askST art

Antarctic meltdown

After decades of expansion, Antarctica's sea ice cover mysteriously decreased by an area about the size of Indonesia from 2014 to 2017, according to US space agency Nasa. Recent research also found that the glacial melting on the continent is accelerating towards a tipping point, beyond which the loss of ice into the ocean may become irreversible. The Straits Times takes a closer look at the melting continent.

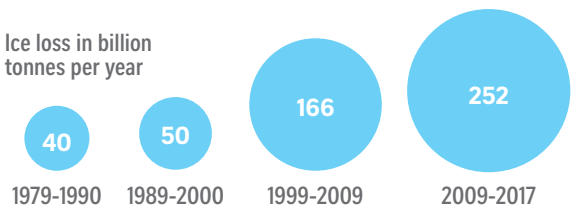
ANTARCTICA

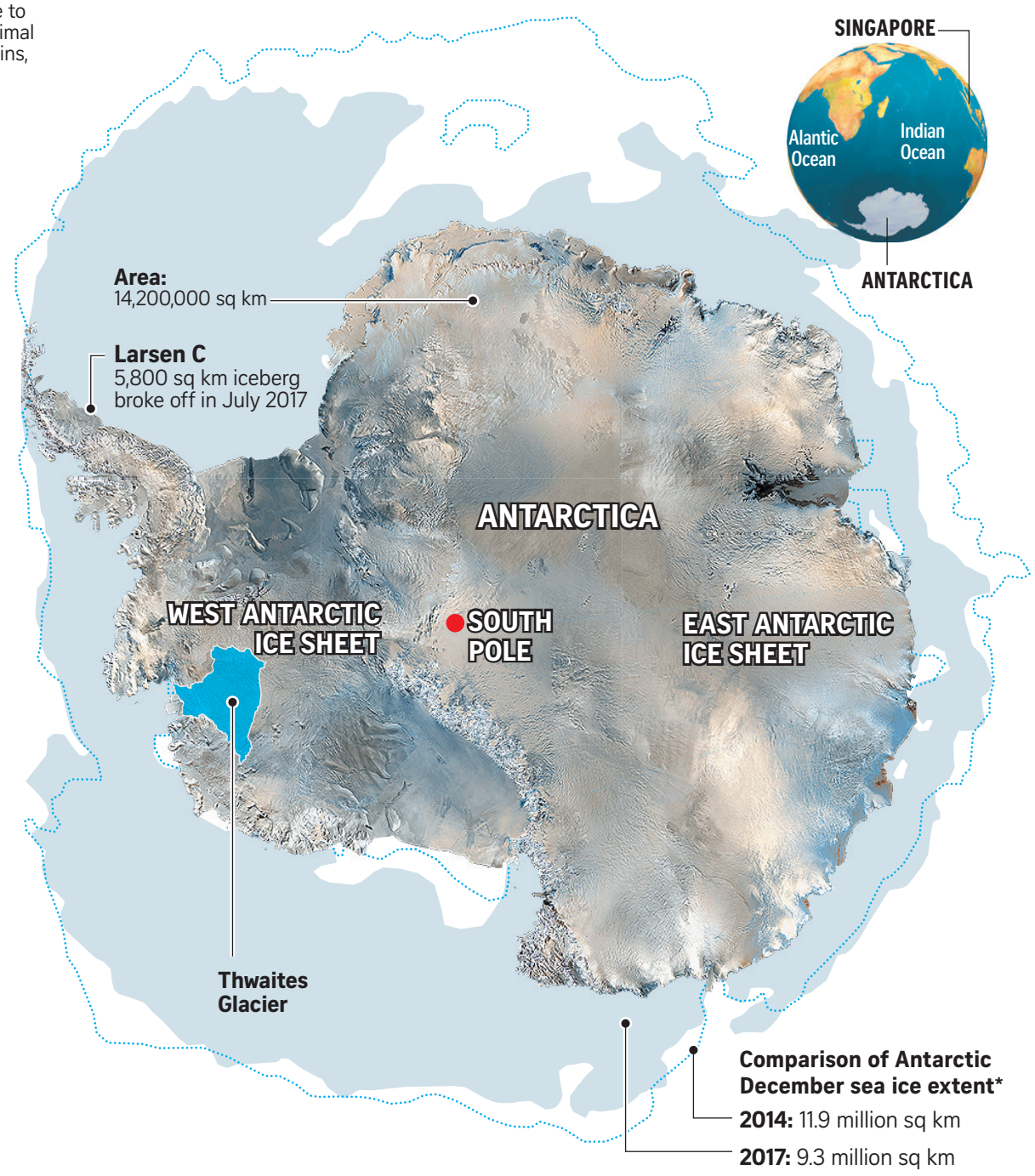
Antarctica is the southernmost continent, fifth largest on Earth. About 98% of the continent is covered by ice averaging 1.9km in thickness. It is home to an abundance of animal life, including penguins, seals and whales.

Cool facts:

- It has no permanent residents.
- First sighted in 1820, it is the last continent to be discovered.
- Explorers first reached the South Pole on Dec 14, 1911.
- The coldest temperature ever recorded at ground level on earth was at the Soviet Vostok Station in Antarctica, at -89.2°C on July 21, 1983.
- It is the largest desert in the world.
- Antarctica holds almost 70% of earth's fresh water, stored as ice.
- There are no countries in Antarctica; the continent is governed by an international treaty (the Antarctic Treaty).
- There are no polar bears in Antarctica.

Accelerating Antarctic ice melt
Antarctica stores enough frozen water to raise global sea level by 57m. The rate of ice loss has increased sixfold since 1979 to more than 250 billion tonnes in 2017.



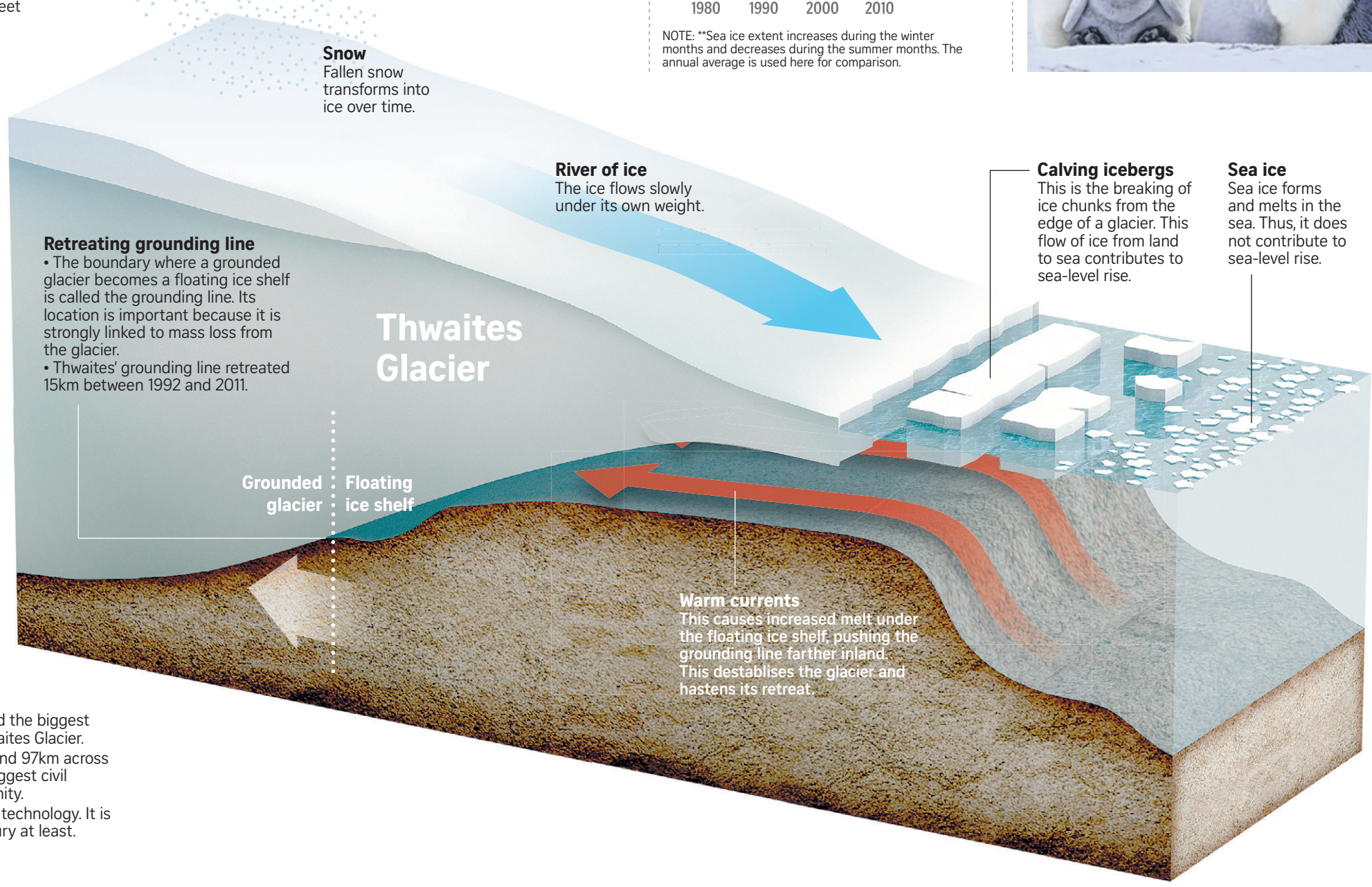


THINNING ICE SHEETS

- A glacier is a huge body of ice that moves slowly over land under its own weight, like a river of ice.
- The warming of the Southern Ocean is causing massive ice loss from Antarctic glaciers to the oceans. Up to a quarter of the West Antarctic ice sheet is now thinning.
- The complete loss of the West Antarctic ice sheet would cause sea levels to rise by about 5m.

The Thwaites Glacier

- Thwaites Glacier drains a vast part of the West Antarctic ice sheet, extending over 192,000 sq km.
- In January, Nasa scientists found a hole under the Thwaites Glacier two-thirds the size of Manhattan,. This is big enough to have contained 14 billion tonnes of ice.
- A Nasa-funded study warns that the melting glacier is now approaching a tipping point. Once this is reached, the glacier could lose all its ice, causing the ocean to rise by 50cm. This loss of ice could take place over 150 years, continuing even if global warming stops.



Possible solution

- Scientists have proposed a radical plan to build the biggest wall in the world to stop the collapse of the Thwaites Glacier.
- The massive barrier will span between 80km and 97km across the width of Thwaites Glacier, making this the biggest civil engineering project ever embarked on by humanity.
- However, the project is unfeasible with today's technology. It is not expected to be attempted for another century at least.

MELTING SEA ICE

What is sea ice?

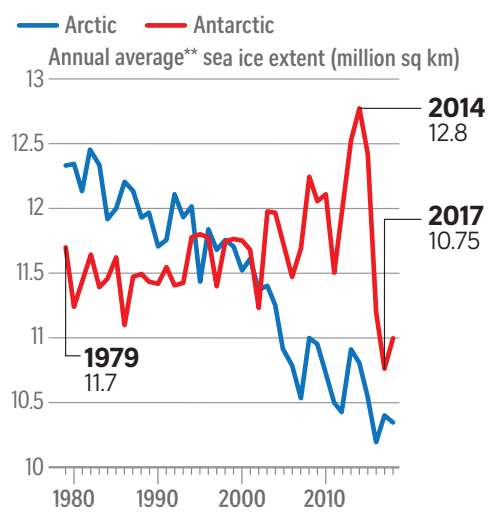
- Sea ice is frozen ocean water. It forms, grows and melts in the ocean, in contrast to icebergs which originate on land.
- Sea ice grows during winter and melts during summer. On average, sea ice covers about 25 million sq km of the earth.

Mysterious decline

- From 2014 to 2017, the Antarctic lost as much sea ice as the Arctic over 34 years, receding 2 million sq km for unknown reasons.
- This decrease is more than

2,800 times the area of Singapore

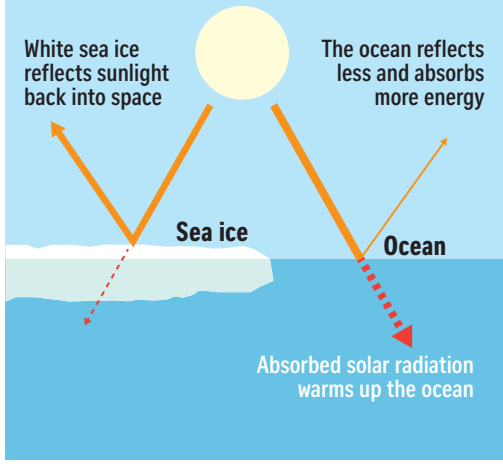
- Sea ice extent in Antarctica increased slightly last year, but has suffered a further reduction so far this year.



NOTE: **Sea ice extent increases during the winter months and decreases during the summer months. The annual average is used here for comparison.

Impact on the climate

- Sea ice plays an important role in the global climate system due to its reflective capabilities. Sea ice reflects incoming solar energy back into space in a process called the ice-albedo feedback.
- Melting sea ice could reduce the amount of solar radiation being reflected back into space, resulting in a warmer earth.

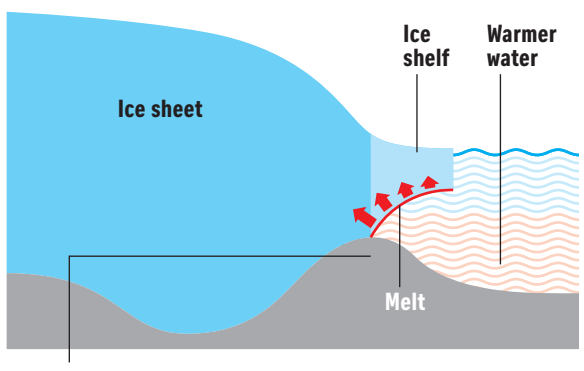


Impact on wildlife

- In Antarctica, Emperor penguins require sea ice that stays solid for most of the year to live and breed.
- In 2016, abnormally warm and stormy weather broke up the sea ice at the Halley Bay colony in the Weddell Sea. Almost all the chicks died. This pattern was repeated in 2017 and 2018.
- British Antarctic Survey penguin expert Phil Trathan said it was impossible to know for sure if the break-up of sea ice at Halley Bay was caused by climate change, but such a complete failure to breed successfully is unprecedented at this site.

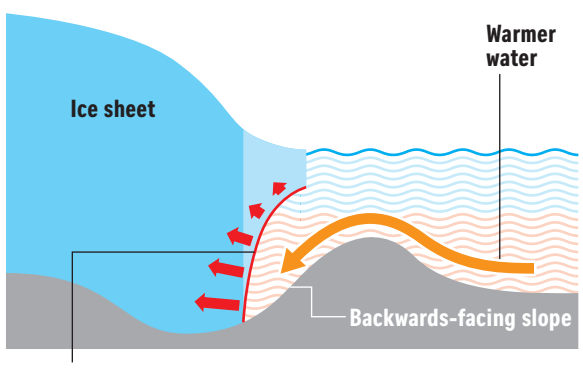
HOW IT WILL WORK

1 Initial conditions



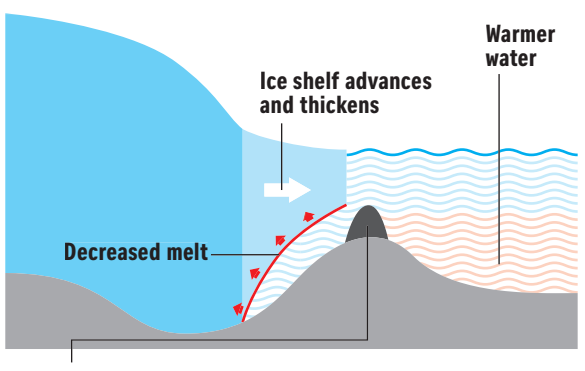
Natural barrier
In a stable glacier, this blocks warm water from reaching the base of the ice sheet.

2 Instability



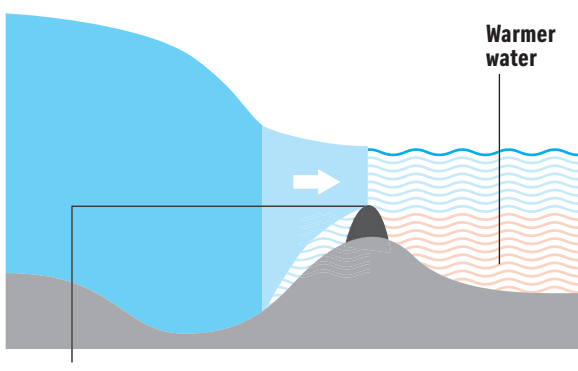
Increased melt
When the grounding line is on a backwards-facing slope, warmer water undercuts the ice, leading to instability.

3 Building an artificial wall



Artificial wall
This will block the warm currents, reducing the melt rate and allowing the ice shelf to thicken and advance.

4 Regrounding



Regrounding
With enough advancement and thickening, the ice shelf will reground with the artificial barrier. If this happens, the glacier will regain mass.

Sources: GUARDIAN, BRITISH ANTARCTIC SURVEY, NOAA, AFP, NSIDC, HOWSTUFFWORKS, ITGC, NEWSWEEK, NEWSCIENTIST PHOTOS: NASA, DAVE PAPE, REUTERS, JOHN DOWNER PRODUCTIONS STRAITS TIMES GRAPHICS: CHNG CHOON HIONG