



1 SPACE, 4 USES: TRANSPORT PLANNING IN LAND-SCARCE SINGAPORE

At just 724.2 sq km, land is a prized resource in Singapore. With so many uses vying for the limited space, it takes some ingenious planning to optimise land use for transport. Here's how the idea for the 4-in-1 East Coast Integrated Depot was born.



Adrian Teo's initial brief in 2009 was straightforward: Design a train depot for the Thomson-East Coast Line (TEL) in the most cost-effective and sustainable manner.

But the LTA engineer and his team of engineers and architects went one better. They came up with an audacious plan to house four major infrastructures – three rail depots and one bus depot – within one compound instead of separately.

This plan came during a time when LTA needed to build a second depot for the Downtown Line (DTL) in the eastern side of Singapore – not far away from the potential sites of the TEL depot and the existing site of the Changi Depot for the East-West Line (EWL).

Adrian, the principal manager of rail design and development says,

“Like coffee, there was 2-in-1, 3-in-1 and now 4-in-1 (for infrastructure).”

The impetus for this idea was simple. “In land-scarce Singapore, we need to save land and depots take up a lot of land. Unlike cars which can go up much steeper inclines, trains cannot. So, a train depot needs to be built within a single level which

takes up a large footprint,” he explained. They found an unconventional solution: By stacking the depots one above the other instead of securing individual ground-level sites, they could save 22 hectares of land, about the size of over 61 soccer fields.

Better yet, the design saved them a whopping \$2 billion in costs.

This is because housing multiple depots together allows LTA to save on land acquisition and capitalise on the efficiency of shared resources at the depots, while housing all this in a structurally efficient building.



THE 4-IN-1 CONCEPT

At the site of the former Bedok Reclamation Plant, the convergence of four depots is underway as part of a massive \$3.2 billion project to futureproof our transport infrastructure. It is slated for completion in 2024.

His team worked closely with like-minded partners from other agencies, such as the Urban Redevelopment Authority. A working group was formed to tackle the challenge of saving land area in the construction of future depots.

This marks the first time LTA is integrating more than one rail depot, which also proved to be an engineering challenge when the chosen site was constrained all round – from obstructions underground to height constraints due to its proximity to the airport.



“People often imagine a government agency to be sticking to the tried and tested,” said Adrian. But he found a receptive management that was open to this breakthrough idea.

“Everyone bought into the simple impetus to save land, while achieving LTA’s requirements and transport goals in an economically viable way,” he added.

Many studies were carried out with consultants and industry experts. While the team encountered several hurdles along the way – such as the poor ground conditions and dense networks of drains and pipelines which could hinder the tunnel works – they were able to overcome them with teamwork.

“Like pieces of a jigsaw puzzle, the idea of stacking rail depots on top of each other started to come together as the answer to the ultimate objective to save land.”

ADRIAN TEO
PRINCIPAL MANAGER, RAIL DESIGN AND DEVELOPMENT

“Everything is a collaborative effort. Tapping on everyone’s mind, the combined effort is what brings about success, so teamwork is very important.”

“There was a pervasive collaborative spirit that came together naturally when faced with the monumental task of building this 4-in-1 depot,” Adrian shared.





MAKING TRANSPORT LESS LAND-INTENSIVE

The East Coast Integrated Depot sets a new bar in land transport infrastructure. By co-locating several depots in a single compound, it has the capacity to house about 220 trains and 760 buses within just 36 hectares of land.

With roads taking up 12 per cent of Singapore's total land area, transport remains one of the most land-use intensive sectors here. In fact, roads occupy almost as much space as housing, which sits on some 15 per cent of total land.

Singapore's growing population will place further demands on the land transport system. While building more roads might seem to be the most straightforward solution to congestion, expanding roads are difficult in a built environment.

So a more efficient use of land resources in transport planning is needed to free up more space for other developments, such as recreation and housing. Seeking more efficient modes of transport is also the way to a more sustainable future.

GOING CAR-LITE

Cars are a land-inefficient mode of travelling. LTA is limiting land-intensive private car travel and prioritising the development of more land-efficient public transport options.

On a single trip and at full capacity, a single-deck bus is able to carry up to 90 passengers, while a six-car train can ferry up to 1,600 passengers. But the average passenger sedan car can fit only up to 5 persons, including the driver.

To encourage more people to utilise more land-efficient forms of transport and reduce reliance on private cars, LTA has cut Singapore's annual car growth to zero since February 2018.

MAKING PUBLIC TRANSPORT THE PREFERRED MODE OF TRANSPORT

LTA has given commuters more viable options in sustainable modes of transport.

With the growing emphasis on developing our public transport infrastructure – from walking and cycling networks to new rail lines – it is easier than ever to ditch the car and walk, cycle or ride to our destinations instead.

MOVING INFRASTRUCTURE UNDERGROUND

It typically costs less to build on the surface. But as our towns and estates grow, it is high time to look below.

Given today's advanced tunnel boring technologies, constructing new subterranean infrastructure – such as underground road, train tunnels, bus interchanges and depots – is much less challenging. This frees up the land on the surface for better uses.

INTEGRATING LAND-USE DEVELOPMENTS

Transit-oriented developments are springing up across the island in the form of Integrated Transport Hubs (ITHs). These are nodes where train stations and bus interchanges are conveniently co-located with residential, retail, and commercial developments so that commuters can transit easily while enjoying the facilities that various ITHs offer.

For instance, bus interchanges can be integrated with shopping malls, saving on land space while making it easier for shoppers to travel by public transport.

CO-LOCATING TRANSPORT INFRASTRUCTURE

The East Coast Integrated (4-in-1) Depot is LTA's latest initiative at optimising land use by our transport infrastructure.

By co-locating transport infrastructure and building vertically – upwards or downwards – the land space can be maximised for transport infrastructure. This provides more parking spaces for buses and trains while they are off-service.

Kim Chuan Depot in Hougang, the world's largest underground train depot, serves as a futuristic model where locomotives can be parked underground while buses sit above the trains.

