



Panel Session: What Will Come To Be The New Normal In Transport Tech?

Driving a Sustainable Future: Data-Driven & Green Technologies in SMRT – Moving People, With Tomorrow in Mind

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CLIMATE RISKS: 1.5°C VS 2°C GLOBAL WARMING



EXTREME WEATHER

100% increase in flood risk. | vs | **170%** increase in flood risk.

SPECIES

6% of insects, **8%** of plants and **4%** of vertebrates will be affected. | vs | **18%** of insects, **16%** of plants and **8%** of vertebrates will be affected.

WATER AVAILABILITY

350 million urban residents exposed to severe drought by 2100. | vs | **410 million** urban residents exposed to severe drought by 2100.

ARCTIC SEA ICE

Ice-free summers in the Arctic at least once **every 100 years.** | vs | Ice-free summers in the Arctic at least once **every 10 years.**

PEOPLE

9% of the world's population (700 million people) will be exposed to extreme heat waves at least once every 20 years. | vs | **28%** of the world's population (2 billion people) will be exposed to extreme heat waves at least once every 20 years.

SEA-LEVEL RISE

46 million people impacted by sea-level rise of 48cm by 2100. | vs | **49 million people** impacted by sea-level rise of 56cm by 2100.

OCEANS

Lower risks to marine biodiversity, ecosystems and their ecological functions and services at 1.5°C compared to 2°C.

CORAL BLEACHING

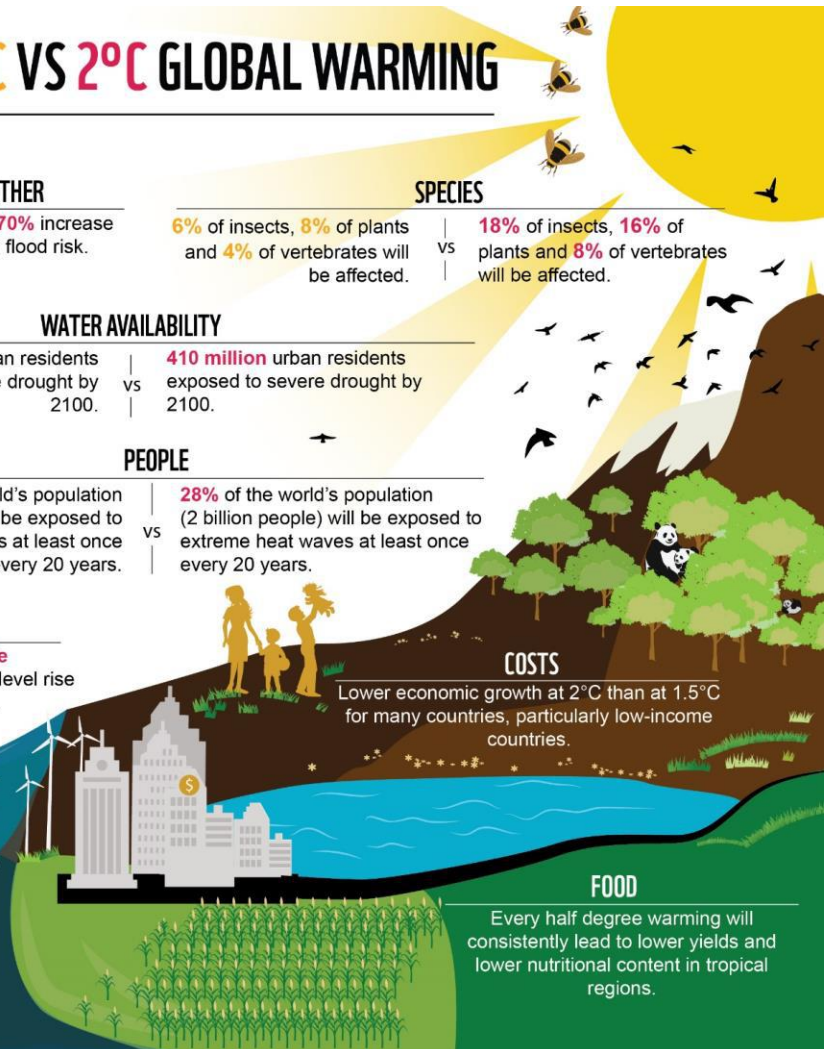
70% of world's coral reefs are lost by 2100. | vs | Virtually **all coral reefs are lost** by 2100.

COSTS

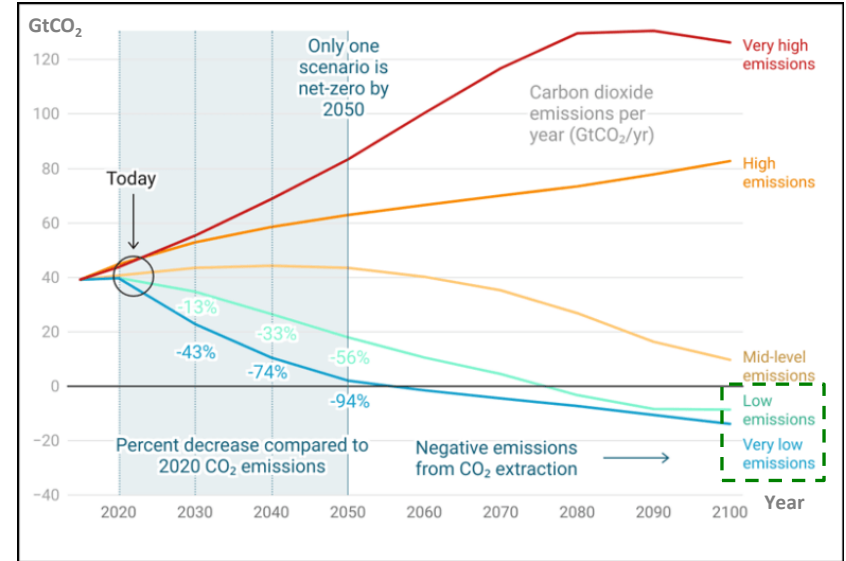
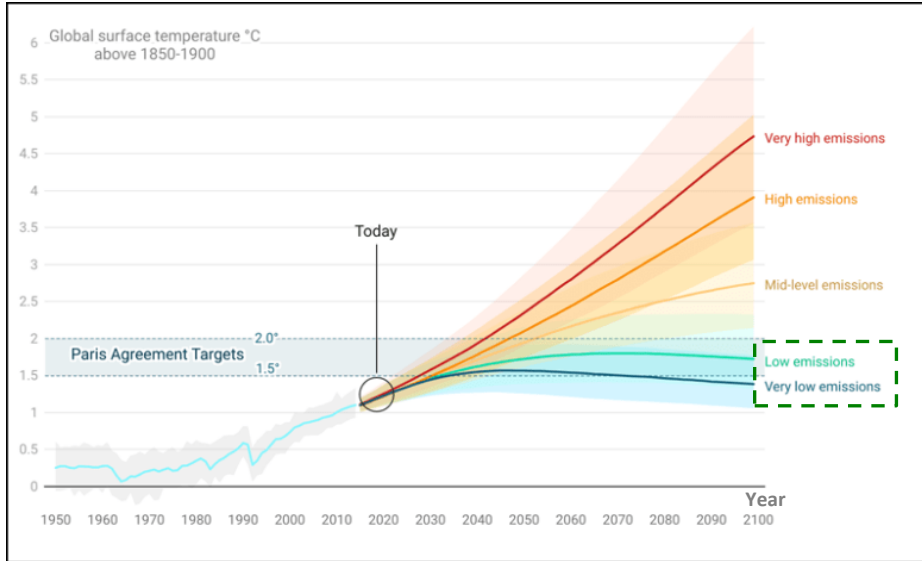
Lower economic growth at 2°C than at 1.5°C for many countries, particularly low-income countries.

FOOD

Every half degree warming will consistently lead to lower yields and lower nutritional content in tropical regions.



Global Temperature and CO₂ Projections



We need to drastically reduce our CO₂ emissions, to avoid a 2°C or higher temperature increase!

Singapore Green Plan 2030



5 Pillars of Singapore Green Plan 2030



City in Nature

Create a green, liveable, and sustainable home for Singaporeans, and build up our carbon sinks by extending nature throughout our island



Sustainable Living

Make reducing carbon emissions, keeping our environment clean, and saving resources and energy a way of life in Singapore



Energy Reset

Use cleaner energy and increase our energy efficiency to lower our carbon footprint



Green Economy

Seek green growth to create new jobs, transform our industries and harness sustainability as a competitive advantage



Resilient Future

Build up Singapore's climate defences and resilience, and enhance our food security



Green Government and Green Citizenry
as Key Enablers



Singapore is aiming for **Net Zero emissions by 2050**.

Our **SG Green Plan 2030** articulates our steps and intermediate targets towards this.

The government has also announced plans to **increase carbon tax** to \$50-\$80 per tCO₂ by 2030.

Carbon Tax

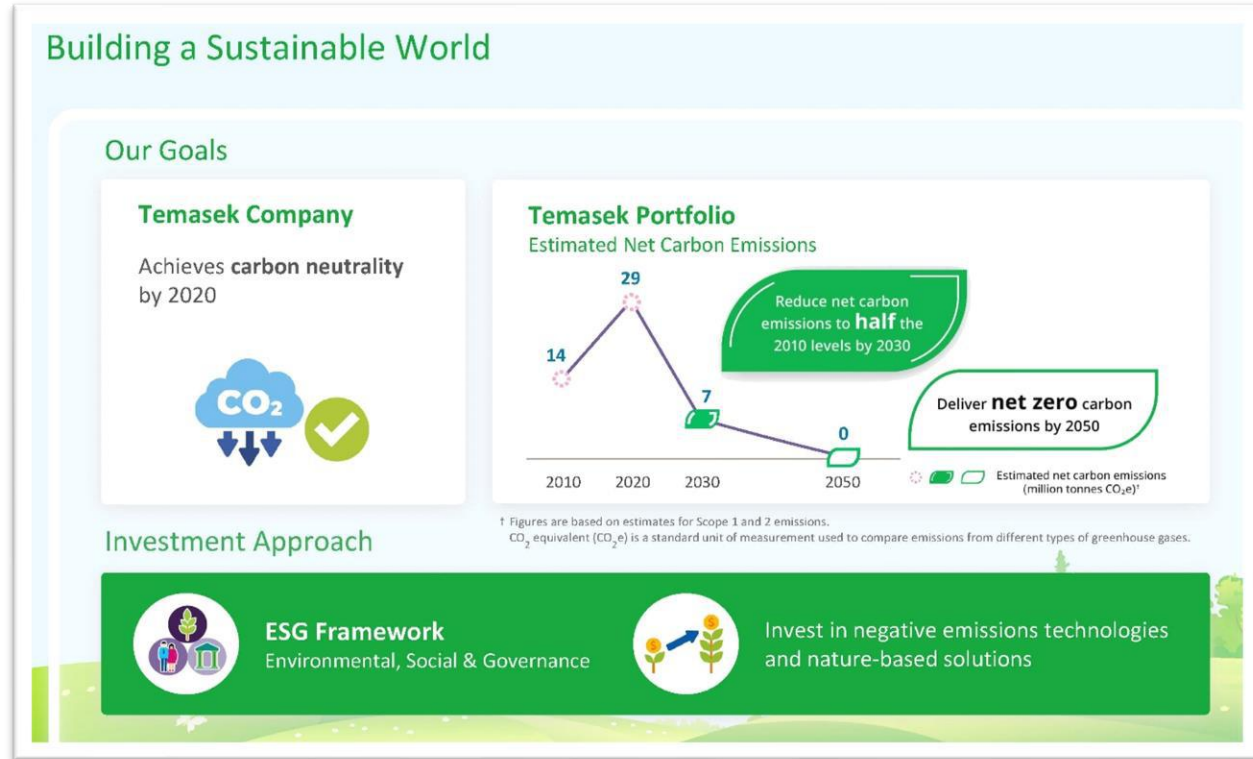
Currently	\$S5 per tonne
2024 & 2025	\$S25 per tonne
2026 & 2027	\$S45 per tonne
By 2030	\$S50 to \$S80 per tonne

Temasek's Environment Sustainability Goals

SMRT is a fully-owned subsidiary of Temasek.

Temasek has similar targets:

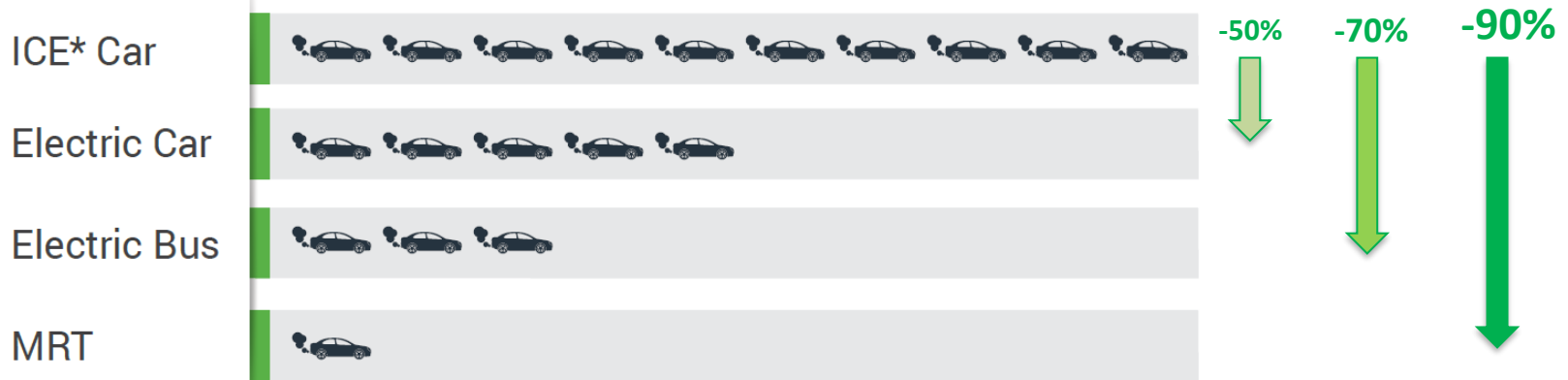
- Halve 2010's emissions by 2030
- Net-Zero by 2050



SMRT's Business is Inherently Green

Our rail services are the most sustainable form of land transport.

Average Carbon Footprint (kgCO₂e/pax-km)

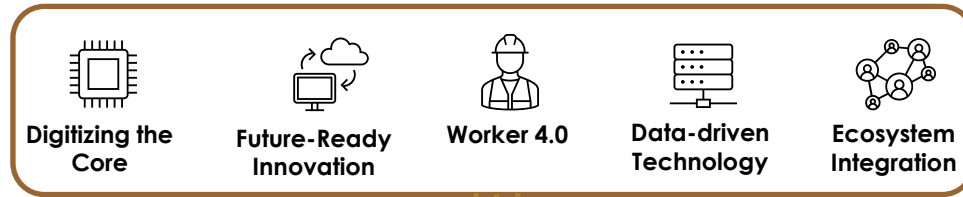


Source: Data from LTA

* Internal Combustion Engine (ICE)

SMRT's Drive to Reduce Carbon Emissions

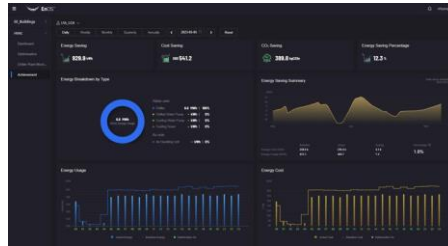
Leverage Technology to Enhance Efficiency, Effectiveness & Sustainability



Green CBTC



Green Station



Solar PV

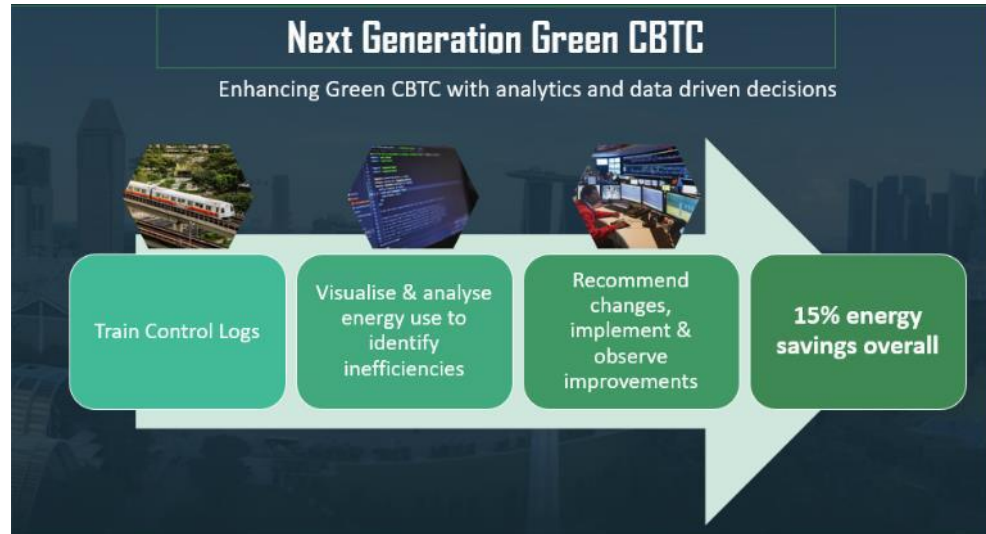


Green CBTC – Optimise Traction Energy Usage



Announcement

Media Release - Thales and SMRT Trains Partner on Next-Generation Rail Signalling Technologies for Greener Rides in Singapore



Green CBTC – Optimise Traction Energy Usage



Advanced Coasting

- Shut off electricity supply to traction motors and do not apply brakes



Adaptive Slow Running

- Dwell time adjustment and speed reduction if train ahead is delayed
- Reduction of start-stop motion



Coordinated Arrivals and Departures

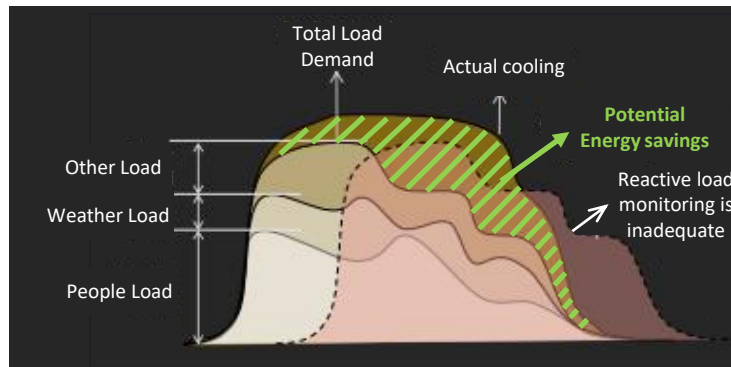
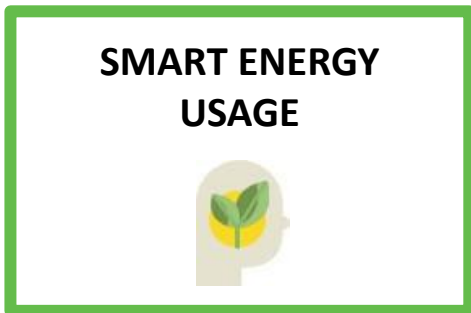
- Coordinate arriving train with regenerative braking with departing train
- Arrival train's regenerated energy is used to accelerate departing train



Peak Limiting

- Limit the number of trains departing at the same time within a common traction power section
- Reduces peak power demand in the network

Green Station – Smart Energy Usage for Air-Con



- The Air Conditioning System (ACS) is a major contributor of energy consumption in stations.
- **Predictive AI** allows the **optimisation and adjustments of ACS setpoints** to reduce energy consumption, while sustaining commuter comfort.

1) Predictive Artificial Intelligence
Reduce Heating, Ventilation and Air-Conditioning (HVAC) energy consumption through predictive AI to adjust setpoints

2) Reduce 5% - 10% energy consumption
For each underground station, this works out to savings of between 105 and 210 MWh a year

3) Reduce over 7,000 Megawatt Hours (MWh) in stations, annually
Equivalent to average annual consumption of 1,500 4-room HDB Flats

4) Sustaining commuter satisfaction and comfort
By the end of 2023, smart energy usage will be implemented in 70 underground stations across the North-South, East-West, Circle and Thomson-East Coast lines

Envision digital | Smart GREEN | SMRT TRAINS

Solar PV Deployment



Solar panels installed on BSD rooftop

Existing

Location	Solar capacity (MWp)
BSD	1 MWp
MDD	1.8 MWp
TWD	1.3 MWp
TEL 1-3 stations	0.7 MWp
Total	4.8 MWp

Planned

Location	Solar capacity (MWp)
BSD Ph. 2	1.5 MWp
NSEWL, CCL stations (TD115)	1.8 MWp
TEL 4 & 5 stations	0.7 MWp
Total	4.0 MWp

What does 8.8MWp mean?

By next year, our total solar output will be equivalent to the **non-traction energy needs of BSD**

We will be generating enough solar energy to power **1900 x 4-room HDB flats**

Moving People, with Tomorrow in Mind

- *Sustainability is part of our business & operations, and we aim to secure a greener and more sustainable environment for future generations.*
- *There are significant challenges ahead – for us, and for Singapore – to reduce our GHG emissions. We need a multi-prong approach to meet our ambitious 2030 and 2050 targets.*



WOMEN IN RAIL MALAYSIA

CONFERENCE

2023

Thank you

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