System Engineering of Mega Projects in Singapore

Dream & Do

- Territory
- Sea Transportation
- Air Transportation
- Land Transportation
- Concluding Remarks

7th Dec 2018

Prof Lui Pao Chuen
CSD&M 2018
Singapore

Artificial Diamond
Created by Stress
We Have a Territory of 1,400 Square Kilometers

Being small is a limitation is also be an advantage

- Land ~ 710 sq.km
- Sea ~ 690 sq. km
- Total ~ 1,400 sq.km
Scarcity of Land is a National Challenge

- DEFENCE (19%)
- HOUSING (18%)
- TRANSPORTATION (12%)
- EMPLOYMENT (18%)

Graph showing land area in square kilometers from 1950 to 2040.

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Aspirations for Our Green, Healthy and Smart Nation

Jurong Lake District

Caring, learning, creative, active and green Tampines

WEALTH

HEALTH

Healthy Babies

Happy Children

Fighting Fit Soldiers

Our Future

Happy & Healthy Seniors
Kampung Admirality: A Vertical Urban Village for All Ages! Integration of the Community, Health-care & the Environment
Beat 535 projects from 57 countries to win the “Building of the Year” 2018
Singapore is a Maritime Nation
Maritime industry contributes 7% of GDP & employs > 170,000 people

- 130,000 ships call at Port of Singapore each year
- 600 ships anchored in our harbour at anyone time
- 1 ship arrives or departs the port every 3 minutes
- 1,000 ships moving in through our waterways each day
Although City Terminals’ lease expire in 2027, plans have started to transfer activities to Pasir Panjang Terminals since last year. Meanwhile further consolidation will be made to Tuas Port when the mega Port begins operations in 2027.
Phase 1 Tuas Mega Port Development

- Reclamation area
- Dredging area
- 222 CAISSONS
- 8.6KM LONG WHARF STRUCTURE
- -23m CD DREDGING DEPTH

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Singapore Industry in Aerospace began in 1972 with SIA operating 10 aircraft. SIA now operates 100.

There Will be No SIA without an International Airport in Singapore.

- Better food
- Free alcoholic drinks
- Free headsets for movies
- Very high standards for operations and maintenance

- SIA Girl

JYM Pillay
Former 2PS MINDEF
Founding Chairman
SIA
Recover Land Development Potential Downtown and East with Relocation of Paya Lebar Air Base to Changi

Advanced Intelligent Transportation System Needed for Integrated Civil & Military Aviation
Changi Airport Passenger Capacity

• T1: 24 m passengers/year
• T2: 23 m passengers/year
• T3: 22 m passengers/year
• T4: 16 m passengers/year
• Total: 85 m passengers/year

2017 Passengers = 62.2 million

• T5: 50 million passengers per year by 2030
Intensify Use of Changi Airport Land With Jewel Mixed-use Development
Work underway to operationalize Runway 3 for civilian co-use by 2020
T5 for 50 Million Passengers Per Year Under Planning

An Example of Whole of Government Approach to Plan and Implement Major Projects
The Backbone of Our People Moving System is Rail

Rail Will Double from 180km to 360km by 2030
ERP 2 Affordable With Technological Progress

Technological Progress

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ERP 2 Will Help to Maximize Utilization of Roads Solution Must be Trains and Integrated Cities

Ngien Hoon Ping
CE LTA

Making Sense of our Roads

Networks are the Cornerstone of the LTA C3 System

Integrating the Real-Time Transportation Needs of Individuals and Supply Will Provide Unprecedented Level of Service

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Intelligent Transport Systems Enables DARS (Dynamic Allocation of Resources & Services)
Matching Demand for and Supply of Public Transport

Comprehensive Real-Time Situation Picture of Demand & Supply

Operation Centre
- Assessment
- Projection
- Planning

Integrating the Real-Time Transportation Needs of Individuals and Supply Will Provide Unprecedented Level of Service

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Global Challenge: Climate Change
Must Be Prepared for Extreme Weather & Sea Level rising

Challenges:
• Rising Temperature
• Extreme Weather
  • Drought
  • Flood
• Sea Level Rising
MSS reported that Singapore’s continuous temperature records since 1948 show that the island has warmed. Surface air temperature has risen by an average of 0.25°C per decade between 1948 and today.

The upward trend is approximately double the trend in global temperatures, which occurred at a rate of 0.12°C per decade from 1951-2012.

Fig 1 – Annual mean temperature in Singapore from 1948 to 2017 (Data based on climate station)
Singapore’s year-to-year rainfall is highly variable; however, on a longer term basis, average annual rainfall total for Singapore since 1980 has increased at an average rate of 100 mm per decade.

Data based on 28 rainfall stations across the island that have continuous records from 1980 onwards. (To account for the spatial variation in rainfall over Singapore, more stations were used for the trend analysis, but not all selected stations have records before 1980, resulting in the shorter period of available data.)
1980 - 2009 Spatial Variation of Singapore Annual Rainfall
Annual Rainfall Over Central Catchment is 50 cm Higher Than Changi

Annual Isohyets (1980-2009) CM

- MacRitchie = 2600 mm
- Changi = 2000 mm
- Difference = 600 mm ~ 30%
integration of policy, science and technology in Large Scale Systems
3 Lessons from Dr Goh Keng Swee Minister of Interior & Defence 1965

1. **Dream & Do**
   “The only way to avoid failing is not to do anything. That will be the ultimate failure.”

2. **Self Belief**
   Beyond World Class

3. **Determination**

Thank you