

Singapore's Energy Transition

Perspectives of a small island city state



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Outline

1. Singapore National Circumstances
2. Climate Efforts
3. Energy Transition

1. Singapore's National Circumstances

Singapore faces more severe constraints than most other countries, which make it more expensive for Singapore to de-carbonise

- Physical constraints – small (730 sq km), low-lying, highly urbanized island state, with no hinterland
- High population density – with 7,800 pax per km²
- Energy constraints – Singapore imports almost all of our energy. This is an existential issue for us
 - Already shifted to the cleanest burning fuel (**natural gas**), making up 95% of electricity production
 - We are Alternative Energy Disadvantaged (AED), but continue to **facilitate the adoption of renewable energy** where technically and economically feasible
 - **Limited renewable energy options** e.g. hydro, wind, geothermal; deployment of solar is limited due to land constraints
 - **Low-carbon alternative technologies are nascent**, e.g. CCUS and hydrogen
- Export orientation and open economy with a sizeable manufacturing mix – due to lack of hinterland and natural resources; this means we are subject to global prices and demand



Source: SunSeap

Singapore accounts for ~ 0.1% of global emissions

Singapore's National Circumstances

27KM



50KM

Physical Geography

- Small size (750km²)
- Densely populated
- Flat, low lying
- No natural resources

Naturally constrained

- Land
- Manpower
- Energy
- Water
- Food



Parties may be affected not only by climate change but also by the impacts of the measures taken in response to it

Impact of Climate Change on Singapore

- Sea level rise poses an existential threat to Singapore as a low-lying city state.
- Protecting against rising sea levels could cost ~\$100 billion over 100 years
- Annual mean temp (degC) has been rising since 2009, coupled with dry spells and more intense rainfall
- Efforts on climate adaptation are undertaken by the Resilience multi-ministry Working Group

Convention Article 3:5 – Keep Markets Open

- Parties mandated to promote a **supportive and open international economic system**
- Measures taken to combat climate change, **should not constitute a means of arbitrary or unjustifiable discrimination or disguised restriction on international trade**

Impact of Response Measures on Singapore

- Trade is three times our GDP
- We import for all our needs: Energy, Water, Food
- Parties' response measures would have impacts on our exports:
 - Carbon Footprint Standards;
 - Carbon taxes, tariffs;
 - Carbon Border Adjustment Mechanism

Convention Article 4: 8,10 – Take account of AED constraints

- Parties to take into consideration in the implementation response measures/the commitments of the Convention, the situation of small island countries...and **Parties with economies highly dependent on... the use of fossil fuels for which such Parties have serious difficulties in switching to alternatives**

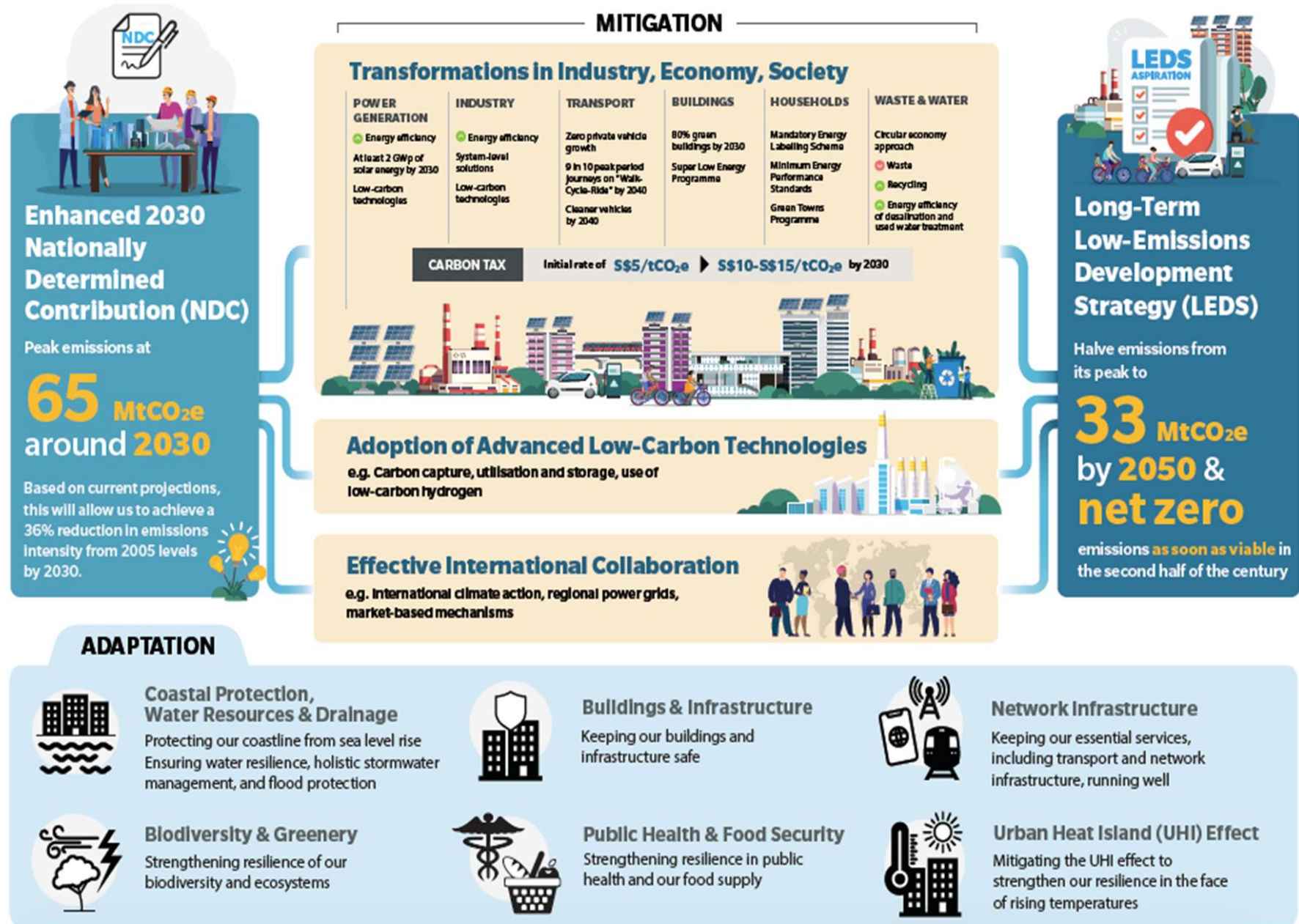
2. Singapore's Climate Efforts

Singapore accounts for only about 0.1% of global emissions.

Notwithstanding this, our national circumstances, and **AED constraints**, we have made ambitious climate commitments

International cooperation to address the global climate challenge. Need for all countries to act.

- ❑ Importance of economic growth to provide resources to address climate change
- ❑ Each country's contribution to take account of its national circumstances
- ❑ Climate efforts must be anchored in the rules based multilateral system, respecting the principles and provisions of the UNFCCC, and related organisations, viz, IMO, ICAO, WTO



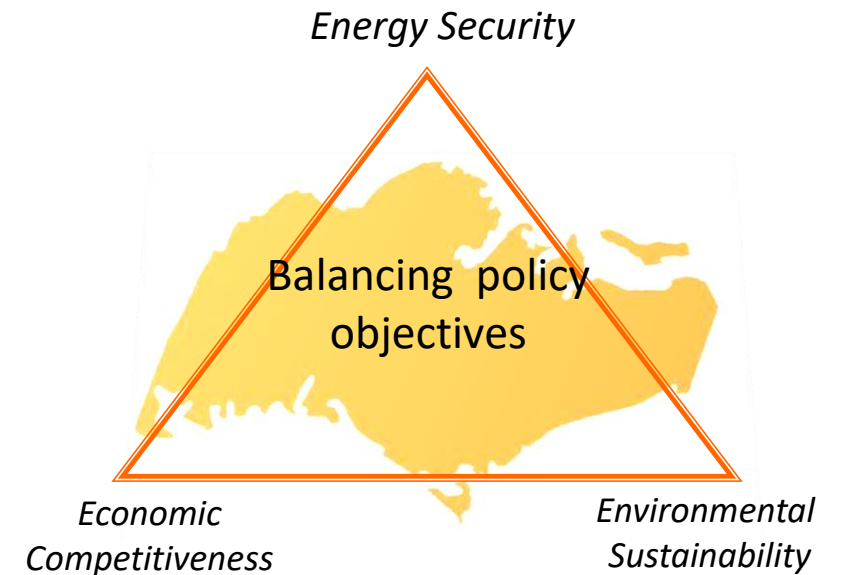
3. Singapore's Energy Transition

Sustainability underpins our economic strategies

- ❑ We press on with our efforts to complement UNFCCC's multilateral cooperative objectives to combat climate change. We have made ambitious climate commitments at the UNFCCC.
- ❑ Assist our industries and enterprises to decarbonise
- ❑ Support enterprises and workforce harness sustainability as a competitive advantage, invest in innovation, and seize new growth opportunities in the green economy
- ❑ Expand Singapore's global connection to capture cross-border opportunities

As we take bold steps to address climate change, we remain pragmatic

- ❑ We need to balance various policy objectives
- ❑ Assist enterprises, and support workers in the green transition



Decarbonising the energy sector is key in greening our economy

- ❑ The energy sector powering industries and households contributes 40% of direct emissions
- ❑ Demand for energy will grow as we digitalise the economy and electrify transport and processes
- ❑ Energy transition is challenging for Singapore. Renewable energy options adopted by other countries are not available to us. Little wind, hydro, or tidal power
- ❑ Solar is our most viable form of renewable energy. However, we have heavy cloud cover and limited land available to expand solar energy capacity
- ❑ Despite the limitations and complexities, we continue to forge ahead to transform the energy sector, and reduce carbon footprint

Transforming the energy sector, reducing the carbon footprint

We continue to enhance the energy efficiency of power generation plants

- Even as natural gas remains a major source of energy before lower-carbon fuels such as hydrogen become viable

We further accelerate solar deployment, despite land constraints and dense population

- On track to achieve solar deployment target of at least 2 GWp by 2030 (equivalent to powering 350,000 households annually).
- Since 2015, solar installed capacity has increased by over 9 times to 560 MWp in 3Q 2021
- Exploring vertical solar panels to overcome our land constraints
- Looking at ways to integrate energy storage systems into the grid - to overcome the intermittency of solar energy, and manage the stability and resilience of the energy grid

Meaningful abatement however can only be achieved through:

- Tapping renewable energy beyond our shores, and
- Developing the use of low-carbon alternatives in the longer term

Tapping renewable energy beyond our shores

- ❑ We plan to import up to 4GW of electricity by 2035. This will constitute around 30% of Singapore's electricity supply
- ❑ In the interim, we will conduct small-scale 100MW trials and pilots. This will help us learn, build confidence, and pave the way for our larger-scale electricity import projects

Develop the use of low-carbon alternatives

- ❑ Low-carbon hydrogen and carbon capture, utilisation and storage, have the potential to be game-changers, especially for hard-to-abate sectors such as Energy and Chemicals
- ❑ However, these technologies will take time to mature and become more commercially viable.
- ❑ We are studying how we can catalyse the development of these technologies

Even as we push on with decarbonisation, there are new economic opportunities

Green financing

- This will grow as companies look to financing instruments to support sustainability investments

Carbon services and carbon credits market

- Firms and countries will want to trade in carbon credits to offset their emissions and meet their climate goals
- Monitoring, reporting and verification services needed

Sustainable tourism

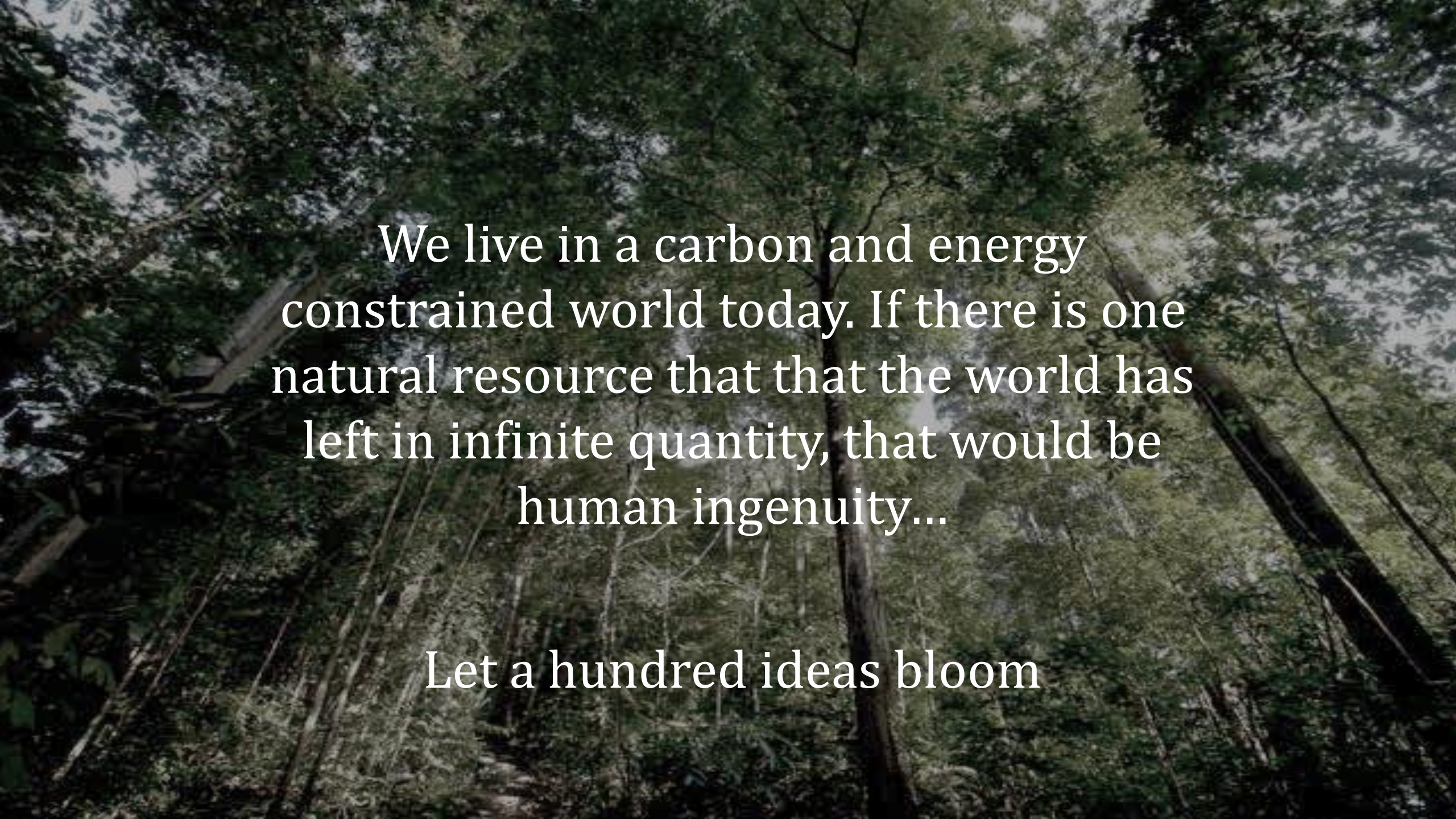
- Singapore as a sustainable urban destination. We are taking steps to work with the tourism industry to move towards more sustainable operations, create sustainable products and experiences for visitors
- This includes the hotel sustainability roadmap. To spur hotels to adopt sustainable practices

Deepening workforce capabilities to benefit from the emerging green economy and low-carbon power sector

- ❑ We will equip our people to seize upcoming opportunities in the transition to a green economy and low-carbon power sector**

- ❑ Reskilling and upskilling programmes offered by agencies**
 - The Career Conversion Programme for Clean and Renewable Energy Professionals
 - Setting up of centres of excellence for training and research in green financing

- ❑ Continue to roll out training programmes to keep pace with the evolving needs of the transition to a green economy**

A low-angle shot of a dense forest. The camera is positioned on the ground, looking up at the towering trees. Sunlight filters through the thick canopy of green leaves, creating a dappled light effect. The trunks of the trees are dark and vertical, reaching towards the top of the frame. The overall atmosphere is serene and natural.

We live in a carbon and energy
constrained world today. If there is one
natural resource that that the world has
left in infinite quantity, that would be
human ingenuity...

Let a hundred ideas bloom