



AQSA INTERNATIONAL CONGRESS 2023
Envisioning Sustainability and Digitalisation
in ASEAN Construction Industry
15-18 May 2023
Sibu Sarawak Malaysia

“Singapore: In Reflection and
Motivation in Moving Forward”

BY ER DR LIEW KH

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SINGAPORE: IN REFLECTION

In the last fifty years, **Asia** has seen many economic growth and developments in industries, social and communal facilities with improvements of better and more **modern infrastructures**. **China and East Asia** together with **ASEAN** are intimately entwined in expanding trades and investments which create the symbiosis boom in the building constructions in cities as well as the rural regions.

Singapore has been enjoying many decades of economic and development progress is now facing new efforts in the **envisioning sustainability and digitalisation** of the **construction industry**.



SINGAPORE: IN REFLECTION

This presentation is to highlight some of the **past developments** that provide impetus to meet the **sustainability and digitalisation concerns** in **new construction projects** in Singapore.

These **mega projects** are enumerated in various sectors of the industry.

1. Land Infrastructure

Since the **first reclamation** works began in **1822**, Singapore's land area has expanded by almost **25 percent** from **58,150 to 71,910 Ha**.

SINGAPORE: IN REFLECTION

1. Land Infrastructure

Reclamations and land improvements to the **world's first** at **Changi Airport** started in **June 1975**.

52,000,000 m³ - landfill and seafill

200 Ha - swamp land was cleared/filled with
12,000,000 m³ - earth from the nearby hills

40,000,000 m³ - sand fill up the seabed

870 Ha - reclaimed

200 Ha - landfill

670 Ha - seafill

1,300 Ha - total site area



SINGAPORE: IN REFLECTION

1. Land Infrastructure

Changi East in 2017 and Beyond



Table 8.1 Project specifications (after Choa et al., 2001).

Project	Area (ha)	Length of vertical drain (Mm)
Phase 1A	501	–
Phase 1B	52	28
Phase 1C	524	49
Area A – North	91	13
Area A – South	45	50
Total	2086	140



Vertical geo drain: About half a million of vertical straw-like strips are inserted deep into the ground to drain water out from the marine clay.

SINGAPORE: IN REFLECTION

1. Land Infrastructure

Reclamations and **land improvements** such as in the **world's first** master planning of **Jurong Island** to amalgamate **seven islands** by JTC.

Physical land reclamation began in **1995**, and Jurong Island was officially opened in October **2000**. From the **991-Ha** land area of the original seven islets, Jurong Island currently has a total land area of **3,200 Ha**.



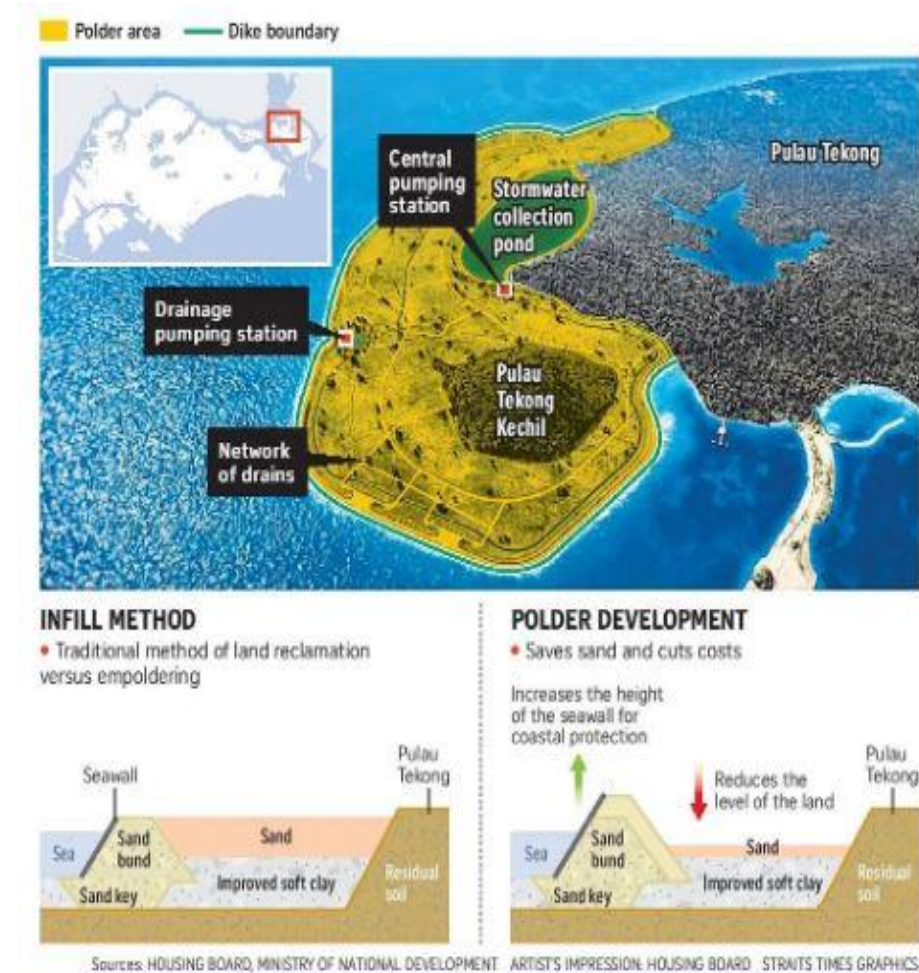
SINGAPORE: IN REFLECTION

1. Land infrastructure

In 2016 by HDB, **Pulau Tekong** island **first-of its kind** in Spore/Asia using innovative **polder** technology instead of land filling.

Empoldering, substantially **reduces** the amount of **sand fill up** needed for the new land, reaping **savings** on upfront construction costs.

Significant parts of Singapore are **4m** or less **above mean sea level** and are at risk when sea levels rise due to climate change.

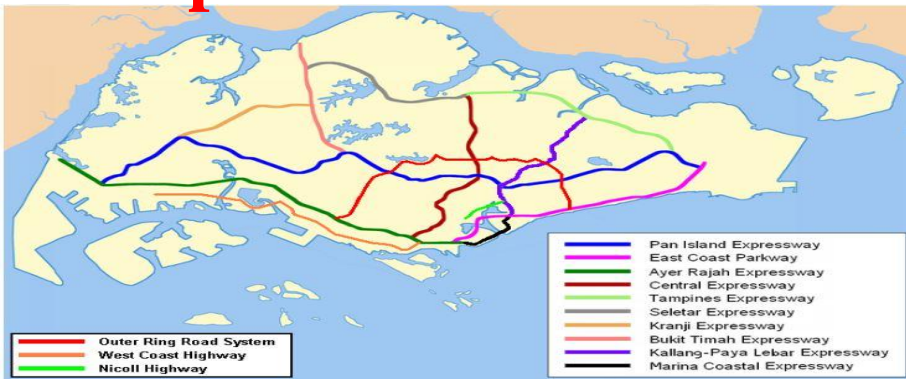


SINGAPORE: IN REFLECTION

2. Land Transportation

Expressways with interconnections of **6 to 8 lanes** started with PIE expanding to MCE, KPE etc and SEA longest road tunnel.

ERP system in road usage. In 2022, approximately **1.1 thousand lane-km** of roads were paved as expressways. **Total road network** connects all corners of the island with more than **9,500 lane-km** of roads and expressways occupying **12 per cent** of our total land area



SINGAPORE: IN REFLECTION

2. Land Transportation

Kallang-Paya Lebar Expressway (KPE) Tunnel
12km long and is the **longest in Southeast Asia**

Central Expressway (CTE) Tunnel

Marina Coastal Expressway (MCE) Tunnel

Fort Canning Tunnel (FCT)

Woodsville Tunnel (WVT)

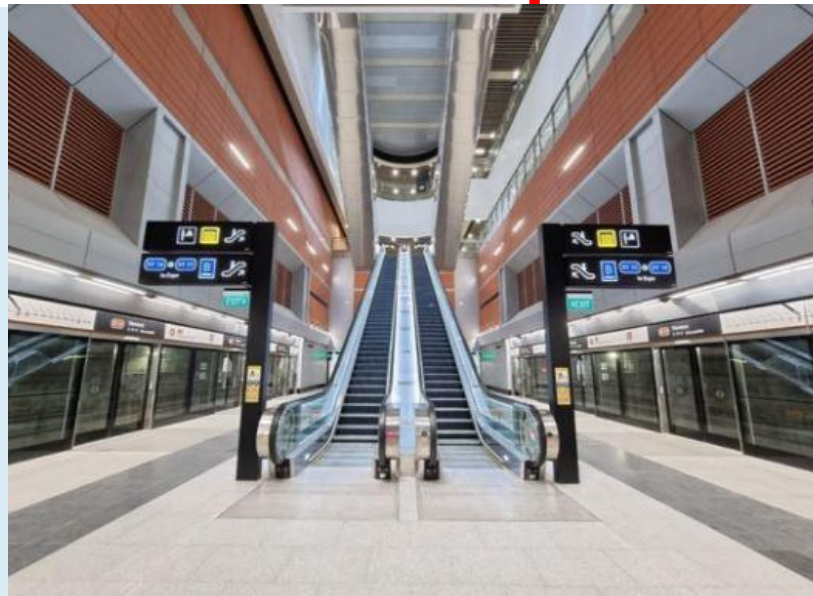
Sentosa Gateway Tunnel (SGT)



SINGAPORE: IN REFLECTION

2. Land Transportation

Mass Rapid Transit started in **1987** with NSL to EWL, NEL, CCL, DTL, TEL adding new ones and stations such as CRL& JRL **total 8 lines** with Spore-Johor RTS by **2026**. As of **2022**, it now has **six lines** in operation with a total combined route length of **231 km** and **134 operational stations**



SINGAPORE: IN REFLECTION

3. Container Port & Harbours

From Tanjong Pagar, Pasir Panjang etc container ports to **Tuas Mega port**. Innovative constructions using large precast caissons alleviate piling. Development of Tuas Mega Port is held over **four phases** to handle **65 m TEUs**.

The Maritime and Port Authority of Singapore (MPA) commenced **reclamation** works for Tuas Port Phase 1 **in February 2015** and completed it in **November 2021**. The reclamation works involved a total of **34 million man-hours**, with the support of over 450 companies.

SINGAPORE: IN REFLECTION

3. Container Port & Harbours

The key feature of the new mega port is the **caissons**. These large watertight chambers keep the water out by air pressure, allowing construction work to be carried out with ease. These concrete retaining structures are designed as the foundation of the Tuas Terminal Phase 1 and are one of the **largest in the world**. Each caisson weighs up to **15,000 tonnes** and measures up to **28 m tall X 28 m wide X 40 m long** (equal to 10 storey HDB block) .

Using caissons is faster harbour structure construction. A total of **222 caissons** for the mega-terminal for Phase 1 development.



SINGAPORE: IN REFLECTION

3.Container Port & Harbours

Soil improvement works for **414 Ha** of land, including **294 Ha**

Fabrication and installation of caissons (structures used to line the walls of the quay) to form **8.6 km of seawall** in Phase 1.

Phase 2 reclamation works commenced in March **2018**. MPA had completed all caisson fabrications in April **2022**. **227 10-storey tall caissons** had been used to form **9.1 km of seawall** for Phase 2.

MPA has also commenced the planning for Tuas Port Phase 3.



SINGAPORE: IN REFLECTION

3.Container Port & Harbours

Paving the way in Digitalisation and Sustainability

Tuas Mega Port will be an automated, intelligent, and sustainable port.

Deploying **AI and Automation** in Port Operations

5G-enabled Automated guided vehicles (AGVs) and Automated

Cranes **Reducing Emissions.** AGVs which reduces carbon emission by about **50%.** PSA aims for Tuas Port to achieve **net zero emissions** by 2050.



Tuas Port – A Smarter and Greener Port

PM LEE HL: Tuas Port will be world's largest fully automated port when completed in 20 years

SINGAPORE: IN REFLECTION

4. Air Port

Changi International Airport from **T1-T3**, **Jewel** and now **T4** in operation with **T5** towing behind in construction.



Operationalising a Three-Runway System (End 2015 – 2020s)

SINGAPORE: IN REFLECTION

4. Air Port

Terminal	Opened	Floor area	Handling capacity	Parking bays
Terminal One	1 July 1981; 41 years ago (operational) 29 December 1981; 41 years ago (official)	308,000 m ²	24 million passengers	29 (aerobridge) 16 (remote)
Terminal Two	22 November 1990; 32 years ago (operational) 1 June 1991; 31 years ago (official)	358,000 m ²	28 million passengers (by 2024)	35 (aerobridge) 11 (remote)
JetQuay (CIP Terminal)	15 August 2006; 16 years ago (operational) 29 September 2006; 16 years ago (official)	2,000 m ²	N/A	0
Terminal Three	9 January 2008; 15 years ago (operational) 25 July 2008; 14 years ago (official)	380,000 m ²	22 million passengers	28 (aerobridge) 15 (remote)
Terminal Four	31 October 2017; 5 years ago (operational) 3 August 2018; 4 years ago (official)	225,000 m ²	16 million passengers	25 (aerobridge)
Terminal Five	Mid-2030s (planned)	TBC	50 million passengers	TBC
Jewel Changi Airport	17 April 2019; 4 years ago (operational) 18 October 2019; 3 years ago (official)	35,000 m ²	3 million passengers	
Total		1,308,000 m ²	90 million passengers (by 2024)	117 (aerobridge) 42 (remote)

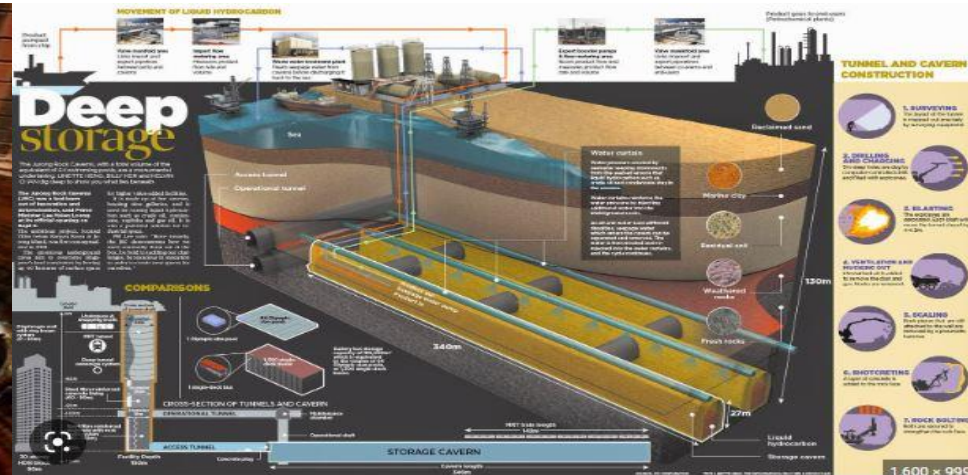
SINGAPORE: IN REFLECTION

5. Facilities

Underground caverns for storage of petroleum.

Jurong Rock Caverns (JRC) is the first commercial underground rock caverns facility for the storage of liquid hydrocarbons in South-east Asia.

Located at a depth of **150m** below the ground, and 130m beneath the Banyan Basin on Jurong Island, JRC can store up to **1.47 million m³** of liquid hydrocarbons such as crude oil and condensate.



SINGAPORE: IN REFLECTION

5. Facilities

By utilising **subterranean** spaces for storage, JRC enhances the **security** of the products in storage, **saving** of approximately **60 Ha of land** above ground, used for **higher value-added** activities such as petrochemicals manufacturing.

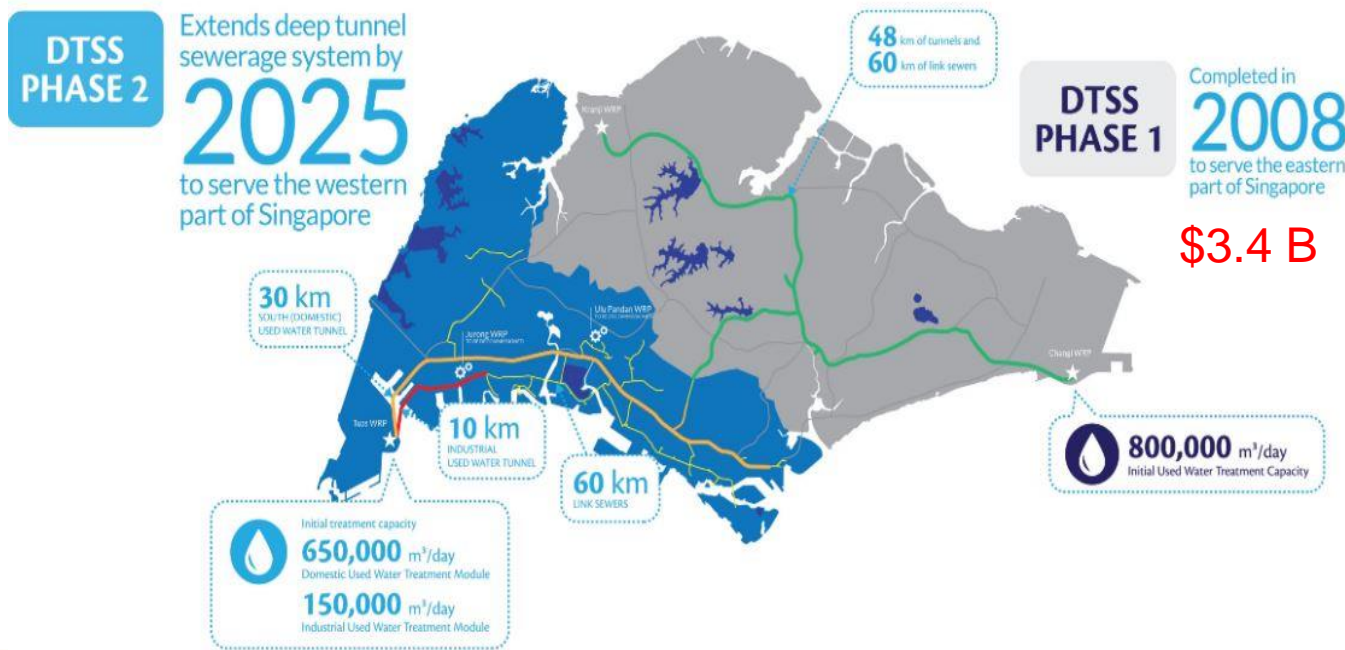
JRC complements and enhances the existing network of **integrated** infrastructure developed by JTC on the Island, making Singapore's position as a **leading global energy** and **chemicals hub**.

In **2007**, Southeast Asia's first commercial underground storage facility began beneath the seabed of Banyan Basin on Jurong Island. **Five caverns** measured **27 m high X 20 m wide X 340 m long**. Officially opened on **2 September 2014** by Prime Minister Lee.

SINGAPORE: IN REFLECTION

5. Facilities

Construction of many land alleviating projects such as **DTSS**, **NeWater** as well as integrating wastes disposal and management (**land fill** and **incineration**) with **desalination plants**.



A used **water superhighway** of the Deep Tunnel Sewerage System (DTSS) **cost-efficient** and **sustainable** solution for **long-term (2060)** needs for used water collection, treatment, reclamation and disposal to meet Republic's water demand of **430 million gallons per day** by:

5 NeWater Plants

5 Desalination Plants

SINGAPORE: IN REFLECTION

5. Facilities

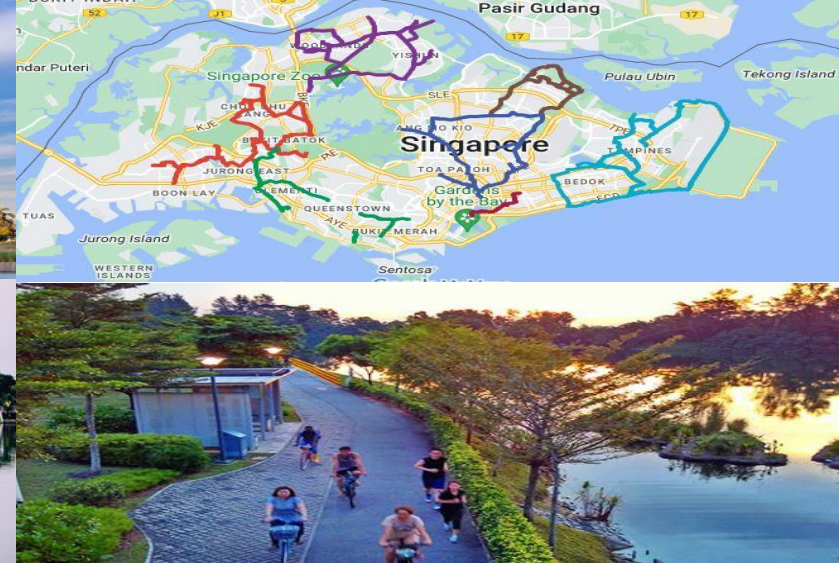
Theatre on the Bay, Gardens by the Bay with many **park connectors** network



\$600 million, 60,000 m²
120 musicians, 1,600 seats.



Sustainability of the Supertrees
De-humidifying the air before cooling
Cooling only the occupied zones
Minimising solar heat gain
Generating energy/ harnessing waste heat



300 km island-wide network of linear green corridors connect gardens and nature parks

SINGAPORE: MOTIVATION

ENVISIONING SUSTAINABILITY & DIGITALISATION

New **sustainable** and **digital construction** developments tackling climate change, **rising sea level** and **CO2 reduction** are in the plans tapping on digitalisation technologies. Some are undertaken by the **government** while some are **private** initiatives/ innovative ideas:

1. Coastal Protection (Government)



About 70 per cent of Singapore's coastline is currently guarded by hard structures, including sea walls and stone embankments.

Increasing and improving capacity of the drainage system -**widening** and **deepening** drains Republic's first **computer modelling** system **Coastal - Inland Flood Model** assess how sea level rise/heavier rain impact the nation.

Flood protection setting the minimum **platform level at least 5m above** sea levels

SINGAPORE: MOTIVATION

2. Floating Cities (Private)

Proposed by Shimizu for Singapore



CO₂ Reduction and Energy Conservation

- Carbon negative
- Carbon chain (Carbon cycle)
- CO₂ recovery and ocean sequestration
- Power generation from a space solar power satellite
- Power generation from ocean thermal energy conversion
- City in the Sky cooling system
- Wave power generation

Ecosystem and Planting

- Formation of diverse ecosystems
- Creation of a shallow inland "sea" (lagoon)
- Planting on upper levels
- Growing of mangroves to create ecotones
- Maintenance of tropical forests and creation of estuaries

Self-Sufficiency and Recycling

- Plant factory for food self-sufficiency
- Waste recycling system
- Grain, livestock and other farming in the plains portion
- Clean up and conversion of drifting "garbage islands" into energy resources

Safety and Security

- City disaster and business continuity planning (BCP)
- Structural planning/disaster and evacuation measures/strong wind countermeasures/wave and tsunami countermeasures/lightning countermeasures

Maritime Construction

- Magnesium alloy structural materials are refined from seawater
- Construction of an artificial offshore ground structure (Bonded honeycomb structure)
- Ultra-high-rise marine construction ("Smart" system float-over deck structure)

Environmental Island
The Technology behind Green Float

Reducing CO₂, conserving energy resources, reducing waste products, solving food problems, preserving ecosystems, preventing pollution ...

The question is how to deal with these issues comprehensively.

We are gathering leading global technologies to do so based on a botanical approach.

Green Innovation Float Innovation
Beyond CO₂ reduction towards CO₂ -ve
Food self sufficiency & zero waste

30 storeys high
10,000 units
200 m² each
300,000 pax
200 Ha

100% renewable energy
Fight sea level rise
Earthquake & tsunami proof
Free from typhoons & hurricanes

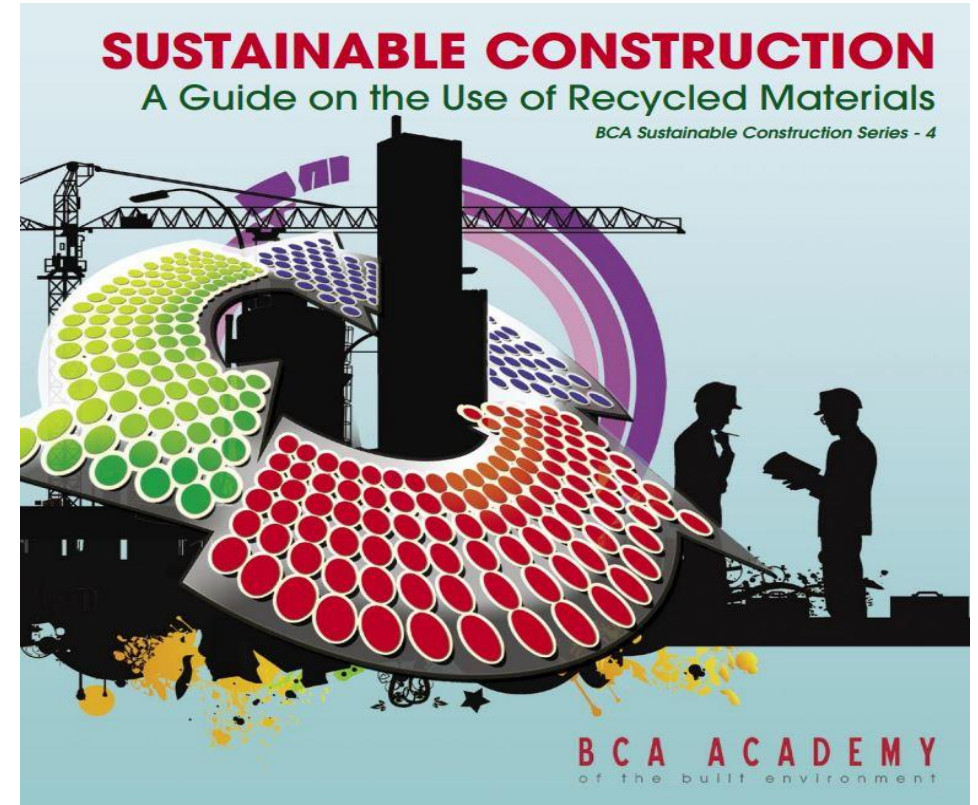


SINGAPORE: MOTIVATION

5. Green Building materials for sustainable construction (Govt)

Through **Sustainable Construction** to optimise the use of natural resources and greater use of **recycled materials**

- **Eco-concrete** is defined as concrete with at least 50% of recycled by mass of total aggregate content non-structural applications.
- **Recycled Aggregate (RA)**. Aggregate resulting from the processing of inorganic material previously used in construction
- **Recycled Concrete Aggregate (RCA)**. Recycled aggregate comprising principally of crushed concrete
- **Manufactured Aggregate**. Aggregate of mineral origin resulting from an industrial process involving thermal or other modification
- **Structural Works**. Works in relation to those parts or elements of a building which resist forces and moments and includes load-bearing walls elements designed to resist forces and moments



SINGAPORE: MOTIVATION

5. Green Building materials for sustainable construction (Private)

World's first eco-friendly alternative to steel rebars using **waste plastic bottles**
GFRP KEco rebar = Eco-friendliness and safety

Re-uses wasted plastic with **productivity** and **usability** of recycled PET chips from plastic bottles

Removing styrene monomer for more eco-friendliness

CO2 reduced by 43% compared to steel rebar and **energy reduced by 45%**.

100 years of lifespan, **two times stronger** and **75 percent lighter** than steel bars

lightweight by only **1/4** compared to steel

excellent **thermal barrier** properties for **non-magnetic, non-conductive, non-corrosion**

Easy handling and **reduce transport costs**



SINGAPORE: MOTIVATION

6. Green Energy Solar to Sodium Ion Energy on Digitalisation (Govt)

Singapore is also putting in place plans to reach **one GWp** solar deployment after **2020**

In **2018**, PUB and EDB for **large-scale solar** photovoltaic (PV) systems deploying **floating solar** of **50 MWp** on Tengeh Reservoir. Potential for **100MWp** system

One of the **world's largest** sea-based **offshore floating solar test-beds** of **5 megawatt-peak** north of Woodlands **4 GW** of **low-carbon electricity imports** into Singapore **by 2035**

“Energy Storage: Energy storage is poised to play a central and burgeoning role in the clean energy industry”

Southeast Asia's largest energy storage system officially opens on **2 Feb 2023** with maximum storage capacity of **285 MWh** using **800 large-scale lithium iron phosphate** batteries.



SINGAPORE: MOTIVATION

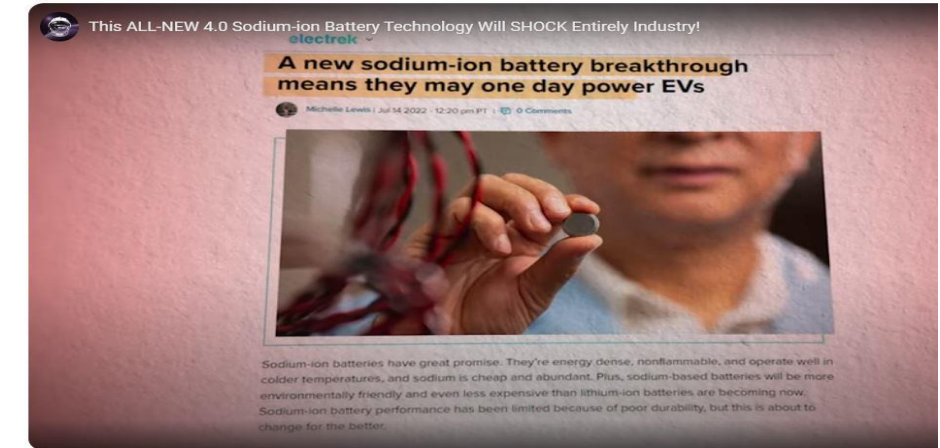
6. Green Energy Solar to Sodium Ion Energy on Digitalisation (Pte)

LITHIUM-ION VS SODIUM-ION BATTERY

<ul style="list-style-type: none">Sodium is more than 500 times more abundant than lithium. It can also be extracted from seawater at a low cost.	<ul style="list-style-type: none">Lithium availability is limited to a few countries, which is why prices have risen more than seven-fold since 2021.
<ul style="list-style-type: none">Sodium is more environmentally friendly and can be transported at zero volt, making it safer.	<ul style="list-style-type: none">Lithium is less environmentally friendly than sodium and must be always stored with a minimum charge, increasing fire risks.
<ul style="list-style-type: none">A Sodium-ion battery uses aluminum which is cheaper than copper.	<ul style="list-style-type: none">Lithium-ion battery uses copper, which is three or four times more expensive than aluminum used on sodium batteries
<ul style="list-style-type: none">Sodium-ion battery has a higher operating temperature range. This means these can be used in more extreme temperatures without the risk of thermal runaway.	<ul style="list-style-type: none">Lithium-ion battery has lower operating temperature range and can cause fire if operated in higher temperatures.
<ul style="list-style-type: none">Sodium-ion battery charges faster than lithium-ion variants and have a three times higher lifecycle.	<ul style="list-style-type: none">Lithium-ion battery has a slow charge rate and smaller lifecycle compared to sodium-based batteries.

This ALL-NEW 4.0 Sodium-ion Battery Technology Will ...

YouTube · Tech Life · 6 Apr 2023



“ Equally as exciting is the continued progress of sodium-ion batteries towards commercialization as evidenced by recent activities of major global battery producers, including CATL, BYD, and Reliance Industries. Sparc is well positioned as one of the only ASX listed companies actively targeting sodium-ion batteries.”

Stephen Hunt

SINGAPORE: MOTIVATION

6. Green Energy From Wastes and Algae (Private)

Reusing/Valorising of farm & poultry wastes and tapping on Nature's Wonders of Algae

WORLD ENGINEERS SUMMIT 2017
SINGAPORE

BIOGAS PLANT GREEN ENERGY FROM POULTRY WASTES IN SINGAPORE

Dr Er Liew Kian Heng
P.E. (Civil), P.L. (Arch)
Adjudicator
Principal Consultant
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BENEFITS

- 1. Waste = Resource/Energy**
 - Minimised waste stream
 - Biogas plant: Pollutants/GHG's producing electricity
 - Waste heat reused
- 2. Self-sufficient and sustainable farm**
- 3. Zero waste policy, multi-faceted approach**
 - Water 100% reused and recycled
- 4. Higher revenues and cost savings**
 - Increasing food security, fighting food scarcity, and promoting safe food
- 5. Reduces the negative impacts on the environment**

LIEW STRATEGICS
BUSINESS-INNOVATION-TECHNOLOGY-MANAGEMENT

The Nature's Wonder of Algae

INPUTS

- CO₂
- WATER/MOISTURE
- SUNLIGHT
- NUTRIENTS such as Phosphorus

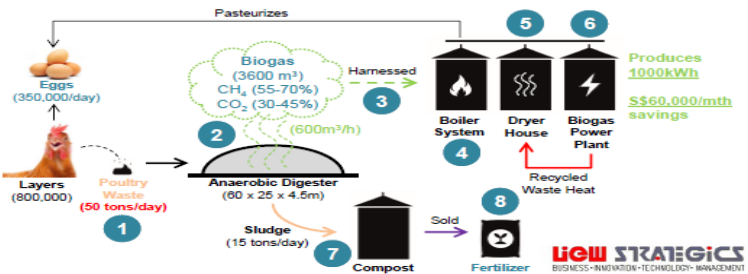
UNICELL ALGAE

OUTPUTS

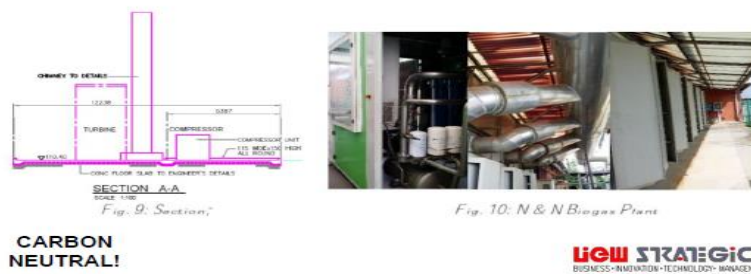
- O₂
- PROTEIN
- LIPIDS (OMEGA 3, 6, 9 etc)
- POLYSACCHARIDES
- ANTIOXIDANTS
- VITAMINS (A, B, C, E)
- MINERALS (Ca, K, Mg, Se, Fe, I, Zn)
- PHYTOCHEMICALS
- NUTRITION (health/medical/ Nutraceutical etc)

LIEW ENZYMIOS

HOW IT WORKS



BIOGAS POWER PLANT



Dr Liew Kian Heng
Consultant / Innovator
LIEW ENZYMIOS

Currently, the Recirculating Aquaculture System (RAS)

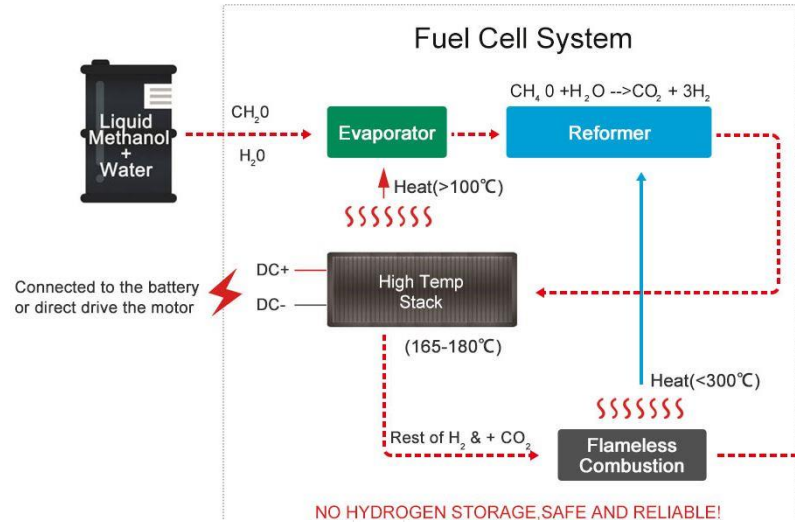
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SINGAPORE: MOTIVATION

7. Green Energy Methanol Fuel Cell Technology (Private)



300W Methanol Reformed Fuel Cell



5KW Methanol Reformed Fuel Cell

Waste-to-methanol: Process and economics assessment

Gaetano Iaquaniello^{a,c}, Gabriele Centi^b, Annarita Salladini^a, Emma Palo^c, Siglinda Perathoner^b, Luca Spadaccini^d

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<https://doi.org/10.1016/j.biortech.2017.06.172>

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Abstract

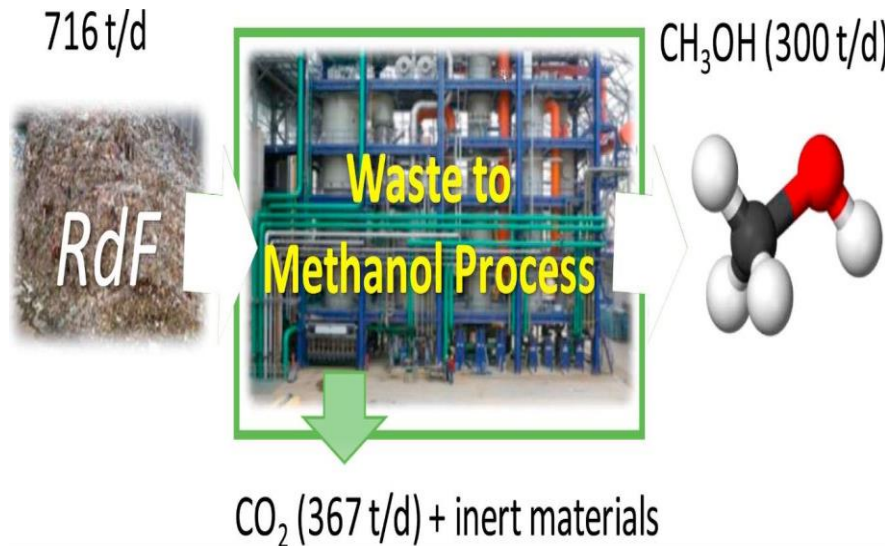
The waste-to-methanol (WtM) process and related economics are assessed to evidence that WtM is a valuable solution both from economic, strategic and environmental perspectives. Bio-methanol from Refuse-derived-fuels (RdF) has an estimated cost of production of about 110€/t for a new WtM 300t/d plant. With respect to waste-to-energy (WtE) approach, this solution allows various advantages. In considering the average market cost of methanol and the premium as biofuel, the WtM approach results in a ROI (Return of Investment) of about 29%, e.g. a payback time of about 4 years. In a hybrid scheme of integration with an existing methanol plant from natural gas, the cost of production becomes a profit even without considering the cap for bio-methanol production. The WtM process allows to produce methanol with about 40% and 30-35% reduction in greenhouse gas emissions with respect to methanol production from fossil fuels and bio-resources, respectively.



Applications—
Transportation —Truck



Multifunctional Mobile
Charging Car



SINGAPORE: IN MOVING FORWARD

The **reflections** of past construction achievements could help to spearhead **Singapore** into more **sustainable and digital centric concerns** enabling **innovative** enhancements and **constructions**.

Moving into 21st century of Asian prowess has been **mind boggling** and the last two decades for Singapore to continue to make more improvements could contribute to the region while **holding hands** with all our **ASEAN friends** in growing more with **Asia and globally**.



SINGAPORE: IN MOVING FORWARD

1. Trans-ASEAN Gas Pipeline (TAGP)

Securing Long Term Energy Supply for the Region

Achieved through **interconnection of the gas pipeline** infrastructure of ASEAN Member States, as well as **connectivity** through **LNG regasification terminals** to enable gas to be transported across the borders. **Flexibility** of gas movement by **4,500 km** of pipeline (mainly undersea) about **US\$7 billion**.

As of the end of **2012**, ASEAN had **7.5 trillion cubic metres (tcm)** of gas reserves, representing **3.5% of the world total**. Over the last two decades, gas production in ASEAN has more than doubled and will grow by **30% over the next 20 years**.

It accounts for almost **one-quarter** of the world total **LNG liquefaction capacity** in mid-**2013** (ref SEA Energy Outlook/published by IEA).

SINGAPORE: IN MOVING FORWARD

2. ASEAN Power Grid (APG)

Enhancing Electricity Interconnectedness

Interconnecting power grids in the region is a key strategy in strengthening Southeast Asia's **energy security** and **transitioning to renewables** through efficient resource sharing.

The **Lao PDR–Thailand–Malaysia–Singapore Power Integration Project** serves as ASEAN's pilot in addressing technical, legal and financial issues of multilateral electricity trade.

23 June 2022 project commenced for up to **100 MW** of renewable hydropower will be traded from **Lao PDR to Singapore**.

SINGAPORE: IN MOVING FORWARD

3. Johor Bahru-Singapore Rapid Transit System (RTS) Link

Construction of JB-Singapore RTS Link on Singapore side has reached 50% mark: S Iswaran

THU, MAY 11, 2023 - 06:04 PM

Malaysian counterpart **Anthony Loke** told reporters that work on Malaysia's side is **36 per cent complete**.

Iswaran said: "Based on the progress that has been achieved on both sides, we expect to be ready and on time for commencing passenger services by the **end of 2026**

The RTS Link is a **4km-long** cross-border rail shuttle service, with **2.7km in Malaysia and 1.3km in Singapore**.

It will be able to carry **10,000 commuters per hour** in **each direction**.

35% of Causeway traffic to be absorbed by JB-S'pore RTS Link by Jan 2027: M'sia's MRT Corp



The RTS Link is expected to cost around **RM10 billion (\$3.25 billion)**, with **Singapore bearing 61 per cent** of the cost.

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SINGAPORE: IN MOVING FORWARD

4. Proposed P2P Link (Private)

Envisioning In Overcoming World's biggest Perennial Jams at Woodlands & Tuas Links

- a. **300,000 av daily pedestrians** traveling to and fro across the **Causeway and Second Link** and excludes those travelling on motorcycles, cars, vans, lorries and buses.
- b. **130,000 vehicles daily**, including **4,000 trucks** and lorries entering Singapore,
- c. **1.0 km-long** Causeway up to about **1.6 km point-to-point**
- d. **100,000 motorcycles** registered auto-clearance crossing mainly the Causeway daily.
- e. **200,000 vehicles** per day capacity for **Second Link**
- f. **500,000 or more** commuters movements during school and public holidays and long weekends.



SINGAPORE: IN MOVING FORWARD

4. Proposed P2P Link (Private)

Floating People to People Link to overcome perennial jam at causeway

S'poreans coming back from JB stuck at Causeway for 8 hours overnight

Better start heading back soon.

Jason Fan | August 12, 2019, 02:33 PM



World is building walls but Singapore must build bridges: Heng Swee Keat

FRI NOV 22, 2019 - 11:39 AM

Heng Swee Keat

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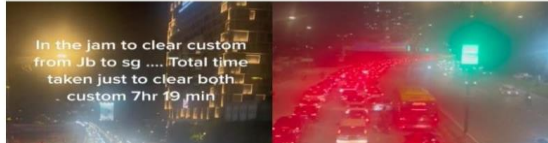
Singapore family gets stuck for 7 hours in ridiculous traffic jam on Causeway

Dec 21, 2022 08:25 pm



Lengthy traffic jams are a norm when it comes to crossing the Causeway. But one Singapore family had to endure a seven-hour jam just to get back home from downtown Johor Bahru.

On a weekday, no less.



In the jam to clear custom from Jb to sg Total time taken just to clear both custom 7hr 19 min

7-hour jam on M'sia side of second link on Sunday, April 2, vehicles struggle to return to S'pore

Causeway also jam.

Belmont Lay | April 04, 2023, 01:01 AM



Petir

#Unity (from Our Diversity)

"We must build bridges, not walls. We must get right for!"

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April 21, 2023

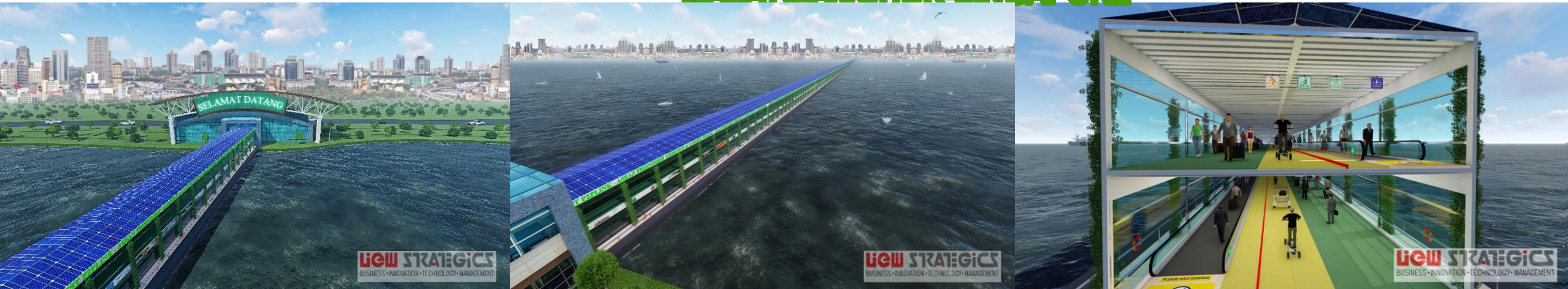
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SINGAPORE: IN MOVING FORWARD

4. Proposed P2P Link (private)

**WORLD'S LONGEST GREENEST SEAMLESS
FLOATING PEDESTRIAN BRIDGE
BETWEEN
TWO NATIONS
MALAYSIA/JOHOR-SINGAPORE**



With just between 1.0 to 1.6km or shorter
MRT/Crooked-Friendship Bridges costing hundreds S\$m,
At low-cost **fully-aircon double-deck** floating solely for
pedestrians would relieve the existing crossings
Solar Energy, E-smart Immigration, **EV, PDA, Buggy**
Co-locate both Custom & Immigration of both countries.

1.0-1.6km is budgetary estimated at about **RM120m**
(\$36m). With conservatively **100,000 daily traffic** @
minimal **footfall/ridership @ \$1/ pax /entry** the
revenue per year \$36 million a year
Bonus advertisements and **60 million tourist** visiting
“Greenest and Busiest P2PLink in the World”

SINGAPORE: IN MOVING FORWARD

**In the ASEAN SPIRIT of cooperations
We are united in diversity with solidarity forever
And help us divine in United Governance
Asean Spirit Soar above all frailties and Boundaries**



THANK YOU

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Salamat

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