## URBAN SYSTEM STUDIES:

# INDUSTRIAL INFRASTRUCTURE


**LIM CHIN CHONG**

**Member of Panel of Experts, Centre for Liveable Cities, Singapore**

**Former DCEO of SSTEC and Director of JTC**


**9 June, 2017**


CENTRE for LiveableCities SINGAPORE

To distil, create and share knowledge on liveable and sustainable cities

# OUTLINE

- ECONOMIC OVERVIEW
- CHALLENGES OF INDUSTRIALISATION
- FACTORS OF SUSTAINABLE INDUSTRIAL DEVELOPMENT
- CONCLUSIONS

# OUTLINE

- **ECONOMIC OVERVIEW**
- **CHALLENGES OF INDUSTRIALISATION**
- **FACTORS OF SUSTAINABLE INDUSTRIAL DEVELOPMENT**
- **CONCLUSIONS**

# ECONOMIC JOURNEY

## Before 1960s:

Transforming the Colonial Trade Economy

- High unemployment (10%)
- High population growth (4.4%)
- Limited industrial development
- Slow growth in entrepôt trade

# ECONOMIC JOURNEY

## 1960s – 1970s:

Building Industrial & Infrastructure Foundations

- Economic dependence on trading and British military spending
- Reliance on Malaysia as hinterland
- Exposure to external economic shocks

# ECONOMIC JOURNEY

1980s:

Evolving from Domestic Market to Global Market

- Erosion of wage competitiveness from lower-cost developing countries
- Recession of 1985 – 1986 as result of external demand weakness

# ECONOMIC JOURNEY

## 1990s:

Erosion of Competitiveness

- Resource constraints and rising costs
- More intense competition in low-tech sectors
- 1997 Asian Financial Crisis

# ECONOMIC JOURNEY

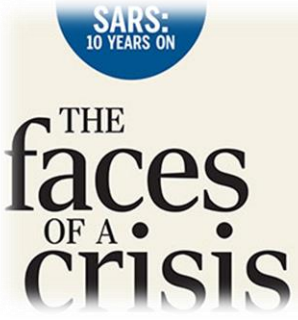
## 2000s & beyond:

Exposure to World of Major Crises

- Sept 11 attack in 2001 compounds global economic malaise
- 2003 SARS crisis hit tourism and economy
- 2007 - 2008 Global Financial Crisis







# ECONOMIC JOURNEY

## Summing up…

- As a small country evolving from colonial rule to an independent city state, Singapore faced many challenges over the last 5 decades.

- Many challenges were influenced by external political and economic crises.

- Coupled with the lack of domestic market and resources, Singapore's journey of economic development has always been on a difficult terrain.

# SINGAPORE'S PAST

## Massive unemployment | Economic survival crisis

**1959 - Self governance**

**1965 - Independence**

**Key issues**

- **Massive unemployment**
- **Economic survival crisis**

# INDUSTRIALISATION: A WAY TO SURVIVE

Early years， industrialisation was necessary for Singapore to survive in order to：

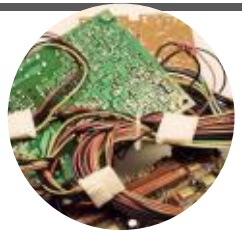
- reduce economic dependence on entrepot trade
- create jobs for its rapidly growing population

Singapore’s economic survival depended on its ability to：

- provide necessary **industrial infrastructure**
- attract investors to set up manufacturing plants
- satisfy investor needs quickly and well



# COMPETITIVE ECONOMIES



**60s**
**Labour Intensive**

**70s**
**Skill Intensive**

**80s**
**Capital Intensive**

**90s**
**Technology Intensive & Services**

**2000…**
**Knowledge Intensive & Innovative**

USD

(GDP per capita)

60000
50000
40000
30000
20000
10000
0

1960 1962 1964 1966 1968 1970 1972 1974 1976 1978 1980 1982 1984 1986 1988 1990 1992 1994 1996 1998 2000 2002 2004 2006 2008 2010 2012 2014

**1960 Winsemius Report**

**1967 Economic Expansion Incentives Act: Allowed foreign companies to apply for pioneer status on new investments that would get five years of tax concessions.**

**1968 Employment Act: Provisions improved labour relations and investment climate**

**1979-1981 Wage Correction Policy: A high wage policy designed to force companies to raise productivity and move towards higher value-added activities**

**1985 Economic Committee Report – Recommended new directions for the economy; new direction set for manufacturing and services as twin pillars of the economy.**

**1991 Strategic Economic Plan (SEP) – set the strategies and programs for Singapore to become a first league developed country within the next 30 to 40 years.**

**2003 Economic Review Committee (ERC) Report – set a clear direction for Singapore's economy over the next 15 years, while addressing the current downturn; recommendations to remake Singapore into a globalised and diversified economy, and a creative and entrepreneurial nation.**

**2010 Economic Strategies Committee (ESC) Report released – key recommendations are to achieve higher productivity growth through skills and innovation, be an energy smart economy, enhance land productivity, build a distinctive global city and endearing home.**

（Data : World Bank；Photo：EDB）

# SINGAPORE'S PRESENT

## Knowledge-based Economy | Low unemployment rate

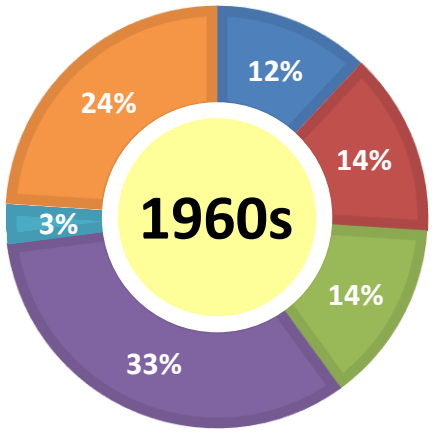
### 2016 Economic Performance

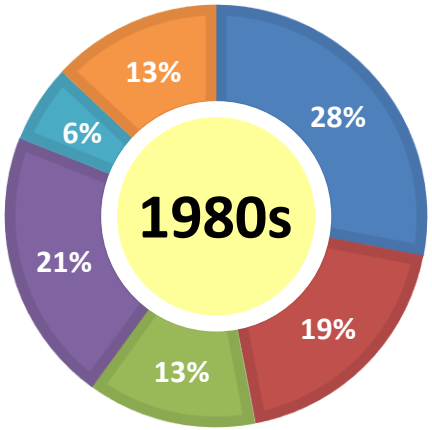
- GDP : S$410 B
- Per Capita: S$ 73,000
- Unemployment： 2.3%
- Knowledge-based Economy

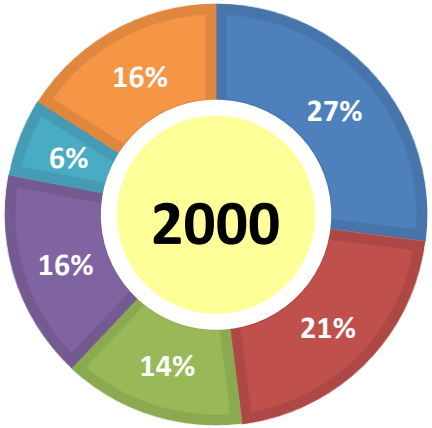
# ECONOMIC STRUCTURE

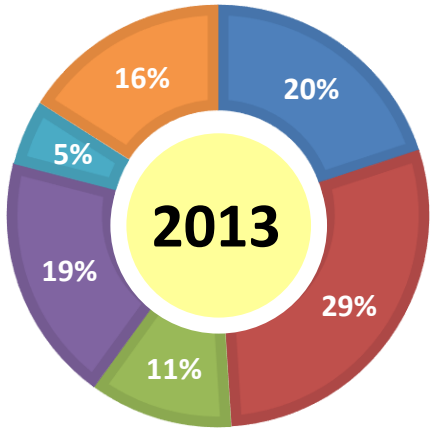
**1960s --- 2010s**

- **Manufacturing sector: increased from 12% to 20%**
- **Finance & Business services: increased from 14% to 29%**



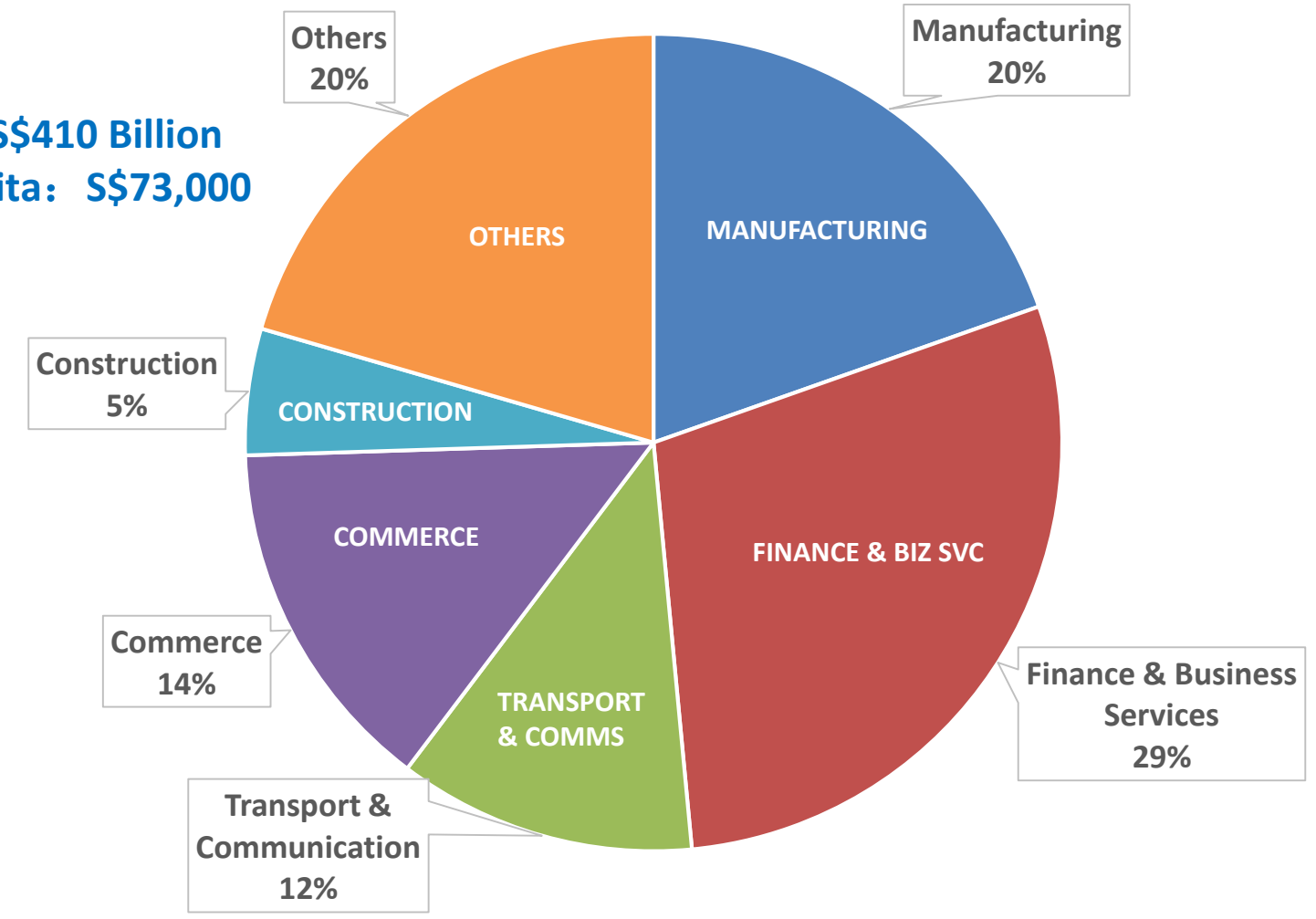



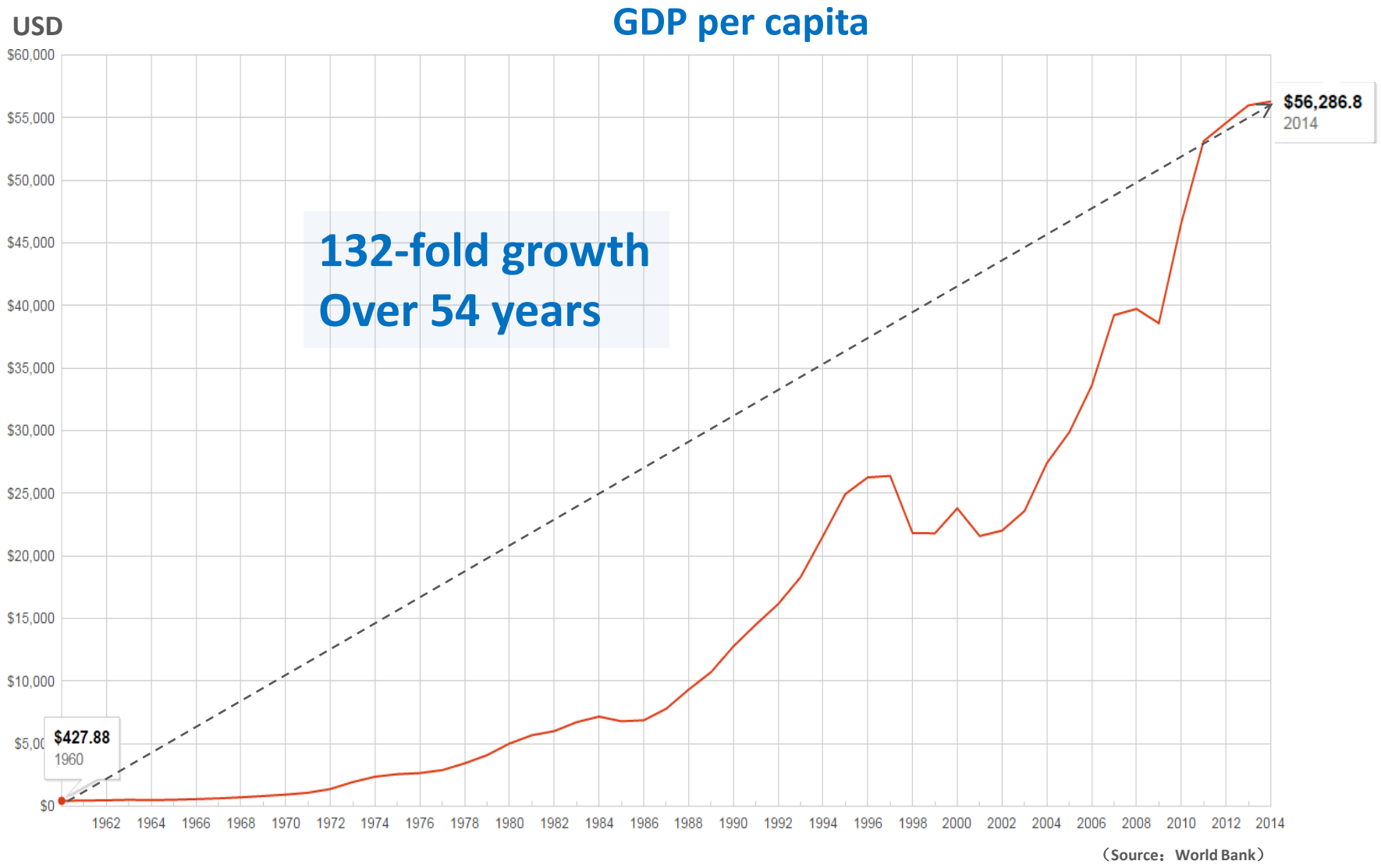

Manufacturing
Finance & Business Services
Transport & Communication
Commerce
Construction
Others

# ECONOMIC STRUCTURE (2016)

**GDP： S$410 Billion**
**Per Capita： S$73,000**



# SINGAPORE GDP GROWTH

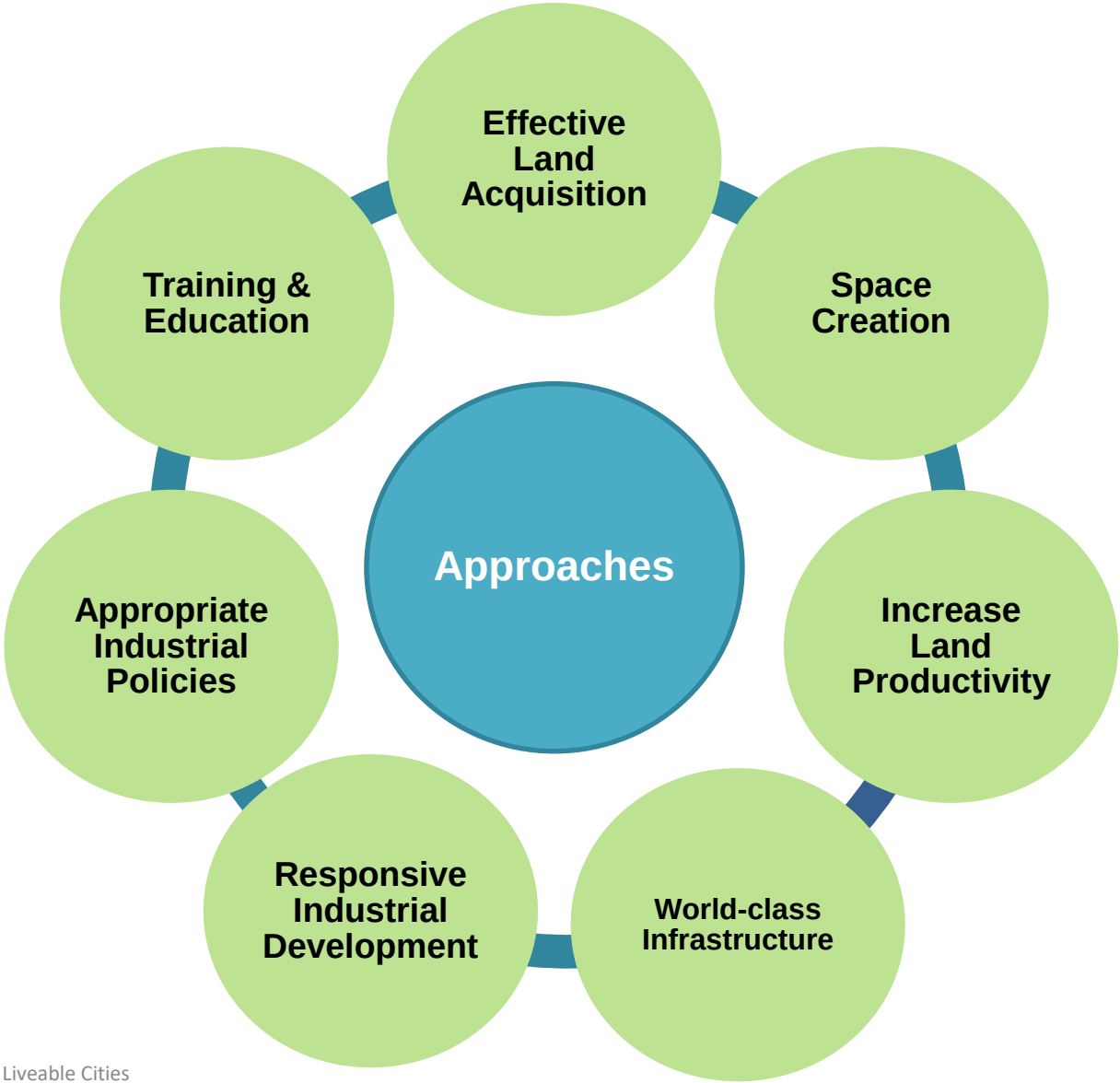


# OUTLINE

- ECONOMIC OVERVIEW
- **CHALLENGES OF INDUSTRIALISATION**
- FACTORS OF SUSTAINABLE INDUSTRIAL DEVELOPMENT
- CONCLUSIONS

# CHALLENGES OF INDUSTRIALISATION

# APPROACHES TAKEN



# EFFECTIVE LAND ACQUISITION

**1960s – 1980s**

**Jurong Town Corporation (JTC) was empowered with compulsory land acquisition**

- Ensure adequate land supply to support industrialisation
- Compensation amount can be appealed by landowner, but not the acquisition decision
- Provide landowners with resettlement facilities

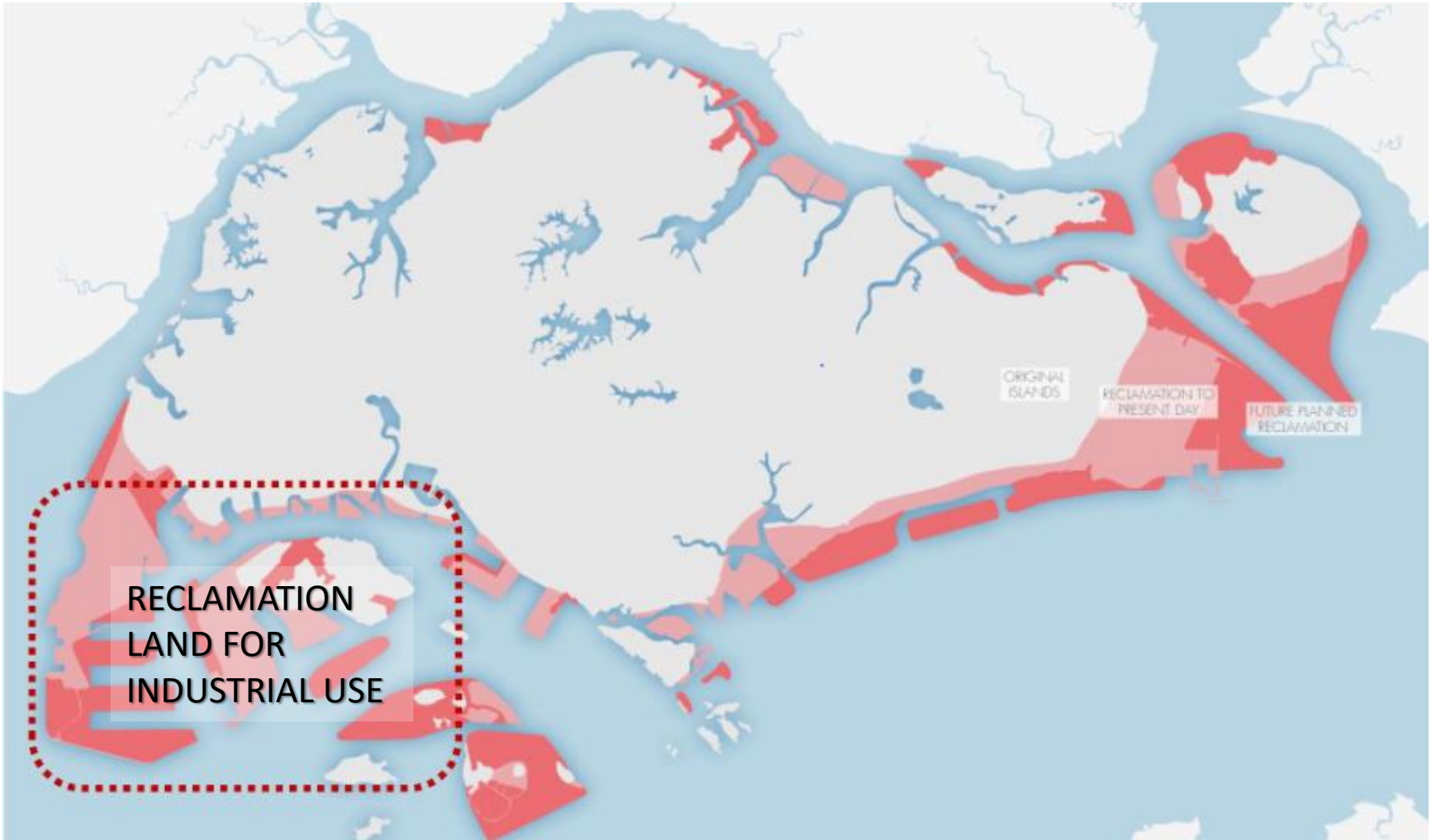
# EFFECTIVE LAND ACQUISITION

**1990s**

- En Bloc Redevelopment Program of old industrial estates
- Repurchase land with low value-add & unproductive usage at market rate
- Land use optimization
- Introduce higher density & value-add cluster, i.e. Biomedical Industry, Media industry

# SPACE CREATION

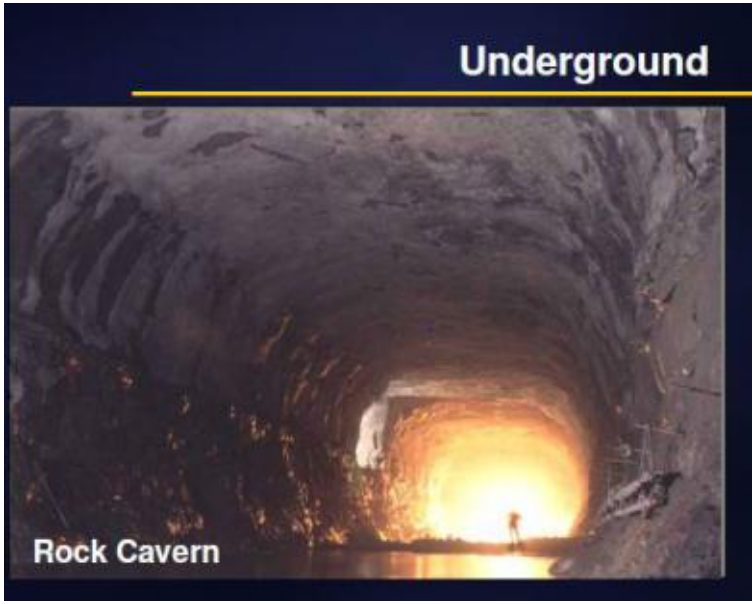
## **Create land from sea** (1960: 582 sqkm 2015: 719 sqkm)



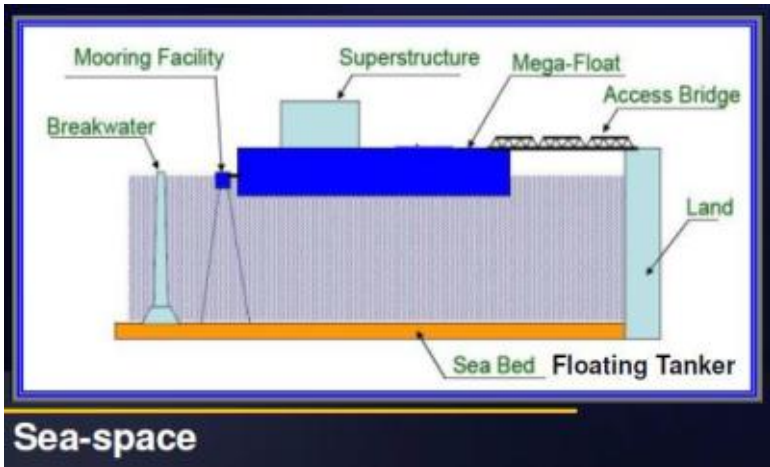
# SPACE CREATION

## Unconventional Industrial Space Solution

- Stack up factories
- Rock cavern
- Sea-space



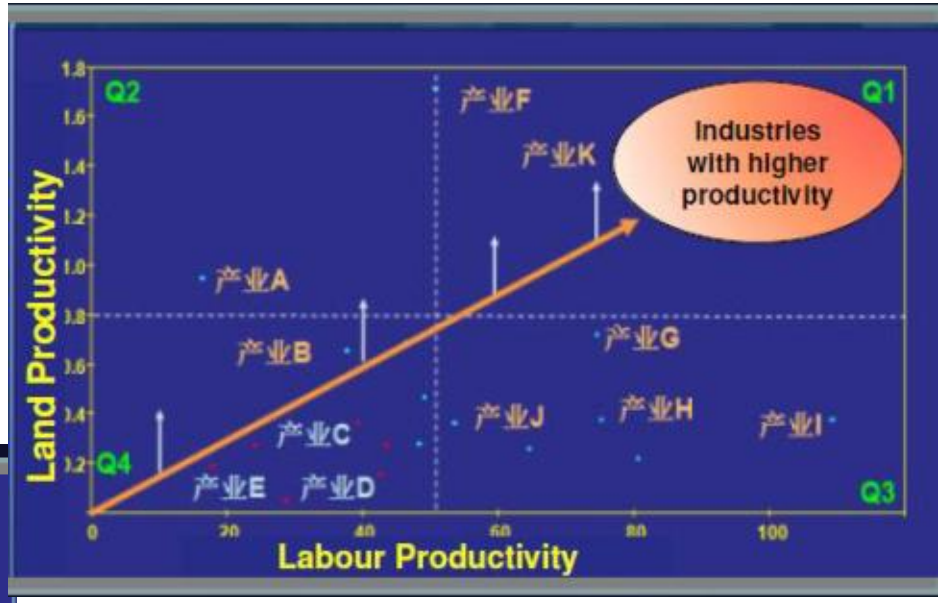




# LAND INTENSIFICATION

## Higher Land Productivity

## Supply & Demand Assessment of Industrial Land





## Industrial Productivity Matrix

# LAND INTENSIFICATION

## Vertical Integration:

Mixed use buildings for co-location of work-live-play-learn activities

# WORLD-CLASS INFRASTRUCTURE

# RESPONSIVE INDUSTRIAL DEVELOPMENT

1960s

Generic Industrial Estates

Business Park / Science Park

1970-1990s

Specialised Park

2000s

Innovative Industrial Landscape

# RESPONSIVE INDUSTRIAL DEVELOPMENT


Specialized Industrial Parks

Wafer Fab Parks

Aerospace Park

Business Parks

One-north

Cleantech Park

Biomedical Park

Jurong Chemical Island

Airport Logistics Park

Jurong Port

Jurong Marine Base

# APPROPRIATE INDUSTRIAL POLICIES

**Adopting the '4P' Principles to meet customers' needs:**

1. **Policies**
2. **Products**
3. **Price**
4. **Processes**

| Tool |
| --- |
| Economic Expansion Incentives Act (1967) |
| Land Acquisition Act (1967) |
| Employment Act (1968) |
| Wage Correction Policy (1979 to 1981) |
| Employment (Amendment) Act (1988) |

| Tool |
| --- |
| Winsemius Report (1960) |
| Development Plan of 1960-64 |
| 1971 Concept Plan |
| JTC's 10-Year Master Plan (1980) |
| 1991 Concept Plan |
| Industrial Land Pricing |

| Tool |
| --- |
| Cluster Development Fund (DCF) (1993) |
| JTC's Industrial Land Plan 21 (IP21) (1997) |
| Industrial Parks for the 21st Century (iPark21) initiative |
| 2001 Concept Plan |

# TRAINING & EDUCATION

**Continuous upgrading of training & education system to provide competitive manpower resources for industrial development:**

- **Adapt education system of modern technology and industries**
- **Integrating training & education with industrial policies**
- **On-the–Job Training & Retraining to continually upgrade labour productivity**

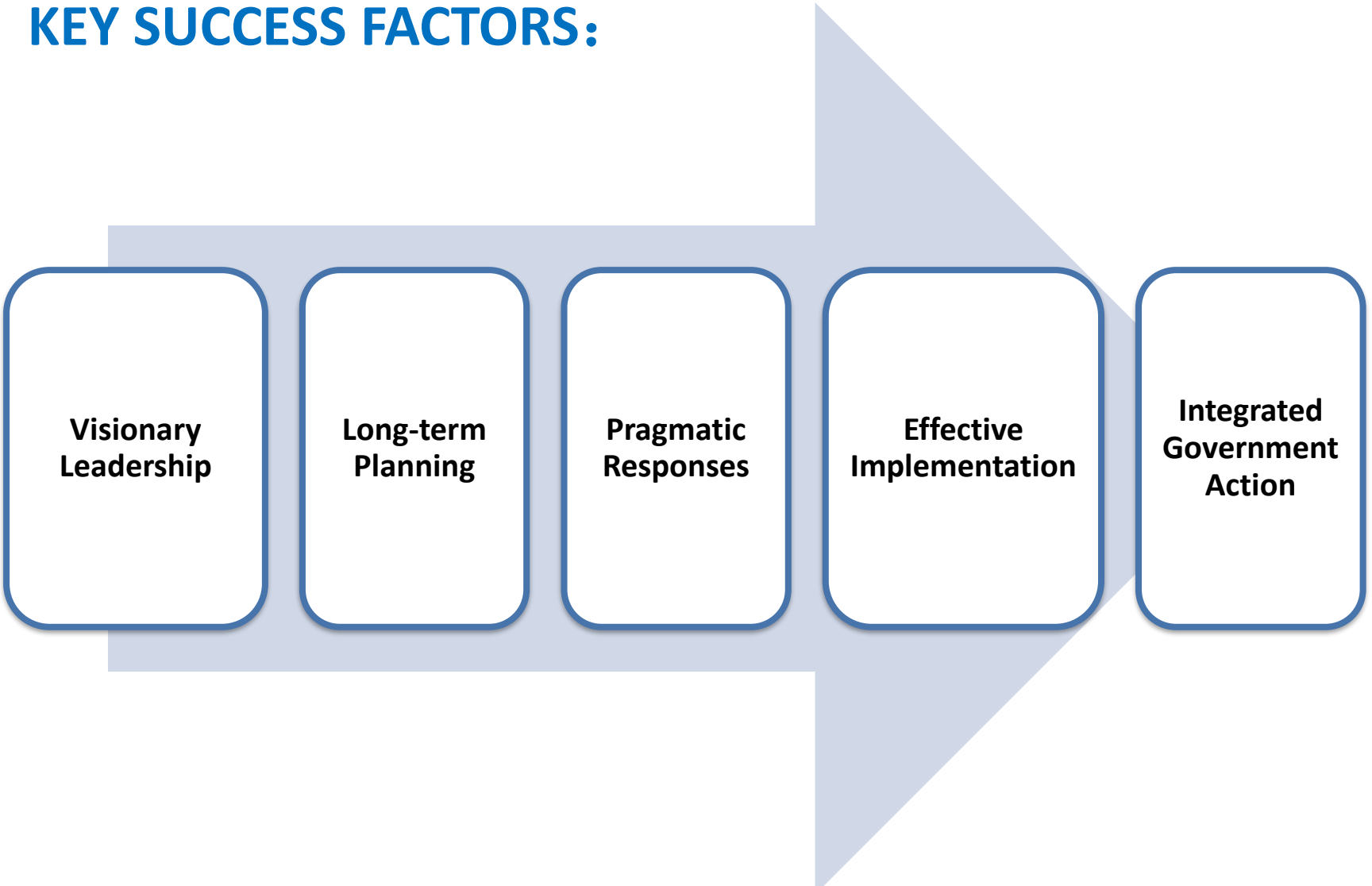
| | |
|---|---|
| 70s & 80s | • *Tata-Government Training Centre*<br>• *Rollei-Government Training Centre*<br>• *Philips-Government Training Centre*<br>• *Japan-Singapore Technical Institute*<br>• *German-Singapore Institute*<br>• *French-Singapore Institute* |
| Now | • *Chemical Process Technology Centre (CPTC)*<br>• *Institute of Chemical and Engineering Sciences (ICES)*<br>• *Chem Gallery @ Jurong Island*<br>• *Insitutes of Technical Education* |

# OUTLINE

- ECONOMIC OVERVIEW
- CHALLENGES OF INDUSTRIALISATION
- **FACTORS OF SUSTAINABLE INDUSTRIAL DEVELOPMENT**
- CONCLUSIONS

# SUSTAINABLE INDUSTRIAL DEVELOPMENT

## KEY SUCCESS FACTORS:

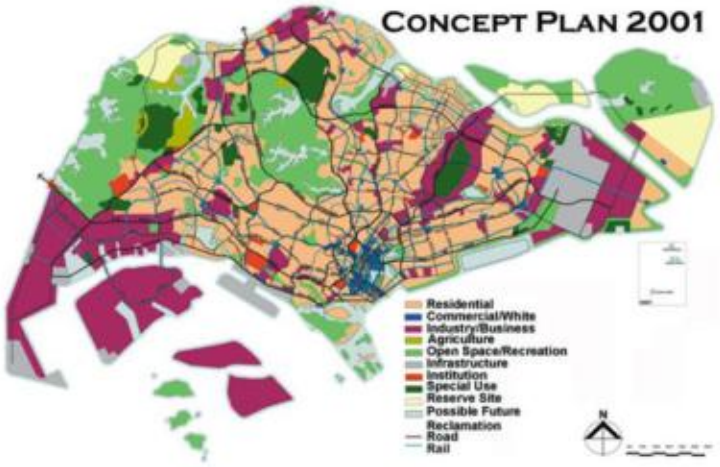


# VISIONARY LEADERSHIP


*"In short, industry would modernise and enrich… [and it] would not only generate economic growth but also help to bring about a rapid transformation of social attitudes to those more consistent with needs of modernising societies"*

*-- Dr Goh Keng Swee, Singapore's first Finance Minister*

# LONG-TERM PLANNING




Concept Plan is a strategic land use plan:

- Guides Singapore's development over the next 40 to 50 years
- Ensures sufficient land to meet long-term population and economic growth
- Balances all land use needs

**MASTER PLAN 2008**


Master Plan is a statutory land use plan:

- Guides Singapore's development over the next 10 to 15 years
- Translates the broad long-term strategies of the Concept Plan into detailed plans
- Shows the permissible land use and density for developments

# LONG-TERM PLANNING OF INDUSTRIAL LAND USE

**Redevelopment Program**

- En Bloc Redevelopment
- Selective Buy Back

**Optimized Land Use**

- Enhance Land Productivity

**Policy Review**

- Lease Renewal & Extension
- Pricing Strategies
- Land Allocation Policies

Industrial Parks for the 21st Century (iPark21) initiative

JTC's Industrial Land Plan 21 (IP21) (1997)

JTC 10-year master plan for new industrial landscapes and infrastructure

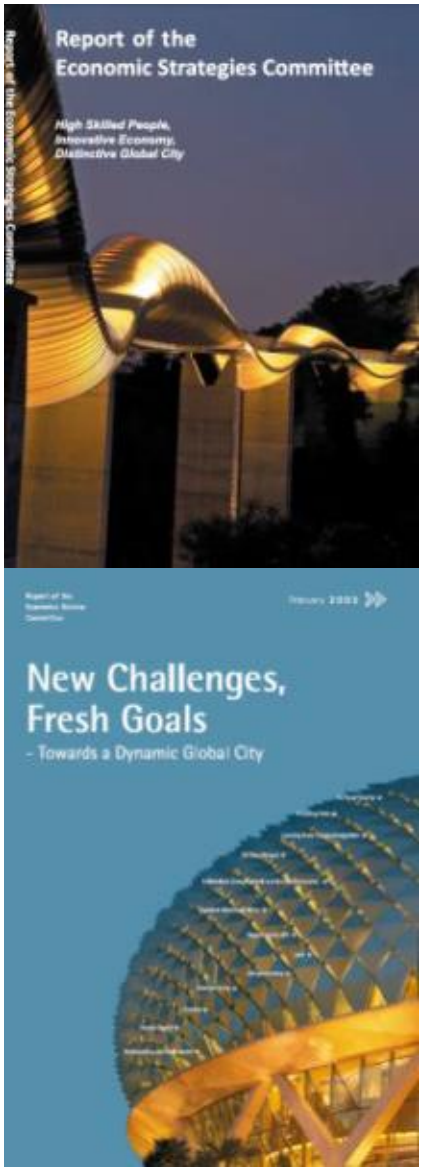
# PRAGMATIC RESPONSES

## Constant adaptation to external changes

- Regular review of economic competitiveness
- E.g. Strategic Economic Plan; Economic Strategies Report; Economic Review Report

## Flexible execution of policies

- Customization
- One-stop Services



# PRAGMATIC RESPONSES

## On-going innovation

- Land and space intensification
- Integrated services and utilities
- Just-in-time design & implementation

## Outcome focus

- Ensure productivity growth ahead of wages
- Keep land and space affordable and available
- Move up value-chain to generate higher value


## EFFECTIVE IMPLEMENTATION

# Pro-business environment

- Invest ahead of demand to build up industrial infrastructure
- Provide quick start up for investors to set up operations
- Build closer relationships with clients

## EFFECTIVE IMPLEMENTATION

# Competitive infrastructure

- Affordable industrial land and space
- Complete and reliable amenities & utilities
- Strong logistics support and port services

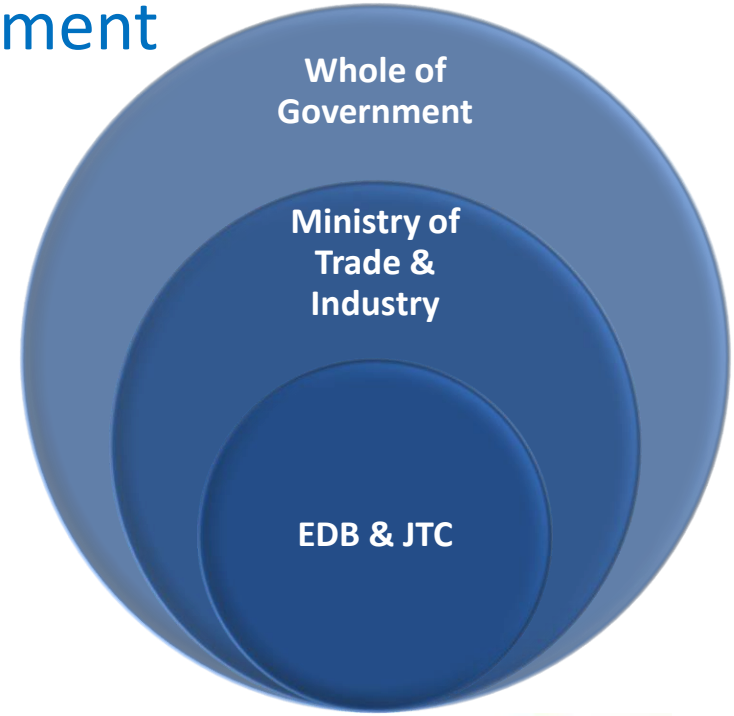
# INTEGRATED GOVERNMENT ACTION

- Whole-of-Government Approach
- Multi-prong strategy compassing economic, industrial infrastructure, manpower, training, labour relations & technology advancement

# INTEGRATED GOVERNMENT ACTION

**EDB** (Economic Development Board) and **JTC** (Jurong Town Corporation) are the Key agencies for Economic & Industrial Development

**EDB** is responsible for **planning, marketing and executing strategies to make Singapore a global hub for business and investment** across manufacturing and internationally traded services.




**JTC** is responsible for **planning, promoting developing and managing the industrial parks, infrastructure and amenities**.

# OUTLINE

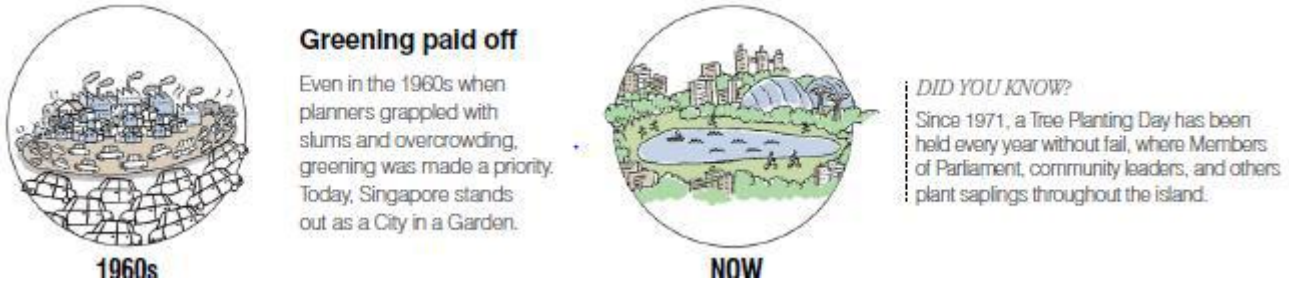
- ECONOMIC OVERVIEW
- CHALLENGES OF INDUSTRIALISATION
- FACTORS OF SUSTAINABLE INDUSTRIAL DEVELOPMENT
- **CONCLUSIONS**

# CONCLUSIONS

Singapore's economy development has taken an approach of *integrating economic direction with industrial infrastructure*.

*Strategic industry choices and close institutional ties* had been the enabler of such an evolution.

This has *embedded Singapore's competitiveness into policies, programme, master plans, infrastructure and business space as well as industrial land*.



# CONCLUSIONS

Singapore continues to face the *challenge of staying relevant and keeping competitive* in a mature economy.

To sustain development， Singapore has to:

- *Maintain strong economic fundamentals, pursue innovation and upgrade its capabilities on a continual basis*
- *Complement the hard infrastructure with the soft aspects of a global city, in order to remain relevant in the global competition*


**Marina Bay realised**

Marina Bay as a seamless extension of the Central Business District, was first mooted in the 1970s. From just an empty land, it has become an iconic destination.


*DID YOU KNOW?*

Land around Marina Bay was reclaimed throughout the 1970s, 1980s and 1990s. The first detailed land use plan was exhibited in 1992. Planners have worked on this project from the 1970s until today.

# DISCUSSION

# CASE STUDY: JURONG ISLAND

# CASE STUDY: JURONG ISLAND

**Development Timeframe：**

- **1990s till now**

**Land Area：**

- **32 sq km (Reclamation & Amalgamation of seven islands)**

**Current Status：**

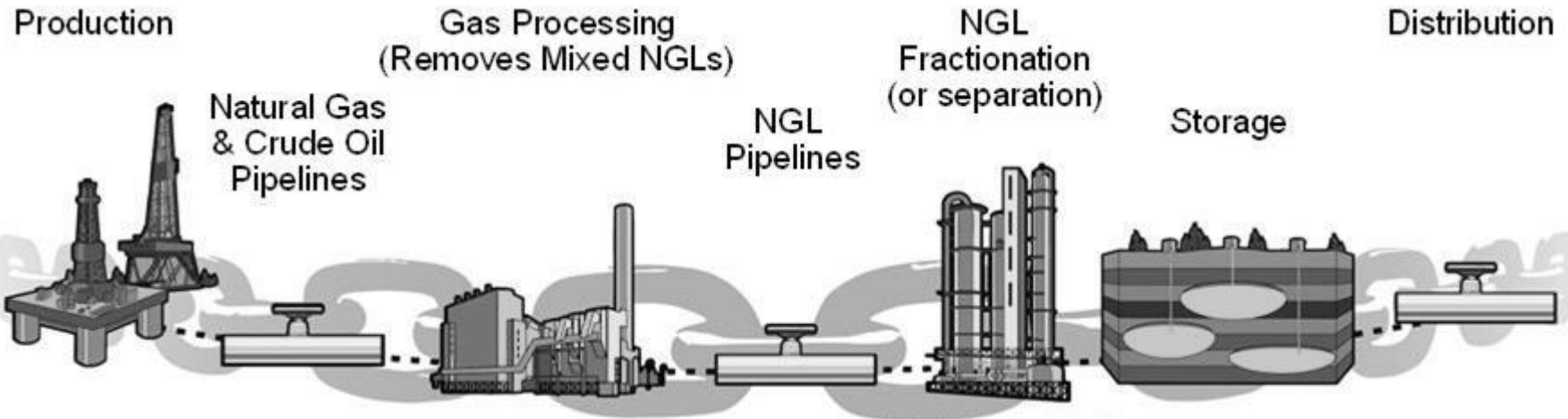
- **Complete value chain of chemical cluster S$ 35 billion of investments by more than 100 companies**

**Singapore is the 3rd largest oil refinery hub in the world**

# CASE STUDY: JURONG ISLAND

**Jurong Island operates as an integrated chemical hub with a vertically integrated structure where the output from one plant becomes the input for another, allowing them to feed off each other symbiotically.**

**Today Jurong Island is the cornerstone of Singapore's energy and chemicals industry and home to a vibrant portfolio of more than 100 leading global petroleum, petrochemical and specialty chemical companies.**



# CASE STUDY: JURONG ISLAND

Jurong Island was outfitted with three types of networks:

- an infrastructural network of service corridors, utilities, logistic services, power, roads, sewerage and telecommunications
- an integrated network of tightly synergised companies
- an IT network for a common e-business platform

These networks enabled companies locating their plants on the island to set up operations easily.





# CASE STUDY: JURONG ISLAND

**Cost Efficiency**

The integration of utilities and logistics infrastructure allowed companies to have a cost-efficient structure, saving up to 30 percent on capital outlay and 15 percent on transport.

**Key pillar of the economy**

The production output of the oil refining industry on Jurong Island reached 1.5 million barrels per day in 2014.

The petroleum, petrochemical and specialty chemical industries together form a key pillar of Singapore's economy, accounting for some 34 percent of the country's total manufacturing output in 2014 worth over S$100 billion.

# INTEGRATED PETROCHEMICAL VALUE CHAIN

| Refining | Crackers | Petrochemicals | Specialty Chemicals |
|---|---|---|---|
| 1.3 million barrels/day | 4 million tonnes /annum of C2 | Over 40 companies E.g. Elastomers Polyolefins Oxo-chemicals | Over 20 companies E.g. Oilfield & Water Consumer Lubricant Additives |
| Asia's leading oil hub Top 5 export refining hub | Top 10 global chemicals hub ~100 chemical companies in a single location | | |

# CASE STUDY: JURONG ISLAND

## Planning for the future

To enhance Jurong Island's competitiveness and sustainability, the Jurong Island Version 2.0 initiative was launched in 2010 to review five key areas:

- New Energy
- Logistics and transportation
- Feedstock options
- Clean Environment
- Clean Water



# THANK YOU!