

# **Social Infrastructures**

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This dissertation is presented as part fulfilment of  
the degree of Master of Architecture (Professional) in  
the School of Architecture, Planning and Geomatics,  
University of Cape Town

November 2015

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## **Acknowledgements**

I thank God for the giving me the strength and confidence to complete this dissertation. I sincerely thank Kevin Fellingham for the guidance and encouragement in finishing this dissertation and for also being my supervisor. In Addition, I would like to thank my friend Emmanuel Obasuyi and respondents for the support and willingness to spend some time with me in gathering important data.

Last but not the least, I am really grateful to my mother Associate Prof. Abimbola Windapo for the continuous support I received towards completing this dissertation. Without this support I will not have been able to complete this task.

## **Preface**

I have conducted this research due to my personal interest in undertaking works of architecture in the city of my birth, Lagos, in transforming its urban environs and prominent waterfronts from their states of degeneration to spaces that positively contribute to the public realm.

Only a few works of architecture have made efforts to deal with the urban problems in contemporary Lagos and the general practice of Architects is to generate pseudo-European classical architecture or typical off the shelf architectures that are seen in architecture magazines.

My intent in doing this research is to propose a sort of provocation which can be a starting point for developing a new Lagosian architectural identity that transforms the city into something previously unimagined and perhaps finally bring into birth the city of Lagos which Rem Koolhaas views is yet to come.



# Social Infrastructures

*A shift to decentralized infrastructure as a means of rejuvenating blighted Lagosian contexts and places of similar genus*

## Abstract

This research stems from reports of the interaction between the growing informal communities such as Makoko, the coastal plains of the degenerating Lagos contexts and their limited access to central infrastructure. The effects of climate change on the low-lying coastal plains further exacerbate the degeneration experienced in these contexts. Therefore this research examines how people live independently of central infrastructure in informal contexts such as Makoko and whether this autonomy can be embedded into interventions that are integrated within the socio-economic networks of these contexts in a bid to shift from defective central infrastructures to social infrastructures that transform the blighted Lagos contexts in a manner that builds resilience at a local level.

By using Makoko as a site for exploration and communicating with the locals of the context, Lagos professionals and non-governmental organizations, it emerged that there is currently an unhealthy relationship between the state, its local governments and its informal communities such as Makoko, in that the city of Lagos is managed principally from the office of the governor. This central management results in infrastructures that are implemented without critical acknowledgement of the problems faced by individuals who live in the many informal contexts of Lagos thereby resulting in little or no observable transformation in its (Lagos) degenerating contexts. It was also observed that Makoko has a unique urbanity of soft infrastructures that lend themselves to different scales of functions in the context and diverge from the typical hard infrastructures employed by the Lagos state government.

The observations and findings point to the fact that the relationship between the state and its people must be strengthened for delivered infrastructures to be of any consequence in realizing any positive social change and transform Lagos and settlements like Makoko from their states of human and environmental degeneration by acknowledging that these contexts have unique problems and urbanisms that must be fused into any interventions within their precincts in a sustainable, ecological and economical way. This move will go a long way in transforming and legitimizing Lagos's degenerating contexts as important facets of the city.

Keywords: Central Infrastructure, Hard Infrastructure, Infrastructure,  
Lagos, Liquid Urbanism, Makoko, Spatial Agency, Social Infrastructure,  
Soft Infrastructure, Sustainability

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fig. 1 Collage conceptualizing the idea of infrastructure as an essential element for the surviaval of Makoko in Lagos.

## **Introduction**

### *Towards Social Infrastructures*

This dissertation is based on the water-based informal settlement called Makoko located in the coastal city of Lagos. Lagos is a West African state located at the south-west of Africa's most populous nation and economic superpower, Nigeria. Lagos has a total area of 3,577.28 square kilometers with approximately 40% of its area covered by water bodies and wetlands, the biggest water body being the black brackish Lagos lagoon which has shallow depths ranging from 1.5 meters to 3 meters<sup>1</sup>. In addition, 12% of Lagos's landmass is subject to seasonal flooding as a result of bad drainage and climate change<sup>2</sup>. The sprawling city of Lagos, usually referred to as Eko (city) by locals, forms 37% of Lagos's land area and has become one of the world's largest mega-cities with a population of approximately 20 million people<sup>3</sup>.

Lagos due to its closeness to the equator (6.4531° N, 3.3958° E) has a hot tropical climate with an average monthly maximum temperature of 30° Celsius, with a mean yearly rainfall of 1,647.26mm and peak rainfall of about 300mm in the month of June<sup>4</sup>, and a mean relative humidity of 84.7%. The state experiences its highest temperature between November - December and February - March, while the lowest temperature occurs around June - July; July being the coolest month.

Currently, in the city of Lagos there is a great lack of central infrastructure. Less than 40% of the Lagos population is serviced with pipe-borne water from the Ogun River (fresh water) which runs to Lagos from Abeokuta a nearby precinct in the south-west of Nigeria and about 60% of the Lagos population gets untreated water supply in an informal manner usually through boreholes that exploit the ground water of the state.

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<sup>1</sup> HALL, J. 2014. Sea Level Rise and the Lagos Waterfront: assessing impacts and adaptations in Ijora -Oloye, AKINSETE, E., HOELZEL, F. & OSHODI, L. 2014. Delivering Sustainable Urban Regeneration in Emerging Nations: Introducing Neighborhood Hotspots. *Journal of Architectural Education*, 68, 238-245.

<sup>2</sup> OMOJOLA, D. & ELIAS, P. 2011. The Physical Environment. In: OGUNLEYE, M. (ed.) *State of The Environment Report - Lagos Lagos*: Ministry of the Environment, Lagos State, ADEYEMI, K. 2012c. *Makoko Floating School*. Amsterdam: NLE.

<sup>3</sup> AKINSETE, E., HOELZEL, F. & OSHODI, L. 2014. Delivering Sustainable Urban Regeneration in Emerging Nations: Introducing Neighborhood Hotspots. *Journal of Architectural Education*, 68, 238-245.

<sup>4</sup> OMOJOLA, D. & ELIAS, P. 2011. The Physical Environment. In: OGUNLEYE, M. (ed.) *State of The Environment Report - Lagos Lagos*: Ministry of the Environment, Lagos State.

Also there is a massive lack of electrical energy in Lagos and this is a Nigerian national crisis. Energy provision in Nigeria remains extremely inadequate, with the national grid generating approximately 4,500 megawatts of power annually through hydro electricity, while the city of Lagos alone has an estimated demand of 10,000 megawatts<sup>5</sup>. This fact illustrates the absolute shortage of power in the city.

In addition, less than 2% of the Lagos population is serviced with central sewage systems. Most homes employ onsite septic tanks and soak away systems which are usually evacuated into the Lagos lagoon without appropriate treatment<sup>6</sup>.

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<sup>5</sup> AKINSETE, E., HOELZEL, F. & OSHODI, L. 2014. Delivering Sustainable Urban Regeneration in Emerging Nations: Introducing Neighborhood Hotspots. *Journal of Architectural Education*, 68, 238-245

<sup>6</sup> ADEYEMI, K. 2012c. Makoko Floating School. Amsterdam: NLE.

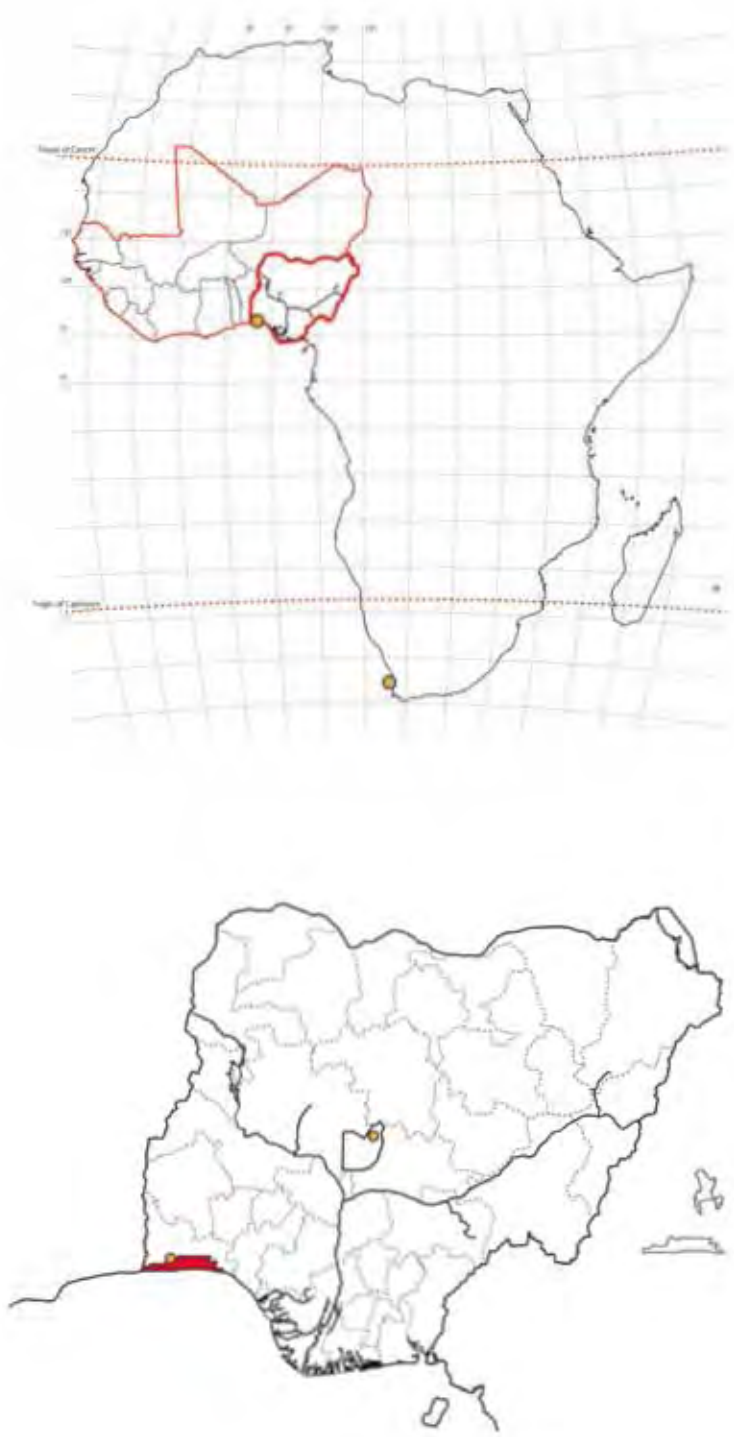
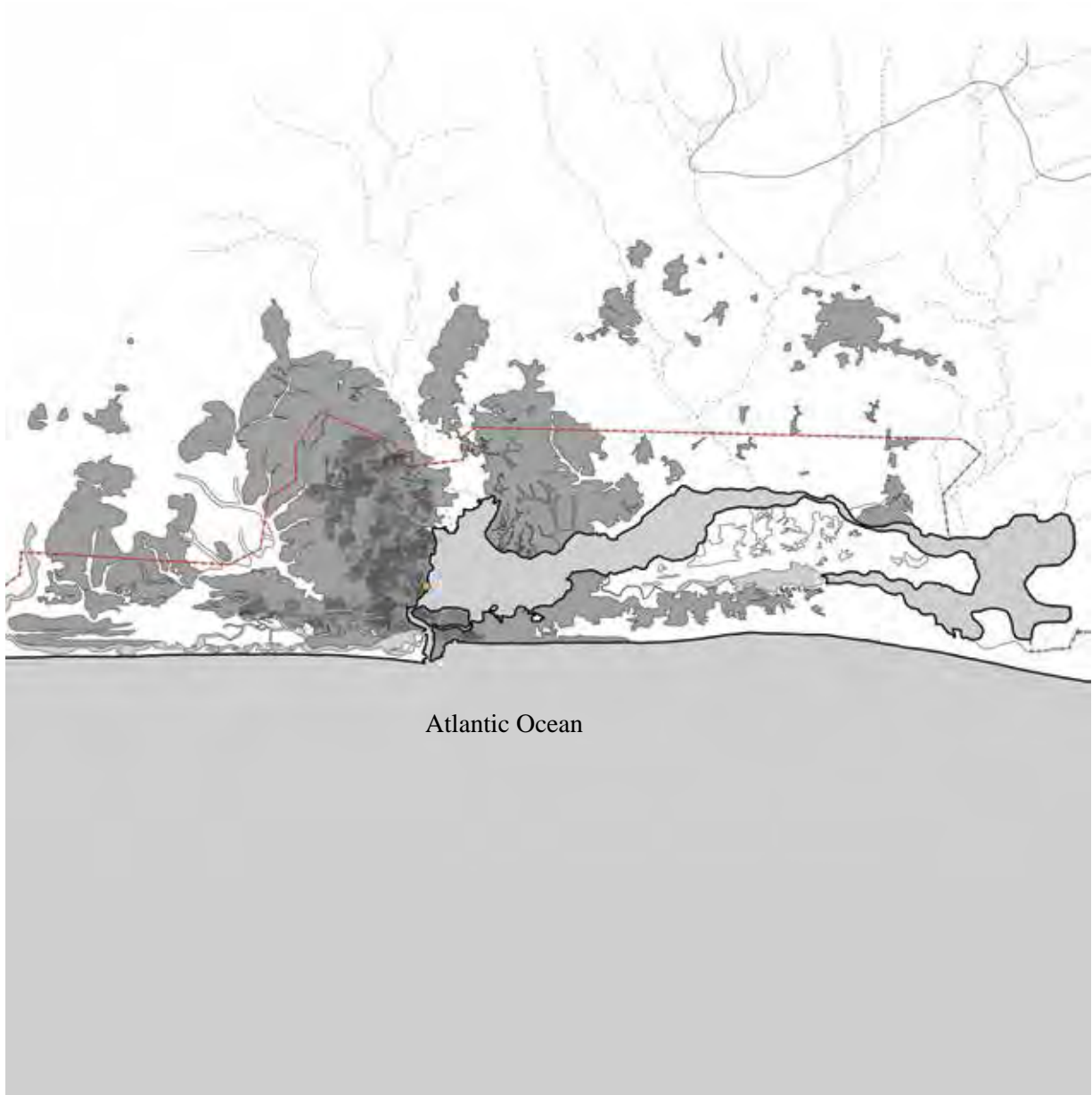


fig. 2 Maps of Locating Lagos and Nigeria in Africa.



**fig. 3** Map showing Lagos state and its surrounds. The vast Lagos lagoon and important fresh water rivers and creeks are clearly seen. The yellow dot indicates the location of Makoko.

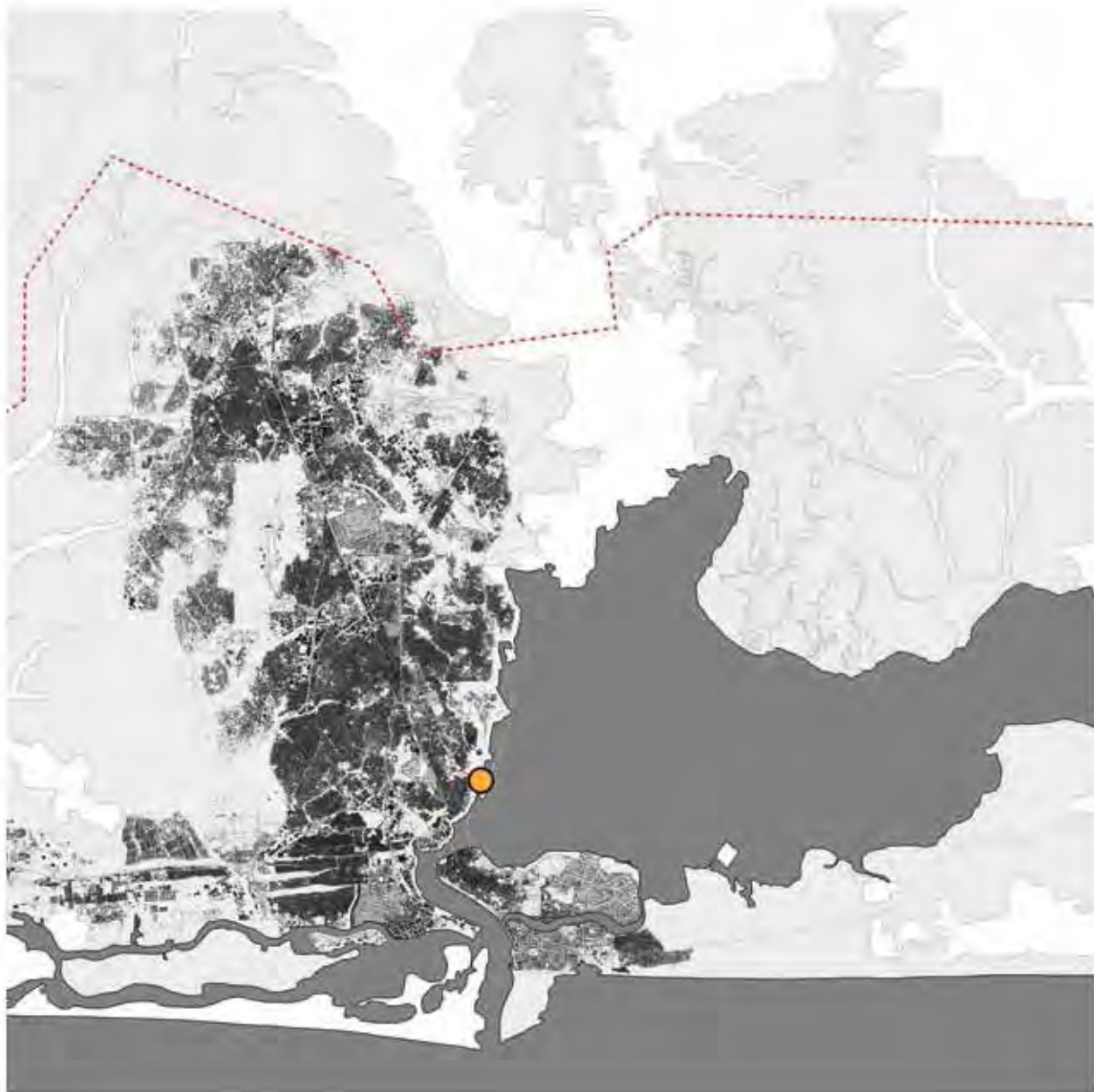


fig. 4 The location of Makoko at the heart of the city of Lagos.



**fig. 5** The Makoko water-based settlement is seen clearly in close proximity to the third mainland bridge.

## CLIMATE IN LAGOS

Measured at an altitude of 40m

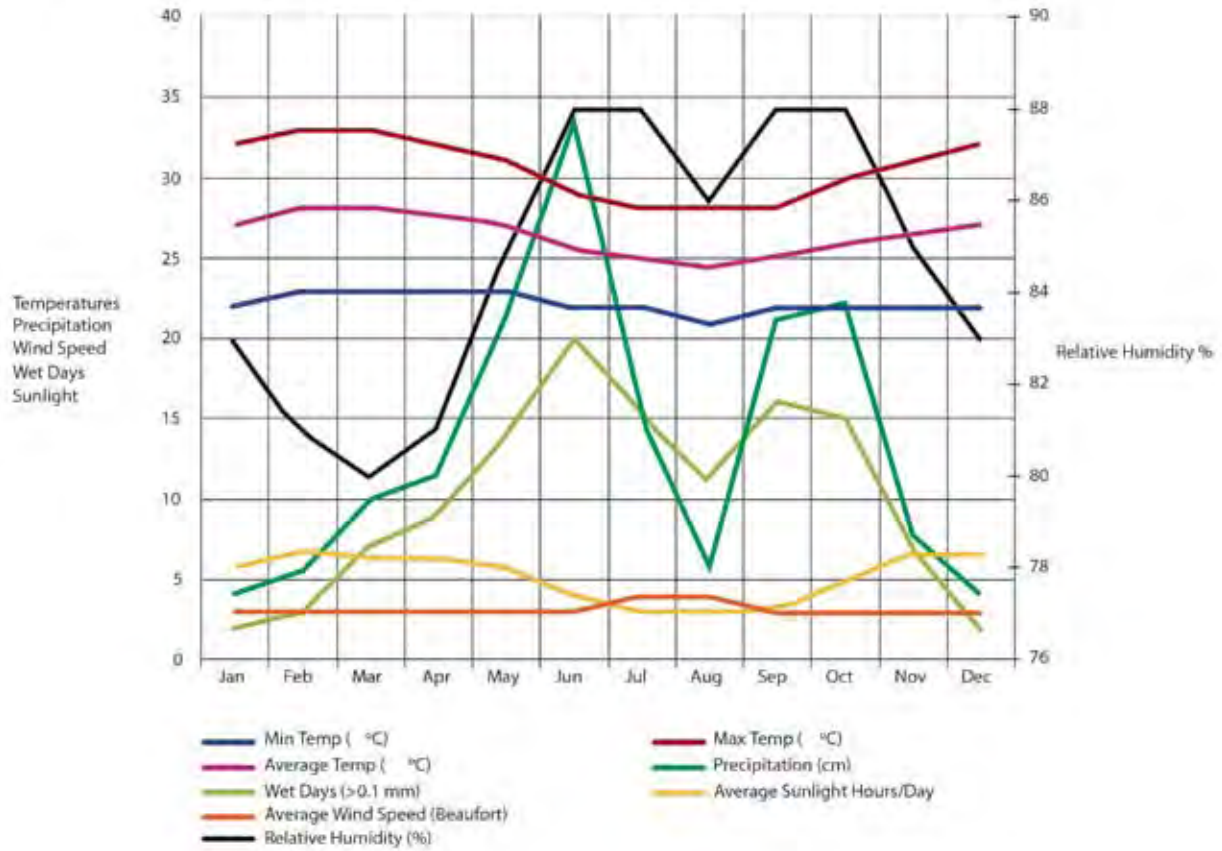


fig. 6 Weather conditions in Lagos. Showing the intense, temperature, humidity and rainfall conditions of the tropical climate.



**fig. 7** A tank for storing water pumped up from a borehole. A common symbol in Lagos displaying the autonomy of the people from infrastructures of the state.

Makoko has been chosen as a case-study to examine how people live independently of lacking central infrastructure and whether this autonomy can be embedded into interventions that are integrated within the socio-economic networks of these contexts in a bid to shift from defective central infrastructures to social infrastructures that transform the blighted Lagos contexts in a manner that builds resilience at a local level.

Central infrastructures refer to infrastructural systems delivered that are imposed on local contexts with little or no consultation with the individuals who live in these contexts. These infrastructures can also be referred to as hard infrastructures as a result of their finite nature and exclusion of people in their creation and they are unable to house a variety of functions as stipulated by Michael Oppenheimer a proponent of soft and hard infrastructure<sup>7</sup>.

Social infrastructures on the other hand, refer to those decentralized infrastructures that work with the specificities of local contexts. Social infrastructures possess innate abilities to be implemented at varying scales to reinforce the existing socio-economic interdependence between people in dense Lagosian contexts in order to create positive social change in an economical, ecological and sustainable way. Social infrastructures due to their ability to adapt to different scales, networks and functions are soft infrastructures and are more in tune with this contemporary era due to their ability to house a diversity of functions<sup>8</sup>. These infrastructures mostly include flexible public spaces and built structures with tectonics that allow for easy adaptation and reinforcement of human social interactions.

However, currently, the top-down management of the city of Lagos prevents its infrastructures from being of greater significance in the lives of its people while its local governments are unable to act independently of the state in supplying local infrastructures that resonate with the problems found in local contexts to create positive urban reformations in the built environment. Therefore, it can be said that the state has failed to provide central infrastructure to its growing population and this has resulted in the human and environmental degeneration of the city and when coupled with the effects of climate change this degeneration is further exacerbated.

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<sup>7</sup> OPPENHEIMER, M. 2011. Climate Change and world cities Rising currents: Projects for New York's Waterfront. New York: New York, NY: The Museum of Modern Art.

<sup>8</sup> Ibid.

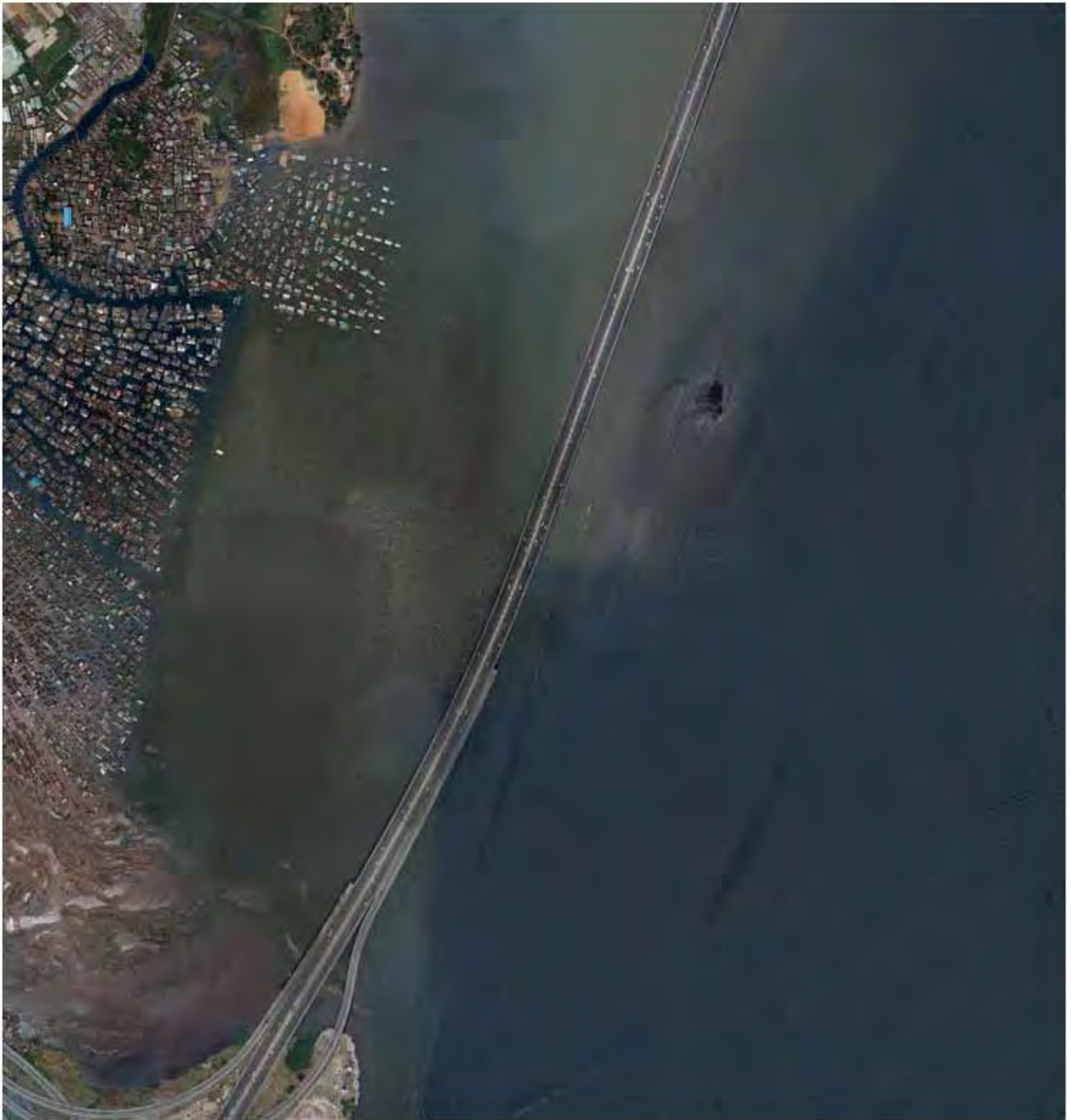
This research posits that there has to be a shift from central infrastructure to social infrastructures due to the state's failure to provide central infrastructure to its growing population. Makoko is used as a case-study to examine the urban infrastructure problems facing the Lagos context through an exploratory study that involves an in-depth urban study through maps and in a specific manner through onsite exploration and interviews. Finally, the research proposes types of social infrastructures that can be used at different scales in halting the degeneration of Makoko and other blighted precincts in the city of Lagos.



**fig. 8** Aerial photograph of the Makoko water community. A unique settlement in Lagos



**fig. 9** Aerial photograph of the Makoko water community in 2012 also showing the Oko-Baba Sawmill, the Third Mainland Bridge.  
From the Lagos state Orthophotography Department.





**fig. 10** Site plan of the Makoko context in the present day. The intricate water routes are clearly shown in black. The organic pattern at the bottom corner of the image are timber rafts floated from nearby forests and cut into size at the Oko-Baba sawmill.





**fig. 11** Aerial photograph of Makoko in 1981. The context has also experienced the population growth common in other precincts in Lagos.



**fig. 12** Aerial view of Makoko from the Makoko Floating School. The image shows the primary single storey dwellings on stilts.

## Research rationale

The motivation for investigating the provision of social infrastructures in blighted Lagos settlements stems from reports of the degeneration of Lagos's urban environment due to a lack of appropriate infrastructures for the sustenance of the city<sup>9</sup>. This lack of urban infrastructure also results in the heightened vulnerability of settlements such as Makoko to the effects of climate change, and the erosion of public spaces for the socio-economic interaction between Lagos's populace. The reports suggest that Makoko and similar contexts present an opportunity to re-imagine the delivery of infrastructure in the city in a decentralized manner that takes account of specific local conditions in the city in halting the degeneration of blighted city precincts. The study rationale will be considered in the following sub-sections:

### *Urgent Need of Infrastructure*

The government of Lagos is involved in a game of catch-up in supplying infrastructure to its 20 million people<sup>10</sup>, 70 percent of whom live in informal settlements and with a predicted population growth to 24million by 2020<sup>11</sup> the environmental degeneration of Lagos is only going to get worse and possibly unbearable if the right steps are not taken to curb it.

### *Climate Change*

About half of the world's population is densely located in coastal zones and this is on the increase<sup>12</sup>. African coastal settlements will be more vulnerable to flooding or Sea level rises than Western coastal cities due to the lack of adequate infrastructure to protect them<sup>13</sup>.

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<sup>9</sup> ADEWOLE, A. T. 2009. Waste management towards sustainable development in Nigeria: A case study of Lagos state. *International NGO Journal*, 4, 173-179, ADEYEMI, K. 2012c. Makoko Floating School. Amsterdam: NLE, UDUMA-OLUGU, N. & ODUWAYE, L. The Regeneration of Lagos Lagoon Waterfront for Recreation and Tourism (pp. 759-764). Real Corp 2010. 15 th International Conference Proceedings Held at Vienna, 2010.

<sup>10</sup> ADEYEMI, K. 2012a. African Water Cities. *City Catalyst*, 82, 98-101, AKINSETE, E., HOELZEL, F. & OSHODI, L. 2014. Delivering Sustainable Urban Regeneration in Emerging Nations: Introducing Neighborhood Hotspots. *Journal of Architectural Education*, 68, 238-245.

<sup>11</sup> HALL, J. 2014. Sea Level Rise and the Lagos Waterfront: assessing impacts and adaptations in Ijora -Oloye.

<sup>12</sup> Ibid.

<sup>13</sup> ADEYEMI, K. 2012b. Floating City Solutions for Africa's Vulnerable Coastal Communities: The Case of Makoko. *Perspectives*, 82, 98-101.

Additionally, the Intergovernmental Panel on Climate Change (IPCC) has predicted sea level rise to range from 0.18 to 0.59 meters by the end of the 21st century<sup>14</sup>. This sea level rise could bring about damaging consequences on the coastal populations of Lagos and a sustainable redevelopment of the Lagos coastal plains could shed light into mechanisms that will allow African coastal settlements to cope with the effects of climate change.

### *Provision of public space*

Lagos does not have much recreational space. Only 2 percent of the four hundred and ninety six hectares identified for public space is available for recreational purposes<sup>15</sup>. Now, the city reportedly has a population of approximately 20 million people and a density of 40,000 people per hectare which is substantial when compared to the international average of 600 people per hectare<sup>16</sup>.

Public open space is important for the recreation, socialization and agglomeration of people in the city. This unplanned encroachment of public space in Lagos prevents larger activities such as play, festivals and markets to occur in an organized manner. There is therefore a need to provide public space when intervening in the blighted precincts of Lagos.

### *Unique Opportunity for Re-imagination of Infrastructure Delivery*

In a TED talk delivered by renowned photographer Iwan Baan the interesting dynamic and autonomous livelihoods of the Makoko settlement is highlighted<sup>17</sup>. The talk revealed how the water-based community lives independently of the state. This led to an in-depth exploration to discover whether the autonomous nature of the community can be fused into systems for delivering infrastructure.

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<sup>14</sup> PACHAURI, R. & REISINGER, A. 2007. IPCC fourth assessment report. IPCC, Geneva.

<sup>15</sup> UDUMA-OLUGU, N. & ODUWAYE, L. The Regeneration of Lagos Lagoon Waterfront for Recreation and Tourism (pp. 759-764). Real Corp 2010. 15 th International Conference Proceedings Held at Vienna, 2010.

<sup>16</sup> AKINSETE, E., HOELZEL, F. & OSHODI, L. 2014. Delivering Sustainable Urban Regeneration in Emerging Nations: Introducing Neighborhood Hotspots. Journal of Architectural Education, 68, 238-245, UDUMA-OLUGU, N. & ODUWAYE, L. The Regeneration of Lagos Lagoon Waterfront for Recreation and Tourism (pp. 759-764). Real Corp 2010. 15 th International Conference Proceedings Held at Vienna, 2010.

<sup>17</sup> BAAN, I. 2013. Ingenious Homes In Unexpected Places.

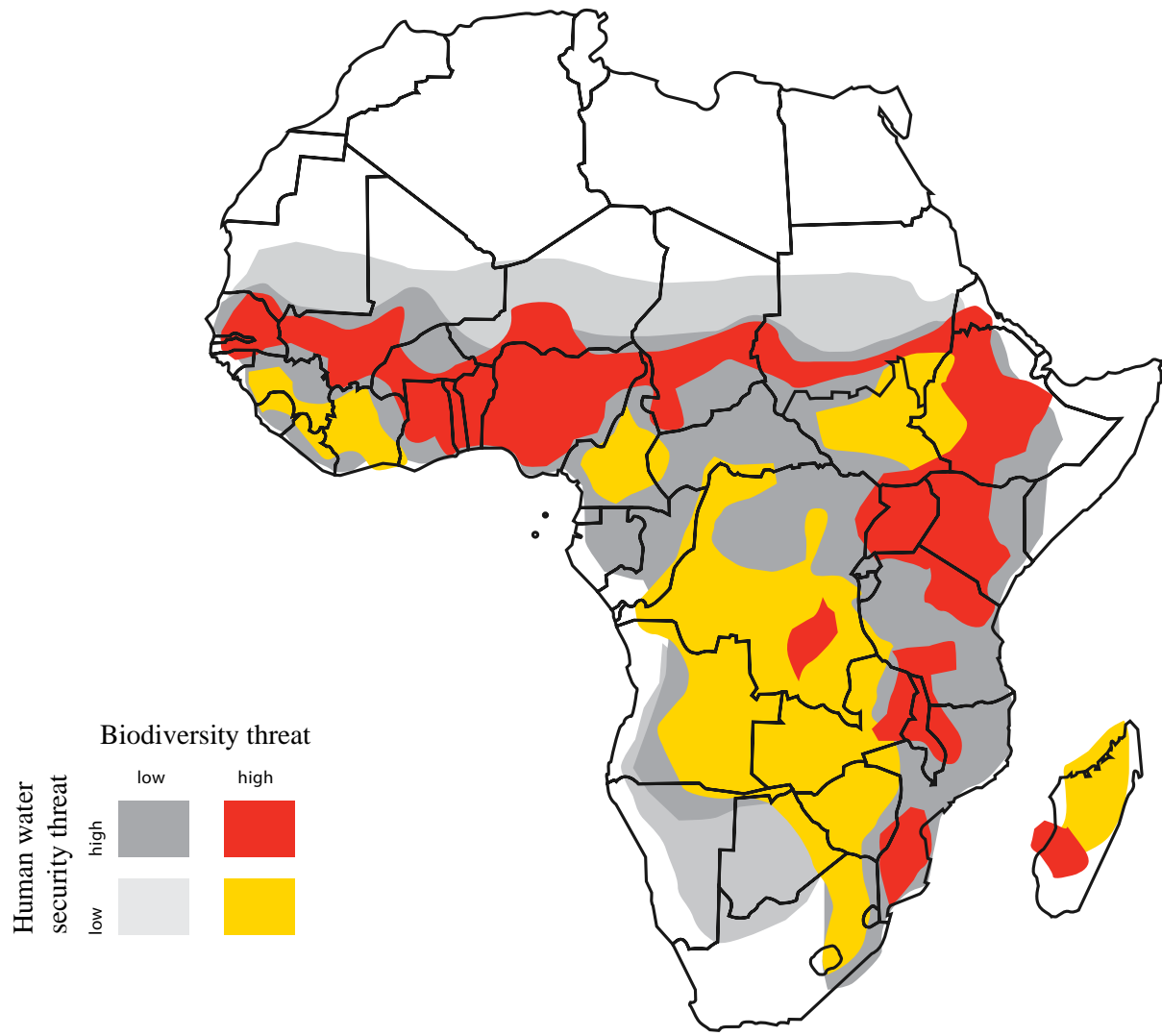
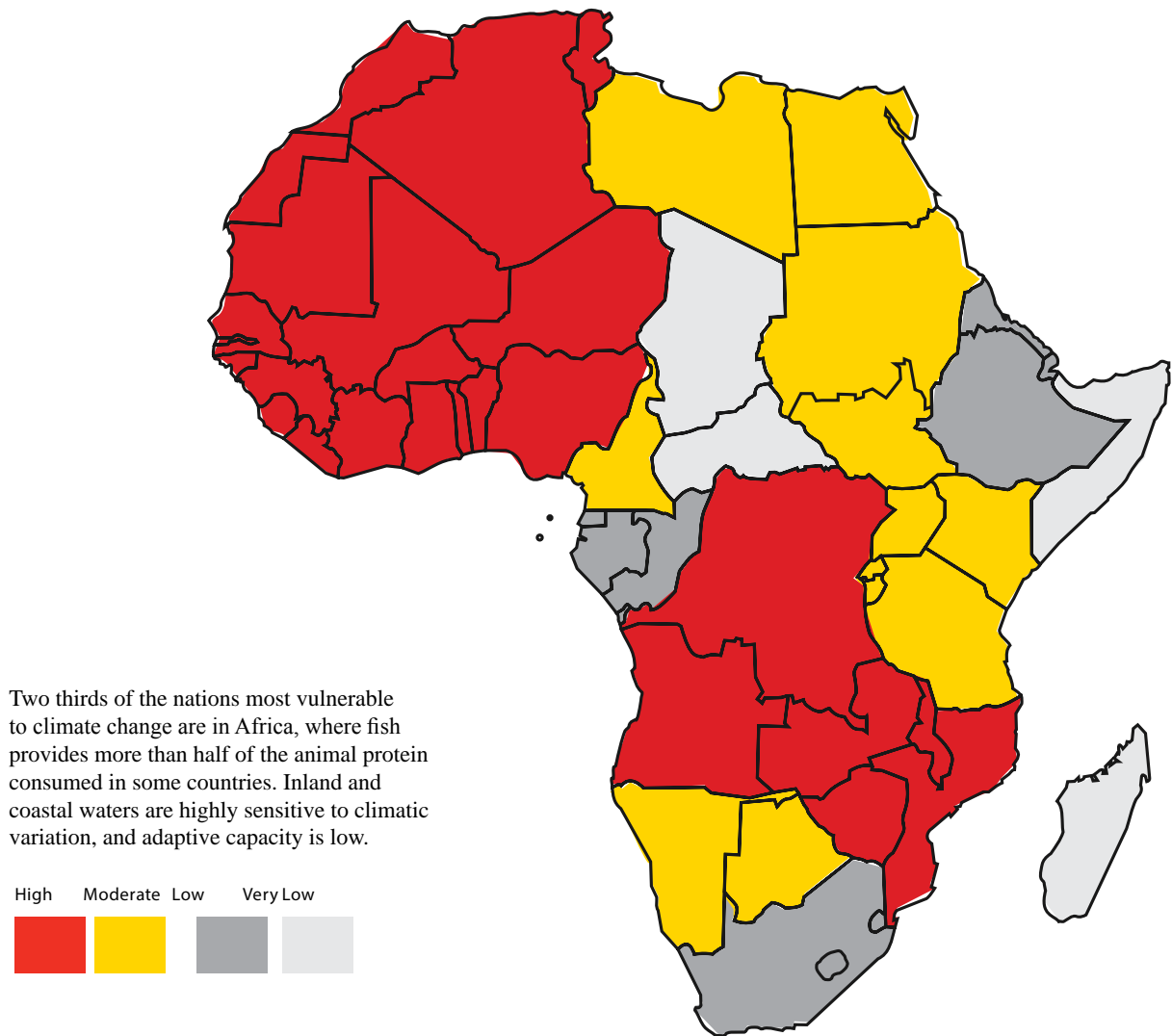


fig. 13 Diagram showing the biodiversity and human water security threats in Africa.



**fig. 14** Diagram showing the threat levels of climate change to fishes and aquaculture in Africa. In a context like Makoko the impact of climate change on water diversity can be devastating.

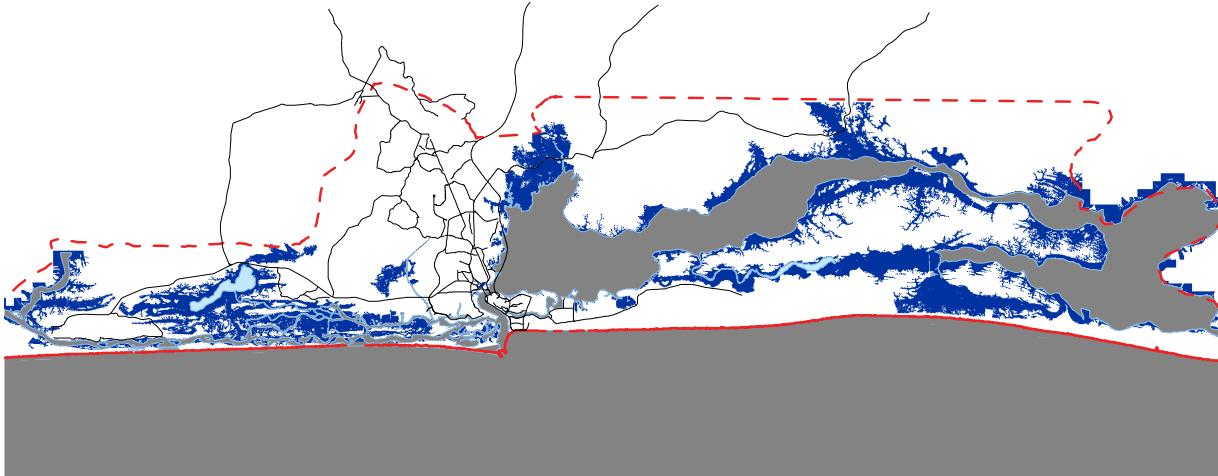


fig. 15 Submerged land areas after a sea level rise of 1 meter.



fig. 16 Waste dumping site underneath the Third Mainland Bridge showing a great lack of sanitation infrastructure.



**fig. 17** Flooding on Herbert Macaulay Way. A road close to the Makoko precinct.

## **Research Aims and Objectives**

The primary intent of this research is to examine the factors contributing to the current state of urban degeneration in Makoko. In addition the research examines how people live independently of central infrastructure in the context and whether an architectural intervention that takes into account the specific infrastructure problems, urban conditions in the precinct and its autonomy can be used in the formation of strategies for providing infrastructure at different scales so as to curb the urban degeneration being experienced in the context and contexts of similar genus.

## **Scope and limitations**

As a result of the contextual nature of the project Makoko was studied on-site so as to raise unique contextual problems that can be tackled through design. The water based area of Makoko is the focus and limit of this research so as to make the exploration manageable and productive.

However, some of the contextual information gathered might not be accurate and sufficiently capture the complexity of Makoko and the problems its people face due to the inability of the government to release current and sufficient geo-spatial data, the distance of the project site, and the visible hostility of the Makoko people towards foreign persons. Also, due to the fact that Makoko is a unique context the solutions developed by this research may not be thoroughly applicable to other blighted areas in Lagos and contexts of similar genus.

## Literature Review

The review of extant literature regarding the factors contributing to the degeneration of Makoko and the city of Lagos has revealed that the government's inability to provide infrastructure to its teeming population, climate change and the lack of public space are to blame for the degeneration of the precinct.

### *Basic Infrastructure Deficit*

The infrastructure shortage in Lagos is explained succinctly by Kunle Adeyemi in his statement that:

Under-funded municipal governments are typically trapped in a continual game of catch-up in their efforts to address infrastructural deficits and deliver urban services consistently overwhelmed by teeming populations<sup>18</sup>.

This infrastructural deficit will be further exacerbated considering the fact that the Lagos urban environment which is made up of a large percentage of informal settlements (70 percent) will experience a population increase from 20 million people to 24 million by the year 2020 thereby worsening the urban degeneration of the city and highlighting the futility of central infrastructure in the Lagos context.

Water, electricity and sanitation infrastructure which are basic needs in society are immensely insufficient in Lagos. For example less than 40 percent of the Lagos population is serviced with pipe-borne water from the Ogun River (freshwater) which runs to the city of Lagos from Abeokuta a nearby precinct in the south-west of Nigeria and due to this lack, about 60 percent of the Lagos population gets untreated water supply in an informal manner usually through boreholes that exploit the ground water available in the city.

Furthermore, there is a massive lack of electrical energy in Lagos and this is a Nigerian national crisis. Energy provision in Nigeria remains extremely inadequate, with the national grid generating approximately 4,500

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<sup>18</sup> ADEYEMI, K. 2012b. Floating City Solutions for Africa's Vulnerable Coastal Communities: The Case of Makoko. Perspectives, 82, 98-101.

megawatts of power annually through hydro electricity, while the city of Lagos alone has an estimated demand of 10,000 megawatts<sup>19</sup>. This fact illustrates the absolute shortage of power in the city.

In addition, less than 2% of the Lagos population is serviced with central sewage systems. Most homes employ onsite septic tanks and soak away systems which are usually evacuated into the Lagos lagoon without appropriate treatment<sup>20</sup>.

Looking particularly at the Makoko context, Kunle Adeyemi reveals that there is a total lack of governance and political interest in the community<sup>21</sup>. Only about 5% of the Makoko population has access to electricity which is gotten illegally from power lines on land, while there are only 7 privately owned water points on site, which are expensive<sup>22</sup> and are insufficient considering the fact that the United Nations Children Education Fund and the Department for International Development stipulate that 20-40 litres of water is the minimum standard for drinking and sanitation alone. Also there is a large lack of sanitation facilities in the community.

### *Public Space*

As a result of the poor urban management highlighted and the continuous influx of people into Lagos there is a great lack of public space. This is illustrated by the fact that only 2 percent of the four hundred and ninety six hectares identified for public space is available for recreational purposes<sup>23</sup>. This unplanned encroachment of public space has limited the amount of open space where several socio-economic activities can occur in the city of Lagos and the Makoko precinct.

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<sup>19</sup> AKINSETE, E., HOELZEL, F. & OSHODI, L. 2014. Delivering Sustainable Urban Regeneration in Emerging Nations: Introducing Neighborhood Hotspots. *Journal of Architectural Education*, 68, 238-245.

<sup>20</sup> ADEYEMI, K. 2012c. Makoko Floating School. Amsterdam: NLE.

<sup>21</sup> Ibid.

<sup>22</sup> OSHODI, L. & HOELZEL, F. 2014. Makoko/Iwaya Waterfront Rejuvenation Plan. Lagos, ADEYEMI, K. 2012b. Floating City Solutions for Africa's Vulnerable Coastal Communities: The Case of Makoko. *Perspectives*, 82, 98-101.

<sup>23</sup> UDUMA-OLUGU, N. & ODUWAYE, L. The Regeneration of Lagos Lagoon Waterfront for Recreation and Tourism (pp. 759-764). Real Corp 2010. 15 th International Conference Proceedings Held at Vienna, 2010.

### *Climate Change*

Climate change is one of the most urgent problems of design today<sup>24</sup> . Michael Oppenheimer demonstrates the seriousness of the issue in his statement that:

Harsher storms will lead to flooding and the loss of crops and safe drinking water. All of this taken together will mean the destruction of homes, jobs, food and tragically, lives<sup>25</sup> .

Additionally, given that Lagos is a city with low-lying coastal plains the effects of climate change will be felt intensely by the Lagos population. The effects are further exacerbated in the blighted Lagos context when coupled with the general lack of infrastructure and political capacity to mitigate this climate change<sup>26</sup> . According to Kunle Adeyemi the impact of climate change, rising sea levels, increased rainfall and flooding are becoming a day-to-day reality for people of Lagos and other contexts with similar coastal conditions. Furthermore, the Intergovernmental Panel on Climate Change (IPCC) has predicted sea level rise to range from 0.18 to 0.59 meters by the end of the 21st century<sup>27</sup> and this could have devastating consequences on the Makoko precinct.

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<sup>24</sup> OPPENHEIMER, M., BERGDOLL, B. & JUDITH, R. 2011. Rising currents: Projects for New York's Waterfront. New York, NY: The Museum of Modern Art.

<sup>25</sup> OPPENHEIMER, M. 2011. Climate Change and world cities Rising currents: Projects for New York's Waterfront. New York: New York, NY: The Museum of Modern Art.

<sup>26</sup> HALL, J. 2014. Sea Level Rise and the Lagos Waterfront: assessing impacts and adaptations in Ijora -Oloye.

<sup>27</sup> PACHAURI, R. & REISINGER, A. 2007. IPCC fourth assessment report. IPCC, Geneva.

### *A Shift to Neighbourhood Management*

The highlighted degeneration in Lagos leads us to question whether central infrastructure has any relevance in the Lagos context and if decentralized infrastructures should be opted for in curbing the current state of degeneration in Lagos. In recent years neighbourhood management has emerged as an effective model for the reversal of urban decline particularly in areas such as Makoko where the issues are numerous, complex and intertwined<sup>28</sup>. Nabeel Hamdi addresses the need to reform the current top-down management of cities by stating:

What we need for governance is to define and refresh that triadic relationship between the state, the market and the community and then set out roles, responsibilities, duties and obligations<sup>29</sup>.

Nabeel Hamdi and AbdouMaliq Simone also highlight the fact that there are organic social organisations (social infrastructures) in informal settlements everywhere that draw strength from the multitudes that exist within them to sustain their precincts and for design to contribute positively to the development of these contexts a right balance must be struck between it and the ephemeral practices of people<sup>30</sup>. This sort of cooperation between design and specific local conditions according to Leslie Lokko will create infrastructures that resonate deeply with local contexts and stand the test of time<sup>31</sup>.

It emerged from the review of literature undertaken that a shift in the methods of delivering infrastructure is critical in transforming blighted precincts like Makoko. In addition, literature suggests that the principles of spatial agency which stipulate that the ethical way of designing space is one which focuses on the empowerment of others by allowing them to engage in their spatial environments in ways previously unknown or available to them is the appropriate way to achieve adequate spatial transformation.

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<sup>28</sup> AKINSETE, E., HOELZEL, F. & OSHODI, L. 2014. Delivering Sustainable Urban Regeneration in Emerging Nations: Introducing Neighborhood Hotspots. *Journal of Architectural Education*, 68, 238-245.

<sup>29</sup> HAMDI, N. 2013. *Small change: about the art of practice and the limits of planning in cities*, Routledge.

<sup>30</sup> Ibid., SIMONE, A. 2004. People as infrastructure: intersecting fragments in Johannesburg. *Public culture*, 16, 407-429.

<sup>31</sup> ASGEDOM, A. & LOKKO, L. N. N. 2000. *White papers, black marks: architecture, race, culture*, Minnesota, University of Minnesota Press.

This shift is critical as AbdouMaliq Simone explains that:

Our aspirations in the city depend largely on the institutions, infrastructures, populations and economic activities that are available to us<sup>32</sup>.

There is therefore a need for an exploration that investigates whether social infrastructures can replace the defective central infrastructures in a bid to transform blighted precincts like Makoko and to also avoid a contemporary milieu of architecture which Iain Low stipulates do not respond to the dynamics of African spatial practice but are rather obsessed with form<sup>33</sup>. The avoidance of formal obsession is particularly important in a unique context like Makoko which exists in a terrain of water.

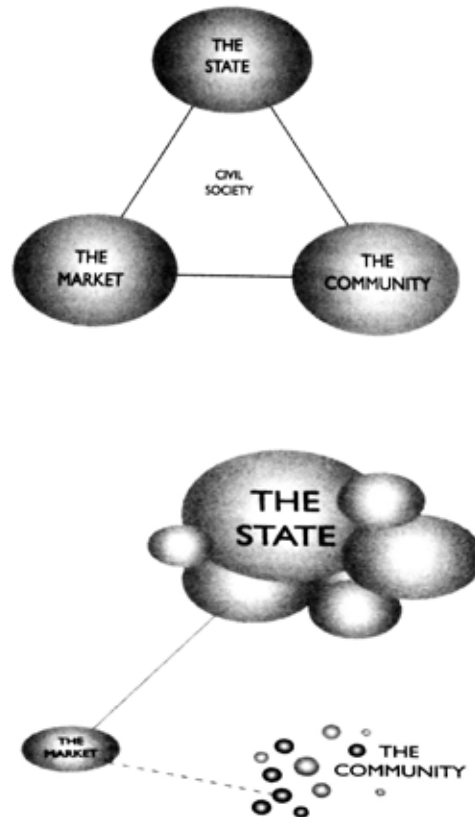


fig. 18 Diagrams showing the portrayed and actual relationship between states, markets and communities.

<sup>32</sup> SIMONE, A. 2005. The right to the city. interventions, 7, 321-325.

<sup>33</sup> LOW, I. 2003. Space and transformation. Digest of South African Architecture, 7, 34-38.

### *Infrastructure Projects in Makoko*

Factually, there are two projects in Makoko that currently deal with the problems of infrastructure delivery in the water-based community. On one hand the Neighbourhood hotspot designed by Fabienne Hoelzel and the Makoko Floating School by Kunle Adeyemi.

The Makoko floating school looks beyond the existing system of stilts and incorporates a platform that floats on the Lagos lagoon using a triangular timber frame with a square base of 10 meters (100m<sup>2</sup>). The floating platform copes with sea levels adequately but its ability to be replicated by the Makoko people in the construction of their dwellings and structures comes into question because it differs from the existing built forms present in Makoko.

In the Neighbourhood hotspot morphological cues were read from Makoko and were refined by the architect. These cues were materiality, stilt technology, floating pathways and, the outdoor platforms. These morphological cues were synthesized to develop a large public plinth that hovers 1.5 meters above water on which a variety of activities can take place. There is a sense that hovering above water is the right starting point for any structure to be built on water in Makoko.

The urban strategy of the Neighbourhood hotspot greatly contrasts the floating school. Fabienne Hoelzel designed an urban strategy that features 23 different hotspots<sup>34</sup> which try to blend with their specific fabrics within the Makoko community. Each hotspot thereby becomes a branch of the community instead of an alien object like the Floating school and a similar strategy can be used in any other interventions carried out in Makoko.

The Hotspot features an innovative system for both sanitation and electricity generation. Human waste from the dwellings in Makoko are transported to a biogas plant at the hotspot that transforms the waste into methane gas for electricity production; transforming something which was once useless and dumped into the lagoon into a valuable resource that also encourages better sanitation. The floating school also encourages this system by featuring compost toilets which convert human waste to compost for farming.

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<sup>34</sup> AKINSETE, E., HOELZEL, F. & OSHODI, L. 2014. Delivering Sustainable Urban Regeneration in Emerging Nations: Introducing Neighborhood Hotspots. *Journal of Architectural Education*, 68, 238-245.

Potable water is obtained in the floating school and the Neighbourhood hotspot through rainwater. Rainwater is used as a source of potable water due to its availability all year round in Lagos. They both use large roof surface areas in capturing the rain water and store the water in storage tanks. The Makoko floating school and the Neighbourhood hotspot are unique infrastructure projects in Lagos and show that there is value in working with the resources available in Makoko. There is a need however for further studies into the viability of these schemes in the design of infrastructure for the Makoko precinct that takes into account the urban conditions towards curbing the degeneration being experienced.



**fig. 19** The Makoko Floating School currently in a visibly dilapidated state.



**fig. 20** 3D visualization of Kunle Adeyemi's floating structure as an urban strategy to rejuvenate Makoko. A potentially monotonous proposal.

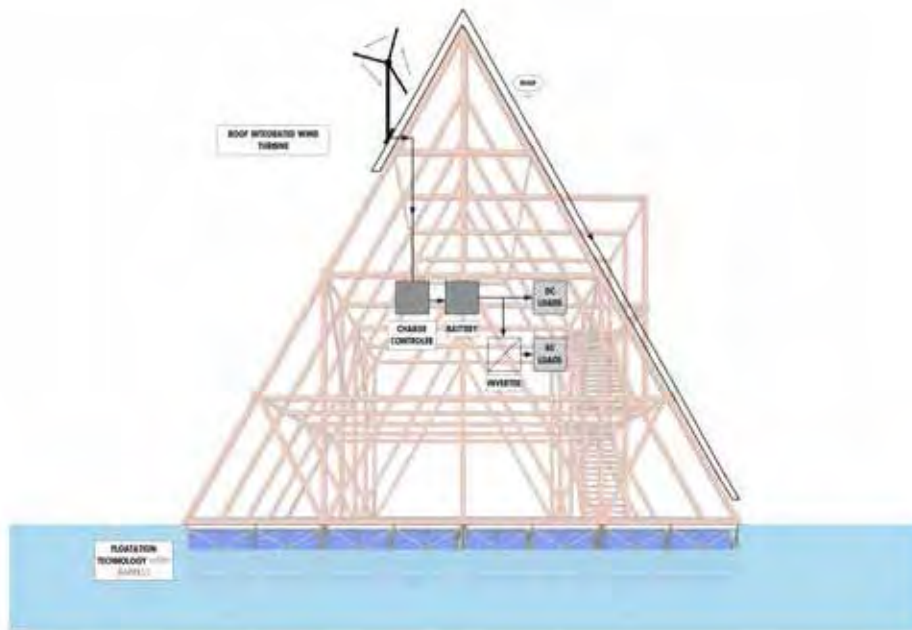
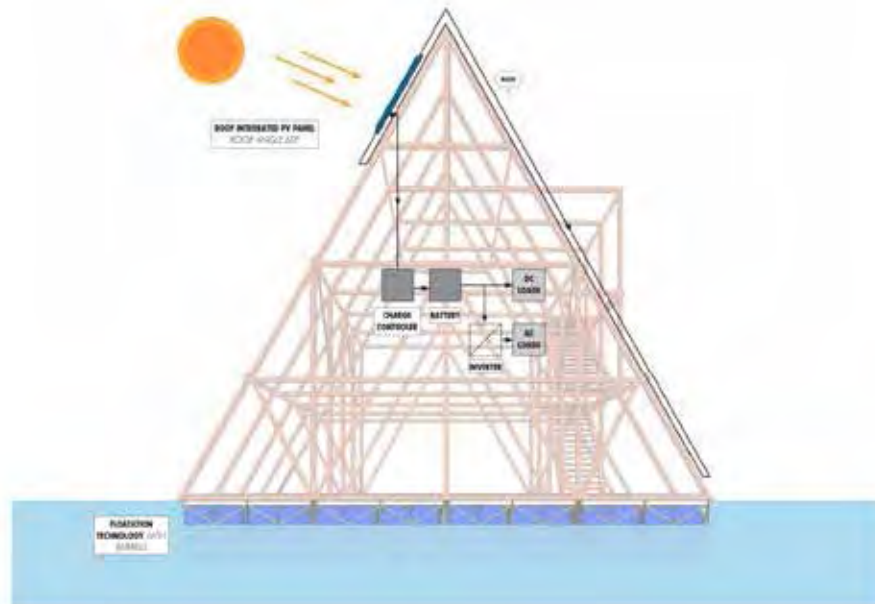


fig. 21 Solar and wind strategies proposed by Kunle Adeyemi as possible ways of generating energy in Makoko.



fig. 22 3D visualization of the Neighbourhood hotspot. The Architect learnt extensively from the existing urban morphology of Makoko in designing the structure.



fig. 23 A hotspot in context. The building's structure allows it to blend seamlessly with the Makoko context.

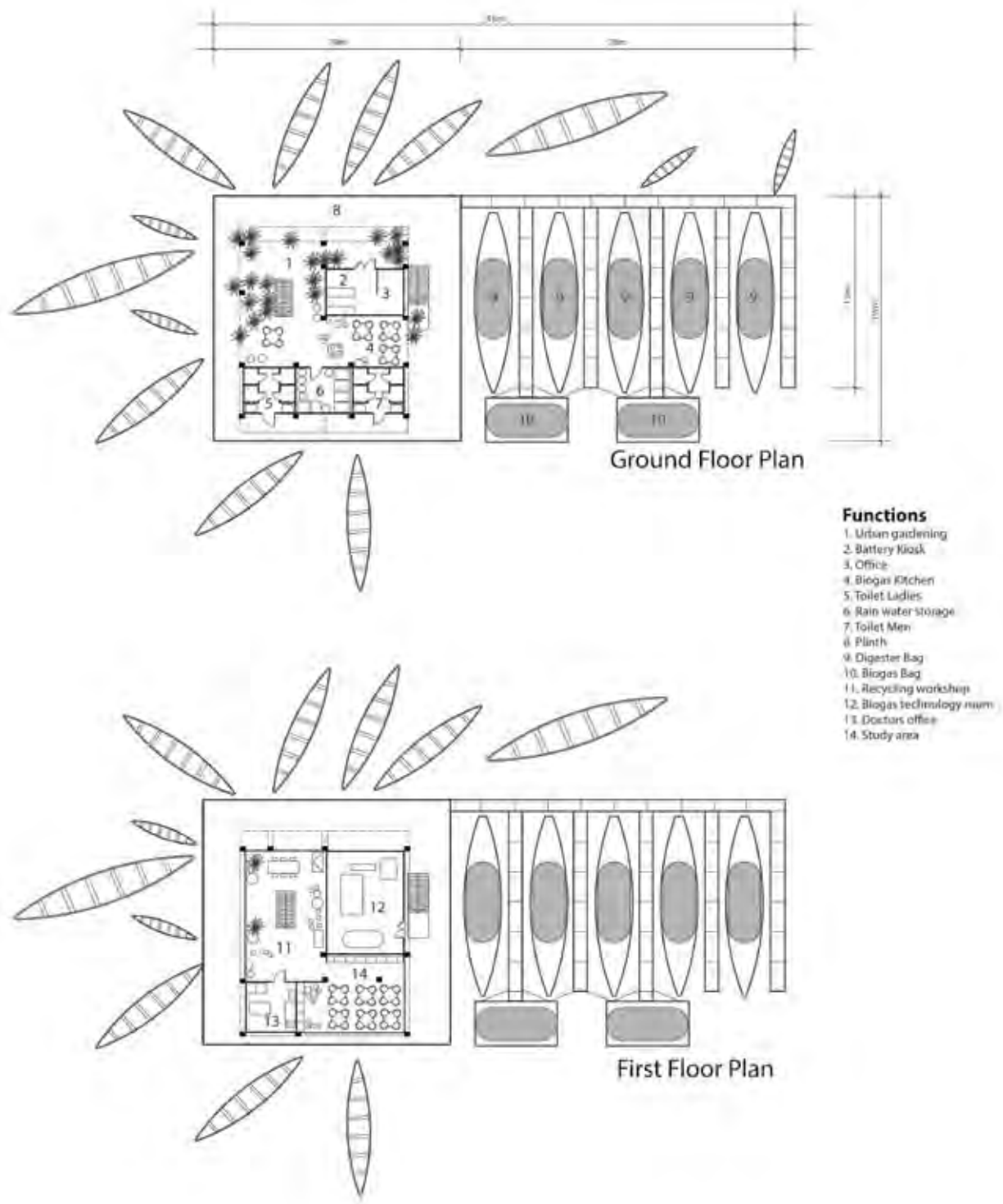
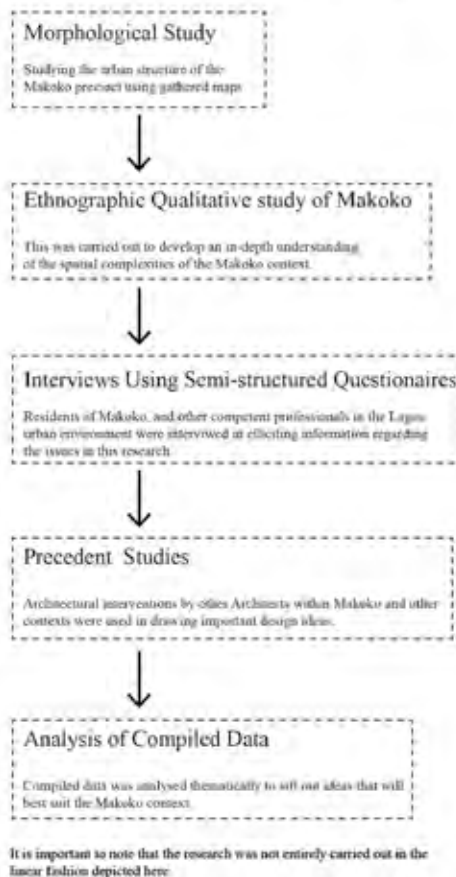


fig. 24 3D visualization of the Neighbourhood hotspot. The Architect learnt extensively from the existing urban morphology of Makoko in designing the structure.

## Research Methods

A morphological study was carried out to understand the urban structure of Makoko using gathered maps before onsite studies were carried out to clarify previously gathered data. An ethnographic qualitative research approach was employed as the principal method of getting primary research data that appropriately captures the complexities of Makoko. This qualitative research information is important as currently available literature does not capture sufficiently the specific spatial complexities of Makoko and therefore, this method of research will ensure an in-depth understanding of the Makoko context in order to produce a fitting architectural intervention.

### Research Methodology Diagram



## Area of the Study

Makoko is a 19th century (1860) informal settlement located at the heart of Lagos on the fringe of the vast Lagos lagoon in the Lagos Mainland. It is but one of the 201 slums and coastal settlements (Ijora-Oloye, Otto, Badia, Oworonshoki, Ajegunle and Iwaya) located in Lagos.

It has a population of about 50,000 inhabitants many of whom live below the poverty line earning incomes less than 1.25 Dollars per day<sup>35</sup>. The Makoko people survive in Lagos using the resources of the lagoon by fishing, and the Lagos forests by lumbering. This provides Lagos with about 40% of its fish and a large portion of its wood used in making paper, furniture and other goods. The timbers are brought to Makoko in the form of rafts which are floated through rivers, creeks and the lagoon.

Within this community there are a diversity of tribes which comprise of mostly Eguns, Ilajes, Ijaws and Yorubas<sup>36</sup>. Makoko is also divided into 6 sub-communities namely Migbewhe, Adogbo, Apollo, Yashiwhe, Okoagbo and Sogunro.

The people of Makoko are truly living in the terrain of water in an autonomous manner that can be learnt from in designing Lagos's tropical urban environment. Makoko is therefore, an appropriate site to locate and test social infrastructures that can operate at different scales in the regeneration of the immediate context and the broader urban environment.

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<sup>35</sup> AKINSETE, E., HOELZEL, F. & OSHODI, L. 2014. Delivering Sustainable Urban Regeneration in Emerging Nations: Introducing Neighborhood Hotspots. *Journal of Architectural Education*, 68, 238-245.

<sup>36</sup> OSHODI, L. & HOELZEL, F. 2014. Makoko/Iwaya Waterfront Rejuvenation Plan. Lagos.

## **Method of Data Collection, Sampling Technique and Study Respondents**

Semi-structured interviews were conducted with urban practitioners in Lagos and residents of Makoko so as to further elicit information that responds to the research objectives. Due to ethical reasons the identities of the interviewed persons will not be revealed and therefore they will be referred to as respondents. These respondents were selected through a purposive sampling technique because of the view that they will have the answers to the research questions. Respondent A is a legal professional in Lagos who runs the Social and Economic Rights Action Centre (SERAC). This respondent is an important player in fighting for social justice for vulnerable communities in Lagos that have been neglected by the state. Respondent B is a professor of Architecture at the University of Lagos who currently works on social housing projects in Lagos. Respondent C is an individual who has worked extensively in Makoko and runs a practice called Arctic Infrastructure which deals with infrastructure planning management and development. Respondent D is the principal of the Makoko Whayinna Primary School and an important community figure in the settlement. Respondent E is a lecturer at the University of Lagos Architecture School who has done housing research in Makoko. Respondent F is a GIS (Geographic Information Systems) Professional in Lagos. Respondent G is a town planner who works in blighted precincts in and outside Lagos. Lastly, respondent H is a previous employee of SERAC who has had extensive on-site experience of the Makoko context. Unstructured informal interviews were also carried out with other residents of Makoko and Lagos. The combined experience and status of the respondents show that they will provide relevant information that addresses the research objectives.

The study also makes use of precedents in and outside the Makoko context to reveal design ideas that can suit the Makoko context and all gathered information were analysed thematically.



fig. 25 Children fishing in Makoko



**fig. 26** The forest where the Makoko people get timber from are highlighted in green. The wood is floated to Makoko through the rivers and creeks highlighted in the form of rafts.

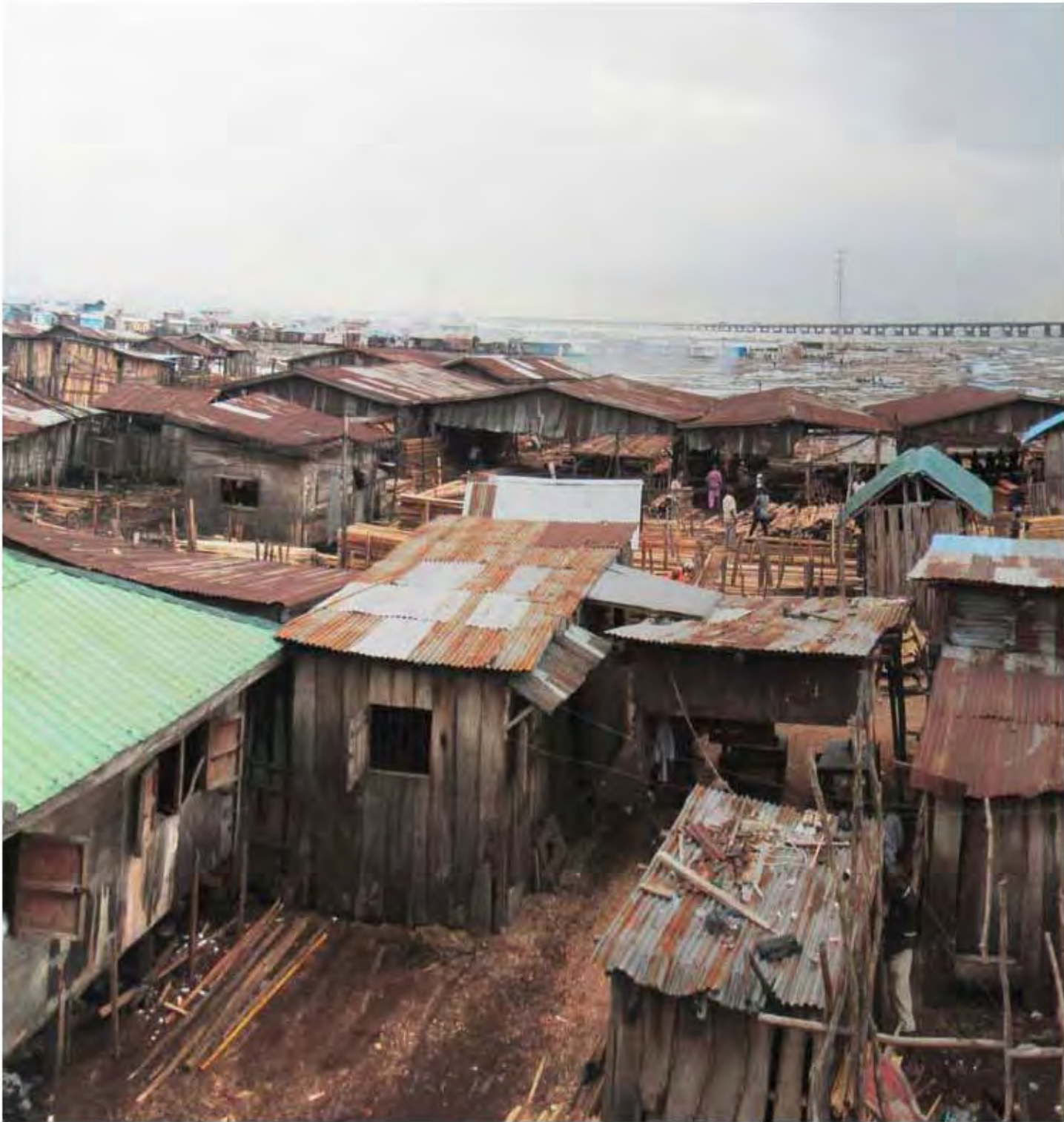
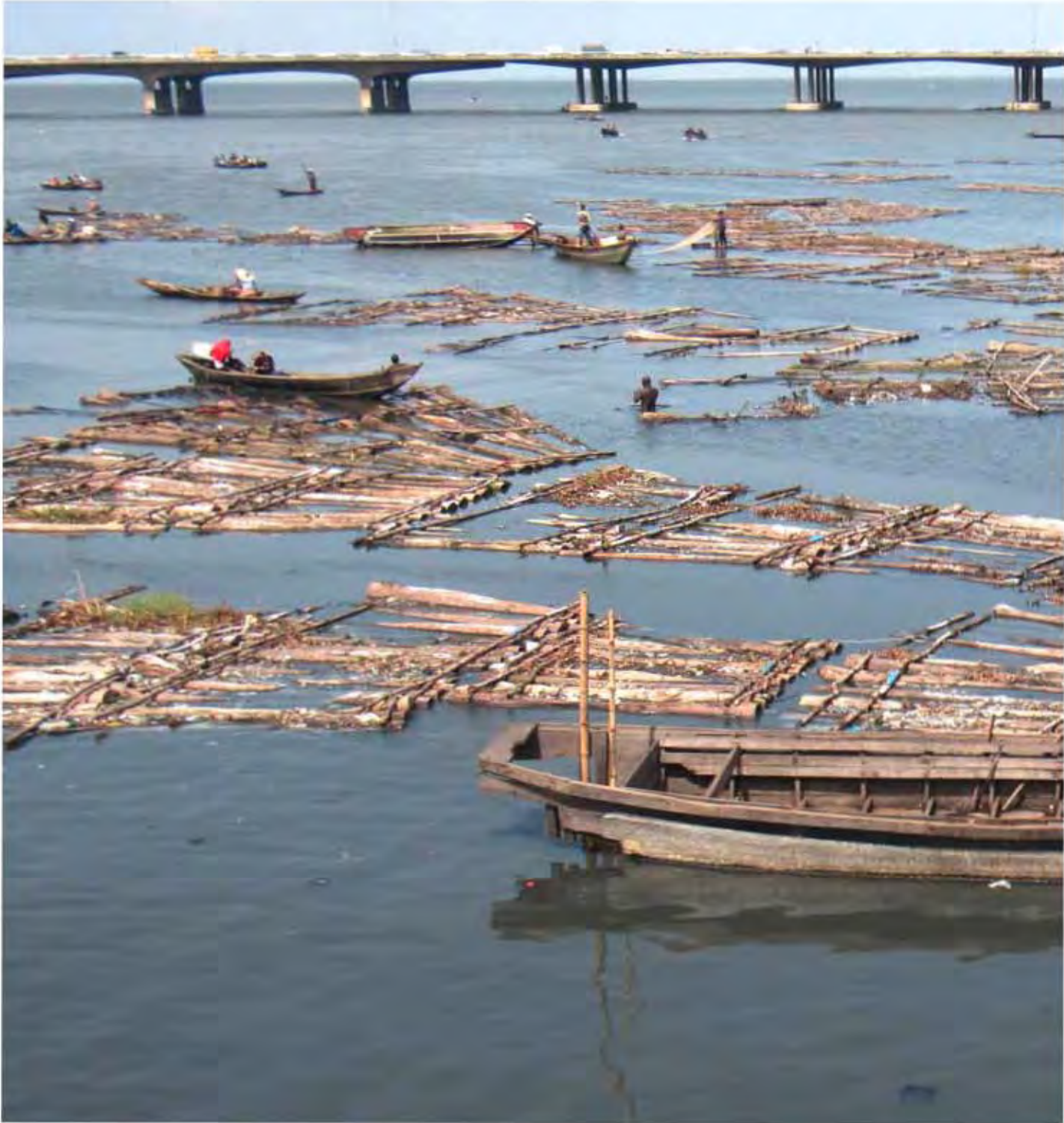


fig. 27 Panoramic view of the Oko-Baba Sawmill where floated Makoko timbers are cut to size.





**fig. 28** View towards the Third Mainland Bridge from the Floating School showing the timber rafts cut at the saw-mill.

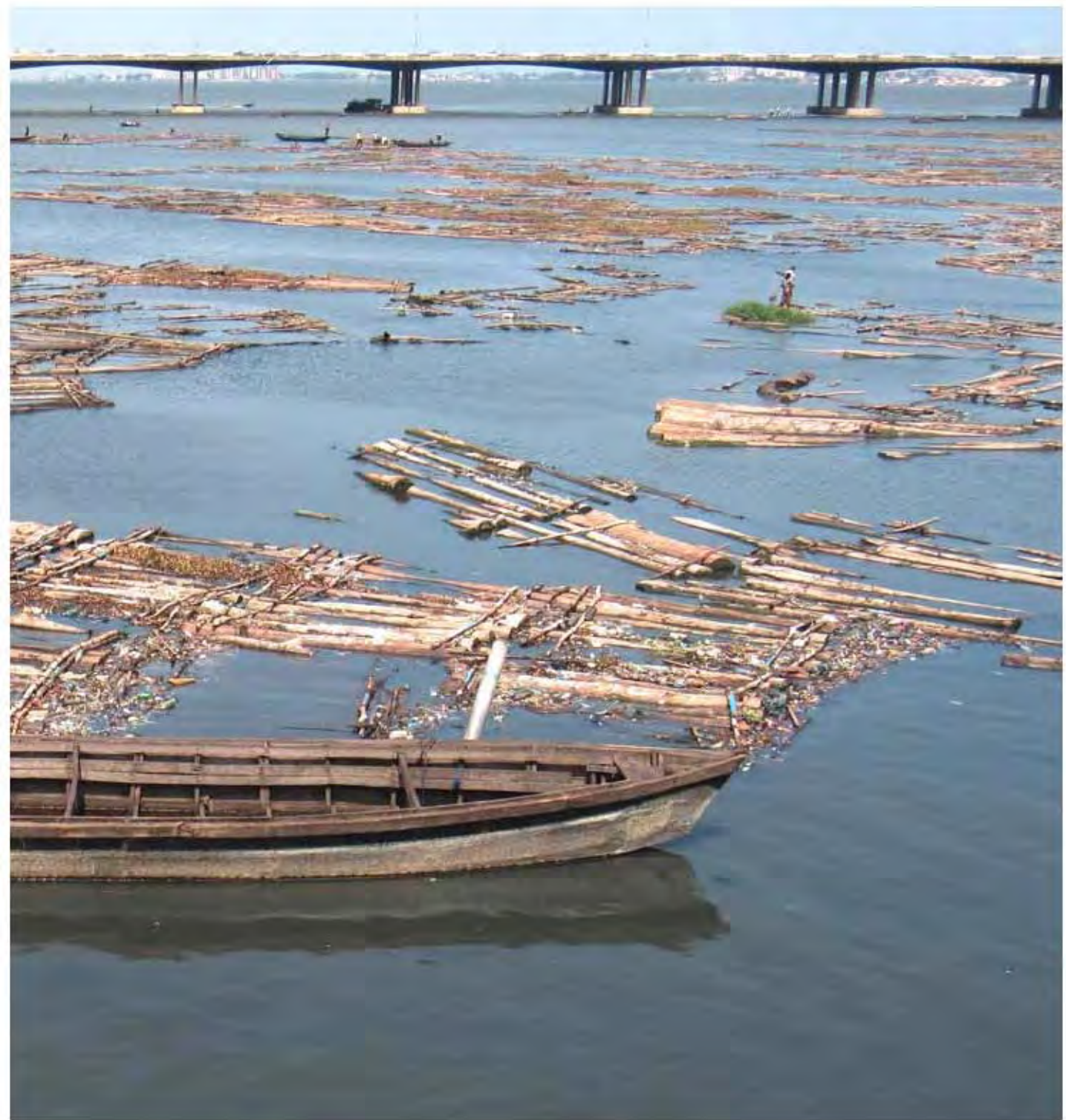




fig. 29 Timber rafts.



**fig. 30** Diagram showing the Makoko sub-communities

## Exploration of Makoko

### Access and Morphology

#### *Access*

On land, it is observed that there are 4 primary access points into Makoko. The first being from the Lagos Third mainland bridge, the second from Herbert Macaulay way and the other two lead into the 20 meter wide Apollo street which gives Makoko access to other parts of Lagos. These points on land can be accessed by automobiles and on foot.

The water based areas of Makoko can only be accessed on foot through intricate narrow pathways that scatter from Apollo Street leading to areas where canoes can be hired for the navigation of the water-based community.



**fig. 31** The 4 primary access points into Makoko are indicated with red dots. The yellow line indicates a pathway used during the research to access the water-based areas of the community. The blue dots are the three primary boat hiring points.



**fig. 32** Boat hiring point used during this research to access the water-based parts of Makoko.

### *Morphology*

Before on-site studies the urban morphology of Makoko was studied through gathered maps. This morphological study revealed that water-based Makoko has a distinctive urban configuration and liquid urbanity when compared to most contexts in Lagos. The most prominent features of Makoko's urban structure are its water routes which vary in size depending on their importance in commuting around the settlement. Reclaimed landmasses are used in defining the water routes. The masses are created by dumping solid waste objects into the lagoon and covering the waste with sawdust and sand to achieve stability. Floating platforms are used in the older areas of the community which start from Apollo Street as a means of moving from land to their raised water based dwellings.

The dwellings of the Makoko people are built mostly using timber obtained from the surrounding forests processed at the local Oko-Baba sawmill into workable timber sizes. The availability of timber for construction allows the creation of dwellings raised on stilts that are suitable for coping with seasonal floods. The timber dwellings are nestled within this intricate network of reclaimed land, water ways and floating decks in a manner that makes them assets for the people of Makoko, in that these timber structures allow a wide range of functions to take place in and outside them at different scales. Functions such as retail, fish smoking, timber milling, water trade, schools, churches, boat making and others take place in these structures.



**fig. 33** A composite morphological diagram showing the land masses, water routes, pathways and dwellings that form Makoko's urban structure. Study was done at one of the oldest parts of the community.

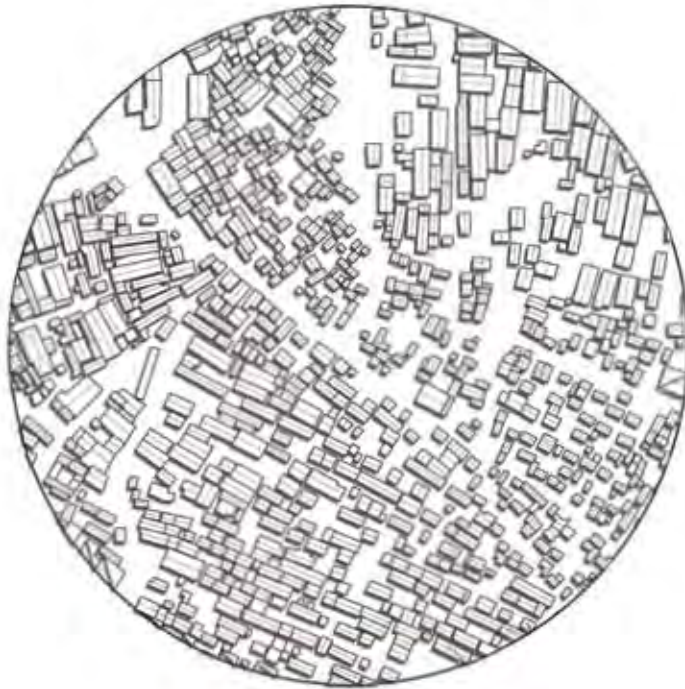


fig. 34 Organically arranged fabric and the reclaimed land masses.

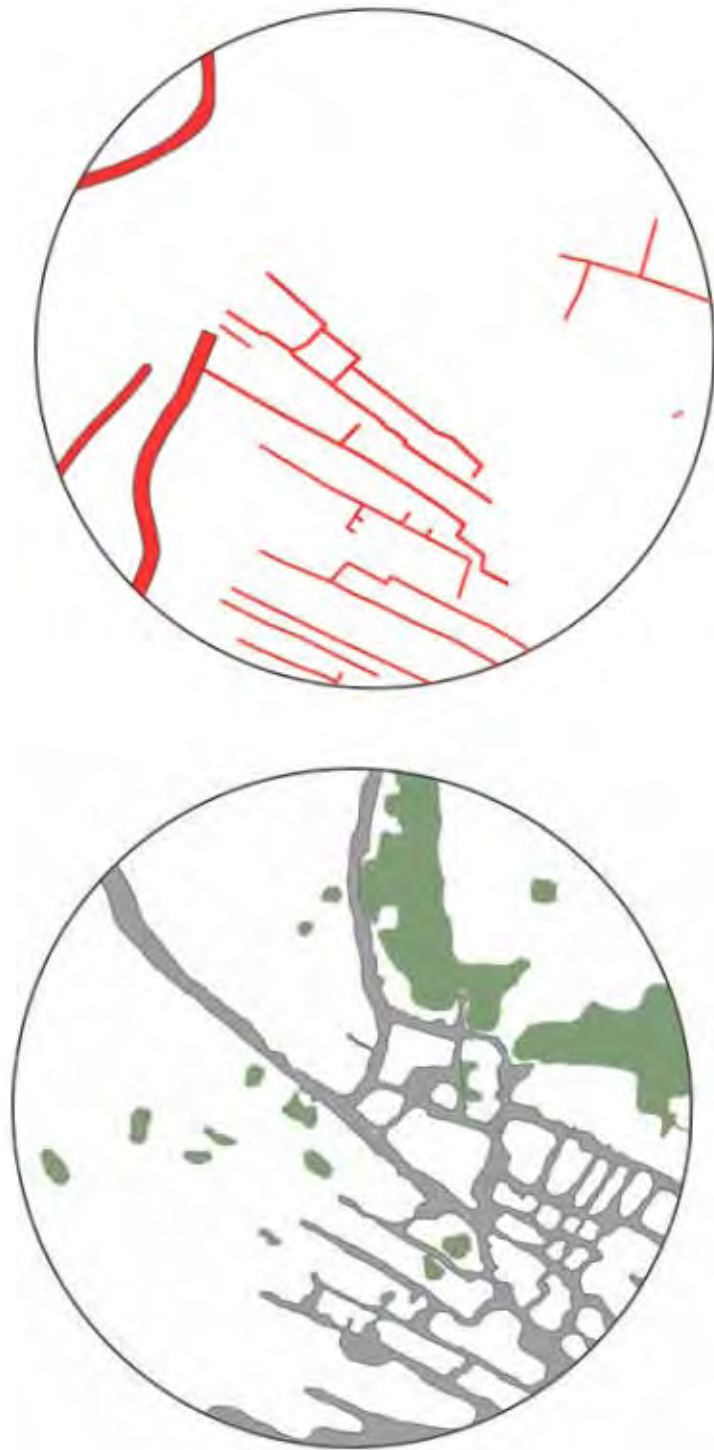


fig. 35 Pathways, water routes and wetlands.



fig. 36 Morphological study of the whole Makoko precinct

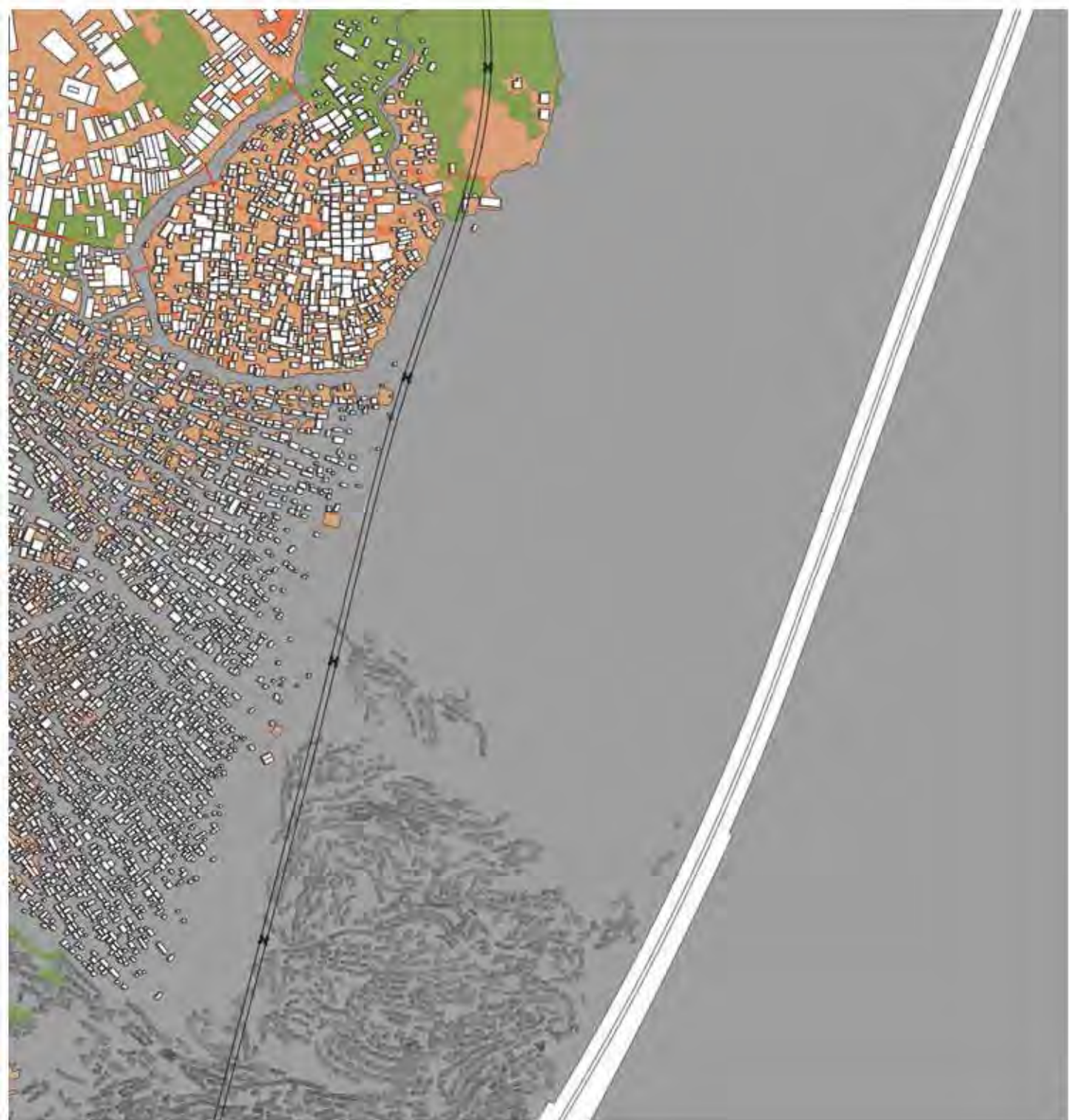




fig. 37 Water routes of Makoko. The dump sites around the community are highlighted in red. Scarce vegetation in green.



**fig. 38** Diagram showing the organic land forms of Makoko.



**fig. 39** Red dash showing building limitation as a result of high voltage powerlines. The Lagos government demolished dwellings within the 100 meter distance from the powerline in 2012 shown in red.

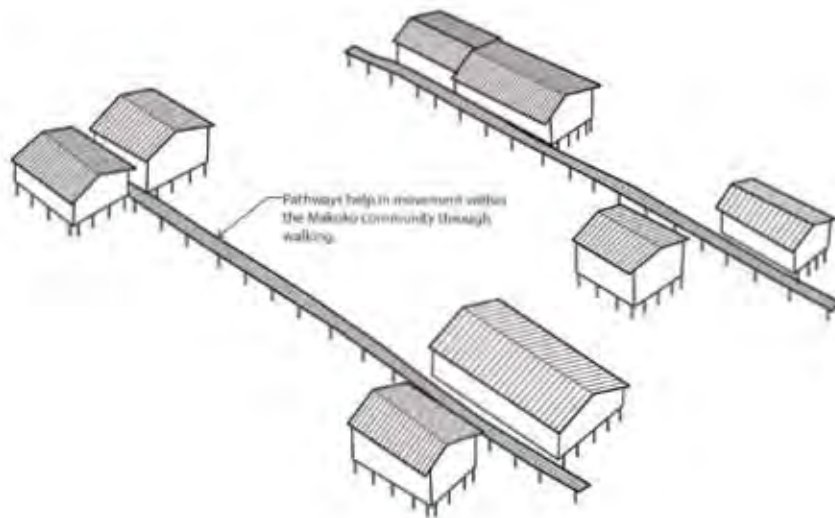
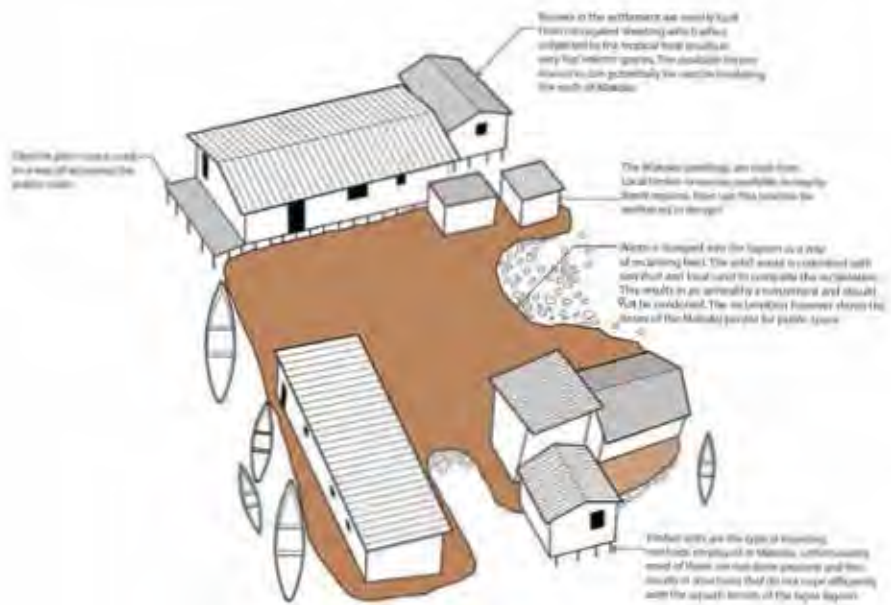


fig. 40 Diagram showing land reclamation and movement platforms in Makoko.

## **Infrastructure Scales**

The available infrastructure scales in Makoko were discovered through site explorations and categorized looking through the Lens of Rem Koolhaas's Small, Medium, Large and Extra large<sup>37</sup>. The small and medium address scales ranging from the domestic to the public while the large scales address infrastructures of Bigness. Finally Extra-large refers to the urban configuration developed as a result of the combination of the small, medium and large.

It has been discovered that the different scales of infrastructure in Makoko depend on each other for sustenance. This therefore makes the urban network in the community very sensitive and any interventions carried out within the community must respect this liquid urbanism. This relationship between the different scales can be illustrated by discussing the process of making smoked fish known as Eja Kika in Makoko.

The Lagosian delicacy Eja Kika starts process of production when fishermen in Makoko set of deep into the lagoon to fish. The fish is brought back to women who wait in and around the floating school which is located at the eastern side of Makoko and close to the power line. From the power line the women take the fish on their canoes to timber sheds which sit on reclaimed land and it is at this domestic scale where the fish is smoked using wood bought from the sawmill. And after the fishes have been smoked they are then transported by boat to the Market located on land.

The scales highlighted here are fishing, the floating school as a surface for waiting and socialization, the sheds for smoking the fish, the Oko-Baba sawmill and the Asejere Market. There are a variety of relationships with even greater complexity and this autonomous sustenance highlights the power of these relationships and the necessity to reinforce them in implementing any other infrastructures to improve the living conditions in Makoko.

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<sup>37</sup> KOOLHAAS, R., MAU, B. & WERLEMANN, H. 1995. S, M, L, XL, The Monacelli Press.



fig. 41 Smoked Fish in a Lagos market.



- Schools
- Police station
- Mosques
- Asejere Market
- Fish smoking sheds
- Clinics
- Churches
- Water points
- Small scale retail shops

**fig. 42** Estimated locations of mapped programmes in Makoko. Sawmill area is indicated by a blue dashed line.

### *Small Scales*

The smallest and most fundamental scale in Makoko is the canoe scale. Canoes are assets that the inhabitants of Makoko use in transporting goods and services which they sell by canoeing all over the community. Also, income is generated from canoes by transporting people from land to water based areas in the community. Canoes are the most essential components in Makoko as they allow movement and socialization in Makoko. Without canoes most activities in the community will not be able to take place.

Dwellings on stilts in Makoko on observation are also of small scale. They are used for income generation through rental and trade by attaching little kiosks or trading from inside them through windows and large openings. The water points, boat making, fish smoking and retail scales are examples of small scales in Makoko.



**fig. 43** A woman selling her goods in Makoko.



fig. 44 Woman selling food from her canoe.



**fig. 45** A boat hiring point. The foot traffic in the area has resulted in the development of small - scale trade.

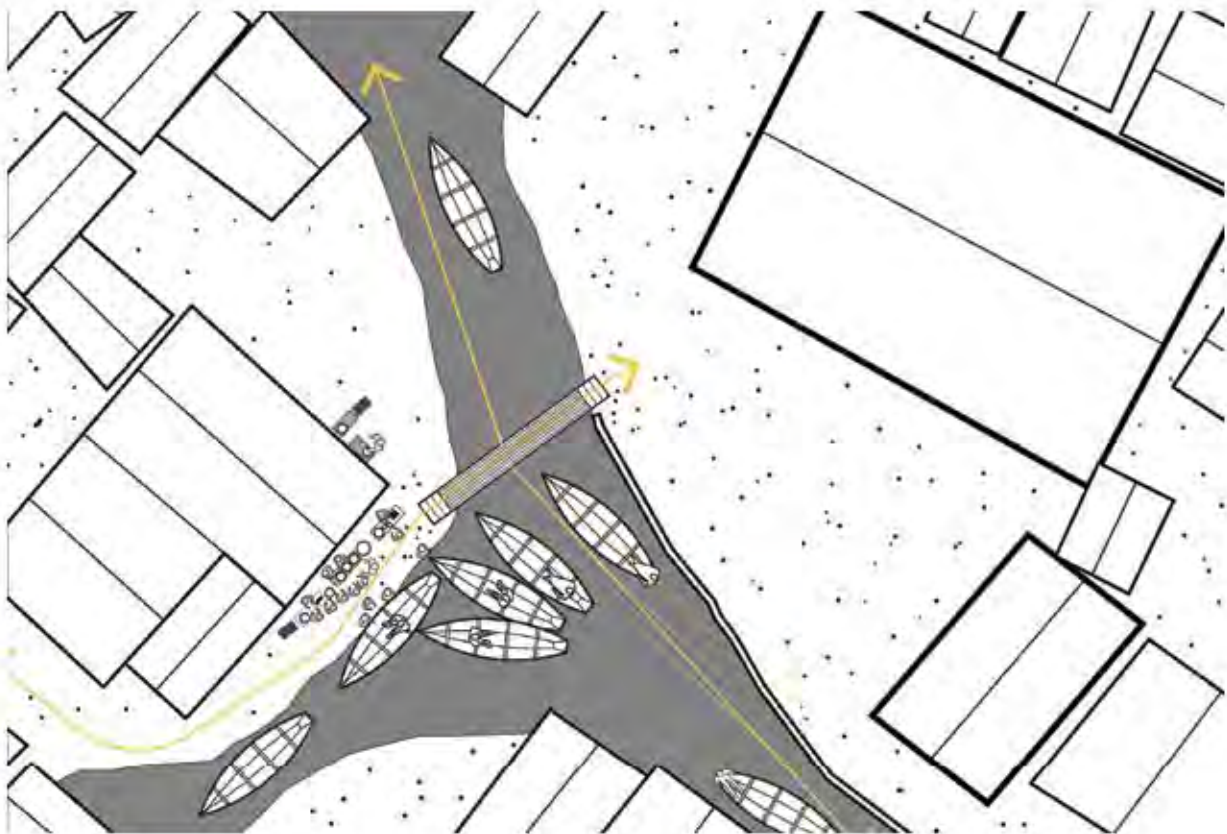
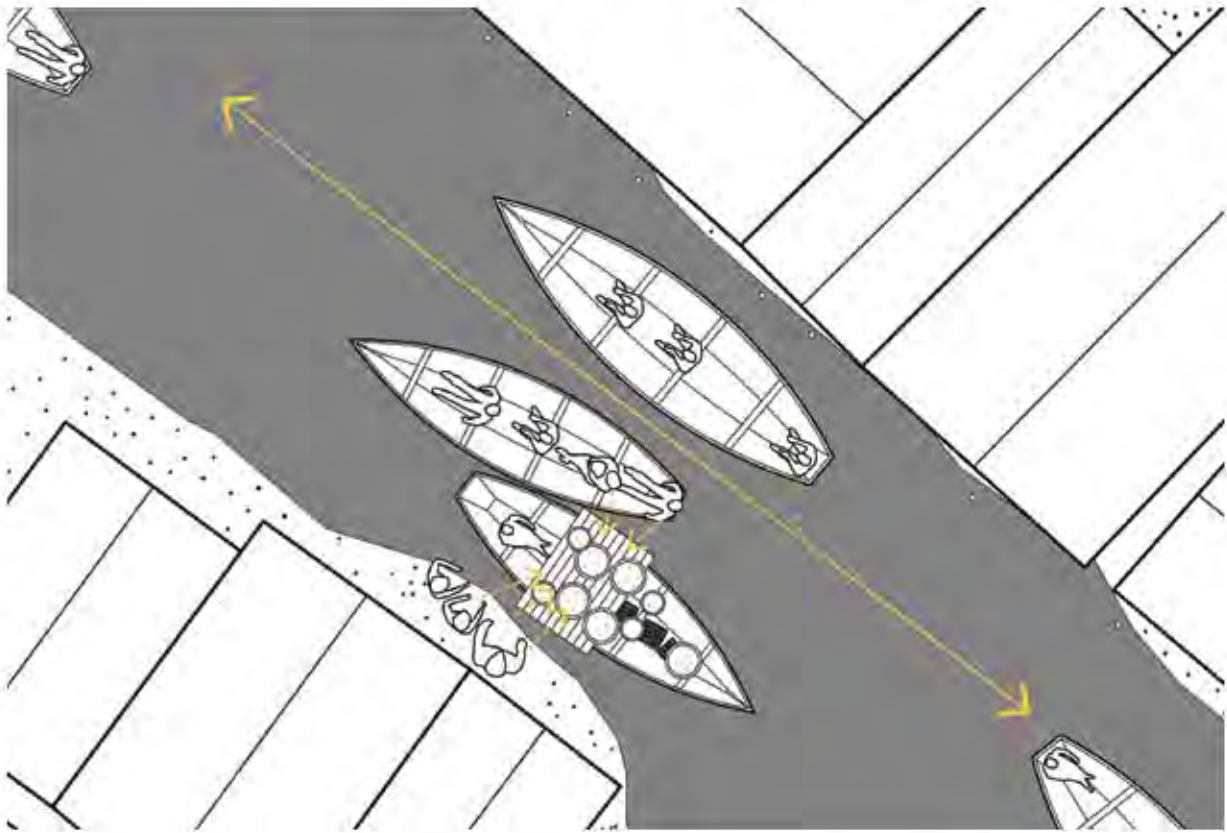


fig. 46 Top diagram showing canoe trade and socialization. Bottom diagram shows a canoe hiring point and the trade around it.



**fig. 47** A unique double-storey dwelling in Makoko. On observation most are single-storey.



fig. 48 A water point in Makoko

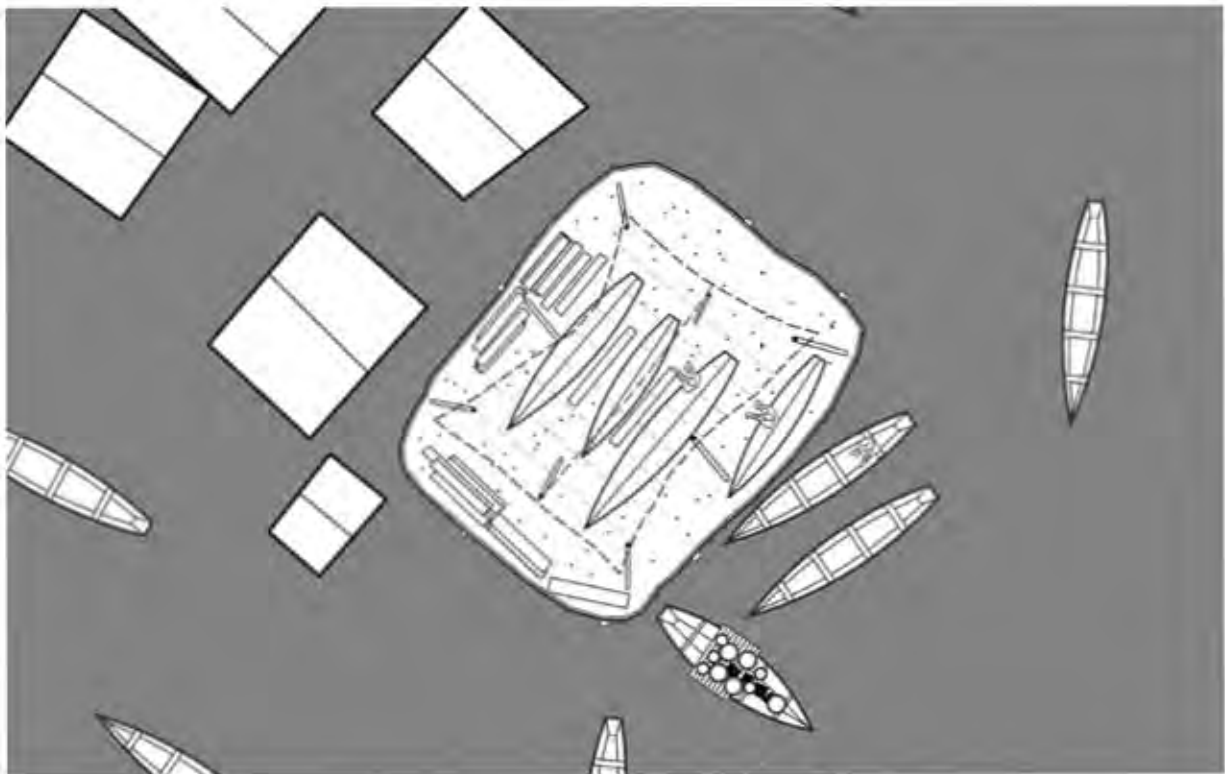
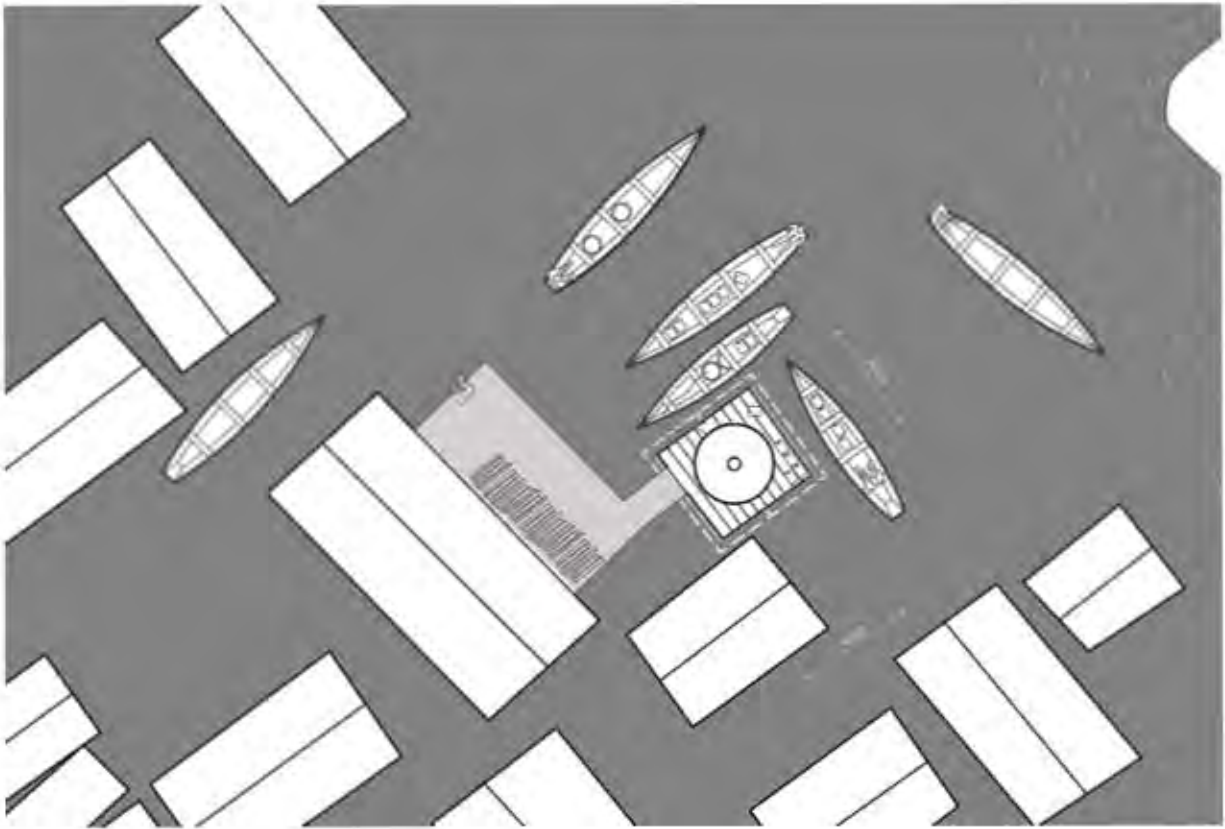


fig. 49 Diagram of a water-point and a canoe making area in Makoko.



fig. 50 A view of the canoe making structure from the Makoko Floating School.

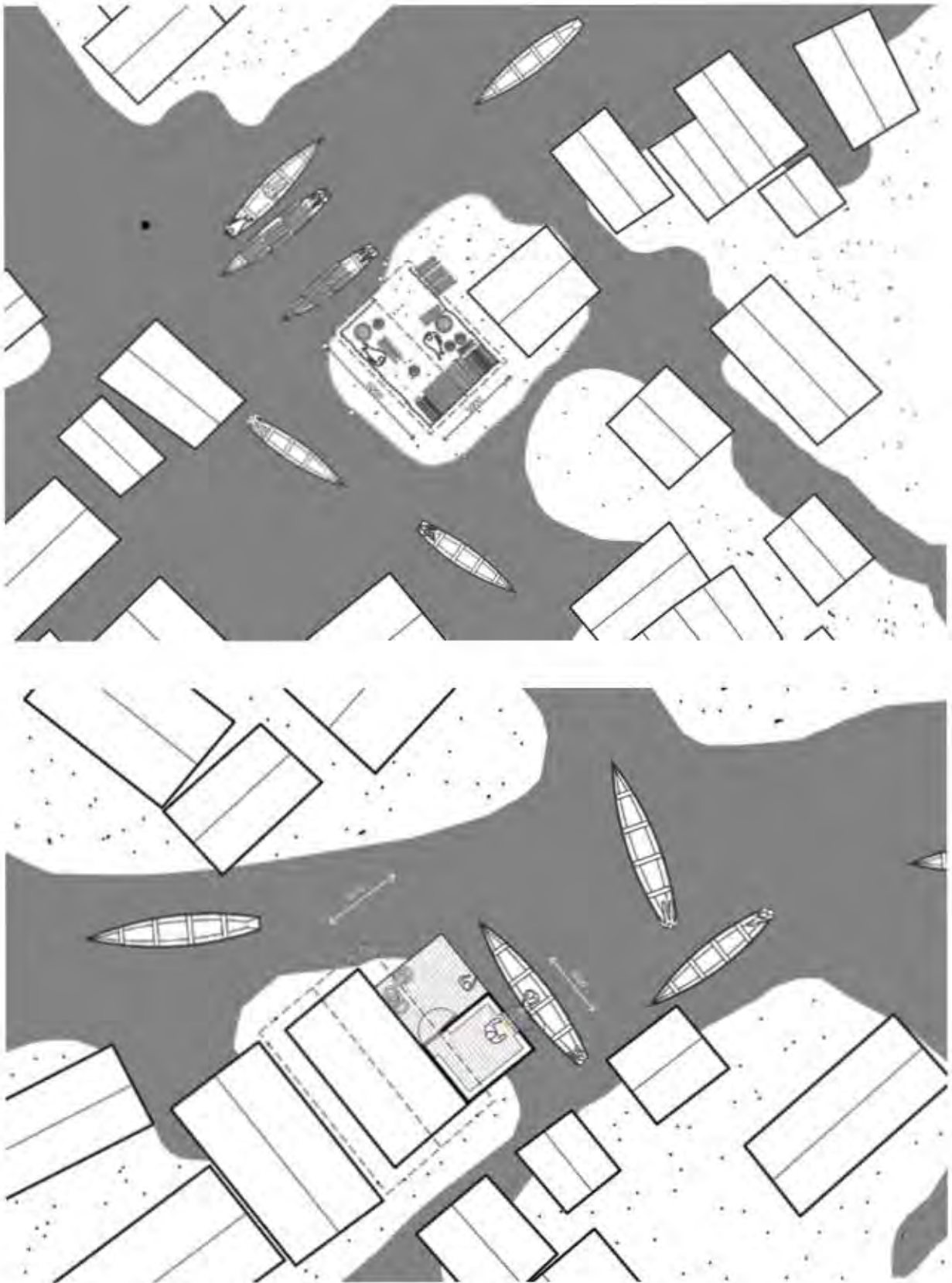
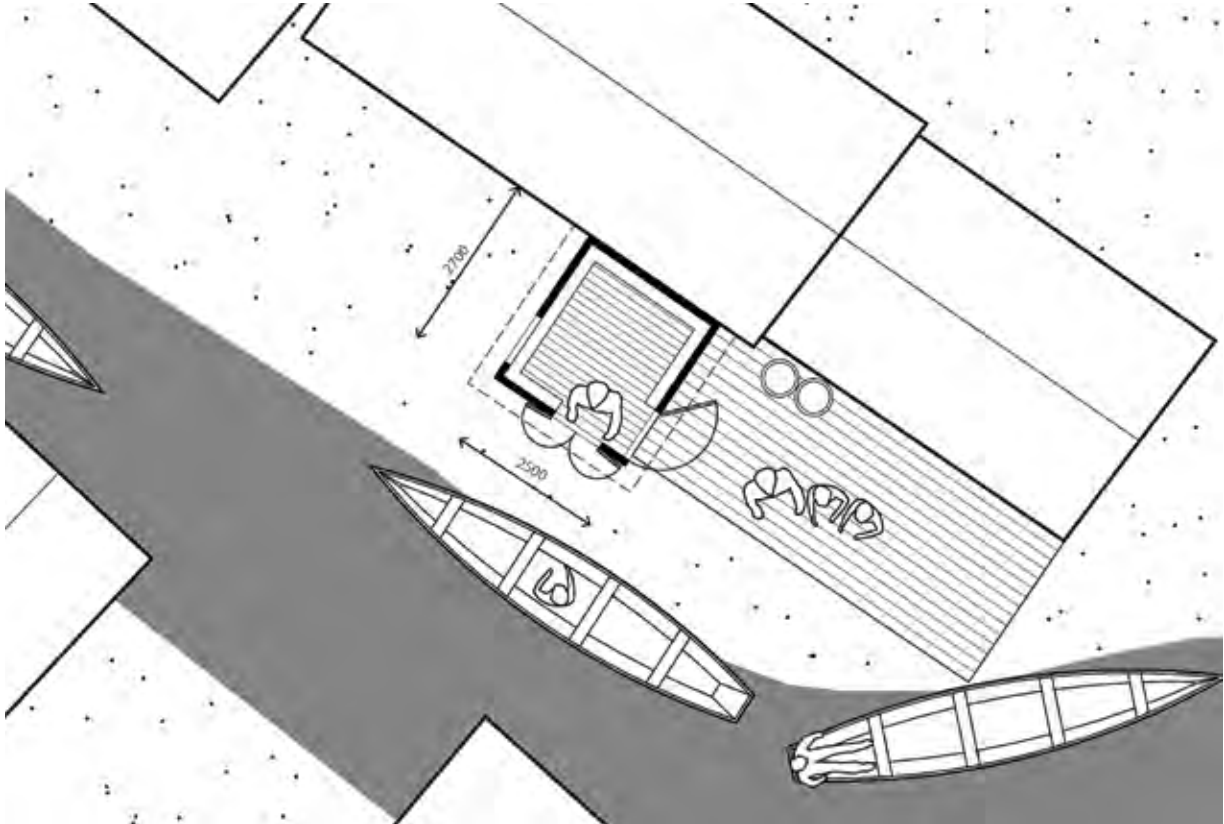


fig. 51 Diagram of a fish smoking shed and a kiosk attached to a dwelling.



fig. 52 A little Kiosk attached to the side of a dwelling.



**fig. 53** A little Kiosk attached to the side of a dwelling.

### *Medium Scales*

The medium scale is the highest level of infrastructure in the water-based Makoko community. The only observable medium scales present in the Makoko context are the Churches, Oko-Baba sawmills, the schools, health centres and the Asejere Market. In total there are 16 churches scattered all over Makoko and most define public spaces around them. There are also 4 privately owned clinics and 3 privately owned schools.



**fig. 54** A church beside the canoe hiring point. Most of the churches in Makoko are built with concrete blocks contrasting the timber used in building most Makoko structures. The churches define public space.

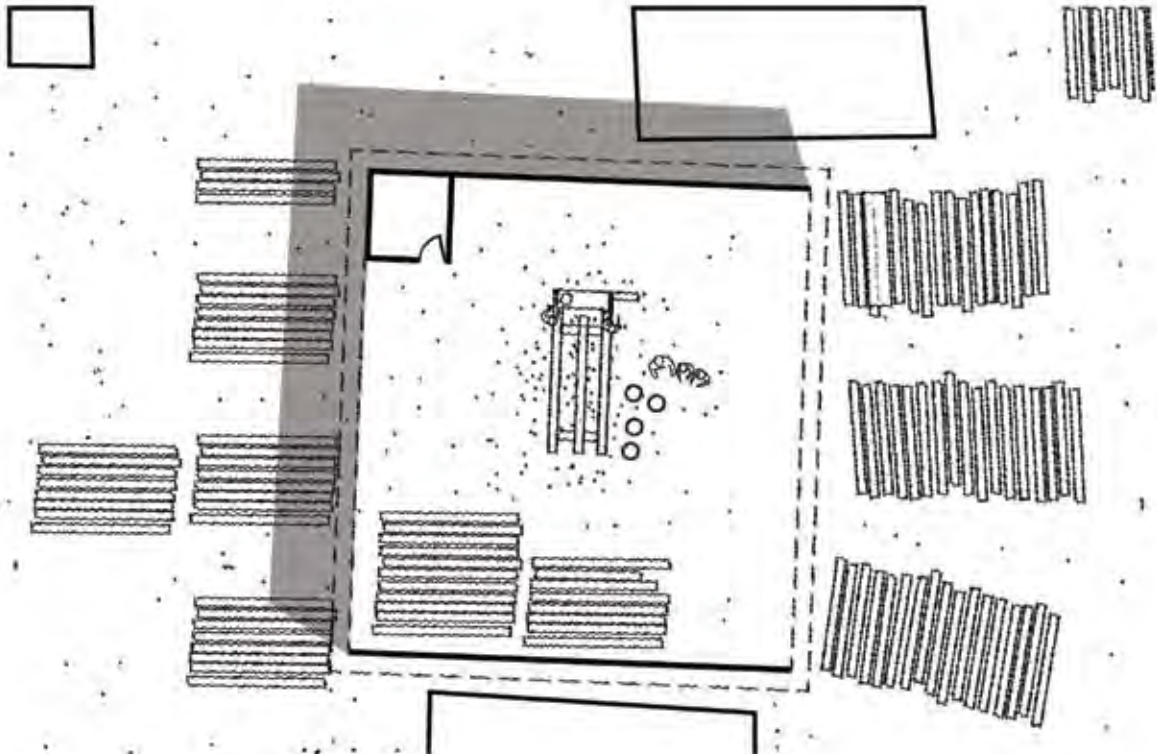
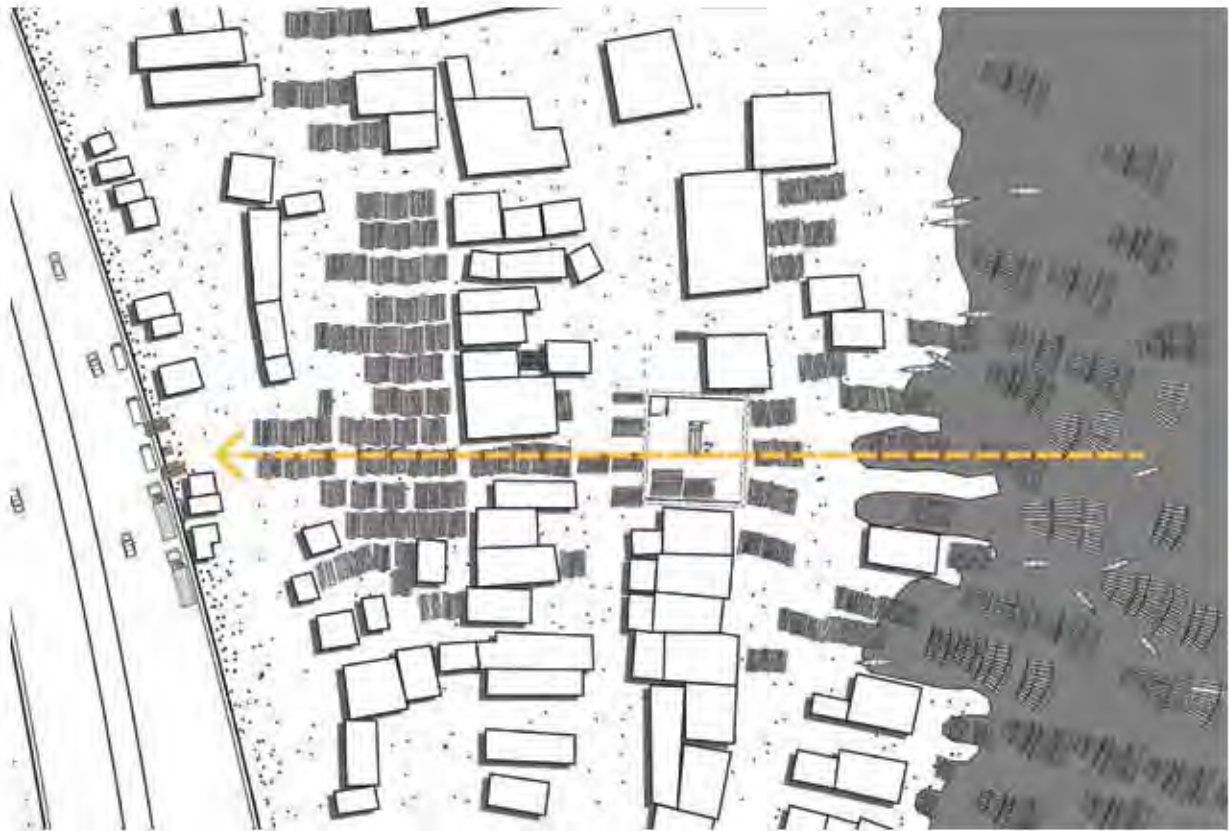


fig. 55 The Makoko sawmill. The images show the timber rafts and a shed where the timber logs are cut into varying workable sizes.

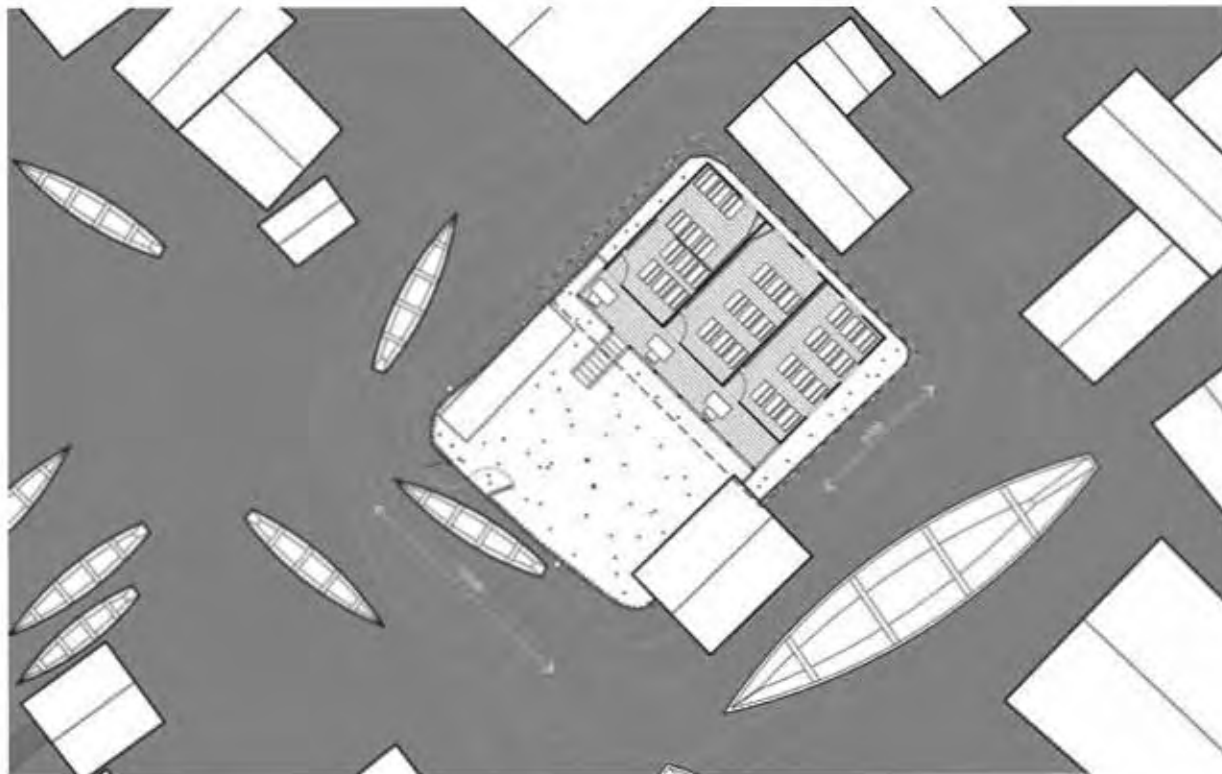


fig. 56 The Makoko Whayinna Primary School.



**fig. 57** The dilapidated Makoko Whyinna Primary School.

### *Large Scales*

There are no large scale infrastructures in Makoko. Unfortunately the lack of these large scale infrastructures such as schools, health centres and sanitation centres has left the Makoko community in a grossly degenerated state and this prevents the community from moving onto a greater level of human and environmental development. It is therefore important for the government and other note-worthy parties to intervene in the supply of these infrastructures.

### *Extra-Large Scale*

When looked at as a whole Makoko has an intricate urbanity. In order to lead this urbanity into a greater level of sophistication larger scale infrastructures highlighted should be provided in the context in a manner that responds to the pre-existing configuration of the settlement.

## **State of Makoko**

The exploration of Makoko has revealed that government threats and neglect are the primary reasons that the water-based settlement is in a state of degeneration. Respondent D alluded to this fact in stating that:

The biggest challenges we face in Makoko are government challenges. There are no government schools in the community, no government hospitals in the community, no government boreholes in the community and often we get news that the government is coming to demolish our community to build hotels.

This neglect has also resulted in the absence of large scale infrastructures, the absence of systems to cope with the effects of climate change (flooding), and the absence of sufficient public space. Respondent A also alludes to the lack and importance of public infrastructure by saying:

Lagos does not have a city management system and for any change and transformation to occur government participation is important.

### *Absence of Large Scale Infrastructures*

As highlighted the degeneration of Makoko stems from the fact that there are no larger scale infrastructures. Therefore it is critical to proffer appropriate social infrastructures to the context of Makoko so as to aid its inhabitants in living in the city fittingly as the standard of living in the context is deplorable and moves have to be made to remedy this current situation.

This lack of adequate large scale infrastructures coupled with issues of climate change, and rapid population increase has resulted in Makoko being a largely unhealthy and degenerating environment and thus resulting in the high vulnerability of the Makoko people to diseases, poverty and etc. Furthermore, the education and health infrastructures of Makoko are virtually non-existent. There are only three schools on water which are insufficient considering the fact that the youth population far outnumbers the adult population as is the case generally in Lagos. According to Respondent G who is a Lagos planning professional, children should not have to walk more than 800metres to a primary school and for secondary schools a distance of 1.5km is the maximum allowed walking distance. Unfortunately this is not the case in Makoko as there are no secondary schools within the community.

In addition, all the four health care facilities in Makoko are privately owned and expensive. This leaves the people of Makoko vulnerable to dangerous water-borne diseases considering the poor state of sanitation in Makoko. Diseases such as malaria and typhoid are easily contracted and in some cases people die from these diseases.

### *Climate Change*

The world climate change could have great social consequences on Makoko. Although it was observed that the stilt dwellings in the community which are located about 1m above sea level cope well with floods even during the rainy season. Also, the use of the local timber results in buildings that cope sufficiently with the heat of the Lagos sun.

### *Public Space*

Of the 472, 810 m<sup>2</sup> area of Makoko only 2.8% is public space<sup>38</sup>. This leaves an insufficient amount of outside space for daily activities to occur within the community. Although, it is clear that canoes, timber decks (platforms), churches shops, reclaimed landmasses and water routes within Makoko allow for socialization and other important activities to occur within the community, these structures are not significant enough in scale to accommodate larger activities like markets, festivals and play areas for children.

The provision of public space within the community should therefore be a priority when implementing any infrastructure projects in Makoko so as to confer these installations higher importance in the community.

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38 OSHODI, L. & HOELZEL, F. 2014. Makoko/Iwaya Waterfront Rejuvenation Plan. Lagos.

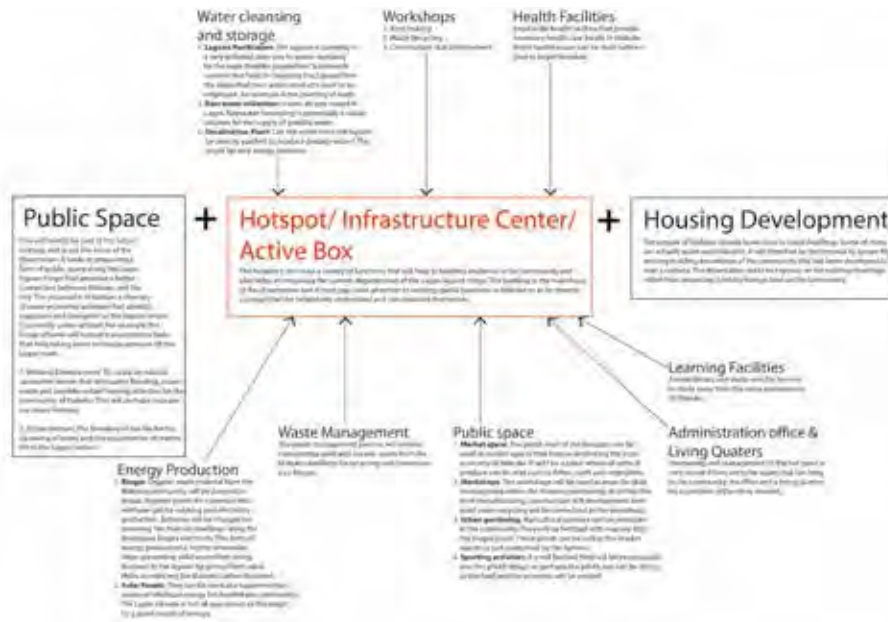


fig. 58 Initial speculated infrastructure needs in Makoko.

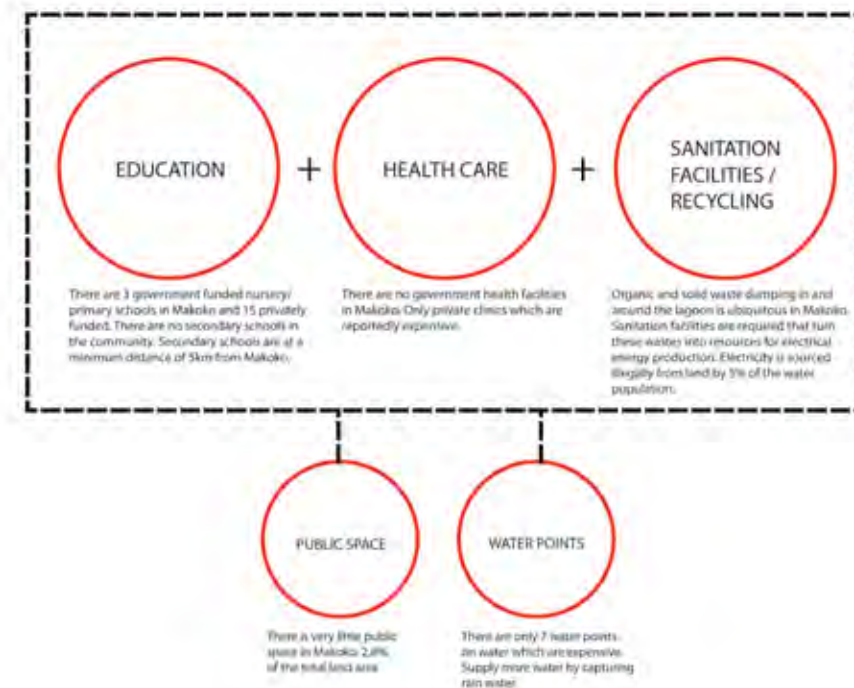


fig. 59 Infrastructural needs after site exploration. Similar to previous speculation but the need for housing is not a priority here as there is local capacity in building dwellings.

## **Findings**

### Essential Findings for Design

Provided that the Lagos government becomes willing to supply infrastructure in Makoko, the most important elements and ideas for designers, planners and the government to harness in providing effective infrastructure in Makoko are its liquid urbanism, the use of renewable resources (solar energy, rainfall, timber and waste), and human resources.

#### *Local Resources*

To provide infrastructure in Makoko and contexts of similar genus it is important to understand the fact that there are human and material resources already available in the context for development and these resources should be harnessed in any new rejuvenation interventions.

Minimal disturbance of the socio-economic networks in Makoko while upgrading is important and the drive to tap into local resourcefulness is also being advocated by the existing Makoko rejuvenation plan which highlights the importance of local human and environmental resources for the development of the settlement. Respondent E who is an Architect in Lagos also explains this by stating that:

The best way to get at these people is to find out what sustains them. When intervening in such a community it is important to tap into their lifestyle.

#### *Renewable Material Resources*

The people of Makoko are already using some renewable resources readily available in their context and in places close to Lagos such as the timber they get from their local sawmill. Other resources that can potentially be used to provide necessary infrastructure in support of existing infrastructure include human organic waste, solid waste, rain water and tropical sunlight.

The Oko-Baba sawmill in Makoko and surrounding forests supply a wide range of hardwoods and soft woods which the Makoko people use in building boats, homes, furniture, cooking and other uses. Logs of wood ranging from 12 feet (3650mm) to 36 feet (10970mm) in length are floated down from the Onigambari, Aga-Owu, Ife, Shasha, Omo and Oluwa forests in the form of rafts. The forests are located in other Nigerian states to the North of Lagos. The hardwoods available in Makoko include Akun, Iroko, Mahogany, Cedar, Black Afara, Aba, Ekiki Aka, Abora, Oparun, Irin, Yere, Eki and Ofu and the soft woods include Somi, Awun, Arere, Akomu, Apako, Odogbo, Opepe and Igi Oke. The Eki, Akun and Oparun (bamboo) are the most common for building dwellings while Abora is used in building furniture. The soft wood Somi is used in making paper.

In addition, the large volume of rainfall in Lagos suggests that rainwater can be captured to provide additional water for drinking and sanitation in Makoko to supplement the existing water points in the context.

Also, the electricity provided by the state government can be supplemented by using other resources like sunlight and organic waste available in Makoko in generating the much needed electrical energy. Lagos's high temperatures make it a feasible location for solar energy to be used in generating energy. Although, using organic waste to generate electricity will be more transformative because it will also help in providing a cleaner environment and purer water (cleaner lagoon water) for the Makoko people because at the moment there are various dump sites at Makoko in and around water that also destroy essential marine life.

Timber Sizes
25 x 304 x 3650
76 x 304 x 3650
76 x 101 x 3650
50 x 152 x 3650
50 x 76 x 3650
50 x 101 x 3650

**Table 1.** Timber sizes available in Makoko

### *Human Resources*

Nigeria has an unemployment rate of 23.9 percent and in Makoko 20.1 percent of the inhabitants are unemployed<sup>39</sup> and considering the fact that 31.5 percent of those employed work in the informal sector (fishing, boat making, kiosk trade, etc.), which is the culture of the Makoko people, it is important to ensure that the developed infrastructures tap into this informal network while also encouraging greater sophistication by providing formal education in the community so as to build greater capacity that will push the locals to take ownership of their context and also provide a means of employment.

### *Liquid Urbanism water culture*

The research has shown that there is a liquid urbanism in Makoko which is very dependent on the water terrain for sustenance. The urban structure of Makoko shows that raised platforms on stilts, reclaimed land and its water routes are essential components that should be highlighted when designing in the context. This urbanity also encourages the free flow of water and this also protects its inhabitants from the effects of climate change such as flooding and temperature rise as the materials used in construction are appropriate for the tropical weather of Lagos.

### *Existing interventions in Makoko*

Part of the exploration of Makoko involved a further study of the Floating School and the Neighbourhood Hotspot. According to Respondent A the Floating School is unsuccessful because of the current absence of the state to sustain it and the currently uncompleted Neighbourhood Hotspot will suffer the same fate without state management. Furthermore, on interviewing locals in Makoko it was revealed that the floating structure played a role in the destruction of homes in Makoko. This incident was as a result of the heavy coastal winds which blew the floating structure towards some dwellings, resulting in their destruction. Secondly, its triangular form is limiting because it will not allow for easy vertical expansion and adaptation by the growing population of Makoko. Also, considering the fact that the floating structure is meant to be used on an urban scale to transform Makoko it will lead to a monotonous urban environment which will compromise the intricate urban fabric of the community and the public realm and can also amplify the highlighted problems. Additionally the rainwater

<sup>39</sup> INNOCENT, E. O. 2014. Unemployment Rate in Nigeria: Agenda for Government. *Academic Journal of Interdisciplinary Studies*, 3, 103, OSHODI, L. & HOELZEL, F. 2014. *Makoko/Iwaya Waterfront Rejuvenation Plan*. Lagos.

collection, solar panels and compost toilets included in the school as a sort of stand-alone system do not perform as the architect intended.

Although the Floating school has failed in its drive to provide the above infrastructures, it has however become an important public space in the Makoko precinct and therefore an asset to the community. This is because it is one of the only publicly accessible surfaces in Makoko. Furthermore, the school uses the available timber in Makoko in a unique manner that increases the strength of the wood through lamination.



**fig. 60** Women trading and waiting for fish at the Makoko Floating School.



fig. 61 Timber structure of the Floating School. A unique detail in Makoko.

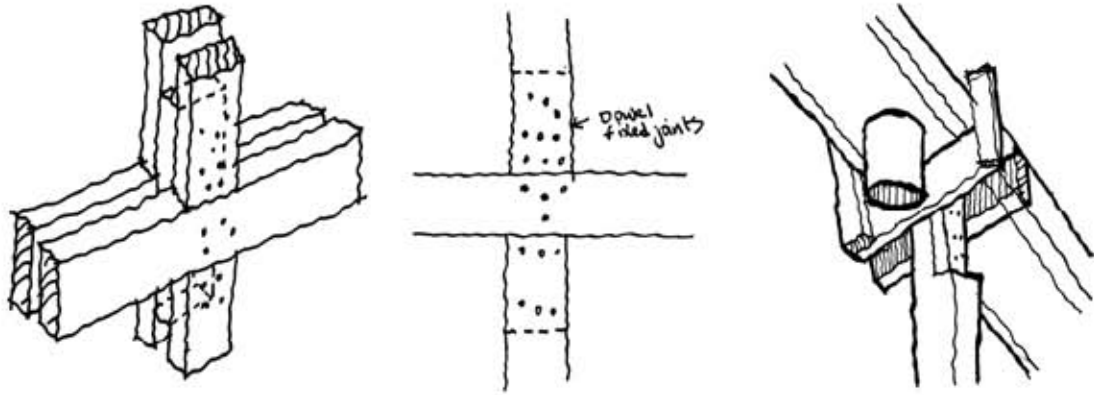


fig. 62 Site detail sketches of the Floating School and Neighbourhood Hotspot.

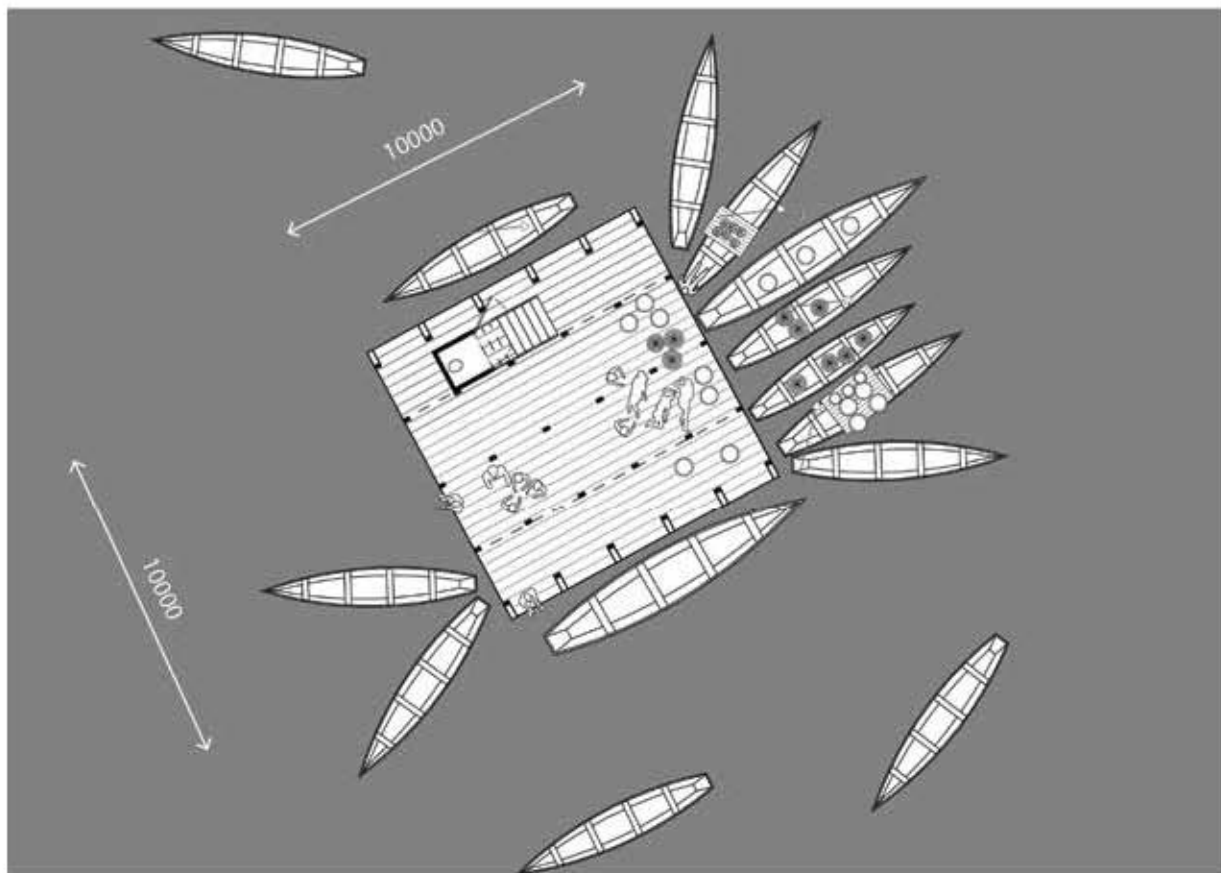


fig. 63 Diagram of the Floating School as an important public space in the Makoko community.

## Proposition

### Design development

This proposal works with the premise that the Lagos government has become interested in developing Makoko. The findings highlighted have been taken into account in generating a design that takes the unique issues present in Makoko into account.

#### *Urban Strategy*

As in the Neighbourhood hotspot, this study proposes an urban strategy in which the developed interventions are scattered all over Makoko at important nodes which already exist so as to tie into existing networks. Although, the design developed takes the urban strategy of the hotspot further by proposing bridges rather than branches of the Makoko community. The bridges will span over existing water-ways thereby becoming landmarks that delineate the currently undefined routes in the settlement. By using a bridge strategy outsiders can come into Makoko and experience the context in a manner previously unavailable to them thereby opening Makoko to tourism. The Rialto Bridge in Venice is a similar structure as it helps in connecting different parts of Venice and also has a programmed surface.

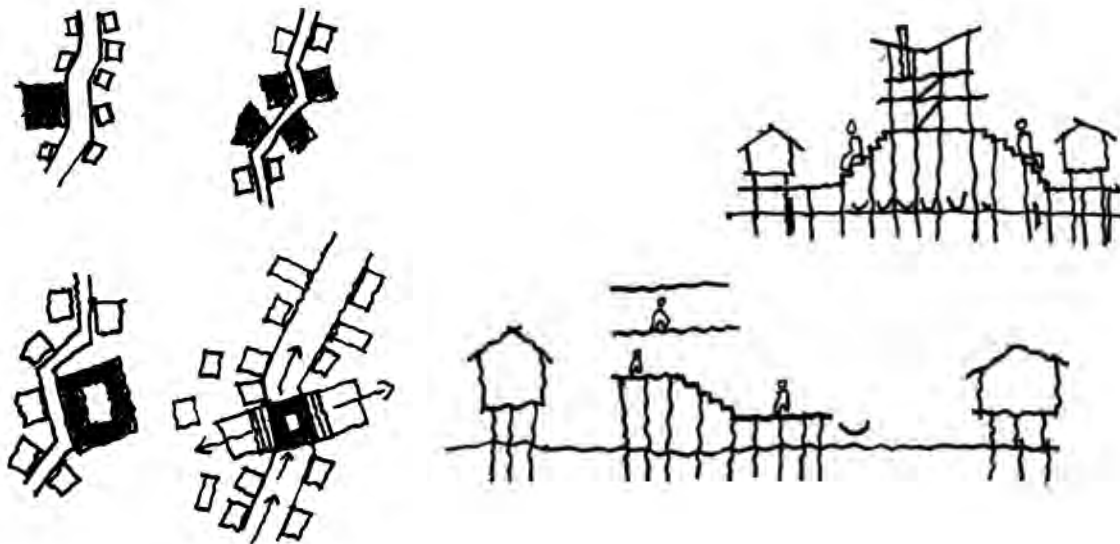
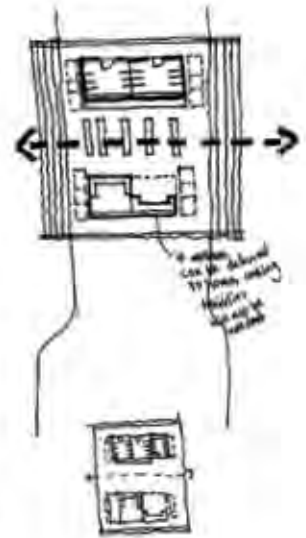
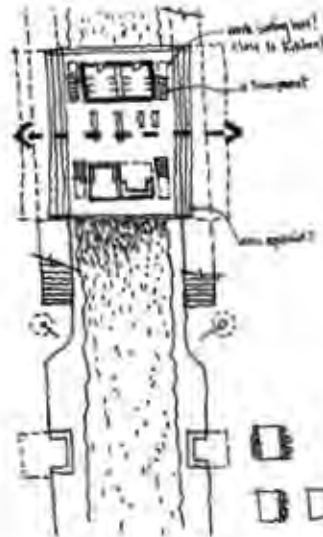
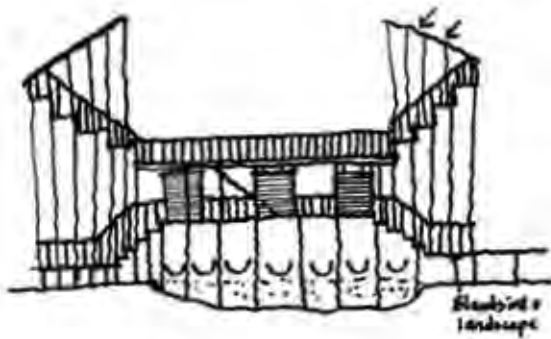
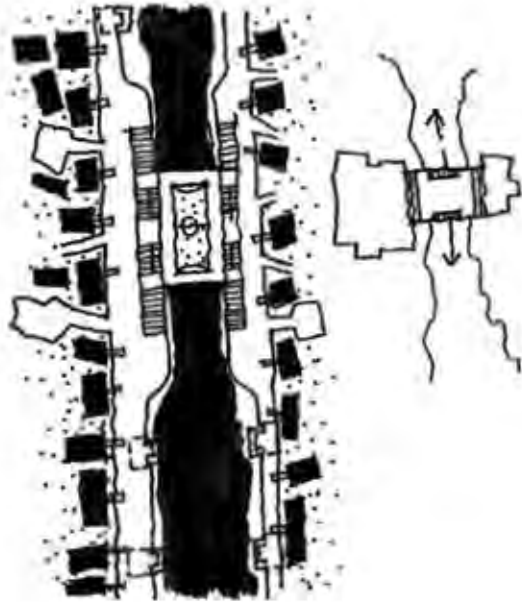
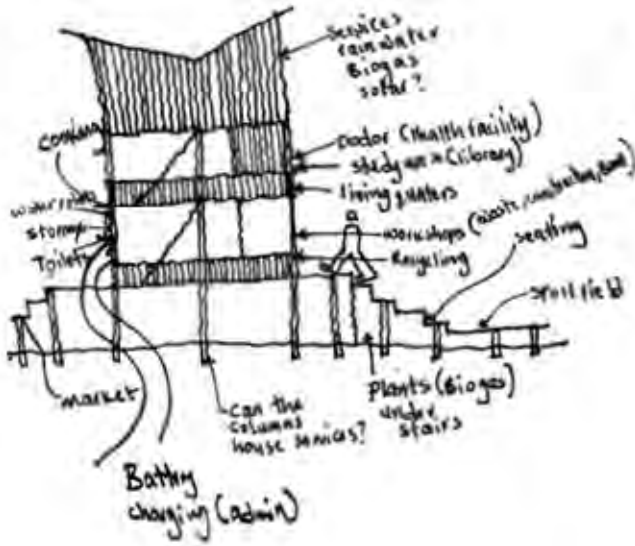


fig. 64 First sketches showing the strategies for intervening in Makoko.



fig. 65 The Rialto bridge Venice.



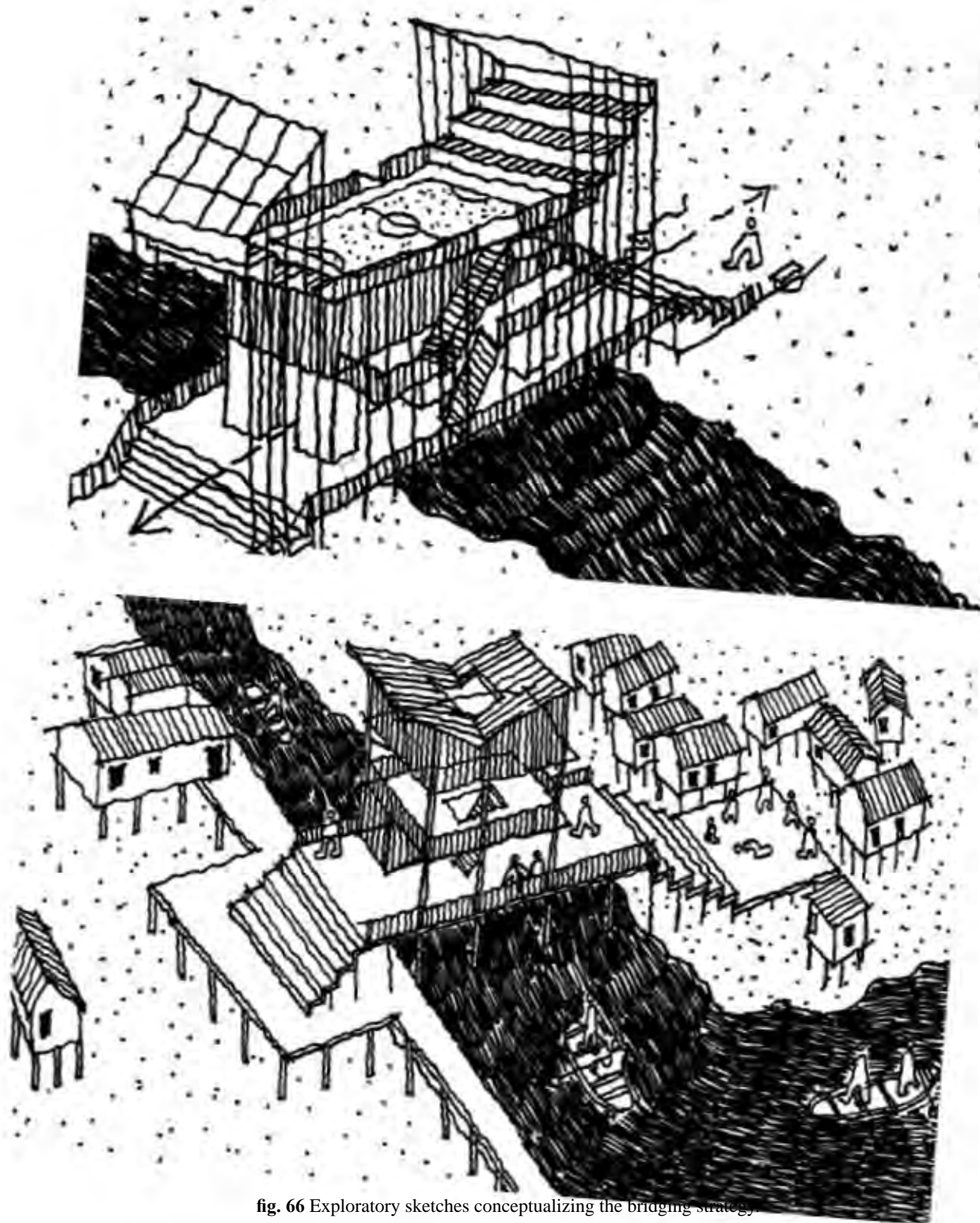


fig. 66 Exploratory sketches conceptualizing the bridging strategy.



fig. 67 Nodal strategy for infrastructure intervention. The yellow dots highlight the selected sites.

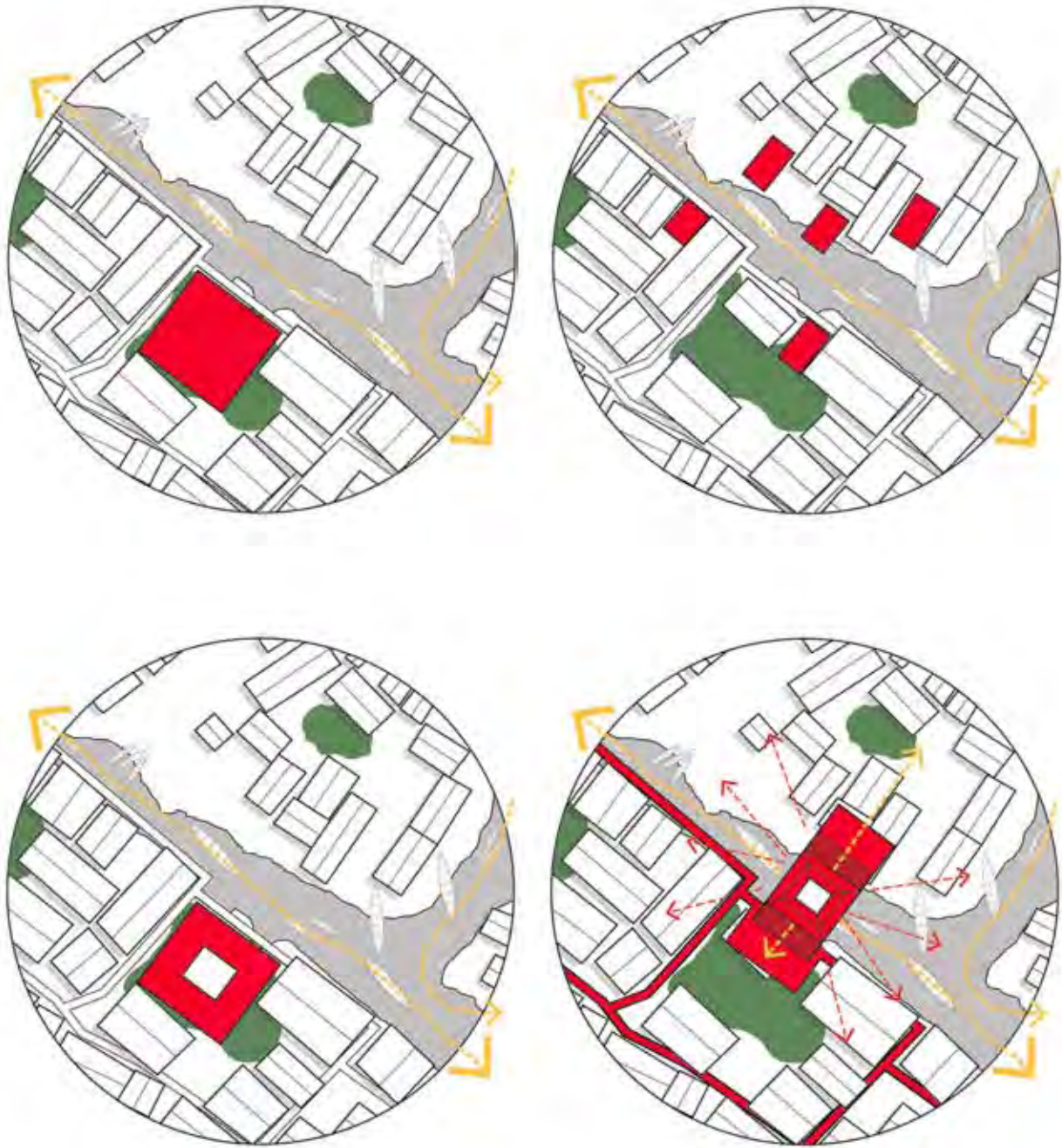


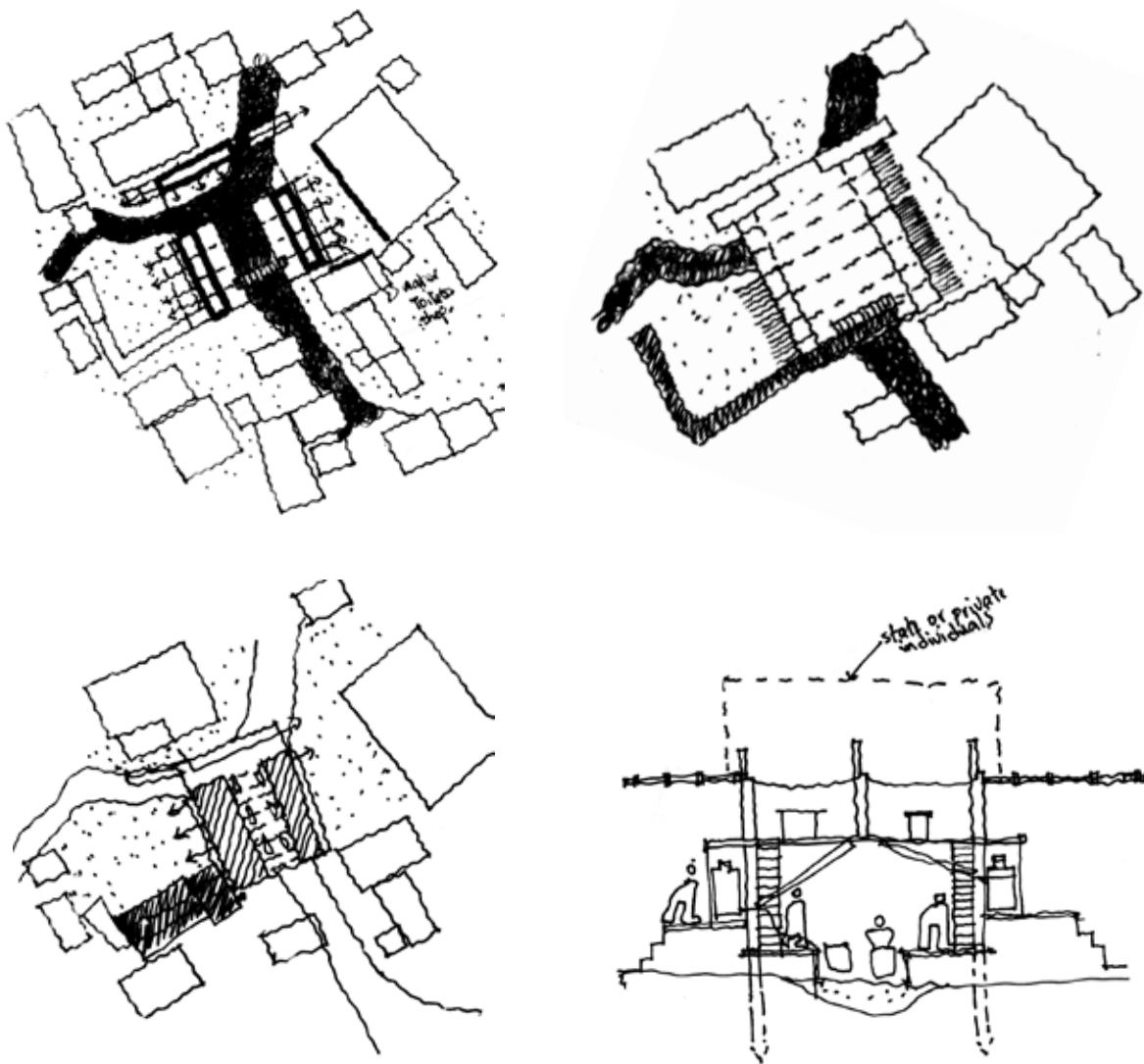
fig. 68 The branch, spread and bridge strategies.

### *Sites and Programmes*

Of the many nodes in Makoko three have been chosen as sites to design infrastructures that are of small, medium and large scale. These sites were selected to develop three prototypes that respond to different conditions. The first one is of medium scale and it engages with a transition from land to water and the second is a large scale and it deals with dwelling on water and the third is of a small domestic scale.

*Medium Scale - Market Building*

The design which engages with moving from land to water is located at an existing canoe boarding point on the west side of Makoko. At this node there is high foot traffic and as a result of this informal trade has sprung up. The intention of this design is to reinforce the activity which occurs at this node by providing a better articulated ferry point with stalls on either side for informal trade to occur. Above the ferry point there is a large market that spans over the ferry point and creates shade around its context with a planar roof so as to define the formed public space.



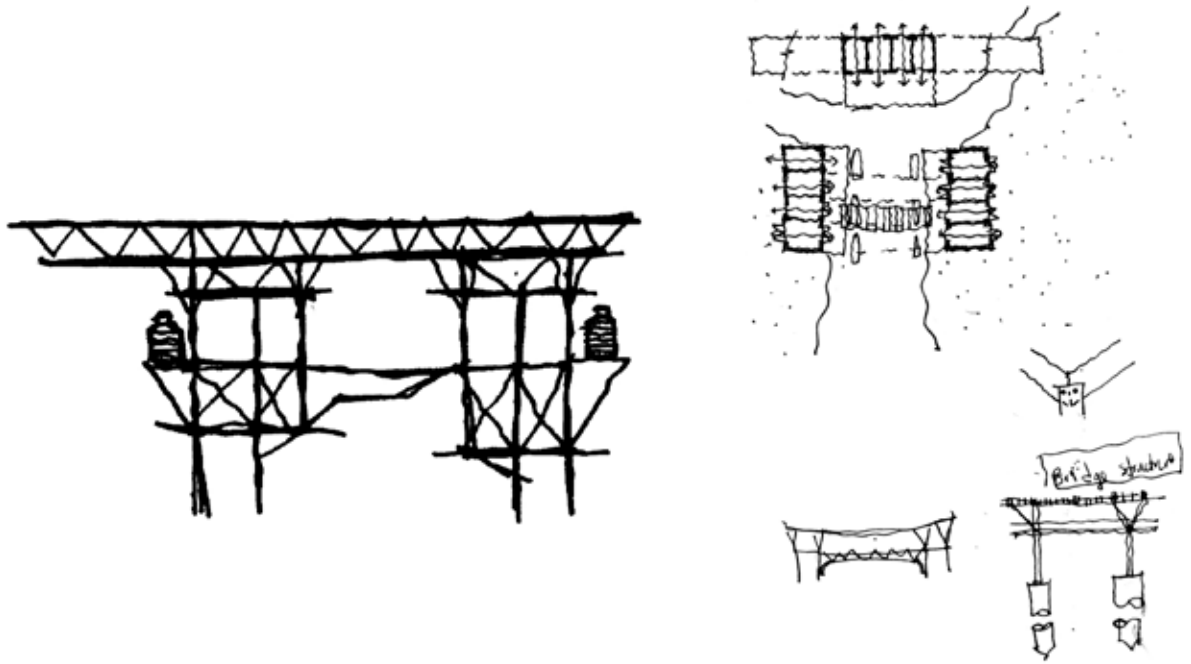


fig. 70 Exploratory sketches of the medium prototype.



fig. 71 Collage of articulated canoe ferry point on ground floor of medium building.

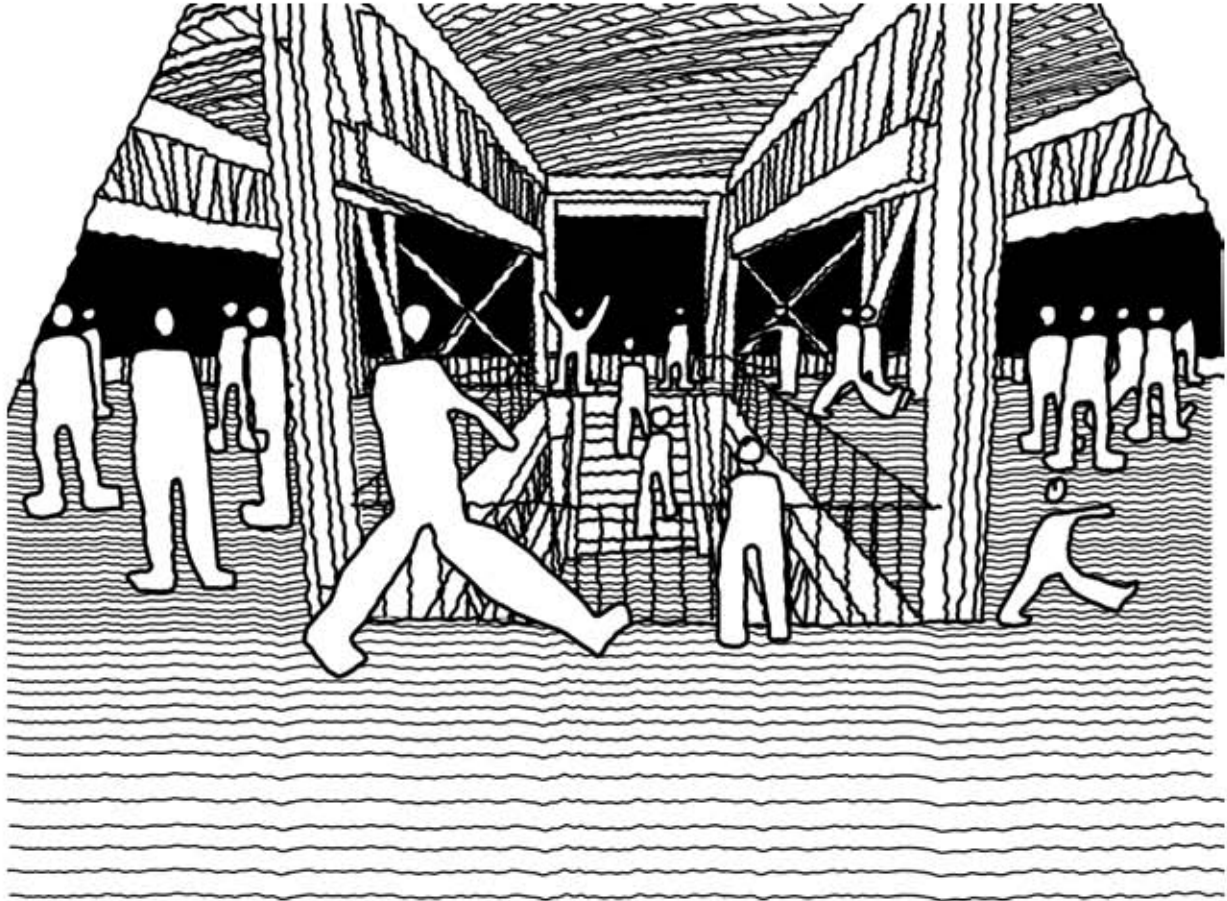


fig. 72 Sketch of first floor market space.

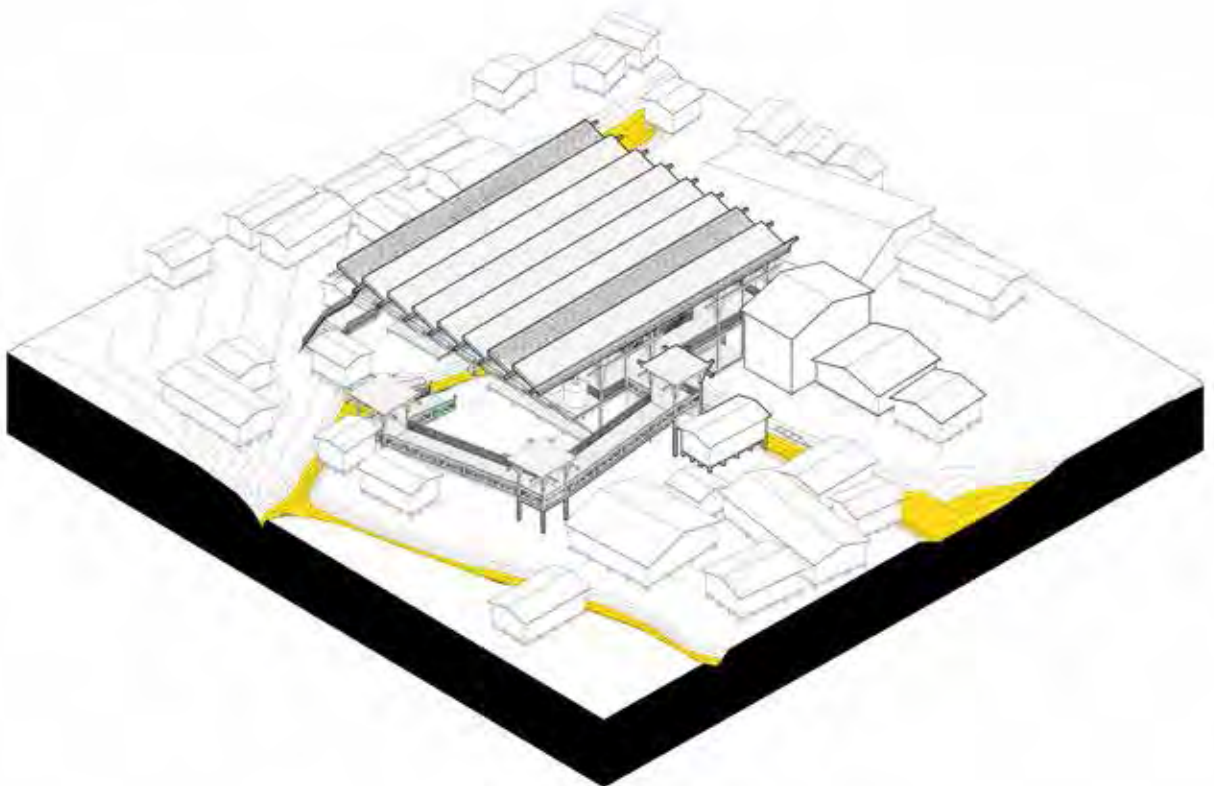


fig. 73 Axonometric drawing of Medium scheme.

### *Large Scale - Health Centre*

The second intervention is located at the heart of Makoko and is fully surrounded by water. It is a four storey building with a fairly large play area on its roof where football and other sporting, recreational and community activities can be carried out.

The initial speculative proposal was at the top of Makoko and it had too many functions within it which have been simplified to make it primarily a health centre. It has been moved from its previous site to a more central location in the settlement so a long movement spine from land to water can be created which makes it more accessible to the Makoko populace and also allows a link to the Whayinna primary school.

The link to Whayinna primary school was created to give the children easy access to the health and recreational facilities available in the building as the current school does not have sufficient play space. On its ground floor it also has a ferry point with stalls for trade and socialization. Cascading staircases similar to those of Renzo Piano's Pompidou centre are used in moving between the levels of this large scale prototype.



**fig. 74** The externalized cascading staircase of the Pompidou centre allows for efficient movement between levels.

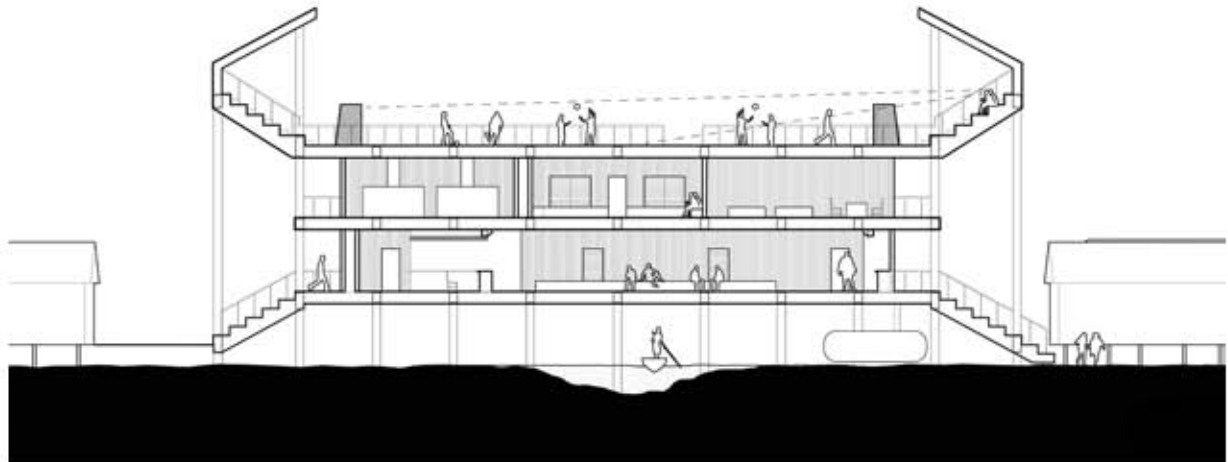
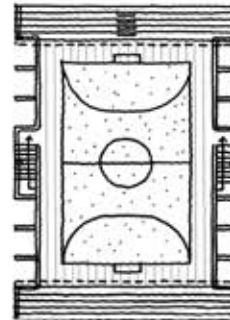
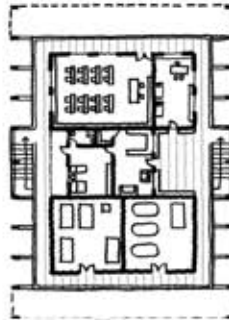
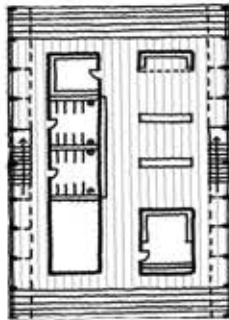
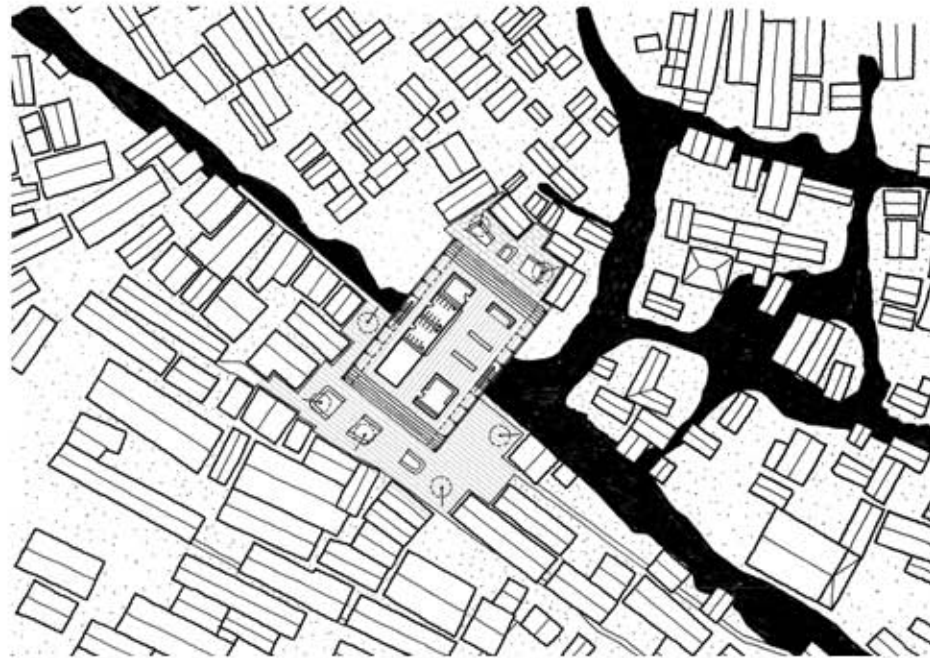


fig. 75 First proposal for large building.

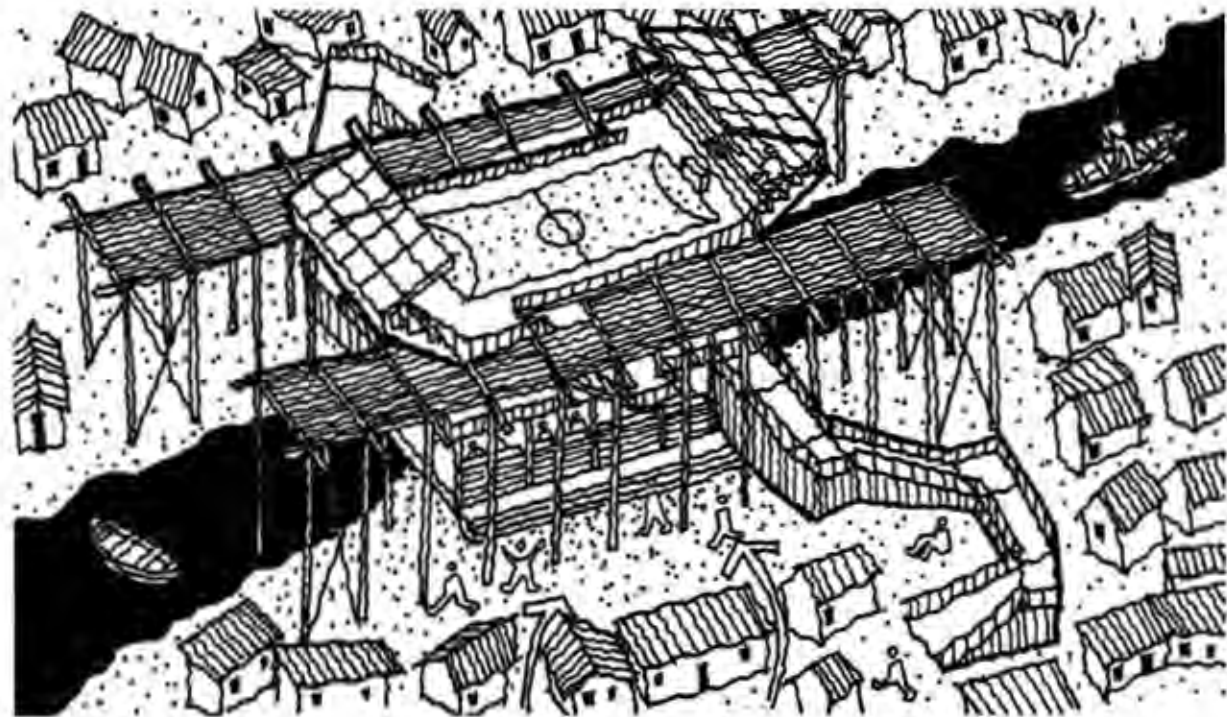
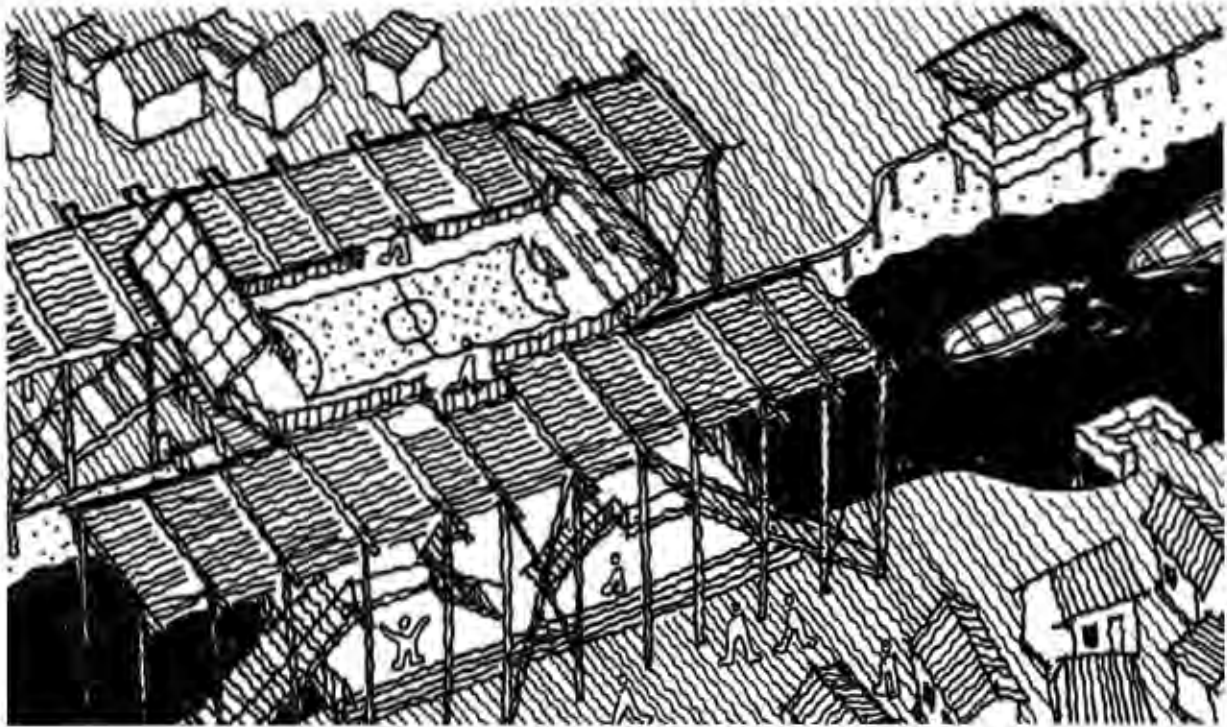


fig. 76 Axonometric sketches showing different strategies for public space creation.

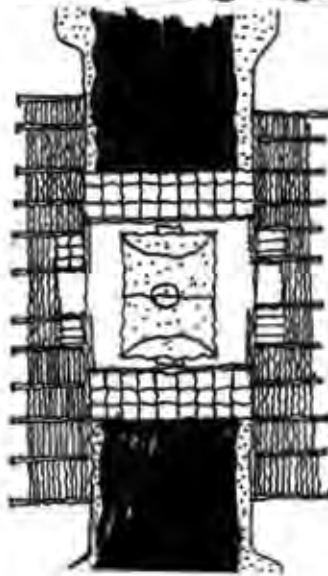
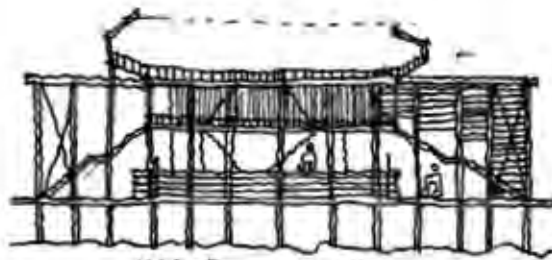
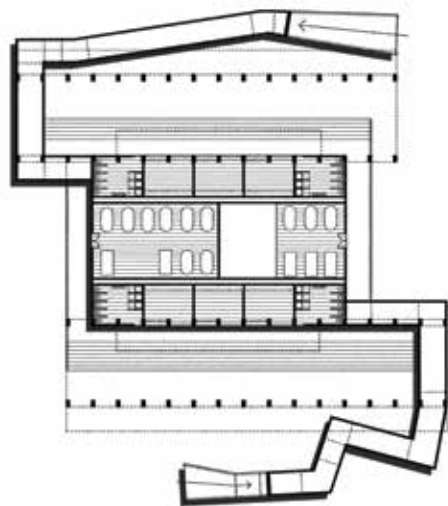


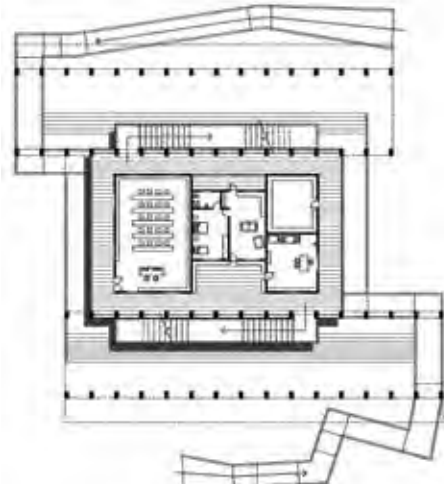
fig. 77 Exploratory elevation sketches of large building.



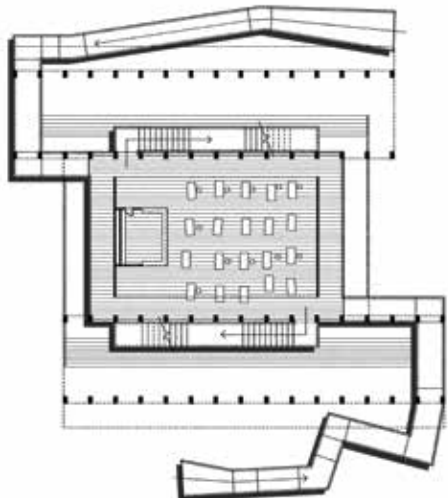
fig. 78 Context plan of Second proposal for large building.



Ground Floor Plan



Second Floor Plan



First Floor Plan



Roof Plan

fig. 79 Plans of second proposal.

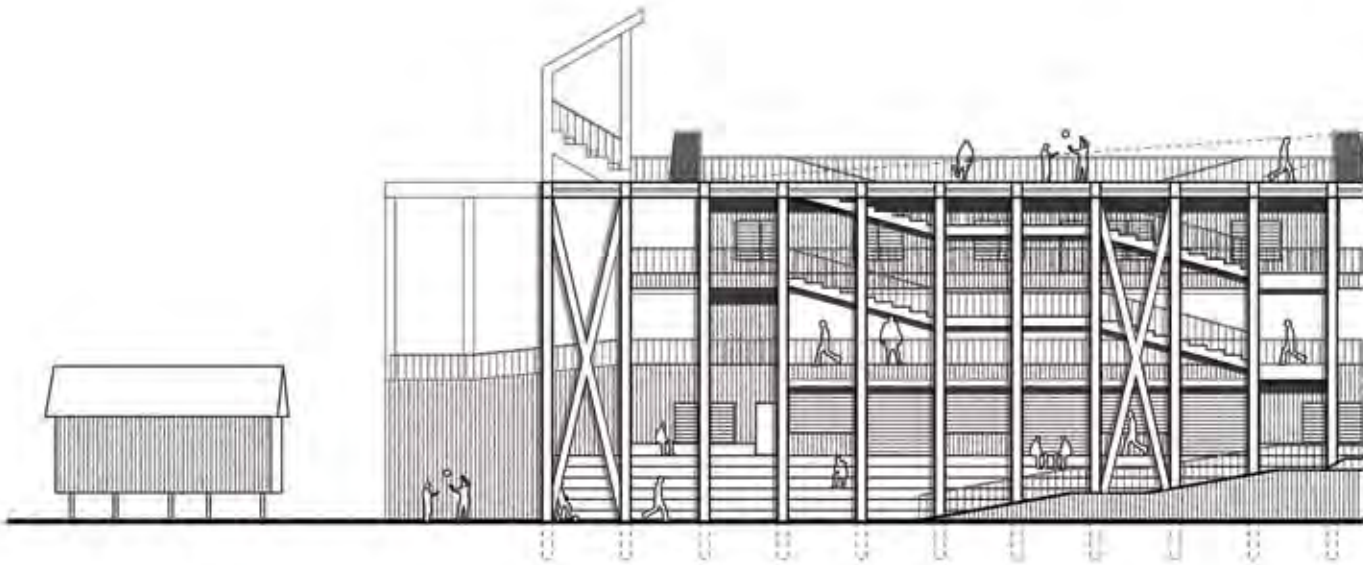
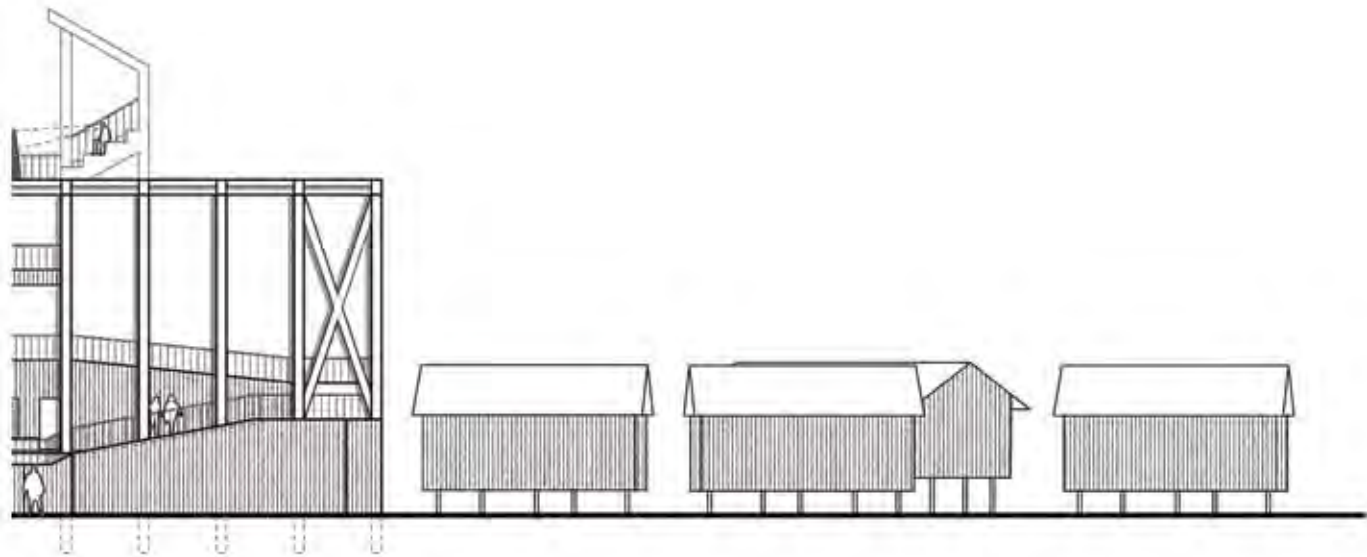
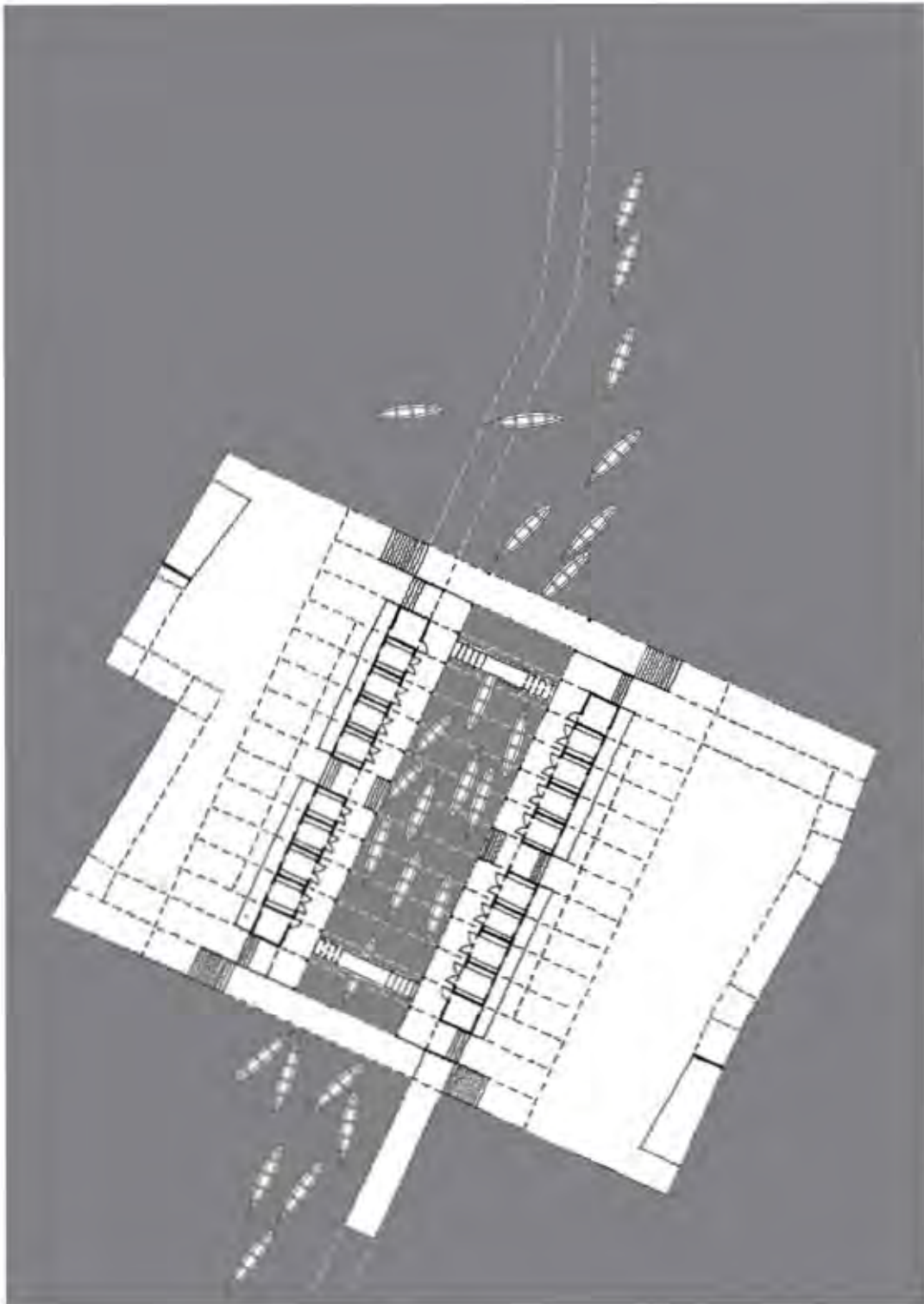


fig. 79 Elevation of Second proposal for large building.





**fig. 80** Urban strategy for final proposal. Creating a long movement spine that ties into the existing walkways to the north of Makoko.



**fig. 81** Ground floor plan of final proposal showing canoe ferry point on ground floor.

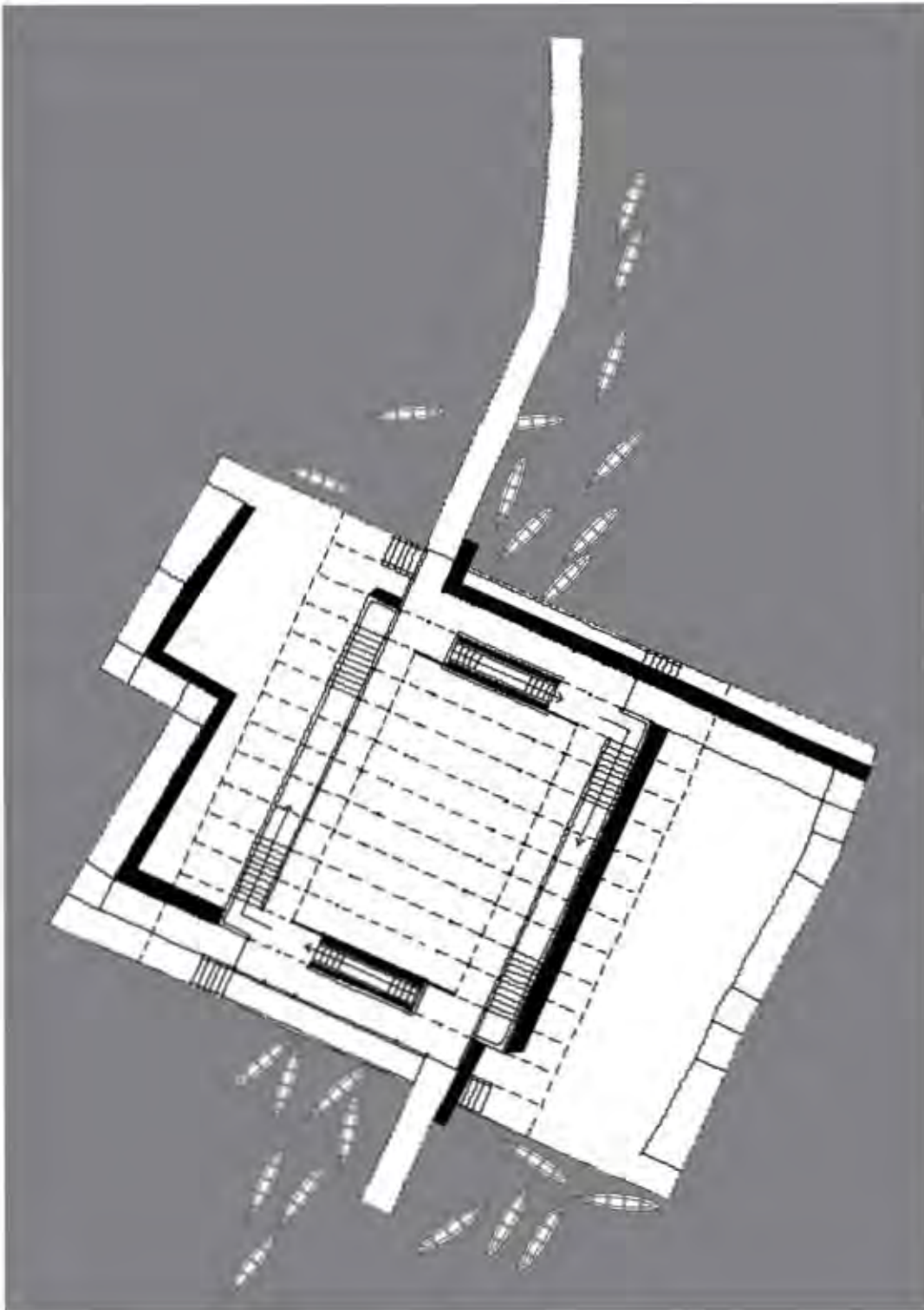
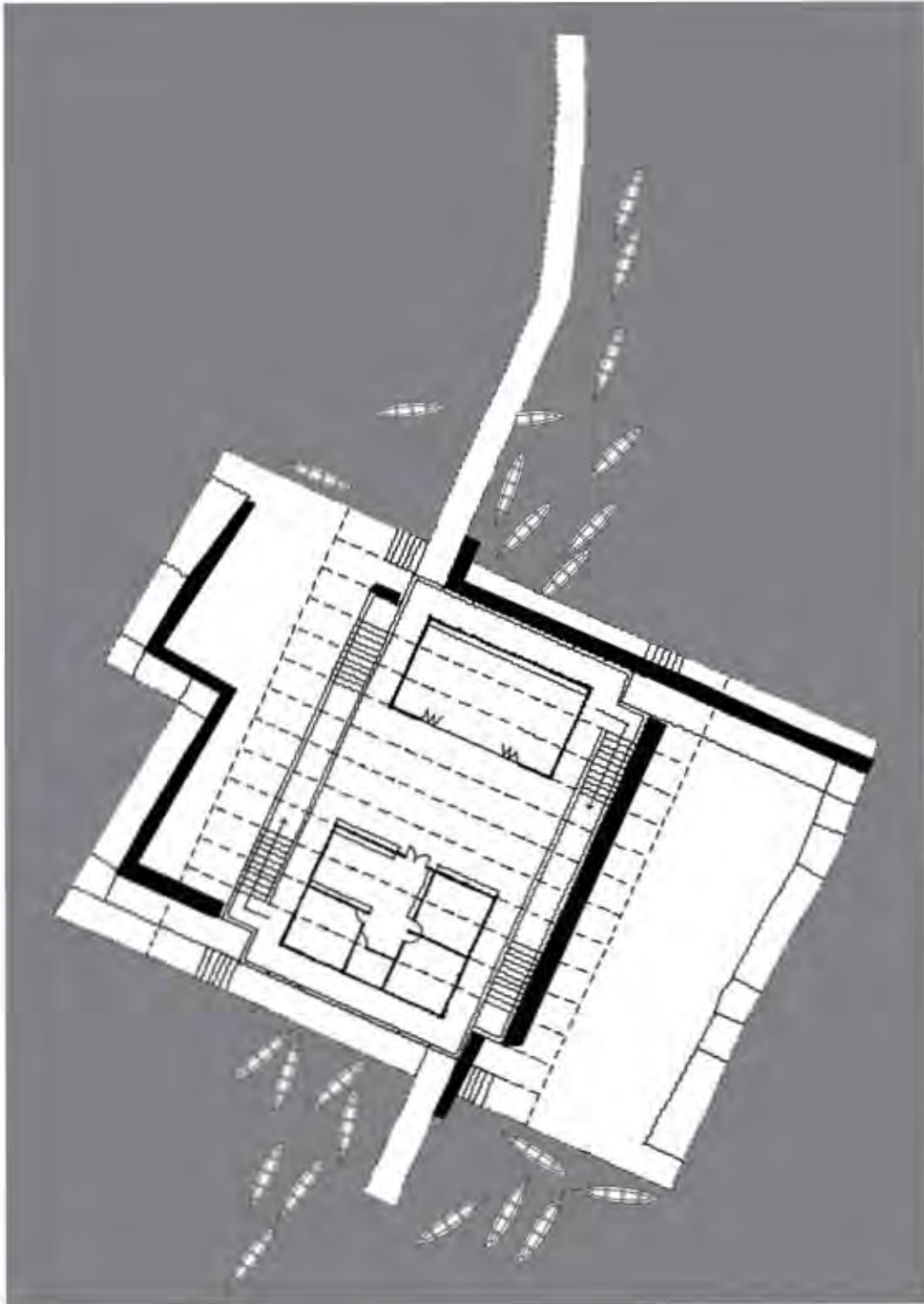
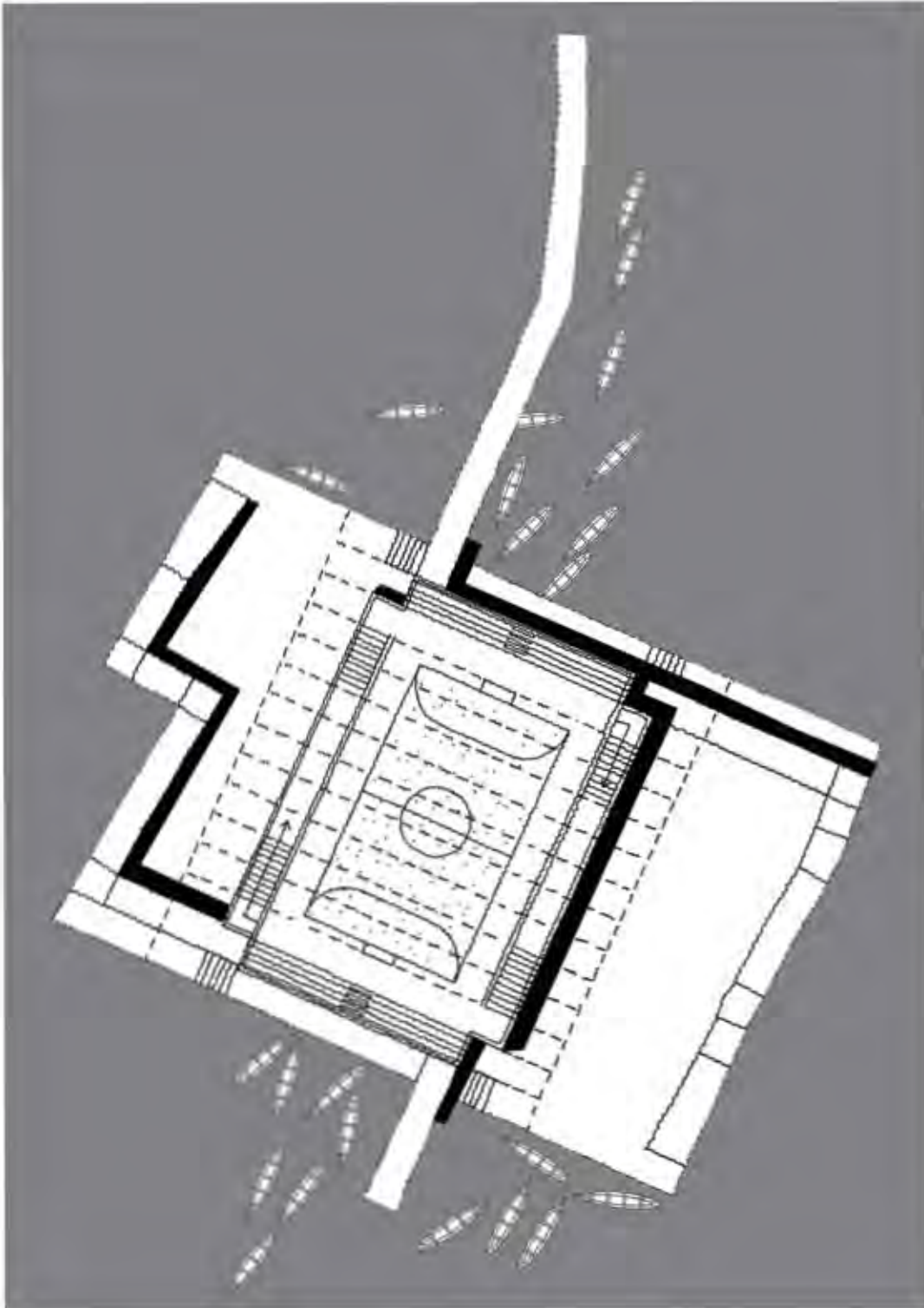


fig. 82 First Floor Plan. Market level of large building



**fig. 83** Second Floor Plan showing clinic and daycare centre.



**fig. 84** Third Floor Plan showing play area

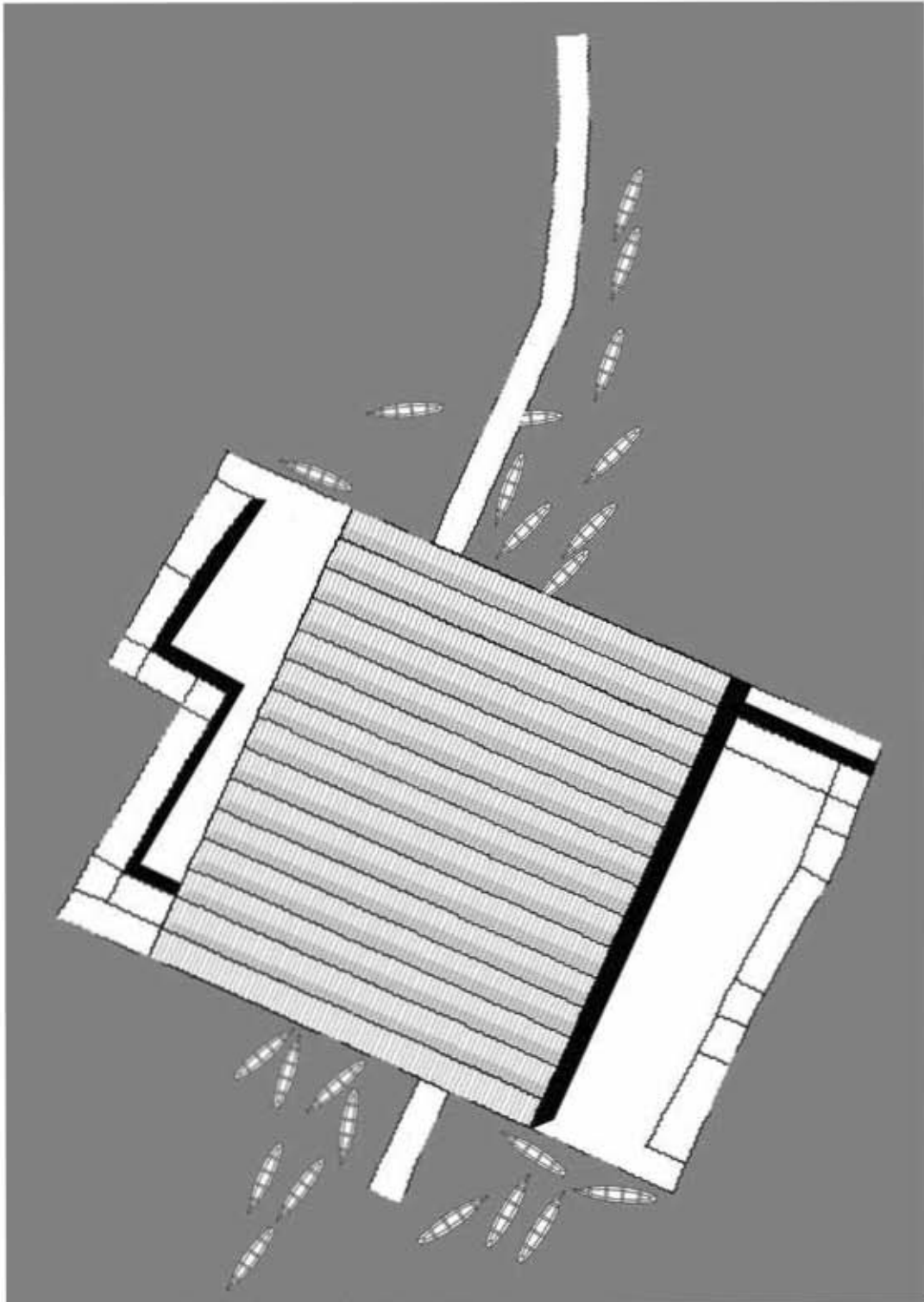


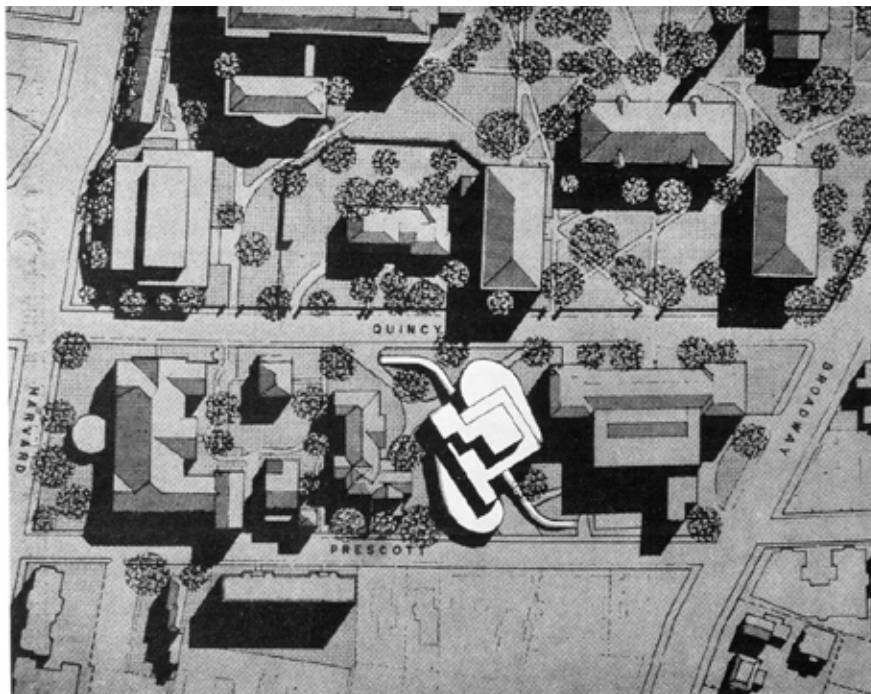
fig. 85 Roof Plan

### *Small Scale - Fish Smoking Shed*

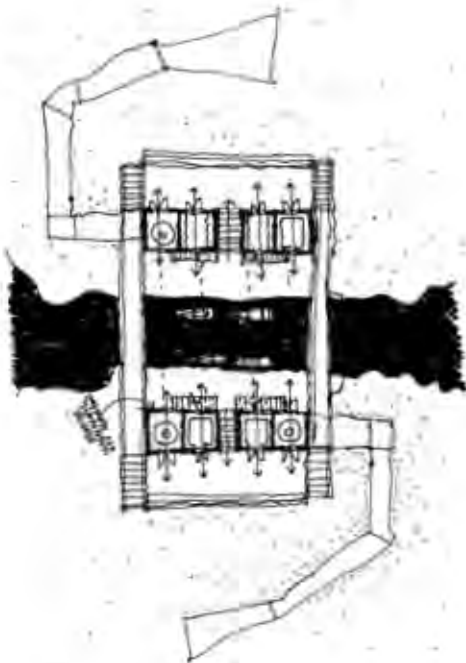
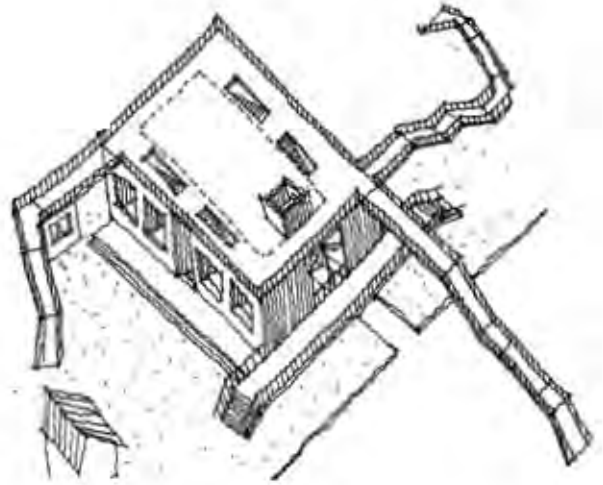
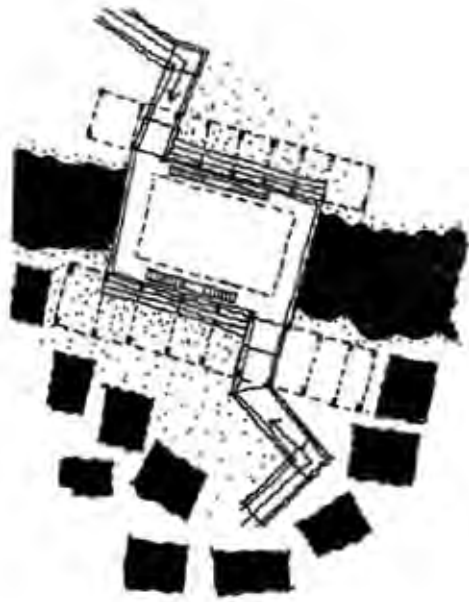
The third small scaled prototype deals with upgrading an existing fish smoking shed located on a patch of reclaimed land surrounded by water. The patch of land on which the shed sits is vulnerable to erosion because its retaining walls which are made of timber are not properly constructed and the surface is not paved in any way. The shed is therefore improved by creating a better timber retaining wall and providing a paved surface. Also, the timber roof of the shed is modified to collect rainwater which can be used in the process of smoking fish.

### *Public Space*

More public space is provided in the medium and large scale prototypes by selectively removing some dwellings in the community and housing the displaced individuals in new dwellings funded by the state located around the designed structures. The generated space is then defined by ramps as seen in Le Corbusier's Carpenter Centre. The ramps help in achieving a fluid transition from the public space into the interventions and they are at the scale of the surrounding dwellings which helps the designed prototypes in blending into the Makoko urban fabric..



**fig. 86** Le Corbusier's Carpenter Centre



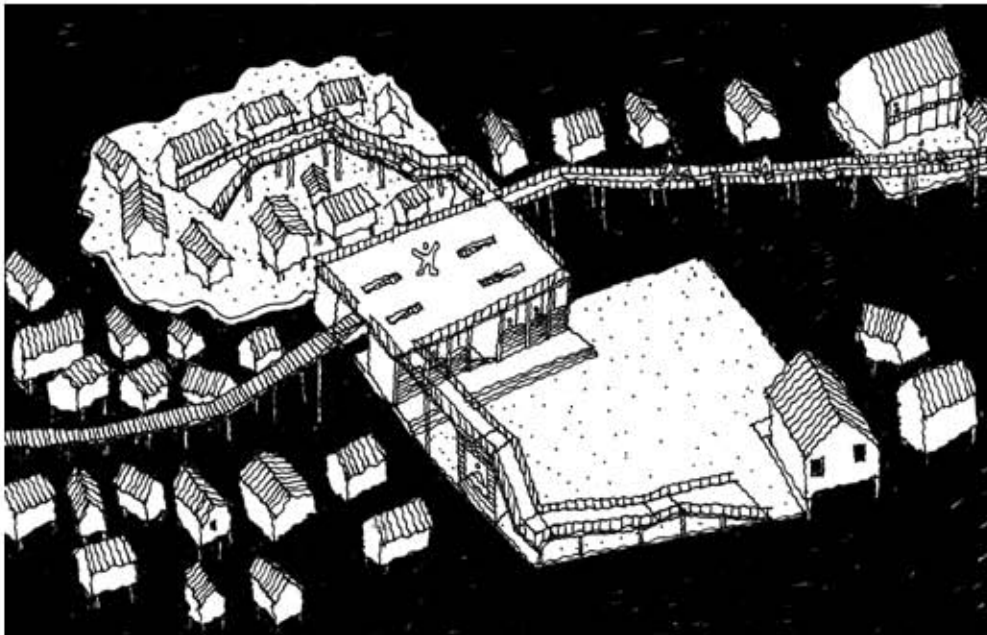
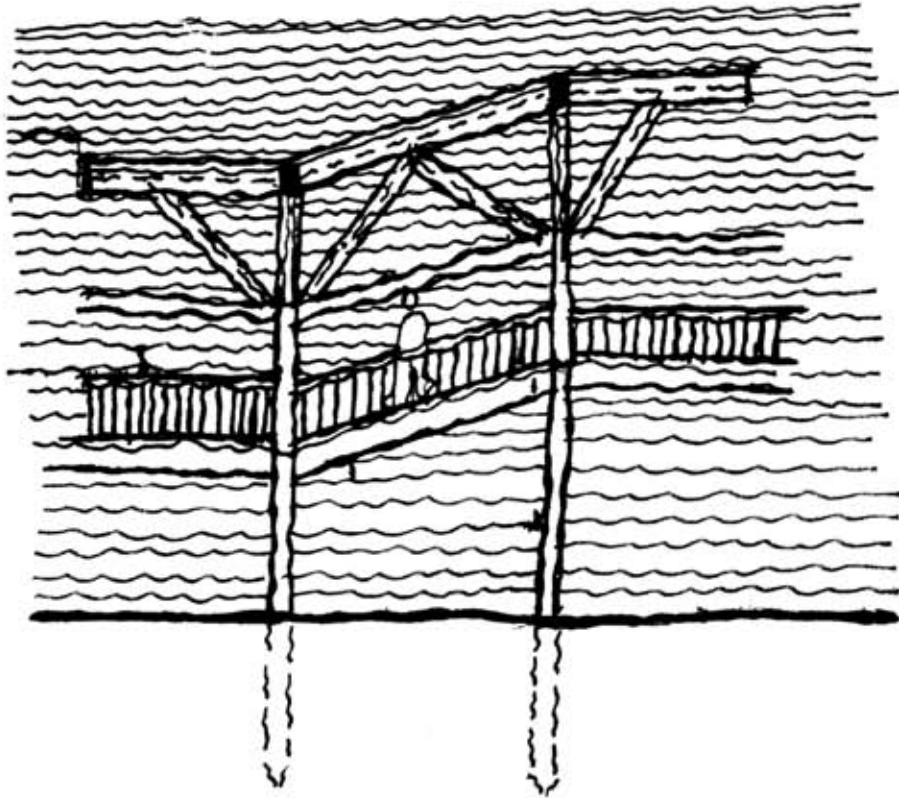


fig. 87 Exploratory sketches showing ramps

### *Platforms*

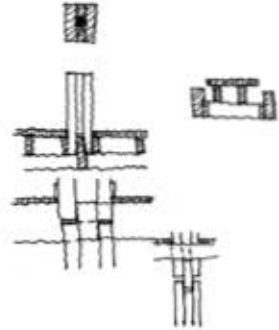
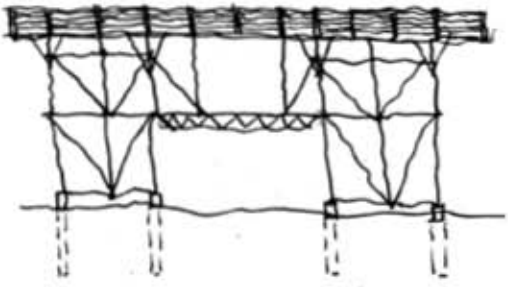
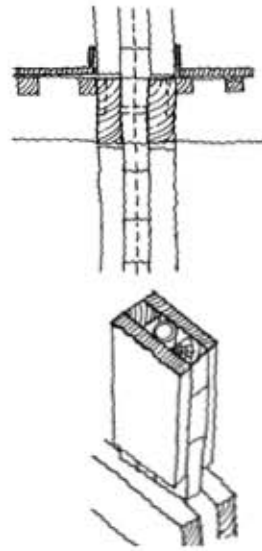
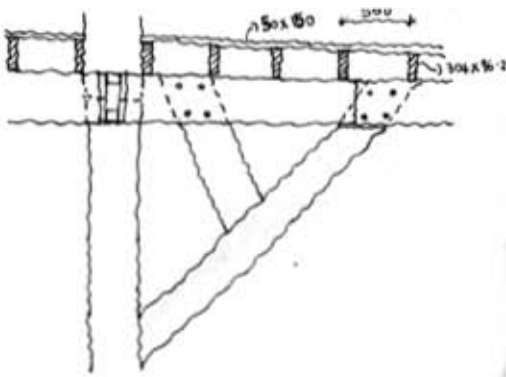
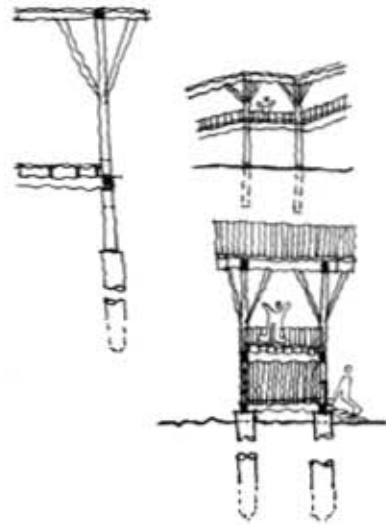
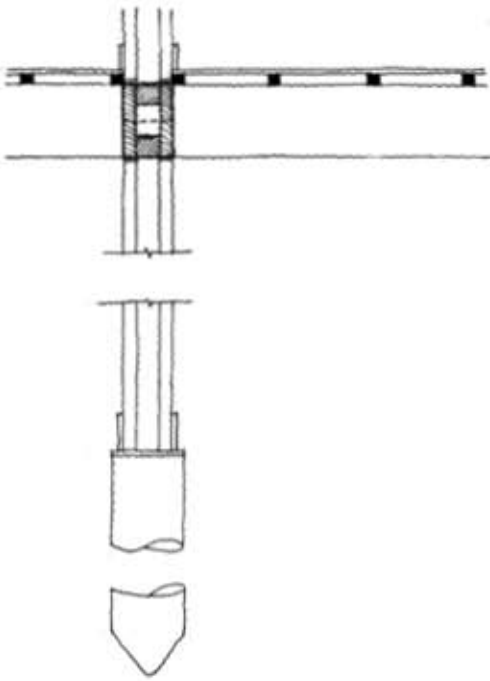
The importance of surfaces in a terrain of water such as Makoko cannot be understated. Surfaces raised above water are used for a wide range of day to day activities in Makoko. As highlighted in the floating school which has become one of the most vibrant spaces in Makoko in which people have several functions like parties, buying and selling, church worship, playing, fish net making etc.

### *Structure*

The timber available at the Oko-Baba sawmill are used as the primary structural material. The long-spanning Akun hardwood has been chosen due to its strength, as the timber which will be used in building the structural components of the interventions while the Abora hardwood will be used for infill (walls, floors, ceilings, furniture, fittings etc). The main timber structure comprises of 200 x 200mm laminated Akun columns and 200 x 200mm Akun laminated Akun beams. The beams and fabricated trusses are spanned using 200 x 50mm Akun joists nailed to the beams.

The large spans of the medium and large buildings which are 8 meters and 18 meters respectively over the existing water ways led to the development of timber trusses which allow the buildings to hover above the water routes. All spanning timber members are designed using a span to depth ratio of 1:15.

Concrete piles will be used as foundations. Piles will give the developed buildings longer life spans which timber stilt foundations will not be able to as timber rots on contact with water if not well treated.



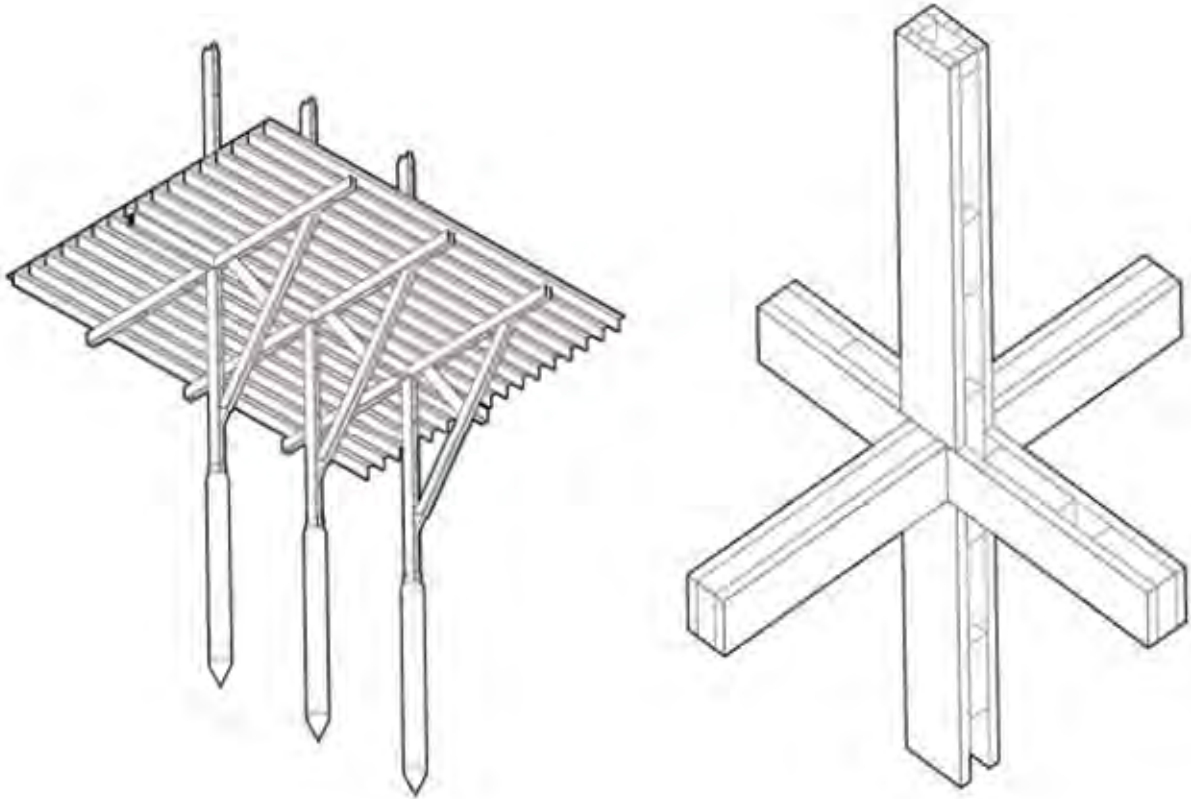
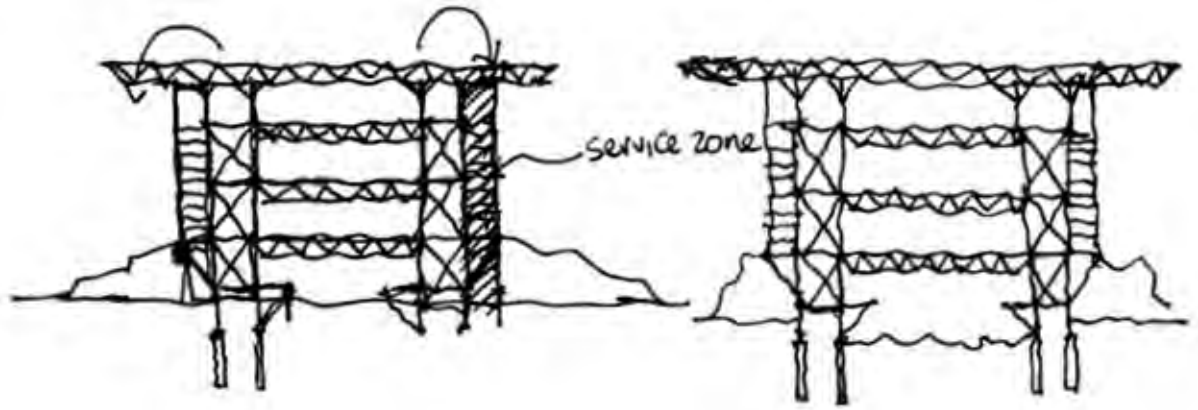


fig. 88 Exploratory structural sketches



fig. 89 Structural exploration with a span to depth ratio of 1:10



**fig. 90** Structural exploration with a span to depth ratio of 1:15. A more elegant structural option

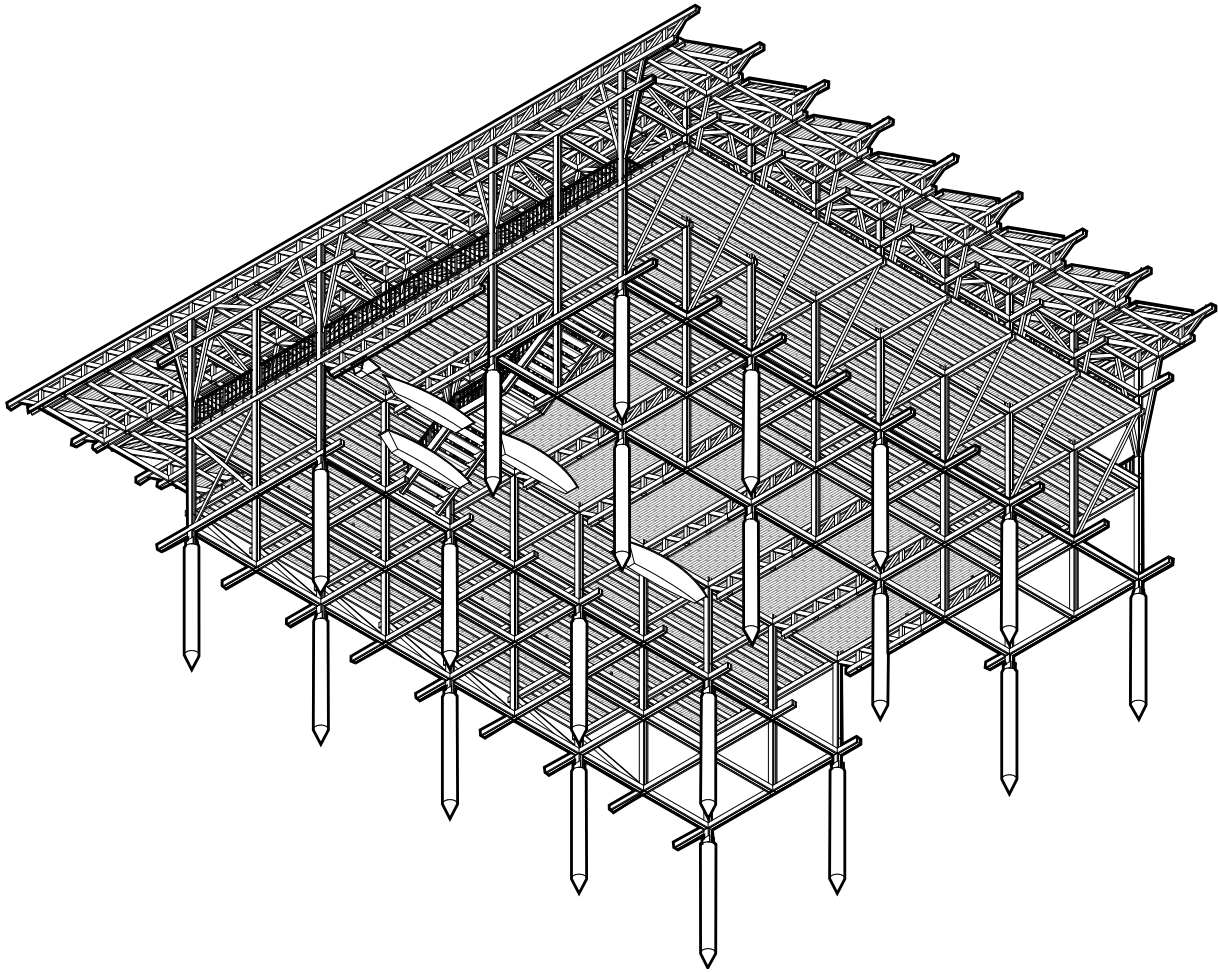


fig. 91 Medium building structure

### *Enclosure*

Oparun (bamboo) slats nailed to timber studs that have been used by the interventions as the materials for creating enclosure. This material is also used in the floating school and many dwellings in Makoko as a walling material and they create a visibly satisfying aesthetic that fits into the Makoko context. All doors and windows are made out of the Abora hardwood.



**fig. 92** A Market stall showing the use of bamboo for enclosure.

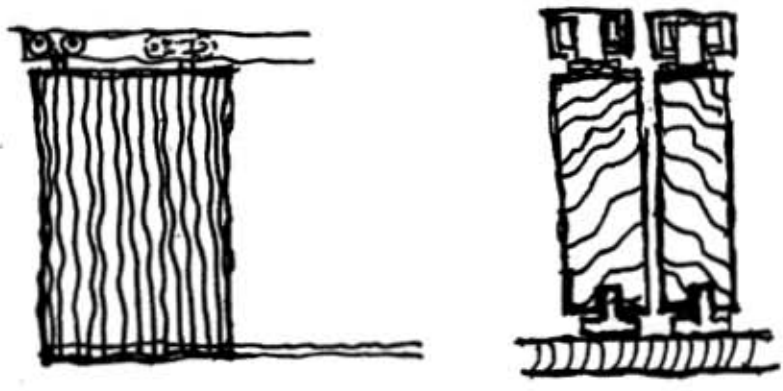
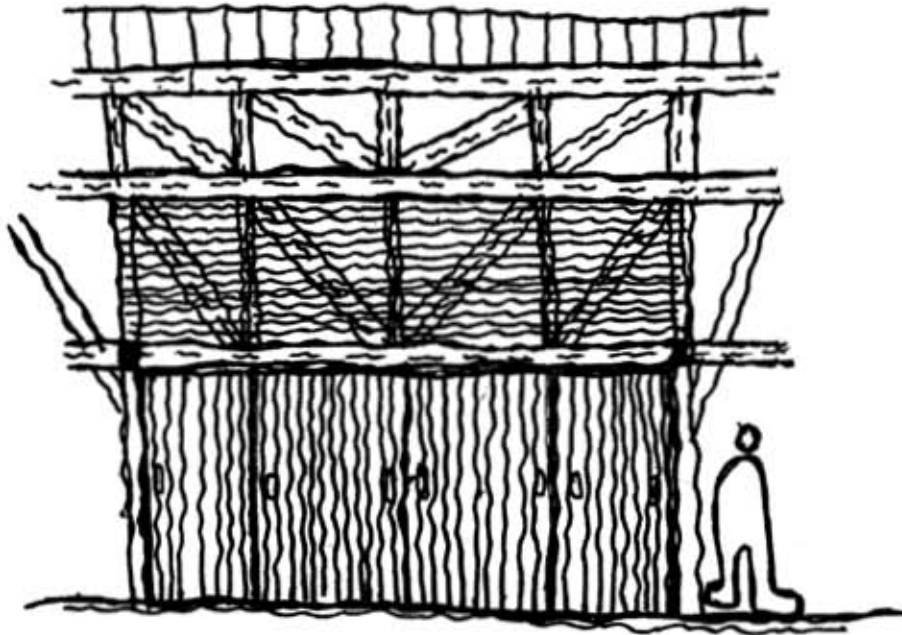


fig. 93 Sketch of large doors made from the Abora hardwood used in enclosing the market.

## Roof

The medium and large scales include large planar roofs made of the Akun wood that are covered by durable fibre cement sheets and translucent corrugated polycarbonate sheeting at certain areas of importance. The primary function of this roof is to create large surfaces for the collection of rainwater so as to supplement existing water points available in the context. The roof also creates shade that articulates and protects the created public space and the interior of the buildings from the hot tropical sun. A civic presence that contrasts most of the structures in Makoko is also achieved.

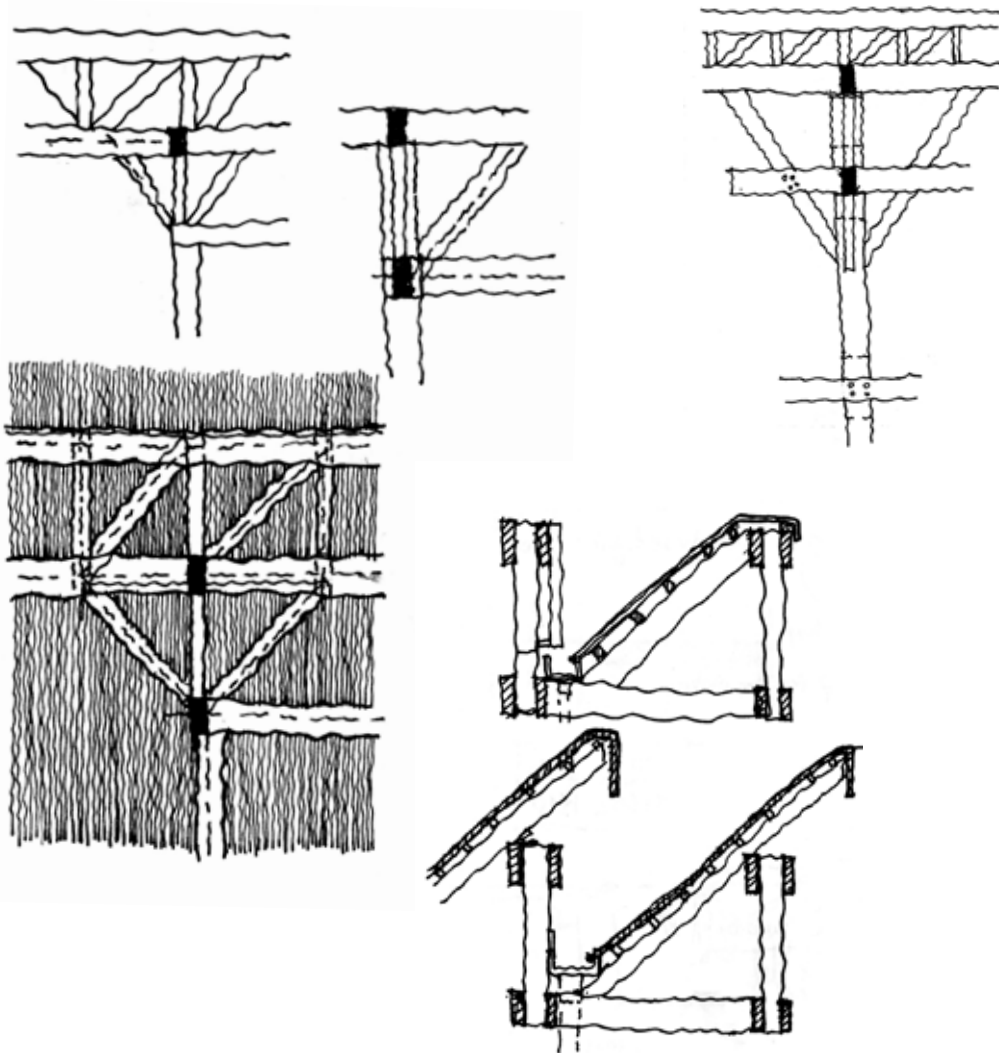


fig. 94 Roof structure sketches

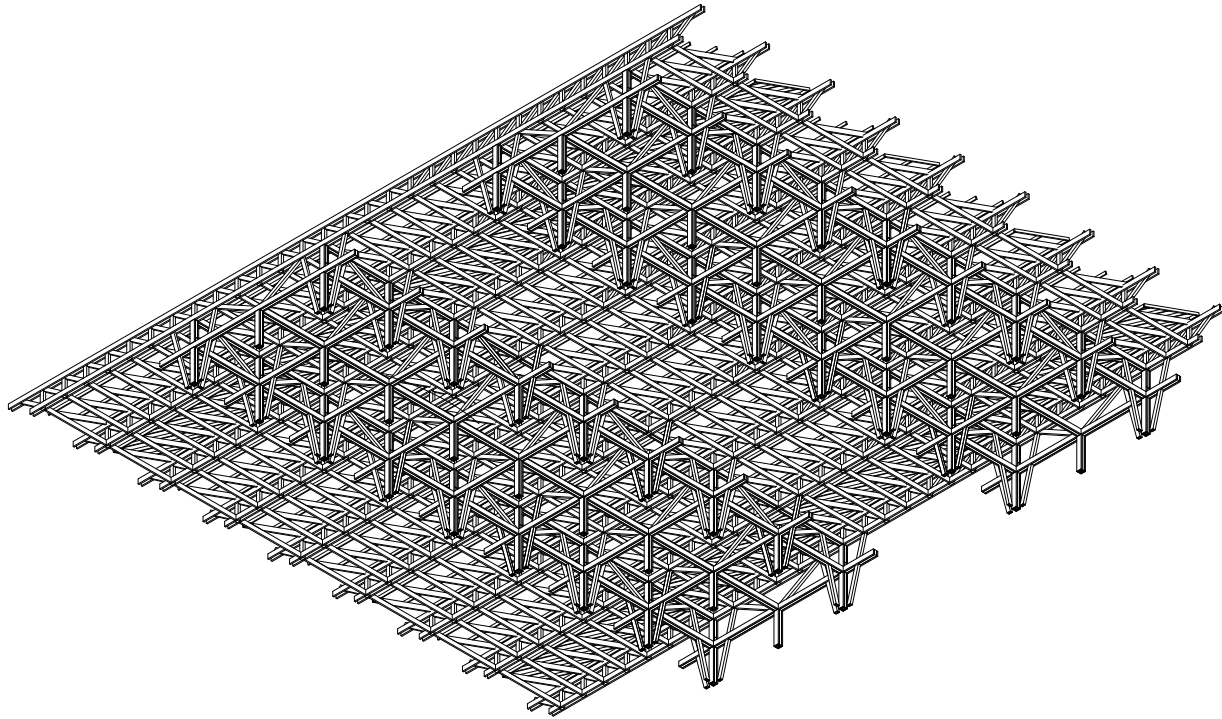


fig. 95 Axonometric drawing of roof structure.



fig. 96 3D visualization showing the water tanks, the roof and ramp.



**fig. 97** Sectional perspective visualization of the medium building.



**fig. 98** 3D visualization looking towards the market from the ramp.

## Conclusion

The study examines the problems facing the people of Makoko in order to understand how the community has thrived autonomously in the city of Lagos, and whether the autonomous livelihood of the community can be harnessed in curbing the urban problems faced by the settlement towards proffering types of social infrastructures that can be implemented at different scales and halt the degeneration of the settlement and contexts of similar genus.

It was found that the most pertinent problems being faced by the community are government neglect in the provision of basic (water, sanitation and electricity) and large scale infrastructures (schools, health facilities, etc), climate change, water pollution and a lack of public space.

Furthermore, it emerged that Makoko possesses a unique liquid urbanism and water culture that allows it to cope independently of government intervention to a certain extent, with the highlighted problems due to the community's usage of renewable resources that are readily available in the Lagos context.

Based on these findings, this research concludes that forms of decentralized infrastructures that harness the way of life of the Makoko community and blighted coastal city precincts of similar genus can be developed towards transforming these precincts from their current states of urban degeneration.

In addition, it is therefore critical that an administrative capacity is formed in Lagos which develops and enforces policies that encourage local government participation in the supply and management of infrastructure in Makoko and similar precincts so as to also foster a more cohesive relationship between people and the state. A better relationship between the state and its people will ensure the sustenance of designed infrastructure.

This dissertation proposes an urban strategy that seeks to rejuvenate Makoko by providing infrastructure at existing nodes of the community. Three nodes (sites) have been chosen in which pilot infrastructure projects of small, medium and large scales have been designed. These interventions have been designed looking from a broader overview to the specificities of the Makoko community. Implementation of these projects in reality should yield to substantial positive spatial transformation and rejuvenation of the Makoko precinct.

Although the research is limiting in that it does not engage sufficiently with other professionals in the built environment that are necessary for any infrastructures to be developed, this dissertation has however provided a basis for further development in Makoko and Lagos which is sensitive to the conditions of unique city precincts.

## Glossary

### 1. **Infrastructure:**

Infrastructure in the context of this dissertation goes beyond the norm of centrally delivered services and discusses systems for rejuvenation and service delivery that appreciate local resources (human and material) in positively transforming the Makoko context and the Lagos context.

### 2. **Hard Infrastructure:**

Hard infrastructure in this research refers to centrally imposed infrastructure that does little to build on the specificities of local contexts in their execution. Hence, they result in little or no betterment to the problems they try to solve.

### 3. **Soft Infrastructure:**

This refers to infrastructures that learn from and adapt to varying scales in local city precincts.

### 4. **Liquid Urbanism:**

This speaks to the way in which water should be lived on. Liquid urbanism suggests that the flow of water should not be excessively tampered with. Structures like stilts, piers and floating platforms should be employed in liquid urbanism.

### 5. **Sustainability:**

In the context of this essay sustainability talks about upliftment being brought about by harnessing locally available resources both human and material.

## End Notes

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## Image References

*All images/ diagrams/ drawings by author unless specified.*

Fig. 11. 1981 Aerial Photograph of Makoko - Kunle Adeyemi

Fig. 13. Biodiversity and water security threats in Africa - Kunle Adeyemi

Fig. 14. Climatic threats to fishes and aquaculture - Kunle Adeyemi

Fig. 15. Submerged land areas in Lagos after a sea level rise of 1 meter - Kunle Adeyemi

Fig. 18. Relationships between, state, market and community - Nabeel Hamdi

Fig. 20. Urban strategy visualization of Floating structure - Kunle Adeyemi

Fig. 21. Solar and wind energy strategies for electricity generation in Makoko - Kunle Adeyemi

Fig. 22. 3D Visualization of Neighbourhood Hotspot - Fabiene Hoelzel

Fig. 25. Children fishing in Makoko - [blogs.mprnews.org](http://blogs.mprnews.org)

Fig. 28. Smoked fish in a Lagos Market - [southpawgroup.com](http://southpawgroup.com)

Fig. 65. Images of the rialto bridge in Venice - [allposters.com](http://allposters.com), [inmygroup.com](http://inmygroup.com)

Fig. 74. Pompidou Centre - Le Centre Pompidou (Book)

Fig. 86. Carpenter Centre site plan - Evan Chakroff



# Presentation Images



Bayo Windapo

## Social Infrastructures

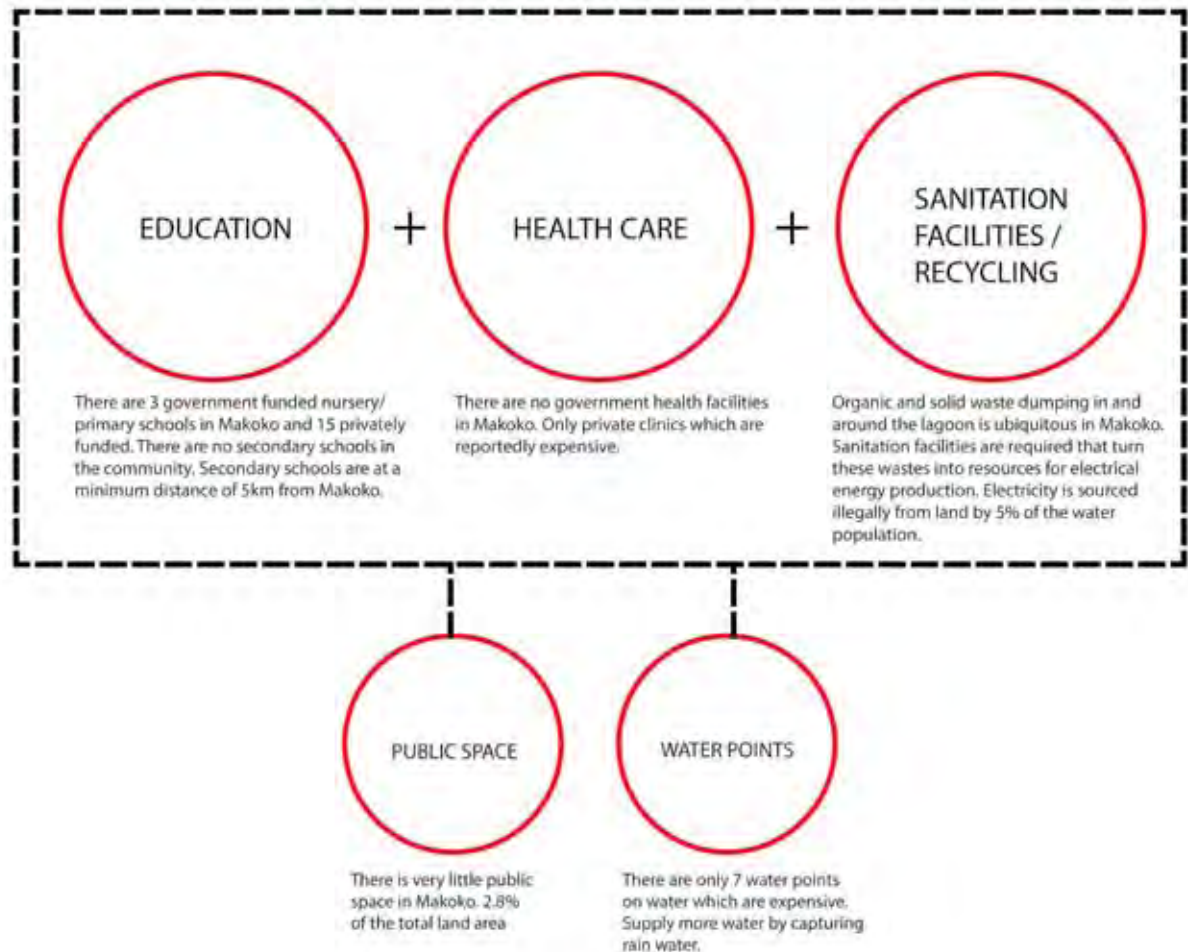
*A shift to decentralized infrastructure as a means of rejuvenating blighted Lagosian contexts and places of similar genius.*

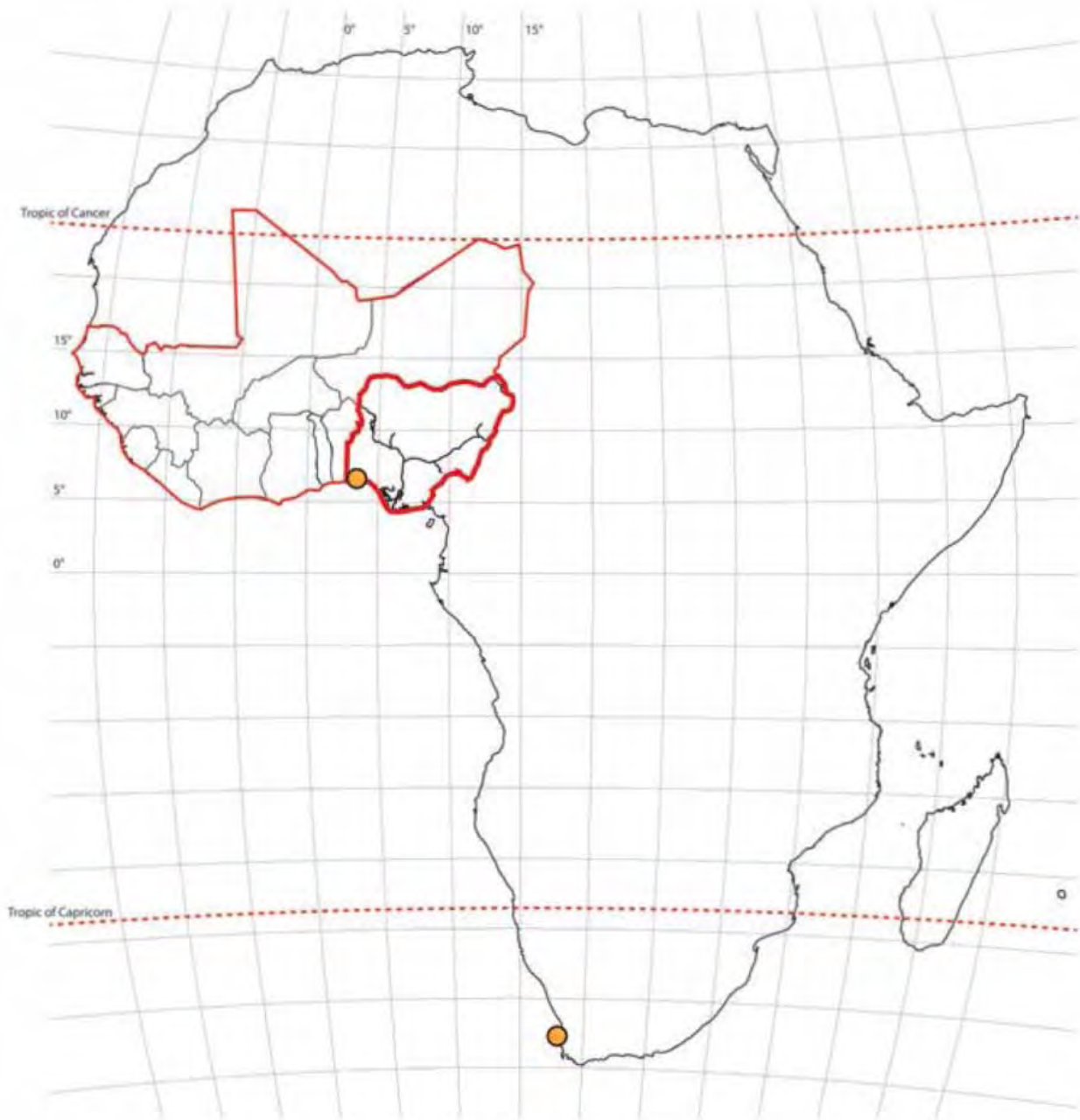
### Abstract

This research stems from reports of the interaction between the growing informal communities such as Makoko, the coastal plains of the degenerating Lagos contexts and their limited access to central infrastructure. The effects of climate change on the low-lying coastal plains further exacerbate the degeneration experienced in these contexts. Therefore this research examines how people live independently of central infrastructure in informal contexts such as Makoko and whether this autonomy can be embedded into interventions that are integrated within the socio-economic networks of these contexts in a bid to shift from defective central infrastructures to social infrastructures that transform the blighted Lagos contexts in a manner that builds resilience at a local level.

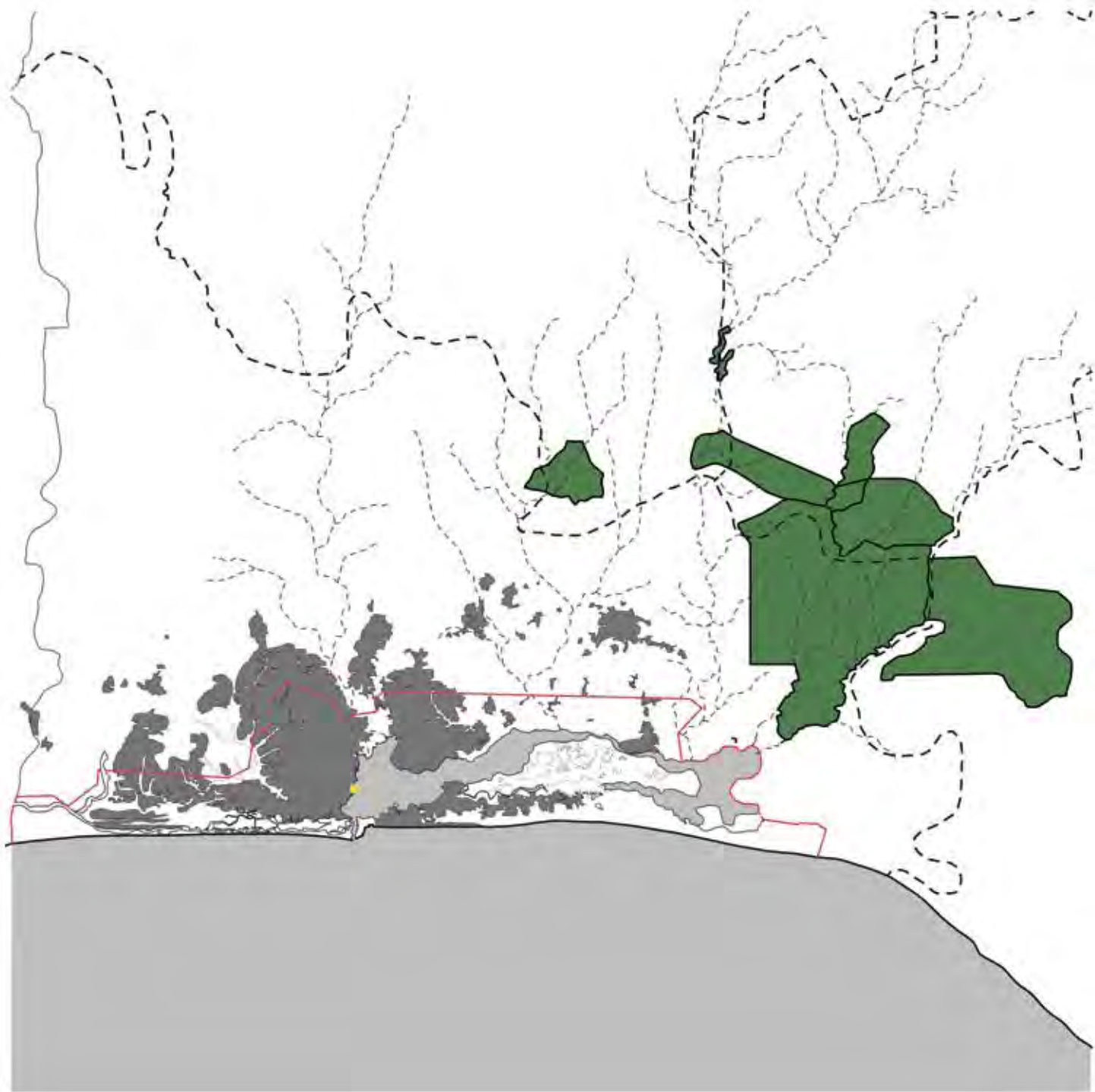
By using Makoko as a site for exploration and communicating with the locals of the context, Lagos professionals and non-governmental organizations, it emerged that there is currently an unhealthy relationship between the state, its local governments and its informal communities such as Makoko, in that the city of Lagos is managed principally from the office of the governor. This central management results in infrastructures that are implemented without critical acknowledgement of the problems faced by individuals who live in the many informal contexts of Lagos thereby resulting in little or no observable transformation in its (Lagos) degenerating contexts. It was also observed that Makoko has a unique urbanity of soft infrastructures that lend themselves to different scales of functions in the context and diverge from the typical hard infrastructures employed by the Lagos state government.

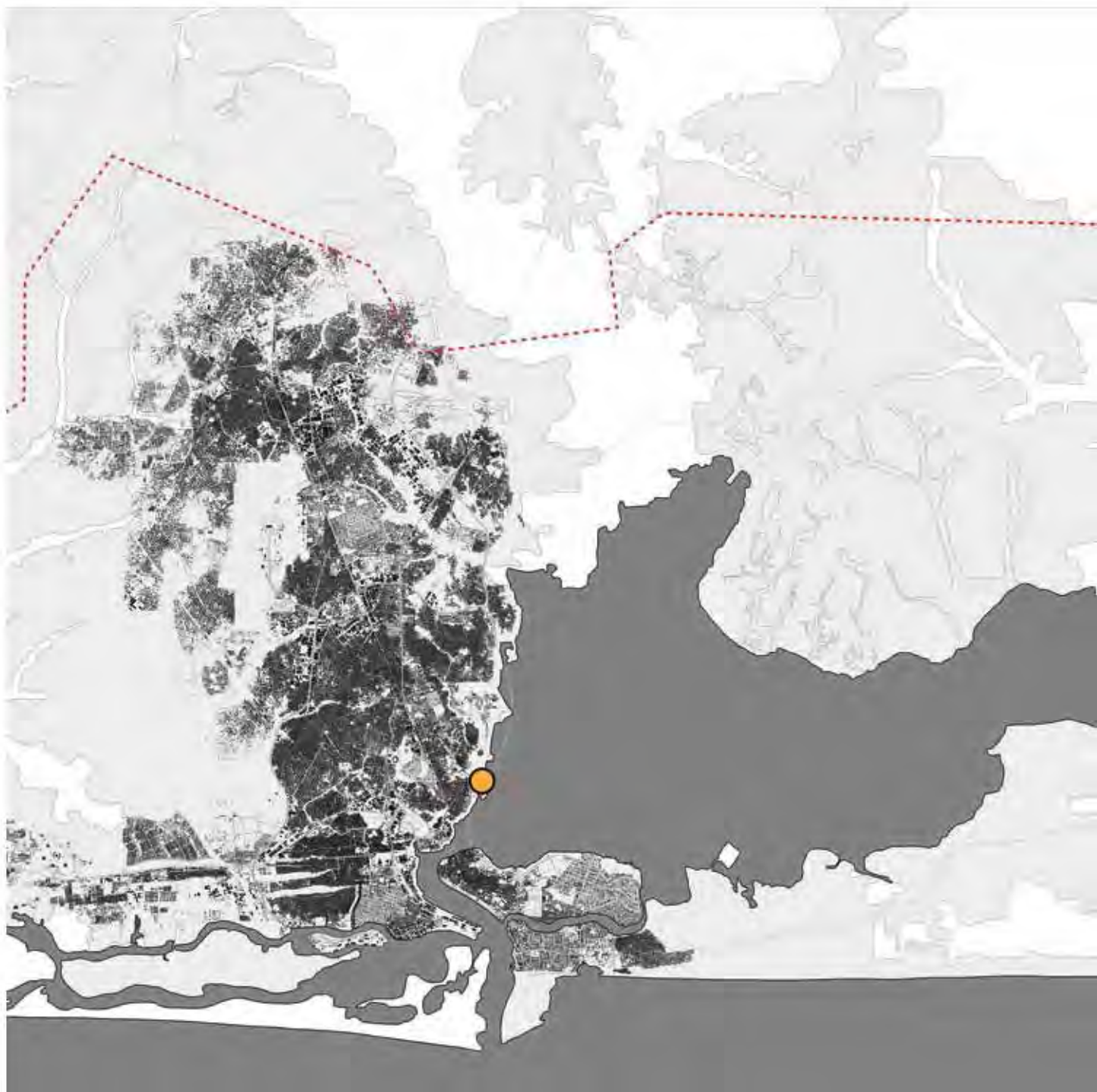
The observations and findings point to the fact that the relationship between the state and its people must be strengthened for delivered infrastructures to be of any consequence in realizing any positive social change and transform Lagos and settlements like Makoko from their states of human and environmental degeneration by acknowledging that these contexts have unique problems and urbanisms that must be fused into any interventions within their precincts in a sustainable, ecological and economical way. This move will go a long way in transforming and legitimizing Lagos's degenerating contexts as important facets of the city.













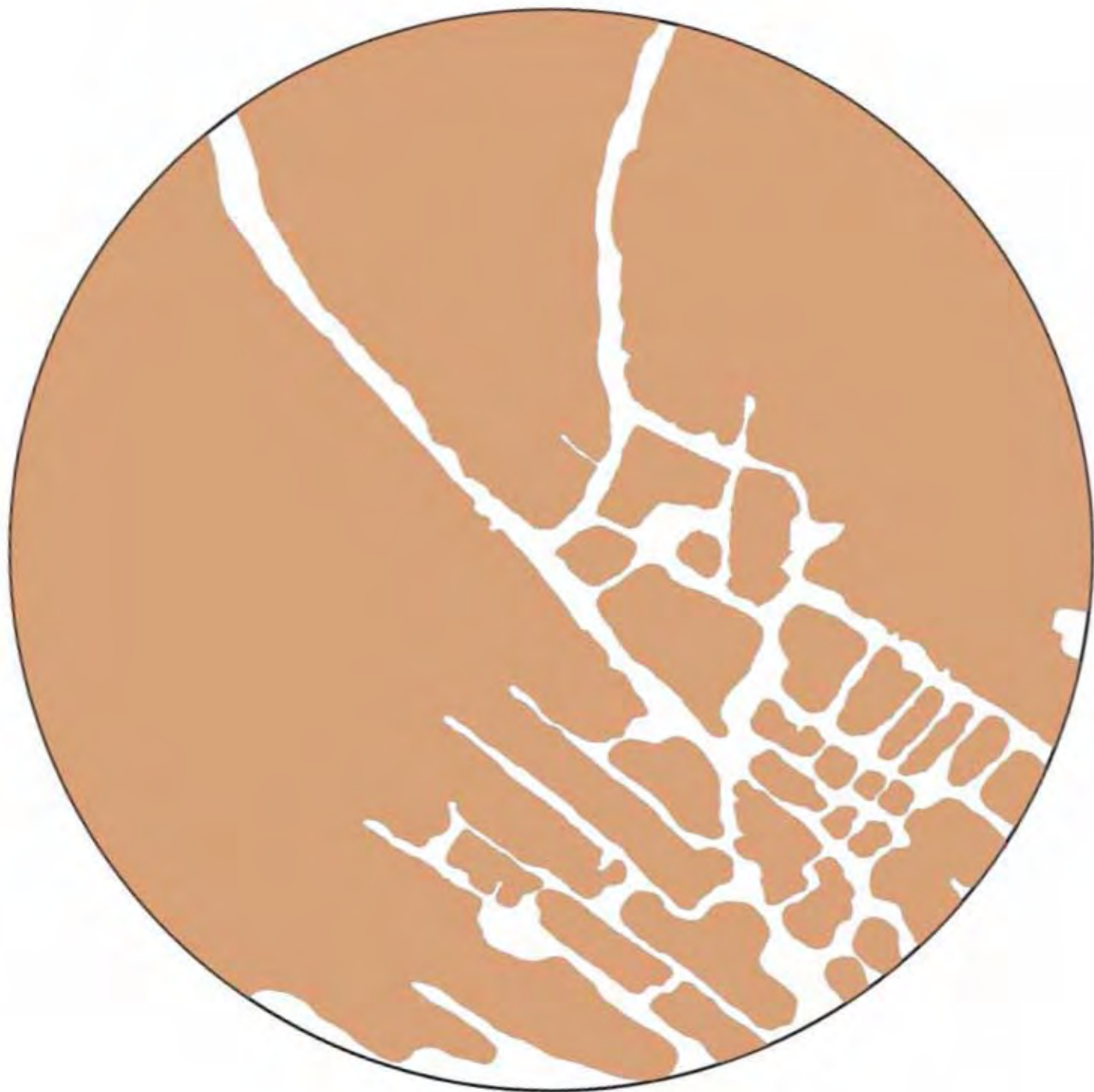




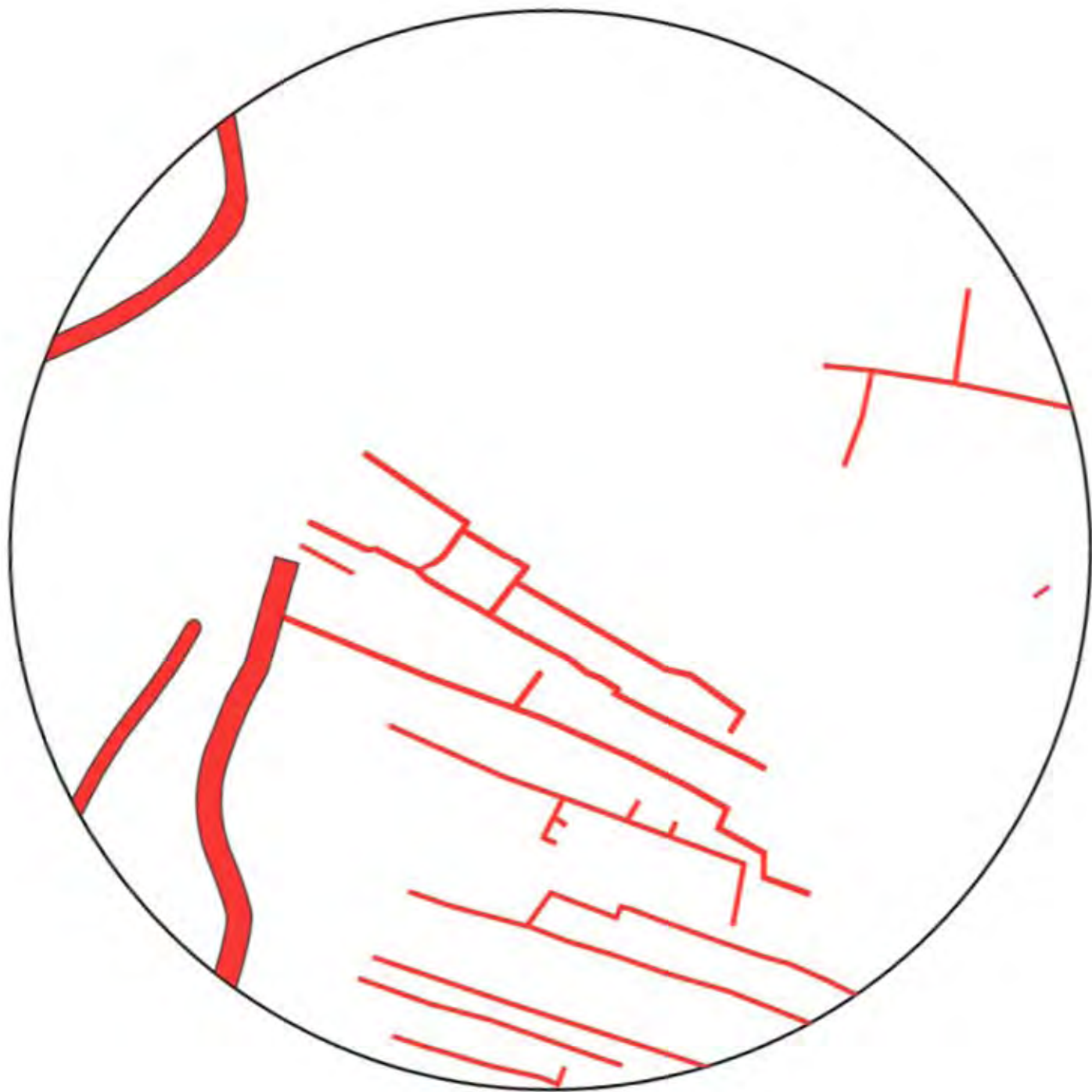


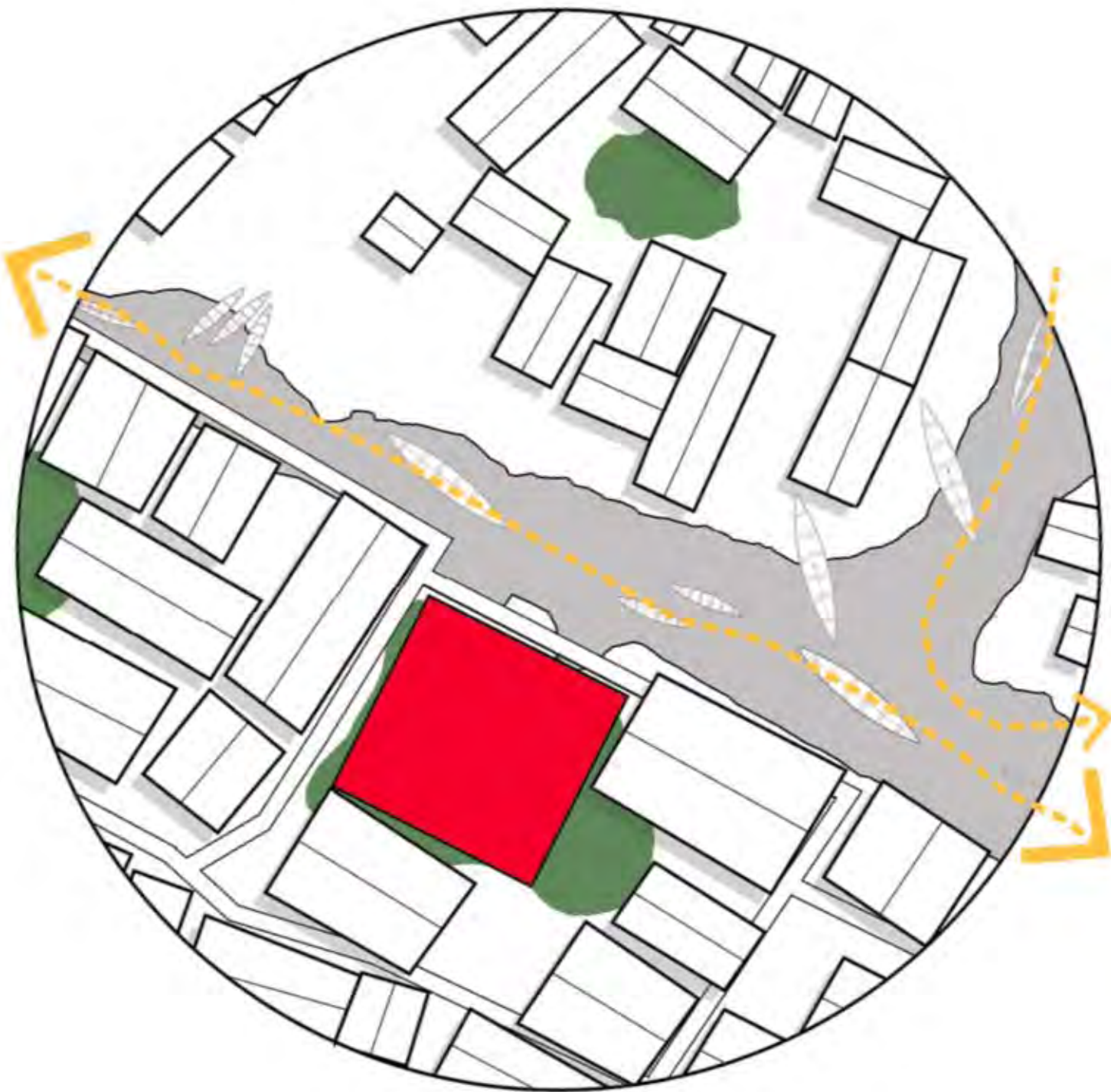


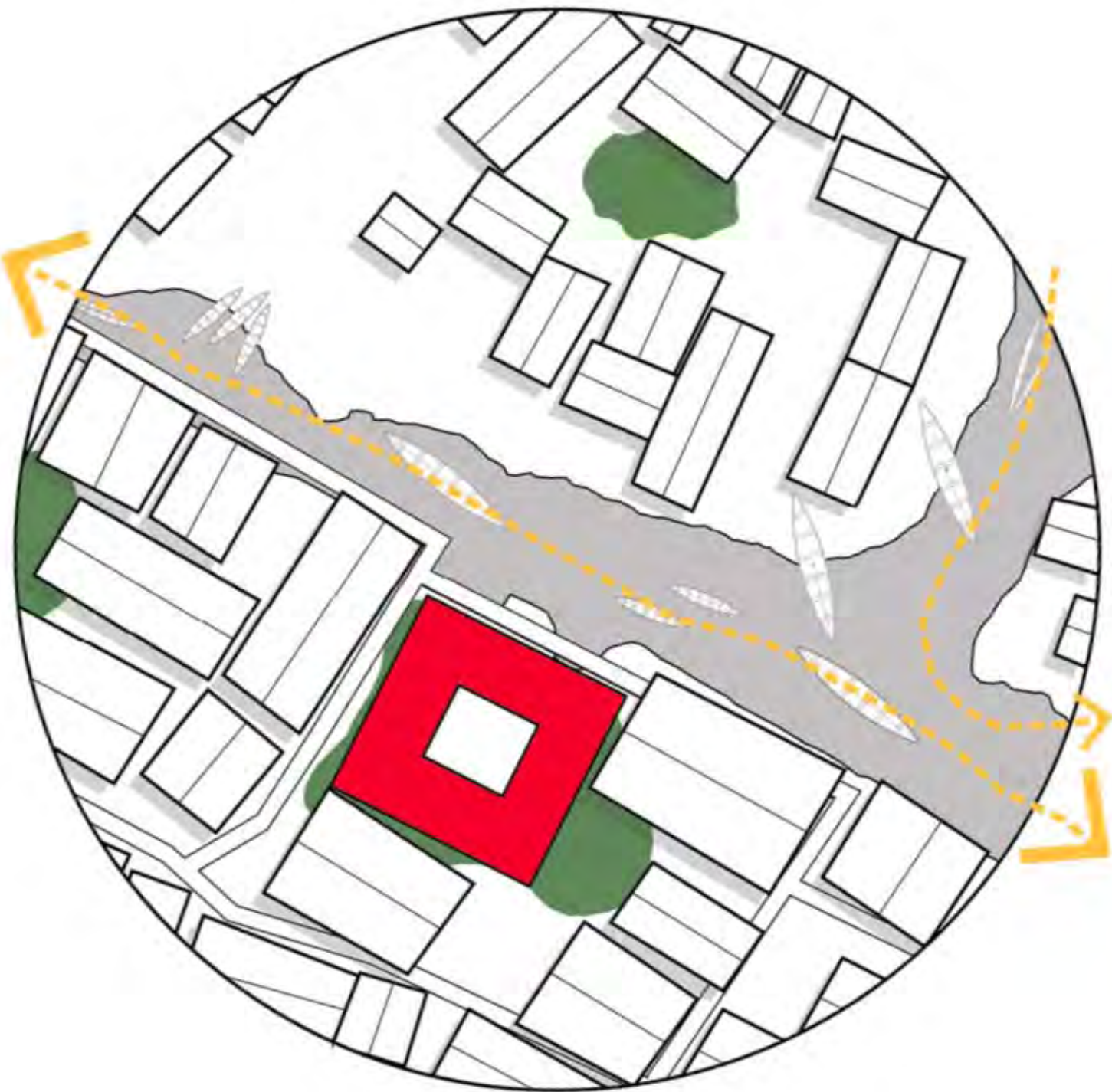
















































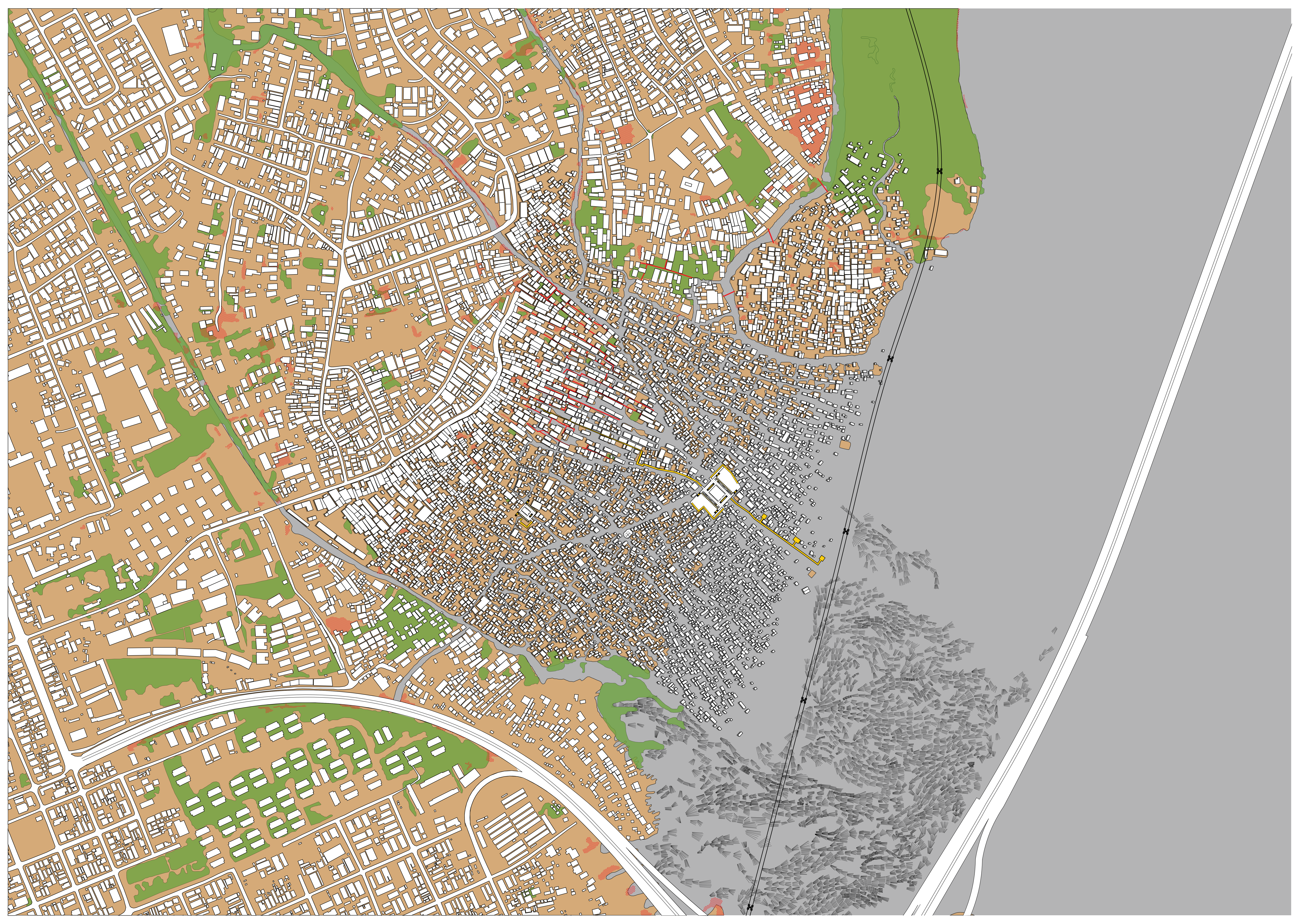


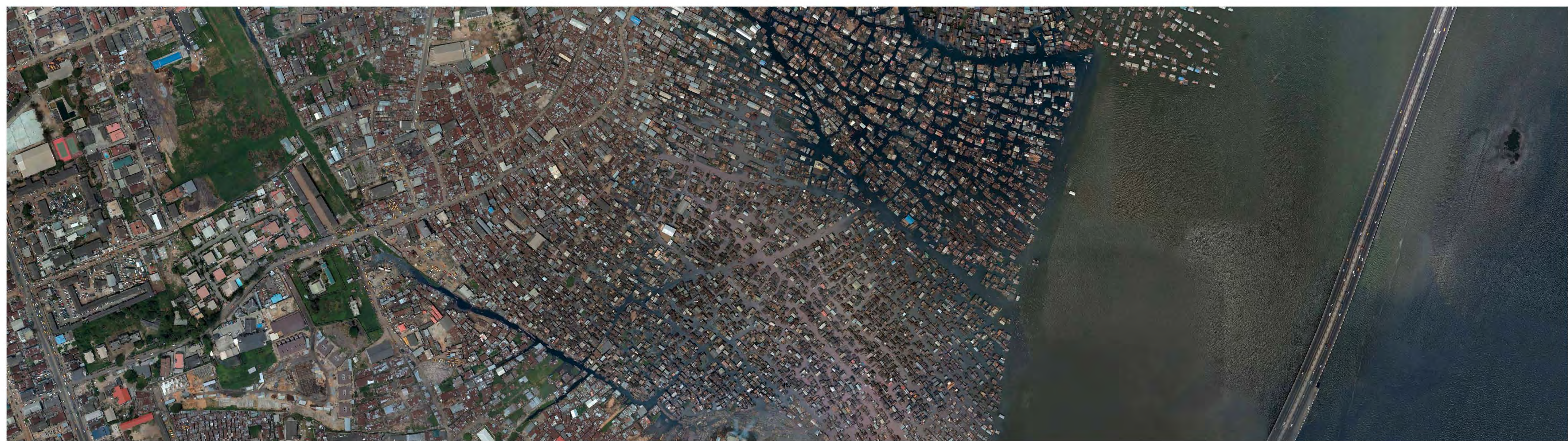
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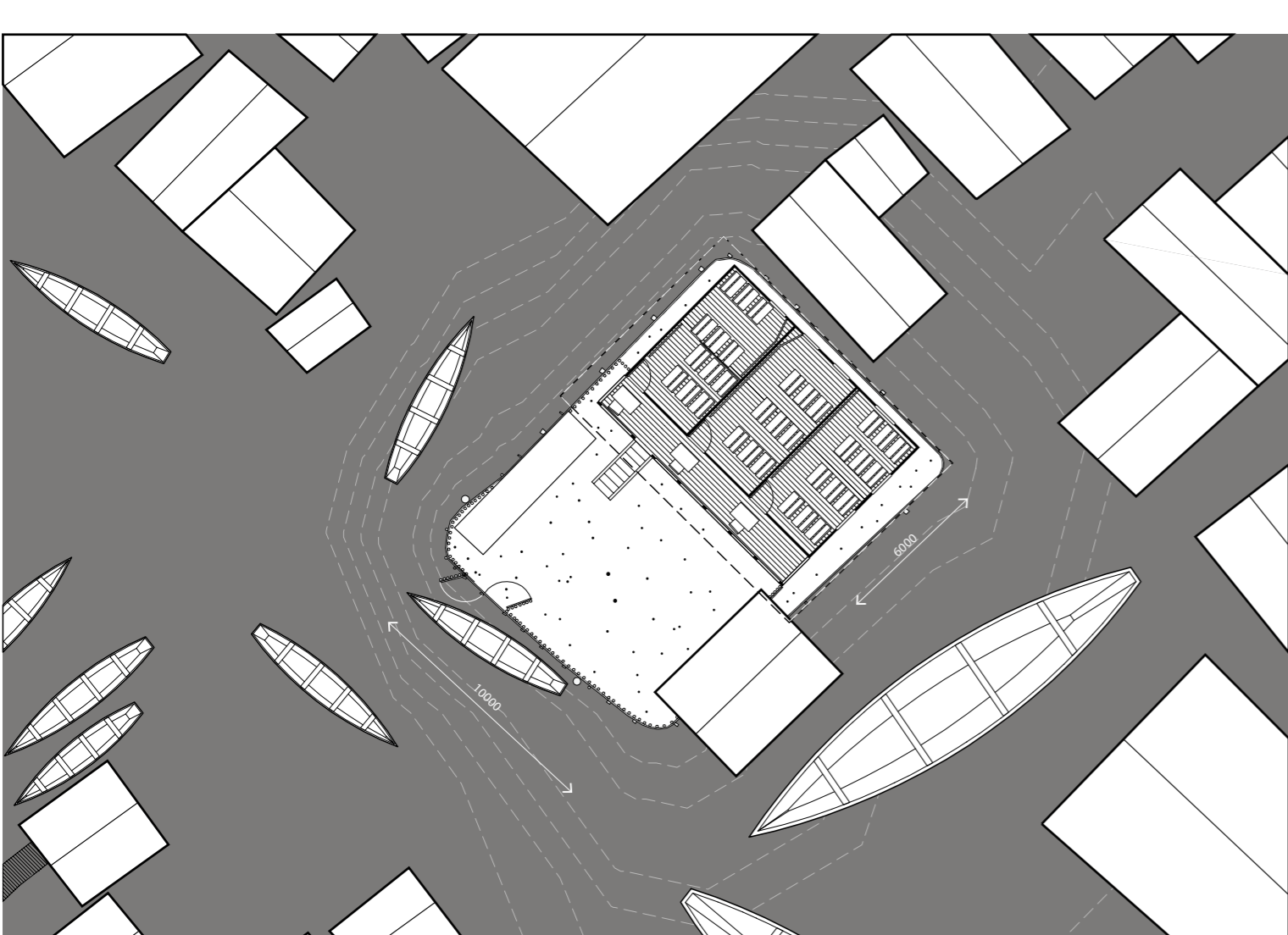
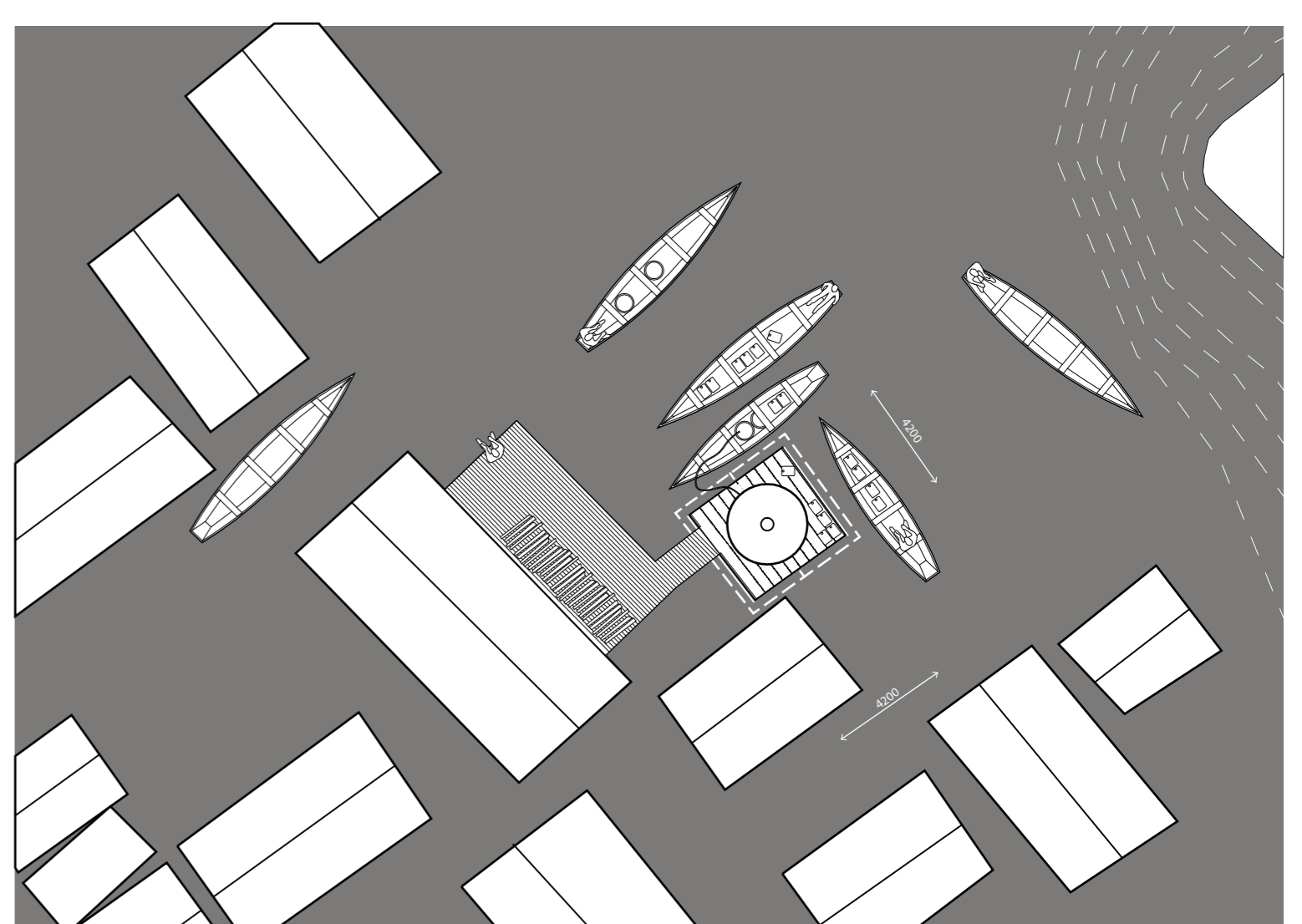
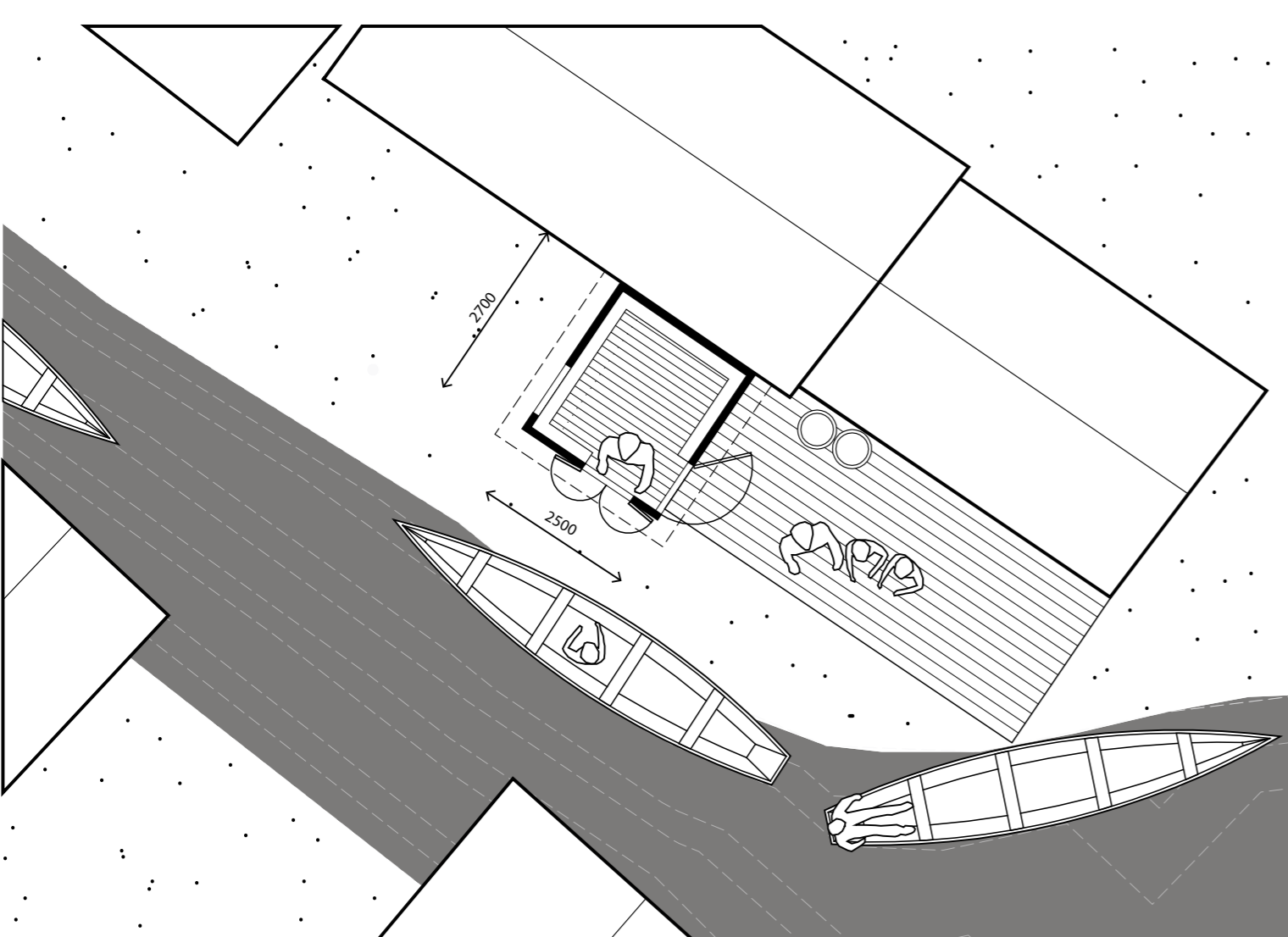
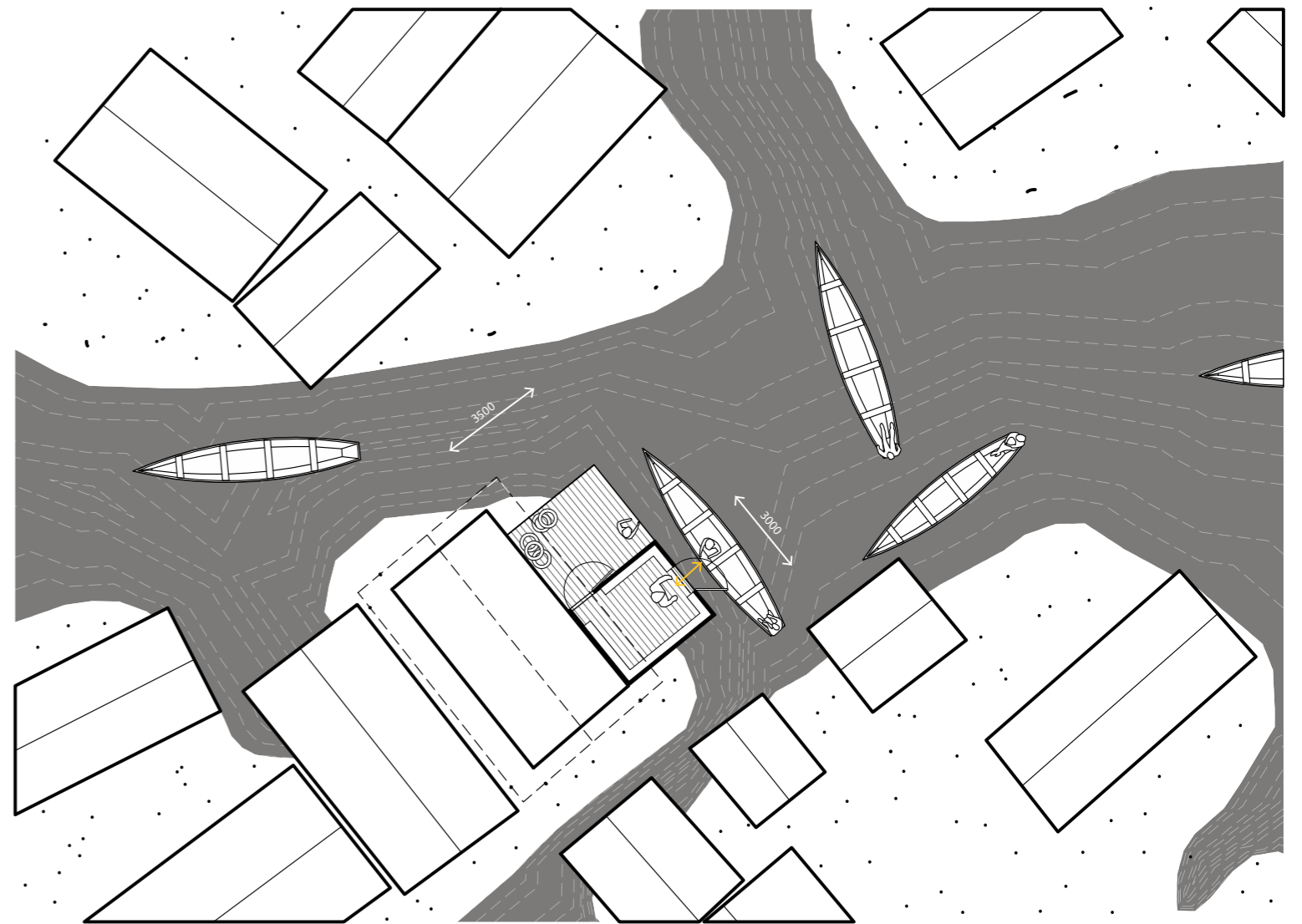
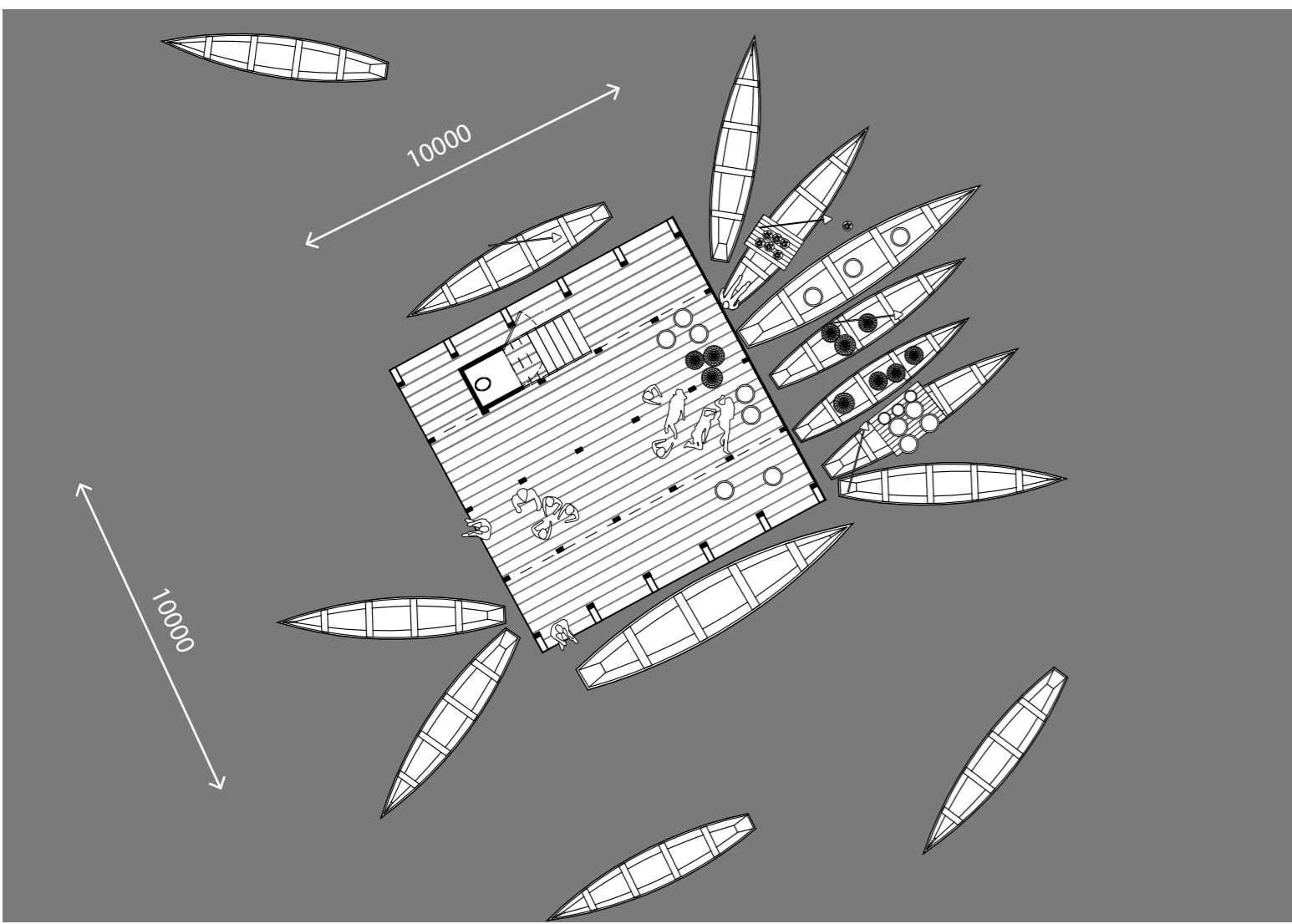
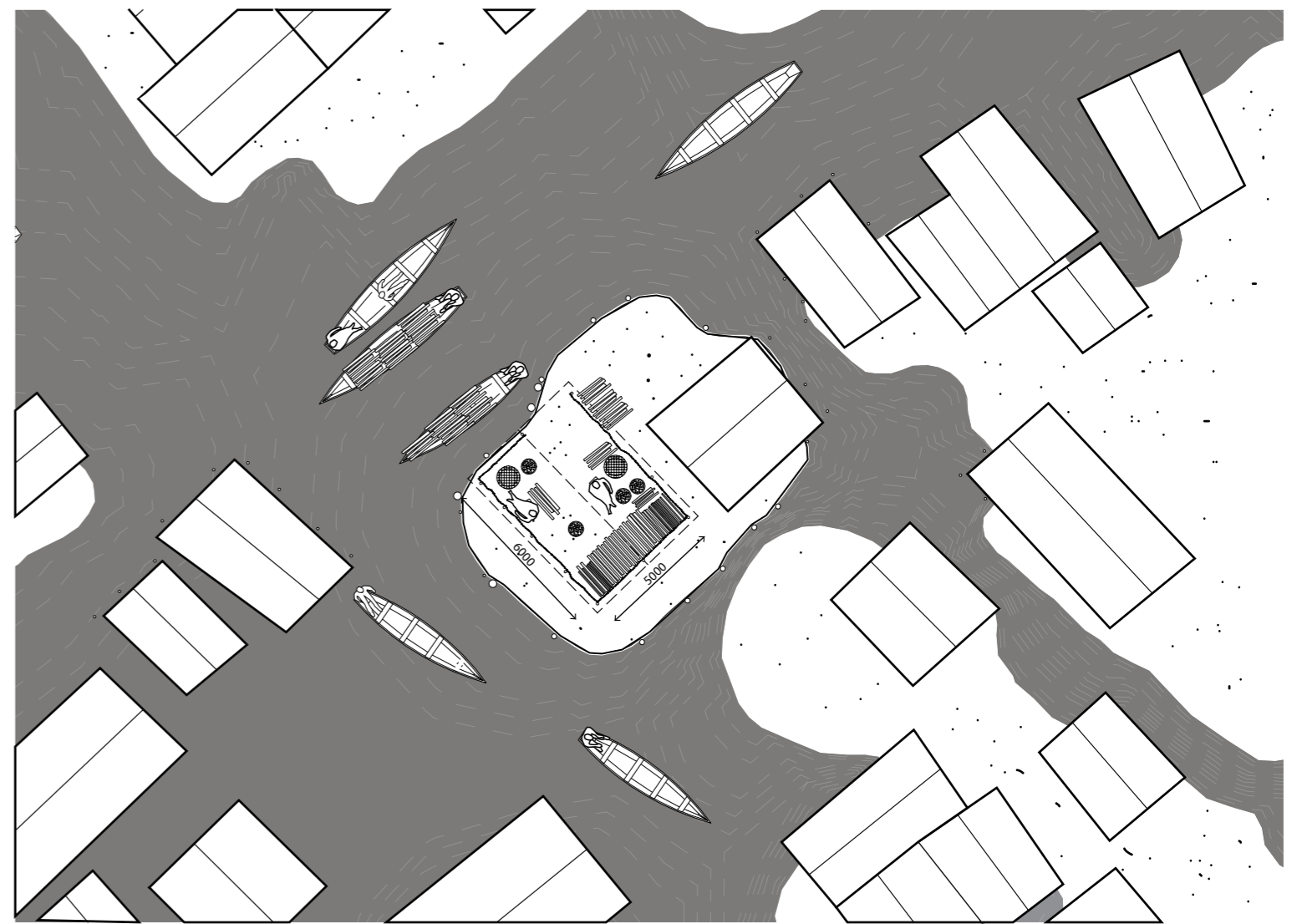
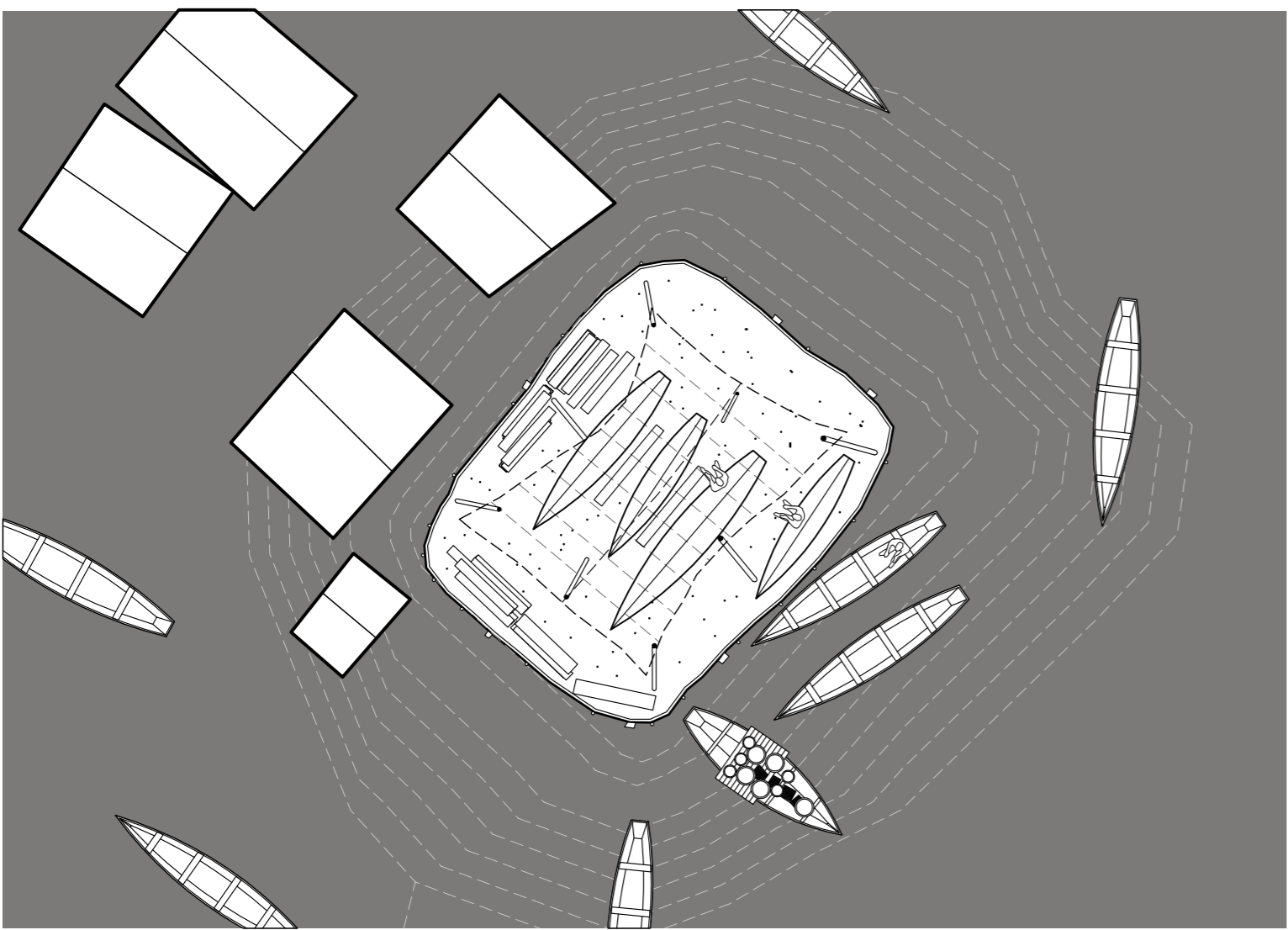
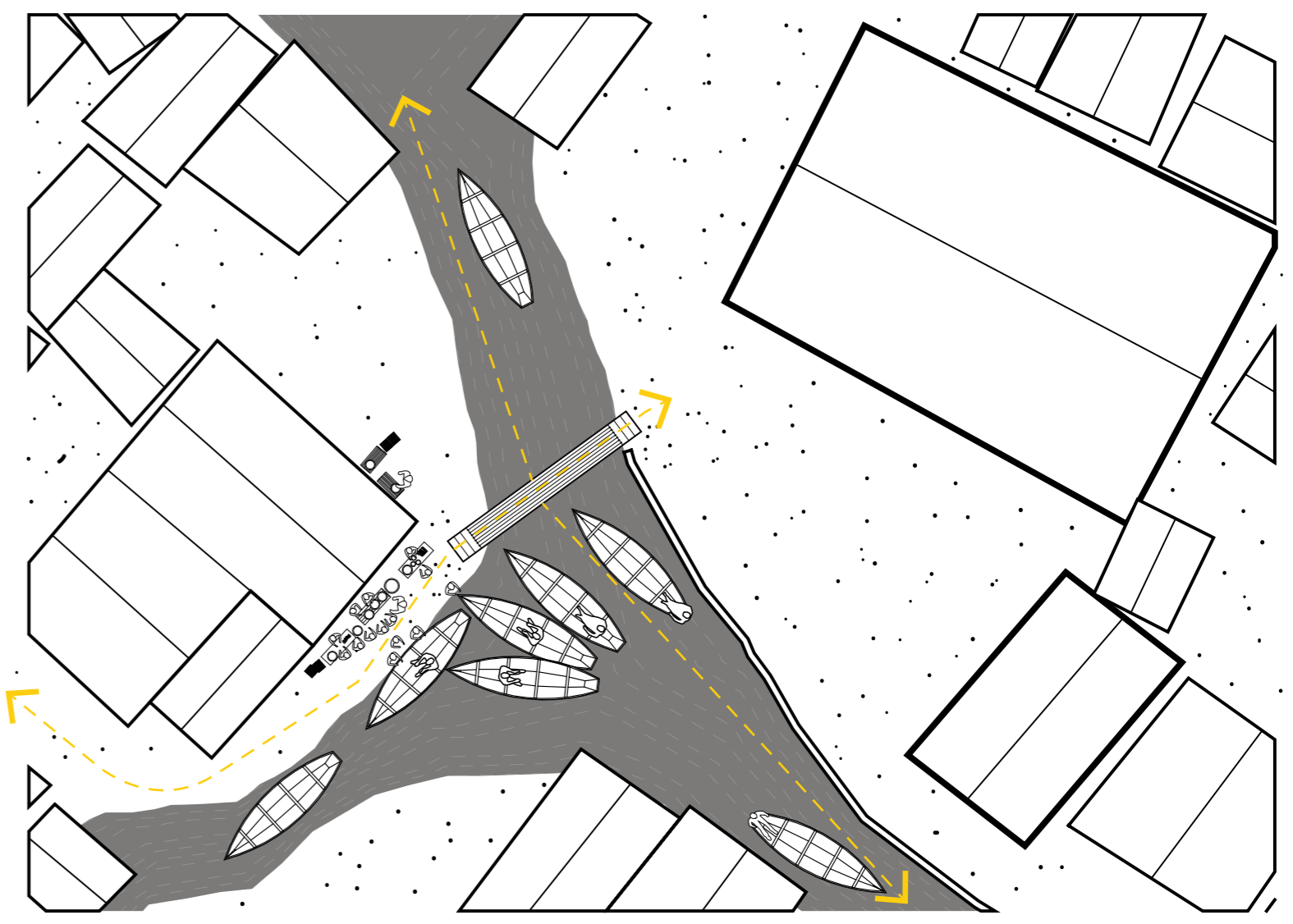
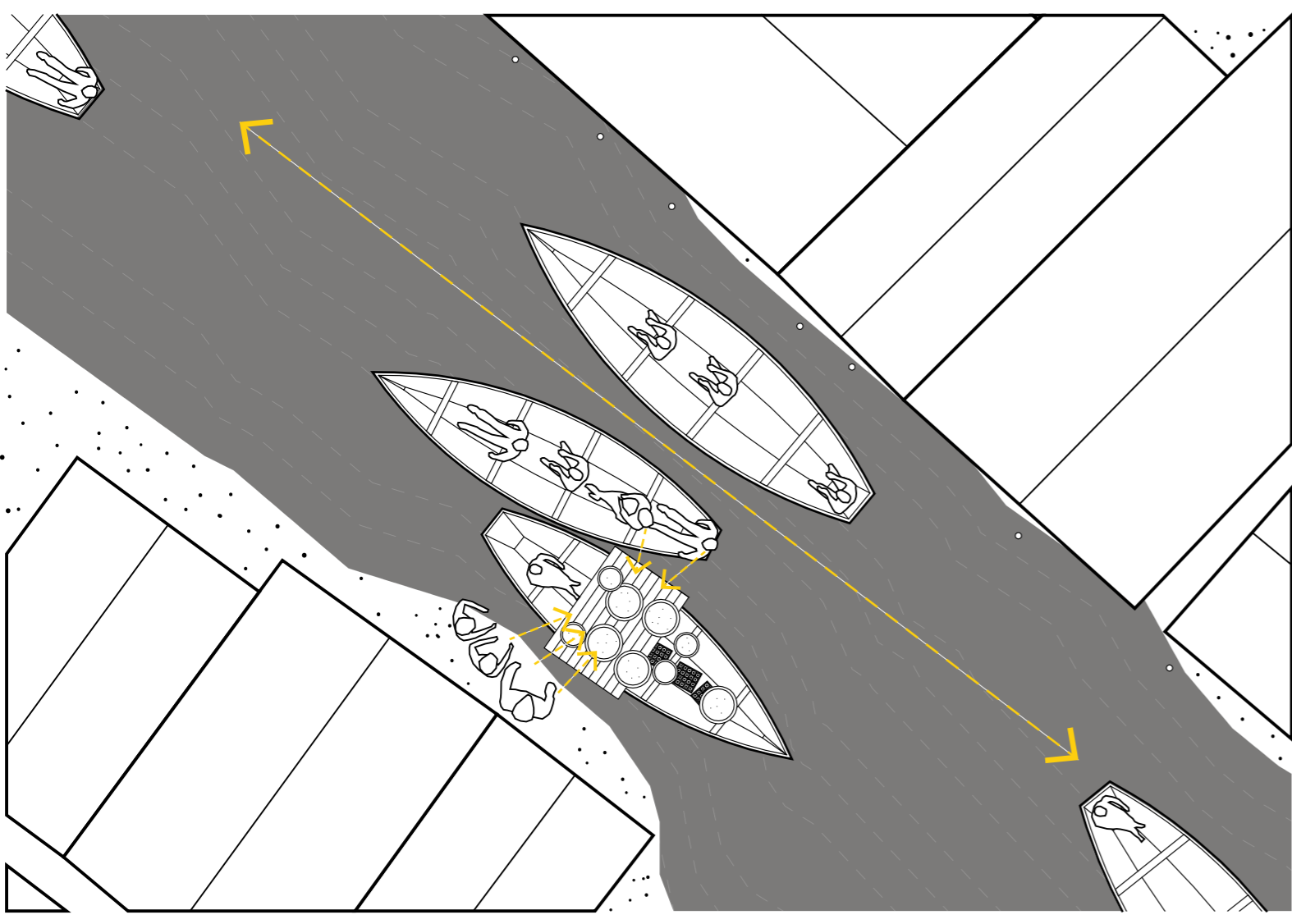


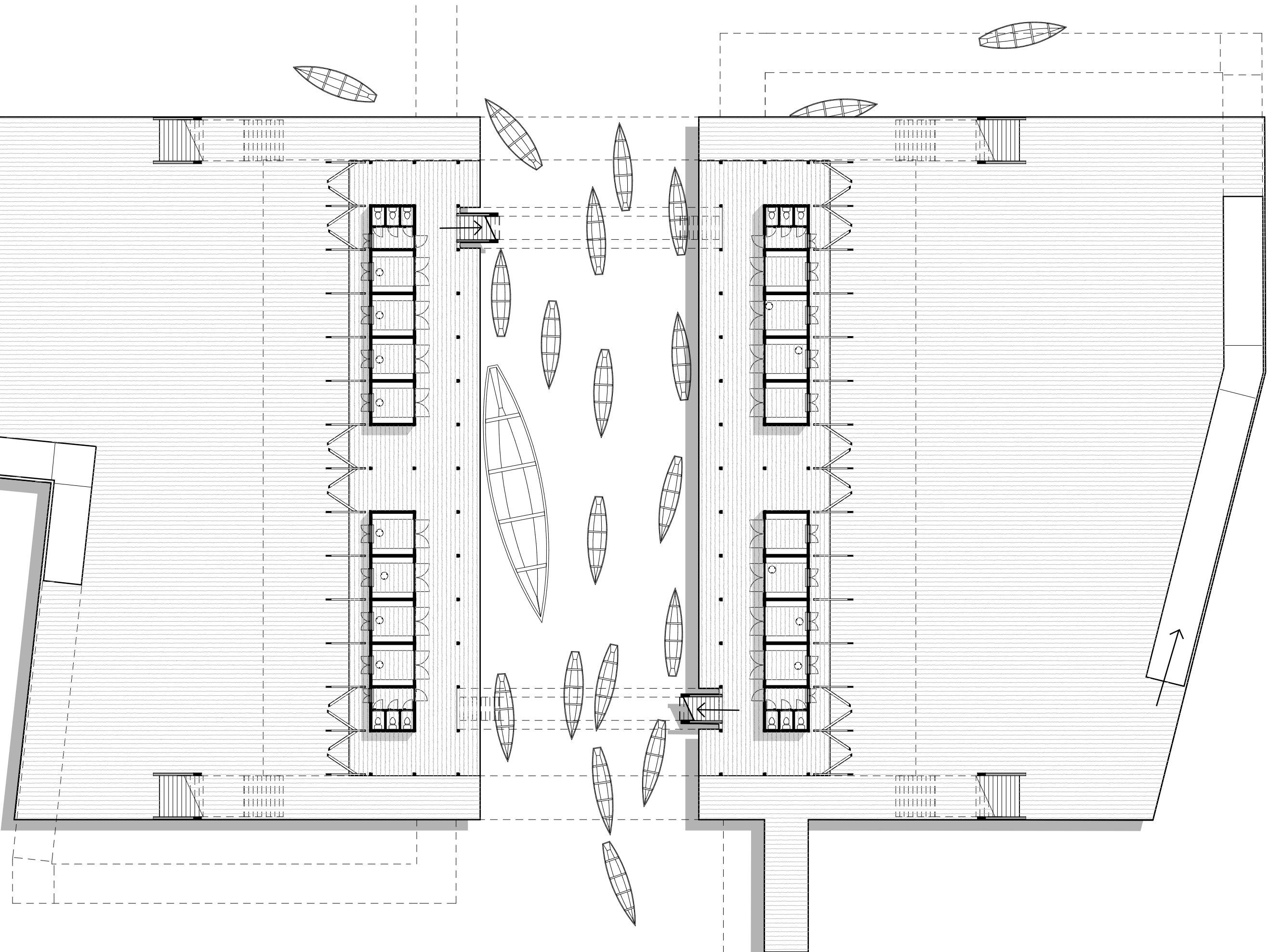
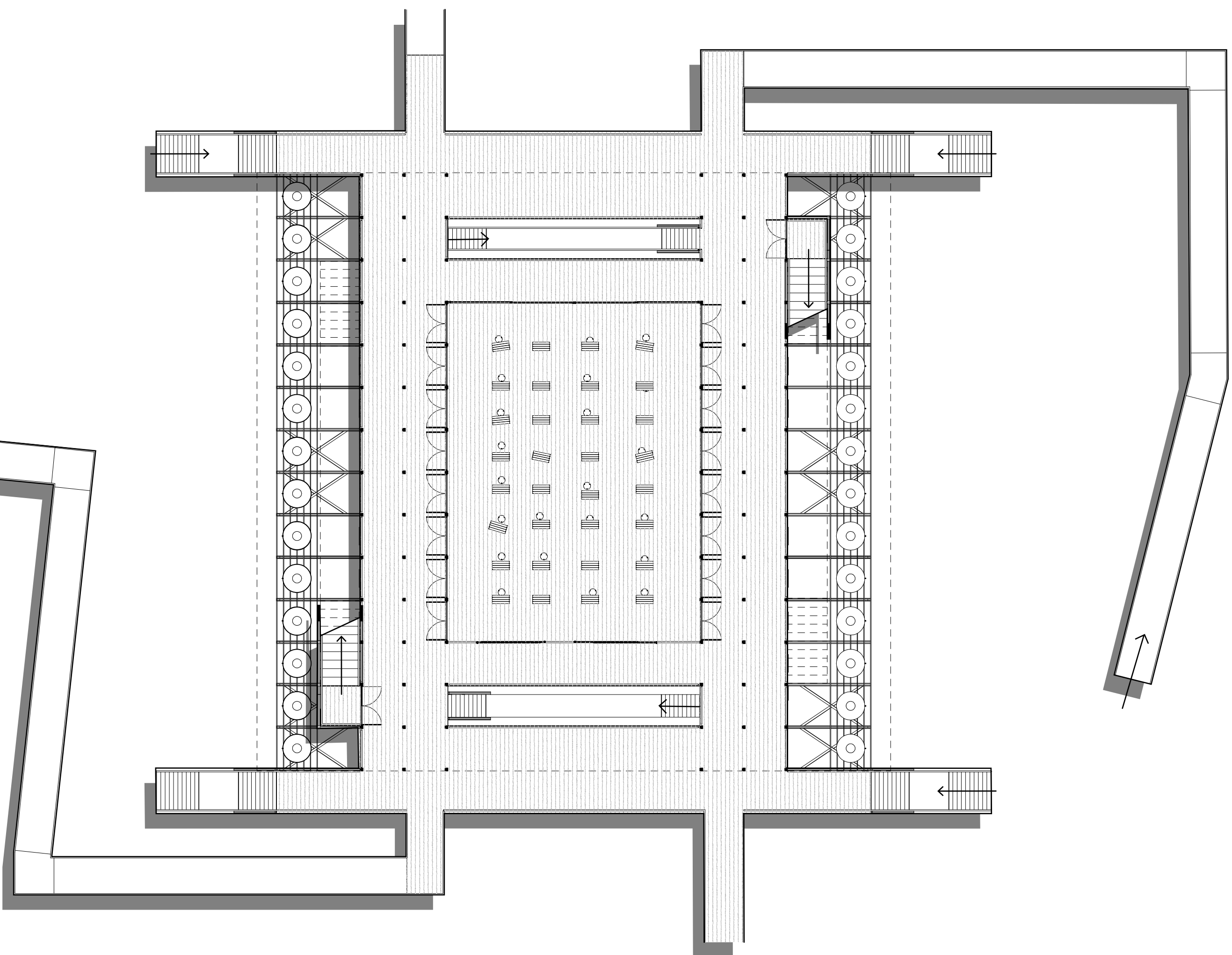
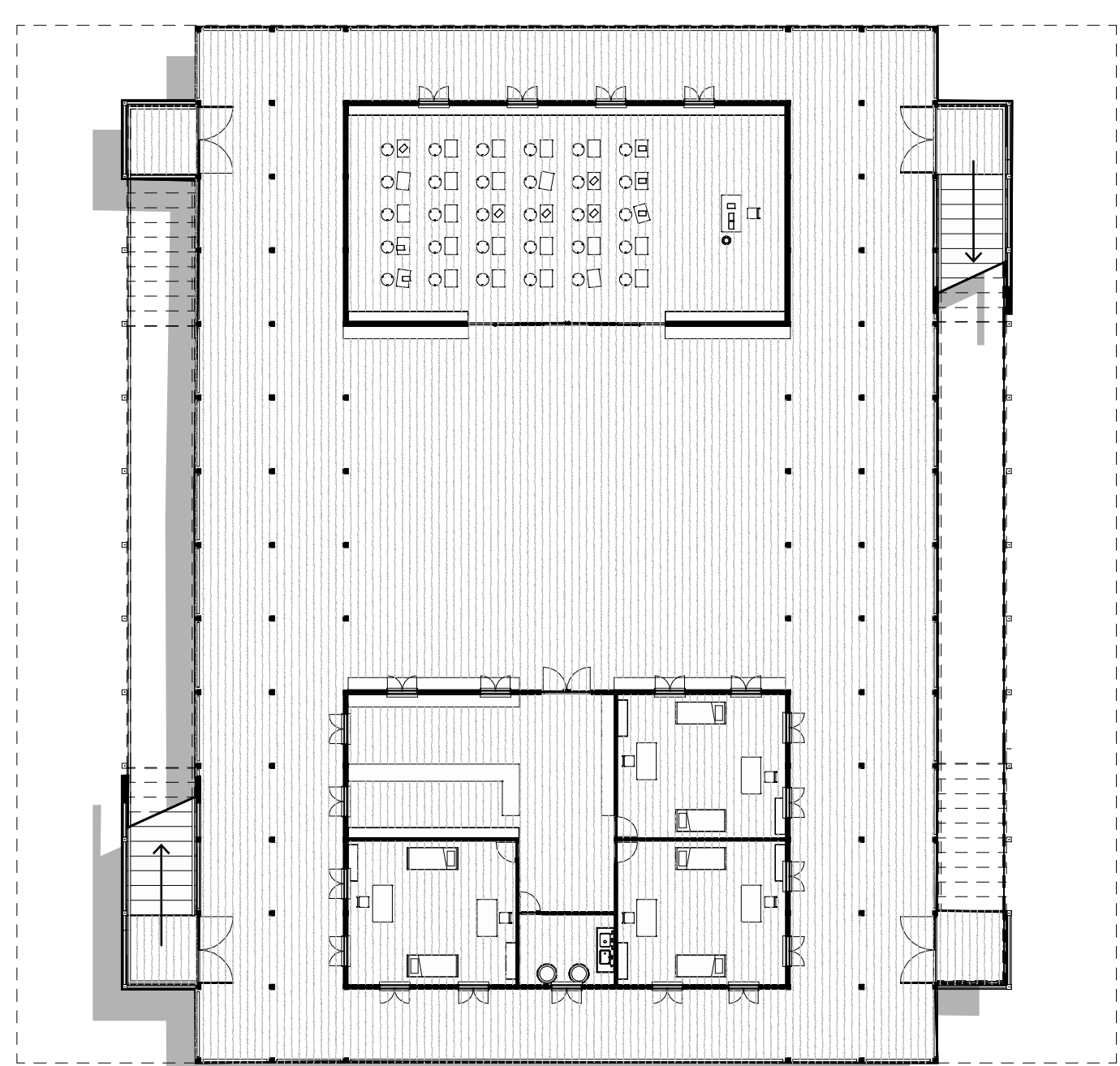
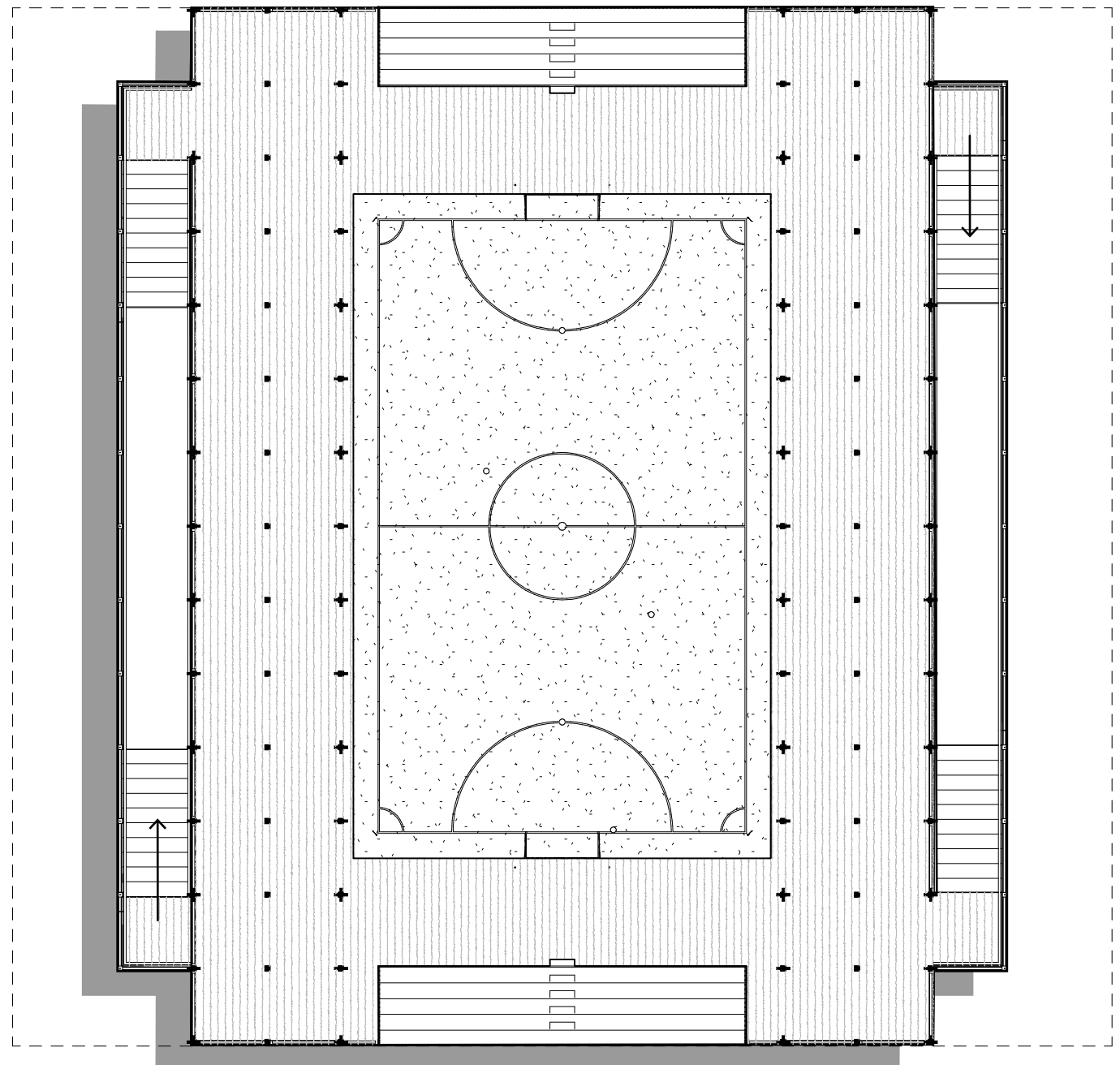


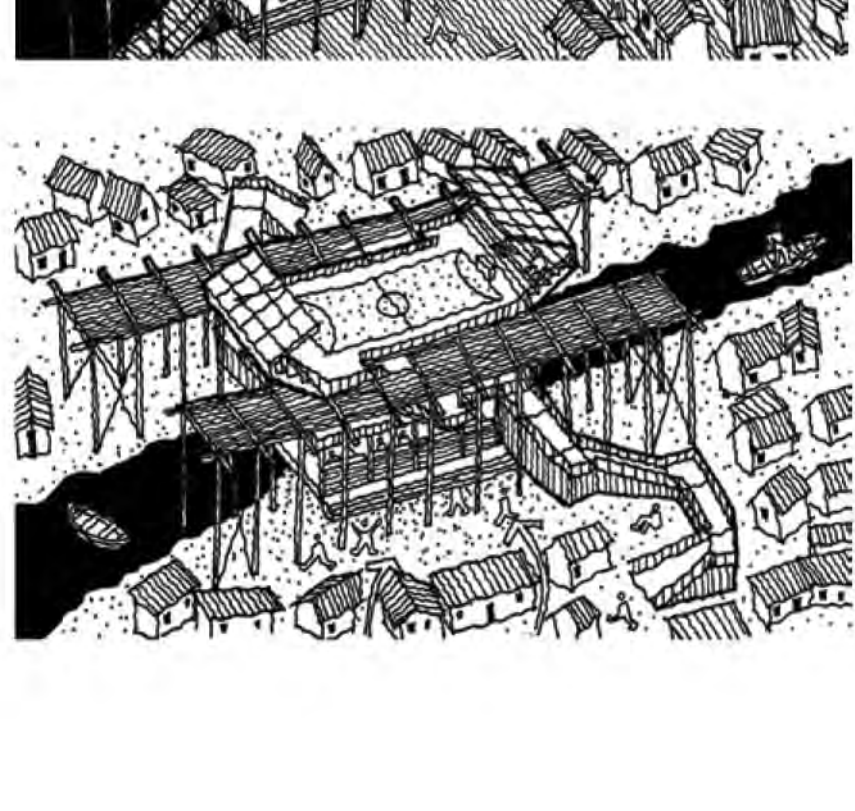
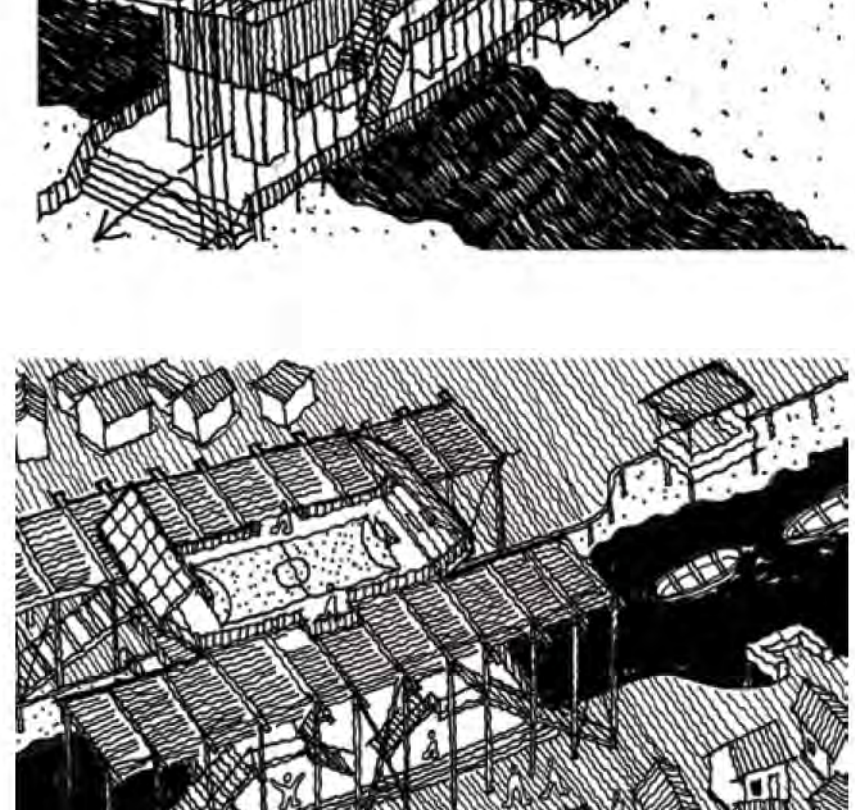
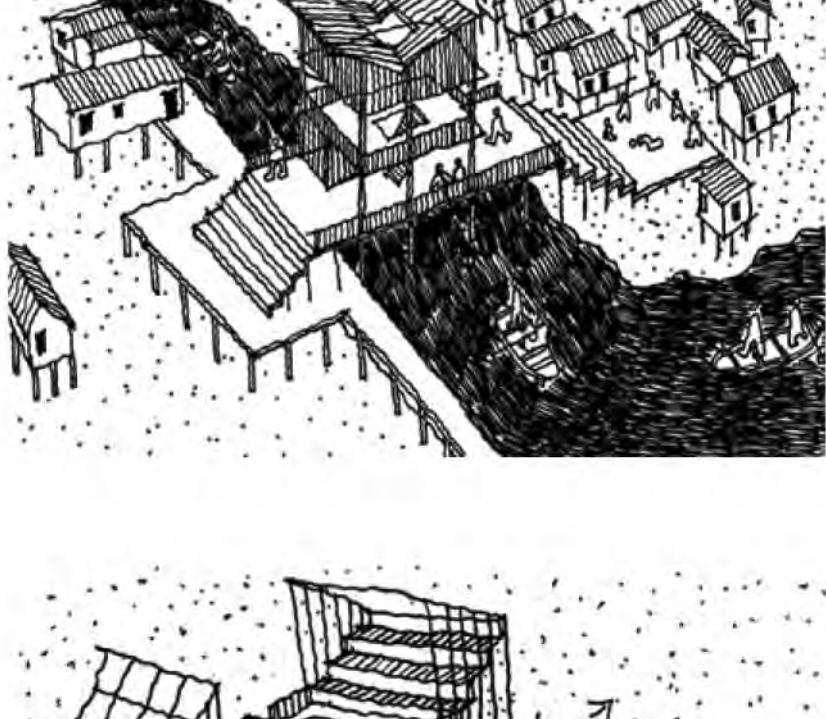
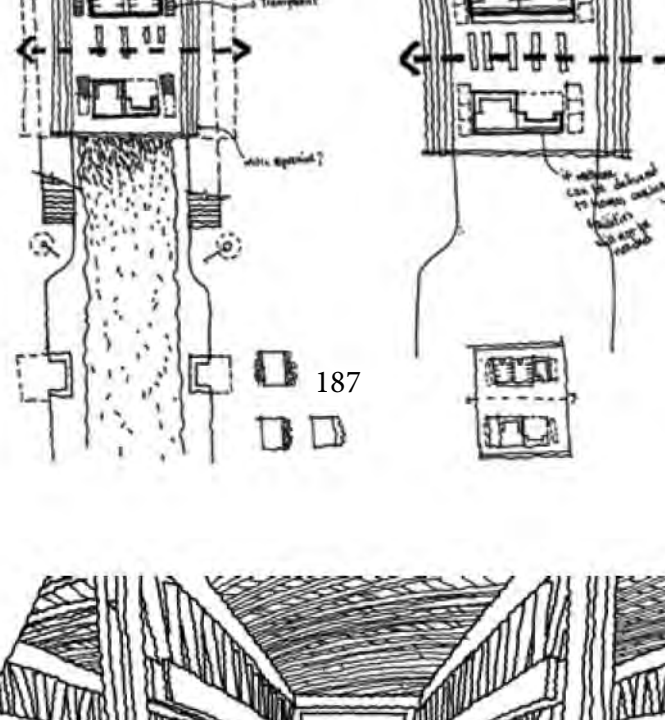
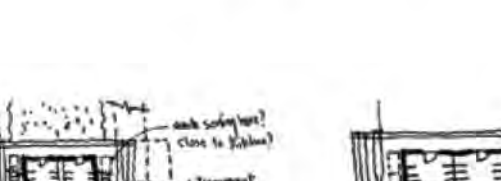
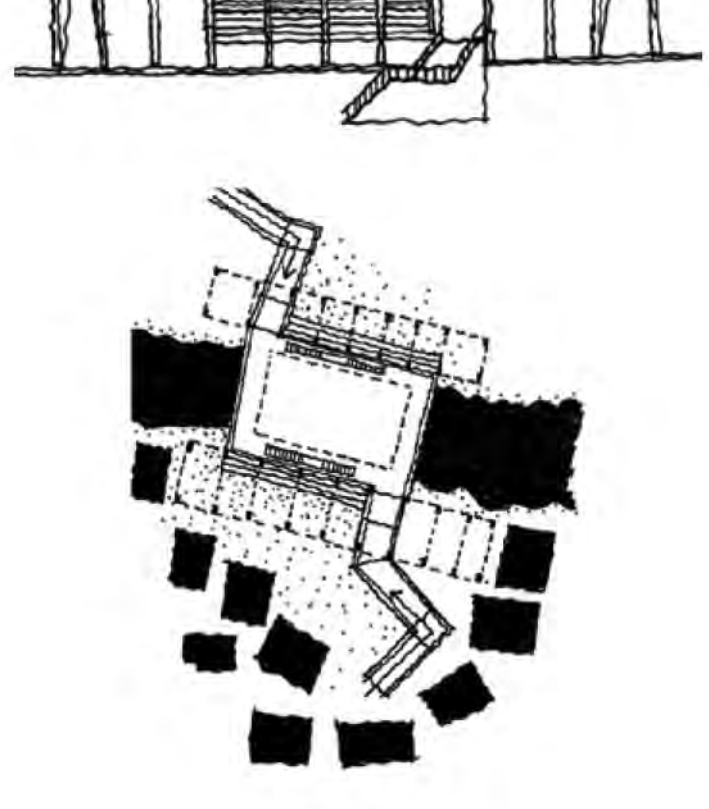
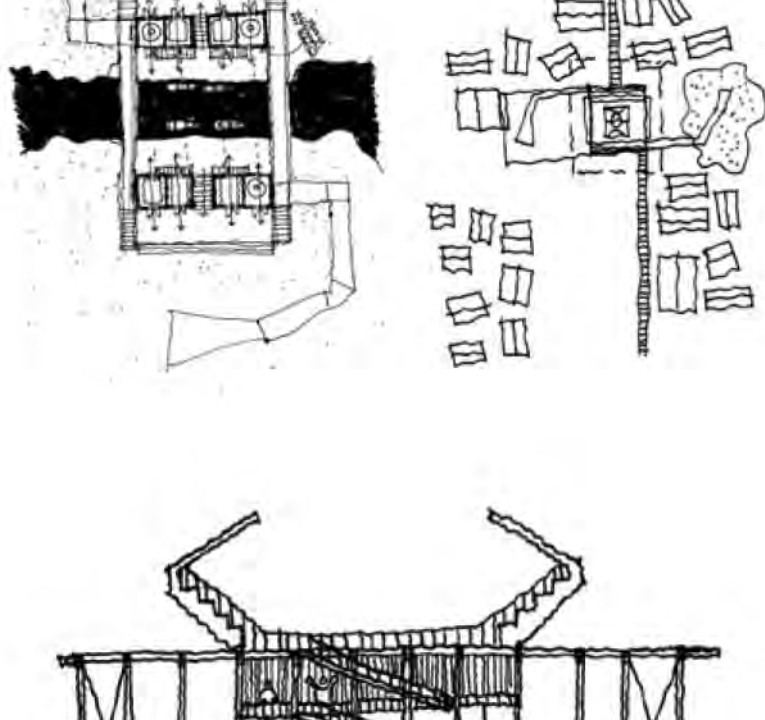
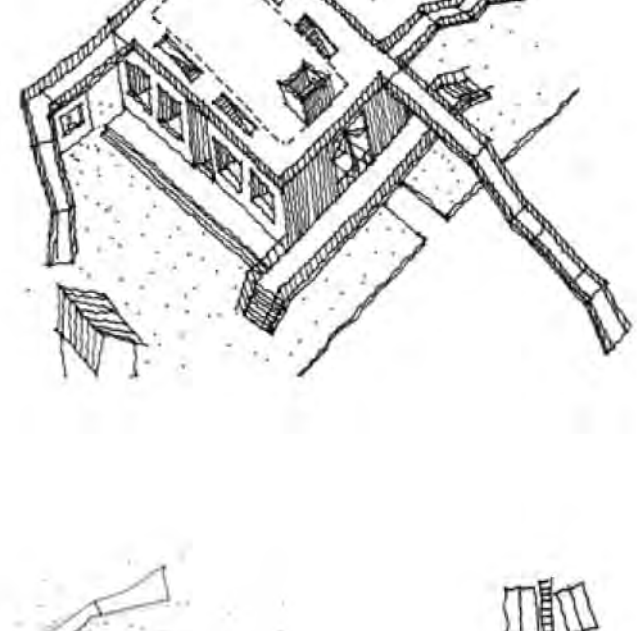
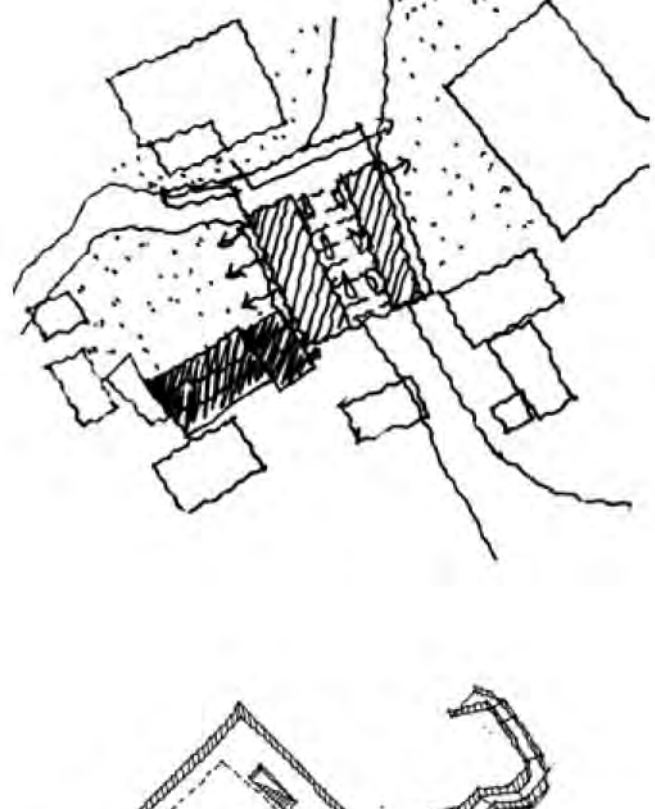
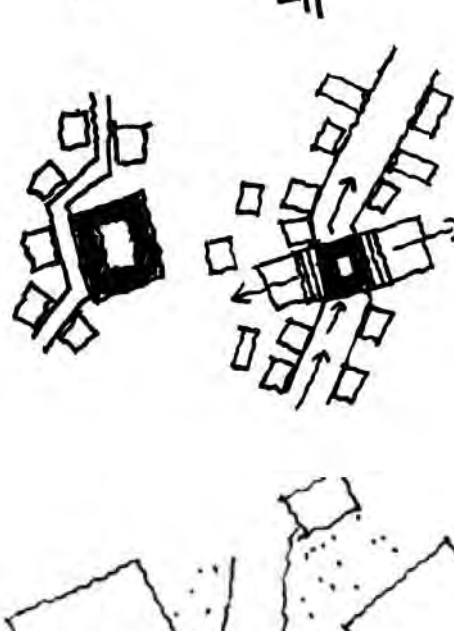
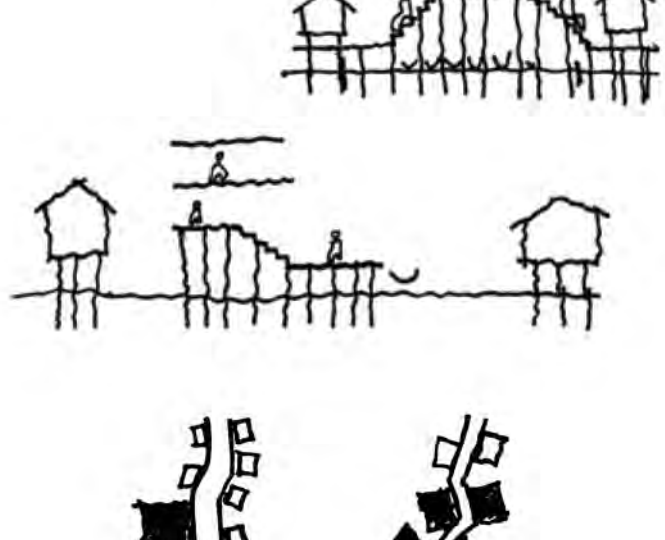


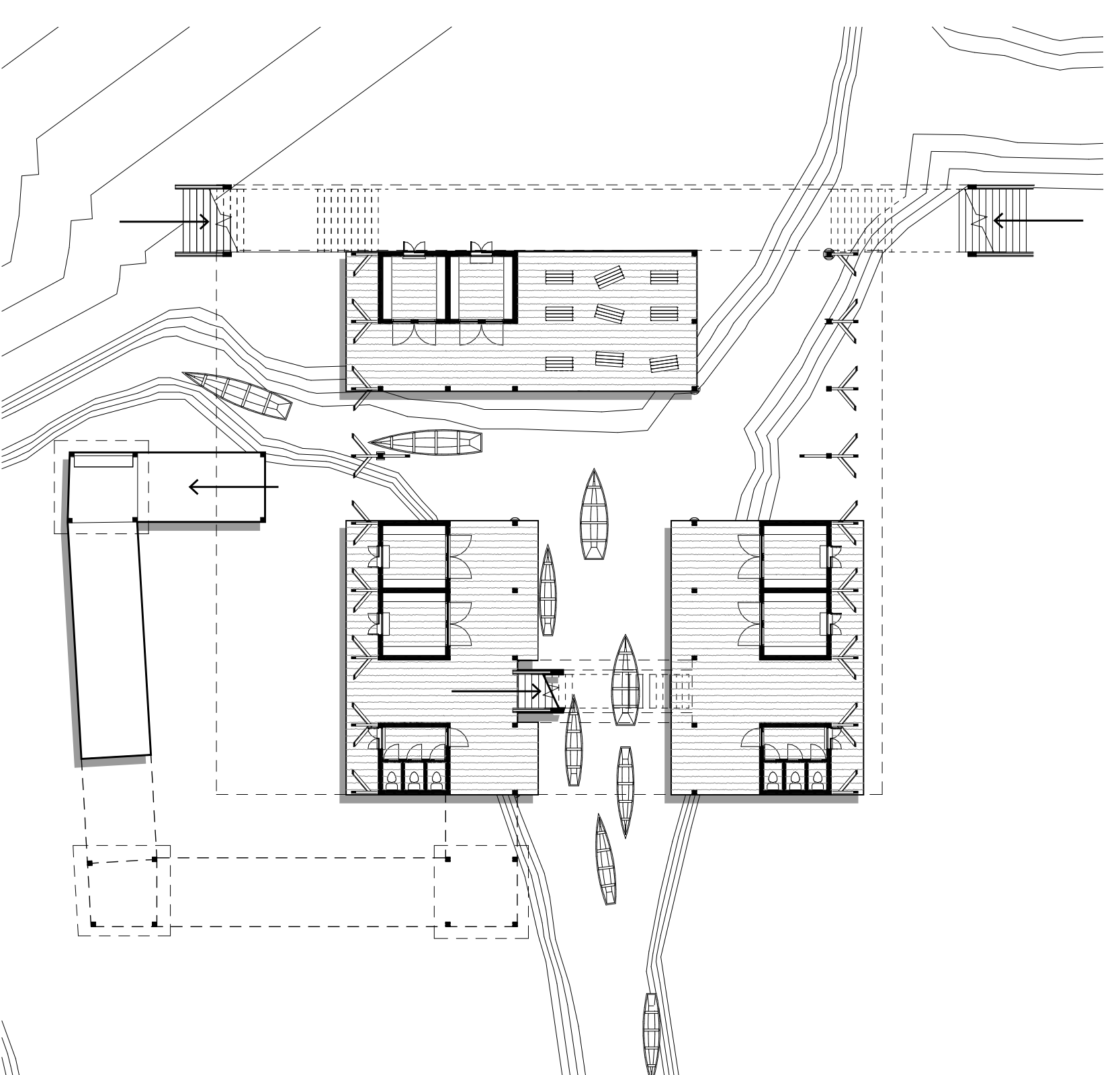
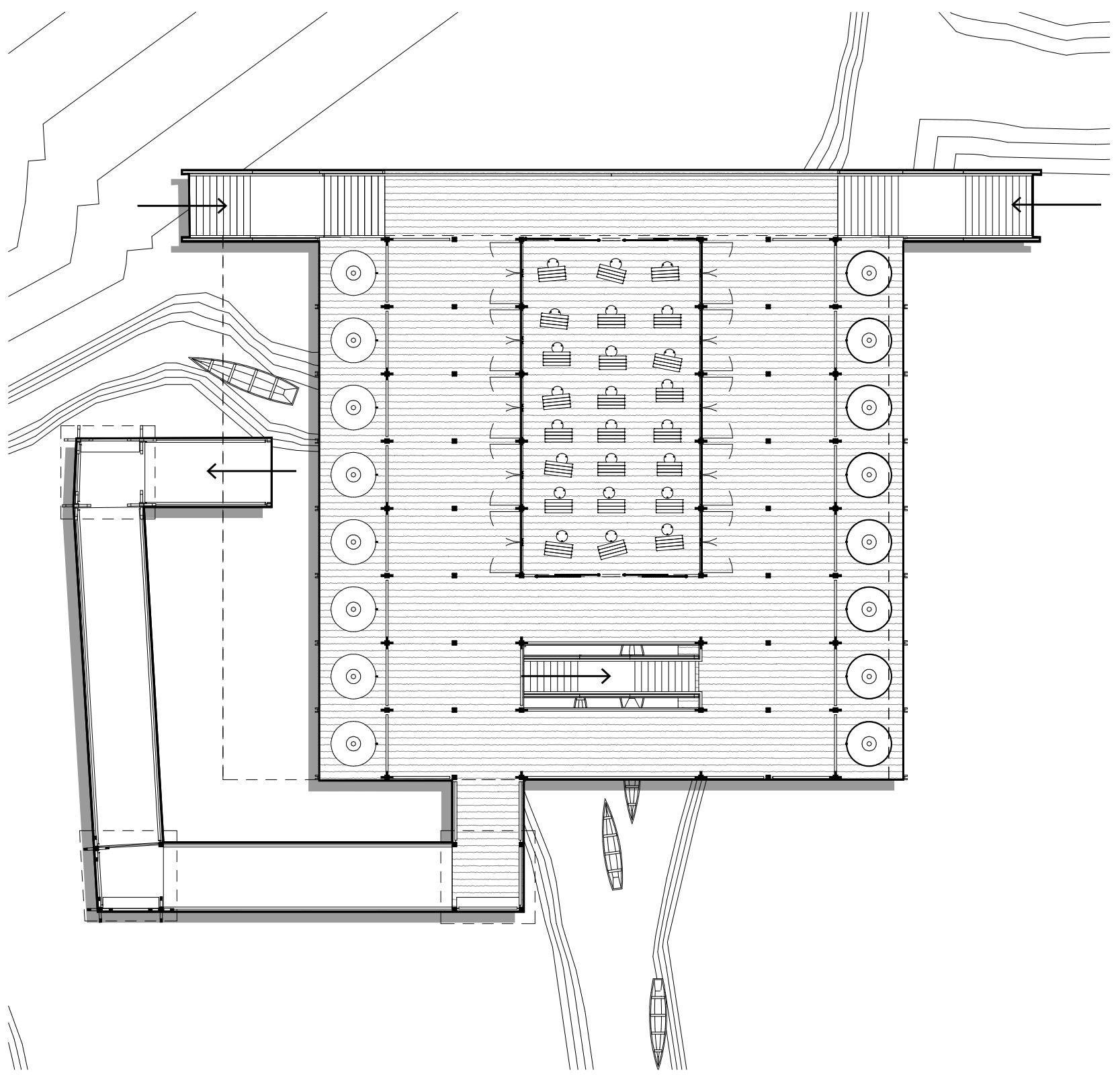
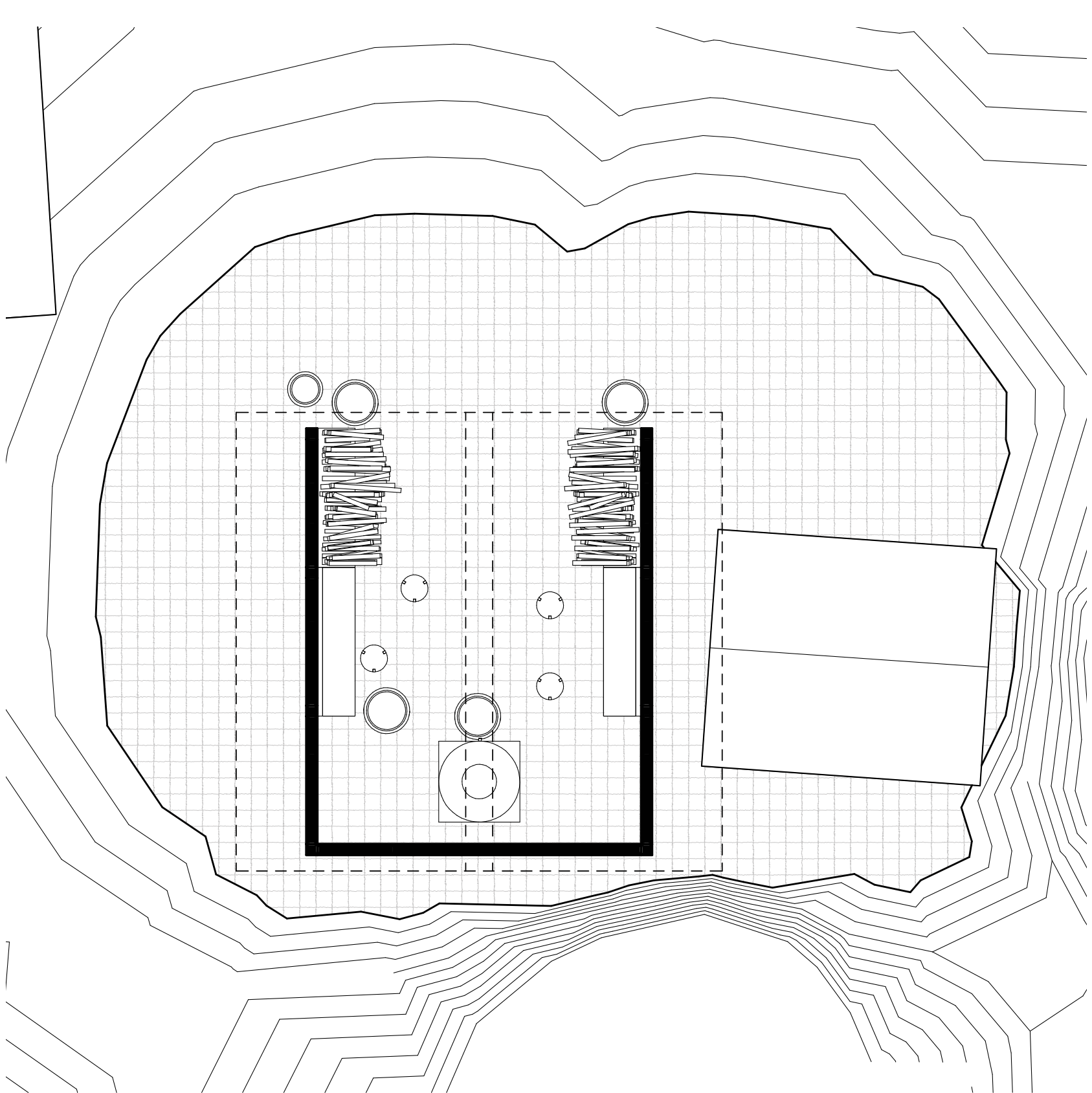


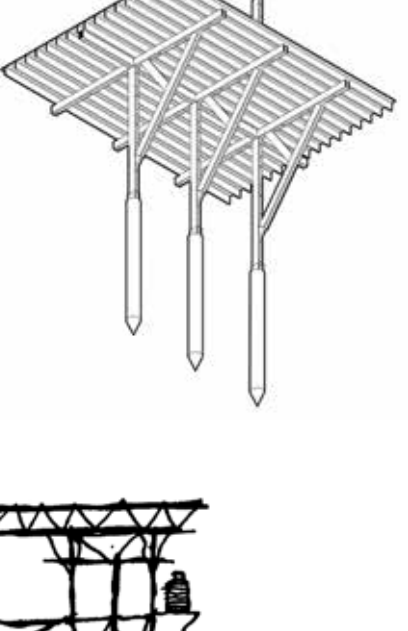
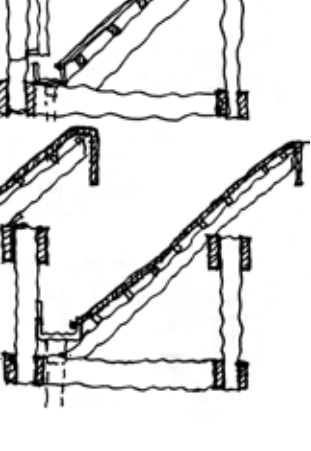
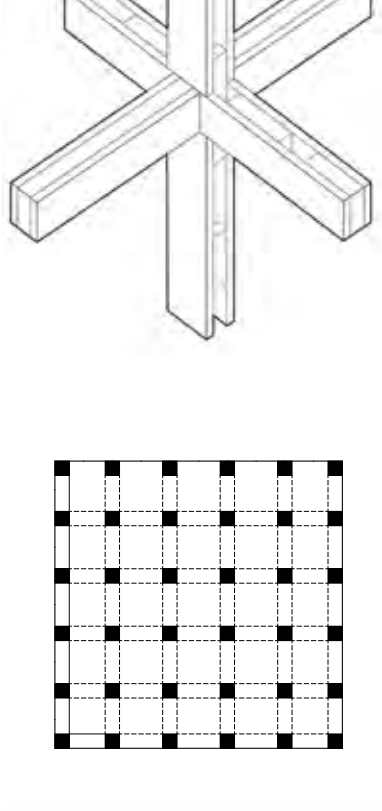
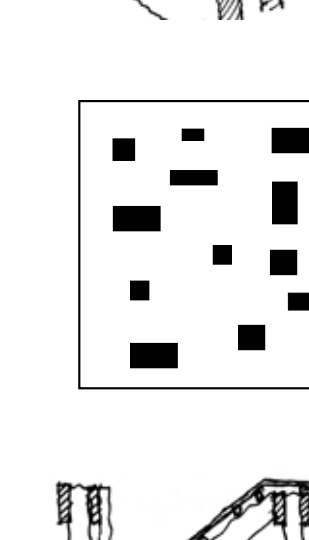
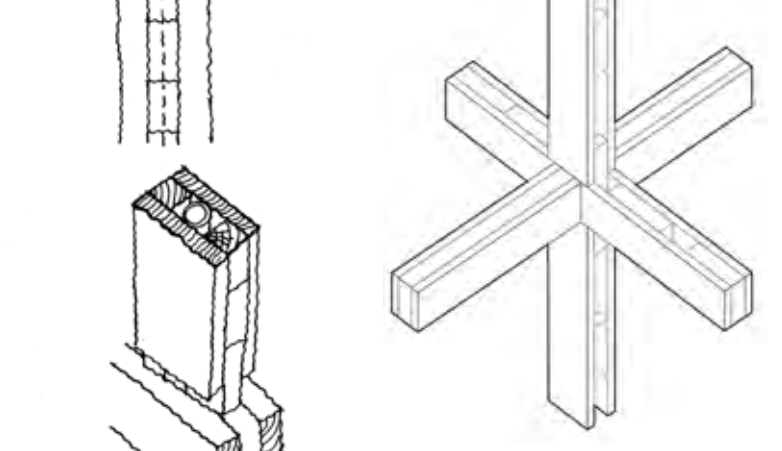
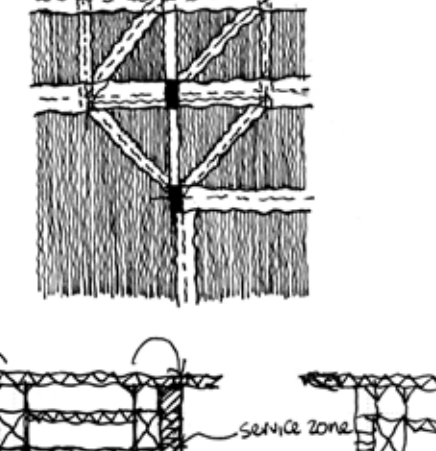
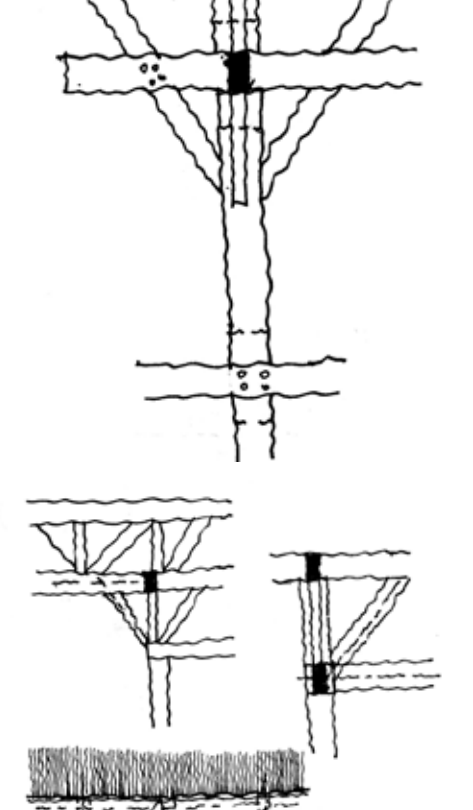
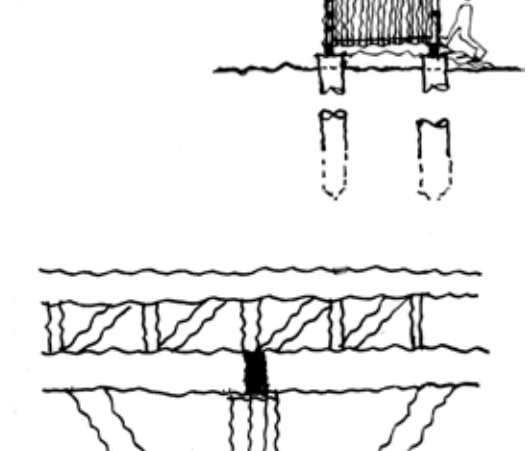
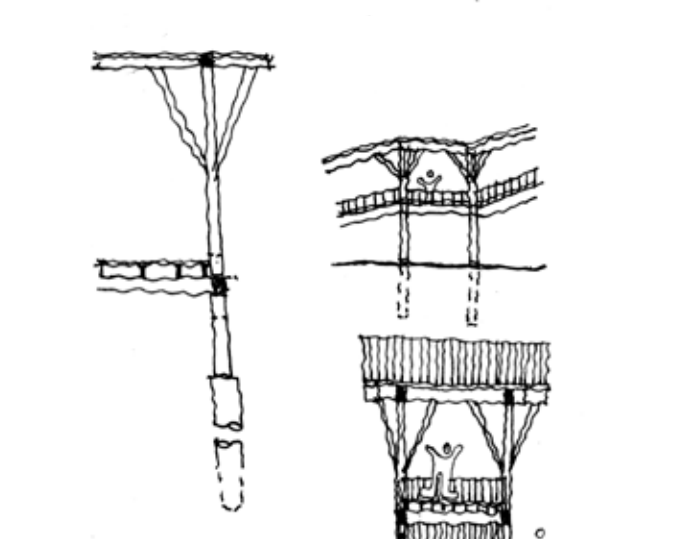
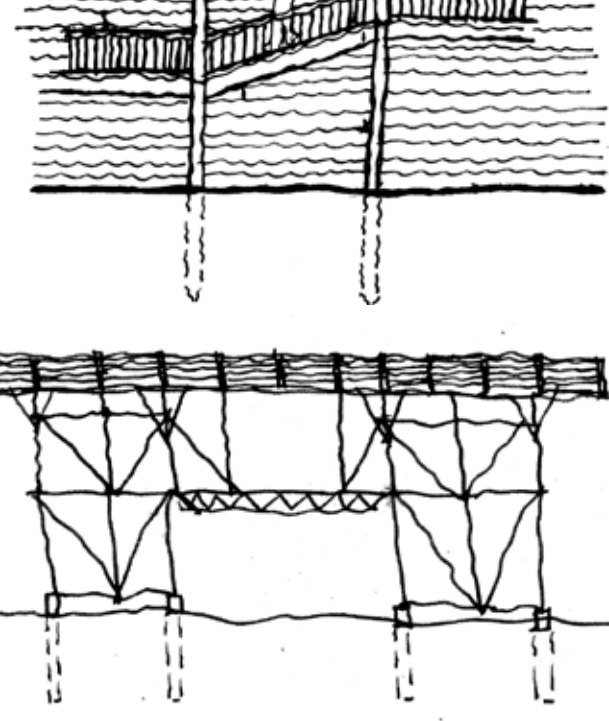
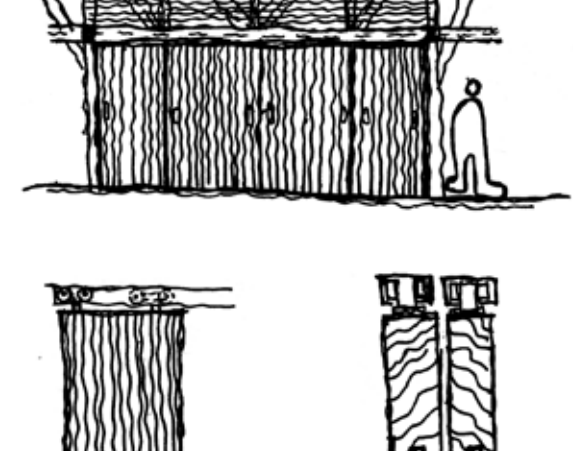
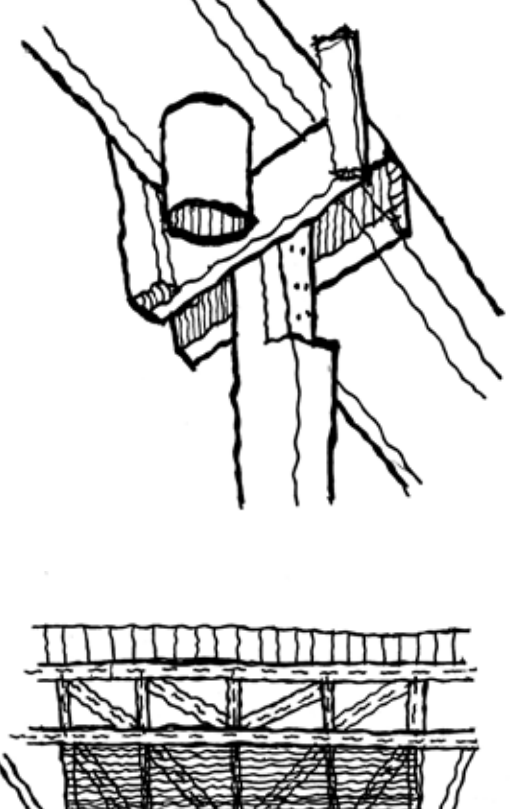
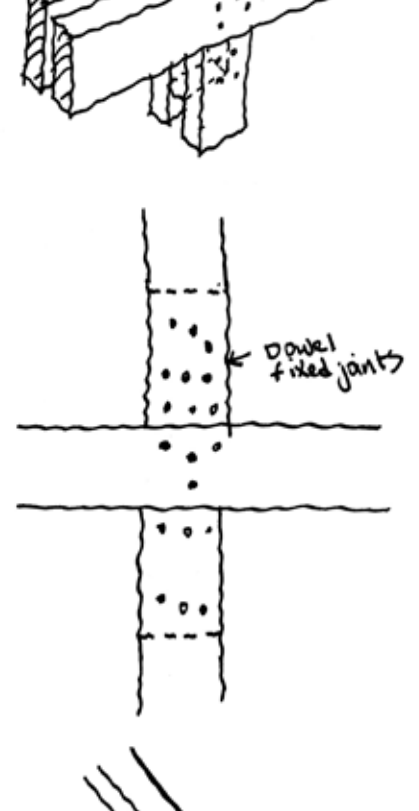
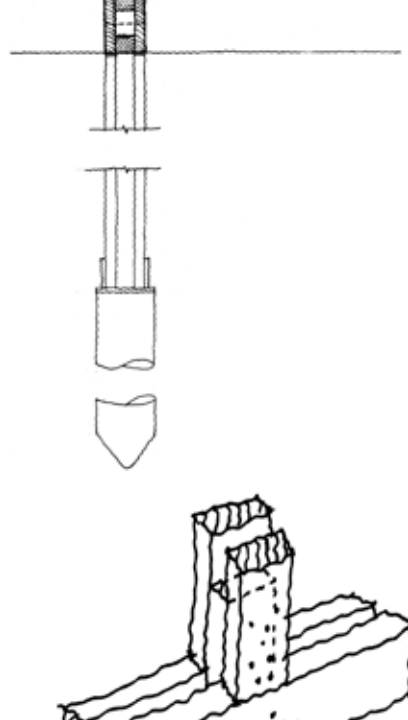


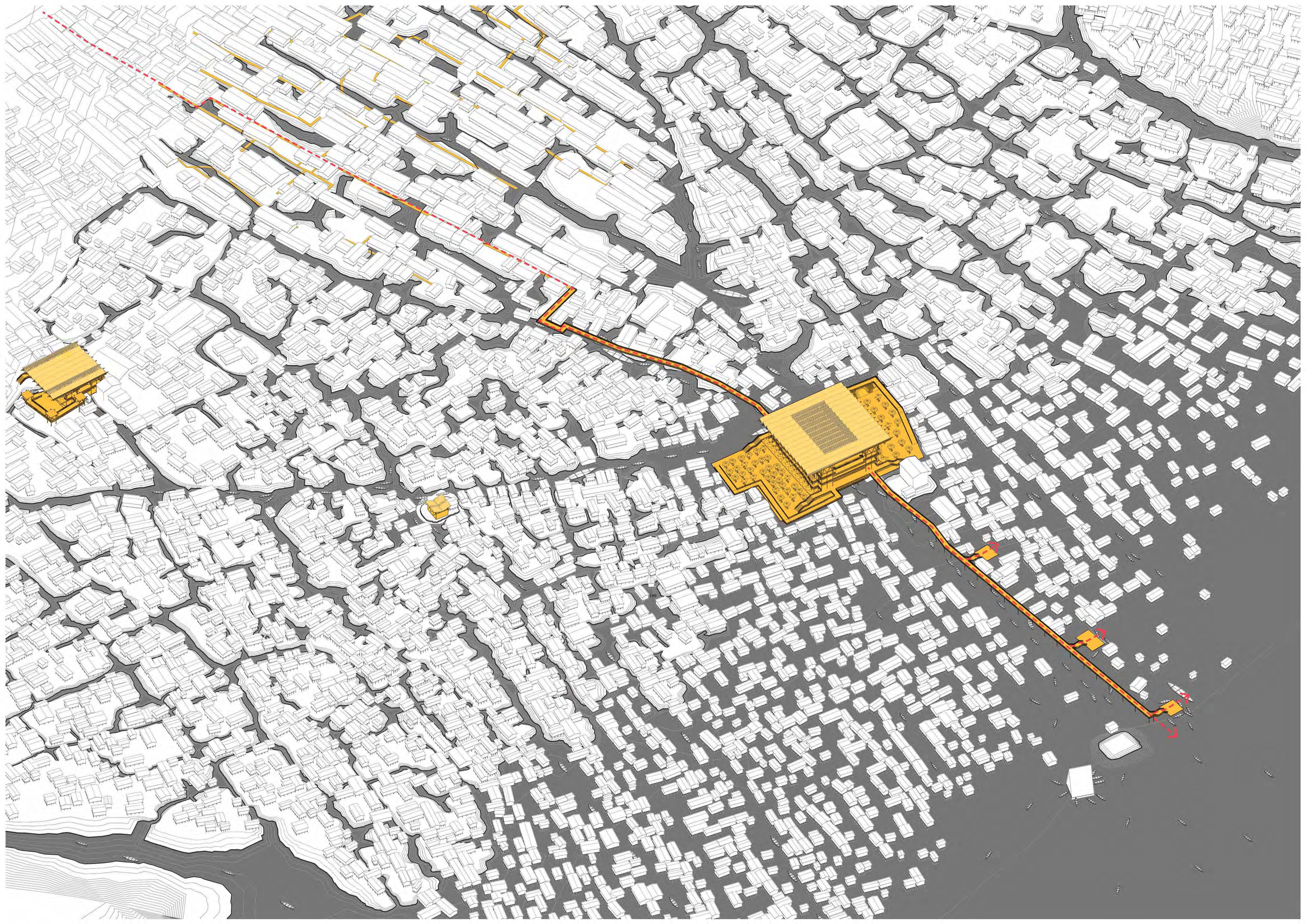


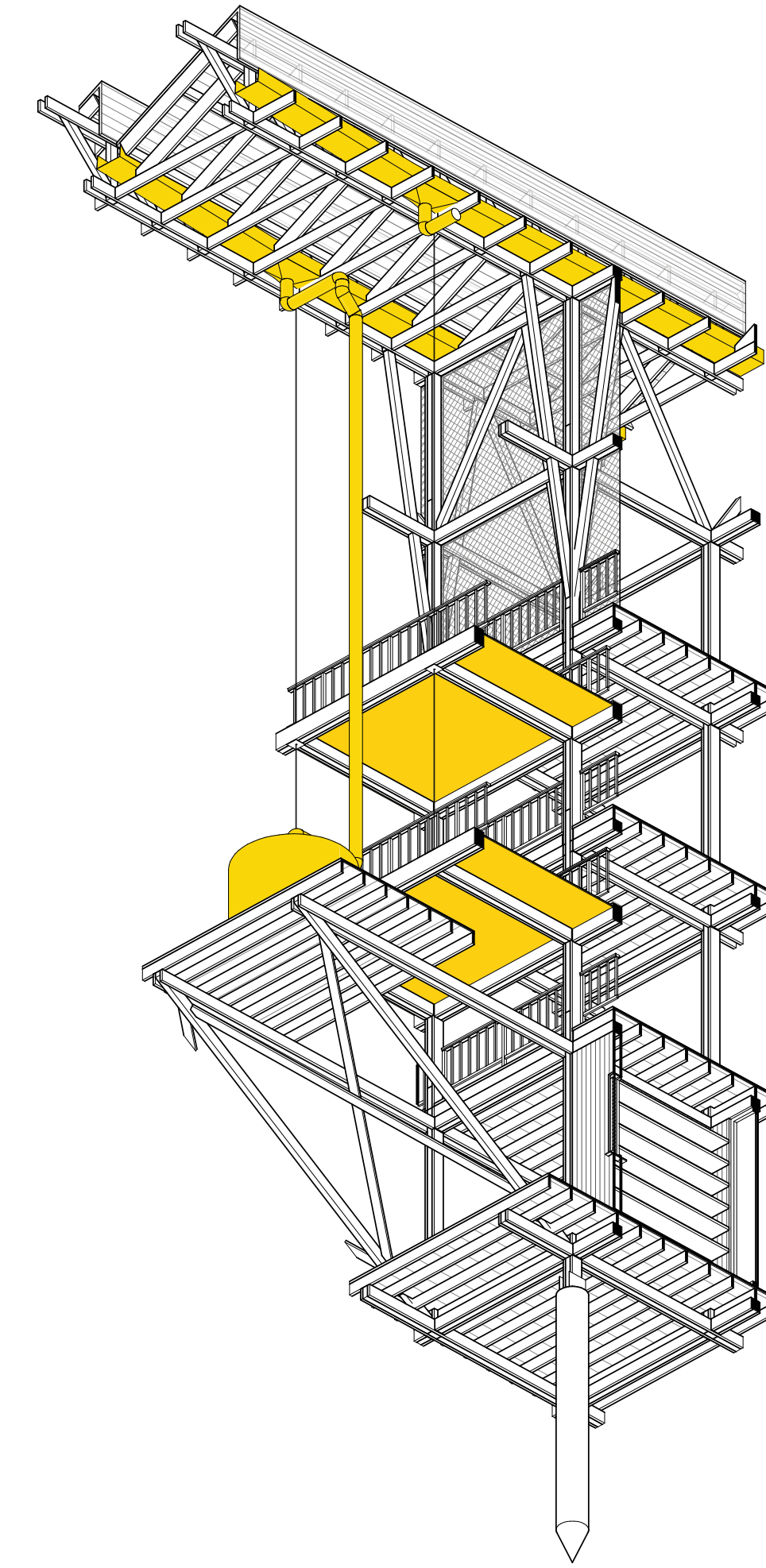
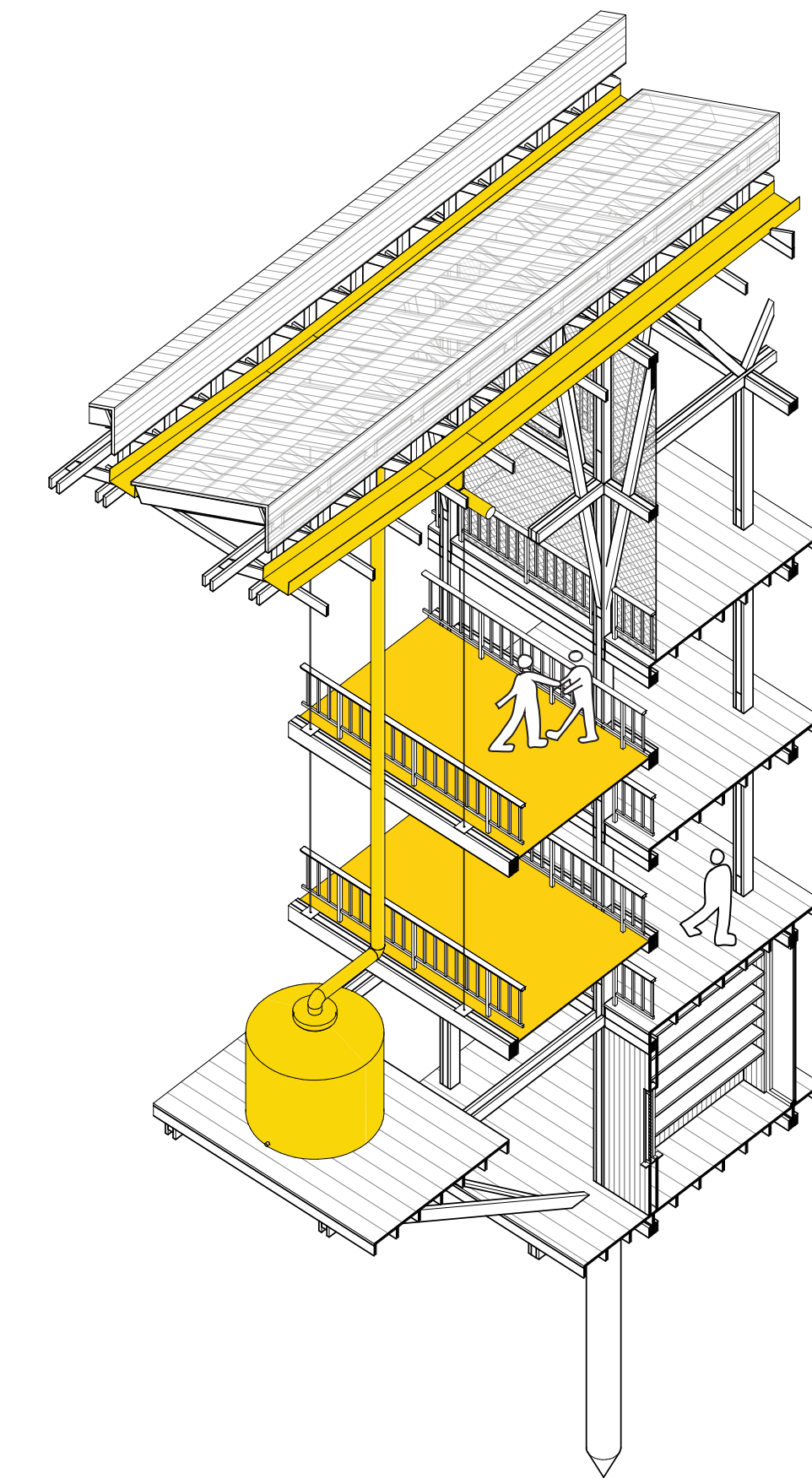
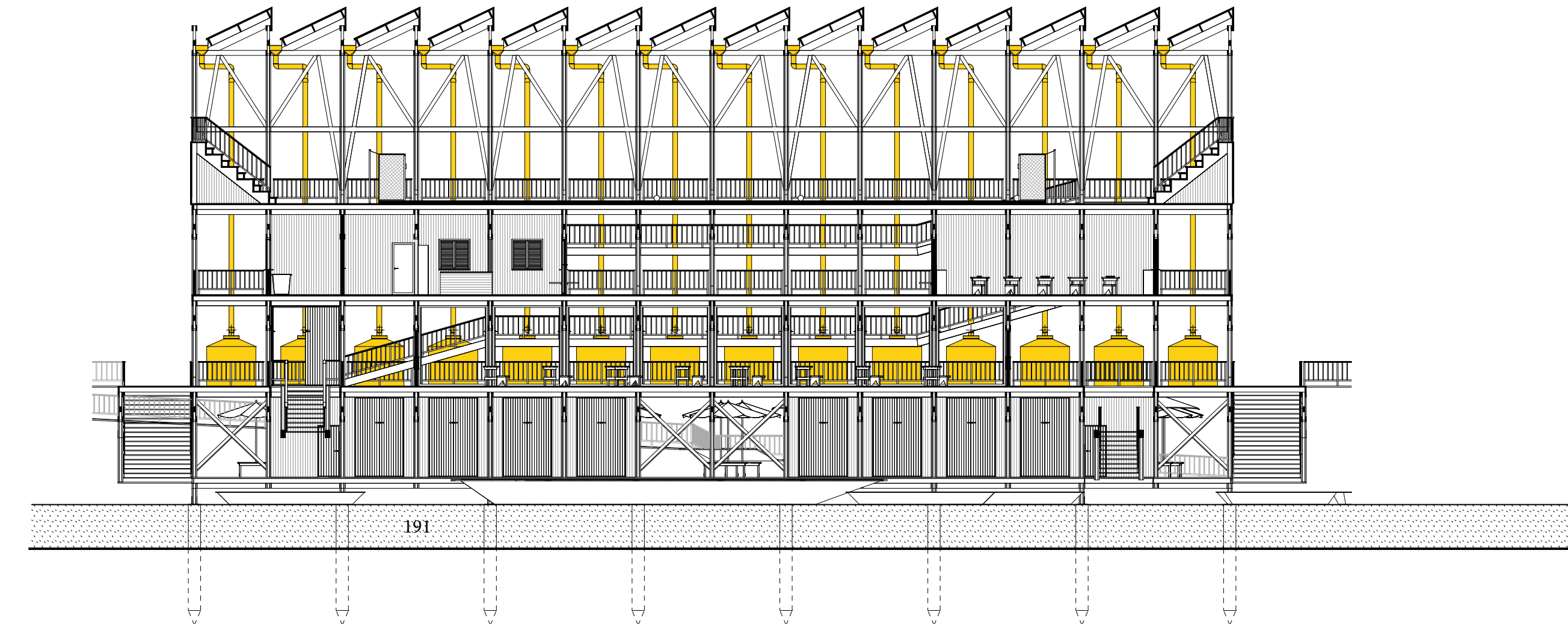
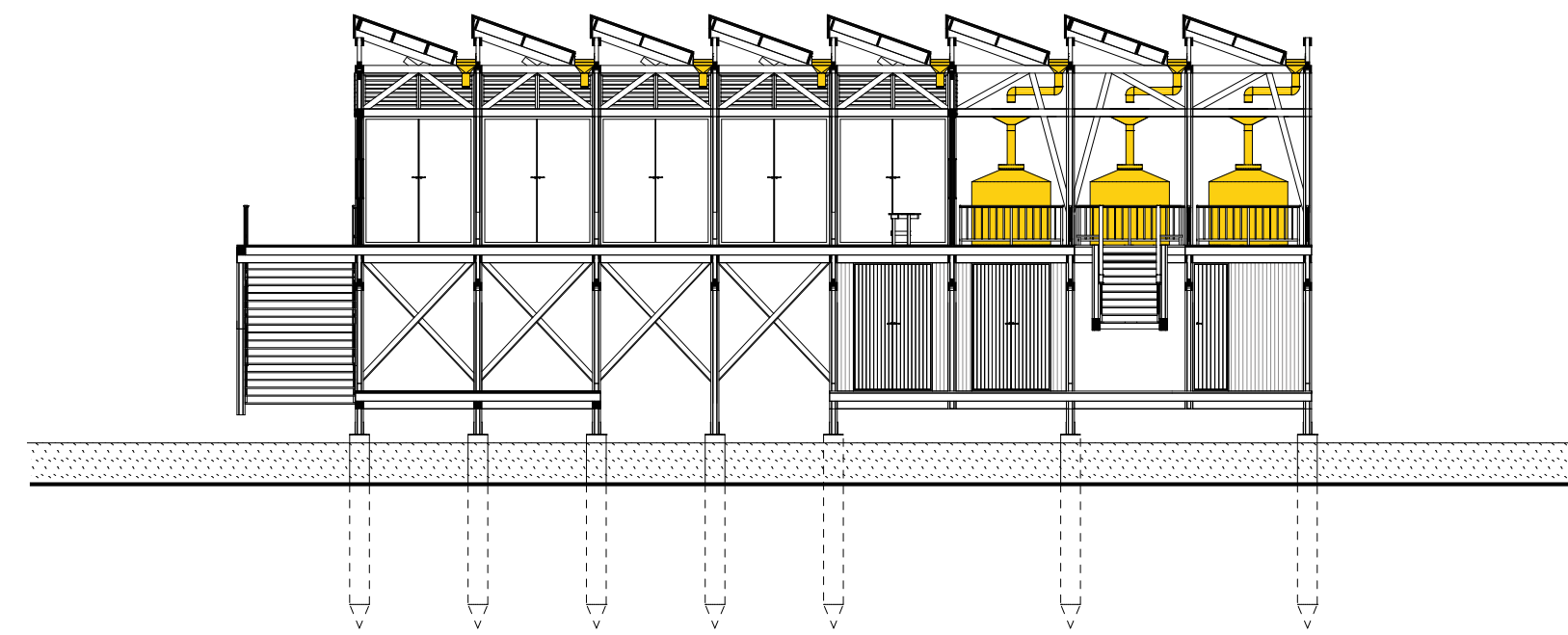
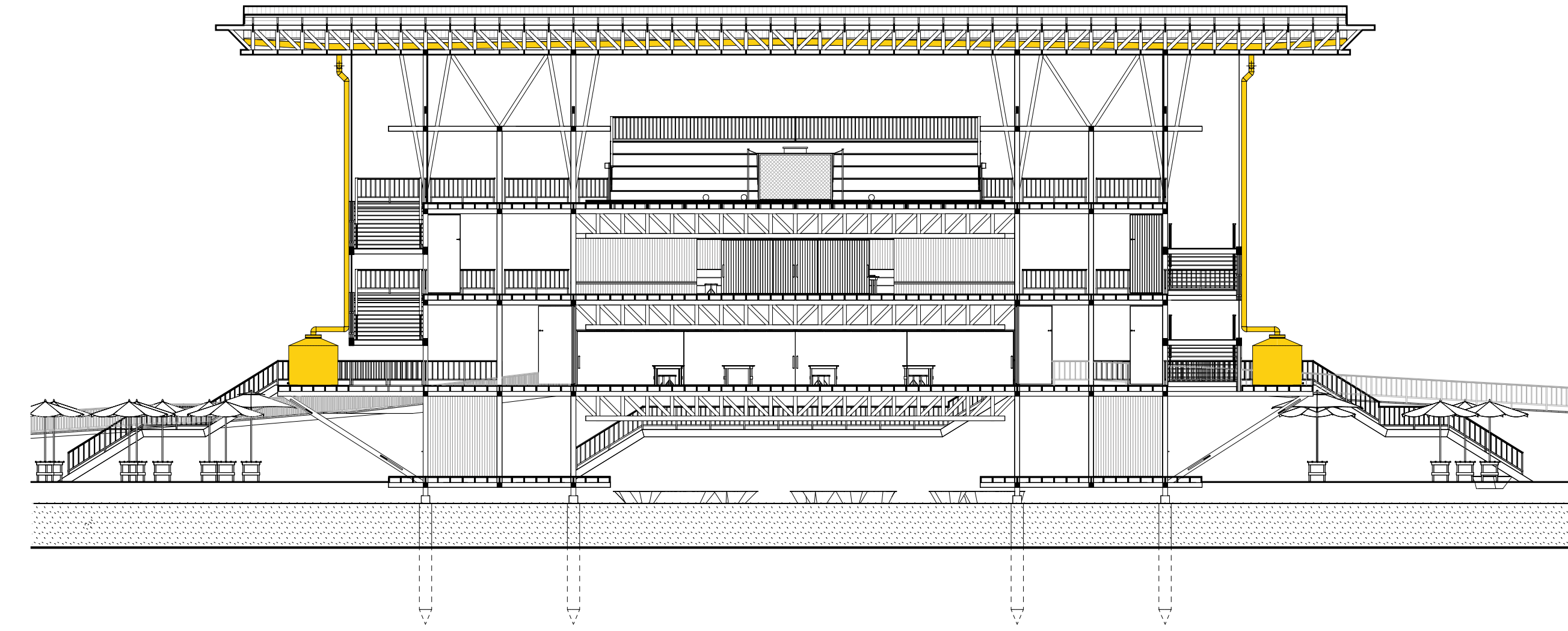
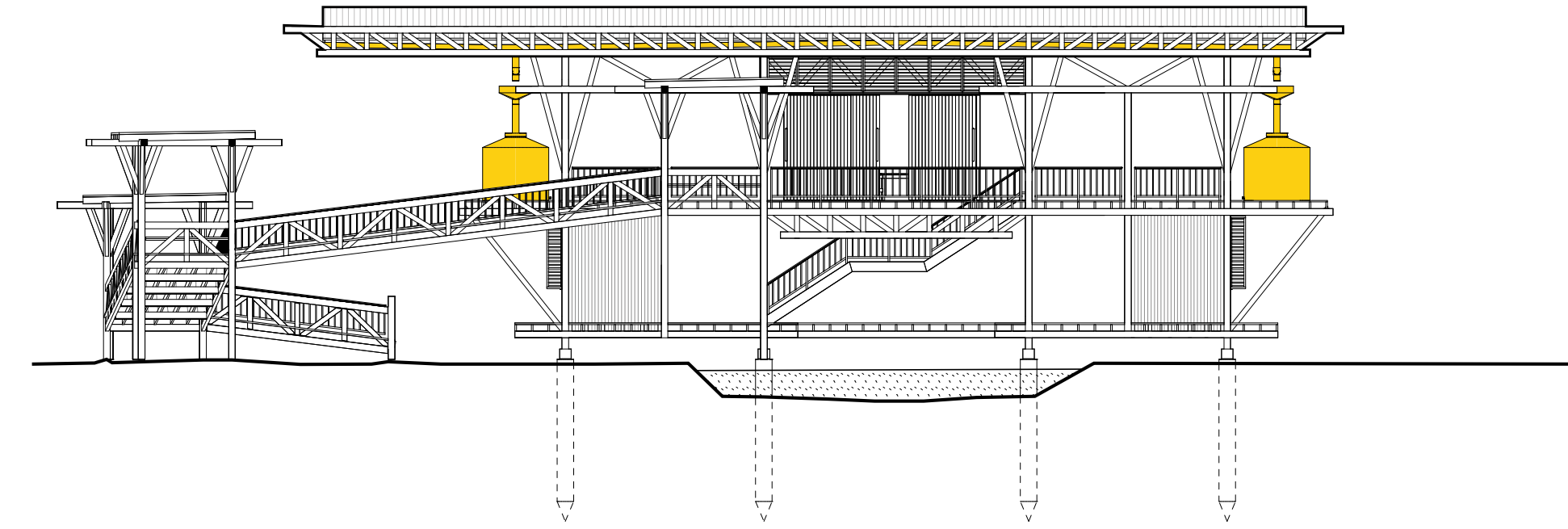
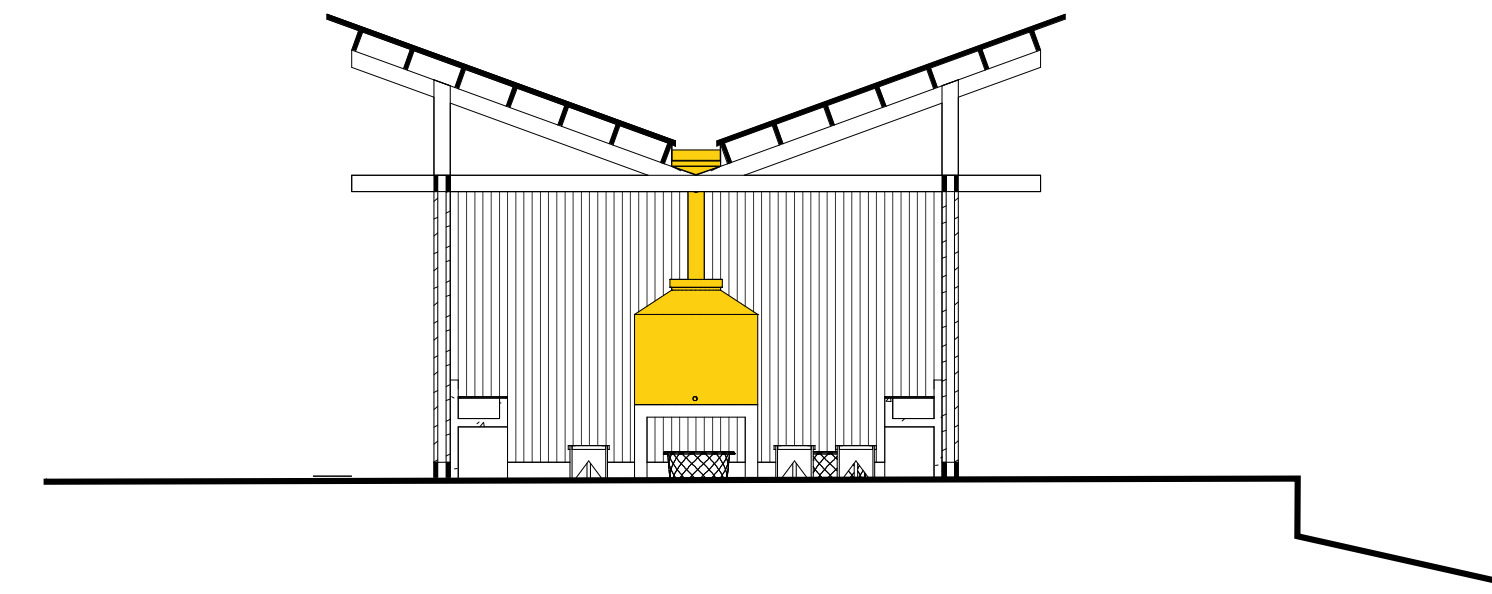


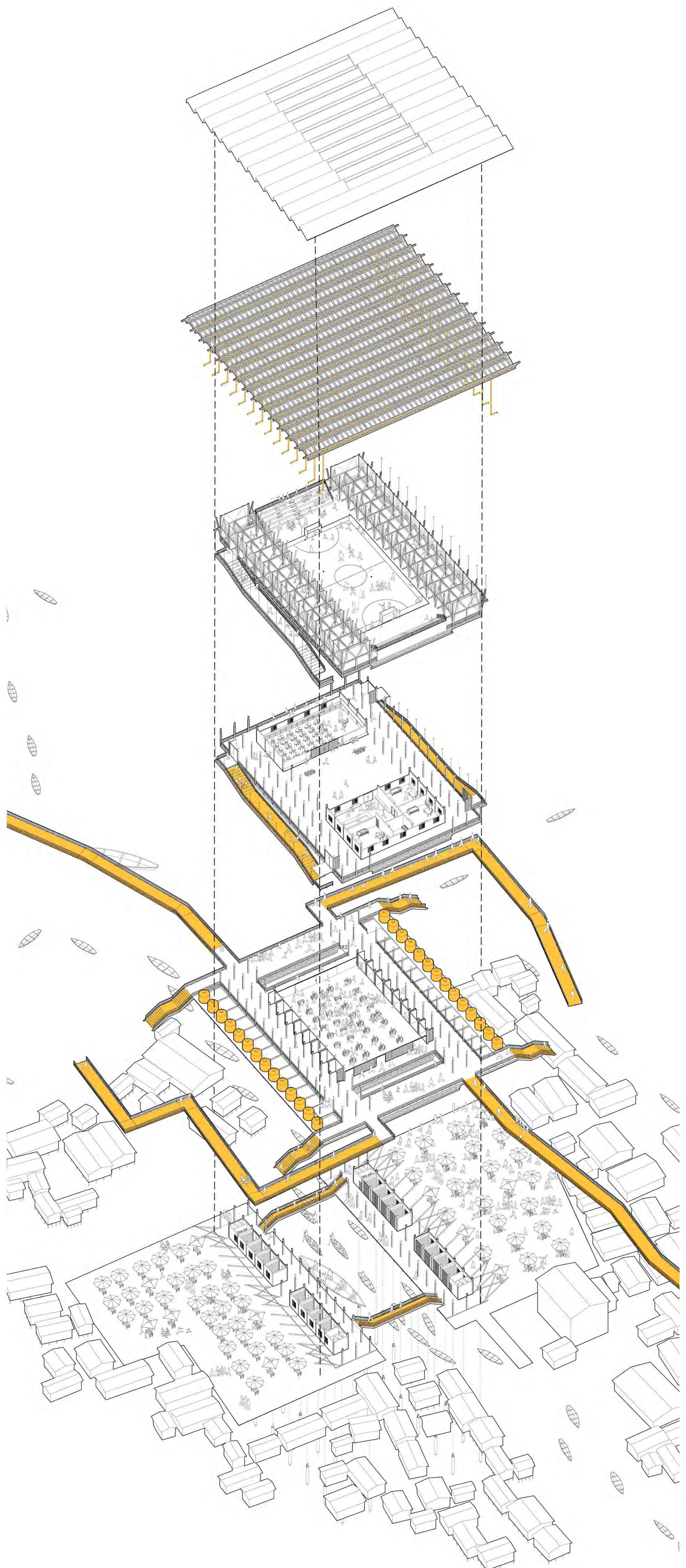


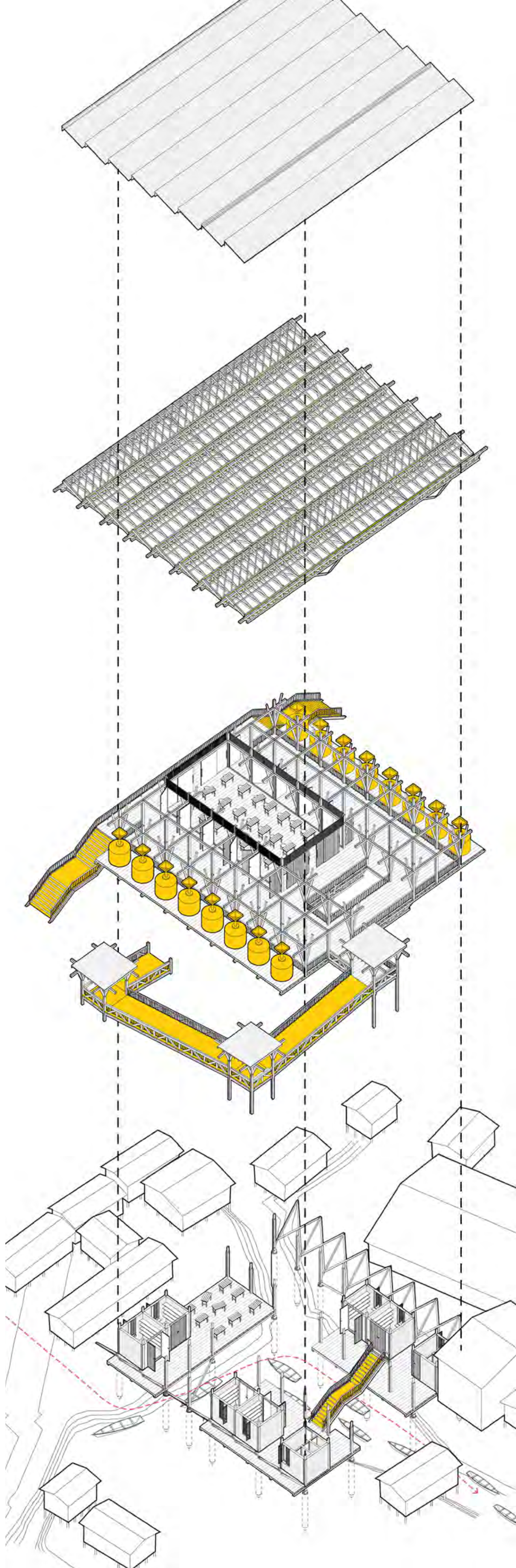
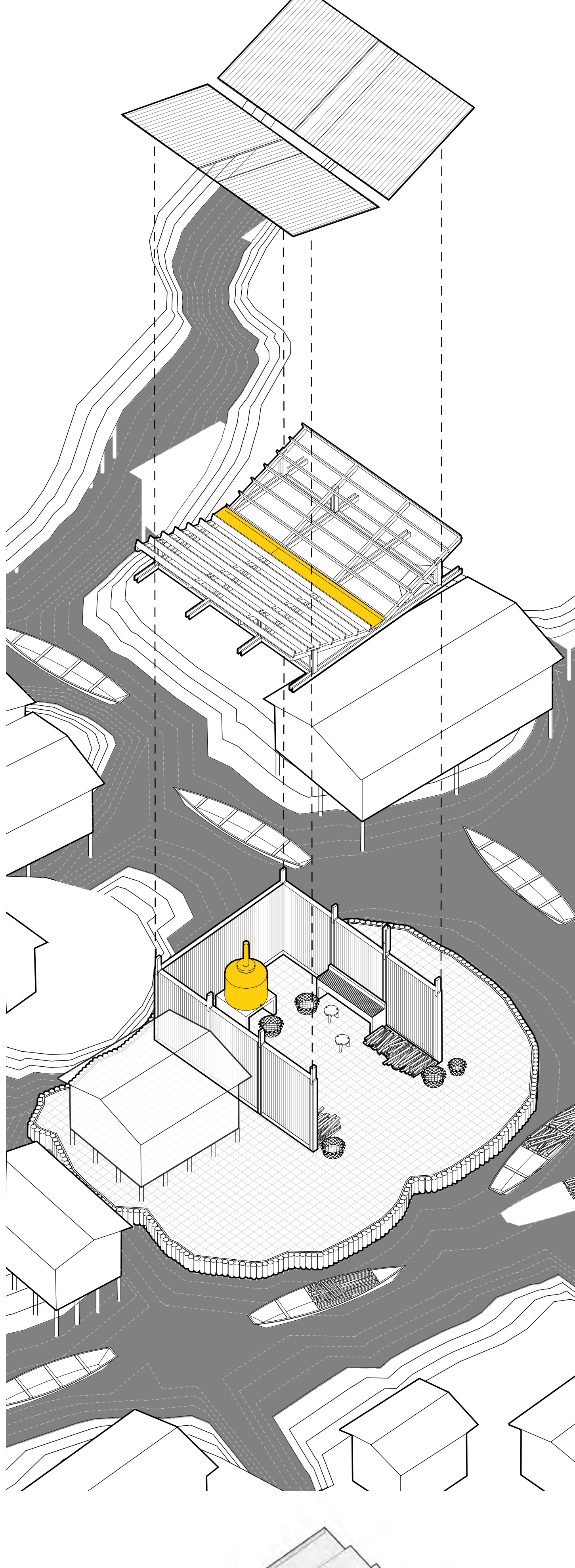








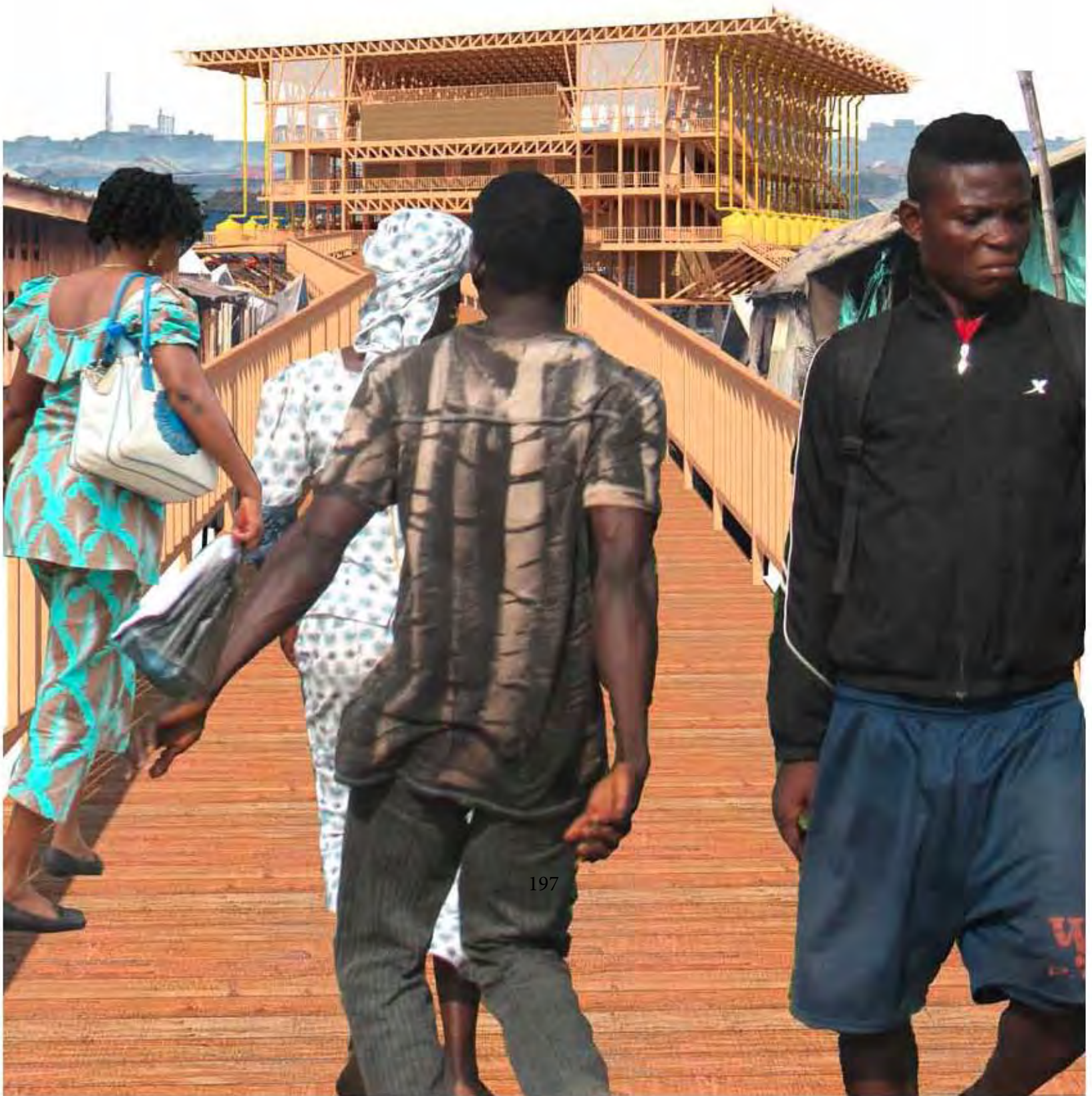








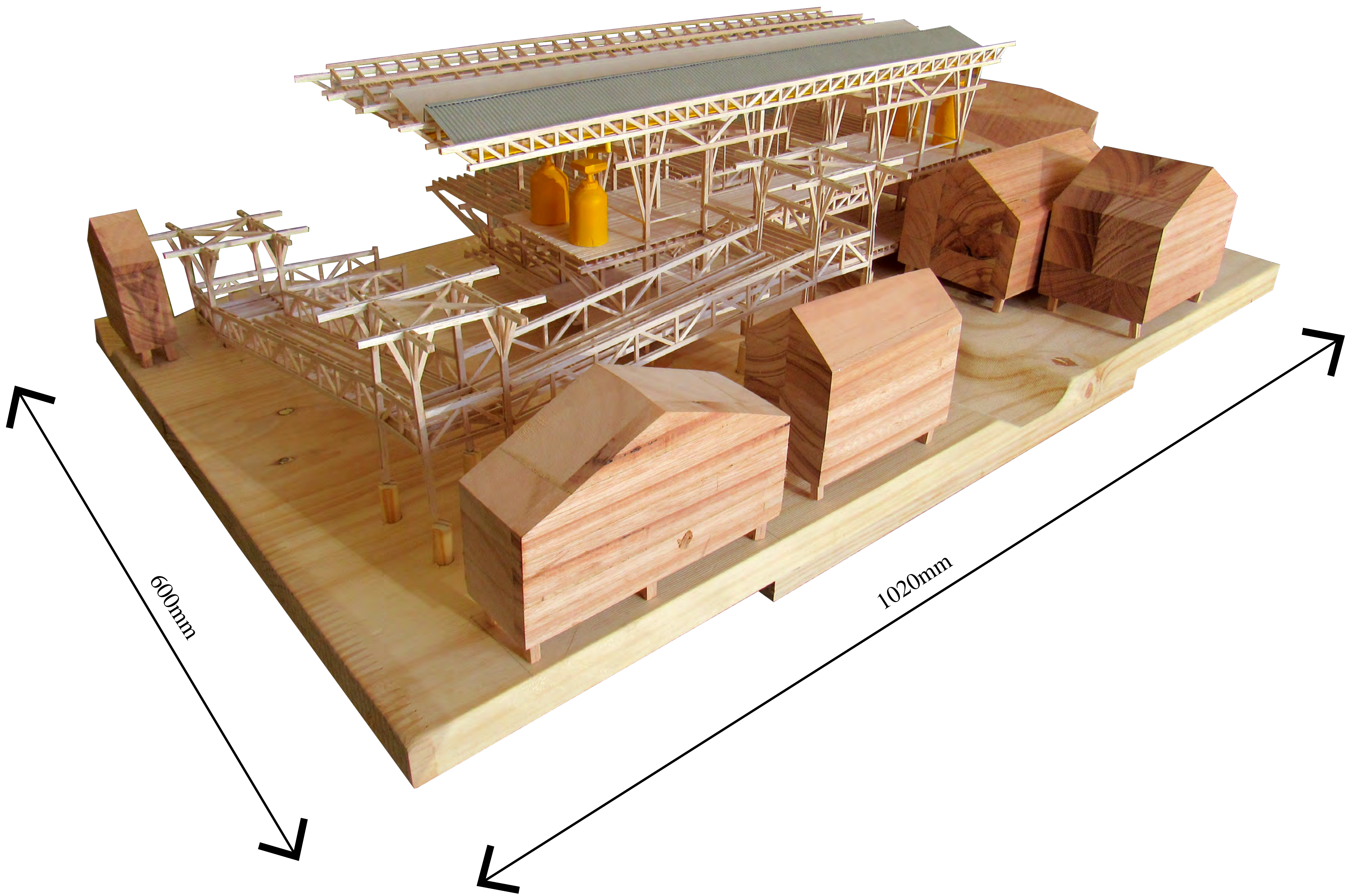








# Model Images

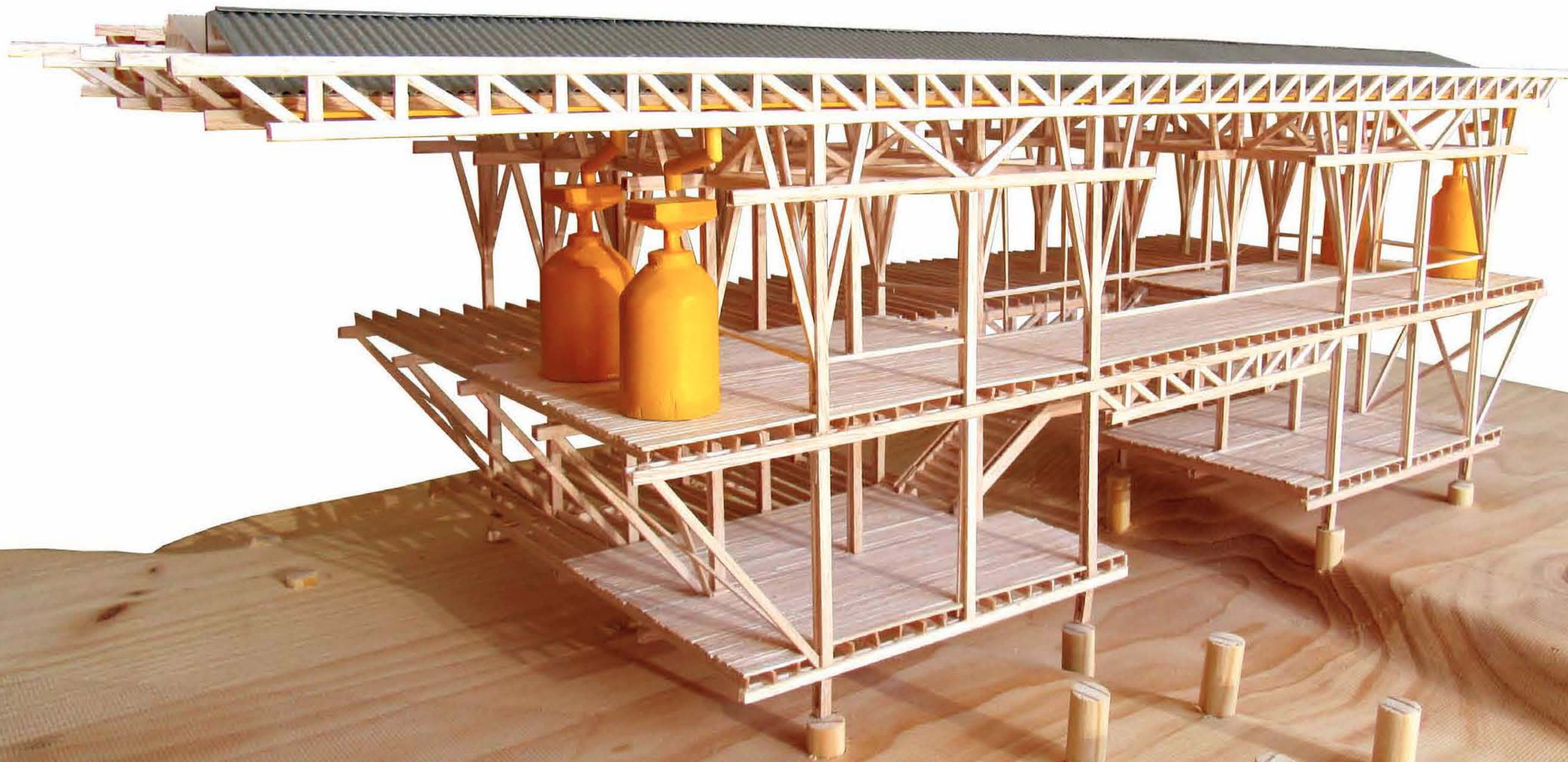


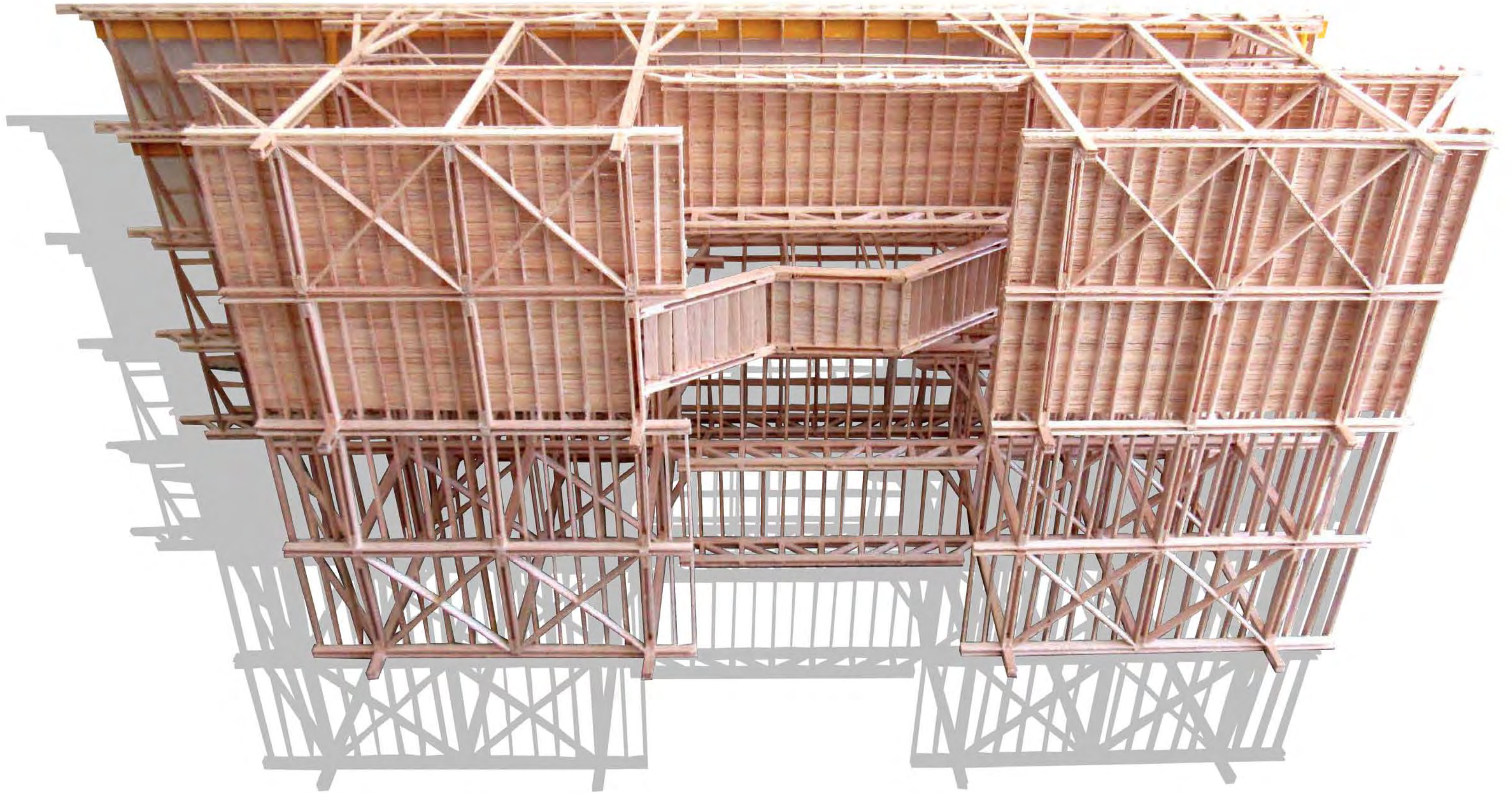
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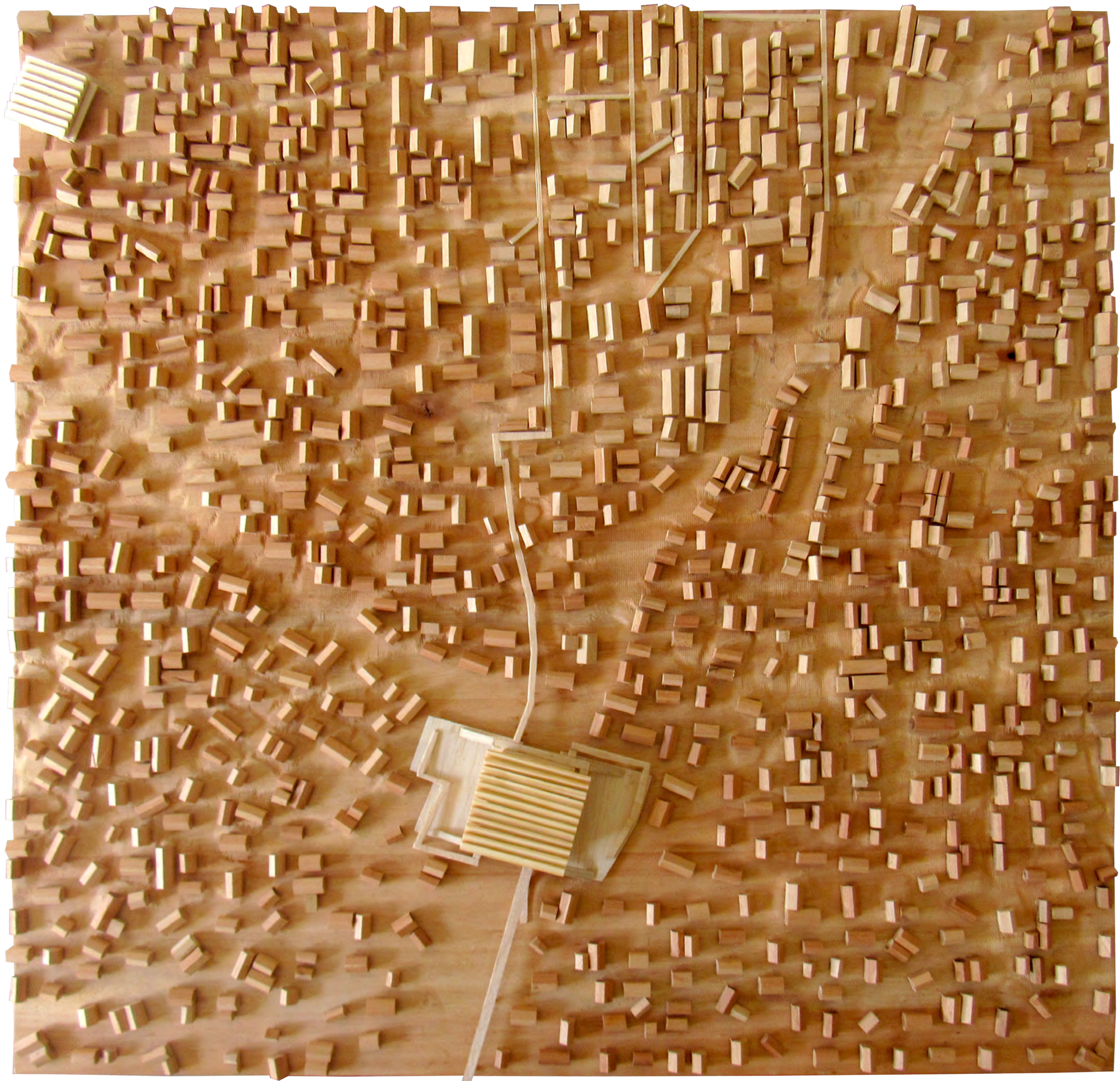












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900mm

