Thanks to land reclamation, the tiny red dot has broadened its shores substantially. Lim Tin Seng discovers just how much Singapore has grown since colonial times.

Over the past two centuries, Singapore’s land area has expanded by a whopping 25 percent—from 58,150 to 71,910 hectares (or 578 to 719 sq km). This gradual increase in land surface is not because of tectonic movements or divine intervention, but rather the miracle of a man-made engineering feat known as land reclamation. The quest for land is as old as time immemorial; one of the reasons nations go to war is to gain new territory to support a growing population. Land-scarce Singapore, however, has elected to create new land by reclaiming it from the rivers and the seas.

**Boat Quay: The First Reclamation Project**

Many people think of land reclamation in Singapore as a fairly recent phenomenon, but in actual fact the earliest reclamation project took place in colonial times. When Stamford Raffles landed at the mouth of the Singapore River in January 1819, the lay of the land was vastly different from what we see today. The river was flanked by mangrove swamps and mosquito-infested jungle, and what is now Telok Ayer Street and Beach Road were coastal areas that hugged the sea.

It did not take long for the British to get down to business. Singapore was officially claimed by Raffles as a colony, and just four years later, the island witnessed the first of its many topographic transformations. The first land reclamation project in Singapore took place in 1822 at the south bank of the Singapore River. Initially, Raffles had eyed the Esplanade-Rochor River beachfront, north of Singapore River, as the commercial district. But as the area was unsuitable for shipping activities due to shallow waters and the surf, Raffles altered his town plan accordingly.

As work on the foundation of the first buildings constructed along Collyer Quay were linked at the second storey by a verandah that faced the sea. Peons armed with telescopes would be stationed along the verandah to announce the arrival of their company ships. Collyer Quay was built on reclaimed land by convict labour and completed in 1864. Courtesy of National Archives of Singapore.

Collyer Quay: Creating the Waterfront

Boat Quay and Commercial Square grew rapidly. By the late 1840s, the mercantile community had outgrown the site, spilling over to another reclaimed strip of land to the south. Known as Collyer Quay, this stretch— from Johnston’s Pier to the old Telok-Ayer Market—was reclaimed between 1859 and 1864. This was part of a scheme conceived by the Municipal Engineer, George Chancellor Collyer.

Collyer wanted to build a seawall to serve as a landing site and a road behind it so that merchants could have their establishments facing the waterfront. This would not only improve the aspect of Singapore’s waterfront, but also allow the merchants to keep an eye on the movement of ships carrying their goods. Indeed, some of the first buildings constructed along Collyer Quay were linked at the second storey by a verandah that faced the sea. Peons armed with telescopes would be stationed along the verandah to announce the arrival of their company ships.

As work on the foundation of the seawall could be carried out only when the tide was at its lowest ebb, an occurrence that took place once every fortnight, the
reclamation proceeded at a glacial pace. It took three years for the seawall to be completed and another year to lay the road behind it.1

First Reclamation at Telok Ayer: Redrawing the Coastline

In the late 1800s, Collyer Quay was further expanded with the Telok Ayer Reclamation Scheme was commissioned. Completed between 1879 and 1897, it altered the shore- line of Telok Ayer by extending it seaward with a 42-acres tract. The aim was to create new land so that thoroughfares, including Cecil Street, Robinson Road and Raffles Quay, could be built to link the commercial district and the new port at Tanjung Pagar via Telok Ayer.12 Prominently, these two areas were cut off by the hills of Mount Wallich, Mount Palmer and Mount Erskine, making the movement of goods between the port and town cumbersome.13 This reclamation project was a com- plex one as the Public Works Department (PWD) had to blast out parts of Mount Wallich and Mount Palmer in order to create an opening into Tanjong Pagar. The earth from the excavations was then used as landfill to create Telok Ayer Bay. The work was not to be easy as the hills were rocky and the sides had to be cut and graded. In addition, the shoreline had to be drained while keeping a section of it accessible so that fishermen could continue their trade. By 1886, the stretch extending into Cecil Street was completed, allowing the colonial government to start leasing the reclaimed land to merchants.10

Second Reclamation at Telok Ayer: An Unexpected Tidal Basin

As merchants moved into the reclaimed lands of Telok Ayer, commercial activities began to expand westward. This led to the development of Tanjung Pagar and the growing importance of New Harbour (named Kepel Harbour in 1900) as the main port-of-call in Singapore.11 However, many ships were cut off by the hills of Mount Wallich, Mount Palmer and Mount Erskine, making the movement of goods between the port and town cumbersome.13

The plan for the new harbour, unveiled in 1902 and revised in 1904, was drafted by the engineering firm Cooke, Son & Matthews, and entailed reclaiming an 88-acre tract with a 5,000-ft-long sea- wall that stretched from Johnstone’s Pier to Tanjung Malang where Palmer Road stands today. The initial plans were more ambitious but, in the end, the authorities decided to scale back their plans due to budgetary constraints.26

Work began smoothly at first but in 1910, problems began to surface when dredging operations commenced. When engineers discovered that the seawall was sinking, work was suspended. At the time, 85 out of the 88 acres of land had been reclaimed and 4,120 feet of the seawall erected. However, as the construction of the seawall had been carried out simultaneously on both ends, the engineers were left with an incomplete seawall and a gaping 86-ft space in between.28

To salvage the project, engineers reinforced the foundations of the seawall and allowed it to settle for the next 10 years. Therefore, the unclaimed area would be converted into a tidal basin for anchoring small vessels with the gap in the seawall serving as an entrance.31 Construction resumed in 1930 and was completed in 1932.30 By then, the cost of the project had ballooned from 2.5 to 15 million Straits dollars.2

Kallang Basin and Beach Road

The hefty cost of the Telok Ayer Tidal Basin project did not stop the colonial government from commissioning more reclamation projects. In August 1931, it unveiled a massive reclamation project at Kallang Basin for the construction of Kallang Airport. Costing 9 million Straits dollars, it involved the reclamation of 339 acres of mangrove swamp dubbed “the worst mosaic-inflected land on the island”. Due to the complexity and cost, the PWD was asked to lead the project. And perhaps to prevent the repetition of the Telok Ayer Ayer Basin fiasco, the PWD first had to blast out parts of Mount Merah Besar. It would take another 30 years before any work began, a pilot project was carried out by the HDB in 1963 to reclaim 48 acres in the Bedok area.

Work on the East Coast Reclamation site began officially in 1966 and would continue for a remarkable 30 years over seven phases.23 Phases I and II from Bedok to the tip of Tanjong Rhu took place between 1966 and 1971, resulting in 458 hectares of land as well as a 9-km stretch of sandy beach.

LAND RECLAMATION: HOW DOES IT WORK?

The proposed site for reclamation is first investigated to determine seabed conditions, availability of fill materials as well as the shape and alignment of the reclaimed area. Environmental studies are then carried out to assess the impact on water quality, water level, tidal flow, sedimentation and marine life.

Work proper begins with the erection of containment dykes made of sand and rock around the perimeter of the area to be reclaimed. Materials such as cut-hill soil, sand and clay are then transported from other sites to fill the enclosed area. The newly reclaimed land must be allowed to settle naturally over time before any structures can be built. In most cases, however, the process is speeded up with soil improvement methods.

Since the first reclamation project carried out in 1822, fill materials have significantly increased as soils excavated from inland hills and sand dredged from surrounding seabeds.

By the mid-1980s, however, these resources began to run out and Singapore had to import sand from neighbouring countries. This soon became a problem when the cost of foreign sand skyrocketed from less than $20 per sq m in the 1970s to $200 per sq m in the 1990s. The situation hit critical levels when Malaysia and Indonesia banned the export of sand to Singapore in 1997 and 2007 respectively. Although Singapore had to turn to other countries for sand, it recently developed a more sustainable method that has reduced the amount of sand needed for reclamation works. Called embanking, it has since been successfully deployed by the HDB for the on-going reclamation of Pulau Tekong.

Reclamation work taking place at Pasir Panjang. With rising costs and restrictions on sand exports planned by neighbouring countries, Singapore has developed technologies to try reduce the amount of sand needed for reclamation. Photo: Ria Din/Courtesy of Wildsingapore.

The Beach Road and Esplanade recla- mation project carried out in 1968 was one of the first large reclamation projects in Singapore. When completed in October 1971, the project added 486 hectares from Bedok to Tanah Merah Besar.

Phase V involved the reclamation of Telok Ayer Basin. Starting in 1974, it extended the already reclaimed foreshore by 34 hectares and expanded the basin.
On completion of this phase in 1977, the coastal land at Pasir Ris was transferred to the Urban Redevelopment Authority (URA). The city centre was planned to be developed around a waterfront promenade. The site was developed with commercial and residential developments, a mega hotel and casino called Marina Bay Sands, a massive lagoon, and Marina Centre and a massive lagoon. This was followed by several other reclamation projects in 1979 and 1980, 277 hectares of foreshore and swampland were reclaimed from Clementi.36

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New Lands for Industries: JTC

The reclamation projects undertaken by JTC in the west of the island were mainly for industries. The earliest project took place in 1963 to reclaim 46 hectares of land for the Jurong Industrial Site. This was followed by a string of reclamation projects in the 1970s that added over 2,000 hectares in Jurong and Tuas. These lands were used for the expansion of the industrial estate as well as for the construction of shipyards to support the marine sector. In the late 1980s, the Tuas site was further extended by 650 hectares, and a golf course and a park subsequently added to inject some greenery to an otherwise industrial area.40 JTC’s reclamation works also extended to the islands off the southwestern coast. From the late 1980s, Pulau Bukom and Pulau Busing were enlarged, while Pulau Ayer Merbau, Pulau Seraya and Pulau Sakra were merged with the surrounding islets to provide new land. Most of these reclaimed islands were used for the petrochemical industry.41 As the industry grew, JTC embarked on a reclamation scheme of mega proportions in 1993, morgan seven southwestern islands – Pulau Merlimau, Pulau Ayer Chawan, Pulau Ayer Merbau, Pulau Seraya, Pulau Sakra, Pulau Pesek and Pulau Pesek Keil – into a single entity called Jurong Island. The massive project was carried out in four stages at a cost of $4 billion. When completed in 2003, Jurong Island gave Singapore a substantial 3,000 hectares of new industrial space. Today, Jurong Island is home to more than 100 petroleum, petrochemical and specialty chemical companies.42

New Lands for Infrastructure and Recreation: MPA

The Maritime and Port Authority of Singapore (MPA) – formerly Port of Singapore Authority or PSA – reclaimed land primarily to develop the Port of Singapore and Changi Airport. Its earliest project took place in 1967 when 23 hectares of land were reclaimed to build Singapore’s first container terminal at Keppel Harbour. The Tanjong Pagar Container Terminal opened in 1971 with three container berths.43 Between 1972 and 1979, some 41 acres of foreshore along Pasir Panjang were reclaimed by the PSA. This was part of a larger effort to move lighter
Since the first reclamation works began in 1822, Singapore’s land area has expanded by almost 25 per cent. From 58,150 to 71,910 hectares. The areas shaded in pink indicate how much land has been reclaimed thus far. The areas in red show possible plans for future reclamation and indicate how much of the island’s original coastline may change by 2030 if these plans come to fruition. Map courtesy of blogs.nparks.gov.sg pp.337-340


57 Singapore. Parliament. Parliamentary debates: Official report. (1999, July 26). Parliament’s reclamation of Pulau Ubin: A decade later, PSA announced additional reclamation works at Pasir Panjang to connect it to the mainland via the coastal expressway. The first two phases were carried out from 1993 to 1999. In June 2015, reclamation works under the final two phases were launched and are expected to be completed by the end of 2016.

58 Housing and Development Board, Reclamation of East Lagoon (Vol. 13, col. 75). Singapore: [s.n.].


64 55 acres of land from sea by year’s end. (1967, August 28). The Straits Times, p. 5. Retrieved from NewspaperSG; Chia, 1988, p. 43. A decade later, PSA announced additional reclamation works at Pasir Panjang to connect it to the mainland via the coastal expressway. The first two phases were carried out from 1993 to 1999. In June 2015, reclamation works under the final two phases were launched and are expected to be completed by the end of 2016.


