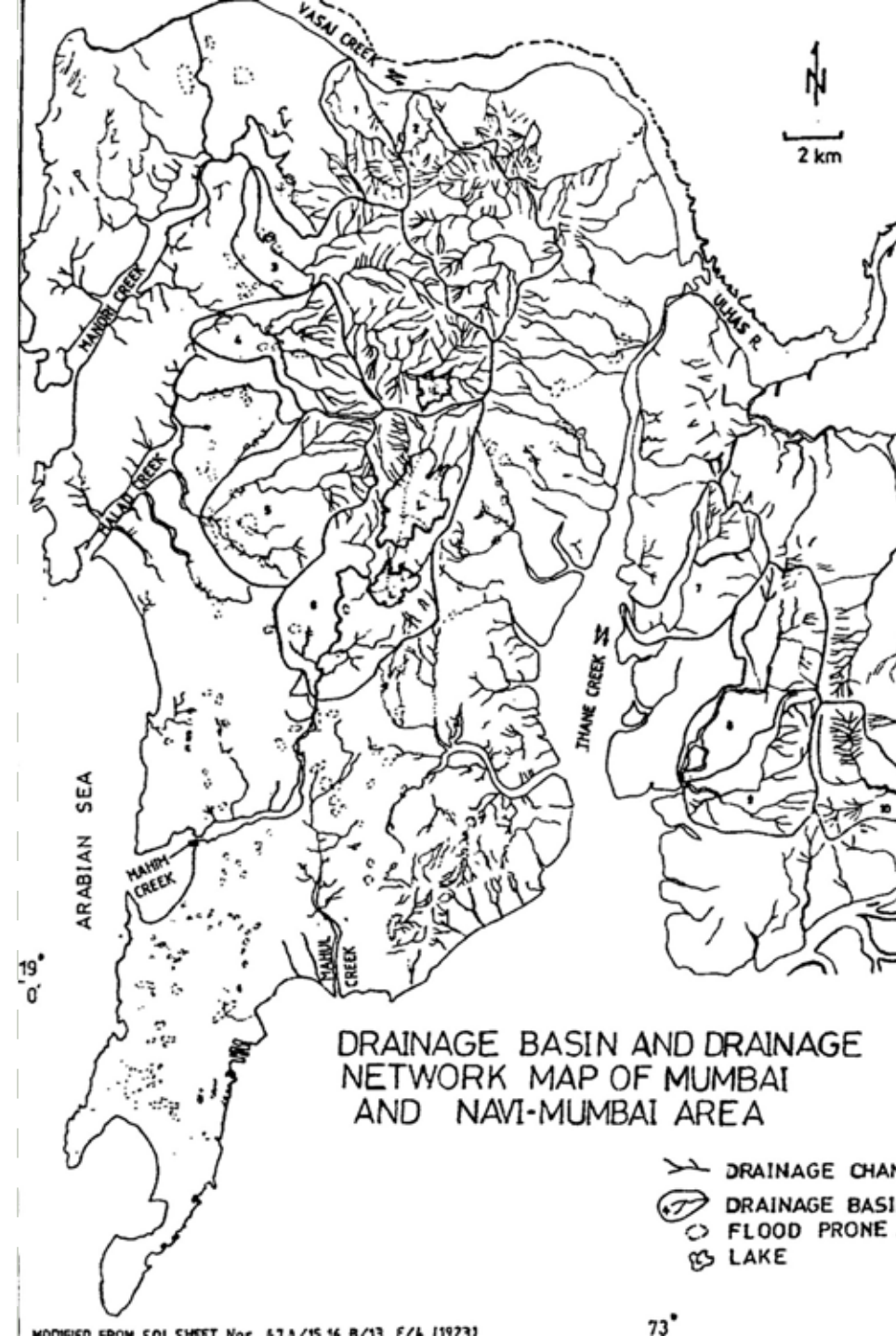
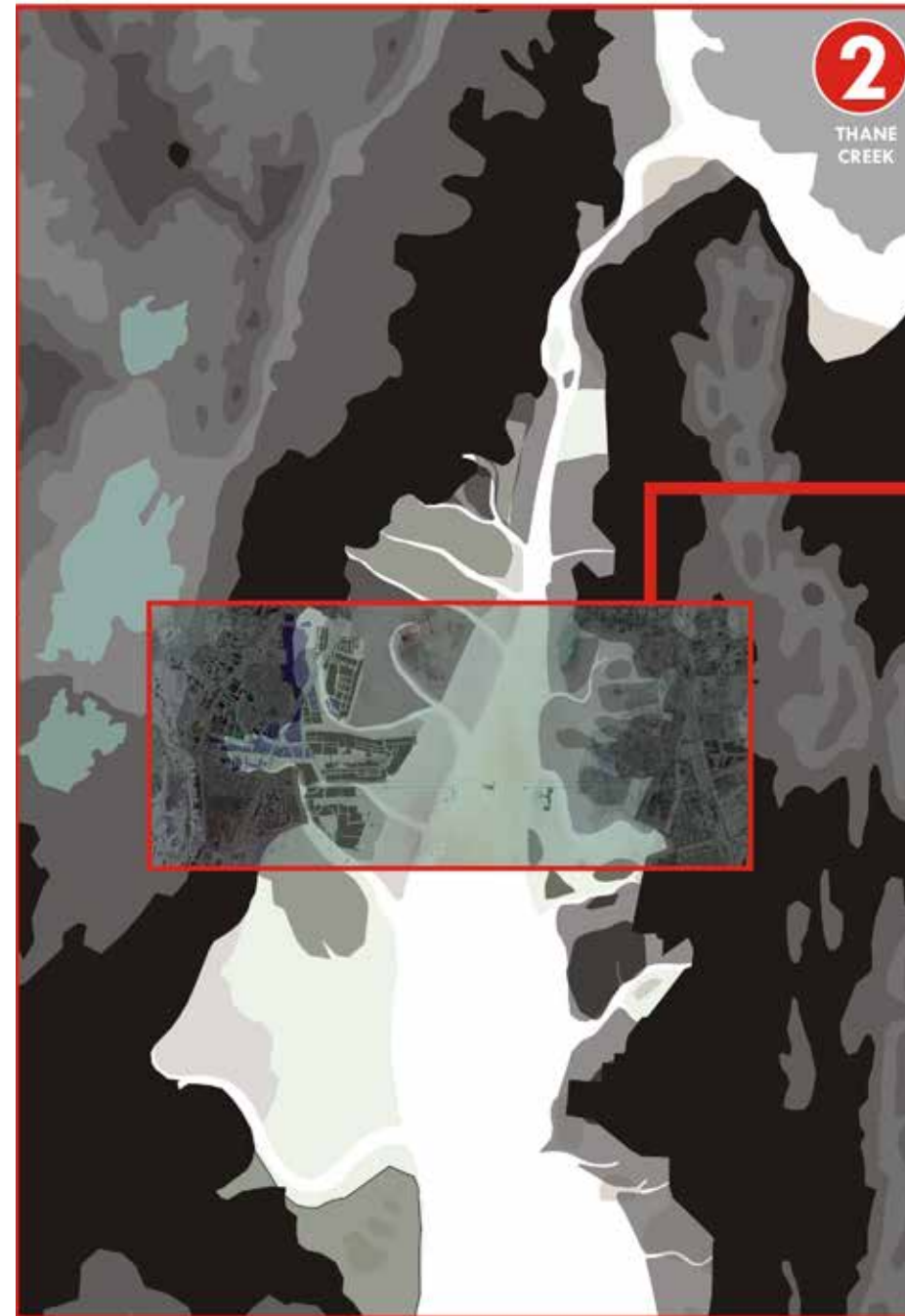


Fig. 3. Mean monthly rainfall (cm) and temperature (°C) in Mumbai.



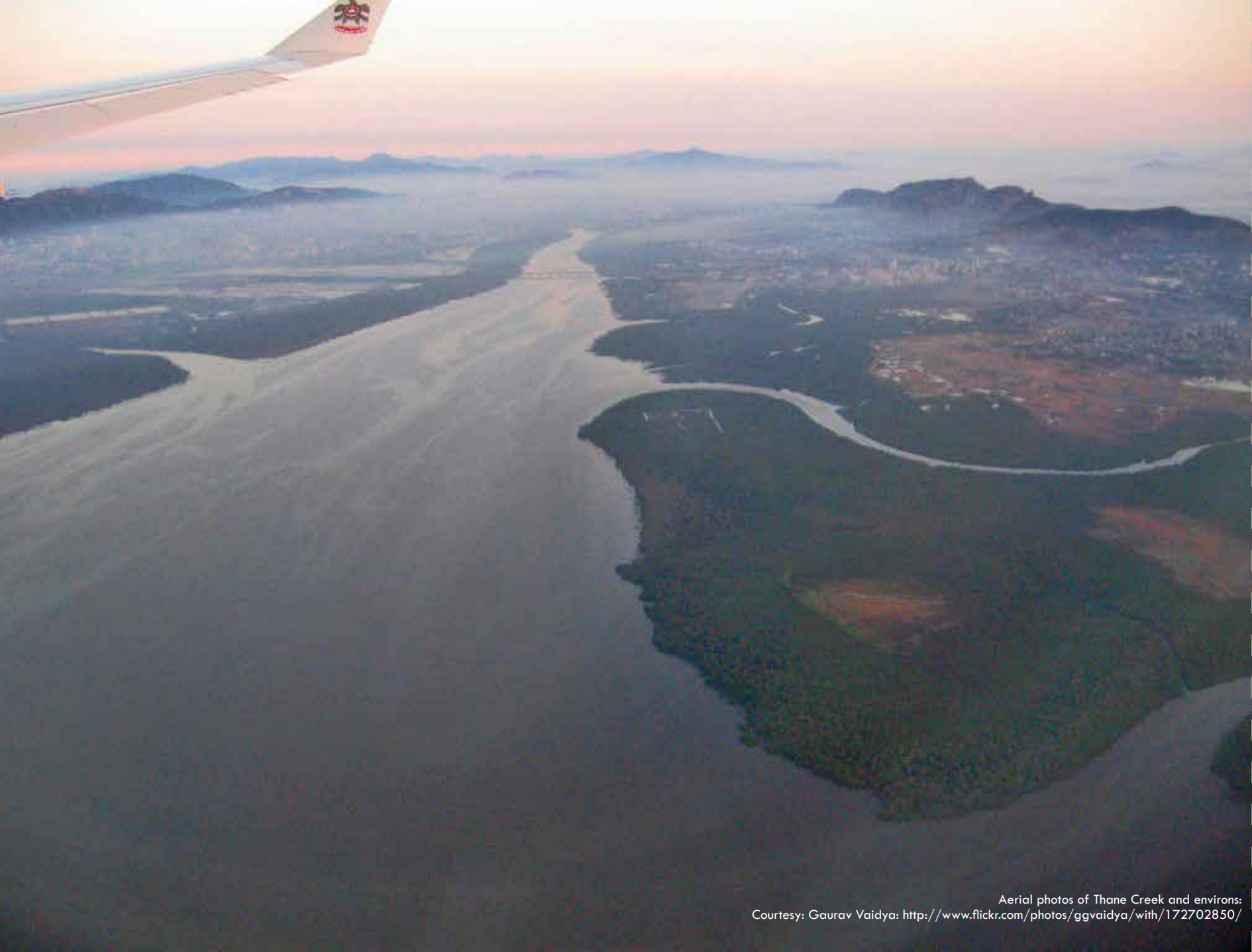




## SCALE 2: THANE CREEK:

- INTRODUCTION AND MORPHOLOGY
- CLASH OF THE CLAIMANTS FOR THE SALT
- EFFECTS OF EXCLUSION FROM 3 ADMINISTRATIVE PLANS
- CURRENT STATUS OF COASTAL REGULATION ZONING + COUNTER RECOMMENDATIONS FOR IACM
- MANGROVE ECOSYSTEM OF THANE CREEK
- FISHERY IN THANE CREEK
- ALTER EGOS: FIGURE AND COUNTERFIGURE
- WHAT IF....





Aerial photos of Thane Creek and environs:  
Courtesy: Gaurav Vaidya: <http://www.flickr.com/photos/ggvaidya/with/172702850/>

## INTRODUCTION TO THANE CREEK

### INTRODUCTION:

Thane creek (Long 72° 55' to 73° 00'E and Lat 19° 00' to 19° 15' N) is 26 km long. It is connected to the Mumbai harbour on its south and joins by minor connection with Ulhas river on its North near Thane city. Geologically, the Mumbai Thane region is part of the Deccan trap that was formed by volcanic effusions at the end of cretaceous period. The creek is narrow and shallow at the riverine end due the presence of geomorphic head near Thane city and is broader and deeper towards the sea. It is tidally influenced with dominance of neretic waters and negligible fresh water flow except during monsoon. The substratum of the creek is made up of consolidated and unconsolidated boulders intermingled with the loose rocks and rarely with sand and gravel. Extensive mudflats are formed along the banks of the creek which are characterised by growth of mangroves.

### STATE AND EFFECTS OF UNRESTRAINED ANTHROPOGENIC ACTIVITY:

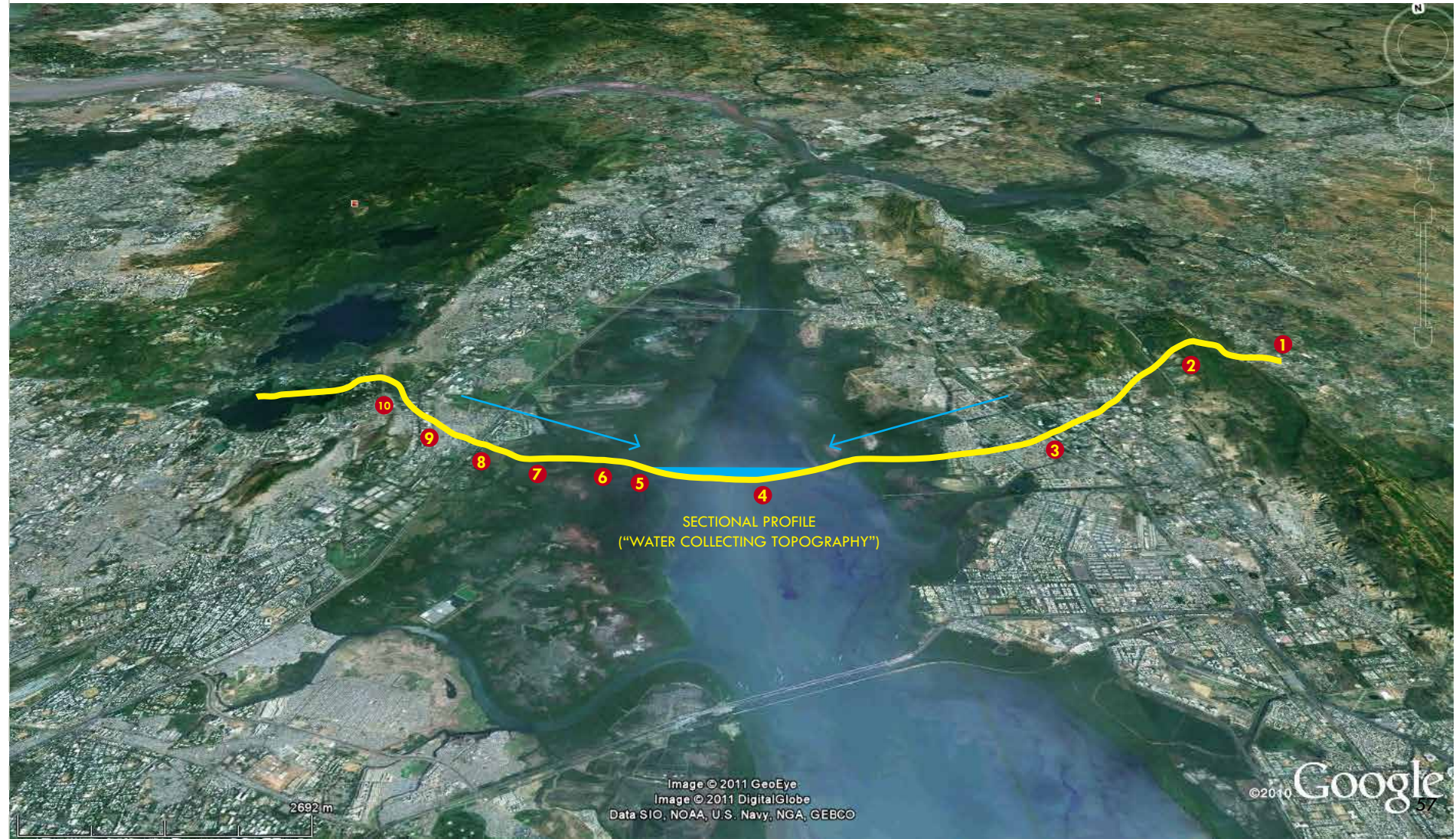
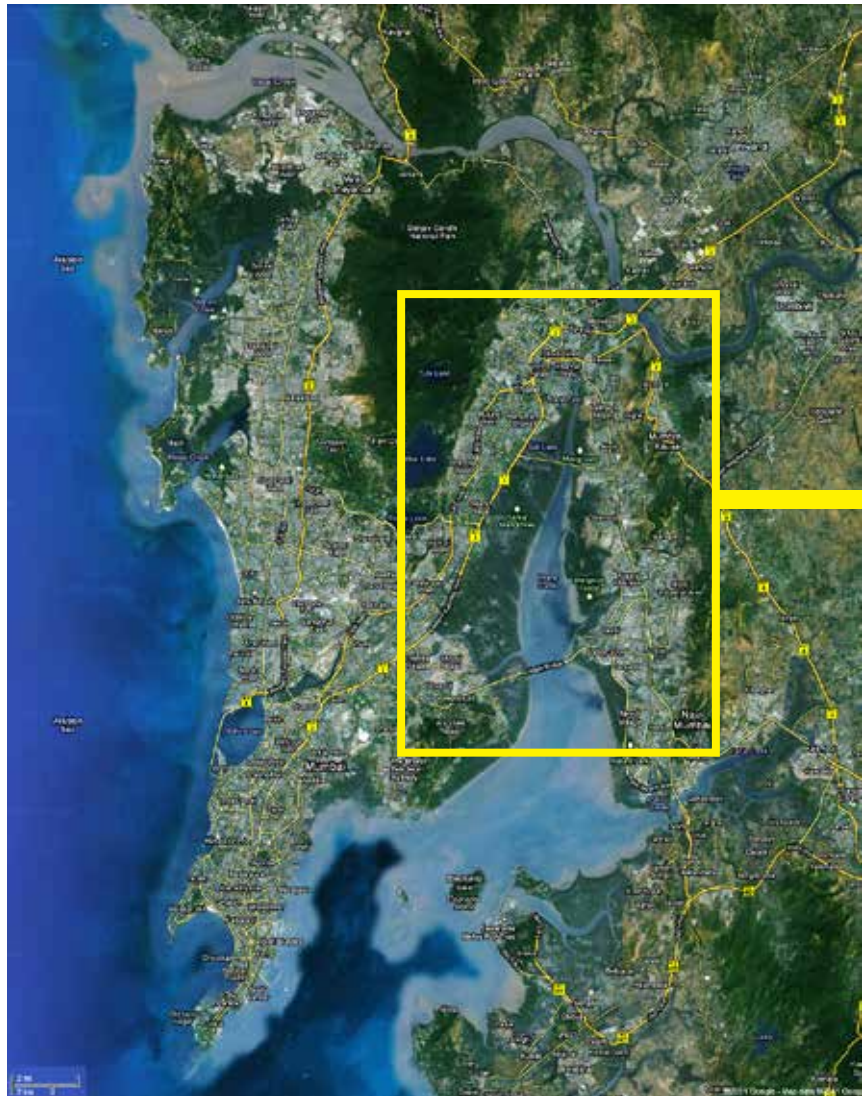
A few decades back heavy industrialization and consequently urbanization have occurred along both the banks of the creek. On the east bank exists Asia's largest industrialized zone namely Thane Belapur industrialized area along with the Navi Mumbai Urban area. The west bank has highly urbanised Mumbai and Thane region along with a good number of industries. According to TMC-ES report (2000), there are about 2000 industries along the creek of which 51 are large, 250 medium and 1221 small industries. Among the industries, 10 % are chemical industries, 63 % are engineering 4 % are textile & pharmaceutical and other 23 %. Moreover the human population in Thane city alone has doubled in past 10 years. Such an extensive industrialization and urbanization has adversely affected the creek. In 1981, a report showed Thane creek to receive 27 mld. of industrial waste water and 6 mid sewage, which increased to 180 mid. and 350 mkt respectively. The TMC-ES report (2000) quotes 294 mld. and 145 to 260 mid. industrial waste and domestic sewage waste respectively, released in the creek within the Thane city limits. To this more is added from the Urban areas of Mulund, Bhandup, Kanjurmarg, Deonar, Vikhroli, New Mumbai, Vashi etc. Not only the industrial effluents and domestic wastes are released in the creek but since 1995 the creek is also being indiscriminately used as a dumping ground for huge quantity of solid wastes.



The urbanization and industrialization around Ulhas river estuary and Thane creek and the load of the effluents indicate detrimental state of the wetland ecosystems. For such ecosystems under the stress of anthropogenic activities, careful and continuous monitoring of different ecological aspects is necessary so as to access the status and impact of pollution. Such studies will help in deciding the preventive and remedial measures. They can also help in assessing effectiveness of implemented remedial measures. Unfortunately, such monitoring is not seriously practiced in our country, as a result many coastal ecosystems are subjected to uncontrolled pollution affecting their productivity.

A few decades ago the Thane creek and Ulhas river estuary had luxuriant growth of mangroves, other vegetation and a variety of seafood wealth. Different types of prawns, crabs, shells and fishes flourished even in the inner upstream stretches of both the ecosystems. However, in the past 20 years the status of these rich environments has deteriorated. It is very essential to study different parameters of the ecosystems to assess their present status.







## STATE GOVERNMENT

The Government issued a notification to allot the salt-pan land at Mulund for a dumping ground. The land had been given on lease to private parties for salt making and the lease end only in 2016.

## HUDCO

Mumbai may very soon have a - 'city within a city' spread over 5,500 hectares. Plan includes beaches and water recreation facilities, entertainment centres and amusement parks, corporate offices, residential buildings, golf courses and stadiums and an enterprise economic zone.

## MMRDA

To resettle encroached hutments, MMRDA has asked the Central Government to release salt pan lands, to improve traffic flow in the city corridors.

## MCHI

The MCHI—which comprises the leading luminaries of the building industry—wants the state and central governments to increase the floor space index for salt pan lands from 1 to 2.5 to allow the 'salt pan owners' to carry out construction activity, to develop the large idle land.

## BUILDER LOBBY

Builders say, 'Developing housing on salt pan lands means more areas for development will be opened up, which will, in turn, bring down the cost of housing.'

Development in Mumbai is concentrated and occurs at a 45 degree angle, unlike other cities where it takes place at 360 degrees. This has led to a housing problem. Developing salt pan land wouldn't solve the problem but it would help in easing it.



## the SITE



## CENTRAL MINISTRY

A group of central ministers cleared a proposal to reclaim 667 hectares of salt pan lands in Mumbai to rehabilitate 42,000 slum families, most of them currently living close to the airport in Santa Cruz.

Once these slum-dwellers are removed, the airport authorities will utilise this freed land to expand and modernise the airport.

## MANGROVE PARK

The project was first mooted in 2001 and would be the first of its kind in the country. It was initially intended to cover 150 hectares and was then extended to 1,000 hectares of salt-pan land.

The park would help conserve mangroves, revive degraded ones and help prevent encroachments and dumping. It would also give citizens the opportunity to learn more about this eco-system through walks and boathides.

# CONCRETE SET TO REPLACE SALT

There are numerous contrasting claimants for the CRZ Protected Salt-Pan Lands, which wish to fulfil the bursting needs of Mumbai City

## the ENVIRONMENT and the 26/7 Flood Lesson:

Environmentalists say the salt pan land (about 5,000 acres in Mumbai) is extremely crucial for the city and should be left undisturbed. This is because the marshy region absorbs surplus water from the sea during high tides. If this land is reclaimed, the sea water will lash other parts of the city.

City environmentalists have warned, developing the salt pan lands presents another problem, they say that such open spaces are essential for allowing fresh air to circulate. Moreover, the salt pan lands act as a storage space for surplus high tide water, and reckless building could raise water levels in other areas of the city.

Flooding happens in any city adjacent to the sea for two reasons. During the high tide surplus water hits the city. If it rains at this time, the force of the surplus rainwater is blocked by the high tide.

Every city has its share of dissipation spaces - wetlands, wastelands, mangroves and salt-pan lands. These act like sponges and take the pressure out of the high tide.

In the past 10 years each of these has been destroyed systematically in Mumbai. Mangroves have given way to golf courses. Reclamation has been permitted on a wide scale.

## SYSTEMATIC SHORTLIVED DEVELOPMENT !!?

First there is a transition from wetland to wasteland. From the domain of the sea we create land that is first deemed wasteland. Then we change its status to a no-development zone.

Then we say 'it's a no-development zone' but it is contiguous to development areas hence allow small construction.

Then it is easy to take the next step and allow non-polluting industry like software. And then there is no turning back.

This has happened in Chedda Nagar in northeast Mumbai when salt-pans were filled in to create land. Because of actions such as this the sea is thwarted. Also in the way urbanization has eaten up over 30,000 ha of wetlands of Vasai-Bhayander and Navi Mumbai.

## CLASH OF THE CLAIMANTS FOR THE SALT

### SALT-PAN LANDS: MIXED RIGHTS OF USE AND OWNERSHIP

Environmentalists say that 5000 acres of Saltpan lands in Mumbai are crucial for the welfare of the city and should not be disturbed. Various conflicting lobbies, of course, have differing views. But before we even think of how to use the land it would be interesting to see whether the ownership and usage pattern would allow us various usages.

An alarming Times of India Report (TOI), said 'The official line is that the salt pans will be utilised only to re-house slum dwellers who are displaced by crucial infrastructure projects in the city. But behind closed doors, sources disclose, ministers and bureaucrats are working overtime to hammer out a plan to trifurcate these eco-sensitive stretches between Centre, state government, and developer. There is also a move to increase the floor space index (FSI) to 2.5 for the salt pans which, ironically, fall under the stringent coastal regulation zone (CRZ), which prohibits any construction close to creeks, mangroves and the high tide line.' As per TOI report the land is to be shared amongst Centre, State and developer at 33.3 % each and pay monetary compensation to the land owner.

Who are the main players in this exercise?

- 1) The State Govt – already leasing a part for a dumping ground, whereas the present lease runs till 2016.
- 2) HUDCO – planning for a beautiful Singapore like city, within Mumbai city, with the complicated land holding not yet unraveled.
- 3) MCHI /Builders lobby- body of building luminaries/builders want the FSI to be increased to allow free construction for the owners to develop their plots
- 4) Central Ministry – more interested in granting permissions so that air port slums could be cleared
- 5) A Special Mangrove Park – unique of its kind covering 1000 hectares of land by multiple owners.

6) As per Shri Ramanand Tiwari, Secretary, Urban Development, Central Govt, (quoted from Land &Development Office, Ministry of Shipping REPORT OF 2001-2) BMC has no right over the salt pan land as part of it should revert back to the jurisdiction of the Centre and BMC has no right to use it for dumping.

7) From an extract of a reply given by Shri Dilipkumar Mansukhlal Gandhi, Minister of State in the Ministry of Shipping to Shri Chandrakant Khaire & Shri Kirit Somaiya in Lok Sabha 'A group of Ministers headed by Urban Development Minister, Government of India including the then Minister for Shipping as also other Ministers of the State Government recently visited some salt pan lands at Mumbai to examine the possibility of development of immediately available Salt Pan Lands, which may help rehabilitation of slums on lands of Central Government agencies such as Railways, Airports, Mumbai Port Trust, etc. The detailed modalities for development of these lands are being worked out by the Department of Urban Development, Ministry of Urban Development & Poverty alleviation for consideration by Group of Ministers constituted for this purpose.

And what do we face? Most of the lands in Mumbai are held by private owners. Godrej owns about 3,000 hectares of Saltpan lands and Lok Group 180 acres. (Survey conducted by Space & People Magazine' India July 2005 as quoted in Mumbai Reader). From 1837 lands were given for salt farming on lease whose leases were to expire after fixed terms, to revert back to government. There were also private original land owners.

One cannot think of the tremendous disaster awaiting Mumbai in case the environmental protection of the salt pan lands and the mangroves is gone in all these groups pulling each other on their own agenda. Once again there is a need for a concerted effort to understand and unravel the tricky issue to balance the needs.



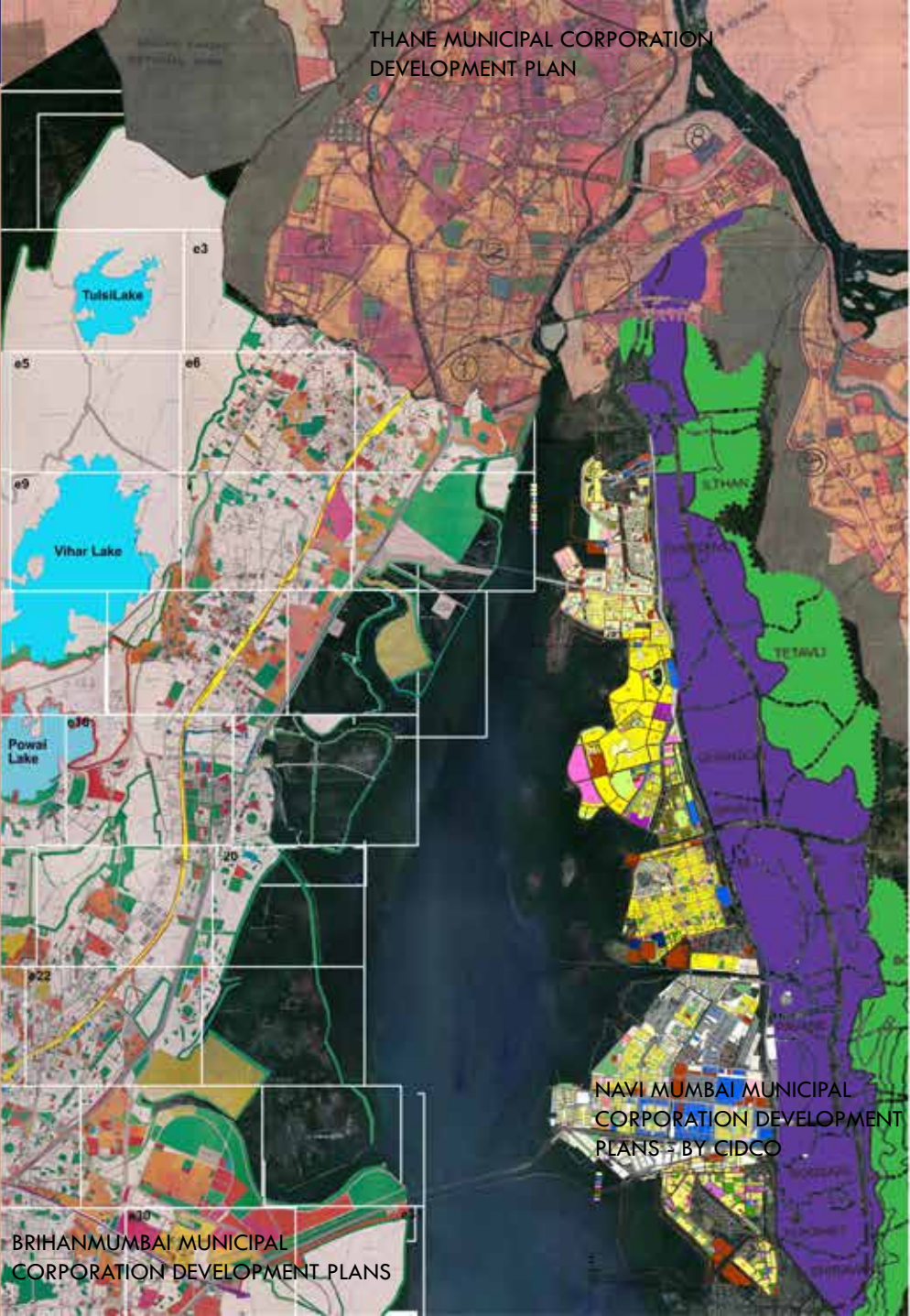
Courtesy: <http://i2.media.daumcdn.net/photo-media/201105/13/yonhap/20110513233206610.jpg>



EFFECTS OF EXCLUSION IN 3 ADMISTRATIVE PLANS:

Most of the industries in MMR region are clustered in three large industrial areas namely Thane–Belapur belt, Kalyan–Ulhasnagar–Ambarnath belt, western shore of Thane creek and around Patalganga river. These industries manufacturing a wide range of products such as dyes, pharmaceuticals, fine chemicals, plastics, petro and agrochemical, fertilizers, and refined petroleum products release the waste water to Thane creek, Ulhas and Patalganga rivers. A rough estimate of industrial wastewater generated by these industries is about  $5 \times 10^5 \text{ m}^3/\text{d}$ . The domestic wastewater generated in Mumbai city which amounts to  $2 \times 10^6 \text{ m}^3/\text{d}$  is released untreated or partially treated to the marine environment transporting 450 tons of BOD, 63 tons of nitrogen, 11 tons of phosphorus, 0.18 tons of Cu, 0.36 tons of Zn and 0.09 tons of Pb every day. In addition many industries are located at other places of MMR release their waste waters to nearby rivers, estuaries and creeks which acts as conduits to the coastal zone. During the period of 1959–1974, phosphate–phosphorus concentrations in the nearshore zones of MMR increased by about 40% from 0.82 to 1.13 mmol/dm<sup>3</sup> and later to 2 mmol/dm<sup>3</sup> in 1984. Comparison of various data records over the years has shown that there is a significant deterioration of water quality in the coastal and marine waters around Mumbai. Thane and Mahim creeks are probably the most polluted locations with heavy increase in N; P and significant depletion of dissolved oxygen. Mahim bay and Thane creek were once bestowed with good fisheries, flourishing Oyster beds and lush fringing mangroves. These regions used to be visited by a number of migratory birds. Due to the recent industrial and domestic activities and high pollution concentrations, birds are hardly seen there and fisheries are nonexistent. Initially the waste waters flowing into these coastal waters were untreated, but during the last two decades partially treated waste water is being released. Two ocean outfalls at Bandra and Worli and several effluent treatment plants were constructed by Mumbai Water Supply and Sewerage Board with the help of World Bank. Environmental assessment studies before the implementation of these outfalls have shown significant improvement of physico-chemical characteristics of coastal waters at those regions.

However, Thane Creek is still, as of now, ignored by the municipal administration of BMC, TMC and CIDCO, in the development plans they are considered No Development Zones or demarcated as non-existent Municipal parks. This blatant exclusion and separation of responsibility has caused ecological criticality.



CURRENT STATUS OF COASTAL REGULATION ZONING + COUNTER RECOMMENDATIONS FOR IACM:

The current state of environment of the MMR coastal region thus shows that the unplanned development, high population density imposes severe restrictions on resources and conflicts among stakeholders. The population of MMR will continue to grow along with the need for resources such as housing, fresh water, energy and transportation network. Therefore, the main Integrated Coastal Management [IACM] challenges before MMR are: (1) to maintain aesthetic and recreational water quality of the coastal waters surrounding the region, (2) to maintain viable commercial and recreational fishing in the face of increased urban, industrial and municipal pollution, and land reclamation, (3) to maintain maritime navigation and viable ports, (4) disposal of solid, waste water and dredged materials in an environmentally safe way, and (5) housing, water supply and transportation. Often, there are conflicts among various interest groups such as:

(a) the use of wetlands and mangroves for land development has negative impact on port management, loss of property due to coastal erosion and fishery resources, (b) waste disposal activities affects the coastal water quality, fisheries, recreation and tourism, (c) unplanned land reclamation procedures will lead to the loss of tidal flushing resulting in polluted beaches, and (d) use of forestry and agricultural land for developmental purposes resulted in poor air quality and elimination of greenery. In this context, there are needs and opportunities for continuing research in natural and social sciences particularly in areas of public policy, education, conservation and protection, waste water treatment technology, water supply, etc. Presently, there are several legislation and acts available for coastal management of the MMR region. The CPCB at the federal level and Maharashtra Pollution Control Board at provincial level exercise the authority to control waste discharges for the purpose of water and air (Prevention and Control of Pollution) Act, 1974. Under Environment (Protection) Act, 1986 Coastal Regulation Zone (CRZ) rules were formed to regulate the activities in the coastal areas. CRZ plans are being drawn up coastal states under this act. Ministries of Environment and Forest at the federal and provincial levels have taken several important steps for conservation of mangroves, wetlands and coral reefs in the region. MMR has an industrial siting policy since 1973. These acts and directives are aimed at the management of the marine coastal areas, though an approach towards IACM is yet to crystallize clearly. However, the CRZ is already being breached continuously, and tide-lines and not fixed, and Mumbai is under exceptions. Its vagueness leads to loopholes and the creek line is constantly encroached or developed.



MANGROVE ECOSYSTEM OF THANE CREEK:

INTRODUCTION TO THE MANGROVE ECOSYSTEM:

The mangrove forests serve as breeding ground and act as nursery for fish, number of crustaceans, prawns, crabs etc. They also shelter and support growth of molluscs like bivalves and gastropods, The mangrove mudflats harbour benthic organisms like the polyhaetes, oligochaetes, nematodes, platyhelminthes and a number of bacteria that help in the decomposition of the mangrove litter. The mangrove litter makes the mudflats so rich in organic matter that they export the nutrients to the aquatic system around (i.e. creeks and estuaries) as well as to the sea and support their authotrophic food chain and the fishery. Thus mangroves create a highly productive environment around them and also make the adjacent water bodies productive.

OTHER USES OF MANGROVES:

Mangroves are used by the coastal villagers for fuel wood and fodder for domestic animals. Avecinia propagules are used as food and a source of proteins and vitamins. The wood timber does not get warped in water and is termite resistant hence is used for housing, boat building, fencing, poles etc. It is also a rich source of tannin and a number of chemicals of medical and pharmaceutical importance. Wine extracted from Avicennia has aphrodisiac effects. The potential role of mangrove ecosystems is also that it acts as a sink for anthropogenic contaminants in tropical and subtropical areas. Mangrove forests protect the shoreline from erosion. The mangroves in fact can be compared to our lungs. The dense foliage helps in reducing CO2 sequestration and provide oxygen.

MANGROVES IN THANE CREEK:

‘Total existing mangrove cover along the banks of the creek is approximately 2.2 sq km. In general, 40 % mangrove area has been lost in past decade due to solid waste dumping, reclamation, cutting for aquaculture ponds, etc.

ZONE 1: TOTAL STRETCH 6 KMS.

Being on the Riverine side the average salinity was less (19.30 ppt.) and ranged from 0.46 to 34.80 ppt. The mangrove zone was approximately 50 m wide. The main mangrove damaging factors in this zone were cutting for fuel & fish aquaculture ponds and dumping of solid wastes. Hence, extensive growth of Acanthus was observed. Proportion of Avicennia marina : Sonneretia apetala to others was 40: 40: 20.

ZONE 2: TOTAL STRETCH 10 KMS.

In this zone the salinity was slightly higher (1.90 to 38.00 ppt. Avg. 23.51 ppt.), the average width of the mangrove belt was 100 m. The mangroves suffered damage due to reclamation for saltpans, fish aquaculture ponds and cutting for fuel. A layer of oil & grease was seen on the mangroves probably due to industrial pollutants released in this region.

ZONE 3: TOTAL STRETCH 10-12 KMS.

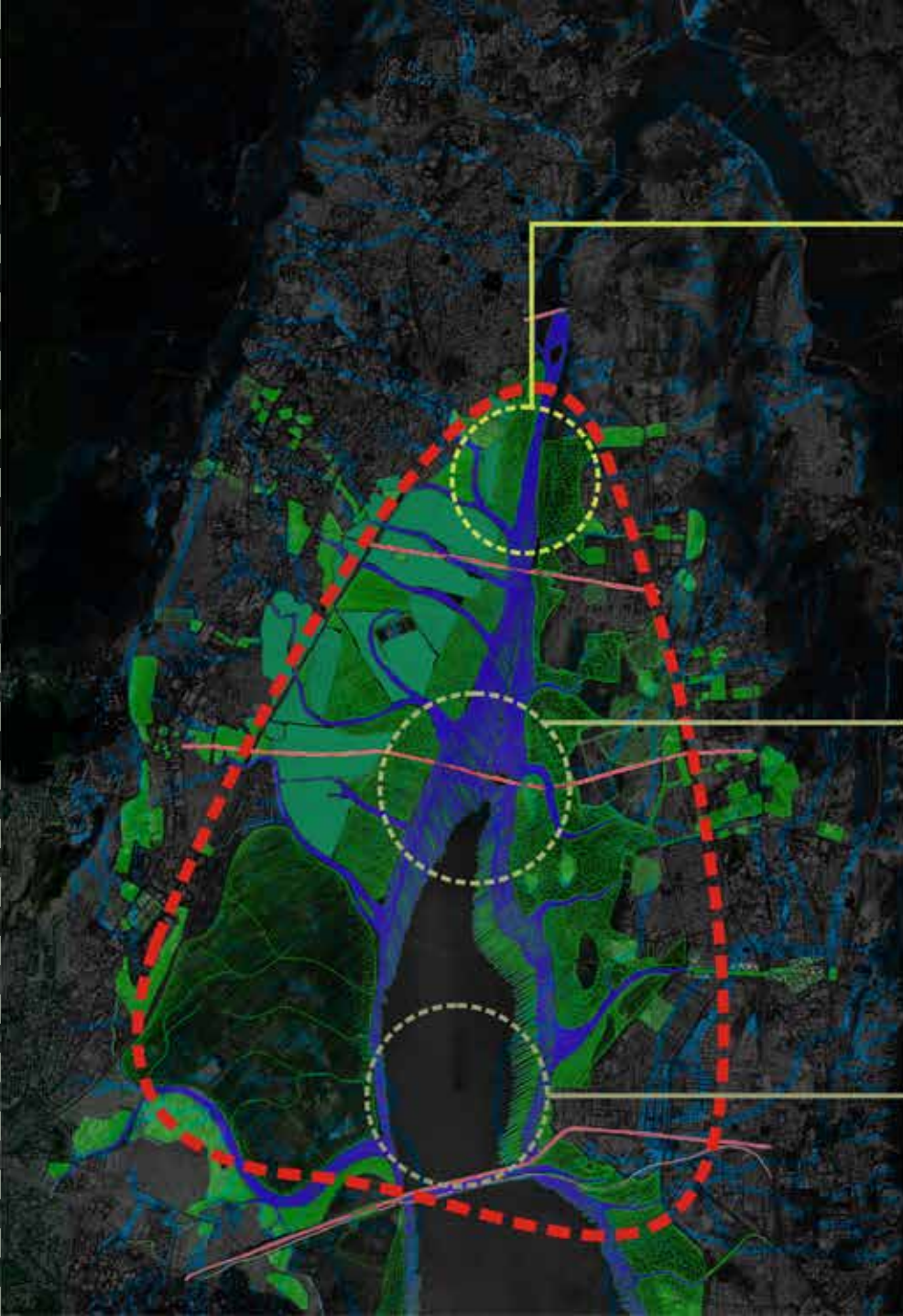
This zone being at the seaward end experienced higher average salinity (5.20 to 38.00 ppt. Avg. 27.42 ppt. ). The distribution of mangroves was uneven in this zone. Cutting for fuel, and aquaculture ponds was the main factors damaging the mangroves. In certain regions solid waste dumping also damaged the mangroves.

SEASONAL VARIATIONS BASED ON MONSOON

- Early monsoon - flowering of Avicennia spp.
- Fruiting of Avicennia spp. which continues up to October
- Flowering and fruiting of Sonneratia spp.
- Late monsoon - flowering of Rhizophora spp.,
- Flowering and Fruiting of Salvadora spp.
- Flowering of Excoecaria spp.
- Infestation of Hablea purea moth to Avicennia spp.
- Occurrence of Tassar silk moth.
- Occurrence of Praying Mantis, leaf curl insects
- Germinating propagules of mangroves on the mudflats.
- Secondary growth of the mangroves starts with onset of monsoon resulting in much branching.
- Post monsoon
- Rhizophora spp. flowering
- Death of germinated propagules
- Premonsoon
- Flowering of Acanthus ilicifolius

RECOMMENDATIONS:

In past one decade almost 40 % cover is lost due to various anthropogenic activities. Conservation of mangroves needs to be done on top priority basis. Mangrove trees are very important for protecting the shoreline. They also provide food to the aquatic fauna. Their destruction by cutting for fuel and reclamation for various purposes should be stopped. If at all they are cut and utilized for the benefit of local people, then their plantation should also be done and taken care of by the people who have reaped the benefits of these plants. If the mudflats are cleared for aquaculture ponds, only the required piece of land should be cleared, and the banks of these ponds should be specially planted by mangrove trees which will also be a source of nutrients to the growing shrimps and fishes in the aquaculture ponds. If proper plantation is not done and the mudflats are left exposed, the prickly Acanthus will occupy that place. As it is very difficult to destroy Acanthus illicrfolius, the mangrove cover will be lost. To achieve conservation, local people need to be educated and motivated.



- TRUE MANGROVES**  
Avicennia marina, Avecinia acutissima, Avicennia officinalis
- MANGROVE ASSOCIATES**  
Acanthus ilicifolius, Calatropis gigantea, Clerodendrum inerme
- NONMANGROVE HALOPHYTES**  
Aeluropus lagopoides

- TRUE MANGROVES**  
Rhizophora apiculata, Rhizophora mucronota, Excoecaria agallocha
- MANGROVE ASSOCIATES**  
Derris trifoliata, Fabaceae Derris spp., Fimbristylis ferruginia
- NONMANGROVE HALOPHYTES**  
Sesuvium portulacastrum

- TRUE MANGROVES**  
Aegiceras corniculatum, Sonneratia apetala, Sonneratia griffithi
- MANGROVE ASSOCIATES**  
Salvadora persica, Thespesia populnea, Uruchondra setulosa
- NONMANGROVE HALOPHYTES**  
Scirpus littoralis

ECONOMIC POTENTIALS:

- AVICENNIA (marina, acutissima, offinalis):**  
Wood used for small cabinet carpentry  
Bark used for tanning  
Ashes mixed with paint for bonding  
Green fruits made into poultice  
Leaves used as fodder
- SONNERATIA apetala:**  
Wood used for packing cases/ chests  
Timber used for house construction, planks, door boards, rough furniture, boat building  
Fruits eaten in curries  
Bark and fruits used for tanning
- RHIZOPHORA (mucronata, apiculata):**  
Wood used for heavy construction, logs used as poles for bridges and boats  
Bark rich in tannin  
Bark astringent used in hemorrhages, hematuria and angina.  
Fruits eaten, juice made into a wine  
Young shoots cooked and eaten  
Baskets for sifting grains  
Yields pulp for blotting/ corrugating papers
- SALVADORA persica:**  
Used in preparation of toothpaste  
Leaves eaten as vegetable & in sauces  
Fruits edible, sweet used in fermenting drink  
Decoction used as a tonic & emmenagogue  
Stem bark for gastric trouble  
Decoction leaves used for asthma and cough  
Poultice used for piles and tumors  
Fruits used in bilousness and rheumatism
- EXCOECARIA agallocha:**  
Wood used for toys and general carpentry  
Latex for ulcers, rheumatism, leprosy and paralysis.  
Drastic purgative and abortifacient.  
Decoction of leaves for epilepsy  
Roots used in embrocations for swellings
- ACANTHUS ilicifolius:**  
Leaves for fermentation in neuralgia and rheumatism.  
Used as expectorant  
Roots used in asthma, paralysis, leucorrhea and debility.  
Powdered leaves for fish/prawn food





FISHING COMMUNITY ON  
ULHAS RIVER, THANE DISTRICT

## FISHERY IN THANE CREEK

Thane creek and Ulhas river estuary were once very rich ecosystems giving excellent fishery yield, but since the development of the Asia's largest industrial belt and consequent urbanisation; the fishery of this region is declining. Gokhale and Athalye (1995) while studying the upstream stretch of Thane creek during 1991-1993 observed almost 67% decline in fishery near Thane city as compared to that in 1984-85. Presently fishing activity near Thane city has completely stopped due to extremely poor yield.

A study of zonewise distribution of fin fish fauna of Ulhas river estuary and Thane creek show a total of 61 types belonging to 23 families were recorded of which 47 types were recorded in Ulhas river estuary and 55 types in Thane creek. The difference in number could be mainly due to more brackish water conditions in Ulhas river estuary as compared to dominance of sea water in Thane creek. The shell fishery distribution has been shown a total of 17 types recorded which included molluscs and crustaceans. In Thane creek 12 type of fishery organisms were recorded of which molluscan types were more than Ulhas river estuary. Edible clams, *Cardium* spp. and *Katelysia* spp. were not observed in Ulhas river estuary probably due to lower average salinity (as the fresh water flow is more) and faster currents of water. The fishery declines towards riverine end of the creek as well as estuary.

Gokhale and Athalye (1994) estimated quantitative fishery in 5 km upstream stretch of Thane creek near Thane city and compared it with the earlier data of 1984 -85. They reported 67 % decline in fishery of this region caused due to pollution. Presently there is "zero" fishing practice in this region as no fish catch is available. This shows, to what extent the pollution has increased. Fishery organisms like fishes *Trypauchen* vagina, mudskippers and molluscs *Paphia* spp., *Aleretrix* spp., *Cardin*", spp. and prawns were abundant in Thane creek about 20 years back. They were seen tip to zone 1. The mudskipper and prawn are not obtained almost throughout the Thane creek. This has happened mainly due to a) severe and growing pollution (organic and chemical) and b) the changing sediment composition of Thane creek in the past decade (partially due to the damming of Ulhas river). The siltation has also gotten enhanced due to heavy sewage load, solid waste dumping and construction activities. Such sediments are very sinking type, and are unfavorable for bilvalves. Hence probably the above organisms got eliminated from the creek. Zone 1 of Thane creek also showed heavy pollution by plastic bags which clogged the nets making the fishing operations almost impossible.

The only favourable observation to note is significantly good variety of fishery at the mouth of the Creek. The fishery however is not able to move in the upstream zones. This suggests that if the pollution in the creek is checked in time, the fishery in the upstream zones can be revived.

## ECONOMIC POTENTIALS:

### FISHING TYPE ACTIVITY

Barrier net (Vana) - 1

### FIN-FISH FAUNA:

*Chaetosus nasus*, *Mystus gulio*, *Otolithoides brunneus*, *Mugil spigleri*, *Muugil Dussumieri*, *Scaena Dussumieri*

### SHELL-FISH FAUNA:

*Scylla serrata*.

### FISHING TYPE ACTIVITY

Driftnet (Disco jail) - 45

### FIN-FISH FAUNA:

*Chaetosus chacunda*, *Lates calcarifer*, *Terapon theraps*, *Teuthis cramin*, *Therapon jarbua*, *Mystus gulio*, *Otolithoides brunneus*

### SHELL-FISH FAUNA:

*Parapenaeopsis sculptilis*, *Peneaus sp.*, *Cardium sp.*, *Paphia sp.*, *Katelysia*.

### FISHING TYPE ACTIVITY

Driftnet (Disco jail) - 250

Dragent (Yeri) - 10/ 150 (prawn)

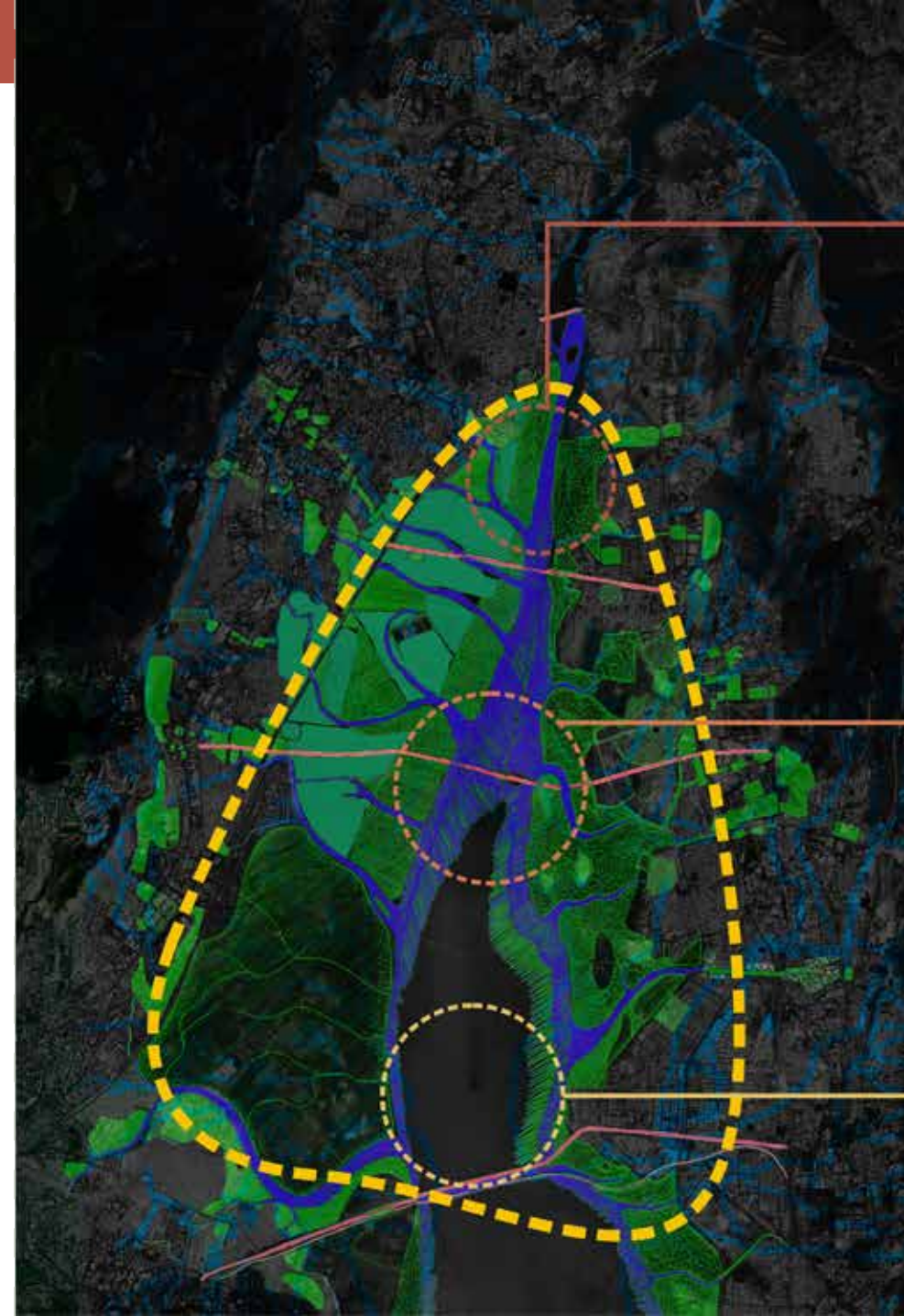
Bag net (Dol/ Bokshi) - 11

### FIN-FISH FAUNA:

*Sillage Sihama*, *Kawala coval*, *Trichiurus savala*, *Coilia Dussumieri*, *Scaena glaucus*, *Equula splendens*, *Polynemus tetradactylus*, *Cynoglossus elongates*, *Caranx sp.*, *Rastrelliger kanagurta*, *Umbrina russelli*, *Engraulis sp.*, *Pellona elongata*, *Clupea sp.*, *Gobius giuris*, *Arius thalassinus*

### SHELL-FISH FAUNA:

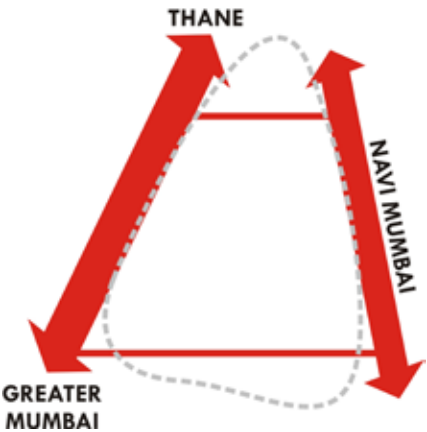
*Metapenaeus monoceros*, *Alpheus sp.*, *Portunus sanguinolentus*, *Octopus sp.*, *Loligo sp.*





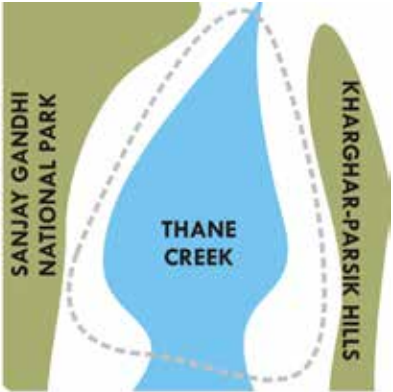
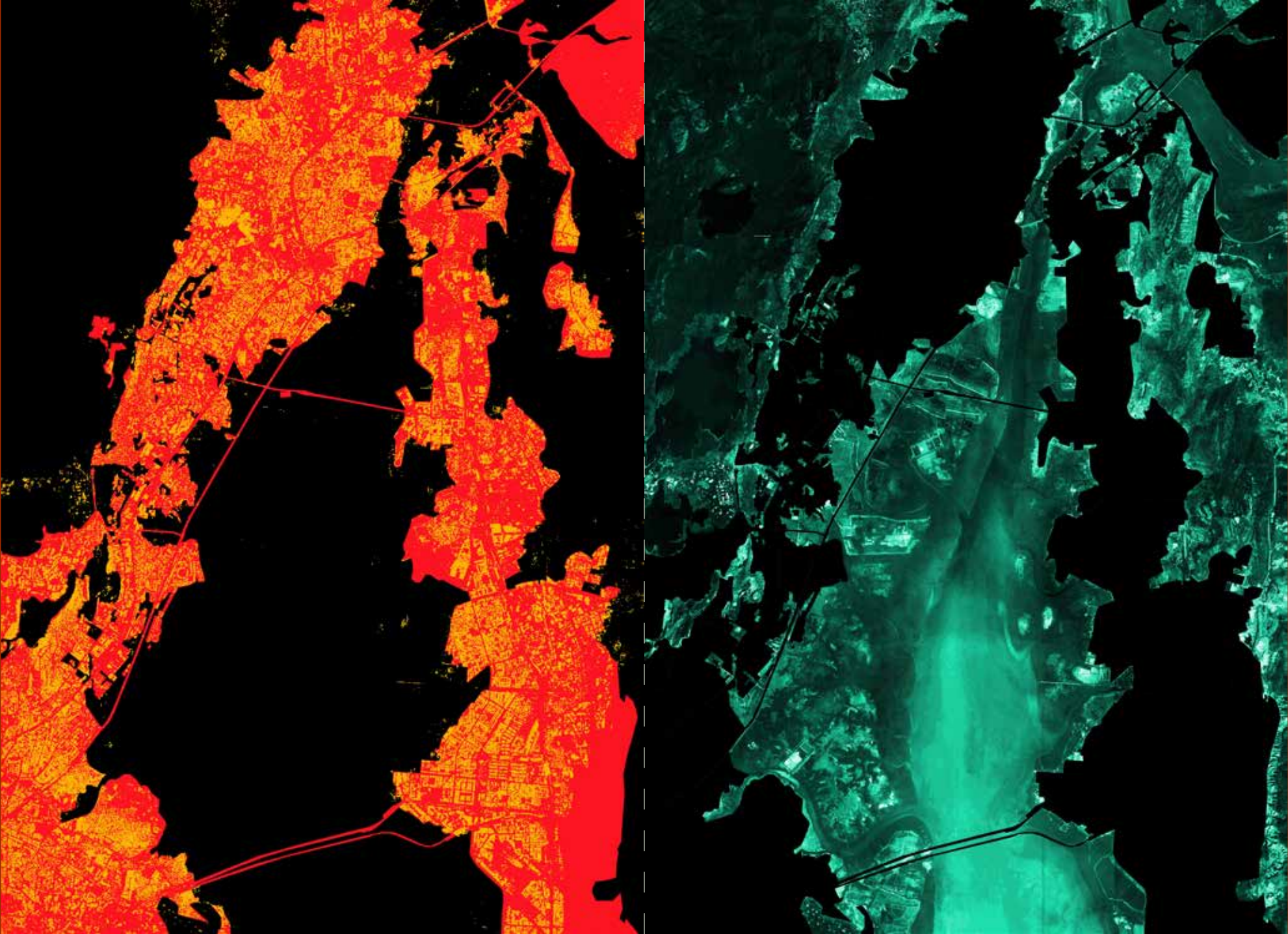
“FIGURE”/ CITY VS. “COUNTER FIGURE”/ NON-CITY:

The Thane Creek area can be analysed and understood as the conflicting alter-egos that define it. This type of analysis isolates the ‘urban’ or ‘built-up’ structures and infrastructures that are predominantly associated with the understanding of this area, against the ‘natural’ or ‘ecological’ underlying landscapes and life which are often forgotten/ ignored in the larger discourse about Thane creek. Rarely are the two discussed together.



“FIGURE” / “CITY”:

The FIGURE represents the human occupied organization of the urbanized peripheries. The property of the Western edge is nearly impervious, as a resultant of the expansion of Mumbai, and is locally understood as the ‘Central line’ in railway lingo. Across on the East is the Navi Mumbai or New Bombay twin city expansion along with Trans Thane Creek the largest industrial belt of Asia running parallel to the coast, known as ‘Harbor line’. This planned urban development surrounding older fishing villages, along with Thane connect to the west in 3 locations - Kalwa bridge, Airoli bridge and Vashi bridge. However the figure has a strong North South orientation also marked by the types of connectivity - the Kalwa and Airoli bridge are both ‘toll’d’ entry points thus the goods are mostly taken through Vashi bridge making the movement orientation very North-South dominant.



“COUNTER-FIGURE” / “NON-CITY”:

The COUNTERFIGURE consists of the Thane creek itself, with the hills of Sanjay Gandhi national park to the west and the Kharghar-Parsik hills to the East. In natural state, these are a singular continuous ecological system. The hills drain into the creek. The creek itself is an inter-tidal “sponge” connecting Ulhas river to Bombay harbor. This continuity is interrupted by the FIGURE, and is often studied and managed now as separate ‘coast’ and ‘hill’ entities. But this non-human occupied territory has it’s own life - it breathes and moves with a very complex and introcate living ecosystem This thesis elaborates on the mangroves and fishery systems. The diversity is attributed to the estuarine condition from the fresh waters of the rivers and monsoon drainage and the sea waters. Sanjay Gandhi is supposed to be strictly reserved (but the borders of the non-occupation keep changing, leave alone the 300 AD rock-cut cave occupations). Park-Kharghar hills are smaller, not fully occupied yet, but could soon be.



COMPOSITION OF “FIGURE”/ CITY:

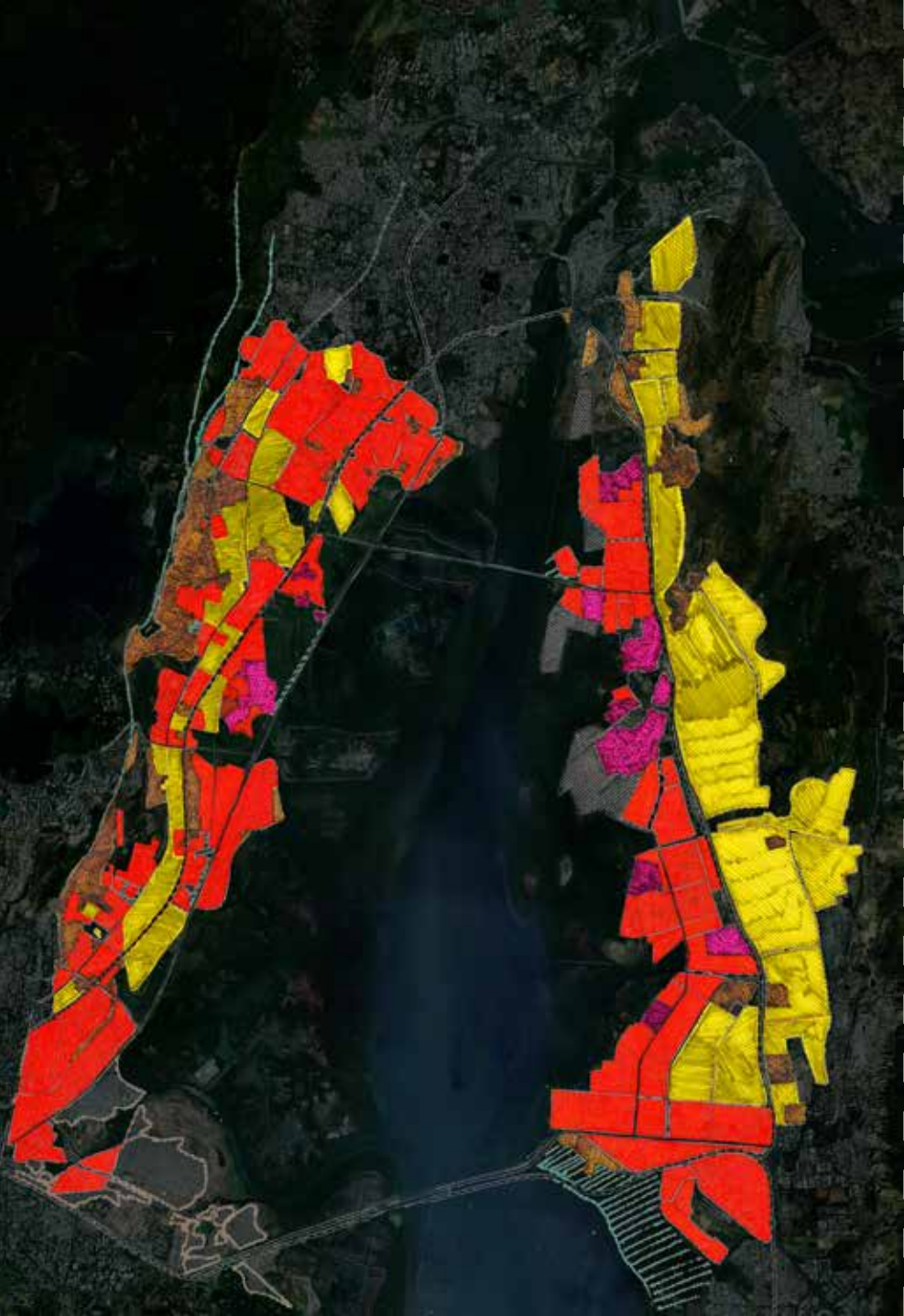
‘FORMAL’ NON-INDUSTRIAL URBAN AREAS

INDUSTRIAL AREAS

OLDER FISHING VILLAGES NOW GROWN INTO SLUMS

‘INFORMAL SETTLEMENTS’/ SLUMS

DESIRE FOR “FIGURE”:  
DEVELOP AND EXPAND FOR \$



COMPOSITION OF “COUNTERFIGURE”/ NON-CITY:

WATER - INLETS/ DRAINS/ CREEKS

OPEN SPACES - ACCESSIBLE AND INACCESSIBLE

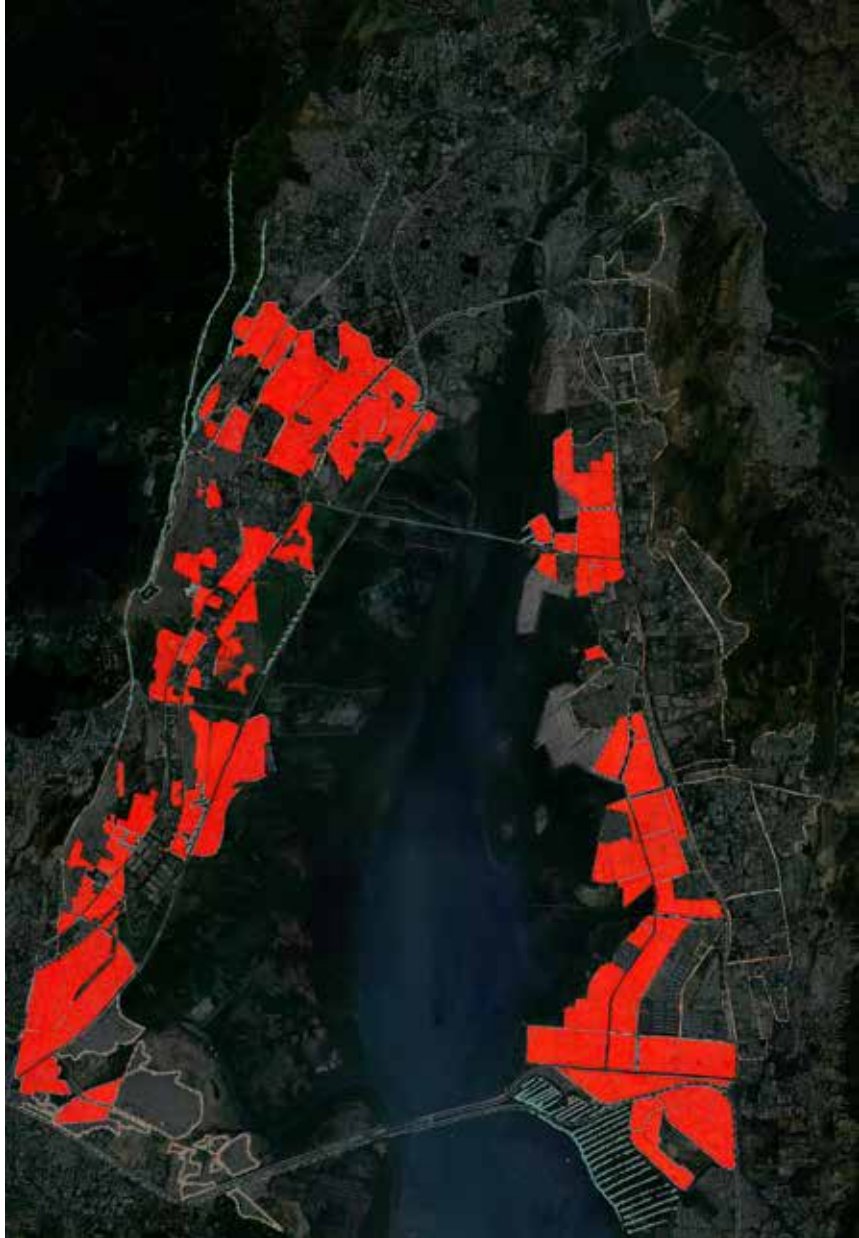
SALT-PAN LANDS

FOREST/ HILL AREAS (PROTECTED/ OPEN/ OCCUPIED)

DESIRE FOR “COUNTERFIGURE”:  
CONSERVE AND PROTECT







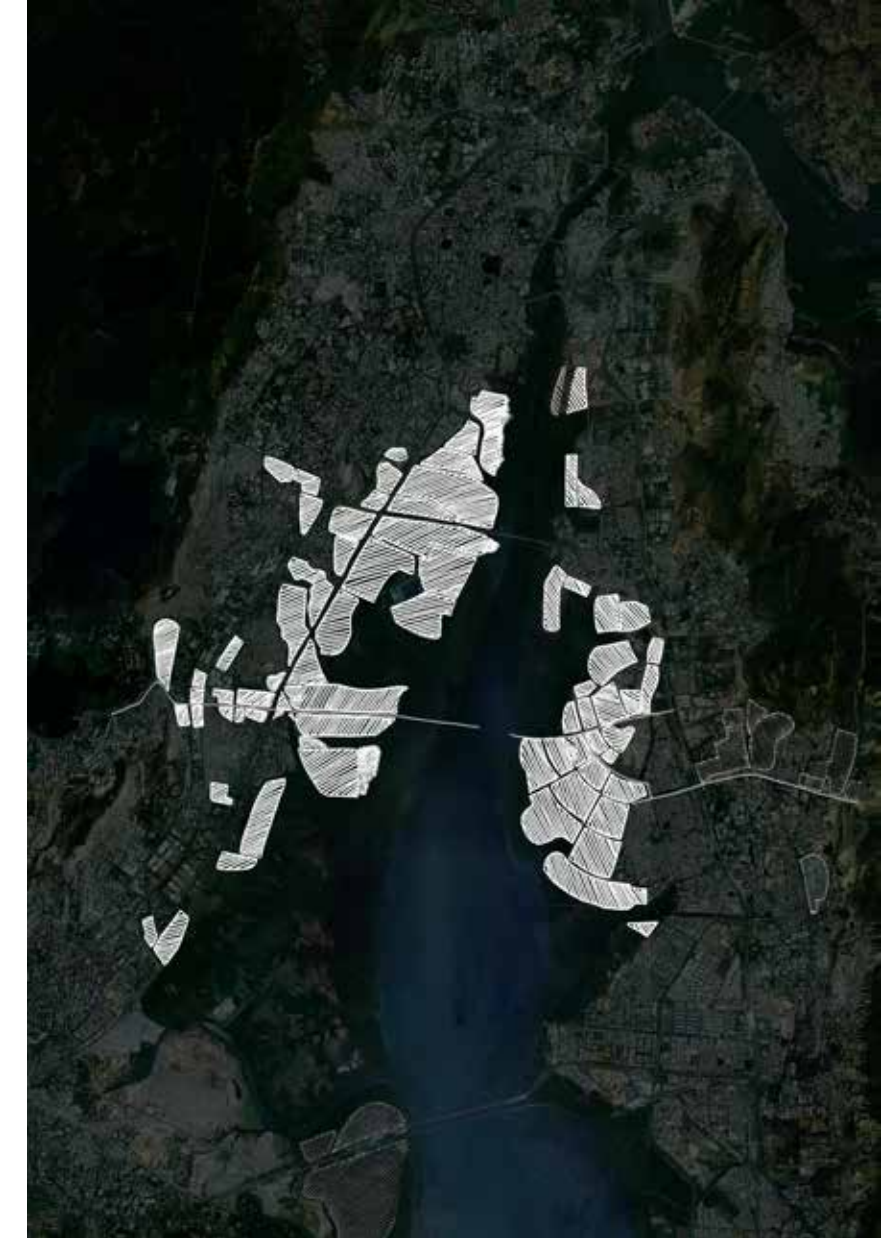
**'FORMAL' NON-INDUSTRIAL URBAN AREAS**



**INDUSTRIAL AREAS**

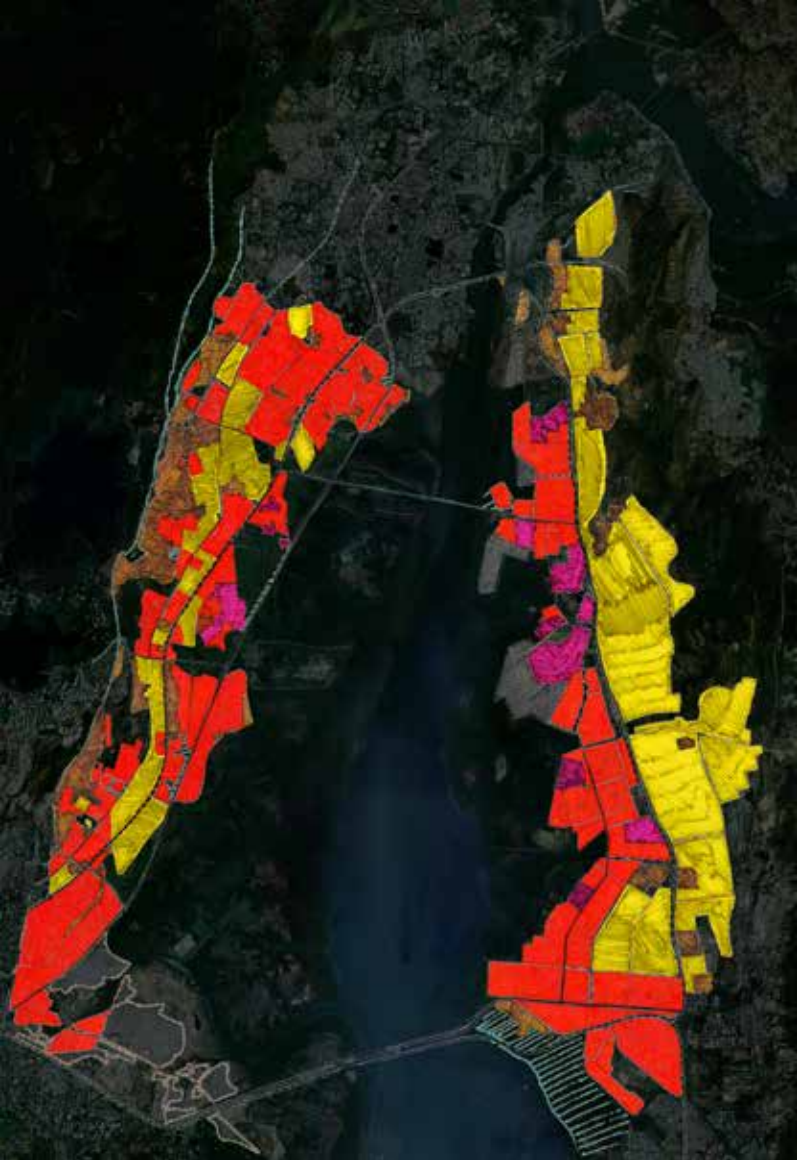


**OLDER FISHING VILLAGES NOW GROWN INTO SLUMS  
'INFORMAL SETTLEMENTS'/ SLUMS**

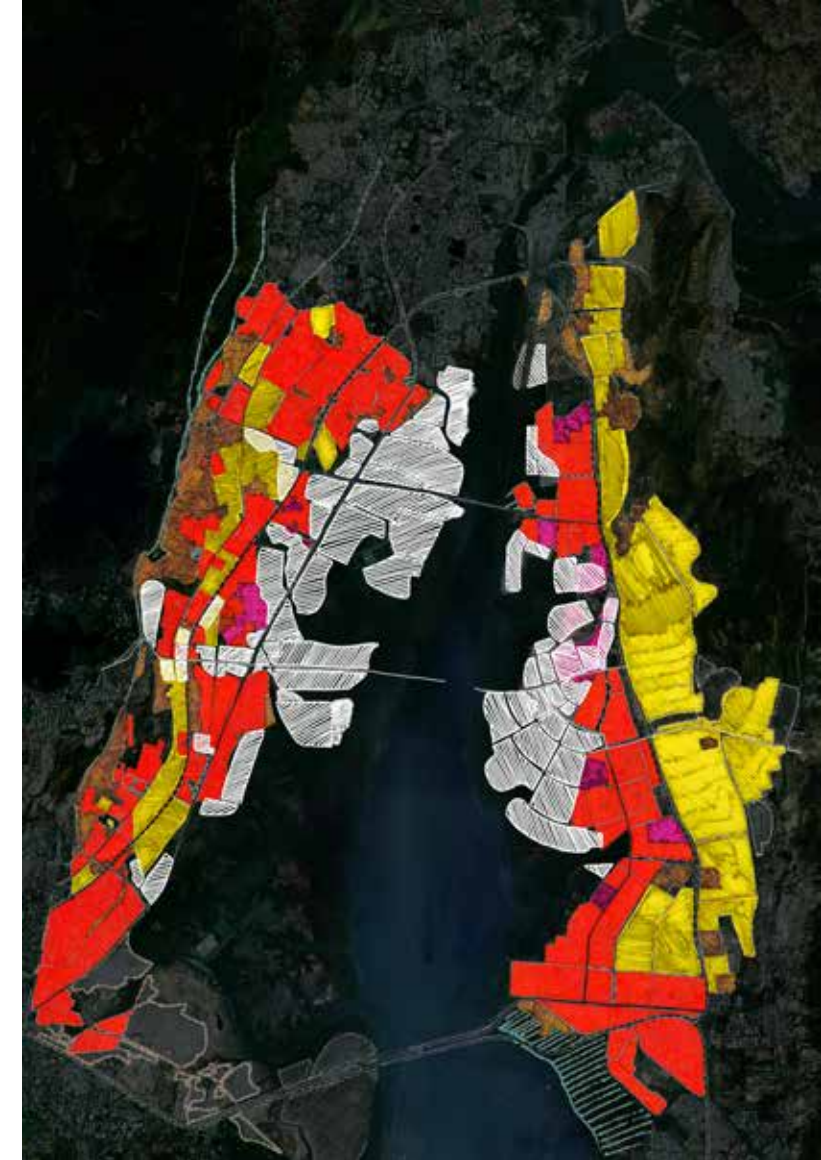
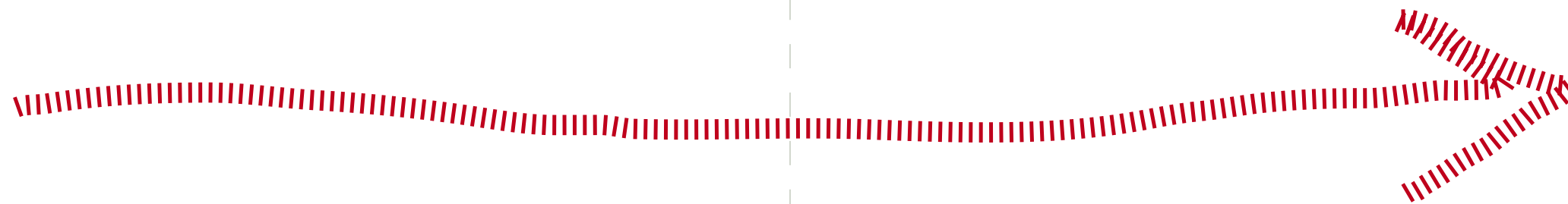
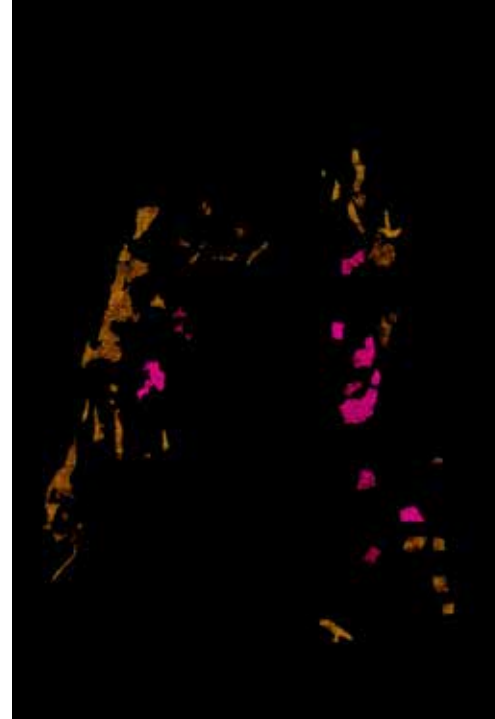
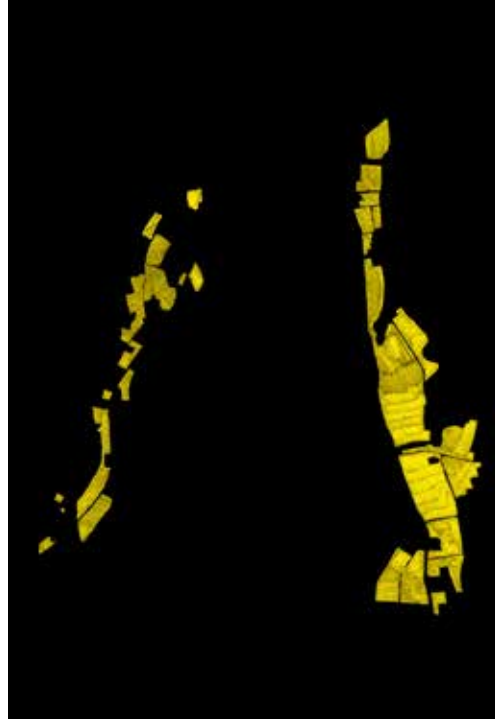
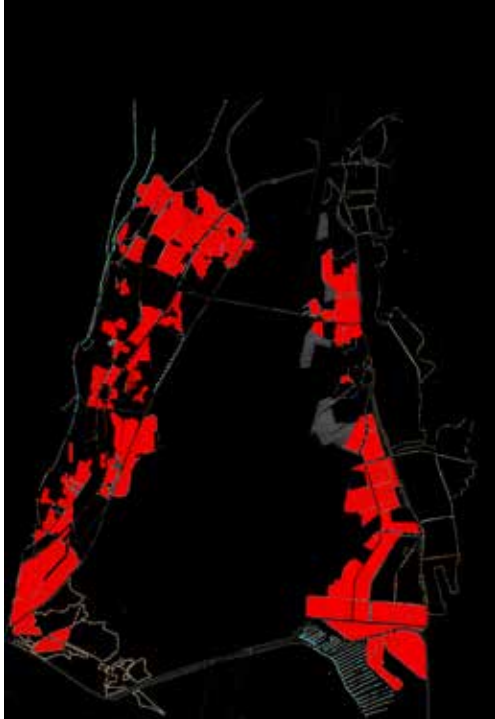


**AREAS OF COUNTERFIGURE UNDER PRESSURE OF  
CONVERTING INTO FIGURE**





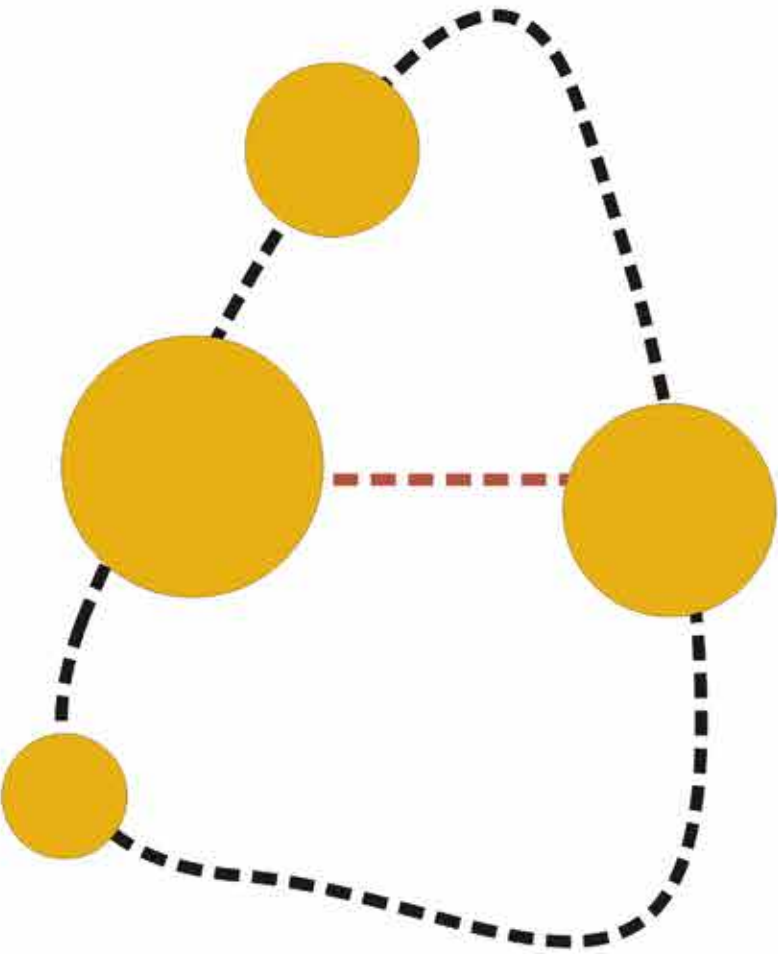
CURRENT FIGURE:  
NORTH-SOUTH ORIENTED EXCLUSIVE LARGE GRAINED  
IMPERVIOUS DEVELOPMENTS



POSSIBLY TRANSFORMED FIGURE:  
**MORE** NORTH SOUTH ORIENTED EXCLUSIVE LARGE GRAINED  
IMPERVIOUS DEVELOPMENT



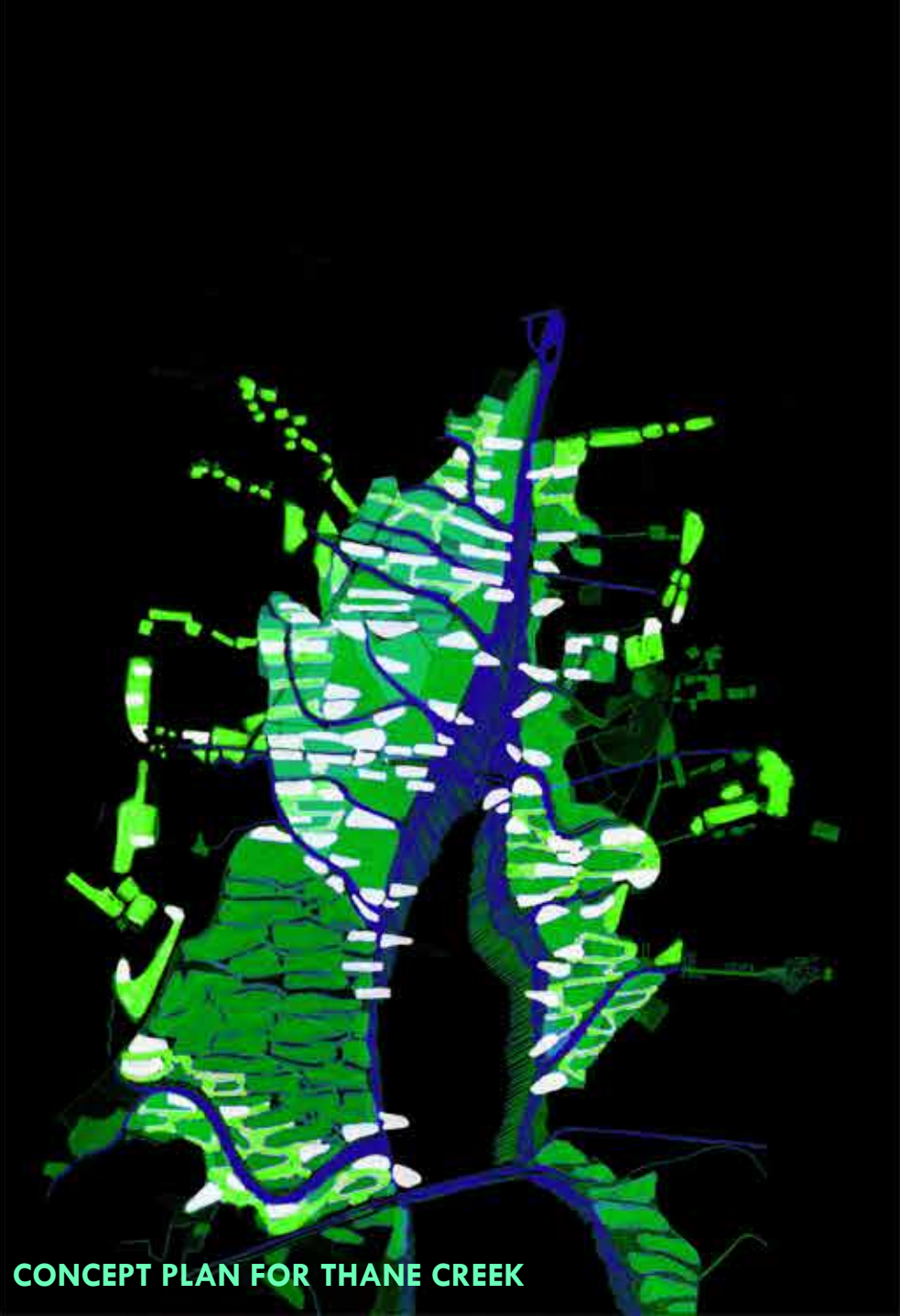
INSTEAD OF...



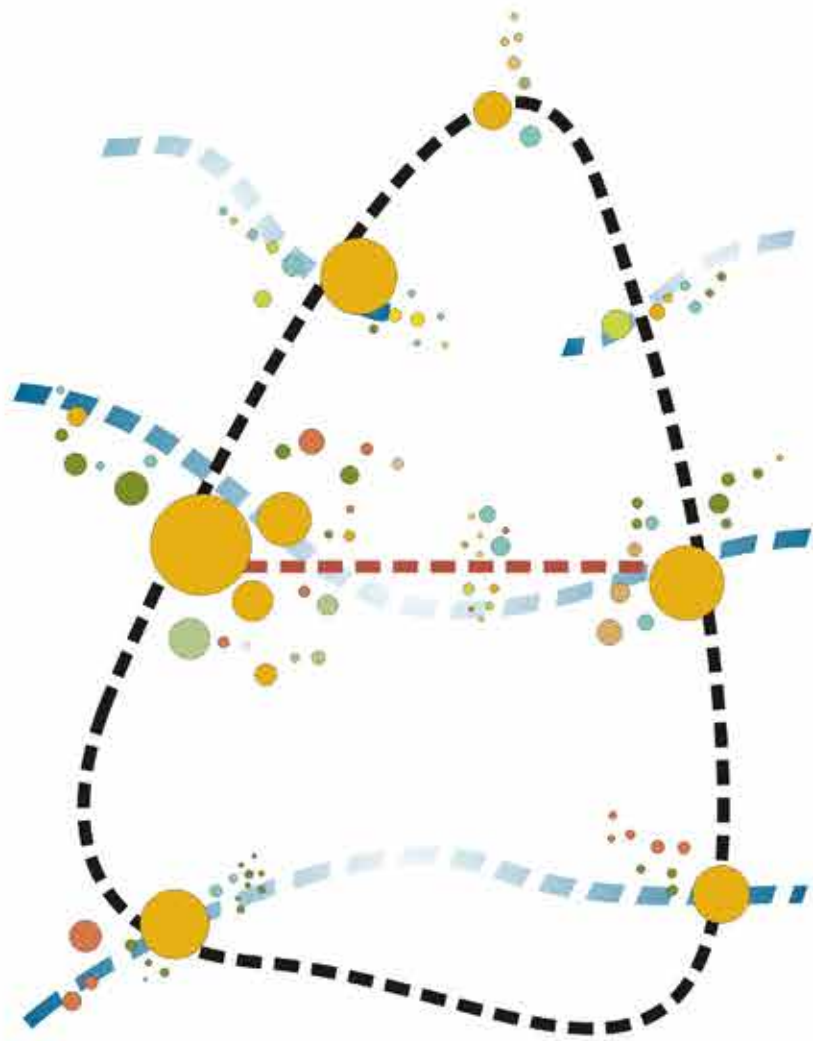
INSTEAD OF... MORE NORTH SOUTH ORIENTED EXCLUSIVE  
LARGE GRAINED IMPERVIOUS DEVELOPMENT...



CONCEPT PLAN FOR THANE CREEK



WHAT IF...

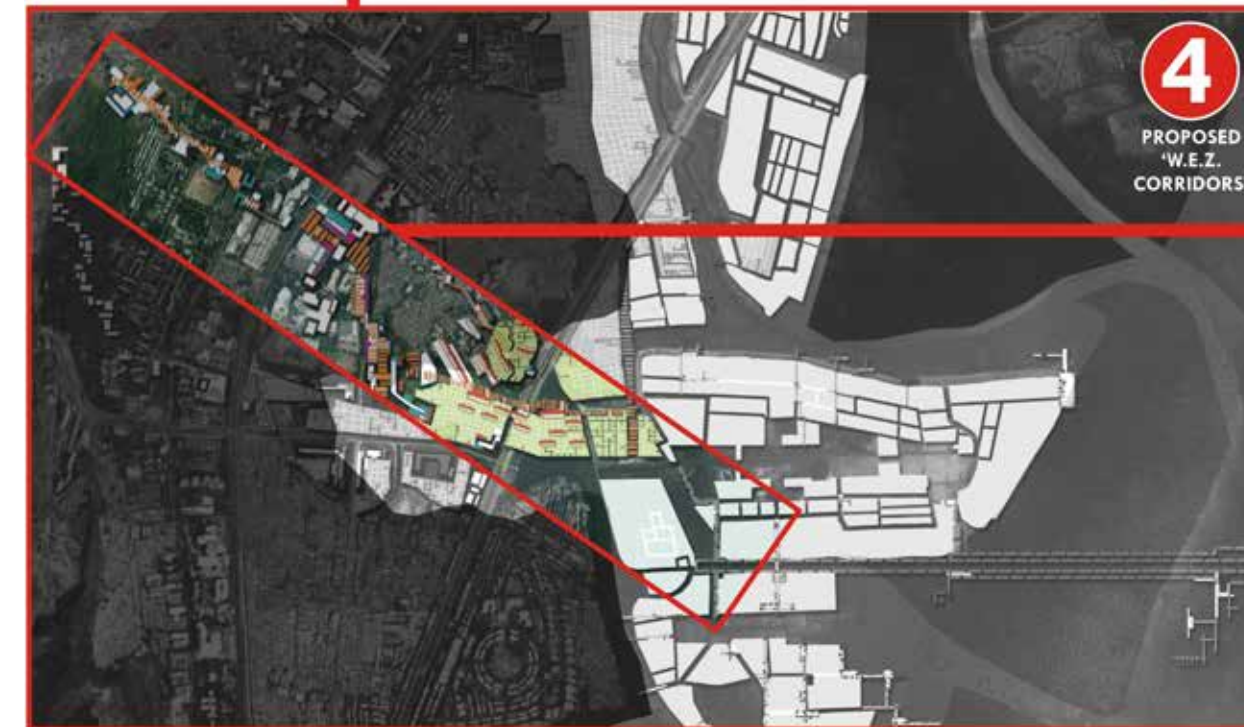


WHAT IF... THE OPPORTUNITY OF THIS FLUX CAN BE USED  
TO INTRODUCE A DIFFERENT STRATEGY - INTEGRATING  
AND WEAVING THE DESIRES OF THE "FIGURE" AND  
"COUNTERFIGURE", IN A SPONGY, DISTRIBUTED, FINER  
GRAINED RESILIENT DEVELOPMENT PATTERN...



**SCALE 3/4: PROPOSAL:**  
**SPONGY URBANISM:**  
**WETLAND ECONOMIC ZONE [W.E.Z.] and**  
**BRIDGING THANE CREEK:**

- THE W.E.Z. MANIFESTO: PROPOSAL FOR A “WETLAND ECONOMIC ZONE”: ADDRESSING CITY SCALE ISSUES ON A DESIGN SCALE
- INCLUSIVE RESILIENT LIGHT URBANISM
- PRODUCTIVE LANDSCAPES
- APPROPRIATE TECHNOLOGIES FOR PRODUCTIVE SKIN LAYER AND MAINTAINING THE SPONGE CHARACTER
- LOCATING AND CONCEIVING W.E.Z. CORRIDORS
- PROPOSING INTEGRATION OF “W.E.Z.” CORRIDORS: WATER COLLECTION, REUSE, DISCHARGE AND LANDSCAPE PLAN AS FIXED INFRASTRUCTURE
- SPATIAL QUALITY OF W.E.Z.





INSTEAD OF...

WHAT IF...

GLOBAL SCALE:

GLOBAL SCALE:

FLOODING DUE TO TIDES, CLIMATE CHANGE AND MONSOON

CREATION/ RESTORATION OF A SYSTEM OF DRAINAGE THROUGH THE URBAN FABRIC AND FOLLOWING THE TOPOGRAPHY

LACK OF POTABLE WATER

WATER RETENTION AND HARVESTING INFRASTRUCTURE AS THE FUNDAMENTAL SPINE OF THE CORRIDORS AND PROJECTS

CITY-SCALE:

CITY-SCALE:

ACCOMODATING THE NEED FOR SPACE

USING STILTS INSTEAD OF RECLAMATION, USING THE SURFACE OF THE WATER, RESILIENT CLUSTERS INSTEAD OF LARGE IMPERVIOUS DEVL.

CONNECTIVITY/ MOBILITY

BRIDGING THANE CREEK THUS INTEGRATING EAST/WEST CONNECTIVITY AND WATER-BASED MOBILITY

EXCLUSIVE ECONOMIC GROWTH SECTORS

PRODUCTIVE LANDSCAPES AS A MEANS TO PROTECTING CRITICAL ECOLOGICAL BALANCE + ECONOMIC OPPORTUNITIES FOR POOR CLASSES

QUESTIONING THE INTEGRITY OF POLITICAL VISIONS

ESTABLISHING VISIONS BEYOND G.D.P. : EQUITY, ECOLOGY AND EDUCATION

CREEK SCALE:

CREEK SCALE:

CLASHING CLAIMANTS

INSTITUTING 'WETLAND ECONOMIC ZONE' - UNDER THE MUMBAI METROPOLITAN REGIONAL DEVELOPMENT AUTHORITY [M.M.R.D.A.] - A COMMON CENTRAL BODY INTEGRATING THE RESPONSIBILITIES REQUIRED BY AND NEEDS OF ALL THE MUNICIPAL ADMINISTRATIONS, AND OTHER BODIES AND COMMITTIES THROUGH COLLABORATION, PARTICIPATION AND NEGOTIATION THUS BRINGING A DEGREE OF INTEGRATION, THUS TAKING RESPONSIBILITY FOR ALL THE W.E.Z. DEMARCATED AREAS, PART OF WHICH WILL BE SOLD TO REAL ESTATE MARKET ALSO.

EXCLUSION FROM ADMINISTRATIVE PLANS

INTRODUCING INTEGRATED COASTAL + HILL MANAGEMENT IN DISTRIBUTED LOCATIONS, THUS A MORE HOLISTIC & RESILIENT APPROACH. IMPLEMENTING WISE-USE POLICY ACCORING TO RAMSAR CONVENTION FOR SUSTAINABLE PRACTICES FOR PRODUCTIVE LANDSCAPES

BLANKET CONSERVATION ZONING DISREGARDED

DOCUMENTING THE PASTS, LAYERS, PRESENT AND NEEDS OF THE VILLAGES/ SLUMS: RESTORING LATENT/ HIDDEN LAYERS OF SOCIETY

SOCIO-ECONOMIC EXCLUSION

PURIFICATION LANDSCAPE INTEGRATED AS A STEP TOWARDS THE AWARENESS OF THE WATER POLLUTIONS. CREEKS AND INLETS EXPANDED.

POLLUTION - DETERIORATION OF ECOSYSTEM



SPONGY URBANISM IN THANE CREEK:

The goals which the strategy hopes to achieve basically tackle the built material imperviousness of the urbanization, the imperviousness of the builder nexus which holds the socially exclusive use of land as well as the imperviousness mindset which makes the city purely function in a North/South axis without any accessibility to the shores of the creek. The strategy thus seeks to introduce itself as having a spongy character.

So by defining it’s metaphorical analogy to a sponge, this spongy urbanism needs to be light, porous, elastic or readily compressible. It should absorb and hold water or yield water when pressed. It should allow absorption of various social needs. It may need to have it’s own vernacular - a cultural and physical manifestation of this lightweight resilient nature. The texture of this vernacular is fine grained, porous and perhaps even rough. It is accessible to the elements and in retrospect ought to become the lungs for the conurbation allowing the geography to breathe.

DERIVING THE WEZ MANIFESTO:

A. ADDRESSING THE URBANIZATION “CHOKE” AND THE NEED FOR DRAINAGE AND TIDES.

1. LOCATING THE ‘SPONGE’ AREAS – WETLANDS, MUDFLATS, SALT-PANS, WATER INLETS
2. LOCATING RESIDUAL OPEN SPACES, REMAINING FOREST AREA IN THE FABRIC
3. FINDING THE EXISTING STORM WATER DRAINS AND LOCATING WIDENING LOCATIONS
4. LOCATING INDUSTRIAL SITES POTENTIALLY DEFUNCT IN NATURE
5. USING TOPOGRAPHICAL WATER DRAINAGE LINES; THUS CONNECTING THE HILL-COAST
6. FORMING W.E.Z. CONCEPT CORRIDORS AND CONNECTIONS FROM HILL COAST AND FINDING BARRIER EDGES
7. DEFINE THE WEZ LOCATIONS, PROJECTS

B. ADDRESSING THE “NEED FOR SPACE”

1. UNDERSTANDING THE CRITICAL URBAN NEEDS OF MUMBAI FROM THE VISIONS AND PRESSURES, TO DEFINE AREAS FOR BUILDING IN THE WEZ
2. ALLOCATE AREA ALLOWANCES FOR – SELF BUILT SMALL PLOTS
  - BUILT UP MEDIUM SIZE PLOTS
  - APARTMENT BUA BY DEVELOPERS - REAL ESTATE
3. PROGRAMMATIC ALLOCATIONS SHOULD ADDRESS THE NATURE OF THE LOCATION

C. ADDRESSING MOBILITY AND INFRASTRUCTURE NEEDS

1. LOCATING THE NEW BRIDGE AND OTHER NEW ROADS REQUIRED
2. INTEGRATING LIGHT WATER-BASED MOBILITY

D. ADDRESSING THE NEED FOR WATER

1. USING HARVESTING, COLLECTION AND STORAGE SYSTEM WHICH WILL COLLECT RAIN WATER DURING MONSOON
2. SET UP PURIFICATION AND GREY-WATER RECYCLING SYSTEMS
3. GUIDELINES OF THE WEZ COLLECTS RAINWATER IN ALL BUILT FORMS, THUS COMBINING & INTEGRATING WATER IN ALL WEZ PROJECTS

E. ADDRESSING SOCIO-ECONOMIC EXCLUSIONS + UNDOCUMENTED STORIES – LATENT, RESIDUAL LAYERS OF GEOGRAPHY/ECONOMY/ SOCIETY/HISTORY:

INTRODUCING NEW PRIMARY ECONOMIC SECTORS LIKE FOOD PRODUCTION IN WHICH SOCIO-ECONOMIC CLASSES LIKE THE AGARIS ETC CAN PARTICIPATE AND MAINTAIN – THUS INTEGRATING THEM.

1. DOCUMENTING LATENT/RESIDUAL LAYERS OF LANDSCAPE- SALT-PANS, FISH-PONDS, AGRICULTURE PLOTS
2. USING THESE RESIDUAL LAYERS AS A FRAMEWORK, IN ORDER TO
3. INTEGRATING A “SKIN LAYER” OF “PRODUCTIVE LANDSCAPE”
4. ALLOTMENT OF SELF-BUILT SMALL PLOTS IN ORDER FOR APPROPRIATION BY AS MANY ECONOMIC CLASSES AS POSSIBLE (STILL OWNED BY WEZ) \*\*\*
5. USING THE HARVESTED WATER FOR HYDROPONIC AGRICULTURE. NUTRIENTS ARE ADDED TO THE WATER, THIS WATER IS ROUTED THROUGH PIPES (FOLLOWING THE ALLOCATED GRID-WORK). THE PIPES CONTAIN PLANTS AND SAPLINGS, WHICH CAN BE GROWN THROUGH THE YEAR, AND THE PRODUCTS ARE SOLD FOR ECONOMIC BENEFIT OF THE USERS. THESE PIPES ARE KEPT ON STILTS ABOVE THE WETLAND SOIL, SO THAT THE WETLANDS ARE STILL PROTECTED, AND THE SPACE IS STILL USED FOR PRIMARY SECTOR FOOD PRODUCTION.
6. INTRODUCING AQUACULTURE, MARICULTURE AND OTHER SUSTAINABLE FISHERY PRACTICES IN THE SALT-PANS. ALLOCATING SELF-BUILT SMALL PLOT, JETTY AND MARINA AREAS FOR THEIR APPROPRIATION. THE SUSTAINABLE PRACTICES ARE TO CONFORM TO THE RAMSAR WISE-USE PRACTICES MANIFESTO. RESEARCH, EDUCATION AND TRAINING FACILITIES ALONG WITH MARKET OPPORTUNITIES ARE PROVIDED FOR THIS.
7. SMALL SCALE SUSTAINABLE PRACTICES OF MICRO-INDUSTRIES WHICH USE, RE-USE AND RE-GROW PRODUCTS FROM THE WETLANDS THEMSELVES ARE MANAGED AND ALLOWED
8. ALL WEZ PROJECT LOCATIONS WILL HAVE SMALL PLOT APPROPRIATION ALLOCATION

F. ADDRESSING INSTITUTIONAL PLURALISM + ATTITUDES, LOBBIES, TRENDS, TENDENCIES AND ‘THE AGE OF THE DEVELOPER’:

1. ESTABLISHING THE WEZ IN THE HEART OF THE MMR
  - PUBLIC INSTITUTION UNDER THE MMRDA
  - NON PROFIT SEEKING, IT ONLY SEEKS TO MAINTAIN A HEALTHY ECOLOGICAL BALANCE
  - THE RESPONSIBILITY OF THE URBAN VS ECOLOGICAL CRITICALLY IS SHARED ON A SINGLE PLATFORM, WHICH OVERLAPS RESPONSIBILITIES OF DIFFERENT MUNICIPALITIES, SOCIAL GROUPS AND BRIDGES PUBLIC AND PRIVATE DEVELOPMENTS – THUS IS A PARTICIPATIVE APPROACH
  - PRIVATELY DEVELOPED OWNERSHIPS ARE DISCOURAGED IN ORDER TO MAINTAIN THE CRITICAL BALANCE
  - THE WEZ DOES NOT SEEK TO PURELY CONSERVE / BUILD+CONSUME THE AREA. IT IS A STEP TO TRY AND FIND A PRODUCTIVE BALANCE BETWEEN THE NEEDS OF NATURE AND NEEDS OF THE MUMBAI MAN

G. RE-CENTERING MUMBAI

1.SHIFTING THE MENTAL FOCUS OF READING MUMBAI AS A PURELY N/S RELATIONSHIP, THE NEW BRIDGE IS EXPLOITED FOR ITS E/W CONNECTION POTENTIAL TO RE-CENTER THE MIND OF THE CITY. INSTEAD OF FOCUSING THE ATTENTION ON THE CONSTANT DENSENESS OF THE ISLAND, SEEKING TO CREATE FOCUS OF A BALANCED APPROACH WITH THE WETLANDS, CAN CREATE POTENTIAL FOR A NEW TYPE OF INCLUSIVE CENTER OF THE CONURBATION, ACROSS LAND AND WATER – AND THIS CAN BE A BETTER ALTERNATIVE FUTURE THAN THE D.P. OF THE 2016 PLAN IN WHICH PRIVATE DEVELOPER WILL CONSUME AND EXCLUDE.









1 ADDRESSING THE URBANIZATION "CHOKE" AND THE NEED FOR DRAINAGE AND TIDES.



2 LOCATING THE 'SPONGE' AREAS – WETLANDS, MUDFLATS, SALT-PANS, WATER INLETS



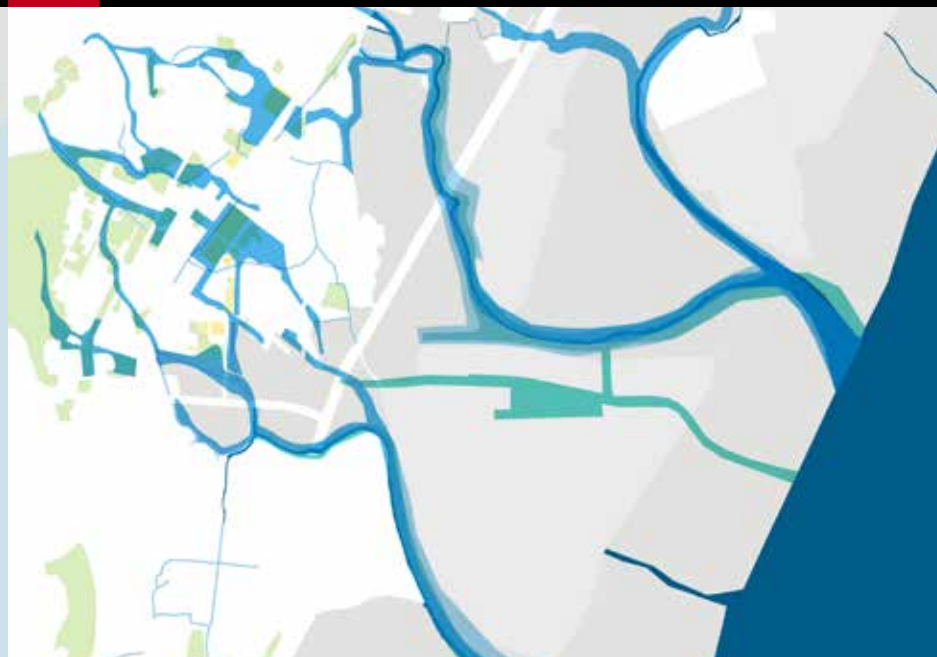
3 LOCATING RESIDUAL OPEN SPACES, REMAINING FOREST AREA IN THE FABRIC



4 FINDING THE EXISTING STORM WATER DRAINS AND LOCATING WIDENING LOCATIONS



5 LOCATING INDUSTRIAL SITES POTENTIALLY DEFUNCT IN NATURE



6 FORMING W.E.Z. CONCEPT CORRIDORS AND CONNECTIONS FROM HILL COAST AND FINDING BARRIER EDGES



7 FORMING W.E.Z. CONCEPT CORRIDORS AND CONNECTIONS FROM HILL COAST



8 DEFINE THE WEZ LOCATIONS, PROJECTS

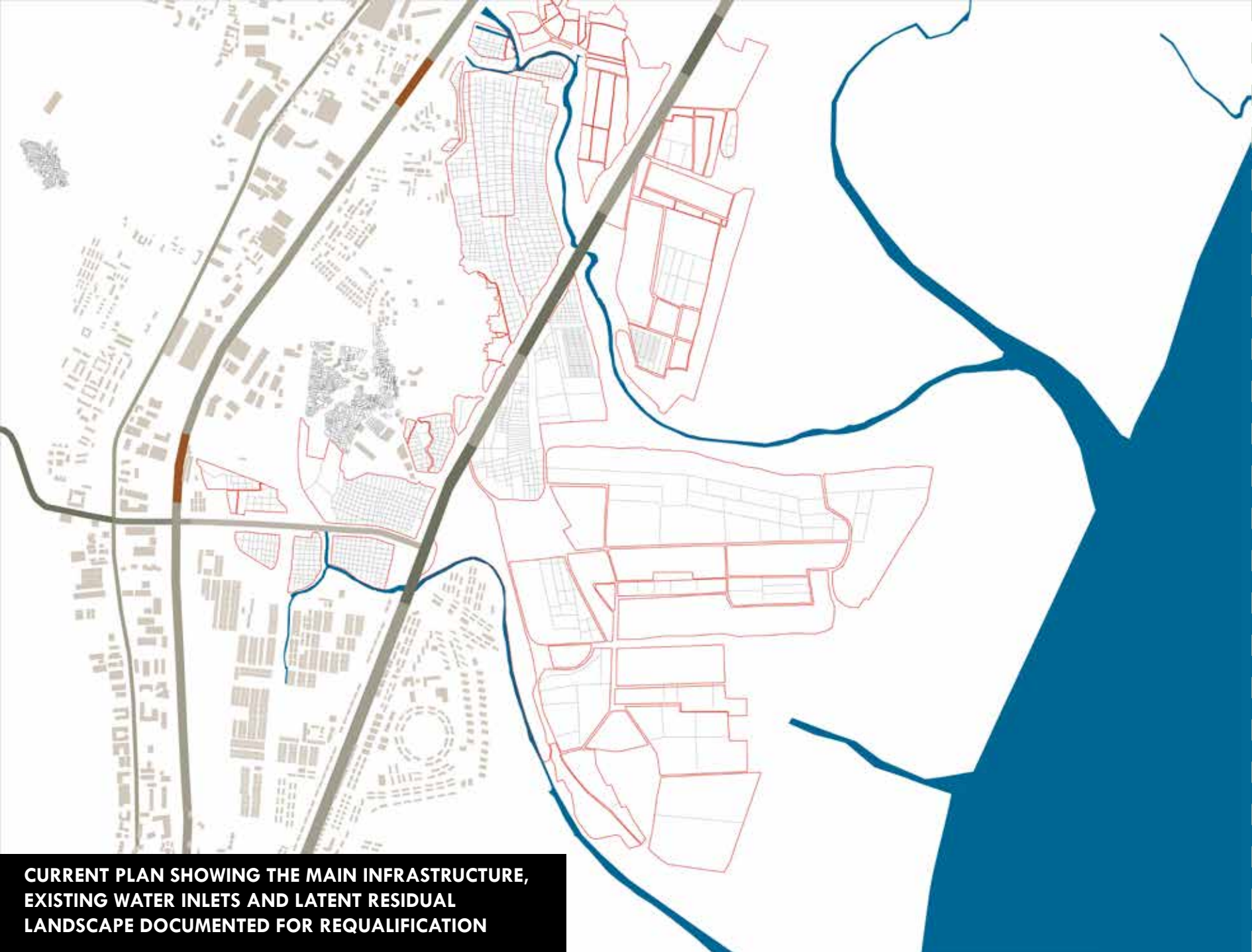




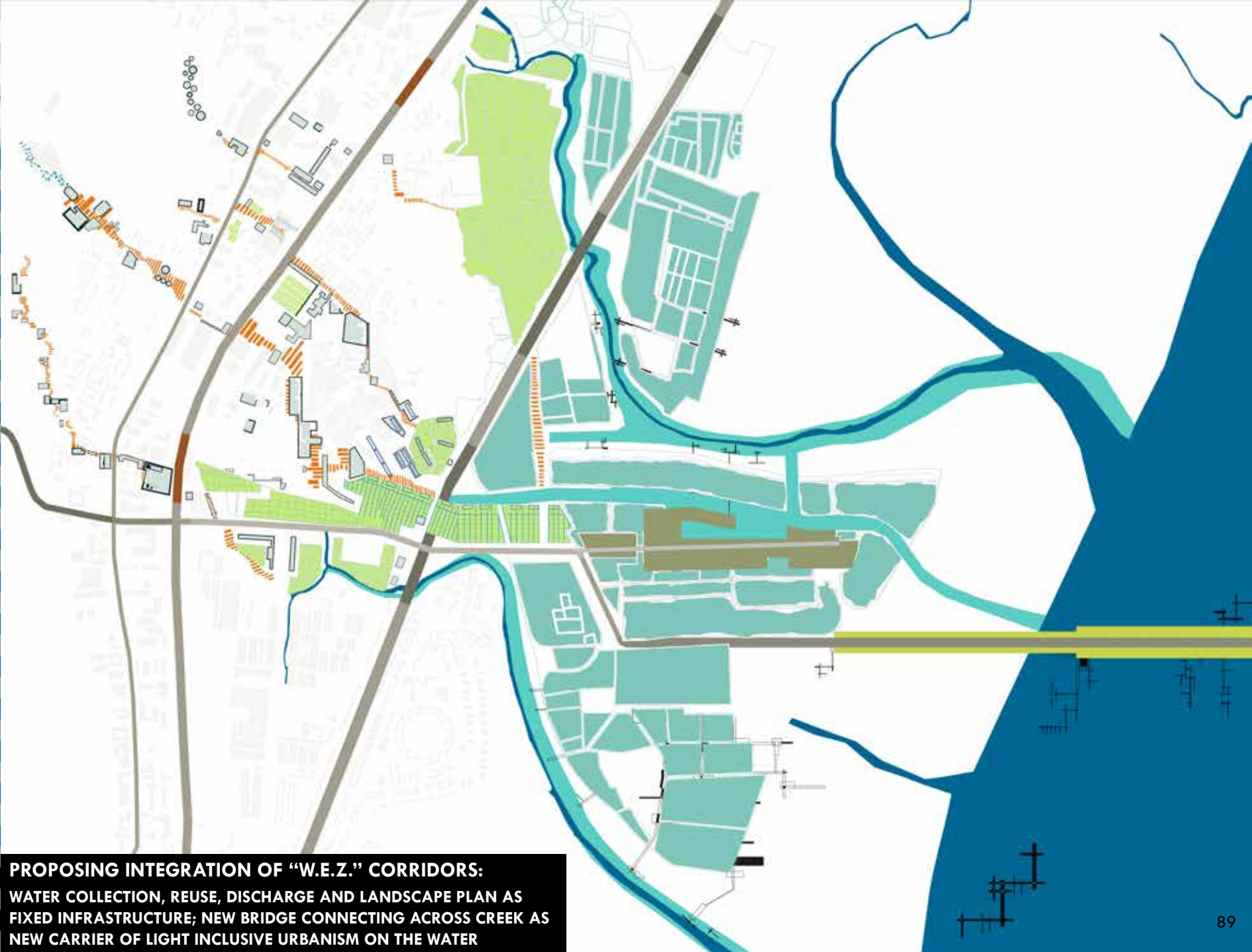
LOCATING AND CONCEIVING W.E.Z. CORRIDORS FOR NEW  
"SPONGY" URBANISM





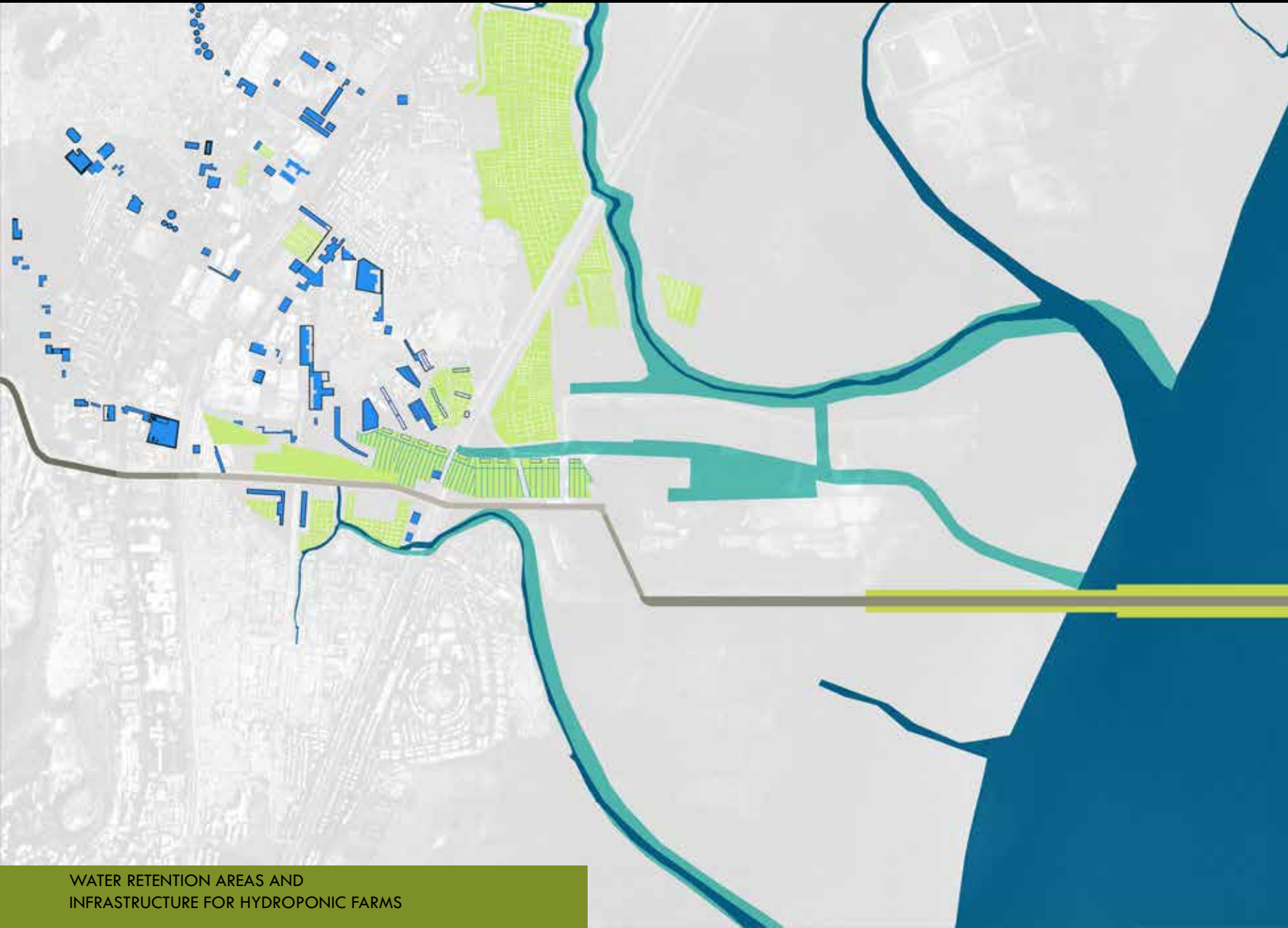


**CURRENT PLAN SHOWING THE MAIN INFRASTRUCTURE, EXISTING WATER INLETS AND LATENT RESIDUAL LANDSCAPE DOCUMENTED FOR REQUALIFICATION**



**PROPOSING INTEGRATION OF "W.E.Z." CORRIDORS: WATER COLLECTION, REUSE, DISCHARGE AND LANDSCAPE PLAN AS FIXED INFRASTRUCTURE; NEW BRIDGE CONNECTING ACROSS CREEK AS NEW CARRIER OF LIGHT INCLUSIVE URBANISM ON THE WATER**





WATER RETENTION AREAS AND  
INFRASTRUCTURE FOR HYDROPONIC FARMS

Water retention areas are laid out in the way that forms a continuity from the hills to the coast. Following the topography makes the water management much easier, and the retention areas, double up as open spaces in non-monsoon season. Such practices will also allow ground water replenishing and cooling of the soil. The collected water is also managed into reusing, purification and recycling circuits. This is the fixed 'spine' of the projects. This corridor also goes over, under or through the urban infrastructures to maintain the continuity.

The fields marked in green on the plan indicate a way of requalifying the older layers of agriculture on the site. The same irrigation lines are used to lay out a layer of piping heirarchy to introduce agriculture again - in the form of hydroponics. The soil on site is allowed to become contiguous to the wetlands, and thus continuing the natural 'sponge' into the land. These hydroponic farms are seen as a new way to allow experimenting productive ways of using the water collected in the system for food production. Such a practice could allow new open air landscapes within the city with people specialised in such knowledge, thus allowing it to become a way for excluded agrarian social groups to regain economic status.







LANDSCAPE PATH AND PUBLIC SPACE COMBINED WITH BEING PURIFICATION PATH CONNECTING HILL TO COAST

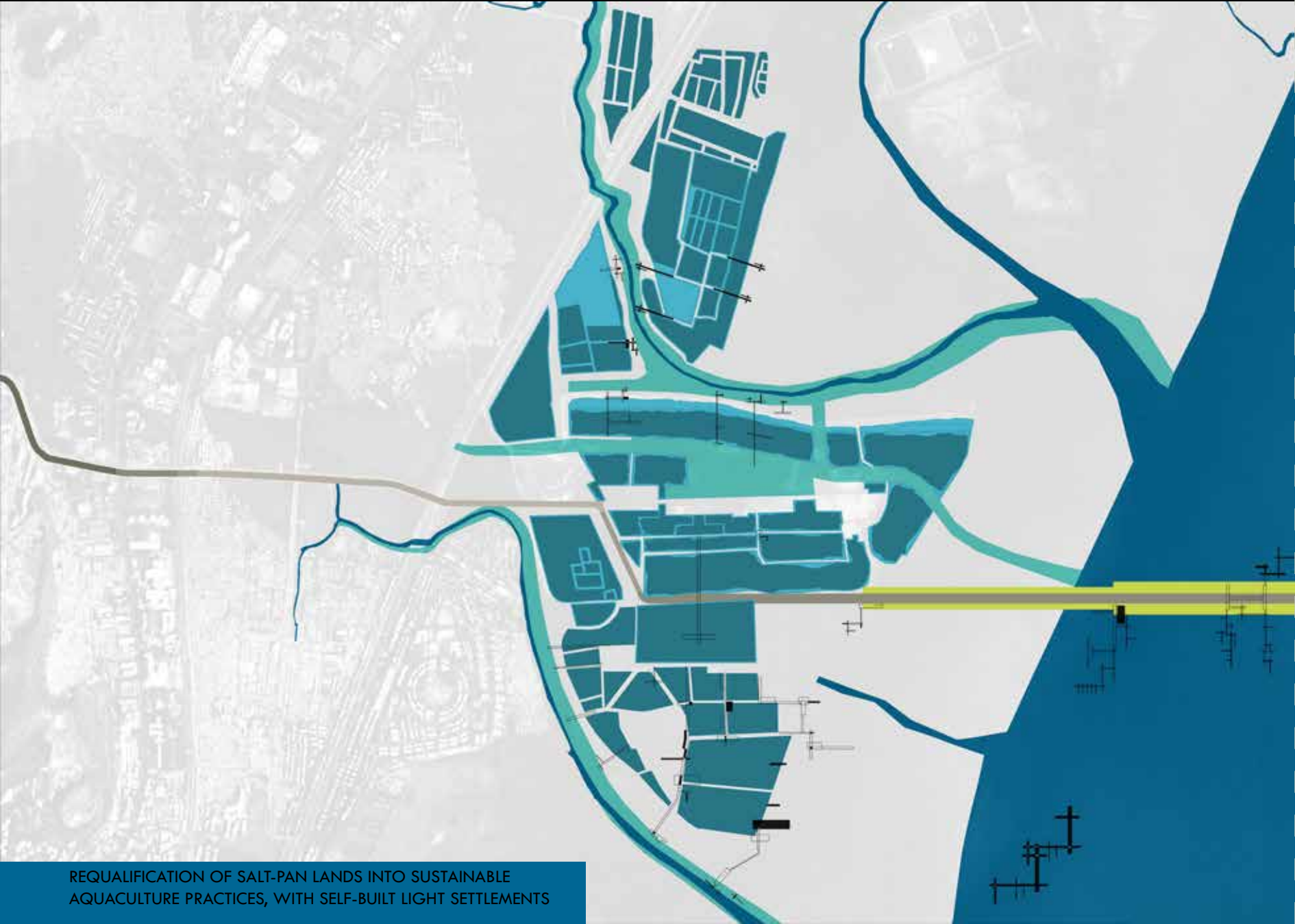
While the collection of water has been integrated into the site, a parallel effort is made to retain and restore soil and its capacity. This can also be combined with being a path of natural purification for the water, and on surface become areas for public open spaces. Technologies like the one indicated in the image should be incorporated strategically throughout the project and become the carrier language for the 'landscape path' that weaves through the urbanized areas and connects the hill to the coast in a continuity.

Such technologies further enable the strategies toward making the land 'spongy' and having a higher capacity toward water safety.





**SPONGY URBANISM: PRODUCTIVE LANDSCAPES:**



REQUALIFICATION OF SALT-PAN LANDS INTO SUSTAINABLE  
AQUACULTURE PRACTICES, WITH SELF-BUILT LIGHT SETTLEMENTS

**SUSTAINABLE AQUACULTURE AND WETLAND  
AFFORESTATION**

The salt-pan lands can be requalified to become sustainable fishing practices like the traditional Gei Wei method from South east Asia, which the afforested trees provide the food for the fishes. This can be combined with more informal and intensive practices in particular locations (this will have to be slowly done and tested), thus creating a new landscape for living for the fishermen, in a way that it also restores the sponge for the intertidal nature of the creek. This is a way for small scale self-built settlements by the fishermen again giving a place an an economy for the excluded classes. Such practices will reinvigorate the use and maintenance of the creek waters themselves, and bring new accessible life to this region.





**SPONGY URBANISM: INCLUSIVE RESILIENT LIGHT URBANISM**

The study looks at forms of (r)urbanism which can support the new functions of hydroponic agriculture and sustainable aquaculture practices that have been proposed. While living with such farming practices is a common phenomenon in South east Asia, for instance - this is not part of the vernacular of Mumbai. Allowing the practice of self-built living along such areas could possibly have a negative impact of over-encroachment, when it comes to high populations like in Mumbai. So although the proposal suggests this type of appropriation, it cannot be without the right kind of monitoring and limits.

However, it is within the framework of imagining alternative futures for this waterbody and it's fringes, that a new form of vernacular suiting the available materials like the timber from the wetlands for instance which are very well suited for these waters, could become a practice of self-built settlement patterns. Details from older timber houses vernacular to 'wadas' for instance, could become an inspiration. Although it became outside the scope of this thesis to understand how to set up sustainable guidelines for such a light, and fragile self-built settlement pattern; it is the suggested form of appropriation.



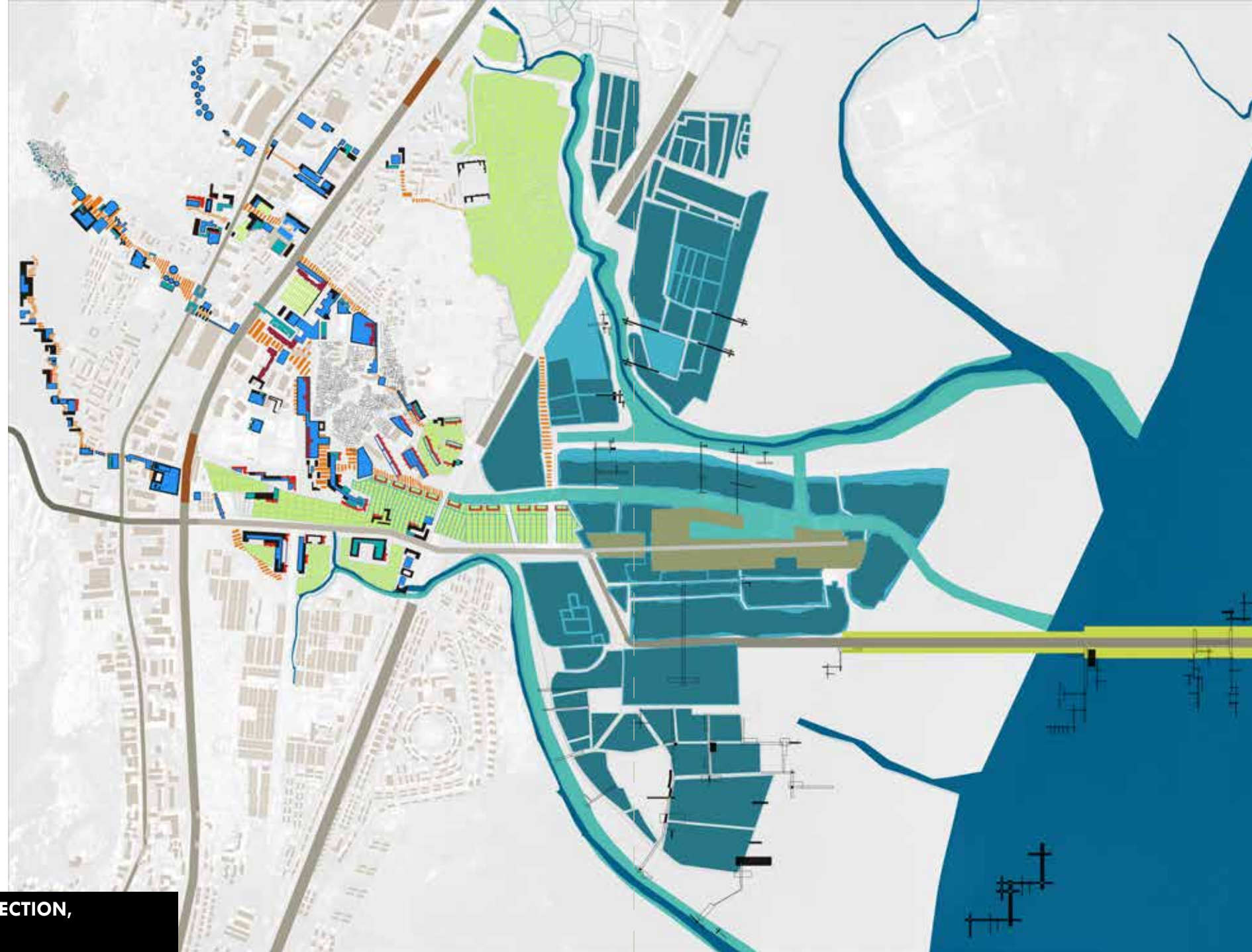


- HYDROPONIC/ OPEN AIR FARMING
- AQUACULTURE/ OPEN FISHING
- BUILT PLOTS TO SELL FOR REAL ESTATE
- SELF-BUILT SETTLEMENTS
- PLATFORMS FOR HIGH END REAL ESTATE AND BUILDING
- WATER RETENTION AREAS + HARVENTING IN BUILT
- 'MEDIUM' SIZE BUILD PLOTS
- WETLAND AFFORESTATION
- MARKET AREAS - FIXED/ FLOATING
- PUBLIC OPEN SPACES
- RELEVENT INSTITUTIONS



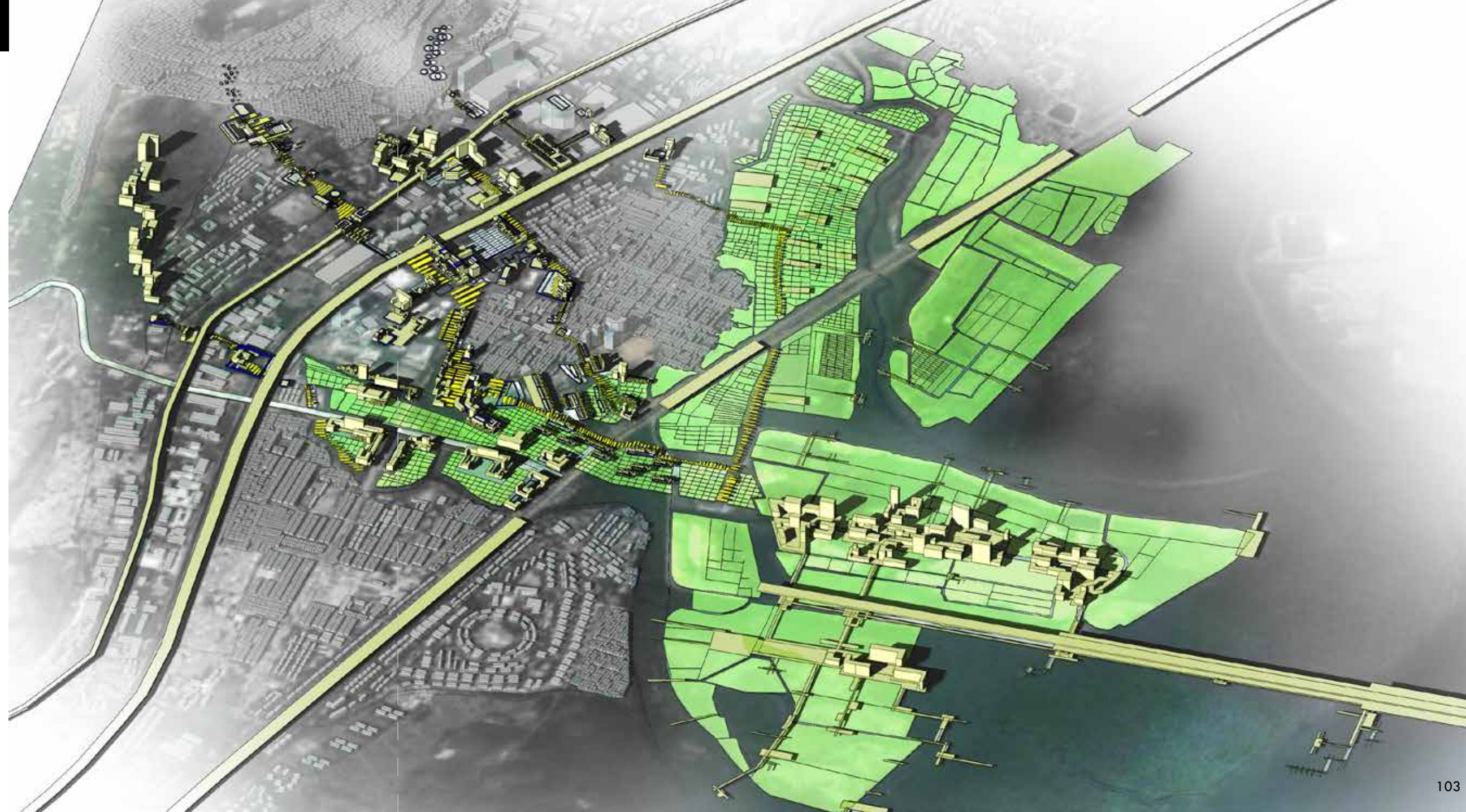
PROJECT DISTRIBUTION ALONG W.E.Z. CONCEPT CORRIDORS FOR BUILT FUNCTIONS





PLAN SHOWING POSSIBLE BUILT-UP FUNCTIONS WITH WATER COLLECTION, HARVESTING AND RETENTION









Photograph showing the self-built settlements on the hill, new developer estate (the towers here are 'Charming Hills' and Neptune mall). The creek and salt-pans are in the far distance.  
Courtesy: Panaramio

## SCALE 5: FRAMES OF W.E.Z. CORRIDOR:

### 1. LOCATION OF FRAMES

- FRAME 1: INTERVENTIONS IN PRATAP NAGAR SLUM
- FRAME 2: INTERVENTIONS IN THE OPEN SPACES OF NAVAL COMPOUND
- FRAME 3: REQUALIFYING DEFUNCT INDUSTRIAL COMPOUNDS TO NEW WETLAND ECONOMIC ZONE [W.E.Z.] ECONOMIES
- FRAME 4: HYDROPONIC AGRICULTURE + SELF-BUILT HOUSING [A NEW VERNACULAR?] - REQUALIFYING LATENT LAYERS OF AGRICULTURE
- FRAME 5 + 6: WETLAND ECONOMIC ZONE [W.E.Z.] CENTER + REQUALIFYING SALT-PANS AS AQUACULTURE FARMS
- FRAME 7: BRIDGING THANE CREEK: RECENTERING MUMBAI

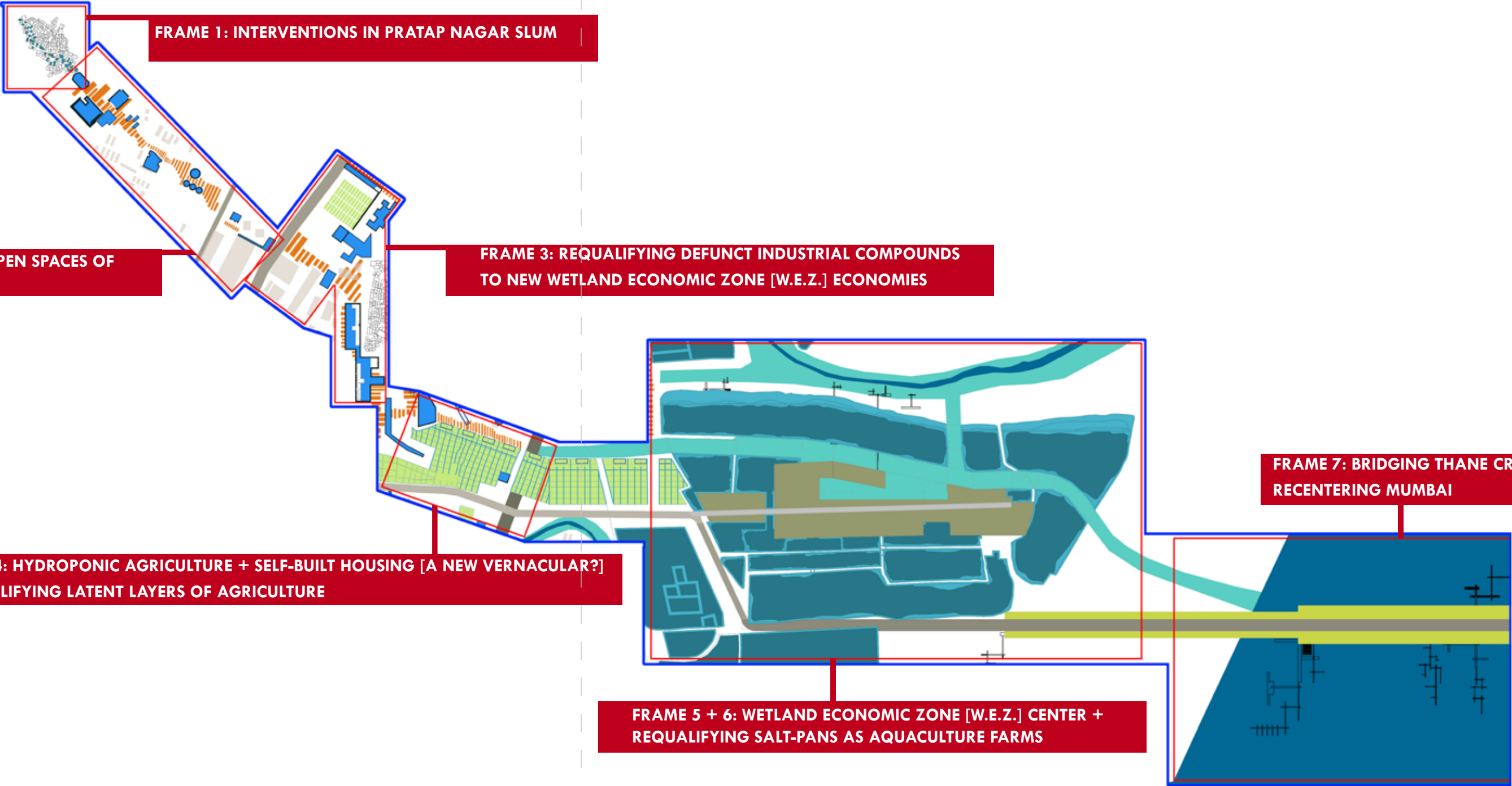
### 2. WATER TRANSPORT NETWORK LAYER















GOOGLE MAPS SATELLITE IMAGERY



DOCUMENTATION AND OBSERVATION

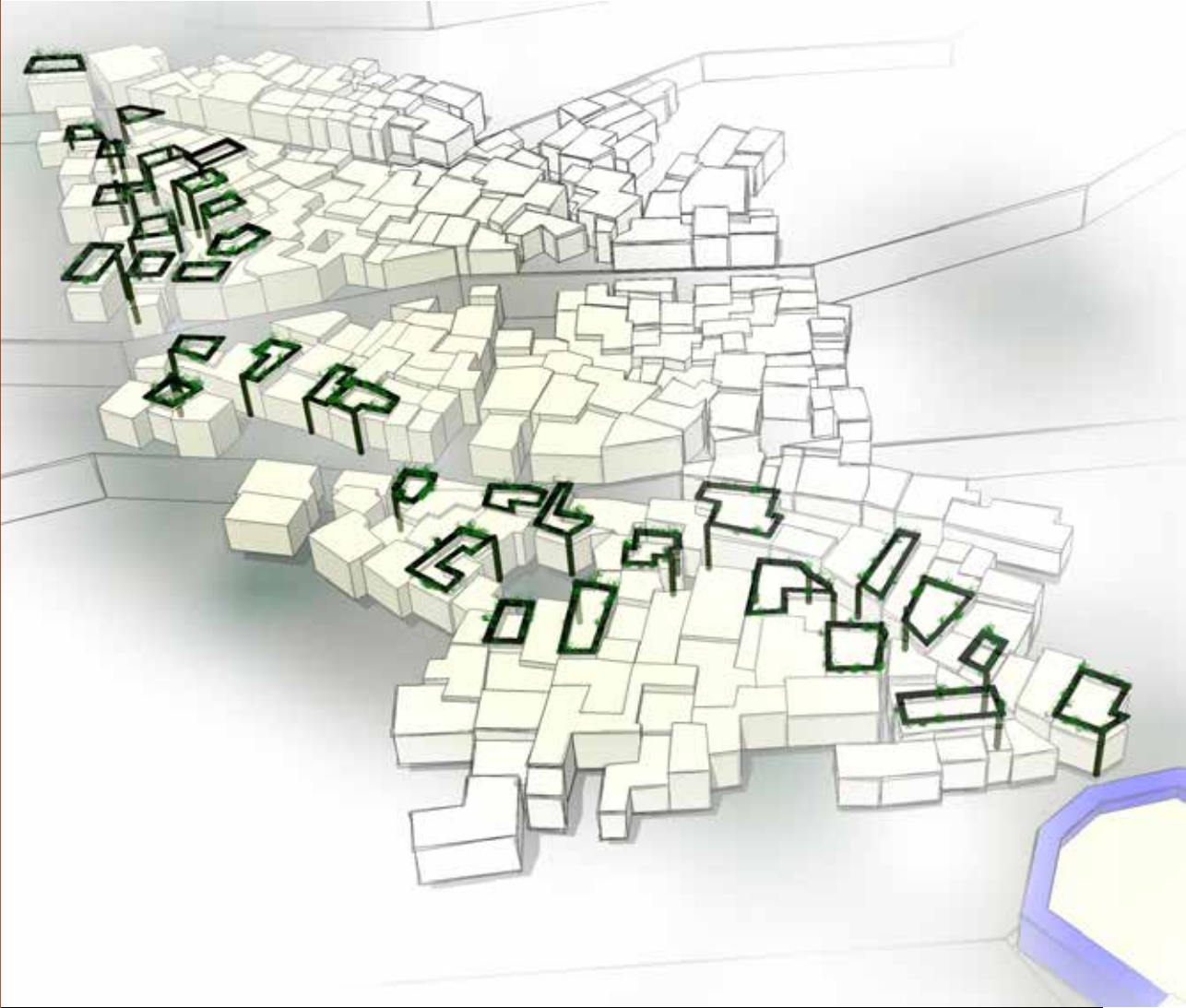
The patterns of settlements show the response to the topography and an alignment perpendicular to the storm water drain.



DESIGN INTERVENTION



WATER COLLECTION AND PUBLIC SPACE/ PLANTERS



VIEW

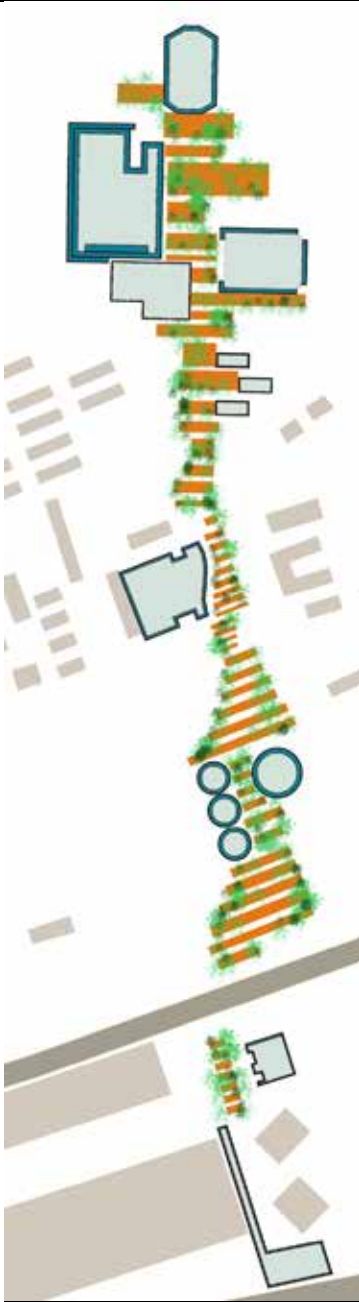




SATELLITE



DOCUMENTATION



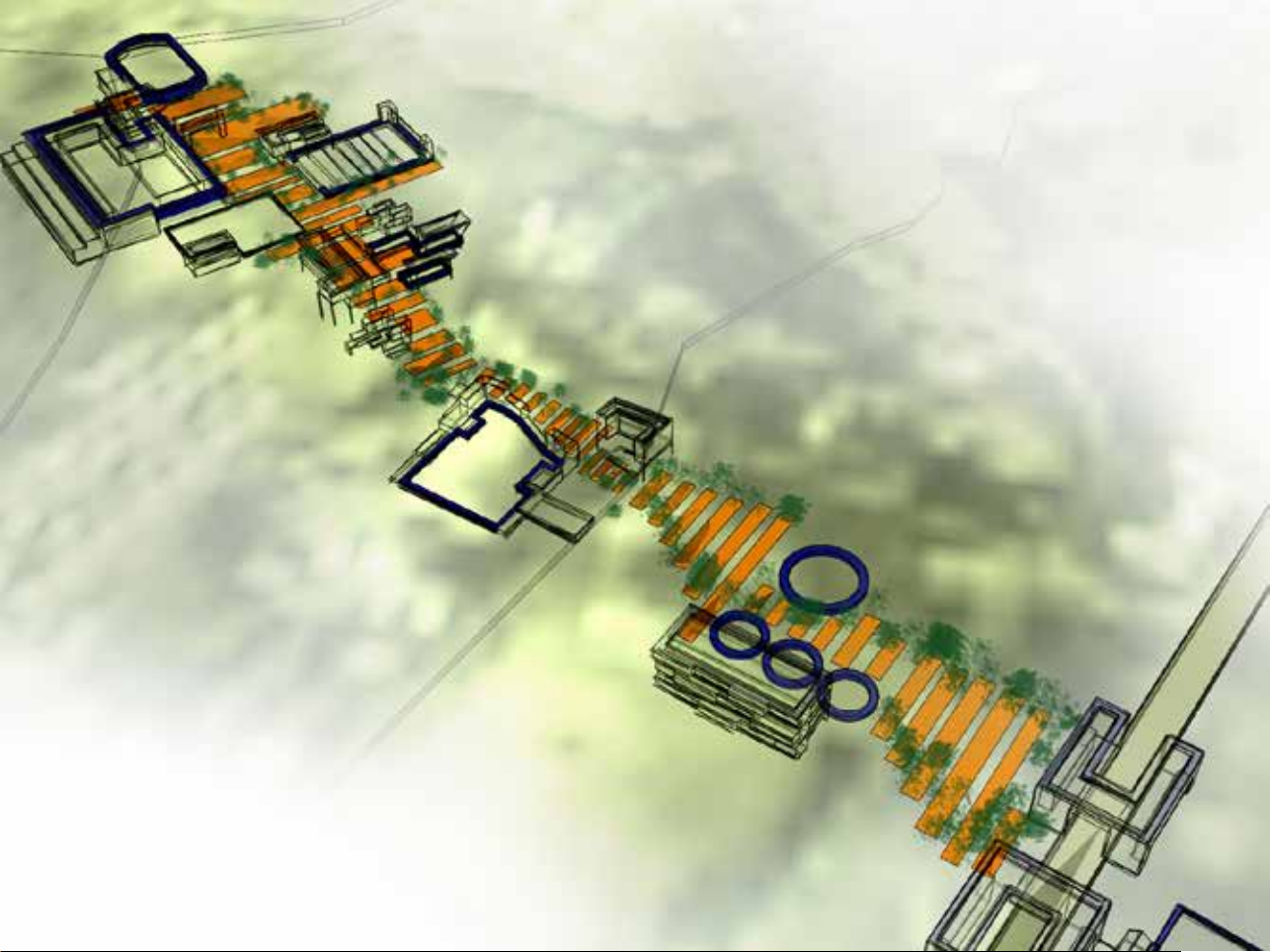
WATER INFRASTRUCTURE



BUILT PROGRAM



Water retention, built program and public space: Mandu  
Courtesy: <http://travel.sulekha.com/india/madhya-pradesh/mandu/photos/mandu-40.jpg>



VIEW





GOOGLE SATELLITE IMAGERY



DOCUMENTING THE DEFUNCT INDUSTRIES



INFRASTRUCTURE PLAN + PROGRAM



POSSIBLE OUTCOME WITH BUILT



VIEW





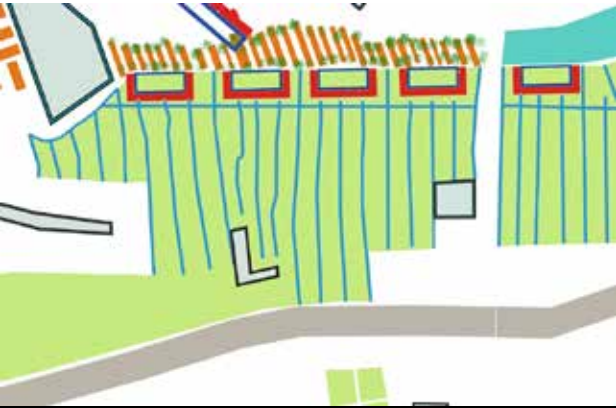
GOOGLE SATELLITE IMAGERY



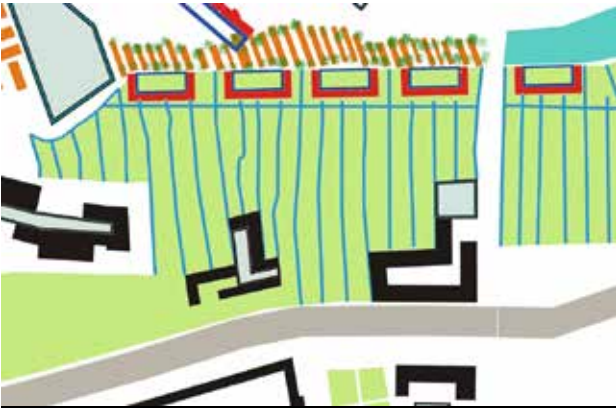
DOCUMENTING LATENT PATTERNS



INFRASTRUCTURE FOR WATER RETENTION AND HYDROPONIC AGRICULTURE



SELF-BUILT SETTLEMENTS



BUILT-UP PROGRAM



INTEGRATED SYSTEM OF WATER AND LIVING



VIEW





GOOGLE MAPS SATELLITE IMAGERY



DOCUMENTATION OF SALT-PANS AND WATER INLETS



DESIGN INTERVENTION



WATER COLLECTION AND PUBLIC SPACE



VIEW





PROPOSED NEW BRIDGE



Historic and recent images of Galata Bridge, Istanbul, Turkey  
Courtesy: [http://en.wikipedia.org/wiki/File:Galata\\_Bridge\\_From\\_Tower.JPG](http://en.wikipedia.org/wiki/File:Galata_Bridge_From_Tower.JPG)  
[http://www.documentarist.com/wp-content/uploads/2010/01/Galata-Bridge-Istanbul\\_abdullah-freres\\_1880-1900.jpg](http://www.documentarist.com/wp-content/uploads/2010/01/Galata-Bridge-Istanbul_abdullah-freres_1880-1900.jpg)





# ‘Survey waterway transport in Thane dist’

Dist Guardian Min Asks For A Concerted Effort To Explore This Option To Relieve Roads Of Traffic

Nishikant Karlikar

The water-way transport may soon be a reality in the coming years as Guardian Minister of Thane District Ganesh Naik has asked the concerned authorities to carry out a survey of water-way transport that connects Navi Mumbai to the Gateway of India along with other parts of Thane district. This might help ease the pressure on other alternative mode of transportation like railways and roadways.

Recently, Naik had called for an urgent meeting of top officials from the Mumbai Metropolitan Region Development Authority, Maritime



**WAT-A-WAY!** Once the water way starts, it will benefit commuters from far off places across the district to travel from Gateway of India - Navi Mumbai or Thane-Airoli, Kalva, Diva, Dombivali, Kalyan, Gaimukh, Vasai etc

board, Maharashtra State Road Development Corporation.

Naik said, "Currently, there is a huge pressure on the roads connecting Mumbai with Thane, Navi Mumbai and other parts of Thane district. This pressure leads to huge traffic jams and wastage of time to daily commuters for whom water-way transport is an apt solution."

Naik added, "By using water transport, it takes only 20 minutes from Navi Mumbai to Gateway of India and Thane district is blessed to have a huge shoreline.

Once the water way starts it will benefit daily commuters from far off places of the district to the Gateway

of India to Navi Mumbai, Thane-Airoli, Kalva, Diva, Dombivali, Kalyan, Gaimukh, Vasai, Palghar , Dahanu etc."

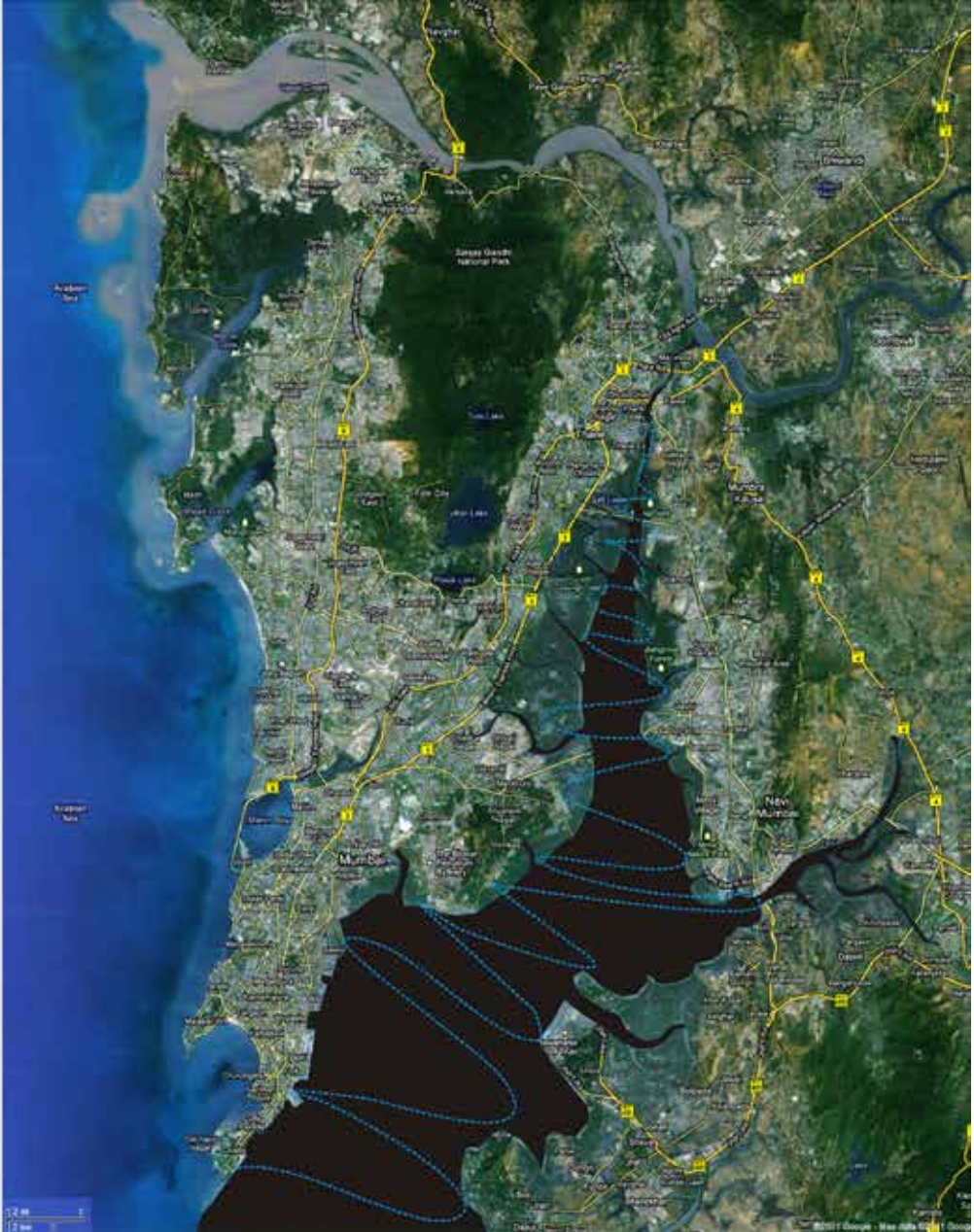
Naik also stressed on the benefit of the sea route connectivity as once started, it can boost tourist activities in the district. In order to start water-way transportation there is a need of a channel, which can also be used by the police for transportation.

The concerned authorities were also instructed to fast track the construction of jetties on the shore of the Belapur, Divale, Karawe, Vashi, Diva Gaon, Talavane, Gonole and Ghansoli.

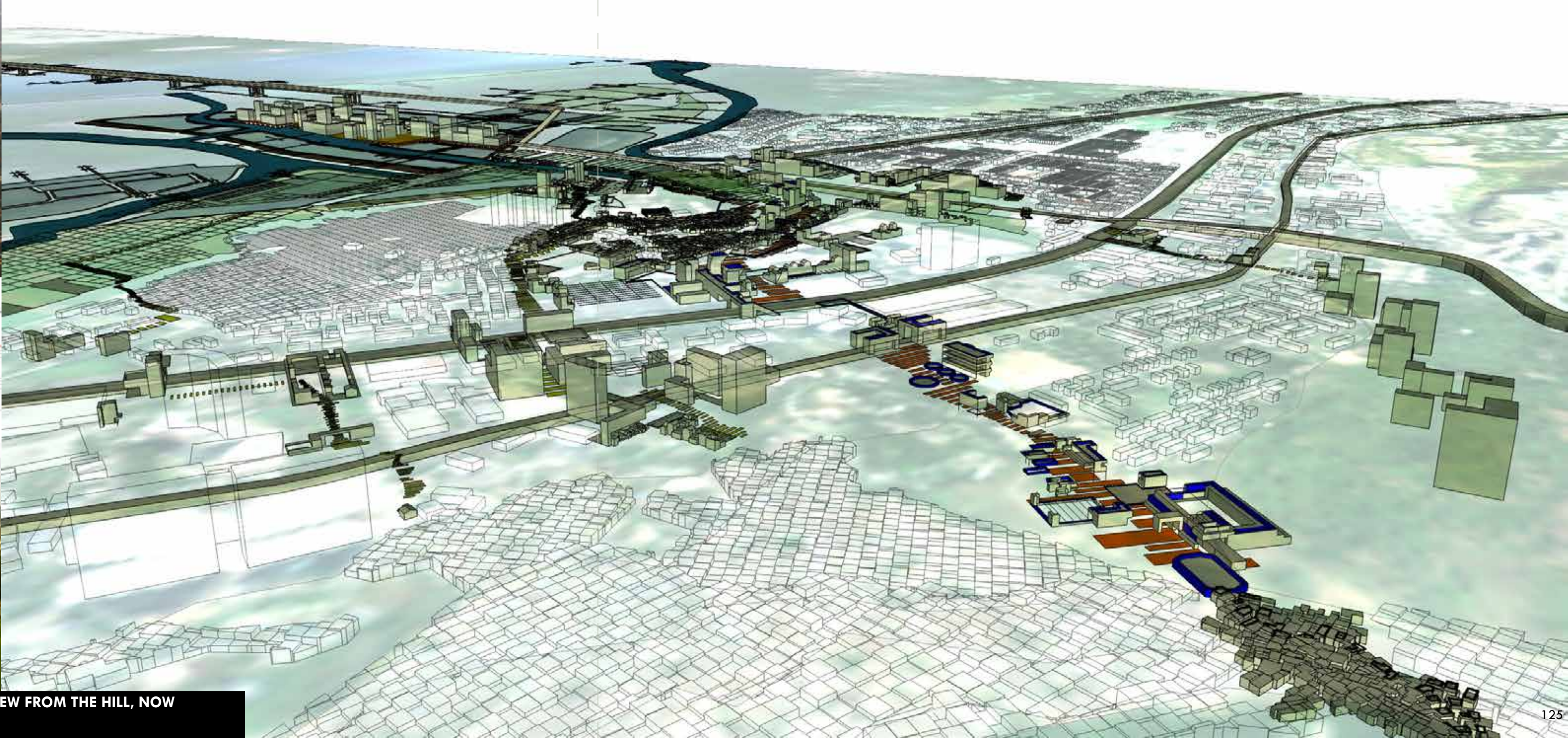
Article from 'Mumbai Mirror' -  
Date: 19/06/2011

## WATER TRANSPORT:

Reviving water transport to a limited extent in Thane creek, seems to be on the mind of some city officials anyway. With this project, this is definitely one of the most important possibilities. The gap within the conurbation will also shrink with the new proposed bridge, and with the layer of water transport underneath it, it can function to connect even up to Bombay harbor. If monitored, secured, controlled and phased well, it can become a very good mobility support. To begin with for the purpose of the project, this connection is important for the new food production areas to connect to the Agriculture Produce Market (APMC) in Navi Mumbai directly, and this market connection is an important starting marker for the economic successes of the project's productive landscapes and bridge market on the water.

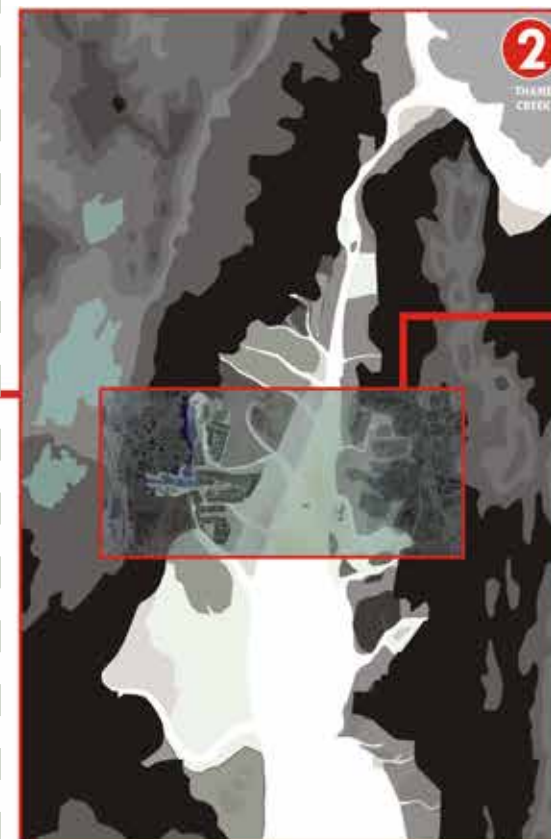
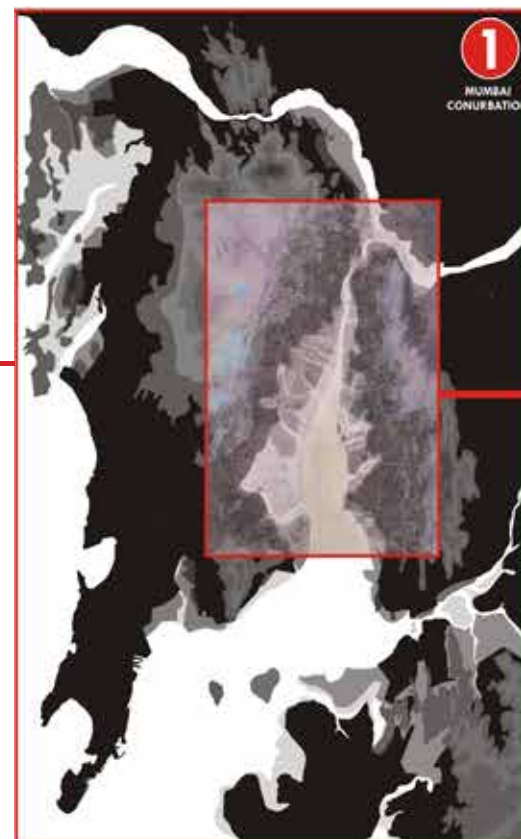
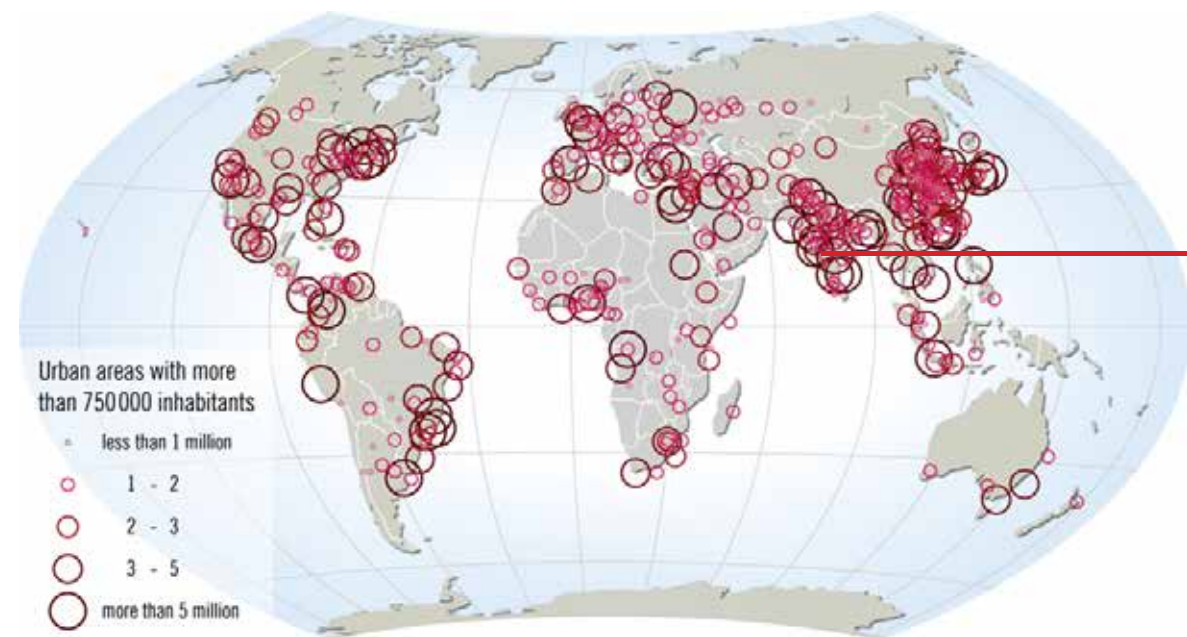






**SPATIAL QUALITY OF W.E.Z.: CONTINUITY IN THE VIEW FROM THE HILL, NOW  
CONNECTING THROUGH TO THE COAST**







CONCLUSIONS

A PROJECT OF PROJECTS: A METHOD IN RAPIDLY DEVELOPING URBAN AREAS:

Urban spatial proposals in cities cannot be a monolithic policy/ masterplan anymore. Uncertainties and flexibility aside, strategies need to incorporate the space for collective debate, participation and finer grained divisions of responsibilities under a holistic framework with straightforward goals. This project hopes to reflect such a culture. While major infrastructure planning will inevitably have to be undertaken, they can become the reason and cause of a much larger scope of concerns.

INFRASTRUCTURE DECISIONS TAKING INTO ACCOUNT DRASTIC ECOLOGICAL BACKLASHES CONCERNING LAND OVER WATER

Realities like torrential rains, rising sea-levels, floods, tsunamis, droughts and other humbling backlashes from nature remind us that urbanism in areas like Mumbai and across the world have to incorporate strategies become platforms of innovation for combining flood defences, water retention, harvesting, combing usable spaces, public open spaces and ‘spongy’ urbanism. Incorporating new technologies such as areas which can be lifted, or simply learning from vernacular examples on harvesting or light-weight constructions will have to make it’s way rapidly into urban norms of coatal built environments.



URBAN AREAS WITH MORE THAN 750000 INHABITANTS  
Courtesy: [http://nordpil.com/static/images/world\\_cities\\_map.png](http://nordpil.com/static/images/world_cities_map.png)

PRODUCTIVE LANDSCAPES AS A STRATEGIC TOOL FOR SOCIO-ECONOMIC INTEGRATION AND COMMUNITY PARTICIPATION:

Using open spaces and residual farming practices in urban areas for production purposes of a specialised nature can become a tool for social groups, especially migrant village groups to become more economically independent within the competitive urban economic sectors that make up a city. The purpose of this is not about actual production, but to introduce an inclusive social order and maintain open spaces of ecological value. Such practices could lead to new orders, new cultures and new knowledge, furthering a notion of an absorptive and assimilative layer of urbanism which can fit onto and into other conventions.

EQUITY, ECOLOGY AND EDUCATION AS A GOAL EQUALLY IMPORTANT TO ECONOMIC DEVELOPMENT:

The most important order of development is economic progress. Contemporary sectors of cities - where in ‘knowledge’ cities or ‘creative’ cities or otherwise seem to have a specific monetary goal and vision. But in cities where social orders are so divided, as in the case of Mumbai - this singular end of profit cannot lead to progressive living habitat. A healthy city must have to include models specifically catering to Equity of services, Ecology and it’s balance and Education about these above all, in order to move above this statis of division that plagues decision-making processes. This requires platforms of integration and creation of knowledge from all disciplines, and policies which can understand specific thesholds of balance and harmony, where one need does not consume the other. Such a sense of maturity of a city could be achieved by innovating the management models of spatial order, in ways that do not categorise needs in 2 dimensions but are able to integrate and monitor further complexities and overlaps - thus becoming a much more resilient (and thus spongy) system.





Throughout the mulling over the possibilities for this thesis, the need of a unique planning strategy that could cross the boundaries of ecological concerns, social concerns, cultural concerns, political concerns, administrative concerns - most of which clash with each other - became the key issue. How can a city hope to tailor-make a method of planning for itself that can propose projects which address particular contentions alongside projects which address others within a holistic framework of balance and harmony...

In *Urban Dialogues* and in *Reclaiming Mumbai*, Professors Bruno De Meulder, André Loeckx and Kelly Shannon quote the Spanish urbanist Joan Busquets claiming that two interesting registers — visions and actions — can be understood as a (urban) “project of projects” and between these two registers, a strategic structure planning that activates a third track, of communication or debate. A further extract says - “A variety of fields of knowledge are deployed in this analysis: urban history and morpho-typology, urban ecology and landscape, societal issues, such as the power game of decision-making or processes of inclusion and exclusion, architecture and urbanism, and, last but not least, local social knowledge concerning daily life in particular places. From the initial stages, architectural knowledge is present as a way to question the existing realities and spatial structures and the desired interplay between future urban space and urban functioning.”

This project of projects hopes to express a proposal towards just such an intervention for the conurbation of Mumbai. The coined notion of ‘Spongy Urbanism’ hopes to become a study of forms and methods to involve and absorb social, economic, political, administrative, natural and geographical capacities of all tacit and explicit natures all together form the complex substance of cities like Mumbai.

To end on a lighter note, I quote a friend who proposed an alternative title for this thesis - “Your thesis is between ‘Slum Dog Millionaire’ and ‘Spongebob Squarepants’ - maybe it should be called ‘Sponge park millionaire’”... Indeed, understandings of a strange, mixed and twisted sense are required to propose strategies in such urban areas of a such a complex nature.

For now, the thesis is still about the notions contained in this title - “ReCentering Mumbai: Appropriation of Thane Creek - exploring ‘Spongy Urbanism’.



Bibliography for “Visions” and conclusions:

1) Mission Make over – The Economic Times of India (ET) – 2/12/2010

2) How to win the mega city challenge – ET – 2/12/2010

3) Vision Mumbai – Transforming Mumbai into a World Class City – A Summary of Recommendations – A Bombay First – McKinsey Report

4) Remaking Mumbai – Rahul Mehrotra – Urban Age, Newspaper Essay, Nov 2007

5) Roads to come up faster and at a cheaper rate after Environment Minister’s visit to Mumbai - - Times of India (TOI) 16/04/2011

6) Green Road for Metro II – But Many Hurdles Ahead – TOI

7) Reort by Chitaranjan Tembhekar – TOI

8) Rs 2 Lakh Crores The Price of Making Mumbai World Class – Vidyadhar Date – Mumbai Mirror

9) Blinkered Vision – Sameera Khan – Architecture Time, Space and People Magazine of India , July 2005

10) Agenda for Bombay – Sharada Dwivedi –

11) Make Mumbai a City State – on Fali Nariman – Mumbai Mirror

12) Make Mumbai Special Administrative Area – TOI

13) Of Mangroves and Leopards – Prasad Shetty –

14) The Politics of the City – Amita Bhavisar ( As quoted in 13 above )

15) Urban Transportation in Mumbai – Bina C Balakrishnan

16) Who are the city’s biggest landlords? Nauzer Bharucha

17) “Reclaiming (the urbanism of) Mumbai” - edited by edited by Kelly Shannon and Janina Gosseye - Published by SUN Architecture, 2009

Bibliography for Water supply:

1) Liquid City - Karin Ann Schierhold – Mumbai Reader 08

2) This Time Tomorrow – Karin Ann Schierhold – Mumbai Reader 08

3) Mumbai will get two desalination plants – Times of India – 7/09/2010

4) Mumbai’s Sea Change – Anjali Joseph - & other articles – Indian Express News Service– Mumbai Reader 2008

5) Equitable Distribution of Drinking Water Supply In Municipal Corporations in Thane District – Sanjay Rode – Management Research and Practice Vol 1 Issue 1 (2009 - pp 14-25)

6) Mumbai’s Water Supply – Understanding our Community Issues – Series: Editor – Dr Nita Mukherjee – The Bombay Community Public Trust

Bibliography for Drainage

1) Maharashtra Floods - Wikipedia – [http://en.wikipedia.org/wiki/Maharashtra\\_floods\\_of\\_2005](http://en.wikipedia.org/wiki/Maharashtra_floods_of_2005) (accessed on 10/04/2011 )

2) Thane Creek- Wikipedia – [http:// en.wikipedia.org/wiki/Thane\\_ Creek](http://en.wikipedia.org/wiki/Thane_Creek) (accessed on 10/04/2011 )

3) Why Mumbai Choked – Chandraskekhar Prabhu – Article, Frontline Magazine, Article 22, Issue 17, Aug 13-26, 2005- India’s National Magazine from the Publishers of the Hindu

4) Down the Drain – R.Swaminathan – DNA – 14/10/2006

5) Integrated Coastal Management of Mumbai Metropolitan Region – Raj C. Murthy, Y.R.Rao. Arun B. Inamdar, - Ocean & Coastal Management 2001 Issue 44

6) Winged visitors give Mumbai the miss as wetlands shrink -Simi t Bhagat , Times of India, Nov 9, 2010

7) Monographs on flood hazards in urban India – Envis Centre on Human Settlements School of Planning and Architecture, New Delhi 110002

Bibliography for Thane Creek data:

1) Integrated coastal management of Mumbai metropolitan region - Raj C. Murthy, Y.R. Rao, Arun B. Inamdar - Ocean & Coastal Management 44 (2001) 355–369

2) The Ramsar concept of “wise use”: Ramsar Information Paper no. 7 - [http://www.ramsar.org/cda/en/ramsar-pubs-handbooks-handbooks4-e/main/ramsar/1-30-33%5E21323\\_4000\\_0\\_\\_](http://www.ramsar.org/cda/en/ramsar-pubs-handbooks-handbooks4-e/main/ramsar/1-30-33%5E21323_4000_0__)

3) Proposed Coastal Regulation Zone (CRZ) Amendments, 2010 - Ministry of Environment and Forests - Government of India

4) Numerical modeling for Thane creek - Indrani Gupta, Shivani Dhage, A.A. Chandorkar, Anjali Srivastav - Environmental Modelling & Software 19 (2004) 571–579

5) Landuse/Land Cover Change in Mumbai- Navi Mumbai Cities and Its Effects on the Drainage Basins and Channels- A Study Using GIS - H P SAMANT and V SUBRAMANYAN - Journal of the Indian Society of Remote Sensing, Vol. 26, No. 1&2, 1998

6) Mangrove Mapping and change detection around Mumbai (Bombay) using remotely sensed data - V. Vijay; R. S. Biradar; A. B. Inamdar; G. Deshmukhe; S. Baji and Madhavi Pikle - Indian Journal of Marine Sciences - Vol. 34 (3), September 2005, pp 310 -315

7) Study of Flora, intertidal Macrobenthic Fauna and Fishery of Ulhas River Estuary and Thane Creek to assess the pollution status and decide mitigation strategy - R. P. Athalye, N. N. Patil, M. U. Borkar, Goldin Quadros, and V.U. Somani - 211 pp. Zoology Dept; B. N. Bandodkar College of Science project report submitted to Mumbai Metropolitan Region - Environment Improvement Society. C/o MMRDA, Mumbai.

Bibliography for Multiple Agencies for Saltpan Lands:

1) Land &Development Office, Ministry of Shipping REPORT OF 2001-2

2) Survey conducted by Space & People Magazine’ India July 2005 as quoted in Mumbai Reader

3) From an extract of a reply given by Shri Shri Dilipkumar Mansukhlal Gandhi, Minister of State in the Ministry of Shipping in a written reply to Shri Chandrakant Khaire & Shri Kirit Somaiya in Lok Sabha

4) Splintering urbanism in Mumbai: Contrasting trends in a multilayered society - Marie-Hélène Zérah - Geoforum 39 (2008) 1922–19