

GEARING UP FOR A GREENER FUTURE

Conducting research on renewable energy. Translating new innovations into usable technologies. Testing new technologies in "Living Labs". Find out how Singapore is helping to develop solutions for addressing climate change that can be exported to the rest of the world!

FROM INNOVATIONS TO SOLUTIONS

Ever wondered how research in green technologies is brought to the market as solutions? Check out these four stages of development!

Stage 1 **Basic Research**
Basic research leads to new innovations, which can bring about solutions for Singapore's long-term environmental and energy challenges.

Case Study **From Nanomaterial To Battery Technology**
Researchers in Singapore have developed a titania-based gel that can be used to coat lithium-ion battery electrodes to produce ultra-fast charging batteries. The prototype batteries can last through 10,000 recharge cycles and can be recharged to 70% of their capacity in only two minutes.

Stage 2 **Proof of Concept**
At this stage, promising scientific innovations are assessed and tested to see if they can be developed into usable technologies.

Case Study **Low-Energy Air-Conditioning Using Membranes**
Air-conditioning in hot and humid climates uses a lot of energy as the intake air has to be dehumidified and cooled at the same time. Researchers here are now developing new membrane air dehumidification systems that can separate the two processes of dehumidification and cooling. This could help us save up to 20% of energy.

Stage 3 **Development and Demonstration**
After the proof-of-concept stage, the new technologies undergo a demonstration phase to show potential end-users what the product can actually do.

Case Study **EVA Electric Taxi**
The EVA electric taxi was developed by researchers in Singapore and is currently being tested. The car is equipped with a super-fast charging battery that gives the vehicle a 200km range with just a 15 minute recharge, and an innovative energy-efficient overhead air-conditioning.

Stage 4 **Test-Bedding and Commercialisation**
Companies and researchers need to test and validate new low-carbon technologies to determine if these solutions can work in the real world. This is commonly known as "test-bedding". Investors also decide at this stage if the technologies can be commercialised and brought to the mass market.

Case Study **3M Smart Urban Solutions Lab**
3M has set up a Smart Urban Solutions Lab here to develop and commercialise solutions to address energy efficiency, sustainability, productivity, and connectivity challenges in cities. For example, researchers are assessing new ways of removing heat from computers through liquids rather than cooled air. This has the potential to reduce energy consumption significantly, especially for data centres.

ACCELERATING SOLAR ENERGY USE IN SINGAPORE

Imagine a Singapore with most of its buildings powered by solar energy. This is the vision behind the government's SolarNova Programme.

SolarNova aims to speed up the adoption of solar energy in Singapore through the installation of solar photovoltaic systems at public sector buildings and facilities.

Since the introduction of the SolarNova programme, solar PV installation has been completed in more than 800 HDB blocks. HDB will progressively install 220 MWp of solar PV panels across more than 5000 HDB blocks by 2020.

The SolarNova Programme has also helped to build up our solar industry, in areas ranging from research and manufacturing to project implementation.



Do you know?

Tech company Apple aims to run its entire operations in Singapore with solar power. It has signed a solar power contract with local company Sunseap to buy electricity that is generated from solar photovoltaic systems installed at different buildings.

SINGAPORE AS A "LIVING LAB"

Singapore is a "Living Lab" where new green solutions can be tested in a real-life setting. Today, we have a number of "Living Lab" platforms dotted around Singapore. Have you heard of any of them?



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HDB Greenprint@ Yuhua

To bring sustainable living into existing public housing estates, HDB has been test-bedding different green initiatives, from energy and water-saving solutions to alternative energy use, in the neighbourhood of Yuhua since 2012.

Here you can find solar panels, LED street lights, lifts with energy regeneration systems and rainwater harvesting systems. There are bicycle-friendly facilities and improved pedestrian paths to encourage residents to adopt more environmentally-friendly transport. Some Yuhua residents have also started to test out smart home technologies, such as a home energy management systems to help save on water and electricity usage.



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Pulau Ubin Micro-Grid

Though Pulau Ubin is still very much a village, the people living and working on the island need electricity. In the past, they had to use noisy, unreliable diesel generators. Now, a micro-grid test-bed has been installed to provide electricity from clean sources like solar energy.



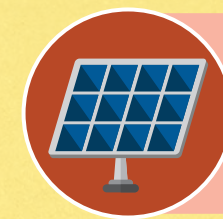
NTU EcoCampus

The \$20 million EcoCampus initiative at the Nanyang Technological University aims to transform the university and CleanTech Park next to it into the greenest campus on earth.

This initiative allows multinational companies to test their latest technologies to achieve the university's goals of reducing energy, carbon, water and waste intensity by 35% in 2020 from 2011 levels.

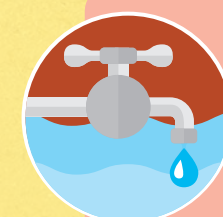
GOING GREEN, GROWING GREEN!

Singapore's efforts to tackle climate change gives rise to new jobs and business opportunities in existing industries, for example helping factories to reduce their energy usage. It also brings economic growth opportunities in the form of new industries, such as solar energy research and production. Beyond the technology areas, opportunities can also be found in financing, trading and insurance.



Clean Technology

Within the cleantech sector, Singapore has secured several key investments in high-value manufacturing, engineering, R&D and regional headquarters activities. The most notable is the growing cluster of companies manufacturing and conducting R&D on solar technologies.



Water Industry

Our NEWater story showcases how Singapore has addressed a vulnerable dependency on imported water. Over the last 40 years, through strategic planning and investment in research and technology, we have diversified our water supply. We now have capabilities in water management, desalination and related technologies that can help other countries better adapt to changing rainfall patterns and possible water shortages as a result of climate change.



Climate Risk Management

Climate risk management encompasses a spectrum of processes including early response to distribution of resources, diversification, risk pooling and insurance. With more than 200 insurance players, Singapore is an ideal launch pad to meet the region's insurance needs for climate-related risks.



HEAR IT FROM A YOUNG PROFESSIONAL!

Ryan Jin, 30, is working as the Programme Coordinator of Nanyang Technological University's EcoCampus Initiative.

Tell us about your work.

I am helping NTU achieve its goal of reducing energy, water and waste intensity by 2020 through the use of cutting-edge sustainable technologies. This includes installing new generation solar photovoltaic systems to test out the technology on campus. I also communicate our efforts to the student community and encourage them to start sustainability projects.

What do you find exciting about your job?

I find it exciting to be given the opportunity to develop demonstration projects and work on new technologies that are yet to be implemented in Singapore!

Through the test-bedding that is done here at NTU, there will be more information about the cost and viability of the technologies. This in turn will encourage more potential users to adopt the technologies in Singapore.

Could you tell us more about test-bedding of solar photovoltaic systems on NTU Eco-campus?

NTU has installed a 5 Megawatt Peak solar photovoltaic system on the rooftops of our Yunan Garden Campus. Comprising some 16,000 solar panels, this project will reduce about 5% of our annual energy consumption.

We are also test-bedding smaller-scale solar installations with newer technologies at different parts of the campus.

What advice would you give to young people who wish to pursue green careers?

Green careers are not just about developing green technologies, or protecting our natural environment.

It's about being "green" in your chosen career. This can range from areas such as policy-making and public education to advocacy for environmental-friendly practices and corporate social responsibility. We can all start by taking simple steps such as putting the environment first in your work-related decisions and buying only from environmentally-friendly companies.