

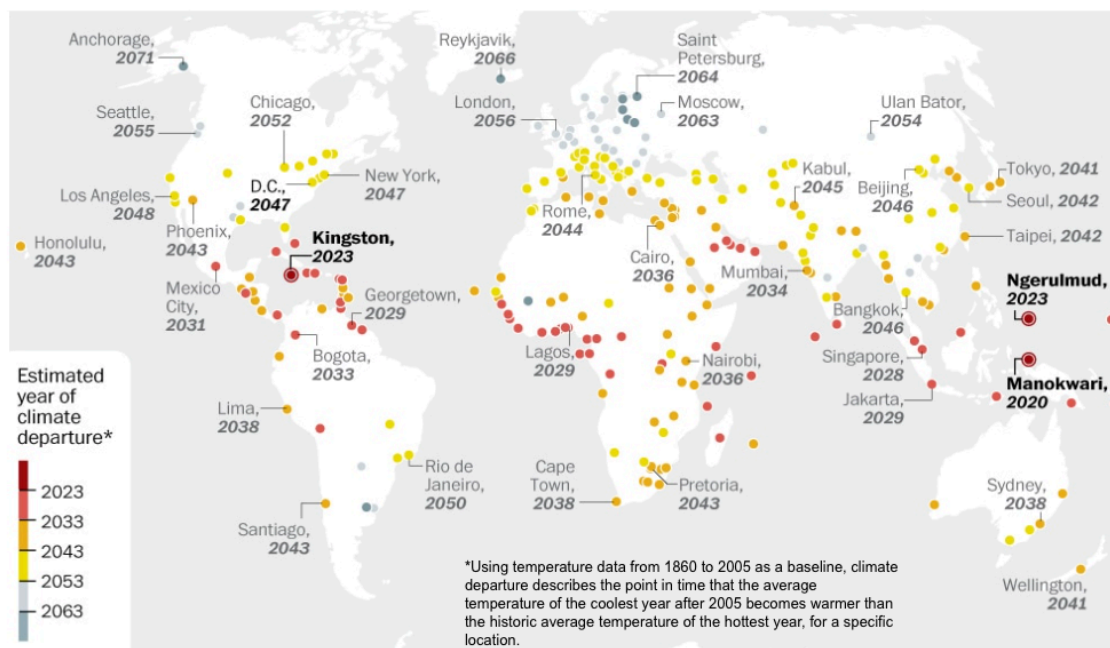
ArcDR3 Initiative  
Architecture and Urban Design for Disaster Risk Reduction and Resilience  
LOCAL SYLLABUS PROPOSAL

# CLIMATE DEPARTURE

National University of Singapore

## 1 | Overview

The world climate is changing. The irreversible departure from the bounds of a country's old climate has been coined as 'Climate Departure'. Caused by the build-up of greenhouse emissions, climate departure poses a threat to not only biodiversity, territorial boundary between sea and land, but humans as well if left unattended to. Tropical climate zones, where Singapore is located, are projected to experience this impact the earliest. First, as a small, low-lying island-state, Singapore faces an existential threat from rising sea levels. Experts estimate that sea levels around Singapore could rise by up to 1m by the end of the century. Second, daily mean temperatures are projected to rise by 1.4 to 4.6°C towards the end of this century. Third, the contrast between the wet months (November to January) and dry months (February and June to September) are likely to become more pronounced. An increase in intense rainfall can lead to flash floods. Conversely, a lack of rainfall poses threats to our water supplies. In 2014, Singapore experienced a record dry spell of 27 days. The drier weather in 2015 and 2016 caused water levels at reservoir in Johor (which Singapore imports water from) to drop to a historic low (about 20% in October 2016). To remain resilient, Singapore need to be able to cope with the impact of changing weather patterns<sup>1</sup>.



SOURCE: Nature. GRAPHIC: Gene Thorp - The Washington Post. Published Oct. 9, 2013.

<sup>1</sup> A Resilient Singapore, Center for Liveable Cities, Singapore, 2018.

At COP21 in 2015 in Paris, Singapore commits to reduce carbon emissions by 36% from 2005 level in next 15 years, as an initiative to mitigate the global warming. In alliance with this initiative, the NUS team for ArcDR3 challenges various factors affected by the *Climate Departure*, focusing on design and research efforts on investigating the relationship between environment, territory and architecture located in the wet tropical region of South-east Asia; our works are specifically focused on the interface between atmosphere and architecture, nature and urbanism, water and landform. The ambition is to develop design strategies for architectural /urban forms and landscape organizations that are not in opposition to the environment – a fundamentally important shift in conceiving the built environment today. As such, the studio is to explore **resilient symbiotic relationships between nature and urbanism**.

## 2 | Learning Objectives

The NUS's challenges on *Climate Departure* aim to strengthen the student's ability to "integrate building / urbanism and landscape designs" with the following emphasis:

- A. Project emphasis – understand the nature of the project and formulates the relevant programmatic components.
- B. Climate emphasis – understand the climatic conditions to design buildings that are sympathetic to it as well as designs that efficiently utilize the energy resource.
- C. Territorial emphasis – understand the nature of site, location, terrain and resources to support design ideas.
- D. Technology emphasis – understand efficient and effective use of available technologies in support of sustainable architecture.

## 3 | Site

Greater Southern Waterfront or selected by studio tutors.

## 4 | Schedule

AY2020-2021

## 5 | Format

MArch 1 studio x 2 (approx. 10 students each)

## 6 | Reference

- Climate Departure

<https://www.treehugger.com/climate-change/climate-departure-when-coldest-year-warmer-warmest-year-record.html>

- A Resilient Singapore, Center for Liveable Cities, Singapore, 2018.

<https://www.clc.gov.sg/research-publications/publications/books/view/a-resilient-singapore>

- Greater Southern Waterfront, Urban Redevelopment Authority, Singapore.

<https://www.ura.gov.sg/Corporate/Planning/Master-Plan/Urban-Transformations/Greater-Southern-Waterfront>

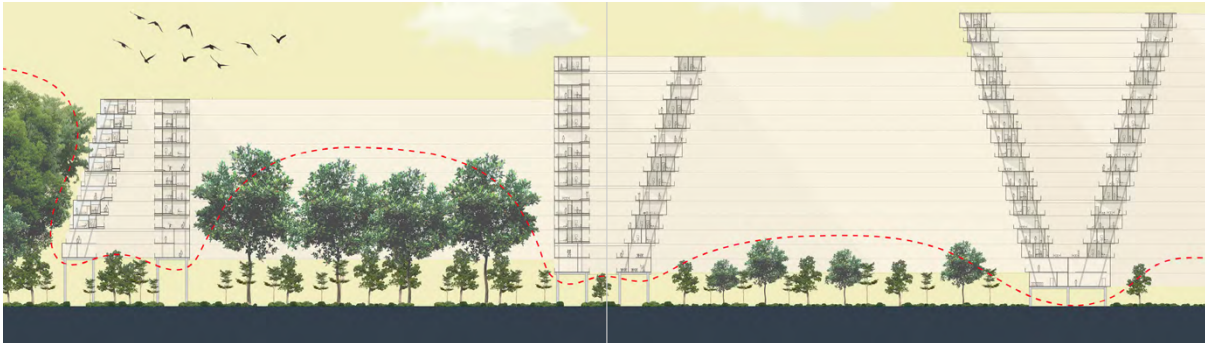
## 7 | Appendix

Studio brief (attached)

## Appendix: Studio Brief

# Re-Forest City™

A/P OKUDA Shinya



*Controlling edge effect of forestry (Liew Jia Qi, Renegotiating Boundaries, Climate and Territory Studio, NUS, 2017)*

## OVERVIEW

Controlling climate, fresh air, shading, privacy, amenity, food and materials: it sounds like a list of essentials for urban habitat, but eventually these are list of functions that natural forest could provide for human-being sustainably. Challenges for urban habitat is that we've been aiming to supply all those essentials artificially, which impact to the natural environment and emit CO<sub>2</sub> accumulatively, ultimately causes the global warming. As a consequence, our climate is departing from the historical patterns, which makes our urban habitat more vulnerable to the natural disasters.

Primitive shape of architecture was started as a shed to protect human race from nature. Historically, mankind has been trying to conquer nature: 17th century Versailles palace or Central Park in Manhattan, those urban nature have been controlled and framed well. When our urbanism grows, sufficiently large enough to has its own ecosystem, our attitude towards nature changed: finding more symbiosis with nature or learning from nature in order to mitigate the issues of the high-density urbanism like noise, heat, pollutions by green corridors, green facades, green roofing, so to speak. However, those current series of mitigation measures require substantial and frequent maintenance artificially.

So, how to develop more resilient urban-nature symbiosis? If we could provide sufficient time and space, eventually forest may regrow by itself without any human interventions and maintenance. It may also recover its own ecosystem and grow biodiversity within naturally. In addition, forest is renewable and it has the everlasting resilience powered by solar. According to the Miyawaki methods<sup>2</sup>, naturally regrown forest develops 10 times faster, 30 times higher and 100 times more biodiversity than conventional reforestation, which may effectively contribute to the carbon sequestration process.

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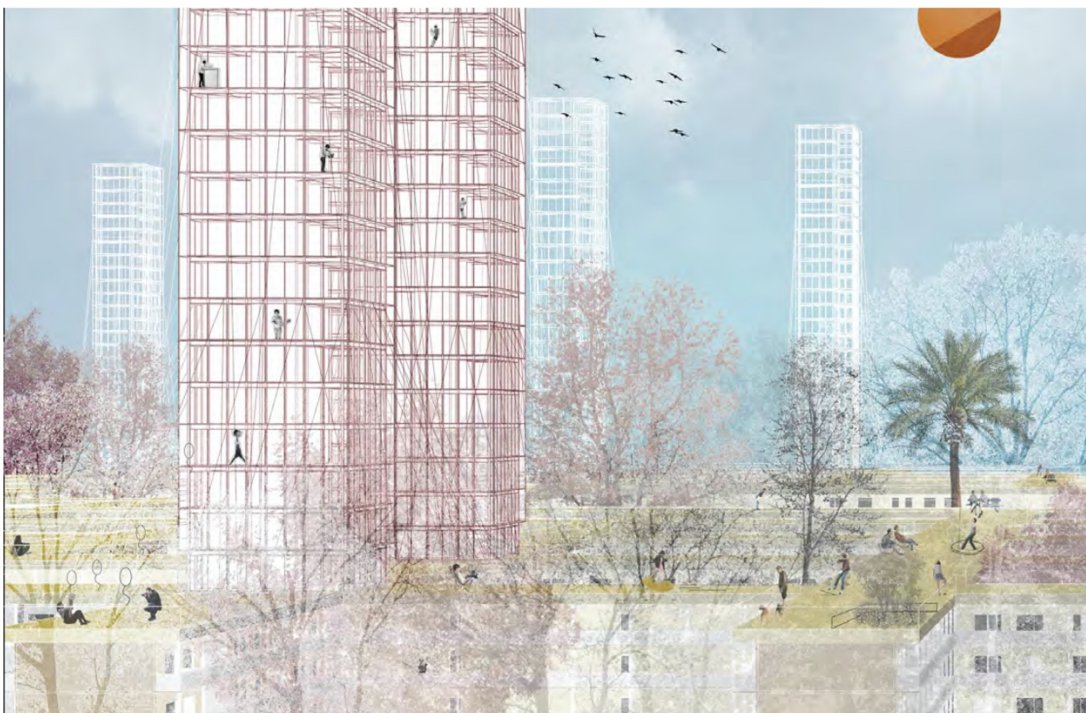
<sup>2</sup> Miyawaki, A., et al., 2017, *The Healing Power of Forests: The Philosophy Behind Restoring Earth's Balance with Native Trees*.

## PROJECT

Eventually, our tropical plantation species may grow up to 4 times faster than the ones in temperate climate<sup>4</sup>, thanks to our year-round sunlight, thus may significantly contribute to the carbon sink nationally, regionally and globally. However, currently there is lack of a proper framework to integrate those spontaneous growth of vegetation in the urban habitat, provided that less-maintained vegetation is not well received by the public (Hwang YH, 2017). The *Re-forest City*<sup>TM</sup> studio is to investigate possible architectural / urban frameworks and interventions between controlled / uncontrolled greenery and human habitat that could host diverse clusters of natural and human ecosystems within respectively.

The studio will commence with group research on carbon sink / emission computations on various form of buildings and landscapes. The investigations will include the boundary designs between control and non-controlled systems to boost the resilience of both the natural ecosystem and the high-density urbanism. Synergy on carbon sink between mass engineered timber architecture / district and naturally grown tiny forest is considered. Multidisciplinary discussions with experts from landscape, forestry, tectonics and urbanism will be facilitated. Lastly, individual visualizations on speculative projects may raise more public awareness and to provide a platform for the next generation architects to debate on the importance of urban-nature symbiosis in future.

While Singapore is a little red dot at the equator, by demonstrating possible symbiosys between contemporary lifestyle and natural environmental, it may encourage the neighbouring nations to protect and further promote the forestry in the regions. This way we hope the necessary economic development in the region should not burden the remaining natural resources and encourage all of us to increase the liability while enhancing the natural ecosystem simultaneously.



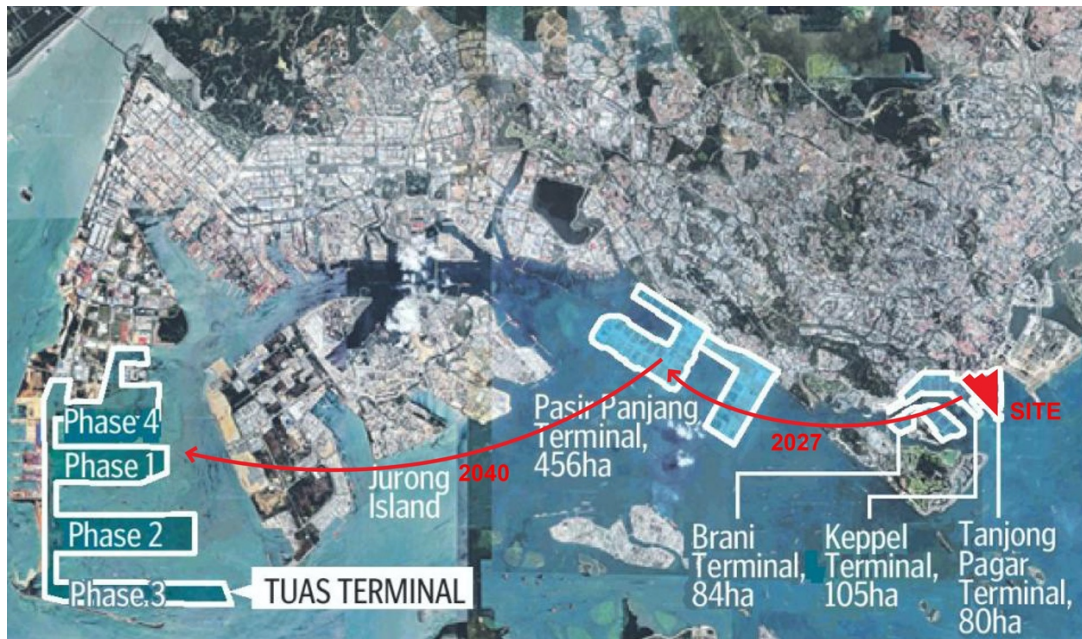
Jiang Yushan, *Roaming City*, Climate and Territory Studio, NUS, 2017

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<sup>4</sup> Okuda, S., et al., 2018, *Cross-Laminated Timber with Renewable, Fast-growing Tropical Species in Southeast Asia*, WCTE.

## SITE

The *Re-forest City*<sup>TM</sup> studio site is located at the former Tanjong Pagar port, which is a very prime piece of land, and we have to maximise the plot ratio. The last thing we need in the land-scarce Singapore is mono-functional district which can be populated in certain hours of the day, so it will need to be designed as live / work / play multifunctional district.



*The lease for Singapore's three city terminals – Tanjong Pagar (80ha), Keppel and Brani – expires in 2027, and the land that will be freed up will be redeveloped as part of the Greater Southern Waterfront project, a sprawling with mixed land uses.*



*In 1966, the Government decided to build the first container port in South-east Asia in Tanjong Pagar (above), when such a concept was still new. The terminal opened in 1972 and halted its operation recently in preparation to the port relocation.*

## REFERENCE

- Miyawaki, A., et al., 2017, *The Healing Power of Forests: The Philosophy Behind Restoring Earth's Balance with Native Trees*.
- Okuda, S., et al., 2018, *Cross-Laminated Timber with Renewable, Fast-growing Tropical Species in Southeast Asia*, World Conference on Timber Engineering, Seoul, Republic of Korea.
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<https://www.ura.gov.sg/Corporate/Planning/Master-Plan/Urban-Transformations/Greater-Southern-Waterfront>
- Steed, H., 2015, *Greening the vertical garden city : the planning, design and management of planting in high density tropical cities*, URA, NPark, Straits Times Press.
- Trees.sg, National Parks Board, Singapore.  
<https://www.nparks.gov.sg/trees#>