[RE]GROWING THE COAST:

Rehabilitation of the Land & Mind

by

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ABSTRACT

Designing for a time beyond our own, this thesis explores a narrative-based approach in response to today's climatic issues, drawing from speculative visions and constructing fictions with surrealist sensibilities. Humanity is currently faced with a crisis of climate while relationally confronted with a crisis of the imagination. The current ontological and epistemological frameworks, along with the general priorities of today's culture, have limited the human imagination in grasping and responding to such issues. Offering alternative lifestyles through designs integrated in the world of the future and its natural elements can reveal so much more of our earth than the myopic position our current society does not provide. Positioned in Central Thailand the work of this thesis explores how architectural thinking and working can contribute to providing sustainable alternatives to the foreseeable future positioning its viewer into a productive future.

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1.0 INTRODUCTION

1.1 PANDORA'S BOX

*"Here even a child will begin a story about his grandmother with the words: 'in those days the river wasn't here, and the village was not where it is...'"*¹

The terrestrial biosphere is forever changing, orchestrated and influenced by a complex array of creatures within natural ecosystems, but perhaps none more prevalent than that of humanity. Since the beginning of human existence, mankind has altered the land beneath their feet, utilizing the natural resources of their lived environment. The advent of agricultural systems revolutionized humanity's ability to shape the biosphere of earth. Transforming native ecosystems into cultivated fields, pastures, settlements, and engineered environments has opened a pandora's box of transformative power for agricultural societies, fueling human population growth of unprecedented sizes and producing drastic societal developments.² This thesis examines potential climate futures through both speculative and surrealist lenses to explore how architectural thinking and working methods intersect with these ideas.

1. Gosh, Amitav. *'The Great Derangement: Climate Change and the Unthinkable.'* (The University of Chicago Press, 2016), 6.

2. Ritchie, Hannah. *'Half of the World's Habitable Land Is Used for Agriculture.'* (University of Oxford, 2019) *Environments*. (UCL Press, 2020), 6.

1.2 THE AGRICULTURAL EXPANSION

Propelled by a growing human demand, the agricultural industry has continued to expand in terrestrial coverage and in production proficiency in forms of complex irrigation systems, industrial manufactured fertilizers, and the widespread use of commercial pesticides. This agricultural expansion has both directly and indirectly affected ecosystems on a global scale in less than favourable manors.³ The mass irrigation systems now required to meet the demand of the global production of agriculture necessitates 70 percent of the earth's freshwater supply. Fertilizers struggle sustainably as foundational ingredients such as phosphorus is in limited supply and nitrogen, also key in fertilizers' makeup, requires a fossil fuel intensive process. Pesticides, through leaking into their surrounding areas of their application, have decimated what natural environments are left surrounding farmlands.⁴ These risks faced by earth's ecosystems are dwarfed by agriculture's growing demand for

3. Rodriguez, Elizabeth, Ryan Sultan, and Amy Hilliker. 'Negative Effects of Agriculture on Our Environment.' (The Traprock, 2004), 31.

4. Rodriguez, Elizabeth, Ryan Sultan, and Amy Hilliker. 'Negative Effects of Agriculture on Our Environment.' (The Traprock, 2004), 28-32.

land, diminishing what natural environments remain on this planet with agricultural expansion in service of endless growth.

With a water to land ratio of greater than 3:1, earth's overall solid terrain only makes up 29 percent of the planet's overall surface, ten percent of which is frozen beneath glaciers and ice, while another 19 percent is barren deserts. This only leaves 71 percent of land on earth inhabitable to the wide majority of terrestrial based organisms including humans. Of this land half has been allocated for agriculture and continues to acquire more land to meet the demand of the growing human population.⁵ The current trajectory of this industry is unsustainable both in ratio of demand to available land but also in consequences of elimination of ecosystems and species found within them.

5. Ritchie, Hannah.
'Half of the World's
Habitable Land Is
Used for Agriculture.'
(University of
Oxford, 2019)

Fig.01 Global Land
Use Chart

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Aerial view of farm-
land and landscape
near the city of Khon
Kaen noeth east in
Thailand.*

1.3 SIDE EFFECTS

The human population and their use of land has determined the changing aspects of the terrestrial ecosystems on earth. Humanity has demonstrated little foresight to the scale of damage and the resulting planetary changes that would accelerate beyond their control, leading to an alarming imbalance to the earth's ecosystems.⁶ Earth has seen a retreating of mass glacier formations, shifting in once stable climatic weather patterns, and the shifting in plant and animal ranges that a growing scientific consensus attributes to human decisions and activity. Climate extremes, such as droughts, floods and extreme temperatures have greatly increased in recent history affecting populations of human and nonhuman alike.⁷

*"In the Anthropocene, there is no possibility of removing human influence from ecosystems: anthropogenic transformation of the terrestrial biosphere is essentially complete and permanent. What has not already been altered directly, we are now altering indirectly"*⁸

Pandora's box has been opened and can not be closed again. Earth faces major issues in this new epoch that can only be solved by finding new solutions rather than trying to make everything as it once was.

6. Ellis, Erle. '(Anthropogenic Taxonomies) A Taxonomy of the Human Biosphere.' (Harvard Graduate School of Design, 2014), 169.

7. Anderson, Jason. 'Climate Change and Natural Disasters: Scientific Evidence of a Possible Relation between Recent Natural Disasters and Climate Change.' (EP ENVIRONMENT COMMITTEE, 2006), 2.

8. Ellis, Erle. '(Anthropogenic Taxonomies) A Taxonomy of the Human Biosphere.' (Harvard Graduate School of Design, 2014), 180.

2.0 SITE ANALYSIS

2.1 THE KEY

Today, over 160 countries face a high mortality risk for over a quarter of their population from one or more natural disasters.⁹ Southern Asia is home to a large number of these countries and experiences more natural disasters than anywhere else on earth. The United Nations ESCAP recorded an estimated 2 million deaths in Asia as a result of natural disasters between 1970 and 2014 and over 6 billion people have been affected during this time. These numbers reflect 56.6 percent of the fatalities globally and 87.6 percent of people affected by natural disasters worldwide. Global warming is having critical effects in Asia.¹⁰ From its technocratic causes to philosophical and historic implication and most importantly the possibility of a global response, Asia has and needs to play a part. The issue today is these implications are rarely addressed. Much of climate matters and conversations around the Anthropocene are seemingly a Eurocentric issue. Yet both the victims and the major contributors to the climate crisis reside in Asia.¹¹

*"The brute fact is that no strategy can work globally unless it works in Asia and is adopted by large numbers of Asians."*¹²

9. UNU-EHS. 'The World Risk Report 2013 - Health and Healthcare.' (Alliance Development Works, 2013), 1.

10. Kim, Sung Eun, Ho Miu David Li, and Jonghyo Nam. 'Overview of Natural Disasters and Their Impacts in Asia and the Pacific, 1970-2014.' (United Nations ESCAP, 2015), 7.

11. Gosh, Amitav. 'The Great Derangement: Climate Change and the Unthinkable.' (The University of Chicago Press, 2016), 90.

12. *Ibid.*, 90.

Fig.03
 Cities at Risk of Sea
 Level Rise Americas

CITIES WITH 10 MILLION +	-NEW YORK -LIMA -BUENOS AIRES	URBON POPULATIONS AT RISK BY 2050s	10 Million+ ●	5m-10m ●	1m-5m ●	0.1m-1m ●
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Fig.04
 Cities at Risk of Sea
 Level Rise Eurasia

CITIES WITH	- LONDON	- ISTANBUL	- MUMBAI	- BANGKOK
10 MILLION +	- DAKAR	- DAR ES SALAAM	- CHENNAI	- JAKARTA
	- LAGOS LUANDA	- KARACHI	- DHAKA	- SHANGHAI

2.2 THAILAND

Thailand, found in Southeast Asia, is among the top ten countries worldwide most exposed to climate change.¹³ Rising sea levels and increasing frequency of extreme weather events leaves the country highly vulnerable to natural disasters. Southeast Asia holds the greatest quantity of coastline at extreme risk of flooding across the developed world and approximately ten percent of this coastline lies in Thailand thus significantly contributing to the country's increasing level of susceptibility to tropical storms and severe flooding.¹⁴ Many of earth's major Delta Cities including New Orleans, Tokyo, Shanghai and Bangkok are sinking.¹⁵ Bangkok, Thailand's capital and largest city, is increasingly putting their 15 million residents (almost a quarter of Thailand's population) in sever risk of natural disasters. Thailand's capital is descending more than 1 cm per year which is 4 times faster than the predicted sea level rise.¹⁶ By the year 2030 Bangkok could be below sea level.

13. Prakash, Amit. "Boiling Point." (FINANCE & DEVELOPMENT, 2018), 22.

14. Ibid., 25-26.

15. 'Sinking Cities: An Integrated Approach towards Solutions.' (Deltares - Taskforce Subsidence, 2013), 6-7.

16. Bremard, Thanawat. 'SINKING BANGKOK: THE INTERPLAY OF POLICY COALITIONS, DISCOURSES AND UNCERTAINTIES.' (National University of Singapore, 2020), 11.

The rapidly expanding city of Bangkok has seen much of the natural landscape replaced with a concrete jungle of a growing mega city, with surrounding land dedicated to a combination of agriculture and aquaculture. The land use policies made within the region have created an imbalance with the natural ecosystem of Thailand, eliminating the land's absorbent capabilities and ability to decrease the severity of natural disasters. The Thai had once lived in harmony with the cycles of wet and dry seasons, celebrating floods as they would fertilize the land. Within today's modern society, floods represent pain and hardship as Thailand's cities have become severely susceptible and vulnerable to natural disasters.¹⁷

17. Engkagul, Surap-
ee. 'Flooding Features in Bangkok and Vicinity: Geographical Approach.' (*Geographical Journal*, 1993), 335.

*Fig.05 2004 Tsunami
Aftermath of tsunami
which devastated
countless regions of
back in 2004*

2.3 CURRENT DEFENCE

A re-evaluation of flood management in Thailand and much of the world is necessary. Current approaches of dikes, levees and floodwalls only provide temporary relief from floods and sea level rise and result in detrimental side effects by cutting off natural marine ecosystems which once created vibrant coastal biomes with the formerly soft shorelines. These types of interventions simply deflect energy to nearby areas, and they are also prone to failure, which could lead to catastrophic consequences.¹⁸ A naturalistic approach might be the right step forward to start a restorative project. Natural ecosystems bring balance to the world with ancient designs more powerful than human made flood walls and side effects that improve the way of life rather than separating it.

18. Lohatepanont, Ken, and Phanawat Ayanaputra. 'Sinking Cities.' (Bangkok Post, 2019)

Fig.06
Weir & Locks -
Hagestein, Netherlands

2.4 MANGROVE IMPACT

Thailand is a littoral nation with a coastline that stretches 2,614 kilometres across the Andaman Sea and the Gulf of Thailand.¹⁹ The country's coastal zone is native to one of earth's most unique and vital forests, the mangrove which can be found fringed across 50 percent of this coast. To date these forests take up 167,582 hectares, 80 percent of which is located on the west coast of the Andaman Sea while the remaining 20 percent is on numerous points along the coastline of the Gulf of Thailand.²⁰

Estimated to contain anywhere between 50 and 110 species, all mangrove trees have the distinct ability to live in ocean and brackish waters as they are able to excrete salt through their leaves. Situated between land and sea the mangrove provides an ideal nursery for a wide variety of marine species as the tangled root systems of the trees provide protection for juvenile fish.²¹ The mangrove tree's deep root system also helps limit erosion along the coast while distributing nutrients to the surrounding seas.

19. Siripong, Absornsuda. 'DETECT THE COASTLINE CHANGES IN THAILAND BY REMOTE SENSING.' (Chulalongkorn University, 2010), 992.

20. Havanond, Dr Sonjai. 'NATIONAL REPORT on Mangroves in South China Sea-Thailand.' (United Nations Environment Programme, 2003), 1-2.

21. Ibid., 6-7.

Along with marine life, mangrove forests also aid in the success of terrestrial species, providing a habitat for rodents and a diverse assortment of tropical birds. A healthy and diverse mangrove forest acts as a first line of defence against tidal storms that can bring in heavy waves and strong winds, protecting coastal communities acting as a natural sea wall. Serving as a carbon sink with the ability to capture up to four times that of the rainforest, the mangrove is vital in large urban areas to mitigate the greenhouse effects put off by mega cities such as Bangkok.²²

22. Sathirathai, Suthawan, and Edward. B Barbier. 'VALUING MANGROVE CONSERVATION IN SOUTHERN THAILAND'. (WEAU, 2007), 109-110.

Fig.07 Mangrove Tree
Benefits

2.5 THREATS TO MANGROVE

More than 35 percent of the world's mangrove forests to date have been cleared from their native locations and in countries such as India, Vietnam and Thailand those percentages are reaching higher than 50 percent.²³ Intensive aquaculture expansion in coastal areas of Thailand is greatly responsible for the decrease of mangrove forests in the country. The remaining mangrove flora that still resides in patches of the coast of Thailand face looming threats both of the continual expansion of aquaculture ponds and rising seas levels which will impact the chemical and physical properties of the mangrove.²⁴

The unsustainable human approaches to stewardship of mangrove forests has not only felt the loss of valuable attributes that mangrove forests offer but also greatly harms the mudflats, seagrasses and reefs that depend on the coastal forest. With no trees to stop erosion in heavily deforested areas sediment levels are imbalanced and entire ecosystems are affected.²⁵

23. Alongi, Daniel M. 'Present State and Future of the World's Mangrove Forests.' (Australian Institute of Marine Science, 2002), 331-332.

24. Havanond, Dr Sonjai. 'NATIONAL REPORT on Mangroves in South China Sea-Thailand.' (United Nations Environment Programme, 2003), 18-21.

25. Lugendo, B. R., I. Nagelkerken, G. Van Der Velde, and Y. D. Mgaya. "Journal of Fish Biology." (Fsb, 2006), 1639-1641.

26. Mangrove Action Project. "Issues at Hand." (Accessed, 2020)

*Fig.08 Mangrove Sap-
ling in Deforested
Coast*

CONSEQUENCES OF MANGROVE LOSS

- + Fisheries Declines
- + Threats to Migratory
Bird Species
- + Degradation of Clean
Water Supplies
- + Salinization of Coastal
Soils
- + Erosion and Land Subsidence
- + Release of Carbon Dioxide
into the Atmosphere
- + Loss of coastal protection
from storms and tsunamis

UNSUSTAINABLE DEVELOPMENTAL THREATS

- + Shrimp Aquaculture
- + Charcoal Production and
Logging
- + Oil Exploration and
Extraction
- + Tourism
- + Urbanization and Urban
Expansion
- + Ports and Roads²⁶

*Fig.09 Thailand Cen-
tral Coast Aquacul-
ture Ponds*

*Fig.10 Thailand Cen-
tral Coast Aquacul-
ture Ponds*

Fig.11-13 Thailand Central
Coastline Recession

3.0 DESIGN APPROACHES

3.1 INTRODUCTION

After the initial shock of the occurrence of a natural disaster in an urban area anywhere in the world, people generally resume their lives as their daily attention is averted elsewhere. The pressing issues made visible by these natural disasters only capture fleeting attention and ultimately fail to capture coherent narratives for the deeply interconnected causes and consequences of these disasters. The current techniques and means of representation of climatic issues allows humanity to observe the starving polar bears and their diminishing habitats or the satellite images of hurricanes and floods that decimate our cities, but fail to create any cohesion or balance between people, habits and the world we live in.²⁷

*"we have become so enamored of our ability to describe large-scale and systemic environmental transformations that we create a false and irresponsible separation between people and nature, inducing a kind of pity for the living world."*²⁸

27. Ghosn, Rania, and El Hadijazairy. 'Geostories: Another Architecture for the Environment.' (Actar, 2018), 17-18.

28. Ibid., 18.

If the current methods of describing the climatic issues facing our planet are indigestible and unrelatable then perhaps a shift in perspective and representation is in order. Prevailing ontologies and epistemologies separate people and the earth in which we live, framing a vision of a world to be conquered and its resources exploited. We now find ourselves at a crisis in our story. Is this crisis the end of a tragic tale or the climax of one yet to have been completed? The next chapter in this tale needs to ensure that earth is an 'integral' rather than 'incidental' part of the narrative if humanity wishes to correct this current trajectory.²⁹ Hope needs to be provided by not only expressing the issues that face our planet and inherently our species but also provide possible solutions to our damaged world. This thesis aims to use architectural thinking and methods to confront these issues drawing from a variety of perspectives and vantage points, and designing with speculative sensibilities, in order to explore alternative futures and vantage points on which we can view our world.

29. Ghosn, Rania, and El Hadijazairy. 'Geostories: Another Architecture for the Environment.' (Actar, 2018), 17.

3.2 SURREALIST METHOD

3.21 SURREALIST METHOD

*"As we watch the sun go down, evening after evening, through the smog across the poisoned waters of our native earth, we must ask ourselves seriously whether we really wish some future universal historian on another planet to say about us: 'with all their genius and with all their skill, they ran out of foresight and air and food and water and ideas', or 'They went on playing politics until their world collapsed around them'"*³⁰

This warning given by Burmese statesmen and secretary-general of the United Nations U Thant in 1971 paints a haunting image of outsiders looking in.³¹ Witnessing humanity's misguided focus and self-inflicted downfall, these strangers look on with judgmental eyes at the demise of human civilization, our collapse seemingly so preventable from their perspective. It is often the case in one's life that strategic decisions present themselves once the proper distance and time from the situation has occurred.

The climatic issues facing planet earth intrinsically fall into this category as the scale and severity of earth's current state is incomprehensible at the myopic position that people live their lives.

30. Gosh, Amitav.
'The Great Derangement: Climate Change and the Unthinkable.'
(The University of Chicago Press, 2016),
113.

31. *Ibid.*, 113.

"People observe daily weather changes but they do not perceive climate... weather is experienced locally, while understanding the global effects of climate change would require perceiving the world as a whole."³²

What if U Thant's future historians built a museum of our history? What would these exhibits present? Would the isolated nature of museum displays that see objects removed from their context present new perspectives of our current world? Could exhibiting the Central Gulf of Thailand in a range of scales and intricacies from the miniature to the gigantic allow for our eyes to focus and comprehend each individual character and its purpose until the assemblage of all these pieces can be understood as a whole? Using the tool of surrealist imagery, the following exhibits explore these questions creating spaces for the viewer to "escape external structures, to peer into unconscious interiors and explore what's hidden there."³³

32. Ghosn, Rania, and El Hadijazairy. 'Geostories: Another Architecture for the Environment.' (Actar, 2018), 11.

33. Wango, Dr. Kamau. 'Drawing with My Students' (International Journal of Advanced Research, 2021), 3.

3.3 MUSEUM OF THE FUTURE

3.31 TIMELINE EXHIBIT

An exhibit derived in accordance with U Thant's concerns for our plant, 'Timeline' displays coastal Thailand at pivotal stages in history. Walking down the catwalk one peers down into pits each frozen in time. The row to your right displaying biomes largely uninhibited by human structures, rich in diversity and manner of life. To the left a display reflecting that of the right but in a time past the advent of the industrial revolution, a time where people rule the earth, claiming acreage for their cities and farms, early warning signs of misguided land use can be observed creeping from the sea. The following rows next to these display the current trajectory of many delta cities around the world, a future where storms rage and water cover our cities, a future past our saving.

Fig.14
Museum of the Future
- Timeline Exhibit

3.32 MANGROVE EXHIBIT

Separated from the busy world of today, the following exhibit encloses its viewer in a room surrounded by select characters integral to the success of coastal ecosystems across the equator. Central in the room and to this story lies the sapling of a mangrove, its roots digging into soil covered in a layer of water while other arms reach to sediment past the height of the water level in the room. With nothing else to distract your attention you observe the shadows the young tree casts, the light from above that only partially penetrates through its leaves and patterns in the ground created due to the interaction of sediment, water and the roots of the young tree. The room draws your attention to a system and species greatly overlooked in human history but possess the ability to bring hope to the coast.

Fig.15
Museum of the Future
- Mangrove Exhibit

3.33 FLORA EXHIBIT

On a boat at sea looking towards the shore, or on a plane in the sky peering down at the ground below, a forest is observed as but a single entity, an object viewed as a whole. In contrast to this perspective, when surrounded by the flora, the likes of black mangrove, tropical ferns, and palm trees, are so unmistakably their own individual entities and separate from the world around them. Viewing the forest from either perspective reveals unique characteristics about its web-like structure and varying tendencies within its makeup. In an attempt to bring together such qualities understood from unique vantage points the following exhibit gives each species that contributes to the flora of the mangrove its own space within the room, learned from individually, yet understood within the web in which it is connected. (See Appendix A)

Fig.16
Museum of the Future
- Flora Exhibit

3.34 BELOW SEA-LEVEL EXHIBIT

The sea is a barrier to much of the world where humanity lives, limiting our access and understanding of the biomes in its depths below. But what if water was not a barrier that separated us from the ocean? What if we could walk past the blockade of the coastline? What could we learn of the connections between land and sea? Propelled into such a world, you walk along the mudflats, along the gulf of Thailand in this last exhibit, observing where land once met sea over your left shoulder and the swaying seagrass over your other. Fish swim across your path and disappear in the grass fields below sea-level while fishing boats float above your head ready to check the crab nets lowered in the water the day before. This perspective of sea life below provides a new awareness of the finite connections and balance that can be created between all manor of life. (See Appendix B)

Fig.17
Museum of the Future
- Below Sea-Level
Exhibit

3.4 SPECULATIVE METHOD

3.41 SPECULATIVE METHOD

*"nothing on Earth or anywhere else stands still. The images of our future and the environment we live in should consist of more than holding on with white knuckles to what we have because, truly, this isn't obtainable."*³⁴

The earth is in constant motion, rotating beneath our feet, shifting its tectonic plates below its crust, and altering the shape of its coastlines with the rolling of tides. Nature is not static but constantly moving and evolving, making a clear view into the future a difficult task and designing for said future even greater of a challenge. But like an early explorer's vessel guiding the way to unmapped territory, meditated speculative designs can be used as a tool to *"transform our own present into the determinate past of something yet to come."*³⁵ Providing design sensibilities for an imagined future, architecture can influence the mindset of others toward responsible and innovative future conduct, giving hope with the

34. Lally, Sean. 'The Air from Other Planets: A Brief History of Architecture to Come.' (Lars Müller Publishers, 2014), 25.

35. Ibid., 10.

introduction of alternative futures. The purpose of this transformation is not simply to keep a vision of the future alive but also to point out current issues and develop plans so that these shortcomings do not ultimately hinder future developments.³⁶

'Stories and ideas matter for the Earth' They can be used to understand earth's intricacies, provide alternative lifestyles and ways of seeing. Stories can be a means of 'world making' and speculative architecture can be the paper on which to write such a story. *"In the face of gloomy ecological predictions for the Earth, speculative fiction might help us comprehend such new worldly conditions and reflect on reality without realism, without optimization, without determinism, and without fear of the cosmic scale."*³⁷

36. Lally, Sean. 'The Air from Other Planets: A Brief History of Architecture to Come.' (Lars Müller Publishers, 2014), 23.

37. Ghosn, Rania, and El Hadijazairy. 'Geostories: Another Architecture for the Environment.' (Actar, 2018), 21.

3.42 THE BLUE REVOLUTION

The human population has seen drastic growth since the advent of the industrial revolution. A planet with a human resident count of about 1 billion 200 years ago now in 2021 sees that number approach 8 billion.³⁸ With a predicted trajectory of 11 billion people worldwide within the next 100 years, the global agricultural industry would need to increase production by an unmanageable percent over the next century to meet the demand of such a population.³⁹ With today's agricultural practices' heavy reliance on land and freshwater, two resources in a limited supply, a production increase of this magnitude is not feasible to feed the populations predicted in our near future.

There is one place on earth where the space and water required to meet the agricultural demand of the growing human population can be met, the deep ocean. Seventy percent of earth's surface is covered by ocean, half of which is classified as a biological desert (biological productivity is completely absent).

38. Roser, Max, Hannah Ritchie, and Esteban Ortiz-Ospina. "World Population Growth." (University of Oxford, 2019)

39. Jones, Robert. 'Towards a Blue Revolution: Catalyzing Private Investment in Sustainable Aquaculture Production Systems.' (The Nature Conservancy and Encourage Capital, 2019), 24.

Cultivating these empty spaces poses no threat to sea life as they are located thousands of miles away from the nearest marine ecosystems. Aquaculture in the deep ocean has the potential to feed upwards to 100 billion people with 300 million square km of open sea to farm, allowing for a released burden of land-based farms.⁴⁰ But how do you operate and maintain something as labour intensive as a fish farm while it sits thousands of miles out to sea? The answer has always been 'you simply can not.' But with countries, including the United States, Philippines, China and Norway, invested in finding answers to this question, the reality of deep ocean farming is on the horizon.⁴¹

The Blue Revolution is upon us, ostensibly providing solutions to many environmental matters that seemingly before such a reality had no answers. This in turn could provide a stage for a yet unperceived future. What would a world having relocated farming and consequently shifted its reliance off the occupation of land and freshwater look like? How will land once dedicated to farming be redistributed? How will this affect the local small-scale farming industry if large agriculture production moves out to sea? Will we misuse such an

40. Jones, Robert. 'Towards a Blue Revolution: Catalyzing Private Investment in Sustainable Aquaculture Production Systems.' (*The Nature Conservancy and Encourage Capital*, 2019), 24-25.

41. *Ibid.*, 67.

opportunity, once again failing to assign value to nature, or conversely work towards creating a more sustainable future? Speculating the effects of this next revolution, this thesis situates itself within such a world, exploring design possibilities in a time where land is not monopolized by agriculture. What possibilities would present themselves within this future for a delta city such as Bangkok? What could become of the aquaculture fields that separates the city from the gulf of Thailand or the coastline once lined with mangrove forests and a diverse array of aquatic species?

Fig.18 SalMar Off-
shore Fish Farm

3.43 THE RECONNECTION

*"It is a great testimony to the connectedness of life on earth that the fates of the largest and the tiniest life should be so closely dependent on each other."*⁴²

There is an unrelenting interaction within the natural world that transpires between that of living organisms and the non-living elements on earth. These relations are foundational in the health and balance of ecosystems, each element of nature a piece of a puzzle that is not complete if these relationships are broken. The complexity of these connections, and the web of which they create, seemingly expand as myopic research in niche disciplines reveals additional layers of integral relationships within nature. These networks can reach great distances, across ecosystems separated by sizable geological space yet remain no less integral to the health and success of said ecosystem.⁴³

For centuries the marshes and mudflats along the coast of Thailand relied on such an interaction, dependent on the fluctuation of the rivers during the monsoon seasons to carry sediment from the Chao Phraya river valley down to the coast. Intertidal sediment accumulations allowed seaside flora to cope with tidal changes but the advent of expansive farmlands, dams, levees, and

42. Johnson, Steven. *'The Ghost Map: The Story of London's Most Terrifying Epidemic and How It Changed Science, Cities, and the Modern World.'* (Riverhead Books, 2006), 96.

43. Erik Jørgensen, Sven. *'Integration of Ecosystem Theories: A Pattern: A Pattern.'* (Kluwer Academic Publishers, 2002), 1.

the city sprawl all but cut off this connection preventing the coast from adjusting to the rise of the sea. The effects of this sever produced major imbalance and loss spanning the urban to the rural, the terrestrial to the aquatic, clearly demonstrating the importance of these natural interactions by the effects of their absence.⁴⁴

The sizable exodus of agricultural production in and around Bangkok provided a major opportunity for a fundamental shift in the metropolitan configuration. Space once allocated to shrimp pods were given the ability to rest. The crowded city given an opportunity to introduce green veins of life, reconnecting ecosystems cut-off from one another, effectively reintroducing old paths for water to flow that once ran into streets and homes of the people of Bangkok.

The proximity and interaction of the natural and urban has provided new conditions and ultimately new ways of observing and integrating with the natural world, reintroducing a dependence and appreciation for the ecosystems that provide life for humanity. It must be remembered that humanity along with all other living things falls into this web of interaction ultimately connected to the natural world and affected and dependent on its balance.

44. Pumijumnong, Nathsuda. "Mangrove Forests in Thailand." (*Springer Science+Business Media New York, 2014*), 63.

Fig.19 The Reconnection Drawing 1

Fig.20 The Reconnection Drawing 2

3.44 A NEW FARMING SYSTEM

The turn of the 21st century saw Thailand's fishery industry climb to be among the world's largest, producing and exporting aquaculture-based products at a rate unmatched in its time.⁴⁵ As previously discussed, the age of the blue revolution greatly impacted and influenced the reshaping of the urban plane in Bangkok, but perhaps stimulated an even greater impact and certainly more direct changes in the development and formation of land-based aquaculture along the central coast of Thailand. The reduction in demand of this coastal farming and subtraction of the previous mandate on the land provided new opportunities for farmers to positively impact their agricultural practices.

Although seemingly advantageous to local farmers, more sustainable and secure aquaculture systems such as 'silvofisheries,' that plant mangrove trees alongside shrimp ponds, received major reluctance from farming communities before the blue revolution.⁴⁶ Even with government incentives, establishing such structures reduced the ponds' potential yield and with land in such high demand and a competitive market, such systems were not plausible for many farmers. The emigration of large-scale characters in the farming market allowed local farmers to

45. Huitric, Miriam, Carl Folke, and Nils Kautsky. 'Development and Government Policies of the Shrimp Farming Industry in Thailand in Relation to Mangrove Ecosystems.' (*Ecological Economics*, 2002), 443.

46. Takashima, Fumio. 'Silvofishery: An Aquaculture System Harmonized with the Environment,' (1994), 13.

seriously consider and implement silvofisheries or similar systems. These systems' ability to increase biodiversity, reduce coastal erosion, saltwater intrusion, and increase the success rate of shrimp larva increasingly gained the favour of farmers and saw their implantation along the coast.⁴⁷

Even with the major industry shift from the shores of Thailand, coastal farmers still play a major role in the success of deep-sea aquaculture. The growing of juvenile shrimp, for example, are highly susceptible to diseases that can wipe out an entire crop. But hatcheries closely resembling that of their natural environment have a much greater success rate than that of an artificial or foreign environment.⁴⁸ For this reason, the deep-sea farming corporations rely on community farmers like those in Thailand to provide them with juvenile aquatic species too fragile to grow during early stages of their life out at sea. With a healthy relationship with these corporations and the room to continue to grow food for their local communities, the farmers of Thailand's coast have successfully adjusted with the changing of times, creating a more balanced and healthier world around them.

47. Takashima, Fumio. 'Silvofishery: An Aquaculture System Harmonized with the Environment,' (1994), 13-14.

48. Ibid., 14-16.

Fig.21 A New Farming
System Drawing 1

Fig.22 A New Farming
System Drawing 2

3.45 COASTAL GROWTH

Located off the Gulf of southwest Florida, between Cape Romano and the mouth of the Lostmans River resides a chain of unorthodox islands and mangrove islets, formed not by sand bars or rock formations but rather the conglomerate of countless shellfish. These oyster-bars-turned-islands reach heights and scales large enough to sustain plant life and have become the foundation on which mangrove trees along the gulf have dug their roots, expanding their ecosystem perceivably limited to a line that separates land and water.⁴⁹

Natural developments such as the Ten Thousand Islands have provided an organic blueprint for coastal redevelopment strategies, widening the boundary of rehabilitation potential. In sequence with the urban and rural developments in central Thailand, great strides were made along the coastal provinces of Samut Sakhon, Samut Prakan and Bangkok to reinstate the diversity of plant and animal life that once lined the gulf. The lack of presence of a great deal of flora and fauna native to these coastal regions inhibited the opening strategies for the reinstitution of many species. Requiring models much closer to the region of Thailand, the analysis of neighbouring countries with similar coastal conditions were studied to help imagine a productive gulf. The

49. Lara, Monica R., Jennifer Schull, David L. Jones, and Robert Allman. 'Early Life History Stages of Goliath Grouper *Epinephelus Itajara* (Pisces: Epinephelidae) from Ten Thousand Islands, Florida.' (Inter-Research, 2009), 224.

help imagine a productive gulf. The reintegration of the flora native to these coastal regions was a delicate process and without the involvement of the local communities surely would not have been possible.

Teaching those directly affected and familiar with the local territory of the ecology and biology to facilitate the natural regeneration of species like the red mangrove provided pride among local communities as their efforts empowered their people and protected those throughout the country. Their toil, resulting in the regeneration and health of the forests, mudflats, seagrass beds and coral reef, bring new jobs and opportunities to their people.

Neither this, nor either of the previously mentioned projects were results of quick acting designs, but required major shifts in the systems of power previously embedded and a mindset understanding the important benefits these interventions would provide, not in the time of their installation but for the future they could instill. Change is not always immediate but our actions to make change can last for generations.

Fig.23 Coastal Growth
Drawing 1

Fig.24 Coastal Growth
Drawing 2

4.0 CONCLUSION

4.0 CONCLUSION

The Narrative-based approaches explored in this thesis design for a time beyond our own, develop a world opposing that which we live, involuntarily draw from speculative prospects, and forge fictions of the imagination. The value of such stories often lacks serious contemplation from its viewer as the societal understanding of such work situates it in categories absent of real-world application.⁵⁰ Yet contrary to this understanding, narratives of this sort cannot help but incorporate nonfiction facts into a world of speculation.

The research and application of work from organizations such as the 'Mangrove Action Project,' that demonstrate the feasibility of coastal rehabilitation, or initiatives like 'Mangroves and Markets,' that provide real alternative sustainable solutions for shrimp farmers in Vietnam and Thailand, provide tangible examples in practise today, grounding narratives such as those presented in this thesis. Truly, the largest obstacle that stands in the way of such speculative futures from becoming a reality lies in the limits of human imagination within current ontological and epistemological frameworks and the general priorities of today's culture.

50. Lally, Sean. *'The Air from Other Planets: A Brief History of Architecture to Come.'* (Lars Müller Publishers, 2014), 25.

*"the climate crisis is also a crisis of culture, and this of the imagination"*⁵¹

People instinctively seek to position themselves within the narrative before them, checking its plausibility and where they may fit into such a world. Architecture can be used to enrich these stories, provide a relatability and foundation for self-insertion. Offering alternative lifestyles through designs integrated in the world and its natural elements can reveal so much more of our earth than the myopic position our current society does not provide. The work of this thesis does not claim to provide a solution to climate change or the challenges that face Thailand, but rather seeks to display the possibility of change, the importance of including the natural world with ours, and to expand paradigms of architectural practice to unearth new productive territories.

*"There is no such thing as a natural disaster. Nature doesn't make disasters we make disasters by not being able to design."*⁵²

51. Gosh, Amitav.
'The Great Derangement: Climate Change and the Unthinkable.'
(The University of Chicago Press, 2016),
9.

52. Da Cunha, Dilip.
'The Invention of Rivers.' Presented at
the Daniel Urban
Kiley Lecture, Harvard
GSD, (2019)

4.1 EPILOGUE

Fundamentally grounded in research and realistic hypotheticals the interpretation of speculative futures presented in this thesis heavily relied on worlds created on innovative technology and design strategies with parameters that make them as relevant in the future as they are today. With a desire to present viable alternatives to many of today's destructive systems, speculation was used to give such strategies a platform and chance to come to fruition through hypothetical futures. Through the use of digestible methods, engaging visuals and the insertion of technology present in varying scales of application in today's world, this design strategy intends to provide hope and present obtainable goals that can be enacted upon today.

As discussed in chapters prior, the 'crisis of the imagination' stems in many cases beyond an inability to imagine viable solution but rather is rooted in the myopic position people live their lives, obstructed with metaphorical blinders preventing a full view of the world. In an attempt to remove these blinders, the museum exhibits within this thesis were developed around the surrealist sensibilities of juxtaposition, abstraction of

normality and a desire to activate the unconscious mind through imagery. Such exhibit designs correspondingly reacted to the current museum structure. Aiding in the misunderstanding of our world, museums present their objects in a hierarchical fashion, isolating characters not truly understood in sterile display cases or hanging from museum ceilings. Giving the characters underrepresented and lacking appreciation the space and views they require along with unique displays of interaction, these exhibits desire to present new vantagepoints and characters to consider in hopes of widening the field of view of humanity. These exhibits in coordination with the speculative stories first present new ways of observing our world and then ways in which we can improve it.

The power of stories and those of fiction in particular resides in their ability to immerse its viewer into new worlds, allowing them to write their own sub chapters within these narratives, filling in details that only the reader has the knowledge to create. If truly immersive these worlds of fiction can provide the antidote to a society plagued with a crisis of the imagination, exploring new possibilities and ways

of seeing earth, encouraging those emerged within these stories to add to their complexity and diversity. The content and characters of the stories and worlds created within this thesis were finely tuned to address selected circumstances and climatic phenomena that transpire along the coastal shores of Thailand. But the methods of representation and stylistic choices presented in this work certainly have no bounds to the coast, Thailand or even Asia. This country is just one of many nations around the world that face looming environmental threats, and therefore our responses needs to be global, able to be applied and adapted across cultures and nation lines. Narratives provide such a universal connection, not refined to one language, continent or race, able to be molded to address planetary and molecular issues while providing the framework for new views of the world, acting as an instrument for the creation of ideas that can unite us in a cause to build a healthy future.

5.0 APPENDIX

APPENDIX A.

MANGROVE FLORA

In accordance with the United Nations Environment Programme the Global Environment Facility studied the geographical distribution at the habitat level of the mangrove flora in Thailand with major attention aimed at the mangrove forests that remain in the Gulf of Thailand. The national report recorded 71 species of both trees and shrubs that comprise the mangrove forests of the gulf of Thailand. Of these species, 27 are classified as "true mangroves" (species that are bound to saline or brackish water) and 44 are classified as "mangrove associates" (species of littoral vegetation of the landward zone of mangrove forests).⁵³ The distribution of these mangrove species forms in distinct zonal patterns, where a combination of species favors distinct environmental conditions. With little to no overlap of species competing for space, the flora of the coast works together to make a healthy and diverse forest. This flora is at risk though as many of the species that are vital in the balance of the mangrove forest are at risk of extinction and could greatly influence the success of the coasts of Thailand.⁵⁴

53. Havanond, Dr Sonjai. 'NATIONAL REPORT on Mangroves in South China Sea-Thailand.' (United Nations Environment Programme, 2003), 3-4.

54. Ibid., 2.

Fig.25 Mangrove Life
Cycle

01

MANGROVE TREES PRODUCE
SMALL YELLOW FLOWERS
USUALLY FROM FEBRUARY TO
APRIL

02

THE FLOWER DOES NOT PRODUCE
SEEDS LIKE MOST OTHER FLOWERS
BUT INSTEAD PRODUCE YOUNG TREES
CALLED PROPAGULES.

03

THE GERMINATED PROPAGULE
CONTINUES TO GROW FROM
THE FLOWER

04

AFTER ABOUT 12 MONTHS THE
PROPAGULE HAS GROWN LARGE
ENOUGH TO FALL OFF THE TREE

05

THE PROPAGULE MAY LAND IN THE
MUD AND START GROWING
IMMEDIATELY OR TRAVEL IN THE
WATER FOR UP TO 24 MONTHS

06

AFTER THE PROPAGULE HAS LANDED
IN SOIL IT WILL START GROWING ITS
ROOTS, WITHIN 6-10 WEEKS LEAVES
WILL START SHOOTING

ACANTHACEAE

- AMARANTHACEAE**

- APOCYNACEAE**

- ARECACEAE

- ASTERACEAE**

- AVICENNIACEAE

- BEGONIACEAE**

- BIGNONIACEAE**

- BURSERACEAE**

- CALOPHYLLACEAE**

- COMBRETACEAE

- EBENACEAE

- EUPHORBIACEAE

- FABACEAE

- GOODENIACEAE

- LAMIACEAE

35. *Premna serratifolia*
36. *Volkameria inermis*

Fig.26 Mangrove Flora Chart

LECYTHIDACEAE

- 37. *Barringtonia asiatica*
- 38. *Barringtonia racemosa*

LYTHRACEAE

- 39. *Pemphis acidula*
- 40. *Sonneratia alba*
- 41. *Sonneratia caseolaris*

MALVACEAE

- 42. *Heritiera littoralis*
- 43. *Thespesia populnea*

MELIACEAE

- 44. *Aglaia cucullata*
- 45. *Xylocarpus granatum*
- 46. *Xylocarpus moluccensis*
- 47. *Xylocarpus rumphii*

MELASTOMACEAE

- 48. *Melastoma villosa*

MORACEAE

- 49. *Ficus microcarpa*

MYRISTICACEAE

- 50. *Horsfieldia irya*

MYRTACEAE

- 51. *Melaleuca cajuputi*

PANDANACEAE

- 52. *Pandanus odoratissimus*

PRIMULACEAE

- 53. *Aegiceras corniculatum*
- 54. *Ardisia elliptica*
- 55. *Rapanea porteriana*

PTERIDACEAE

- 56. *Acrostichum aureum*
- 57. *Acrostichum speciosum*

RHIZOPHORACEAE

- 58. *Bruguiera cylindrica*
- 59. *Bruguiera gymnorrhiza*
- 60. *Bruguiera hainesii*
- 61. *Bruguiera sexangula*
- 62. *Ceriops decandra*
- 63. *Ceriops tagal*
- 64. *Kandelia candel*
- 65. *Rhizophora apiculata*
- 66. *Rhizophora mucronata*

RUBIACEAE

- 67. *Guettarda speciosa*
- 68. *Scyphiphora hydrophylacea*

SALICACEAE

- 69. *Scolopia macrophylla*

SAPINDACEAE

- 70. *Allophylus cobbe*
- 71. *Pouteria obovata*

TILIACEAE

- 72. *Brownlowia tersa*

1. RED MANGROVE	4. YELLOW MANGROVE	7. BURMESE MANGROVE
2. LOOP-ROOT MANGROVE	5. NARROW-LEAVED KANDELIA	8. RED MANGROVE HYBRID
3. SPURRED MANGROVE	6. WHITE BURMA MANGROVE	9. BLACK MANGROVE

Fig.27 Mangrove
Family Tree

APPENDIX B.

Mangrove + Mudflats + Seagrass

*Mudflats, seagrass beds and the coral reef all play a part in an interconnected system with the mangrove flora to create arguably earths most diverse and important ecosystems. Mudflats, also known as intertidal zones, neighbour mangrove forests in sheltered estuaries and bays. Comprised of a buildup of sediment, mudflats are flooded at high tide and provide a rich ecosystem for nesting and breeding birds, fish and crustaceans. Providing food and income for local populations, mudflats also serves as a barrier between land and sea for coastal communities.*⁵⁵

*Seagrass fields which can be found in shallow salty and brackish waters serve as the succeeding habitat in the life cycle of many marine species following life in mudflat beds and the mangrove forests. Providing food and shelter for a wide verity of species ranging from large fish, turtles, marine mammals, birds and invertebrates seagrass beds are productive ecosystems heavily aiding in the success of coral reef construction.*⁵⁶

55. Foster, Natalie, Malcolm Hudson, Simon Bray, and Robert Nicholls. 'Intertidal Mudflat and Saltmarsh Conservation and Sustainable Use in the UK: A Review.' (University of Southampton, 2013), 96-97.

56. Nordlund, Lina Mtwana, Emma L. Jackson, Masahiro Nakao-ka, and Jimena Samper-Villarreal. 'Marine Pollution Bulletin: Seagrass Ecosystem Services-What's Next?' (Elsevier Ltd, 2018), 145-146.

Fig.28 Coastal Thai-
land Ecosystem Loca-
tions

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