SKYWARD SERENITY

Prathamesh Sunil Pednekar

SKYWARD SERENITY

PRATHAMESH PEDNEKAR

Thesis submitted to the faculty of the Virginia Polytechnic Institute and State University in partial fulfillment of the requirements for the degree of

Masters Of Architecture

in Architecture

Nathan King, Chair

Luis Ricardo Borunda Monsivais

Andrew Gipe-Lazarou

April 29th, 2024

Blacksburg, VA

Keywords: skyscraper, vertical city, vertical development

[ABSTRACT]

SKYWARD SERENITY

PRATHAMESH PEDNEKAR

ABSTRACT

This thesis explores the challenges of urban sprawl and land scarcity, focusing on Mumbai, a city constrained by geographical boundaries and marked by high population density. With Mumbai encircled by the sea on three sides, opportunities for horizontal expansion are severely limited, prompting the exploration of vertical development as a sustainable and innovative solution. This research proposes a vertical urban model that stacks traditional city sectors—residential, commercial, and recreational—within a compact vertical space. The aim is to house a growing population efficiently, while freeing ground-level areas for vital green spaces such as farms and public parks, especially targeting the eastern coast of Mumbai, the city's last undeveloped frontier.

A central element of the thesis is the design approach, which counters the typical social isolation found in high-rise living. Drawing inspiration from the communal dynamics of Mumbai's traditional chawls, the proposed architectural model merges communal living areas with private spaces to foster both community interaction and individual privacy. This hybrid design approach is thoroughly developed through an analysis of chawl lifestyles, adapting their community-enriching aspects to suit the demands of modern urban living in vertical structures.

By investigating the feasibility and benefits of vertical integration through detailed architectural designs and urban planning frameworks, this study not only addresses Mumbai's physical constraints but also prioritizes the psychological and social well-being of its inhabitants. The outcome is a holistic urban development model that not only enhances urban life quality but also provides a template for other densely populated cities facing similar challenges. This thesis sets a precedent for future urban planning endeavors, promoting a balanced, sustainable approach to city development that can be adapted globally.

SKYWARD SERENITY

PRATHAMESH PEDNEKAR

GENERAL PUBLIC ABSTRACT

This thesis investigates the problems of limited land and the spreading out of cities, particularly looking at Mumbai. Mumbai is a crowded city that can't grow much sideways because it's surrounded by the sea on three sides. To manage this, the study suggests building upwards, stacking different parts of the city—like places where people live, work, and play—on top of each other in tall buildings. This way, more people can live and work in less space, and the ground can be used for parks and farms, especially on the eastern side of Mumbai which hasn't been developed much yet.

A significant part of this project is creating building designs that help people feel connected to their community, even in tall buildings where it's easy to feel isolated. It takes inspiration from Mumbai's traditional chawl homes, where everyone shares some spaces and knows their neighbors well. The idea is to mix private spaces where people can have their privacy with shared areas where they can meet and spend time with others.

By exploring ways to build up instead of out, the study not only finds solutions for Mumbai's lack of space but also looks after the mental and social health of its residents. The final goal is a new way of building cities that makes life better for people and can be used by other crowded cities around the world. This work aims to show a way forward for city planning that is thoughtful and can be applied globally.

ACKNOWLEDGMENT

I am profoundly grateful to my family— my mummy, papa, and Aaji for their unwavering support and blessings. They have encouraged me at every step of this journey. I would like to Thank my sister Aditi for inspiring me to pursuing architecture and guiding on every stepping stone. A special thanks goes to my best friend and roommate, Nupur, for her constant motivation and for always taking care of me.

Thankful,

To Nathan, for his trust in my decisions and his concise, valuable inputs.

To Luis, for offering a unique perspective at every stage of the project.

To Andrew, for his expert guidance and the insightful discussions that challenged and expanded our thinking.

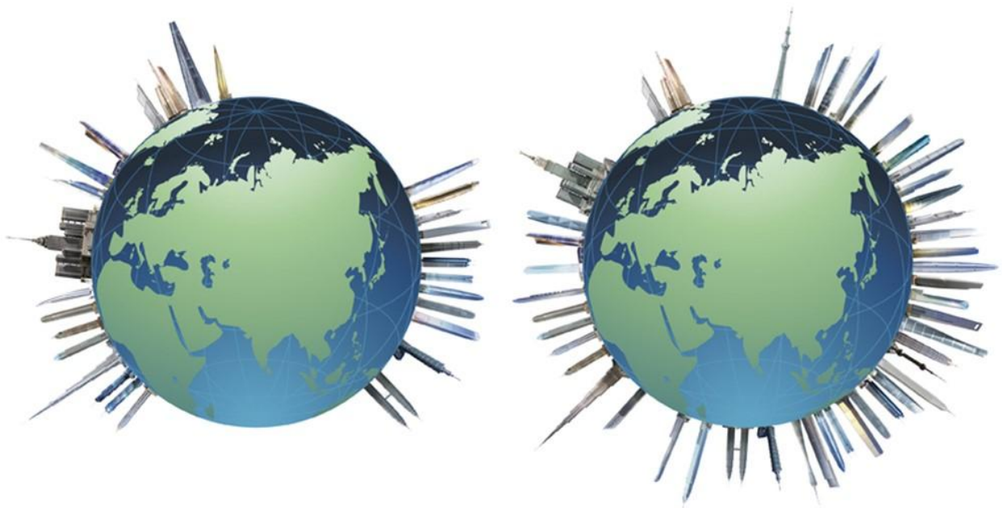
[TABLE OF CONTENT]

TABLE OF CONTENT

[INTRODUCTION]

THE HOW AND WHY OF SKYSCRAPERS

For more over ten millennia, towers and lofty structures have been utilized for communication, defense surveillance, and clock visibility. Even though skyscrapers are undoubtedly more modern, they are still more than a century old. Skyscrapers are constructed with a specific function in mind, much like towers. Three of the main motivations behind the construction of skyscrapers were to lower housing costs, equalize inequality, and enable more people to dwell in urban areas. Depending on where you check, things may or may not still be true today. [Kevin Forestell,2020]



Evolution of skyscrapers around the globe.

WHY WERE SKYSCRAPERS BUILT? [THE PURPOSE]

Buildings known for more than just their towering height have several purposes in urban settings. The following are some main justifications for building skyscrapers:

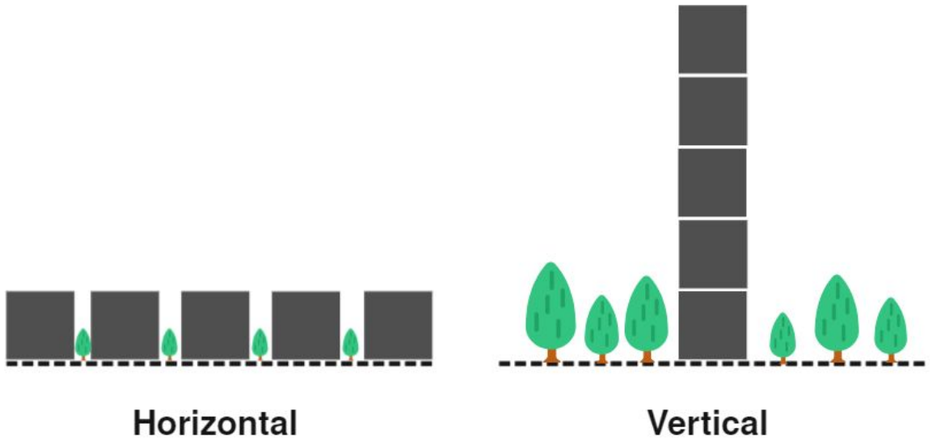
- **Maximizing Limited Space:** Building higher is a sensible approach in highly populated cities where land is expensive and scarce. A larger number of people and businesses can occupy a smaller amount of land thanks to skyscrapers.
- **Economic Symbolism:**Skyscrapers are frequently associated with economic power and advancement. They are frequently connected to financial and commercial hubs and can serve as a symbol of the economic development of a nation or community.
- **Architectural Innovation:** Creating skyscrapers challenges the limits of engineering and architectural design. They serve as a tribute to both human genius and the ongoing development of building technologies.
- **Concentration of Resources:** Skyscrapers are able to host a variety of buildings together, including homes, hotels, restaurants, and offices. Utilizing infrastructure and resources more effectively may result from this specialization.
- **Urban Landmark:** Skyscrapers frequently turn into recognizable landmarks that contribute to the skyline and character of a city. They could develop into tourist destinations and sources of community pride.
- **Environmental Aspects:** It may surprise you to learn that, when constructed responsibly, skyscrapers can use less energy than single-story structures housing the same number of people. They can lessen overall urban sprawl and integrate green technologies.

Skyscrapers were made possible by advances in the understanding and use of steel and iron in construction. More precisely, the Bessemer Process, which produced bulk steel beans, paved the path for skyscrapers. All bets were off now that high-quality iron beams could be made more quickly and affordably. Architects and builders may invent and conjure up new constructions that previously seemed impossible.

As skyscrapers grew more feasible and the first one was erected, city planners, architects, and engineers were captivated by the opportunity to pack more people into smaller spaces, so providing more housing - preferably at a lower cost. However, the first skyscraper was not a residential building at all.

A major factor in the rise in popularity of skyscrapers was the large-scale urban migration. Because they are easily accessible, near restaurants, shopping, events, and transportation hubs, city centers are desirable places to live. Despite their origins as office buildings in urban areas, they are also gaining popularity as a kind of home.

Ideally, cheaper pricing for buying or renting would have resulted from the idea of cramming more people into a smaller area of land and constructing upwards. It appears that the contrary has occurred. Living in the center of a city and close to all the activities has come to be associated with condos as a luxurious lifestyle.



Vertical Development
Vs
Horizontal Development

FIRST SKYSCRAPER

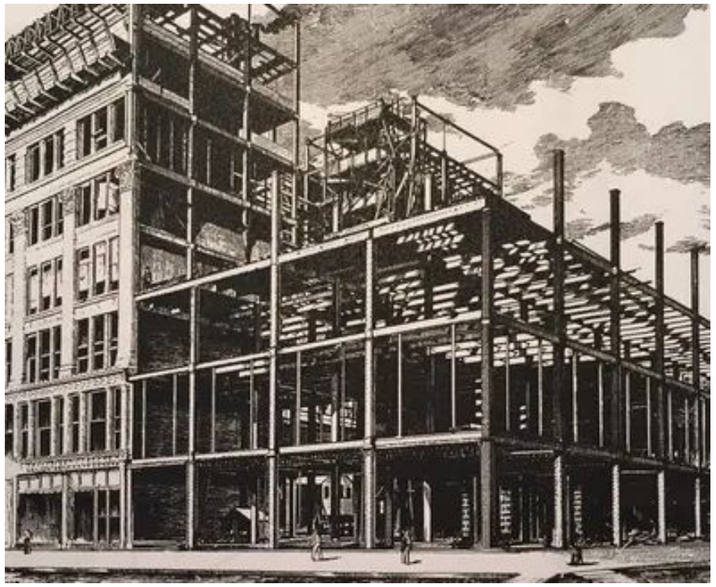
In Chicago, Illinois, a skyscraper was constructed for the first time in 1885. It was a William LeBaron Jenney-designed ten-story home insurance building. The structure was built using a "modern" (or, to put it another way, "modern for the 1880s") steel frame, which allowed it to be taller and more stable than a structure made of masonry.Chicago saw unprecedented mass development after a fire devastated the city in 1871.

Rebuilding the city was intended to provide the foundation for its economic development and revival. The Home Insurance Building was intended to be located in the heart of the economic core of Chicago. Instead of using bricks and wood, they intended it to serve as a model example of current building styles that use steel, iron, and stone. Other contemporary features like secure elevators and plumbing were also included in the structure.

First Skyscraper.

THE SKEPTICISM OF HITTING NEW HEIGHTS

The project was actually put on hold by local officials due to concerns that the 138-foot structure would topple over. It's incredible to think that the Burj Khalifa, one of the world's tallest structures, rises more than 2,716 feet into the sky. Before authorizing the project to move further, authorities carried out a variety of safety inspections and testing. The structure was expanded by two storeys in 1890. The LaSalle Bank Building was constructed in its place after the building was destroyed in 1931.[Kevin Forestell,2020]



https://dozr.com/blog/skyscrapers

Framework used to build a skyscraper

THE EVOLUTION OF THE TERM “SKYSCRAPER”

You might be asking why a structure of ten stories was ever called a "skyscraper." Actually, since the 1880s, the term's classification has changed. A skyscraper at the time required to have ten stories or more. With the advancement of technology in the 20th century, this classification became too accessible.

THE GROUPING OF CONTEMPORARY SKYSCRAPERS

These days, a structure can only be referred to be a skyscraper if it is free-standing, has more than forty stories, and is higher than 150 meters (492 feet) without the need for tension wires or other supports. Another requirement for classifying a building as a skyscraper is that 50% of its floor area must be livable. For this reason, the CN Tower in Toronto, for instance, is referred to as a tower rather than a skyscraper. [Kevin Forestell,2020]

TODAY'S SKYSCRAPERS

Skyscrapers have developed into recognizable structures that practically challenge contemporary architects. Supertall and megatall structures, which are categorized as being higher than 300 and 600 meters, are now considered subclasses of skyscrapers.

The Jeddah Tower in Saudi Arabia is expected to be the tallest skyscraper in the world. It was scheduled to be completed in 2020 and began in April of that year. But the construction hasn't been going as planned. When the skyscraper is finished, it should have more than 200 stories and rise more than 3,280 feet into the sky. The construction of it will cost more than $2.2 billion.

Jeddah Tower.

THE GLOBAL RUSH TO BUILD NEW SKYSCRAPERS

*Building name, City (COUNTRY). Year..... Metres**	*Building name, City (COUNTRY). Year..... Metres**	*Building name, City (COUNTRY). Year..... Metres**
1. **Youguo Temple**, Kaifeng (CHN). 1049 ..... 56.4 ▲	*35.* **Tianning Temp.**, Changzhou (CHN). 2007.... 153.8 ▲	*69.* **The Center**, Hong Kong (CHN). 1998 ..... 346.0 ▲
2. **Saint Basil's Cath.**, Moscow (RUS). 1561 ..... 47.5 ▲	*36.* **Notre-Dame Cath.**, Paris (FRA). 1345 ..... 96.0 ▲	*70.* **The Torch**, Dubai (UAE). 2011 ..... 336.8 ▲
3. **Leaning Tower**, Pisa (ITA). 1372 ..... 55.8 ▲	*37.* **Statue of Liberty**, NY (USA). 1886..... 93.0 ▲	*71.* **Burj Al Arab**, Dubai (UAE). 1999 ..... 321.0 ▲
4. **Sakyamuni Pagoda**, Yingxian (CHN). 1056... 67.3 ▲	*38.* **Berlin Cathedral**, Berlin (DEU). 1905 ..... 116.5 ▲	*72.* **Cayan Tower**, Dubai (UAE). 2013 ..... 307.3 ▲
5. **Giralda**, Seville (ESP). 1568 ..... 104.1 ▲	*39.* **Mangia Tower**, Siena (ITA). 1348..... 102.0 ▲	*73.* **Chrysler Building**, NY (USA). 1930..... 318.9 ▲
6. **Yellow Crane T.**, Wuhan (CHN). 1985 (reno).... 51.0 ▲	*40.* **Agbar Tower**, Barcelona (SPN). 2004 ..... 144.4 ▲	*74.* **Q1 Tower**, Gold Coast (AUS). 2005 ..... 322.5 ▲
7. **Temple of Kukulkan**, Tinum (MEX).ca800 ... 30.0 ▲	*41.* **Hopewell Centre**, Hong Kong (CHN). 1961.... 222.0 ▲	*75.* **The Index**, Dubai (UAE). 2010 ..... 326.0 ▲
8. **Himeji Castle**, Himeji (JPN). 1346..... 46.0 ▲	*42.* **Dai Heiwa Kinen Tō**, Osaka (JPN). 1970..... 180.0 ▲	*76.* **Almas Tower**, Dubai (UAE). 2008 ..... 360.0 ▲
9. **Giant Wild Goose Pag.**, Xian (CHN). 652 ..... 64.5 ▲	*43.* **Singer Building**, NY (USA). 1908 ..... 186.6 ▲	*77.* **Marina 101**, Dubai (UAE). 2015 ..... 426.5 ▲
10. **St. Paul's Cathedral**, Macau (CHN). 1640.... 25.8 ▲	*44.* **Bank of America**, Houston (USA). 1983..... 237.8 ▲	*78.* **Zifeng Tower**, Nanjing (CHN). 2010..... 450.0 ▲
11. **Angkor Wat**, Angkor (KHM). ca150..... 57.9 ▲	*45.* **Palace Cul.& Sci.**, Warsaw (POL). 1955..... 237.0 ▲	*79.* **Empire State Building**, NY (USA). 1931..... 443.2 ▲
12. **Colosseum**, Rome (ITA). A.D.82 ..... 47.8 ▲	*46.* **Capital Gate T.**, Abu Dhabi (UAE). 2011 ..... 164.7 ▲	*80.* **Shun Hing Sq.**, Shenzhen (CHN). 1996 ..... 384.0 ▲
13. **Parthenon**, Athens (GRC). 438 B.C. ..... 13.7 ▲	*47.* **500 Fifth Av.**, NY (USA). 1931 ..... 212.5 ▲	*81.* **Petronas T1**, Kuala Lumpur (MYS). 1998 ... 451.9 ▲
14. **Leifeng Pagoda**, Hangzhou (CHN). 975 ..... 71.0 ▲	*48.* **Woolworth Building**, NY (USA). 1913 ..... 241.4 ▲	*82.* **CITIC Plaza**, Guangzhou (CHN). 1996 ..... 390.2 ▲
15. **Guggenheim Museum**, Bilbao (SPN). 1997... 53.0 ▲	*49.* **Philadelphia City Hall**, Phi. (USA). 1901 ..... 167.0 ▲	*83.* **Bank of America**, NY (USA). 2009..... 365.8 ▲
16. **Porcelain Tower**, Nanjing (CHN). ca1420..... 79.0 ▲	*50.* **30 St Mary Axe**, London (GBR). 2003 ..... 179.8 ▲	*84.* **Al Hamra**, Kuwait (KWT). 2011..... 412.6 ▲
17. **World Building**, NY (USA). 1890 ..... 106.4 ▲	*51.* **Carnegie Hall T.**, NY (USA). 1991..... 230.7 ▲	*85.* **Two IFC**, Hong Kong (CHN). 2003 ..... 412.0 ▲
18. **U.S.Capitol**, Washington D.C.(USA). 1863 .... 87.8 ▲	*52.* **Metropolitan Life**, NY (USA). 1909..... 213.4 ▲	*86.* **Trump INT**, Chicago (USA). 2009..... 423.2 ▲
19. **Park Row Building**, NY (USA). 1899..... 119.2 ▲	*53.* **Pan Am Building**, NY (USA). 1963 ..... 246.3 ▲	*87.* **Jin Mao Tower**, Shanghai (CHN). 1999..... 420.5 ▲
20. **Flatiron Building**, NY (USA). 1902..... 86.9 ▲	*54.* **Lake Point T.**,Chicago (USA). 1968..... 196.5 ▲	*88.* **John Hancock**, Chicago (USA). 1969 ..... 457.2 ▲
21. **Taj Mahal**, Agra (IND). 1648 ..... 73.0 ▲	*55.* **GE Building-Rockefeller**, NY (USA). 1933.... 259.1 ▲	*89.* **Guangzhou IFC**. Guangzhou (CHN). 2010.... 438.6 ▲
22. **Wat Arun**, Bangkok (THA). ca1820 (reno) ..... 79.0 ▲	*56.* **CCTV Headquarters**, Beijing (CHN). 2012 .... 237.5 ▲	*90.* **KK100**, Shenzhen (CHN). 2011 ..... 441.8 ▲
23. **Palace of Westminster**, Lond.(GBR). 1859... 120.7 ▲	*57.* **The Shard**, London (GBR). 2013..... 306.0 ▲	*91.* **Princess Tower**, Dubai (UAE). 2012 ..... 414.0 ▲
24. **Neuschwanstein Castle**, (DEU). 1892 ..... 90.0 ▲	*58.* **Torre Costanera**, Santiago (CHL). 2014..... 300.0 ▲	*92.* **Willis Tower**, Chicago (USA). 1974 ..... 527.0 ▲
25. **St. Paul's Cathedral**, London (GBR). 1710 ... 111.3 ▲	*59.* **Capital City MT.** Moscow. (RUS). 2010..... 309.8 ▲	*93.* **ICC**, Hong Kong (CHN). 2010..... 484.0 ▲
26. **Sta. Maria del Fiore**, Florence (ITA). 1471.... 114.5 ▲	*60.* **Mercury City**, Moscow (RUS). 2013..... 338.8 ▲	*94.* **Shanghai WFC**, Shanghai (CHN). 2008..... 494.3 ▲
27. **St. Peter's Basilica**, Vatican City. 1626..... 138.0 ▲	*61.* **Grand Lisboa**, Macau (CHN). 2008..... 258.0 ▲	*95.* **Federation Towers**. Moscow (RUS). 2016... 506.0 ▲
28. **Washington Monument**, (USA). 1884 ..... 169.2 ▲	*62.* **HSBC Building**, Hong Kong (CHN). 1985 .... 178.8 ▲	*96.* **Taipei 101**, Taiwan (CHN). 2004..... 508.0 ▲
29. **Pittsfield**, Chicago (USA). 1927 ..... 168.0 ▲	*63.* **Baiyoke TII**, Bangkok (THA). 1997 ..... 328.4 ▲	*97.* **One WTC**, New York (USA). 1972..... 526.7 ▲
30. **Potala Palace**, Lhasa (CHN).1645 (reno) ..... 117.0 ▲	*64.* **Eiffel Tower**, Paris (FRA). 1889 ..... 324.0 ▲	*98.* **One WTC**, New York (USA). 2014..... 546.2 ▲
31. **Sydney Opera House**, Sydney (AUS). 1973... 65.0 ▲	*65.* **Bank of China**, Hong Kong (CHN). 1990..... 367.4 ▲	*99.* **Abraj Al Bait Tower**, Mecca (KSA). 2012 .... 601.0 ▲
32. **Pyramid of the Sun**, Teotih.(MEX). ca200 .... 71.2 ▲	*66.* **F&F Tower**, Panama City (PAN). 2011 ..... 236.4 ▲	*100.* **Shanghai Tower**, Shanghai (CHN). 2015 .... 632.0 ▲
33. **Great Pyramid**, Giza (EGY).ca2550 B.C. ..... 146.5 ▲	*67.* **Central Plaza**, Hong Kong (CHN). 1992 ..... 373.9 ▲	*101.* **Burj Khalifa**, Dubai (UAE). 2010..... 829.8 ▲
34. **Cologne Cathedral**, Cologne (DEU). 1880 ... 157.4 ▲	*68.* **The Trump Building**, NY (USA). 1930..... 282.6 ▲	*102.* **Kingdom Tower**, Jeddah (KSA). 2019..... 1,007.0 ▲

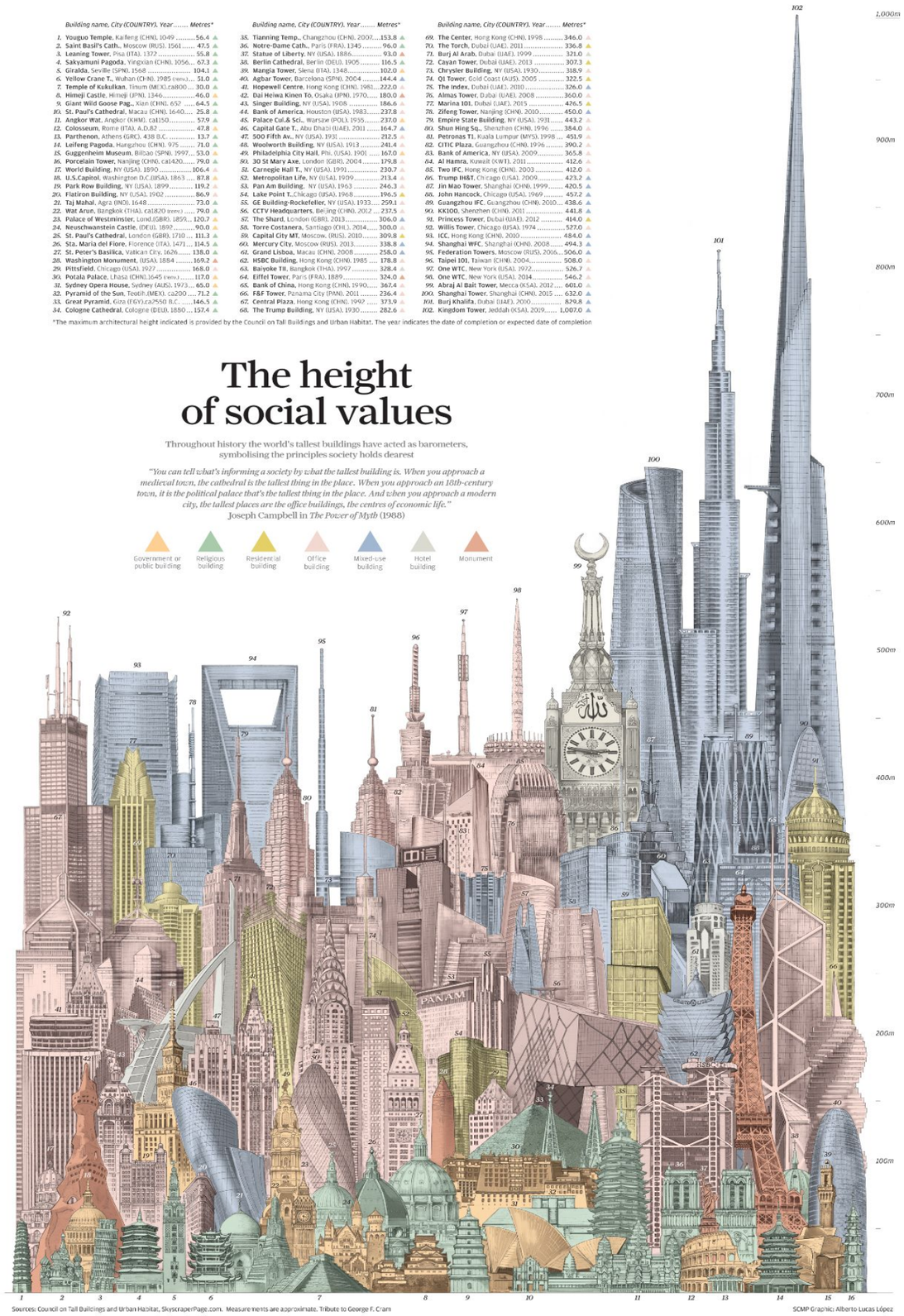
*The maximum architectural height indicated is provided by the Council on Tall Buildings and Urban Habitat. The year indicates the date of completion or expected date of completion

The height of social values

Throughout history the world's tallest buildings have acted as barometers, symbolising the principles society holds dearest

"You can tell what's informing a society by what the tallest building is. When you approach a medieval town, the cathedral is the tallest thing in the place. When you approach an 18th-century town, it is the political palace that's the tallest thing in the place. And when you approach a modern city, the tallest places are the office buildings, the centres of economic life."
Joseph Campbell in *The Power of Myth* (1988)

Government or public building · Religious building · Residential building · Office building · Mixed-use building · Hotel building · Monument



Sources: Council on Tall Buildings and Urban Habitat, SkyscraperPage.com. Measurements are approximate. Tribute to George F. Cram

SCMP Graphics: Alberto Lucas López

https://2015.sopawards.com/wp-content/uploads/2012/11/The-height-of-social-values.pdf

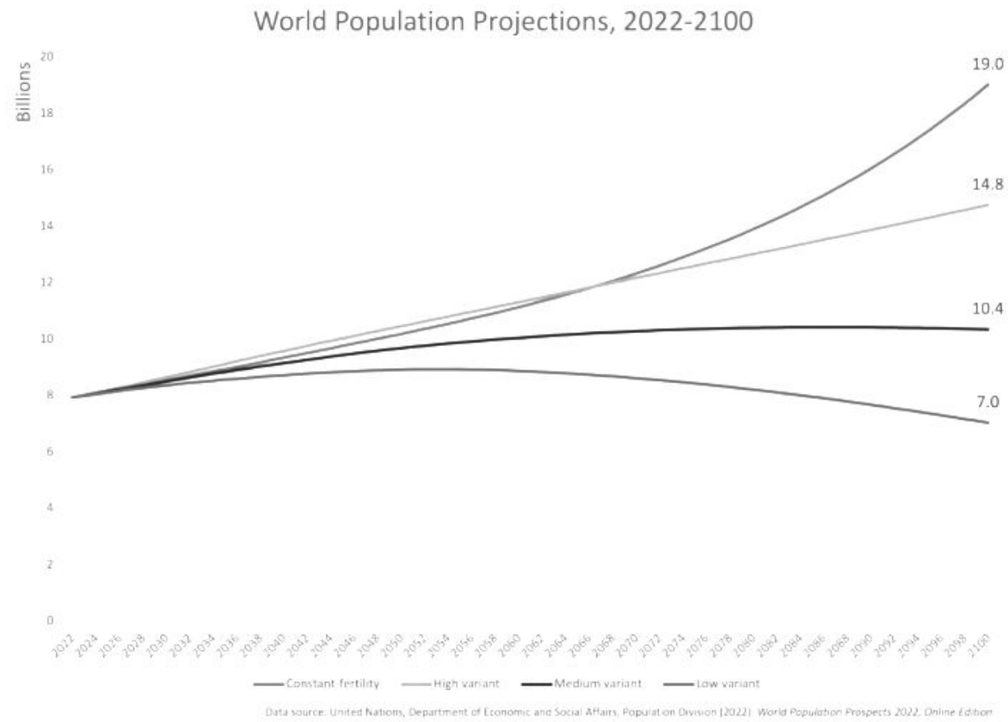
[RESEARCH]

RESEARCH QUESTION

HOW SKYSCRAPERS ARE THE FUTURE OF URBAN GROWTH ?

STATISTICS AND CITY SELECTIONS

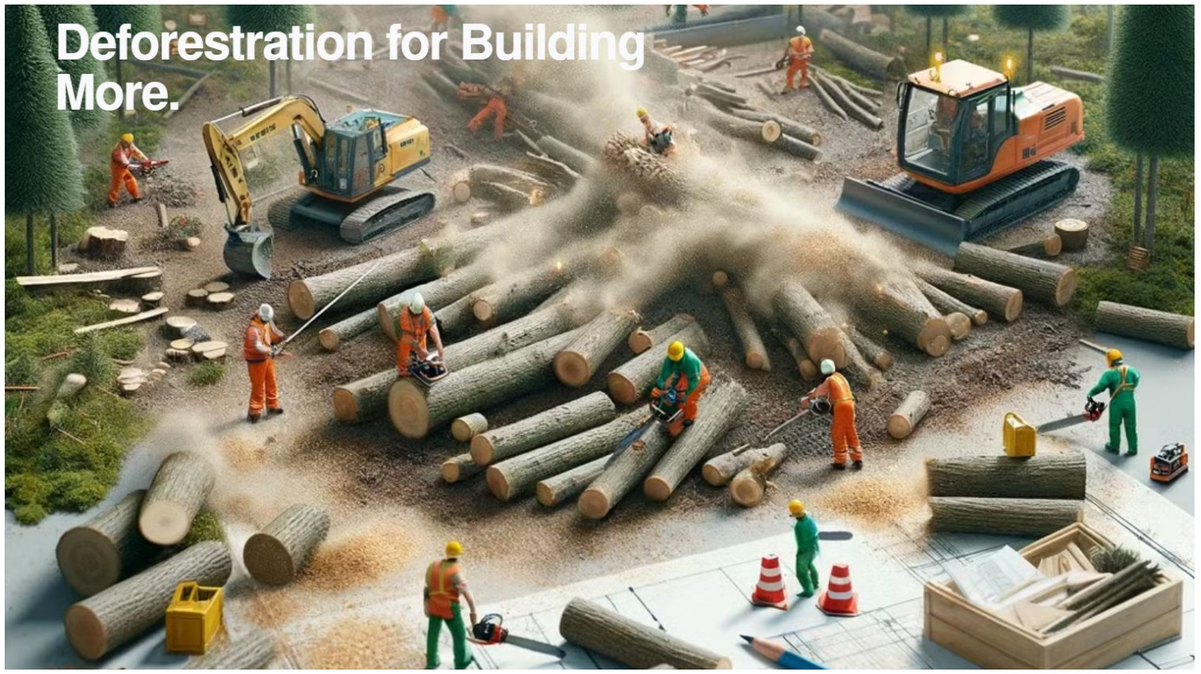
World population will be **19 Billion** by 2100.



Population Growth graph

Where will we accommodate the growing population?

EFFECTS OF SCARCITY OF LAND TO CONSTRUCT



CREATED USING DALL·E

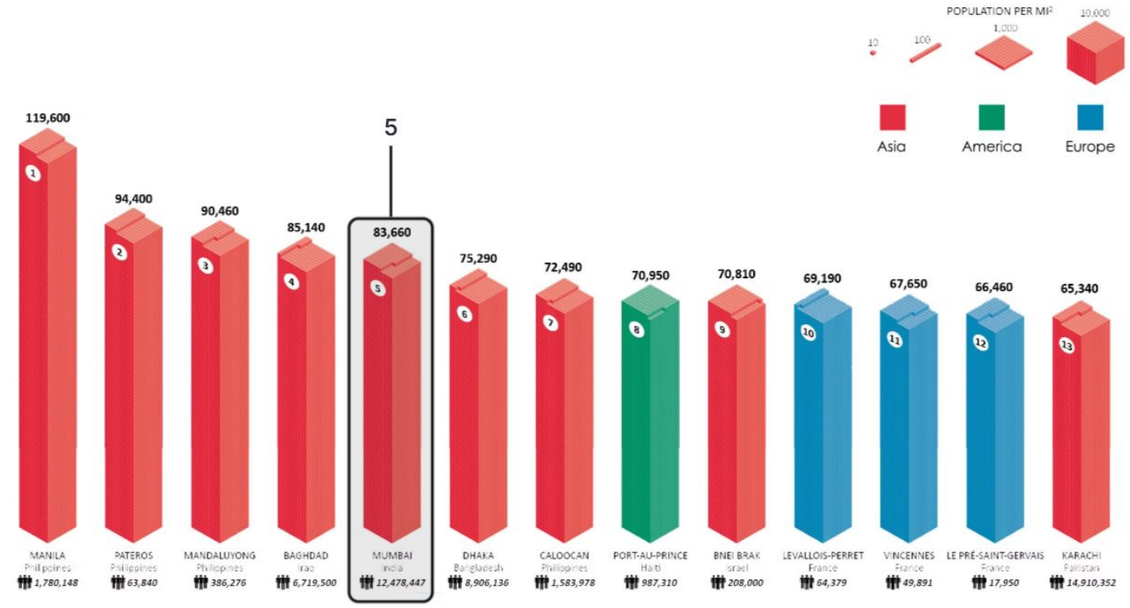
Deforestation driven by the scarcity of land for construction is a critical environmental issue. As urban areas expand and the demand for residential and commercial spaces increases, forests are often cleared to accommodate new developments. This process not only results in the loss of valuable forest ecosystems but also disrupts biodiversity, contributes to the increase in atmospheric CO_2 levels, and exacerbates climate change. The removal of trees without adequate reforestation also leads to soil erosion, reduces water quality, and can cause a significant alteration in the local climate. Addressing this issue requires thoughtful urban planning and sustainable development practices that balance the need for growth with the preservation of natural habitats.

CREATED USING DALL·E

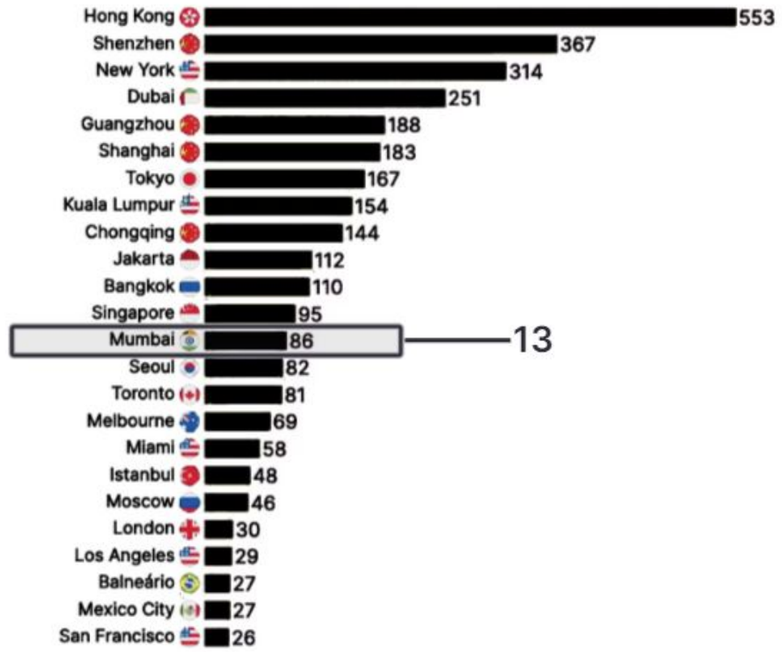
The construction of man-made islands to address land scarcity represents an innovative yet environmentally contentious solution. While these developments can provide much-needed space for urban expansion, tourism, and infrastructure, they also pose significant environmental risks. The creation of artificial islands often involves extensive dredging and land reclamation, which disrupts marine ecosystems, damages coral reefs, and affects the natural flow of currents and sedimentation. This can lead to decreased fish populations, poorer water quality, and the loss of habitats for marine and coastal species. Moreover, such projects typically require a massive input of resources and energy, contributing to carbon emissions and further stressing environmental systems. The long-term impacts include increased vulnerability to storms and rising sea levels, underscoring the need for careful ecological assessments and sustainable practices in such ventures.

CREATED USING DALL·E

The peak of urban sprawl, driven by the scarcity of land, poses significant environmental challenges. As cities expand outward into suburban and rural areas, this sprawling growth consumes vast tracts of undeveloped land, leading to habitat destruction, loss of agricultural soil, and increased greenhouse gas emissions from commuting. Urban sprawl often results in inefficient land use with low-density developments that require more infrastructure and energy per capita compared to more compact urban areas. Additionally, the increased reliance on automobiles due to longer distances between homes, workplaces, and essential services exacerbates air pollution and contributes to traffic congestion. This pattern of development not only impacts local wildlife and ecosystems but also strains water resources and increases surface runoff, leading to more severe flooding and water quality issues. Addressing urban sprawl requires integrated land use planning and promoting sustainable urban development strategies that focus on densification and public transit accessibility.

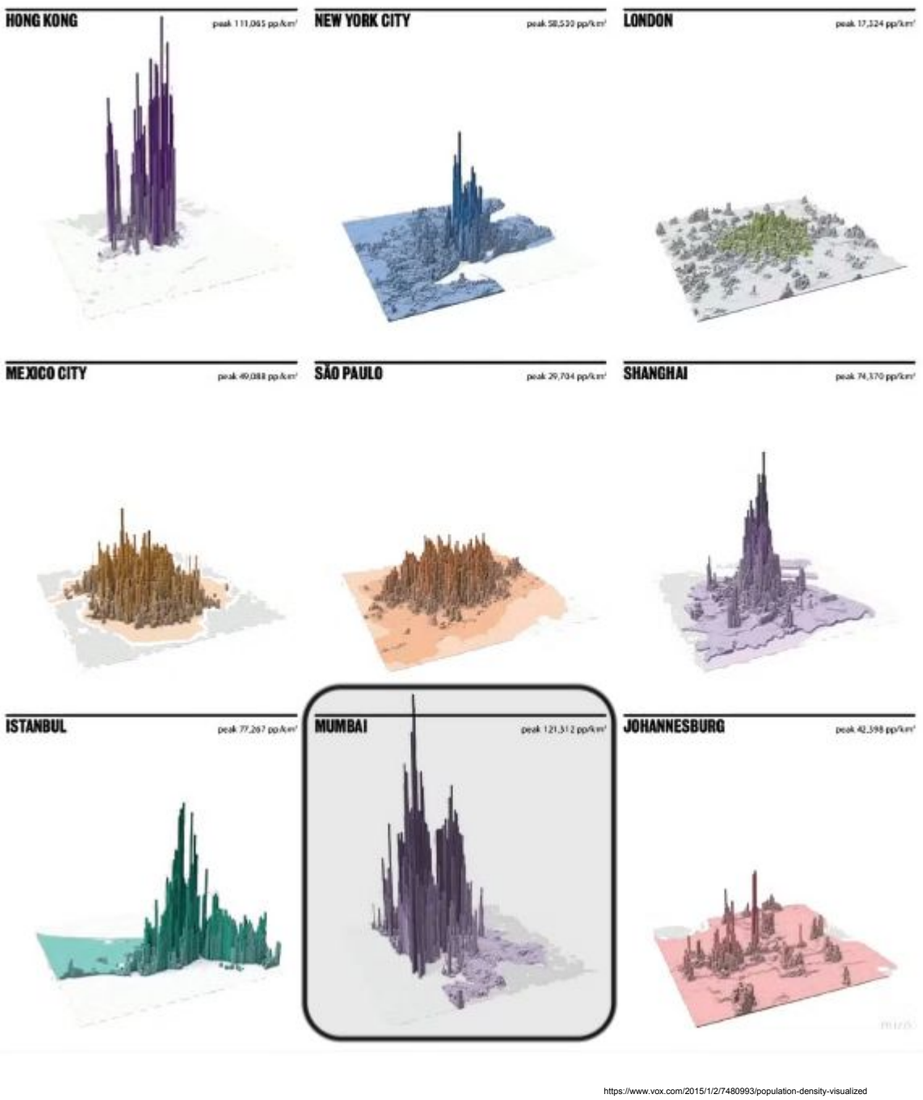


Top 10 Most Densely populated Cities.



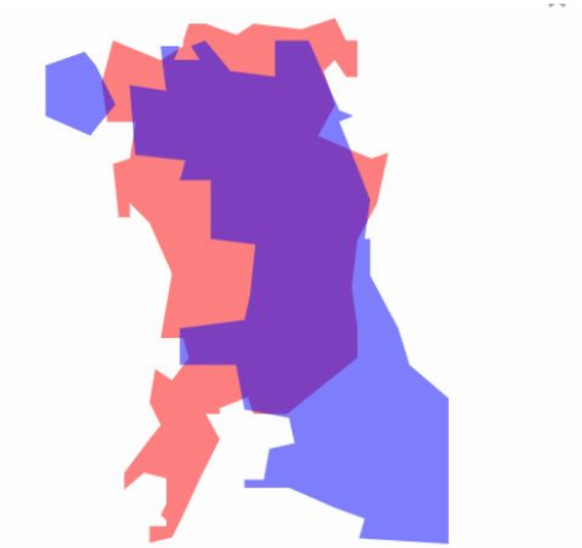
Cities with Most Skyscrapers Built

POPULATION DENSITY DIAGRAM OF MUMBAI COMPARED OF OTHER MAJOR CITIES



https://www.vox.com/2015/1/2/7480993/population-density-visualized

Population density Diagram of major cities around the world.



Mumbai and Chicago have same Geographical Area.

But

Population of Mumbai is 22 M and Chicago is 2.5 M

Hong Kong city is 1.83 times Mumbai

But

Population of Mumbai is 22 M and Hong Kong is 7 M

Area of New York city is 1.30 times of Mumbai

But

Population of Mumbai is 22 M and NYC is 8.5 M

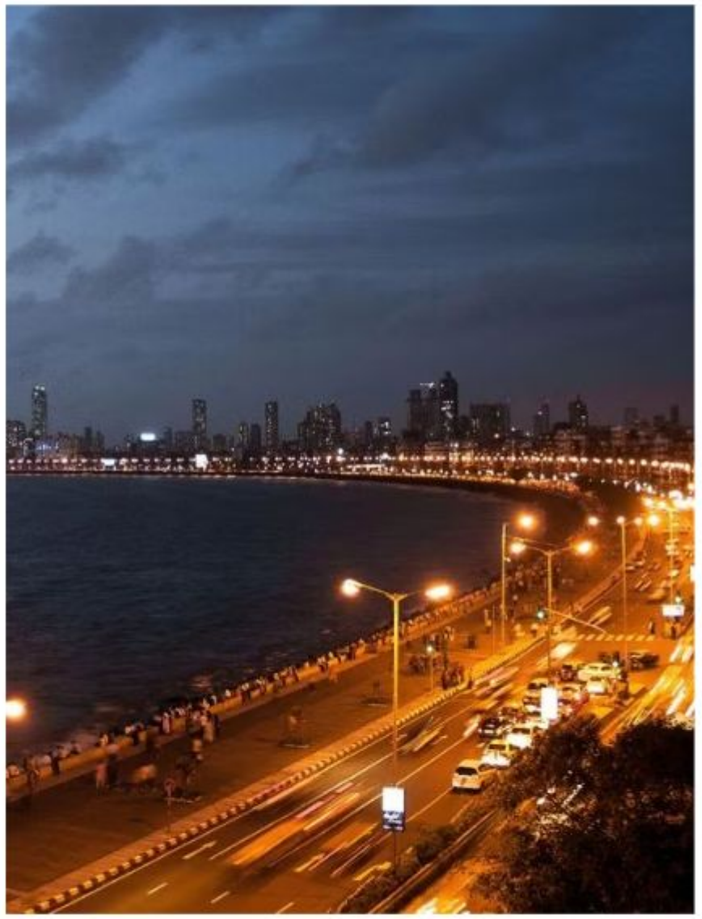
LOW FSI OF MUMBAI

BURSTING AT ITS SEAMS		
CITY	FSI	DENSITY
Mumbai	2.5-5	32,400
OTHER INDIAN CITIES		
Delhi	1.2-3.5	12,100
Chennai	1.5	10,000
CITIES WITH HIGH *FSI*		
Los Angeles	13	2,400
New York	15	1,800
Denver	17	1,500
Tokyo	20	4,400
Hong Kong	12	26,400

FSI of mumbai raised from 2.5 to 5 a year ago but its still less than other major cities around the world.

ESSENCE OF MUMBAI

Mumbai, often hailed as the "City of Dreams," magnetizes a vast influx of individuals from rural areas across India, drawn by the allure of economic opportunities and the promise of a better life. This migration has dramatically increased the population density of the city, making it one of the most densely populated urban areas in the world. As people flock to the city, the demand for housing, services, and infrastructure skyrockets, leading to overcrowded living conditions and the rapid expansion of both formal and informal housing sectors. Slums and makeshift settlements often emerge, lacking basic sanitation and adequate facilities, which pose significant health and safety risks. Moreover, the strain on Mumbai’s resources affects the quality of life, with issues such as water scarcity, waste management challenges, and severe traffic congestion becoming increasingly prevalent. The city’s infrastructure struggles to keep pace with its growing population, highlighting the urgent need for comprehensive urban planning and sustainable development initiatives to accommodate its burgeoning populace while ensuring a livable environment for all.



Marine Drive

Marine Drive, a picturesque boulevard in Mumbai, traces a sweeping arc along the Arabian Sea coast, creating a stunning 3.6-kilometer-long promenade. Known as the Queen's Necklace for its sparkling street lights that resemble a string of pearls at night, it's a favored spot for both locals and tourists seeking respite and spectacular sunset views. This iconic landmark encapsulates the vibrant spirit of Mumbai, offering a scenic escape amidst the bustling city life.

Mumbai Local Train

The Mumbai local train network, often termed the lifeline of the city, ferries millions of commuters daily across its extensive and bustling routes. Renowned for its efficiency and the sheer volume of passengers it handles, the trains are a quintessential part of Mumbai's fast-paced life. Despite the crowd and rush, it remains the most cost-effective and time-saving mode of transportation in the sprawling metropolis.

CHAWLS OF MUMBAI

Chawls of Mumbai

A Mumbai chawl represents a unique type of residential building prevalent in the city, typically consisting of multi-storied structures divided into small, single-room tenements. These chawls, often characterized by their communal living arrangements, have shared amenities like bathrooms and water taps, fostering a close-knit sense of community among residents. Despite the cramped conditions, chawls remain a vital aspect of Mumbai's urban culture, illustrating the city's socio-economic diversity and the resilience of its inhabitants.

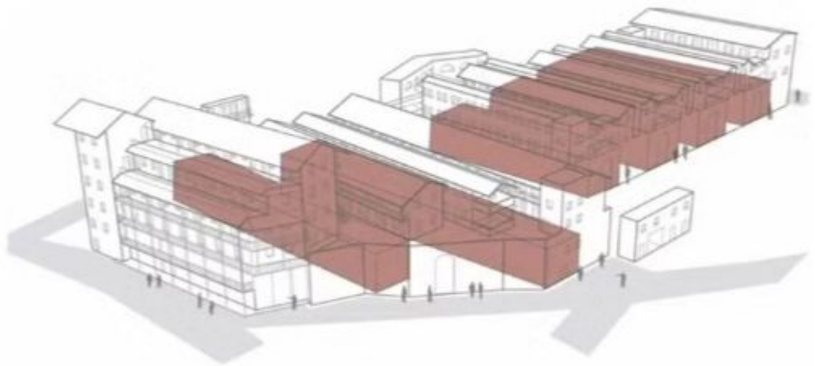
SWADESHI CHAWL

Swadeshi Market in Mumbai is known for its vibrant and bustling atmosphere, rather than a distinct architectural style. This market, situated in the heart of the city, is packed into a relatively compact area, featuring a series of small shops and stalls that showcase an array of goods, from fabrics and clothing to accessories and household items. The architecture of Swadeshi Market is typically functional, designed to maximize space utilization with multi-tiered stalls and narrow lanes that snake through the market. This setup reflects the practical needs of a high-density trading environment where the focus is more on the commercial activity and the lively interactions than on architectural aesthetics. The overall ambiance is one of dynamic commerce, with the architecture serving more as a backdrop to the colorful and often chaotic trade activities.

Swadeshi Chawl Front Elevation

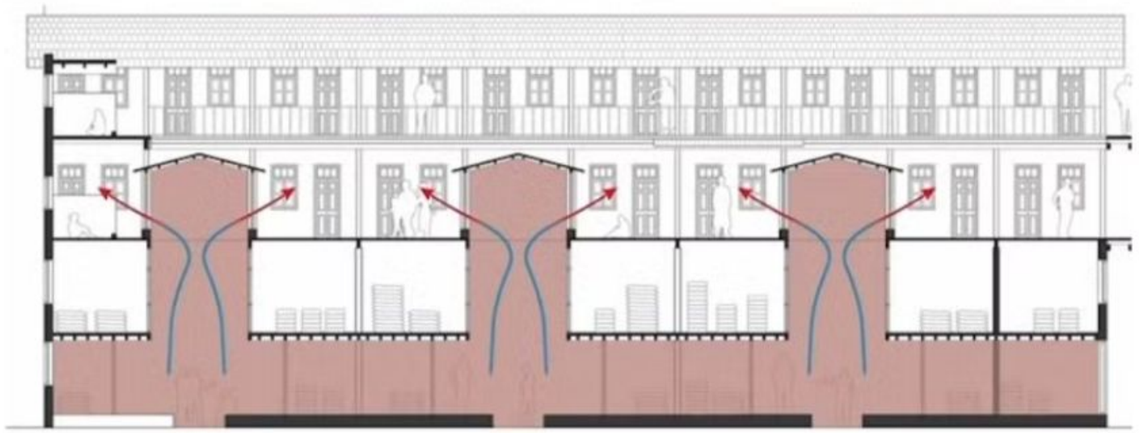
SWADESHI CHAWL

The marked sections in the illustrations below indicate the locations of the markets. Typically, street markets are situated alongside buildings. However, in the case of Swadeshi Chawl, the market extends inside the building, serving as a thoroughfare that links the streets both above and below. This arrangement not only facilitates commercial activity but also functions as an open-to-sky courtyard for the residential units situated above the retail spaces.



Swadeshi Chawl with highlighted market spaces

This architectural design enhances visual connectivity among the residents, fostering a sense of community interaction. The open courtyard allows for ample natural light and air circulation, creating a pleasant and communal environment where residents can interact and engage with each other. This layout not only supports the vibrancy of the market but also strengthens the social fabric of the community living above it, making the market a central and integral part of everyday life in Swadeshi Chawl.



Swadeshi Chawl section

Swadeshi Chawl courtyard.

The Photograph is an image of one of its courtyard of swadeshi chawl.

BHATIA CHAWL

Bhatia Chawl has a courtyard where height of courtyard is double the width of courtyard. This allows visual connectivity for the residents in the common balcony of the chawl.

Bhatia Chawl Section

Bhatia Chawl courtyard

COMMON BALCONY AND COURTYARD

Common balconies in chawls play a crucial role in fostering public interaction among residents. These shared spaces, often running the length of the building, provide a communal area where daily life visibly intertwines. Unlike private balconies, these common areas are accessible to all residents of the floor, making them a bustling hub of activity throughout the day.

These balconies serve multiple functions: they are places where residents can dry clothes, children can play under the watchful eyes of neighbors, and adults can engage in conversation and share news. The proximity encouraged by the shared balcony space naturally leads to the development of close-knit relationships and a strong sense of community. In the context of urban living, where personal space is limited, these communal balconies become vital social venues, offering residents opportunities for socializing and mutual support, thus enhancing community bonds within the chawl.

Common Balcony of Chawls

Dahi Handi Festival Celebration in Courtyard of chawl

Courtyards in chawls serve as vital communal spaces that significantly enhance public interaction among residents. These open areas, usually located in the center of the chawl structures, provide a shared space where the community can gather for a variety of activities. Functioning as the heart of the chawl, courtyards are often used for social gatherings, festivals, and daily leisure activities.

The design of these courtyards encourages residents to come together, fostering a strong sense of community and belonging. Children play here under the watchful eyes of their neighbors, creating a safe and communal environment for young families. Adults use this space for informal meetings or simply to enjoy a moment of respite in the open air. This setup not only promotes social interactions but also helps in building a support system among the residents, where people look out for each other, share resources, and celebrate together. The courtyard thus becomes a crucial space for community life, bridging individual differences and nurturing bonds within the chawl.

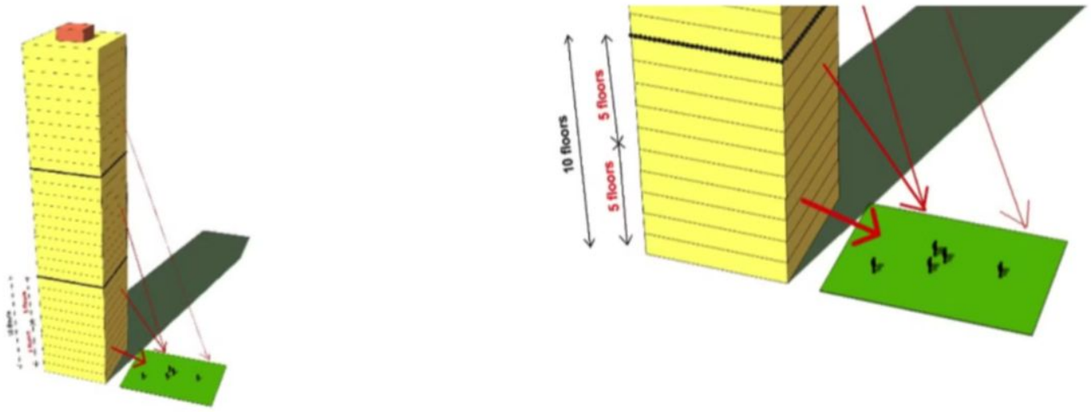
COMMUNITY INTERACTION SPACES IN CHAWLS

LIFESTYLE OF MODERN HIGHRISE

Modern High Rise Building Floor Plan

Modern high-rise buildings often feature a minimalistic approach to common spaces, typically including only a small lobby area on each floor. This limited space serves as the primary public zone within the vertical layout of the building, restricting opportunities for casual interactions among residents on their respective floors. Consequently, residents are largely reliant on the landscaped areas at ground level for any meaningful social engagement.

This architectural configuration can inadvertently foster a sense of isolation among inhabitants. Without adequate communal spaces in the upper levels of high-rises, opportunities for spontaneous neighborly interactions, which help build community ties, are significantly reduced. Over time, this lack of social connection can contribute to feelings of loneliness and may even lead to social isolation and depression. In contrast to more traditional residential designs that incorporate larger communal areas conducive to regular social interaction, the streamlined, efficiency-driven design of modern high-rises can thus impact the mental well-being and social health of its residents.



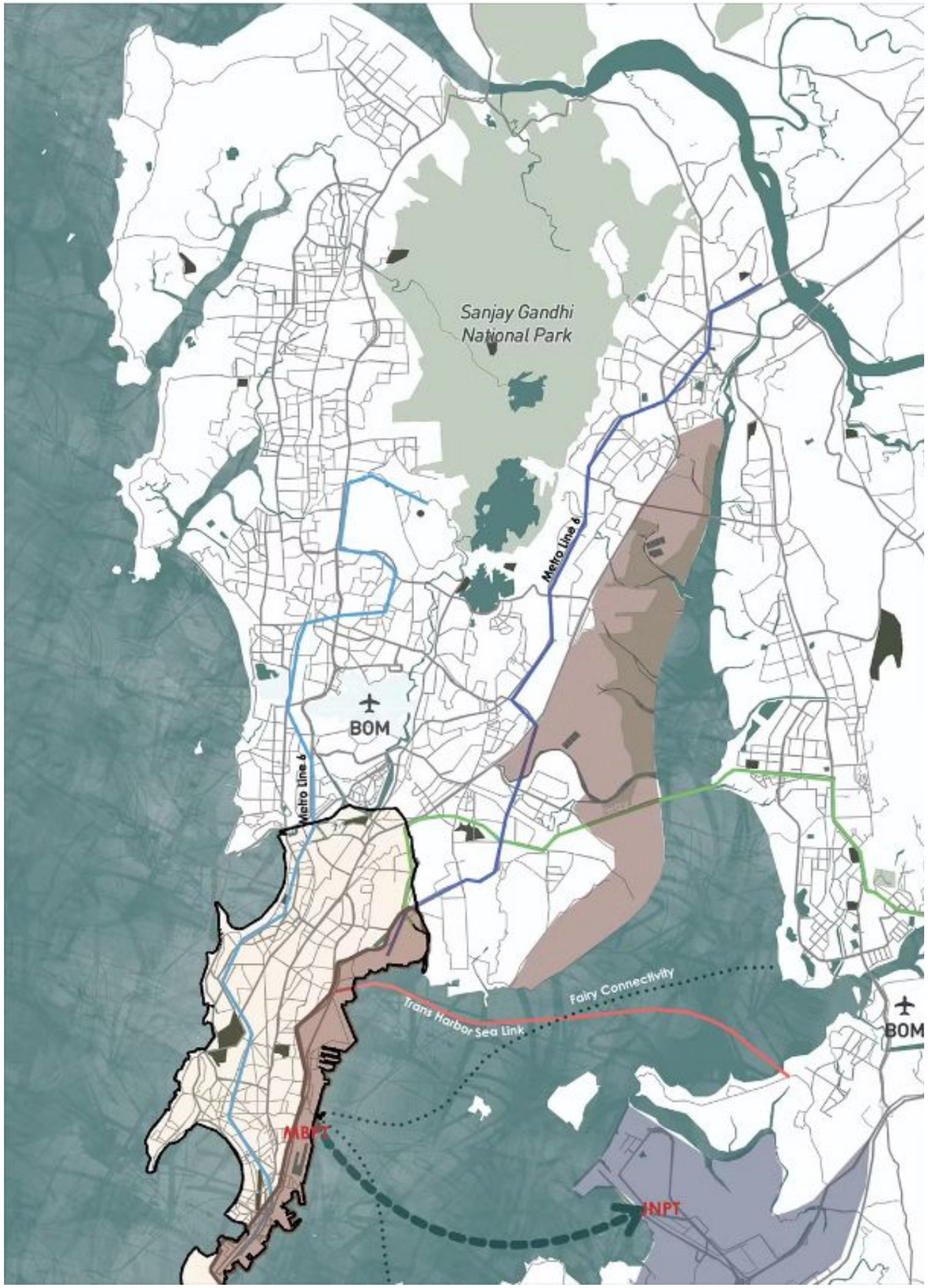
Visual connectivity from highrise

The study highlights a pivotal finding regarding the relationship between building height and the facilitation of social interactions. It sets the tenth floor as a critical threshold, beyond which both visual and verbal communications among residents significantly diminish. This observation underscores the challenges posed by vertical distance in high-rise buildings, as it hampers the spontaneous exchanges that are vital for fostering community ties.

On a more positive note, the study identifies the fifth floor as an optimal level for situating social spaces within a building's structure. Placing communal areas on or around the fifth floor enhances the likelihood of resident interaction because it remains within an easy reach for those both above and below this level. This strategic positioning supports more frequent and effective communication, enabling residents to maintain a sense of connection and community. By designing buildings with these considerations in mind, architects and developers can create more engaging and socially vibrant environments, thereby mitigating the isolation often experienced in taller residential structures.

[SITE]

CONNECTIVITY TO EAST COAST MAPPING



SITE SELECTION

Mapping analysis reveals the uneven development along Mumbai's east coast, with the northern section remaining largely underdeveloped due to its marshy terrain and dense mangrove forests. In contrast, the southern strip of land, which is part of the island city, is highly coveted despite having areas with low pedestrian traffic, scattered industrial zones, and residential patches. This part of Mumbai has historically seen limited development primarily because the land is owned by the Mumbai Port Trust. The port operations here were significantly reduced in the early 2000s when activities were relocated to the Jawaharlal Nehru Port Trust (JNPT), as indicated on the map.

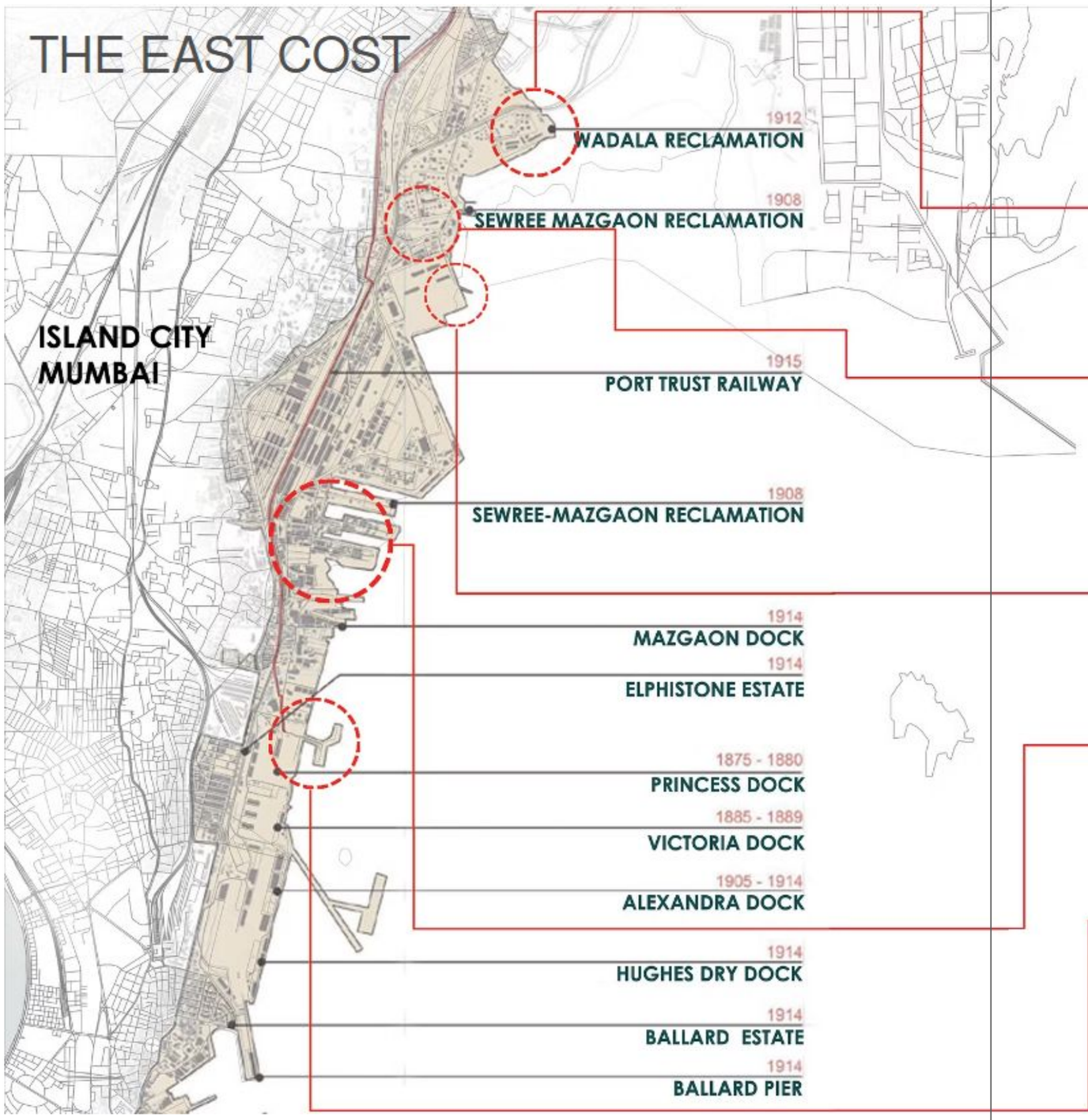
Recently, the value of this southern strip has seen a remarkable increase due to several major connectivity projects currently under construction. These projects include two metro lines, a railway line, and a highway, all designed to enhance access and stimulate development in this roughly 1 square kilometer area. These infrastructural developments are poised to transform the region, potentially turning it into a vibrant hub of commercial and residential activity, thereby reversing years of relative neglect and underutilization.

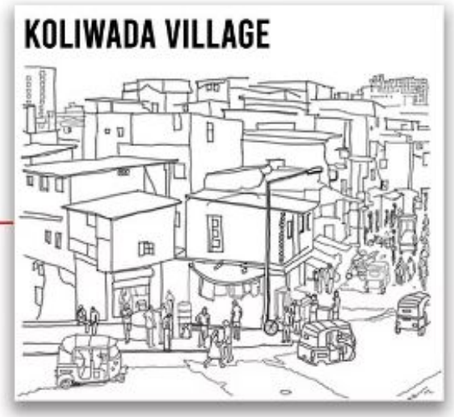
Mumbai Trans Harbour Sea Link

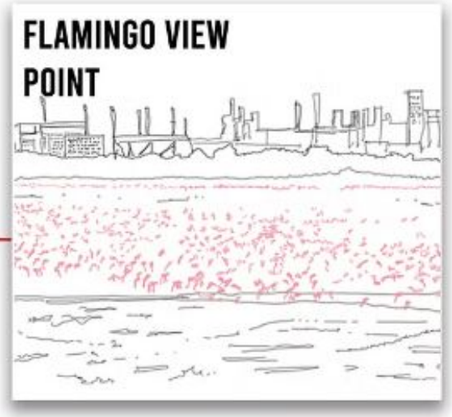
New Metro Lines

New Mumbai Airport

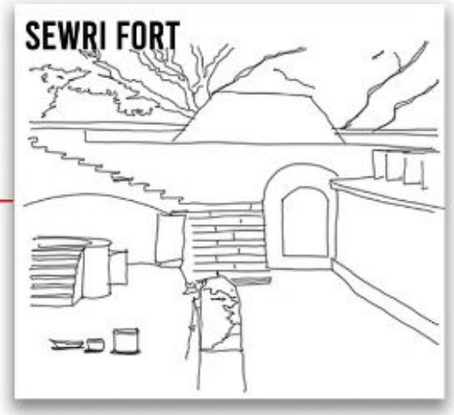
- UNDEVELOPED AREA
- RAILWAY LINE
- EASTERN METRO LINE
- WESTERN METRO LINE
- TRANS HARBOUR SEA LINK
- FAIRY CONNECTIVITY
- JNPT PORT
- ISLAND CITY OF MUMBAI

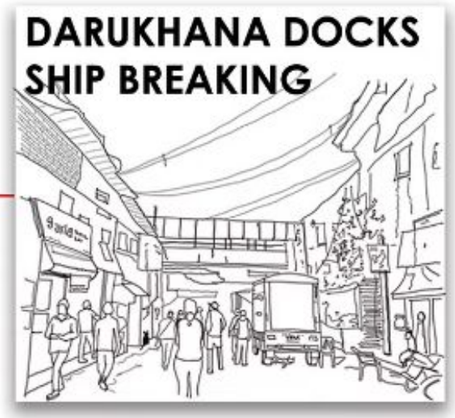

THE EAST COST
ISLAND CITY
MUMBAI
1912
WADALA RECLAMATION
1908
SEWREE MAZGAON RECLAMATION
1915
PORT TRUST RAILWAY
1908
SEWREE-MAZGAON RECLAMATION
1914
MAZGAON DOCK
1914
ELPHISTONE ESTATE
1875 - 1880
PRINCESS DOCK
1885 - 1889
VICTORIA DOCK
1905 - 1914
ALEXANDRA DOCK
1914
HUGHES DRY DOCK
1914
BALLARD ESTATE
1914
BALLARD PIER


KOLIWADA VILLAGE


FLAMINGO VIEW
POINT


BHAUCHA DHAKKA
FISH MARKET


SEWRI FORT


DARUKHANA DOCKS
SHIP BREAKING

Site Study

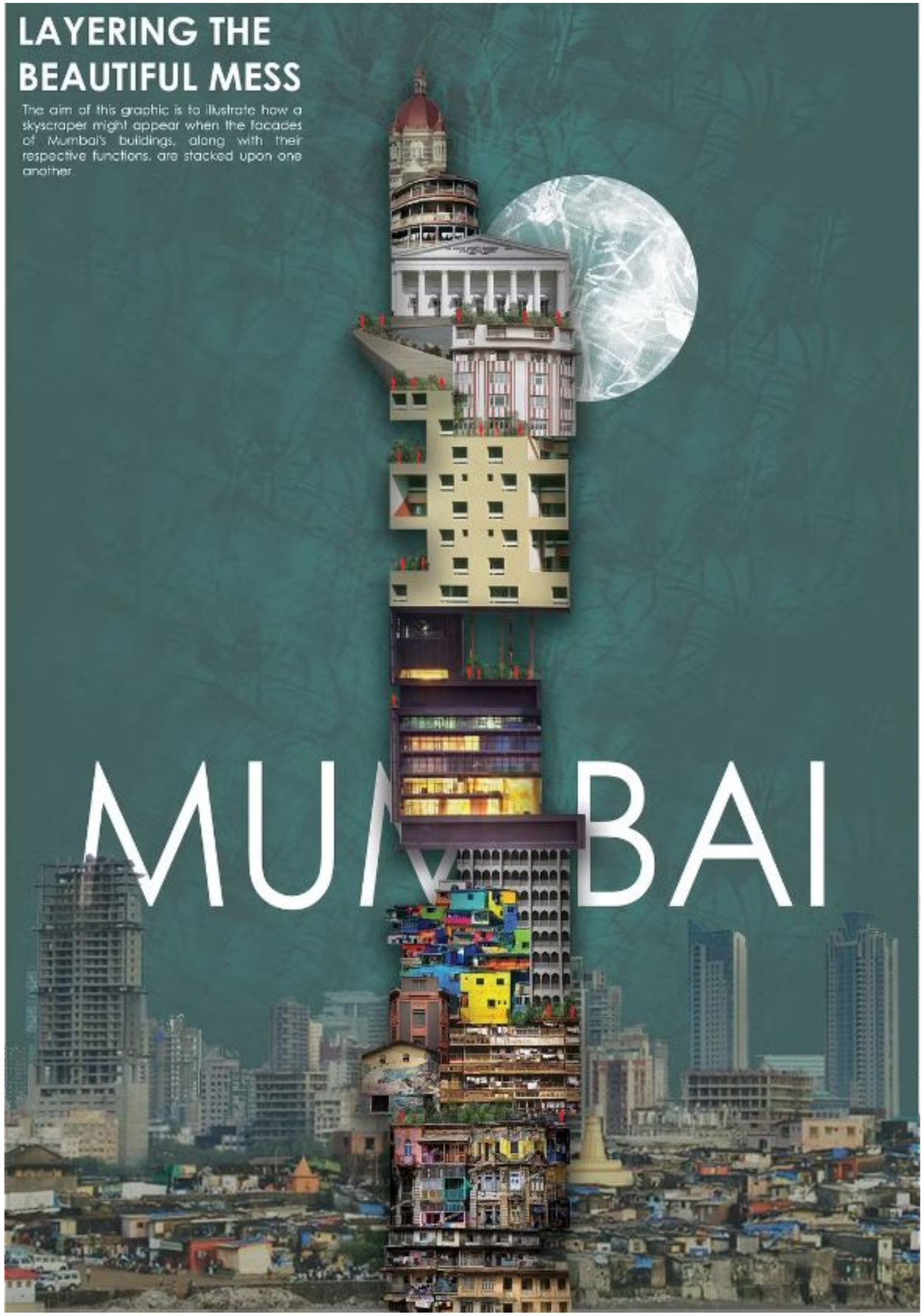
SITE PHOTOS

Empty old Warehouses

Slum Houses on site

Less maintained Waterfront

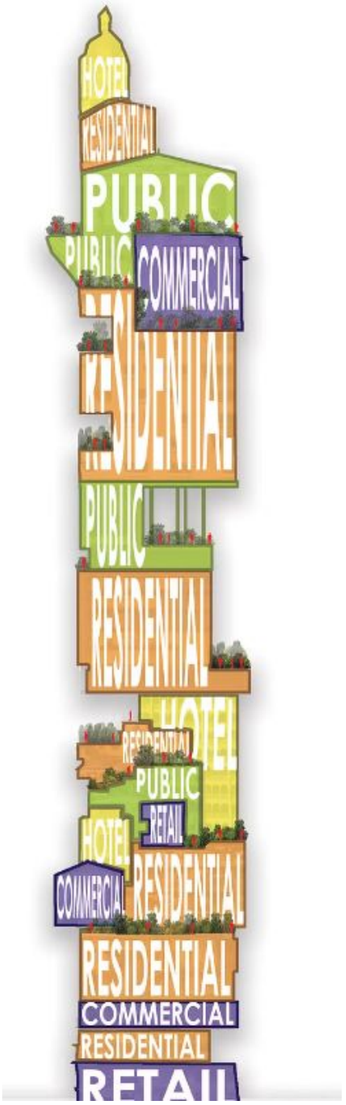
(THE DESIGN)



Concept Collage

The graphic vividly illustrates a layered fusion of various architectural facades, representative of Mumbai's diverse urban landscape, stacked atop one another. This visual concept is designed to envision a vertically integrated, mixed-use urban typology that mirrors the multifaceted character of Mumbai's cityscape. The idea is to create a seamless blend of retail, commercial, industrial, and residential spaces within a single vertical zone.

Such a design aims to cater comprehensively to community needs by placing essential services and living spaces in close proximity within a skyscraper setting. This approach not only maximizes the use of vertical space but also enhances the convenience and quality of urban life, promoting a sustainable model of city living. The diagram below highlights the intricately mixed-use nature of this skyscraper concept, which I plan to incorporate into the final design. This innovative architectural solution is envisioned as a microcosm of Mumbai's vibrant urban fabric, rising skywards.



- Highly Mixed Used
- Lot of Open Terraces
- Integration and access to public spaces to every floor.
- Lot Of Green Spaces

Mixed used Nature of Concept Design

HIGHRISE OF HOUSES

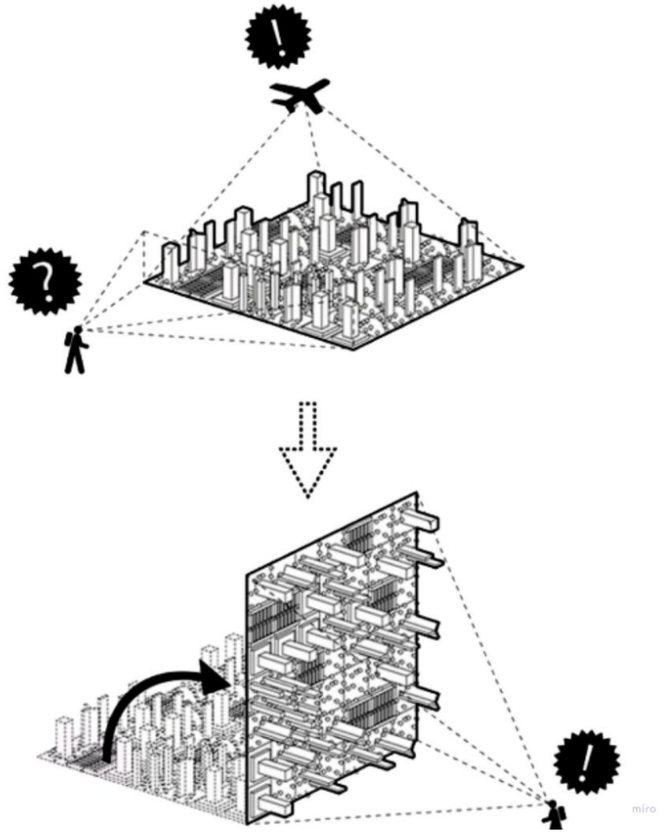
This is case James Wines, an architect known for blending art and architecture with environmental consciousness, approached the concept of high-rises with a unique perspective that often challenged conventional norms. In his designs, Wines envisioned high-rise buildings not just as functional living spaces but as three-dimensional canvases that interact with their environments. One notable concept is his approach to the "high-rise of houses," which imagines a skyscraper as a stack of various forms of traditional houses, each with its own distinctive style and green elements, such as roof gardens and external green walls. This concept not only critiques the monotonous aesthetics of typical urban skyscrapers but also integrates elements of suburban idylls into urban high-density living. Wines' visionary designs promote sustainability and community-oriented living, proposing a future where high-rises enhance human and environmental health through innovative architectural expressions and green integration.

This case study is one of the inspirations considered while design process.

Section of Highrise of homes

Elevation of Highrise of homes

FLIPPING HORIZONTAL TO VERTICAL



Imagining Horizontal as Vertical

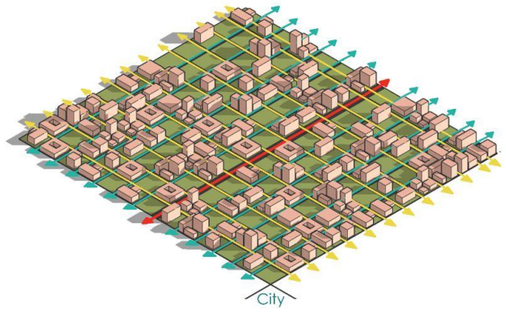
Imagine if we could transform a traditional horizontal city layout by rotating it 90 degrees into a vertical orientation. In this scenario, what were once highways would become elevator cores, acting as the main vertical conduits for movement within the structure. Streets would be reimagined as lobbies, serving as access points on each floor, while the buildings that previously occupied city blocks would now represent individual floors in a high-rise.

This vertical reinterpretation of a city's structure not only shifts the perspective but also alters the dynamics of circulation and space utilization. Each element of the city—from transportation routes to residential and commercial districts—finds a vertical counterpart, offering a compact, efficient use of urban space. This concept challenges traditional urban planning and opens up new possibilities for high-density, vertically integrated living environments. The vertical city could dramatically reduce the footprint of urban development, while potentially enhancing connectivity and accessibility by centralizing services and amenities.

DESIGN DEVELOPMENT

A typical city designed with grid planning features clearly defined blocks, highways, streets, and avenues, each color-coded with distinct hues. This organizational strategy uses various colors to differentiate each type of thoroughfare, enhancing navigability and the visual aesthetics of the urban layout.

1

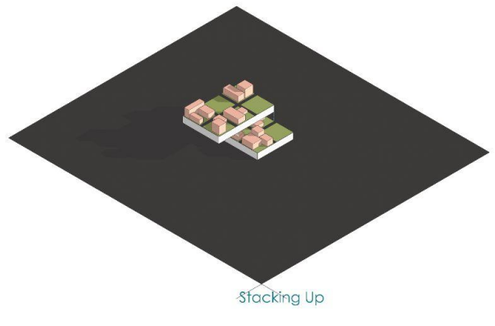


The concept envisions grouping 12 blocks together to form a single sector, with the aim of making each sector self-sufficient. This approach includes providing all essential services and facilities needed within these boundaries, ensuring that residents have convenient access to everything they require for daily living.

2

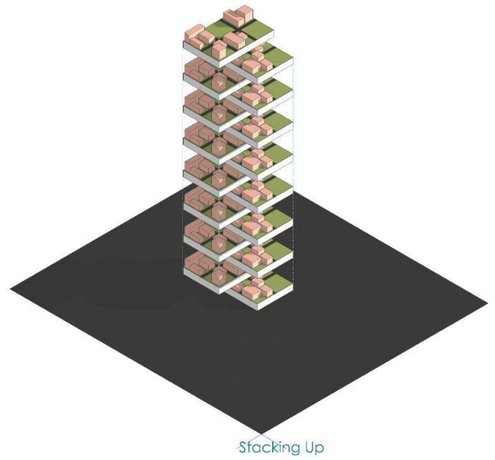
The plan divides each sector into two groups, consisting of six blocks each, and stacks these groups on top of each other. This layered approach optimizes space and fosters a more integrated community structure within the sector.

3



Stalking up the remaining sectors of the city on top of each other.

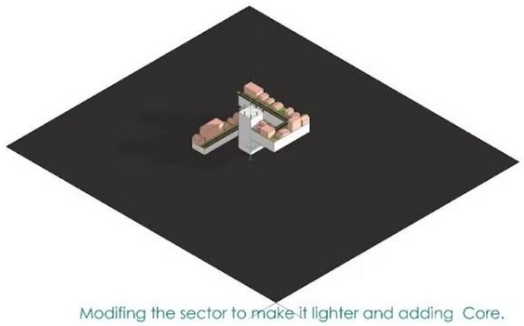
4



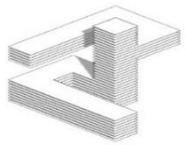
DESIGN DEVELOPMENT

The sector design has been refined to enhance functionality, particularly in terms of circulation, by incorporating a central core and adding a courtyard that opens on one side. This modification improves both natural lighting and ventilation throughout the sector, making the space more livable and efficient.

5

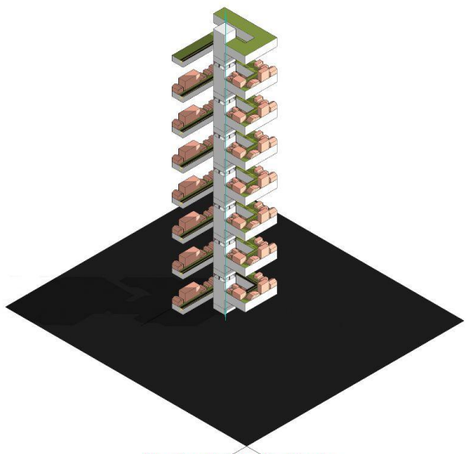


Modifing the sector to make it lighter and adding Core.



The revised sector design involves stacking up the modified units while integrating a break space between each sector. This break space is strategically planned to serve as a connection point for the buildings when they are expanded in the future, utilizing skybridges to link them seamlessly.

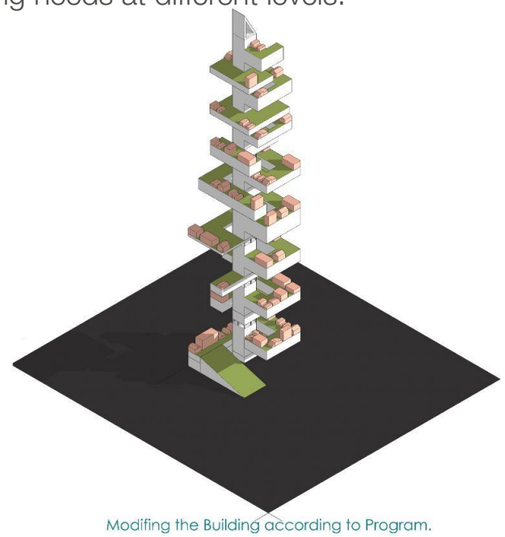
6



Stacking Up Modified Sector

The sector design is being adapted to suit specific capacities and functions, with adjustments that include tapering the buildings as they ascend. This modification not only enhances the structural stability of the buildings but also optimizes the distribution of space according to the varying needs at different levels.

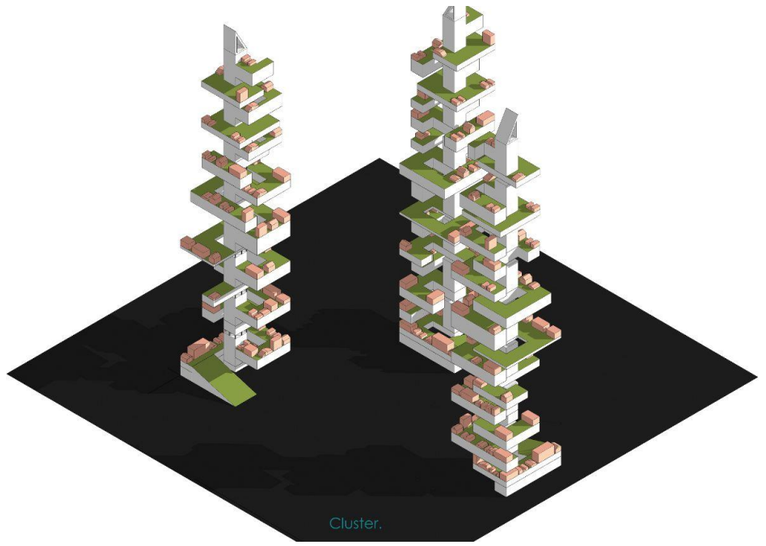
7



Modifing the Building according to Program.

The tower design has been expanded to accommodate the desired number of residents by multiplying the number of towers and strategically rotating them. This adjustment ensures optimal use of space and enhances the overall functionality and aesthetic appeal of the development.

8

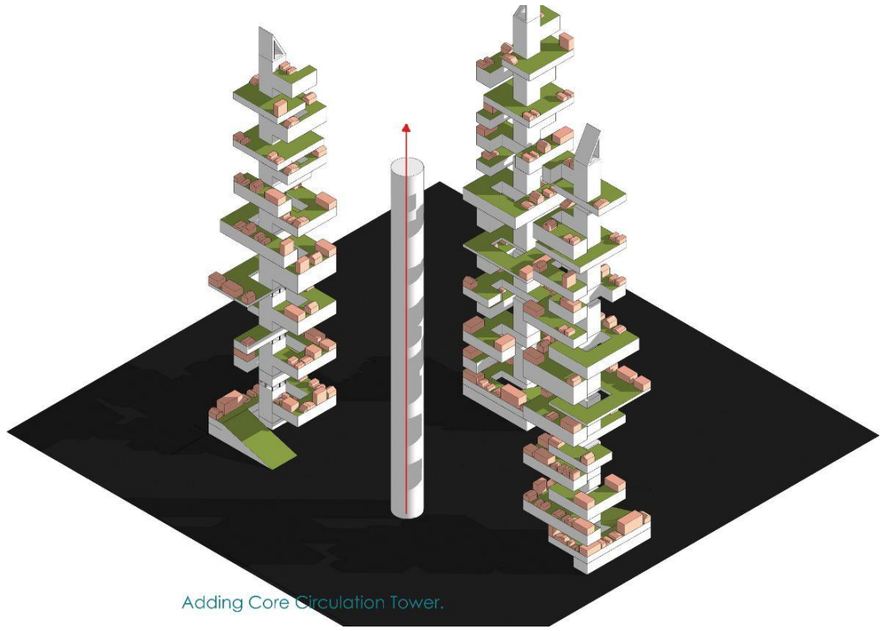


Cluster.

DESIGN DEVELOPMENT

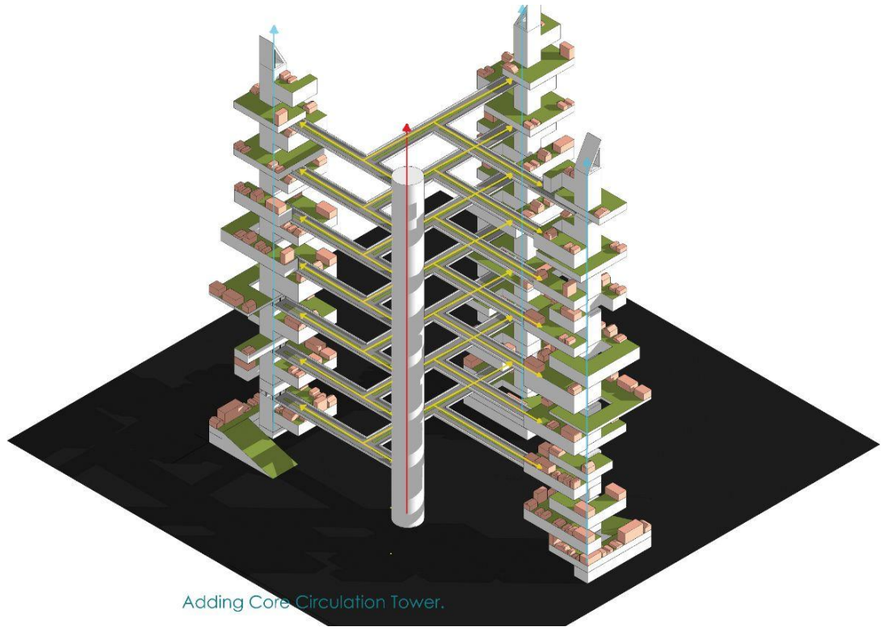
A circulation tower has been added at the center of the design, functioning as a rapid vertical transportation hub. This tower is equipped with high-speed service and passenger elevators, facilitating swift movement throughout the building.

9

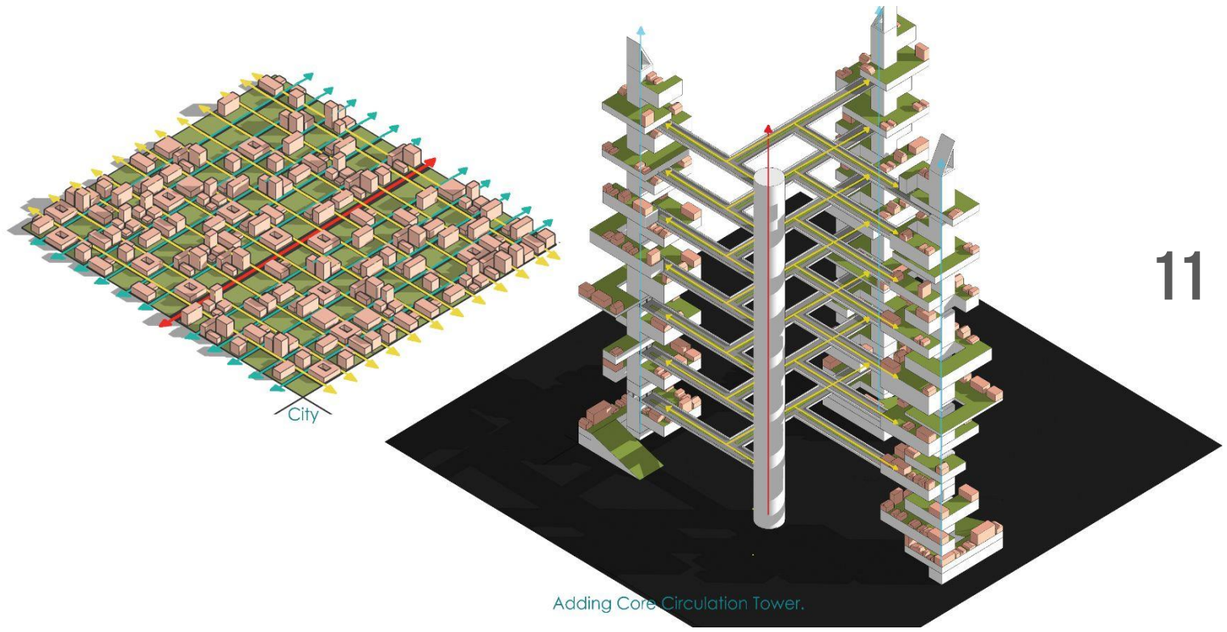


The circulation tower is linked to three buildings, with sky bridges introduced at each sector level to connect the break spaces of every tower, thereby creating a cohesive ecosystem. This design enhances accessibility and integration across the entire complex.

10



VERTICAL CITY PROPOSAL VS HORIZONTAL CITY

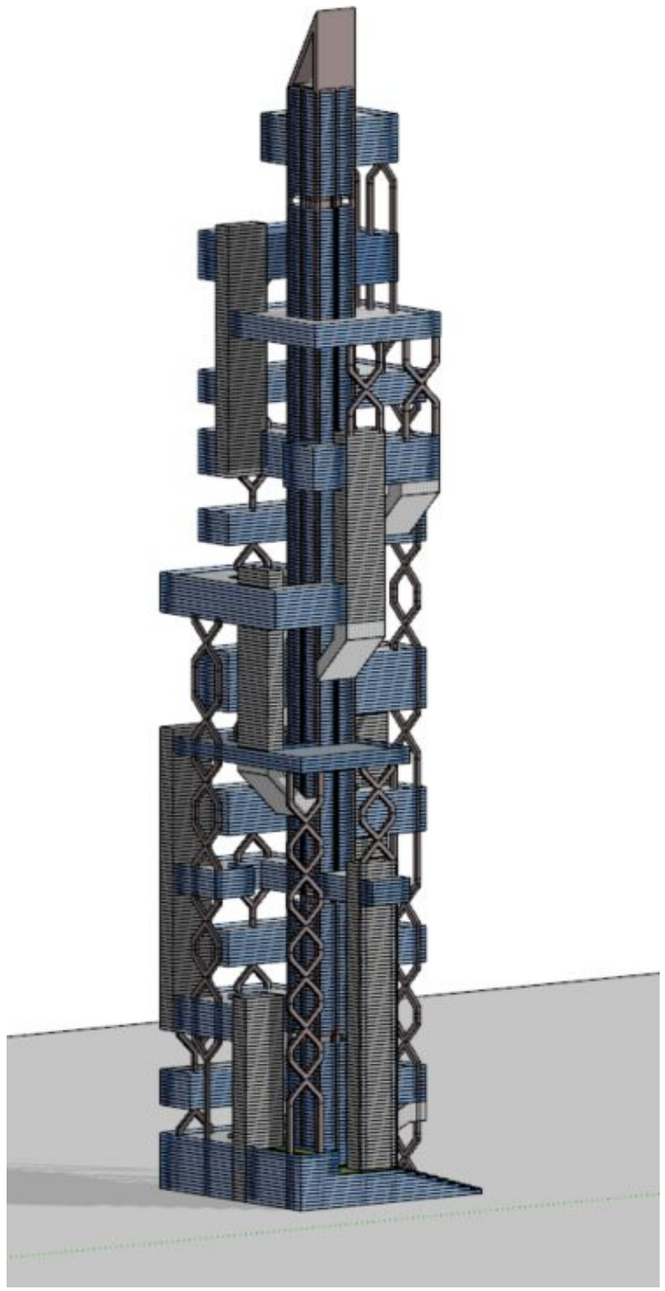


11

In contrast to conventional city planning, the proposed vertical structure reimagines elements traditionally found in urban landscapes—such as blocks, streets, avenues, and highways—into vertical equivalents. This innovative design features terraces that replicate urban blocks, skybridges that serve as avenues connecting different parts of the structure, pathways that mimic city streets, and a central circulation tower acting as the main highway facilitating vertical movement. This vertical integration allows for a compact, efficient use of space while still maintaining the functional diversity of a sprawling urban environment. This architectural approach not only optimizes the available area but also enhances connectivity and accessibility, embodying a modern take on urban development.

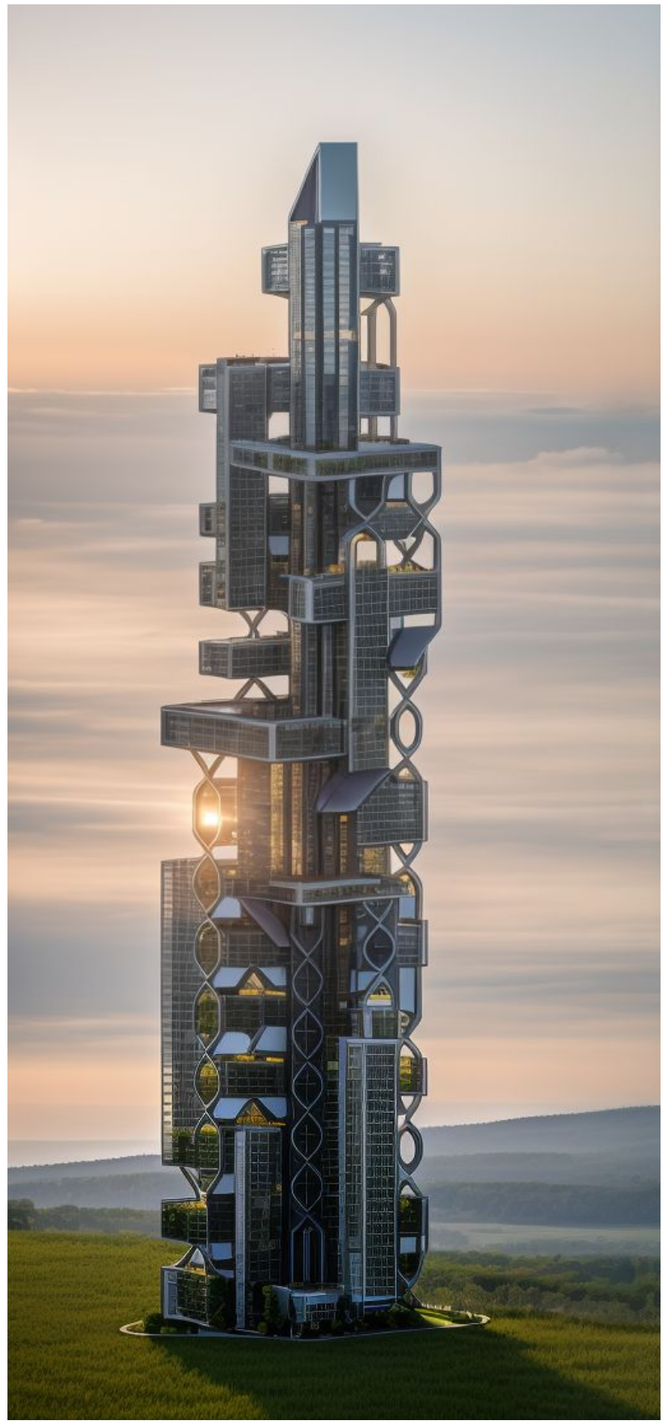
MODIFIED DESIGN OF A SINGLE TOWER

The tower design has been refined by incorporating additional secondary cores and structural elements into the facade, enhancing both its aesthetic and functional attributes. Additionally, escalators have been integrated to facilitate diagonal circulation, improving access and mobility across different levels of the building.



View of tower

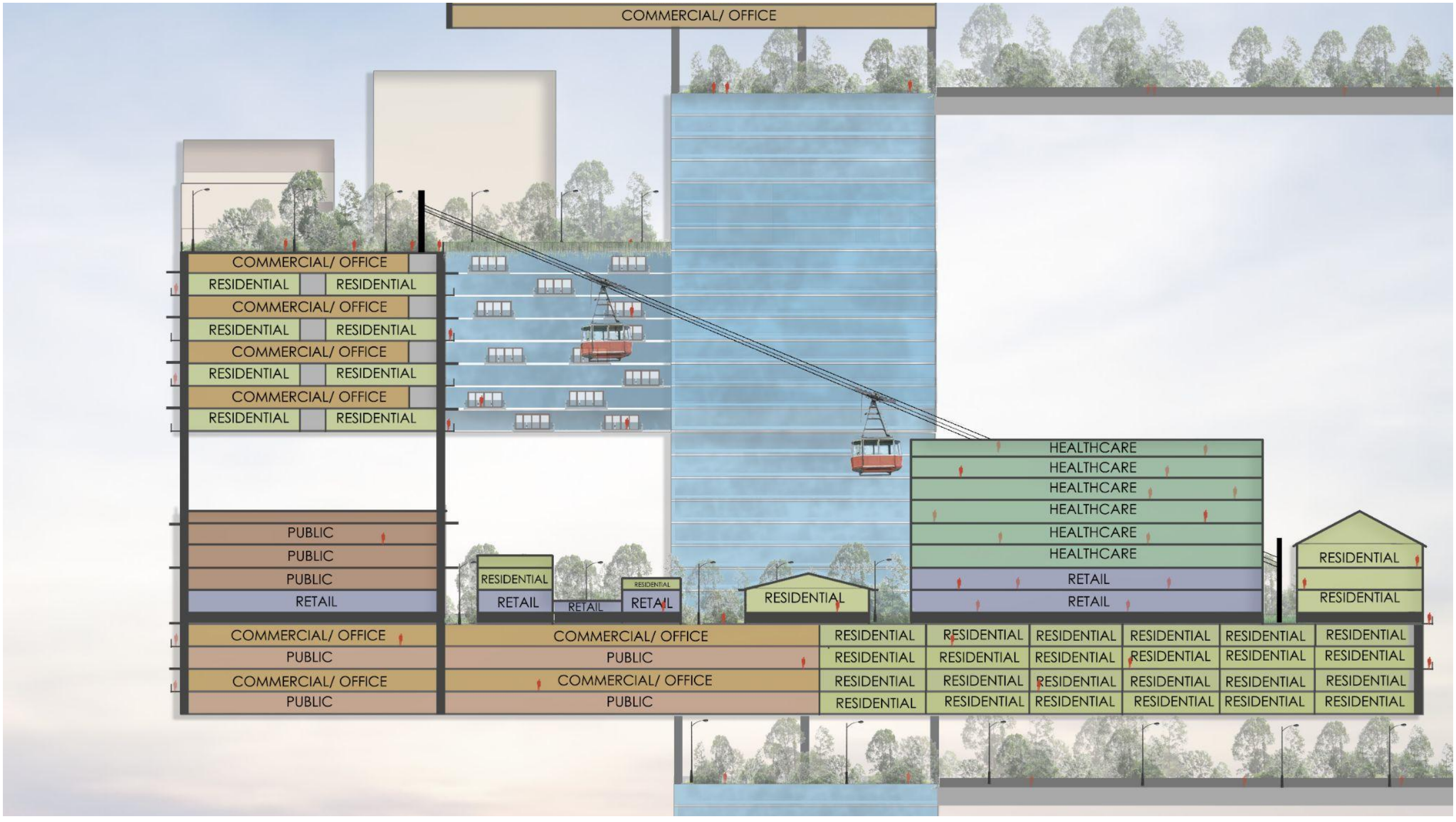
An effort has been made to generate a rendered image using ArchiVinchi by providing a detailed prompt. This initial rendering aims to explore how the AI interprets the base image of the final design, allowing us to experiment and assess the capabilities of AI in visualizing architectural concepts.



AI interpretation of the base Design

MODIFIED DESIGN OF A SINGLE TOWER

The concept depicts a schematic cross-section of a sector, showcasing a highly mixed-use typology within. This illustration not only highlights the diverse functionality of the sector but also features connecting sky bridges that link various parts of the structure. Additionally, buildings positioned atop terraces serve multiple programs, enhancing the sector's utility and spatial dynamics. This layout emphasizes integration and connectivity, ensuring that various components—from residential to commercial—coexist seamlessly within a single vertical environment.



Concept Section Of a Sector

NUMBER ESTIMATIONS

Population Density of Mumbai- 73000 per SQ Mile

Site Area - 0.9 SQ Mile

65,700 people to be considered to be populated on site.

One tower-22,500 people

PROGRAM DISTRIBUTION

Program Which should be in every sector-

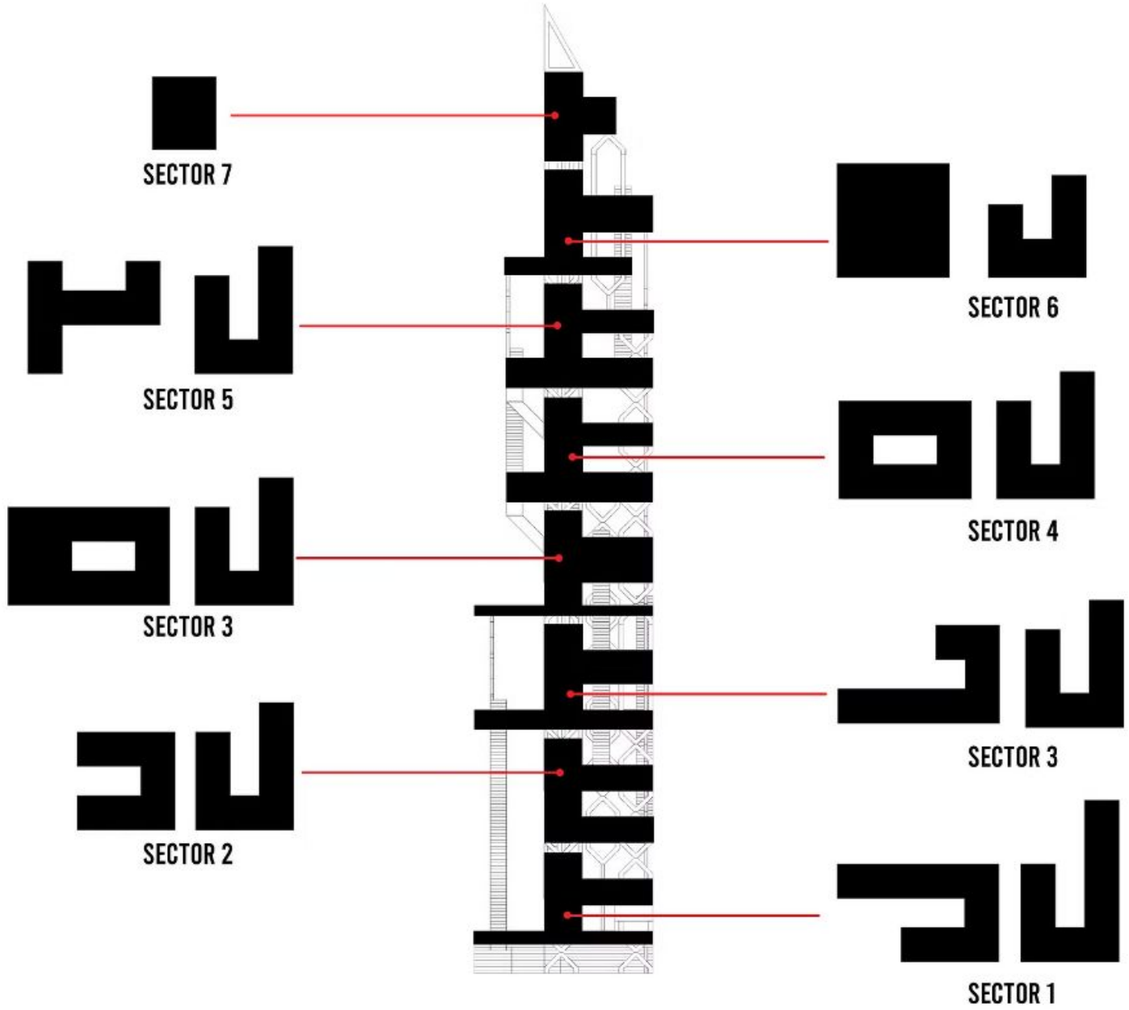
- Residential
- Commercial
- Retail
- Industrial
- Public

1. Gym
2. Parks and gardens
3. Walkways
4. Small Community gathering spaces

Program Which should be in Tower-

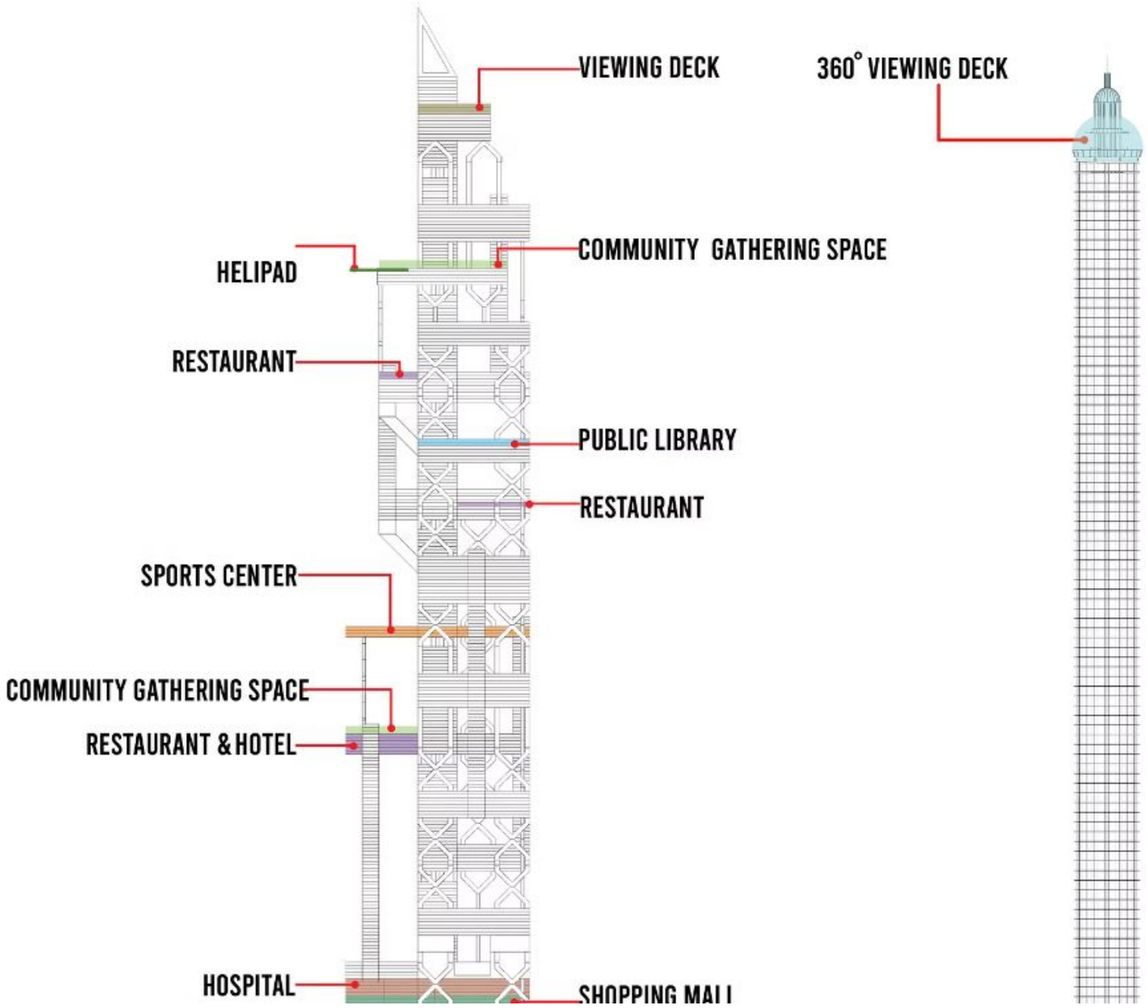
- Sports Center
- Huge Gathering spaces
- Health Care
- Library
- Education
- Helipad
- Hospitality

SECTOR DISTRIBUTION



Sector Distribution Diagram

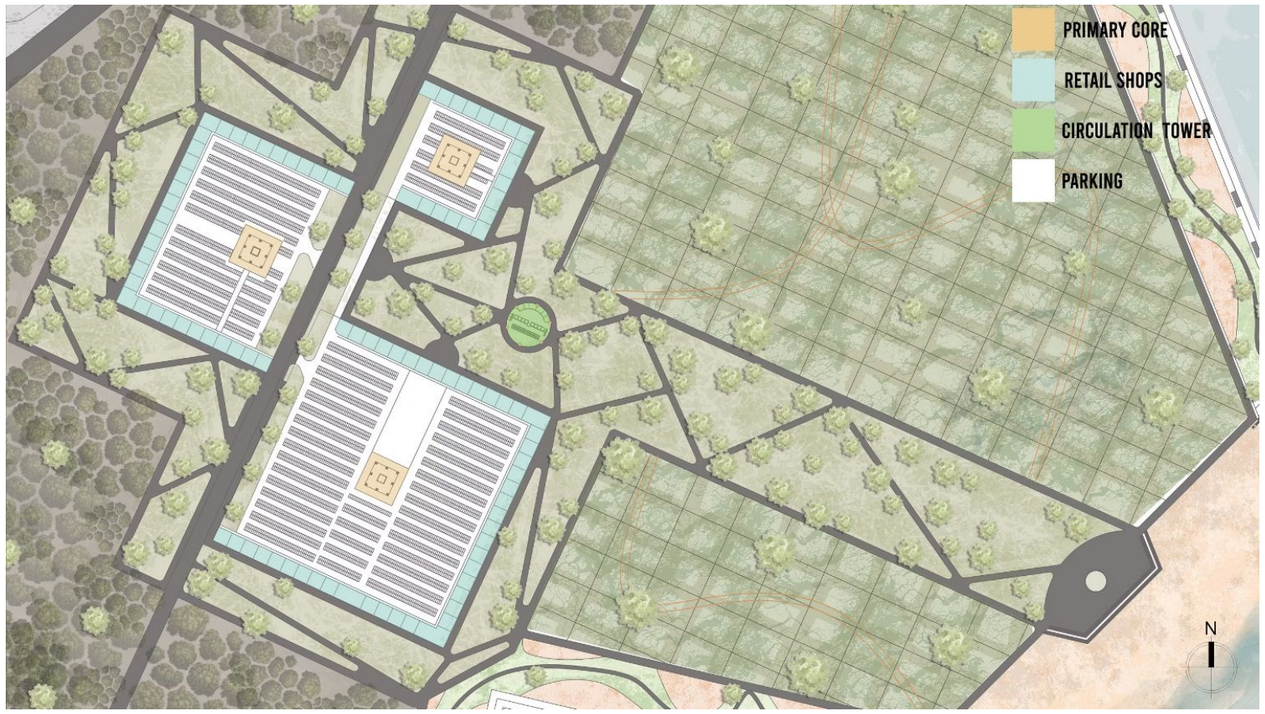
PROGRAM DISTRIBUTION DIAGRAM



Program Distribution Diagram

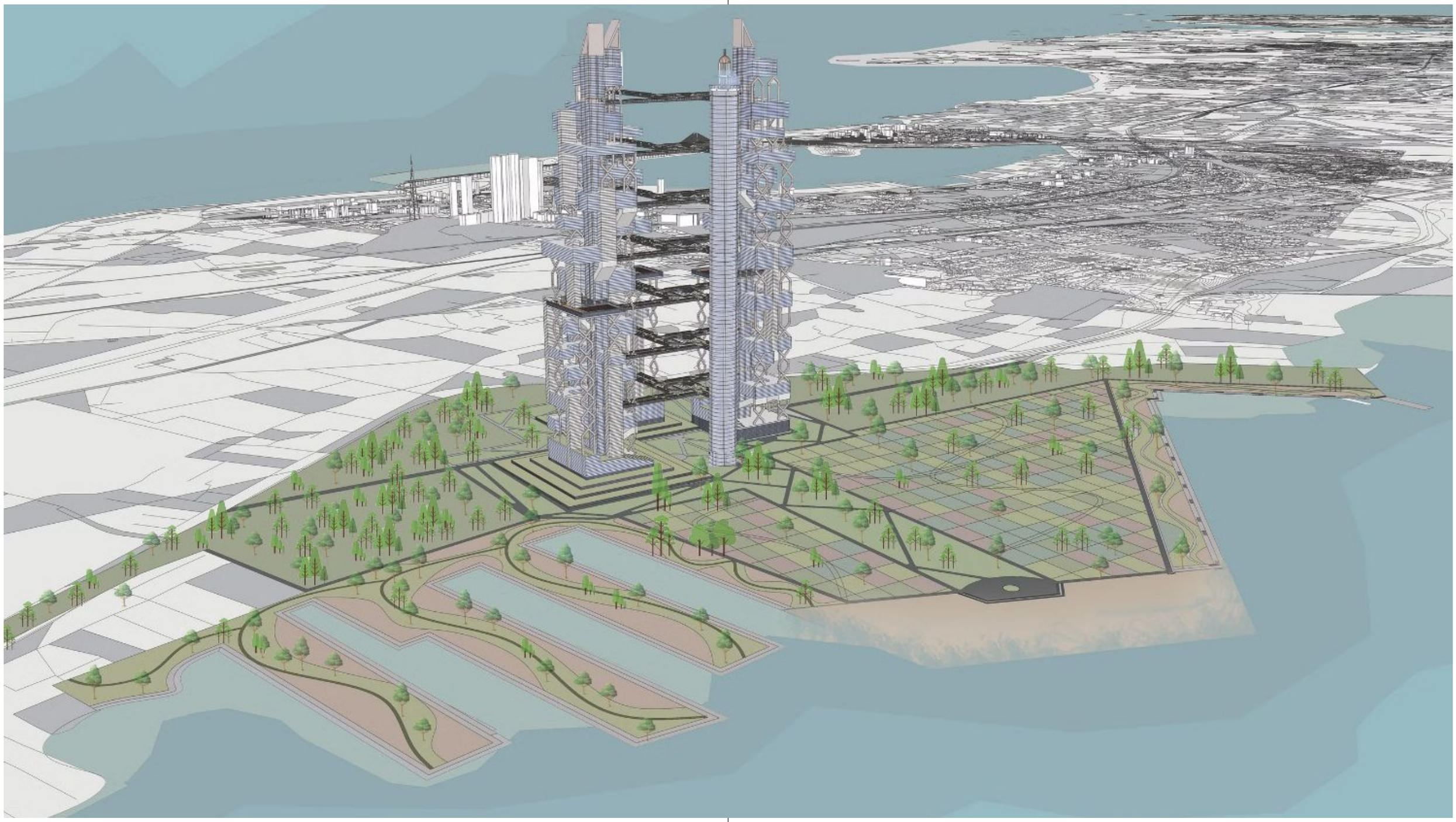
SITE PLAN

Overall Site Plan



Building With Site

OVERALL AERIAL VIEW OF PROPOSAL WITH SURROUNDING CONTEXT



Aerial View Of Site

AI GENERATED RENDERS OF PROPOSED STRUCTURE

AI interpretation of the Site Elevation

CREATED USING ARCHIVINCI

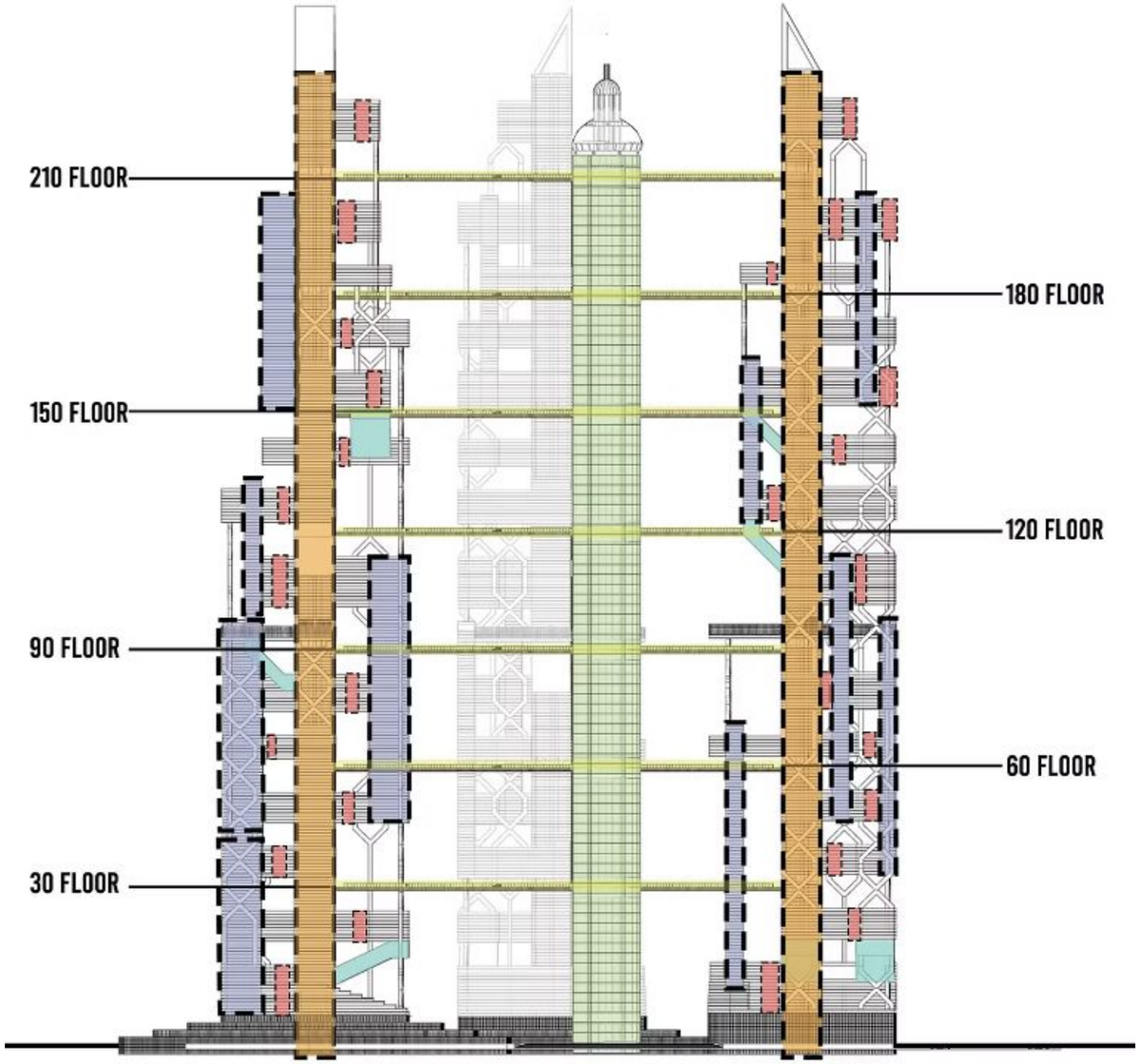
AI interpretation of the Site Elevation
During Night

CREATED USING ARCHIVINCI

Rendered View from Arabian Sea

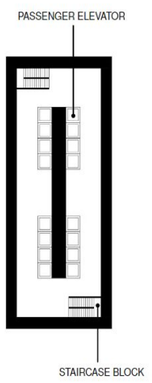
"Proposed view of the megastructures along the East Coast of Mumbai, set against the expansive skyline of the city and the Arabian Sea."

CIRCULATION BETWEEN THE TOWERS

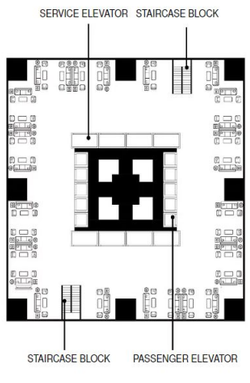


Circulation Diagram

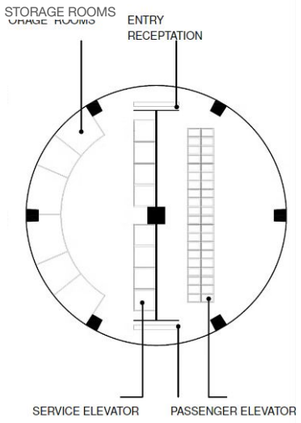
PRIMARY CORE
SECONDARY CORE
TERTIARY CORE
CIRCULATION TOWER
SKY BRIDGE
ESCALATOR



Secondary Core

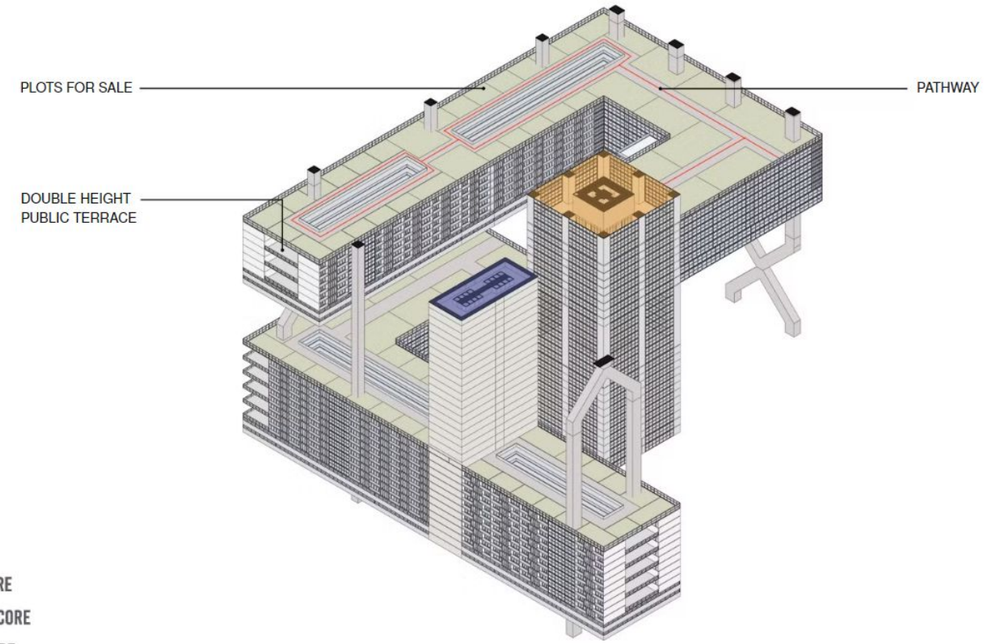


Primary Core



Circulation Tower

WORKABILITY OF A SECTOR

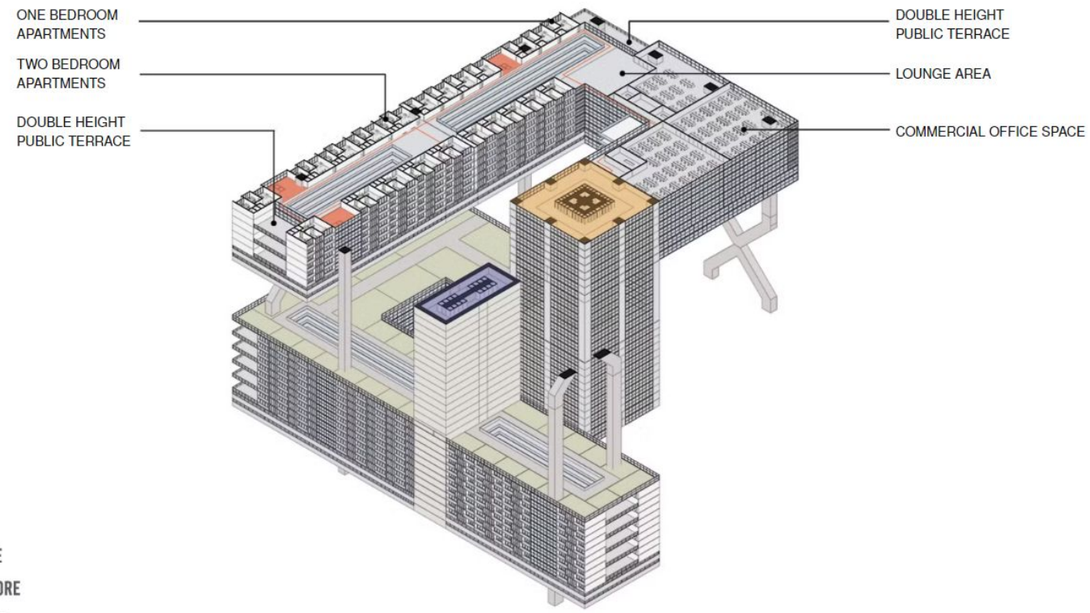


PRIMARY CORE
SECONDARY CORE
TERTIARY CORE

Terrace Floor Plan

The terrace is designed with two main features. Firstly, it includes green-hatched plots available for purchase by anyone, offering the flexibility to construct according to individual needs and preferences. Secondly, a pathway winds through these plots, mirroring the streets of Mumbai but elevated in the air. This pathway, beginning at the primary core, ensures that the terraces are accessible only through this central point, creating a unique aerial urban experience that combines accessibility with the novelty of high-rise green spaces.

WORKABILITY OF A SECTOR

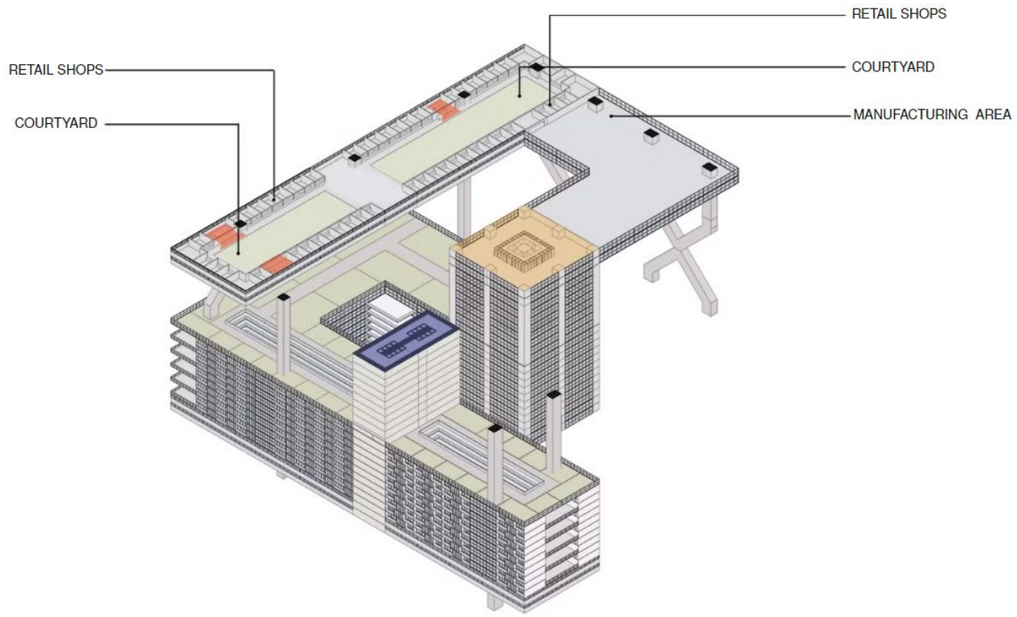


PRIMARY CORE
SECONDARY CORE
TERTIARY CORE

Typical Floor Plan

The typical floor in this building is a mixed-use space that integrates residential, commercial, and public areas. Residentially, it features both one-bedroom and two-bedroom units. Commercially, there are three distinct office spaces. Separating the residential and commercial zones is an indoor lounge that acts as a buffer space, enhancing privacy and noise reduction. Additionally, the design incorporates double-height terraces on alternate floors, which are intended for recreation and social gatherings. The layout is organized around two central courtyards, with all the different programs positioned to surround these open spaces, creating a sense of community and openness throughout the floor.

WORKABILITY OF A SECTOR



PRIMARY CORE
SECONDARY CORE
TERTIARY CORE

Retail and Courtyard Plan

The design places retail shops around the courtyard, drawing inspiration from the chawl typology explored during the research phase. The courtyard serves as the central gathering space and a playground for children, embodying the communal spirit of traditional chawl settings. Additionally, each sector includes a manufacturing area attached to this central courtyard, integrating work and leisure spaces to foster a vibrant community atmosphere.

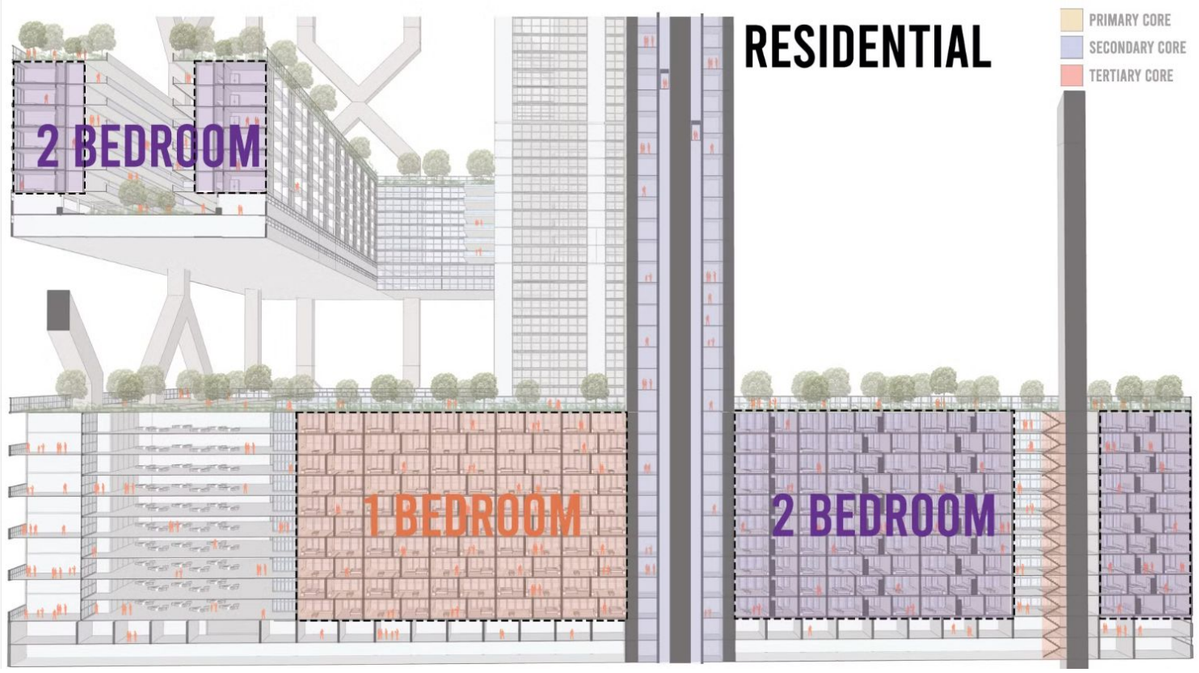
SECTION OF A SECTOR

Section Of a Sector

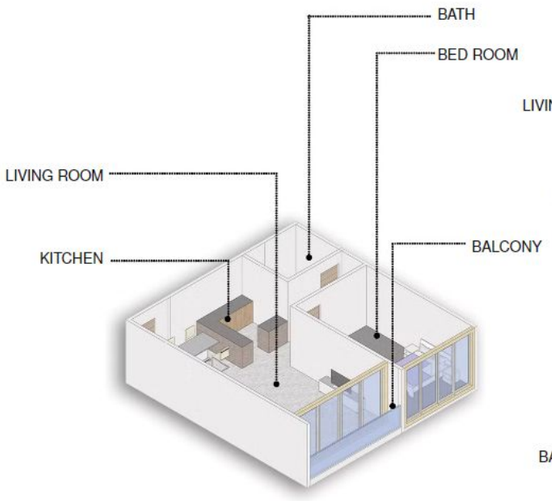
The diagram presents a sectional cut through a sector, offering a detailed view of its internal layout. The upper half of the section reveals a cross-section of the courtyard, while the lower half displays a double-height terrace to the right, followed by an indoor lounge and residential apartments. The bottom floor is dedicated to retail spaces, enhancing the accessibility and utility of the sector. Below this, the lowest floor is designated for the services that support the entire sector, centralizing essential utilities for efficiency and convenience.

The top of each section of the sector features a terrace designed with plots available for sale and pathways that function similarly to streets. The section also provides a cross-sectional view through both the secondary and tertiary cores, as indicated in the diagram. These cores are integral to the structure's vertical circulation and are strategically positioned to facilitate efficient movement throughout the building.

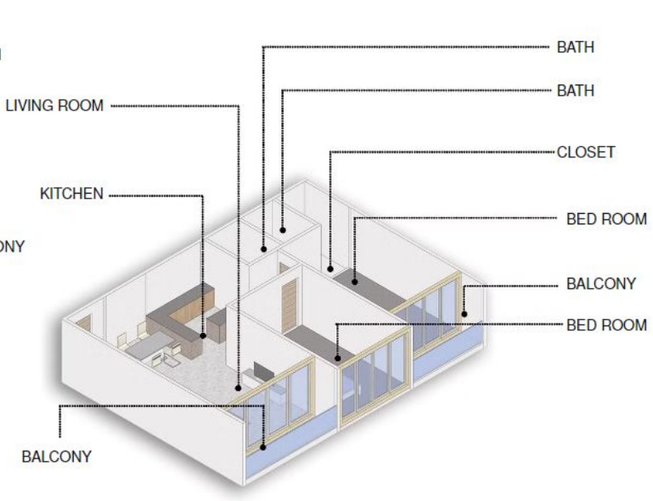
RESIDENTIAL UNITS



Residential Spaces

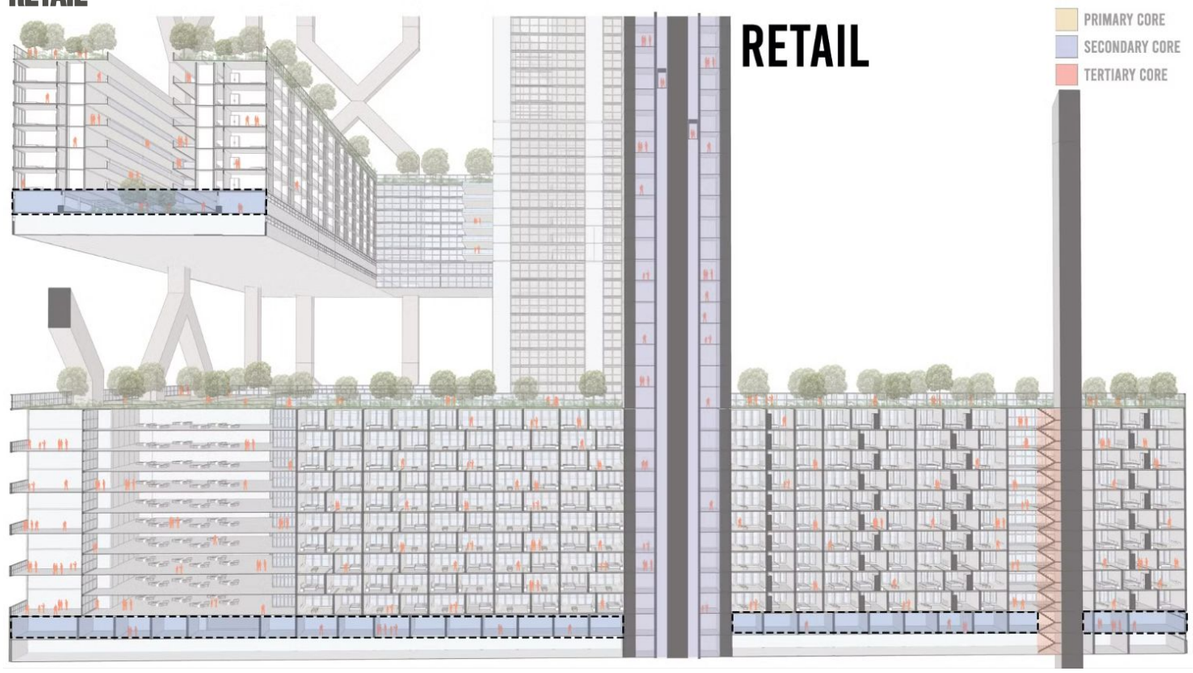


One Bedroom Unit



Two Bedroom Unit

RETAIL

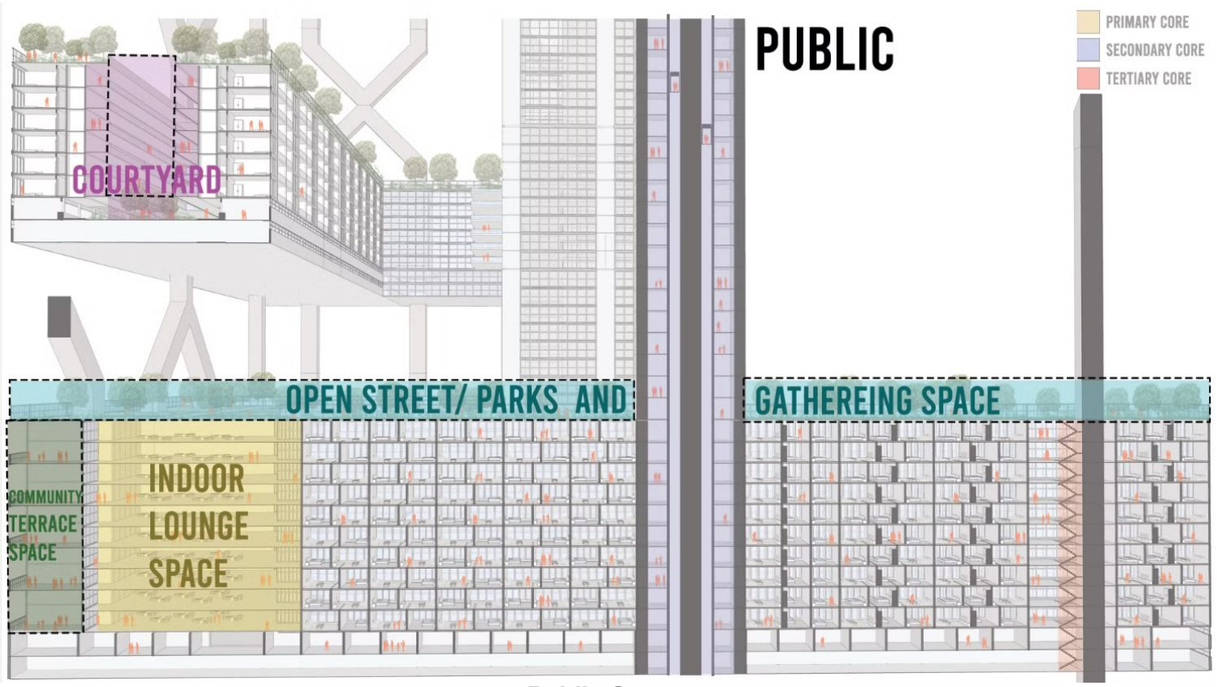


Retail Spaces

Courtyard With Retail Spaces

The view depicted above showcases a courtyard and adjacent retail area bustling with activity. People are seen interacting with each other, while children play in the central space. Retail shops line the periphery, creating a lively border around the courtyard. Residents enjoy a clear view of this vibrant communal area from their common balconies, enhancing the sense of community and oversight within the space.

PUBLIC AREAS



Public Spaces

Courtyard Section

The section illustrates how residents on the common balcony can visually interact with each other, enjoying unobstructed views of the courtyard. This design allows for ample natural light to flood in from the courtyard, brightening the space and creating a welcoming environment for the inhabitants.

Courtyard Section with Highlighted Balconies

DOUBLE HEIGHT PUBLIC TERRACE

Double Height Public Terrace

This view highlights the double-height terrace, which is featured on alternate floors of the sector. Residents can be seen relaxing on benches, enjoying the scenic views in the tranquility of the evening. This terrace serves as a peaceful retreat for residents to unwind and connect with their surroundings.

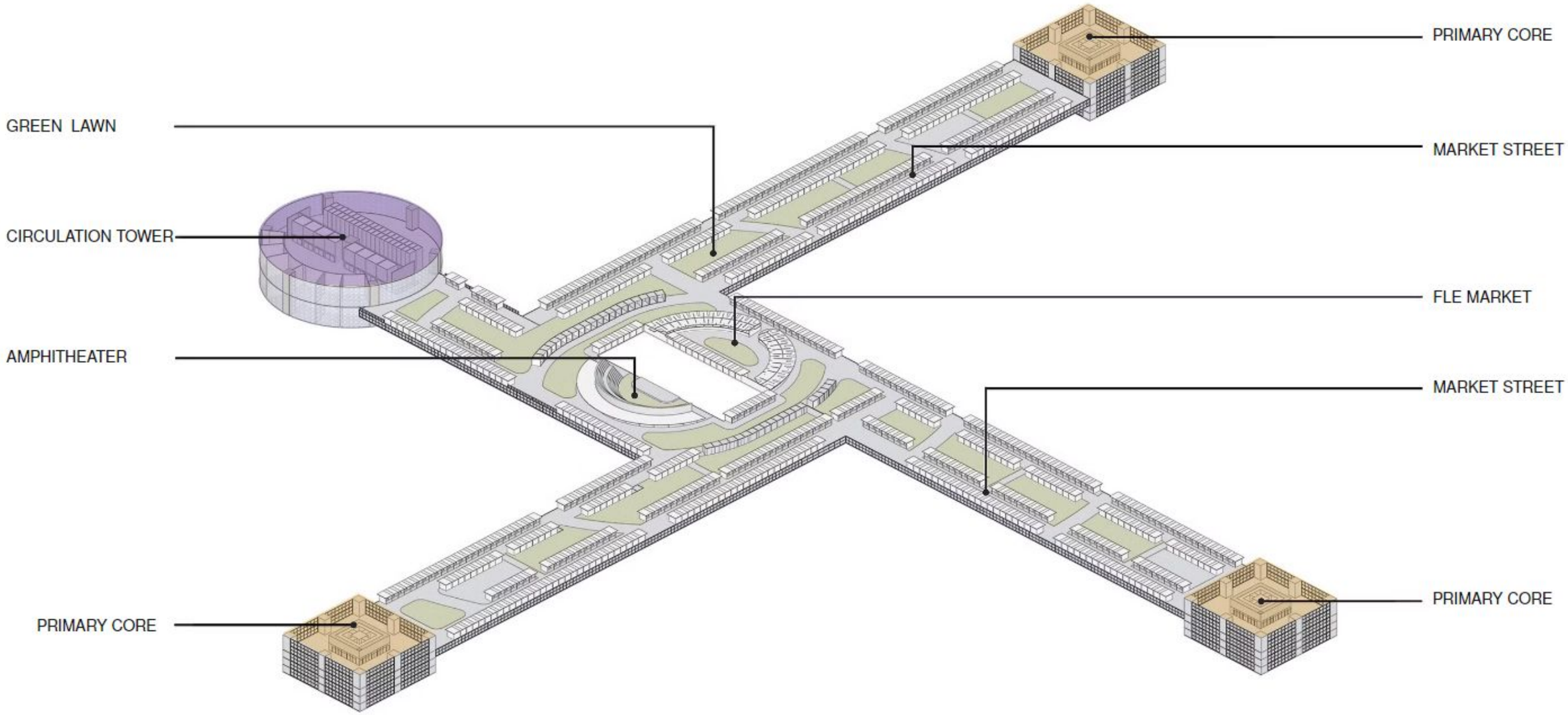
TERRACE OF SECTOR

Terrace of a Sector

This view captures the terrace of the sector, where residents have purchased plots at the top and constructed their own homes and places of worship. This area reflects a diverse and personalized use of space, allowing residents to create environments that meet their specific cultural and personal needs.

The street captures the vibrant essence of a Mumbai street, bustling with roadside shops and abundant with trees and plantations. This lively atmosphere is reminiscent of the city's bustling thoroughfares, filled with commerce and lush greenery, enhancing the urban experience.

THE SKY BRIDGE

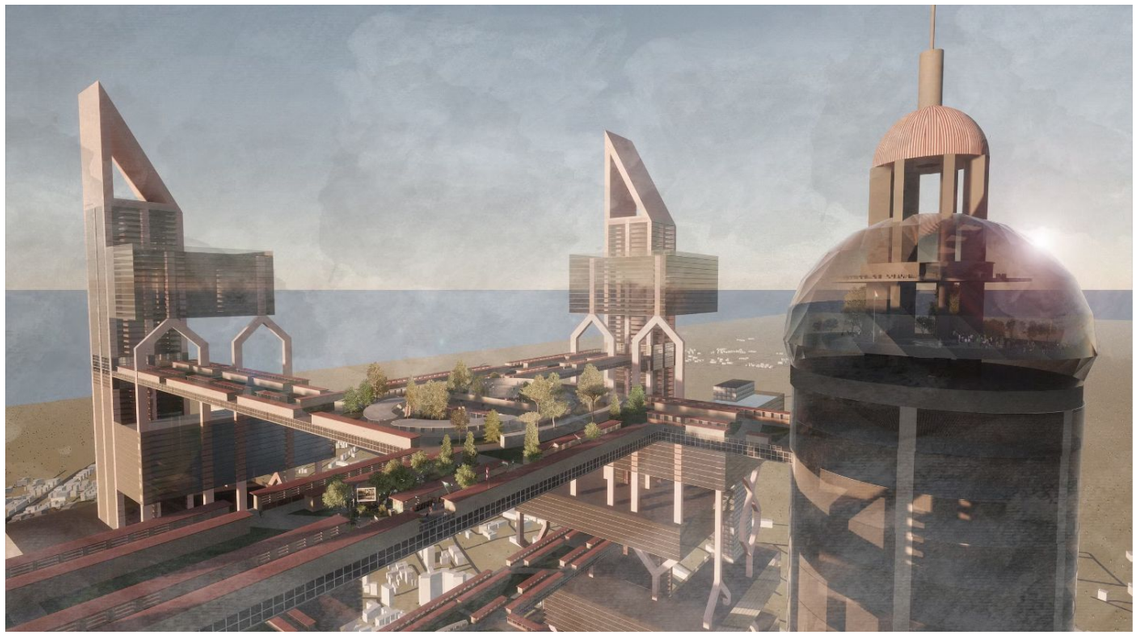


Sky Bridge

The view presents an isometric drawing of a skybridge linking the primary cores of all three towers with the circulation tower. This connection is strategically placed after every 30 floors, corresponding to each sector's break floor, facilitating smooth movement and integration across the structure at regular intervals.

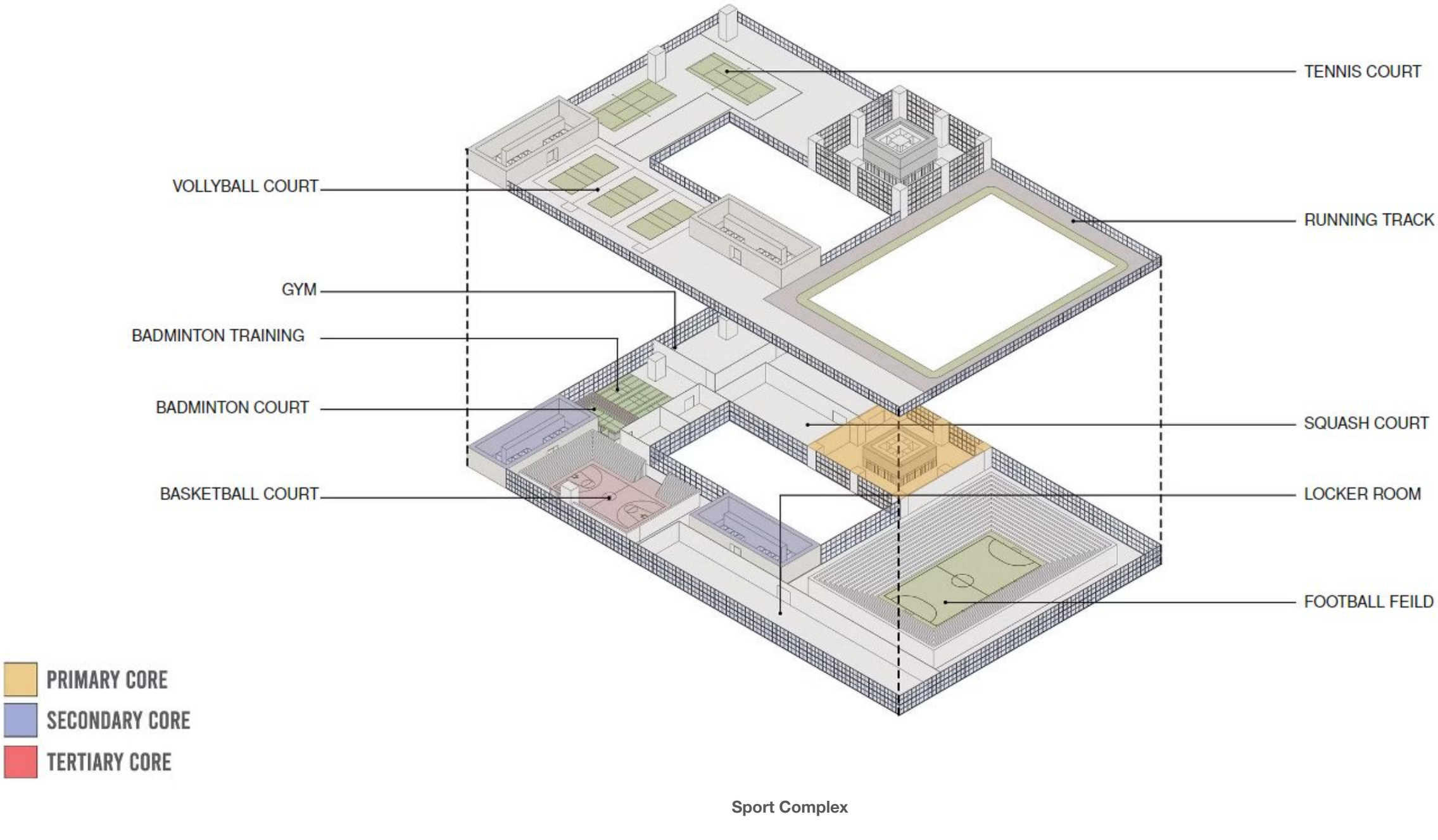
The bridge features a network of market lanes, reminiscent of the bustling and vibrant markets found throughout Mumbai. Interspersed with these commercial areas are numerous green spaces, providing places to rest and relax. At the central junction where the four lanes converge, there is a large amphitheater and a flea market, creating a dynamic hub of activity and culture within the bridge's structure.

Market Lane on a Sky Bridge



Sky Bridge Aerial View

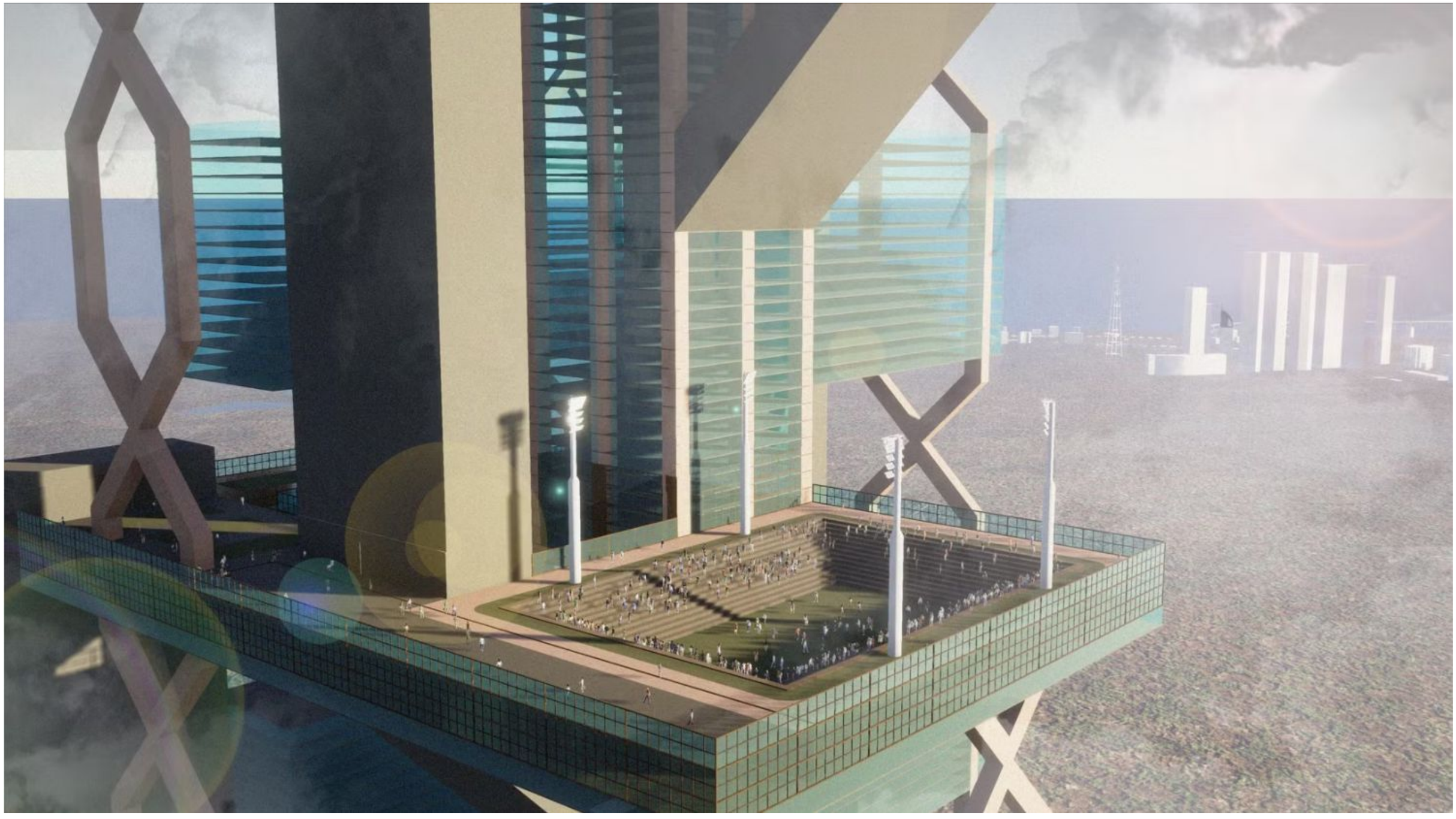
Amphi Theater on Sky Bridge



Sport Complex

The isometric illustration depicts a sports center featuring a variety of courts and a large football stadium. This expansive facility is designed to accommodate multiple sports, providing ample space for both team and individual activities.

SPORTS CENTER



Sports Center Aerial view

[CONCLUSION]

The thesis proposes a framework for the development of vertical cities in Mumbai, rather than presenting a final design. It takes into account the existing city infrastructure, with a focus on improving connectivity through metro and road networks. The framework revolves around towers comprised of sectors, each spanning 30 floors and subdivided into two parts to enhance connectivity and maximize natural light penetration. Break zones, strategically placed every 30 floors, are designated as refuge areas in case of emergencies.

Moreover, the framework emphasizes the replication of towers according to the population density requirements of the area. Sky bridges are proposed to link all break zones, aiming to replicate the bustling streets and markets of Mumbai within the vertical cityscape. Suggestions for further development include optimizing space utilization, integrating recreational parks and farmlands, and exploring innovative materials and construction techniques.

To ensure a holistic approach, the thesis suggests interviewing residents to gather insights into the essence of Mumbai. This input can inform the development process and help preserve the unique character of the city. However, a key challenge remains: how to seamlessly integrate the essence of low-rise development into the vertical structures, maintaining the distinct identity of Mumbai while embracing vertical urbanization.

(REFERENCE)

- https://dozr.com/blog/skyscrapers
- https://skyscraper.org/supertall/all-content/
- https://www.thoughtco.com/how-skyscrapers-became-possible-1991649
- https://www.visualcapitalist.com/rush-build-new-skyscrapers/
- https://scholarworks.rit.edu/cgi/viewcontent.cgi?article=11512&context=theses
- https://theconversation.com/its-time-to-recognise-how-harmful-high-rise-living-can-be-for-residents-87209
- Larcombe, Etten, Logan, Prescott, & Horwitz. (2019). High-Rise Apartments and Urban Mental Health—Historical and Contemporary Views. *Challenges*, *10*(2), 34. https://doi.org/10.3390/challe10020034
- Nguyen, L., Van Den Berg, P., Kemperman, A., & Mohammadi, M. (2020). Where do People Interact in High-Rise Apartment Buildings? Exploring the Influence of Personal and Neighborhood Characteristics. *International Journal of Environmental Research and Public Health*, *17*(13), 4619. https://doi.org/10.3390/ijerph17134619
- Surichi, M. (n.d.). *An analysis of high-rise living in terms of provision of appropriate social spaces for children*. https://www.urbandesignmentalhealth.com/journal-5---high-rise.html#:~:text=Children%20tend%20to%20be%20greatly,develop%20through%20recreation%20and%20play.
- (OpenAI, 2023) - was used to improve the quality of sentence formation and Dalle was used few images

List Of Used Figures

- **Evolution of skyscrapers around the globe -** https://old.skyscraper.org/WEB_PROJECTS/SUPERTALL_SURVEY/2018.html1
- **First Skyscraper-** https://www.thoughtco.com/how-skyscrapers-became-possible-1991649
- **Framework used to build a skyscraper-**https://dozr.com/blog/skyscrapers
- **Jeddah Tower-** https://thetowerinfo.com/buildings-list/jeddah-tower/
- **Top 10 Most Densely populated Cities.** https://www.titlemax.com/discovery-center/the-25-cities-with-the-highest-population-density-in-the-world/
- **Cities with Most Skyscrapers Built-** https://slowrevealgraphs.com/2023/05/25/the-cities-with-the-greatest-number-of-skyscrapers/
- **Population density Diagram of major cities around the world-** https://www.vox.com/2015/1/2/7480993/population-density-visualized
- **Swadeshi Chawl Front Elevation-** [Sameep Padora 2018] https://www.youtube.com/watch?v=dwC4SRQx7Zg
- **Swadeshi Chawl with highlighted market spaces-** [Sameep Padora 2018] https://www.youtube.com/watch?v=dwC4SRQx7Zg
- **Swadeshi Chawl section-** [Sameep Padora 2018] https://www.youtube.com/watch?v=dwC4SRQx7Zg
- **Swadeshi Chawl courtyard-** [Sameep Padora 2018] https://www.youtube.com/watch?v=dwC4SRQx7Zg
- **Bhatia Chawl Section-** [Sameep Padora 2018] https://www.youtube.com/watch?v=dwC4SRQx7Zg
- **Bhatia Chawl courtyard-** https://www.youtube.com/watch?v=dwC4SRQx7Zg
- **Common Balcony of Chawls**
- **Dahi Handi Festival Celebration in Courtyard of chawl**
- **Community spaces in**
- **Chawl-**https://publications.risdmuseum.org/risd-grad-show-2020-architecture/rashi-harshil-lalaji
- **Modern High Rise buildings floor plan in Mumbai**
- **Visual connectivity from highrise-** https://www.urbandesignmentalhealth.com/journal-5---high-rise.html#:~:text=Children%20tend%20to%20be%20greatly,develop%20through%20recreation%20and%20play.