

Sustain: Low-carbon and Resilient – Summary of concepts and strategies

1. To move Singapore towards **becoming a low-carbon city**, our strategies will focus on:
 - a. **Decarbonising and diversifying our energy supply**

With solar energy being the most promising renewable energy option for Singapore, we will increase the deployment of solar panels on our rooftops, waterbodies, and even our building facades. We will continue to explore alternative energy supply options, such as low-carbon hydrogen, geothermal and nuclear, to determine their suitability for Singapore and where appropriate, adapt our infrastructure to support them. Our energy grid will also be enhanced to support our increasingly complex power systems, while maintaining grid reliability. For instance, we will use digital technology to optimise our grid's design, planning, and operation to better manage and integrate electricity drawn from cleaner but intermittent sources.
 - b. **Moving towards a regenerative built environment**

Sustainability will be at the core of our entire building lifecycle, for both new and retrofitted developments. One way is to use more sustainable and low-carbon materials such as recycled materials or carbon dioxide mineralised aggregates, to lower the overall lifecycle carbon footprint of our built environment. Our estates and buildings can also be integrated with more greenery and adopt innovative design to perform better in our climate, as well as support the well-being of residents. As an example, HDB estate Punggol Point Crown has lush greenery to connect residents with nature and incorporates facade shading features. We can further incorporate smart facilities management technologies and design for ease of maintenance, to utilise resources more efficiently.
 - c. **Closing our resource loops**

We will plan and invest in infrastructure to close our resource loops, to ensure Singapore continues to develop in a sustainable and resilient manner. For instance, we are developing ways to turn bottom ash from the incineration of our waste into construction materials such as NEWSand, to extend the lifespan of Semakau Landfill.
2. To **prepare and protect our city against the effects of climate change**, our strategies will focus on:
 - a. **Enhancing flood resilience**

Besides expanding our drainage infrastructure to handle more intense rainfall, we are planning for more space-efficient drainage systems. For instance, we are exploring an underground drainage and reservoir system consisting of caverns and stormwater tunnels, to mitigate flood risk and provide synergistic benefits. We are also planning for coastal protection solutions with multi-functional uses, thus remaking our coastal land into liveable, adaptable and sustainable spaces.
 - b. **Cooling down urban heat**

The rise in temperatures will be exacerbated by the Urban Heat Island (UHI) effect as cities absorb and retain more heat than rural areas. Under the Cooling Singapore 2.0 programme, Singapore is developing a Digital Urban Climate Twin to identify the key sources of UHI to guide mitigation strategies. To ensure thermal comfort, we will continue to adopt urban design strategies, such as providing more open spaces around buildings, to reduce heat accumulation.

3. To optimise our limited resources, we will **adopt a systems-level planning approach** focusing on:
 - a. Co-locating infrastructure
As our economy grows, we will continue to find ways to integrate our urban infrastructure, to maximise energy and resource recovery, as well as optimise land use.
 - b. Supporting circular economies
We will support circular economies by strategically siting industries to close resource loops in the production process. For instance, at the upcoming Sungei Kadut Eco-District, businesses in agricultural technology, food manufacturing and processing, environmental technology and biosciences, will be sited near one another to reap synergies.
4. To safeguard options for future generations, we will continue to adopt innovative strategies to **optimise the use of our limited space** focusing on:
 - a. Optimising sea space
We will work with industry and researchers on ways to optimise the use of our sea space, in a manner sensitive to the marine environment, such as through co-locating uses, matching appropriate uses to suitable sites, and harnessing technology. For instance, we have co-located solar panels with fish farms along the East Johor Strait.
 - b. Exploring creative solutions for land creation
Beyond traditional land reclamation, we have been exploring other solutions for land creation. Examples include the polder project at Pulau Tekong which can protect our island from rising sea levels, while significantly reducing the amount of sand.
 - c. Unlocking our underground space
We will explore the feasibility of creating more underground caverns which can be a significant space resource.