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Livable Cities: A Conference on Issues Affecting Life in Cities

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INTRODUCTION

Livable Cities: A Conference on Issues Affecting Life in Cities

What makes a city livable? Transport, housing, health. Open space, mobility and the environment. Matters of culture, entrepreneurship, crime and safety. Affordability and access to education. Depending on whose 'livability index' you look at, it may include design quality, sustainability and the digital infrastructures of the smart city. Other criteria applied may encompass food access, job opportunities or walkability. Inclusivity and the politics of participation also come into play. Discrimination in all its forms impacts livability and social and political equity.

The past two decades have seen an exponential rise of livability measures. Reflecting increased urbanity globally, they risk making the notion of the city ever more contested. The two cities that host this event are cases in point. The Mercer Livability Ranking takes New York as the datum by which all other cities globally are graded – as better or worse. London, by contrast, measures itself: the London Assembly scoring everything from air quality to indices of deprivation. When we consider the livability of cities then, it is clear we are dealing with a plethora of issues – both isolated and, inevitably, interconnected.

Responding to this scenario, the papers in this publication tackle these issues above from various angles. They examine how we live in cities, and how every issue we encounter morphs with considerations of others, whether housing, architecture, urban planning, health, IT, crime and safety, city management, economics or the environment.

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SMART, FUTURE, FLEXIBLE - ADAPTIVE ARCHITECTURE AND URBANISM

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INTRODUCTION

The research paper focuses on climate change and flooding problems, affecting millions of people and infrastructure, especially densely populated coastal areas worldwide, majorly affecting urban poor, slums and neglected communities. Now challenge for coastal cities is to adapt as per climate change and extend cities on water and ground. The research is primarily focused on the coastal city region of Mumbai, India. The vital aspect of this paper is to study and understand typologies to adapt on ground and water by hybrid method for climate-responsive, cost-effective and energy-efficient building for expansion of habitat on water and ground. The quest is to make hybrid flexible typologies based on the local environment, socio-economic status, context and local materials. The form, space and functional organization of typology design are in the course of human behaviour (time, space and activity) of the area, which can be adapted as per rising sea level, family growth and need. It is possible through the fusion of design, science, engineering and technology, and people's participation in construction. The term "adaptive architecture and urbanism" means adapting and building as per budget available, adapting to community needs, adapting to the climate crises, adapting to place and context, and adapting to architecture level to urban scale. This research paper is a chapter of PhD study at TU Innsbruck, Institute of Experimental Architecture, Hochbau.

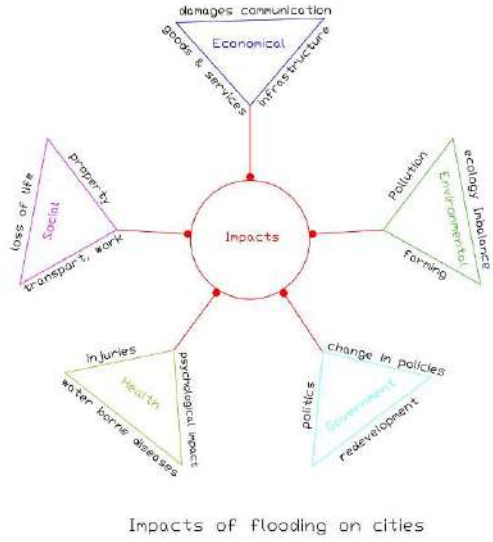

Figure 1. Climate and flooding impact (drawing by author)

PROBLEM

The planet has made into headlines throughout the twenty-first century. And the news is not good. The diagnosis is bleak: the world we live on and live with is exhausted, drained, depleted, damaged, broken. In short, the condition is such that the planet is in urgent need of critical care. In medical terms, acute care is a specialized branch of medicine dedicated to diagnosing and treating life-threatening conditions.[1] Rising sea levels, flooding cities are affecting countries around the world. Its impact is on the economy, environment, health, social and political. As per the stats, major coastal cities are at high risk, including New York, Miami, Shanghai, Osaka, Indonesia, Mumbai, etc. These cities are witnessing increased population, high economy, land and living costs. As per United Nations in the 2017 ocean conference, more than 600 million people (around 10 percent of the world's population) live in coastal areas that are less than 10 meters above sea level.[2] We are changing the Climate, and Climate is changing us.

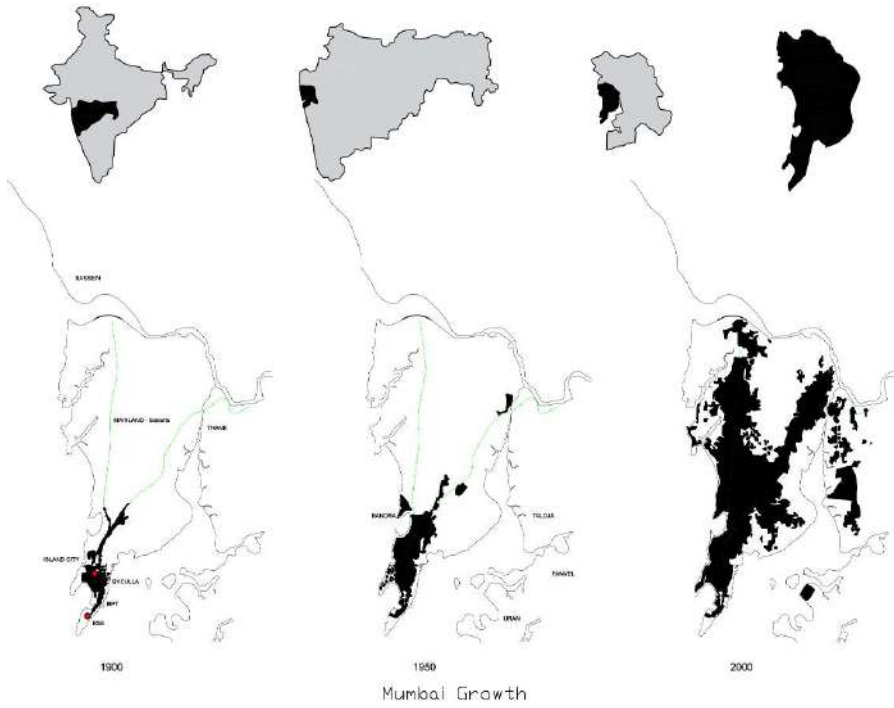

Figure 2. Mumbai location and growth 1900-1950-2000 (drawing by author)

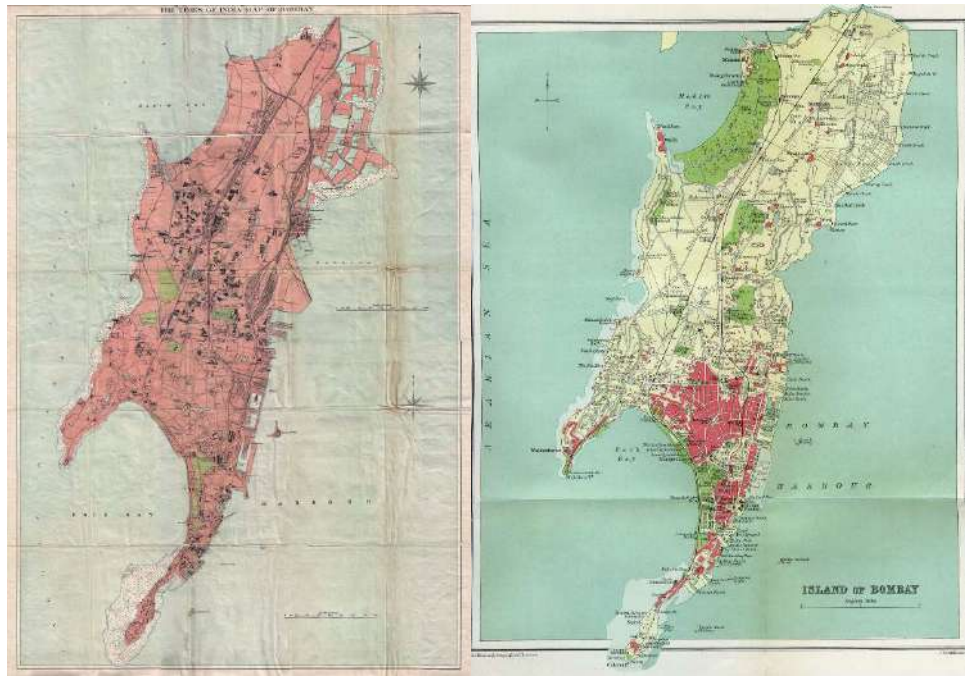

Figure 3. Left image- Historical map Mumbai (Bombay) 1895 and right image - Historical map Mumbai (Bombay) 1909

Coastal floods accounted for only 1% of the flood events, while riverine floods accounted for the vast majority. River flooding in many areas deposit fertile sediments that aid food production. Flash floods that bring a level of unpredictability accounted for almost a sixth of the total, as did unclassified events. Floods are amongst the most damaging and recurrent of all disasters.[3]

Mumbai-Urban Poor

Poor communities often live in the most hazardous and unhealthy environments in urban areas. Many build their homes and grow their food on river floodplains in towns and cities. Others construct their shelters on steep, unstable hillsides or along the foreshore on former mangrove swamps or tidal flats. People suffering from these poor conditions may find their difficulties compounded by the consequences of climate change.[4] Mumbai, the capital city of the state of Maharashtra, according to United Nations, as of 2018, is the most populous city of India and the seventh-most populous city in the world with a population of roughly 20 million. A large island was created from the former seven smaller ones (Colaba, Little Colaba, Bombay, Mazagaon, Worli, Parel and Mahim), and the most significant land reclamation projects were completed by 1862. Mumbai is the result of intensive land reclamation measures that continue to this day. [5]

Mumbai is estimated to have the largest slum population of any city in the world. In 2016, an estimated 55 percent of Mumbai's population lived in slums. A slum is a densely populated area typically characterized by poverty, deteriorated housing/buildings and poor living conditions. Apart from the millions of people living in Mumbai slums, the city also has a high number of homeless who cannot afford any form of permanent shelter. The official number of homeless people in the city is around 50,000. Some argue that the actual figure might be much higher.[6] Mumbai's flood risk makes the city a "high-risk" place for climate change vulnerability. Among the world's 31 megacities, Mumbai ranks as the ninth riskiest based on about 50 factors ranging from preparedness to exposure to climate shocks like heat waves, drought, hurricanes, and flooding. Mumbai's high population density, high poverty rates and poor sewage and drainage systems heighten the risk posed by climate-related events like flooding. "Mumbai is a significant city in terms of the economic wealth it generates." The city's economy rivals that of some developed nations in Europe. Its stock exchange is valued at around $2.2 trillion - almost twice the entire GDP of Mexico or Australia. Its Hindi-language Bollywood entertainment industry generates billions of dollars in global revenues each year. Property developers are aware of sea-level rise, but they're in the business to sell. "No developer in Mumbai does any kind of risk analysis on how sea level and climate change is going to factor into their risks," says Rohitashwa Poddar, managing director of local developer Poddar Housing and Development.[7]

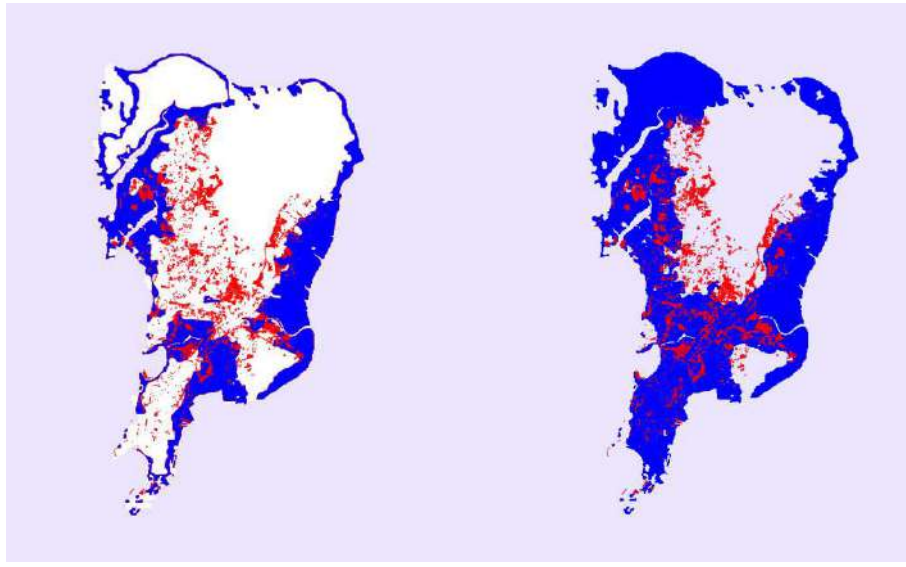

Figure 4. Mumbai flooding in 2050 with current slum population drawing by author after (source info: climate central organization)

Figure 5. Mumbai in a standstill due to heavy rainfall, flooding 2020 – Damaged Houses, Railways, Roads, Hospitals and Infrastructure and more (source: anonymous)

Facts and Figures of Mumbai Neglected Communities

1. Slums and Neglected communities in Mumbai – 55 %
2. Population Density - 300,000 inhabitants per sq km
3. Distribution of religion - 62% Hindu, 30% Muslims, 28% others
4. Economy - Average monthly household Income in Indian rupees – Rs
(14% ----less than Rs 4000, 26%---- Rs 4000 – 6000, 28%---- Rs 6000- 8000, 6%---- Rs 8000 -10000, 5%---- Rs 10000 – 12000, 2%---- Rs 12000 – 14000, 4%---- Rs 14000 – 16000, 6%---- Rs 16000 – 18000, 5%---- Rs 18000 – 20000, 1%---- Rs 20000 – 24000, 3%---- Rs 24000 – 26000)
5. Average property prices - 30,000 to 80,000 per sqm (Cost changes area to area)
6. Origin – 95 % Immigrants and 5% Locals
7. Average household size – 6.5 persons
8. Employment - 20% work outside, 35% Self employed, 30% Wage employed, 15% Temporary jobs
9. Major migrant group from states of India - 37% Tamil Nadu, 36% Maharashtra, 10% Karnataka, 6% AP and Telangana, 11% other states

METHODOLOGY

The PhD research applies speculative design as a method in practice for flooding cities. Speculative design is an evolving design practice that encourages the world to think further ahead and be more comprehensive in possibilities. The speculative design combines design-thinking methods with the story-telling and future-world-building techniques of speculative fiction to produce prototypes of future or experiences. These fantastic artifacts may be in the form of a physical or digital product, video, documentary, book, manual, website, sculpture or something else. Their purpose is to generate discussion, debate, and awareness beyond projected or plausible futures so that designers, companies, and the public not only live with more awareness of how their actions contribute to manifesting and hindering the future, but so they also begin to imagine and articulate their preferred futures.[8]

ADAPTIVE APPROCH

Why? Moving away from flooding or retreat is an option and adapting to the situation and building and living with it is more important. So we need a hybrid method of approach, design and construction. We are using both traditional and new technological methods and techniques in building flooding cities. Humans have a long history of living on the water. Our water homes span the fishing villages in Southeast Asia, Peru and Bolivia to modern floating homes in Vancouver and Amsterdam. As our cities grapple with overcrowding and undesirable living situations, the ocean remains a potential frontier for sophisticated water-based communities.[9]

Land reclamation is not the only method to build on water or flooding cities. Landfilling/land reclamation has many disadvantages: high costs, enormous material needed and wary of soil subsidence, extensive construction time, damages marine ecosystem and environment, and can create more problems in future. Example projects built on water Pulau tekong – Singapore, Central and wan chai – Hong Kong, Palm Jumeriah, Dubai etc. Therefore we have two possible approaches for flooding cities. One way is to build on stilt, and the other is floating structures. Floating architecture (buoyancy force of the water) can adapt, shift and adjust as per rising sea levels and flooding, build easily and quickly, environment-friendly, no damage to the marine ecosystem, protected from earthquakes, easy and fast to make, modular form and flat in nature. Sustainable and ecological building system for Africa's coastal regions by architect Kunlé Adeyemi- Makoko Floating School - An estimated 2,000 people enter Lagos every day, ending up in informal settlements like Makoko.

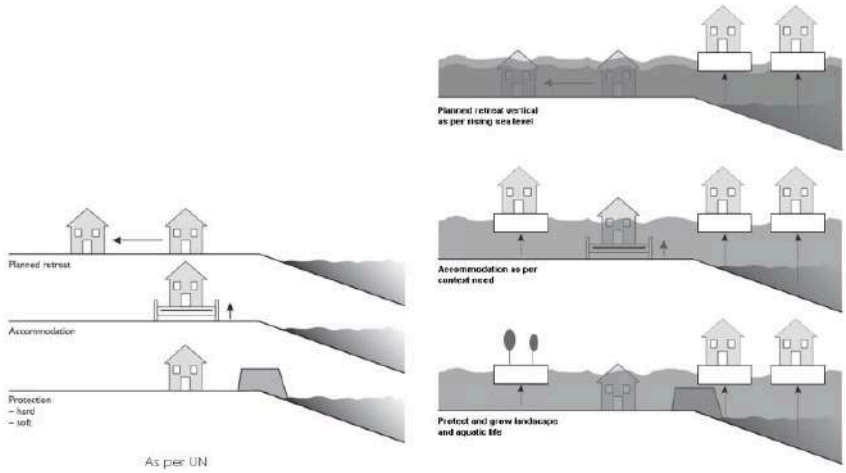

Figure 6. Left drawing by United Nations and right drawing adapting to sea level rise by author

It was founded as a fishing village in the late 19th century by immigrants from the Egun ethnic group. As its population swelled and land ran out, they moved onto the water. Today Makoko is home to people from a variety of riverine communities along Nigeria's coast. Makoko Floating School is a prototype floating structure built for the historic water community of Makoko, located on the lagoon heart of Nigeria's largest city, Lagos. As a pilot project, it has taken an innovative approach to address the community's social and physical needs because of climate change and a rapidly urbanizing African context.[10] Floating structures "Copenhagen Islands" - Australian architect Marshall Blecher and Magnus Maarbjerg from Danish design studio Fokstrot have teamed up to create a wooden island floating in Copenhagen harbor. Complete with a single linden tree, the 20-square-metre floating platform is a prototype for a project called Copenhagen Islands. It was designed to be used as a public space.[11]

FLEXIABILTY

The author uses the term flexibility and defines it as - the ability to be easily modified or shifted, or added. To explain in detail, it applies two things, one on floating structure form and the other in construction. The author speculates typology as *Cell or Molecule* with an area and size – 18, 25, 40 and more, adding cell as area, space-based on family increment, size and growth. Cubic element, which is highly flexible in nature, is used as a design principle. The simple Implementation process and construction of these architectural typologies can adapt on the ground and floating platforms (demands lightweight construction). Good environment and high-quality spaces as per community/social working requirement and conditions (Fisherman, small scale Industries, welding shops, stitching, recycling units and more). Typologies are Climate responsive for ample light and ventilation, social interaction, contact with neighbours (day and night). Open home to outdoor community space, as life occurs mainly on streets, accumulation of squares, courts, terraces and balconies. Courtyard turns individual blocks and chains, and blocks with courtyards are grouped as quarters. Local building materials are used for construction of typologies -Lower-income G+2 (Clay and Bamboo) -Middle-income G+4 (Masonry Building – Recycled, Cavity blocks, Exposed façade, handmade terracotta tiles) - Higher income G+6 and above (Apartments - concrete frame and masonry Structures).

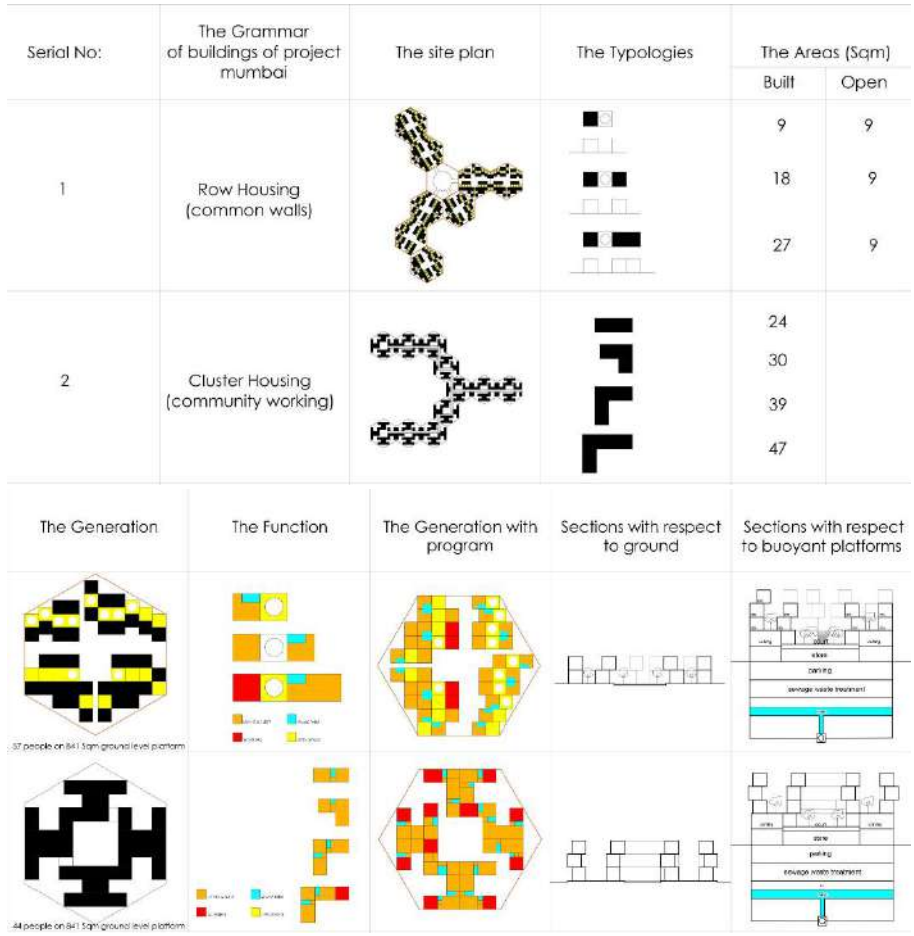

Figure 7. Typologies – area, module, number of people, relation, generation, function and spaces (drawing by author)

GEOMETRY, FORM, STABILITY, MOVABILITY AND BALANCE

Geometry is vital in any architectural design as it is an essential part of structure, materials, space and function for comprehensive design. The author uses a hexagonal form for two main reasons, one for science and the other for flexibility. Science says floating platform needs to be round in nature for balance and stability of the whole structure (metacenter, center of gravity and buoyancy), and hexagonal shape and form is close to circle, due to the six faces of the platform, it's easy to connect one platform to the other vice versa, and additionally, this creates multiple variations and flexibility (Fig-9) in arranging platform for city development. Flexible hexagonal structures are easy to move, adapt, arrange, shift and connect. Significantly climate response and adaptive to flooding situations adjusting to rising sea level, floating platforms can be oriented for better light and wind directions based on Climate.

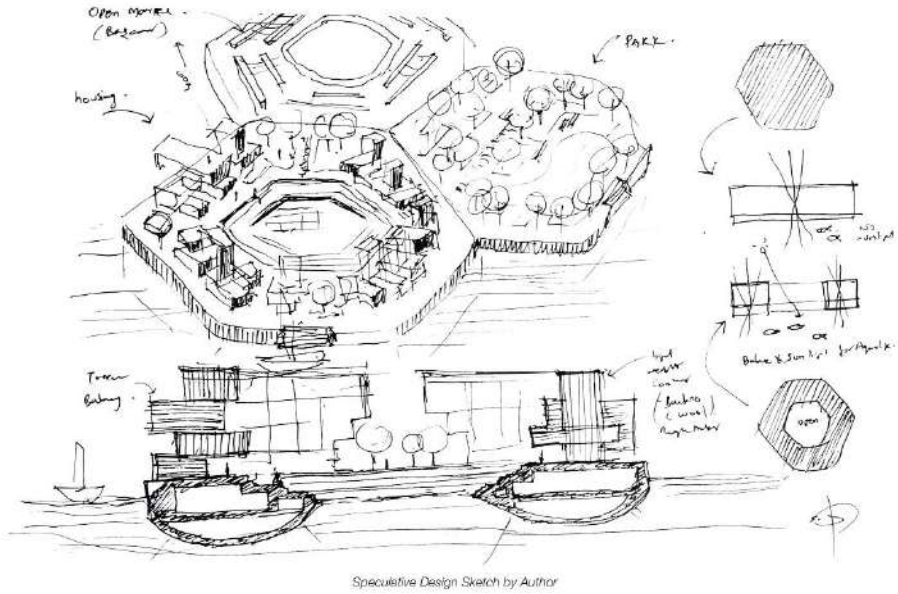

Figure 8. Sketches show cluster/community housing, park, and market (bazar) on hexagonal floating platform with open and build spaces - drawing by author)

ARCHITECTURE, URBANISM AND LANDSCAPE

Mumbai city needs affordable housing and infrastructure due to high urbanization; flooding is creating more significant problems as it costs the town three times more (one for building, two for cleaning debris and three for rebuilding again). So we need new innovative ideas and solutions- Floating architecture is one way. The flexible typologies can grow and adept at the urban scale to become clusters, groups to extend, shift based on city prerequisites. The multiple variations bring flexibility in reconfiguring the city and its growth. It can accommodate and fulfil urgent city needs for present and future desires, i.e., affordable housing for urban poor (fishermen or neglected communities), recycling industries, recreational spaces, public buildings, institutions, working hubs, agriculture, vertical farming and more.

This extended floating city on the water can control and reduce winds, sun, and heat waves from the ocean to the city, converting it to generate solar and wind energy. Few floating structures can collect trash, clean river (methi) from the pollution that connects to the ocean. Floating architecture has the potential to conserve ecology and ecosystem land, marine and aqua life by not polluting and avoiding land reclamation, channeling industry waste inlets to floating filtration structures before letting into

the ocean. Floating agriculture, farming and landscape can control pollution, maintain ecology and create space for recreational activities. It would be an exceptional way to conserve and restore the city's lost environment. These projects can start in small scale at the community level. These would be possible by the support and collaboration with the government, subsidy, and low-interest rates from banks to urban poor. Local people's participation (Students, NGO's, Institutes and others) in building their own community houses, schools, toilets and infrastructure with experts and professionals' support.

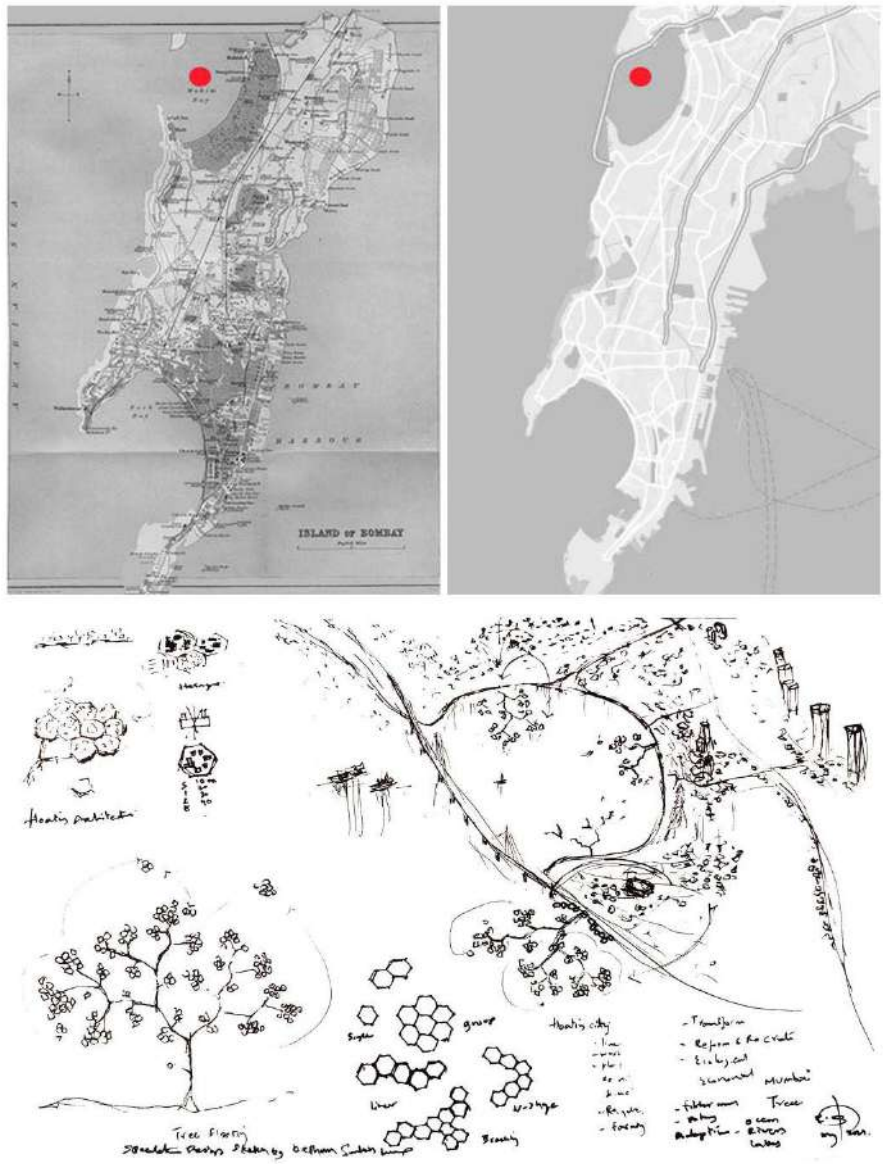

Figure 9. Mahim Bay, Mumbai - Extension of city on water – Sketch Speculative design floating architecture.

CONCLUSION

The PhD research aims to study flooding scenarios in Indian cities and make speculative designs scenarios for possible solutions based on Climate, place and socio-economic realities. Further, these speculative designs are to be showcased to local citizens in the form of exhibitions and offer choices to choose what they need—and modify or improvise the designs based on community's feedback and build along with them (community participation). These can be achieved with the help of government's support in the form of subsidies and loans or sponsored material from construction companies. The typologies mentioned in the paper can be built with lightweight hybrid and local materials with advanced construction techniques. The Hybrid materials and advanced techniques of construction are part of author's research.

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