SEA REGION

ARCHITECTURE OF TERRITORY

ETH Zurich DArch
FCL Singapore

Assistant Professorship of
Architecture and Territorial Planning
Project 2, 2014

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Hans Hortig, Stefanie Krautzig

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Singapore, Johor, Riau Archipelago

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Research and Design Project

ARCHITECTURE OF TERRITORY investigates phenomena and processes of urban transformation of contemporary territories. It comprises a shift of interest from cities to broader territorial frames and to what was once considered as the non-urban realm or the city's "constitutive outside": the nature, the ocean, the rural, the wild.

SEA REGION project builds on the research of the hinterlands of contemporary cities since 2011, where Singapore and its multiple territorial imprints have served as the paradigmatic research case.
SEA REGION project on the tri-national space of Singapore, Johor and Riau was carried out with students from the ETH Zurich, collaborators, experts and guests.

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Book Colophone

Five different works on the Sea Region were prepared by the students and are brought together in this book.

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เกาะหิมพานต์ฝั่งตะวันตก

เกาะหิมพานต์ฝั่งตะวันออก

ปากน้ำประแส

ปากน้ำบางปะกง

ปากน้ำเจ้าพระยา

ปากน้ำแม่กลอง

ปากน้ำปราณบุรี

ปากน้ำประจวบคีรีขันธ์

ปากน้ำชุมพร

ปากน้ำหลังสวน

ปากน้ำไชยา

ปากน้ำพังงา

ปากน้ำตะกั่วป่า

ปากน้ำระนอง

ปากน้ำกระบุรี

ปากน้ำปากจั่น

ปากน้ำบางตะบูน

ปากน้ำแม่น้ำเพชรบุรี

ปากน้ำบางตาล

ปากน้ำบางขุนเทียน

ปากน้ำสมุทรสาคร

ปากน้ำสมุทรปราการ

ปากน้ำเกาะสีชัง

ปากน้ำแหลมสิงห์

ปากน้ำบางปู

ปากน้ำบางพระ

ปากน้ำแหลมฉบัง

ปากน้ำบางละมุง

ปากน้ำพัทยา

ปากน้ำเขาสามมุข

ปากน้ำบางกะจะ

ปากน้ำแหลมงอบ

ปากน้ำตราด

ปากน้ำเกาะกูด

ปากน้ำเกาะช้าง

ปากน้ำเกาะกง

ปากน้ำเกาะกูด

ปากน้ำเกาะช้าง

ปากน้ำเกาะกง

CHINA SEA

SINGAPORE STRAIT

JOHORE

SINGAPORE ISLAND

JOHORE

MALACCA STRAIT

MAIN STRAIT

PHILLIP CHANNEL

JOHOR BAY

MIDDLE CHANNEL

SOUTH CHANNEL

GREAT KARIMUN

PARIT

PAPAN

BULAN

BATAM

PULAU BIN

JOHOR

SINGAPORE

SOUTH CHINA SEA

MALACCA STRAIT

SINGAPORE STRAIT

NORTH CHANNEL

MIDDLE CHANNEL

SOUTH CHANNEL

PULAU BATAM

PULAU BINTAN

PULAU KARIMUN BESAR

PULAU KUNDUR

PULAU BULAN

PULAU COMBOL

PULAU SUDI

PULAU REMPANG

PULAU GALANG

SELAT DURIAN

SELAT COMBOL

PONTIAN

JOHOR BAHRU

Johor Bahru

Tanjung Langsat

SINGAPORE

Changi
Airport

Tanjung Pelepas

Kukup

Malacca Strait

Harbour
Front

MALAYSIA
INDONESIA

MALAYSIA
INDONESIA

SINGAPORE

Singapore Straits

Batam
Center

Sekupang

BATAM

KARIMUN

Tanjung Balai

Durian Straits

JOHOR STATE

Tanjung Langsat

SINGAPORE

Tanjung Pelepas

Kukup

Malacca Strait

Changi Airport

Harbour Front

MALAYSIA

INDONESIA

MALAYSIA

INDONESIA

SINGAPORE

Singapore Straits

Sekupang

Batam Center

BATAM

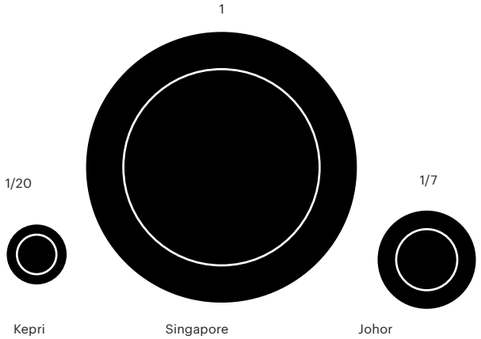
KARIMUN

Tanjung Balai

Durian Straits

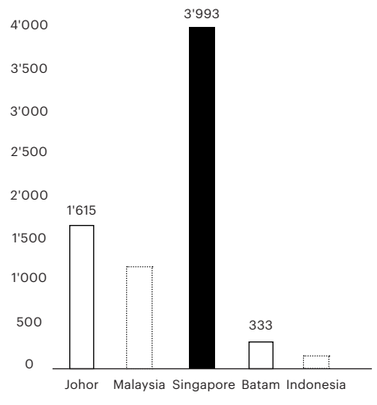
Urbanisation Process

GDP Comparison 2012-2030

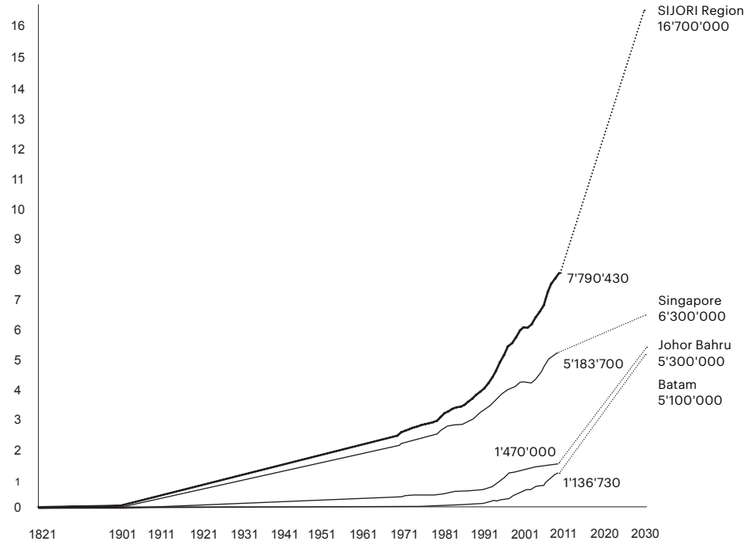


	Kepri	Singapore	Johor
	18.2 Billion USD	370.4 Billion USD	49.4 Billion USD
GDP per Capita	6.557 USD	56.998 USD	9.997 USD

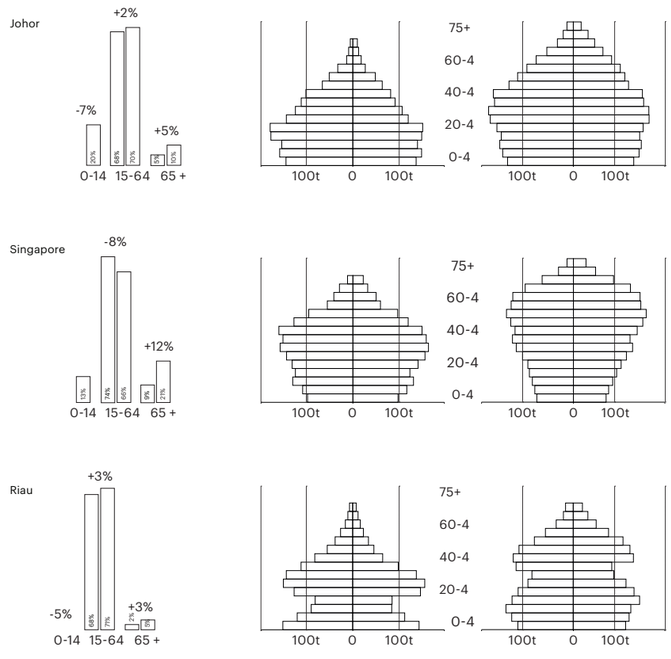
Average Monthly Income, 2010 (in USD)



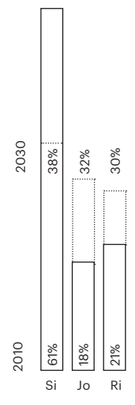
SIJORI Population Growth 2010-2030



Changing Demographics 2012-2030



SiJoRi Population Growth and Distribution



In maritime cultures, the sea used to be seen and imagined as the land: the source of livelihood, the space of everyday life and connections among people and settlements, which all gravitate toward it as the centre. Archipelagic civilizations, such as the Malay world along the Straits of Malacca and the Straits of Singapore, have for centuries created their cultures around the sea, which offered conditions for exchange of peoples, goods and ideas. Life of continuous coming and going between land and sea, gave rise to the perception of the world as the space of continuity between land and water.

Since the mid twentieth century, the territories and cultures of the Straits of Singapore and the surrounding archipelago have become more fragmented and separated. The emergence of three nation states in the region after Singapore's independence in 1965 led to the gradual solidification of the maritime borders along the Straits, and the disruption of free movement of people across the formerly open sea.

In parallel, new technologies have placed increasing demands on the maritime space as the crucial space for logistics, trade and economic globalization, further contributing to the complete change of nature of societal interaction with the sea. The 1960s "container revolution" gave boost to the global shipping industry, and increased the need for control of the growing cargo traffic. In the words of artist Allan Sekula, "What began in the mid-1950s as a most American improvement in cargo logistics, has now taken on world-historic importance. The cargo container—a standardized metal box, easily transferred from ship to truck to train—has radically transformed the space and time of port cities and ocean passages. ...Today, over ninety percent of the world's cargo moves by sea. Without a revolution in ocean-going cargo-handling technology, the global factory would not exist, nor the phenomenon of globalization itself."

Concomitant to the processes of nation forming and economic globalization transforming the maritime space, urbanization processes have unfolded in the region. Though Singapore was created as an island city-state, since the 1990s it has also come to represent the densely populated core and the economical focal point of a larger urban territory that stretches across the Straits of Singapore and the Straits of Johor into the Indonesian Riau Archipelago and peninsular Malaysia. In the 1970s, Singapore's economy began to expand and incorporate productive hinterlands outside the national boundary. As a result, Johor Bahru and Batam, two fast-growing industrial cities each now nearing one and a half million inhabitants, have emerged north and south of Singapore. The three cities, set together in an archipelago-shaped constellation of land, water and built fabric around the Straits, now de-facto form a cross-border metropolis and a metropolitan region of around eight million inhabitants.

In contrast to the booming cities, the more distant fringes of the metropolitan region are still relatively removed from urban development and the arrival of industries. Especially the quiet, hard-to-reach archipelago of small islands resists urbanization—fishing communities are still found here in kampong on stilts along the shoreline. Though the life of local communities has changed significantly during the twentieth century through government intervention, a couple of remaining groups of sea nomads Orang Suku Laut, are still found in the quieter waters to the south and east of Batam and Bintan islands. These territories can now be understood as rural fallow lands, undergoing slow erosion and the loss of population to towns and cities.

The Sea Region project portrays this maritime metropolitan region by placing focus on the sea, the ways the sea has influenced urban transformation, and was itself transformed in the process. Taking the sea-centric view, the project unravels a few distinct lines of the regions urban history and urban transformation.

The first transformation process we explored has been the increasing fragmentation and sharpening of differences in the archipelago's urban geography, owing to the national borders and the formation of wider borderzone territories, but also to the inexorable and still ongoing consumption of coastal areas for the purposes of industry and logistics.
Central to this process, Singapore's port operations— increasingly efficient, automated, but still dependent on ever-larger spaces and infrastructures—gradually moved out of the inner city. This was also the move of an increasing autonomy: from the port as a vivid mixing of people and goods on the waterfront earlier in the twentieth century, toward the port as an isolated and secured urban entity toward its end. Together with the highly efficient port terminals, the Strait of Singapore became a thoroughly planned, managed and instrumentalized urban surface, with corridors for movement, zones for anchorage and other restricted purposes. The combined effects of water-dependant urban functions including shipping, petrochemical industries as well as elaborate programs and installations of military security, appear as forces exerting physical pressure on the littoral zone, and sculpting, through land reclamation and dredging, the coastal topography to its needs.

The second transformation process that occupied our attention has been a move over time from archipelagic culture of life and settlement organization in the region, to the land-based logic of urban development.
While for traditional archipelago cultures, the sea has been intimately connected to all aspects of everyday life, and provided the blueprint for settlement disposition along the coasts, the effect of urbanization in this region went in the opposite direction, creating an increasing disconnection of cities and urban life from the sea.
Paradoxically, over the course of a century, the daily life of Singapore become removed from the port and “protected” from the sea; with Batam and Johor following a similar path. Cast back inland, behind reclaimed lands and heavy infrastructures, the centres of all three cities in the region are withdrawn from the coast.

Finally, we committed ourselves to understanding the changing perceptions of the sea. While gradually loosing purpose as a space of free movement of people, and absorbing the functions of security, industrial activity, and the all-important cargo shipping, the sea has become an urban frontier and the frontier of public interest and imagination. The anthropologist Michael Taussig, and the Singaporean writer David Teh noted that the disappearance of the maritime is a global phenomenon. In the words of Taussig, "The conduct of life today is completely and utterly dependent on the sea and the ships it bears, yet nothing is more invisible.” The sea is reduced to “the beach, a fantasy.”

The Sea Region project proposes a common vision for the cross-border metropolis centred on the sea. For the time being, approaches to transnational urbanism and urban planning of the metropolitan region of Singapore, Johor and Riau Archipelago are not sufficiently discussed. The region is still divergent in terms of governance, despite the high degree of economical synchronization promoted here since

the late 1980s through experimentation with the “Growth Triangle“ model of exchange among the three constituent parts in the metropolitan constellation—and despite the shared maritime culture and history. It was thus not a surprise to us that the articulations of common interests in form of urban visions and cross-border institutional alignments that would allow for joint steering of urbanization processes, are presently all lacking, and urgently need to be developed.

The Sea Region project has departed from the standpoint that the urbanisation of the sea and the coastal areas is patently the central element of the problematic of the cross-border metropolitan growth. The relationship with the sea is crucial not only for the ports and the shipping, but for the three cities, their quality of life and their contact with environment. Yet, the theme of urbanisation of the sea and the coastal areas is still apparently understudied, it has not yet arrived in urban planning policy debates. Exceptions and examples of changing awareness are found among cultural institutions and artists in Singapore, such as Charles Lim and Zai Kunning, who are recollecting and reconstructing the sea and archipelago culture for the public.

The Sea Region project is essentially a vision for a unified maritime space, which enables new connections among Singapore, Johor and the Riau Archipelago, and connections between the individual cities in the region with the sea. Through the design of new cross-border territories and territorial structures, the project gives new contours to the region’s identity. To do this, the project creates a common program for such sea-centered metropolitan urbanism, consisting of the following research and design themes: 1—marine and the coastal nature protection; 2—metropolitan fishery and aquaculture; 3—public sea transport; 4—heritage protection of traditional sea cultures in the region, and 5—the rediscovery of the sea and the coasts as collective and public spaces.
The project further proposes a series of concepts and interpretations

of the current territorial developments in the region, and finally, it puts forward five regional metropolitan plans—large scale strategic and design approaches to the cross-border metropolitan archipelago.

In this way, the Sea Region reframes the regional territory and places the sea back in its centre. Instead of being seen as separate entities, Singapore, Johor and Riau the Archipelago can be seen as parts arranged around a common maritime space. In the words of Rafi Segal, who observed the similar role of the Mediterranean, the Straits can be seen as "a single common element that holds everything around it in place, as a figure shaped by its unifying role."
As the metropolitan region and the three cities continue to grow, the movement from the national to the cross-border logics of organization of territory, and from the hard borders and borderzones to the porous ones, will be inevitable. With it, the sea space will transform once again from its recently acquired homogeneous, industrial character, to become more diverse and interwoven into the urban and the public.

Our work in the region of Singapore, Johor and Riau Archipelago was linked together with teaching and intensive fieldwork in the format of design research studios and master thesis projects. During the autumn of 2014, the prelude to Sea Region was a five-day seaborne expedition. With ten students of ETH Zurich and many local collaborators and friends, we traversed the fragmented and separated waters around the Straits in order to look at the cities and the region from the sea. Moving by boat among the three countries and cities, we experienced the unifying effect of the sea, the single panorama of the maritime region, in its complexity and beauty. The students worked in groups of two and the studio resulted in one collective work, the Sea Region metropolitan plan.
The Singapore Strait, one of the world's most intensely urbanized seas, has always been the lifeline of the region. The project wants to

return the extraordinary sea of the Strait into the centre of public discourse and imagination about the region's future.

Architecture of Territory—Designing an Urban Sea
The view on the sea as an urban territory opened for us as soon as we encountered the extraordinary maritime urbanism of the Singapore Straits, four years ago. It seemed that the major shipping route surrounded by three cities, could become a paradigmatic case of the "urban sea": an urbanized territory centered on and determined by the sea and the maritime activity, and a territory whose description necessitates a departure from the conventional land-based approach to urbanism.
The Architecture of Territory (the ETH DARCH Assistant Professorship of Architecture and Territorial Planning) had just been initiated at that time, with the purpose to test the possibilities of architects' engagement with urban territories as themes of research and design. This was not a coincidence—throughout the 20th century, urbanization processes have continued to challenge the disciplines of architecture and urbanism to expand their concepts and approaches beyond the conventional frames, focused on cities and urban agglomerations.
At present, even remote spaces and landscapes are pulled into the vortex of urbanization; the urban has become the universal condition.
During its history as a discipline, architecture has gradually encompassed building design and construction, urban design and urban planning, incorporating larger spatial scales over time. A rescaling of architectural practices into larger territorial dimensions appears essential once again, corresponding to the increasing scales and complexities of urbanization.
Following this line of thought, the Architecture of Territory has started to look beyond the areas of "concentrated urbanization" that comprise various forms of contemporary urban agglomerations, and to investigate urban transformation processes characteristic of the field of "extended urbanization."

This comprises a shift of interest from “cities“ in the traditional sense to broader territorial frames, and to what was once considered the non-urban realm or the city’s "constitutive outside": the city's hinterlands, “rural" countrysides and "nature", jungles, deserts and seas and oceans.
Within architecture, urbanism and the related fields of urban studies, the research on urbanisation of the sea has been receiving increasing interest and importance. For example, several recent projects and authors have tried to learn from the geopolitical and urban processes that increasingly divide the Mediterranean basin, and lead to the loss of the sea’s inherent role as mediator among peoples and cultures inhabiting its shores (Stefano Boeri and Multiplicity in Solid Sea and Rafi Segal et al. in Seaborne Cities). EPFL Laba studio led by Harry Gugger has examined the Barents and the Baltic seas as subjects of urban design. The Marine Spatial Planning Initiative has been set up by the UNESCO in order to help countries in ecosystem-based management of marine environments, by finding space for biodiversity conservation alongside economic development. Neil Brenner and Christian Schmid of the ETH Zurich and Harvard GSD Urban Theory Lab have been spearheading crucial theoretical developments for research and design work on territories of extended urbanisation.
The benefits and opportunities of architects’ and urbanists’ approach to territories of urbanization are many. The major advantage is the possibility to recapture the problematic of territorial development from being almost purely technical and administrative domains they are now. Territories—including the sea—need to be recovered also in their political, social, cultural and historical dimensions. For that synthesis of multidisciplinary approaches to territory, the work of architects and urbanists will be crucial.

Sultan Iskandar
Lake Park

Johor Strait
Coastline Park

Pulau Ubin
Nature Park

Johor River
National Park

Central Catchment
Lake Park

West Johor National Park
Ramsar Conservation Park

West Coast
Lake Park

Southern Islands
Maritime Park

Maritime Biodiversity
Park

Sekupang
Coastline Park

Batam Central
Coastline Park

Batam Island
Lake Park

Riau Archipelago
National Park

Metropolitan Parks

- Urban parks
- Lake parks
- Great outdoors
- Second coastline

0 2.5 5 km

N

Urban Fishing

- Urban fish production and recreation
- Integration of coastal kampungs into urban fabric
- Connecting tourism and sea culture

0 5 10 km

N

Desaru
Timur
Barat
Johor Bahru Centre
Senoko
Pontian
Kukup
Changi
Pengerang
Tanah Merha
Jurong
Habour Front
Singapore Centre
Sebong Lagoi
Batam Centre
Belakang Padang
Sekupang
Batam Ferry Terminal
Teluk Dalam
Trikora Beach
Kawal
Tanjung Balai
Barelang
Tanjung Pinang
Pulau Abang

1 h
30 min - 2 h
1 h 20 min
1 h 20 min
20 min
1 h
45 min
20 min
20 min
2 h 30 min
1 h 20 min
1 h
2 h

Network
of Increased
Accessibility

- Railway
- Main road network
- Fast ferries international and interregional connections
- Sea Transport as an alternative: Crossing the Johor Strait
- Connecting centres and peripheries
- Sea transport as urban experience: Hop-on-hop-off
- Primary Hub
- Secondary Terminal
- Tertiary terminal
- MRT coastal station
- MRT station
- Informal terminals in kampungs
- Jetty

0 5 10 km

N

Habour Front

55 min

Belakang Padang

Sekupang Archipelago Gateway

Pulau Pemping

Pulau Kasu

Batu Aji Archipelago Gateway

Pulau Geranting

Balerang Archipelago Gateway

RIAU ARCHIPELAOG HERITAGE ZONE

Pulau Bakau

Selat Nenek

Riau Archipelago Heritage Park

- Protected natural heritage zone
- Highly protected Mangrove zone
- Protected fishing grounds
- Highly protected fishing grounds
- Protected area of living heritage
- Kampungs within the Park
- Other kampungs in the region
- Border of the Park
- Main routes in the Park
- Entrance to the Park

0 5 10 km

N

Oceanopolis

- Culture
- Heritage
- Leisure and tourism
- Protected nature
- Research and development
- Free trade market
- Education
- Industry
- Hub
- Amenities ship
- Speed boat
- Seafarer' gateway
- Passenger gateway

0 2.5 5 km

N

Sea Region

The phenomenon of maritime borders in the region is historically new - in the formerly open sea of the Singapore Straits the national borders gradually took effect after Singapore's independence in 1965. The combined demands of industry, logistics, and trade have further contributed to the formalization of borders and fragmentation of the regional space. In the 1960s, the "container revolution" gave boost to the global shipping industry and led to the need for control of the growing cargo traffic, which changed the character of the Straits irreversibly. As a result, the sea as the space of everyday life and movement among Singapore, Johor, and Riau Archipelago is severely parcelled. The three cities now develop in an independent manner; the coasts in the region are occupied by port terminals, industrial facilities, security installations and gated estates; the urban centres are withdrawn from the coast. The sea has become an urban frontier and the frontier of public interest and imagination.

The Sea Region wants to propose a vision of a unified maritime space, by designing connections among the three cities, and connections between the cities and the sea. To do this, the project will start by reframing the regional territory and placing the sea back in its centre. Through the design of new cross-border territories and territorial structures, the project will give new contours to the region's identity.

The opportunities for cross-border metropolitan thinking on the relation to the sea were explored through the topics of nature protection, fishery and aquaculture, public sea transport, cultural heritage of the archipelago and the coastlines and sea as public space.

Nature Park -
As Cross-Border Logic in
the Trinational Metropolis

Between 1854 and 1869, the British explorer and naturalist Alfred Wallace created an extraordinary journal of natural wealth of the region, The Malay Archipelago. Upon his visit to the island of Singapore, he wrote of the 'most luxuriant' vegetation, gambier plantations and forests with free roaming tigers, and of 700 species of beetles he had collected there. He praised the favourable conditions of climate and soil on this spot, deeming it 'productive' beyond any other he had visited in his travels in the East.

But already during the XIX century, after the port settlement had been established in 1819, the urban transformation the island was far reaching. Agriculture, the building of roads, railways and buildings led to the cutting down of jungles, drying of swamps and disappearance of coastal mangrove forests.

During the XX century, the effects on the physical environment of urbanization and industrialization intensified. The post-independence development agenda during the 1960s, 70s and 80s emphasised on Singapore's economic autonomy from Malaysia, brushing other concerns aside. Bedok, East Coast and Jurong areas were among the first to undergo a complete transformation of the physical setting, the 'cutting' of hills and 'filling' of the coastline. Until today, the land reclamation has added around 25 percent to Singapore's land area, replacing much of the old coastline with a new artificial interface between land and sea.

The 1980s brought regionalisation of economic processes, with manufacturing, electronic industries and agriculture leading the migration from Singapore to Riau and Johor. These processes were helped by independent initiatives by Malaysian and Indonesian governments to industrialize, including the massive palm oil production, and the development of petrochemical facilities (such as Pasir Gudang) for processing, storing and trade of oil along the Straits of Singapore and the Straits of Johor. As a consequence of the high paced growth of cities in the last three decades, much of the trinational region has experienced the same pressures on 'nature'. Huge reclamation projects are today equally characteristic of the coastlines of Singapore, Batam Islands and Johor Bahru. It is estimated that in Singapore, 99 percent of all original mangrove forest has been extinct, while the Johor State has experienced the highest mangrove losses in Malaysia, with 42 percent reduction since the 1970s. The impact on marine ecosystems of the shipping movements, dredging, reclamation and the spilling of chemical material is high throughout the region. In Singapore alone, more than 80 percent of the territorial waters are used for the activities of the port, corresponding to large reduction of coral and other habitats. The absence of freshwater sources in Singapore and Riau led to the building of reservoirs, starting with MacRitchie Reservoir in 1867. The damming of river mouths along the coasts to collect fresh water has changed most of the former brackish streams.

Looking at the sites and practices of nature protection in Singapore, Batam and Johor, it is first apparent that, in the region focused on the sea, the coastal areas have been especially sensitive to change. In the port cities, the access to the sea has been crucial for much of the logistics, industries and even the military; through real estate and tourism the coast has become a commodity too. At the same time, the costal areas are also the places of the richest biodiversity, of concentration of traditional settlements, culture and economy, thus also the areas where most valuable heritage sites can be found.

It is further apparent that so far economic development agenda had dominant role over 'nature' or any other possible agenda in guiding urban growth. Instead, 'nature' reemerged in region as the byproduct of urban development. The state institutions in Singapore have promoted parks and greenery with human-centered, utilitarian and economic function. Nature was coupled with other urban functions, such as land reservation and military zones in Changi, Kranji and the Southern Islands, or source protection in Bukit Timah. The tendency that emphasizes on environmental management and engineering solutions to ecological and environmental conflicts in the growing city has prevailed. An important part of incorporation of nature into the urban development has been the practice of 'greening' Singapore, focused on urban and aesthetic function of greenery for the city dweller. This served urban branding purposes as well, promoting Singapore as 'garden city', the 'city in the garden' and even the 'greenest city on Earth'.

Thought Singapore, Johor and Batam form a cross border metropolitan area, they are also three cities in different stages of development, and with differing conceptions and mechanisms of nature protection. For example, the Iskandar planning authorities have given high attention to the coastline of Southern Johor in their plans, but they might not be able to implement them. In the Riau Archipelago, the plans and mechanisms of nature protection are still weakly developed. In all three cities, growing concerns over role and place of nature are increasingly evident.

The goal of the project is to explore a common vision for nature protection in the trinational region, and to provide arguments for nature areas as 'productive areas' that can substantially raise appeal and value of living, work and leisure in the cross-border metropolis. The project will emphasize on the dimensions of nature protection so far missing in the region: it will explore the opportunities for cross-border nature protection; it will emphasize the protection of biodiversity in nature areas in addition to their urban benefits; it will also consider nature as form of 'heritage.'

Fishing and Mariculture - A Vision for Local and Regional Food Production

Traditionally, fishing has been one of the main economies in the region. Older generations of Singaporeans remember the schooners of the Makassar Bugis docking at the barter trade centre in Pasir Panjang, the local gathering point for boats from all over the Indonesian archipelago, where the trade of fish, sea cucumber and other foods and small goods flourished into the 1980s. Different factors brought modernization to the traditional fishing and food economies and cultures. From the mid XIX century, steamships enlarged the scale of fishing and fish trade. Singapore was an important fishing harbour where products were sold and distributed to the Malayan hinterland via railway and roads.

In the industrial society, eating habits gradually changed too. Fresh fish and canned fish replaced the dried salted fish. Growing populations all over Asia introduced the need for cheaper food; poultry for example replaced marine products as major source of animal protein in the diet of the region's population. It is estimated that in the early 1980s, 75'000 people were still fishing on the Straits (70% Indonesian, 27% Malay and 3% from Singapore). In the late 1980s, Singapore opted to phase out most of its agricultural production. Today the city imports 95 percent of its food, and only 3 percent of fish consumed in the city comes from local farms and fishing grounds. The production of ornamental fish for export in several agro-technology parks today actually exceeds the sustenance production.

The fish arrives to Singapore from long distances; from Indonesia it is shipped by carrier vessels, from Malaysia and Thailand it sometimes comes by lorries. From the countries further out such as Norway, the fish arrives by plane directly from the airport to the Jurong Fishery Port before being distributed. Large-scale commercial fishing is now present in the region alongside local and traditional fishing and sea farming. Motorization of boats pushed the frontiers of the former fishing grounds into deeper waters; this requires larger vessels, larger ports and cold storages, and implies a high degree of regulation and bureaucracy. These infrastructures, together with massive supply and distribution networks, usually give large-scale commercial fishing advantage over fish from local production. In this manner commercial fishing practices often results in destruction of local fishing economies and markets. After 1965, the regional fragmentation to national territories led to weakening of trading networks. In 1981 for example, the Indonesian authorities confiscated 16 fishing vessels from Malaysia and observers of the event noted that 'to be caught fishing in Indonesian waters entails the risk of losing boats, gear, the day's catch, or even life itself.' Until today difficulties with taxation and declaration of goods in the cross-border situation prevent or reduce the flow of catches from Riau to Singapore, or foster informal trade under false declarations.

Additional issues such as land reclamation, the heavy shipping traffic in the Straits and the discharge of chemicals, puts the marine environment in the region under pressure.

Since the 1970s, aquaculture (and fish consumption) has grown tremendously and many commercial fish and prawn farms can be found off the coastline of the Strait of Johor. This type of farming also poses environmental hazards as it often involves removal of mangroves and water pollution. Traditional fishing communities are still mostly active in Riau. In Batam municipality, traditional fishing continues to form an economic base for about 5 percent of the population (in 2010, 9487 households were active in the fishing, compared to only 1758 active in agriculture). These are communities whose daily lives and practices are already in the gravity vortex of the nearby cities. Possibilities to preserve or integrate their cultures and ways of life into modern urban economies in the region have so far presented unsolvable equations.

The goal of the work is to examine potentials for trinational fishing and aquaculture in the region that would be able to meet the local needs. The project explores the advantage of cross border planning strategies: ways to ensure high water quality and ecological quality of the marine environment, and ways to create local territories for fishing and sea farming in balance with other functions of the maritime space. The project also discusses cross border approach to regulations concerning the production, distribution and trade. The project provides arguments for the productive role of fishing and mariculture, in their ability to raise appeal and quality of life in the cross-border metropolis, and explores ways in which they can be seen as an element of region's identity and cultural heritage.

Sea Transport - Reconsidering Cross-Border Public Transport Over Water

The Singapore, Johor and Riau region has a rich tradition of water transport. Though land-based forms of transportation steadily grew and became predominant during the XX century, people still move by sea. High-speed ferries connect the local and the regional ferry terminals and harbours into a relatively dense network. Singapore Tourism Board reports that in 2013, more than 1.5 million visitors arrived in Singapore by sea; more than half of all arrivals, around 70,000 per month, were from Indonesia. Similar numbers were reported for Batam: nearly 70,000 Singaporean and 23,000 Malaysian visitors arrived at the island by ferry in February 2013.

Looking at the seascapes in the region, one can observe great differences in the use and types of boats. Huge air-conditioned ships dominate the international shipping fairways and the anchorages of the Singapore port, while in other parts of Singapore and Johor people still move by bumboats. Chinese sampans move among the islands in the Riau Archipelago.

The technological changes have radically transformed the nature of sea travel, and had great impact on the shape and function of ports and cities. The period from the XVI to the mid XIX century in Southeast Asia and the world is known as the Age of Sail; human migration and international trade from the Arab world, India, China and Europe reached Singapore and the region by sailboats. During the first half of the XIX century more efficient steam ships and ocean liners gradually replaced sailboats, and subsequently other new techniques and technologies continued to transform the nature of sea transport. Among the most important, the 'containerization' of the 1960s was a logistic revolution that enabled globalization and escalation of cargo shipping. Around the same time, with the advent of air travel, line voyages nearly ceased to exist. These changes also revolutionized the character of the port and its interaction with the city. In Singapore and other port cities, this has been a movement from the times when port and waterfront presented commercial and cosmopolitan centres, to the present day when the port and the sea have became logistic territories at the periphery of public perception.

Political history of the sea region is equally crucial, as it gives an insight into the changing nature of maritime borders. The colonial period was marked by a bipolar political geography in the region: after the Anglo-Dutch Treaty of 1824, Riau Archipelago was controlled by the Dutch with their port in Tanjung Pinang, rivalled by the British in Singapore and Johor. The flows of goods in the Singapore Straits were highly regulated at the time, but in terms of people flows the territory was borderless. There were no passports and everyday movement by sea was prevalent. Ferry connections between Johor Bahru and Singapore as well as Singapore, Batam and Tanjung Pinang, where frequent and small boats could be rented for shorter distances and travels across the Strait.

With the events of the 1963-66 Confrontation and of Singapore's independence in 1965, the fluid character of the border was replaced by attempts to establish national sovereignties over maritime space. The gradual introduction of national borders also reflected in new ways of water transport. The flexible, small-scale boats were replaced by large-scale, directional ferry connections. Todays ferry terminals function as intermodal interchanges, immigration checkpoints and commercial centers (with shopping malls, casinos, etc.); they generally have no public waterfront. The immigration control procedures – the fingerprints, passport scans, check-in and boarding, etc. – have added to the formalization of the water transport. The ferries follow fixed routes and cross the international shipping fairway on designated crossing points. With a capacity of up to 250 passengers, they travel at speed of 28 knots (50 km/h). They serve different uses, from business to weekend leisure trips.

By contrast to the increasingly rigid patterns of public movement across the Straits, the transfer of goods in the region was simplified through the introduction of special economic zones – the new 'borderless' territories and free-flow regimes of globalized production and trade. Thus, in less than fifty years since the independence of Singapore, the character of movement across the sea in the region has been reversed: from a flexible and open transport based on smaller boats, to an increasingly rigid and directional type of movement.

The goal of the project has been to explore possibilities for a new model of water based public transport in the trinational region. The specific interest has been in the possibility of small scale, flexible connections (smaller boats, longer waterfronts, flexible embarkation and disembarkation) that could complement the existing transport networks. The project provides arguments for the 'productive' role of water transport for the region, in its ability to raise appeal and value of living, work and leisure in the cross-border metropolis. The project explores ways in which water transport can be seen as an element of region's identity and cultural heritage.

infrastructures and services. Their incremental growth would be desirable, but they often fall victim to industrial expansion and tourism.

The shift from traditional archipelagic culture of settlements focused on the sea, to the modern land-based thinking and approach to planning and development, has made life on mainland more attractive. The heritage of the archipelago should thus be seen as the specific asset for the region's culture and identity.

The goal of the project has been to explore a common vision for preservation of the maritime culture of the trinational region, by curating sites of memory in the archipelago.

Memory Archipelago - Valuing Sea Culture in the Growing Metropolis

Pulau Ujong, the Malay transliteration of the Chinese Pu Luo Chung, named Singapore as the 'island at the end' already in the IV century. Geographically, Tanjung Piai in the west of Johor Bahru marks the southernmost point of the peninsular Malaysia and of the Asian continent. From here, the Asian mainland dissolves into the 18,307 islands of the Indonesian Archipelago.

Archipelagos, the groupings of geographically or geologically related islands, can consist of different types of islands: continental, desert, oceanic or tropical islands. Very small islands, such as emergent land features on atolls, can be called islets, skerries, cays or keys.

The roughly 2,760 inhabited islands in the Johor, Singapore and Riau region can be described in terms of their traditional archipelagic culture in which settlement structures used to stretch along the coast, and economy and daily life gravitated towards the sea. Few hundred other islands in the archipelago are uninhabited and covered by vegetation. At the same time, the archipelago is a site of conflict imposed by urbanisation, the reshaping of landscape for infrastructures, industrial zones or tourist facilities.

Islands and coasts in the region are rich places of memory, as most traditional settlements are located along the coast and in the river mouths. Calm and shallow waters of the archipelago, safe anchorage places and rich fishing grounds have always attracted settlers. Settlements along the Johor River leading to the hinterland were of great importance; this passageway to the interior had even attracted the Portuguese fleet to sail beyond Kota Tinggi in 1535. Next to the indigenous Malay, diverse ethnic groups from China, Mongolia, Thailand and Java settled in the region. From the XVI to mid XIX century, in the period of international maritime trade and warfare known as the Age of Sail, the Europeans arrived in the region and founded their ports. These continuous migration flows and cultural crossovers in the archipelago have created a rich and specific cultural heritage.

Not many sites of history and memory in the region are known and accessible. Due to their often remote locations on small islands, they are removed from public view and semi-forgotten. The preserved heritage sites include for example the Raffles Lighthouse, the Kusu and the Sister's islands, and the Penyengat Island, with its mosque, the former fort and the residence of the sultan ruling over the Malay-Bugis Kingdom in the late XVIII century. Other sites such as the Fort Canning Lighthouse and the Long Ya Men rock have been rebuilt, occasionally even in a different location. The quarantine station on Saint John's Island, the recreational facilities on Pulau Damar Laut, and schools and cemeteries on other Southern Islands have been lost.

In Riau, there are areas and relationships that are exceptional in the fact that they still convey the more traditional form of archipelago culture. Here, children take boats to the next island to reach school, mosques are the places of public life even on the smallest of islands, houses are built on stilts on the shore and boats connect between island communities.

The future of these island communities in the archipelago is uncertain; they are already to various degrees subsumed in the urban economy and dependent on modern

Sea Urbanism - Reinventing Urban Life on the Sea

Every year 120,000 vessels pass through the Malacca and the Singapore Straits, carrying one quarter of the world's cargo and making it one of the busiest shipping routes in the world. The southern end of the Malacca Strait is formed by a tight passage through the Singapore Strait, connecting the Indian Ocean with the South China Sea and the Pacific, and linking the major Asian economies, India, China, Japan and South Korea. The maximum size of a vessel that can make passage through the Strait is referred to as 'Malaccamax'; bigger boats have to take a detour through the Lombok Strait, Makassar Strait or other passages through the islands of Indonesia.

Due to its favorable natural conditions and deep water, the Singapore Strait and the port became one of the most important shipping nodes. At any time, there are about 1,000 vessels within the port limits of the Maritime and Port Authority of Singapore (MPA). This fleet of container ships, oil tankers and cruise ships creates an astonishing density resembling a floating city. Comparing the footprint of buildings in the city parts overlooking the Strait with the footprints of vessels on the water, one begins to read the water and the land as one continuous urban fabric.

This 'urban sea' also forms an autonomous urban territory, with restricted entrance points, designated traffic lanes and crossing routes, highly separated uses and user populations. In order to facilitate the vast amount of traffic, the Singapore Strait is a highly regulated space. In 1971, an agreement took effect between Singapore, Malaysia and Indonesia to coordinate vessel movement in the Malacca and the Singapore Straits. In 1994, this regional cooperation was extended trough the United Nations Convention on the Law of the Sea, granting the 'right of transit and innocent passage' to all ships. The passageways are further implemented by the Traffic Separation Scheme, a system of street-like traffic corridors projected onto the water. In order for any foreign vessel to access Singapore's waters, a pilot, knowledgeable of the conditions of the port, has to enter the boat and navigate its way through the harbour. Arriving ships and boats are parked in designated anchorage zones, or unshipped at ports and jetties. These various zones, their strict regimes of use and highly dense activities, coin the space of the Strait as 'urban' and as prime illustration of the phenomenon of urbanization of the sea.

While the commercial shipping and port activities continue to grow and compete for water surface and costal access in all three countries in the region, there are also other users at urban sea. Oil tankers, cargo ships and bulk carriers are intermingling with cruise ships and passenger ferries, in total representing an offshore population of roughly 10,000 to 20,000 individuals. The population flows between the sea and land are subject to different logics and protocols of immigration control; the permeability of the sea-land boundary is continuously fine-tuned. While cruise ship terminals offer immigration-on-demand to the arriving tourists, supply boats operate 24-7 to deliver medicine, food and mail to cargo ships who's crews are generally not allowed to enter foreign territory.

The changing port-city relationship over time transformed urban physiognomies and characters of cities worldwide. The evolution of Singapore's port was greatly influenced by the remaking of the political geography of the region, as well as technological revolutions. Artist Allan Sekula observed that 'since technological inventions like steam boats and logistic improvements like the container, the logics of port logistics and cargo handling changed dramatically. The replacement of manual labor by cranes and the deepening of port areas for bigger ships emptied (dehumanized) the port facilities and created logistic hubs along the coast.' The 'containerization' of the 1960s was a logistic revolution that enabled escalation of cargo shipping in Singapore. Around the same time, with the advent of air travel, line voyages nearly ceased to exist. These influences marked an urban transition from the times when Singapore's port and the waterfront presented commercial urban cores and most cosmopolitan parts of the city, to the present day when the port and the sea have became largely 'invisible' logistic territories at the periphery of public perception.

A parallel phenomenon with great impact on life by and with the sea was the formation of the maritime national borders that gradually took effect in the region during the 1960s. The combined demands of industry, logistics and globalized trade contributed to their strengthening. Together with industrial and port facilities, national security installations occupy large stretches of the coastline separating the city from the sea. The highly secured and utilized national waters de facto function as an extended borderzone, which stretches from the sea onto the land: the maritime borders in the region have their reflection the land.

The skyline of downtown Singapore and the skyline of vessels in the deep-water echo each other: two distinct worlds, visually connected, virtually cut off. The psychological distance among the three cities, Singapore, Batam and Johor is great; instead of uniting the region, the sea separates.

The goal of the project has been to rethink the sea space and the coastlines in the trinational region, as space that can perform urban public functions; a space of public encounter, business, cultural exchange, leisure, a cosmopolitan space. The sea and the ports in the region used to hold these public functions in the past; the project therefore considers how some of those qualities can be reclaimed in the present.

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Unless stated otherwise, all diagrams and photographs are original to this book. Original photographs are the work of instructors and students of Architecture of Territory during the autumn semester 2014. All satellite images are taken from Google Maps and Google Earth.

The maps presented in this volume are based on the (digital) map data collection "Architecture of Territory: Singapore Metropolitan Region" which was assembled by ETH Zürich Assistant Professorship of Architecture and Territorial Planning, M. Topalovic, in the period of 2011–15, at the Future Cities Laboratory in Singapore.

This map data collection was created in order to visualize and thus help imagine, discuss and research the urban characteristics and urbanization process of the tri-national metropolitan region centred in Singapore. It is the result of an extensive collection of map information originating from different sources, including existing planning documents provided by local authorities in three countries, commercially available map data as well as open source maps.

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In memory of Benjamin's drowned iPhone.

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Architecture of Territory
ETH Zurich
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Sea Region
Singapore, Indonesia, Malaysia
Project 2

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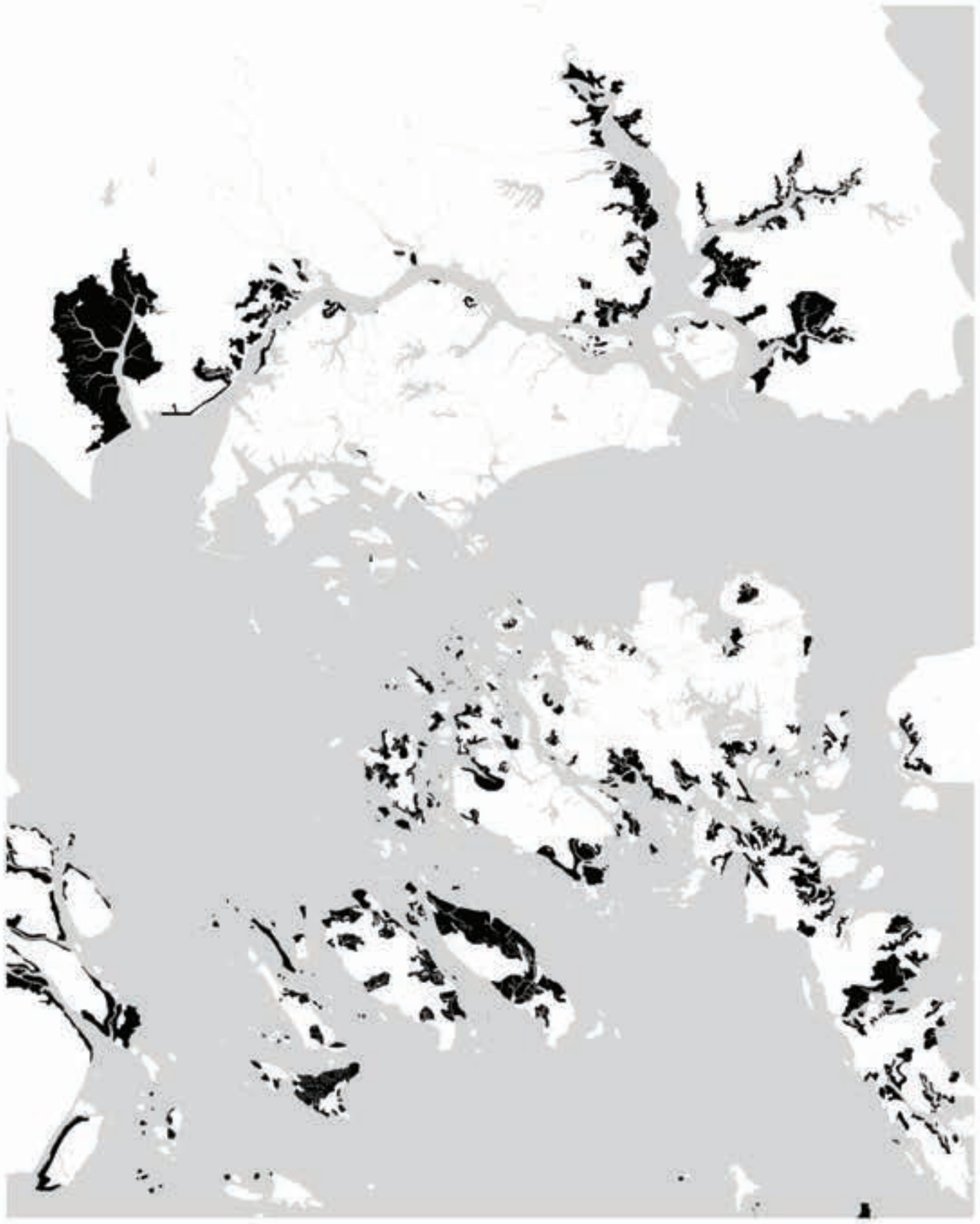
METROPOLITAN NATURE

The Role of Nature in the Trinational Metropolis

by
Luca Bazelli
Matthias Mueller



Mangroves and swamps

Around one hundred and fifty years ago the region of Singapore, Johor and the Riau Archipelago was almost entirely covered by rain forest and mangrove wetlands. It was an environment of an enormous concentration and diversity for countless species of plants and animals. Throughout the XIX and the XX centuries until today, the urban growth put pressure on open space and on nature in all parts of the region: in the cities, along the coastline, and on the marine ecosystems. The coastal areas are environmentally most valuable in terms of biodiversity but at the same time, the pressure to build along the coastline is the highest.

The value of nature for society and the political practices related to nature transformation and nature protection in the region seem to be complex and unclear. Each of the countries uses its own logics and standards in the relationship to 'nature' and to 'green'; their value for the city and urban life seems to be still underestimated in comparison to European cities for example, where a more stable relationship to nature developed over time.

The purpose of the project Metropolitan Nature has been to understand and describe the processes of urbanization of nature in the region. After close examination, the project has identified and described four categories of 'nature' which have emerged in the region's development: Constructed Nature, Strategic Nature, Protected Nature and Land Banks. Each of the four categories carries a strategic role for urban development processes and practices in the region.

The project then proposes methods of working with existing nature areas that have the potential to lead to a common, transnational vision for nature areas. This vision is based on establishing new, cross-border ecologies, establishing public access to nature areas and ecologically continuous areas along the coastline.

What Remains

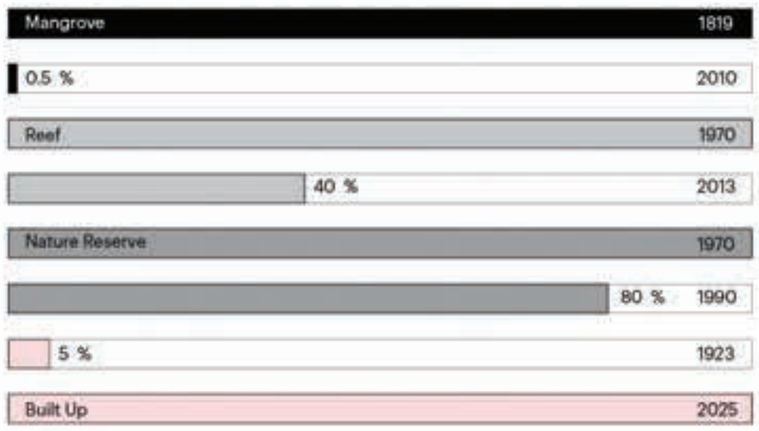
After John Crawfurd travelled along the Johor Strait in 1825, he reported about the 'endless wood of the most magnificent timber'. The area of Singapore, Johor and Riau was covered with jungle. Today, the three countries of Singapore, Malaysia and Indonesia remain 'megadiverse' countries, which means that they belong to a group of countries that harbour the majority of the earth's species and are therefore considered extremely biodiverse.
With over twenty thousand species of flora and fauna, the trinational region is among the most biodiverse in the world. Yet, what remains today is only a fraction of what has previously existed. Altered landscapes, a sprawling built environment and an increasingly polluted sea have begun to replace the native biodiversity.

Map of megadiverse Countries, geography. about.com

'Why bother about a few trees? It is true that a few trees, when cut down, have a comparatively small value; but it is not their individual value as dead timber with which we should be concerned'

R.E. Holttum, Singapore Botanic Gardens director, 1926-1949 writing in the Straits Times (1950)

Legenda
Mangrove by 1956
Reefs by 1956
Nature reserves by 1896
Built-up by 1923



Legenda
Mangrove by 2014
Reefs by 2014
Nature reserves by 2014
Built-up by 2014

From City in the Jungle...

In 1820, when Singapore had a population of only 1000 people, the island and its surrounding land was covered with primary rainforest, freshwater swamp forest and mangrove. The clear water was full of sea grass beds and coral reefs, the habitat of a wide variety of maritime fauna.

To Jungle in the City

Thirty years later, only half of Singapore's native forest remained intact. Today, forests make up only 4.5% of the island's surface. Less than 2% of the original mangrove forests remain around the coastlines of the three cities of Singapore, Johor and Batam. Many of the species have been threatened by deforestation, new building construction and land reclamations such that only 40% of the region's potentially present species have been recorded. Only a few areas of original nature remain intact, appearing as little islands within the urbanized region.

Ideal of the Garden City

Managed green, frequent along the city's streets and medians, is what most city dwellers in Singapore see every day. This type of 'groomed nature' is for many the most common, if not the only, exposure to nature.
These kinds of greens are no longer self-generating ecosystems, they largely depend on human intervention for their maintenance and survival.

Gardeners at work, Clementi Road

Constructed Nature

The spots shown on this map are areas of constructed nature. In these zones, green has been planned, designed and carefully maintained. City parks represent managed nature.

On the map, two types of constructed nature are shown. Dark pink represents the city parks, light pink represents the golf courses.

Mempat Tree
In 1963, former Prime Minister, Mr. Lee Kuan Yew, had a vision to make Singapore a garden city. That year, he planted a Mempat tree at Farrer Circus, implying the start of Singapore's greening campaign.

Name:
Chinese Garden

Type:
Water reservoir
Urban park

Size:
0.14 km²

Date of Production:
1975

Accessibility:
High

Garden as Urban Identity

The Chinese Garden was built in 1975 and spans 13.5 ha. The park was designed by Professor Yuen-Chen Yu, a well-known Taiwanese architect. The concept is based on classical Northern Chinese imperial architecture and landscaping.

The implementation of urban nature in form of a park is a common practice in Singapore. Today the Chinese Garden and a few other parks in Singapore have been declared nature reserves.

Production of Nature

Singapore's ideal of being a garden city evolved from a law introduced by the Housing Development Board, responsible for social housing projects. The law requires the implementation of parks after exceeding a certain amount of built dwellings. Today 287 parks exist in Singapore, most of which resulted from this legislation.

Urban Parks

The golf course is the typology of designed green which is closest to the urban park. The presence of golf courses around the trinational region is remarkable, whereas the urban park appears almost exclusively in Singapore.

Softening the Hart Edges

Singapore is reminiscent of a garden in the sense that most of the trees along the streets are regularly pruned and maintained. According to the tree planting campaign, between 1967 and 1990, 5 million trees were planted in Singapore.

Trees have many positive effects on the surrounding: they reduce noise pollution, provide shade and shelter, produce aesthetic benefits, create buffer zones around water catchment areas and improve street-level micro climates. The Singapore Green Plan, released by the Ministry of Environment in 1992, was one of the first formal plans to attempt to balance the country's economic and environmental needs.

Name:
Zaharan
Botanical Garden

Type:
Urban park

Size:
0.6 km²

Accessibility:
High

Johor's Garden

The Zaharan Botanical Garden is an addition to the Stultan Abu Bakar Royal Palace. It appears as the only major designed urban park in the region outside of Singapore.

Additional green spaces outside of Singapore are typically unplanned, residual green fields located between patches of urbanisation. Opportunities exist for the residual green to be designed and integrated into the existing urban context.

Enclosed Land

The water reservoir of Duriangkang is enclosed with a long fence and thus, withdrawn from the neighbourhood. Yet, a cutout opening in the fence leads to the lake, allowing children to informally use the reservoir as a fishing site.

Kids fishing at
Sungai Duriankang, Batam

Strategic Nature

The blue patches cover all the natural areas that also serve a vital infrastructural function.
On the map two types of strategic nature are shown.

Dark blue emphasizes the military zones. Light blue indicates the water reservoirs.

Tembusu Tree
The Tembusu is a large evergreen tree in the family of Gentianaceae. It is native to Southeast Asia, and growing in open and swampy lowlands. The Tembusu is one of Singapore's most distinctive trees. The Tembusu is listed as a Singaporean heritage tree and appears in the back of its five dollar bill.

Name:
Sungai Ladi
Sungai Harapan
Muka Kuning

Type:
Water reservoir

Size:
52 km²

Accessibility:
Low

Storing Water

The Sungai Ladi water reservoir is one of 14 reservoirs of Batam and its surrounding islands. Batam's reservoirs provide enough water for its region. Since the population is growing rapidly, it strongly depends on its water resources. All of the reservoirs are under the protection of the government.

Coupled Functions

Water reservoirs in Batam are one of the few places where nature is protected.

Due to Indonesia's economic and political position, preservation of nature is more difficult than in developed countries. If a place like the Sungai Ladi Reservoir with its surrounding forests is under nature protection, it is likely due to circumstances that concern protection of the water reservoir from urban pollution.

Refused Access

Indonesian cities are often forced to construct a fence around their water reservoirs in order to protect them from illegal dumping of waste and water pollution. Another reason for putting a fence around the whole reservoir is to protect it from illegal construction. However, people living nearby find ways to use the reservoirs informally for fishing and swimming.

Name:
Upper Peirce Reservoir

Type:
Water reservoir

Size:
0.06 km²

Declaration Date:
1910

Accessibility:
Medium

Partial Public Use

The Lower Peirce Reservoir is one of the oldest reservoirs in Singapore. It contains many trees that are more than 100 years old. The Lower Peirce Trail is a small hiking track that takes visitors through the reservoir's mature secondary forest. The Lower Peirce Reservoir consists of different zones of public access. Next to a public road and the Lower Peirce Trail, the forest is inaccessible but not fenced in. Highly protected military zones and golf courses are part of the reservoir too. Fishing is allowed in certain locations, but swimming is forbidden. In comparison to the size of the whole reservoir, the accessible areas are rather small. Nevertheless the way Singapore uses the central water catchment as a partially accessible public place shows how various urban functions can be combined in such zones.

Protection as a Secondary Effect

The Singapore National Park board describes the Central Water Catchment of the Lower Peirce Reservoir as a nature reserve. Its valuable location within the city suggests that the effort to keep the reservoir protected is primarily out of necessity. Since 2005, the reservoir has been protected under the Parks & Trees Act, but prior to this it was only protected to guarantee secured water supply.

Lack of Service

Only a part of the waterfront is accessible. Based on the low number of visitors, the idyllic greenery seems to be underestimated by the residents. Beside a few fishermen, the Lower Peirce Reservoir is rarely visited. One issue concerns its lack of connection to the public transport system; it is only reachable by car. The lack of service facilities like toilets and cafes also poses a problem for the visitors.

Modified Nature

After walking through the forest paths, one has the impression that the Lower Peirce Reservoir is an unbuilt, natural leftover of Singapore's original landscape; however this is not the truth. The ground has been modified so that it can direct as much rainwater as possible into the lakes. Nevertheless, the nature reserve boasts a rich biodiversity with over 500 animal species.

Type:
Military zone

Size:
47 km²

Accessibility:
Low

Nature's Safest Border

Military terrains are used as training sites for the armed forces. These areas are characterized by lush vegetation surrounded by barbwire fences and warning signs. These sites are completely separated and do not have any exchange with the surrounding context. Even the coastline is negated by turning its estuaries into water reservoirs.

Rivers as Water Reserves

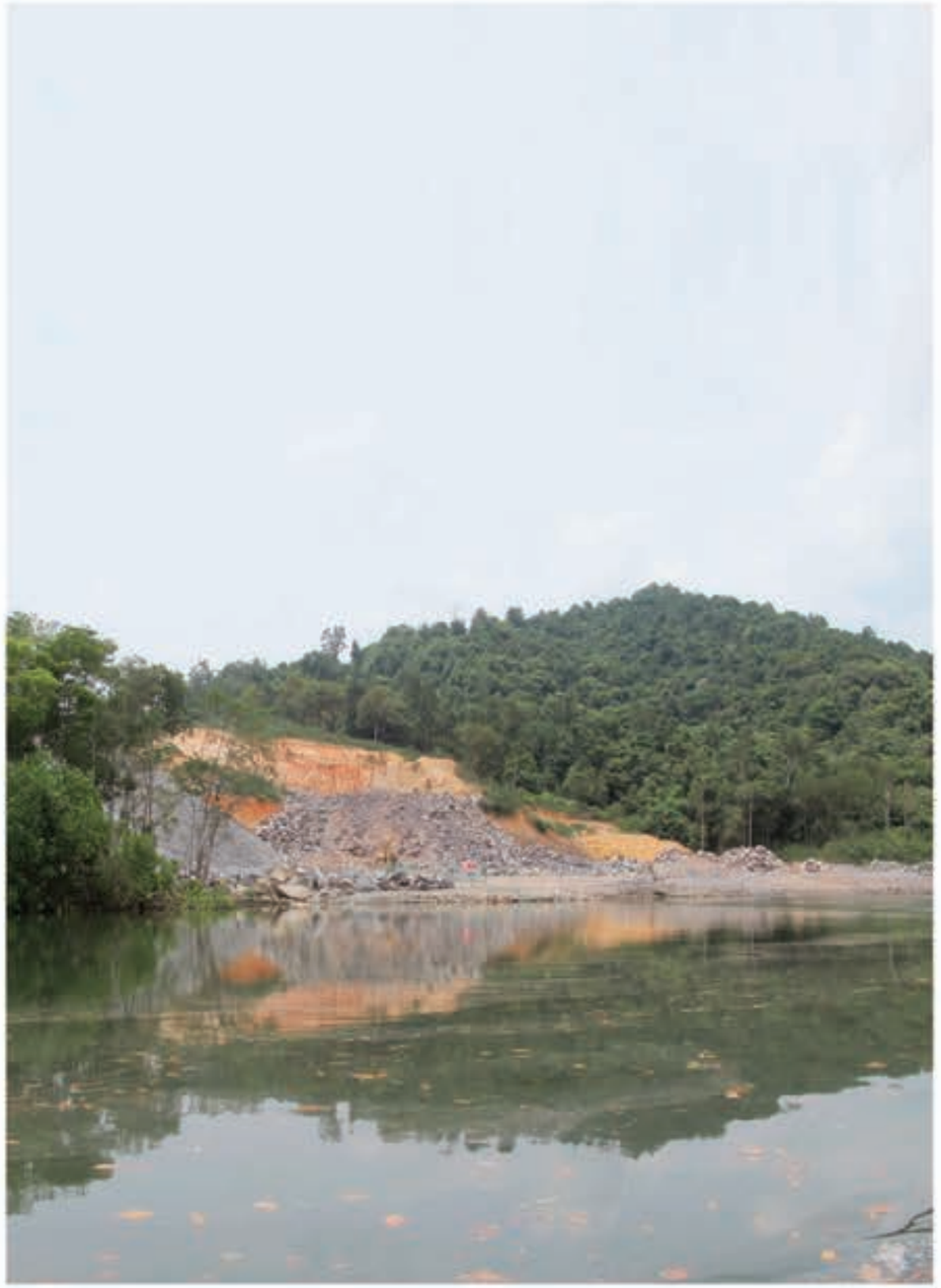
The original rivers within this site are turned into an interconnected water reservoir system.

Large dams harm biological diversity by flooding land, fragmenting habitat, isolating species, interrupting the exchange of nutrients between ecosystems, and cutting off migration routes. The Causeway, built as a dam, has had the same impact on the Johor Straits.

Border fence enclosing the Singaporean military zone, from the Johor Strait

Undefined Edge

The Johor River and its surrounding forests have been declared as forest reserves, protected areas for wildlife, flora and fauna. The Sungai Belunkor forest is one example of an area protected by the Ministry of Environment of Malaysia. Upon visiting the site, it appears that the edge of the protected area is not marked or maintained. This is potentially why one finds a stone quarry or a depot of metal waste in the heart of mangrove forest.



Stone quarry in between the mangrove forest, Sungai Belunkor, Johor

Unstable Protection

These areas represent the relatively intact natural areas. These areas still have a self-generating ecosystem and all of them are nominally protected. On the map two types of unstable protected nature are shown. Patches highlighted with a deep green are internationally protected. Light green patches are nationally protected.

Dipterocarp Tree

The Dipterocarpaceae are a family of 17 genera and approximately 500 species of mainly tropical lowland rainforest trees. Some species are now endangered as a result of overcutting, extensive illegal logging and habitat conversion. They provide valuable woods, aromatic essential oils, balsam, resins and are a source for plywood.

Name:
Sungai Buloh

Type:
Wetland reserve

Size:
0.9 km²

State of Protection
IUCN Category IV

Declaration Date:
2002

Accessibility:
High

From Shrimp Farming to Wildlife Park

Originally Sungai Buloh was used for shrimp and fish farms. In 1989 the site was declared as a nature park. Later the area was redeveloped into a park for wildlife.

The United Nations Environment Programme estimates that shrimp farming causes approximately a quarter of the destruction of mangrove forests in Asia (Hamilton, 2013). Thus, it is surprising that a big part of the park is a mangrove boardwalk.

New Master Plan

In 2001, Sungai Buloh was declared as a nature reserve. It was expanded from eighty seven to one hundred and thirty hectares. In the same year, the reserve was recognized as a site of international importance for migratory birds.

The production of a new master plan is in progress, which proposes to enlarge the reserve and to integrate it into the Kranji Countryside.

Singapore's Natural Heritage

Particularly significant is Sungai Buloh's unusually high variety of bird species, which includes migratory birds from as far as Siberia on their way to Australia. This is one of the reasons why Sungai Buloh is internationally protected. The World Wide Fund for Nature (WWF) has helped to manage the reserve ever since it was first protected. The strongest partner of all the heritage sites in Singapore is the International Union for Conservation of Nature (IUCN).

Consuming Wildlife

As a tourist attraction, Sungai Buloh has become popular and economically viable. Since Singapore has an extremely small amount of nature areas left, it is important for the country to protect it.

Cross-Border Relationship

Johor Bahru, on the opposite coastline, profits from Singapore's conservation sites; these provide a view into the green forests for the housing developments planned at the reclaimed Danga Bay area.

Name:
Sungai Pulai
Tanjung Piai
Pulau Kukup

Type:
Ramsar site

Size:
138,6 km²

State of Protection
Ramsar Convention
on Wetlands

Declaration Date:
2003

Accessibility:
Low

Biodiversity of the Rivers

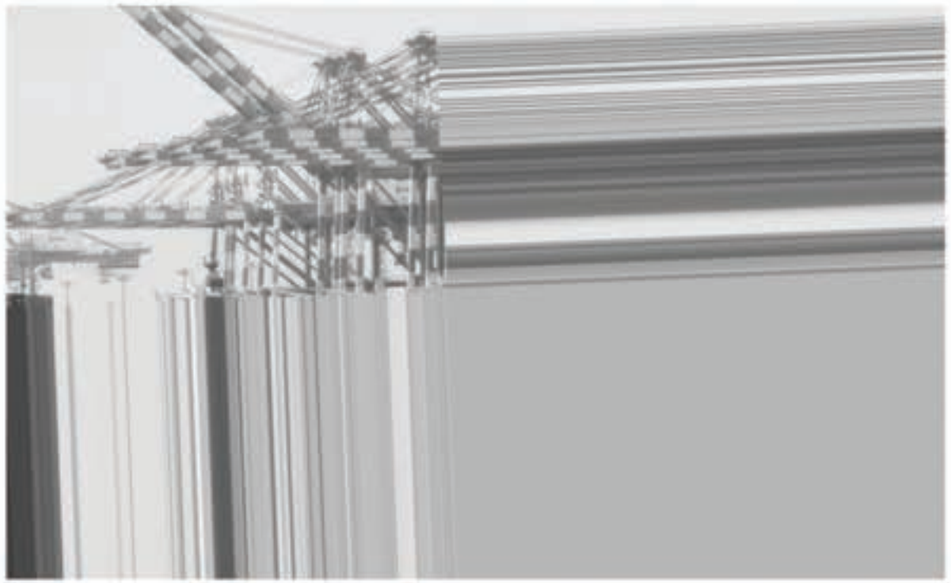
The Sungai Pulai carries the inflows of both seawater and fresh water, providing high levels of nutrients. River systems are the zone of the earth's highest biological diversity – but also of most intense human activity. An estuary is a semi-enclosed coastal body of water with one or more rivers or streams flowing into it, connected to the open sea.

Mangrove estuaries like the Sungai Pulai are among the most biodiverse and nutrient-rich natural habitats in the world. In 2003 the international Ramsar Convention on wetlands decided to put it under its protection status.

Ramsar Convention on Wetlands

The Ramsar Convention was formed to discuss the international impact of wetlands. The convention's mission is 'the conservation and wise use of all wetlands through local and national actions and international cooperation.' UNESCO for example cooperates with them and helps to secure a high level of protection for the site.

In 1999, four years before the site received protection, the Tanjung Pelepas container port was built at the river delta. The main consequence of this was the loss of sea grass beds, home to a large number of unique species in the region. The problem of the protection policy on marine habitats is, that there is no central agency responsible for the conservation of marine resources. This lack of central oversight exposes marine biodiversity to more risks than necessary.



Development Pressure

The Sungai Pulai River is under the jurisdiction of the planning authority of Iskandar, Malaysia. They are planning further developments like a new petrochemical and maritime industrial zone, which will soon cut its way into the site and the mangrove forest.

Local people, who are mainly fishermen, are being deprived their source of livelihood. They will also have to bear the health risks of living near a petrochemical plant.

Name:
Nongsa River

Type:
Forest reserve

Size:
2.2 km²

State of Protection
Under Bappeda

Accessibility:
Medium

Protection in Percent

Few of the protected sites in the region of Batam lie along the coastline, where biodiversity and the need for conservation are at their highest. Economically viable sites along the coast are less likely to receive protection.

The government's strategy for selecting protected sites is controversial and unclear.

Tourist Industry along the Coast

People in Batam know the Nongsa region because of its beautiful sandy coast, which had once been a local leisure and recreation space. Today the coast is being developed as a tourist attraction, simulating to Singapore's Sentosa Island. The property of the coastline is nearly fully sold to investors who are developing the land into resorts and golf courses.

Virgin Island

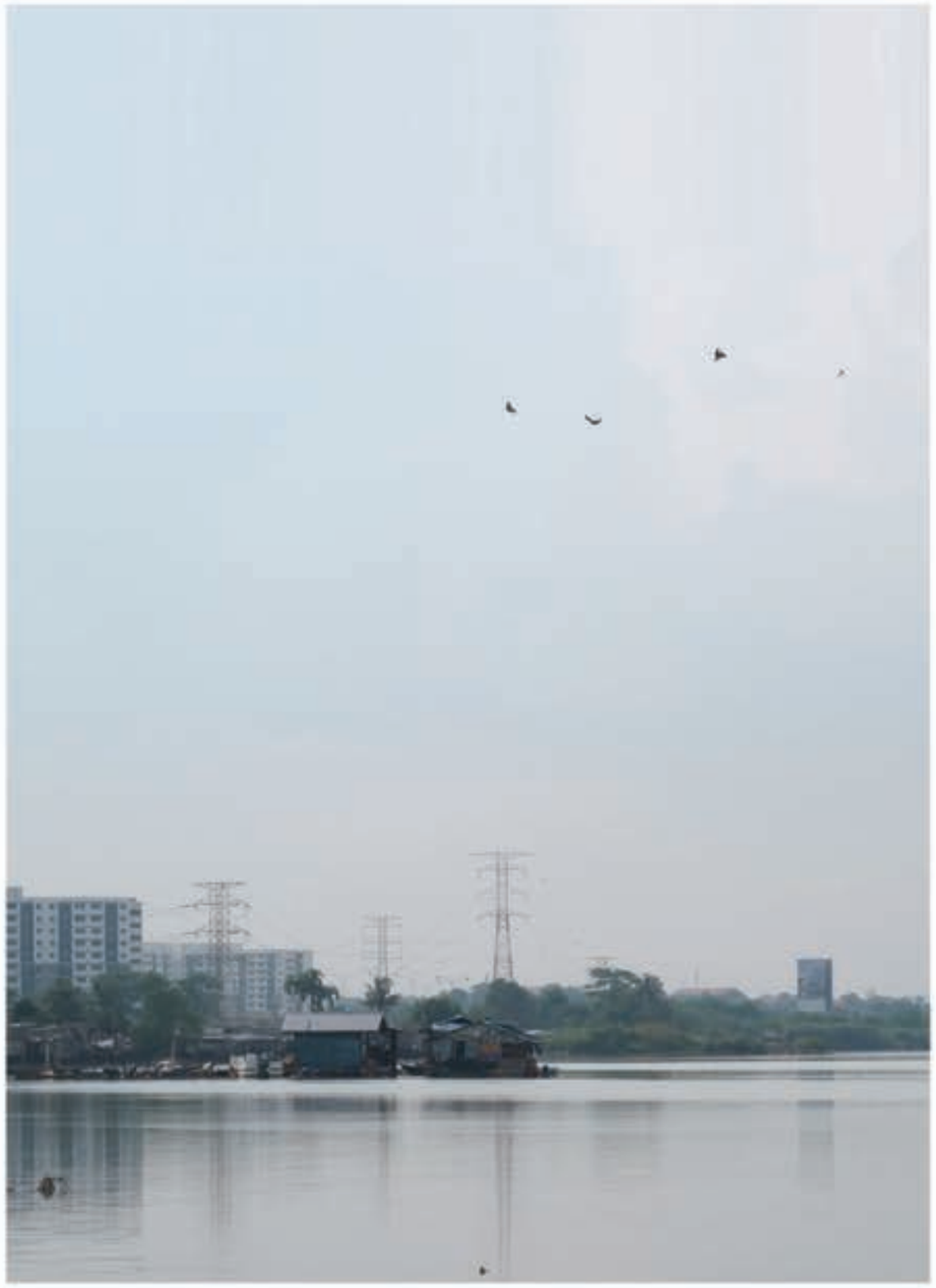
In the heart of Nongsa, where ferries shuttle tourists back-and-forth to resorts, an intact mangrove forest appears like an island in the midst of the surrounding development.

Supposed Mangrove Replantation

A new project is underway at the riverside. The construction workers in the picture are about to build a new bridge over the river. The clearing of the mangrove forest will be replaced through replanting efforts. The restoration and rehabilitation of existing or former mangrove forest areas is extremely important today. But actual planting of mangroves in such a place surrounded by forest is rarely needed as mangroves annually produce hundreds of seeds per tree, which under the proper water conditions can recolonize mangrove areas very quickly. So the primary issue is the polluted water and the lack of regulations concerning waste management along the river.

Ignored Value

The Sungai Tebrau on the coast of Johor Bahru still maintains a few patches of its natural coastline.
The master plan of Johor Bahru's future development shows that the entire coastline will be reclaimed, developed or altered in the near future.



Kampung Senibong,
Johor Strait

Land Banks

The areas shaded in yellow are in danger of being developed or are already part of a development master plan.

These natural leftovers are located in unprotected areas facing rapid urbanisation.

Mangrove

Mangroves protect shorelines from damaging storm and hurricane winds, waves, and floods. Mangroves also help prevent erosion by stabilizing sediments with their tangled root systems. They maintain the water quality and clarity, filtering pollutants and trapping sediments originating from the land. Mangrove forests are home to a large variety of fish and help to regenerate the fish stock.

Name:
Sungai Melayu

Type:
Development zone

Size:
5.74 km²

Accessibility:
High

Natural and Cultural Heritage

The Kampung Melayu is one of the last kampungs in the city of Johor Bahru. Prior to 2012, it remained isolated from the surrounding urbanisation. In 2012, the Johor government positioned the Kampung Sungai Melayu as an agro-tourism destination to allow the kampung residents to profit from state's booming development. Yet, the master plan, updated in 2014, shows that the largest part of the Sungai Melayu river will be reclaimed and redeveloped with residential buildings and commercial properties.

Habitat in Spite of Development

Discussing biodiversity in a place surrounded by construction sites may seem surprising; yet, it seems that a majority of species have survived and remain in Sungai Melayu. Despite the extent of habitat destruction and modification, a diversity of marine and land life is still present.

The present approach, where development takes precedence over conservation, has not yet resulted in drastic reduction of marine biodiversity. Protecting the last patches of original green on the Johor Straits would be a positive step towards preserving the remaining biodiversity.

Name:
Sungai Tebrau

Type:
Development zone

Size:
14.7 km²

Accessibility:
High

Lack of Planning Capacity

The Iskandar Regional Planing Authority (IRDA) is responsible for the land use in the Johor Bahru region. One of the authority's five goals is the protection of the natural environment. Yet, the future plans and proposals of the IRDA do not seem to foreground the importance of environmental protection and management. The IRDA's explanation is that they cannot handle the speed of growth and development; thus, they are forced to make quick decisions that are sometimes unable to fully take environmental concerns into account.

Conquering the Coast

As Johor Bahru experiences economic growth similar to Singapore's own development in the past, the perceived gap between the two cities is not as large as it was only a few years ago. The most recent project, which helps to connect the cities, is a MRT route planned parallel to the Causeway. Singapore, in parallel, has as a consequence declared its northern shore as a future development zone.

Selling the Green View

Due to its location between the urban setting and the still intact nature, Sungai Tebrau is of great interest to developers and investors. Crescent Bay, a large housing project built over a forest along the river, promotes its apartments with the great view into nature across the river in Singapore. Yet, this natural view will not last long as there are already plans to develop these green areas.

Name:
Tanjung Uma

Type:
Heritage site

Size:
0.2 km²

Accessibility:
Medium

Batam's Oldest Village
Tanjung Uma is the largest and oldest fishermen village located in Batam City. Therefore, the local government assumed that Tanjung Uma has the largest indigenous communities and declared the villages a cultural heritage site. As a result, these villages will be saved from the plans of the Batam Industrial Development Authority, which proposed to use the site for housing estates.

Topography as Natural Border
The topography of Tanjung Uma is acting as a natural border and played a role in preserving the villages; a little hill surrounds the village and slope was too steep to accommodate development.

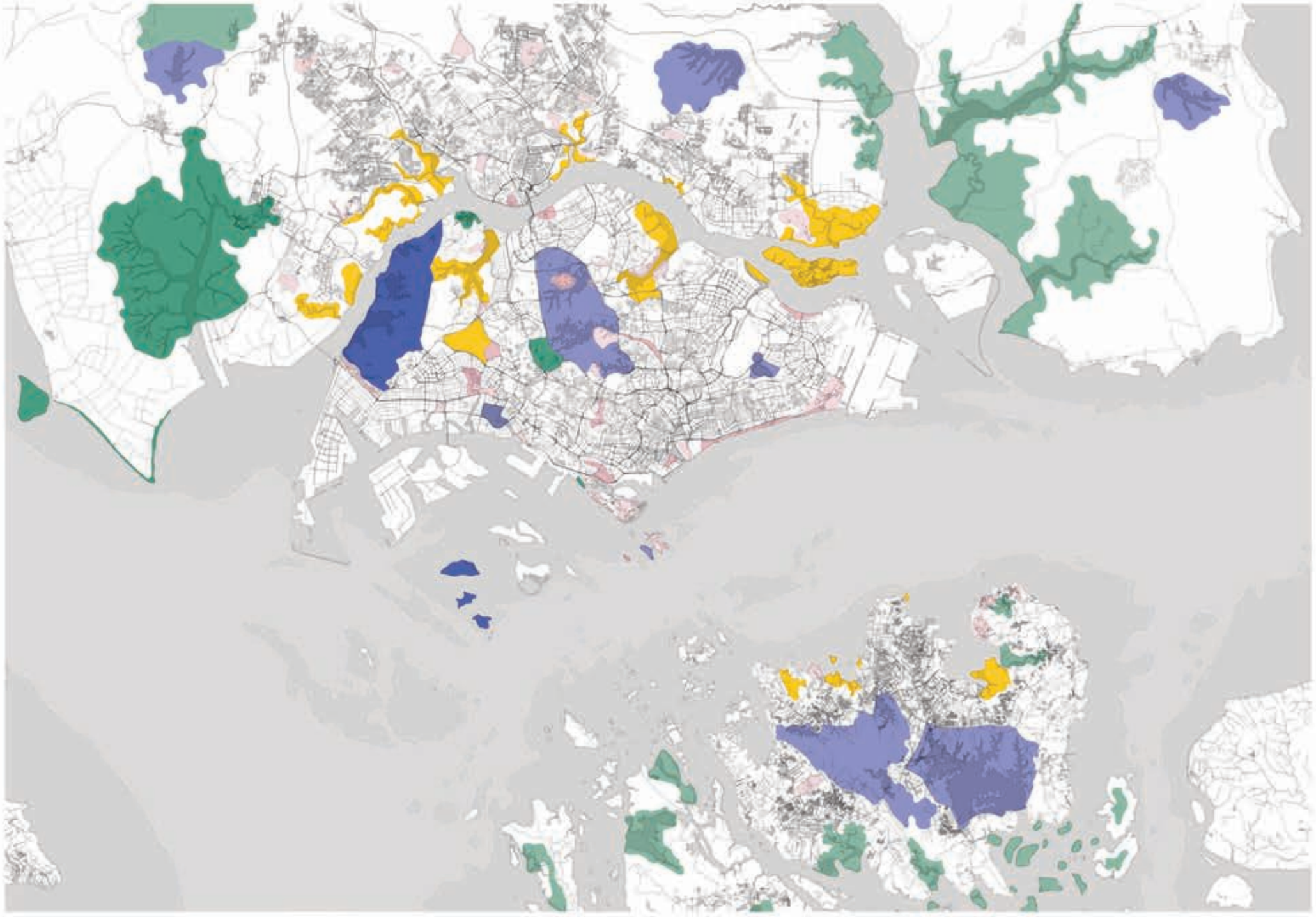
Resident's Resistance
Several riots and a number of protests have been taking place in Batam city. Tanjung Uma residents want to urge the development authority through a petition to recognize the village and 33 other villages as historically important.

Changed Livelihood
The days when fishing was the village's only livelihood are over. Only a few residents still earn a living as fishermen. Most of the men are working in the city in the construction industry, textile industry, or on farms. Pollution of the mangroves and deterioration of the water quality has also made fishing a less viable occupation.

The Logic of the Green

After analysing the present condition, certain organizational logics of nature in the trinational city are identifiable.
Each country has its own logic for each of the presented typologies of nature and green. Factors that affect each country's management of these areas include: wealth, the amount of land available, population, and its relationship to neighbouring countries. Time is also an important factor. Part of the areas of our category 'Land Banks' used to be protected forty years ago; some of the areas of 'Constructed Nature' used to be primary forests.

Integral Greenery and landscaping of Singapore's public Housing Board Developments (HDB), Bukit Batok, Singapore


Legenda
Constructed nature
Strategic nature
Protected nature
Land banks
0 2.5 5 km
N

Batam Island

Effective Nature Area in the Region

Amount of 'Nature and Green' in Square Metres per Capita

	Effective Nature Area in the Region	Amount of 'Nature and Green' in Square Metres per Capita
Constructed Nature	0 %	0 m²
Strategic Nature	27 %	121.5 m²
Protected Nature	5.4 %	24.3 m²
Land Banks	2.7 %	12.2 m²

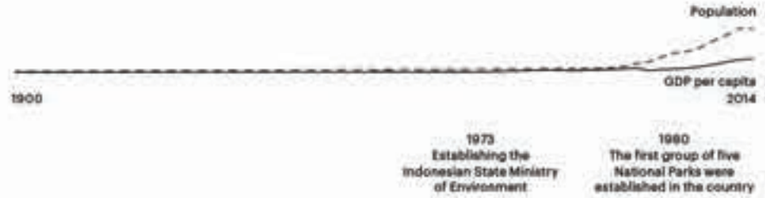
Johor Bahru District

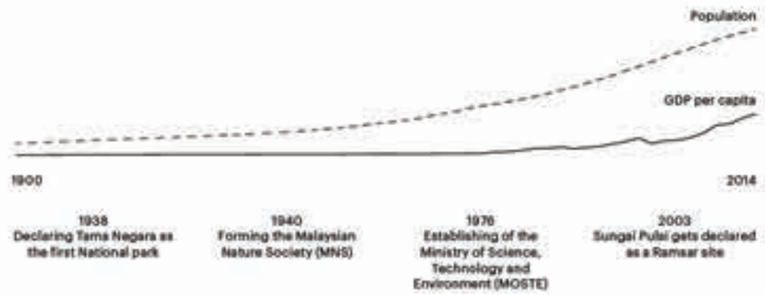
Constructed Nature	0.1 %	0.8 m²
Strategic Nature	2.5 %	21.2 m²
Protected Nature	5.5 %	46.5 m²
Land Banks	4 %	33.85 m²

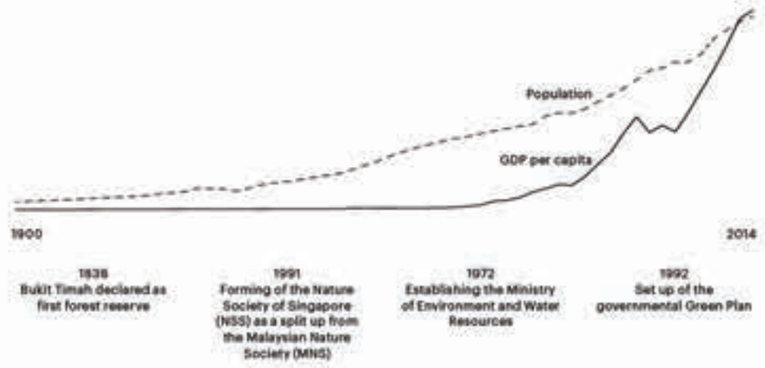
Singapore

Constructed Nature	2 %	2.6 m²
Strategic Nature	13.5 %	17.9 m²
Protected Nature	1 %	1.3 m²
Land Banks	5.5 %	7.3 m²

Development of Nature Protection through Time







Batam

There are only golf courses and no public parks in Batam. Water reservoirs are of high importance to the island due to its geographical isolation, and cover big parts of the island. Protected nature areas are distributed onto uninhabited islands and unaccessible areas, rather than to environmentally significant locations for the city.

Close to the city centre there are only few natural coastal areas remaining, that would have a potential to be protected.

Johor

As planned nature and green areas in Johor Bahru are only the Botanic Garden and numerous golf courses. Since the city is located on the mainland water supply from water reservoirs is not necessary.

Further outside of the city, large areas of protected nature can be found, since land shortage is not a problem for Johor.

There are many natural patches remaining around the city centre, which are facing the pressure of future developments.

Singapore

There are many public parks in Singapore and the number of golf courses in comparison to the rest of the region is comparatively low.

Water reservoirs are also of very high strategic importance for the island, to secure its independence. The reservoirs are strictly protected and no urban development is allowed in their proximity.

There are hardly any protected areas in Singapore, due to limited land reserves. The natural left over sites are rather of small size and can be found in thin stretches along the coast.

Metropolitan Parks

Our proposal aims to rethink the value of existing green and open for the general public and their possible modifications, conservation and protection. All propositions aim to improve living quality and environmental well-being in the region. Parks need to be well distributed throughout the region. Nature with strategic or infrastructural uses should also be opened to the public. Natural areas outside the metropolitan core should be accessible. The remaining natural coastline should be preserved and reinterpreted, not only as border between water and land, but also as contact between nature and city.

Rethinking of metropolitan green; The second coastline

Sultan Iskandar Lake Park

Johor Strait Coastline Park

Pulau Ubin Nature Park

Johor River National Park

Central Catchment Lake Park

West Johor National Park Ramsar Conservation Park

West Coast Lake Park

Southern Islands Maritime Park

Maritime Biodiversity Park

Sekupang Coastline Park

Batam Central Coastline Park

Batam Island Lake Park

Riau Archipelago National Park

Metropolitan Parks

- Urban parks
- Lake parks
- Great outdoors
- Second coastline

0 2.5 5 km

N

Urban Parks

The Urban Parks are located in the metropolitan core and appear as public green and open spaces integrated in the urban setting. Being of variable sizes, the urban parks take advantage of unique or unused spots throughout the city.

For the residents, it is important to have a park within walking distance or easily accessible by public transport. Main uses are active or passive recreation in the daily city life, which means that open fields, playgrounds, sport facilities and cafes are part of the park's program.

Amount of Constructed Nature

Lake Parks

The lakesides are part of the water reservoirs throughout the metropolitan region and appear as large patches of strategically protected nature mostly surrounded by residential areas. Since the ground in the forest is modified for filtration of water, an intensive alternative use is not conceivable.

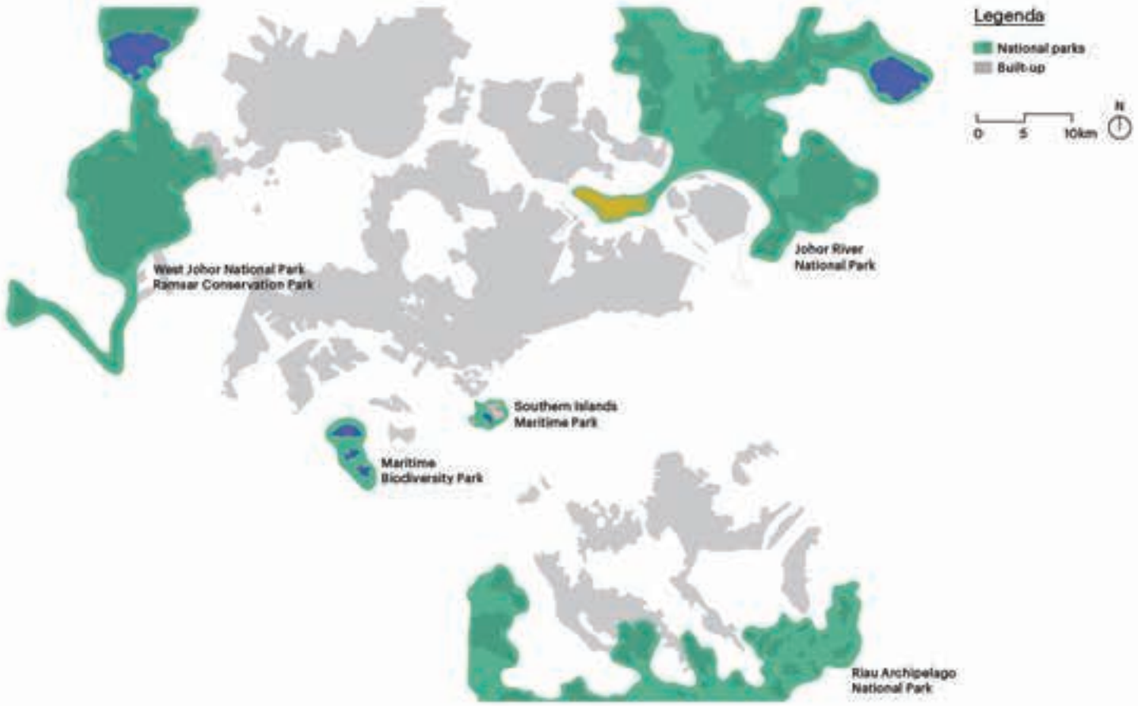
Instead, the proposal introduces urban parks along the shore of the lakes and connects paths through the forest to the city. Thus, the lakesides serve as local recreation areas in the metropolitan region. Basic services and advanced public transportation are provided. Sports like hiking or fishing as well as public events and educational projects are part of the program.

Amount of Accessible Space in the Strategic Nature Areas

Great Outdoors

The Great Outdoors refers to three huge patches in the proposed plan, that unite several areas of protected nature mainly consisting forest and rivers. These patches appear at the edge of the metropolitan core and do justice to the picture of wild, intact nature. The great outdoors are accessible as a weekend destination and thus require minimal infrastructure.

Whether over land or water, guided or unguided, a trip to the Great Outdoors is an adventure. Bird watching, night fishing and other activities are offered and connected to a possible overnight stay in a kampung. Educational and environmental projects also help to conserve the natural and cultural heritage of the region.

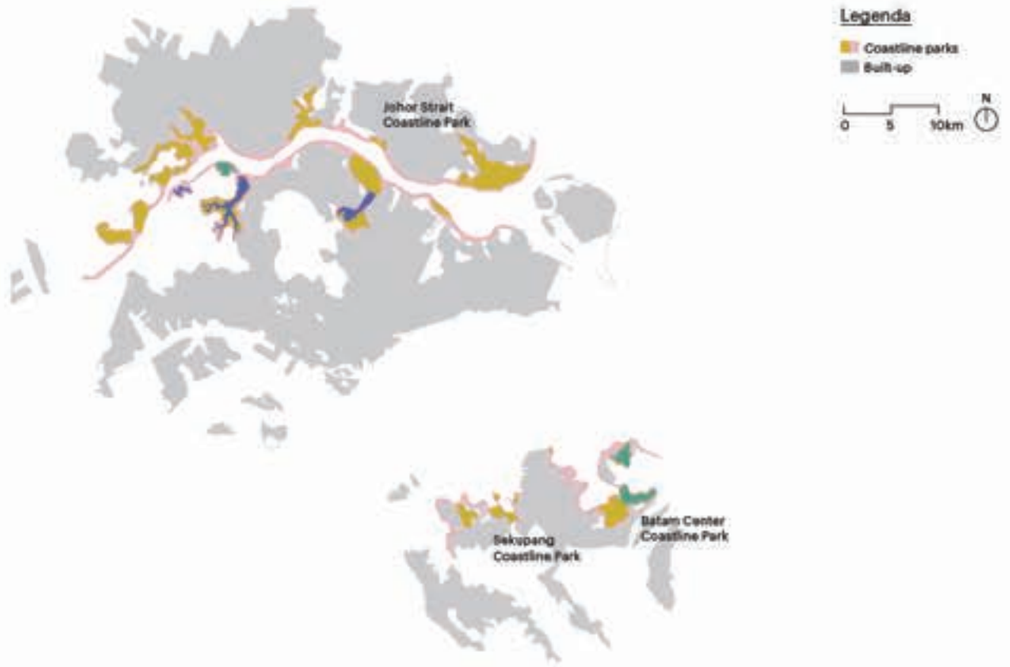


Amount of National Parks and Conservation Areas

Current	158 km²
Proposal	383 km²

Second Coastline

The Second Coastline consists of diverse natural leftover areas along the coasts of the metropolitan region. They appear at the edge of each city, often facing the neighbouring city. Lacking protection, these areas face significant development pressure. The proposal aims to rethink these river mouths as an extension of the actual coastline. Natural bays reach inland, enlarging the highly valued coastline of the metropolitan core. The new coastline is no longer the line where the land meets the sea, but where the built fabric meets coastal nature. Urban parks, with paths and open spaces are part of the second coastline. The residents around the second coastline benefit from the proximity to the green. The Second Coastline increases living qualities in the cities, but also changes the character of the existing border zones, making the three cities more open to each other and to the sea.



Length of the Green and Public Coastline

Current	183 km
Proposal	285 km

Legenda

- Remaining woods
- Parks and paths
- Waterbodies

0 1 2 km N

Left:
Existing green areas

Right:
The second coastline;
Future scenario of the metropolitan green areas along the Johor Strait

Second Coastline Project

The remaining forests along the rivers are preserved in their present state. Urban parks are introduced along the shore of the Johor Straits and the rivers leading towards it. A second layer of green is added, which creates a connecting line between sections of the coastline and frames the remaining green areas. It mediates between the urban fabric, the remaining forests and coastline and increases their accessibility for the public. A connected 'green coastline' is created, from which other urban parks, which would lie further inland are also accessed.

Through these interventions, the area which was previously available for development shrinks, but its value in terms of quality-of-life and location increases. The construction of the Causeway as a bridge instead of a dam is proposed to make the Johor Straits flow again; more bridges will follow and borders will fade.

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p.13: The National Archives of the UK (TNA). In the Jungle.

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Acknowledgements

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Kelong construction and fishing village, Bintan

Architecture of Territory
ETH Zurich
FCL Future Cities Laboratory

Sea Region
Singapore, Indonesia, Malaysia
Project 2

Asst. Prof. Milica Topalovic
Hans Hortig
Stefanie Krautzig

CULTIVATED SEA

Fishing and Aquaculture in the Metropolitan Region

by
Simone Michel
Anna-Katharina Zahler

Coastal kampungs and fishery ports

The first people to inhabit the Singapore, Johor and Riau Archipelago were nomadic fishermen who lived on the sea for months at a time, following the monsoon seasons. Today, traditional fishing can still be found in the remoter areas of the archipelago. It remains an important source for the region's food production, and it is increasingly seen as part of the region's leisure landscape.

The region's urban growth stands at odds with the traditional fishing communities, through the expansion of petrochemical industries, shipping facilities, ports and construction along the coastlines, underwater dredging and land reclamation destroy marine habitats and reefs. Industrial waste and runoff water are sources of serious marine pollution that render fishing and aquaculture in the region undesirable and even hazardous.

Apart from the environmental challenges for the seafood production in the region, Singapore imports 95% of its food and its fish from all over the world. The remaining areas of traditional fishing culture are increasingly hard to discover in the metropolis and mostly invisible to the city dweller.

The project challenges the dissociation with the once main source of livelihood of the region. The analysis of the region's fishing cultures and aquaculture production shows that Singapore, Johor and Riau Archipelago could be self-sufficient in its seafood production. This vision of a shared trinational sea space as space for production speaks in favor of supporting the region's traditional and local economy. Along these lines, three cultivation strategies have been developed in the project: "Urban fish farms" in close proximity to the cities, especially Singapore; instead of disappearing, the traditional kampungs on the shoreline should be integrated into the urban fabric in Batam and Johor; and lastly the accessibility to tourists of remote fishing communities in the archipelago should be created in a low-invasive and sensitive way.

The project also tries to create a connection between the urban life and the fishing culture: fishing should be seen as part of identity and cultural heritage of the cross-border metropolis.

Territorial Logic of the Productive Sea

Although it has little water area, Singapore is surrounded by two of the world's largest and most abundant fisheries. As one of the world's largest archipelagoes, Singapore's southern neighbour, Indonesia, has more sea than land. For centuries, there was no strict maritime border between Singapore, Malaysia and Indonesia, and fishermen could navigate freely. In 1973, Singapore and Indonesia agreed on a fixed maritime boundary. Crossing the border, to fish or navigate, requires a Singapore-issued license. The rigid enforcement of this policy has forced the local fishermen to adapt their routines. Unfortunately, this border does not impede environmental issues such as overfishing and pollution. All of the nations are equally affected.

Weighing the catches,
East Coast Bintan

Fishing Borders

In 1973, Singapore and Indonesia signed an agreement about a strict maritime border between both nations. Prior to this, people used to trade, fish, and transport goods between the nations without a strict border. Since 1973, crossing the border from both sides has involved a number of obstacles. Crossing the border nowadays is only allowed with a license.

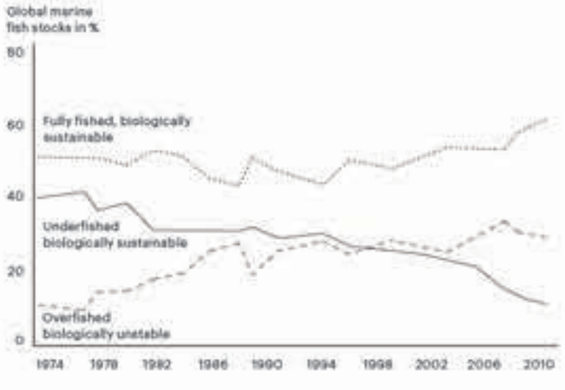
Because of the large sea areas in Malaysia and Indonesia, it is difficult to monitor the whole length of the maritime border. Instead, Malaysia and Indonesia have agreed to a grey fishery zone. This allows fishermen from both sides to fish across the maritime border in a certain area.

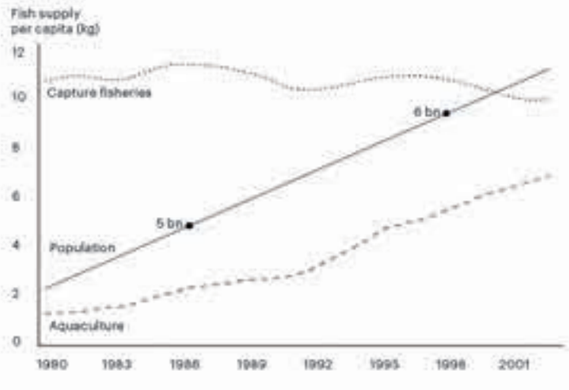
In Between the Sea Nations:
Singapore Enclosed

Singapore has a strict maritime border with Indonesia and Malaysia. A fishery grey zone between Malaysia and Indonesia enables the fishermen from both nations to cross the borderline within a certain distance.

Exploitation of the Fish Stocks

Overfishing has increased in recent years due to large-scale commercial vessels entering the region, mainly from the South China Sea. These ships are capable of fishing in deeper and deeper waters. Fishing regulation of these large vessels is impeded by the size of the area. The traditional fishermen of Johor and Riau Archipelago fish using small vessels; only some go to deeper waters. They understand their dependency on fish stock and do not overfish. In addition, the government of Singapore is concerned about the fish stocks and supports prudent small-scale fishing and other fish stock-friendly practices like aquaculture. Singapore, due its low fish production, has a an indirect effect on overfishing.





Global Trends in the State of World Marine Fish Stocks

The growing world population has a greater demand for protein. To meet the demand, the sea is being overharvested and exploited. This leads to a decrease of the average age and size of fish caught.

The Rising Consumption of Aquaculture Products Worldwide

In addition to the growing population, the demand for fish per capita is rising. Most of this increased demand is met by the developing aquaculture, with the percentage from the capture methods remaining fairly constant.

The Big Ones Take it All

Although most of the fish species are not overfished yet in the region, the future conceivably bring a change. More large fishing vessels, primarily from Japan and China, are illegally fishing in the Exclusive Economic Zone or territorial waters of Malaysia and Indonesia. This has a detrimental impact on the fish stock.

Water Quality - Fishing next to Industry

Over 80 percent of marine pollution comes from land-based activities. Industrial and urban runoff, along with chemical and biological waste from aqua- and agriculture, creates a zone of polluted water around the major cities. This is especially true in the Johor Strait, where the water current is too slow to carry the runoff coming from Singapore and southern Malaysia. This results in poor water quality. The water inside off-loading container ships often comes from a different ecosystem, and releasing it into the local environment can have detrimental effects. Regulations and monitoring of shipping traffic through the Singapore Strait keeps water pollution quite low. The stronger current in the Singapore Strait raises the water quality south of the island.

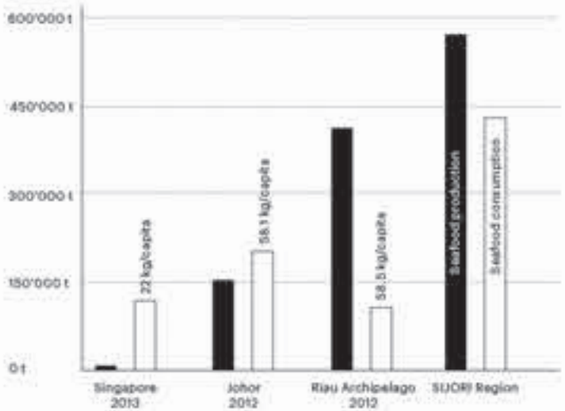
Hantu and Bukom Island, Singapore

Fishing at Odds with the Industry

Our research yielded little information about the water quality in the region. Information to date shows that the region's ecosystems are in a fairly good state. Certainly, the rising industrial and urban impact of Singapore, Johor Bahru and the Riau Archipelago will continue to deposit pollutants like oil, fertilizers, garbage, sewage disposal and toxic chemicals into the marine water. This will continue to impact the region's diverse ecosystems and its water quality.

Cross-Border Economies

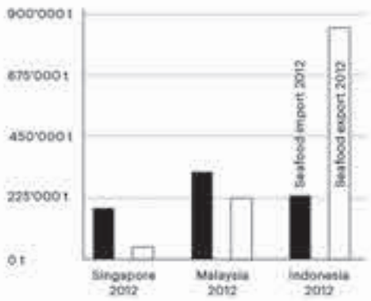
Indonesia is the second biggest seafood producer in the world, and the Riau Archipelago produces the highest amount of seafood in the SIJORI region. Its low population density means that it is able to export fish to the rest of the region. In contrast, Singapore's dense population and small water area makes it dependent on imported seafood.



Johor Bahru produces 20 times more seafood as Singapore, but its large population still relies on imported fish. Importing fresh and chilled fish requires short transportation routes, so that trade within the region is more convenient.

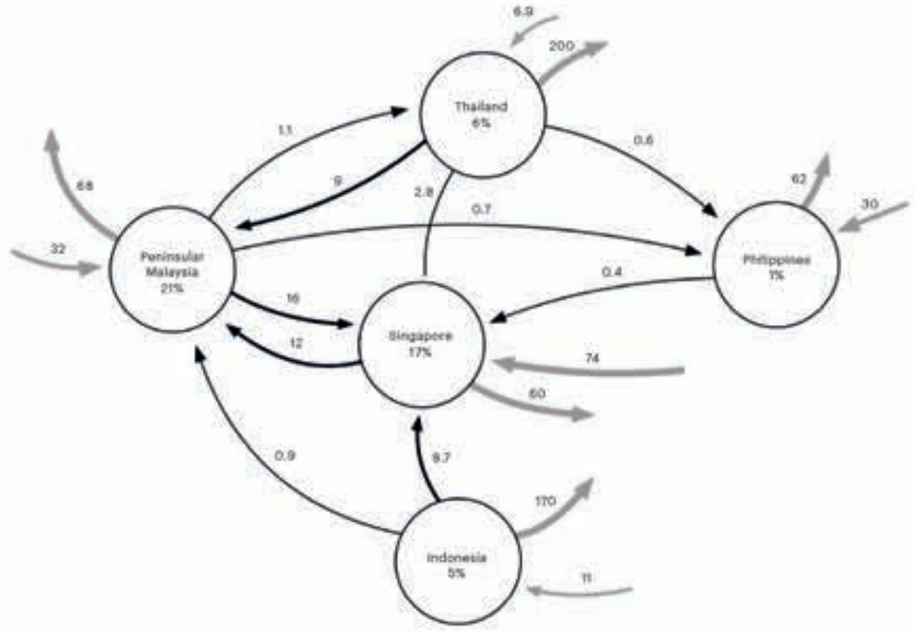
The Possibility of Self-Sufficiency in Seafood in the Region

Singapore's small seafood production (6,675 tons/year) can only cover 5% of its consumption. Johor, despite producing around 154,851 tons a year, also depends on seafood imports. The Riau Archipelago has the highest fish production in the region with 410,321 tons a year. Looking at these numbers, the SIJORI region as a whole could be self-sufficient in seafood production.



Indonesia, the Biggest Seafood Exporter in the Region

Singapore imports 95% of its seafood. Malaysia is a large importer and exporter of seafood. Indonesia exports three times more than it imports.



Seafood Trade in the SIJORI Region

In 1978, the highest percentage of seafood was exported to non- ASEAN countries. Singapore had the highest valued import in the region. Thailand and Indonesia had the highest valued exports.

In 2012, 15% of the value of exports of fishery commodities from Malaysia went to Singapore and 5% to Indonesia. 18% of the value of imported fishery commodities to Malaysia came from Indonesia and 29% of it from China.

Trade of ASEAN Countries in Fish and Fish Products, 1978

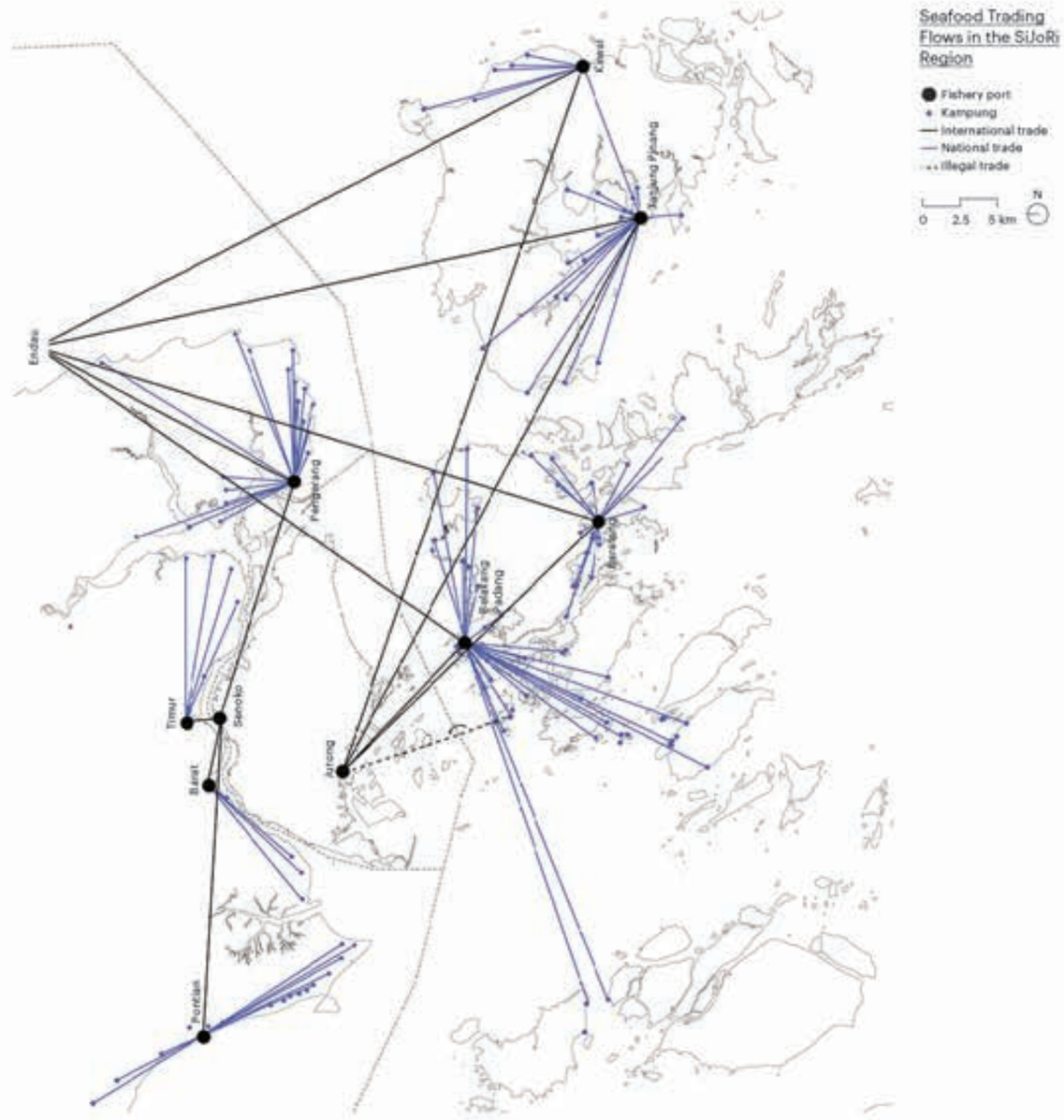
→ Trade within ASEAN
⇢ Trade with countries outside ASEAN
% of exports to other ASEAN countries
16 Trade rate in mio. USD

Legal and Illegal Seafood Flow Across the Border

Fish caught in the national waters has to be brought to a fishery port in the same nation where it will be registered. To avoid the trip and taxes, some fishermen trade their fish illegally by selling it at the border to another vessel.

Seafood Trading in the SIJORI Region

After fish has been caught all over the region, it will be gathered from a carrier or a lorry and transported to the next fish market or fishery port. After being registered and, if needed, licensed, the fish can be brought abroad. For bringing the fish to another country, every vessel needs a license.


Seafood Trading Flows in the SIJoRi Region

Fishing as a Diverse Culture

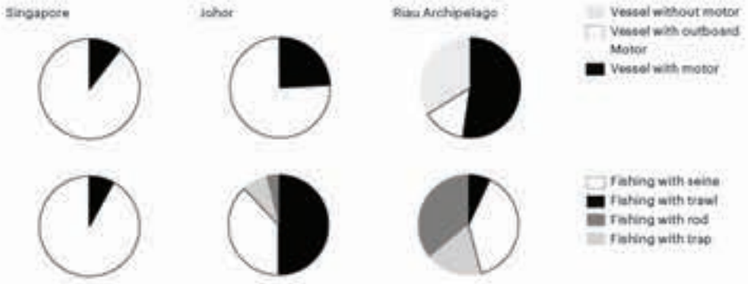
Over generations, people have adopted and mastered distinct fishing techniques best suited for their particular conditions and demands, resulting in a wide diversity of fishing practices in the SIJORI region. Commercial fishing, small-scale traditional fishing, and reef fishing are fishing methods are common to Singapore, Johor and Riau Archipelago. Some fishermen specialize in a specific technique, which nowadays can only be found at specific points in the region. One example is fishing with a kelong along the east coast of Bintan.
Fishing is not only providing food fish supply, but it is also a part of the cultural identity of the region and structures the landscape. Additionally, it represents a particular way of working and living for many people living in rural areas.
Fishing culture and connection with the sea is becoming obsolete in city life. The remaining traces are generally limited to recreational fishing by city dwellers in certain locations.

Boat building in Pulau Buloh

Mapping the Fishing Grounds

In the SIJORI region there are many different types of fishing. They range from collecting mussels to midscale commercial fishing. Until recently, the sizes of fishing vessels stayed small. In contrast to nearby countries, Singapore, Johor and Riau Archipelago mostly fish within their national waters or the EEZ. Every type of fishing has its own territory. Small-scale traditional fishing takes place near the kampungs and inshore; reef fishing near the coast; for kelongs, near the kampungs and out in the open sea. Commercial fishing has the widest range, from near the kampungs, the fishery ports, and the in- and offshore. Much fishing infrastructure, is out on the sea and not visible most of the time. The following pages map fishing types according to where they are found in the region.

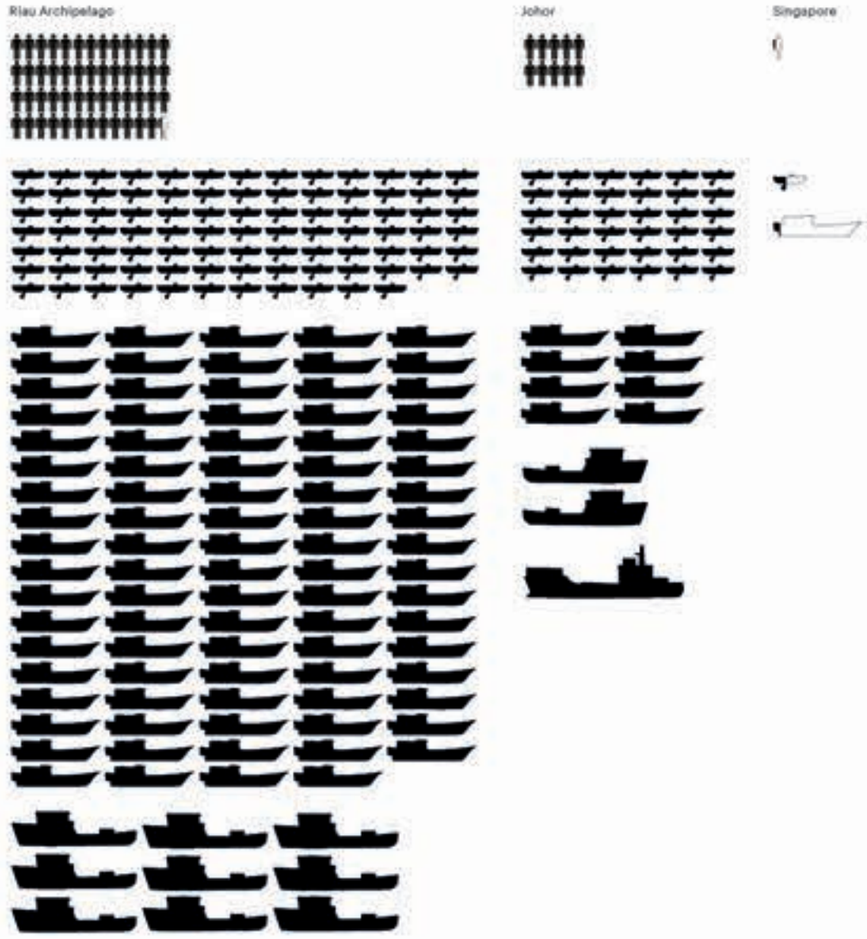
Fishing in the Singapore Strait



Large Fleet, Small Vessels

Singapore's fleet with 38 fishing vessels mostly consists of seine fishing vessels with outboard motor. Three-quarters of Johor's 4,681 fishing vessels are motorized. Half of the fleet fishes with trawls.

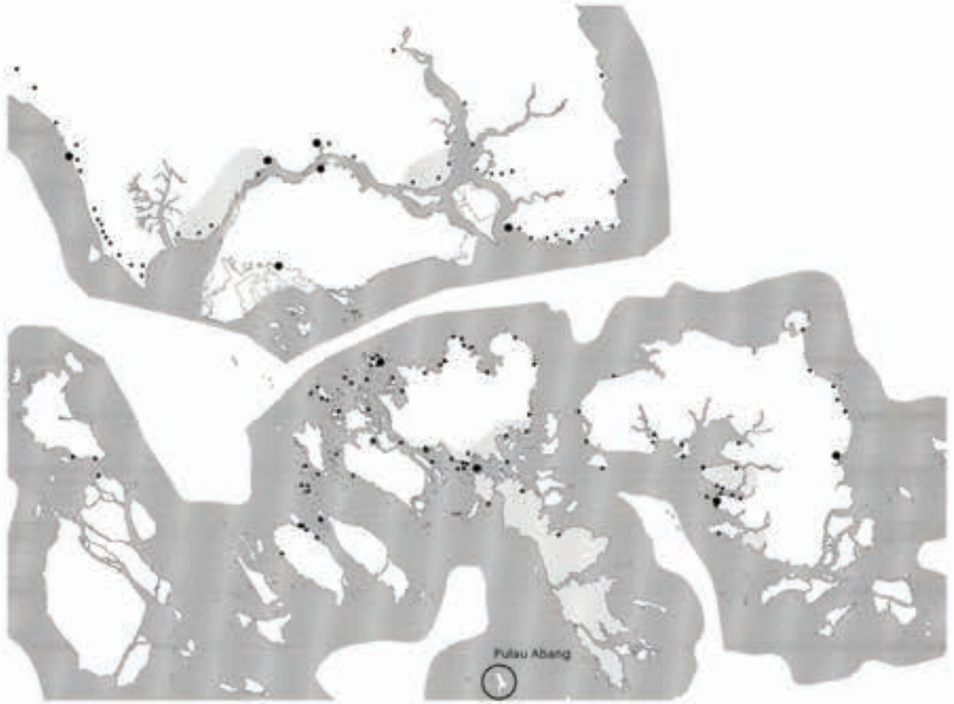
Riau Archipelago has the biggest fleet in the Region with 18,811 vessels. Around one-third is without motor and more than half of the fleet fishes with rods or traps.



Numbers and Sizes of Fishing Vessels in the Region

1000 Fishermen
100 Traditional small-scale fishing vessel (0-5 GT*)
100 Commercial fishing vessel (5-35 GT*)
100 Commercial fishing vessel (35-70 GT*)
100 Commercial fishing vessel (70+ GT*)

*GT= Gross Tonnage= volume of all enclosed space of the vessel



- Kampungs
- Fishery ports
- Inshore fishing
- Future urbanisation

0 5 10 km N

Left:
Traditional fishing areas in the region

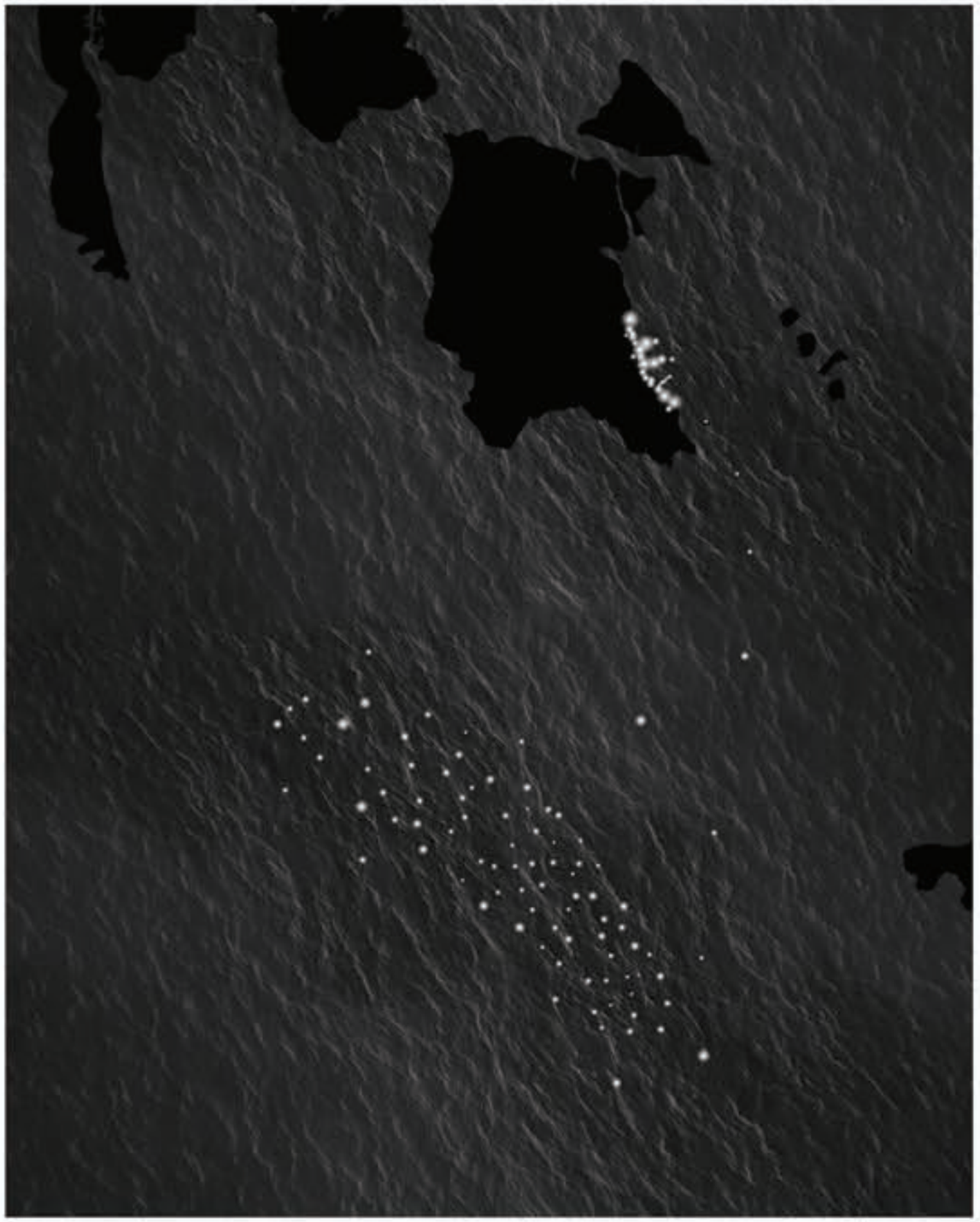
Right:
Night fishing near Pulau Abang

Small-scale Traditional Fishing

Small-scale fishing (fishing with small boats, unmotorized or between 0-5GT, for one or two people) has been present across the region for generations. The high price of larger vessels and fuel is one reason for the fishermen to stay small-scaled. Another reason is a greater sustainability of the fish stock. Traditional fishing grounds are primarily inshore and near the coast. One major reason is, that the unmotorized boats cannot cope with the natural forces of the deep sea.

The fishing season lasts all-year around, except for several days during the rainy season when the sea is additionally dangerous. Some fisherman build community groups to support each other and work together. Both governments, of Johor State and Riau Islands Province, support the traditional, and thus sustainable, fishing communities with boats, knowledge and fishing products. Most of the small-scale fishermen live in traditional coastal kampungs. For them, fishing not only means income, it is their way of living with the sea.

The growth of nearby cities imposes on their fishing territories, which sometimes causes them to move further away, leave their villages entirely, or change to another line of work.



1.

Traditional fishing village on Pulau Abang

1.
Night fishing

2.-3.
Construction on the Sea

4.-6.
Home based ice factory

7.
Kampung fishery port

Kampung Infrastructure

The Kampung on Pulau Abang, a traditional small-scale fishing village, is built out of wood on the sea. The villagers, who live and work here, depend mostly on the fishery for their livelihood.

In the kampung, there is much infrastructure for fishing. In addition to the fishing fleet there is an ice factory which produces ice for fish transport. Another small port has a fish carrier vessel which brings the fish to the next fishery port.

Small-scale fishermen go out to fish from afternoon until night; they also farm fish, and catch fish from small stakes. The women do some of the fish processing.

The provincial government of the Riau Islands aims to support the traditional fishing villages by promoting "kampung tourism". On Pulau Abang, a home stay for tourists has been built inside the village. While the villagers welcome the idea of visitors, there have been very few so far.

2.

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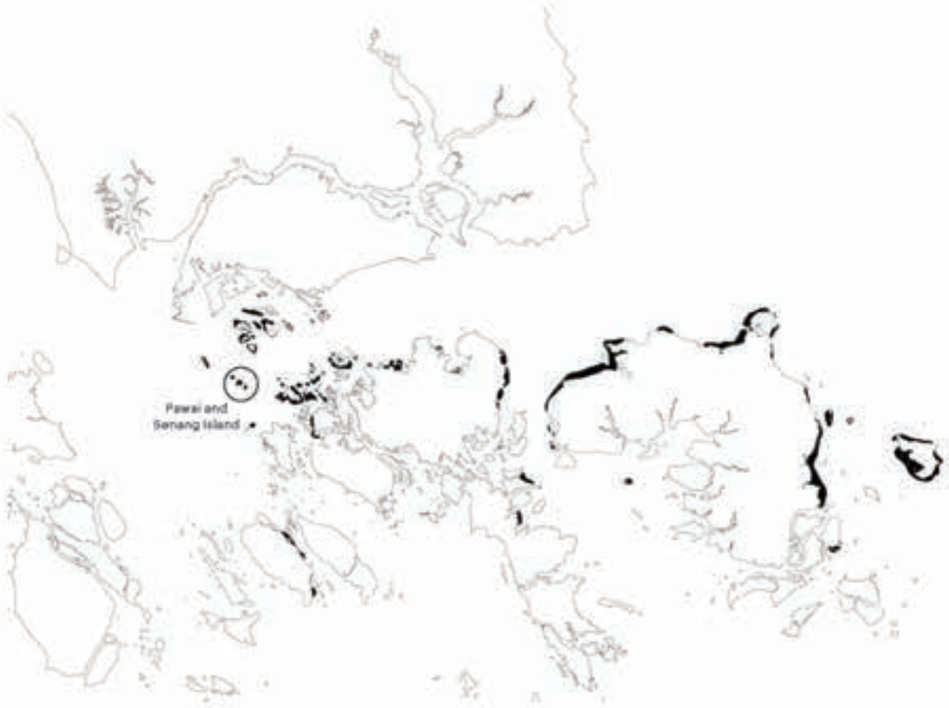


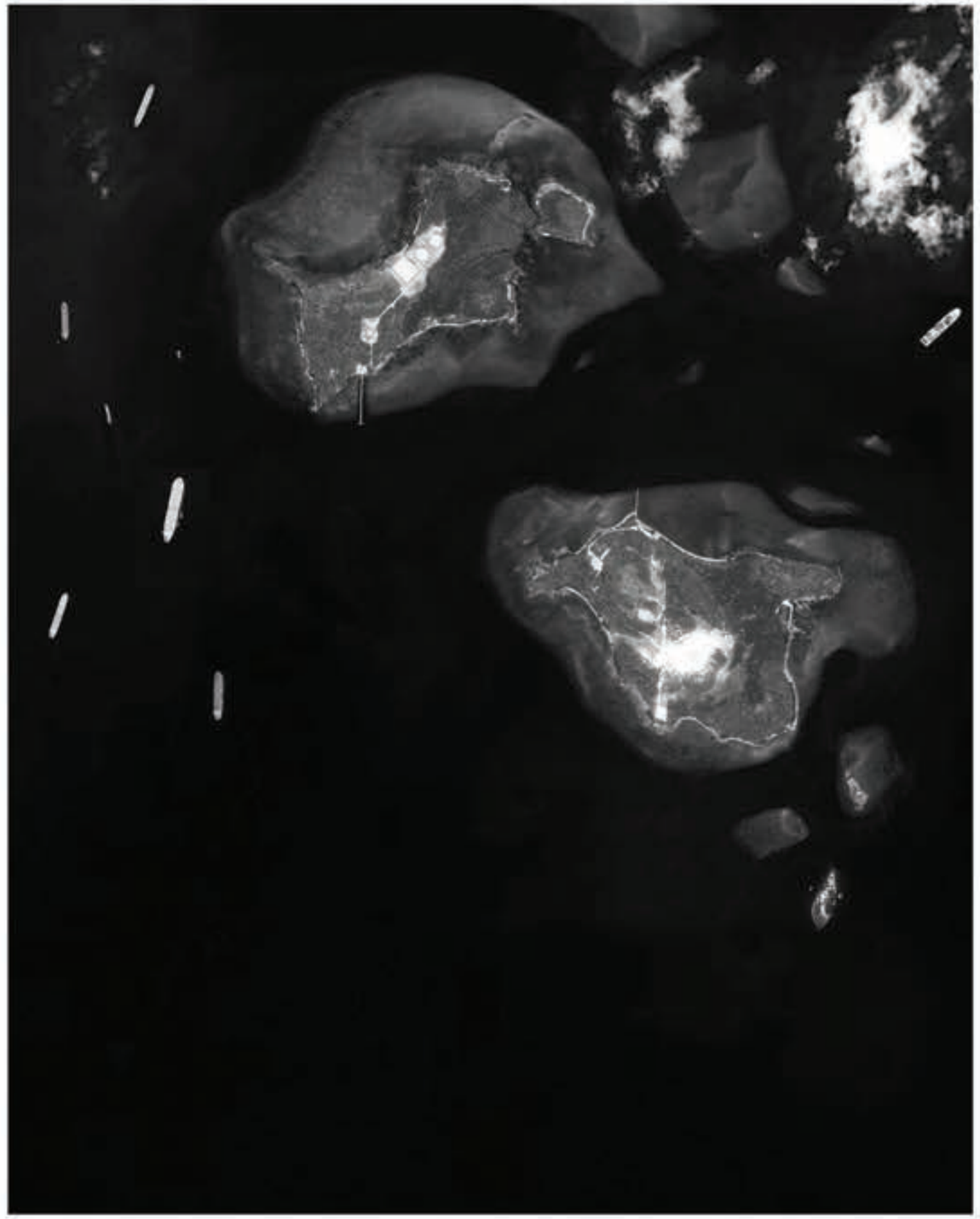
Left:
Areas of high reef fishing activities in the region

Right:
Coral Reefs of the Pawai and Senang Island, Batam

0 5 10 km N

Reef Fishing

Reef fishing can include collecting mussels in low tide or fishing with a net, a trap or with other techniques. It happens along the coast, without a boat. Often the reef fishing is done for the fisherman's own sustenance, rather than for selling. Water pollution, channel dredging, and land reclamation are destroying the reefs and threatening their fish populations. Singapore has 0.1%, Malaysia has 0.4%, and Indonesia has 16.7% of the worlds coral reefs.

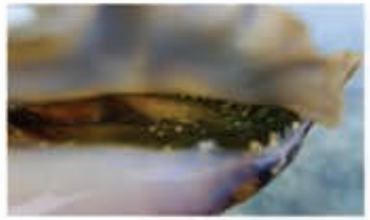
















Reef fishing, picking up shells, calms and conches on Trikora Beach, east coast of Bintan















Left:
Traditional large-scale fishing areas in the region

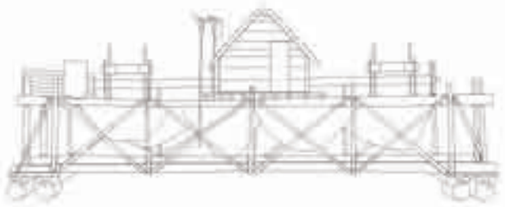
Right:
Traditional fishing and kelong building village, near Teluk Dalam, Bintan

Middle:
Drawing showing the construction of a kelong

Bottom:
Position of kelongs is shifted by small motor boats, depending on weather condition and seasons

Kelongs - Traditional Large-Scale Fishing

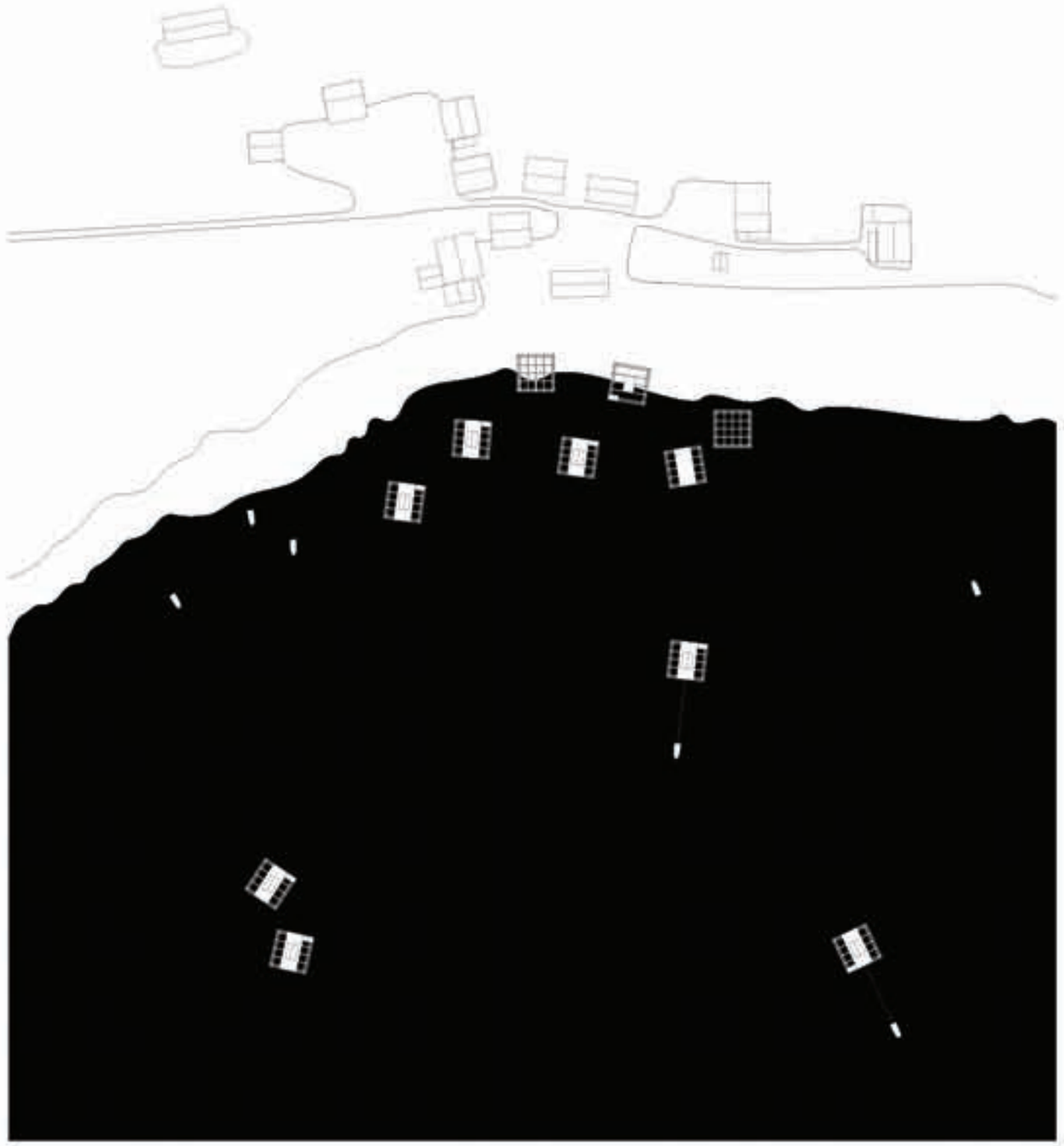
Kelongs are fishing structures consisting of a building on stilts, which sit on a floating platform on the sea. The practice of fishing with floating kelongs can be found mostly at the east coast of Bintan. Because a kelong is a big investment, some fisherman pool their money to buy one together. Some may buy kelongs to rent to fishermen. A kelong lasts for approximately 5 years and costs around 100 million rupiahs. On a good night, a fisherman with a kelong can catch fish valued around 1-2 mio. rupiahs.

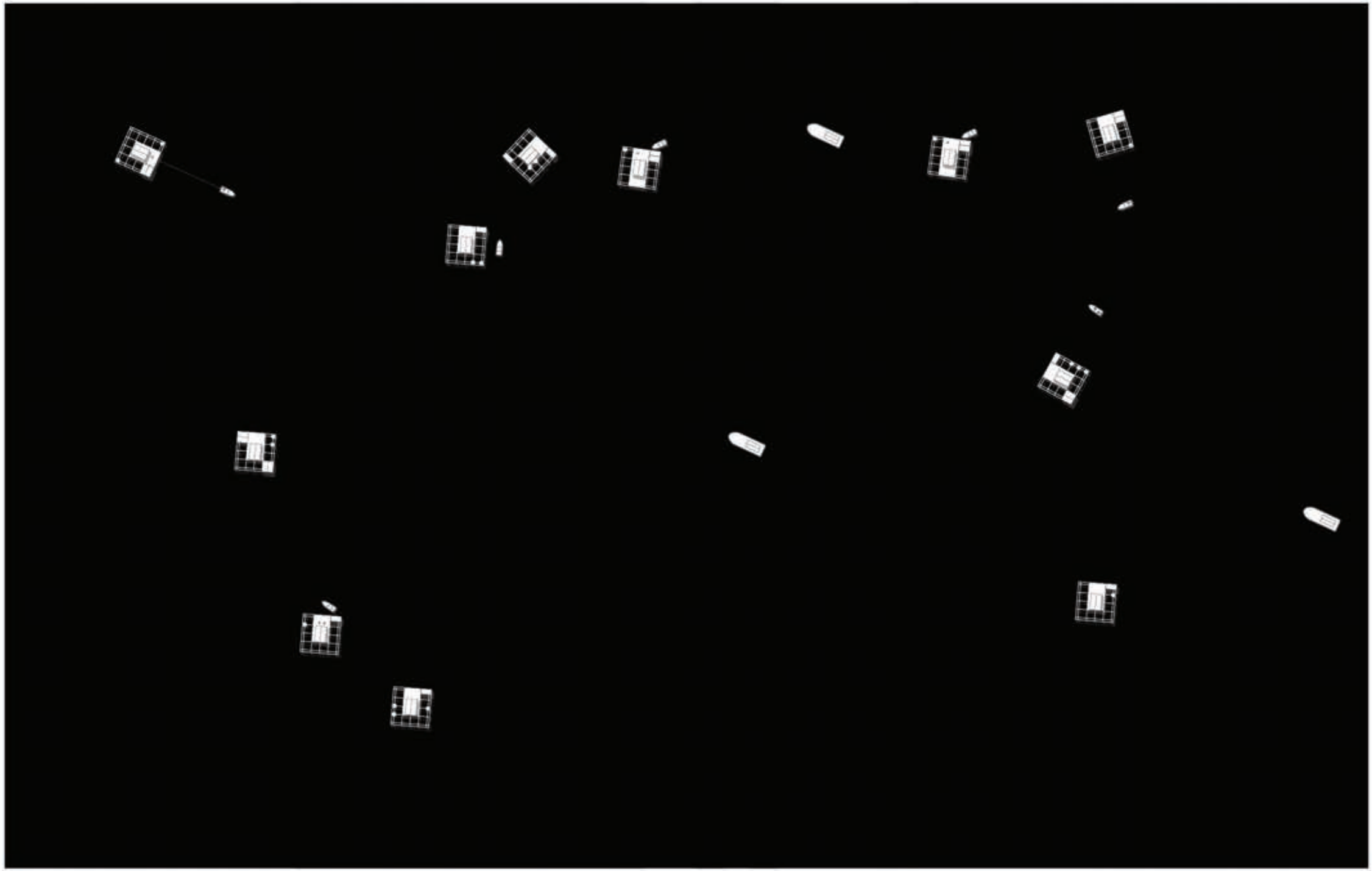


The Kelong Season

The kelong fishing season starts around January, when the fishermen tug them out to sea with small boats, and finishes around the end of September, when the rainy season starts. Older kelongs are not able to stand the big forces of the sea and have to be brought back to the coast earlier.

When at sea, kelongs are illuminated from below by little lamps. This attracts plankton, which further attracts fishes to swim under the kelong. Around three times a night, the fishermen will pull the net and its catch out of the water.





Kelongs configure a temporarily floating village on the sea

1.

Left and right:
Traditional fishing and kelong building village, Near Teluk Balam, Bintan

1.-6.
Fishing village and assemble site

7.
Drying the catch at a home based fish drying station

Building the Kelongs

Shown here is a fishing village where kelongs are also being built. It is a small village with only around 12 houses, located at the east coast of Bintan Islands. The kelongs are built out of local palm leafs and different types of wood. To the bottom of the wooden construction, plastic barrels for flotation are attached. Since the kampung shares it's beach with some resorts, tourists sometimes stroll by.

2.

3.

4.

5.

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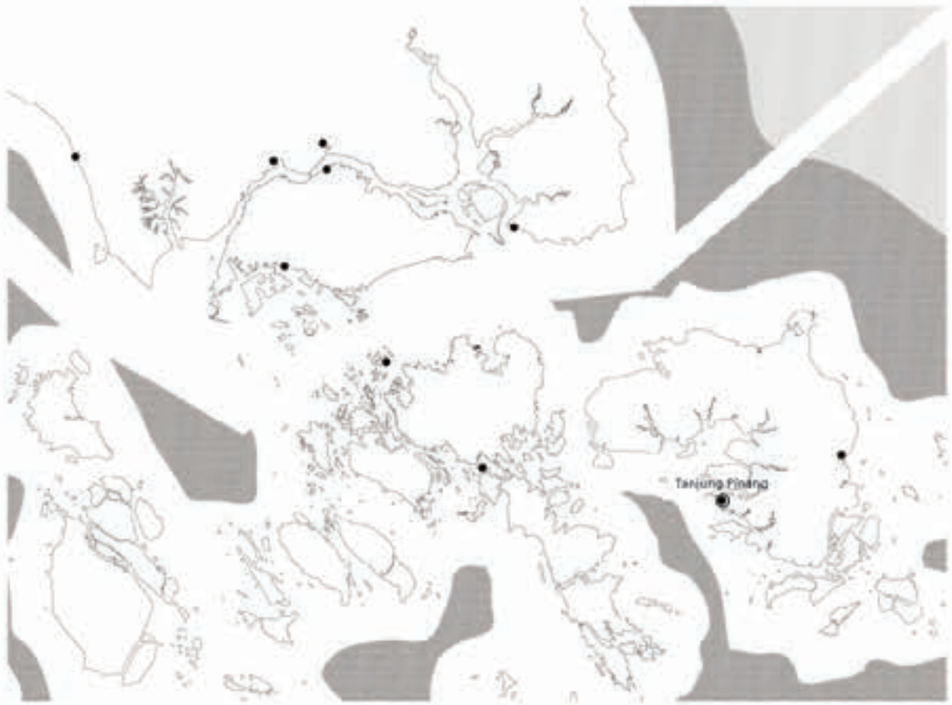
7.



● Fishery port
Offshore fishing
Illegal fishing

0 5 10 km N

Left:
Areas commercial fishing in the region

Right:
Tanjung Pinang fishery port with fish market, Bintan

Commercial Fishing

Commercial, mid- to large-scale fishing vessels are mostly based near fishery ports. Different from small-scale fishing, the fishermen go out to the sea in groups for 10 or more days, not staying only inshore, but also going offshore.

The government of Riau Archipelago also supports community groups of commercial fishermen, but the fishermen must purchase their expensive fuel themselves.

1.-2.
Tanjung Pinang fish market

3.
Store with fishing accessories and equipment

4.-5.
Sorting the catch by species and size

Tanjung Pinang Fish Market, Bintan

In Tanjung Pinang, there is a fishery port and also a big fish market. The fish will be brought from carrier and fishing vessels to the market. There the fish will be sorted, weighed, and prepared for sale. The fish market opens at around 4 o'clock in the morning and ends around noon.

1.

2.

3.

4.

5.

1.
Kawal fishery port, Bintan

2.
Port area

3.-5.
Weighing station and preparing the fish for transportation

Kawal Fishery Port, Bintan

Kawal is the second fishery port on Bintan. Some of the fishermen also live here in buildings on the water or on land. From here, the commercial fishing vessels will go out to the sea for 10 or more days.

1.

2.

3.

4.

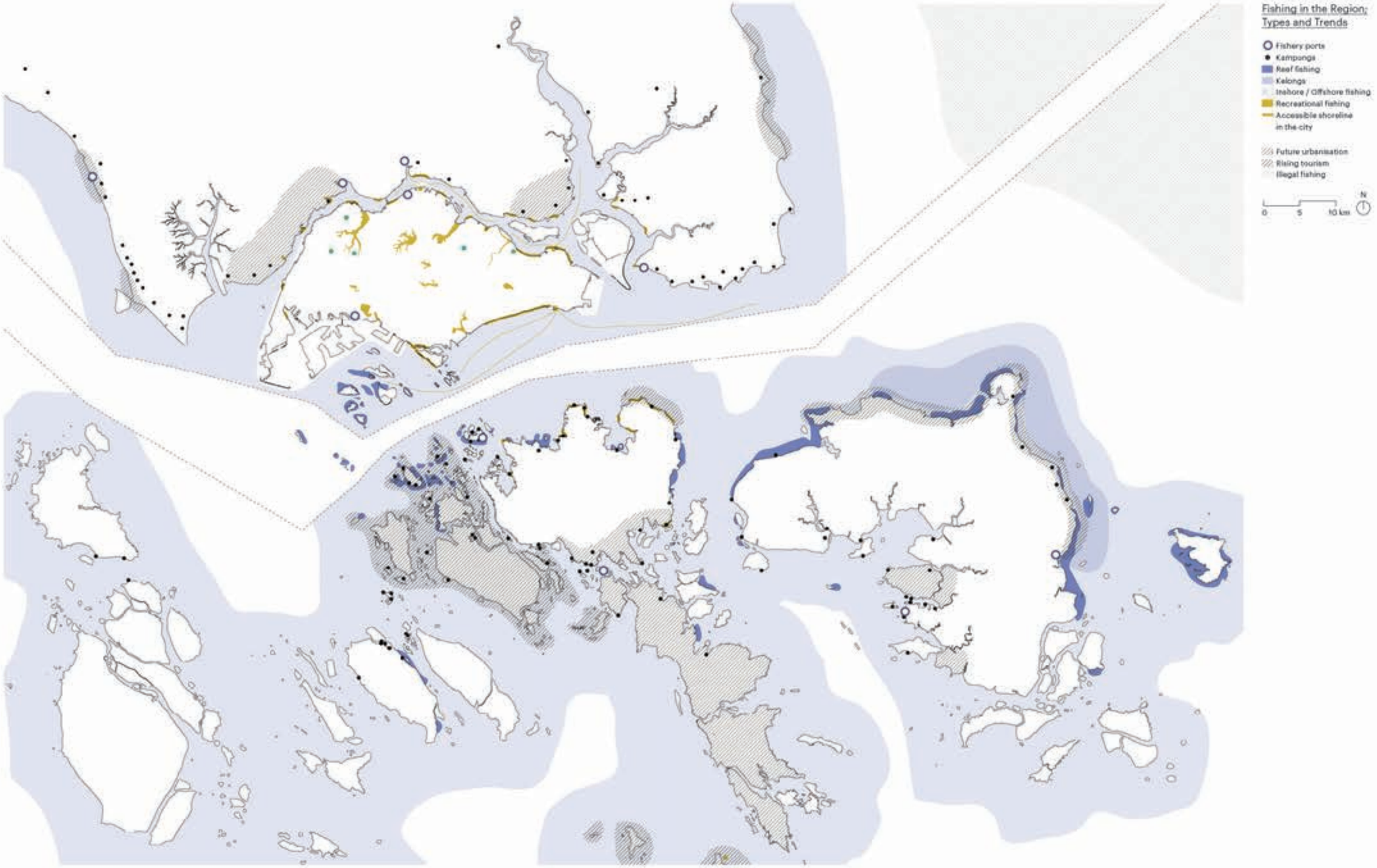
5.

Recreational Fishing

Recreational fishing does not require a license in the region. While there are some opportunities for recreational fishing, its infrastructure is not very developed, especially in the city. One recreational fishing method is angling. There are some locations in Singapore where angling is allowed. However, only 7.5% of the shoreline is accessible to the public. Another opportunity is to charter a boat to go out fishing for the day.

Top:
Recreational fishing at Changi Beach

Bottom:
Recreational fishing at the Tanjung Pinang Ferry Terminal


Fishing in the Region:
Types and Trends
Fishery ports
Kampongs
Reef fishing
Kelongs
Inshore / Offshore fishing
Recreational fishing
Accessible shoreline
in the city
Future urbanisation
Rising tourism
Illegal fishing
0
5
10 km
N

Aquaculture as Production and Escape

One could say that the aquaculture of today is one of the more visible parts of sea culture. Unlike fishing boats, which are out on the sea, aquaculture can easily be observed along coast in the whole region. Presently, the sea-based fish farms create a picturesque scene when viewed from the city. Despite their proximity, the fish farms are difficult to access.

Compared to the fishing culture, fish cultivation is a relatively new phenomenon in the region. In the past four hundred years, brackish water ponds, suitable to aquaculture, could only be found in Indonesia. In Malaysia and Singapore, brackish water cultures were predominant in the late 1920s. After marine aquaculture started in the 1960s, it grew rapidly during the 1980s.

According to the FAO (Food and Agriculture Organization of the United Nations), aquaculture "is understood to mean the farming of aquatic organisms including fish, molluscs, crustaceans, and aquatic plants. Farming implies some form of intervention in the rearing process to enhance production, such as regular stocking, feeding, protection from predators, etc. farming also implies individual or corporate ownership of the stock being cultivated."

Intended to provide a more sustainable seafood harvest, and secure fish stocks, aquaculture is growing in the region. It has potential to reduce the pressure on natural marine resources through more controllable, sufficient production. The ponds and floating fish farms provide reliable income and a stable home for many. As recreation, fish farms provide an oasis away from hectic urban life. Through these relationships, aquaculture could rekindle the lost relationship between the land and the sea.

Fish farm in front of Singapore, Johor Strait

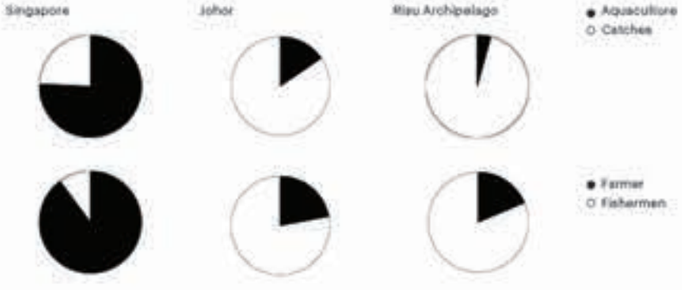
Mapping the Aquaculture

The cultivation of fish in floating farms has a shorter history than traditional fishing. Nevertheless, it has become part of the region's traditional sea culture.

The practice of aquaculture is increasing regionally as well as worldwide. Although many fish farms are large in area, their productivity still has room for improvement.

It comprises only a small part of the overall seafood production, but has greater capacity to help the region achieve self-sufficiency and sustain its marine resources.

Two fish farmers on one of the first farms in the Johor Strait



Aquaculture in Comparison to Fishing

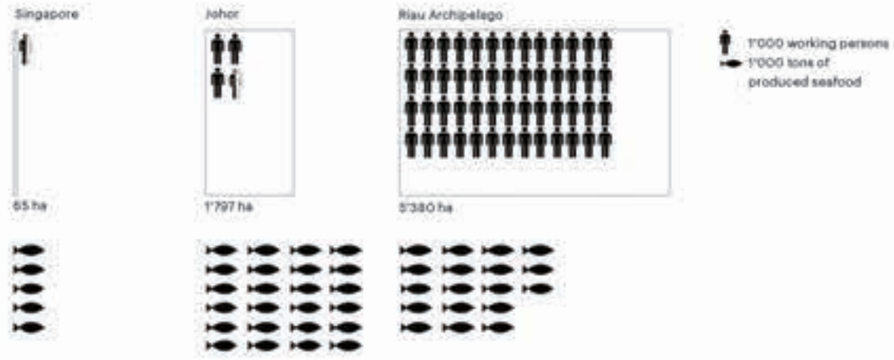
The number of people employed in seafood production varies throughout the region. In Johor and the Riau Archipelago, aquaculture is a small part of the whole production. In Singapore, where there is limited fishing area, aquaculture leads production.

Distribution of Seafood to and from Fish Farms

The distribution of seafood from fish farms is a multistep process. The fingerlings (baby fish) are spawned in hatcheries, which are mostly land-based. Some fish farms also receive live fish from other catches to raise.

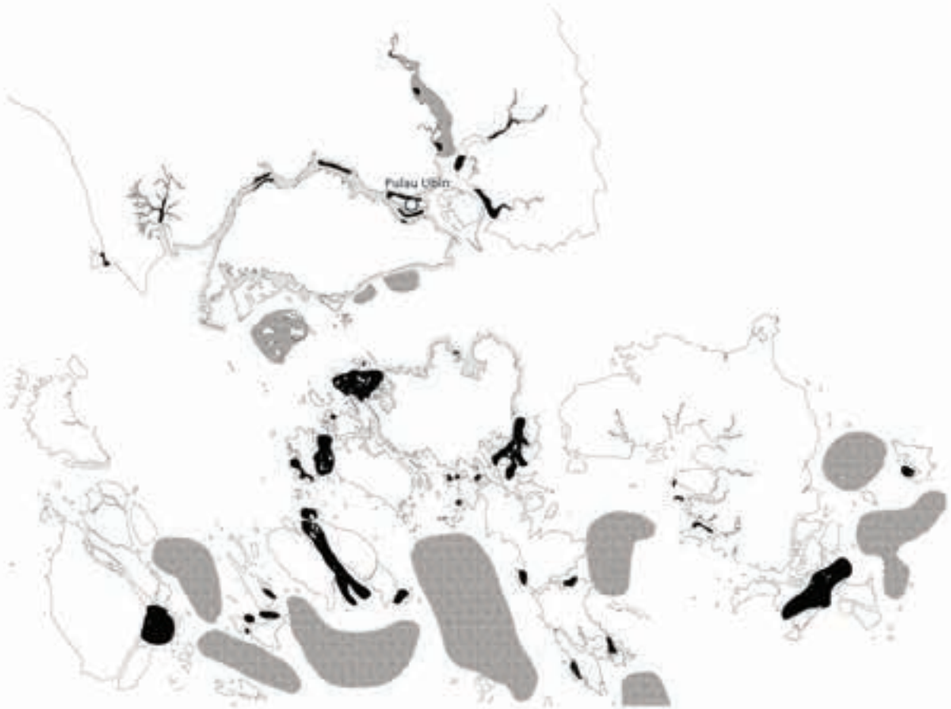
The fish farm, or so-called ranching is the growing station for seafood. To cultivate mussels, a rope is hung into water, where the larvae can settle and grow up.

From the fish farm, the goods go to a fishery port, a fish market, a sales manager, or directly to the customer.



Areas of Fish Farming and Number of Working People

While Singapore's aquaculture sector is rather small compared to that of the rest of the region, it is highly productive for the number of people employed there. The trend is to subsidise highly productive farms. In Johor, there are land-based fish farms, that organize themselves in cooperations. In the Riau Archipelago, fish farms tend to be smaller, more numerous, and are often integrated in the kampung.



Sea-based fish farms
Potential for aquaculture
Low on water quality

0 5 10 km N

Left:
Areas of high sea-based activity in the region

Right:
The floating farms along the coast of Changi Beach and Pulau Ubin

Bottom:
Modules and typologies of sea-based fish farms

Sea-Based Fish Farms

The sea-based fish farms are mostly situated in the Johor Strait, the Johor Rivers, and the Riau Archipelago. Dense clusters of farms are found near the metropolitan regions, mainly in the Johor Strait. One advantage of sea-based farms is the abundance of usable sea surface. The farms raise a number of fish species, mussels, crustaceans, and seaweed. The different species have life cycles of three to seven months till they get harvested.

Aided by government subsidies, commercial interests promote highly productive and efficient fish farms.

Marine net cages | Marine canvas tanks | Pen culture | Seaweed or mussel frame

Modules for Fish Farming

Each farm consists of floating frames, filled with open nets or closed tanks, or simple ropes for mussel or seaweed growing. On the frame, simple huts are built for working space or storing material.

Highly productive fish farms can be run relatively isolated from the seawater environment. They use seawater tanks, equipped with techniques to clean and oxygenate the water.

Farm Run by Foreigners

With knowledge of fish farming he gained in Canada, Joey came to Singapore to start his own business. His farm is one of the few that can reach the minimum of 17 tons production per year. This quantity was set by the government of Singapore to increase production and weed out unproductive farms.

Floating Home

Some fish farms are not only a working place to cultivate seafood. They represent an alternative lifestyle to urban life.

This farm, run by local Singaporean owners, is equipped with all the needs for daily life, as well as dogs and plants. On the weekends, visitors may come here to fish by day or stay overnight. Most cosy farms will not reach 17 t per year, and may have to close down in the near future.

Land-based fish farms
Potential for aquaculture

0 5 10 km N

Left:
Areas of land based fish production in the region

Right:
Cluster of fish farms along Pulai River, a tributary of Johor River

Bottom:
Typologies of land-based ponds with applicable modules

Land-Based Fish Farms

Most of the land-based farms in the region are situated in Johor around the Johor River. The ponds are used to raise a number of fish species and prawns. Land-based fish farms are dependent on freshwater supply and are, therefore, built near rivers or coastal areas. Creating the ponds is labor-intensive, requiring that the mangroves be cleared. The government authority for fishery and aquaculture of Johor declared Johor and Pulai River as aquaculture development zones.

Basic pond module | Net cages | Canvas tanks | Tanks on land

Ponds Hidden in the Forest

Once the ponds are created, they can be combined with different modules for fish farming, depending on the cultivated species. The net cages are open in the water, in contrast to the canvas tanks, that can be run isolated from the water inside the ponds. The tanks on the land are smaller than the ones floating in the ponds and mostly used to hatch.

● Selected recreational spots of fishing
Rising tourism areas

0 5 10 km N

Left:
Fishing and sea related activity zones in the region

Right:
1./2.
Land-based ponds, Kampung Pendas, Johor

3./4.
Pen culture pond, Trikora Beach, Bintan

5./6.
Restaurant and anglers, Pulau Ubin, Singapore

Escape the City for Fish Farms

Fishing, once a major part of local traditions, still has a high significance for the local inhabitants. As such, there are several spots in aquaculture sites open for recreational purposes. They are located next to the sea, alongside seafood restaurants and land-based ponds.

Very few sea-based fish farms are easily accessible for recreation. For this reason, they are relatively unknown and not present in the mind of people, although the farms have their own special atmosphere.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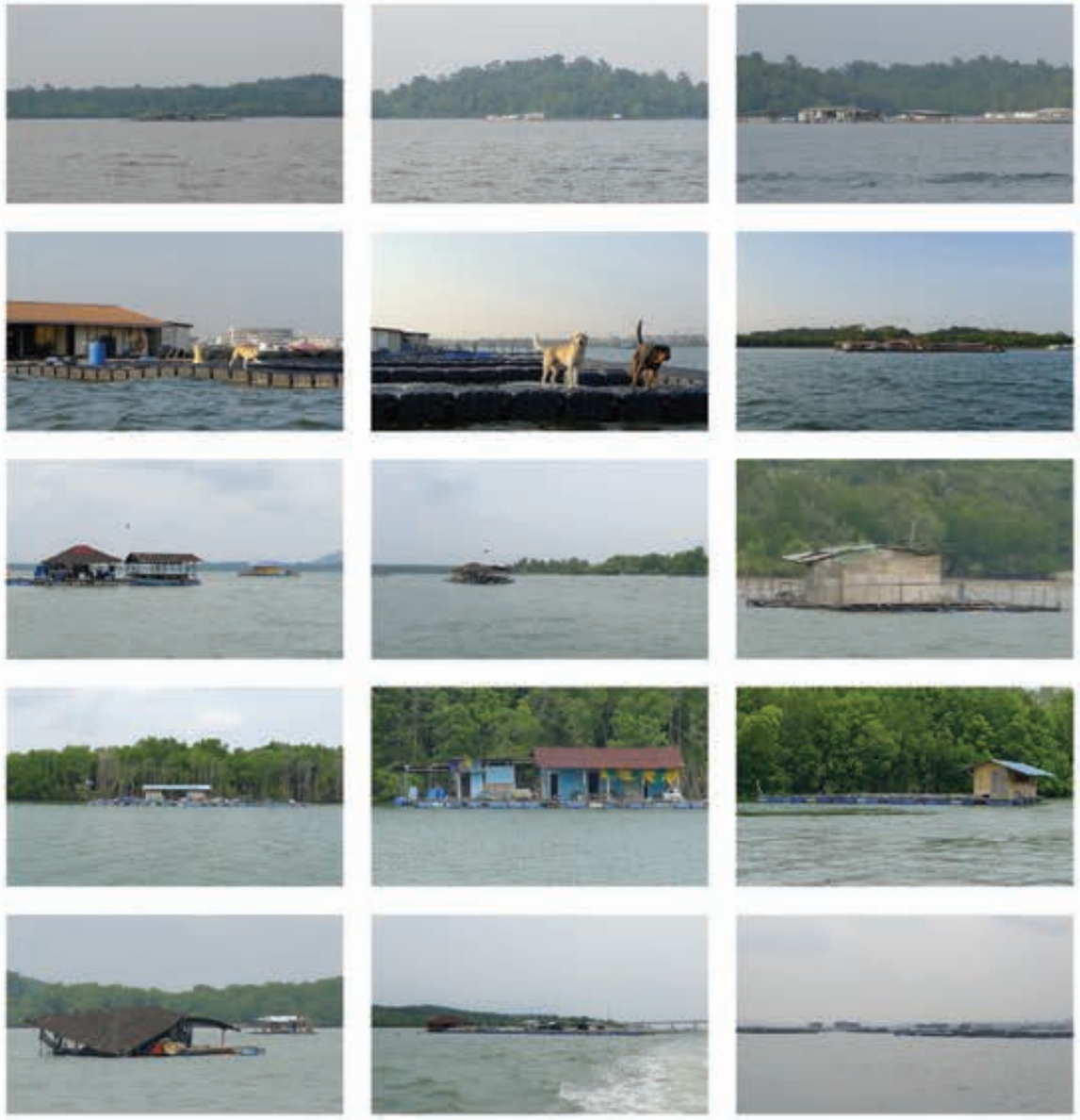
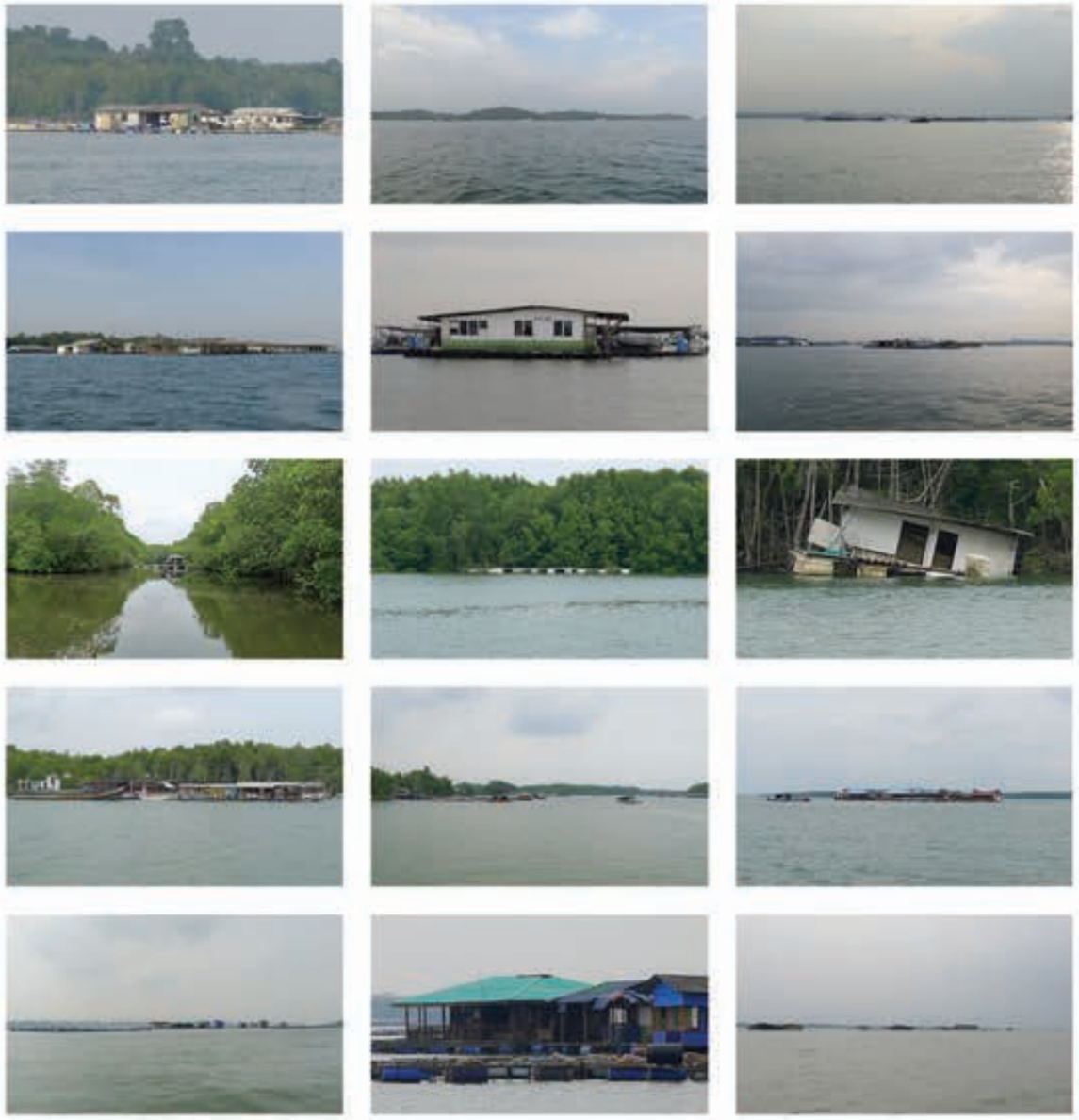
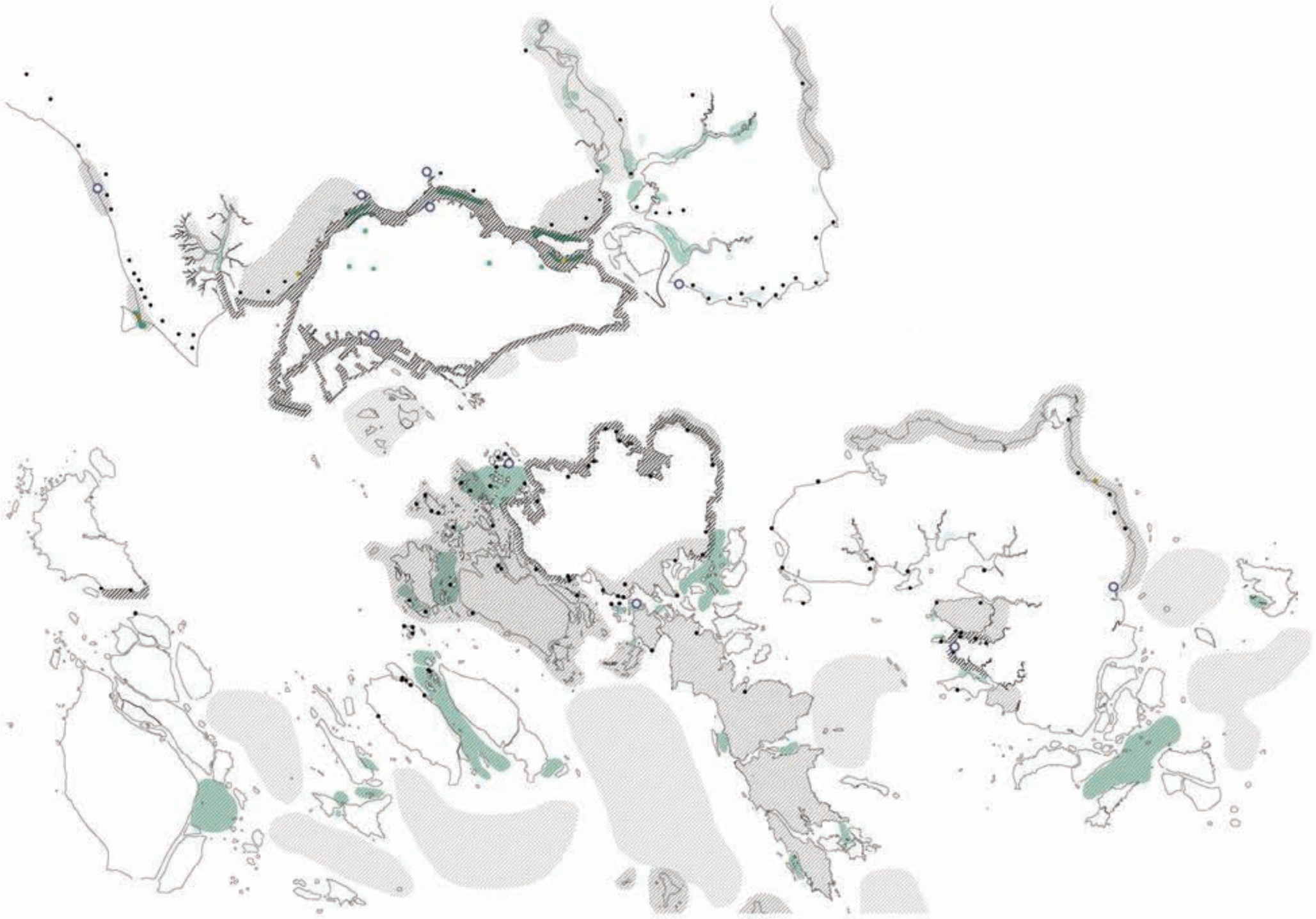


The diversity of sea based fish farms in the SUORI region




Aquaculture in the Region
Types and Trends
Fishery ports
Kampungs
Recreational fishing
Sea-based fish farm cluster
Sea-based fish farms
Land-based fish farm cluster
Land-based fish farms
Urban sea shore
Future urbanisation
Rising tourism
Rising aquaculture
Potential for
offshore aquaculture
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0
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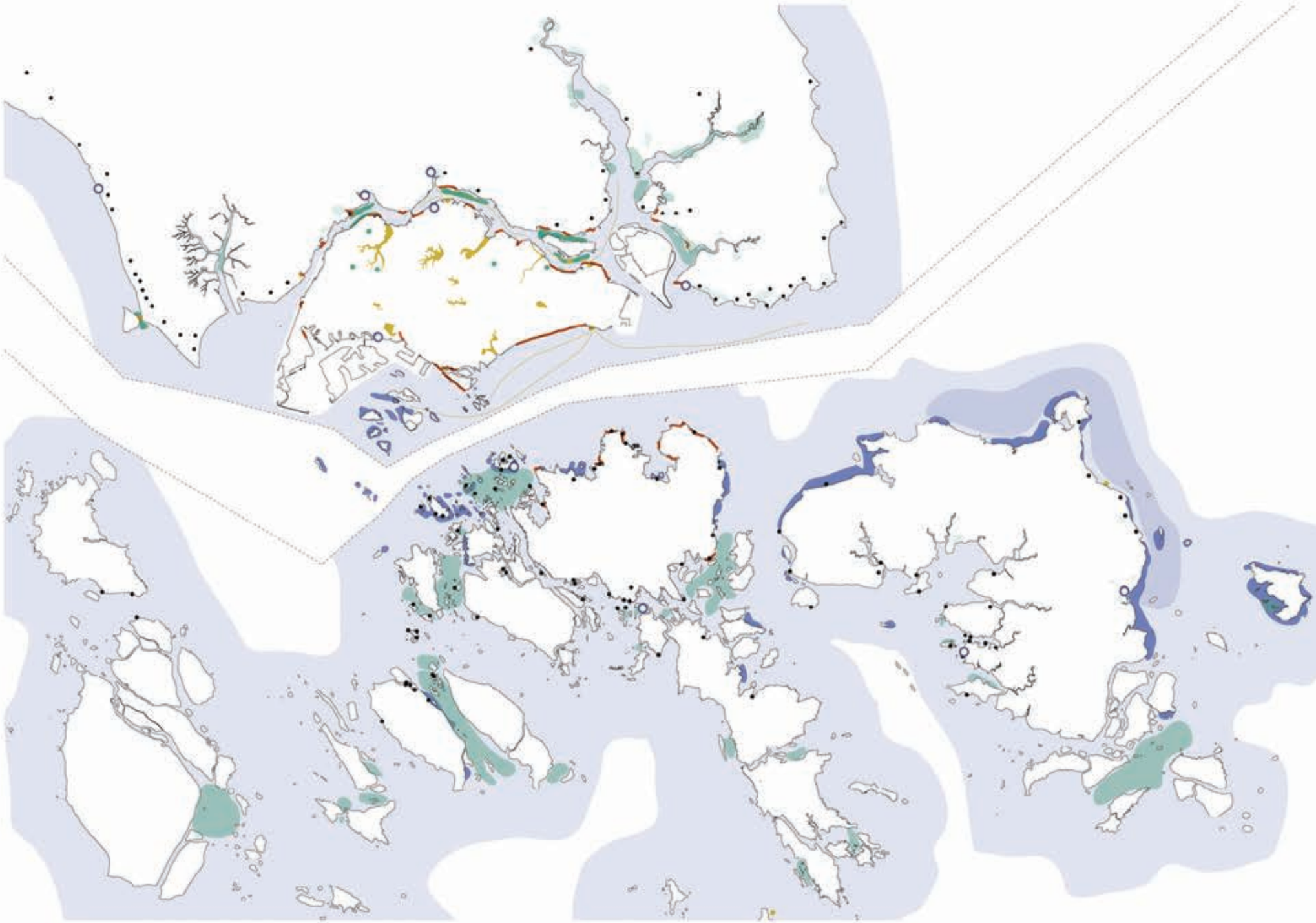
10 km

Production meets Diversity

While fishing and aquaculture of the region currently produces enough seafood to feed the population, there are several problems that must be addressed in the future. One of them is the issue of the rapid regional growth leading to a decrease of fish stocks.
This raises the question of social and economic sustainability for the metropolitan region and its development. Several potential aquaculture sites are not reachable because of lack of infrastructures or funds.
The need for recreational spaces, and tourism growth around sea culture, could provide a beneficial secondary income for farmers and fishermen; increases in visitors could also have detrimental effects.
By sustaining this sea culture, their traditional way of life can survive.
Singapore currently produces 5 percent of its seafood; the government has mandated an increase to 15 percent. To achieve this goal, the aquaculture is encouraged to increase production through new techniques. Fishing does not receive as much support, because of the relatively small sea surface and its high dependence on infrastructure.
Governments of Johor and the Riau Archipelago also aim to support increased seafood production via aquaculture as well as fishing.
The support includes subsidies to fishing communities in the form of material, education, technology, and infrastructure. There is also an emphasis on social and cultural affairs. The increase of income and a fair distribution of it helps the rural areas to be autonomous.
As long as the communities are stable, they will be able to retain their culture. One way to reach a higher awareness of the traditional sea culture is to increase its visibility and accessibility as a recreational activity.

Land reclamation in Danga Bay on the Straits of Johor approaching the fish farms


Mapping Fishing and Aquaculture Grounds
Reef fishing
Kelonga
Inshore / Offshore fishing
Sea-based fish farm cluster
Sea-based fish farms
Land-based fish farm cluster
Land-based fish farms
Ports
Kampung
Recreational fishing
Accessible shoreline in the city
0 5 10 km
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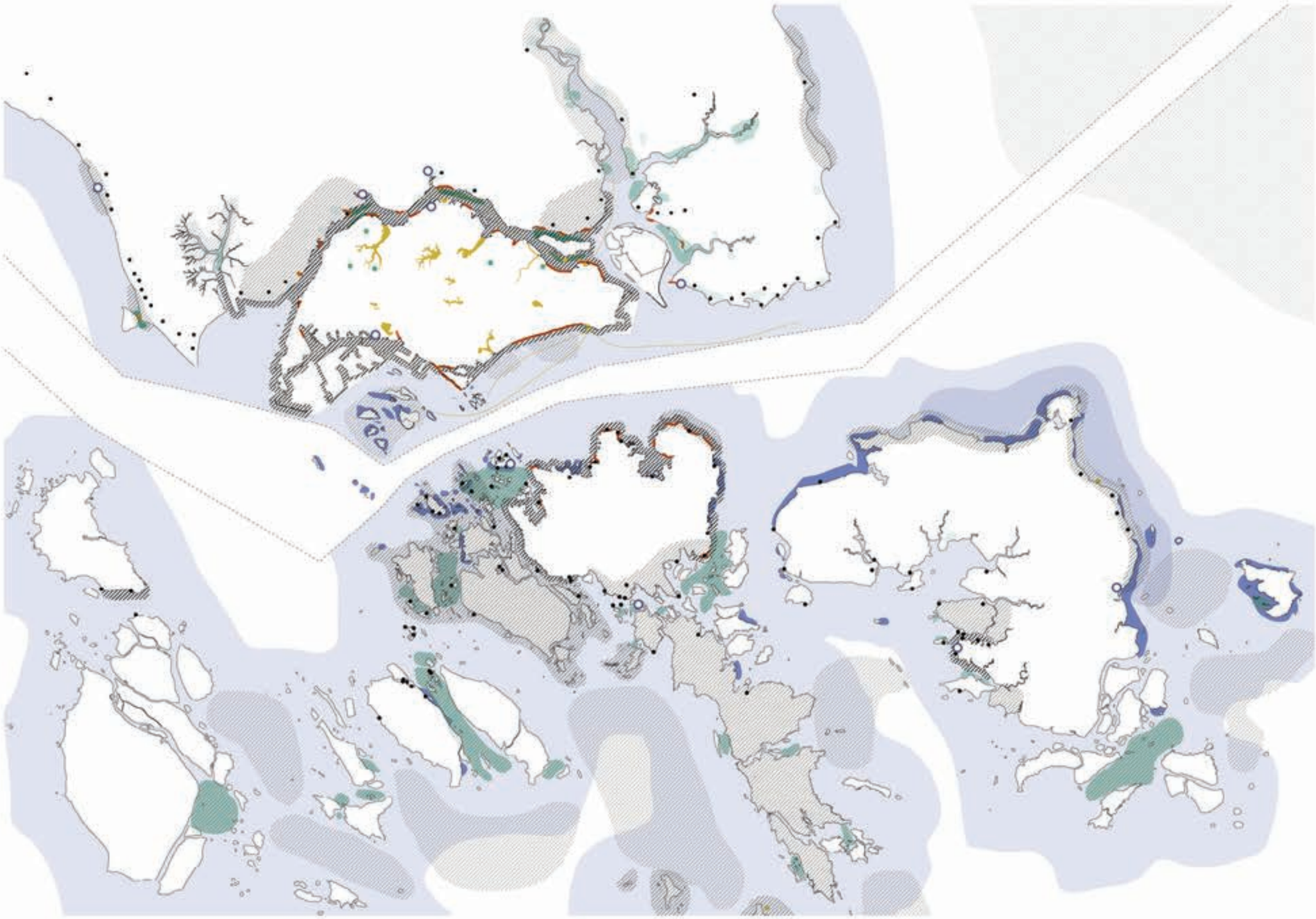


Trends Affecting Fishing and Aquaculture

Urban Sea

Areas where the natural form of the coast has been artificially rebuilt, result in a reduced connection between the city and the sea. Most of the traditional kampungs have disappeared and with them the traditional culture.

Dredging and land reclamation process destroyed the reefs, which are important for the fishstocks. The water quality in these areas are impacted by industry and the city.

Future Urbanization

Growing cities are a challenge for fishing and the aquaculture. Due to development, traditional kampungs are jeopardised, because they do not fit the view of a modern city. With the disappearing kampungs, nearby small-scale fishing grounds have gone out of use.

Rising Tourism

Growing cities require recreational space. The traditional coastlines need a sensible, sustainable touristic development that supports the existing population and their sea culture.

Rising Aquaculture

Rising fish consumption, government support, and technical advancements are growing the aquaculture industry.

Potential for Offshore Aquaculture

These zones are a suitable for new developments in the aquaculture industry, mainly because of good water quality.
Nowadays there are no fish farms, because of lack of funds and technical support.

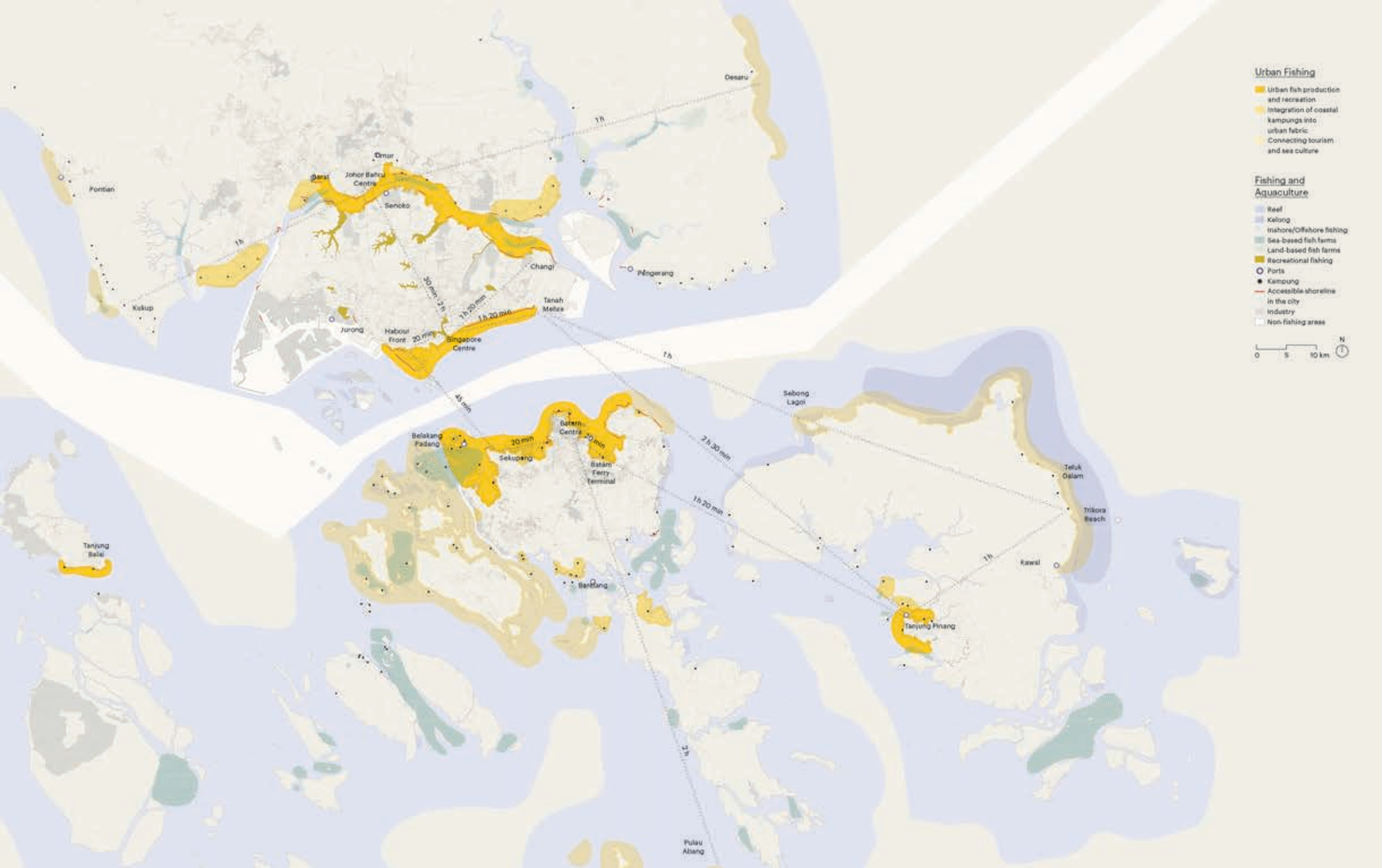
Illegal fishing

The offshore area is illegally fished by larger, foreign vessels, which reduces the region's fishstocks. It is both an environmental and an economic loss.

Urban Fishing

Any kind of viable proposals for reconnecting the sea and land must include advantages for both sides. One option is to make seafood production and sea culture more visible and accessible to the general public. As a result, it would again become part of the city, and at the same time, offer a welcome contrast to urban life.
In the city centres, especially in Singapore, the perception of an island is gone. The public accessibility to the coast is low, and the traditional sea culture has nearly vanished. In the city, the sea-based aquaculture has big potential for reconnecting the sea and the land.
The growing city and its encroaching on the surrounding territories drives displacement of the rural sea-based population. The remaining kampungs sometimes suffer under isolation, further impacting the resident fishery.
Some developers perceive views of fish farms or fishing boats as aesthetically unappealing; however, these signs of traditional culture could be a valuable and picturesque part of the landscape. As an important cultural and geographic identifier of the region, reconnecting recreation with the existing fishing tradition could reintroduce a missing cultural aspect into society.

Urban fish production and recreation park


Urban Fishing
Urban fish production and recreation
Integration of coastal kampungs into urban fabric
Connecting tourism and sea culture
Fishing and Aquaculture
Reef
Kelong
Inshore/Offshore fishing
Sea-based fish farms
Land-based fish farms
Recreational fishing
Ports
Kampung
Accessible shoreline in the city
Industry
Non-fishing areas
0
5
10 km
N
Desaru
Timur
Barat
Johor Bahru Centre
Pontian
Senoko
Changi
Tanah Merah
Kukup
Jurong
Harbour Front
Singapore Centre
Selong Lagoi
Batam Centre
Belakang Padang
Sekupang
Batam Ferry Terminal
Teluk Dalam
Tanjung Balai
Bantang
Kawal
Tanjung Pinang
Pulau Abang
1h
30 min - 2 h
1h 20 min
20 min
45 min
2 h 30 min

Timur
Barat
Johor Bahru Centre
Senoko
1h to Desaru
1h to Kukup
Changi
Pengerang
Jurong
20 min
Singapore Centre
1h 20 min
Tanah Merah
Harbour Front
1h
1h 30 min
45 min
20 min
Batam Centre
Batam Ferry Terminal
20 min
Sekupang
0
1.25
2.5 km
N

1 h to Singapore, Tanah Mehra

2 h 30 min to Singapore, Tanah Mehra

1 h 20 min to Batam Centre

1 h

1 h

Berakit

Sebong Lagoi

Malang Rapat

Sebung Pereh

Teluk Dalam

Trikora Beach

Kijang

Tanjung Uban

Teluk Sasah

Busung

Penaga

Tembiling

Pulau Lobam

Fengyan

Kawal

Pulau Mapur

Gelga

Senggarang

Bugis

Piring

Tanjung Pinang

Tanjung Siambang

0 1.25 2.5 km

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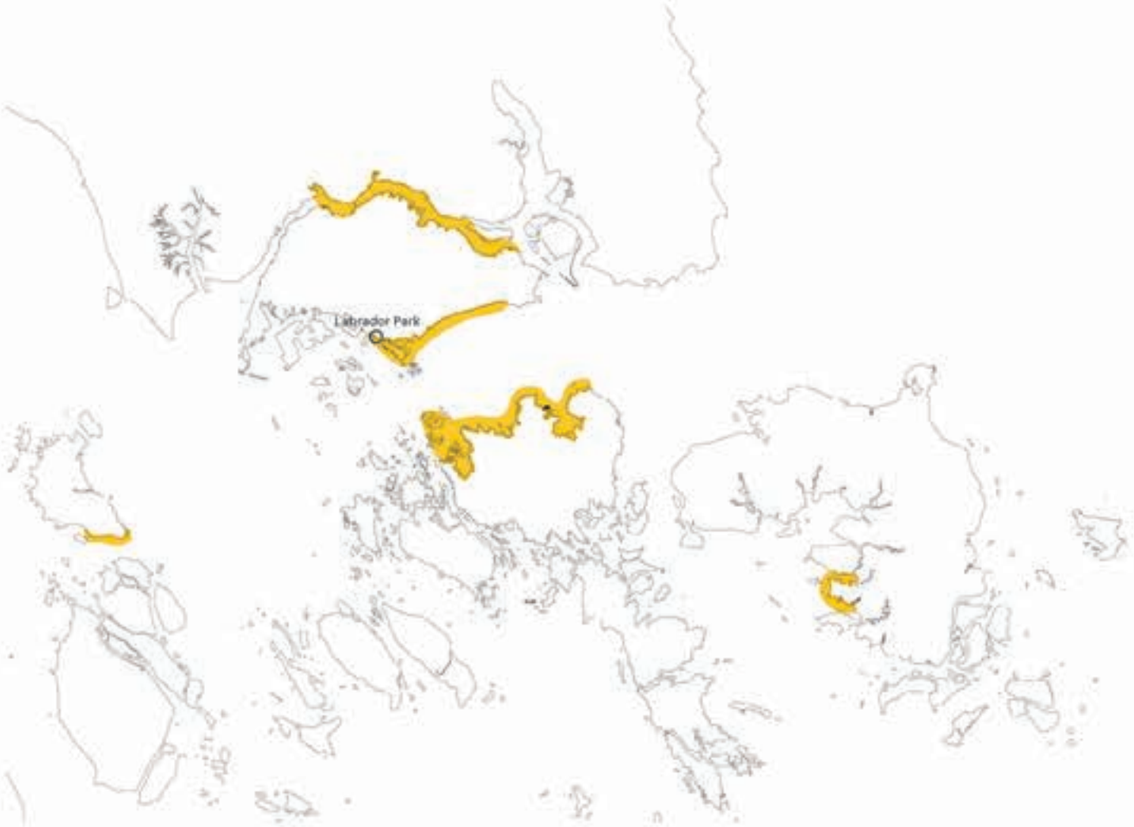


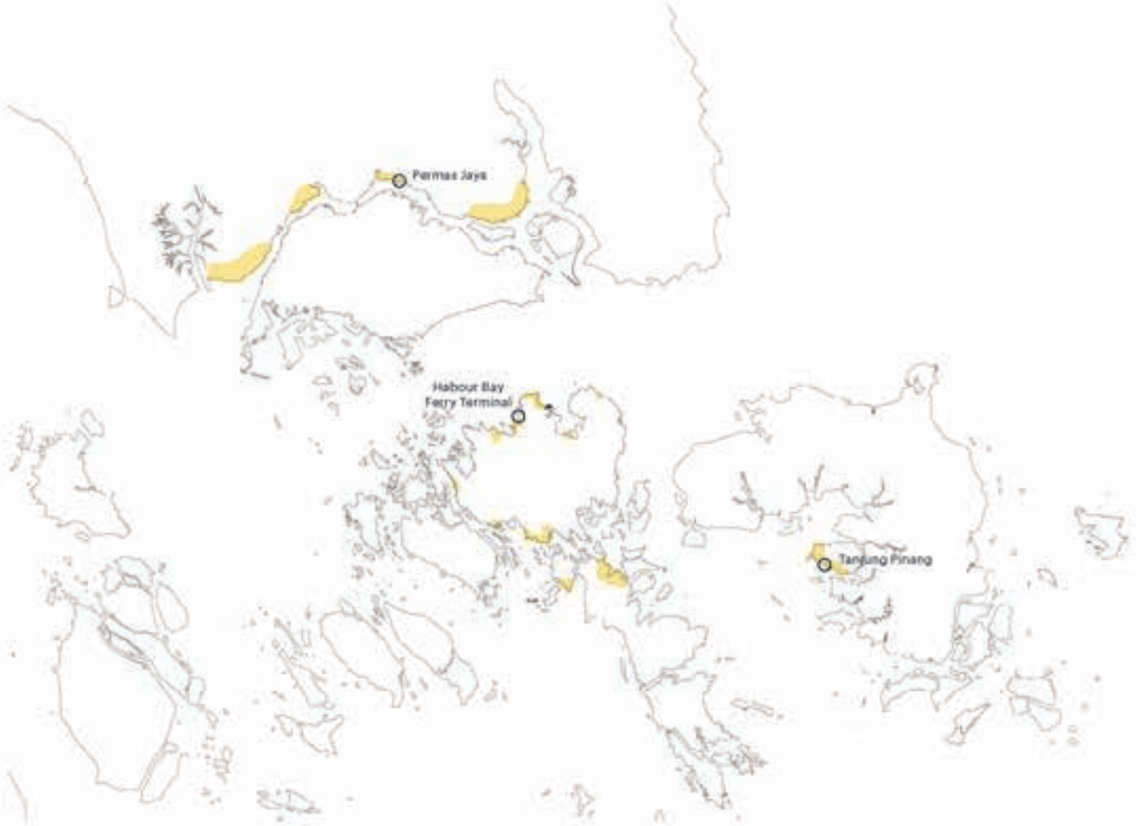
Urban Fish Production and Recreation

Aquaculture is the urban fishing of the future. The growing need of fish can be produced in close proximity to the city. Because the water in the fish farms is filtered from the surrounding seawater, the fish farms are not as vulnerable to urban pollution. This adjacency to the city also reduces transportation time and cost.

An area of approximately 560 to 560 meter of highly productive fish farms could, meet another 15% of Singapore's seafood demand.

Along a densely developed coast, floating fish farms could reconnect the sea and land through a variety of recreational activities. A fish market with fresh fish connects the land and the floating park and provides economic support for the fishermen.

Above and right:
Urban fish farms at
Labrador Park, Singapore



Integration of Coastal Kampungs into Urban Fabric

In the cities of the region, much of the fishing culture has already disappeared; it is important to integrate the remaining traditional fishing culture into the city. It is a part of the identity of the region and also can be a valuable part of the new city which keeps the people connected to the surrounding sea.

We propose a sensitive integration of urban elements into the kampung and connection between the kampung and the urban fabric, instead of isolating or replacing it.

Like this, the sea culture can remain in the city and can be a part of the daily life, as a cultural centre with restaurants, fish markets and other sea-oriented functions. This will preserve and reinvigorate the traditional way of life.

Above and right:
Integrating coastal kampungs to the urban fabric

1.
Kampung in Tanjung Pinang

2.
Kampung next to the Habour Bay Ferry Terminal in Batam, surroundet by city and industry

3.
Kampung Senibong next to Permas Jaya, Johor

1.

2.

3.

Connecting Tourism and Sea Culture

Sea-based tourism has both beneficial and harmful potential in relation to traditional fishing culture.

For the kampungs close to tourist areas, small interventions could include a cafe, small store with local products or even a small home stay. Visitors and locals can get in contact with one another. This can lead to a better understanding and awareness for nature, local society, and culture.

The traditional way of life around fishing can remain an important part of the regional landscape and identity in the future.

Above and right: incorporation of the recreational and sea culture; traditional Fishing village (white) in between resorts (grey) at Trikora Beach, Bintan

East Coast of Bintan,
traditional fishing village
in between resorts

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The boat as main mode of transport, Western islands of Batam


SHASI

New international ferry terminal by Peter Haibout, Johor Bahru

Architecture of Territory
ETH Zurich
FCL Future Cities Laboratory

Sea Region
Singapore, Indonesia, Malaysia
Project 2

Asst. Prof. Milica Topalovic
Hans Hortig
Stefanie Krautzig

SEA TRANSPORT

Passenger Mobility in the Sea Region

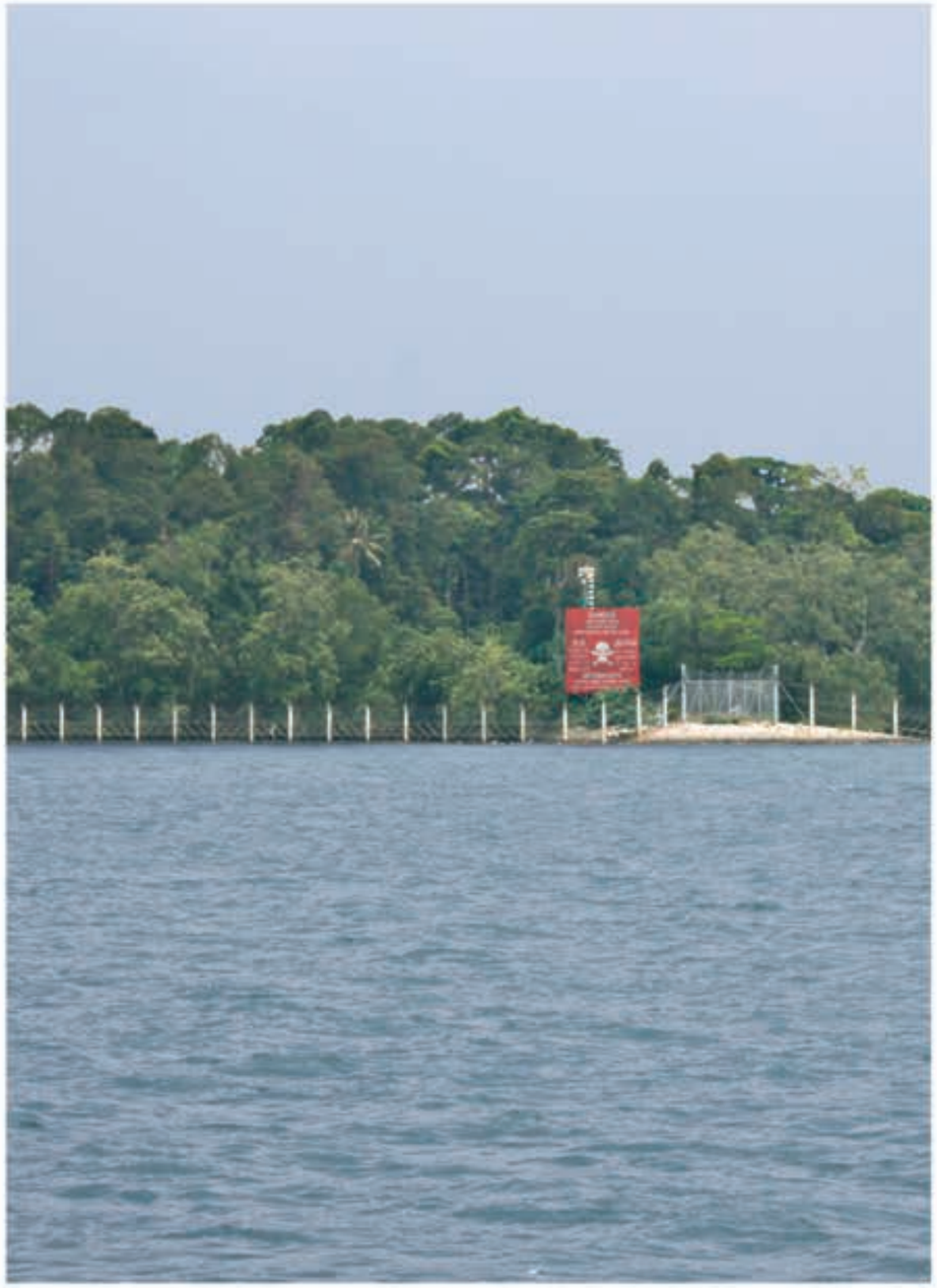
by
Sarah Barras
Benjamin Blocher

Public Ferry and Boat Connections

Historically, most settlements in the region of Singapore, Johor and Riau Archipelago were placed along the coasts and oriented toward the sea; the sea transport was the sole means of movement among the coastal communities up to the modern era. The maritime passage through the Archipelago and the Straits shaped the distinct and diverse ethnic, religious and cultural character of the region.
After the dramatic political shifts of the 1960s, precipitated by Singapore's independence from Malaysia, the national maritime borders were introduced, cutting through the formerly unified territory. Restrictive measures on border crossing and highly secured checkpoints reshaped the habits and the patterns of the people's daily movements. While passenger mobility between the Riau Archipelago and Singapore remains sea-based and still relatively underdeveloped, the massive land-based transport links between Singapore and Johor have completely replaced the older boat and the rail connections. Other signs of the shift from the maritime to the land-based urban culture in the region include the disappearance of coastal kampungs, the large-scale industrial and security zoning of the coastline, and the gradual loss of the public access to the sea and the coast.
This project promotes the increasing public access to the sea, and the establishing of a dense and diverse network of cross-border sea transport among the three countries. Aiming to improve the existing rigid and directional system, the project proposes new models of sea transport that would increase the appeal and the quality of life in the cross-border metropolis. The project consists of four main strategies: a new network of fast ferry connections and multi-modal terminals, a small-scale water-bus routes, new connections over the Johor Strait, and a hop-on-hop-off routes in the areas where the central and the residential urban fabric touches the coastline.
The project also aims to recapture the character of an open maritime space of the Straits of Singapore and Johor and to rebuild some of the region's historical and cultural connections. The sea transport network should be seen as part of the cultural heritage of the region and the cross-border metropolis.

The Narrative of Crossing Borders

Using transport in the SIJORI region always involves crossing a national border. Travelling from Singapore to Johor Bahru and the Riau Archipelago, we experienced how difficult and time consuming these relatively short trips can be. Travelling within the region has changed significantly throughout the last two centuries. The shift from a relatively borderless, unified territory to three separate nation-states greatly impacted the movement of people and goods; Singapore in particular has enclosed itself within highly secured borders. Through the process of state formation, travelling across the region became more formal: the necessity of visas made border crossing more complicated, more expensive, and almost unaffordable for the daily work migrants going from Johor to Singapore and back. With the introduction of the Indonesia-Malaysia-Singapore Growth Triangle (IMS GT), cross-border exchanges increased, especially for commercial passenger and cargo traffic. The formerly strong cultural and social ties among coastal communities have nearly disappeared in the wake of three separate states focused on their own economic and social growth.



A Short Journey, a Long Trip

The easiest way to find out how sea transportation really works in the region is to take the ferry to Batam, Indonesia. Only 18 kilometres from Singapore, the island plays an important economic role in the region.

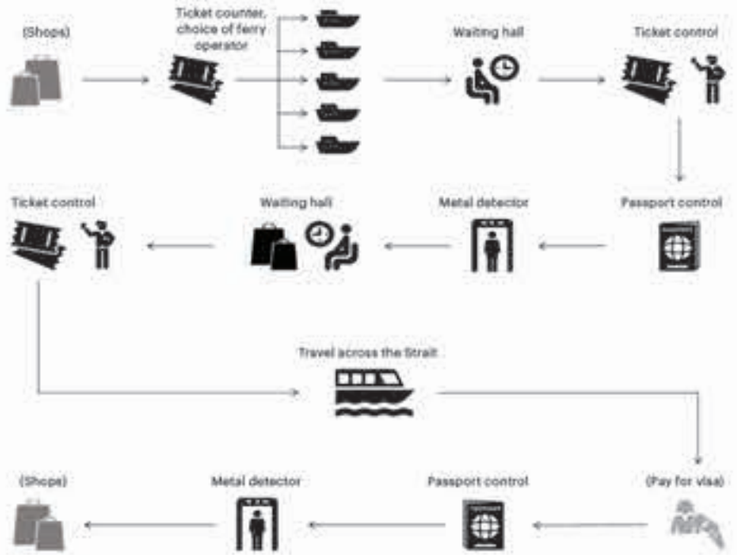
The short distance implies that the ferry crossing is short and simple. On the contrary, it is not. The entire process of entering the ferry terminal, rushing through its huge shopping mall, clearing immigration and security was more involved than we anticipated. Exactly the same procedure took place on the other side. Surprisingly, the shortest part of the journey is the ferry ride itself. Rather than the estimated 45 minutes, it took over two hours.

Border crossings at the Causeway and Second Link, Singapore's only connections to Malaysia, are just as tedious. Both countries have built enormous infrastructures on either side of the massive Causeway dam and Second Link bridge. Passengers must walk hundreds of meters through these massive buildings to pass immigration and security.

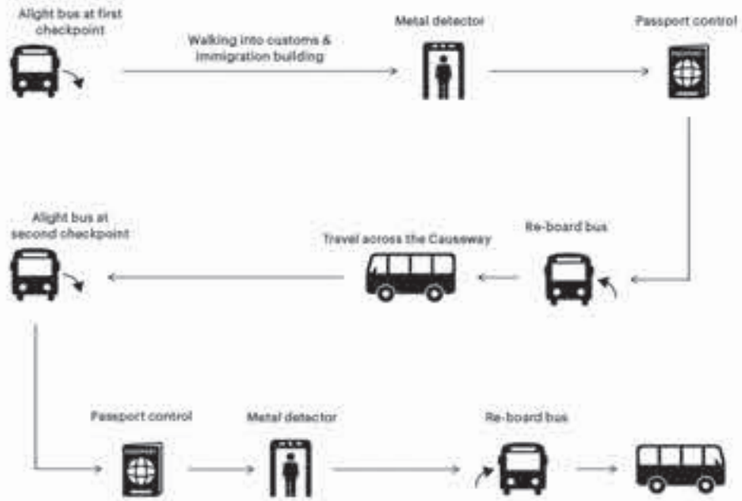
In the following chapter we explore the reasoning behind these absurd phenomena by analysing the history of the region's politics and national borders.

Strait of Singapore - Indonesia, Singapore, Malaysia
The image shows the Singapore Causeway Terminal in Woodlands. For a building designed to accommodate the border crossing procedure, it is enormous.

In both cases - travelling by causeway to Malaysia or by ferry to Indonesia - a full body scan is performed.



Crossing the "Maritime" Border
Crossing the Strait of Singapore by boat does not differ much from taking an international flight. The procedure is similar in terms of effort to go through immigration and the boarding of he vessel.



Crossing the "Land" Border
In the specific case of the Causeway and the bridge of the Second Link, the travel experience by bus is dominated by hopping on and off buses while shuttle to the different security and immigration checks.

From Free to Restricted Mobility

Throughout its long and complex history, the SIJORI region has experienced multiple periods of development and the rise of new geopolitical entities. In pre-colonial times, powerful political centres and by loose boundaries characterized the Malay world. During the colonial age, the Dutch and English empires divided this world under their own spheres of influence, forming the territorial basis for what would become modern-day Indonesia, Malaysia, and Singapore.

Each of these periods can be distinguished by distinct and overlapping patterns of human mobility. Historically, the region relied entirely on the maritime connections; people moved freely over water, trading within the region and the rest of the world by sea. As colonies, lands gained importance for their resources and agricultural production. The efficiency in the transport of goods towards Europe or the other colonies was an important factor for the development of the inland transport network, but the main connections and trade routes remained sea-based.

In more recent history, sea transformed from connection to border. The sea's identity as common resource and a central, interactive space, was dramatically reduced by the introduction of political borders. After the 1963-66 Indonesian-Malaysian Confrontation of and shortly after Singapore gained independence, the sea became a zone physically demarcated by control boats, during which new grounds were set for establishing sovereignty.

The multiple realities reunited under the sign of the Indonesia-Malaysia-Singapore Growth Triangle indicated the shared will to re-introduce a fluidity across the maritime borders, but mostly to the exchange and transport of goods. The cross-border movement of passengers remains a sensitive issue, and immigration control is central to international political and economical negotiations.

A view of Singapore from the Sea, Jacob Janeen, 1838

Petrus Plancius Map, 1594

Before 1800: A Maritime World

Before the arrival of the British in Singapore, the region was maritime-based. The early settlements were built on islands, along the seacoast or riverbank, leaving the rest of the territory covered by dense tropical forest. These skilled maritime people had a great geographical advantage, as ships on the international trade routes between China and Europe passed through the Straits. The pattern of the seasonal monsoon made the region's calm waters a safe place to stop.

Only after the development of long-range, east-west trade were distinct political units created. The traditional Malay states were always fragile entities, because their control relied on the sea routes. The courts strung from island to island, from one riverbank to the other, remaining extremely vulnerable to changes affecting the international trade routes. Any decline in trade had a consequent effect on the political structure of the Malay states and could potentially lead to destruction.

1.
Extract of a map showing the Singapore and Johor railway line, 1912

2.
Wagon-ferry jetty at Johor Bahru, 1919

3.
Completed Causeway, 1924

1824-1963: Development of Transport Infrastructure Singapore - Johor

The development and improvement of the connection between Singapore and the Malaya started with their growing political and economical association during colonial times, under the British East India Company.

Whereas Singapore soon turned into a port of regional importance, Malaya emerged as a major producer and exporter of raw materials. Goods were brought to the Singapore Port, and shipped throughout the world, an interdependency that only increased with time. For greater efficiency, a railway was built on both sides of the Strait, first connected by a ferry, and later linked by the Causeway.

2.

1919, Johor Strait Ferry
Before the Causeway was built, between 1907 and 1919, people and cargo were transported across the Johor Strait by ferry.

Because of the rising demand for cargo transport, so-called wagon ferries were introduced (image) in order to increase efficiency. Soon the ferry reached its limit, driving demand for more viable alternatives.

3.

1924, Johor Strait Causeway
Passengers could cross the new Causeway by rail, by automobile, and on foot. In addition to increasing cargo transport, personal transport grew to 30,000 people per day by 1953.

Top:
The Singapore Strait, 1950s

Bottom:
Market in Singapore, 1940s

1819-1963: Evolution of the Relations between Singapore and the Riau Archipelago

The history of maritime access between the Riau Islands and Singapore is one of growing and contracting borders. The signing of the Anglo-Dutch Treaty in London in 1824 introduced political borders to the region. A shared border zone between Singapore and the Riau Archipelago allowed people of common ethnic background free, unrestricted movement across the Strait.

The cultural and familial ties between Singaporeans and Riau Islanders concerned more than their social heritage; it was also important to their economic livelihood. Until 1963, the economy of the Riau Archipelago was more integrated with Singapore than it was with the rest of Indonesia. Movement across the Strait was perceived by the inhabitants of Riau as an way of life and a sign of shared economic advantages. Even after Indonesian independence and the subsequent creation of national borders, the islanders continued to sail freely to Singapore.

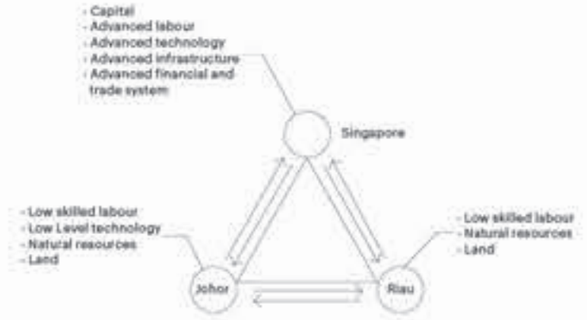
The Indonesian-Malaysian Confrontation of 1963-66 was the first geopolitical event to drastically restrict this regional mobility. The Riau Islanders suddenly found newly imposed national borders forbidding them from freely entering Singapore.

1967
Vehicles being checked on the first day of immigration control at the Woodlands Checkpoint

The Arising of Borders after Singapore's Independence

After Singapore gained independence, interaction with neighbours in the Riau Islands and Johor became significantly reduced. Despite the strong economical, social, historical and ethnical connections developed over centuries, each nation's citizenship and nationality suddenly took priority, leading to a breakdown in regional ties.

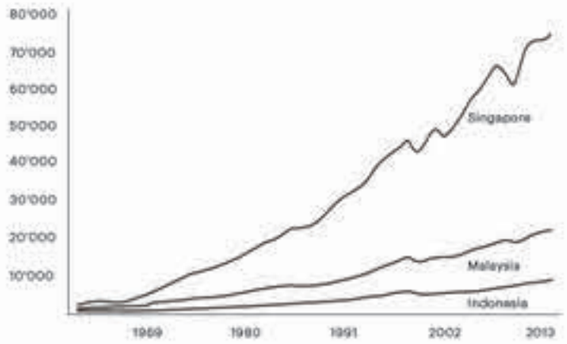
To compensate for its newfound sense of isolation, Singapore spent its early years strengthening its national identity. Border restrictions were slowly increased over time, but because of the varied economic and political development of the three nations, they eventually led to a complex political situation, particularly between Singapore and Malaysia.

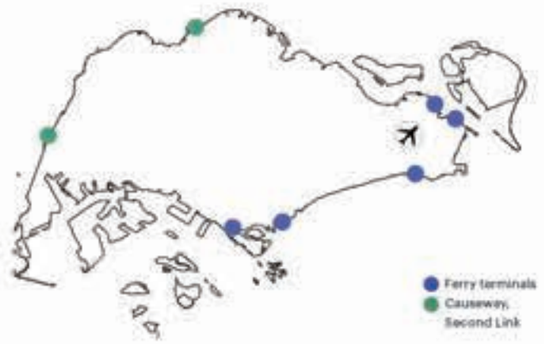


Indonesia - Malaysia - Singapore Growth Triangle

In December 1989, Singapore's Deputy Prime minister Goh Chok Tong announced the Growth Triangle a new economic cross border regional development concept. It was intended to open opportunities for Singapore to address the competitive pressures of globalization by accessing cheap labour, land, and associated resources such as water and food in the Riau Islands and Johor. In addition, the agreement would attract investment to the region, making it more competitive with other regions in East and Southeast Asia.

However, the Growth Triangle and the implemented Special Economic Zones have not relaxed the tight customs and immigration controls for people trying to reach Singapore from Indonesia or Malaysia. For instance, workers from Batam and Bintan cannot move to Singapore as easily as other tourists or business people. Nor has the Growth Triangle made border relations with Johor any less complicated in terms of travel time and immigration processes, as shown on the following page.





Economical Development in the Border Triangle

The graph compares the GDP per capita of the three countries: Singapore, Malaysia and Indonesia. It shows the changing pace of economic development for the three countries after Singapore gained independence. The border became as restrictive in the economic as in the physical sense, creating greater financial disparities across the Straits.

A shop owner told us: "According to the stories of the old people in Tanjung Pinang they would go to Singapore just to clean their jackets, just to buy rice! ... Now it is the reverse. Singaporeans come to Indonesia to shop."

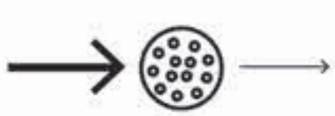
Checkpoint Border Permeability

Singapore has just eight border checkpoints. While the tight border may be easy to control, it is nevertheless a source of debate among the three nations.

The Complexity of Border Crossing

After the nature of the border changed in the last decades, the cross-border transport links acquired different levels of political significance between the nations on either side. In the specific case of the SIJORI region, it is essential to differentiate the borders between each nation.

The distinction is especially visible in the material manifestation of customs and immigration facilities. In some cases there is a separation of transport infrastructure from border security, while in others transport links and checkpoints are united as part of the same procedure. Although the before mentioned examples are referring to the border between Singapore and Johor, some of the same concepts described here after Paul Barter (2006), could be applied to the maritime border with Riau.



"Filter"
Certain practices at the border are clearly made to encourage or discourage certain types of flow. This filtering role of the border can however also be observed on an economical level (toll), without considering the checkpoint hassle. The "filter" acts in both ways since the two countries have contrasting interests regarding goods traffic (as seen in the competition between ports) and private mobility (loss in tax revenues).

"Valve"
Very similar to the "filter" concept in terms of encouraging or discouraging flow, the "valve" tends to be more precise. In fact, it indicates that the filtering varies depending on the flow direction and on who is controlling the opening and closing of the "valve".

"Gateway"
This is an example of cross-border transport link playing a role that relates to sovereignty and territoriality. It is the physical, visible sign of one country claiming authority over its territory. The practical role of the checkpoint as domination entity is complemented by a symbolic way in making the nation's territoriality visible.

Increasing Toll Charges
The constant increase in toll charges for the Causeway and the already high costs of the Second Link cause an economic filtering effect.

Stronger Controls
The filtering process at the Causeway often falls in the hands of Singaporean immigration and customs officers, who "for security reasons" conduct highly selective and discriminatory practices. The filtering process contributes to the massive traffic jams on the Causeway leading into Singapore.

Checkpoint Buildings
Loudly proclaiming the territorial authority, one gigantic machine-like building, as the one from Johor Bahru depicted here, "welcomes" the visitors on each side of the Causeway.

"Bargaining Chip"
The transport links can also be understood as a "tit-for-tat" exchange, as between Singapore and Malaysia. They act as a "bargaining chip" in the political and economical relationships between the two countries. The pushing and bargaining between the two countries happens on different levels. As shown above, the dependence of Singapore on Malaysia for water supply, and the employment many Malaysians have in Singapore.

"Collision Point"
The transport links can be depicted as "collision points" between different policy regimes. There is no evidence of a will to resolve these political discrepancies via any kind of cooperation.

"Figurative Bridges"
Neither Singapore nor Johor has seen the Causeway or the Second Link as "figurative bridges", i.e. as representative of a potential for cooperation between the two nations. The implementation of transport links doesn't seem to be perceived as a possibility to collaborate towards a globally competitive cross-border region, in spite of the central concept behind the Indonesia-Malaysia-Singapore Growth Triangle to create an "extended metropolitan region".

Trading for Water Access
The Second Link is a site of real friction between Singapore and Malaysia. Both countries have considered different approaches to recovering the costs and managing demand on the new bridge. This discussion created a standstill over the toll rates and eventually created an unfavourable situation for both nations. Since its completion in 1998, the bridge has not been used to its full capacity.

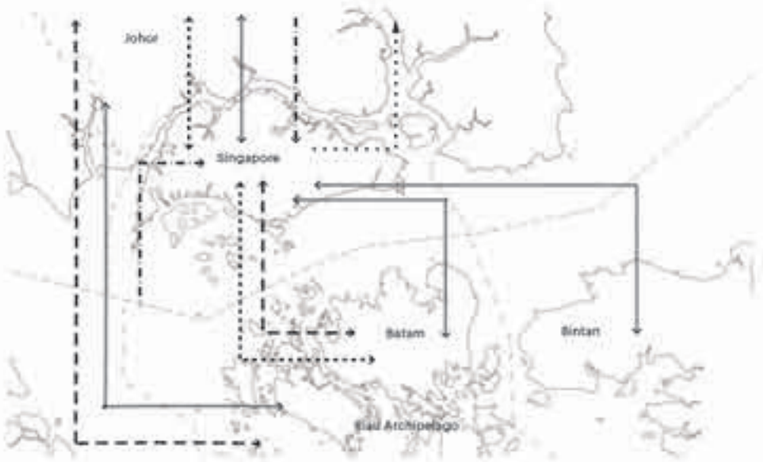
The "Scenic" Half-Bridge
Since the 1990s, Singapore and Malaysia have had a back-and-forth discussion on the necessity to replace the Causeway with a bridge. Reopening the Johor Strait to maritime traffic would benefit Malaysia, but Singapore has been opposed to the project. Instead, Malaysia has presented a proposal to turn its side of the Causeway into a "crooked", or better, "scenic" half-bridge.

"Rebordering" Instead of Cooperation
The construction of the Second Link was meant to augment flows of resources between the two nations. Instead of becoming a connection it became, and is now another mean of imposing Singaporean or Malaysian sovereignty, with a checkpoint built on both ends of the bridge. Moreover, the impasse created by the lack of cooperation between the two countries, which contemplated different approaches in order to recover the costs and to manage the tolls on the new bridge, caused eventually a lose-lose situation. The bridge was in fact never used to its full capacity.

Human Mobility in the SIJORI Region

The dynamics of cross-border interactions and movement within the region are extremely complex. It is necessary to separate the flows in different categories, principally into "work" and "leisure". Singapore can be seen as the economical centre of the entire region. More global companies are headquartered there, whereas Johor and Riau more often function as Singapore's hinterland, where the services and industries of Singapore-based companies can profit from comparatively low wages and cheap land.

Part of Singapore's economic advantages result from its status as a global transportation hub. Goods produced in the region are shipped worldwide from Singapore's harbour; Changi Airport connects passengers from the region to destinations around the world. Singapore's centrality is evidenced in the way people move across the regional triangle.



Reasons for Movement

- Work (daily commute)
- Work (weekly stay)
- Leisure (shopping/ tourism)
- Medical care
- Living/Retirement

Singapore- Johor / Johor- Singapore

Thousands of Malaysians commute daily from Johor, where the cost of living is lower, to work in Singapore, where they earn higher wages. A smaller number of Singaporeans have moved to Johor, either as commuters or as retirees, in order to improve their standard of living. They tend to move their entire family there, to keep their familial ties strong. Singaporeans cross the border for various reasons: to access a Singaporean-level education, to get medical treatment, or for social activities. Singaporeans often travel to Johor on the weekend for cheaper shopping.

Singapore-Riau / Riau-Singapore

A daily commute to Singapore is still not affordable for most Riau Islanders. They often rent accommodation in the city-state, returning home on the weekends or for longer holidays. In recent years, many Indonesians from all over the country have moved to Batam to work in the growing manufacturing industry based there. Inversely, only 300 Singaporeans live in Batam, either at global companies and or with their own businesses. Recent resort development on Batam and Bintan has made the Riau Archipelago a destination for Singaporean tourists.

Riau-Johor / Johor-Riau

The ties between Singapore and Riau and Singapore and Johor seem to be stronger than those between Johor and Riau. These regions are competitors in the low-wage market. Nevertheless, Bintan and Johor serve each other as leisure destinations.

Interregional Plan

- Sea connections
- Land connections
- Airports

0 5 10 km N

Number of Border Crossings to Singapore

The graph shows the number of foreign border crossings into Singapore. Almost all travellers coming by Land are from Malaysia. Travellers by boat are mainly from Indonesia. Despite the geographically strong link to both regions, Singapore has 30 times more Malaysian border crossings than Indonesia.

Singapore's air connections

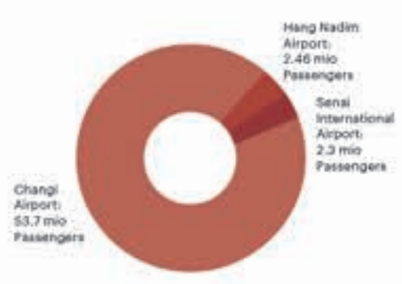
Integration in the Global Network

While the region relies mostly on land and sea connections, global connectivity requires the efficiency and speed of air transportation. Within the region there are three major airports: Changi Airport in Singapore, Senai International in Johor, and Hang Nadim Airport on Batam. As one of the most important air traffic nodes in Asia, Changi is the region's largest airport and its global gateway.

While the two other airports only serve local destinations, they are able to operate in a lower price range. Neither airport links directly with Changi, however it is possible to connect to Changi by ferry and bus. Less than 1% of all Changi passengers connect this way.

Airport Region

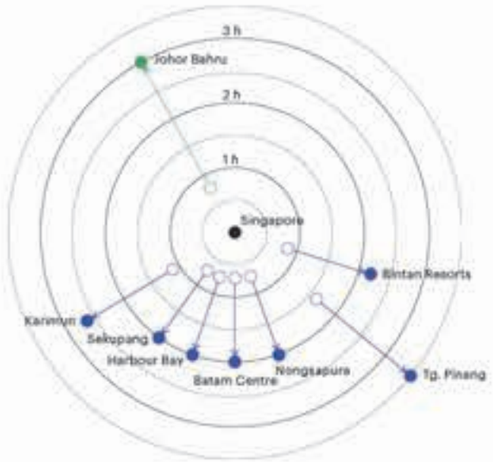
The map shows the three international airports of the SIJORI region, including the miniscule number of passengers that travel from one airport to the other for connecting flights. Due to its enormous international presence, Changi Airport can be regarded as the regional centre of passenger air transport.

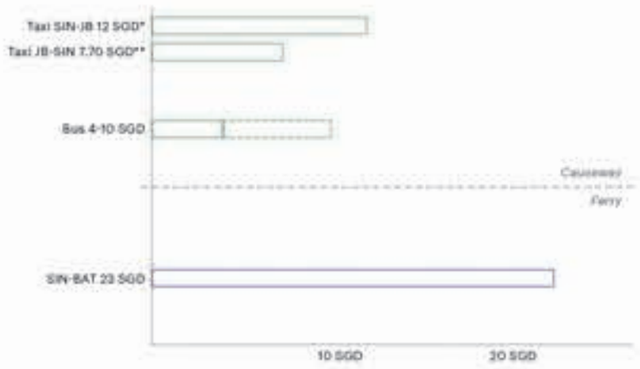


Constrained Accessibility

In any archipelago, isolation is a potential issue. In a region characterized by strong geographical diversity, as well as economical, political and social differences, access to transportation becomes an even more complex issue. Geographical distance is not the only factor in determining the connectivity of remote islands; but through measuring accessibility from a given starting point, it is possible to compare ways to reach a certain island, place or region.

In order to be able to give a clear answer to the issue of accessibility, certain parameters are needed and have to be implemented in the calculation model. These are: real travel time, density of the network, frequency of connections, and quality of connection. These travel times are in turn impacted by their political infrastructures. As SIJORI spans across three countries, border control and other political issues greatly influence travel times, making them unpredictable. Cost of visa is another important factor as average salaries vary up to 90% in the three different countries. This means, that even if the crossing is possible, it might not be financially feasible for every passenger.





Distance and Costs

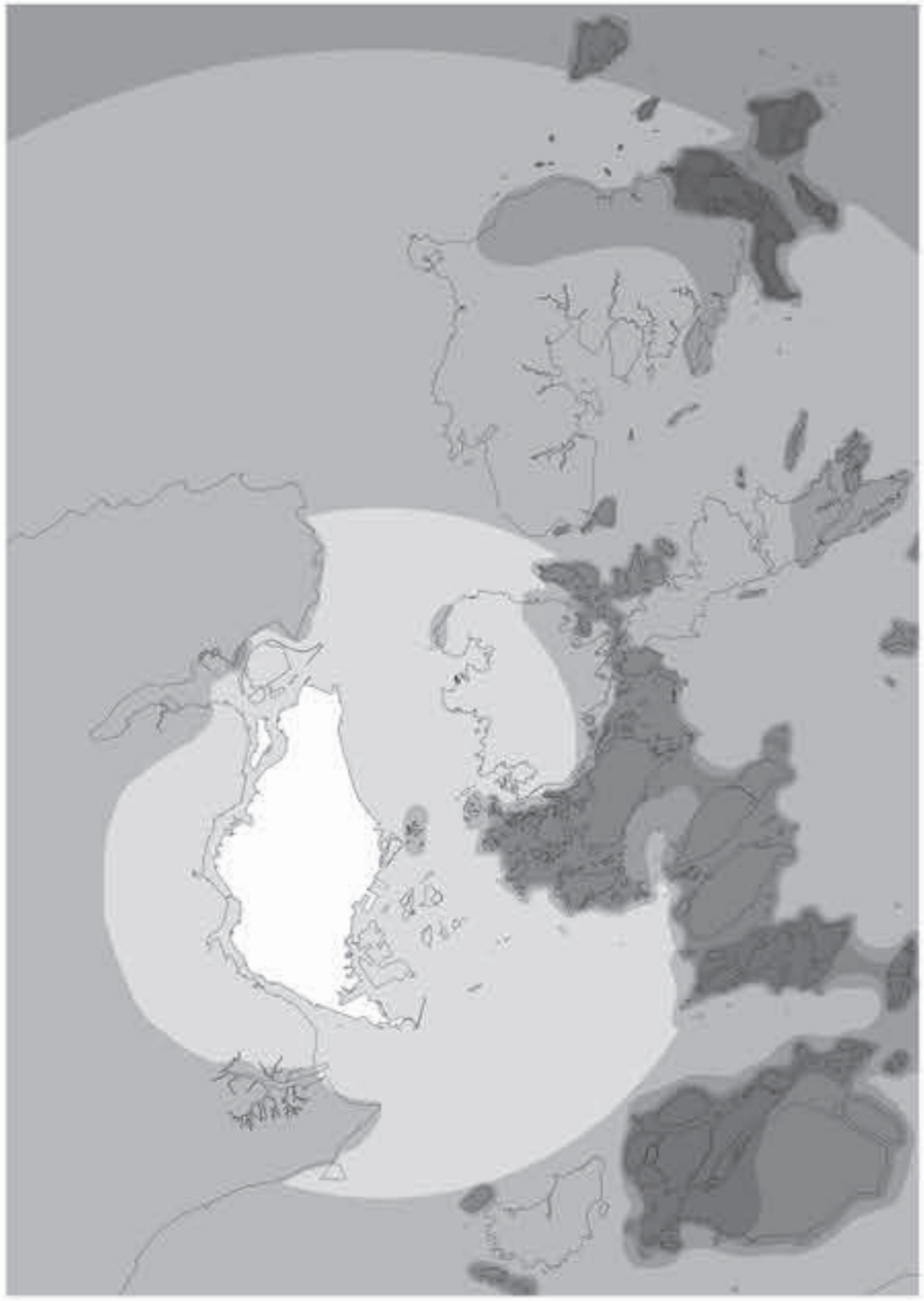
The diagram shows the actual time needed to reach certain destinations when starting in Singapore. The empty circles show a projected travel time, given changing and improvement of the border crossing process and increasing the general speed of transport.

The diagram middle shows the prices for a cross-border journey from Singapore to Johor and from Singapore to Batam. The connection to Johor coasts less than going to Batam. This factor may be the reason why there are roughly twenty-five times more commuters travelling from Johor to Singapore than from Batam to Singapore.

Accessibility from Singapore in Isochrone Lines (hours)

The map shows the accessibility by public transport (train, ferry, bus and MRT) starting from Singapore when travelling to destinations in the surrounding region. To draw these isochrone lines, a calculation is performed that uses variables like the weekly frequency of connections, travel time and standard waiting- and boarding time at the port.

The concept was introduced by "Island Studies Journal, Vol. 9, No2, 2014, pp. 293-306", where it was used in a study on the accessibility between Athens and the Aegean Islands in Greece.



The Boat and the City

Multiple sea transport networks unite the trinational region. This infrastructure consists of diverse types of vehicles and terminal typologies. Modern, air-conditioned ferries hurtle across the Strait on fixed routes and scheduled times, bringing commuters and tourists from one shopping mall-terminal to the next. Nearby, small hand-made traditional wooden boats flit from island to island carrying people and goods from well-built concrete piers to precarious wooden jetties, connecting traditional kampungs to the hectic urban centres. These contrasts - local transport in wooden boats and high-speed, highly regulated cross-border travel - characterise the multidimensionality of passenger mobility within the sea region.

A Comparison of Boat Typologies

A number of different boat typologies are used, depending on the location and type of passenger. The boat operators are just as diverse. In some places the competition for transport is very high, while others have fewer operators.

Government can hand out concessions to secure the connection, and make sea transport affordable to the public.

Location of Ferries
The map shows the location different ferries within the region at a defined time during a weekday (Source: "Marine Traffic").

Ocean Ride
Speed (knots) 20-28
Capacity (pers.) 150-300

Dumai
Speed (knots) 24
Capacity (pers.) 270

Island Cruise
Speed (knots) 10-15
Capacity (pers.) 50-100

Bumboat
Speed (knots) 10
Capacity (pers.) 12

Pancung
Speed (knots) 10
Capacity (pers.) 30-40

Ferry Typologies in the Region
At least five different ferry typologies are observed in the region. The difference in size is clearly visible. Each of the boat serves a different purpose and is used on different routes. Different companies or private owners operate them.

Top:
Boarding a ferry in Tanjung Pinang.

Below:
Ferry Baruna Jaya

The Modern Fast Connection

Entering the mall in Harbour Front Terminal was a disorienting experience. Its large shopping mall conceals the ferry terminal, but regular signposting guided us to the ticket counters. There were five ferry operators, all offering similar prices, so we just chose the soonest departure time to our desired port. Before the trip began, we had to cross the border to leave Singapore, which involved going through security and passing customs. At peak times, the wait can be quite long, but our process was fairly smooth. The actual trip began after reaching the berth and boarding the speed ferry. In the closed, air-conditioned cabin, it is difficult to perceive the sea's undulation. As we left the impressive landscape of Singapore's large cargo terminal behind, a strange quietness pervaded the room. Other than the distracting, animated movie playing on the screens, it was a restful and relaxing time before arriving in the chaotic Batam ferry terminal.

1.
Pandan's industrial surroundings

2.
People and goods squeezed on a pancung

3.
Waiting for the next ride at Belakang Padang

The Traditional Way

Next to the international ferry terminals in Sekupang, we encountered a different kind of sea transport: dozens of wooden boats floating around a crowded jetty. There were no formalities or regulations here; we bought the ticket right before getting on board the traditional "pancung". Stepping into the boat was difficult because of the strong sea, but we eventually managed to sit down. The narrow wooden bench wasn't very comfortable, but it would do for a short trip. The boat was crowded with people and goods to be transported all over the archipelago.

As the motor started to rumble, the wind began to blow, and mist rose from the pancung's wake. We tourists enjoyed the experience, but the locals sat inside the closed plastic canopy, shutting out part of the beautiful island landscape from their view. Docking in Belakang Padang brought other surprises: a completely different world, only a few kilometres away from Singapore's skyline.

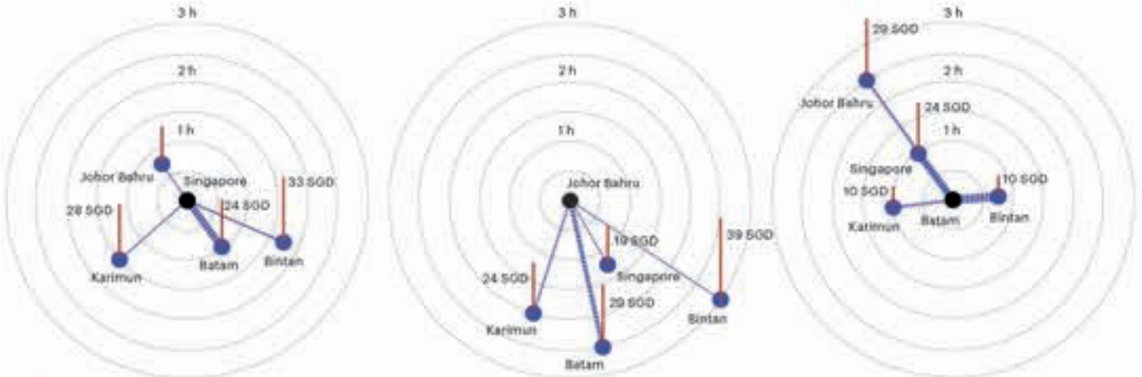
2.

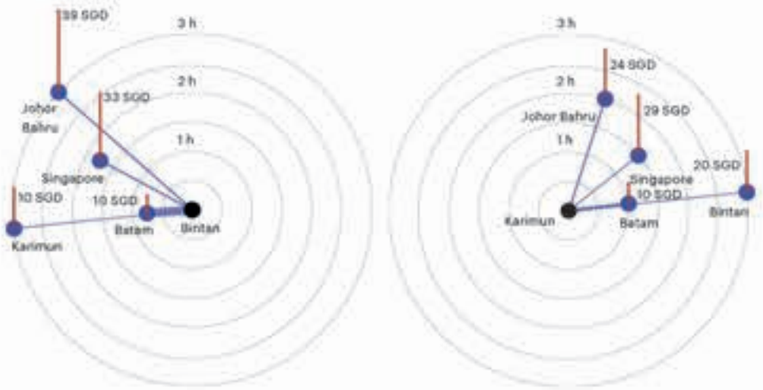
3.

Fast Ferry Network

In terms of transport modalities and inter-regional connections, the regional triangle can be split in two: on the one side, Singapore and Johor are almost entirely connected by the Second Link and the Causeway; on the other side, the Riau Archipelago, which is only reachable by ferry. With few exceptions, the Islands of the Riau Archipelago are only connected to each other by ferry.

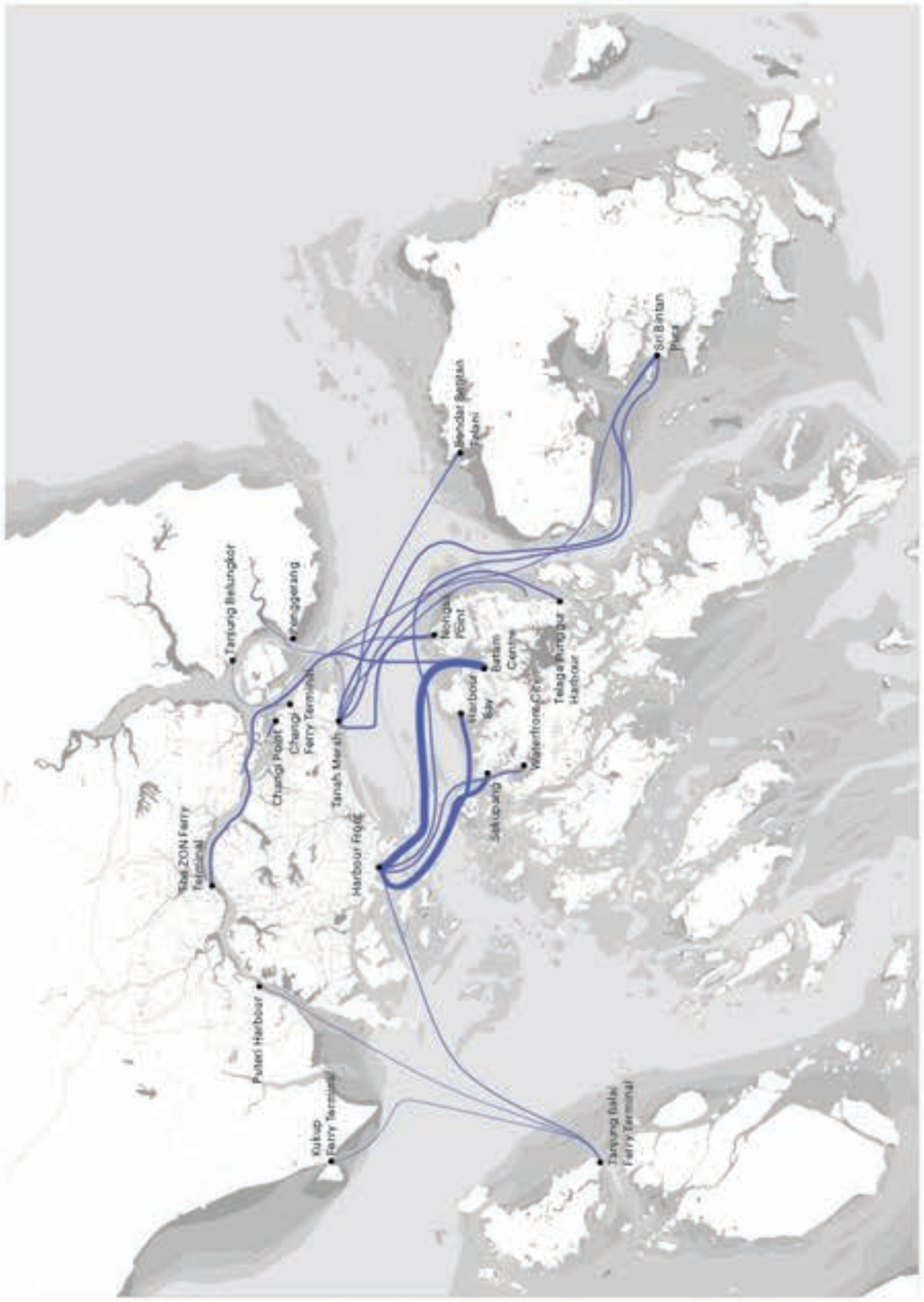
This chapter presents all of the region's scheduled international and national connections. In terms of frequency and passenger flow, the most prominent ferry link is between Singapore and Batam. It is more reliable than the links among the Riau islands, or even the ferries between Riau and Johor. Once again, Singapore is at the centre of all of these regional ties.





Comparing Five Regional Centers Regarding their Sea Connections

The graphs show a qualitative comparison of frequency, duration, and prices for connections within the region. The five points stand for the five biggest cities of the region: Singapore, Batam, Bintan, Johor, and Karimun.



Scheduled Ferries in the Region

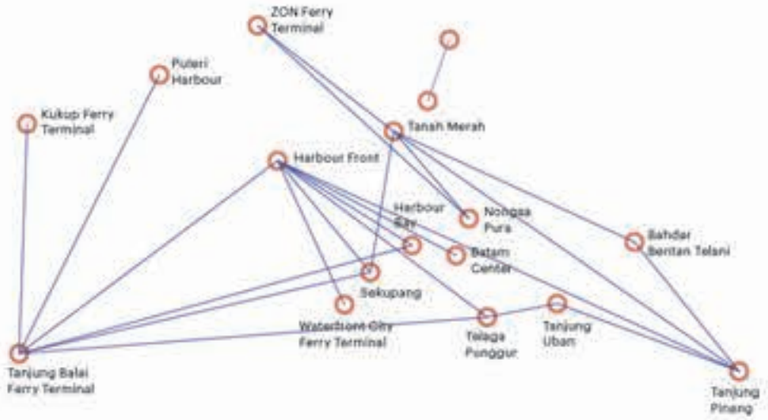
The national ferry connections are surprisingly diversified in the Riau Archipelago. Among the strongest ferry connections in the whole region is the one from Telanga Punggur to Tanjung Pinang, which is frequented by a lot of commuters on a daily basis.

National Ferry Connections

— Ferry route
● Ferry terminal

0 5 10 km N

The map shows all cross border Ferry Connections in the border triangle. The most frequent connection is between Telaga Punggur and Sri Bintan Pura in Tanjung Pinang.



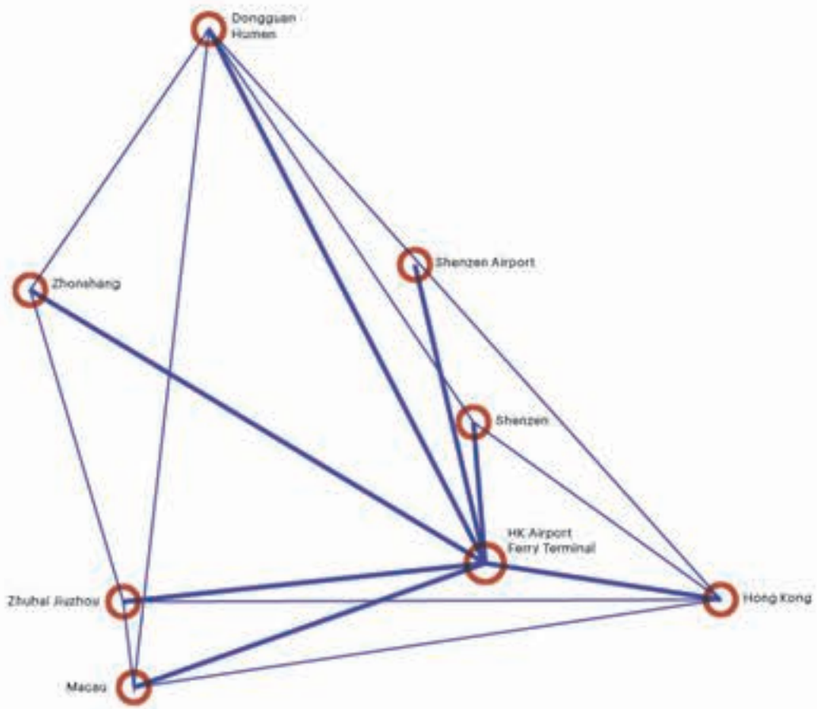
Sijori Region: Existing Fast Ferry System and Major Ferry Terminals

Terminals
Ferry connections

0 2.5 5 km

Framework of Ferry Connections

The schematic depiction of the international and interregional fast ferry connections shows how decentralized the SIJORI sea transport network is. Dense routes across the Straits define a primary traffic line, but the rest of the network is scattered. For example, from two destinations in Singapore, it is possible to reach five terminals in Batam, which in contrast have none or little other connections to other terminals.



Pearl River Delta: Existing Fast Ferry System and Major Ferry Terminals

Terminals
Ferry connections

0 2.5 5 km

Comparison to Pearl River Delta Fast Ferry Network

Unlike the SIJORI region, the Pearl River Delta has an important hub in every urban centre in the region. These transport hubs are connected through fast ferries, offering a faster journey than travelling by car. As the central point in the network, Hong Kong airport acts as important node in the intermodal-traffic exchange.

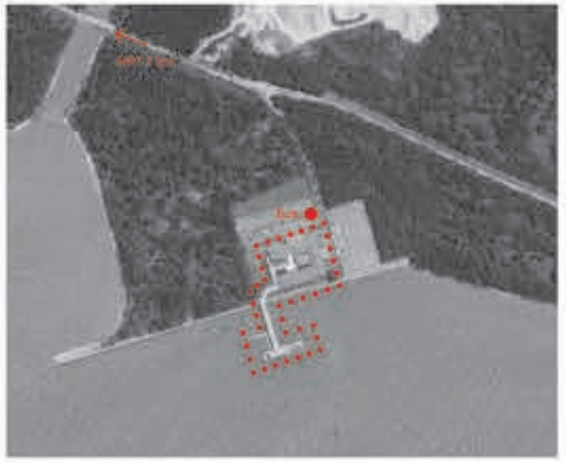
0 20 km

Ferry Terminals in the City Fabric

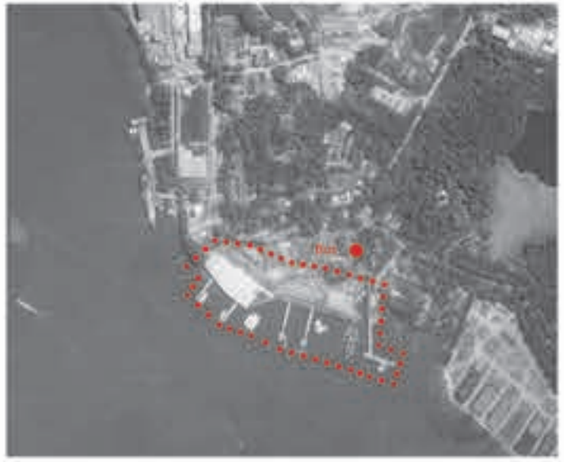
Where two or more public transport systems meet at a node, it is important to increase efficiency in the transition from one transport mode to the next. Differences in scale of access at each ferry terminal – international, national, or local – produce very different architectural typologies, as demonstrated in the examples on the following pages.

Central and Peripheral Terminals
Some terminals are well connected to the network and the city centre. Others are built in the outskirts, which reduces their accessibility and increases the time to reach them.

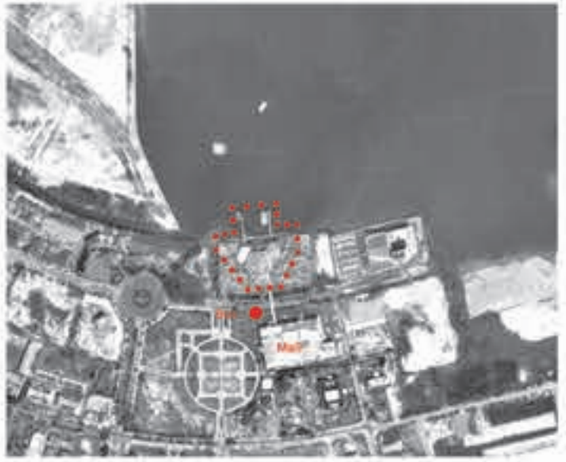
Harbour Front, Singapore
The main ferry terminal of Singapore, located on its south coast, near Sentosa, offers international connections to both Malaysia and Indonesia. It also functions as a terminal for cruise ships. Harbour Front terminal is housed within one of Singapore's largest shopping malls, VivoCity, which also contains an MRT station.



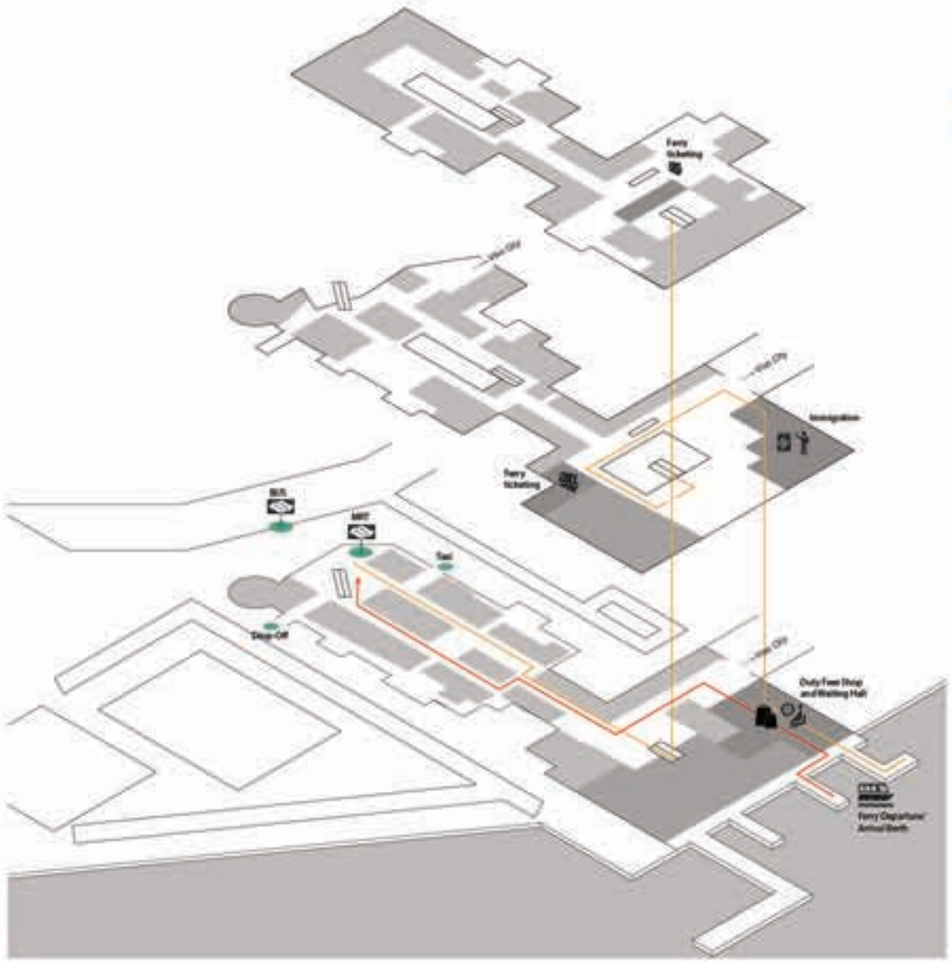
Tanah Merah, Singapore
Situated next to Changi Airport, this terminal is far from the city and lacks sufficient public transport connections. Compared to Harbour Front, this terminal has limited connectivity to other major terminals in the region, and mostly serves tourists travelling to Bintan Resorts.



Sekupang, Batam
Sekupang terminal lies on Batam's outskirts, which makes it difficult to access, even by taxi. A bus service operates infrequently between Sekupang and Batam Centre. Sekupang offers frequent international service to Singapore, national connections to other major Indonesian cities, and as a node for local sea transport to the kampungs on Batam's west coast and outer islands.

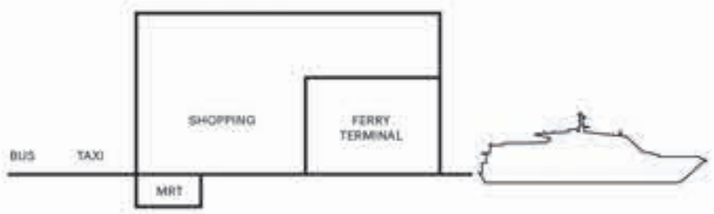


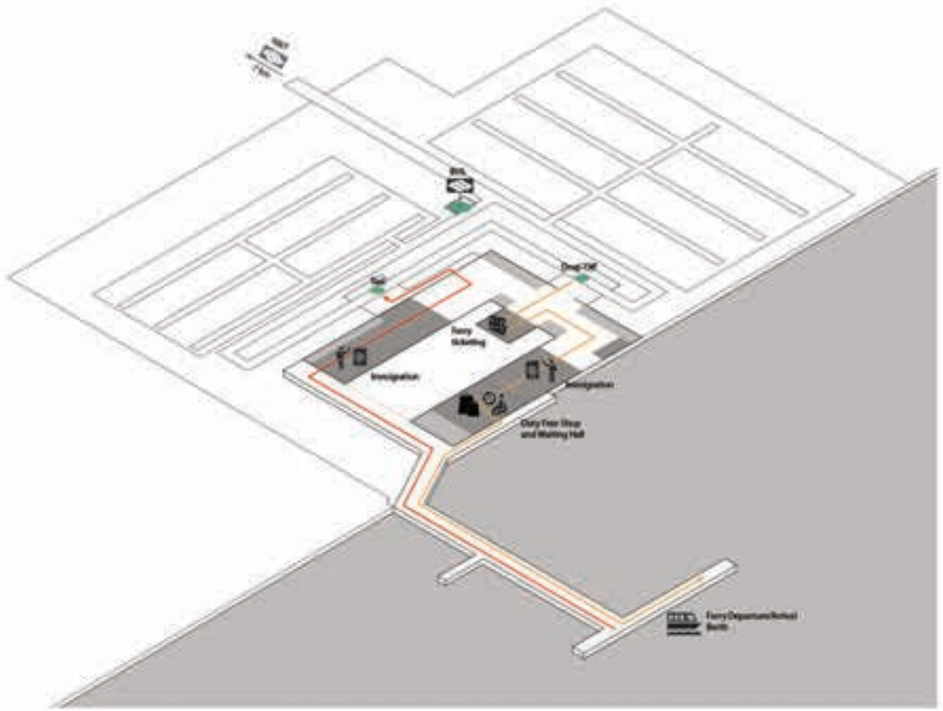
Batam Centre, Batam
Batam Centre is an important regional traffic node with the most frequent connections to Singapore as well as various connections within the Riau Archipelago. In emulation of Harbour Front, Batam Centre is part of a "MegaMall." Except for an intermittent bus service, there is no public transportation to connect to the rest of the island.



Harbour Front

Using Harbour Front as example, the aim is to show how a sea terminal can also serve as a inter-modular transport exchange. From Harbour Front, reaching the city is very direct and easy, as the MRT station and bus stop are located within the terminal building, which combines shopping and dining options with transport.





Tanah Merah -
The Mono-Modal Terminal

With one bus connection that runs every half hour, Tanah Merah is quite difficult to reach by public transport. Although it is located near the airport, there are no public transit connections between them. Since it is a mono-modal terminal, the process of boarding is more immediate and simpler.

Flexible Small-Scale Connections

For centuries, transportation within the region was primarily sea-based, over time, transportation within Singapore and Johor slowly changed to land-based modes. However, it remained sea-based in the Riau because of its archipelagic geography. Today, some of the smaller islands are still only accessible by boat. The most flexible means of travel in the Riau is by private boat, which provides free movement within a certain range, at least to the next ferry terminal.

The smaller islands' limited access to the outside world is proving to be a hindrance in their growth. Young people are leaving the traditional kampungs for the big cities. In order to reverse this trend, connections between areas and the regional terminals must be improved. For instance, the government has established a few routes that operate with concessions or subsidizing, such as the routes from Sekupang to the western islands around Batam. These boats are important means of transport for goods and passengers. The government controls ticket prices to keep them affordable for the population. Although they operate on a regular basis, these ferries travel infrequently, making at most one trip per day.

Public transport boat landing at a village in the Riau Archipelago

Small-Scale Public Transportation

The government subsidizes a few local ferry routes on a regular yet infrequent schedule. It works like a bus system, where the boat follows a regular route with fixed stops and a timetable.

The boats are privately operated but sell tickets at government-controlled prices to keep it affordable. By introducing this very basic means of public transportation on more routes, accessibility for passengers and goods to more remote island settlements could be greatly improved.

Routes with Government Concessions

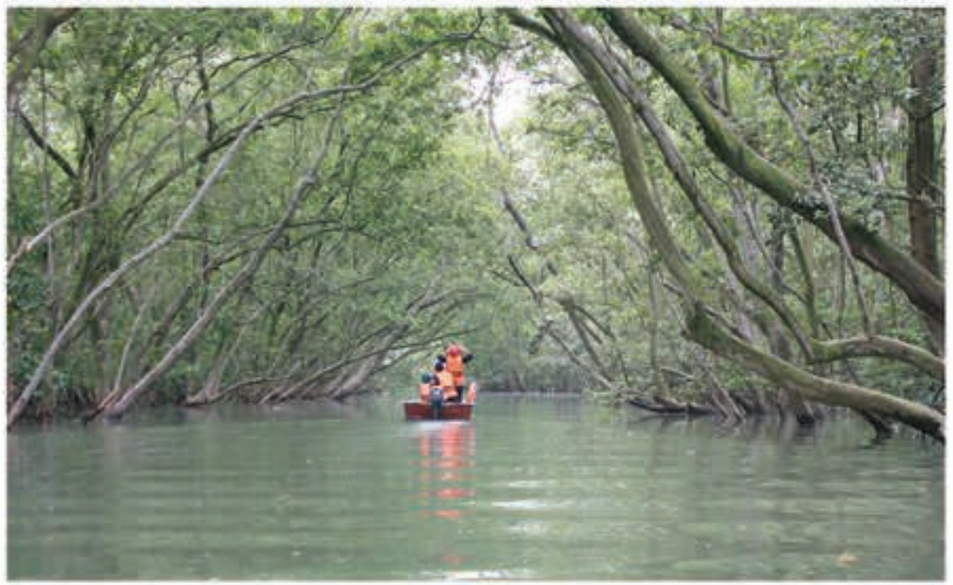
In this specific case, the government defines the route and a private owner operates the boat. The boatman has been granted a concession, which entitles him to offer this route. In return for having a monopoly on that specific route, the government defines the ticket price. The boat offers an important service, supplying the islands with food and consumer goods, as well as transporting passengers. This particular route operates one round trip six days a week, starting in Pulau Telukbakau at 7am and returning from Belakan Padang at 1pm.

Pulau Panguru water bus that carries people and goods at Belakang Padang

Subsidised Route

In this case the government defines the route and operates the boat. This route operates free of charge, three times a week. By establishing a functioning route, the aim is to create a demand, so that eventually it can be privatised and transformed into a concession model, like the previous example.

A boat arrival at Pulau Karas Besar



1.

1.
A boat ride through the mangroves in Johor

2.
A traditional house built on the sea in the Riau Archipelago

3.
The Harbour at Belakang Pakang with a big number of private boats in the foreground.

Small Scale Private Boats and Water Taxis

Small boats, made of wood or fibreglass, are used for private travels. In terms of mobility, size, or capacity, they are comparable to automobiles. A fairly large number of people own a private boat, which increases their mobility within the region. However, their travel range is limited by distance, and weather and sea conditions. Boat owners often serve as water taxis for private hire.

2.

3.

Small-Scale Private Boats

Private boats for everyday life

0 5 10 km N

The map shows areas where small scale private boats are being used for everyday and commuting it can be compared to a car on land.

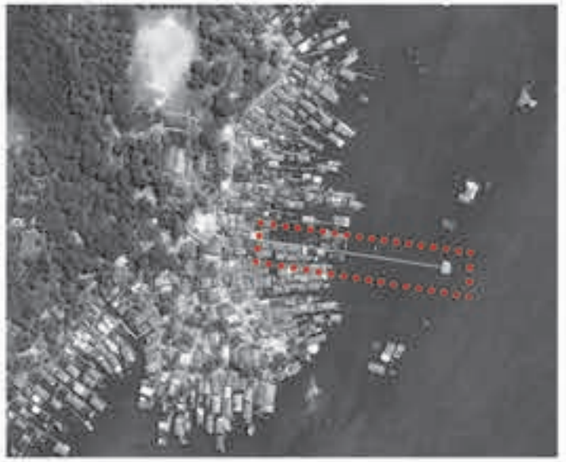
How Terminals Interact with the Urban Fabric

Typically, the local terminals are embedded in the urban fabric of the kampungs on the outer islands. Depending on the layout, size, and geographic location of the island, one or several jetties are built at the pancung's departure point. The main piers are concrete structures made by the government, while the secondary piers are simple traditional wooden structures built by locals.

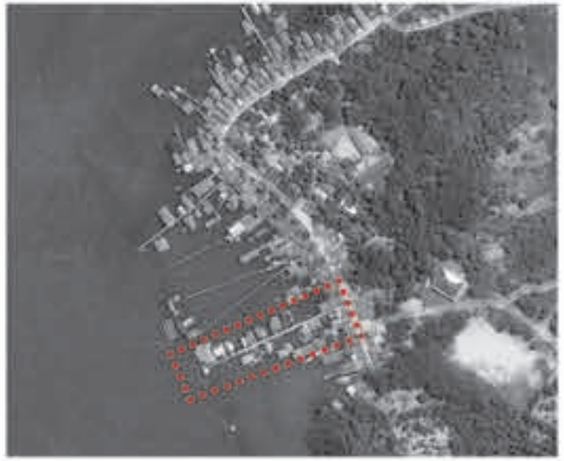
As the houses are built on the seashore and have their own piers, they demonstrate a strong land-sea connection. Together, the houses and piers form a linear strip that follows the coastline, incorporating the kampung's entire infrastructure into one urban system. As a result, most of the island kampungs have a similar urban morphology.

Sea-Based "Bus-Stops"
The spots on the map highlight kampungs of varied size, scale and public facilities, which are all part of the public transportation network.

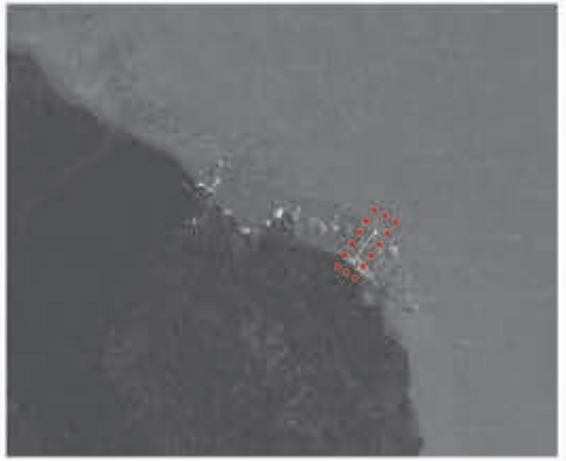
Belakang Padang
Belakang Padang was established as a trade port long before Batam developed. It is still one of the most important kampungs in this area, and operates as a main harbour to the islands west of Batam. Residents visit its market regularly. Most of the goods are ferried to Belakang Padang from Batam and then distributed throughout the area.



Pulau Kasu
Pulau Kasu does not have its own market, and industries sometimes function temporarily here. To purchase anything other than staples, people have to travel to the market in Belakang Padang.



Pulau Pecong
This island is very similar to Pulau Kasu, but with an even smaller population.

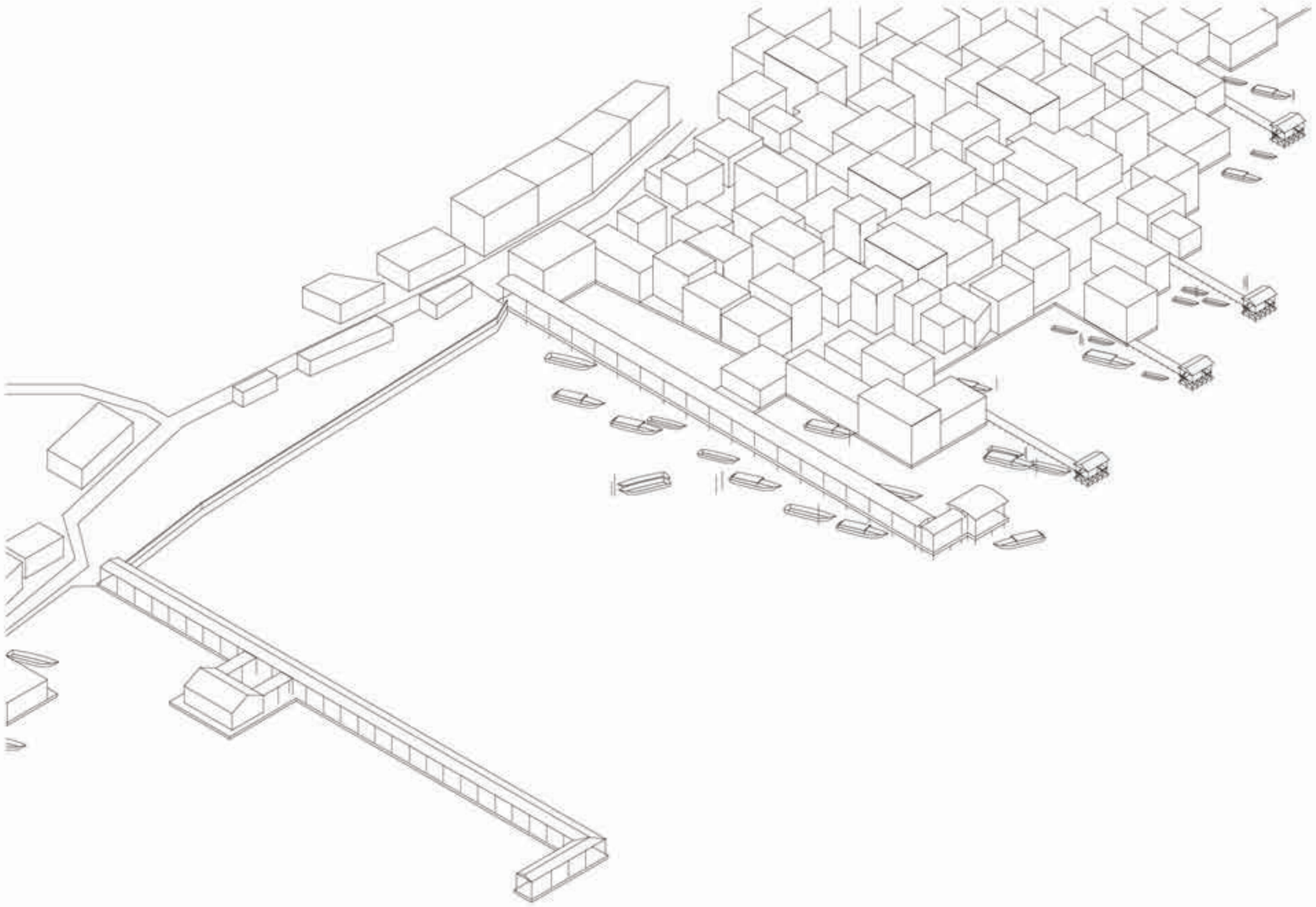


Pulau Ketumbar
Compared to the other kampongs, Pulau Ketumbar is extremely small and consists only of a few houses. This community's small size makes them even more dependent on the public transit route as a supply chain.

An Important Centre in the Archipelago

Before Batam was turned into a city of regional influence, Belakang Padang was one of the biggest and most important centres within the Riau Archipelago. Nowadays, although its greater regional importance has decreased, it remains an important centre for the smaller kampungs and islands to the west of Batam. From here, residents can get frequent ferry transportation to Batam's Sekupang Harbour. Since Belakang Padang has the area's largest market, goods are imported here and distributed across the islands.

The jetties are organized depending on the destination of each boat. The main pier is made of concrete, while the other piers are built in wood in a more informal way.



The Accessibility of the Coastline

The urban centres of Singapore, Batam, and Johor have surprisingly little public access to the sea. The three cities were developed inland, with their coastlines occupied by industrial production sites and larger housing developments. The few publicly accessible coastal areas are widely distributed and poorly connected to the city centres and each other.

1.
Publicly accessible parts of the coastline in the region.

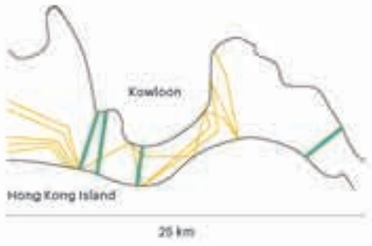
Urban Centres with Limited Connection to the Sea

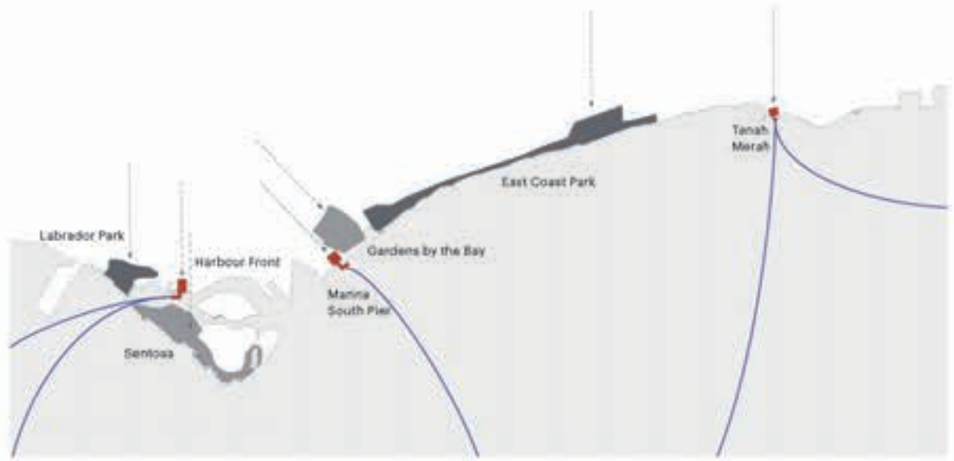
Johor Bahru, Singapore, and Batam have developed into land-based urban centres. They are removed from the seashore, with limited access from the city.

As shown in previous research, only 7.5% of Singapore's coast is publicly accessible. The rest of the coast is taken up with industrial areas, military zones, nature reserves, and private estates. Similar trends are visible in Johor Bahru and Batam.

Victoria Harbour, Hong Kong

Different modes of transportation - highway tunnels, underground MRT lines and ferries - connect Hong Kong's main island to Kowloon across Victoria Harbour. The coast is lined with points of interest such as museums and cultural centres, where the public can access the sea.





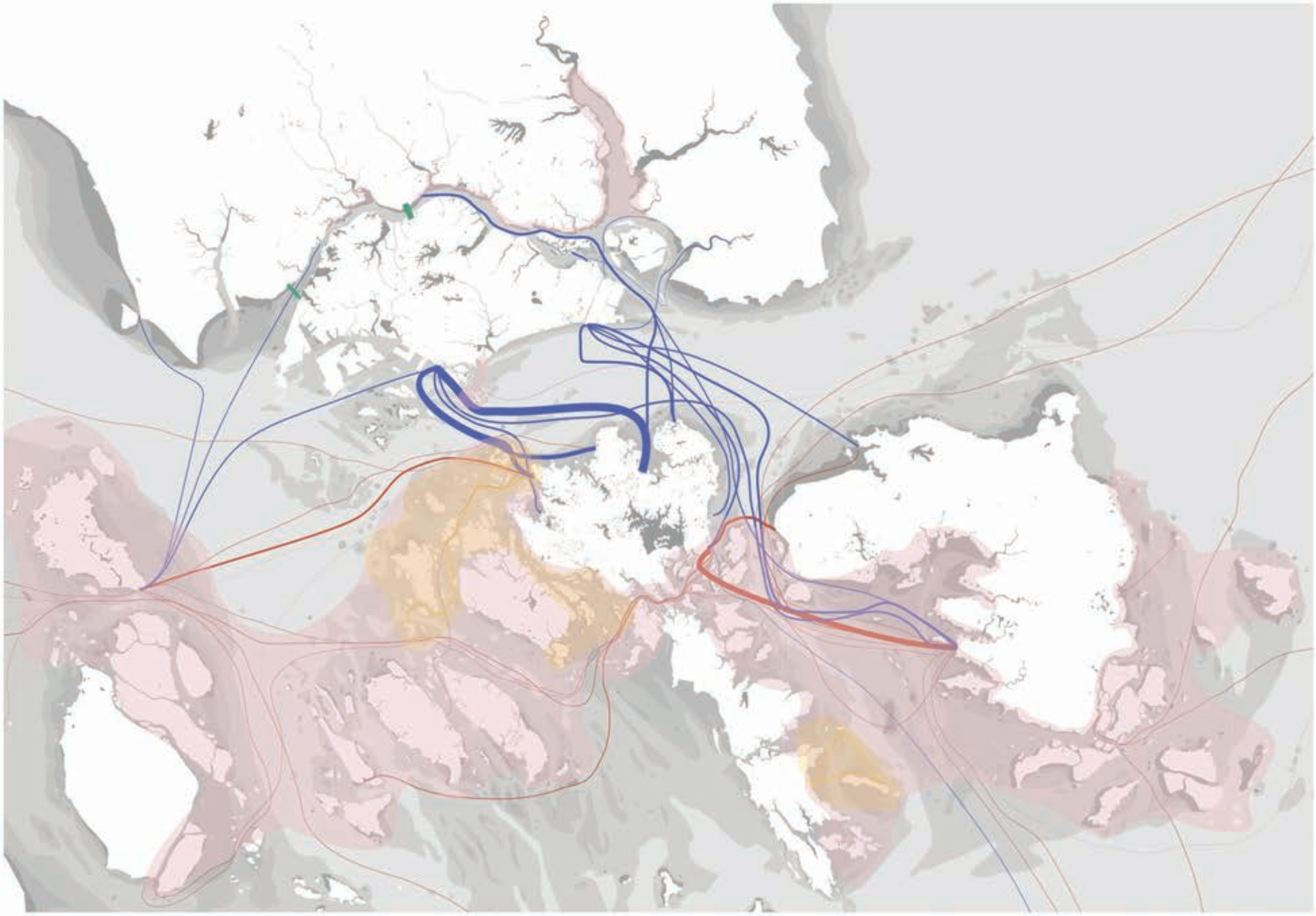
The Fragmented Public Shoreline

Singapore's highest concentration of publicly accessible stretches of coastline is found along the east coast, where the two largest ferry terminals are also found. Park connector trails link points of interest in this seaside park to the city. There is no interaction between this public park and the ferry terminals, the city's gateways to the sea.

Lake Constance

The shores of Lake Constance, a lake on the border of Switzerland and Germany, are dotted with small towns and villages. Not all the coastline is publicly accessible, but points of interest are accessible from land by car, or by lake via a system of hop-on-hop-off boat services that sail from town to town.

The Public Coastline at Changi as a leftover Space


Layers of Transport Typologies
International ferries
National ferries
Scheduled local connections
Flexible local connections
0
5
10 km
N

Network of Increased Accessibility

The central aim of the project is to facilitate connectivity between points through the region, by streamlining, extending, and improving the existing transportation structure.
The secondary goal was to present alternatives to the existing inflexible land-based connections by re-introducing the region's traditional sea-based transport.
On a practical level, the project will improve and refine existing connections to reduce travel time. On a conceptual level, the focus is on re-establishing a relationship with the sea through experiencing the coastal and nautical heritage of the region.

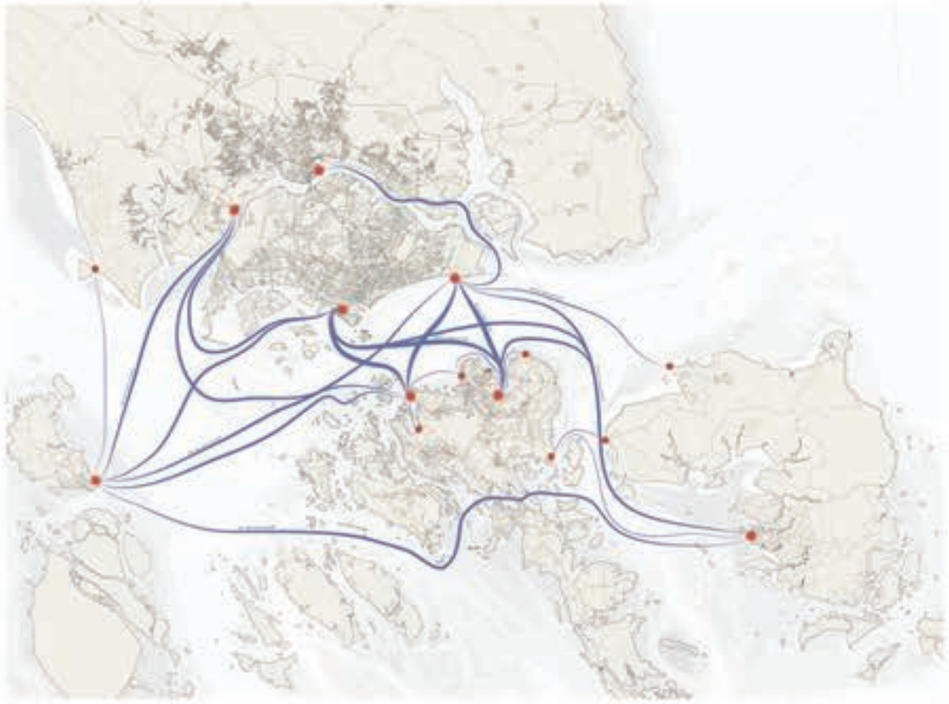
Experiencing the
Johor Strait

Network
of Increased
Accessibility

- Railway
- Main road network
- Fast ferries
  international and
  interregional
  connections
- Sea transport as an
  alternative. Crossing
  the Johor Strait
- Connecting centres
  and peripheries
- Sea transport as urban
  experience.
  Hop-on-hop-off
- Primary hub
- Secondary terminal
- Tertiary terminal
- MRT coastal station
- MRT station
- Informal terminals in
  kampungs
- Jetty

0 5 10 km

N



Regional map with fast ferry connections and hubs

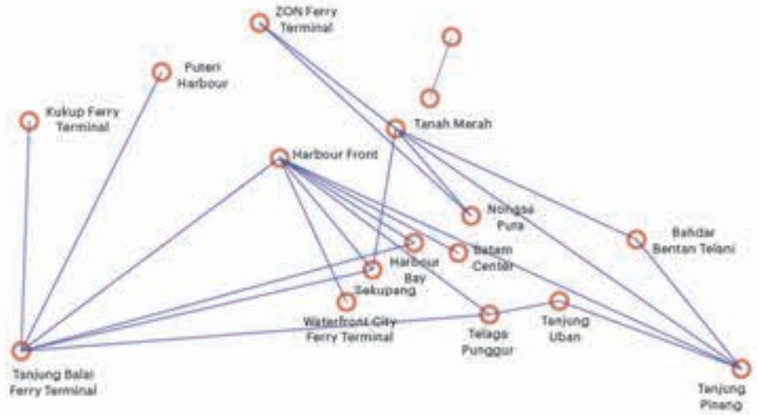
Fast Ferry Connections

As a first step, the project increases large-scale transport efficiency for international and national routes. By establishing different hierarchies for the existing ferry terminals, a limited number of strategically sited hubs in the urban fabric would connect to the region via fast ferries. In addition to centralization, the advantages include greater frequency, improved efficiency, and reduced travel time. We propose reducing the six different ferry operators to just one. This measure would simplify scheduling and ticketing.

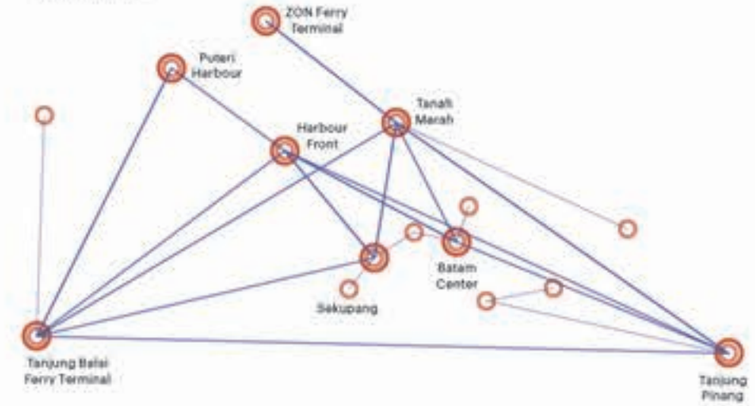
Identifying Hierarchy and Network Reconfiguring

Currently all terminals in the existing fast ferry network operate more or less equally. The large variation in frequencies of stops makes the system difficult for travellers to navigate. In the new proposal, eight key terminals will be transformed into larger hubs, which would be linked to one another in a regional network. More local terminals would link into these regional hubs, and connect with the local public transportation system. By establishing an organised and flexible hierarchy, the overall network would become more efficient and its structure simplified.

The Existing Fast Ferry System



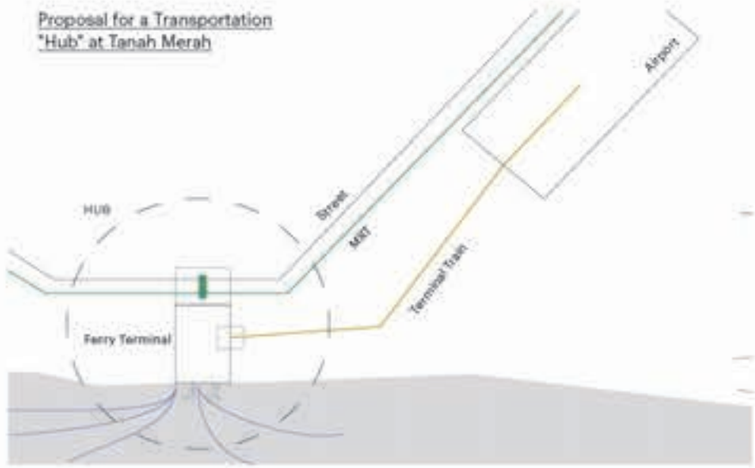
Proposal for "Hubs" and Connections



Tanah Merah: a Multi-Modal Hub

Establishing a new central transport hub here would take advantage of Tanah Merah's proximity to Changi airport, linking air, sea, and the city's MRT system. Fast ferries would connect the region with the world. Locating an integrated immigration portal here would expedite international tourist and worker arrivals. For example, Airport Basel Mulhouse, which is jointly operated by Swiss and French authorities, is located in French territory.

Proposal for a Transportation "Hub" at Tanah Merah



Shuttle Between the Islands

Kampungs
Existing route
Implemented route

Left:
Regional map showing a redefined network of increases accessibility in rural areas

Right:
Case study showing possible routes for increased public transportation

Network of Increased Accessibility

The more than 1000 islands of the Riau, many of which are home to kampongs, have few or nonexistent ferry connections. This project aims to reduce the isolation of these island communities by improving their connection to the region.

Until now, the government has implemented a few public transportation routes, which we call "water buses," that are either subsidised or operated on concession. In general, this concept works, but it is only a starting point: a small number of kampungs have been impacted so far; the frequency of stops is still quite low; and the maximum number of trips is only six per week. Our project proposes to increase the number of routes significantly, and by connecting them to local transport hubs as described above, to create a viable multi- level sea transportation network.

Connecting the Johor Strait

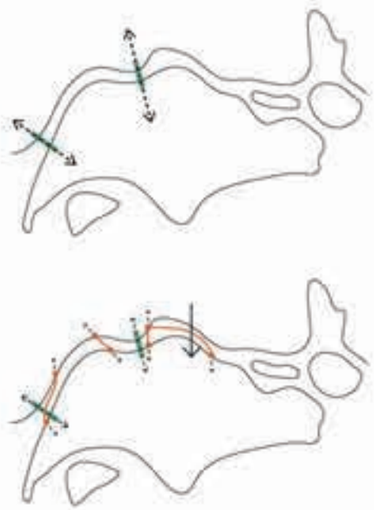
- Publicly accessible coastline
- Coastline route and terminal
- Railway and MRT

Left:
Regional map showing possible alternatives to the Causeway and Second Link for crossing the Johor Strait

Right:
The map shows the Johor Strait. The places where the coastline is accessible are indicated.

Sea Transport as an Alternative

An estimated 90 million people cross the Strait of Johor over the Causeway and Second Link, the only two land connections between Johor and Singapore. Our analysis revealed that traffic jams and inefficiencies in the border crossing procedure is highly inefficient and can take hours. Because of their geographic proximity, we propose a sea-based alternative to connect Singapore and Johor. Ferries will shuttle passengers across the Johor Strait at key points of interest on either side. As a first step, we propose connecting the existing ferry terminals with the three new MRT stations now under construction near the shore; a second phase would incorporate a large network of transport modes. Our idea is that better connectivity will unite the two cities and positively impact them both.

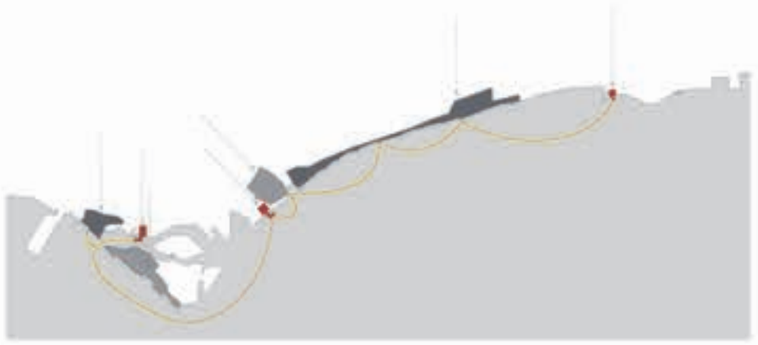


Left:
Regional map showing a proposal to reconnect the coastline

Right:
Perspective along the south east coastline from Tanah Merah to Sentosa

Hop-on-Hop-of Along the Coastline

This map shows the points on the coastline, which are currently accessible to the public. In Singapore this number is exceptionally low, around 7.5%. The situation in Batam and Johor is not much different. In interviews with residents from around the region, we gathered that there was a general desire to change this. We believe there are opportunities to revitalize these remaining publicly accessible parts of the coastline. Drawing from the long history of boat travel around this archipelagic region, we will introduce a boat service that regularly stops at certain points of interest along the coast. Our goal is to implement a connection designed for leisure and experience, so that people can reconnect with the sea and their sea heritage.



New connection of Singapore's South East Coastline

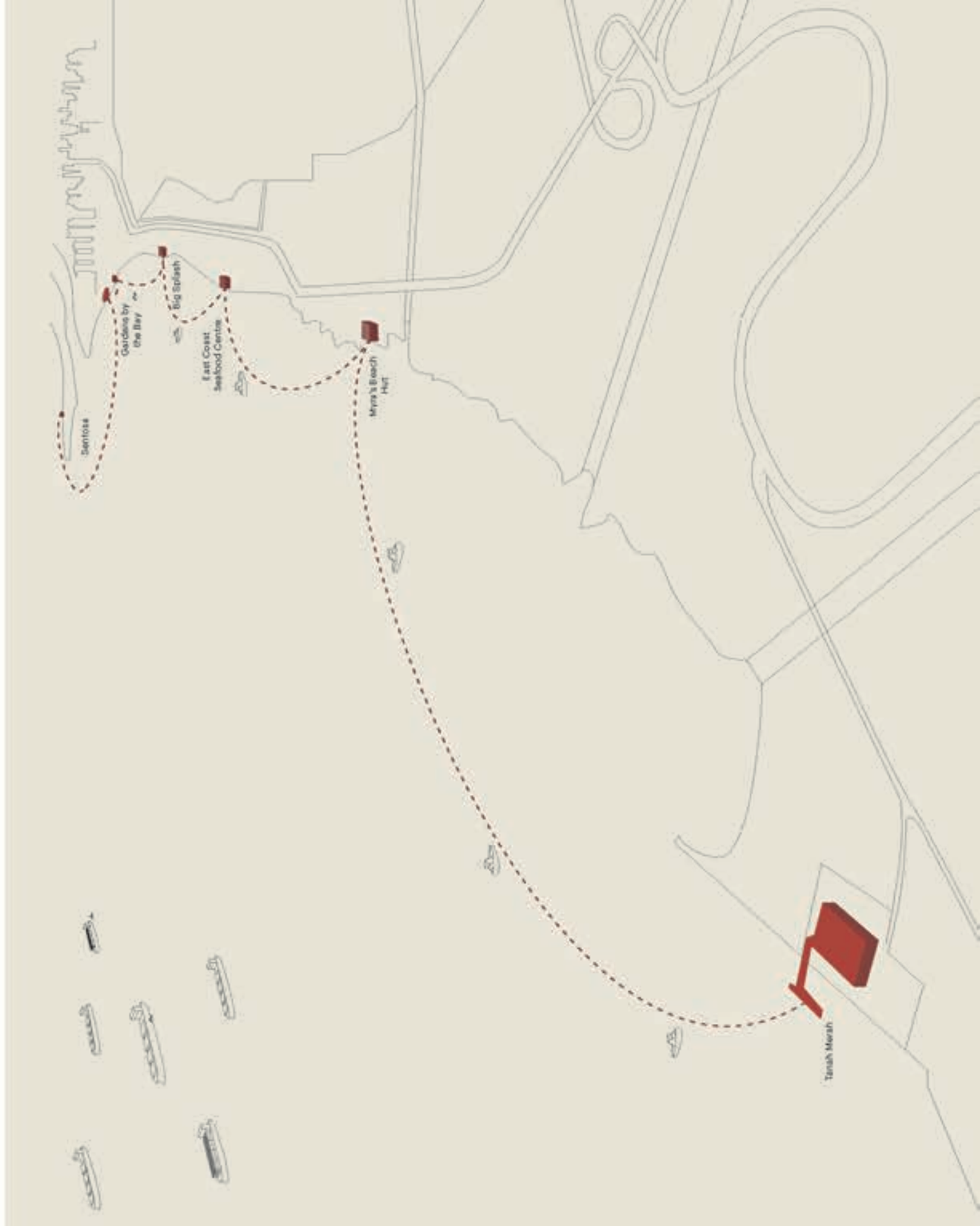


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Image Credits

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Acknowledgements

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A huge thanks to Magnus for providing us chocolate and ideas.

Also, thank to Revel, IT guy at FCL that had enough trouble trying to rescue all the broken laptops.

In memory of Benjamin's drowned iPhone.

View on the archipelago in Pulau Talan, Batam

Pulau Buluh, Batam

Architecture of Territory
ETH Zurich
FCL Future Cities Laboratory

Sea Region
Singapore, Indonesia, Malaysia
Project 2

Asst. Prof. Milica Topalovic
Hans Hortig
Stefanie Krautzig

MEMORY ARCHIPELAGO

Living Heritage in the Sea Region

by
Manuel Crepaz
Martino Iorno

The Riau Archipelago consists of 1248 islands: Singapore, Batam, Bintan and Karimun are the largest and the most populated islands in the region. While many of the remote and smaller islands in the archipelago are still relatively shielded from urban and industrial development, major coastal stretches of the larger islands are developed as industrial zones, and have turned into inaccessible areas. This industrially occupied areas of the coastline now stand in between the cities and the sea; the urban centers and the residential areas are withdrawn inland from the coast.

The islands economies, ways of life and daily routines have changed too; the traditional cultures of the archipelago can still be found on and around the smaller islands, in the archipelagos remote waters, while 'the modern life' and employment possibilities are strong magnets for migration to the cities on the bigger islands, or on the 'land'. Recently, the tourism industry has started to discover the remote parts of the archipelago, where the 'tropical paradise islands' benefit from their proximity to Singapore, but the tensions between the ensuing tourist developments and the island communities remain.

This project attempts to portray the unique way of life in the archipelago, and proposes that parts of Riau Archipelago should be seen as the territory of the living heritage of the entire region. The role and the practices of heritage protection in the region have been further examined and presented. As a possible vision of such Memory Archipelago, the project proposes a heritage park, which allows the establishment of noninvasive forms of tourism and urban living in the archipelago landscapes, in alliance with nature. The park supports the local island economies, enables the improvement of infrastructures, and provides a framework for the protection of natural resources. The Memory Archipelago heritage park is situated off the west coast of Batam, which has been identified as one of the most valuable remaining areas of archipelago culture.

Archipelago as Heritage

What we understand by the word 'heritage' is evidence of the past. All the elements which connect the past to the present and to the future give this trinational, differentiated region an identity. So we can say that heritage is something strongly connected with the perception of the past. Historical sites, buildings as well as the natural environment, can be considered as the heritage of the present-day society.

"A Large Chart Describing ye Streights of Malacca and Sincapore", Samuel Thornton, 1723

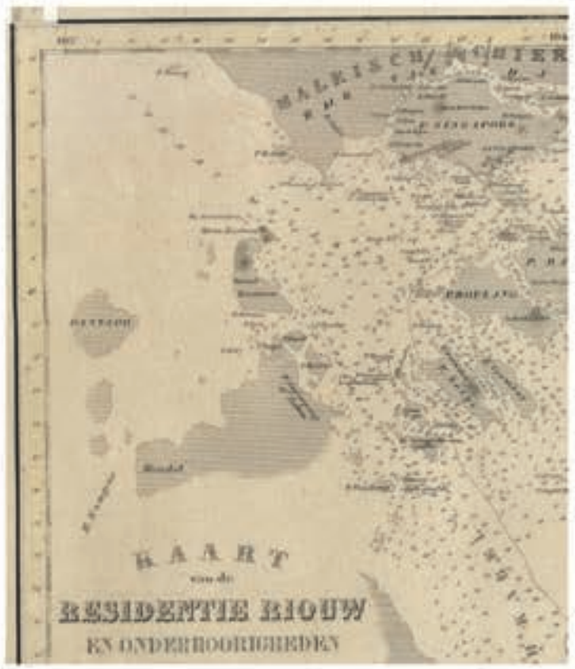
Left:
"Nouvelle Carte des Mer entre Comprises Le Detroit de Banca et Po. Timon, avec la partie Orientale du Detroit de Malacca", Jean-Baptiste de Mannevillette, 1775

Right:
"Map of the Riau Archipelago, Sumatra Indonesia", including Malaya and Singapore, W. F. Versteeg, 1860

From The Sea to the Land

The perception of the archipelago has changed greatly throughout history; this change is clearly visible in the evolution of the cartographic representation. The initial focus of cartographers was to provide detailed information for the shipping routes passing through the Malacca and Singapore Straits. Everything related to the hinterland remained a mystery. Cities along the coast were represented only insofar as their capacity to perform as port facilities.

A significant historical change in the region's cartographic representation is the shift from mapping the sea to the mapping the mainland. Only gradually did the perception of land beyond the inhabited coastlines become important. Initially, maps of the region represented the water and the coastline; later detailed information, e.g. names of places, further inland appeared on the maps. Another major change in mapping the region, was the awareness of proportion. When mapping naval movement in the Straits, the proportions and size of the islands tended to be perceived as smaller and more distorted than they were in reality. What is the perception the maritime region today?



Borders in the Archipelago

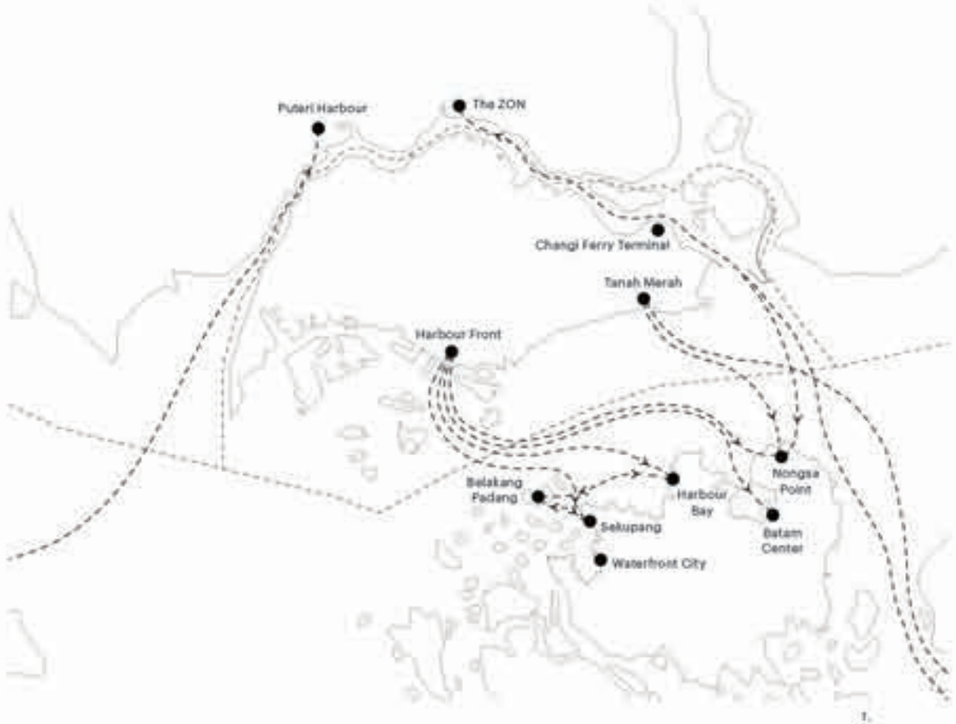
Initially, the region was understood as a vast expanse of sea with fragments of land, linked to each other through the water. The sea was the connecting element of the region until the implementation of national borders ended the interactions of communities within the newly defined nations. The move from a unified region to a detached and distant relationship between the three nations have made exchange complex and the effects of this are still strongly felt today.

Left:
Prominent sea connections in the region before confrontation, 1963

Bottom:
Boat Quay Singapore, 1929

Strong Interaction before Confrontation

Before the confrontation in 1963, the borders set from the Anglo-Dutch Treaty still allowed strong interactions within the archipelago. The sea region was perceived as one whole space. As shown in the image, the early 20th century Riau Islanders used to go to Singapore to exchange goods and meet people from throughout the archipelago.



1.
Separated bilateral sea connection in the region after confrontation, 1963

2.
Portrait of palm oil worker on Pulau Mecan

3.
Portrait of petrol supplier on Pulau Belakang Padang

Reduced Interaction after Implementation of Borders

After the confrontation, national borders radically divided the region. The increasingly formalized and regulated process of border crossing and the growing economic differences between Singapore and the rest of region represented a radical change. For inhabitants of the Riau Archipelago, it became more and more difficult to maintain a connection to Singapore. The industrial development of Batam began in the early 1970s and the population grew rapidly. Batam, rather than Singapore, became the new socioeconomic point of interaction for the surrounding island communities.

2.

Pulau Mecan

"I went working to a Malaysian palm oil plantation for the five past years. I didn't have a passport at that time and had to go to Tanjung Pinang and then to Johor Bahru on a small boat with 6 other people."

3.

Pulau Belakang Padang

"I'm Singaporean, I don't belong to Belakang Padang. I was ten during the years of the confrontation when I left my hometown. I wish I could go back to my sister but unfortunately I don't have enough money."

Archipelago as Urban Backstage

Since the seventies, the similarities across the archipelago have diminished and the differences and inequalities between the individual islands have escalated. Lee Kuan Yew, Singapore's first leader after independence, described the achievements of Singapore as "a transition from third world to first." While the cities with a strong land-based economy fit into the world market and continue to grow, the rest of the archipelago is experiencing stagnation and decline. The population of the islands tends to decrease as people migrate to cities in search of economic prosperity.

Land-Based Development
Kota Batam is the largest city and the largest island in Riau Islands Province. With its strategic location near the Malay Peninsula and Singapore, it is strongly linked to the mainland. It is one of the richest and fastest growing municipalities in the nation with a growth rate of 11% per year.

Tradition of Fishing as Everyday Life
The main activity on the smaller islands of the Archipelago remains traditional fishing, which is based on regional export. Many of the islanders started fishing directly after primary school.

Singapore Age Groups
As shown in the graphic, the average age in Singapore is relatively young: around 38.9 years old. The reason is the prospering economy of this nation: offering job opportunities to people from all over the world.

Pulau Mecan Age Groups
In Pulau Mecan, a considerable portion of the youth leave the island to reach other more prospering destinations. This exodus leaves the island with a remarkably high average age.

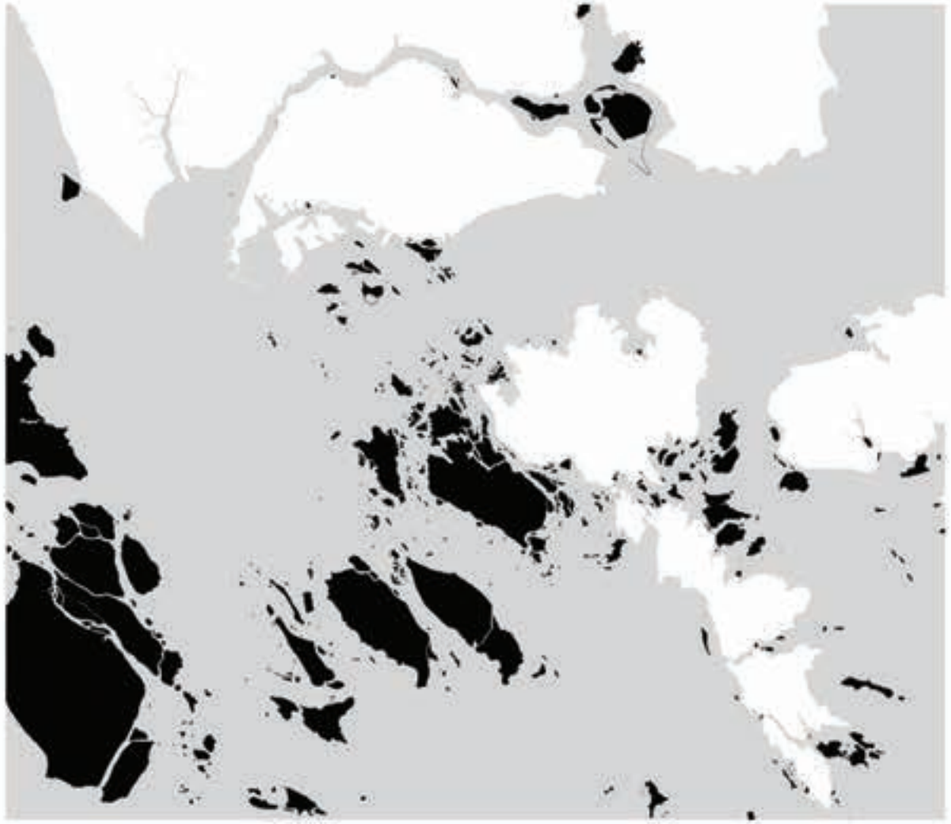
Top:
Mainland and large islands

Bottom:
Smaller islands of the archipelago

The southern islands of Singapore are used for industrial, military and leisure purposes.

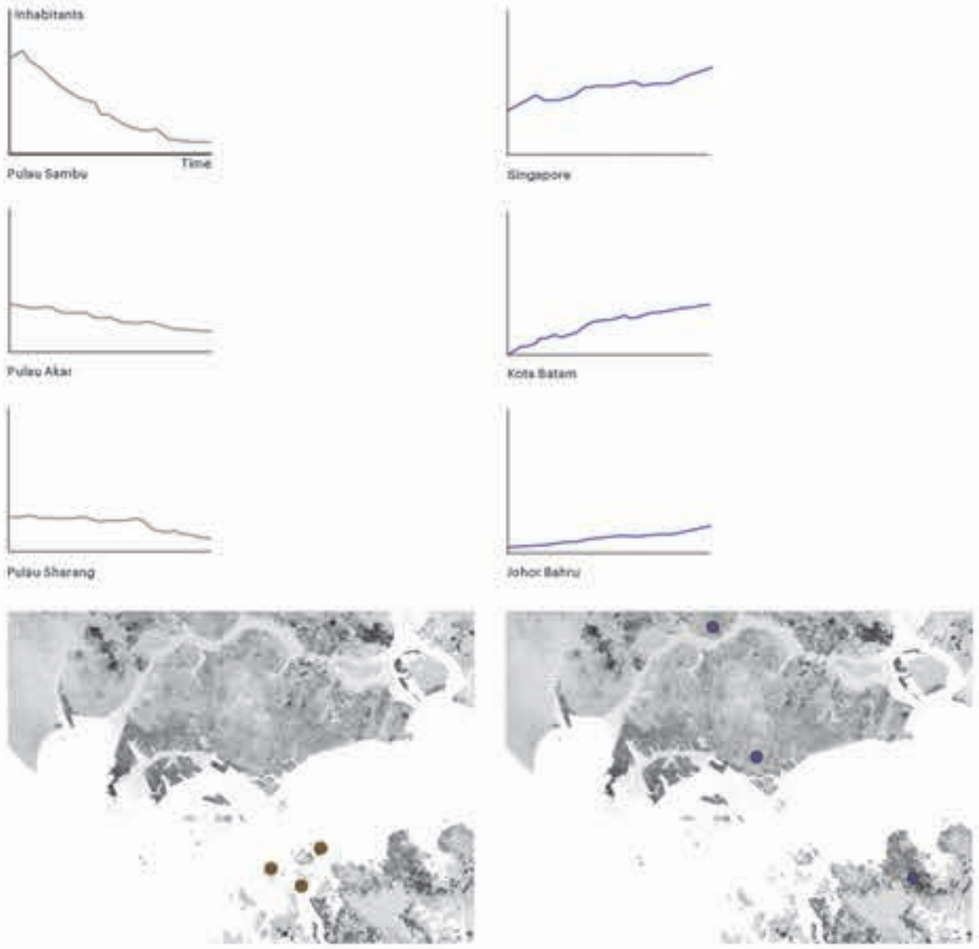
Archipelago
Population: 245'676
Total Area: 1'811 km²
Density: 135.65 Inh./km²
Remarkable is the huge land area of this region in comparison to the small degree of urbanisation.

Singapore
Population: 5'399'200
Total Area: 716.1 km²
Density: 7'540 Inh./km²
In this case the relatively small dimension of the total land area is completely urbanised and reaches an impressive density.



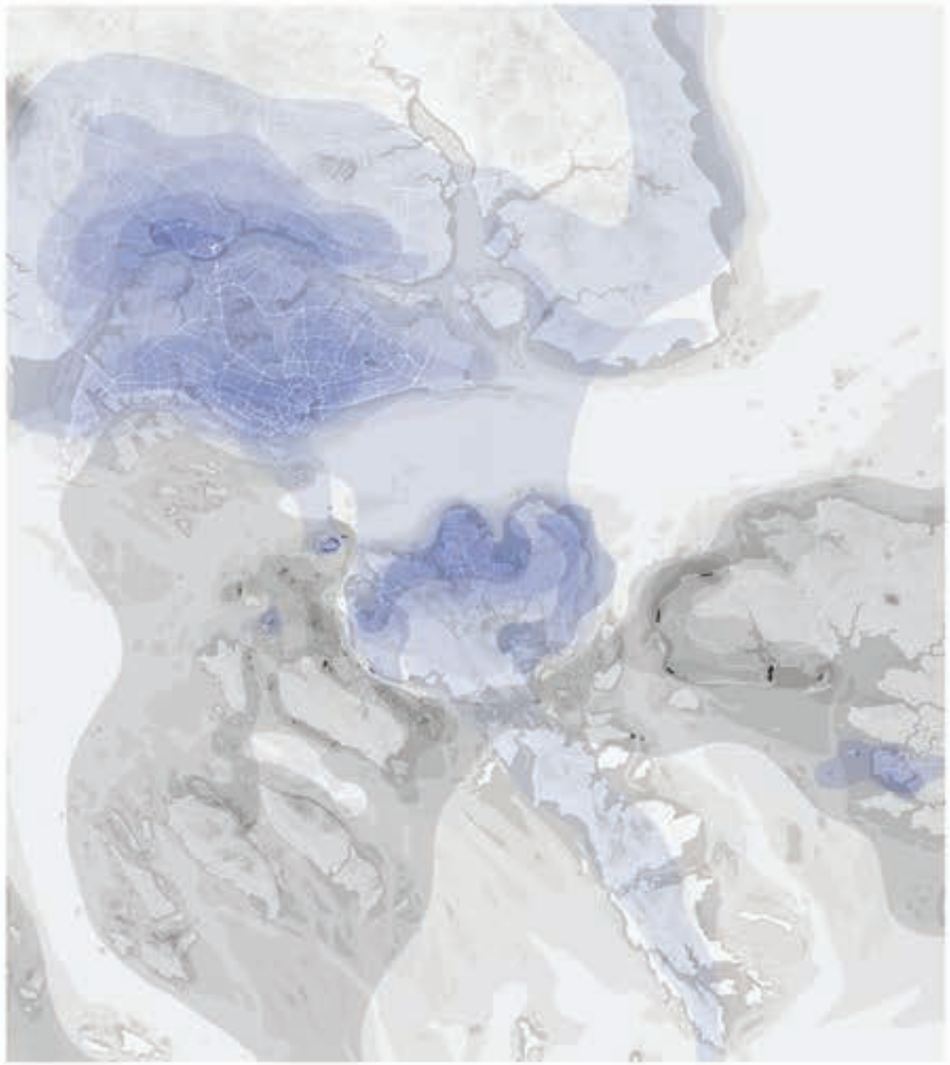
The large islands of the archipelago are left white and considered as an extension of mainland.

Terrain Vague?
The French word "vague" means wave, emptiness and uncertainty. It refers to the open or uncertain future of areas on the edges of the metropolis, which could be progressing or declining, their future is vague. Some parts of the archipelago are becoming industrial extensions of other cities but without becoming cities themselves.



The Shrinking vs.
the Growing Archipelago

A regional trend of migration from the smaller islands towards the larger, more prosperous islands can be identified throughout the smaller islands of the archipelago. The graph of Pulau Sambu shows a clear population decline, whereas Kota Batam's population is still growing.



Population Changes

- Growing population
- Stagnating or declining population

From Monuments to Territories of Heritage

An economically and culturally developed country such as Singapore considers it increasingly important to preserve and construct a national identity. There is a strong effort to protect the country's history and many heritage institutions operate in Singapore. Yet, if we consider the archipelago as a whole region and its history as a shared history, we would understand that heritage doesn't find its limits within the national borders. The economically disadvantaged parts of the Riau Archipelago, despite being very rich in terms of history and heritage, seem to be forgotten. Their cultural contributions are left off the radar of most preservationists.

1.

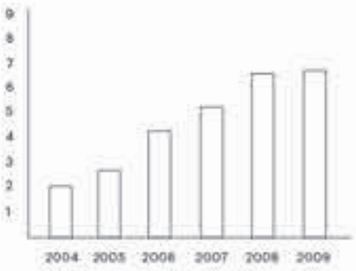
2.

3.

1. Heritage Tree project, Singapore

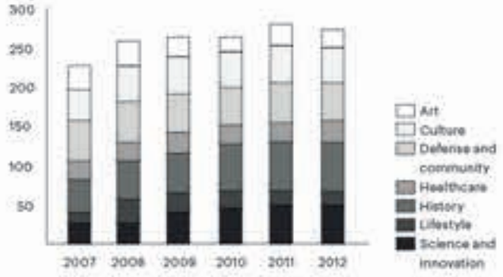
2. Malay Heritage Center, Singapore

3. Merlion monument, Singapore



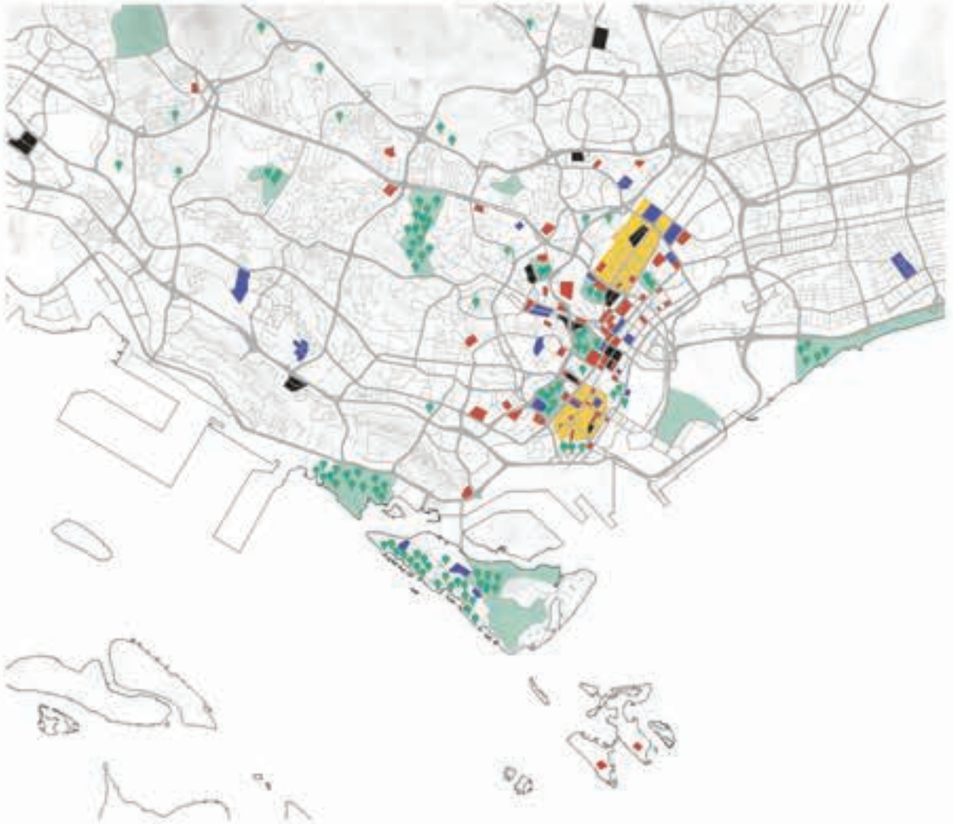
Government Funding

Government founding for arts and culture in Singapore has continued to grow, increasing about ten percent from 2011 to 2012 to a total of 478.8 million SGD.



Heritage Galleries and Museums

The total number of museums and heritage galleries in Singapore has grown steadily from 46 in 2007 to 55 in 2012. More museums are stated to open in the coming years to add to the heritage scene in Singapore.



1. Singapore

2. Johor Bahru

3. Tanjung Pinang

1.

2.

3.


Declared Heritage
Heritage institutions
Museums
Districts
National monuments
Heritage trees
Johor Bahru:
5 National monuments
5 Museums
4 Heritage institutions
Singapore:
64 National monuments
23 Museums
13 Heritage institutions
178 Listed heritage trees
Kota Batam:
1 Museum
Pulau Penyengat:
5 National monuments
1 Museum
1 Heritage institution
Tanjung Pinang:
3 National monuments
1 Museum
1 Heritage institution
Pulau Galang
Vietnamese Refugee
Camp:
1 Museum
1 Heritage institution

Scanning the Physical Geography

Each island in the archipelago is different from the others. Each has different properties that allow it to be distinguished from the rest of the archipelago. An island can typically be defined by its form, name and functions. These island qualities used to be a constant in the past, today, they are increasingly put into question. To understand the dynamics of the island transformations, it is essential to have an overview on the actual situation.
The land area and the form of some of these islands changes constantly due to processes of land reclamation. Their names also change over the course of history or even vanish. This archive seeks to provide a temporal snapshot of the appearance and formation of the fragments of the present archipelago.

Islands of the Riau Archipelago

The Island Archive

An archive of the islands of the archipelago offers an idea of the uniqueness and diversity of this region. The distinction of the islands by shape, function, and in some cases, by name seems crucial. Normally, a name refers to the historical background and so to the cultural heritage. Many of the islands in this region are unnamed and unpopulated.

Jurong Island
Function: Petrochemical Industry
Area: 32 km²
Population: 0

Tekong Island
Function: Military Use
Area: 24.43 km²
Population: 0

Pulau Kapalajernih
Function: None
Area: 18.46 km²
Population: 0

Pulau Mantang
Function: Kampung
Area: 5.58 km²
Population: 0

Pulau Kelong
Function: Kampungs

Pulau Mapur
Function: Kampung
Population: 0

Pulau Ungar
Function: Kampungs
Population: -

Pulau Telan
Function: None
Area:
Population: 0

Pulau Durian
Function: Kampung
Area: 5.58 km²
Population: 0

Pulau Senjonkong
Function: None
Population: 0

Pulau Numbin
Function: None
Population: 0

Pulau Poto
Function: None
Area: 5.58 km²
Population: 0

Pulau Seturnah
Function: Housing Project
Area: 10.3km²
Population: 0

Pulau Ubin
Function: Leisure
Area: 10.2 km²
Population: 0

Sentosa
Function: Leisure and Housing
Area: 5.58 km²
Population: 200

Pulau Durian Kecil
Function: None
Area: -
Population: 0

Pulau Pemping
Function: Oil Industry
Pipeline-Kampung
Population: 200

Bukom Island
Function: Petrochemical Industry
Population: 0

Semakau Island
Function: Landfill
Area: 3.5 km²
Population: 0

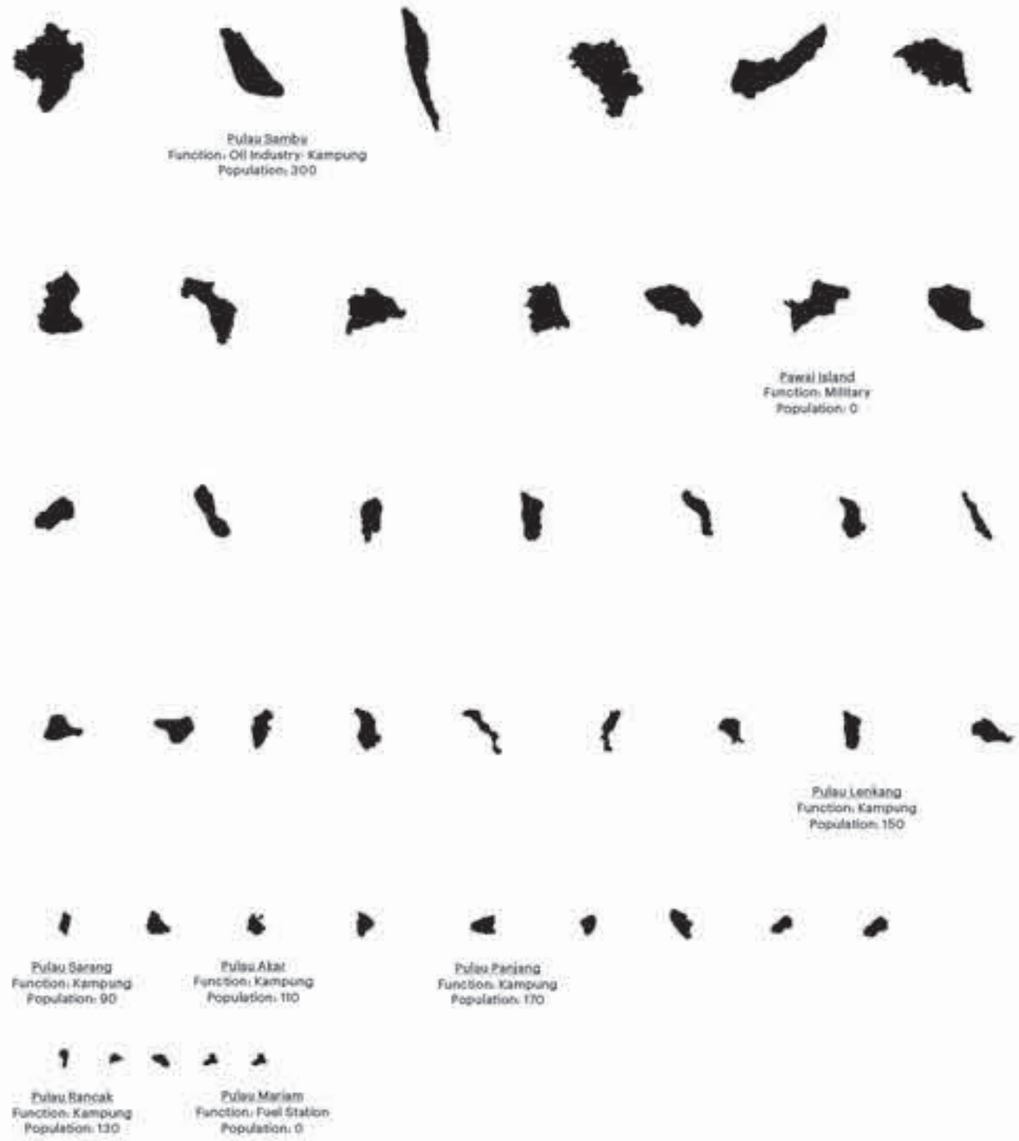
Pulau Belakang Padang
Function: Kampung
Area: 3.5 km²
Population: 18'508

Sudong Island
Function: Military
Area: 1.8 km²
Population: 0-515

Pulau Nipah
Function: Border Limit
Population: 0

Pulau Baluh
Function: Kampung
Area: 10 km²
Population: 0

Sebarok Island
Function: Industry
Population: 0



Pulau Samba
Function: Oil Industry: Kampung
Population: 300

Pawai Island
Function: Military
Population: 0

Pulau Lenkang
Function: Kampung
Population: 150

Pulau Sarang
Function: Kampung
Population: 90

Pulau Akar
Function: Kampung
Population: 110

Pulau Panjang
Function: Kampung
Population: 170

Pulau Rancak
Function: Kampung
Population: 130

Pulau Mariam
Function: Fuel Station
Population: 0

... and other 995 unnamed islands

Extended Mainland

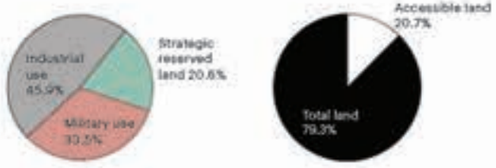
Singapore is comprised of a mainland island and sixty-two much smaller islands, totalling 778 km² of land. The precious land in the constellation of islands around Singapore is exploited and transformed into mono-functional zones. The gravitation exerted from the mainland economic activities, which include the petrochemical industry, waste disposal, military, housing and leisure zones, absorbs the surrounding islands and transforms them into an extension of itself. The minority of these islands are accessible to the public; the majority are accessible only to authorized personnel. These islands become a kind of extension of the city and the mainland without being a real part of it.

Singapore Island's Constellation

- Industrial use
- Military use
- Leisure area
- Enclosure
- Mobility

Monofunctional Islands?

The urban structure of Singapore is rationally organized; clusters of relatively monofunctional areas are found around the urban and residential fabric in the center of the island. The main land-use categories are industry, strategic reserved land, residential mix, military and landfill. Only 20.7% of the islands' area is accessible to the public.



1.
Industrial islands constellation Singapore

2.
Singapore's military area from the Johor Strait

3.
Sebarok Island Singapore

Island "Gated Communities"

In the case of Jurong Island, there is a new integrated security management system for the security checkpoint. The new vehicle and pedestrian checkpoint on the road link between Jurong and mainland Singapore is part of the on-going island security strategy.

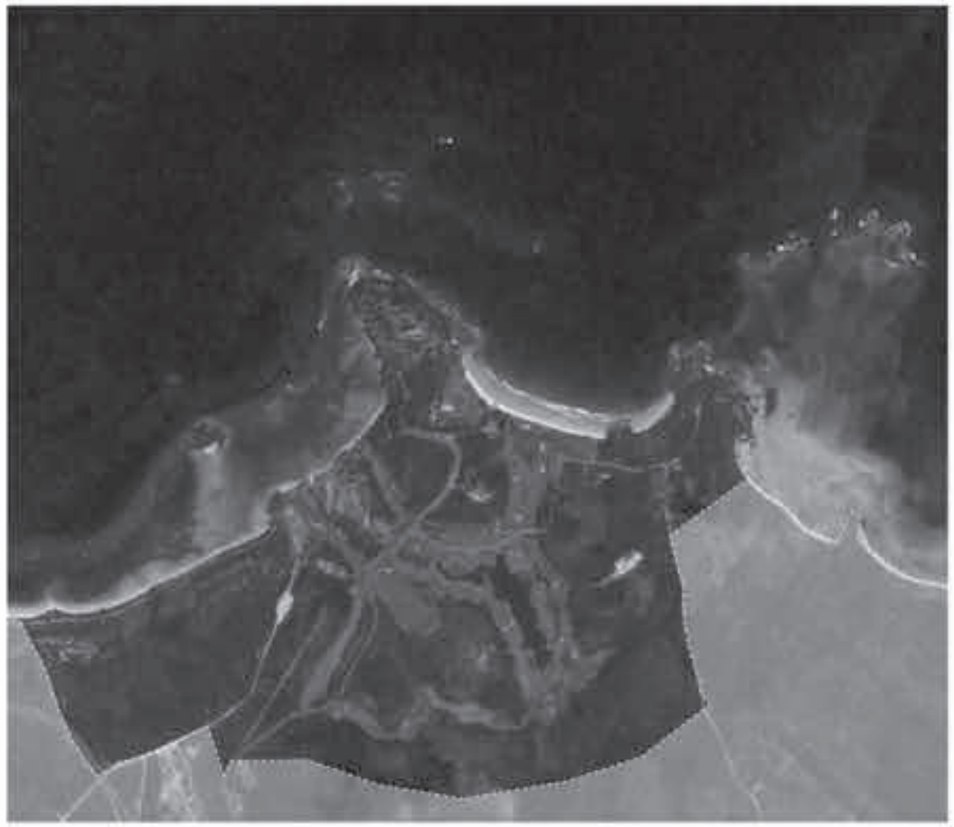
2.

3.

"Singaporeanization" of Bintan

Since the 1970s, the growing need for land pushed Singapore to expand its economic operations onto the islands of Batam and Bintan. This only became possible through the concept of the Growth Triangle, which territorialized in the form of special economic zones. The special economic zone in the north of Bintan was developed into a tourist enclave, run by Singaporean companies. The governments of Singapore and Indonesia contribute to the creation of a 'gated globalism', which here occurs at the expense of local communities. Local coastal communities were evicted and resettled further inland to make space for the tourist resorts.

"The authorities used other tools of pressure to get villagers out. The school that used to be nearby was moved to the new settlement. It's now very difficult for villagers who refused to sell their land; it is hard for us to send our children to school, which lies 9 km away. "



Top:
Bintan Resorts area

Bottom:
Police oppressing a demonstration against the Bintan Beach International Resorts (BBIR)

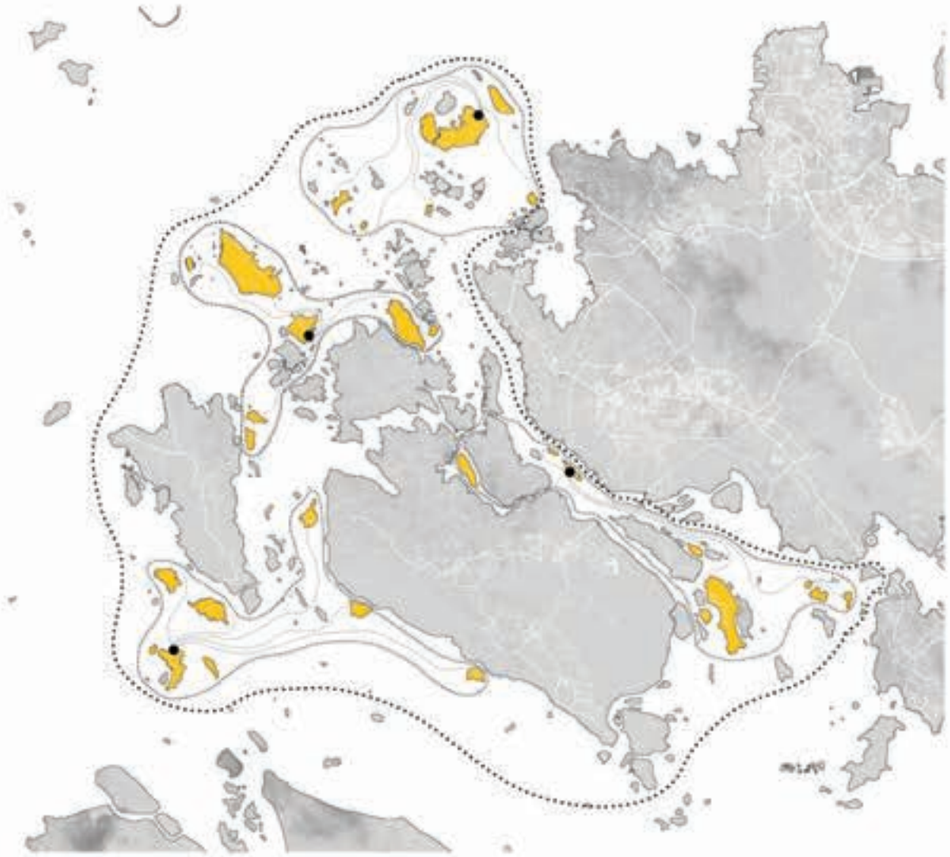
Enclaves: Fragmented Integration

There were many demonstrations in the 2000s and also violent reactions against the authorities defending the gated industrial and tourist communities in the areas of Tanjung Lobam and Tanjung Uban. People were demonstrating to protest their evictions without just compensation. People working in the new tourist and industrial enclaves were from Java and other places; the local people were rarely included in the new economic activities of these places.

Living Heritage

The islands of western Batam have a high density of kampungs. The links between these islands also remain intact. Unlike Bintan, the forces exerted by the economies of the Indonesia-Malaysia-Singapore Growth Triangle less affect Batam. Its cultural content and large concentration of shrinking kampungs makes it a valuable but vulnerable area.

The area can be marked as "living heritage" as most of the population here lives by following traditional ways of life. However, the population of these kampungs is drastically decreasing and their prospects for better education and better income are low. This means and urgent intervention to safeguard the assets of the intangible cultural heritage.

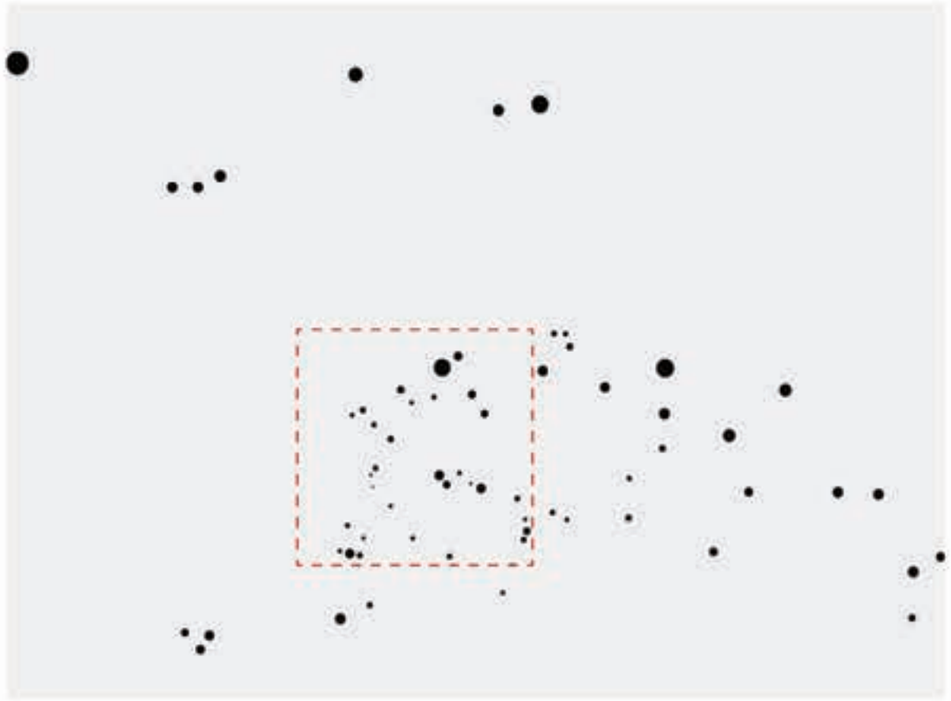


Batam Island's Constellation

Living heritage

Fragmented Living Heritage

In this area of the Riau, the intensity of population and living heritage is very high; yet, the internal interactions between the different islands are getting weaker. Notice the large number of islands and the relatively small number of kampungs.



Top:
Map of kampungs

Bottom:
Map of the fragmented archipelago

Island Heritage

Each island in this region is significant different from the others. Each island has its own history, people and thus, unique cultural heritage. In order to analyse this diverse region, we developed a series of island typologies, which present common characteristics and differences. Main distinctions were made according to the type of activities carried out on the island, its people and infrastructures. Additionally forms of relations and connections among the islands in the archipelago determine the islands typologies. The typologies include: the "Everyday Islands", the "Forgotten Destinations", the "Carcerary Islands", the "Unnamed Islands" and the "Happy Islands."

Traditional fish stakes in Pulau Abang, Batam

Island Stories

Hendro is staying on Pulau Sambu working along with his son as long for as his employer allows him. In case of unemployment he would move to Batam to look for a new job.
Age: 39
Origin: Pulau Sambu
Work: Workman at Wika Pertamina

Eja was a secondary school English and Mathematics teacher in Pulau Macan and had a class of 30 kids. After the school closed, he was forced to move to Belakang Padang in search of a new job.
Origin: Pulau Dansi
Age: 35
Parents work: Fishing

Rachman is mainly a fisherman in Pulau Akar. Besides fishing, he is an Rukun Tetangga (RT), a neighbourhood assistant, and every two weeks, he goes to meet the RT's of the four surrounding islands to talk about administrative decisions.
Age: 51
Work: Fishing and RT
Origin: Born on Pulau Akar

Abdullah Aziz was fisherman on Dansi. Insufficient catches due to the lack of fish forced him to move to Pulau Lenkang. He goes fishing everyday in the international waters where the fish is larger.
Age: 53
Work: Fishing
Origin: Pulau Dansi

Asad has lived in Belakang Padang since he was 30. His two sons live in Batam Center and occasionally visit him on the weekend.
Age: 65
Origin: Pulau Pemping

Declining Numbers on Smaller Islands

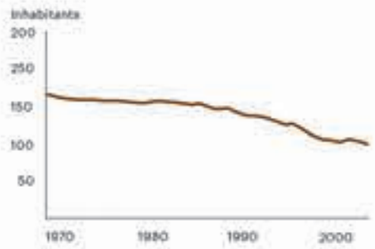
Smaller Islands in the west of Batam are experiencing declining resident numbers. Mostly people move to bigger islands to have better access to public facilities or to transport to the main island.

Everyday Island Typology

- Services
- Primary school
- Mosque

Everyday Island

The Everyday Island like Pulau Langkang Kecil is the most common typology found in this part of the archipelago. The population of these islands is shrinking and the main activities are defined almost exclusively by fishing. The settlements are usually small clusters of houses that grow radially into the sea around a center, which typically include a mosque and a primary school. They normally lack access to clean water on the island and are strongly dependent on other islands for other facilities.



1.

1.
Front view of an everyday island like Pulau Langkang Kecil with mosque

2.
Tommy, a fisher from Pulau Akar

3.
Traditional charcoal oven, often to be found in kampungs

2.

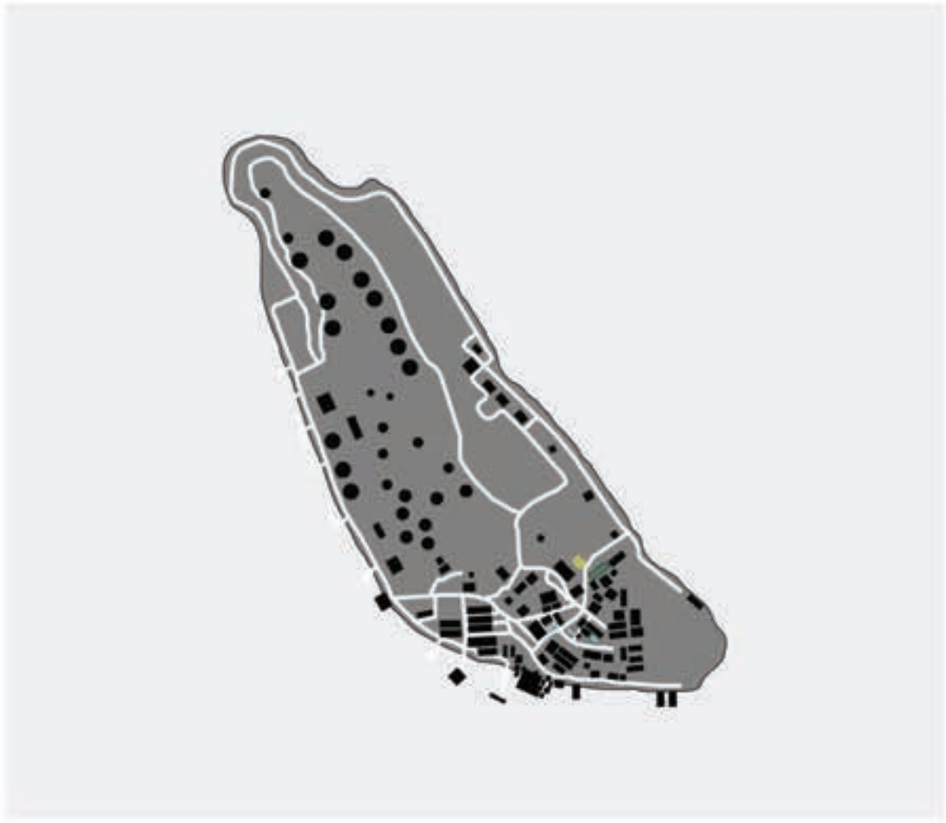
3.

Tommy

"I do what my father did. I'm an arpoon fisher and my brother is a trap fisher"

Traditions as Potential

The long history of certain sites gives the region a strong identity. Maritime culture and traditional ways of living along with the richness of the natural resources could be used as a potential for a kind of "eco-tourism" to incentivize the local micro-environments. Traditional fishing or the production of charcoal from mangrove woods could play a role in creating a tourist attraction for living heritage.

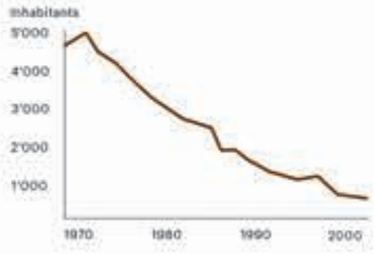


Forgotten
Destination Typology

- Primary school
- Services
- Mosque

Forgotten Destination

Islands with a rich past history, which is legible in material elements on the island represent a strong site of heritage and interest. Sambu Island had strong relations with the Dutch before independence.



1.

2.

3.

1.
Painting of Pulau Sambu in the Pertamina golden age in the 80's

2.
Delvi, one of the few islanders still living on Sambu

3.
Secondary school closed down in 2013

Delvy
"As we can see from the population numbers, economy and production activities are prospering on the Mainland."

History as a Capital
The long histories of certain sites give the region a strong identity. After Indonesia won independence from the Dutch and, when Batam was mostly covered by forest, Sambu was one of the most populated centres of the region.

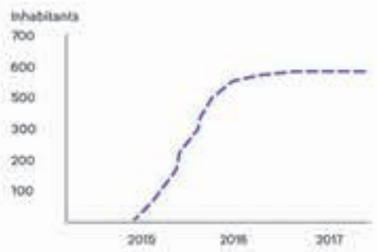
When Batam built its first industry zones in the 1970s, Belakang Padang was left behind. The island used to be one of the main trading centres in the region, now it is facing depopulation. Its biggest asset is its history as a trading post.

Carcerary
Island Typology

- Primary school
- Services
- Mosque

Carcerary Island

Funtasy Island Development Pte. Ltd. was established in 2010 to pursue the vision of creating the largest eco-park in the world. This vision is manifested in the 300 million SGD development of a cluster of six islands into Funtasy Island. The real estate is at 16 km from Sentosa Cove, and the prices for a bungalow start from 368,000 SGD. The development of tourist enclaves has created a fragmented condition in the Singapore-Indonesia border zone. This type of gated globalism disconnects the islands from the rest of the Riau Archipelago.



1.
Waterfront of the Funtasy Island Resort

2.
Mohammad, a worker with on a two years contract on Funtasy Island

3.
Visualisation of Funtasy Island Resort with Singapore's skyline in the background

1.

2.

Mohammed
"All I do is for my family down in Jakarta. I'm employed on the Funtasy Island Project as a workman for 2 years. After this I'll move to my family."

3.

Sense of Home vs.
Sense of Going Home
The future of this site is an enclosed community of people mainly coming from Singapore with no interest in interacting with the surrounding areas. The result is an interruption, a void cut-out of a dense net of potential interactions.

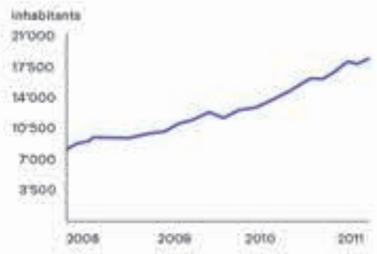
Happy Island Typology

- Services
- Schools
- Mosque

Restaurants:	16
Hotel:	1
Mosques:	4
Primary schools:	3
Secondary school:	2
High schools:	1

Happy Island

The definition of a Happy Island like Belakang Padang, is an island that is experiencing prosperity and growth. Happy Island's are rich in cultural, ethnic and economic diversity and infrastructure. They are regional centres, which serve the surrounding islands and therefore create a tight network.



1.
View on the kampung and Pulau Sambu

2.
Edy Yousuf, restaurant owner in Belakang Padang

3.
Street view of a lively street in Belakang Padang town centre

4.
Traditional food production

2.

Edy Yousuf

"I'm owner of a restaurant in the center of Belakang Padang with a total of 2 employees: my wife and my daughter. We cook all kind of traditional dishes."

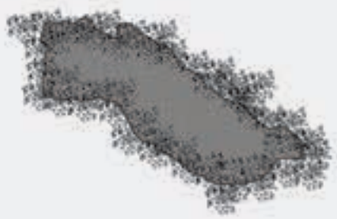
Tourist Hotspot and Traditions

Moving life is what characterizes this Islands. The streets are full of people coming from different places of the archipelago. Many

3.

kids come from kampongs to go to secondary or high school; others come here for work other come from Batam for eating or shopping. "My mum, my friends and I went to Batam during the holidays. However, we sidetracked a little and took a tiny boat or sampan, to Pulau Belakang Padang, the home to our newly met Indonesian friend cum tour guide."

4.



Unnamed Island

Only a short distance from the urban centres of Singapore and Batam, untouched islands appear. Covered in mangroves, these islands and their surrounding waters serve as source of livelihood for fisherman. It is crucial to preserve mangrove and other unnamed and uninhabited islands from development.

1.

1.
Mangrove coastline at low tide

2.
View from Pulau Durian

3.
Boat journey in the mangrove forest in the Johor Strait

2.

3.

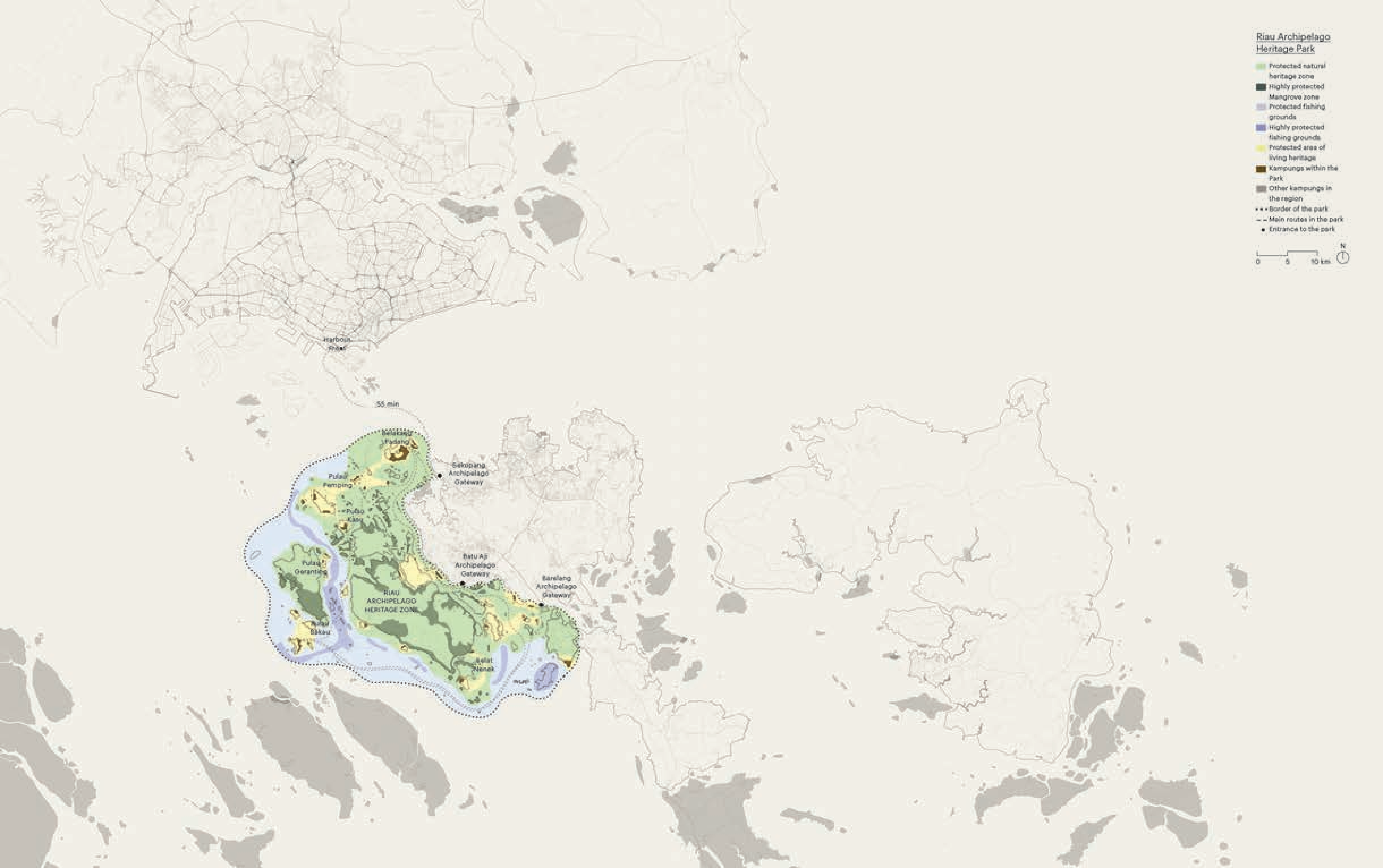
Archipelago's quiet Edge

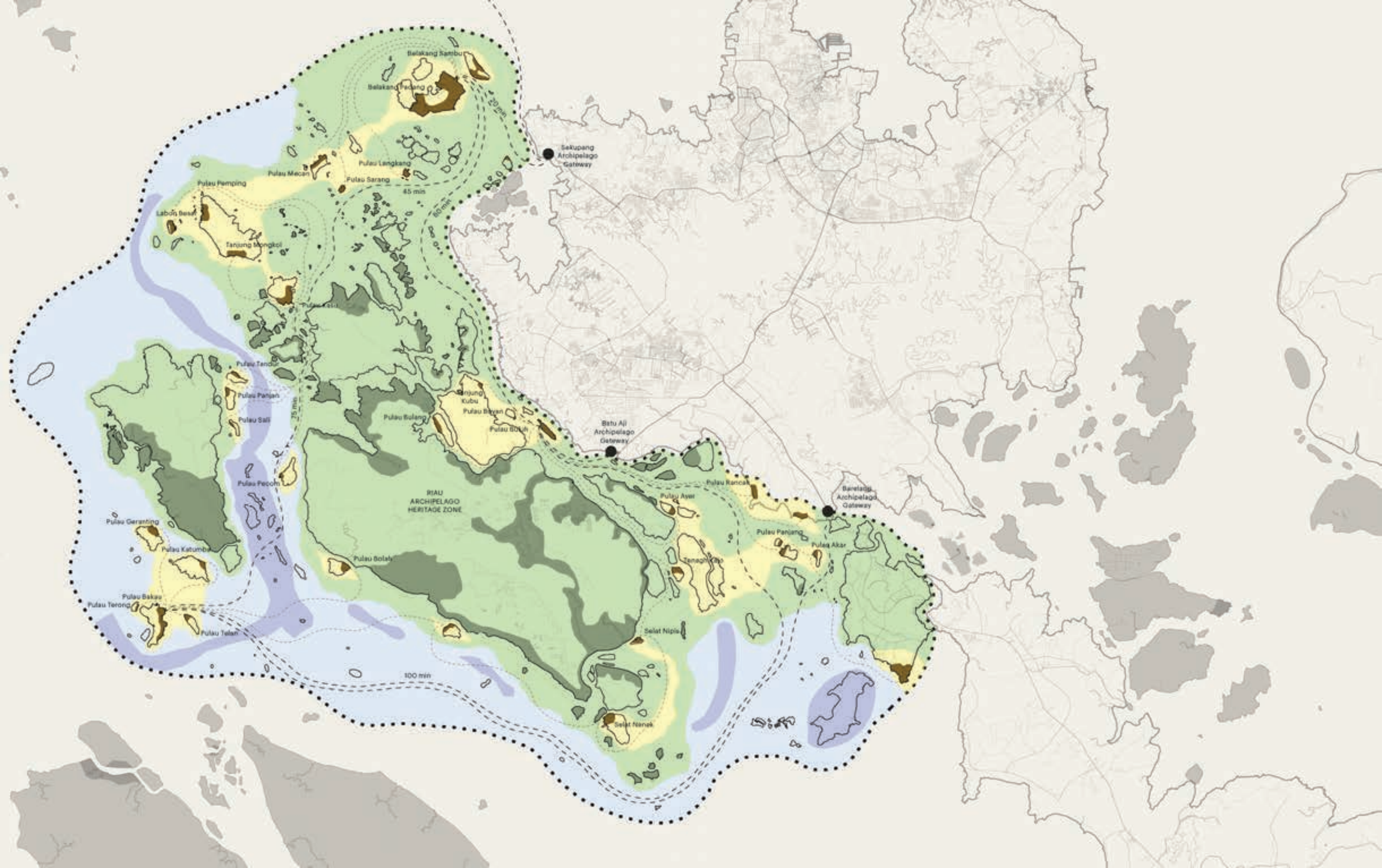
Fishing and agriculture are still important in the quiet parts of the Riau Archipelago, and could be valuable for the city in the future. Any development here should be most carefully considered.


Interactions in the Archipelago
Schools
Services
Mosque
Belakang Padang
"Happy Island"
Pulau Sambu
"Forgotten Destination"
Boat to Batam
Unnamed Island
Pulau Mecan
"Everyday Island"
Pulau Cukus Sarang
"Everyday Island"
Pulau Langkang Kecil
"Everyday Island"
Funtasy Island
"Carcerary Island"

Riau Archipelago Heritage Park

The idea of the project is to acknowledge and promote the potential created by high density of living heritage in the Riau Archipelago, and, by doing so, create opportunities for its revitalization. Increasing the intensity of linkages between the islands of the area would be the basis for forming a single, large island constellation named "Riau Archipelago Heritage Park". The park would function as an archipelago within an archipelago. With a size equal to that of Singapore and as a destination for tourism which seeks to encourage and preserve the natural environment and local traditions. The proximity and good connections to Singapore and Batam make it a potentially attractive destination for socially responsible tourism, personal growth, and environmental sustainability.


Riau Archipelago Heritage Park
Protected natural heritage zone
Highly protected Mangrove zone
Protected fishing grounds
Highly protected fishing grounds
Protected area of living heritage
Kampungs within the Park
Other kampungs in the region
Border of the park
Main routes in the park
Entrance to the park
0
5
10 km
N
55 min
Pulau Pemping
Sekupang Archipelago Gateway
Batu Aji Archipelago Gateway
Barelang Archipelago Gateway
Pulau Geranting
RIAU ARCHIPELAGO HERITAGE ZONE
Pulau Bakau
Belat Nenek


Belakang Sambu
Belakang Padang
20 min
Sekupang Archipelago Gateway
Pulau Langkang
Pulau Mecan
Pulau Sarang
Pulau Pemping
65 min
80 min
Labon Besar
Tanjung Mongkol
Pulau Tanda
Pulau Panjan
Pulau Sali
25 min
Pulau Bulang
Tanjung Kubu
Pulau Buran
Pulau Bolah
Batu Aji Archipelago Gateway
Pulau Rancak
Pulau Ayer
Baneladu Archipelago Gateway
Pulau Panjang
Pulau Akar
Pulau Pecom
RIAU ARCHIPELAGO HERITAGE ZONE
Pulau Geranting
Pulau Katumba
Pulau Bolah
Pulau Bakau
Pulau Terong
Pulau Telan
Selat Nipis
100 min
Selat Nanek

Natural Cultural Heritage Park

The park should be the result of the three most powerful potentials of the region: traditional production, cultural heritage and nature within the archipelago. These potentials should be developed and promoted as attractors, giving a stronger identity to the unique heritage of the archipelago. The zone should be put under protection to incentivize only less-invasive eco-tourism, which does not pose a threat for micro-environmental relations. There is a need to prevent the park from "Singaporization" and the establishment of enclaves and carcerary islands in the Riau Archipelago Heritage Park.

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View from Batam of the Strait with Singapore in the background

Architecture of Territory
ETH Zurich
FCL Future Cities Laboratory

Sea Region
Singapore, Indonesia, Malaysia
Project 2

Asst. Prof. Milica Topalovic
Hans Hortig
Stefanie Krautzig

SEA URBANISM

Towards a Public Sea Space

by
Panos Coucopoulos
Alessio De Gottardi

Ships, fairways and anchorages

Boundaries of many forms and functions – territorial, geographical, mental – circumscribe the identity of a territory that remains in limbo: the Singapore Strait. Gaps in social, economical, demographic, and cultural characteristics constitute the complex and hard-to-define boundaries in the trinational region. These intangible gaps are echoed in the architectures of formal territorial demarcations along the Singapore Strait and the region's coastal areas. At the same time, shared interests in investment opportunities, flows of goods, necessity of resources, and in sovereign identities, anchor the three sides together in a cross-border geopolitical form – a 'triangle' - of questionable stability and balance.

The project Sea Urbanism tackles the problem of redefining the identity of the Singapore Strait. Instead of the Strait seen as the industrialized borderzone territory, and a geographical and mental margin, the project asks how could the sea of the Strait become a public space? Who could benefit and in what ways from being out on the sea? The value of living at and being close to the water has inspired the proposal for a new zone of maritime public uses within the Singapore Strait, which opens up in-between the existing shipping lanes and the security systems. Specific areas have been selected for different functions, to enable exchange within this new zone among the seafarers, locals and tourists, supported by an extended network of public sea transport. The reinvention of the public sea space, which breaks existing barriers and bridges gaps, invites a reflection on the rigid planning and political approaches to the cross-border relationships within the metropolis, and speaks of an opportunity and a necessity of envisioning the Singapore Strait as the space of common future among the three countries.

Grammar of (Dis-) Engagement

Unlocking the potential of a territory implies understanding and grasping the relation of given territory to its surroundings, as well as to its inhabitants. In our study of the Singapore Strait as an urban territory, the first step was to comprehend how the local populations relate to their territory. Given the geographical proximity to the sea, we initially considered the relationships to the sea to be representative of land-maritime interactions, only to be surprised by our later findings.

View of Telok Blangah Road in Singapore where the former coastline was situated before the land reclamation process.

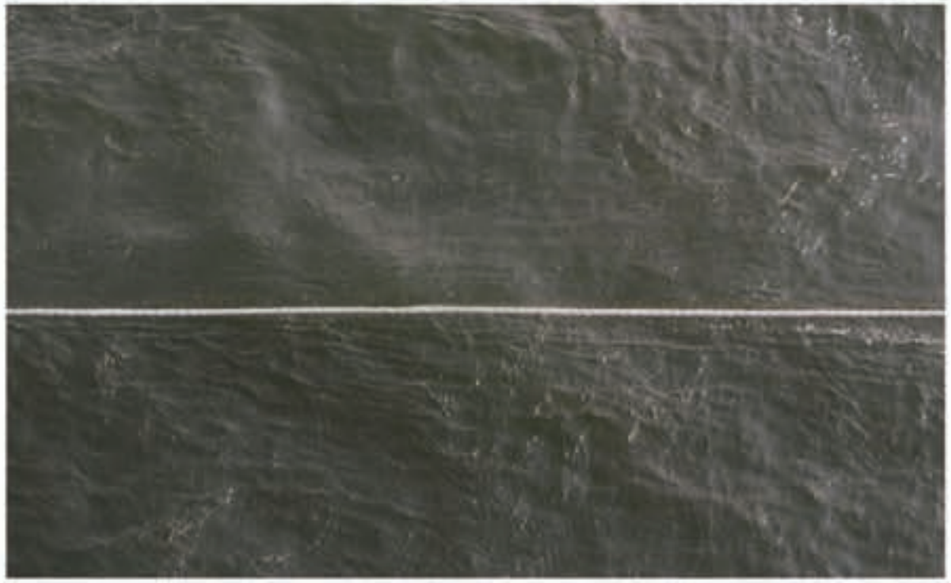
Shifting Perceptions

Lying one degree north of the equator and a small strait south of Johor Bahru is the lozenge-shaped island of Singapore. It is considered both the southern-most city of the Malay Peninsula and the northernmost island in Indonesia's Riau Archipelago.

A common sea unites the three territories into one bigger territorial entity; however, the same sea also divides them.

Inaccessible Seafront

Despite its island geography, Singapore has a noticeable disconnection from the sea. One of our first urges when confronted with this topic was to qualitatively and quantitatively calculate the time and distance necessary to reach the shoreline from our base at CREATE on the NUS Campus. After reaching the coast, another 70 minutes and 5.5km of walking was necessary to reach the sea.



Drift (Rope Sketch), Charles Lim, Sea State, 10 min video, 2012

Fear and Distance

As eloquently presented in the works of Charles Lim, Singapore's relation to the sea is one of a voluntary nullification and deprecation.

A 2011 advertisement of the Singapore Navy reads: 'We all take the sea for granted. But that wouldn't be possible without the advanced naval technology that is deployed around our shores. Take the multifunctional radar that is installed on our frigates. Conventional radar can only help with surveillance. Multifunction radar also controls the Aster anti-missile system and helps target aircraft and low-flying missiles. In combat, when every second counts, it makes all the difference. But what's the best thing about this radar? It makes sure you don't even have to think about the sea. Ever.'

Hanis, 26, female, Singapore

'I learned to swim 3 years ago, but most of my friends don't swim as well.

I go to East Coast Park for the cafeterias and to Sentosa on Sundays for the beach, but I don't swim. Why would I bring you to a beach if there's no food or café there?'

As David Teh comments in regards to the above text: 'The sea is a horizon of unspecified threats, a domain of unquiet souls. And the promise of the state is not its conquest, but its negation. (You don't even have to think about the sea. Ever.) The repressed idea of the sea, if not its image, belongs to the prophylactic complex that guards a matrix of drip-fed, suburban xenophobia.'

Singapore is out rightly dependent on ships and the sea, yet their presence has been cast away from the city and hidden behind the gated container parks of the logistics zones.

In our own personal experience, a 45-minute walk along the streets parallel to the coastline in the Clementi area yielded no access to the seacoast.

Artificial beach,
Johor Bahru (Malaysia),
2014

Prestige

In the case of Johor Bahru, Malaysia, the relation to the sea is a platonic one.

'The beach has a special expensive type of sand that comes from Sabah (region in Malaysia). It is not allowed to swim here', were the words of an employee at Danga Bay Development in Johor Bahru, during the presentation of the project.

Here the connection with the sea 'has been reduced to leisure, to the ownership of views, the phantasmatic enjoyment of 'lifestyle'', as anthropologist Michael Taussig describes it.

High levels of pollution coupled with the stark political context of the destructive presence of the Causeway have marked the collective perception of the sea. Yet, recently imported investments are revamping that perception and transforming it into a well sought out commodity.

Komag, 25, male, student at UTM
'We are not capable of swimming. Maybe only 20%, or less, of Malays swim. It depends on the family; if the father can swim, he will teach his children.'

1.

1.
Kampung in Batam

2.
Kampung in Bintan

3.
Stranded garbage at a kampung in Bintan

Our Yard, the Sea

The presence of the sea in the Riau Archipelago is regulated by more practical relationships. The sea acts as the intermediary between fishing, transport, commerce, and housing.

Appropriated and utilized in the daily life of the locals, the sea is indispensable to the organization of these communities but evinces no romanticized social values. It strongly affirms the concept of a means to an end thus deliberating it from any collective prohibition in regards to its use (view photo 3). Therefore, a sort of inertia governs the relation of the population towards this commodity.

Bayu, 27, male, Bintan
'I don't swim. In my family only my aunt can swim.'

2.

3.

The Sea as Another Urban Territory

Seaport cities like Singapore have witnessed drastic evolution and transformations in their waterfront redevelopment.
Over time, the port functions and infrastructures changed dramatically, and with them the place of the port in the urban fabric of the city.
The port's human element has been reduced by technological advancements and automation in maritime and trade logistics. Its interaction with the city has been reduced by expanding infrastructure, such that the city has gradually retreated from the active waterfront.

Map showing the density of vessels on the Singapore Strait from 14.10.2014 - 09.11.2014

Sea
Users

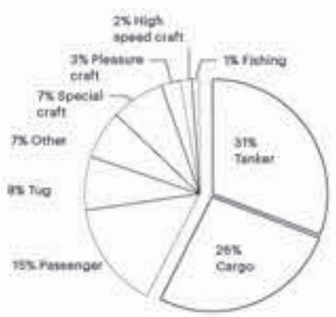
Our search to understand the urbanized territory of the Strait began by trying to discern and quantify the various users. This helped us understand the main functions that take place within the Strait and ultimately realize the strong polarization of uses comprising this heavily rationalized and trafficked territory.

Time Spent in Port

According to the ICC International Maritime Bureau, each type of vessel requires different loading and unloading times. Because bulk cargo is so difficult to discharge, bulkers spend more time in port than other ships. A study of mini-bulkers found that it takes, on average, twice as much time to unload a ship as it does to load it.

Intense Port Movement

A third of the world's shipping moves through the Strait of Malacca and Singapore Strait each year, including most trade between Europe and China, and nearly all the crude oil that moves from the Persian Gulf to the big Asian economies like China, Japan and South Korea. There are about 1,000 vessels in port at any one time, with a new vessel arriving every 2-3 minutes. About 130,000 vessels arrive in Singapore each year alone, according to both Singaporean and international estimates. That breaks down to about four ships entering the Strait every minute.



A Polarized Clientele

'Logistics is the management of the flow of goods between the point of origin and the point of consumption in order to meet some requirements, of customers or corporations.'

More than 70% of all vessels crossing through or across the Strait are related to the transport of goods and commodities. The Strait provides the deep water passage to the Port of Singapore, one of the five busiest ports worldwide.

Goods are exchanged both on land and on water, either while stationary or underway, through an operation called ship-to-ship transfer.

Piracy on Cargo Vessels

There were 125 pirate attacks reported in the region in 2013, triple the number from 2009. (Over the same period, attacks off the Horn of Africa shrank from 197 to 13.) Half of the world's attacks now take place in the waters off Indonesia, Singapore and Malaysia. Pirates of southern Asia are mainly in the business of stealing cargos of liquid fuel.


PT16

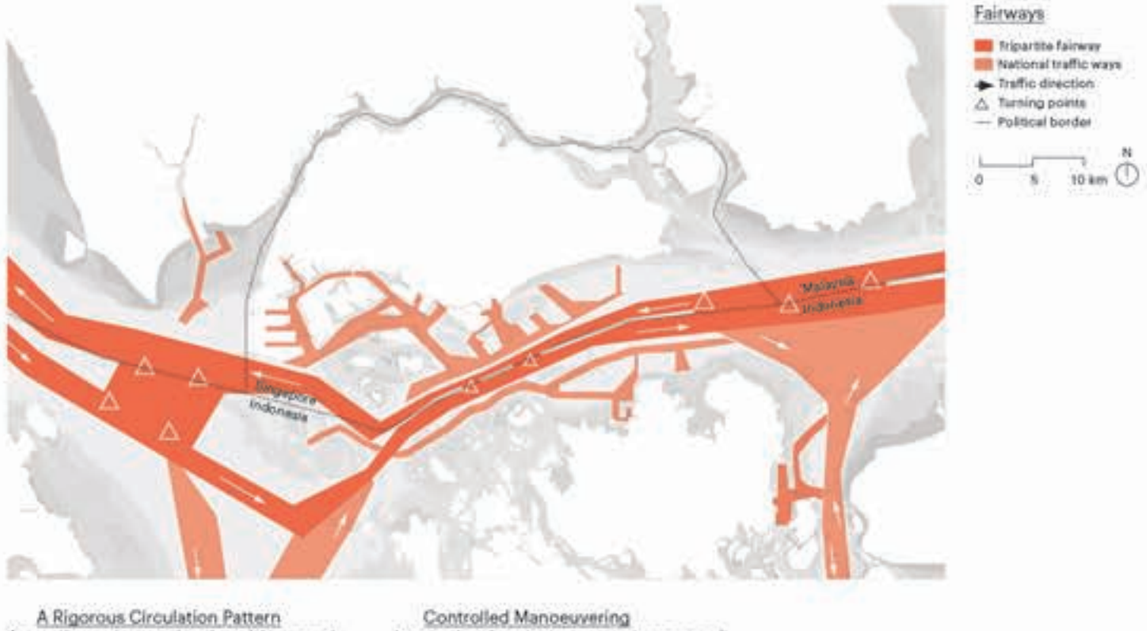
Revealing the Seaway Code

International and national laws and legislations that precisely regulate the movement of vessels within the different jurisdictions govern the heavily trafficked Straits. Similar to land-based transport networks, sea transport is comprised of traffic corridors, primary and secondary traffic lanes, anchoring zones and defined maneuver zones.

Vessels have the liberty to cross international waters without requesting permission but by only reporting to the respective authority; to cross national waters, however, permission is mandatory.

This highly planned and monitored territory supports political borders and boundaries that interact with the presence of the sea fairways and define the relationship between the neighboring countries.

Seaway traffic in the Strait



A Rigorous Circulation Pattern

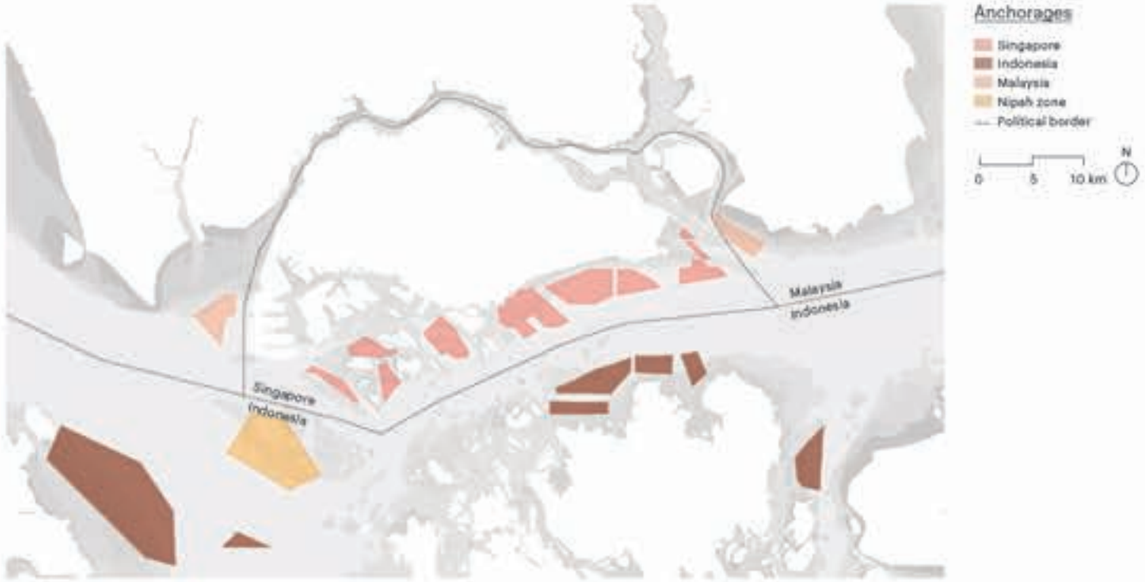
According to international maritime regulations, bigger vessels are obliged to give the right-of-way to smaller ones when in contact. Sea fairways in the Strait are clearly divided into two mono-directional lanes that facilitate the organization and flow of crossing vessels.

Vessels with overall internal volume of 300 GT and above or with a length of 50m and above are obliged to follow the defined fairways.

Controlled Manoeuvering

International zones are no anchorage and no fishing zones. The control of these zones falls into the hands of the marine authority, the coast guard, maritime enforcement agency, marine police and the department of fishery of each respective country.

The danger triangle zones, the so-called 'Yellow Boxes', function like imaginary traffic light intersections. They are principally turning points. These intersections are controlled and supervised by the respective national authorities to which the national waters belong. While in the Yellow Box, the vessel is permanently in contact with the authorities on mainland, which help steer it through.



Transient Parking Zones

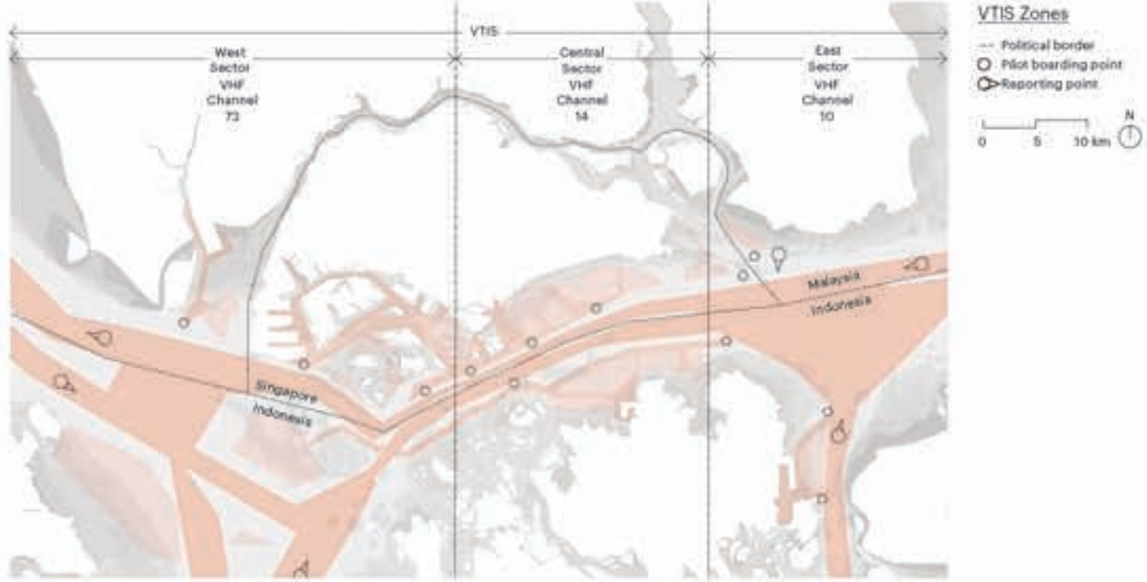
Anchoring for vessels, much like car parks, is paid by the minute. The anchoring timer starts the moment the anchor is dropped until it is lifted from the sea bottom. The fare is calculated by multiplying the vessel's unladen weight with the cost per ton. Minimum calculated weight is 20 tons. Fares are based on international agreements; therefore do not vary between the different countries. Vessels book their anchoring before arriving through an independent marine agent. The purpose of anchoring must be reported to the authorities beforehand. Three are the main reasons for which vessels anchor outside the port: (i) the port is full, (ii) the ship is broken or (iii) it is waiting to enter the docks. Therefore, anchoring zones are basically transient waiting zones.

Nipah Transient Anchorage Area NTAA

This free-of-charge anchorage area is conveniently located in international waters very near the Singapore waters. With a seabed that suits ship-to-ship operations, lay-ups and other marine activities, it is an established choice for vessel operators.

A Competitive Market

Bunkering and supply costs vary greatly between the three countries surrounding the Strait. It is not uncommon practice today for vessels to load their cargo in Singapore and then move to Indonesian waters in order to cover their supply or bunkering needs at a much lower cost. The infrastructure of these cheaper alternatives is not as competitive or well organized as Singapore.



A Safe Passage

The Malacca and Singapore Straits are divided into Vessel Traffic Information System (VTIS) Sectors, three of which are in Singaporean territory. A mandatory ship-reporting system, known as STRAITREP, was developed in 1998 between Indonesia, Malaysia, and Singapore as a tripartite agreement for safer passage through the Straits. The system was developed to promote safety of navigation, to protect the marine environment and to facilitate the movement of vessels within the Straits.

Vessels with overall internal volume of 300 gross tonnage and above or with a length of 50m and above are required to announce their arrival a minimum of twelve hours before arrival and once approaching a Sector. Vessels carrying hazardous or noxious cargo on board are required to notify the local authorities 24 hours prior to their arrival. All passenger vessels with a VHF are also obliged to report their arrival.

Vessels must communicate their speed, size, direction, defects or other potential threats, number of people on board and the presence of hazardous cargo before entering the traffic corridor.

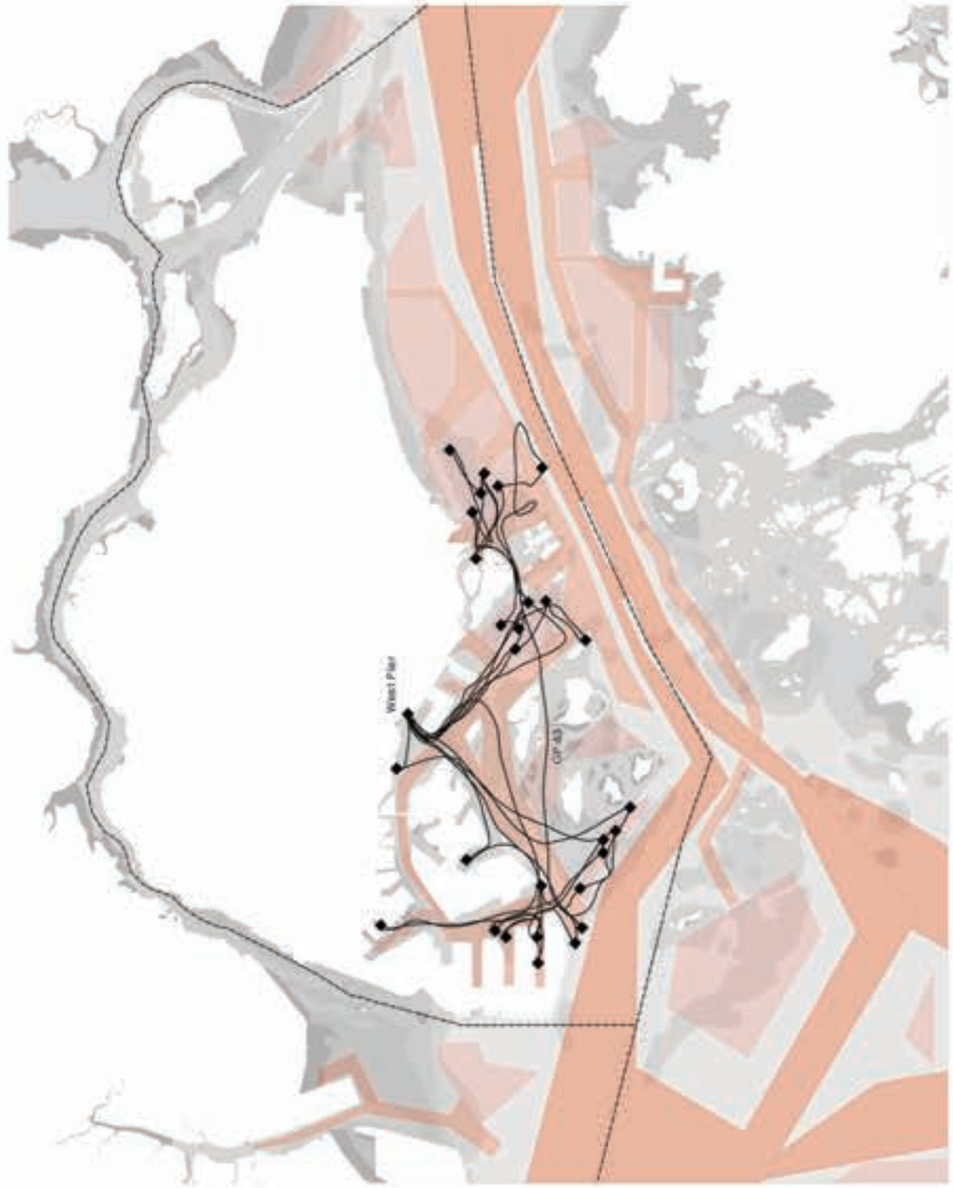
Steering in the Yellow Boxes is also accomplished with the use of the VTIS system. It is further used at the Pilot Boarding Points, where pilots employed by the local authority are boarded on the vessel entering the port to help steer it to the pier. This is a common practice at many ports that ensures the safe docking of the ship, as local pilots are familiar with the seabed, coordinate easier with the local MPA and can safely execute all necessary manoeuvers.

Sea Traffic

Sea traffic is regulated by a combination of laws similar to land-based traffic laws and informal, user-made rules. Compliance to this combined rule systems and a set of strict time grids guide the complex traffic through the Strait.

From Malaccamax supertankers ploughing miles after miles of endless blue from port to port to the smaller more agile Indonesian panchungs buzzing around them, the variety of users and purposes is endless. Our study focused on three case studies in order to get an overall picture of how these actors form the territory.

A bulk carrier vessel crossing the Strait



Connecting Land to Anchorages

The map traces the activity of a passenger vessel, based in West Pier Singapore, on October 27, 2014. It is used for pilot boarding and to bring crew members back and forth from the anchored ships to immigration control.. This vessel type is not permitted to cross national borders.

Crew Supply Vessel

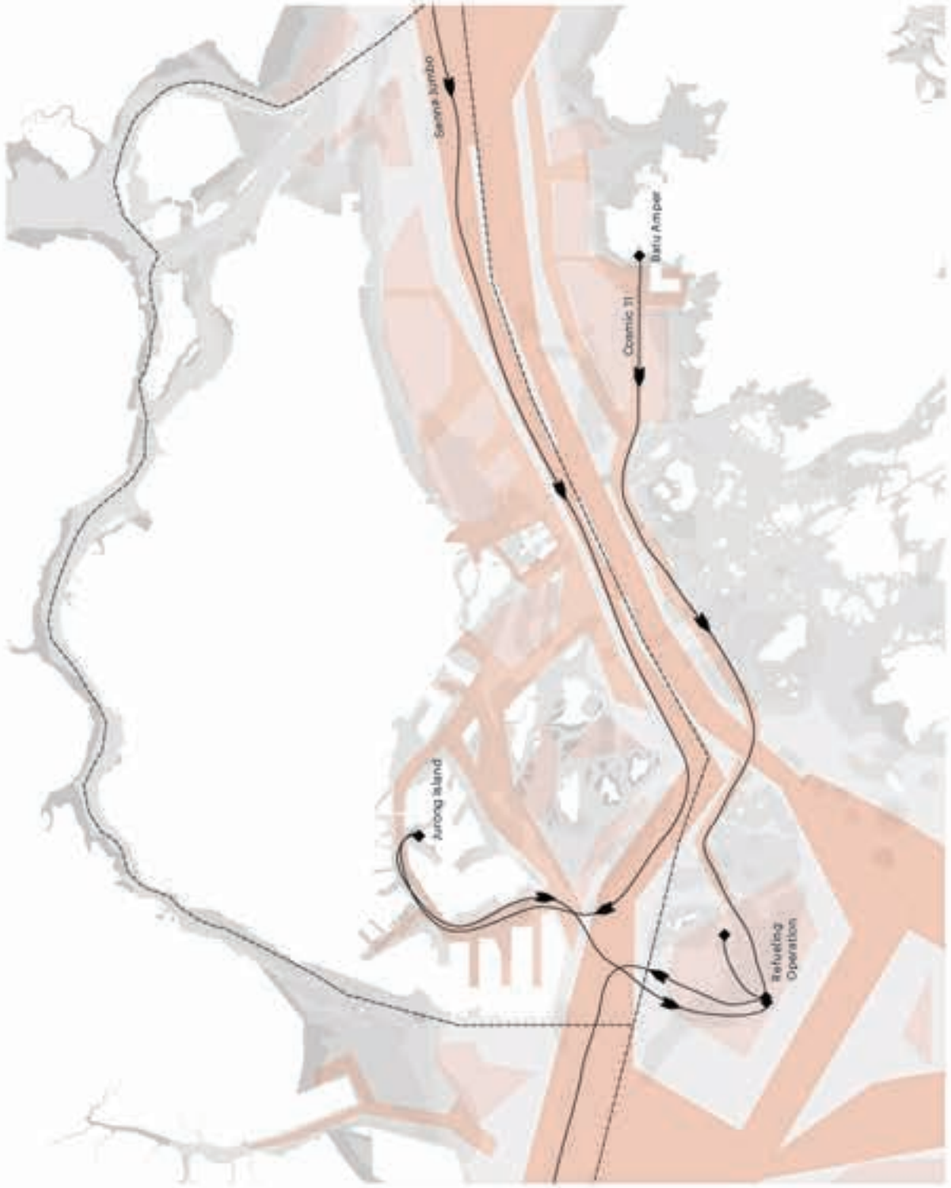
Name:	GP 43
Ship Type:	Passenger
Flag:	Singapore
Dimension:	15 m x 4 m
Draught:	1.4 m

Crossing Through

In this case, a vehicle carrier arriving from Korea required two days to cross the Strait. After waiting at the anchorage zone for about 8 hours until a berth was made available, the vessel moored at Pasir Panjang terminal where it loaded and unloaded cargo before continuing its voyage towards India.

Vehicle Carrier Vessel

Name:	VIOLET ACE
Ship Type:	Cargo
Flag:	Bahamas
Dimension:	189.3 m x 32.3 m
Draught:	8.8 m



Each Location a Distinct Purpose

This LPG tanker from China, after loading/unloading its cargo at Jurong, left the Singapore national waters and crossed to Indonesian waters, where it was refueled by a local fuel supply vessel in the free NTAA Nipah zone. Vessels, due to bunkering supplies being more economic in Indonesia, often repeat this.

Fuel Supply Vessel / LPG Tanker Vessel

Name:	COSMIC 11 / SENNA JUMBO
Ship Type:	Tanker / Tanker
Flag:	Indonesia / 3.6 m / 6.6 m Thailand
Dimension:	69.95 m x 10.7 m / 224 m x 36 m
Draught:	3.6 m / 6.6 m

A Cargo-Focused Transport Landscape

The word 'traffic' comes from an Old Italian word meaning, 'trade'. Centuries later, the busy Strait is a vibrant testimony to the continuity of language. The signs of a territory developed around the transport of goods dominate the sea: available infrastructure, the density of freight-related vessels crossing the Strait, and the revenue generated from shipping. On another note, transport of people by sea is comparatively minor and constrained to a much smaller scale and common interest. This is directly related to questions of political and sovereign context as well as the orchestrated effort of the previous decades to cultivate a sovereign identity for Singapore. International agreements further promote the ease of exchange of goods to the disadvantage of exchange of people.

Loading and unloading of container vessels at the Tanjung Pelepas port

Scars and Connectors

Today, the coast of Singapore is lined with berths designated for the mooring of cargo vessels and other freight transport vessels. Development plans from the building authorities of Malaysia and the Riau Islands Province indicate similar trade-oriented strategies.

Passenger ferry terminals, however, remain few in number and significantly outdated in infrastructure when compared to the investments and renewing policy of cargo terminals.

Cargo Landing Points

— Political border
— Berth

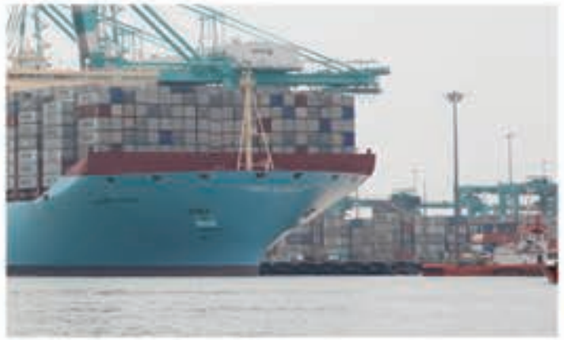
0 5 10 km N

Passenger Landing Points (Ferry Terminals)

— Political border
— Ferry paths
● Ferry terminals

0 5 10 km N

Vessels in the Singapore Strait

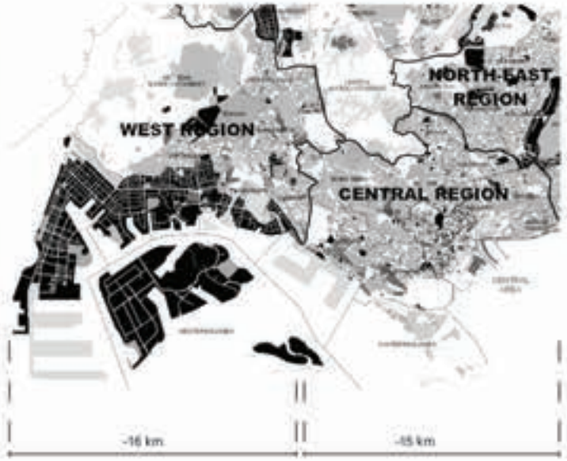


Vessels and marine infrastructure in the Singapore Strait

The Port (and the) City

The invention of the standardized cargo container in the mid-1950s radically transformed the space and time of port cities. What was once a vibrant, multilingual environment of seafarers, fishermen, dockers, sailor bars, flophouses and brothels is now substituted by vast anonymous tracts of land necessary for the storage and storing of the containers.

As automatization and maximal efficiency penetrated the very core of maritime trading the old waterfront culture was rendered obsolete and faded gradually. This change had a great impact on the relation to the city. Time witnessed the port city evolve into two strongly independent entities: the port and the city.



Tanjong Pagar Terminal

From a trading post for the British East India Company close to two centuries ago, the port of Singapore has evolved to handling over 60,000 containers per day. In 2027, the lease on the city terminals expires. The port that played a vast role in transforming Singapore to the successful island nation it is today, will move westwards to Tuas. This will free waterfront land close to the city to be developed.

This move and further dissociation from the city manifests a global trend of ports becoming evermore autonomous. As the port ceases to be a centrality in the city, the city pushes away from it. Moreover, as ships transform into super-ships, the port necessitates more space and infrastructure, obtaining dimensions comparable to the size of the city.

These changes yield political decisions which translate into territorial manifestations and are reflected in the planning process of the Urban Redevelopment Authority in the Master Plan 2014: the once integrated port is now a mono-functional zone in the outskirts of the city.

Above left:
Map of Singapore, 1914

Above right:
Master Plan 2014, URA

Below left:
Until 1960, Tanjong Pagar Terminal

Below right:
After 1960, Tanjong Pagar Terminal re-developed

1920

260'000 tons
Cargo storage capacity

5'764
Port calls

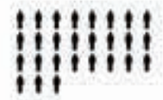
11'000
Employees

1955

17'000'000 tons
Cargo storage capacity

8'030
Port calls

6'300
Employees



2014

47'140'000 tons
Cargo storage capacity

130'000
Port calls

5'650
Employees

More Goods, Less People

The Port of Singapore, one of the five busiest ports in the world, is a major transshipment hub, the world's biggest bunkering hub, and ranks in the top five positions in terms of containerized traffic handled. Yet, albeit an increase of 1800% in terms of expansion in the last century, the amount of workforce has decreased by 50%.

This depletion of workers, a direct result of automation and technological advancement, reflects the shifting relation of the port to the city. The relationship between the port and the city is evermore diminished.

1955

2014

2030

Ports

Cargo terminals
Industrial ports

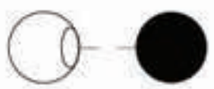
Expansion of port infrastructure sites and facilities through the years

Primitive port/city
Until 1800s

Expanding port/city
1800 - 1900s

Modern industrial port/city
1900 - 1950s

Retreat from the waterfront
1950s - 1980s



Redevelopment of the waterfront
1970s - 1990s

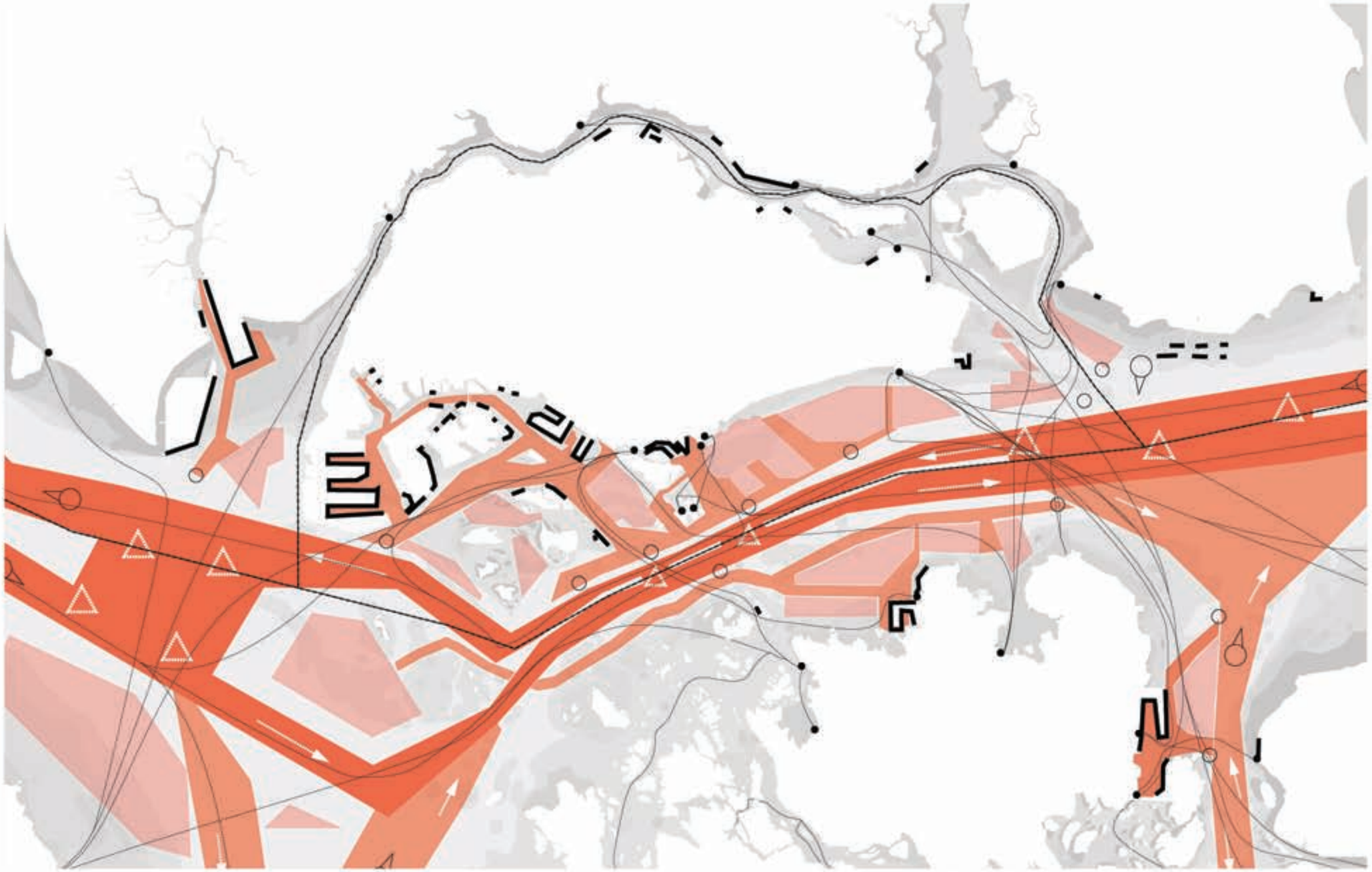
A Receding Port/City Relation

As a result of evolution and changes in maritime trade handling functions, land-maritime interrelationships have shaped the port-city interface and directly impacted the waterfront development of cities. The early featured close spatial and functional association with the city. In their efforts to accommodate oil-refining and container terminals, large-scale contemporary ports have increased capacity, at the expense of urbanity.

Sprawling Ports

Through an extensive land reclamation process, the city of Singapore has and is continuously expanding its port infrastructure towards the sea. Once directly connected to the bustling city centre, Keppel Harbour has been abandoned in favour of areas more remote and secluded from the flows and activities of the city.

Economic benefits and fiscal projections are primary concerns in the future development planning strategies of Singapore's neighbors. Both Malaysia and Indonesia are constructing and expanding existing port facilities around the Strait. As a major international passage for maritime handling, this 16-kilometer wide strait attracts the interest of global maritime investments.



An Urbanized Vocabulary

At first glance, studying a sea territory seems to require a different approach than the study of land-based territories. Our investigation revealed that the vocabulary to describe the Strait is similar to those familiar to land-based conditions.

Sea Transport

- Fairway
- Trafficway
- Anchorage
- Traffic direction
- Political border
- Berth
- Reporting point
- Ferry paths
- Ferry terminals
- Pilot boarding point

0 2.5 5 km N

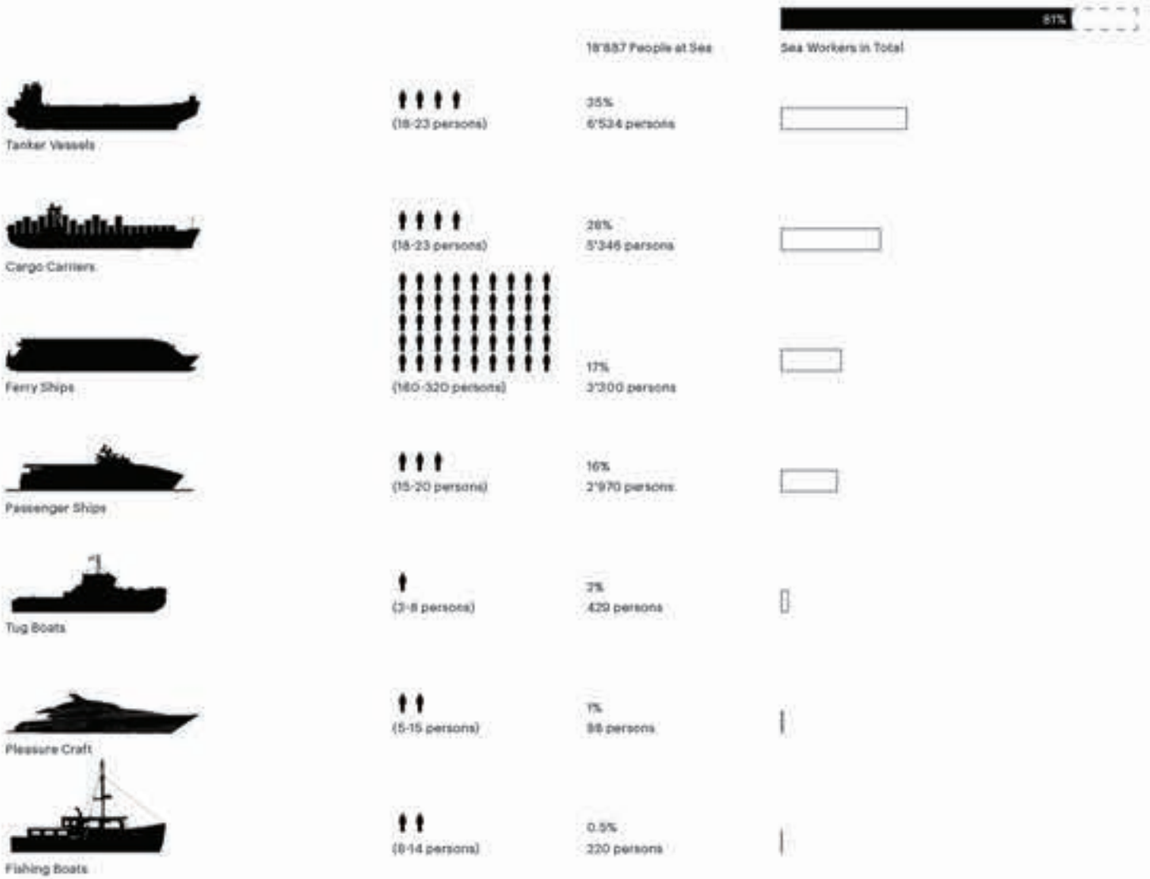
Men and the Sea

Foreign visitors, migrants, seamen, stevedores, dockworkers, longshoremen: all vivid, multicultural individuals that transformed the image of ports into a condensed small piece of the world. The port city was a condensed urban manifestation of globalized connections. Today, as relationships between ports and cities are steadily fading, and machines replace dockworkers, what is left of this thalassic world? Which populations still interact with this saltwater world and what remains of their connection to the city?

Map showing the presence of vessels in the Strait on 30.10.2014

People in Motion

After an analysis of the vessel traffic within the Strait, the next step was to understand the principal populations that move around this territory. These transient populations temporarily occupy the space before moving onto their next destination. This dynamic workforce circulates on different frequency patterns.

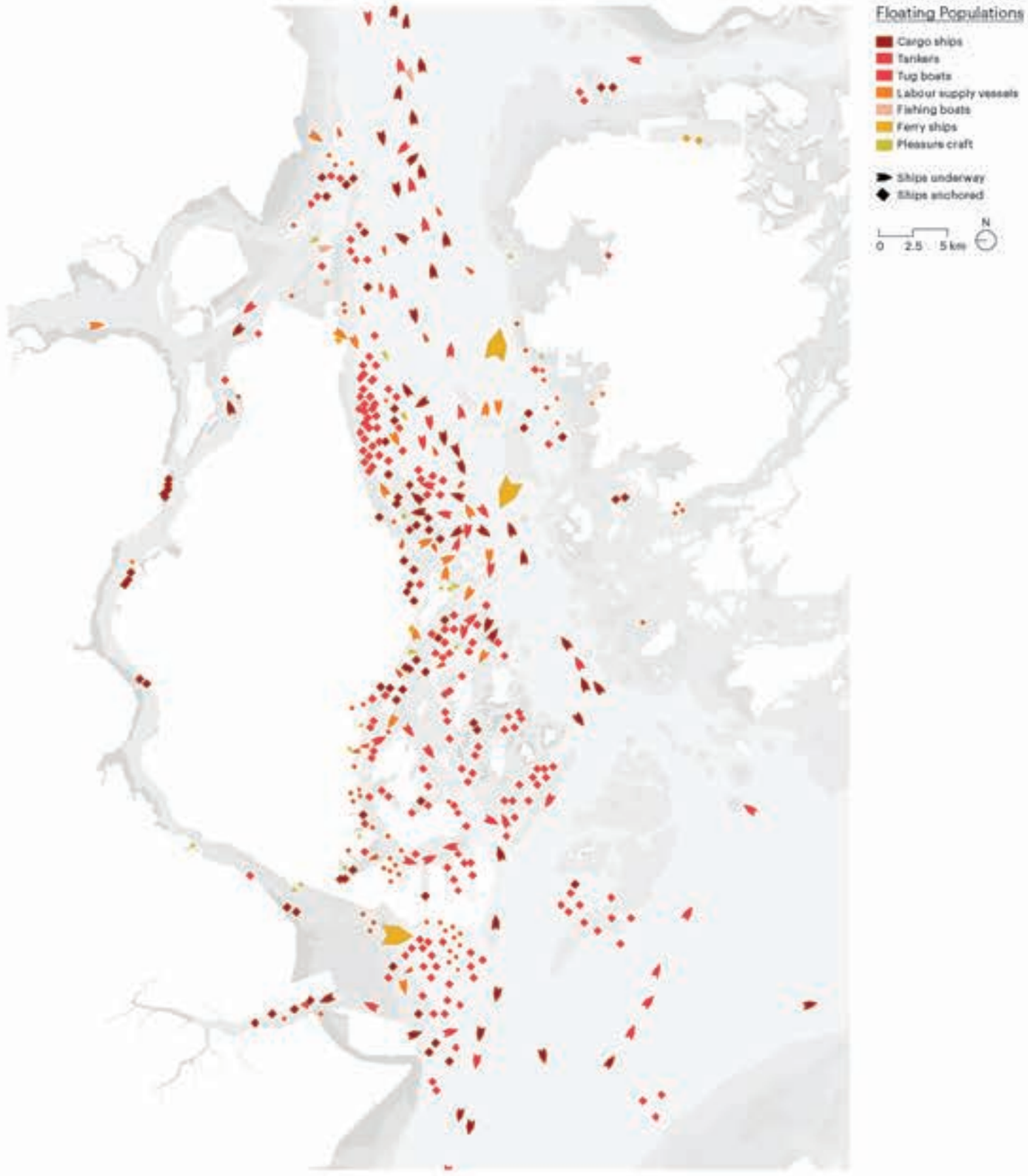


Shifting Populations

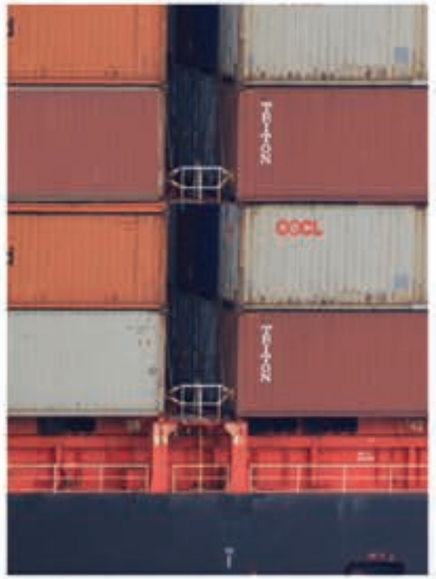
They are passengers aboard vessels crossing through or temporarily anchored within the limits of the Strait, from seafarers, to ferry passengers, cruise ship passengers, to workers providing land-to-sea services.

What distinguishes these groups is the brevity of occupancy. This bulk of population is always present but is in a continuous flow, shifting by the minute with the entry and exit of each ship.

Those aboard tanker vessels and cargo carriers make up 63% of this sea-based population. The large size of their ships, compared to the small number of crew, means that live in extremely low-density conditions. Passenger ships with higher densities are fewer in number and have lower circulation frequencies through the Strait.



Fishermen in the Strait, Singapore



Pilot boarding near the Port of Singapore, Singapore

Workers at Sea

Two basic groups comprise the biggest portion of workers at sea: local sailors and deep-sea mariners. The first are contracted employees who sail out for a couple of weeks at a time from a given port. The latter are hired for one or more voyages that extend for several months at a time.

Living on the margins of society, professional mariners are the transient population par excellence. They travel from port to port without ever resting at one port for any more than a few days, which is the time necessary for their vessel to be loaded/unloaded or repaired. With the quick turnaround of modern ships, spending only a matter of hours in port, a seafarer's free time ashore is drastically limited. Once ashore, seafarers seek the pleasures they are deprived of on board.

Ebadach, 23, Mechanic, India
4 Hours in Singapore
'I rest just 4 hours in the transit room, while waiting for the plane. I don't want to visit Singapore. It's too much chaos for me.'

Rahii, 32, Engine Officer, Indonesia
1 Night in Singapore
'The container ship is unloading right now. I have one night to spend here: I will meet some friends and have fun.'

Shipping: Crew vs Revenue

Passengers :	2 Million per year (20 crew members/vessel)
Port Calls :	130'000 per year
Revenue for Singapore :	20 Billion SGD per year (7% of GDP)
Revenue per Ship :	153'846 SGD

Yoga, 48, Captain, Malaysia
4 Days in Singapore
'I took a room here at the Singapore Marine Club. My ship has to be repaired because of a problem of the navigation equipment. So I asked my wife to fly in from Malaysia for 4 days. We will visit the city.'

Transient Population
'She tortures me but I couldn't live without her', were the words of an Indonesian deep-sea mariner when referring to his 'home', the sea. Seafarers have a particular relation to both the sea and the land. They could live for months at a time in either one, based on job availability and the request of the market, but their stay is always temporary. Their relation to the city is of the same quality. When they arrive in port, they only have a few hours to spend in the respective city. They tend to strategize their time according to need: shopping for supplies, resting, and socializing. Sightseeing and tourism are secondary.

1.

2.

3.

4.

1.
Arriving at the Pier

2.
Waiting zone and immigration

3.
Seafarer waiting to be transported to the city

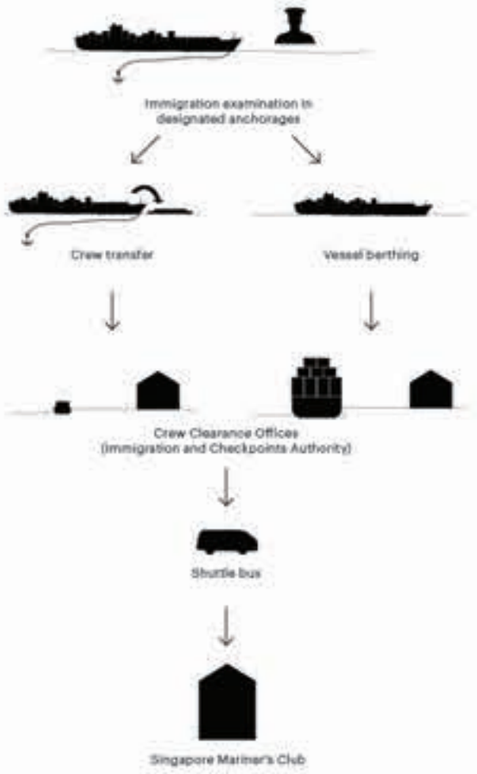
4.
Seafarers waiting to embark

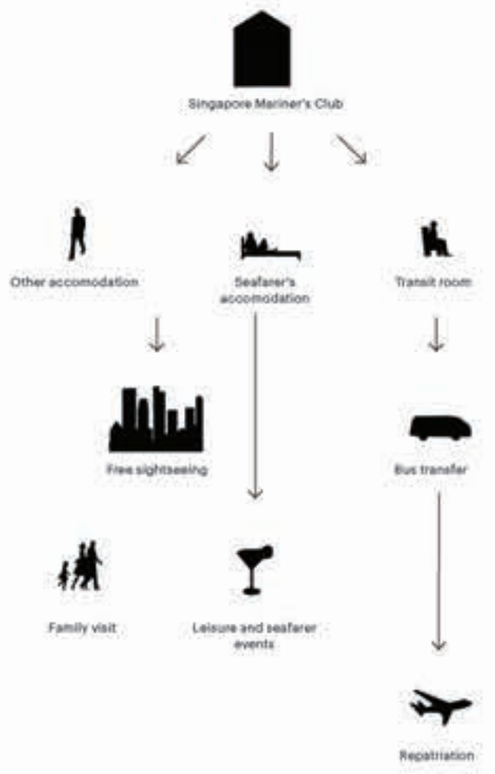
Disconnected from the City
Marina South Pier is a terminal for tourists and day-trippers to the Southern Islands and a principal immigration entry point for seafarers. A series of shipping agencies, including manning and crewing agencies, work out of Marina South Pier and provide their supply services to the ships anchored at the anchorage zones nearby.

Marina South Pier and West Coast Pier are the only two landing points for seafarers that are not situated in a port. Therefore they are the sole gateways to land for seafarers willing to disembark from an anchorage zone. They also issue Landing Passes for seafarers who wish to go on land but are moored in ports without customs clearance.

The Pier functions as a waiting zone for seafarers who have either recently disembarked and are waiting to be transported to the city or seafarers waiting to embark. The Pier is connected to the city by means of two public bus lines, taxi or private transportation. It is situated near the Tanjong Pagar Terminal, but is somewhat dislocated from the city center. Although the Pier is an important immigration point for the city, stretches of undeveloped land separate it from the urban fabric.

Seafarer's Footprint
The above map shows the footprint of a seafarer in the city of Singapore in the form of the official map of Singapore issued by the MPA, Port Authority of Singapore and Singapore Mariner's Club. The map contains only part of the city, centered in Chinatown.





Disembarkation and Immersion in the City

Shore leave for seafarers is a very standardized process within Singapore, but in this post-9/11 environment, security controls and customs clearance have become even more scrutinous. The operation begins before they reach the designated anchoring zone.

Step 1

Once anchored, an immigration officer boards the vessel to control passports and the seamens' discharge books.
As a result, crew members receive either a landing pass or a sign-off pass (only for those who intend to leave the country once ashore).

Step 2

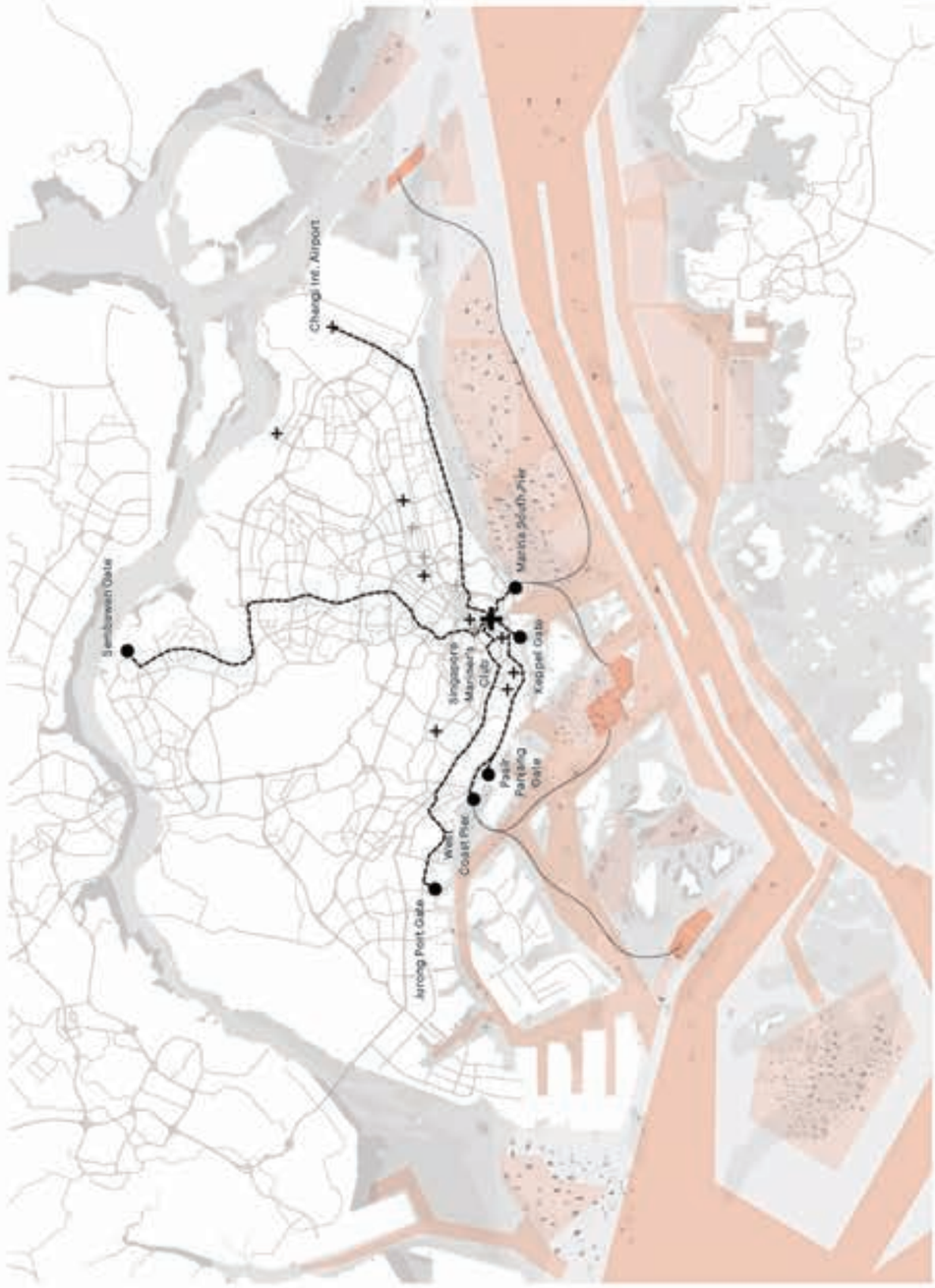
During the loading/unloading of the ship, only 3 officers are required to stay on board to supervise the operation. Therefore, most of the crew usually disembarks.
Seafarers who wish to go ashore necessitate a vessel to transfer them from the anchored ship. This has been or is organised by a marine agency in collaboration with the ship operator.
The passenger vessel brings the seafarers to shore to either Pier, where they are submitted to customs clearance and security checks.

Step 3

After having cleared the immigration process, they are transported to the Singapore Mariner's Club (SMC). The Marina Port Authority, the shipping company or the shipping agent organizes transportation of the seafarers from and to the SMC.

Singapore Mariner's Club

Once at the SMC, seafarers have the choice to either book a room, partake in the free recreational facilities provided by the Club (e.g. free sight seeing, monthly events) or relax in the transit room while waiting to be transferred to Changi International Airport for repatriation.



Tourists at Sea

Passenger cruising services were first introduced in 1844, but became widely popular in the 1960s after large passenger jets rendered ocean liners obsolete. Ocean-going ships became cruise liners, after the luxury 'one-class cruising' concept. No longer used as a practical means of transport, cruise liners were only for pleasure voyages, where the ship's amenities, destinations, and the voyage all became part of the pleasurable experience. Cruise operators have been constantly introducing new amenities on board and augmenting the volume of their ships, transforming them into city-sized floating hotels.

Cruise lines are unique in character for they are partly in the transportation business, and partly in the leisure entertainment business. Cruise ships carry anywhere from 500 to 6,000 passengers and an almost equal amount of crew.

Shipping: Cruise vs. Revenue

Passengers :	1 Million per year
Port calls :	350 per year
Revenue for Singapore :	1,5 Billion SGD per year
Revenue per ship :	4'285'700 SGD

A Fashionable Destination

Southeast Asia, in the last decades, has become a popular destination for tourists and even more so as a cruising destination. From Burma to the 18,000 islands of Indonesia, this region is rich in contrasting cultures. From major port cities like Singapore, Kuala Lumpur, and Bangkok, to tiny fishing villages and ancient temple complexes, the area is abundant in cultural and natural sights to visit. Yet the passenger of a cruise liner will only have the opportunity to have a small glimpse of all this, as every stop is limited to a mere couple of hours at any destination.

Singapore alone attracts a total of more than 30 international cruise ships per year, operated by 10 cruise lines, making about 400 port calls. The vast majority of these are arriving from or departing towards Malaysia.

Cruise Ships in Marina Cruise Centre


1.


2.


3.


4.

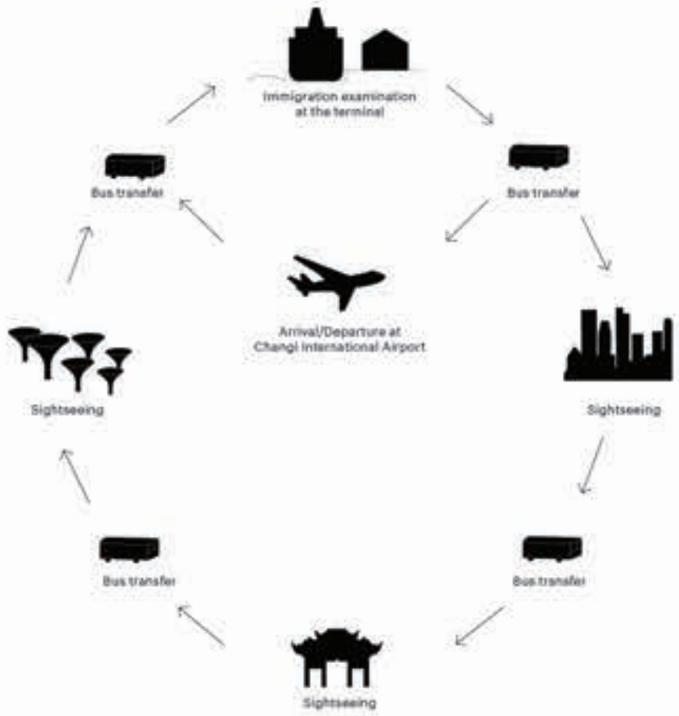
Peripheral Infrastructure

Singapore's two cruise terminals, Marina Bay Cruise Centre and Singapore Cruise Centre at Harbour Front, receive over one million passengers per year. Boasting ideal geographical location, the Marina Bay Cruise Centre is capable of accommodating 'the largest seafaring cruise liners in service today'. Deep waters and the absence of height restrictions provide a large turning basin even for the largest vessels - this means you get to experience faster docking and lesser waiting time, regardless of the cruise line you are on, promotes the Marina's site.

With two cruise ship berths and spacious terminal and car park areas, the facility resembles a modern day airport. Like many newer airports, it is situated on the periphery of the city. Hence, passengers most often rely on the coach services offered by the cruise liner in order to visit the city. The design of the building in itself is car-centred, as the main entrance and whole ground floor are a car park and coach bay area. To access the terminal one needs to take an elevator from the interior of the car park and ascend to the main lobby.

The immigration process is very streamlined and passenger turnaround (since disembarking the cruise ship till leaving the terminal) is about 30 minutes. The terminal is designed to handle two 3,000-person cruise ships concurrently berthed with a total throughput of 13,600 passengers.

1. Marina Bay Cruise Centre seen from Marina South Pier
2. Marina Bay Cruise Centre seen from the city
3. The connection to the city: Marina Bay Cruise Centre's ground floor
4. Waiting zone

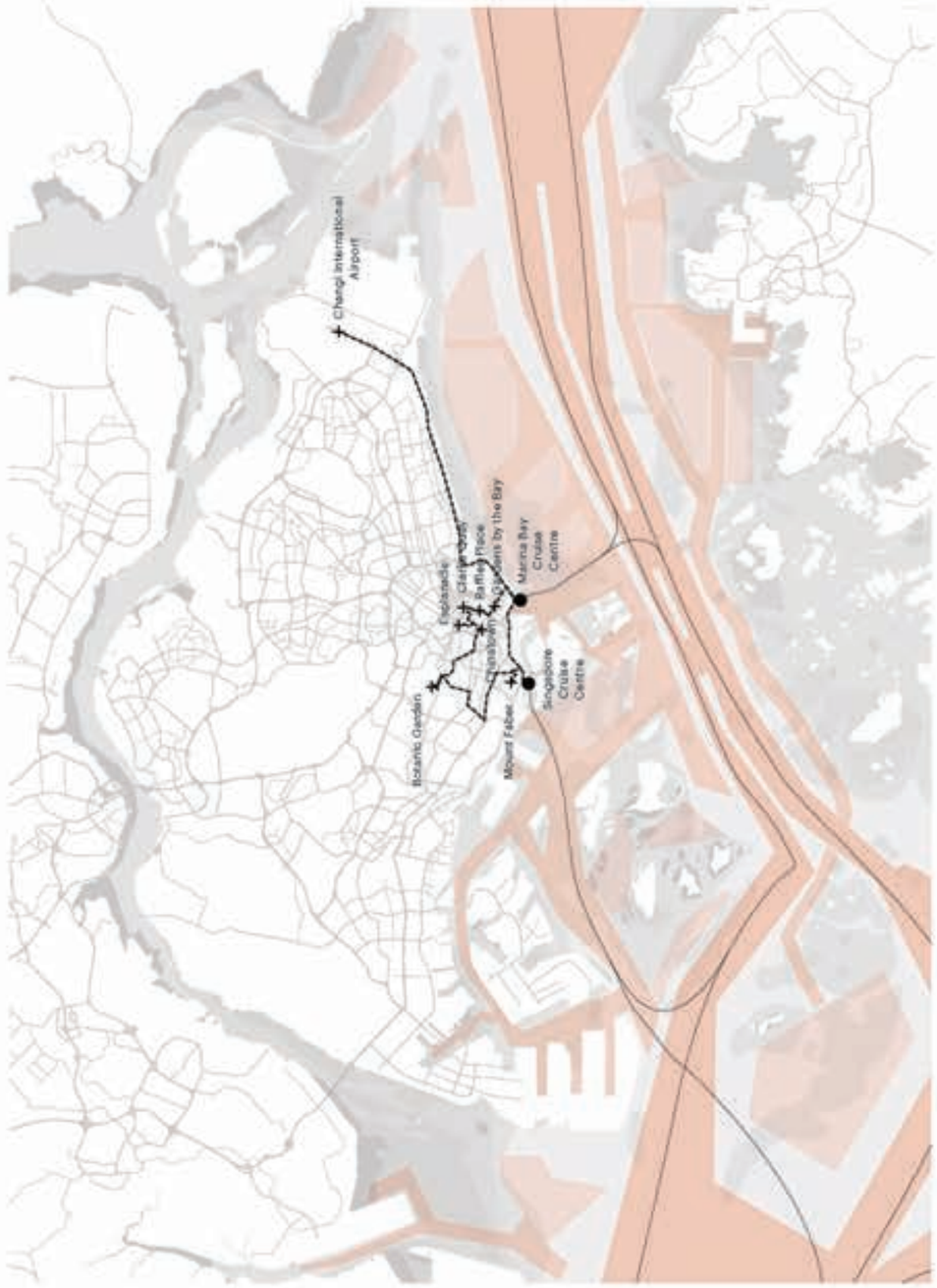


Touring by Coach

Median berth time of any cruise liner is of about 12 hours. Typically a vessel arrives around 8 am to Marina Bay terminal and departs around 6 pm. Passengers have the choice to disembark or stay on board while berthed. Those who decide to visit the city have the opportunity to participate in one of the tours proposed by the respective cruise line that provide organized tours of the city by coach. With a duration of about 5 hours, they are designed to swiftly take the passengers from one tourist attraction to the next, with breaks for eating and shopping. Regardless of the cruise line, these excursions visit the same destinations and do not wander off the trodden path of mass tourism.

The Tourist's Footprint

Cruise ship passengers have limited access to the city. In the case of Singapore, the map shows the main areas the passengers visit: east west from Raffles Place to Bugis, and north south from Orchard Road to Marina Bay.

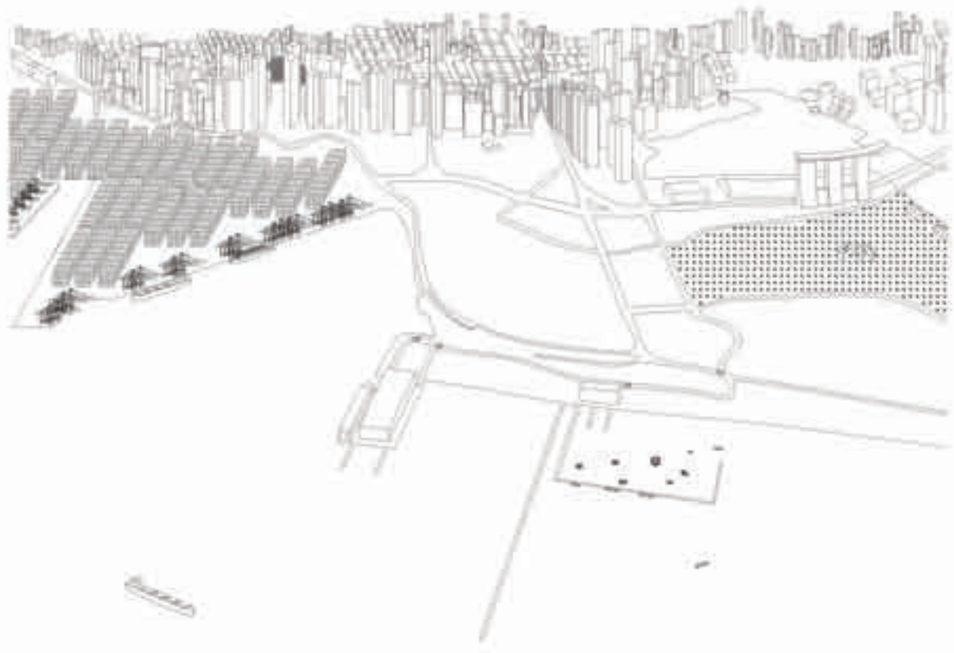


Near and Distant

In very close proximity, yet so far apart: Marina South Pier and Marina Cruise Centre are within walking distance from each other, but represent two very different worlds. One houses luxurious, ample waiting space, while the other has outdoor customs queuing spaces and plastic garden chairs.

Neither has an ideal connection to the city. They lie outside the city and far from any development, behind a multilane highway. Two public bus lines and a future metro line station provide the only access to the city.

The potential impact that these sea passengers can have on the city is drastically limited by these conditions.



Bird's-eye view of the Marina Bay with the two terminals and Tanjong Pagar terminal at the West

Merging Land and Sea

The sea has been an important part of some cultures since antiquity: from maritime civilizations, who recounted stories about the mythical worlds beyond the horizon, to mountain civilizations, which narrated tales of the sea at the end of the world. It has been travelled and explored since prehistory. This body of salty water that covers 70% of the Earth's surface has played an important role in human development. Our fascination with the sea is related to the act of returning home after a voyage; the 'nostimon imar', or sweet return of Ulysses in the Odyssey.
It is only in relation to the land that the sea acquires such an enchanting power. It is the connection of the two that renders either one strong and fascinating and creates this strong magnetism. It is the beauty of going to sea but returning to land that has captivated the imagination of people all through history.
Notwithstanding, the connection between land and sea in the Strait today is becoming ever more faint. Large stretches of industry and port-related infrastructure obstruct the connection between the two, scarce transport connections leave islands cut off and the local populations have still not grasped the full potential the sea has to offer them.

Map showing the stretching of the logistics territory over the Strait and it's coastline

A Disconnected Territory

The first and foremost notable obstacle in the connection between land and sea is the physical connection and accessibility to the sea. For an island nation, Singapore is profoundly disconnected from the sea, as the majority of its coastline is cut off to public access. This model has been extensively exported to the neighbouring seashores in the interest of infrastructural investments pertaining to sea trade, logistics, manufacturing, and oil refinery. The coastline has been acknowledged not as a generator of public qualities but, rather, as a generator of privatized and/or governmental interest. Only recently have development plans of the three nations shown a faint tendency towards the revalorization of the underestimated social relationship between land and sea.

1.

2.

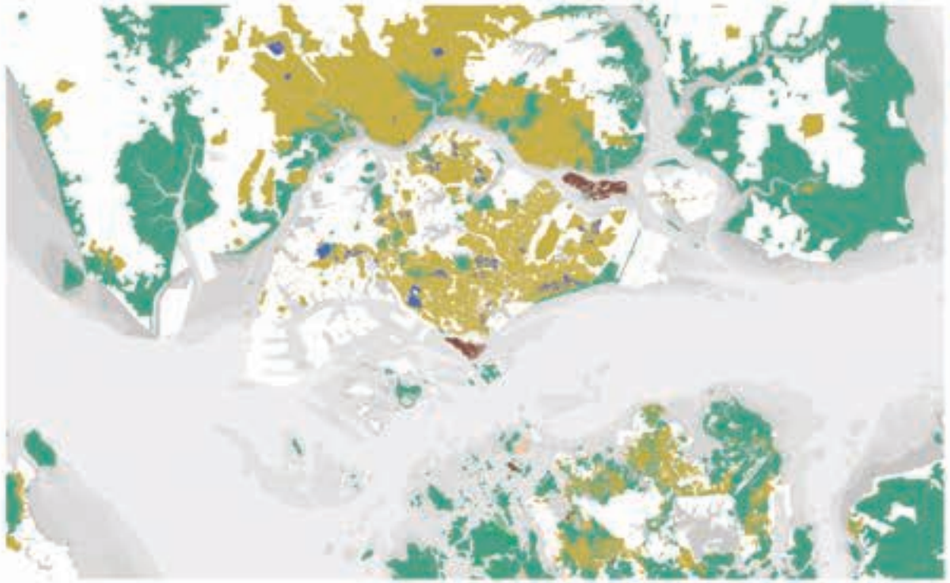
3.

Detaching
Political, financial, strategic, social, or geographical: for many different reasons, Singapore's industry has concentrated along the coastline. This creates physical and social borders between land and the sea, and emphasizes the separation between Singapore and its bordering countries.

1.
Obstructed access to the sea at St. John's Island, Singapore

2.
Military zone in Singapore, Johor Strait

3.
Oil refinery facility in the Southern Islands, Singapore



Fewer Green Public Spaces

In a part of the world with a short modern history, but with great development in recent years that boasts substantial economic forecast of growth in the years to come, nature is a commodity still not completely marred or eradicated from the map. Development in Singapore alone has seen substantial amounts of rain forests and mangroves devoured by cement in the last decades, but grounds for hope remain firm in the likelihood that the adjoining countries will realize this necessity swiftly and translate it into territorial commitments within their strategic plans of the future.

Inaccessibility of the green coast in Johor Bahru

More Logistic Areas

Singapore has development plans to condense and relocate its industrial and logistics zones in favor of creating more coastline for public use. But the same cannot be claimed for the two neighbours. In a rush to catch up with the small giant, Indonesia and Malaysia are investing substantial amounts of money in order to expand and revamp their infrastructural and logistical capacities, with the ambition to reach or surpass the little red dot and partake in its economic boom. These plans project more and bigger ports, bigger logistical areas, shipyards and other satellite facilities relating to marine activities.

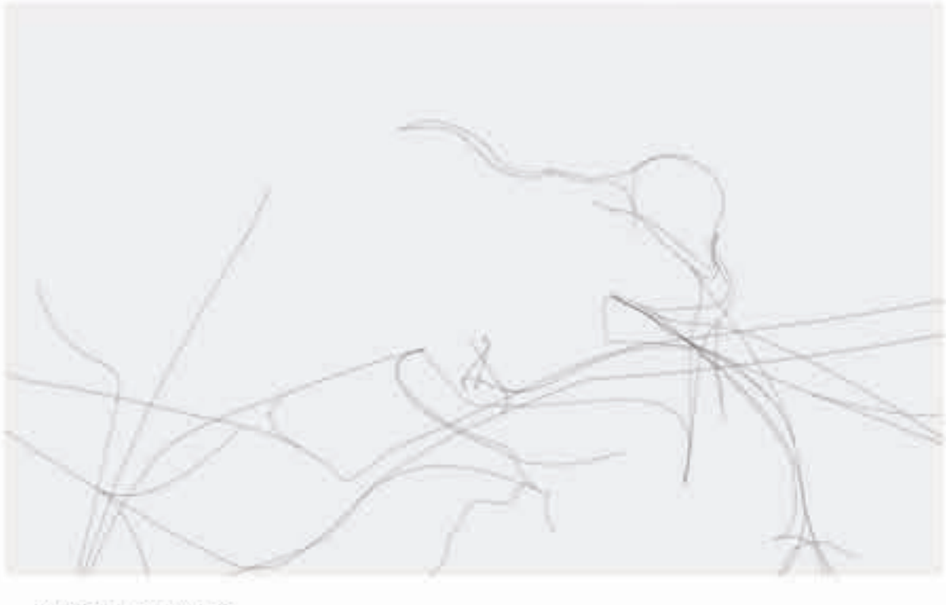
Shipyard in Batam

Underdeveloped Sea Transportation

In the city, land-based public transport utilizes urban space more efficiently, reduces transit time for a large portion of the general public, while propelling commercial and urban development. Its more efficient transit networks create greater accessibility to given areas, creating hubs that act as social condensers. Singapore's planning scheme, which combines public housing with public transport networks, is a sophisticated demonstration of an urban public transport network.

Extensive Road Access

Singapore, among the cities Johor Bahru and Batam, is an exception in promoting public land-based transport. The other two cities are very much car based. Yet also Singapore is extensively planned for private vehicle users, the road network represents a significant economic driver as a means of connecting different areas.



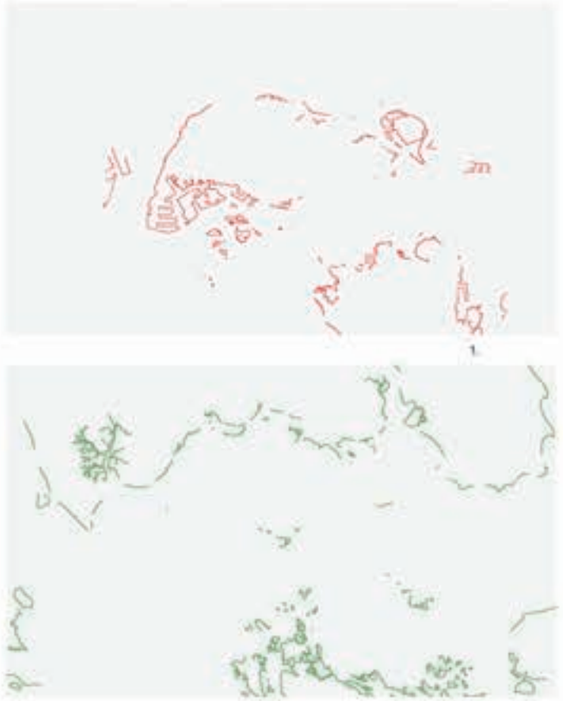
Negligeable Sea Access

Sea access within or between the three countries is greatly underdeveloped despite the potential bilateral economic benefits. Public sea transport is mainly limited to a couple of ferries connecting Singapore and Johor Bahru to Batam and Bintan in the Riau Archipelago. The efficiency, frequency, and punctuality of the existing marine public transport system could be improved.

As a result, many islands, like Singapore's Southern Islands, are poorly connected to their main islands and mainlands.

Living with the Sea

Throughout history, the sea has been an important part of civilization. Today, the sea continues to play an important role in daily life, offering not just economic and commercial mobility for societies, but an emotional and mental connection for individuals. Studies describe the benefit of water in urban contexts; residents who visit the seaside for recreation testify to the positive effects of the sea. In the Singapore Strait, restrictive public access to and limited visibility of the coastline contradict these known benefits.



1.

2.

The coastline:

1.
Industrial, logistical and military use

2.
Public use

3.
Natural green areas

3.

The Non-Accessible Coastline
Description: functions with sealed-off, highly secured areas that require special clearance and/or permission to access them; the sea is obscured behind high walls, gated compounds, and thick layers of bushes.

Types: Industrial parks, logistics zones, cargo storage, port terminals, shipyards, oil refineries, military zones.

Location: most of the coastlines of Singapore and Batam.

The Accessible Coastline
Description: recreational coastal areas, accessible to the public; coastal areas which are not gated or restricted to public access becoming rarer as the economies build around the Strait grow.

Types: seaside promenades, parks, redeveloped wharfs.

Location: Malaysia has the most open coastline. Through its 2006-2025 Comprehensive Development Plan, it is the only country at present proposing a coastal protection plan coupled with balanced development.

The Partly Accessible Coastline
The Malaysian Development Plan described above includes an agenda to protect 231 square kilometers of mangrove along the coastal zone. This vegetation, which protects the shoreline from erosion, has been drastically degraded and encroached upon by development in Singapore and Indonesia. The changing coastline is visible in the map of the natural green coastline of the Strait.

1.

2.

3.

4.

5.

6.

The Unfriendly Coastline
Description: Few pedestrian access points to the sea and physical and visual obstructions are not the only problems of the coastline in the case of Singapore.

Types: Areas of hostile infrastructure, buildings not built at pedestrian-friendly scales, industrial-type barriers and facilities, highways that are difficult to traverse, lack of public facilities, and an overall impression inconsistent with that of an urban coastline.

Location: Singapore

1.
Intersection of Pasir Panjang Road with Clementi Road

2.
Construction of the new part of Pasir Panjang terminal

3.
Harbour Drive

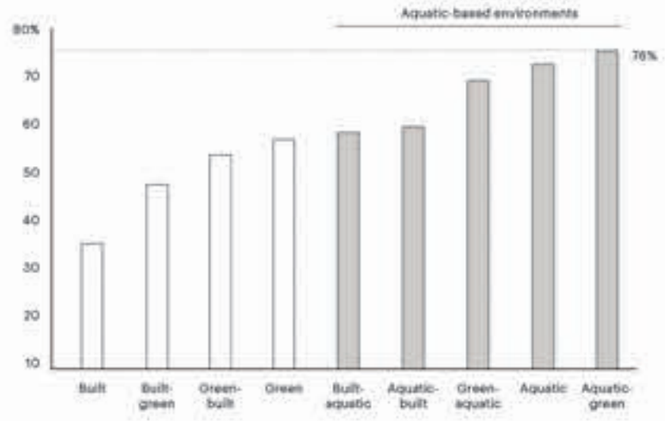
4.
Void and gated space between industrial buildings

5.
Pasir Panjang entrance for employees

6.
Labrador Park

Urban Blue: The Value of Water
Although water covers more than two-thirds of our planet, the sociological benefits of living with 'Blue Spaces,' or aquatic environments, has yet to be fully explored. Recent studies conducted in the fields of environmental psychology, geographical studies, evolutionary psychology and landscape planning describe the value of aquatic environments in 'promoting social, economic, and environmental objectives and influencing human well-being.' Urban planning that introduces more trails along bodies of water and wetlands produce more livable, sustainable cities that promote the mental well being of their citizens.

A 2010 study from the School of Psychology, of the University of Plymouth, UK (see graph right) demonstrated the clear preference individuals show towards built environments that contain aquatic elements, even over 'green environments'.



Maersk Container Ship

Capacity: 20 persons
Surface: 70'000 m²
Surface per person: 3'540 m²

Cost: 185 Million SGD
Dimensions: 400 m x 73 m x 59 m

Cruise Ship Oasis of the Sea

Capacity: 7'700 persons
Surface: 17'000 m²
Surface per person: 22 m²

Cost: 1'300 Million SGD
Dimensions: 360 m x 72 m x 42 m

Belakang Padang Island

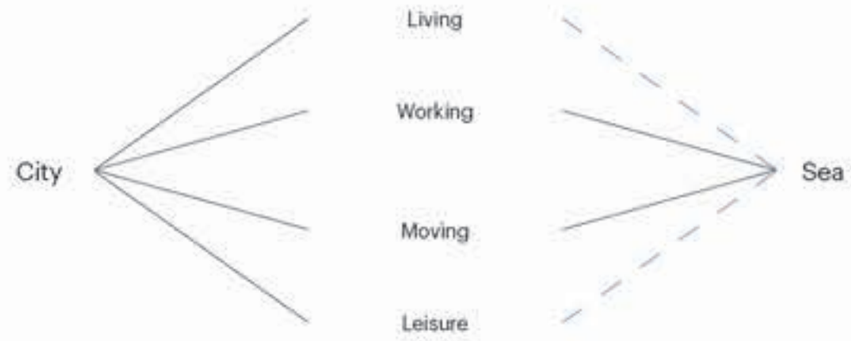
Capacity: 18,000 persons
Surface: 350'000 m²
Surface per person: 19.4 m²

Cost: -
Dimensions: 1.7k m x 1.9 km

The Pinnacle

Capacity: 6'000 persons
Surface: 254'000 m²
Surface per person: 42.5 m²

Cost: 279 Million SGD
Dimensions: 45 m x 163 m x 24 m (x7)



Towards a Balanced Use

In recent history, the sea around the SIJORI region has primarily become used for industrial and commercial purposes. However, it holds the potential of hosting a broader urban program and being better connected with the whole trinational territory.

Potential for the Public Sea

Through a process of superimposing and subtracting the different layers of use of the region, like density, logistics, private land use, we searched for an ideal place to re-claim the coastline from its industrialized, privatized state. By counterbalancing the intense industrialization and segmentation that has taken place on the coastline, the sea itself, and the few unused islands, could re-create a connection between land and sea.

Density of Free Space

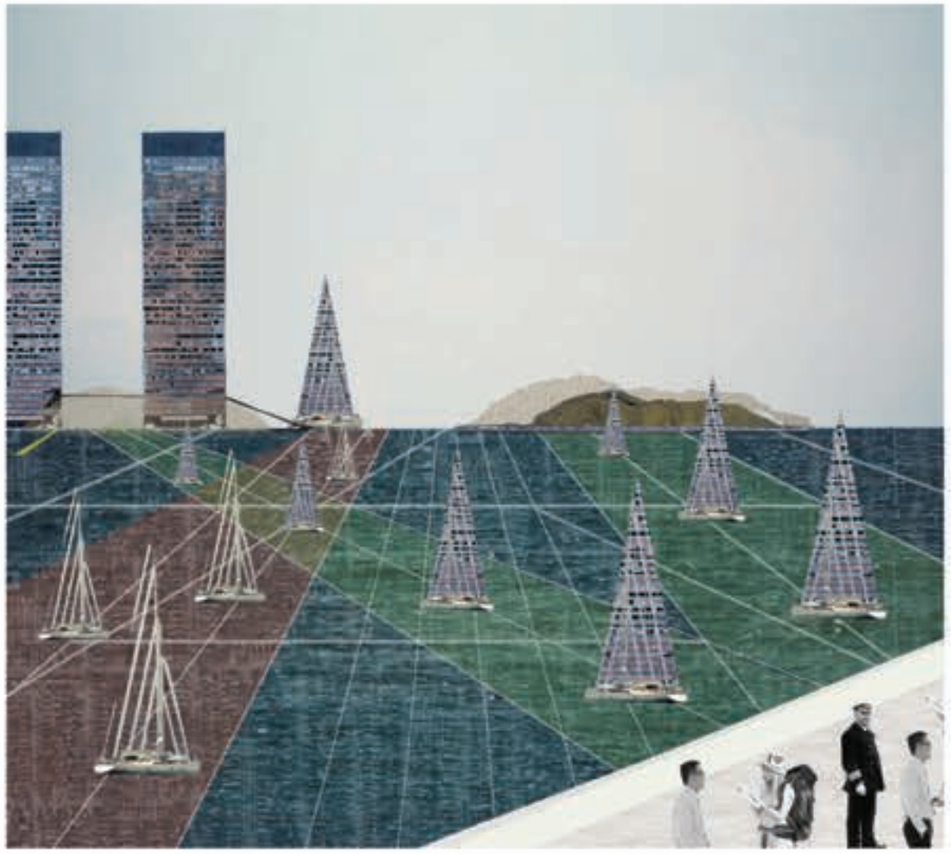
Relatively unused space

N

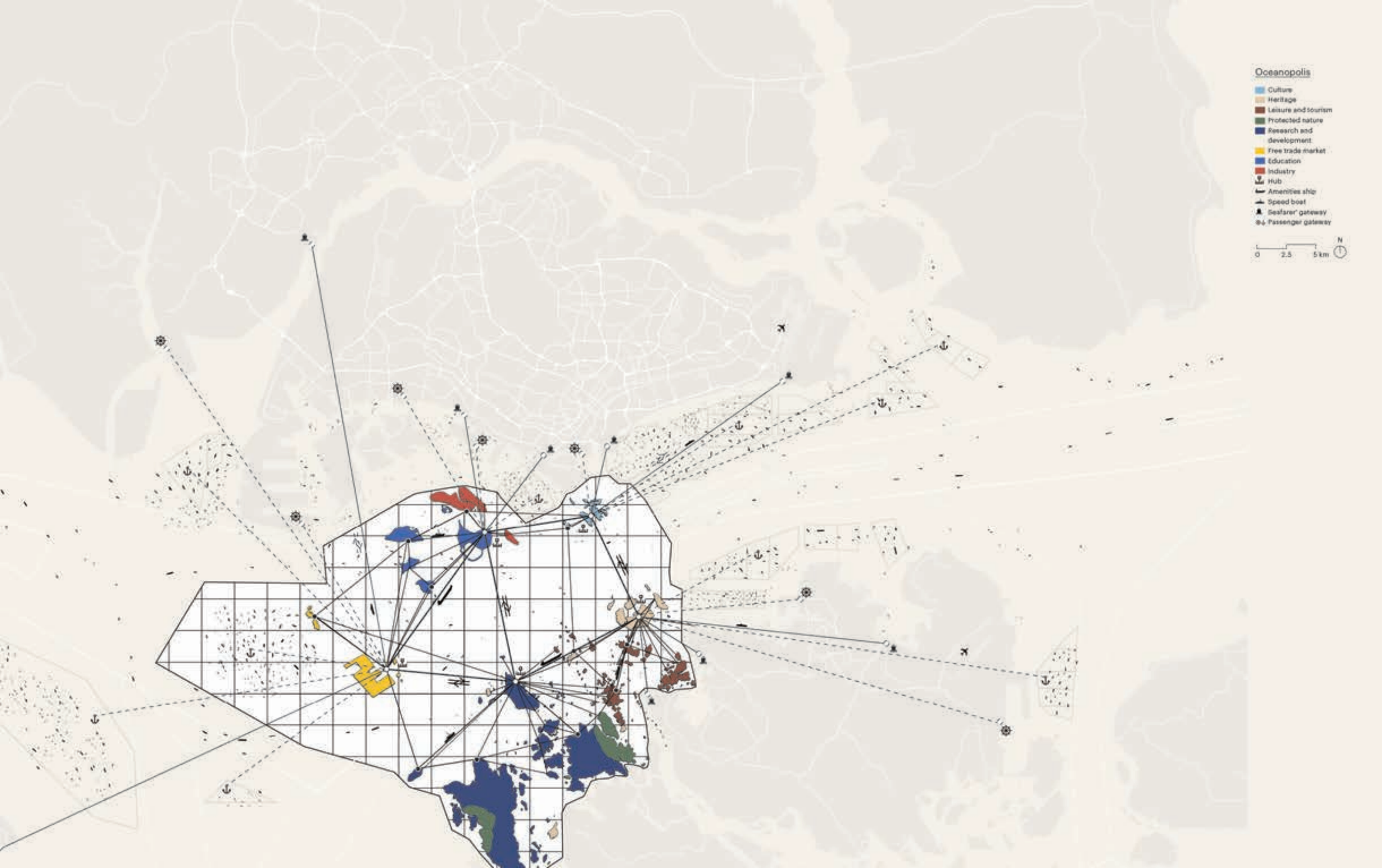
0 2.5 5 km

Oceanopolis

In classical antiquity, Oceanus is the divine personification of the sea, an enormous river encircling the world.
Oceanus was the ocean-stream along the Equator, in which the habitable hemisphere floated.
Oceanopolis is the intention to create a floating habitable hemisphere on the ocean stream at the Equator.
Oceanopolis is about Sea Urbanism in the Singapore Strait.
Oceanopolis is about breaking barriers.
Oceanopolis is about bridging the gap.
Oceanopolis is about drawing a new line.



The intention to inhabit the Strait.


Oceanopolis
Culture
Heritage
Leisure and tourism
Protected nature
Research and development
Free trade market
Education
Industry
Hub
Amenities ship
Speed boat
Seafarer' gateway
Passenger gateway
0
2.5
5 km
N

2. 3.

Breaking Barriers

A New Territory

Oceanopolis will present an opportunity to reevaluate the restrictive borders in the SIJORI region. They have become obstacles between people and ideas that prevent communication and hinder shared progress.

Oceanopolis will address this issue by proposing a Trinational Trans Border Special Zone (TTSZ) as a public platform for the free circulation of people and ideas within the Strait.

Borders

The project does not foresee the alteration or cancellation of any national and international boudaries and regimes, but would instead create an interstitial zone with special regulations for visitors and residents from the three neighboring countries.

To define the site and territorial extents of the TTSZ, we used existing geomorphological elements and previously established borders. The territory incorporates nearby islands of Singapore's Southern Islands and the Riau Archipelago, which are not in current use. Geographic centrality to all three nations was critical to establishing sociopolitical neutrality.

Density of Free Space

We initially set out to choose eligible islands for hosting functions and facilities. Proximity between them was considered. Islands with heavy industrialization, high degrees of land use or dense populations were excluded. Larger islands like Batam were excluded because of potential immigration or infrastructural issues.

Borders and Geography

Another rule to establishing the zone's boundaries was to maintain a maximum distance of 15 km from the 'mainland' coastlines of Singapore and Batam. The 15 km rule was further applied to circumscribe the islands that were chosen to be included in the zone defining, thus, another portion of the border.

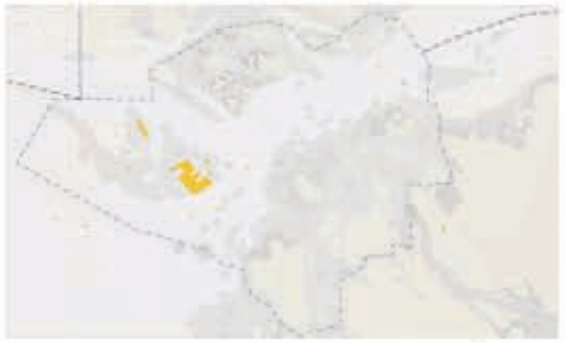
Fairways and Anchorage Zones

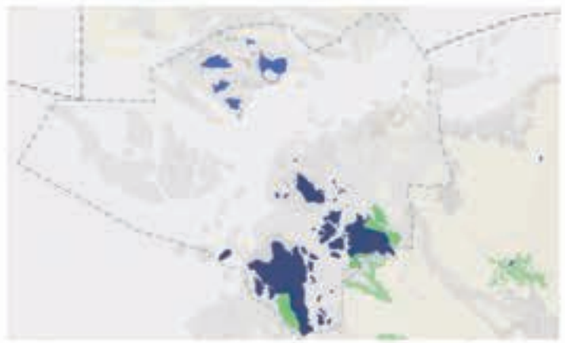
The zone borders are designed to minimize crossings or interactions with the Strait's industrial fairways and traffic ways. While it was not possible to exclude the logistical areas entirely, by taking advantage of turning zones and international waters, the border could be set with minimal impact to the existing corridors.

1.
Density of free space

2.
Borders and geography

3.
Fairways and anchorage zones





2.

3.

Bridging the Gap

A New Public Space

Oceanopolis is an attempt to re-introduce a public space in an otherwise logistical territory. The concept is simple: if the land in the Strait territory divides, then the sea will unify. Shared regional population growth, in the interest of all three countries, is central to the conception of the Oceanopolis, a united, sea metropolis.

Identities

Oceanopolis is subdivided into five clusters of islands, each one with its own functional identity and hub. Each cluster has an individual identity for a better programmatic distribution and division of the planned facilities, but also as a means to avoid polarization of use on certain islands only.

The clusters operate on hub and spoke logic, with principal infrastructure and infrastructure concentrated on the main island, and satellite functions distributed among the lesser islands.

Seafarers and Industry

The most radical proposal of Oceanopolis is the construction of a floating island within international waters. It will house an open market and bunkering zone located right next to the Nipah NTAA and within the special international trade zone. Suppliers from all three countries could sell their products here, allowing them better access to a wider market. Ship operators will also profit from the more competitive prices offered.

By offering dedicated dwellings and other facilities catering to seafarers, the floating island will offer a meeting place specifically for them.

Education, Research and Development and Nature

In a trans border, international and multicultural environment, education an research have the capacity connecting like-minded people of different backgrounds in seeking common goals. Youth centres, universities, art schools, open offices, think tanks, start-up parks are open platforms for thinking, creating, discussing, research and learning across national boundaries.

Culture, Heritage and Tourism

With more than 2,000 years of history, the Riau Archipelago is rich in historical heritage. From floating kelongs to wooden pancungs to the local cuisine, heritage is not only legible in the built environment, but in the everyday lives of its people.

Although the Riau has long been attractive to tourists from across the globe, Oceanopolis would promote a form of tourism that sustains local traditions and practices. Locally recognized landmarks such as the renowned seafood of Belakang Padang would gain protective status.

1.
Seafarers and industry

2.
Education, R&D and nature

3.
Culture, heritage and tourism

2.

3.

Drawing a new Line

A New Network

A well-designed program without the means to access will become obsolete and ineffective. Oceanopolis proposes a new transit network within the TTSZ that works as both catalyst and attractor. This new public transport system is designed to improve efficiency, accessibility and lower overall travel costs for passengers from the three surrounding countries. It will be complementary to existing transportation networks. Marine access to the zone will be regulated and priced like the Singaporean electronic road pricing system. Government subsidies would keep the system functioning and prices competitive.

External Connections

Hub-based external connections would link passengers to and from airports, cruise terminals and ferry terminals via quick and easy intermodal changes. The zone would not require any immigration access. Passengers could directly transfer from one transport system to another at this central location within the Strait.

Seafarers are also connected to the TTSZ by means of small-scale connections that arrive to their respective anchorage zone or port terminal.

Free or reduced fares would make transportation within the zone more attractive to passengers and seafarers.

The network is divided into two systems of transport, both involving water transport:

Ring and Circle Lines

Similar to a land-based metro system, the transport network has three major lines. Larger, slower ships, at a medium frequency, service these lines. They will host other functions on board, such as markets, food courts, temporary exhibitions, or flea markets, to enhance the passenger's travel experience.
- The circle (red line) connects the hubs along a circular route.
- Two ring lines (dark and light green lines) connect three and four hubs respectively, crossing diagonally through the fairway.

Local Connections

Similar to a land-based bus system, smaller, faster ships would connect the outer islands to the hubs at a higher frequency. Every hub in the system is connected to two different lines, thus each line connects two hubs and two clusters. This creates many secondary hubs that give passengers multiple transport choices.

The docking stations for both systems would accommodate swift berthing and unloading and loading of passengers to reduce queue times.

1.
External connections

2.
Ring and circle lines

3.
Internal connections

1.

2.

3.

Urbanizing the Sea

A New Population

Oceanopolis will introduce a new spectrum of programs to attract heterogeneous user groups - tourists, seafarers, local residents, foreign students, researchers, artists, and businessmen - to the Strait. As different clusters accommodate specific programs, they will attract a changing mix of user groups throughout the day, month, and seasons.

A Local's Day

A local university student arrives from Singapore by boat in the morning. He takes his courses and uses the fast boat connection to cross to the next island, where, in less than ten minutes, he borrows books from the library. In the afternoon, he heads to the park, where he has a small picnic with his friends. He uses the Ring line to cross to the other islands and takes advantage of the journey to buy some groceries from his favourite vendor on board, who by now knows him by name.

In the evening, he meets his girlfriend for a short walk along the coast. Afterwards, they make their way to the theatre to watch a performance based on stories and myths of the sea, which is organized by the Riau Arts Association.

A Seafarer's Day

A deep-sea mariner from a cargo cruiser that just set anchor near Tanjong Pagar terminal has been transported with a passenger vessel to the Seafarer's hub. There, he initially books a room for the night at the dwellings specially designed for the short-term needs of seafarers. The concierge gives him a day pass to use any means of transport within the TTSZ, which is free-of-charge during his stay. He heads out straight away, takes the circle line and in 35 minutes is at Belakang Padang, enjoying his preferred Chili Crab.

Afterwards, he joins a friend at the bar for a quick drink and then returns to his room for a well-deserved rest. In the morning, he rejoins his ship for Korea.

A Tourist's Day

After flying into Changi Airport, the couple boarded a vessel at Tanah Merah that brought them directly to Funtasy Island. There they had a nice breakfast on the seaside and got to know a local woman who makes handmade bracelets. They later take the boat to the Seafarer's hub. There, they meet the woman's brother, who is a captain. His ship is berthed in Pasir Panjang, loading new cargo for his upcoming trip to India. After they meet, they head to Pulau Sambu, where they have booked a tour of the museum with a archaeologist friend. At the end of the day, they enjoy lobster at their reserved table at the hotel's restaurant.

1.
Local Resident

2.
Seafarer

3.
Tourist

'Our vision is... an island with an increased sense of 'island-ness' [...] as well as better access to an attractive coastline and a city that embraces the waterline more closely as a signal of its island heritage', URA, Living the Next Lap: Towards a Tropical City of Excellence, 1991.

Twenty years after this declaration of the Urban Redevelopment Authority of Singapore, the city is still fighting to acquire its identity. Finding itself in the middle of an economic boom, this region, Singapore and its siblings, has not had the time to critically assess its goals and directions. Inclined to follow the road that guarantees success and thus a place on the world map, the fragile situation of this region leaves small margin for questioning. Uncertainty is not an option. And the sea, the coast, the relation to the neighbouring countries are all illustrations of uncertainty. It will take time to comprehend them and embrace them. But then, this region will have the opportunity to reestablish its relation to the sea and use it for what it is: part of its habitable territory.

The Strait as a public space

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