

1st International Conference on Aviation Future: Challenge and Solution (AFCS 2021)

Articulate Design Thinking for Sustainable Airport Environment: A Case Study of Singapore Changi Airport T3

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Introduction

- ***Binary thinking** to create cities and buildings have been the critical destructive force against nature*
- *Particularly, **airport construction** has **a negative influence on nature** with pressure regarding the aviation industry's environmental impact*

Introduction

This study aims to find significant implications for sustainable airport design from the critical analysis of Changi Airport T3, Singapore.

*This envisions an articulated design approach by
creating the inner spaces to integrate with
the groundside landscape,
building performance,
green technologies.*

Theoretical Review

for Articulate Design Thinking

Theoretical Review for Articulate Design Thinking

Jacques Derrida / Gilles Deleuze/ Alice Jardine / Ian McHarg...

Binary thinking can be identified as a strong medium to establish authority in the hierarchical structure

*Binary thinking : ruthless industrialization and urban sprawl, which are the most destructive forces against nature
-> Environmental degradation*

Theoretical Review for Articulate Design Thinking

Patrick Geddes

biological thinking to the city and regional planning.

Welter

the term “**biopolis**” for integrating Geddes's biological thought with urban and regional views (Welter and Whyte, 2003).

Luis Mumford

regional planning as a means of responding to the deteriorating environment and put more emphasis on the **coexistence of human and nature** in it (Luccarelli and Mark, 1995).

Ian McHarg

physical planning should be well **mingled with natural conditions and values**. (McHarg, 1992).

Meyer

“the **hybrid of human nature and nonhuman nature**” with several historical precedents of park design (Meyer, 1997).

Ken Yeang

“**ecodesign**” - designing for the benign and seamless biointegration of our built environment with the nature (Yeang, 2006).



Singapore Changi Airport T3

- Opening in 2008 and served to connect T1 and T2
- Breaking the binary thinking
- Integrating nature with the built environment of systematic high performance in airport planning and design.
- Collaborating with landscape architects, architects, and interior designers

Singapore Changi Airport T3

When **landscape design began** during the early stages of project planning, the team was able to integrate building design, interior design, and landscape design into a cohesive whole (ASLA, 2006).

Interdisciplinary and cooperative design process

- TIERRA Singapore (Landscape Architect)
- SOM New York (Design Consultant)
- Airport Design Division CPG(Architect)
- Woodhead Wilson (Interior Designer)



1. Breaking Horizontal Territories

- **Green continuation** from exterior gardens of the airport groundside to inside the terminal
- A series of **large transparent glass 'skins'** of the building
- Visual green connectivity provides **more comfort and natural atmosphere** to visitors inside the terminal
- Creation of a **new culture** and place perceptions such as an **interior park**



Fig. 1. Connectivity of Landscape at T3



Fig 2. Green Lobby (ASLA, 2009)



Fig 3. Wedding Space in T3 (ASLA, 2009)



Ourdoor Butterfly Garden

2. Convergence of landscape architecture and architecture (natural system and building performance)

- Giant **multi-story vertical garden** and vegetation communities
- **Integrating natural performance and system** into the building
- **"Green Wall"**, measuring five meters in height, contains hanging creepers, and a waterfall was incorporated to create the tropical mood
- Functioning as **natural ventilation, filtration, and temperature and humidity controls** inside the building
- **Environmental and energy benefits** to human environments in terms of **microclimates** (Dimoudi and Nikolopoulou 2003, Gartland, 2008, Akbari 1997, McPherson 2002).

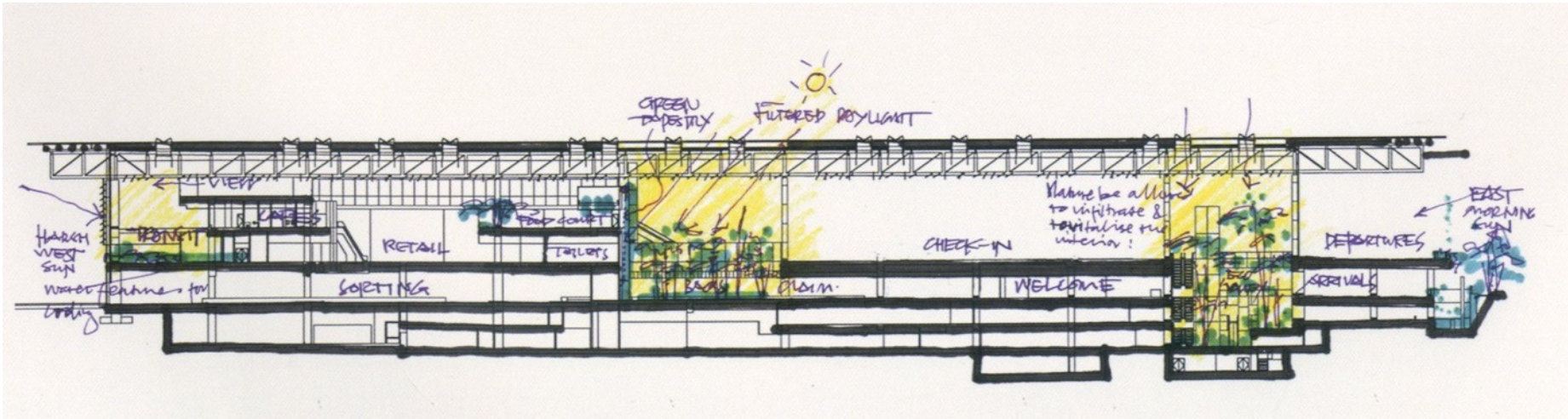


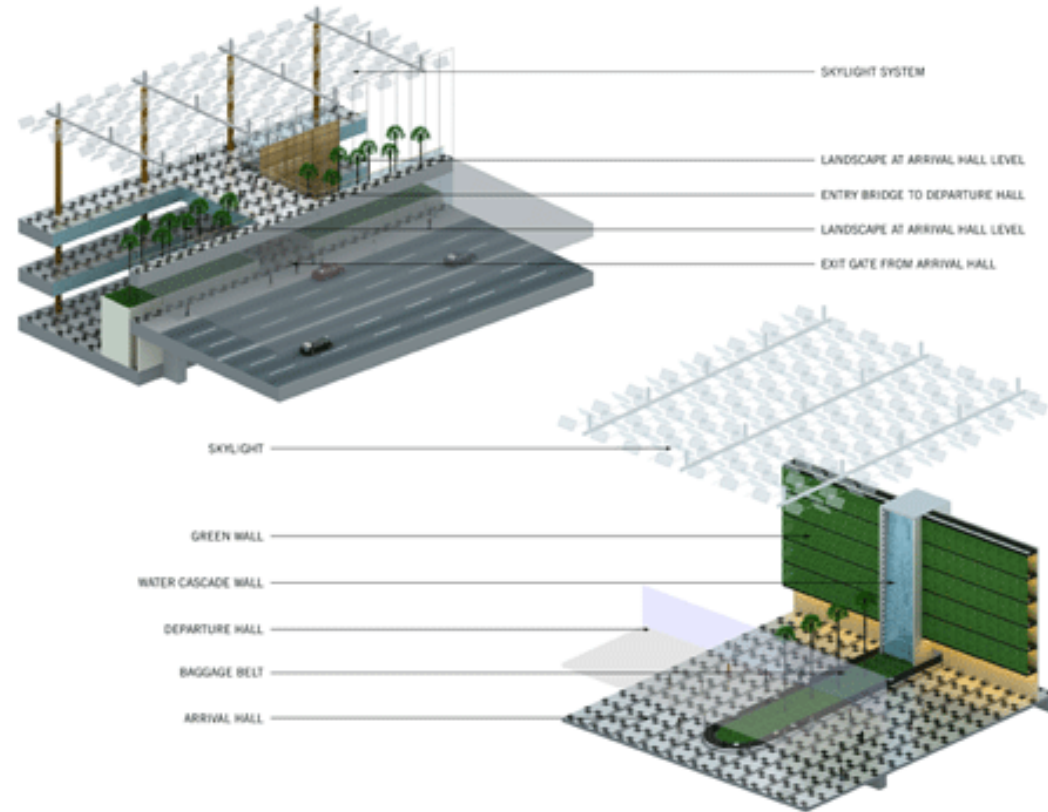
Fig 4. Section of T3 (Vincent, 2008)

- To enhance the **in-door air quality** and environmental conditions of T3
- Selection of **ecologically responsive products** included **cost considerations** and **long-run sustainability**.
- **Landscaping is a significant role to complete the architecture.**
- A significant implication **to break binary thinking** and **to integrate not only landscape architecture and architecture, but also natural system and building performance.**



3. Convergence of landscape and Technology

- Massive green wall was able to be successfully installed and operated thanks to **the double-layer cable** support system and unique roof concept of **'butterfly-winded' skylights**
- The cable support units can be simply attached and detached from the lattice and also **control and maintain the vegetation** efficiently (Vincent, 2008).





Findings: Articulate Design Thinking on the Project



- For the vertical garden, a most critical issue is to provide sufficient natural light to the vegetation for photosynthesis.
- The roof structure of 919 skylights was designed to allow natural light to penetrate the building.
- Perforated metal around catwalks serves to have more lights, and artificial light is used to increase lux levels for the plants (Vincent, 2008).
- The integration of nature and technologies enables the increase in richness and diversity of the airport.
- The interior landscape of Changi airport T3 would be called cyborg landscape.

The background image shows the interior of Singapore Changi Airport Terminal 3. It features a massive vertical garden wall covered in lush green plants. Several tall palm trees are planted in the foreground. The ceiling is a complex, geometric structure with large, white, angular panels and recessed lighting. A yellow sign with the number '46' is visible on the right side of the image.

Conclusion

- Singapore Changi airport T3 is a project that transcends dichotomous thinking
- Articulate collaboration with landscape architects, architects, and interior designers, they tried to create new frontiers of design and culture in airport design.
- A significant and innovative design approach to mingle nature with the building and technology
- A systemic mixture of the building and nature.
- Airport Building performance is enhanced by the synthetic feedback mechanisms between building, vegetation, and technology.
- For more dynamic bio-integration, integrative thinking and multidisciplinary approaches for airport planning.