



**NUS**  
**Sustainability**  
**Strategic Plan**  
**2017 - 2020**

# NUS Sustainability Strategic Plan 2017–2020

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# Introduction

The National University of Singapore is committed to protecting the environment and seeks to incorporate sustainability in all aspects of campus life – from research, education, operations, planning, construction, and instruction to public service.

The multi-year, multi-faceted Sustainability Strategic Plan developed and deliberated by the NUS Sustainability Steering Committee, focuses on the operational aspects of the University. It identifies the University's key environmental impact areas and articulates the goals as well as actions to be implemented to reach the set targets by 2020.

The Plan is organised around the core areas of carbon emissions and natural resources. It serves to articulate the University's aspirations for environmental sustainability in campus infrastructure and operations, and serves as a roadmap of how we intend to get there.

Intended as a "living document", it is expected that the Plan will evolve over time, with a formal review at the end of four years. Whilst it sets a baseline and allows us to assess the environmental impact of the University – as well as facilitate reporting and accountability – it does not preclude continuous innovation and implementation of new technological solutions as and when they become available.



University land area  
[Kent Ridge, Bukit Timah,  
Outram (Duke-NUS)]:

**165.8**  
hectares

Gross floor area:

**1,459,900**m<sup>2</sup>

**1st**

educational institution  
to receive the BCA Green Mark  
Champion Award in 2012

Number of students:

**38,596**  
(as of 2 September 2016)

Number of staff:

**11,282**  
(as of June 2016)

**9**

overseas colleges

**3**

Research  
Centres of  
Excellence

**About  
NUS**

**30**

university-level  
research institutes  
and centres

**70**

Bachelor's  
degree  
programmes

More than

**140**

Masters, PhD and  
Graduate Diploma  
programmes

Over

**70**

double, joint and concurrent  
degree programmes between  
NUS and top universities  
overseas

Over

**60**

sustainability-related  
modules offered

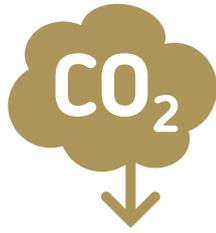
**6**

halls of residences with  
close to  
**3,000**  
students

**5**

residential colleges  
with close to  
**3,000**  
students

# 2016 SUSTAINABILITY HIGHLIGHTS



**15%**

reduction in carbon emissions below business-as-usual level



Reduction in Energy Use Intensity from 214 in baseline year 2012 to

**211** kWh/m<sup>2</sup>/year in 2016

(in spite of 8% increase in Gross Floor Area)



Water Efficiency Index (m<sup>3</sup>/m<sup>2</sup>/year) improved by

**14%**

from baseline year 2012

Recycling rate has increased from 9% in baseline year 2012 to

**17%** in 2016



From 17 Building & Construction Authority (BCA)<sup>1</sup> Green Mark<sup>2</sup> buildings in baseline year 2012 to

**30**

in 2016



Area of green spaces (in buildings) increased from 16,000m<sup>2</sup> in baseline year 2012 to

**26,000m<sup>2</sup>**

in 2016

1. The Building and Construction Authority (BCA) is an agency under the Ministry of National Development championing the development of an excellent built environment for Singapore.

2. Launched in 2005, the BCA Green Mark is a green building rating system designed to evaluate a building for its environmental impact and performance. It provides a comprehensive framework for assessing the overall environmental performance of new and existing buildings to promote sustainable design, construction and operations practices in buildings.

# Policy Framework

## NUS Vision

A leading global university centred in Asia, influencing the world

## NUS Mission

To transform the way people think and do things through education, research and service

## Environmental Sustainability Vision

To make a positive impact on the environment through our academic, research and engagement activities in sustainability



## Sustainability Targets

(Baseline year 2012 unless otherwise stated)

FOCUS AREA	GOALS
<b>Carbon Emissions</b>	Reduce carbon emissions by 23% against business-as-usual level by 2020, against a baseline of 2008
<b>Energy</b>	Reduce Energy Use Intensity by 20% by 2020
<b>Water</b>	Improve Water Efficiency Index by 20% by 2020
<b>Recycling</b>	Increase the overall recycling rate to 25% by 2020
<b>Built Environment</b>	Increase number of Green Mark certified buildings to 40 by 2020
<b>Green Spaces (in buildings)</b>	Increase area of green spaces to 45,000 m <sup>2</sup> by 2020

# Sustainability Steering Committee





# Carbon Emissions

Most of the Earth's warming occurred in the past 35 years, with 16 of the 17 warmest years on record occurring since 2001<sup>3</sup>. Climate change is increasingly being recognised as a global threat which needs to be urgently mitigated. As a small, low-lying island city in the tropics, Singapore is vulnerable to the impacts of climate change such as rising sea levels.

Although Singapore contributes less than 0.2% of global carbon emissions, it is committed to addressing climate change and its impacts. In 2015, Singapore submitted its Intended Nationally Determined Contribution (INDC) to the United Nations Framework Convention on Climate Change in preparation for the Conference of Parties held in Paris in December 2015. In its INDC, Singapore stated its intention to reduce its Emissions Intensity by 36% from 2005 levels by 2030, and to stabilise emissions with the aim of peaking around 2030. Singapore's INDC is a reflection of the nation's support towards global efforts to achieve peaking of global and national greenhouse gas emissions as soon as possible.

Likewise, as a member of the international community, NUS is committed to reducing its energy use and carbon emissions and has continued to make good progress in doing so, well below business-as-usual levels.

## Goal

- To reduce carbon emissions (Scope 1, 2 and 3) below business-as-usual level by 23% by 2020 against a 2008 baseline, while supporting the University's plans for growth in student admissions and research activities

## Strategies

- Actively manage campus energy consumption, particularly buildings, through the University's Energy Policy
- Test-bed renewable energy sources e.g. solar, on campus
- Review and promote alternatives to business air travel
- Review and promote eco-friendly alternatives to university's vehicular fleet

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3. "NASA, NOAA Data Show 2016 Warmest Year on Record Globally", NASA, <https://www.nasa.gov/press-release/nasa-noaa-data-show-2016-warmest-year-on-record-globally>



# Energy Management

As energy use is the main source of carbon emissions on campus, the University actively manages its energy portfolio through conservation and efficiency, as well as by promoting shifts in energy consumption behaviour amongst building users.

## Goal

- To reduce the Energy Use Intensity by 20% by 2020 against a 2012 baseline

## Strategies

- Replace ageing chiller plants with more energy-efficient ones, and consolidate new plants in a few centralised locations for better operational efficiency and reduced energy consumption
- Reduce energy intensity of laboratories through conservation and efficiency projects, including advocating the purchase of energy-efficient laboratory equipment and use of demand-based ventilation systems
- Develop and implement a roadmap for office spaces and teaching facilities to reduce energy consumption through the use of intelligent air-conditioning and lighting controls, building occupancy hours etc.
- Implement charging policy to incentivise building owners to reduce energy consumption
- Effectively manage space to optimise energy usage
- Promote energy conservation through behaviour change





# Water Management

NUS is committed to supporting PUB, Singapore's National Water Agency, in achieving a sustainable level of water consumption and managing the impact of water on the environment. The national target is to achieve per capita domestic water consumption of 140 litres/day in 2030.

As the University continues to grow, it is cognisant of the need to ensure that its water consumption does not rise at an unsustainable rate. As such, the campus Water Efficiency Index has been used as an indicator to measure the University's water usage against its Gross Floor Area ( $\text{m}^3/\text{m}^2$ ).

## Goal

- To reduce the Water Efficiency Index by 20% by 2020 against a 2012 baseline

## Strategies

- Develop and implement a comprehensive water efficiency management plan audited by PUB
- Replace fittings with more water-efficient models in toilets, shower facilities, kitchens, pantries and other water-use intensive areas
- Use harvested rain water instead of potable water for landscape irrigation
- Optimise water savings through the consolidation of chiller plant locations and usage of water efficient cooling towers
- Actively detect and rectify leaks in buildings and facilities
- Cultivate good water usage habits within the NUS community



# Waste Management and Recycling

In line with the Singapore government's strategy to divert waste from the landfill by promoting recycling, NUS has continued to strengthen its recycling efforts over the years, giving waste materials a new lease of life. This waste-to-resource strategy ensures that Singapore does not constrain its development by using up precious resources and instead maximises the use and lifespan of these resources.

## Goal

- To increase the overall recycling rate of the total waste generated by the University to 25% against a 2012 baseline of 9%

## Strategies

- Implement large scale food recycling on campus, in partnership with government agencies which could be the largest source of recyclables on campus by 2020
- Optimise horticulture waste recycling
- Improve paper/cardboard recycling rates, especially from offices
- Promote recycling at large scale events on campus



# Built Environment

Appreciating the importance of a green built environment, NUS is aligned to the Public Sector Taking the Lead in Environmental Sustainability initiative introduced in 2006 by the Energy Efficiency Programme Office, a multi-agency government committee led by the National Environment Agency and the Energy Market Authority. Under this initiative, public sector agencies are encouraged to put in place sustainability measures that include optimising energy and water efficiency as well as waste recycling.

NUS is also fully supportive of the Building and Construction Authority's goal to have at least 80% of the buildings in Singapore to be green by 2030. NUS' University Town (UTown) is one of Singapore's first BCA Green Mark districts, with all buildings within the precinct at least Green Mark certified. This commitment to develop excellent infrastructure through the adoption of sustainable master planning, as well as design and construction principles, has led the University to become the first educational institution to receive the prestigious BCA Green Mark Champion Award in 2012.

## Goal

- To increase the number of Green Mark certified buildings to 40 by 2020

## Strategies

- Develop and implement a Green Mark certification roadmap targeting new buildings as well as existing buildings due for building regularization or major renovation works
- Adopt sustainability features and principles in the design, planning and construction of new infrastructure and buildings on campus
- Take into consideration BCA Green Mark certification's energy-related requirements in the planning and construction of new buildings and retrofitting of existing buildings



# Green Spaces (in buildings)

In Singapore, close to one-tenth of land is devoted to green spaces<sup>4</sup>. To create a liveable and endearing home for residents, the Singapore government actively looks for new ways to create more accessible green and blue spaces where people live, work, and play.

In line with NUS' vision of creating an environmentally-friendly and sustainable campus, the University is also constantly looking for new ways to increase the area of green spaces. In NUS, green spaces in buildings are defined as any green roof, roof garden or vertical greening within the built-up perimeter of the building or complex. Green roofs refer to extensive greening of rooftop surfaces that are generally not designed for access to the public for recreational use, while a roof garden is usually designed to be accessible and utilised as a communal rooftop space. Vertical greening includes but is not limited to planting of creeping plants directly on walls, use of support systems such as wires and fins, use of cassette systems such as modular panels, in-fill panels or modular pots, as well as planter systems.

Green spaces in buildings not only reduce the amount of energy needed to cool the buildings as a result of better insulation – they also improve air quality, rainwater retention and improve the aesthetic appeal of buildings. In some instances, the plants also help to cleanse rainwater as it filters through the plants and soil.

## Goal

- To increase green spaces (i.e. green roofs and vertical greenery) in buildings to 45,000m<sup>2</sup> by 2020, against a 2012 baseline

## Strategies

- Develop and implement a green spaces (in buildings) roadmap for new and existing buildings
- Adopt the use of data analytics and technology in developing green spaces in buildings

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4. Our Home, Our Environment, Our Future", Sustainable Singapore Blueprint 2015, <http://www.mewr.gov.sg/ssb/files/ssb2015.pdf>



# Research

In 2017, the NUSustainability Cluster was formed. Chaired by Professor Philip Liu, Vice President (Research and Technology), the cluster aims to bring together faculty members, students, and staff across NUS to work together, adopting a holistic approach to solve critical issues on sustainability.

## Goals

- Conduct cross-disciplinary research leading to solutions for a prosperous and sustainable future for Singapore and the world
- Facilitate academia-industry collaborations for accelerating the process of research translation in solving real world problems

## Strategies

- Establish structures and funding mechanisms to facilitate cluster members to compete for local and international research grants and be at the forefront of sustainability research
- Cluster various entities under this sustainability umbrella to attract more impactful industry and government funding

By using the campus as a living lab, the University's sustainability efforts in research, education and operation can be integrated. Students will get an opportunity to have hands-on experience to deploy technologies and understand a systems approach towards engineering in sustainability. At the same time, researchers will be able to validate their results and demonstrate the deployability of their research. The University's operational costs may also be lowered from the use of in-house sustainability technologies that maximise efficiency.



# Education

As a global university centred in Asia, NUS strives to deliver transformative education and high-impact research. The University recognises the importance of environmental sustainability, and the need to educate and groom future leaders who are aware and passionate about sustainability. In addition to specialised degree programmes at the undergraduate and postgraduate levels – with most adopting a multi-disciplinary approach, the University offers over 60 course modules in sustainability-related topics that are generally open to students to enrol in.



# Engagement and Outreach

Building on the operations strategies set out by the Sustainability Steering Committee, the Office of Environmental Sustainability (OES) works with other faculties, schools and student groups to engage the NUS community on sustainability issues, particularly in the areas of energy, water, as well as waste management and recycling.

## Goal

- To encourage students and staff to adopt more sustainable practices

## Strategies

- Reach out to students and staff through sustainability campaigns and engagement activities
- Work strategically with student groups and partners to engage students on sustainability issues
- Engage students and staff through OES website, Facebook page

# Measurement and Reporting

## Organisational Boundary

For the purpose of sustainability reporting, NUS – as an organisation – adopts the operational approach as stipulated by the Greenhouse Gas Protocol<sup>5</sup>, for accounting of its carbon emissions. An organisation is deemed to have operational control over an operation if it or one of its “subsidiaries” has the full authority to introduce and implement its operating policies at the operation.

In line with this Protocol, NUS’ organisational boundary is therefore defined as spanning three campuses in Kent Ridge, Bukit Timah and Outram.

## Operational Boundary

NUS reports the following direct and indirect emissions, categorised into three broad scopes based on the Greenhouse Gas Protocol:

SCOPE	DESCRIPTION	RELEVANT ACTIVITIES
1	Direct emissions from sources owned or controlled by NUS	Campus fleet
2	Indirect emissions from the generation of purchased electricity consumed by NUS	Electricity consumption (buildings)
3	Indirect emission that are a consequence of the activities of NUS, but occur from sources not owned or controlled by NUS	Staff air travel Public and private transport (commuter travel)

## Bi-annual Sustainability Report

Following this Plan, the University will issue bi-annual sustainability reports to showcase its sustainability achievements, efforts, progress, and upcoming plans. These reports will serve as the key platform to communicate the University’s environmental sustainability performance and impacts, and ensure that the University is on track to achieve its targets by 2020.

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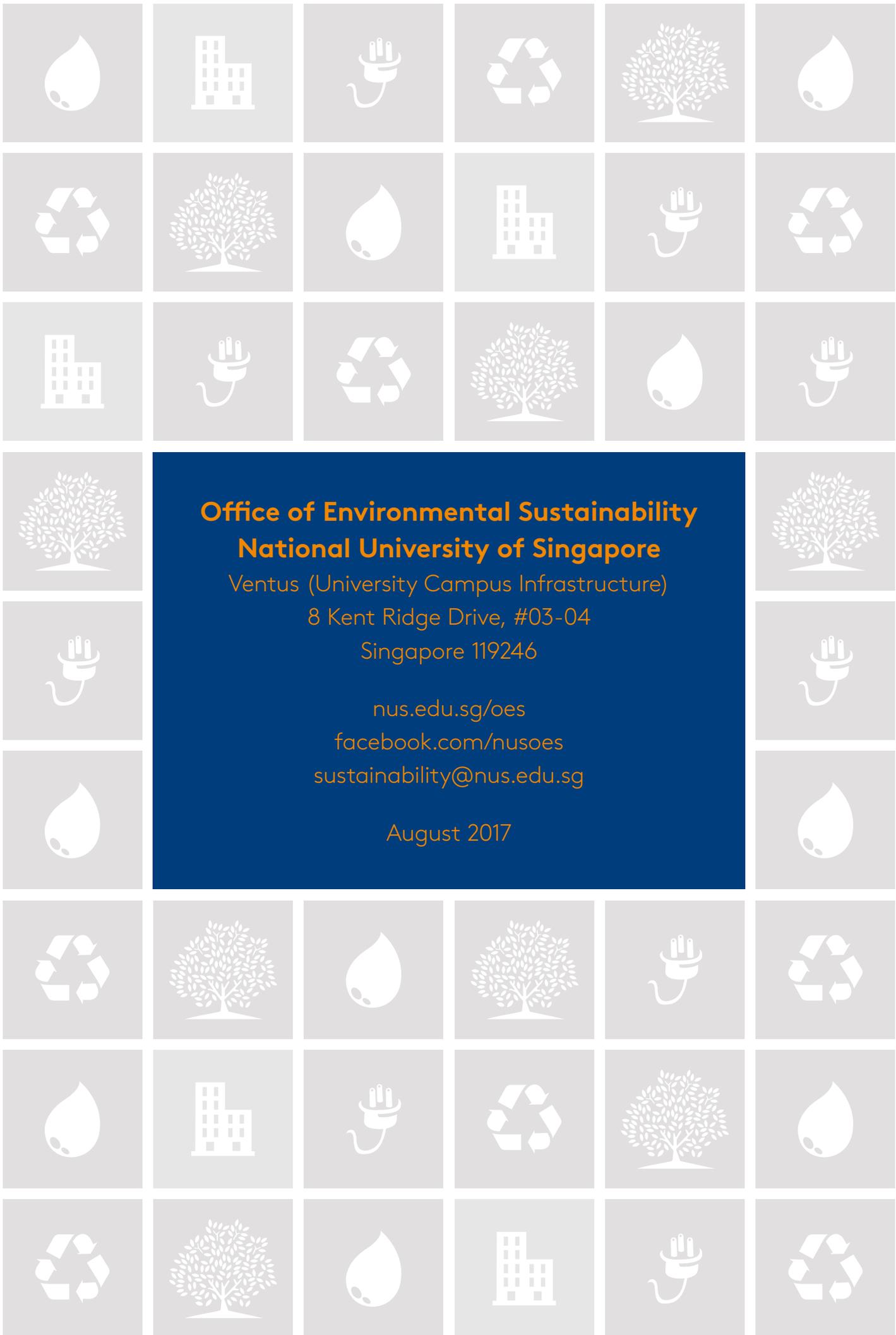
5. Developed by the World Resources Institute and the World Business Council for Sustainable Development

# Glossary of Terms

TERM	DEFINITION
<b>Energy Use Intensity (EUI)</b>	Expressed as energy per unit of Gross Floor Area per year (kWh/m <sup>2</sup> /year)
<b>Water Efficiency Index (WEI)</b>	Expressed as water per unit of Gross Floor Area per year (m <sup>3</sup> /m <sup>2</sup> /year)
<b>Total Recyclables</b>	Includes paper, metals, plastics, horticulture waste (from Apr 2008), glass (from Mar 2015), food waste (from Sep 2014).
<b>Total Waste</b>	Includes Total Recyclables and General Waste
<b>Recycling Rate</b>	Expressed as Total Recyclables divided by Total Waste (%)
<b>Green Mark Certified Building</b>	<p>Defined as any new or existing building that was awarded the BCA Green Mark certification of at least "Certified" and above. May or may not be renewed.</p> <p>*Kent Vale 2 is included in the total number of Green Mark certified buildings, making this an exception to the organisational boundary conditions adopted for the rest of the sustainability indicators.</p>
<b>Green Spaces (in buildings)</b>	<p>Defined as any green roof, roof garden or vertical greening* within the built-up perimeter of the building or complex. The greening medium includes trees, shrubs, climbers, ground cover or turf which are planted in-ground or supported/ planted on man-made structures.</p> <p>*Vertical greening is not included in the computation of Gross Floor Area.</p>
<b>Gross Floor Area (GFA)</b>	Gross Floor Area refers to all covered floor areas of the building, except covered linkways and covered carparks. It includes M&E services buildings.

Note: In this plan, any reference to the term "year(s)" or a specific year (e.g. 2015) is a reference to NUS' financial year (starting 1 April and ending 31 March the following year).





**Office of Environmental Sustainability  
National University of Singapore**

Ventus (University Campus Infrastructure)

8 Kent Ridge Drive, #03-04

Singapore 119246

[nus.edu.sg/oes](http://nus.edu.sg/oes)

[facebook.com/nusoes](https://facebook.com/nusoes)

[sustainability@nus.edu.sg](mailto:sustainability@nus.edu.sg)

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