BT Infographics

Gearing up for climate change

A recent government study projected higher temperatures and more extreme rainfall for Singapore and the region in the later half of the 21st century. The country has adopted various measures in relation to climate change, to reduce carbon emissions as well as to prepare for its impact. ***BY ANDREA SOH***

OBSERVED CHANGES IN SINGAPORE'S CLIMATE

2014 **27.7°C**

1972 **26.6°C**

Daily temperature
From 1972 to 2014, annual average temperature has increased from 26.6°C to 27.7°C.

Rainfall
Annual average rainfall increased from 2,192mm in 1980 to 2,727mm in 2014.

Wind
General wind patterns influenced by north-east and south-west monsoons. No clear trends as wind speed is environment-dependent (eg presence of buildings and trees).

Sea level rise
Annual sea levels in the Straits of Singapore rose at the rate of 1.2-1.7mm a year between 1975 and 2009.

FUTURE CLIMATE PROJECTIONS FOR SINGAPORE

End-century **1.4°C - 4.6°C**

Daily average temperatures are projected to increase by 1.4 to 4.6 deg C by the end of the century (2070-2099), to 28.8 to 32 deg C.

The contrast between the wet months (Nov to Jan) and dry months (Feb and Jun to Sept) is projected to become more pronounced.
Increased intensity and frequency of heavy rainfall as the world warms.

Singapore will continue to be influenced by the north-east and south-west monsoons. No substantial changes in wind direction but potential increase in wind speeds during the north-east monsoon season.

Average sea level rise by 0.25m to 0.76m by the end of the century (2070-2099).

MEASURES TO REDUCE CARBON EMISSIONS

Power Generation
- Switch of fuel mix away from fuel oil to natural gas.
- Encouraging more solar deployment, test-bedding and research.

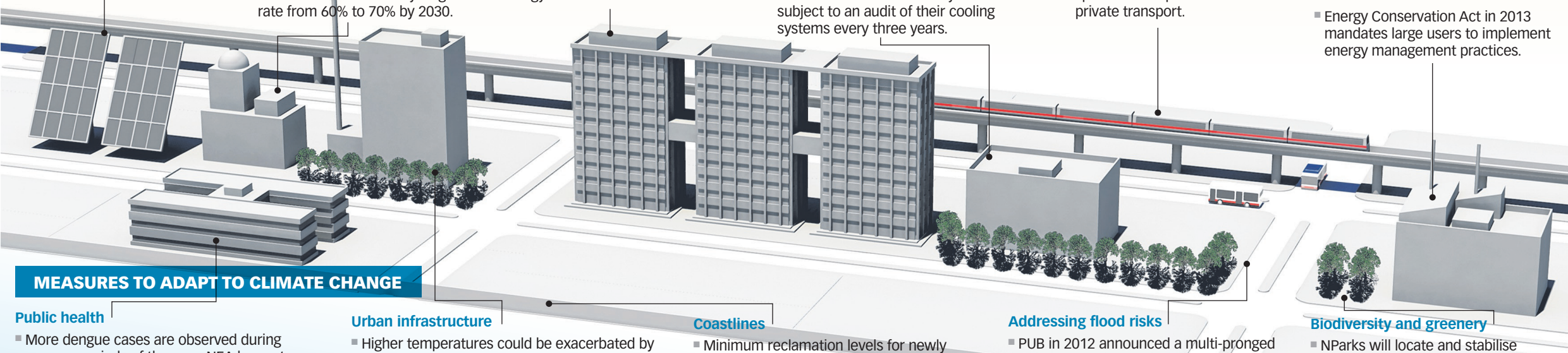
Waste/Water
- Reduce direct methane emissions by incinerating sludge rather than disposing in landfills.
- Reduce plastics incineration and increase overall recycling rate from 60% to 70% by 2030.

Households
- Air-conditioning, refrigeration and lighting consume the most electricity.
- Sales of energy-inefficient appliances under these three categories are now prohibited under the Minimum Energy Performance Standards.

Buildings
- National target to green at least 80% of Singapore's buildings by 2030. Current level is 29%.
- All new buildings and existing ones undergiong retrofitting must meet Green Mark standards. They are also subject to an audit of their cooling systems every three years.

Transport
- Carbon Emissions-based Vehicle Scheme introduced in 2013 to encourage phurchase of low carbon emission cars.
- Target is to achieve a 70:30 split between public and private transport.

Industry
- Government will co-fund and support commercially viable efficiency schemes.
- Encourage more efficient co-generation plants in energy intensive sectors.
- Energy Conservation Act in 2013 mandates large users to implement energy management practices.



MEASURES TO ADAPT TO CLIMATE CHANGE

Public health
- More dengue cases are observed during warmer periods of the year; NEA has put in place a nationwide programme including surveillance of mosquitoes and people as well as public education, law enforcement and research.
- NEA, with the Ministry of Health, is studying the relationship between climatic factors and public health risks such as dengue fever, heat disorders and respiratory diseases.

Urban infrastructure
- Higher temperatures could be exacerbated by the urban heat island effect.
- URA, HDB, NUS and A*Star are studying how the built environment and urban greenery can affect microclimatic conditions such as airflow and temperature.
- The study will also provide recommendations on the planning of public spaces and buildings, such as increasing the amount of greenery and modifying building layouts.

Coastlines
- Minimum reclamation levels for newly reclaimed land have been raised by 1m since late 2011, on top of the earlier requirement of 1.25m above the highest recorded tide level.
- About 70-80% of Singapore's coastal areas have hard walls or stone embankments which help protect against coastal erosion; the rest are natural areas such as beaches and mangrove forests.

Addressing flood risks
- PUB in 2012 announced a multi-pronged approach to strengthen Singapore's flood resilience, including higher drainage design and better modelling capabilities.
- It also plans to develop solutions to manage stormwater run-off, such as green roofs and porous pavements, and to protect buildings through raised platform and flood barriers.

Biodiversity and greenery
- NParks will locate and stabilise potentially vulnerable slopes.
- It will also conduct health checks on trees more thoroughly and frequently, while planting species less vulnerable to storms and strong winds along the streets.

BTGraphics: Andrea Soh, Ludwig Ilio & Gladys Lam Source: National Climate Change Secretariat