



An Institute of



Toward net zero green living in Singapore across scales

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INSPIRING LEARNING
TRANSFORMING TEACHING
ADVANCING RESEARCH



NTU
NIE



Singapore



Outline

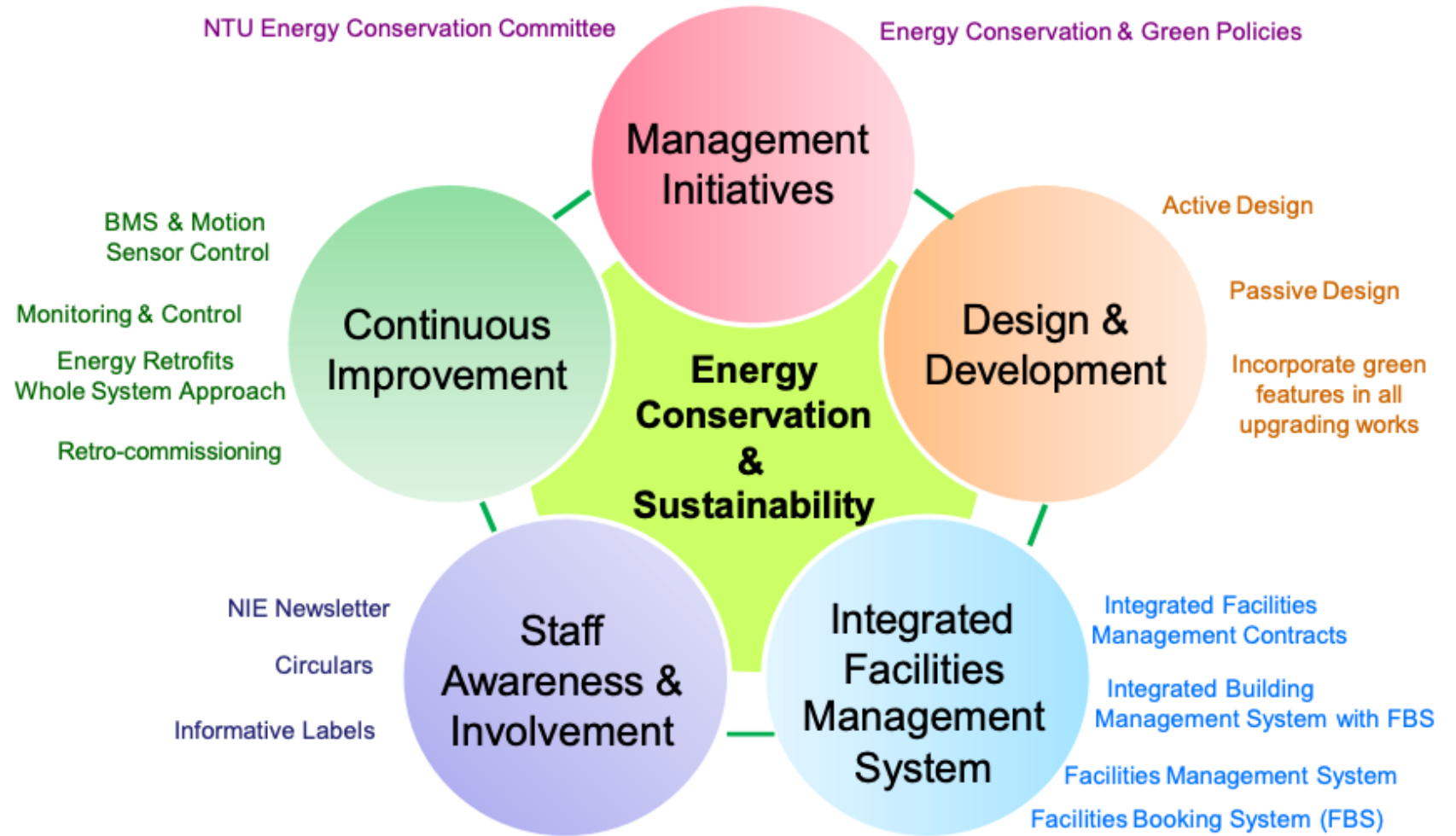
- Description of Efforts for
 - NIE
 - NTU
 - Singapore
- Discussion

An aerial photograph of the NIE Campus, showing several interconnected buildings with light-colored facades and dark roofs. The buildings are arranged in a somewhat U-shape, with a large, prominent circular structure in the foreground. The campus is surrounded by lush green trees and lawns. A road with some parked cars is visible at the bottom of the frame.

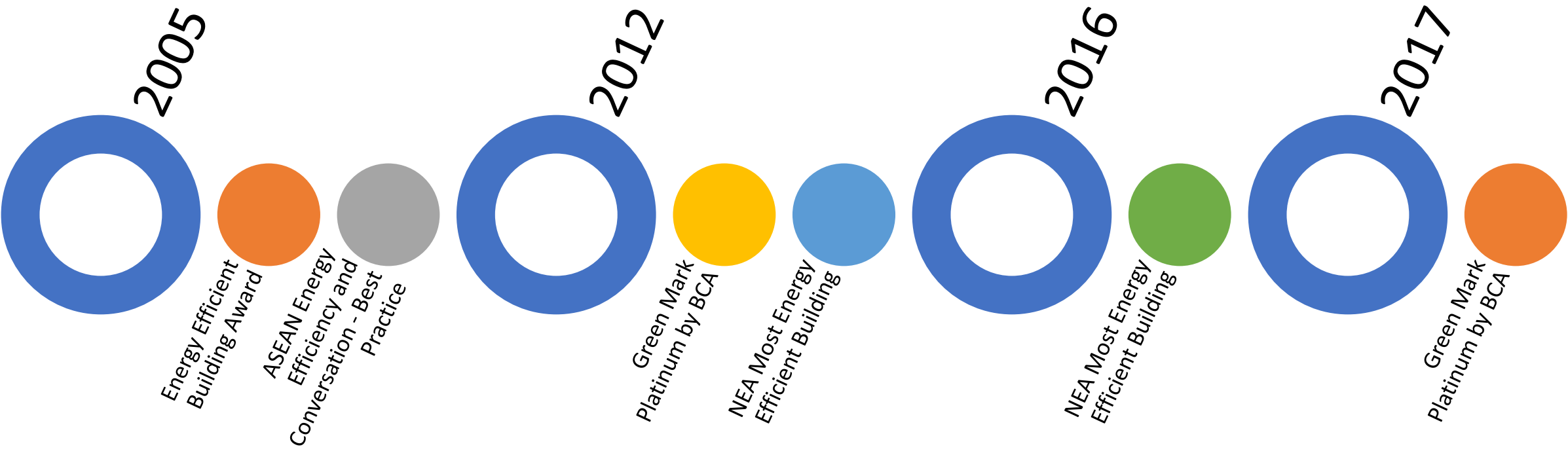
The NIE Campus

- The 16 hectare campus has six main buildings in total gross floor areas close to 11 ha.
- The campus consists of low-rise buildings ranging from 2 to 6 storey height.
- The campus was built in 1997 and completed in 2000.

An integrated approach



Timeline of developments





Continuous improvement and holistic approach to energy conservation and management

- NIE achieved a 60.6% reduction in Energy Use Intensity (EUI) from 2001 to 2020.
- NIE has the lowest EUI among all IHLs in Singapore

Education Programmes

Sustainability courses across undergraduate, postgraduate and teacher inservice programmes

Compulsory course on Singapore Kaleidoscope in which sustainability is a theme.

Teachers as Thinkers talks on Sustainability

Community activities

NIE's Student Club organizes annual sustainability activities since 2018

NIE's Green Clan is a faculty and staff ground-up initiative that organizes regular and ongoing sustainability activities – eg. Newsletters, recycling activity, etc.

- NIE launched a new research centre called the Sustainability Learning Lab (SLL) on the 26 Sep 2022.
- SLL is a formal centre of excellence situated within NIE that aims to be a leading global centre for sustainability education.
- Set against a backdrop of rapid climate change, widespread ecological degradation and uneven development, sustainability is one of humanity's grand challenges. The inception of SLL was driven by the collective aspiration of our research and teaching community to cultivate knowledge, skills, values and attitudes in sustainability as well as foster adaptable and inclusive shared futures.

Core Functions



**SUSTAINABILITY
LEARNING LAB**

National Institute of Education Singapore

i

Rigorous research on sustainability and sustainability education, particularly in Asia.

ii

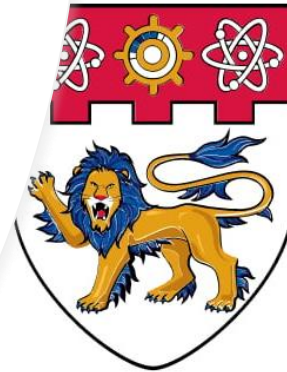
Development of signature pedagogies and curricular materials for sustainability education.

iii

Community outreach and efforts aligned with the United Nation's Sustainable Development Goals as well as the Singapore Ministry of Education's Eco Stewardship Programme.

NTU

- In 2021, the University launched a 15-year Sustainability Manifesto and was the first university in the world to launch a Sustainability Linked Bond.



**NANYANG
TECHNOLOGICAL
UNIVERSITY**

SINGAPORE



NTU's Sustainability Manifesto

- The unifying theme of the Sustainability Manifesto is NTU's belief that its efforts towards sustainability begin on campus, and it must walk the talk in sustainability. To that end, the University aims to:
 - Achieve carbon neutrality by 2035;
 - Achieve 100% Green Mark Platinum certification for all eligible buildings on the main NTU campus;
 - Reduce by 50 per cent NTU's net energy utilisation, and waste generation, by March 2026, compared to the baseline levels of 2011.

30%

REDUCTION IN ENERGY USE



Achieved in 2021
(Target: 50% by March 2026)

54 kgCO₂e/m²

**CARBON EMISSION INTENSITY
DOWN FROM BASELINE OF 56kgCO₂e/m²**



Achieved in 2021



~19,000

**NO. OF SOLAR PV PANELS
IN MAIN CAMPUS**



29%

REDUCTION IN WATER USE

Achieved in 2021
(Target: 50% by March 2026)



21%

REDUCTION IN WASTE GENERATION

Achieved in 2021
(Target: 50% by March 2026)

>220

SUSTAINABILITY-RELATED COURSES AND PROGRAMMES



~500,000

**kWh OF SOLAR ENERGY GENERATED
EACH MONTH FROM PV (AVERAGE)**

Equivalent to saving enough energy to power about 1,229 four-room HDB flats




8

ZERO ENERGY BUILDINGS

2

SUPER LOW ENERGY BUILDINGS



Ramping up energy production on campus with a S\$5.7 million investment

- NTU has invested \$5.7 million to increase solar energy production on campus by 74% compared to the current output.
- On top of the existing 19,000 solar panels on campus, the investment will see an addition 13,000 new solar photovoltaic (PV) panels installed on our campus.
- With the additional panels, NTU's total solar energy output will rise to 11.8 million kWh per year.

Green for Good event

- Green for Good is an annual event organised by the Earthlink NTU student group with several sustainability initiatives across a one-month period.
- Green for Good 2022 was held in March featuring a food sustainability week, a biodiversity and conservation week and a sustainable living week.
- There were also a series of workshops and activities held such as a growing greens workshop, a refashioning workshop and biodiversity walks on the NTU campus.
- The event, aimed at raising awareness on sustainability, and has garnered over 10,000 participants in 2022.





Education – Interdisciplinary Collaborative Core

- Since 2021, NTU has introduced sustainability courses to its common ICC curriculum for all undergraduates.
- These courses aim to develop students with the critical skills to collaborate across disciplines to systematically analyse major sustainability challenges from the perspectives of society, the economy and the environment.
- Building on this foundation of core sustainability courses, sustainability-themed undergraduate programmes such as Environmental Engineering and Environmental Earth Systems Science are also offered.
- In addition, students from other degree programmes with interest in sustainability can also pursue Second Majors or Minors such as a Second Major in Sustainability.



Research examples

- Developing floating new hybrid renewable energy systems.
- Green technologies powered by artificial intelligence to improve energy efficiency of data centres.
- Stretchable and waterproof 'fabric that turns energy generated from body movements into electrical energy.
- Turning plastic waste into clean hydrogen fuel.
- Developing new technologies for the extraction of hydrogen from liquid organic hydrogen carriers.
- Developing advanced solutions for more efficient energy management for homes and the power grid.
- Energy-saving glass 'self adapts to heating and cooling demand.
- Paper-thin and biodegradable zinc batteries.
- Smart window material that controls heat transmission without blocking views.
- Method to boost energy generation from microalgae.

Singapore energy

- Singapore has no reserves of oil, gas or coal.
- 99.7% of Total Primary Energy Supply (TPES) from oil
- Top 3 refined petroleum exporters in 2017
 - United States: US\$77.8 billion (12.4% of exported refined petroleum)
 - Russia: \$58.2 billion (9.3%)
 - Singapore: \$45.8 billion (7.3%)





Survival for Singapore

- Size
- Vulnerability
- Planning

Our Home, Our Environment, Our Future

The Sustainable Singapore Blueprint 2015 outlines our national vision and plans for a more liveable and sustainable Singapore.

This blueprint is a plan for action and provides all of us a unique opportunity to work together to create a better home, a better environment, and a better future that we can all be proud of.

Working together as committed participants, we can realise our vision for:



**A Liveable and
Endearing Home**



**A Vibrant and
Sustainable City**



**An Active and
Gracious
Community**

5 focus areas



-
- An Active and Gracious Community
 - Towards a Zero Waste Nation
 - "Eco Smart" Endearing Towns
 - A Leading Green Economy
 - A "Car-Lite" Singapore



Towards a Zero Waste Nation

- Better **recycling infrastructure** support to facilitate better recycling practices, such as centralized chutes for all new HDB flats.
- **Pneumatic Waste Conveyance Systems** introduced in HDB towns to support convenient and hygienic waste disposal
- Build an **Integrated Waste Management Facility** which will have the capacity to segregate recyclables from waste
- Introduction of more initiatives to **reduce food waste** in F&B businesses and to **improve recycling of electrical and electronic waste**



A Leading Green Economy

The **carbon tax** is set at a rate of S\$5 (4334 KRW) per tonne of GHG emissions (tCO₂e) from 2019 to 2023.

Singapore will review the carbon tax rate by 2023, with plans to increase it to between \$10 and \$15 per tonne of GHG emissions by 2030.



How will we achieve A "Car-Lite" Singapore?

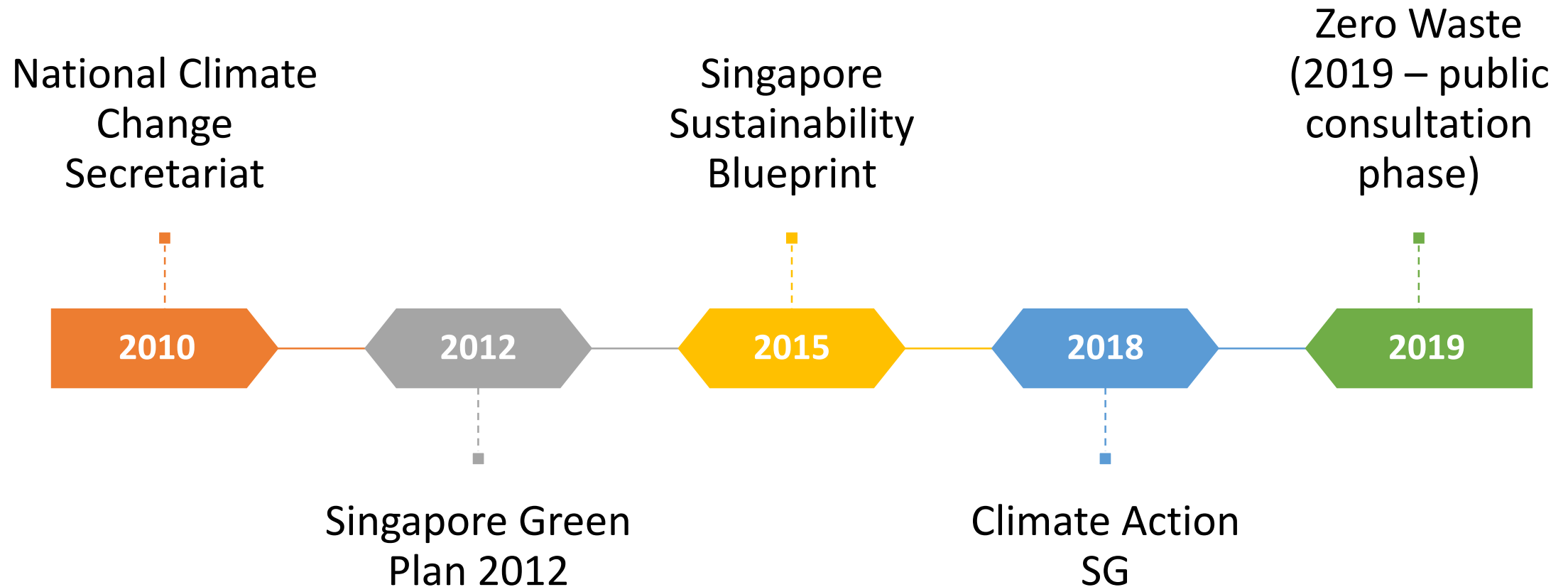
- Innovative features and creative designs in towns to provide a better **cycling and walking** environment
- Comprehensive cycling network that will span more than 700km
- More **car free spaces** in housing estates and the city, such as the Civic District
- Larger scale of **driverless vehicles**
- **Electric car-sharing** scheme that will allow residents convenient access to electric cars

Certificate of Entitlement

- The **Certificate of Entitlement** or COE is the quota license received from a successful winning bid in an open bid uniform price auction which grants the legal right of the holder to register, own and use a vehicle in Singapore for a period of 10 years.
- S\$52,502 (45,514,246 KRW) COE for May 2019
- A brand new Hyundai Sonata ins Korea costs 23,460,000 KRW.



Changing Rhetoric



- Plant 1 million more trees
- Quadruple solar energy deployment by 2025
- Reduce the waste sent to landfill by 30% by 2030
- At least 20% of schools to be carbon neutral by 2030
- All newly registered cars to be cleaner-energy models from 2030



Energy Reset

- Green Energy – solar; hydrogen.
- Green Transport – run on cleaner energy
- Green Buildings – BCA green mark, green towns

Eco- Stewardship Programme

The Eco Stewardship Programme is aligned with the Singapore Green Plan (SGP) 2030

Strengthen the eco-culture in schools towards sustainability

Inculcate informed and responsible sustainability habits in students for life.

Empowers students to make a positive difference in their schools, homes, and community

Through the 4Cs: Curriculum, Campus, Community, and Culture

integrating environmental sustainability into the curriculum

Discussion

Structures

People

Alignment

Thank you

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