

# SINGAPORE'S CLIMATE ACTION PLAN

# TAKE ACTION

# FOR A SUSTAINABLE



# Climate Change: **Singapore will do our part**

According to the Intergovernmental Panel on Climate Change, the increase in global temperature is likely to exceed 1.5°C by the end of the century.

Our world's oceans will get warmer and ice melt will continue, resulting in an average sea level rise of about 40cm to 63cm by 2100.

As a low-lying island city

state, Singapore is particularly vulnerable to the impacts of climate change.

The Centre for Climate Research Singapore has projected that Singapore could experience an increase in daily mean temperature of 1.4°C to 4.6°C, more intense and frequent heavy rainfall events, and mean sea level rise of up to 1 metre by 2100.



# Singapore's Pledge Under The Paris Agreement:

**To reduce our emissions intensity by 36% below 2005 levels by 2030, and to stabilise our greenhouse gas (GHG) emissions with the aim of peaking around the same time.**

Singapore only contributes to around 0.1% of global GHG emissions.

However, we are committed to play our part as a responsible global citizen. We were one of the first 55 countries to ratify the Paris Agreement on climate change. We are committed to

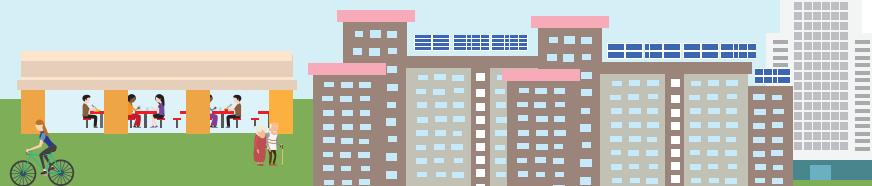
Agenda 2030 and the Sustainable Development Goals (SDGs), including SDG13 to take urgent action to combat climate change and its impacts.

We have taken ambitious steps to ensure that we are on track to meet our commitments.

## Mitigation Efforts

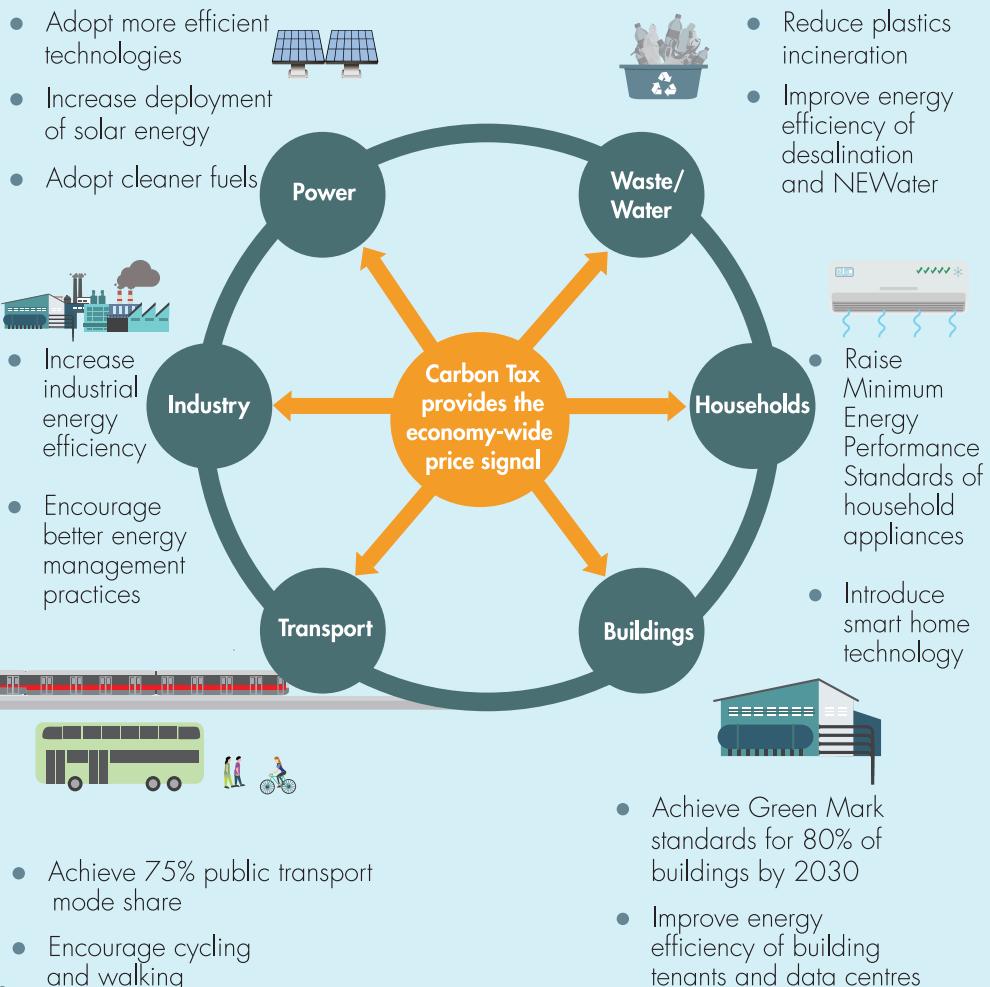
Climate change requires a global response. Singapore is committed to do its part. Singapore's GHG emissions in 2014 totalled 50 million tonnes CO<sub>2</sub>-equivalent.

The industry sector is the largest emitter accounting for about 60% of our total emissions, followed by the buildings (17%) and transport (16%) sectors.



To achieve our Paris pledge and in support of SDG13, we have put in place a comprehensive suite of measures. A summary of our strategies to build a low-carbon and climate-resilient Singapore is provided below.

## We Need To Reduce Emissions Across All Sectors



Singapore's mitigation measures are in line with the SDG13.2 and SDG13.3 targets to integrate climate change measures into national strategies and policies as well as to improve human and institutional capacity to address the effects of climate change.

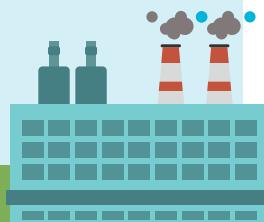
## Improving Our Industrial Energy Efficiency

Singapore is alternative energy disadvantaged. Improving our energy efficiency (EE) is our key strategy to reduce our carbon emissions. We are ranked by the International Energy Agency as amongst the 15 best-performing countries in terms of emissions intensity.



Singapore aims to achieve industrial EE improvement rates of 1-2% per year, similar to that achieved by leading developed countries. We enhanced the Energy Conservation Act in 2017 to require large energy users to conduct regular energy audits and implement energy management systems. This helps them identify energy saving opportunities.

We will be introducing minimum energy performance standards for common industrial equipment and systems, starting with motors in 2018. The Government provides grants to assist companies to implement EE measures. We are also working to grow the industrial EE ecosystem, and build up the capabilities of EE professionals.



## Carbon Tax

Singapore's Carbon Pricing Act was passed in Parliament in March 2018.



From 1 January 2019, industrial facilities emitting 25,000 tCO<sub>2</sub>e or more annually will have to pay a carbon tax on their GHG emissions.

The carbon tax rate will start at S\$5 (US\$3.8) per tonne of GHG emissions, which the Government intends to raise to between S\$10-15 (US\$7.6-11.4) by 2030. The tax will cover 80% of our national emissions. Singapore's carbon tax will apply uniformly across all sectors, without exemption. This maintains a transparent, fair and consistent carbon price across the economy.

As power generation companies are also subject to the carbon tax, the price signal will flow through the whole economy to all sectors.

## Our Green Lungs Are Also Carbon Sinks



Singapore's green spaces have helped us to reduce our carbon footprint. Our LULUCF (land-use, land-use change, and forestry) sector, in particular the category of forest land,

has been a net carbon sink since measurements began in 1990. We will continue to increase our green spaces, and protect and preserve our forests and mangroves.



# Achieving Global Leadership In Green Buildings

By 2030, our aim is for 80% of all our buildings to be green. We will be enhancing the Green Mark Scheme, and stepping up efforts to encourage the retrofitting of tenanted spaces with energy-efficient fittings.



# Increasing Transport Sector Carbon Efficiency

We aim to make public transport the preferred mode of travel in Singapore and to encourage active mobility.



Our mass rapid transit (MRT) network will be increased from 200km to 360km by 2030. 8 in 10 homes will be within 10 minutes walk of a MRT train station. Additional trains and buses have been added to our fleets. We will double the network of cycling paths to over 700km by 2030.



## Cleaner Forms Of Power Generation

Today, 95% of our electricity is generated from natural gas. We are working with companies to encourage the adoption of more efficient power generation technologies.



We also aim to raise our adoption of solar power from 143MWp currently to 1GWp beyond 2020. We are investing significantly in new solar technologies and will deploy floating solar photovoltaic systems on our reservoirs; this will make our water treatment process greener and less dependent on fossil fuels.

## Encouraging More Energy Efficient Households

We have introduced Minimum Energy Performance Standards and the Mandatory Energy Labelling Scheme to encourage the use of more energy efficient equipment in households.



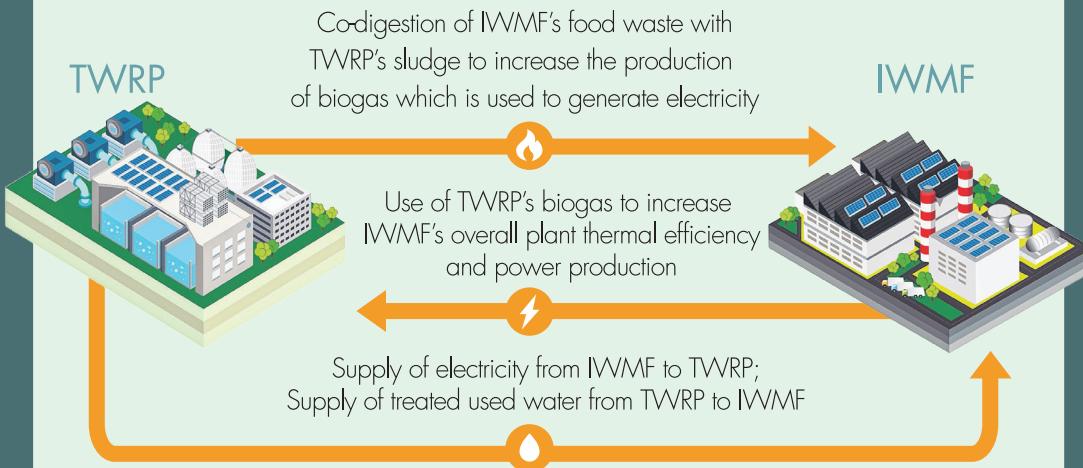
We will be expanding these to cover more equipment.



## Case Study 1

# Tuas Nexus: Enhancing waste-to-energy and reducing our carbon footprint innovatively

In a global first, Singapore will be co-locating and integrating the Tuas Water Reclamation Plant (TWRP) and Integrated Waste Management Facility (IWMF). The integrated facility, called Tuas Nexus, will reap process synergies and benefits from the water-energy-waste nexus. The synergies include:



Taken together, these process synergies will yield a reduction of 200,000 tCO<sub>2</sub>e of emissions annually, equivalent to taking 41,000 cars off the road.

## Case Study 2

# Public Sector Sustainability Plan 2017-2020: Government Taking The Lead

The public sector is one of the largest organisations in Singapore, comprising 80 agencies and employing 145,000 public officers.

The Public Sector Sustainability Plan 2017–2020 was launched in 2017. It outlines the efforts of public agencies to build capability in sustainability and to conserve our scarce resources. Specific targets that the Government has committed to achieve by 2020 include:



Reduction of electricity consumption  
**by more than 15%** from FY2013 levels.

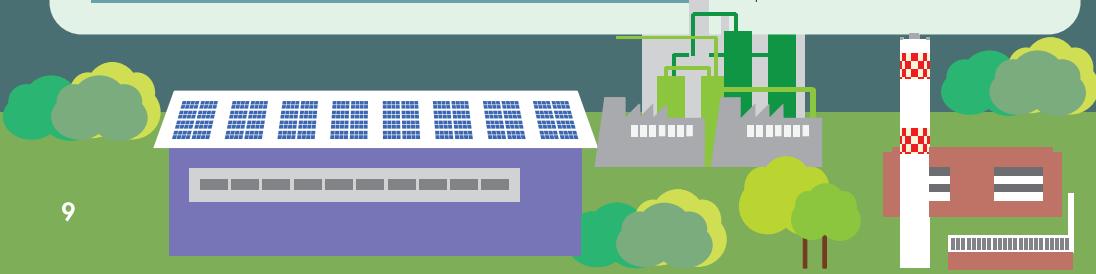


Reduction of water consumption  
**by more than 5%** from FY2013 levels.



All new public sector buildings to attain the **Green Mark Platinum standard**, and existing buildings to attain at least the **Green Mark Gold standard**.

Together, these two targets translate to a decrease of 130,000 tCO<sub>2</sub>e of GHG emissions, equivalent to taking 26,650 cars off the road.

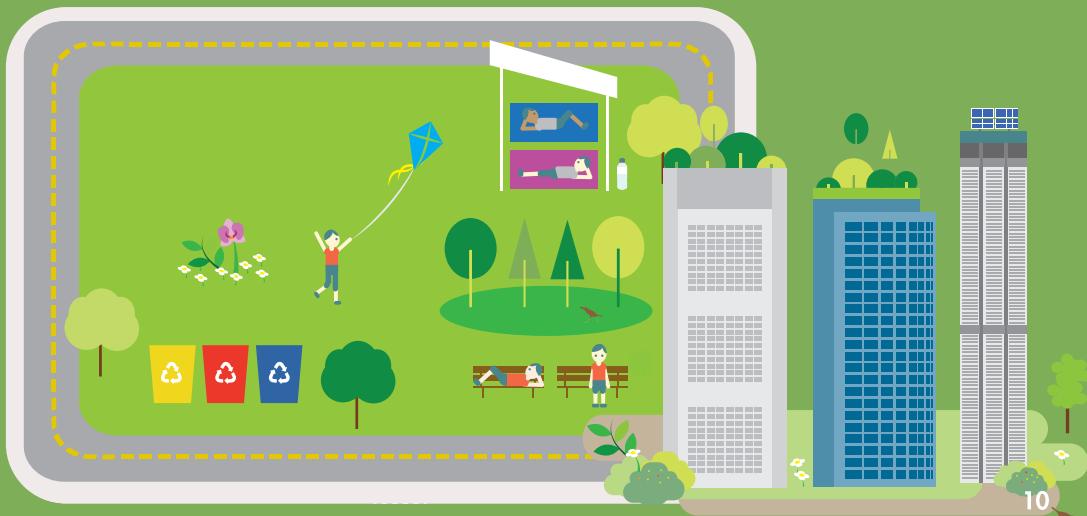


## Case Study 3

# Singapore's Living Labs: Investing in R&D to improve our Energy Efficiency

Singapore aspires to be a living laboratory where companies can develop, test and commercialise urban solutions before scaling up for the region and beyond. S\$900 million will be invested from 2016 to 2020 to tackle Singapore's energy, water, land, and liveability challenges.

One example is the S\$8 million Sembcorp Industrial Living Lab. Mitsubishi Electric will be testing an ozone backwashing membrane bioreactor. This technology provides increased membrane permeability, thus requiring fewer membranes to be utilised and enabling more energy-saving wastewater treatment. If these new technologies are proven successful, they could be deployed in Sembcorp's global operations.



# A Climate-Resilient Singapore

## Forecasting Singapore's future climate

The Centre for Climate Research Singapore (CCRS) is the key node for weather and climate research in Singapore and the wider Southeast Asian region. Since its establishment, CCRS has undertaken several significant projects:

### In 2013

CCRS, in collaboration with the United Kingdom's Met Office Hadley Centre, published Singapore's climate change projections for 2100 and beyond.

These projections provide the basis for our adaptation plans.

### In 2017

We welcomed the World Meteorological Organization's Regional Office for Asia and South-West Pacific to Singapore. Co-located with the CCRS, this office will conduct programmes to enhance the region's understanding of climate science, and tackle challenges arising from climate change and extreme weather.

## Adaptation Efforts

Singapore's adaptation measures are in line with the SDG 13.1 target to strengthen resilience and adaptive capacity to address the effects of climate change, including climate-related hazards.

### Protecting Our Coasts From Sea Level Rise

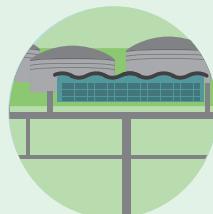
Sea level rise poses an existential challenge to Singapore. We have thus taken steps to strengthen our resilience to coastal flooding by raising minimum land reclamation levels since 2011. We have also installed coastal protection measures on at least 70% of Singapore's coastal areas to manage coastal erosion.



A Coastal Adaptation Study is ongoing – this study will recommend a national framework to strengthen our resilience and safeguard our long-term coastal protection needs.

### Managing Our Water, Minimising Floods

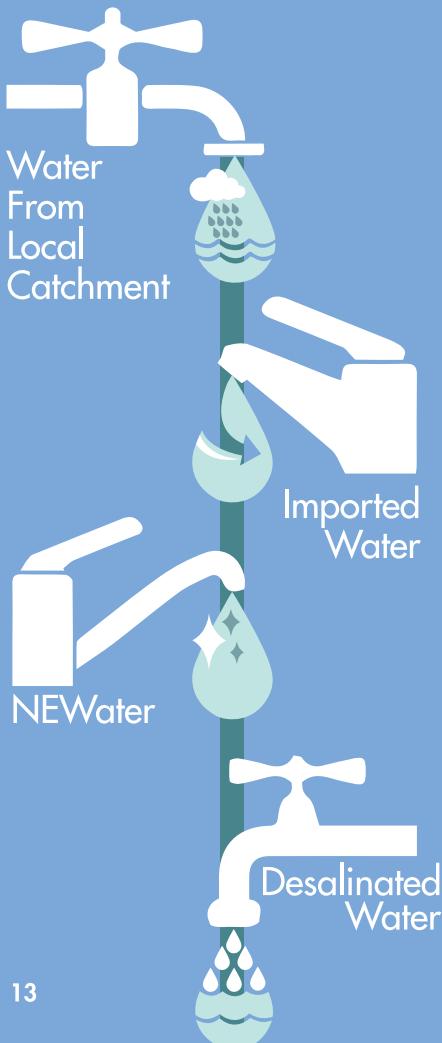
Climate change poses a new challenge to Singapore's water supply, security and resilience. To ensure a sustainable and reliable water supply, we have diversified our water supply sources and now have four National Taps to meet our water needs.



We have also introduced a “Source-Pathway-Receptor” approach to deal with floods, as we experience more frequent and intense rainfall events with climate change.

## Our Four National Taps

Our Four National Taps ensure sustainable and reliable water supply for Singapore.



### Case Study 4

## Towards More Energy Efficient NEWater And Desalination

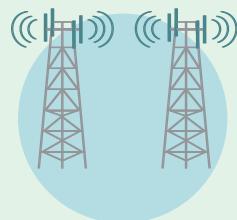
Desalinated water and NEWater (reclaimed water) are our two weather-resilient National Taps. Desalination and NEWater technologies, however, are energy intensive.

We are investing in R&D to improve the energy and carbon efficiency of our desalination and NEWater plants.

Examples of our R&D work include using electro-deionisation and biomimicry to improve the EE of desalination, a membrane flow reversal technology as well as electro-dialysis reversal to improve NEWater recovery.

## Keeping Our Essential Services Running Well

Stronger and more frequent rainfall could result in floods that disrupt our energy and telecommunications infrastructure and affect our air, land and sea connectivity.



We are working to strengthen the resilience of our critical services. For example, significant upgrades to the drainage system at Changi Airport are in progress to protect the airport against flood risks. To protect our commuters and train network, flood barriers have been installed at the entrances and openings of low-lying underground MRT train stations.

## Keeping Our Buildings And Infrastructure Safe

To enhance the climate resilience of the buildings we live and work in, studies have been conducted to understand the potential effects of higher temperatures, rainfall and wind speeds on buildings and building attachments.



Analyses have indicated that the projected changes in temperature, rainfall, and wind speeds are unlikely to have a significant impact on the buildings and building attachments in Singapore as long as they adhere to building codes and are properly maintained. The assessment will be reviewed periodically to account for changes in future climate projections.





## Case Study 5

# Building Our New Changi Airport Terminal 5 And Tuas Port Terminal At Higher Levels

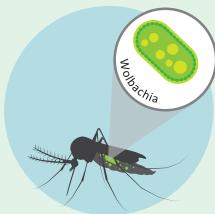
Singapore's container hub ports and airports are some of the busiest in the world. Currently more than 130,000 ships call at Singapore, and more than 33 million 20-foot equivalent units of containers pass through our ports annually.

In 2017, we were the world's top bunkering port, with annual bunker sales crossing the 50 million-tonne mark for the first time. In the same year, Singapore's Changi Airport handled a record 62.2 million passengers.

Climate change can pose significant challenges to both our ports and airports; we have hence incorporated our resilience requirements in planning for our terminals.

To guard against sea level rise, the new Tuas port terminal will be built more than 5 metres higher than the mean sea level; the new Changi Airport Terminal 5 will be built 5.5 metres above the mean sea level. This enables us to ensure the continued resilience of our air and port services.

# Strengthening Resilience In Public Health, Protecting Our Biodiversity And Greenery



Higher temperatures will result in a warmer environment, and could lead to an increase in the mosquito population in Singapore.

We are developing a heat stress information system for the public, and studying novel solutions such as the use of Wolbachia technology in controlling the mosquito population.

To ensure that our trees are in good health and resilient to climate change, trees along major roads and areas with high human activity are inspected at least once a year. In 2014, we established Singapore's first marine park – an ecosystem inhabited by rare and endangered marine animals, to protect our marine biodiversity.

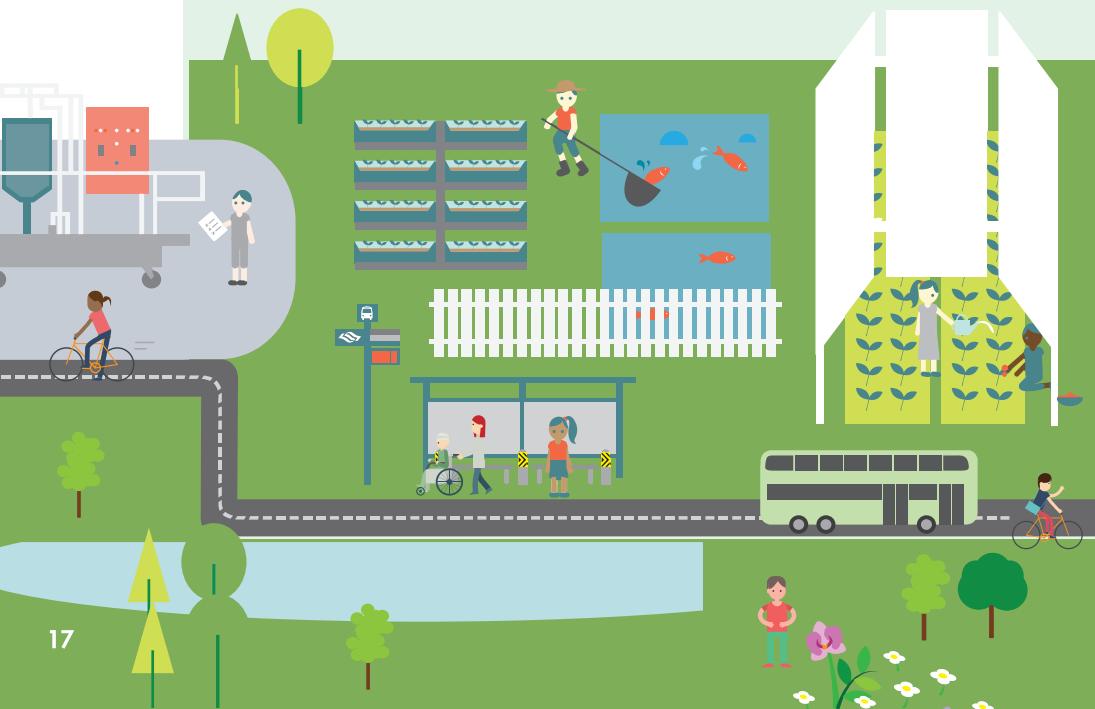


## Ensuring A Resilient Food Supply

Singapore imports more than 90% of our food supply. Changing climate patterns pose risks to our food supply.



We have ensured that our food is imported from diversified sources. We are working closely with local farmers to increase production as well as to prepare for climate change through increasing productivity and R&D.



# Safeguarding Our Climate Future

## A Call To Take Climate Action Together

Singapore is serious in taking climate action. But government action alone will not be sufficient.

This is why Singapore designated 2018 as the Year of Climate Action – to raise national consciousness and rally businesses, communities and individuals to collectively take climate action. We have launched an online portal (<https://www.climateaction.sg>) where individuals and organisations can undertake pledges to reduce our carbon footprint.

As the Chair of the Association of Southeast Asian Nations (ASEAN) in 2018, Singapore will convene a Special ASEAN Ministerial Meeting on Climate

Action (SAMCA) to reaffirm the region's commitment to global climate action.

SAMCA will be expanded to involve China, Japan, the Republic of Korea and the UNFCCC COP's current President and President-designate Fiji and Poland, and will provide the region's contribution to the 2018 Talanoa Dialogue.

As the Chair of the ASEAN Working Group on Climate Change, we are committed to the Action Plan to rally ASEAN's efforts in the fight against climate change.

Let's take action today, for a sustainable future.



