



















CHINA SHIPPING LINE





# SINGAPORE STRAIT - THE CITY IN FRONT OF A CITY

by  
Martin Garcia  
Magnus Nickl



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The Singapore Strait is a major Shipping route of South East Asia. With a width of about 16 Kilometers and a length of approximately 105 Kilometers the Singapore Strait is located between the Singapore Island and the Riau Archipelago, Indonesia. The Singapore Strait also connects the Strait of Malacca in the west and the South China Sea in the east. The biggest virtue of the Singapore Strait is that it provides a deep water passage to the Singapore Port making it one of the busiest in the world. In this work we describe the Strait of Singapore with the tools provided by traditional urban research. Does a water way have patterns assimilable to urban spaces and what can we learn by deploying this knowledge? The results is a novel view associated with a global waterway.



# The Global Shipping Corridor

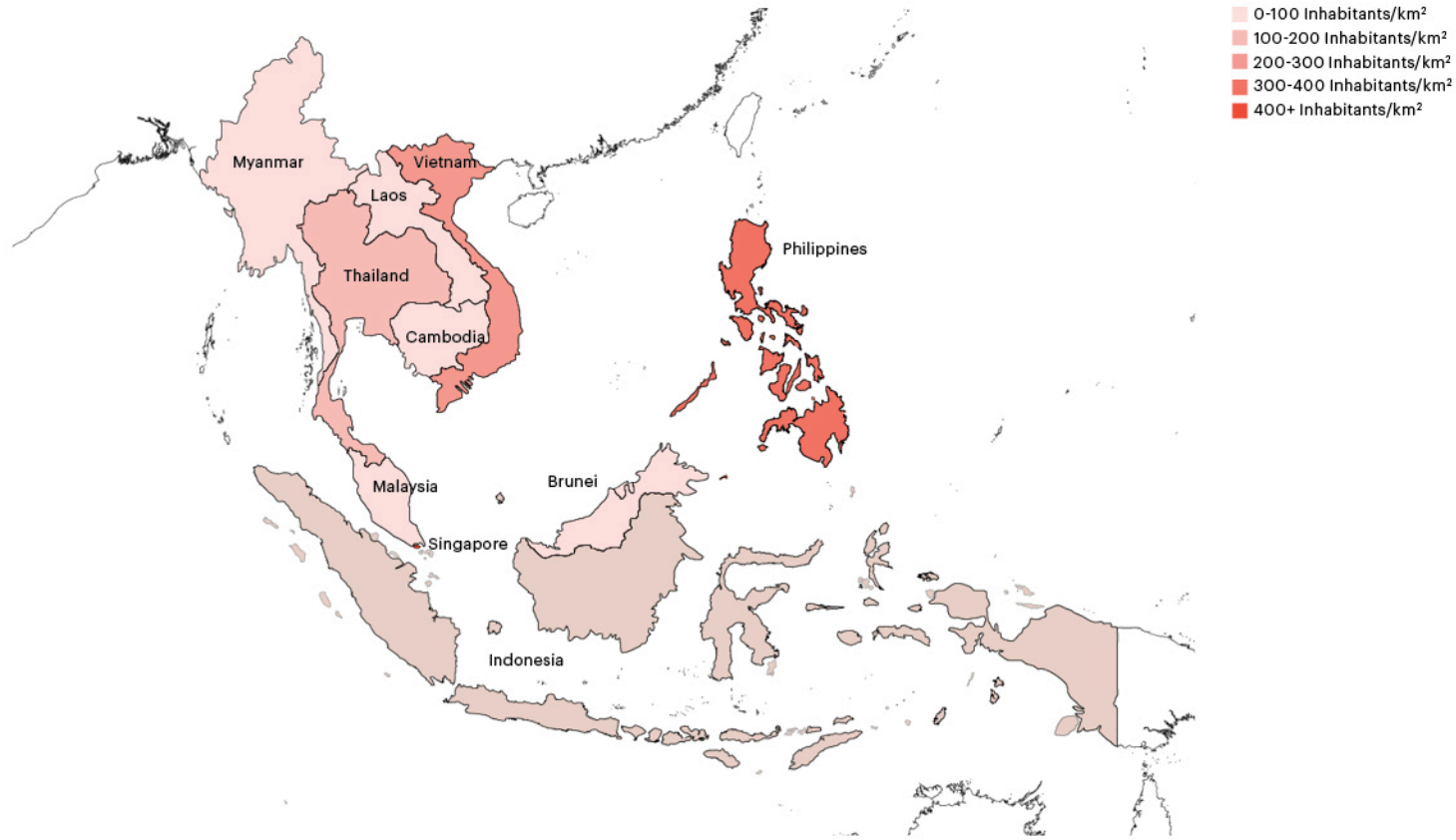
An analysis of global ship movements requires detailed knowledge of ships' arrival and departure times at their ports of call. Such data have become available in recent years. Starting in 2001, ships and ports have begun installing Automatic Identification System (AIS) equipment. AIS transmitters on board of the ships automatically report the arrival and departure times to the port authorities. This technology is primarily used to avoid collisions and in-

creases port security, but arrival and departure records are also made available by Lloyd's Register Fairplay for commercial purposes as part of its sea-web data base ([www.seaweb.com](http://www.seaweb.com)). The same approach is used to track ships on the open sea and the result can be seen by looking at the graphics below.

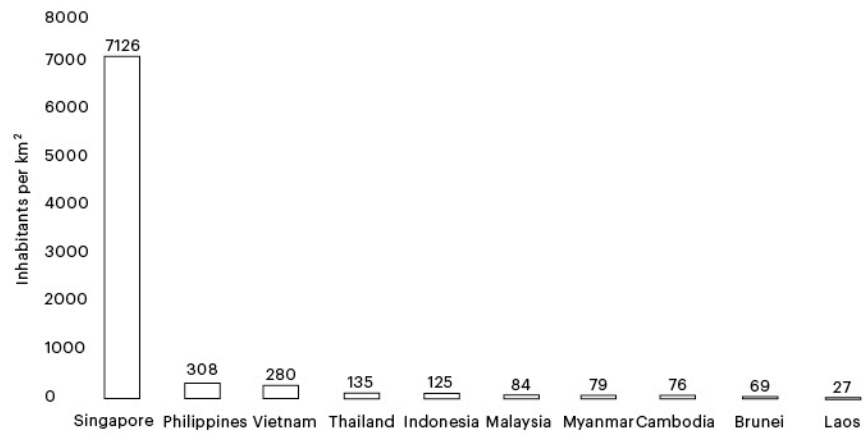


Location of a commercial ships based on GPS tracking, 2012

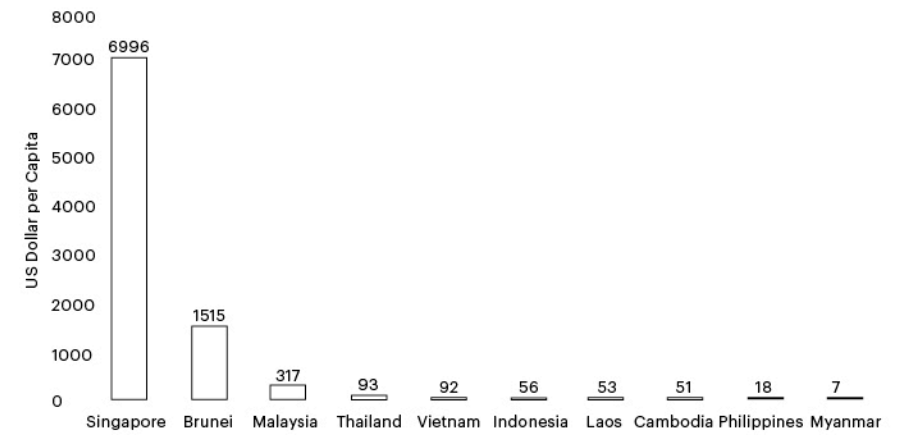




**Population Density in ASEAN Countries**  
 ASEAN covers a land area of 4.46 million km<sup>2</sup>, which is 3% of the total land area of Earth, and has a population of approximately 600 million people, which is 8.8% of the world's population (numbers from 2011). The sea area of ASEAN is about three times larger than its land counterpart. Due to its small size, Singapore has a very high population density forcing the Government to use land in a frugal manner. In order to meet this maxim all shipping facilities, traditionally using a lot of space, are relatively small in size.

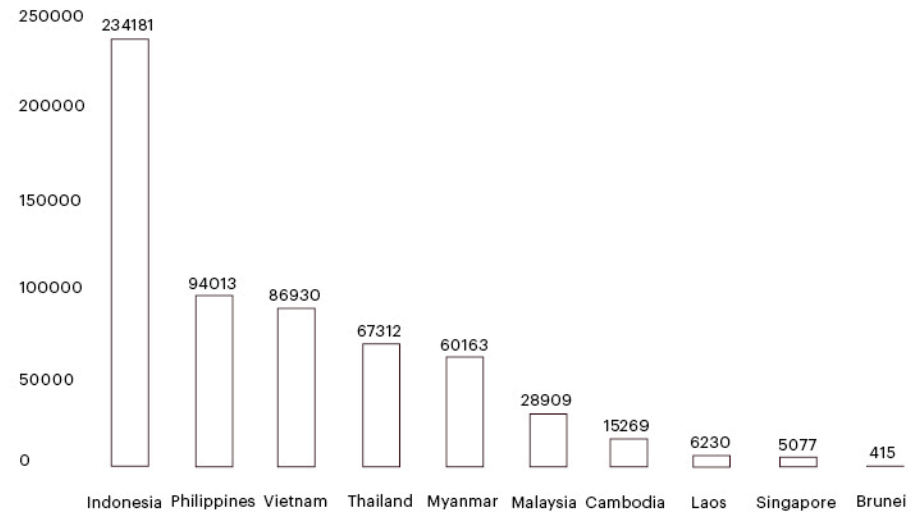


**Foreign Direct Investment (FDI) per Capita in ASEAN Countries**  
 The Foreign Direct Investment (FDI) that was achieved in 2009 accumulated to \$37.9 billion and increased in 2010 to \$75.8 billion. 22% of FDI came from the European Union, followed by ASEAN countries themselves with 16% (numbers from 2011). Due to the debt issues in the European Union and the US, while Japan is still recovering from the tsunami, the forecast for the FDI development in the Asean member countries is slightly negative.

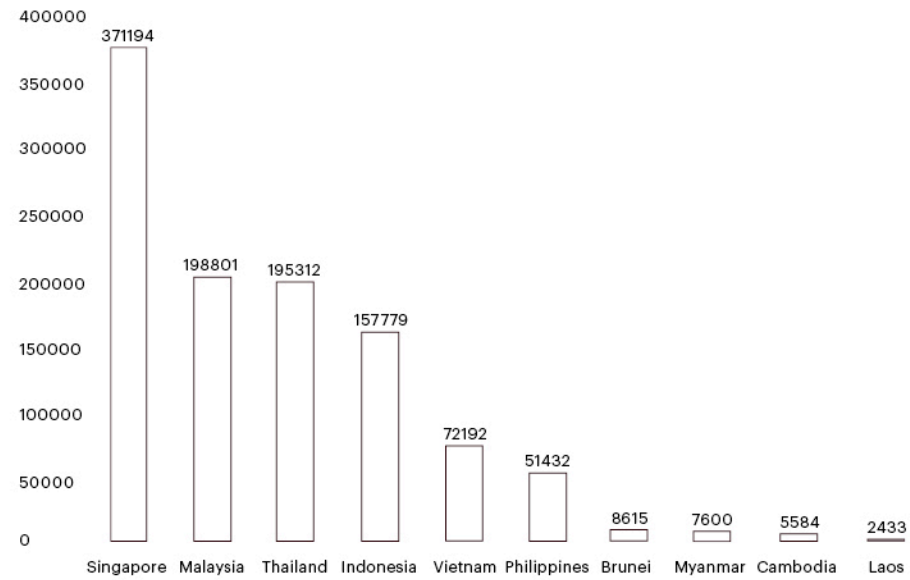




Inhabitants (in thousands)



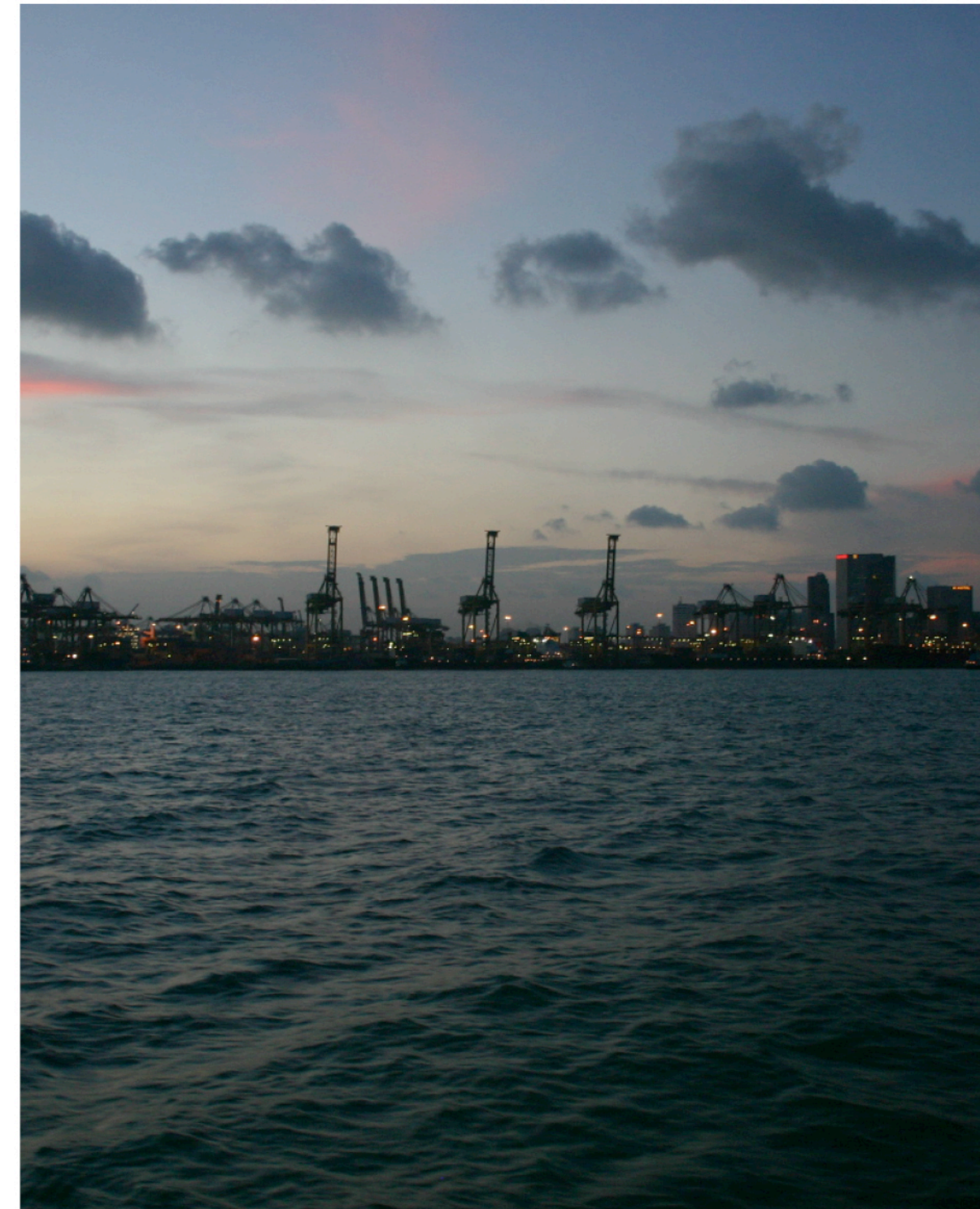
Exports (in Million US \$)



International Shipping and Global Trade

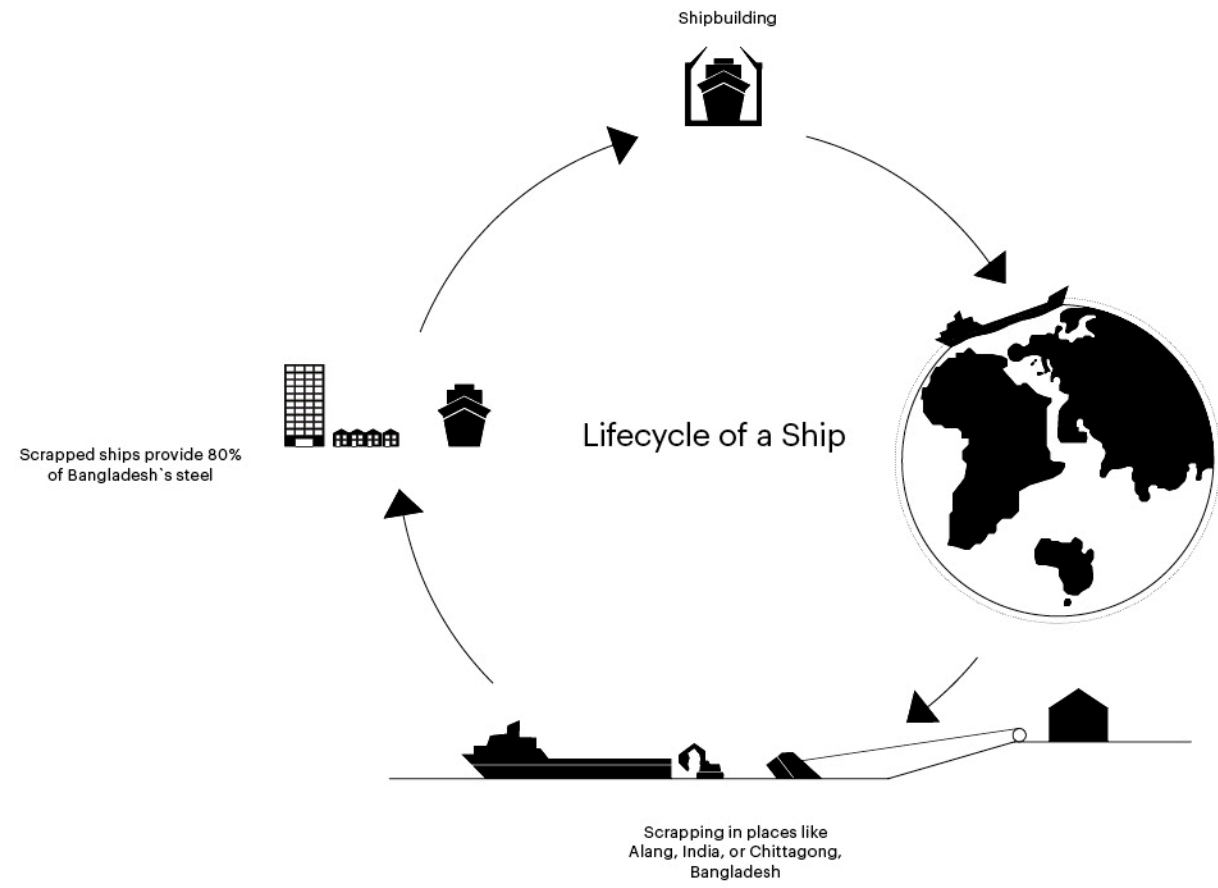
As the world became more developed, proximity to raw materials and to markets became the factors that, above all others, shaped the world's economy and, in particular, the major trade patterns and shipping routes. Eventually, the great seaborne trades became established: coal from Australia, Southern Africa and North America to Europe and the Far East; grain from North and South America to Asia, Africa and the Far East; iron from South America and Australia to Europe and the Far East; oil from the Middle East, West Africa, South America and the

Caribbean to Europe, North America and Asia; and now we must add to this list containerized goods from the People's Republic of China, Japan and Southeast Asia to the consumer markets of the Western world. Global trade has permitted an enormous variety of resources to be widely accessible and thus facilitated the widespread distribution of our planet's wealth.



Tanjong Pagar Container Terminal





Average time in service 26.9 - 31.5 years for oil tankers

### Lifecycle of a Ship

Most ships used in today's world are built in Japan, China, South Korea and in the Philippines. After a certain lifespan, ships will be removed from the fleet. For oil tankers, this span is currently between 26.9 to 31.5 year.

As soon as the ship is no longer used, it will be removed through a process called scrapping. Oil tankers have accounted for between 56.5% and 90.5% of the world's total scrapped ship tonnage. Most of these processes are done in Pakistan, India, and in Chittagong, Bangladesh, which we had the opportunity to visit.



1.



2.



3.



4.

- 1. Ship repair yard, Batam
- 2. Ship construction yard, Batam
- 3. Shipbreaking coast, Bangladesh
- 4. Ship breaking yard, Chittagong, Bangladesh



# Global Shipping Highways

The compound annual growth rate for global container trade volumes from 2002 to 2015 is estimated to be 6.6%, compared to 8.5% per annum during 1980-2002. The average growth rate through to 2010 has been estimated at 7.5% per annum, while for the following five years, the growth rate is expected to decline to 5.0%.

The world's busiest port is contested by several ports around the world, as there is as yet no standardised means of evaluating port performance and traffic. For the past decade, the distinction has been claimed by both the Port of Rotterdam and the Port of Singapore. The former based its measurement on cargo tonnage handled (total weight of goods loaded and discharged), while the latter ranked in terms of shipping tonnage handled (total volume of ships handled).

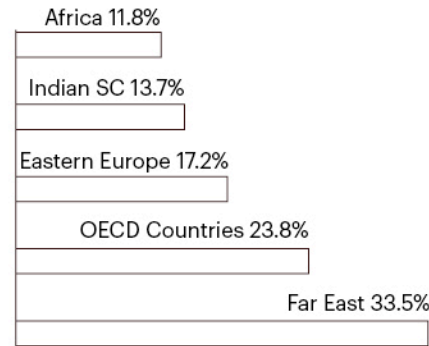
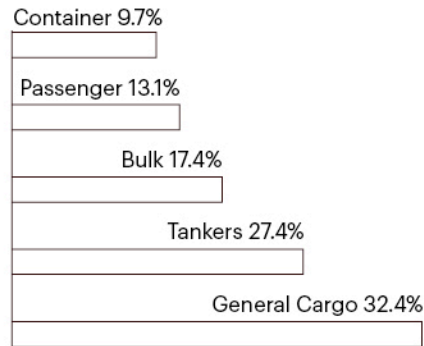
Exports from North Asia are expected to grow more slowly than exports for the world as a whole, due largely to subdued growth in containerized exports from Japan. North Asia's share of imports is also expected to fall over

the forecast period, but to a less significant extent.

Container traffic to and from other parts of Asia is expected to grow more rapidly than the world average. Expansion is expected to be particularly rapid in China, continuing the trend of the last five years, and solid growth is expected in South Asia. South-East Asia is also expected to increase its share of world container traffic over the forecast period.

The intra-Asian trade will continue to outperform global container growth by some percentage points, recording an average of 8.3% per annum over the forecast period.

Intra-Asian trade enjoyed spectacular growth in the decade prior to the 1997 currency crisis, with growth average well in excess of 10% per annum for a decade. The crisis brought a sharp reversal of this pattern, with an absolute decline in cargo volumes in the following year. Growth in the trade has now resumed, and the prospects for the next decade appear solid.

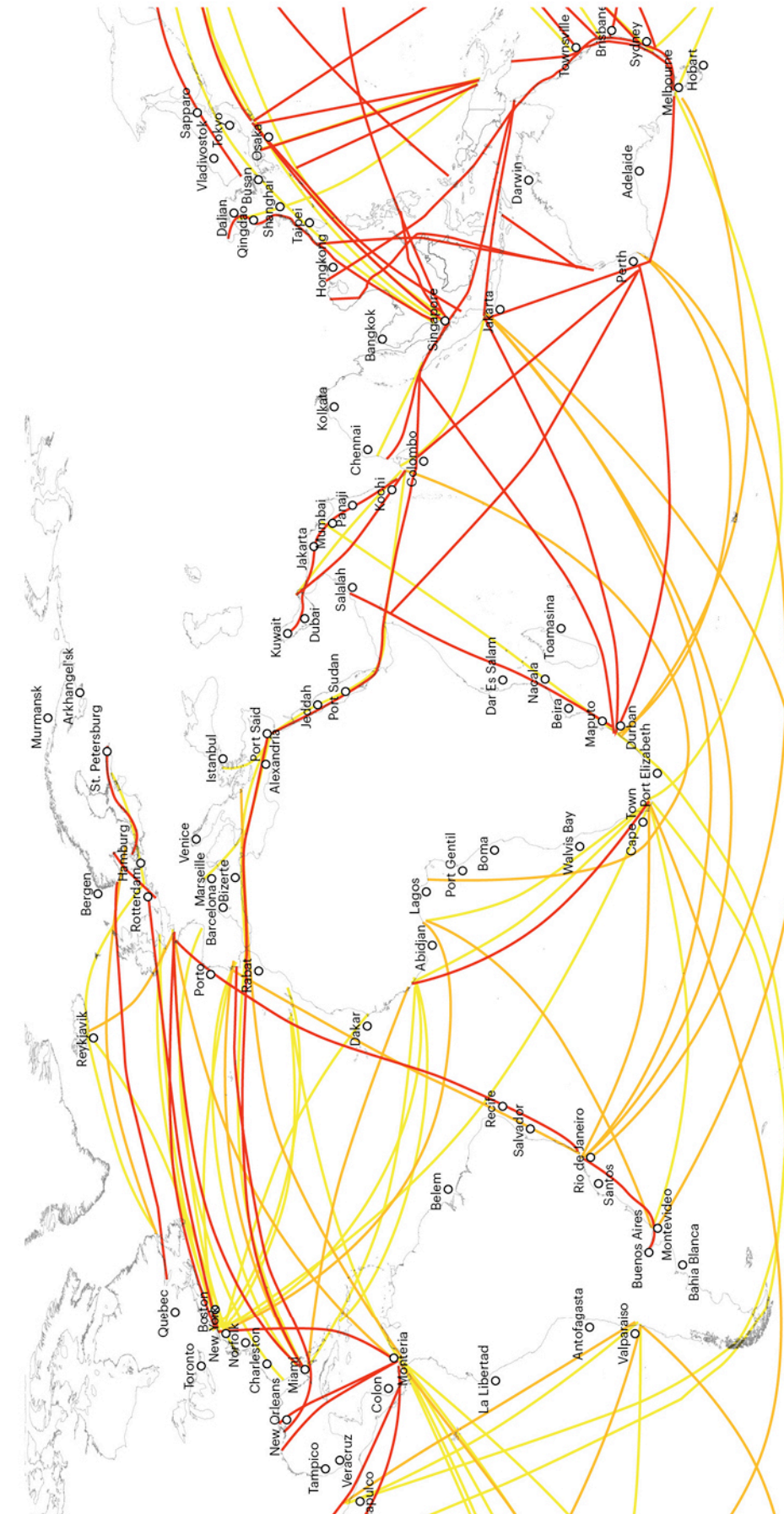


### International Commercial Ship Fleet and Seafarer Supply

Around 90% of world trade is carried by the international shipping industry. There are over 50'000 merchant ships trading internationally, transporting every kind of cargo. The world fleet is registered in over 150 nations, and manned by over one million seafarers of virtually every nationality.

The initial demand estimate combines fleet size and information on manning scales. This is then calibrated to be consistent with supply estimates. The calibration is

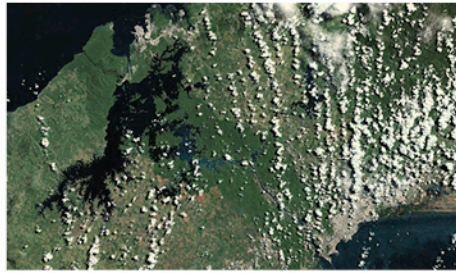
based on estimates of the overall supply/demand balance derived from comprehensive data supplied by over 100 major companies, and information from national administrations and a crewing experts' survey. Based on this evidence, the current estimate of worldwide demand for seafarers in 2010 is 637'000 officers and 747'000 ratings.



Major Trade Routes (2012)

- 100 journeys
- 1000 journeys
- 1000+ journeys





Panama Channel



Gibraltar Strait



Suez Channel



Bosphorus Strait



Cape of Good Hope



Bab Al- Mandab Strait



Cape Horn



Denmark- Sweden



Hormus Strait

Important Features for Shipping

A strait or straits is a narrow, typically navigable channel of water that connects two larger navigable bodies of water. It most commonly refers to a channel of water that lies between two landmasses. Straits used for international navigation between two high seas or exclusive economic zones are subject to the legal regime of transit passage. The regime of innocent passage applies in straits used for international navigation that connect a part of high seas or an exclusive economic zone with the territorial sea of coastal nations. The same regime also applies in straits formed by an island of a state that borders it and the state's mainland if there exists a route through the high seas or through an exclusive economic zone of similar convenience with respect to navigational and hydrographical characteristics. There may be no suspension of innocent passage through such straits.



#01 Shanghai



#02 Singapore



#03 Hong Kong



#04 Shenzhen



#05 Busan



#07 Guangzhou



#08 Dubai



#10 Rotterdam



#7 Basel

Ports

It is to note that the list of largest ports in the world is subject to constant alteration. This is mainly because of the development taking place in each and every country across the globe, with respect to marine cargo transportation and commercial networking. China is the frontrunner in this race to have a stronghold in the marine ports sector.



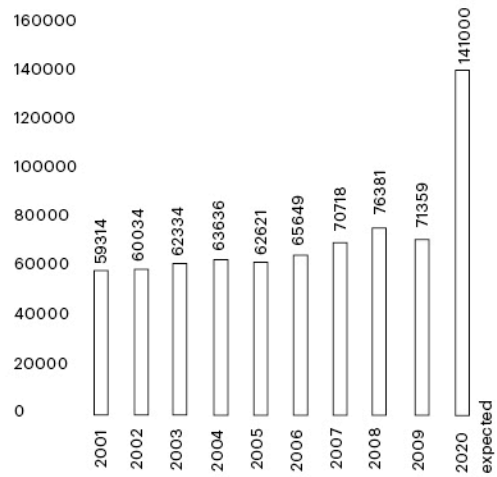
# Malacca and Singapore Straits

From an economic and strategic perspective, the Strait of Malacca is one of the most important shipping lanes in the world.

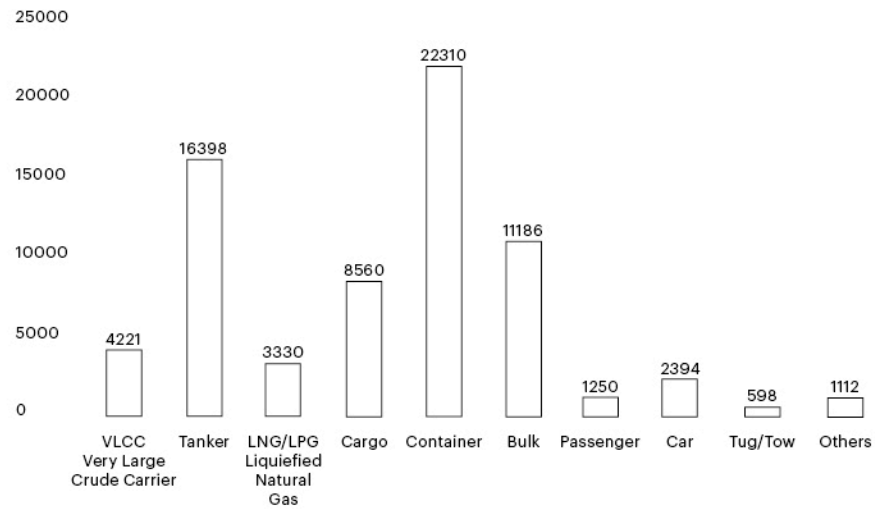
The strait is the main shipping channel between the Indian Ocean and the Pacific Ocean, linking major Asian economies such as India, China, Japan and South Korea.

Over 70'000 vessels pass through the strait each year, carrying about one-quarter of the world's traded goods including oil, Chinese manufactured goods and Indonesian coffee.

Number of Vessels in the Strait of Malacca

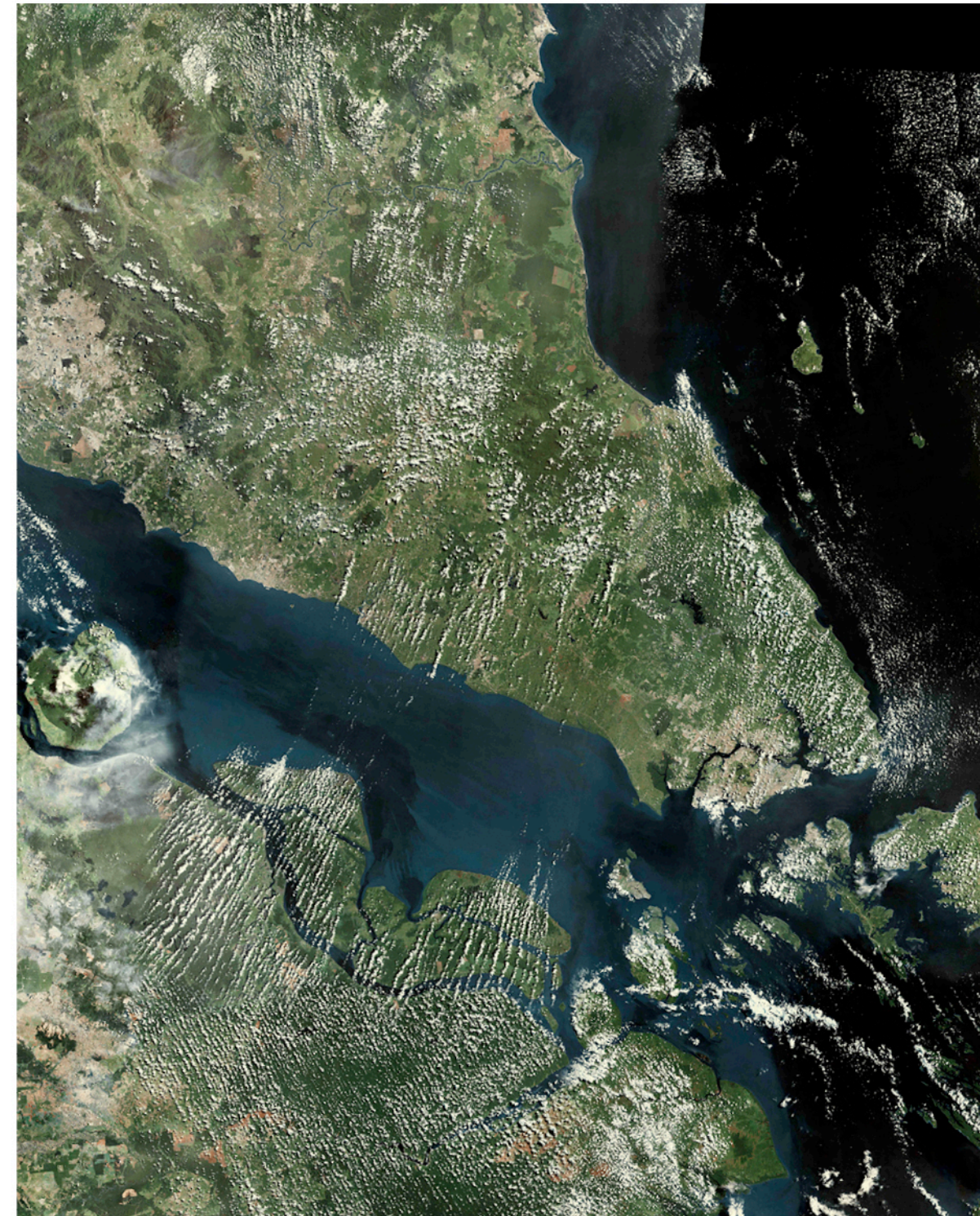


Type of Vessels in the Strait of Malacca (2009)



### Vessels in the Strait of Malacca

About a quarter of all oil carried by sea passes through the strait, mainly from Persian Gulf suppliers to Asian markets such as China, Japan, and South Korea. In 2006, an estimated 15 million barrels per day (2'400'000 m<sup>3</sup>/d) were transported through the strait. The maximum size of a vessel that can pass through the Strait is referred to as Malaccamax. The strait is not deep enough (at 25 metres or 82 feet) to permit some of the largest ships (mostly oil tankers) to use it. A ship that exceeds Malaccamax will typically use the Lombok Strait, Makassar Strait, Sibutu Passage and Mindoro Strait instead. At Phillips Channel close to the south of Singapore, the Strait of Malacca narrows to 2.8 km (1.5 nautical miles) wide, creating one of the world's most significant traffic choke points.







The Strait of Malacca and the Strait of Singapore (2012)

- 0-10 meters
- 10-20 meters
- +20 meters
- Main Fairway
- Turning and Crossing Areas



# History of the Port City

The British Empire comprised the dominions, colonies, protectorates, mandates and other territories ruled or administered by the United Kingdom. It originated with the overseas colonies and trading posts established by England in the late 16th and early 17th centuries. At its height, it was the largest empire in history and, for over a century, was the foremost global power. By 1922 the British Empire held sway over about 458 million people, one-fifth of the world's

population at the time, covered more than 33'700'000 km<sup>2</sup>, almost a quarter of the Earth's total land area. As a result, its political, linguistic and cultural legacy is widespread. At the peak of its power, it was often said that "the sun never sets on the British Empire".



Java, Sumatra, Borneo Map, Wagner & Debes Leipzig, 1914

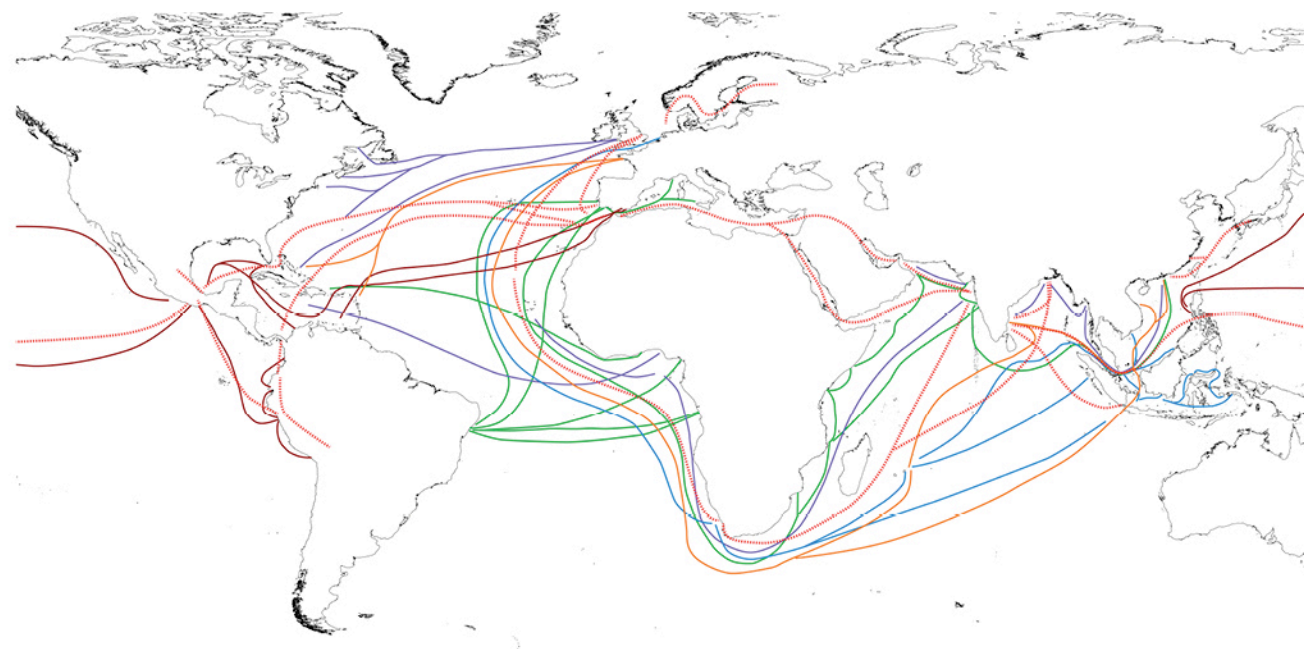


# Singapore as Strategic Location within the British Empire

In late 1818, Lord Hastings – the British Governor General of India – appointed Lieutenant General Sir Stamford Raffles to establish a trading station at the southern tip of the Malay peninsula. The British were extending their dominion over India and their trade with China was expanding. They saw the need for a port of call to “refit, revitalize and protect their merchant fleet” as well as to prevent any advances made by the Dutch in the East Indies.

After surveying other nearby islands in 1819, Sir Stamford Raffles and the rest of the British East India Company landed on Singapore, which was to become their strategic

trading post along the spice route. Eventually Singapore became one of the most important commercial and military centers of the British Empire. The island was the third British acquisition in the Malay Peninsula after Penang (1786) and Malacca (1795). These three British Settlements (Singapore, Penang and Malacca) became the Strait Settlements in 1826, under the control of British India. By 1832, Singapore became the center of government of the three areas. On 1 April 1867, the Strait Settlements became a Crown Colony and was ruled by a governor under the jurisdiction of the Colonial Office in London.



Colonial Maritime Trade Routes, 16-20th Century

- Dutch Trade Route
- Portuguese Trade Route
- French Trade Route
- English Trade Route
- Spanish Trade Route



Colonial Territories in Southeast Asia 19th Century

## Singapore Region: Borders and Connections throughout History

The territory of the Maritime Southeast Asia, or the Malay Archipelago as it is most commonly referred to, comprises Brunei, East Malaysia, Singapore, East Timor, the Philippines and Indonesia. For centuries, the Malay Archipelago has been a unified territory. Through colonial occupation, political borders have been introduced.

The first Malay empire, the thalassocratic Srivijaya, embraced the Malay Peninsula, Sumatra and parts of Java and Borneo, and reigned from the VII to XIII century. Through the appropriation of territorial waters, especially the Strait of Malacca located in the centre of the empire, the Srivijaya built a long and successful history of maritime trade with the Middle East, India, Southeast Asia and China. Srivijaya’s domination of both the Straits of Malacca and the Strait of Sunda gave them control over local trade and the traffic of the maritime Silk Road.

In the XV century, the relations with the Arab world brought Islam to the Malay. A power shift took place in around 1400 with the outset of the Islamic period, covering the territory of the Malay Peninsula, the Riau islands and parts of Sumatra. The Srivijayan prince and king of Singapura, Parameswara, was the founder of the new empire, transforming Srivijaya into Malacca. The sultan actively supported the spread of Islam by sending Muslim missionaries throughout the Hindu archipelago.

Shortly after, the fall of the Sultanate of Malacca and the Portuguese occupation in 1511 marked a crucial turning point for the area, ushering the period of colonization and parcelling of the once united territory. The religious rivalry prevented a peaceful agreement between the sultanate and the Portuguese: shortly after the occupation, a new sultanate was founded in Johor, side-by-side with the Portuguese Malacca.

With the increasing European colonization of Southeast Asia, the Malay territory was becoming increasingly fragmented. Through the Anglo-Dutch Treaty of 1824, the British and the Dutch dominions were established in the north and south. In this manner, the once unified region was irrevocably fragmented, following the lines drawn by the British in 1819. The independence of Indonesia in 1945, Malaysia in 1957 and Singapore in 1963, could not renew the weakened political ties between each geopolitical entities. The fragmented territory surrounding Singapore today represents a complex and paradoxical context marked by cultural unity, the need for economic alliance, and political rivalry.



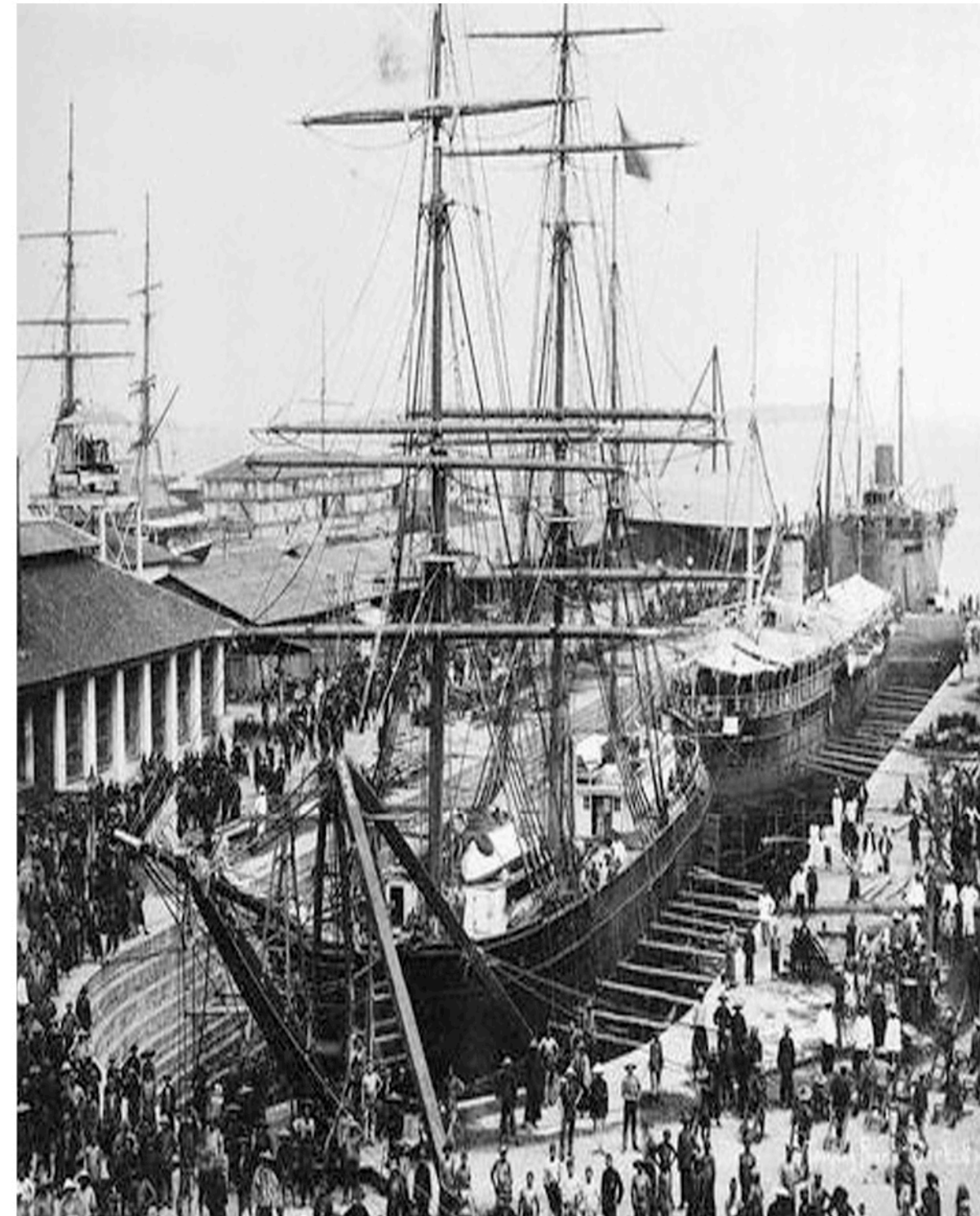
## Strait Settlements

During the subsequent decades, Singapore grew to become one of the most important ports in the world. Several events during this period contributed to its success. British intervention in the Malay peninsula from the 1820s onwards culminated, during the 1870s, in the formation of British

Malaya. During this period, Malaya became an increasingly important producer of rubber and tin, much of which was shipped out through Singapore. Singapore also served as the administrative center for Malaya until the 1880s, when the capital was shifted to Kuala Lumpur.



Main Ports along the Strait  
of Malacca  
Colonial Period



Opening of King's Dock  
1913



# Transformation of the Singaporean Harbour

Raffles made landing on the north bank of the river and discovered favourable conditions for the setting up of a colony. The area on the side of the river's north bank was leveled and firm, but the southern bank was swampy. The settlers found abundant fresh water, and the river itself was a sheltered body of water protected by the curved river mouth. The river was to become the nexus from which the new colony would thrive, and the immediate surrounding areas would form the core of the island's business and civic areas. As the settlement grew, many better-off fami-

lies moved to the East Coast, where they often operated plantations and maintained large sea-side homes near the beach at Katong.

The current planning policy of Singapore's Urban Redevelopment Authority (URA) is to create partially self-sufficient towns and districts, which are each related to one of four regional centres, or to Singapore Central Business District (CBD). These regional centres reduce traffic strain on Singapore's CBD by replacing some of the commercial otherwise fulfilled within the Central Area.

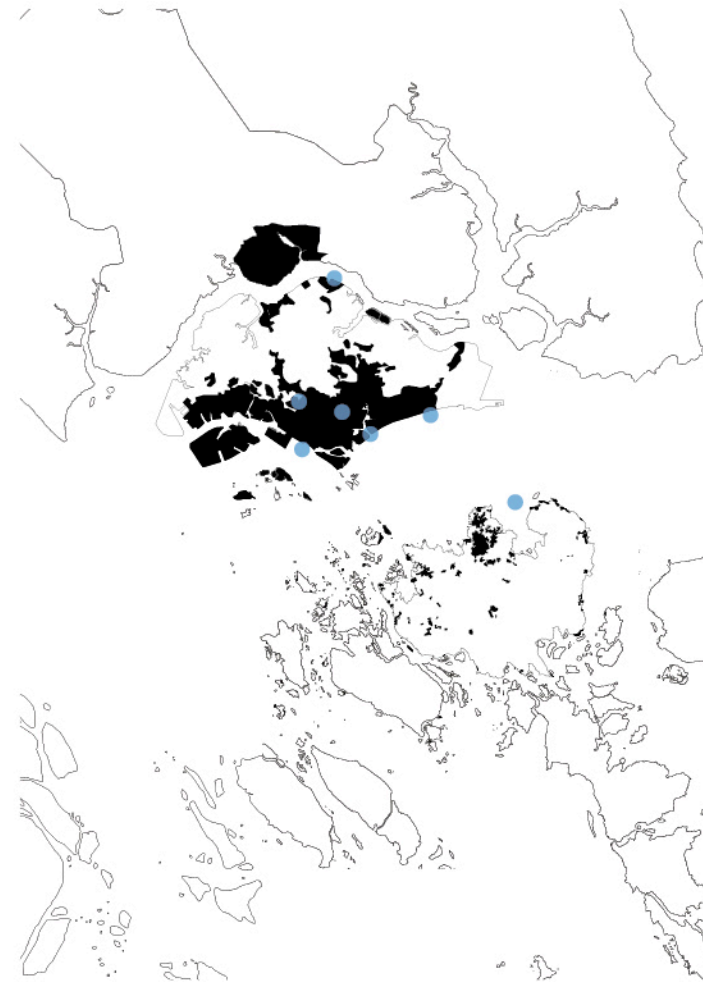


Settlements and Harbours

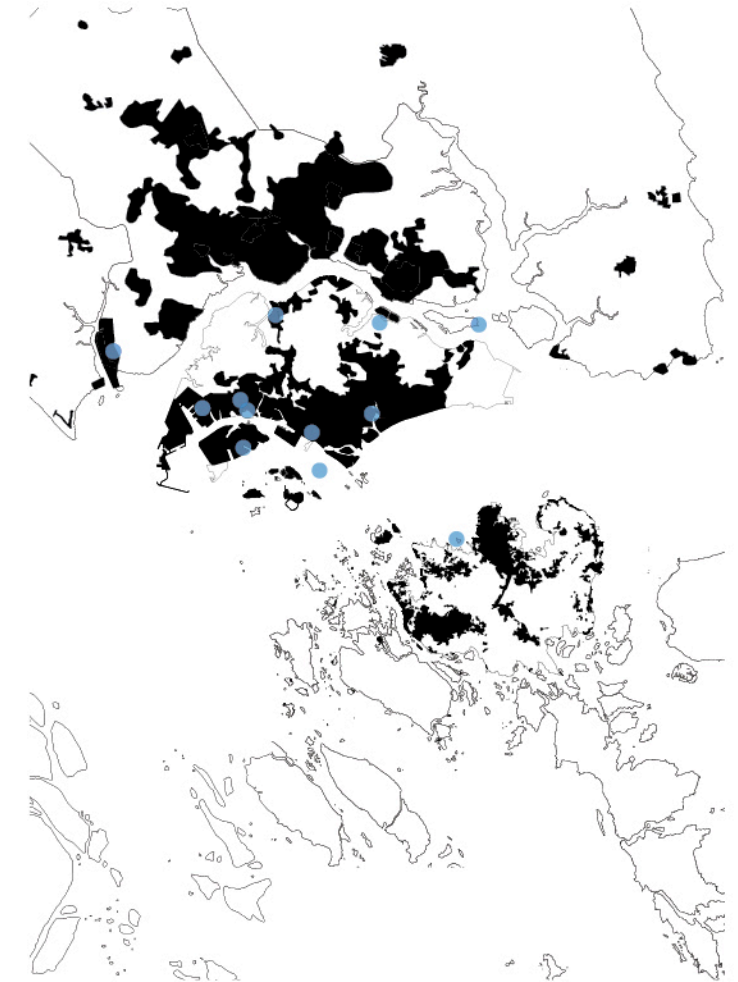
1900



1950



1990



2011



## The Container Revolution

In 1955, a North Carolina trucking entrepreneur, Malcolm McLean, acquired the Pan-American Steamship Company from Mobile, Alabama, a subsidiary of Waterman Steamship. Using a concept developed by Seatrain Lines in the 1930s, he initially favored the construction of 'trailerships'—taking trailers from large trucks and stowing them in a ship's cargo hold. This method of stowage, referred to as roll-on/roll-off, was not adopted because of the large waste in potential cargo space onboard the vessel, known as broken stowage. Instead, he modified his original concept into loading just the containers, not the chassis, onto the ships, hence the designation containership, or "box" ship. In January 1956, he purchased three T-2 tankers and oversaw the construction of wooden shelter decks, known as Mechano decking. This was a common practice in World War II for the carriage of oversized cargo, such as aircrafts. The first ship with containers, SS Ideal X, sailed from Port Newark, New Jersey, to Houston, Texas, on 26 April 1956 and opened a new age in cargo transportation. Shipping firms were slow to embrace McLean's concept. The conversion of existing ships provided the first generation of containerships. Many of these vessels, such as the C-3 freighters altered by Matson Lines in the Pacific, merely added lashings on deck for the securing of containers. The existing booms served as the means to load and unload the boxes. Yet, the addition of containers did not solve the problem of cargo throughput. A lack of standardization in container length and height persisted and forced dedicated service between trucking firms and shippers, precluding the introduction of true intermodalism—the seamless movement of cargo from shore to ship to shore. McLean's new company, Sea-Land, based on the East Coast, preferred thirty-five-foot-long containers, while Matson on the West Coast used twenty-four-footers. Not until 1961 did the International Standards Committee set up formal sizes: the twenty-foot equivalent unit (TEU = 20' length x 8' width x 8.5' height) and the forty-foot equivalent unit (FEU = 40' x 8' x 8.5').

A major technological improvement in the transportation of containers came with the introduction of cellular construction. The installation of vertical rails in the holds of ships, known as cell guides, in conjunction with high-speed shore cranes, made container handling quicker and more efficient. Yet, the transition to containerships did not always proceed smoothly. Grace Lines suffered a severe setback in their trade with the west coast of South America by introducing containers before the market could sustain them. In addition, they incurred the wrath of local labor when stevedores and longshoremen refused to move the containers for fear of losing their jobs. Many companies also faced the challenge of vessel replacement. As their war-built fleets were nearing the end of their service lives, many firms had to choose what type of ships to build. Some companies went with larger freighters, others preferred with barge carrying vessels, others with roll-on/roll-off ships. Even containerships did not prove to be the right choice initially. In 1960, American President Lines constructed two ships that represented a transition point from break-bulk stick freighters to true containerships. The Searacers provided for a mix of container transport and break-bulk cargo. The two conflicting systems of cargo transportation proved inefficient and incompatible, but, nevertheless, symbolic of the crossroads that the shipping industry faced in terms of technology. It was the Vietnam War that demonstrated the true value of the containership. To deliver the mountains of supplies needed to support the armed services, the Military Sea Transportation Service (today known as the Military Sealift Command) contracted with Malcolm McLean. In April 1966, Sea-Land initiated container service between the east coast of the United States and Bordeaux, France, and Hamburg, Germany, laying the foundation for modern trade.



Malcolm McLean



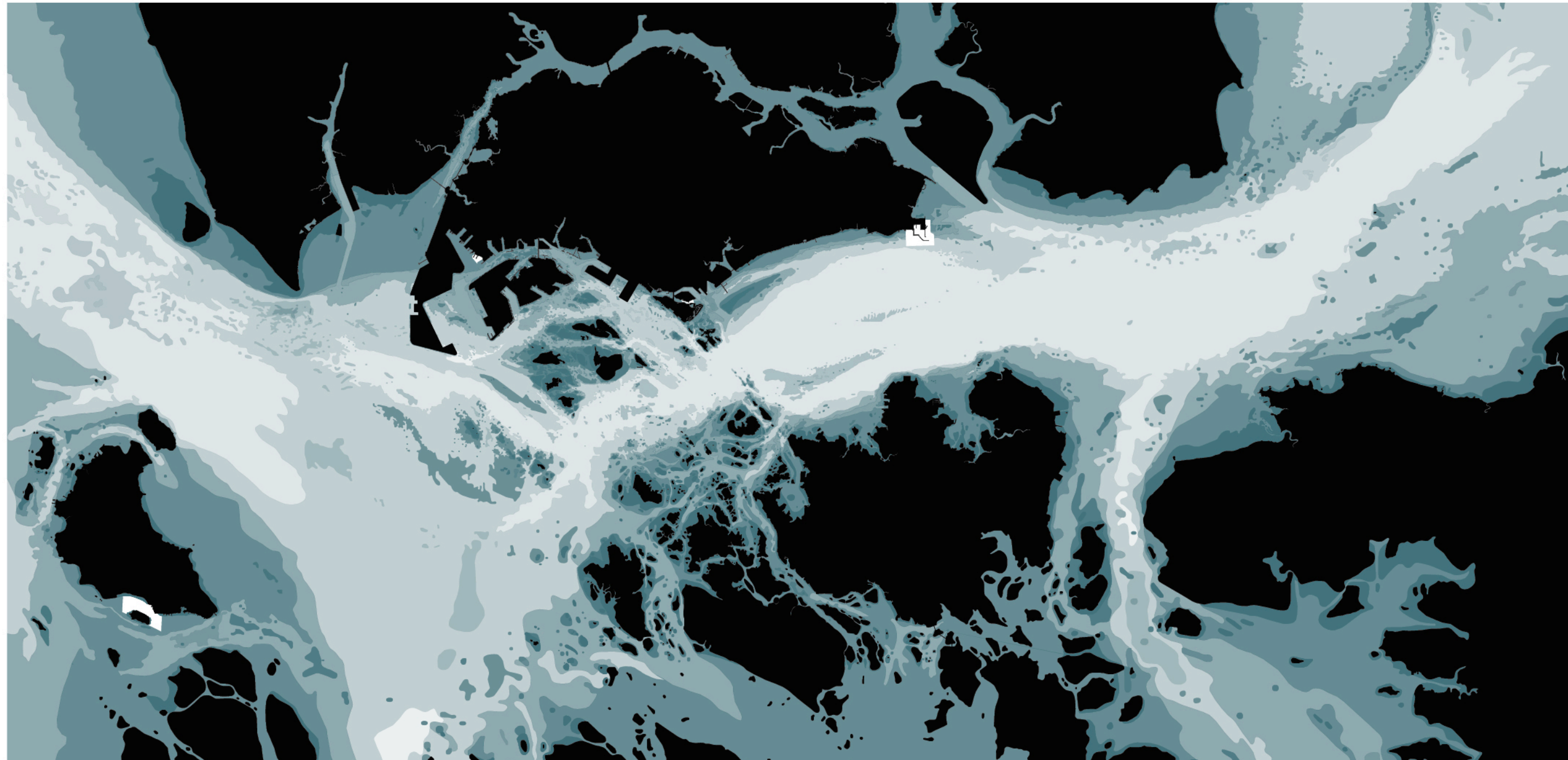
# The Strait as an Urban Territory?

Methods from urban planning are applied to analyze the Strait of Singapore. In a first step, natural conditions, external influences and spatial regulations are identified and possible impacts are taken into consideration. Besides the

obvious users, the shipping industry, several additional layers are introduced. The final result will be a complex structure, which follows similar patterns than an urban plan.







### Influence of the Depths

Compared to the neighbouring coasts, Singapore's natural conditions are optimal for port activities. On the western part of the south west coast the depths allow for the harbouring of vessels with a considerable draft. There are large zones with more than 30 meters depth, but the fact that they are disconnected limits the size of ships which can pass through the strait.

On the other side the Indonesian Islands Karimun, Batam and Bintan have wide swamps and areas with maximum depth of 10 meters, which is inconvenient for a harbour.

A similar situation occurs on the Malaysian parts of the strait. However, Malaysia made significant efforts to remedy to this situation by digging a channel that grants access to the port of Pelepas. The depths in the Strait of Johor in the north of Singapore does not allow the development of container harbour.



### Natural Conditions Define the Location of the Harbour

The most important factors to place a harbour were and still are natural conditions. When favourable natural conditions occur in a given space, significant savings can be achieved for the construction and maintenance of a port. Disregarding natural conditions when building of a harbour may lead to continuous submarine excavations and the need for dams to be constructed.

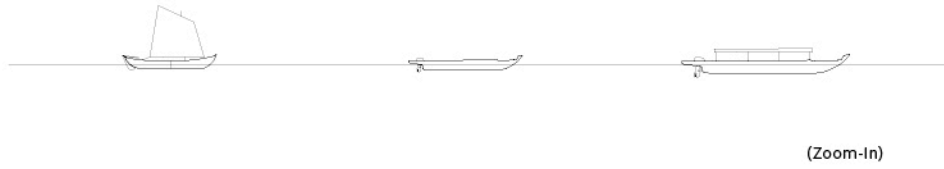
In Batam where most of the coastal areas are shallow, extensive constructions are providing constant access to areas with sufficient depth of the sea where boats can land.



Accessibilities

Small Crafts

A small craft is a boat used for personal, family, and sometimes sportsmanlike recreation. Typically such watercraft are motorized and are used for holidays, for example on a river, lake, canal or waterway. Pleasure craft are normally kept at a marina. They may include accommodation for use while moored to the bank.



Ferries

A ferry is a boat or ship used to carry primarily passengers, and sometimes vehicles and cargo as well, across a body of water. Most ferries operate on regular, frequent, return services. A passenger ferry with many stops, such as in Venice, is sometimes called a water bus or water taxi.



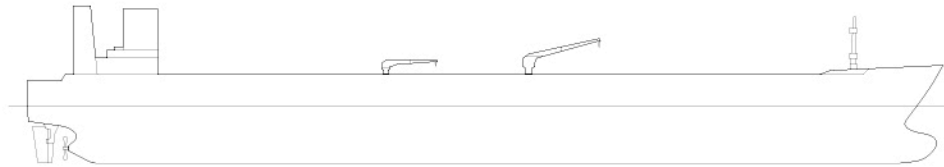
Container Vessels

Container ships are cargo ships that carry all of their load in truck-size intermodal containers, in a technique called containerization. They form a common means of commercial intermodal freight transport.



Very Large Crude Carriers

'Supertanker' is an informal term used to describe the largest tankers. Today it is applied to very large crude carriers (VLCC) with capacity over 250'000 DWT. These ships can transport 2'000'000 barrels (320'000 m3) of oil/318'000 metric tons.



0 - 10m



10 - 15m



15 - 20m



20 - 30m





▶ Current Measurements

**Weak Currents around Singapore**  
 One of the most important factors for a successful harbour is the possibility for a slow approach of the vessels to Jetties or anchorage points. Even if there is sufficient depth, a strong current can hinder the proper operation of a harbour.

The strait of Malacca has many points with sufficient depth for a harbour but only few of these points are protected enough from the strong current coming down from north. As the strait of Singapore is a turning point for the currents coming from the Strait of Malacca and the South China Sea, currents are slowed down considerably at this point. The currents coming from the Strait of Malacca continues passing between Karimun and Batam, while the currents coming from the South China Sea joins to two other currents; a slower one passing through the Strait and a faster one

flowing southward between Batam and Bintan.

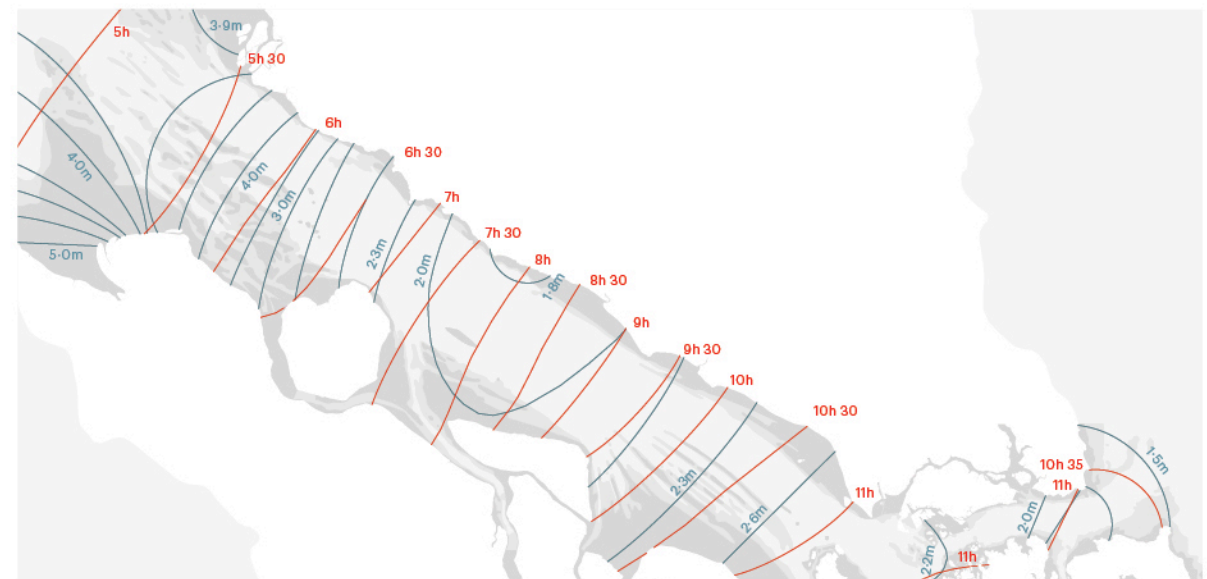
In the case of Singapore the islands in front of the southwestern coast helps to maintain acceptable current velocities. To improve these favourable conditions, Singapore started the reclamation of Tuas. This new terminal provides calm waters to the western coast of Jurong island.

**Moderate Tidal Conditions**

After considering depths and currents, the most important requirements for efficient harbours are favourable tidal conditions. This means slow tidal changes and a small range of difference in terms of water spring. With a water level change of four meters in a time of five hours, the north entrance has the worst values concerning tidal variances.

In these aspects Singapore has a change interval of eleven hours between low tide and high tide, which means that the harbour has enough time to react to unforeseeable phenomena from the sea.

The main spring range in front of Singapore is around 2.2 meters, which compares to the Strait of Malacca. This makes the draft planning of the harbour more precise and allows more conveniences during the construction because the obligatory inclusion of many security factors decreases.



— Main High Water Interval (h)  
 — Main Spring Range (m)





### Border Management

The Strait is a water space managed by Singapore, Indonesia and Malaysia. The management of the water space does not correspond to national borders. The fairway contains water space belonging to the three countries and is regulated by the international water laws. So the actual management of the national waters starts at the borderline of the fairway. Malaysia has three ports on the Strait and an authority agency for each of them. The harbours are Tanjung Kukup, Tanjung Pelepas and the Johor Bahru Port which frontiers directly the borderline to Singapore.

The Maritime Port Authority (MPA) is the only instance for the management of the water space. The fact that this space overlays with the spaces managed by the port operator (PSA), the Jurong Town Corporation (JTC), the Police Coast Guard (PCG), the National Environment Agency (NEA) and the Ministry of Defense (MINDEF) adds a great complexity to this country's small water territory.





#### Spaces of Control

The strait of Singapore is a very small space in comparison to its global importance. The interests of the three countries which are placed on it are represented in its strong regulation and deployment of security forces. Because of its harbour, Singapore is the most organized area on the strait. But Malaysia also has a very regimented and differentiated regulation of its waters.



#### Pulau Nipa

Pulau Nipa is a military island from Indonesia that is situated inside of the Fairway. Originally it was a swamp area with two peaks, but the Indonesian armed forces reclaimed it to two islands which are connected by a street.

Its strategic value lies on how close the island is to Singapore and also on its position inside of the Fairway. The closeness to Singapore gives the Indonesian military a clear visibility to the Singaporean islands, specially to Pulau Sudong, Pawai and Senang which are themselves military islands. So the primary task of the operators resides clearly in observation. There are often spectacular live firing tests in the water space of Pulau Pawai and Sudong which can easily be watched.

The situation on the Fairway also give considerable importance to Pulau Nipa. Every vessel that passes through the strait of Singapore has also to pass quite near to Nipa. The Nipa transit which is a big zone dividing the Fair in two parts is an area controlled by Indonesia which is officially meant for anchorage of accidented vessels. Still the space is clearly controlled by the military. In any case the Island of Nipa gives a certain control of a crucial segment of the strait of Singapore to Indonesia.



#### Pedra Branca

In their letter of July 24, 2003 to the registrar of the International Court of Justice, Malaysia and Singapore requested a decision that would determine sovereignty over several small features in the eastern entrance of the Singapore Strait: Pedra Branca/Pulau Batu Puteh, Middle Rocks, and South Ledge. In assessing the history of this region, the Court concluded in its judgment of May 23, 2008, that as of 1844, Pedra Branca/Pulau Batu Puteh "was under the sovereignty of the Sultan of Johor", the predecessor to Malaysia, but that by 1980 sovereignty over Pedra Branca/Pulau Batu Puteh had passed to Singapore". Taking this history and other factors into account, the Court found "that sovereignty over Pedra Branca/Pulau Batu Puteh belongs to the Republic of Singapore" (twelve votes to four), "that sovereignty over Middle Rocks belongs to Malaysia" (fifteen votes to one), and "that sovereignty over South Ledge belongs to the State in the territorial waters of which it is located" (fifteen votes to one).





### Submarine Infrastructure

The Strait of Singapore evokes the image of a water space overpopulated with ships that separates the Riau Archipelago from Singapore. Rarely someone thinks of a submarine space connecting Singapore to its surrounding more than separating it. The submarine space also contains information about the tidying efforts of different nations.



### Submarine Pipelines and Cables

The pipelines mainly connect Singapore with the oil and gas islands of Jurong and Bukom. There is a gas pipeline going out from Pulau Jurong along Indonesia to Borneo and along Batam to the south. The other special pipeline is the going out of Pulau Bukom to a much deeper area. This is buoys bunkering point provided by Shell.

Most of visible cables are communication cables. They are bundled on the areas managed by the MPA and fairly dispersed on the fairway. Most of the cables going out of Singapore go through a channel in Changi, which is specially assigned for them by the

MPA. The internal cables connect the southwestern Singaporean archipelago with the main island.

There are many anchoring and fishing prohibition zones on the Strait. The most visible are least regulated and located on the zone of gas pipeline in Indonesian waters. The rectangles on the borderlines of Indonesia are disused explosive dumping grounds. The two zones on the Malaysian side are there to keep the entrances of the Port of Johor Bahru and Tanjung Pelepas clear.





Vessels on the Strait  
25.5.2010

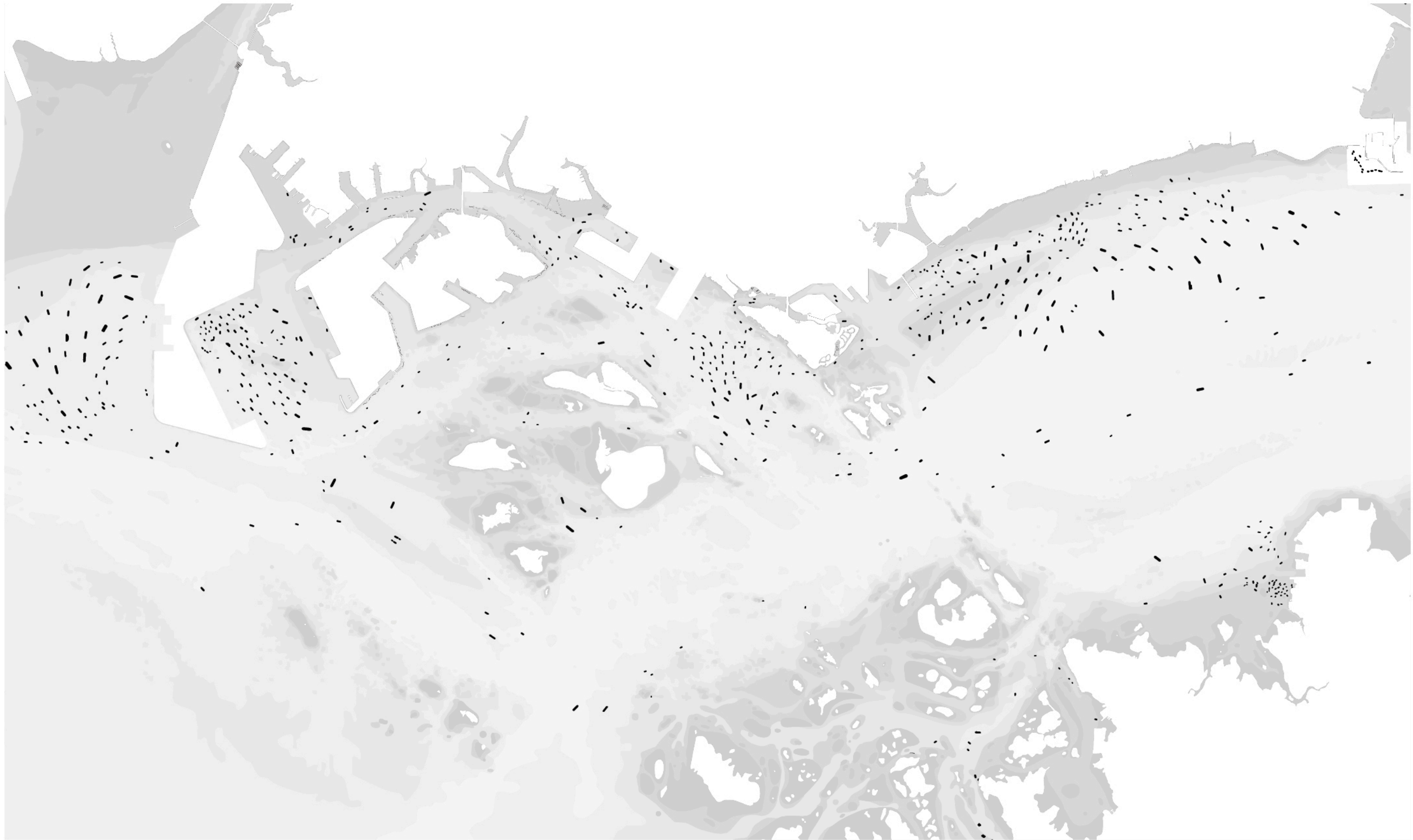
### Space of Shipping

The main users of Strait of Singapore are container ships, oil and gas vessels. Once on the Strait the ships have to consider some regulations such as the assignment of anchorage zones or a jetty. At night, they should consider the guiding lights which mark the way to the different zones.

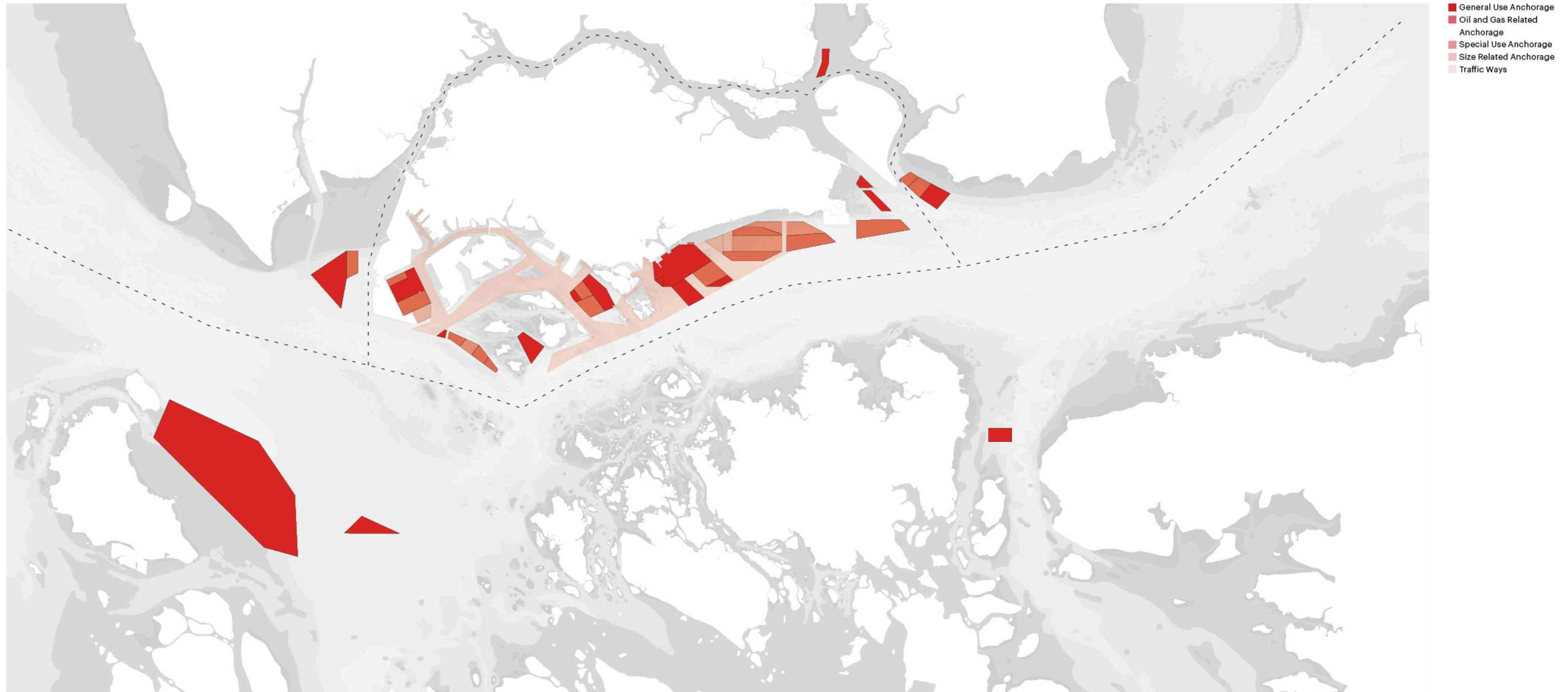
The huge amount of ships passing through the strait continuously is very difficult to perceive. But there are different applications which can help to track nearly all vessels which are on the waters of the strait. On the google satellite image dated the 25.5.2010 there are 728 vessels on the strait. Of course there are many more small craft vessels which are very difficult to locate because of their size on this scale.

By locating these ships and contrasting them to the water somehow a kind of figure ground appears. The vessel can be read as inhabitants or as buildings of the urban territory of the strait.









#### Anchorage Space

The anchorage zones have different uses. There are some general uses that most of the harbours have like holding areas.

Of course in the case of Singapore there are special anchoring points for Petroleum ships as well as for gas ships, which are mostly situated at the western part of Jurong island. Bunkering zones are meant as waiting space for ships which need to be provided with fuel until a bunkering ship comes.

The special use zones are used for unforeseeable difficulties like lack of anchoring points or dangerous goods, but gener-

ally port master directly guides the ships in this zones.

Ships with particular sizes have determined anchoring zones. The Very Large Crude Carriers have an assigned zone at the end of the Tuas reclamation. The small craft vessels have their zones in front of the East Coast beach.

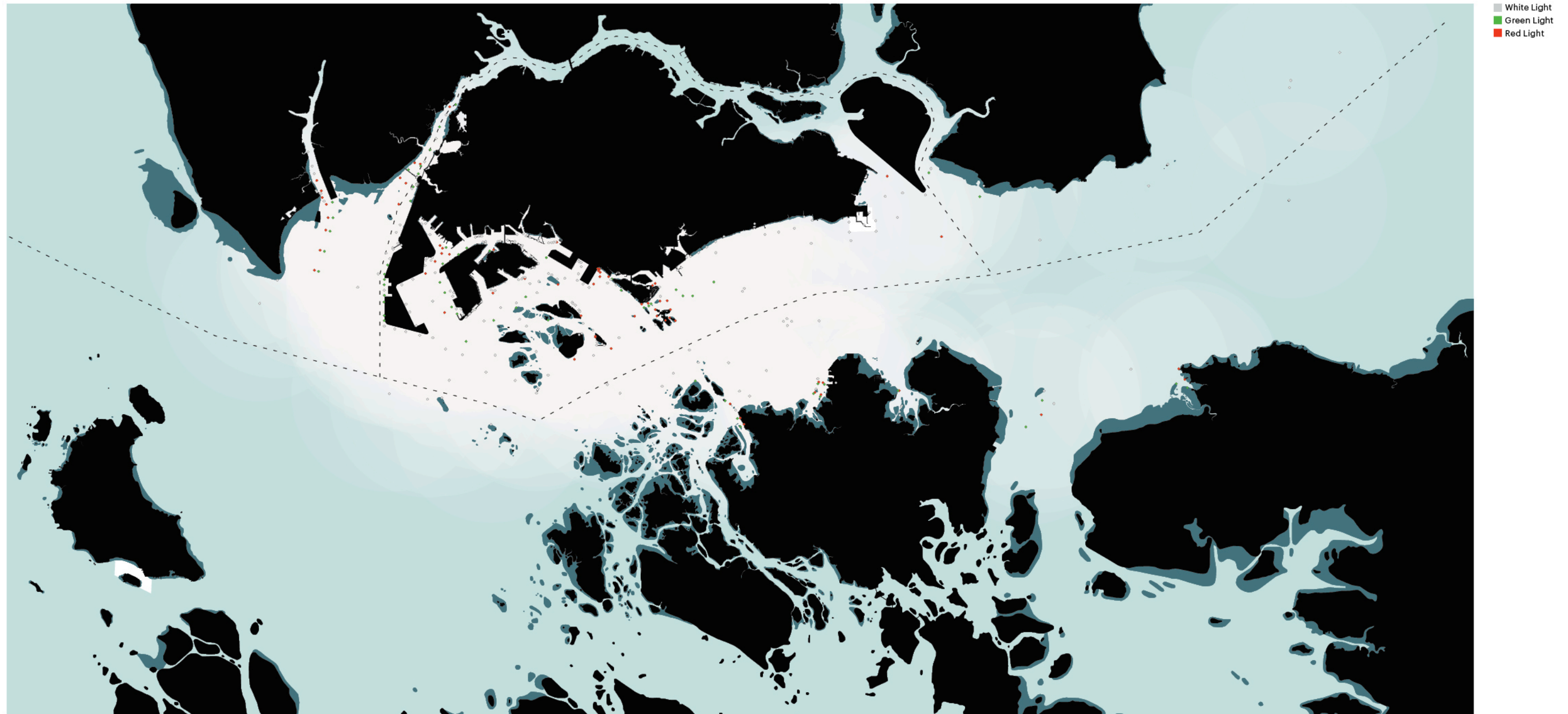
The spaces specifically meant for the traffic of vessels inside the borders of the MPA never frontier directly any land area and have strict velocity limitations.

In general the port master is oversees all the ships which are within the borders of the MPA.







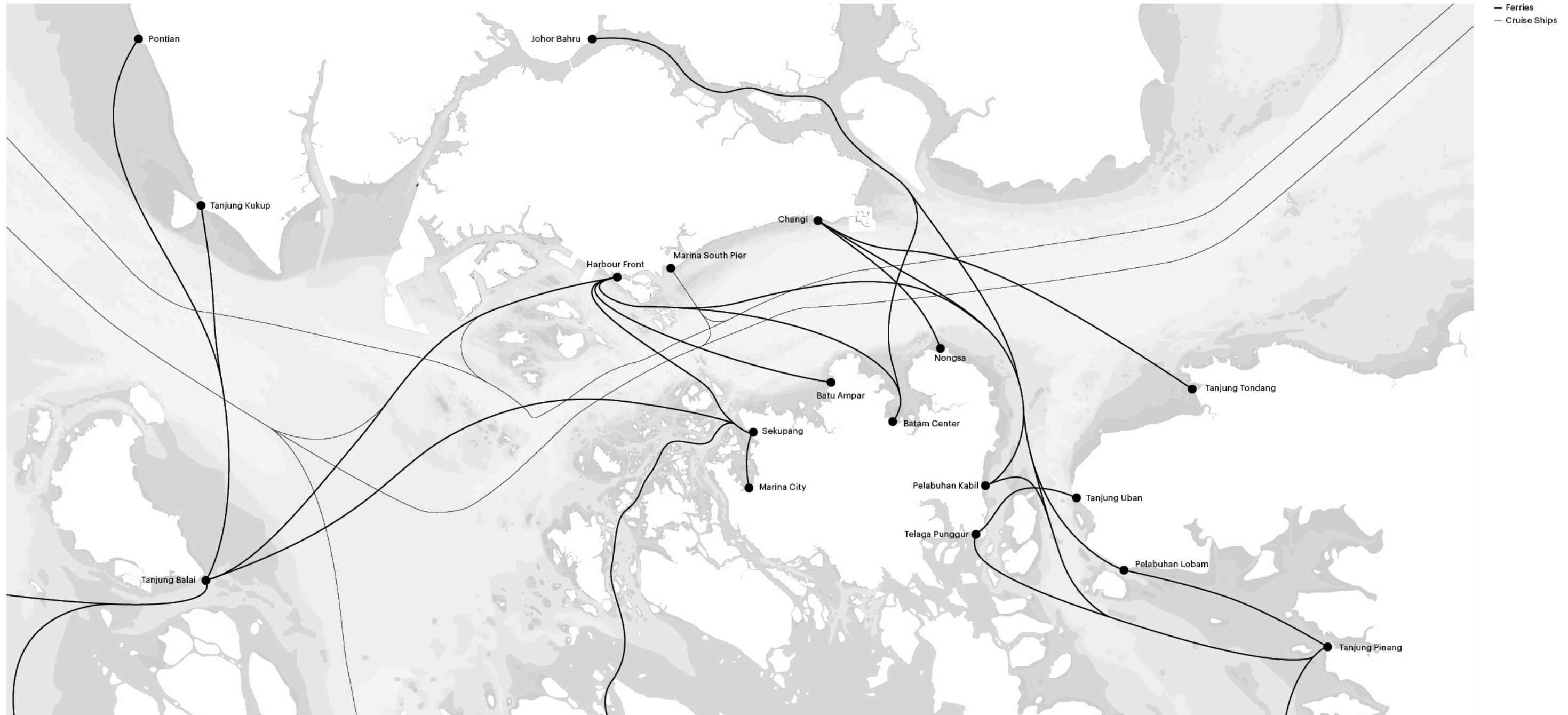


#### Illumination of the Straits

At night the visibility of the harbour routes is obstructed, so lights have to take the task of guiding the ships securely through the changing depths of the harbours.

Like night satellite views where the intensity of illumination of a territory correlates with grade of urbanisation, satellite images of the Strait of Singapore clearly show the areas with the most activities. The illumination in the port of Singapore has also to do with the small space in which a vast amount of ships have to be guided, which also means that more light correlates with more organisations.





### Space of Passengers

Opposite to the commercial shipping traffic there is also also a crossborder traffic. The ships have to use specific ways on the fairway, which are meant for them to cross without any dangerous interference with the main traffic. Some passenger ships are following the main traffic but stop at the same spots as the cross border ships.

Due to the fact that Singapore is a popular tourist destination and the continuous growth of the cruise ship industry, the arrival figures in this ship category are increasing. The docking point is located at Harbour Front, although a new cruise ship terminal is currently under construction near South Pier.

Most of the ferries to Batam are going from Harbor Front and the Changi ferry terminal to the harbours of Batu Ampar and Batam Center. The points to cross the fairway are in front of Sentosa that means very near to Harbor Front and in front of Changi. The other connections also have fix departing times despite having much less passengers.





- Leisure World
- Ferries to Leisure World
- Yacht Harbour
- Sport Fishing Sites
- ▲ Diving Sites

### Leisure Zones

Being such a regulated zone it is quite surprising that the Strait of Singapore has spaces for leisure activities. Even more surprising is that some of these activities take place in the already overpopulated and very restricted areas of the MPA. This coexistence of leisure, military and commercial affected zone so near to each other shows a specific grade of interaction of different intention in this territory.

### The Strait's Leisure Activities

The diving points in front of Singapore lie very near to the live firing areas of the ministry of defense and are also object of various boats driving over them. The special experience a diver can get here is a dive very near to industries and industry affected diving sites.

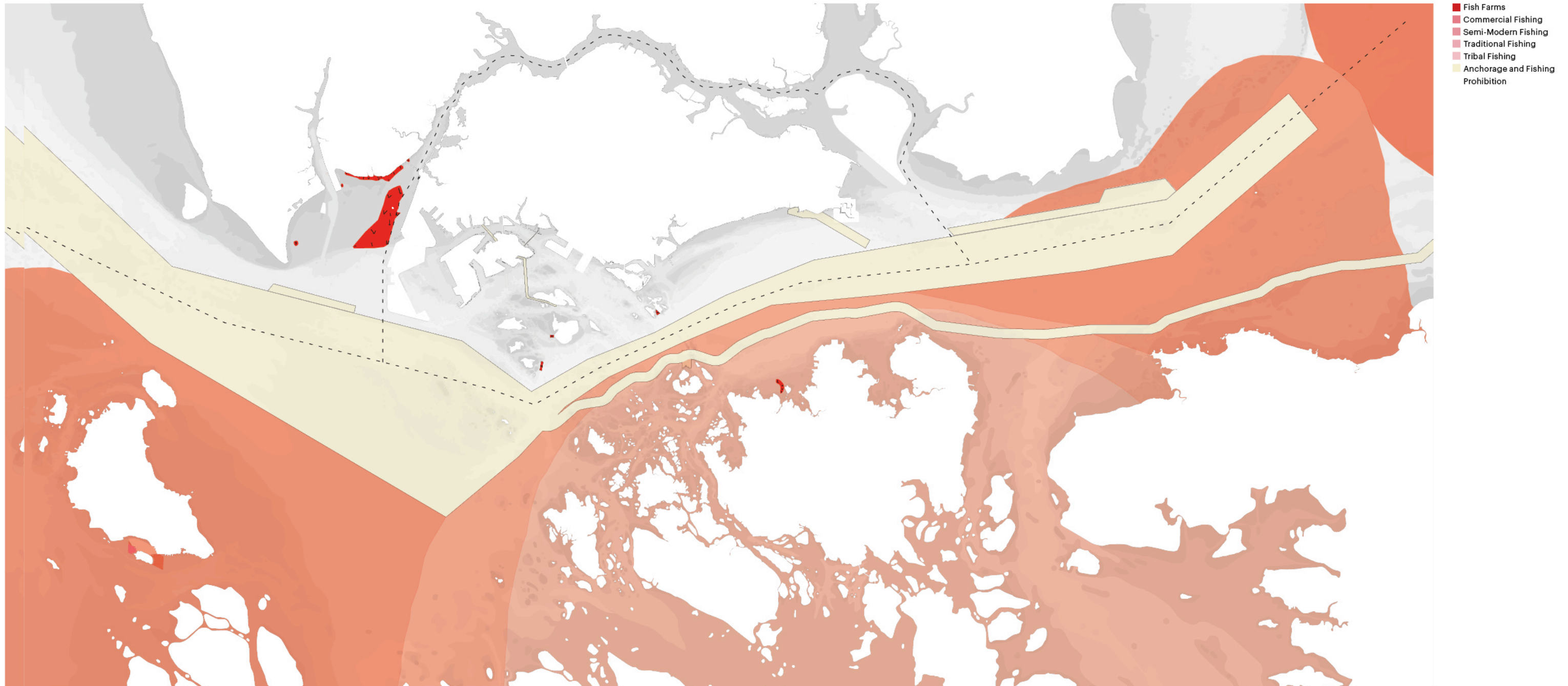
Leisure World is a casino ship which goes from Pasir Gudang through the borderline of Singapore and Malaysia to international waters with the idea of evading the Malaysian laws of gambling prohibition. The ship has everyday more than 200 customers on board. There is a ferry coming from Changi which brings people from Singapore first to Nongsa where Indone-

sian people are joining and then to the Leisure World already on international water.

The sport fishing sites are mainly situated on Singaporian natural reservoirs along the coast. The idea is enjoying the art of fishing without killing the animals. So after catching a fish the fisher normally take a picture and releases it to its freedom. There are some sport fisher spot on Batam and Bintan but they are to informal to locate them precisely.

Singapore has some important Yacht harbors on its coast. The biggest of them is situated on the eastern part of Sentosa.





### Fishing Territory

Indigenous people of Malaysia, Singapore and Indonesia have always used the water of the Strait as a fishing ground. Nowadays this use has decreased specially on the Singaporean and Malaysian side due to the fast growth of the port of Singapore and the pollution that ensued. Batam, Bintan and Karimun did not develop as much as its neighbours and therefore traditional fishing prevails to this day.

Fishing Grounds in the Strait of Singapore is divided into different categories: Tribal and traditional fishing grounds serve as a primary nutrition source for the local community, relying on an undistracted accessibility towards the sea.

This does result in conflicts with other users of the Straits, for example the professional shipping industry and commercial fisherman. Professional fishing is characterized by the use of large vessels and a large capital expenditure.





- South Seasonal Route
- East Seasonal Route
- West Seasonal Route
- North Seasonal Route

### Aquatic Living Space

The strait of Singapore is often seen as a zone that is purely about commerce. But the water space in the north of Batam is used from time to time as a living space by people living on their boats and following their traditional routes.

### The Sea Gypsies

The tribal Malay, the 'Suku Laut' (the sea people) or more commonly known as the sea gypsies, usually move amidst the unpopulated islands of the archipelago. Entire families share a canoe as their home. Their trajectories are related to the seasonal winds, that influencing the sea currents and the fish stocks. The Suku Laut is the poorest and the less respected group among indigenous inhabitants. Governmental attempts to settle the nomadic tribes have all failed.

The 'Rumah-Rumah Terapung' are sea-based houses built like a pontoon with four strong and adjustable chains hooked on the seabed. Those houses have the ability to float on the water following the movement of the tides. Floating houses that can serve as fishing boats are also built. They can move individually or assemble with others on the coast.

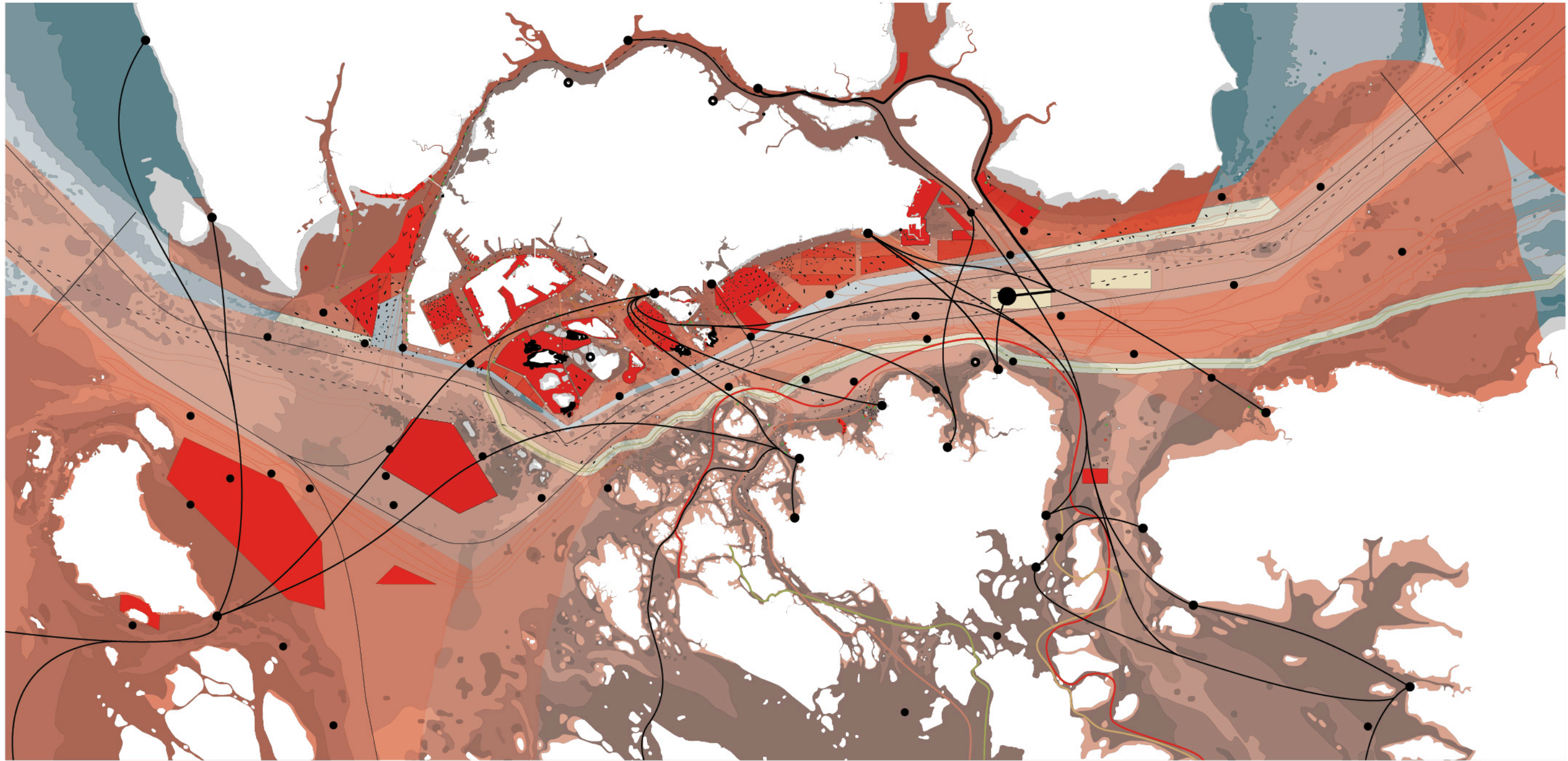




### Piracy

Despite heavy control on the Singapore Strait, acts of piracy have been recorded on these waters. As the authority noticed that most of the pirates were Indonesian, their government was under pressure to invest more money in counter-piracy naval operations. Nowadays there are still some single attacks on the Strait.





### The Urban Plan of the Strait of Singapore

The urban plan combines all the different layers that were introduced in the previous sub-chapters. As a result we get a complex structure of different functions and organisation patterns forming a certain tension against each other but also creating a high diversification of the territory.



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