



## SITE VISITS

Note: Return transfer to respective accommodation will be provided after all site visits.

### LEE KONG CHIAN (LKC) NATURAL HISTORY MUSEUM

**Date of Visit** : DAY 1 TUESDAY 13 JUNE 2017  
**Time of Visit** : 10am  
**Bus Boarding Time** : 9.15am from Accommodation

#### Introduction to the Museum

The Lee Kong Chian Natural History Museum (LKCNHM) is the largest and oldest natural history museum in Southeast Asia today. Located next to the NUS Museum and Yong Siew Toh Conservatory of Music, LKCNHM is a depository of over a million specimens from throughout the region. As a research institution, the museum collaborates with many visiting researchers from institutes all over the world and to date, has published more than 600 research papers and books and has described over a 1000 species of animals during regular local and overseas surveys and expeditions. The museum also has a role in engaging the public about biodiversity and Singapore's natural heritage using the 2500 square meter gallery which has about 2000 exhibits on display.

#### Guided Gallery Tours

During these 1 hour 30 minute gallery tours, the guides will introduce participants to the role of the museum in biodiversity research and education, bring them through the various zones (e.g., plants, birds, mammals, forest) to discuss the variety of life found in Singapore and Southeast Asia, and share some stories about the exhibits in our biodiversity and heritage galleries.

### PSA CORPORATION

**Date of Visit** : DAY 1 TUESDAY 13 JUNE 2017  
**Time of Visit** : 10am  
**Bus Boarding Time** : 9.15am from Accommodation

PSA Singapore, a fully-owned subsidiary of PSA International, operates the world's largest container transshipment hub in Singapore, linking shippers to an excellent network of major shipping lines with connections to 600 ports globally. Shippers have access to daily sailings to every major port in the world at this mega hub. Its excellence in port operations has consistently been recognized by the shipping community. In 2016, it was voted the "Best Container Terminal (Asia)" at the Asian Freight, Logistics and Supply Chain Awards. PSA Singapore handled 30.59 million TEUs of containers in 2016.

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## SINGAPORE BOTANIC GARDENS

**Date of Visit** : DAY 1 TUESDAY 13 JUNE 2017  
**Time of Visit** : 9am  
**Bus Boarding Time** : 8.15am from Accommodation

The Singapore Botanic Gardens is the first tropical botanic gardens to be inscribed as a UNESCO World Heritage Site. For over 150 years, the Gardens is a major tropical botanical research institution and a very popular attraction in Singapore. The Gardens has been the birth place of South East Asia's rubber and orchid industries.

During this tour, guests will visit the Botany Centre and be briefed on the botanical research work in the Micro propagation laboratory, the Herbarium and Library. Guests will view the collection of dried plant specimens used in taxonomic studies in the Herbarium and learn about the creation of orchid hybrids at the micro propagation laboratory as well as get a glimpse of some of the rare books and botanical paintings stored in the Library Archives.

Following the tour of the Botany Centre, guests will take a leisurely walk through the beautiful Tanglin Heritage Core where they will get glimpses of the Gardens' colonial past. This walk will introduce guests to this heritage area's highlights such as the serene Swan Lake, the ancient heritage trees scattered throughout, the war-time handiwork of PoWs (namely the PoW steps), the Plant House with its collection of rare tropical climbers, the iconic Bandstand, as well as the collection of Vanda Miss Joaquim, Singapore's National Flower. There will be plenty of photo opportunities and walking during this stroll.

## SINGAPORE ETH CENTRE

**Date of Visit** : DAY 1 TUESDAY 13 JUNE 2017  
**Time of Visit** : 9am  
**Bus Boarding Time** : 8.30am from Accommodation

The Singapore-ETH Centre was established in 2010 by ETH Zurich - The Swiss Federal Institute of Technology and Singapore's National Research Foundation (NRF), as part of the NRF's CREATE (Campus for Research Excellence and Technological Enterprises) campus.

The centre serves as an intellectual hub for research, scholarship, entrepreneurship, postgraduate and postdoctoral training, aimed at providing practical solutions to some of the most pressing challenges on sustainability. The first programme - the Future Cities Laboratory (FCL) combines science and design for a sustainable urban future with an Asian perspective. Launched in 2014, the Future Resilient Systems (FRS) programme seeks to develop a framework, methods and tools to make critical infrastructure systems more robust and resilient. Based in Singapore, the centre is the only research centre set up by ETH Zurich outside of Switzerland. Through the two programmes, the centre brings together principal investigators from Switzerland and Singapore and researchers from diverse disciplines and backgrounds.

In the course of our work, we actively collaborate with universities and research institutes to promote the exchange of ideas and expertise. In 2017, the Singapore-ETH Centre led the inter-institutional Cooling Singapore research project to develop a roadmap to improve thermal comfort in tropical Singapore, in collaboration with CREATE centres established by MIT, TUM and with NUS. Across our programmes and projects, our engagement with industry and government agencies helps us to put knowledge to action by providing practical solutions to real-world problems.

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## URA CITY GALLERY

**Date of Visit** : DAY 1 TUESDAY 13 JUNE 2017  
**Time of Visit** : 9am  
**Bus Boarding Time** : 8.30am from Accommodation

URA emphasizes R&D in developing practice-oriented and applicable solutions to address urban challenges and improve citizens' daily lives. This talk focuses on URA's research efforts and interests in areas that leverage advancements in ICT technology to aid planning, build capabilities to enhance our transportation network planning, and provide convenience and access to services and amenities in an inclusive and comfortable living environment. Details can be found here: [www.ura.gov.sg/uol/citygallery](http://www.ura.gov.sg/uol/citygallery)

## CAMBRIDGE CARES

**Date of Visit** : DAY 4 FRIDAY 16 JUNE 2017  
**Time of Visit** : 3pm  
**Bus Boarding Time** : 2:30pm from Matrix

The Cambridge Centre for Advanced Research and Education in Singapore (CARES) is a wholly-owned subsidiary of the University of Cambridge. CARES is funded by the National Research Foundation, as part of CREATE (Campus for Research Excellence and Technological Enterprise) and hosts a number of research collaborations between the University of Cambridge, Nanyang Technological University, the National University of Singapore and industrial partners.

CARES is guided strategically by a Governing Board comprised of senior representatives from the three partner universities (the University of Cambridge, Nanyang Technological University and the National University of Singapore), from the National Research Foundation and from industry. Scientific oversight is provided by a global Scientific Advisory Board.

The first programme administered by CARES is the Cambridge Centre for Carbon Reduction in Chemical Technology (C4T). The C4T programme is a world-leading partnership between Cambridge and Singapore, set up to tackle the environmentally relevant and complex problem of assessing and reducing the carbon footprint of the integrated petro-chemical plants and electrical network on Jurong Island in Singapore. It brings together researchers from Chemical Engineering, Biotechnology, Chemistry, Biochemistry, Information Engineering, Electrical Engineering, Materials Science and Metallurgy.

The motivation for the C4T project is to integrate materials design and selection (i.e. for adsorbents and catalysts) with advances in process design to achieve improved selectivity and conversion. Such improvements will provide a reduced carbon footprint and energy demand for both established and new processes. Lowering the cost of CO<sub>2</sub> capture, and technologies and strategies for waste heat utilization are also underlying drivers in the research. The reduction of the carbon footprint from a wider systems perspective through integration of chemical process related loads within the electrical power network is also addressed.

C4T addresses the complex problem of carbon abatement in chemical technologies by focusing on four fundamental aspects. These four collaborative Interdisciplinary Research Programmes (IRPs) combine state-of-the-art experimental analysis with advanced modelling research from Cambridge and Singapore. Whilst each IRP has clearly-defined milestones and deliverables, denoted as work packages (WPs), there is significant interactions among the IRPs.

- IRP 1: Multi-Scale Studies of Catalytic and Adsorption Technologies (MUSCAT)
- IRP 2: Electrochemical Multi-scale Science, Engineering and Technology (EMSET)
- IRP 3: Carbon Abatement in the Petroleum Refining Industry: A Control and Optimisation Research Network (CAPRICORN)
- IRP 4: Integrated Chemicals and Electrical Systems Operation (ICESO)

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## CHANGI WATER RECLAMATION PLANT

**Date of Visit** : DAY 4 FRIDAY 16 JUNE 2017  
**Time of Visit** : 3pm  
**Bus Boarding Time** : 2pm from Matrix

Changi Water Reclamation Plant (WRP) is Singapore's largest water reclamation plant with a treatment capacity of 920,000 cubic metres per day. It receives and treats used water from eastern Singapore. The treated used water is then further purified into NEWater (Singapore's brand of ultra-clean, high-grade reclaimed water) at the NEWater factories or discharged to the sea. Changi WRP is the heart of the Deep Tunnel Sewerage System (DTSS) Phase 1, a superhighway for used water. The DTSS provides a cost-effective and sustainable solution to meet Singapore's long-term needs for used water collection, treatment, reclamation and disposal.

Construction of the DTSS spans two phases. Phase 1 of the DTSS serves the northern and eastern parts of Singapore, and was completed in 2008. Through retrofitting with membrane bioreactor technology, the treatment capacity of Changi WRP was increased from the initial 800,000 to the current 920,000 cubic metres of used water per day (m<sup>3</sup> per day) within the same footprint. Changi WRP will undergo further expansion, which will see the addition of another 100,000 m<sup>3</sup> per day of treatment capacity by end-2019.

Phase 2 of the DTSS extends the system to serve the western Singapore, and is scheduled for completion by 2025. A highlight is the Tuas WRP, which will treat 800,000 m<sup>3</sup> per day of used water from both domestic and industrial sources. The compact plant will incorporate technologies to improve its energy efficiency, reduce waste, and will be highly automated to minimise manpower needs. In another first, an Integrated Waste Management Facility (IWMF) will be sited next to the Tuas WRP to harness potential synergies and reap the benefits of a Water-Energy-Waste Nexus.

The DTSS streamlines how Singapore collects, treats and disposes or reclaims used water, freeing up land for higher value uses. When it is completed, the existing conventional WRPs at Ulu Pandan and Jurong, as well as intermediate pumping stations will be progressively phased out. Used water will be conveyed entirely by gravity to one of three centralised WRPs located at the coastal areas: Changi WRP in the east, Kranji WRP in the north and Tuas WRP in the west. The entire DTSS will result in a 50 per cent reduction in land taken up by used water infrastructure.

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## GARDENS BY THE BAY

**Date of Visit** : **DAY 4 FRIDAY 16 JUNE 2017**  
**Time of Visit** : **3pm**  
**Bus Boarding Time** : **2.30pm from Matrix**

### a. Flower Dome

Step into the Flower Dome and you'll be standing in awe of nature. Spectacular and innovative in design, it is one of the icons of Bay South Garden. The Flower Dome replicates the cool-dry climate of Mediterranean regions like South Africa, California and parts of Spain and Italy. Home to a collection of plants from deserts all over the world, it showcases the adaptations of plants to arid environments. Stop and smell the flowers in the colorful changing displays of the Flower Field, which reflects different seasons, festivals and themes.

Enjoy a cooling and leisurely stroll through the Flower Dome and experience the eerie profile of the baobabs, surrounded by fascinating succulents. Immerse yourself in the spectacular view of the Marina reservoir skyline, as you embark on your journey through the Mediterranean Basin, South West Australia, South Africa, Central Chile and California. You'll discover amazing plants and flowers from different corners of the globe, and you'll be amazed by how different parts of the trees are used in daily lives across different cultures.

### b. Cloud Forest

Enter the Cloud Forest, a mysterious world veiled in mist; entirely different from the Flower Dome. A 35-metre tall mountain covered in lush vegetation shrouding the world's tallest indoor waterfall showcases plant life from tropical highlands up to 2,000-metres above sea level. Ascend to the mountaintop in comfort by lift before descending via two walkways in the clouds for an aerial view of the canopy and mountainside below. Learn about unique biodiversity and geology of cloud forests and the environmental threats they face within the nine unique zones in this cool-moist Conservatory.

### c. OCBC Skywalk

Get an up-close look at the technical marvels of the Gardens' futuristic Supertrees along a 128 meter-long aerial walkway like no other. Offering a spectacular view of the skyline 22 metres above the ground, the OCBC Skyway at the Supertree Grove is a popular attraction for visitors looking for a getaway in the very heart of nature. During the day, a stroll along the OCBC Skyway presents glorious photo-taking opportunities to capture the scenic beauty of the surrounding flora. As dusk falls, the captivating Marina Bay skyline emerges and the entire area comes alive during the twice-daily Garden Rhapsody light and sound show.

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