**ANNEX**

## Milestones in HDB's Sustainability Journey

As the master planner and largest housing developer in Singapore, the Housing & Development Board (HDB) plays a key role in supporting Singapore's commitment to sustainable development. Over the years, we have intensified our efforts in sustainable development, as we continually seek to address challenges such as climate change, while creating a cleaner and more comfortable living environment for our residents. For example, all HDB developments are designed to embrace local tropical climatic conditions through various design strategies. These include strategically orienting residential blocks to reduce heat gain from solar radiation, maximising natural lighting and ventilation in flats and around the estate and harnessing renewable energy, among others.

2 In **2010**, HDB reached a key milestone in our sustainability journey, when **Punggol was designated as the first eco-town**, and a 'living laboratory' to test-bed ideas and technologies that promote sustainable development. Being our youngest town then, Punggol presented an excellent opportunity for HDB to demonstrate sustainable urban planning and design, green technology adoption and to encourage more members of the community to lead eco-friendly lifestyles.

3 The **first eco-precinct in Punggol, Treelodge@Punggol was completed** that same year. The guiding design principle for this eco-precinct was to harness the elements of nature wherever possible, such as wind, daylight, rainfall and greenery, to promote sustainable green living. For example, the 7 residential building blocks are strategically oriented to face the prevailing North-Eastern winds, with generous provision of green spaces at the precinct level. These help to maximise natural lighting and ventilation in the flats and around the estate, while also reducing ambient temperature. The project also features a host of sustainable features such as regenerative lifts, energy-saving light fittings in common areas, rooftops integrated with solar photovoltaic panels and a rainwater collection system, as well as eco decks and green roofs. The impact of these features garnered Treelodge@Punggol a Green Mark Platinum Award – the pinnacle award under the Building & Construction Authority's (BCA) Green Mark certification system which evaluates a building's environmental impact and performance.

4 In **2011**, HDB formulated a holistic and comprehensive **Sustainable Development (SD) Framework** to steer the development of HDB towns. The framework sets out 10 broad desired outcomes in the aspects of environmental, economic and social considerations, and is aligned with the national sustainability objectives in the Sustainable Singapore Blueprint. In particular, the environmental sustainability strategies include reducing carbon emissions, optimising the use of resources and achieving effective energy, water and waste management. Together, these strategies aim to provide a clean, safe, healthy and comfortable living environment for our residents.

5 Guided by the SD Framework, **we extended the suite of eco-features to all new housing projects in Punggol from 2011**, to reduce energy consumption, lower carbon emissions and promote eco living. Since then, all new public housing developments in Punggol have obtained BCA's Green Mark Gold$^{PLUS}$ certification or higher.

6 In 2014, HDB set a benchmark for all our new residential developments to obtain at least a Green Mark Gold certification[1]. To support this requirement, HDB **rolled out the suite of eco-features to all new public housing developments launched from 2014.**

7 Our efforts to develop smart and sustainable homes were further augmented with the development of the **Smart HDB Town Framework in 2014**, which maps out how Information and Communication Technology (ICT) can be harnessed to achieve a more liveable, efficient, sustainable, and safe living environment for our residents (see **Table A** below for further details). Guided by this framework, we introduced smart and sustainable features in Punggol Northshore – our first smart and sustainable district in Punggol. Some of these features, such as environmental modelling of microclimatic conditions, have since been rolled out beyond Punggol to public housing developments in other towns and estates such as Tengah and Bidadari.

8 To further integrate our public housing developments with nature, HDB introduced the **Biophilic Town Framework in 2015**, which outlines strategies to develop urban landscapes and planting to strengthen the connection between the built environment and nature. The Biophilic

[1] In keeping with the recent refinement of the Green Mark assessment criteria, where BCA will be phasing out the Gold certification, HDB has since updated our requirement for all new residential developments to obtain at least a Gold$^{PLUS}$ certification from Nov 2021.

Town Framework was subsequently refined and **applied to new public housing projects launched from Jul 2018**.

9 Beyond green living, HDB has also made bold strides in harnessing solar energy to power common services such as lifts, water pumps and corridor lights, with clean energy. Since solar photovoltaic (PV) systems were first test-bedded in HDB estates in 2008, HDB has been driving the growth of Singapore's solar industry under our **SolarNova programme. Introduced in 2015**, this initiative aims to accelerate solar deployment in Singapore through promoting and aggregating solar demand across government agencies. To date, HDB has committed a total solar capacity of 380 MWp for about 8,400 out of the over 10,000 HDB blocks. This is equivalent to powering 95,000 4-room flats with solar energy.

10 In Tengah, our 24th and newest town, HDB continues to push boundaries in sustainable development. The **masterplan for Tengah** was unveiled in September **2016,** where smart technologies will be used to plan the town from the outset, to create a more liveable, sustainable and safe living environment. Data from climatic modelling tools will also be used to guide the design of open spaces, as well as optimize building layouts and orientation to enhance wind flow and promote natural ventilation within the town. Tengah will also be an Electric Vehicle (EV)-ready town with charging points, and residents in selected developments can enjoy a Centralised Cooling System (CCS). The extensive deployment of solar panels will help to power these features as well as common areas in the precinct. These various systems will be managed by an Energy Concierge, an energy management system, run by artificial intelligence to minimise disruption to services, optimise energy use and promote greater conservation of energy.

11 As part of our efforts to use renewable energy, HDB announced in **2017** that **solar-ready roofs** – roofs designed with structural and electrical considerations to facilitate the installation of solar PV systems – would be rolled out in all future public housing blocks with at least 400 sqm of open roof space where feasible (excluding space needed for essential block services such as water tanks, water pumps and lift rooms). This will enable more productive and efficient installation of solar panels on HDB rooftops.

12 To conserve water, the **Urban Water Harvesting System (UWHS)** was installed in all suitable Build-to-Order (BTO) projects launched from August **2018**, to harvest rainwater for non-potable uses like washing of common areas. The UWHS collects rainwater and stores it in an

underground harvesting tank. The harvested rainwater is treated before being recycled for washing of common areas and irrigation. In this way, the use of potable water (drinking water) for washing of common areas and irrigation can be reduced by more than 50%.

13 In **2019**, HDB officially opened **Oasis Terraces**, our first new-generation Neighbourhood Centre (NC). Oasis Terraces is the first NC to have smart and sustainable features such as motion-sensor lighting and sensor-activated fans for residents' comfort. There are also solar panels on the rooftops, a rainwater harvesting system that treats surface water runoff and a sensor-triggered irrigation system to manage the distribution of water to designated planting zones, removing the need for manual watering.

14 In 2020, HDB launched the **"Designing for Life" roadmap**, to guide the way we plan, design and maintain our towns and estates over the next decade. Supported by three key pillars – 'Live Well', 'Live Green' and 'Live Connected' – the roadmap prioritises residents' holistic well-being in the planning and design of HDB towns, to create even better homes for the future. These initiatives will be applied to both new public housing developments and existing towns over the next decade. In particular, initiatives under 'Live Green' are aimed at driving greater environmental sustainability in our towns and promote green living for all. Beyond implementing the various green urban solutions in HDB towns, HDB will leverage smart technology to make our towns even more sustainable, liveable, safe and efficient.

15 Our sustainable efforts are not confined to newer towns and developments. In **2020**, we announced the **HDB Green Towns Programme**, a 10-year plan that aims to bring sustainable living to all existing HDB towns, with large-scale implementation of green features to improve residents' quality of life. In support of the Singapore Green Plan, this programme focuses on reducing energy consumption, recycling rainwater, and cooling HDB towns. It brings together initiatives that have already been implemented or trialled successfully in some HDB towns/estates, as well as new initiatives that have the potential for scaling up. For example, in **2021**, HDB rolled out a **large-scale cool paint pilot project at Tampines** which will see approximately 130 HDB blocks painted with cool paint. With the use of such paint, the pilot aims to reduce the ambient temperature of the site by up to 2$^{o}$C. In Mar **2022**, HDB also announced that new initiatives such as **e-waste recycling bins, Light Emitting Surfaces (LES) signage, EV chargers and dual bicycle racks will be added to the HDB Green Towns Programme**. Since 2005, HDB has been driving sustainability efforts to achieve a 10% reduction in annual

energy consumption in HDB towns as of 2020. Through the Green Towns Programme, HDB aims to reduce energy consumption by a further 15% by 2030.

16 In Mar **2022,** HDB issued our **inaugural green bond**, which marks our first step into Green Finance Transactions under our new Green Finance Framework. The proceeds from the green bond will be used exclusively to finance or re-finance the development of eligible green public housing developments.

**Table A: Smart HDB Town Framework**

The Smart HDB Town Framework maps out how HDB intends to introduce the smart element in HDB towns and estates by focusing on five key dimensions:

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|---|---|
| **Smart Planning** | The use of computer simulation and data analytics will enable HDB to improve the way we plans and designs our towns, precincts and buildings, and also derive optimal and cost-effective solutions to achieve sustainability goals.<br><br>Real time data is integrated into simulation models to derive the optimal and most cost-effective solutions for urban design technologies in HDB towns. |
| **Smart Environment** | HDB will look into linking estates with a network of sensors to create a "Smart environment".<br><br>These sensors will capture real-time information on environmental factors such as temperature and humidity. Innovative solutions can then be found to create a more pleasant environment for residents. |
| **Smart Estate** | To improve estate services, HDB will leverage Smart technologies to collect and analyse data which help to optimise maintenance cycles and pre-empt problems.<br><br>For example, with data collected by sensors, we can better understand the usage patterns of common amenities, such as lifts and lights. Changes in these patterns could signify potential problems. These facilities or fittings can then be checked and any problem identified can be resolved promptly, with minimal disruption to services. |
| **Smart Living** | HDB will provide digital infrastructure in flats to pave the way for intelligent homes. With such infrastructure in place, residents will be able to tap on Smart home applications developed by commercial companies that can enhance energy savings, and enable them to access services like healthcare, in the comfort of their homes. |
| **Smart Communities** | HDB will leverage crowd-sourced data, data analytics and platforms/ mobile apps to better understand and engage residents, enhance community bonding efforts and empower communities to take greater ownership in co-creating their living environments. |