

Master of Science in  
Urban Science, Policy and Planning  
Graduating Class of 2024  
Master Research Project  
A Compilation of Students' Posters



Lee Kuan Yew  
Centre for  
Innovative Cities

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This team project is undertaken with support from the Urban Redevelopment Authority Singapore (URA).

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# **Independent Projects**



# Harmonizing Holistic Integration of Everyday Heritage for Placemaking

by Michael Sugiyono Susanto, supervised by Dr. Yohei Kato

## Introduction

This study examined the integration of everyday heritage into placemaking. Everyday heritage refers to the intangible cultural practices, traditions, and memories that shape a community's daily life (Mosler, 2019). By recognising everyday heritage, placemaking can become a more inclusive practice. Through mixed-methods case studies of two parks in Joo Chiat, this study investigated whether these parks have successfully incorporated residents' needs and everyday heritage.



Figure 1. KSP (Top), CIP (Bottom)

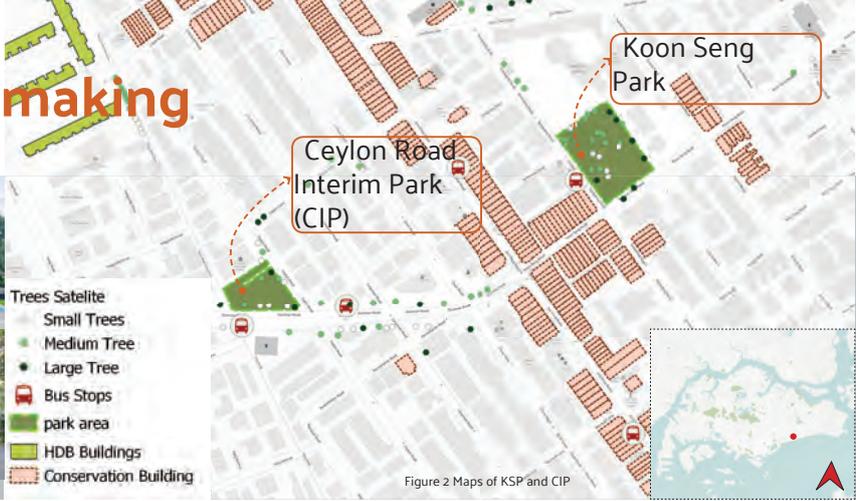


Figure 2. Maps of KSP and CIP

## Research Design and Methodology

- How does traditional heritage differ from everyday heritage in the context of Joo Chiat?
- How do we effectively understand and capture the everyday heritage?

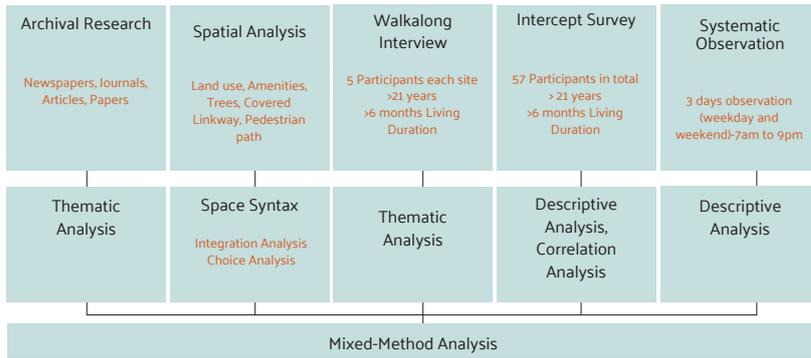


Figure 3. Diagram of Methodology

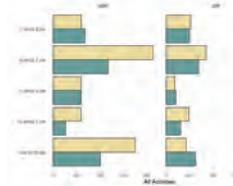


Figure 6. Activities based on Gender

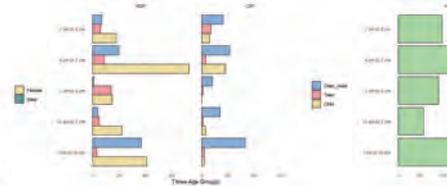


Figure 7. Activities based on Age Group

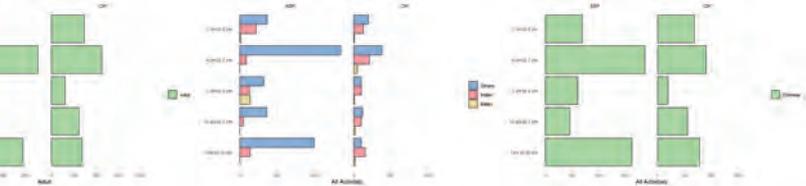


Figure 8. Activities based on Ethnicity

## Conclusion

**Traditional Heritage** attracts residents and typically viewed as tangible or more physical buildings, such as Peranakan architecture, churches, temples around neighbourhood

**Everyday Heritage** is less formally recognized by the residents, but unconsciously the residents highlight the everyday heritage that refers to sense of identity, social interaction, daily practices, such as food culture, festivals, and any informal gatherings

### Understanding Everyday Heritage

Hosting events, guided tour or any cultural celebration to enhance visibility and appreciation of everyday heritage.

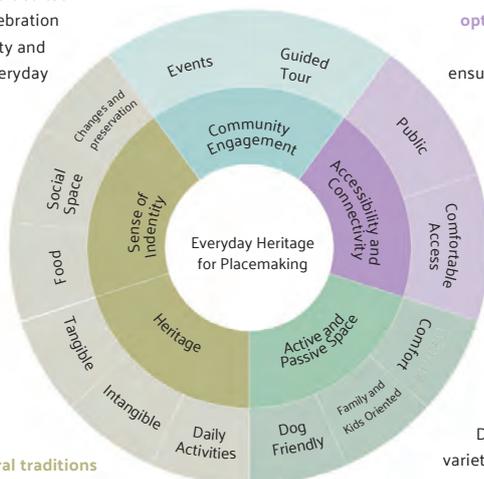


Figure 12. Concept Framework

Integrating cultural traditions and local history into park designs fosters a sense of place and community pride, making everyday heritage a visible and celebrated part of the community's life.

Improving transport options and comfortable pedestrian pathways ensures that public spaces are easily accessible, promoting their use for everyday heritage practices.

Designing parks with a variety of spaces that cater to different activities such as dog parks, family oriented features for kids and educational purposes helps support the daily cultural practices of the community.

## Findings

**Archival research** highlights historical context and highlighted the long standing community driven efforts to preserve heritage and address local issues. **Space Syntax** analysis shows high integration values in parks, indicating they are well-connected and central to community life. Choice analysis revealed the frequency of parks being used as routes between spaces, with higher choice values in KSP compared to CIP, suggesting better utilization and connectivity of KSP. Worth noting that KSP is located nearer to the conservation and commercial area.



Figure 4. Choice Analysis



Figure 5. Integration Analysis

**Observation** indicates activity patterns across different demographics, with high levels of activity during specific hours (7am to 10am and 4pm to 7pm). Notably, this also proves in space syntax analysis shows KSP has more frequent users than CIP.



Figure 9. Activity Heatmap (KSP)



Figure 10. Activity Heatmap (CIP)

**Walkalong interview** highlights the importance of community events and social interactions among residents and visitors in the park as part of everyday heritage. Residents expressed concerns about losing traditional elements amidst modernization, despite their appreciation of urban development in the area. They also suggested improvements for amenities, family-oriented features, and connectivity.

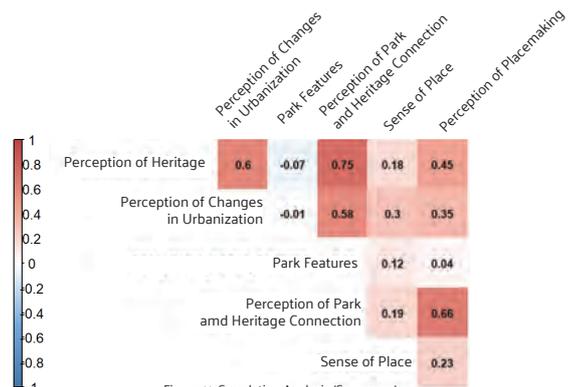


Figure 11. Correlation Analysis (Spearman)

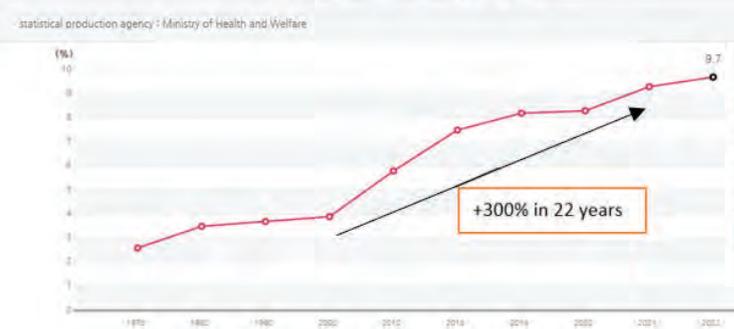
**Intercept Survey** shows positive correlation between heritage perception and park usage, indicating that valuing everyday heritage increases community support for parks.

# Reviving the Future of South Korea:

Ensuring Sustainable Demographics through Strategic Government – Chaebol Collaboration

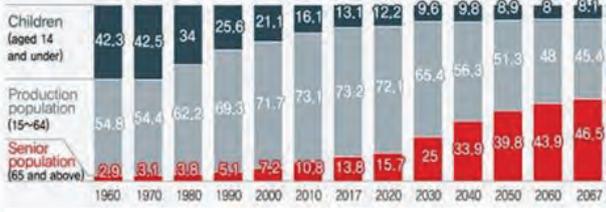
Lau Chien Ho

Current health expenditure (% of GDP)



## Problems

Proportion of population by age group (Source: Statistics Korea, Unit: %, based on media forecasts)



**The Boiling Frog**

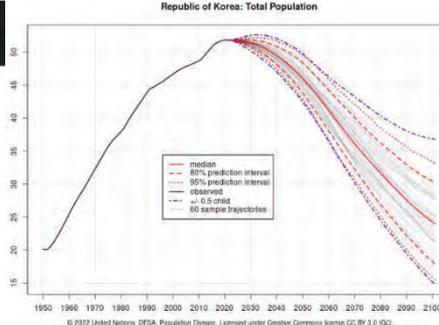
The boiling frog is a fable describing a frog being slowly boiled alive. The premise is that if a frog is put suddenly into boiling water, it will jump out, but if the frog is put in tepid water which is then brought to a boil slowly, it will not perceive the danger and will be cooked to death.

**The Snowball Effect**

A seemingly Unimportant Problem

TIME

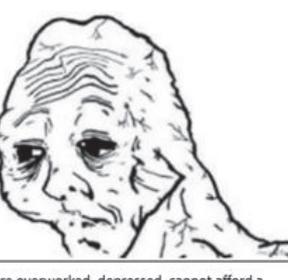
1.81 births per woman (2021)



South Korean Government



South Korean People



We are overworked, depressed, cannot afford a house and finding a suitable (if any) partner is as good as striking the lottery.

**PLEASE HAVE CHILDREN!**

**Proposed Solutions**

**South Korean Government**

**Chaebols**

**Strategic Collaboration**

Major Corporations	Why Should Chaebols care?	Percentage of GDP	Latest Fertility Rate
Samsung, Hyundai, SK Group, LG Group, Lotte Group, Hanwha Group, GS Group, Doosan Group, Hanjin Group, Kia Corporation	Samsung Electronics, Hyundai Motor Company, SK Hynix, LG Electronics, Lotte Shopping, Hanwha Life Insurance, GS Caltex, Doosan Heavy Industries, Hanjin Shipping, Kia Motors	50.7%	0.72 (2023)

**System Drives Behaviours:**

Show people there are more pros than cons to have children and culture will slowly mould around it within one generation.

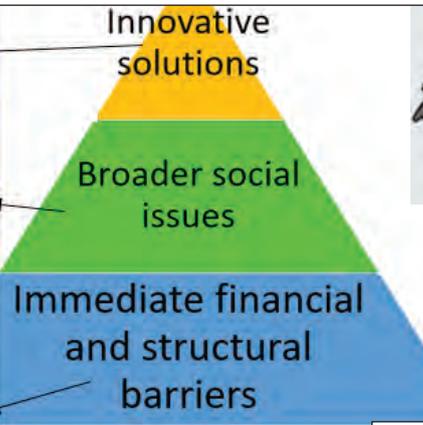
When people tell me I'm missing out on the joy of having kids



**Strategic Collaboration Outcome:**

- National Artificial Intelligence Dating System
  - Entirely voluntary, respecting individual autonomy
  - Best 3 choices to pick from, with tax incentives for couples that marry
- Amendment & Enforcement of Labour Laws
  - Fines for breaking work-life balance laws
  - Special Tax Reliefs for companies with positive impacts on family formation
- Education reforms
  - Chaebol selection by prioritizing candidates based on their marital and family ambitions as equal weightage to tests and skills as people with family tends to work harder
  - Reduces stress and promotes holistic education system
- Certificate of Entitlement for Childlessness & Tax Incentives
  - Bachelor's tax for individuals over 35 or a childless tax for bodily-abled couples (30 and above for females, 35 and above for males)
  - Tax collected used for reducing cost of childrearing & housing grants of couples with at least 1 child, more subsidies for 2 children
  - Interest Rates of Population Control
- Tackle Inequality of low-income earners by distributing a 1% tax on profit collected from Chaebol Entities.

Not only does the Chaebols receive substantial R&D grants/subsidies in this field, they can also sell it as a competitive product that is part of the growing online dating market globally if it is successful in the country.



**CHICKEN RICE JUMPS FROM \$3 TO \$4 NO ONE BATS AN EYE**

**3% CHILDLESS TAX AND EVERYONE LOSES THEIR MINDS**

**Enhanced Ombudsman system:**



**Ombudsman**

[am-budz-man]

An official who investigates complaints against businesses and public entities.

If successful, it solves both its demographic issue and increase its global standing as other nations facing similar issues may take reference from South Korea.

Chaebols have a vested interest in enhancing the Ombudsman system to maintain beneficial collaborations with the government throughout any political changes.

Because not only some younger segments of the population would be disapproving of this necessary policy, South Korea's older and growing share of the population increasingly dominates the electorate, voter dissatisfaction in that segment too could easily lead to a government change, jeopardizing these collaborations and worsening the situation.

# **Team Project: Re(examining) the Growth and Mobility Strategies in the Changi Region**

This team project is undertaken with support from the Urban  
Redevelopment Authority Singapore (URA).

# PREPARING CHANGI FOR FUTURE DISRUPTIONS THROUGH A SCENARIO-BASED APPROACH TO URBAN PLANNING

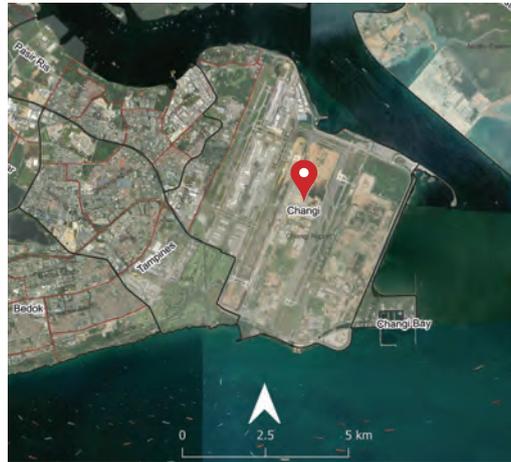
Koo Eugene Abraham, Lim Ling Ling, Merna Alzurikat, Nazula  
Supervisor: Qian Huang



## INTRODUCTION

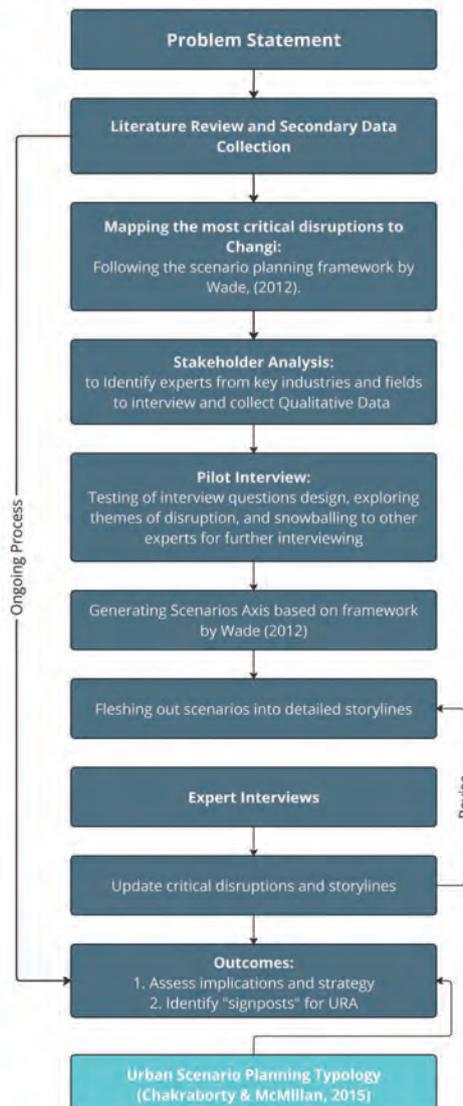
This study revolves around driving sustainable economic development resilient to future disruptions in the Changi region. By applying scenario-based approaches to urban planning problems, the research intends to develop suggestions and indicators that can help planners monitor and adapt to real-world uncertainties in Changi region.

This research addresses critical challenges that aviation regions and economic hubs face, providing practical insights that can help Changi—and potentially other airports—navigate future disruptions effectively. It integrates strategic scenario planning with practical urban planning applications, making it valuable to academic and operational contexts.



Changi Planning Area, Subzones, and Adjacencies. Data Source: Urban Redevelopment Authority (URA), beta.data.gov.sg

## RESEARCH METHODOLOGY



## QUALITATIVE ANALYSIS

Expert Category	NO.	Aim/Outcome	Collection
Government (G) / Academic (A)	3 Gov. 2 Acad.	1-hour Thematic Interview: <ul style="list-style-type: none"> <li>Explore general themes in future disruptions.</li> <li>Assist researchers in identifying general aspects of the topic that the research hasn't investigated.</li> <li>Draw the bigger picture surrounding the research topic.</li> <li>Identify the most relevant disruptions that are of concern to Changi.</li> </ul>	After acquiring consent, voice recording and transcription was collected
Private (P)	1	1-hour In-Depth Interview: <ul style="list-style-type: none"> <li>To dive into one specific topic that has been identified through the literature review or by the thematic interviews in-depth</li> <li>Understand the specific experience and insights of the expert in this topic</li> </ul>	

"...there must be a place where you're testing and innovating all the time. Because when it comes to things like AI, ...it is no longer about learning how to do it. It's about doing it so that you learn what can be done." - A1

"... will Changi remain an air hub?" - A2

## RESEARCH QUESTIONS

How can Changi prepare for future disruptions to secure its role as a sustainable economic ecosystem?

- 1 What future disruptions (technological and economic) will most significantly impact Changi's operations and sustainability over the next 10 years?
- 2 What are the potential impacts of these key disruptions on Changi's economic activities, land use, and transport infrastructure?
- 3 What signals can planners monitor that will indicate how various disruptive scenarios are unfolding?
- 4 What adaptations can Changi implement in response to each scenario?

## RESEARCH GAP

Scenario planning remains underutilized and overlooked in urban planning (Mannucci et al., 2023). Explorations into the theoretical underpinnings of scenario-based approaches are needed to improve its application to urban design and planning. (Jaoude et al., 2021)

Social Technological Economic  
Environmental Political



This chart illustrates the complex interplay of technological & economic disruptions, highlighting how experts frequently introduce additional aspects such as political, social, and environmental factors.



# CHANGI'S FUTURE SCENARIOS

### SCENARIO 1: Tech-Driven Boom

**Global Competition Wins**

- Technological Advancement and Adoption: Rapid
- Economic Stability and Growth: Stable and High
- Air Hub Relevance: High
- Demand for Labor: High for Knowledge-based Skills

**Description:** Changi Planning Area sees high economic growth as it wins global competition and acquires a stable air hub position. Technological advancement increases efficiency and reduces environmental impact as green energy solutions are adopted in advanced technology. This attracts more businesses in the field of technology and R&D as well as logistics companies. As more cargo lands in Changi Airport, autonomous terminals corridors are created to transport goods into the different streams with less travel time, eventually causing less traffic congestion. The airport is also used as an air hub for Autonomous Urban Air Mobility that connects to other air hubs in Singapore using efficiency in transporting goods and passengers to multiple parts of the city state while AV and IV continue to dominate the roads. Ferry terminals are integrated for cargo and passenger movement establishing an interconnected transport system through air-sea-sea. This controllable sea, ground, air-sea and air traffic requires a complex traffic control system where hardware and remote sensing technology are used for a more efficient, safe, and real-time control of traffic.

**Development Potential:**

- Land Use: More spaces and services are required for autonomous operations in the Airport and Logistics companies as machines are more used. Need of providing spaces to test and experiment with new technologies and to integrate virtual and flexible spaces to meet various future business needs.
- Transport: Infrastructure required to operate autonomous transport systems through air-sea-sea. Increased connectivity for both passengers and cargo. Satellite dependent traffic control.

**Economic:** [Image of futuristic airport terminal]

**Technological:** [Image of autonomous vehicles]

### SCENARIO 2: Innovation Amidst Turbulence

**Global Competition Losses**

- Technological Advancement and Adoption: Rapid
- Economic Stability and Growth: Volatile
- Air Hub Relevance: Low
- Demand for Labor: Moderate for Knowledge-based Skills

**Description:** Changi Planning Area sees technological advancement and increased adoption of innovative solutions, attracting high tech companies to reside in Changi as more spaces become available in place of logistic companies in response to Changi losing its place as an international air hub, thus, reducing passenger and cargo travel. As air freight decreases, supply of materials and goods decreases due to decreasing import/export resulting in the increase of prices. As Changi becomes a technological hub, focusing on manufacturing and R&D as its strengths to ensure sustainable development and technological independence, it is faced with many struggles as prices of imported materials and necessary equipment increases. Eventually increasing financial burdens on high tech companies and manufacturers.

**Development Potential:**

- Land Use: More spaces and services are required for high tech companies as Changi becomes a Tech Hub. Necessity of providing spaces to test and experiment with new technologies and to integrate virtual and flexible spaces to meet various future business needs. Investment in manufacturing to acquire self-dependency.
- Transport: Infrastructure required to operate autonomous transport systems.

**Economic:** [Image of industrial park]

**Technological:** [Image of autonomous vehicles]

### SCENARIO 3: Stagnant Future

**Global Competition Losses**

- Technological Advancement and Adoption: Slow
- Economic Stability and Growth: Low/Declining
- Air Hub Relevance: Low
- Demand for Labor: Low for all skills

**Description:** Changi Planning Area sees an economic recession as it loses its position as an Air Hub due to global competition. Construction of Changi Airport Terminal 5 is completed requiring more manpower to be operated as dependency on technological advancements falls behind. This leads to decreased operational efficiency, increased operational costs for Changi Airport, and decreased air traffic for cargo and passengers, therefore Businesses and Logistics companies relocate out of Changi. Traffic congestion decreases however, Changi becomes more disconnected as the planning area becomes less occupied and investment in technologies and businesses decrease.

**Development Potential:**

- Land Use: Repurposing of old Airport Terminal 1 to be used for other attractive amenities for tourists and residents. Repurposing of areas of Changi Business Park to meet other educational, residential, health care, and shopping needs.
- Transport: Infrastructure adapts to meet the needs of the increased residential presence in Changi and promote active and sustainable mobility.

**Economic:** [Image of industrial park]

**Technological:** [Image of autonomous vehicles]

### SCENARIO 4: Stable Growth with Slow Tech

**Global Competition Wins**

- Technological Advancement and Adoption: Slow
- Economic Stability and Growth: Stable and High
- Air Hub Relevance: High
- Demand for Labor: High

**Description:** Changi Planning Area sees a stable economic growth as it remains a leading air hub globally. Air traffic in Changi Airport increases with the construction of Terminal 5, leading to more cargo and passenger movement in Changi, subsequently increasing demand for labor. Slow advancement in technology decreases efficiency of operational costs. Logistic companies' presence in Changi is dominant compared to technology companies and businesses, increase in cargo movement in land transport adds to the traffic congestion issue.

**Development Potential:**

- Land Use: Land allocated for logistics companies and operations increases. Repurposing of areas of Changi Business Park to meet other logistics and aerospace development needs.
- Transport: Infrastructure adapts to meet the needs of the increased cargo and passenger movement.

**Economic:** [Image of industrial park]

**Technological:** [Image of autonomous vehicles]

## URBAN INTERVENTIONS FOR SCENARIO 3: "STAGNANT FUTURE"

**IMMEDIATE**

Establishing Synergies and relations with stakeholders to generate positive outcomes with the target to transition conditions towards "Scenario 1"

**NEAR TERM**

Establishing the required infrastructure to meet existing and new demands for services and amenities. Taking Actions towards attaining current situation to transition to "Scenario 1". Planning for the utilization of potential in the current scenario 3.

**LONG TERM**

Safe operation of the required infrastructure and mega projects to support and maintain conditions and utilizing potential in "Scenario 3" in collaboration with stakeholders. Continuous monitoring is essential. Chance of transitioning at this stage is limited.

**YEAR 1**

Identification of Stakeholders and impacted parties/entities

Stakeholder engagement to coordinate efforts and align Strategies and Synergies

**Economic Stabilization measures:**

- Prohibit immediate financial aid to long-term business with high debt to avoid financial and legal.
- Coordinate emergency loans to reduce or stabilize the financial burden on businesses. Offer subsidies and grants for critical sectors to remain operational, and employment level.

**Technology and Infrastructure Investment:**

- Investment in research and development to ensure safe and reliable operation.

**Workforce Support and Development:**

- Provide support for employees, at all job levels through job placement, training and upskilling.

**YEAR 3**

Market Simulation:

- Government marketing campaigns to attract airlines and passengers, emphasizing safety, efficiency, and service quality.
- Global Collaborations with National Partnerships with Air Hubs for Mutual Benefit.

**Economic Diversification:**

- Diversify into economic activities to include financial services, technology, and tourism.
- Investing in SMEs to revitalize economic situation.
- Incentives for companies interested in quick freight storage and system utilizing air-land-sea transport in Changi.

**Introductions of New Projects:**

- Attracting residential, government and interest increases, the need for housing, amenities and family accommodation increases.
- Establishing committees to support Changi along with health/wellness hub (Chang Hospital) & Smart Changi.
- Establishing new residential projects to meet the needs of the new demographic.

Infrastructure adapts to meet the needs of the increased residential presence in Changi and promote active and sustainable mobility.

**YEAR 5**

Adoption of green energy and sustainable solutions

**Introductions of New Mega Projects:**

- Establishing Changi as a Regional Centre for Research and Development requiring collaboration of different stakeholders.

**Repurposing of old Airport Terminals:**

- To be used for other attractive amenities for tourists and residents.

**Planning for the Long Island Development:**

- To establish attractive amenities for tourists and residents and host new mega projects.

**YEAR 6**

Master Plan Amendments:

- Revisiting all the introduced or needed use boundary as well as flexible spaces to safely adapt to changes and future scenarios.

**YEAR 10**

Operation of Terminal 5

**Operation of Terminal 5**

**Stagnant Future**

- Slow Technological Adoption (AI, AV, EV)
- Increase Demand for Spaces
- Low Demand for Labor
- Low Air Hub Relevance
- Low Economic Growth (volatile prices)
- Logistic Companies Relocate out of Changi

Urbanism   Community   Architecture   Sustainability   Participation

## NETWORK ANALYSIS

**Weighted In-Degree**

67 - CAG

24 - SUTD

**Avg. Weighted Degree Analysis**

0.6 PSA

**Modularity Class Analysis**

0.9 MoT & MoM

0.6 PSA

**Betweenness Centrality Analysis**

24 MoM

**Some Nodes Weighted Degree**

MoT and MoM they are well-positioned to quickly influence the entire network.

The Ministry of National Development (MND) is a crucial bridge between different parts of the network, facilitating the flow of information and resources.

Smaller but critical stakeholders include Tanah Merah Ferry Terminal, Changi Ferry Terminal, and the Singapore University of Technology and Design (SUTD), which play important roles but are more peripheral.

Cross-Cluster Collaboration Opportunities, facilitate collaborations between highly central and peripheral nodes to ensure that specialized expertise is integrated into broader strategies.

Network-Wide Collaboration Initiatives and Knowledge Sharing and Capacity Building Projects should be considered

## LAND USE AND TRANSPORTATION INTERVENTIONS

At this stage Changi's identity transitions towards being more residential as economic and technological recession continues. Land Use Interventions at this stage are aimed at meeting the residents needs but also provide enough flexibility for future scenarios. This includes incorporating Mixed-Use and Flexible adaptable spaces.

**Proposed Land Use Intervention Near-Term**

Collaborations & partnerships between SUTD and CBP enhance the R&D field in Changi, establishing a potential for an R&D Hub.

**Proposed Transport Intervention**

The need to adopt sustainable and active mobility means arises and Changi transitions away from being car centric. The proposed park connects Changi's residents to ECP. Required infrastructure for walkability and cyclability along the area.

**Existing Land Use Plan**

Very little considerations given to the small number of residents in Changi in both land use, transport and amenities. This raises concerns for Changi's preparedness to this future scenario if the relevant indicators and signposts emerge.

**Proposed Land Use Intervention Long-Term**

Increasing residential presence increases demand on amenities, as Logistic companies leave Changi and Terminals become less busy, more space becomes available for mixed-use buildings

# Transforming Changi: Making Changi a Place to Rest, Revere and Work



Done by: Cheng Yu Ching, Lee Xin Yi, Jemima & Ng Keng Seng Shawn  
Supervisor: Dr Felicity Hwee Hwa Chan

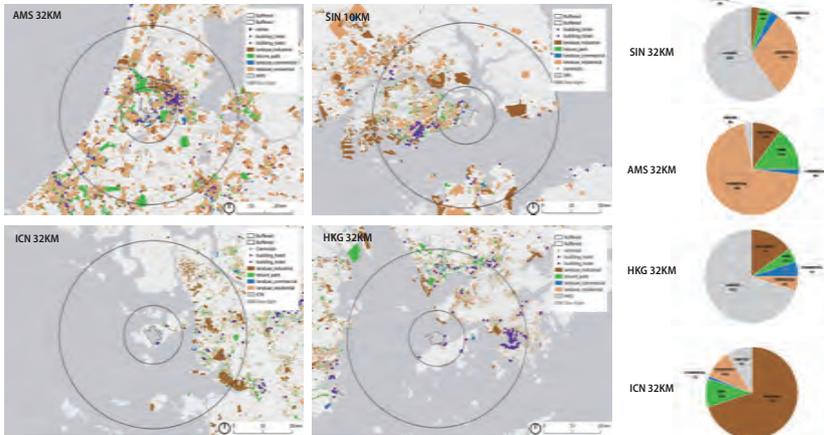


## 1. Research Question & Premise

**Research Question:**  
What kind of strategic land use optimization can support Changi in becoming a thriving aerotropolis?

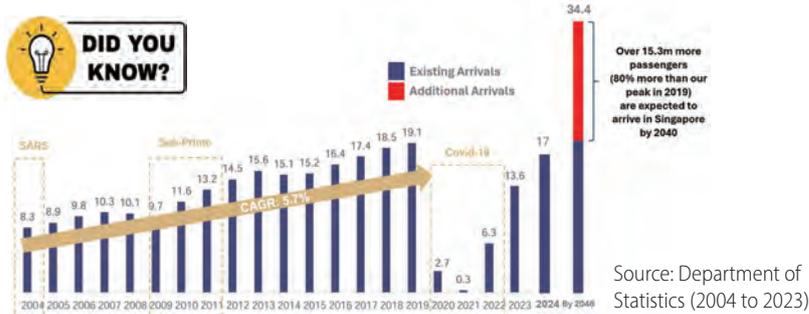
We are undertaking a strategic planning initiative to optimize land use in the southern Changi region, with the goal of developing a thriving aerotropolis, while carefully managing traffic flow. Our aim is to position Changi Airport Terminal 5 and the adjacent Changi East Urban District as the next face of Changi Airport, especially in the latter half of the 21st century. While Changi Airport has been a global benchmark since it began operations in 1981 and is already celebrated for its excellence, we seek to elevate its status further. We envision transforming the southern Changi region into a multifaceted area to rest, revere and work that serves as a sanctuary for both travelers and locals. This will include dedicated zones for traveler decompression post-flight, as well as vibrant spaces for residents to engage with nature and social activities.

## Comparative Land Uses of Global Aerotropolis



## 3. The Backdrop

### International Visitor Arrivals Singapore (millions)



We are confident in Terminal 5's potential for growth due to Changi's proven track record as a successful hub, consistently attracting international visitors even in the face of challenges like the Asian Financial Crisis (1997), SARS (2004), the Global Financial Crisis (2007), and COVID-19 (2020).

Additionally, with more local attractions being developed and the ongoing rise of air travel in Asia, the future looks promising for continued expansion.

## 2. Kasarda's Aerotropolis



**"Look at yesterday's busiest train terminals and you will find today's great urban centers. Look at today's busiest airports and you will find great urban centers of tomorrow."**

John Kasarda in *Aerotropolis: The Way We'll Live Next*

John Kasarda, commonly known as the father of the aerotropolis concept, defines an aerotropolis as a novel urban structure that leverages an airport and its surrounding surface transportation network to quickly link high-value, time-critical businesses with remote suppliers, clients, and partners. This model features a central commercial hub around the airport—known as the Airport City—along with peripheral corridors and clusters of aviation-related businesses. These areas are supported by mixed-use developments that combine commercial and residential spaces, all benefiting from their proximity to the airport and the interconnected infrastructure.

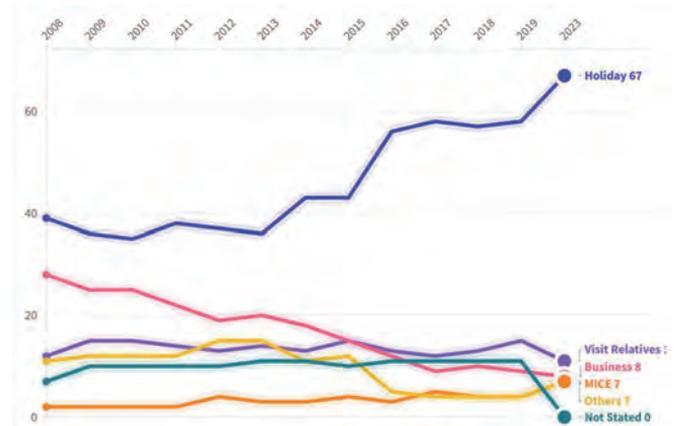
### Spatial Reach

Development Radius: Up to 32 km from the airport

Economic Impact: Measured up to 96.5 km from major airports

Source: Kasarda, J. D. (2008). *Shopping in the airport city and aerotropolis*. *Research Review*, 15(2), 50-56.

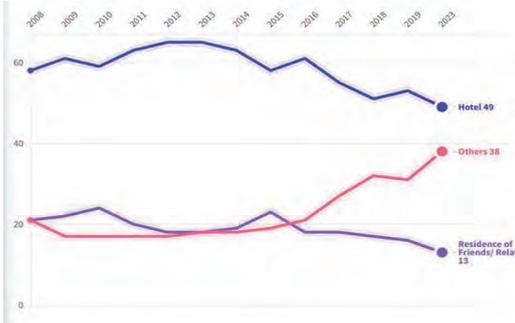
## International Visitor Arrivals Singapore by Purpose of Visit (%)



Since 2008, the proportion of international visitors coming for holidays has increased by over 50%, making leisure travel an increasingly significant segment.

As a result, the share of visitors for business purposes has decreased proportionately. However, the MICE (Meetings, Incentives, Conferences, and Exhibitions) segment has seen a threefold increase over the same period.

# International Visitor Arrivals Singapore (millions)



With 50% of international visitors continuing to stay in hotels, it makes strategic sense to include hotel developments in the Changi East Urban District (CEUD)

Source: Singapore Tourism Board Analytics Network (2024)

Between 2008 and 2019, the average length of stay for international visitors decreased from 3.96 days to 3.34 days. This decline is primarily driven by an increase in the number of 1-3 day visitors. While there has also been growth in the 4-10 day visitor segment, it has been less significant compared to the shorter-stay travelers.

As a result, we aim to focus on the 1-3 day visitors, who now account for 50% of the total visitor base.

Given that the future Changi East Urban District (CEUD) will serve as the face of Terminal 5, this presents a valuable opportunity to capitalize on its potential

# International Visitor Arrivals Singapore by Distribution by Length of Stay (%)

Traveler Group	Approximate Percentage
Transit Traveler (Under 1 Day)	20%
1 – 3 Day Traveler	50%
4-10 Day Traveler	25%
11 Days onwards	5%

Data Series	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Total International Visitor Arrivals (%)	24.60%	23.83%	22.29%	21.99%	24.38%	24.49%	22.26%	21.78%	22.03%	20.90%	21.45%	21.54%	21.47%			
Under 1 Day (Number)	21.49%	20.70%	19.67%	19.49%	19.99%	20.46%	18.10%	18.70%	20.17%	20.67%	20.27%	19.77%	15.41%			
1 Day (Number)	14.89%	13.23%	17.62%	17.60%	18.93%	17.12%	17.72%	17.09%	16.61%	16.51%	16.10%	15.92%	15.40%			
2 Days (Number)	12.46%	13.30%	14.70%	15.46%	14.77%	14.40%	15.61%	15.59%	15.19%	15.49%	15.50%	15.45%	16.13%			
3 Days (Number)	6.69%	6.98%	7.86%	8.26%	7.85%	7.81%	8.80%	9.39%	9.28%	9.60%	9.83%	10.06%	10.99%			
4 Days (Number)	3.81%	3.85%	4.22%	4.23%	4.02%	3.96%	4.54%	4.85%	4.93%	5.16%	5.37%	5.62%	6.15%			
5 Days (Number)	2.47%	2.47%	2.60%	2.54%	2.39%	2.36%	2.68%	2.73%	2.74%	2.92%	2.95%	3.10%	3.58%			
6 Days (Number)	1.82%	1.86%	1.84%	1.79%	1.67%	1.64%	1.82%	1.85%	1.81%	1.80%	1.87%	1.90%	2.39%			
7 Days (Number)	2.57%	2.65%	2.50%	2.49%	2.39%	2.32%	2.43%	2.43%	2.28%	2.27%	2.23%	2.23%	2.95%			
8-10 Days (Number)	1.98%	1.96%	1.84%	1.74%	1.59%	1.53%	1.63%	1.62%	1.47%	1.41%	1.38%	1.37%	1.77%			
11-14 Days (Number)	5.23%	5.18%	4.79%	4.99%	4.12%	4.01%	4.34%	3.97%	3.49%	3.21%	3.04%	3.06%	3.69%			
15-29 Days (Number)	3.20%	3.23%	3.17%	2.96%	2.78%	2.72%	3.02%	2.85%	2.50%	2.33%	2.22%	2.23%	2.55%			
30-59 Days (Number)	1.45%	1.41%	1.17%	1.06%	0.99%	0.94%	0.97%	0.80%	0.70%	0.63%	0.60%	0.60%	0.82%			
60 Days & Over (Number)	0.58%	0.54%	0.45%	0.38%	0.35%	0.34%	0.35%	0.32%	0.28%	0.24%	0.23%	0.23%	0.32%			
Average Length of Stay (Days)	3.96	3.98	3.85	3.72	3.47	3.48	3.49	3.62	3.42	3.36	3.33	3.34	3.80			

Source: Department of Statistics (2024)

## 4. INTERVENTION: MASTER PLAN- FOCUSING ON CEUD & WATER FRONT



Based on the analysis of land use at various airports and the duration of stay in Singapore over the years, we have selected CEUD and the Water Front as our primary planning areas. Through our planning, we aim to effectively provide our target audience with a comfortable, short-term experience of Singapore, thereby preventing potential traffic congestion after the completion of the T5 project.

### TRANSPORTATION PLAN



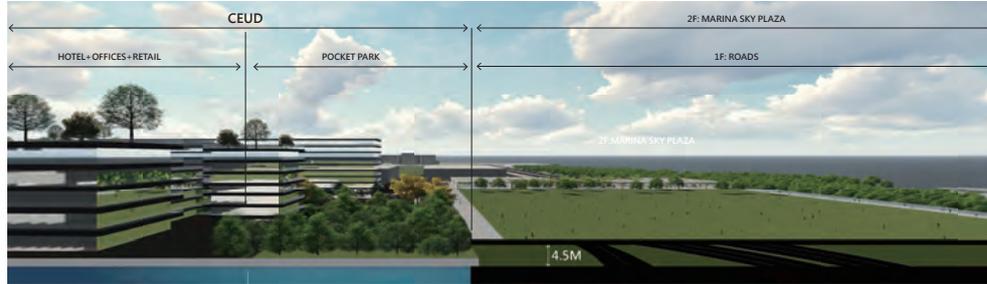
In line with future infrastructure planning, we will develop a comprehensive public transportation system to ensure that the entire area is pedestrian-friendly, with more distant areas accessible by bus or MRT. Within CEUD, shuttle services will be provided for visitors with mobility challenges and those carrying luggage.

### PLANTING DESIGN



Additionally, during the peak tourist season, the central avenue will be transformed into a Flower Avenue, designed to attract visitors. The avenue will feature seasonal planting designs with different color schemes throughout the year, offering tourists a unique visual experience each month.

### TRANSPORTATION PLAN



### MARINA SKY PLAZA



### BLOSSOM AVENUE



# Enhancing the Active Mobility Experience For Workers in the Changi Region

This Master Research Project about Changi Region was undertaken by Singapore University of Technology and Design (SUTD) postgraduate students with support from Urban Redevelopment Authority of Singapore (URA). The project ran between May 2024 and August 2024 and forms a core requirement of the MSc in Urban Science, Policy and Planning at SUTD.

Team	Yeo Han Liang Jeba Mi Zerah Julan Castro Sonia Kamarraj	Supervisors Dr Xin Yang Dr Felicity Chan	 SINGAPORE UNIVERSITY OF TECHNOLOGY AND DESIGN

## RESEARCH QUESTION

**How can the Active Mobility experience be enhanced for workers, especially for last-mile journeys, for a more Connected Changi?**



## RESEARCH SUB-QUESTIONS

- 1 What are the active mobility barriers for Changi workers? What are the workers' perceptions of these barriers?
- 2 What interventions could be proposed to encourage active mobility in their journeys within Changi?

## RESEARCH BACKGROUND & SIGNIFICANCE

 <p><b>FUTURE DEVELOPMENTS</b> Changi East Industrial Zone Changi East Urban District Airport Terminal 5</p>	 <p><b>FUTURE NORTHERN CORRIDOR</b> Cross Island Line MRT 3km of new cycling paths 2.6km viaduct; road-widening</p>	 <p><b>LIFESTYLE DESTINATION</b> Recreation &amp; tourism Round island park connector Heritage trails</p>
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## ACTIVE MOBILITY BENEFITS



## CHARACTERISTICS & ISSUES

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## ACTIVE MOBILITY

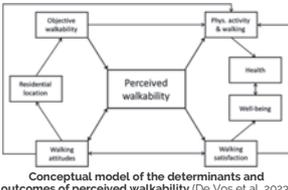
IN SINGAPORE		IN CHANGI	
			
Walk Ride Cycle SG / 2040 LTA Masterplan	SG Walking and Cycling Design Guide / 2018, LTA • URA	People Friendly Walking Cities Report / 2014, CLC • ULI	Active Mobility infrastructure enhancement works in Changi (LTA, 2019)
Walk2Ride initiative	Friendly Streets Pilot	Walking and Cycling Towns	Division of park connector network at Loyang Industrial Estate (NParks, 2024)
Silver Zones	Green Man+	Enforcement Cameras	

## IDENTIFIED RESEARCH GAPS

**Limited Research on Active Mobility in Industrial & Airport Regions**  
Existing studies primarily focus on residential & city centres, neglecting the specific challenges & opportunities for active mobility in industrial parks & airport hubs

**Absence of Customised Environmental Audit Tools**  
While various environmental audit tools exist, there is a lack of tools specifically designed to assess active mobility conditions in industrial & airport settings

## LITERATURE REVIEW

 <p>Conceptual model of the determinants and outcomes of perceived walkability (De Vos et al., 2023)</p>	 <p>Dimensions of integrated cycling policy (Anaya-Boig, 2021)</p>	 <p>Relationship of different factors affecting walkability in various fields. (Sulaiman, 2020)</p>
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## ACADEMIC & POLICY CONTRIBUTIONS

 <p><b>Local Level</b> Infrastructure interventions for Changi Region. Policy suggestions for active mobility</p>	 <p><b>National Level</b> Guide for industrial estate redevelopment</p>	 <p><b>Academic Contribution</b> Development of assessment methodology</p>
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## RESEARCH METHODOLOGY

<b>FUNDAMENTALS OF ACTIVE MOBILITY DESIGN</b> (LTA & URA, 2020B)	 <p><b>DIRECT</b></p>	<p><b>1 Assess Perception of Workers through Online Surveys</b></p> <ul style="list-style-type: none"> <li>Assess critical barriers to active mobility</li> <li>Identify areas to enhance active mobility</li> <li>Identify hotspots for further analysis</li> </ul>	<p><b>Survey Methodology</b> Online questionnaire 15-minute duration</p> <p><b>Participants Profile</b> 45 valid responses from workers aged 21+ &amp; at least 1 month of work experience in Changi in the past 6 months</p> <p><b>Survey Focus</b> Evaluate active mobility infrastructure based on direct, comfort &amp; safety</p>
	 <p><b>COMFORT</b></p>	<p><b>2 Conduct Environmental Audit of Changi</b></p> <ul style="list-style-type: none"> <li>Evaluate presence &amp; quality of built environment elements</li> <li>How well they support workers to walk &amp; cycle</li> </ul>	<p><b>61 questions across 7 categories</b> to assess Accessibility, Comfort &amp; Safety</p>
	 <p><b>SAFETY</b></p>	<p><b>3 Phase Audit</b></p> <ul style="list-style-type: none"> <li>Develop draft audit tool based on literature</li> <li>Conduct researcher audit through site visits</li> <li>Refine questions &amp; test with workers via walkalong interview</li> </ul>	

## SPECIFIC SITES IDENTIFIED FOR STUDY

	<p><b>INDUSTRIAL CLUSTERS</b></p> <ol style="list-style-type: none"> <li>Loyang Industrial Park</li> <li>Changi North Industrial Estate</li> <li>Changi South Industrial Estate</li> </ol> <p><b>AIRPORT CLUSTERS</b></p> <ol style="list-style-type: none"> <li>Changi Airport Terminals 1 to 3</li> <li>Terminal 2 to 4 Park Connector</li> </ol> <p><b>BUSINESS CLUSTER</b></p> <ol style="list-style-type: none"> <li>Changi Business Park</li> </ol>
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Audited sites through non-participatory observation  
At least 2 researchers at a time during weekday morning & evening peak hours

# Enhancing the Active Mobility Experience For Workers in the Changi Region

This Master Research Project about Changi Region was undertaken by Singapore University of Technology and Design (SUTD) postgraduate students with support from Urban Redevelopment Authority of Singapore (URA). The project ran between May 2024 and August 2024 and forms a core requirement of the MSc in Urban Science, Policy and Planning at SUTD.

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## SITE INTERVENTIONS: INDUSTRIAL & BUSINESS CLUSTERS

### Industrial Cluster Intervention #1: Facilitate & Encourage Last Mile Cycling



**Extend cycling paths and reclaim road lanes in inner areas**  
Provide seamless connections from public transport nodes



**Enhance cycling services**  
Bike rental & parking, shower facilities near public transport nodes



**Actively promote cycling as an attractive option**  
Active lifestyle that is beneficial to workers and society; shift culture through community events

### Industrial Cluster Intervention #2: Redesign Transport & Active Mobility Infrastructure



**Redesign road + cycling & walking network**  
Expand paths to reduce conflict between pedestrians and cyclists, with additional safety measures



**Improvement of walking & cycling paths**  
Well-defined paths; regular maintenance & upkeep; clear signages for wayfinding



**More pleasant and enjoyable experience**  
Weather-proof infrastructure; wider range of amenities & recreation options

### Business Cluster: Enhance Workers' Last Mile Experience



**More bicycle rental services & parking spots**  
Encourage greater use of existing infrastructure and well-designed paths

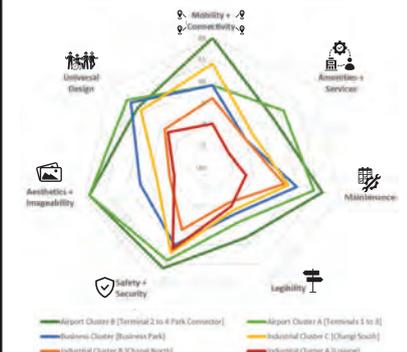


**Clearer, more intuitive walking paths**  
Re-design based on pedestrian behaviour (more direct routes) and with more distinct markers



## ENVIRONMENTAL AUDIT RESULTS

### Key Observations



**Loyang & Changi North Industrial Estates** - ranked lowest for all 7 categories. Interventions should be prioritised.

**Changi South Industrial Estate** - significantly low scores for 4 out of 7 categories - maintenance, legibility, aesthetics/ imageability & universal design. Pilot projects can be tested here.

## SURVEY RESULTS

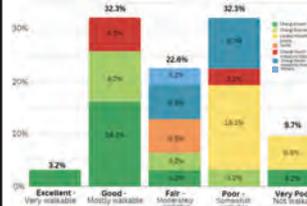
Workers' **demographic profile**: young workforce; across diverse roles (N=45)



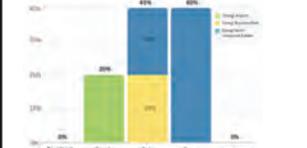
Workers' mean rating for **Direct, Comfort, & Safety in Walking** (N=31)

Category	Mean Rating
<b>Directness in Walking</b>	
Connectivity of walking paths	FAIL
Ease of access of the walking paths	FAIL
Walking accessibility for food and beverage services	FAIL
Walking accessibility for retail and shopping services	FAIL
Seamless connections to MRT stops	FAIL
Seamless connections to bus stops	FAIL
Seamless connections to car parking	FAIL
Seamless connections to cycling paths/bike parking	FAIL
<b>Comfort in Walking</b>	
Sidewalk width	FAIL
Surface condition of sidewalks	FAIL
Cleanliness of sidewalks	FAIL
Presence of shelters and shades	FAIL
Availability of benches and other resting facilities	FAIL
Availability of fountains	FAIL
Availability of drinking facility	FAIL
Aesthetic appeal of the sidewalks	FAIL
Presence of greenery and trees	FAIL
Noise level (i.e. decibels)	FAIL
<b>Safety in Walking</b>	
Availability of traffic signs and information	FAIL
Quality of lighting along walking paths	FAIL
Harmonious use of sidewalks with cyclists	FAIL
Harmonious use of road crossings with motorists	FAIL

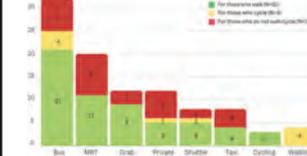
Workers' assessment of overall **walkability** in Changi Region (N=31)



Workers' assessment of overall **cyclability** in Changi Region (N=5)



Workers' other **common modes of transportation**



- Peak periods** of active mobility: 7:01 to 9:00 AM & 5:01 to 7:00 PM. Majority (69%) walk as part of their travel; 11% cycle
- Main reason** for walking is lack of alternative options. For cyclists, it is to maintain a healthy lifestyle.
- Main barriers for walking & cycling**: poor condition of pathways, poor weather conditions, safety concerns, lack of facilities and amenities.
- Top suggestions** to encourage walking: add more shelters and improve walking paths. For cycling: add more dedicated paths, improve biking-related facilities

## SITE INTERVENTIONS: AIRPORT CLUSTER

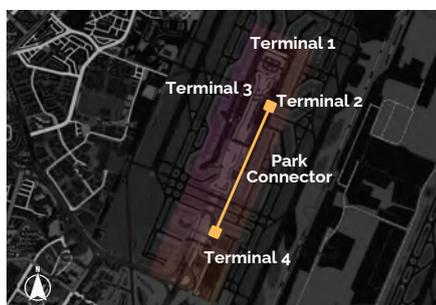
### Enhance Workers' Last Mile Experience



**Encourage morning peak cycling**  
Extend rental service hours to include morning peak to cater to workers



**Enhance comfort of journeys**  
Formal traffic crossings & better lighting, ventilation in closed corridors and basement stops



## IMPLICATION FOR FUTURE URBAN POLICIES & PLANNING

- Case study for other future Changi developments**  
E.g. Changi East Industrial Zone, Airport Logistics Park, Terminal 5
- Mixed-methods approach can be adapted & applied** to assess other industrial estates
- Future researchers & planners** can use & build upon the survey & audit frameworks

## LIMITATIONS & FUTURE RESEARCH AREAS

- Higher sample size would have been ideal.** Our findings nevertheless provide an indication of the workers' lived experiences
- Future researchers could pilot interventions at localised sites** to determine effectiveness & efficiency, before scaling up
- Further studies needed on changing behaviour**, beyond infrastructural improvements

# A VIBRANT CHANGI EXPERIENCE AT NIGHT

Exploring the Potential of Changi's Nighttime Economy

## CHANGI TIMESCAPE ANALYSIS

A timescape analysis of public transportation use between weekdays and weekends, without considering Changi airport, showed peaks during traditional work hours at around 8AM and 6PM. These numbers drop drastically during the weekends, indicating Changi is a transient place to the primary users of the place, i.e. workers. Considering this information, a projection based on Census data, and the number of public transportation uses indicated that most people travel to Changi just to work. The identified nodes of activities are centered around Changi Point, Changi Airport and Changi Business Park.



## RESEARCH QUESTION

The planning area of Changi plays a crucial role in the development and progress of Singapore. Often referred to as "the gateway to the world," Changi is essential for both domestic and international logistics. Home to a bustling international airport (Changi Airport), a prominent convention site (Expo), and a business park (Changi Business Park), Changi is the sixth-largest employment hub in Singapore. Exploring the potential for a Night-Time Economy (NTE) could transform Changi from a transient space into an enjoyable and vibrant destination.

The Night Time Economy (NTE) includes nightlife, shopping, dining and other recreational activities. Successful NTE's bring significant economic and cultural values to the cities. This research aims to answer the following question:

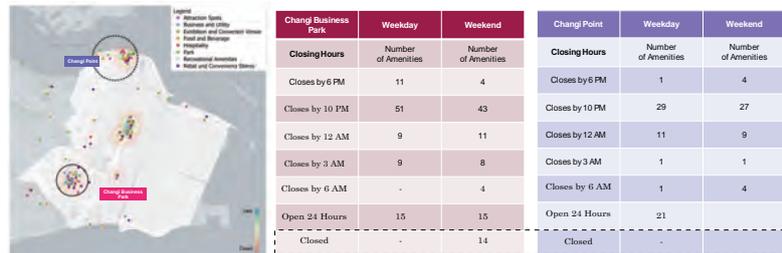
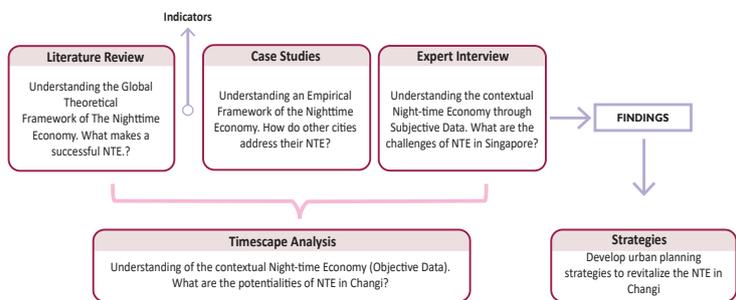
**To what extent does the current demand in Changi support the development of a nighttime economy, and which types of nighttime activities would be most suitable for this area?**

## CHANGI AMENITY ANALYSIS

Recreational and leisure-focused amenities and businesses were analyzed based on their geographical locations and operational hours. The types of businesses or destinations and their operational hours were compared between Changi Point and Changi Business Park. These two areas cater to different activities. While Changi Point remains opens later, Changi Business Park (CBP) has businesses that tend to close earlier, even on the weekends, as CBP tends to primarily caters to workers, who are not working during weekends.

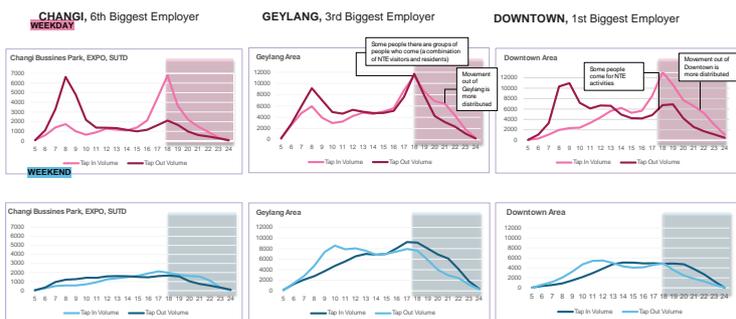
## METHODOLOGY

A mixed methods approach has been used to gather a quantitative understanding of movement patterns and use of space in Changi, through a timescape analysis. Qualitative analysis was done through case studies and professional interviews and offers a global and local context of NTE, providing insights to interpret our findings and develop robust planning strategies.



## SINGAPORE TIMESCAPE ANALYSIS

Changi's timescape when compared to two other areas that are prominently known as workplaces, Downtown and Geylang areas indicate more diversity in tap in and tap out numbers throughout the weekdays and weekends. These areas also have more recreational options in nearby areas.



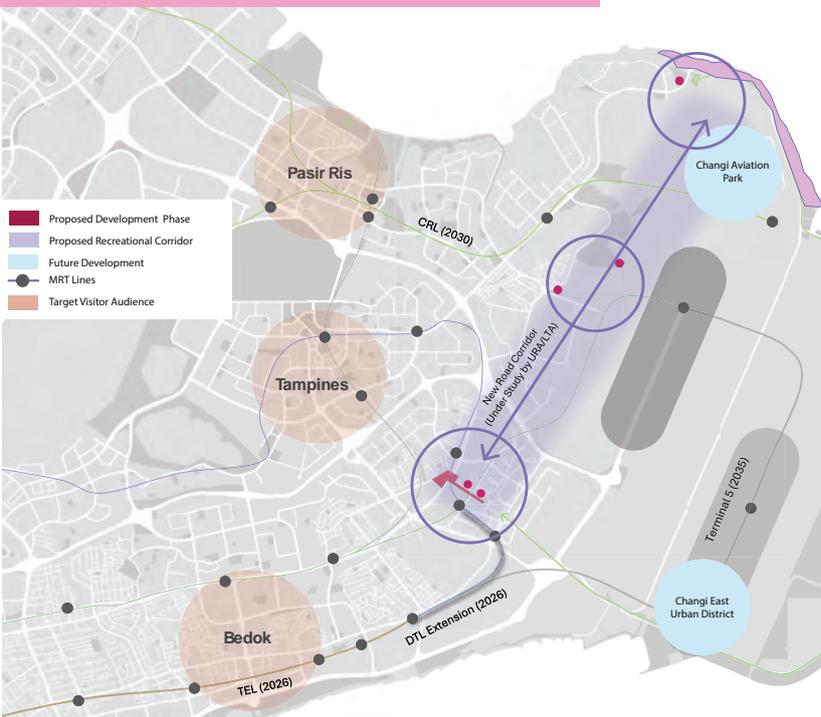
## GLOBAL CASE STUDIES

A comparative case study of cities with similar land use patterns reveals common trends where Night-Time Economies (NTEs) thrive around expo centers and business districts. However, despite having similar land use proximity, Changi's nighttime activities are less vibrant, highlighting untapped potential.



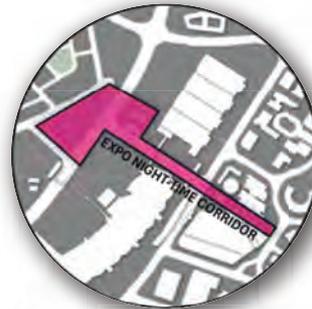
# Night Time Economy Strategy for Changi

## THE CHANGI NIGHT-TIME ECONOMY CORRIDOR MASTERPLAN



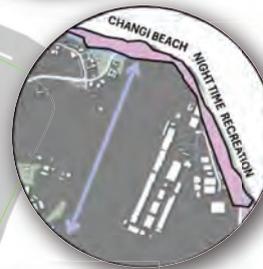
### PHASE 1 (2027)

Developing NTE activities by ensuring easy implementation and flexible activities for both weekdays and weekends in areas with the highest movement concentration in Changi, targeting the intersection of workers, students, residents, and visitors.



### PHASE 2 (2030)

This stage focuses on improving connectivity between Changi Point and CBP-EXPO, as well as with Pasir Ris, gradually attracting visitors from outside Changi while simultaneously building a stronger identity for Changi as a recreational destination.



### PHASE 3 (2035)

In the long term, NTE development in the CBP-EXPO area, Changi Point, and the Changi Heritage Cluster aligns with Changi East Development (Terminal 5 - Changi Waterfront District). Integrating these NTE and recreational locations forms the Changi NTE Corridor, attracting travelers with its market potential and increasing airport traffic.



## PRELIMINARY DESIGN - PHASE 1 - THE CHANGI NIGHT-TIME ECONOMY CORRIDOR MASTERPLAN



Changi – Simei Boulevard is designed as a pedestrian zone with high-quality urban and landscape design. It features covered and sheltered seating areas, abundant greenery and a variety of street food options with ample and well-lit seating to enhance safety. The masterplan emphasizes nighttime activities by offering flexible licenses and permits for operations from 6:00 p.m. to 2:00 a.m., along with cultural events that strengthen local identity and encourage community engagement.