

# GREEN MARK 2021



CERTIFICATION STANDARD



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## Revision Log

Revision	Description	Effective Date
P1	For Pilot	22/04/2021
R1	1st Version	1/11/2021
R1.1	1st Version with minor updates	1/11/2021

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## DEFINITIONS AND ABBREVIATIONS

### **Colour Rendering Index (CRI)**

A measurement from 1 to 100 that indicates how accurately an artificial light source, as compared with an incandescent light, displays hues. The higher the index, the more accurately the light is rendering colours (from U.S Energy Star).

### **District Cooling System (DCS)**

The supply of chilled water for cooling purpose from a central source to multiple buildings through a network of pipes. Individual users purchase chilled water from the district cooling system operator and do not need to install their own chiller plant other than air distribution system. This is different from buildings' in-house air-conditioning system, in part or in full, being maintained and operated by a third party.

### **Energy Efficiency (EE)**

Energy refers to the capacity for doing work. Energy Efficiency means using less energy to perform the same work, which is eliminating energy waste.

### **Energy Use Intensity (EUI)**

EUI is measured by the total electricity used within a building in a year, expressed as kilowatt hour (kWh), per gross floor area (m<sup>2</sup>). As electricity is the main source of energy used in Singapore's buildings, other energy sources are typically excluded in the computation of energy use intensity.

### **Gross Floor Area (GFA)**

The total area of the covered floor space in a building based on the definition under the Urban Redevelopment Authority (URA).

### **Super Low Energy (SLE)**

Best-in-class energy performing building that achieves at least 60% energy savings based on code of 2005, or 40% energy savings based on prevailing code.

### **Zero Energy (ZE)**

A super low energy (SLE) building with all energy consumption, including plug load, supplied from renewable energy sources.

### **Positive Energy (PE)**

A super low energy (SLE) building with 115% of all energy consumption, including plug load, supplied from renewable energy sources.

### **Operational Carbon**

The amount of carbon emissions associated with energy used to operate the building or in the operation of infrastructure (World Green Building Council).

### **Renewable Energy Certificate (REC)**

A market-based instrument representing the proof that a unit of electricity was generated from a renewable energy resource. Once the power provider has fed the energy into the grid, the REC received can then be sold on the open market as an energy commodity. To be recognised REC's shall be compliant SS 673: 2021 Singapore Standard Code of practice for renewable energy certificates.

**Mt Framework (Maintainability Framework)**

The design appraisal tool used for demonstrating the design for maintainability (DfM) performance within Green Mark 2021 Maintainability section.

## WHAT IS GREEN MARK: 2021

The Green Mark 2021 (GM: 2021) has evolved from our previous Green Mark framework to become:

- **simple** – many pre-requisites have been removed, and the criteria have been restructured to two broad categories: (1) Energy Efficiency (the only prerequisite) and (2) Sustainability sections covering Intelligence, Health and Well-being, Whole life Carbon, Maintainability and Resilience.
- **sustainable** – the GM: 2021 criteria have been aligned to meet the United Nations Sustainable Development Goals (UN SDGs), pushing the energy efficiency envelope to mainstream Super Low Energy buildings, and recognising the future requirements from various sustainable finance taxonomies.
- **smart** – GM: 2021 keeps digitalisation efforts in mind to facilitate easy, seamless and secure certification processes.

In addition, GM: 2021 aims to be:

- **owner-friendly** – meeting building developers' and owners' needs for sustainable operations and environmental social and governance (ESG) reporting and demonstrating their leadership
- **cost-effective** – pushing the boundaries of sustainability with a value driven approach, including environmental value, social value and economic value based on a Life-Cycle Cost (LCC) approach
- **user-friendly** – a robust yet flexible framework, that brings all buildings into the same ecosystem of GM: 2021.

## KEY ADVANCEMENTS IN GREEN MARK: 2021

### #1 Aggressive Energy Efficiency (Operational Carbon) Standard

The energy efficiency standard in GM: 2021 has been calibrated and aggressively raised in tandem with the revised standards in the regulatory minimum in environmental sustainability for both new and existing buildings.<sup>1</sup>

Parallel energy efficiency pathways have been developed to meet the aggressive energy efficiency standards set in GM: 2021. They are:

Pathway 1: Energy Consumption based, using the Energy Use Intensity (EUI)

Pathway 2: Deemed-to-comply prescriptive performance, using fixed metrics

Pathway 3: Performance-based energy modelling

An artificial-intelligence (AI) enabled energy calculator is also being developed to facilitate data-driven contextualised simulation as well as demonstration of compliance. More information about the AI energy calculator could be found here at BCA's SLEB Smart Hub. <https://www.sleb.sg/AICalculator>.

All pathways are open for new and existing buildings to use. Each building type has a guide to which of the three pathways can be used for that typology of building (see table 1). To ensure robust efficiency standards are met, a stipulated Total System Efficiency (TSE) of air-conditioning system is required to be demonstrated. TSE measures the overall air-conditioning system efficiency covering the water- and air-side systems (or CU and air side) and provides greater flexibility for designers to optimise their building cooling system's performance.

### #2 Further Alignment with United Nations Sustainable Development Goals

GM: 2021 takes a holistic view of socio-environmental issues. It aligns with the United Nation (UN) Sustainable Development Goals (SDGs) and further translates and contextualises them for implementation within the built environment within Singapore and the urban tropics. Beyond the SDGs, it also takes reference to various developing sustainable finance taxonomies, including the European Union (EU) taxonomy and requirements within the Taskforce for Climate Related Financial Disclosures (TCFD).

Green Mark as a leading green building rating tool, is benchmarked to international tools, the World Green Building Council's Health and Wellbeing Framework and wider evidence-based global imperatives.

### #3 Introduction of GM: 2021 In-Operation

GM: 2021 In-Operation is designed to encourage buildings certified with Green Mark to continuously improve and maintain their environmental practices in operation. It is a streamlined certification process for certified projects not undergoing a retrofit, to maintain a valid Green Mark Certification with the submission of key performance indicators to ensure continued performance of the Green Mark project in energy efficiency, indoor environmental quality (IEQ) and smart operations, etc. Projects can maintain the previous Green Mark award rating or upgrade the ratings based on the energy efficiency performance. For detailed requirement, please refer to this [table](#).

The detail requirement is available [here](#). BCA assessors will conduct random site check for GM: 2021 In Operation projects.

### #4 SLE Residential

Expansion of SLE to cater for new and existing residential projects, emphasising a passive design for the dwelling units and common areas, high efficiency energy systems with smart management controls, and the requirement

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<sup>1</sup> The revised regulatory requirements require new building developments and those undergoing major retrofitting and/or major energy use change to attain 50% and 40% energy savings compared to 2005 levels, respectively, which is comparable to the energy performance standards of Green Mark Platinum buildings of previous versions (GM2015, GM2016 and GM2017).

for adoption of onsite renewable energy to offset a proportion of the key facilities such as the swimming pools, gymnasiums and function rooms.

## #5 Other Key Changes

### **Enhancement on energy modelling and computer fluid dynamics frameworks**

The energy modelling and computational fluid dynamics (CFD) simulation have been enhanced to provide a more complete understanding of building performance through simulations to support the operation of energy efficient buildings, whilst recognising the advancement in simulation software and its use in practice.

- CFD has been enhanced to improve clarity of conditions for both residential and non-residential developments and the approach to wind-driven rain simulations.
- Standardised schedules in energy modelling have been incorporated to enable consistent comparison of annual energy savings of the designed building against reference building for energy savings. Projects using the EUI pathway should adopt the standardised schedules if operational schedules of the building are unavailable at the design stage.



## WHY GREEN MARK: 2021

Green Mark provides a robust and leading method to assess and verify buildings for their environmental performance, assisting project teams and building owners to deliver and demonstrate high performing and sustainable buildings. Green Mark is built upon best practices, climate science, analysis of large building performance data sets and global thought leadership. GM: 2021 aims to further stretch outcomes of buildings to substantially reduce the environmental impacts – focusing on whole life carbon, health and wellbeing, resilience, intelligence and maintainability. GM provides a nationally and globally recognised green building performance rating.

## TARGETED OUTCOME OF GREEN MARK: 2021

GM: 2021 aims to drive energy efficiency and carbon reduction in mitigating the effects of climate change, as well as other sustainable aspects that deliver on addressing the key sustainability drivers.

### Key Sustainability Drivers

Globally, consensus is for Green Buildings to be defined through several key issues including:

- **climate action** (decarbonisation of the built environment)
- **health and well-being** (resilience, social equity, pollution mitigation, health, diversity)
- **resources and circularity** (regeneration of resources and natural systems)

Through Green Mark's co-creation we have identified the key aspects within these issues, which are relevant to our marketplace, and translate them into the delivery of the UN SDGs, in alignment with longer-term sustainable finance considerations. These have been contextualised into our criteria to define the sustainability sections.

These sections, in addition to energy, are Intelligence (smart buildings), Health and Wellbeing (the mental, physical and sociological aspects of buildings and their operation), Whole Life Carbon (which looks at the embodied carbon, construction, fit out and supports corporate plans to transition to zero carbon), Maintainability (the design for safe and effective maintenance) and Resilience (nature-based solutions and leadership).

Green Mark Sections mapped to UN SDGs

<div>EE</div> <div>Energy Efficiency (%)</div>	<div>In</div> <div>Intelligence</div>	<div>Hw</div> <div>Health &amp; Wellbeing</div>	<div>Cn</div> <div>Whole of Life Carbon</div>	<div>Mt</div> <div>Maintainability</div>	<div>Re</div> <div>Resilience</div>
<div>13 CLIMATE ACTION</div> <div>7 AFFORDABLE AND CLEAN ENERGY</div> <div>11 SUSTAINABLE CITIES AND COMMUNITIES</div>	<div>9 INDUSTRY, INNOVATION AND INFRASTRUCTURE</div> <div>8 DECENT WORK AND ECONOMIC GROWTH</div>	<div>3 GOOD HEALTH AND WELL-BEING</div> <div>8 DECENT WORK AND ECONOMIC GROWTH</div> <div>10 REDUCED INEQUALITIES</div>	<div>11 SUSTAINABLE CITIES AND COMMUNITIES</div> <div>12 RESPONSIBLE CONSUMPTION AND PRODUCTION</div> <div>9 INDUSTRY, INNOVATION AND INFRASTRUCTURE</div> <div>13 CLIMATE ACTION</div>	<div>8 DECENT WORK AND ECONOMIC GROWTH</div> <div>9 INDUSTRY, INNOVATION AND INFRASTRUCTURE</div> <div>10 REDUCED INEQUALITIES</div>	<div>14 LIFE BELOW WATER</div> <div>15 LIFE ON LAND</div> <div>11 SUSTAINABLE CITIES AND COMMUNITIES</div> <div>13 CLIMATE ACTION</div>

The United Nations Sustainable Development Goals are the blueprint to achieve a better and more sustainable future for all. They address challenges of the global community, including those related to poverty, inequality, climate, environmental degradation, prosperity, and peace and justice. The Goals are integrated and indivisible, balancing the three dimensions of sustainability.

<https://www.un.org/sustainabledevelopment/sustainable-development-goals/>

## **Programmes related GM: 2021 certification:**

### GreenGov.SG

Formerly known as the Public Sector Taking the Lead in Environmental Sustainability (PSTLES) initiative, the GreenGov.SG initiative forms a component and enabler of the Singapore Green Plan 2030. Under GreenGov.SG, the public sector will strive to attain ambitious sustainability targets in carbon abatement and resource efficiency. As well as being a positive influence and enabler of green efforts. The new and more ambitious targets include:

- Peaking the public sector's carbon emissions around 2025
- Improve Energy Utilisation Index (EUI) by 10% by 2030, from average of 2018-2020 levels
- Improve Water Efficiency Index (WEI) by 10% by 2030, from average of 2018-2020 levels
- Improve Waste Disposal Index (WDI) by 30% by 2030, from 2022 levels

The BCA Green Mark scheme (Platinum SLE standards) is part of the GreenGov.SG requirement for all new and existing buildings under retrofit, and a key enabler in meeting the whole of government sustainability targets.

### Mandatory Higher Green Mark Standard for GLS sites

Projects developed on land sold under the Government Land Sales (GLS) programme and are subject to the Building Control (Environmental Sustainability) Regulations 2008 to attain higher Green Mark standard, are required to

- Submit an application to BCA for the project to be assessed and certified under the BCA Green Mark Scheme.
- Upon completion of building works, inform BCA early to initiate the [Green Mark verification audit](#) so as to facilitate the temporary occupation permit (TOP) and certificate of statutory completion (CSC) process.

Note that the evidence of Green Mark application is required to be submitted along with the application for Building Plan approval. Upon project completion, the relevant clearances showing that the project has been verified and met the prescribed Green Mark Certification rating will also be required before TOP and/or CSC can be considered.

## GUIDELINES FOR APPLICATION AND SUBMISSION

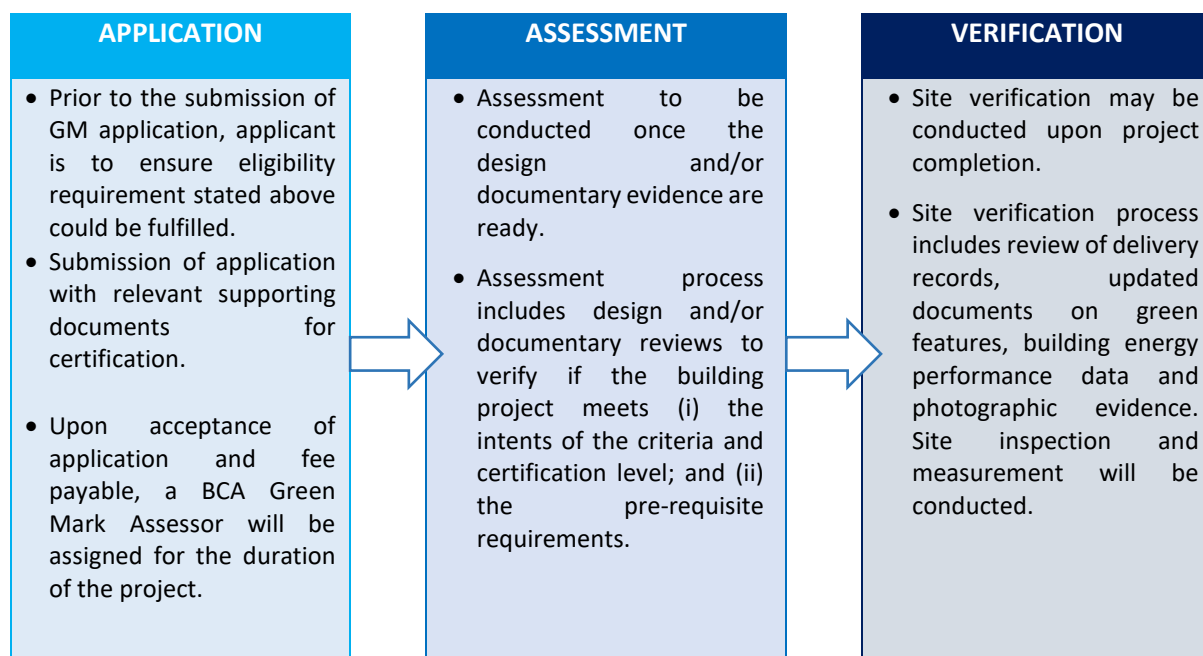
### Eligibility

GM: 2021 is for newly designed and existing buildings either undergoing retrofitting (including major change to the cooling system) or that have not been previously certified. Most of the building types are eligible for assessment, including office towers, retail buildings and hotels. However, GM: 2021 does not apply to office interiors, retail interiors or other interior fit out projects.

Except for GM: 2021 In-operation certification, it is a mandatory requirement for building projects to meet the Building Control (Environmental Sustainability) Regulations 2008 or Building Control (Environmental Sustainability) Regulations 2013 before Green Mark certification could be conferred.

### Submission for Certification

The BCA GM: 2021 certification process is as follows:



Detailed information on the certification process is available on the BCA website:

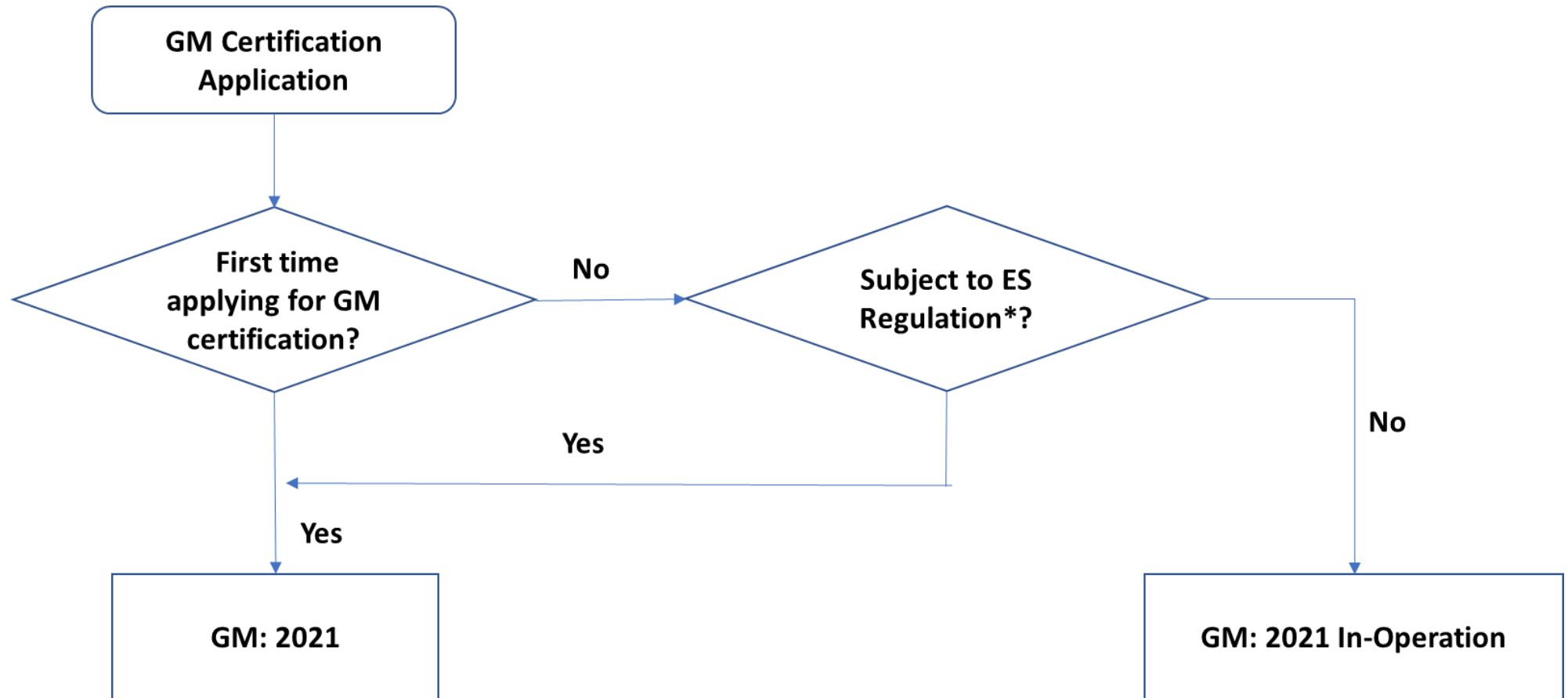
<https://www1.bca.gov.sg/buildsg/sustainability/green-mark-certification-scheme/green-mark-assessment-criteria-and-online-application>

GM assessment will be carried out by BCA's appointed assessors. To be awarded with Green Mark certification, all documents submitted for the BCA GM assessment should be duly verified and signed by responsible person(s) stipulated in Table 1 and appropriate practitioners where applicable. The necessary documents are required to provide the evidence for the performance requirements being met. The project team only needs to provide the relevant information; the full project's documentation is not required for submission for Green Mark certification. The detailed documents required can be found in various technical guides of GM: 2021.

Table 1 Responsible Person (s) for Application Submission

Description	Responsible Persons for Application Submission
GM online submission	<p><b><u>For GM: 2021 Full Certification</u></b></p> <p>SGBC accredited GMAP or GMAAP*, Registered Architect or Professional Engineer</p> <p><b><u>For GM: 2021 In-Operation:</u></b></p> <p>Either Registered Energy Auditors or SGBC's accredited GMAP/GMAAP*</p> <p><i>* Includes GM AP(FM) and GM AAP(FM)</i></p>
Energy Modelling	<p><b><u>Assessment Stage</u></b></p> <p>PE (Mech), PE(Electrical) <u>and</u> accredited GMAAP for co-endorsement on Energy Modelling (EM) form</p> <p><b><u>Verification Stage</u></b></p> <p>SGBC's accredited Green Mark AAP for endorsement on EM form</p> <p>Revised Energy Modelling Guide available <a href="#">here</a></p>
Computational Fluid Dynamics (CFD)	<p>SGBC's accredited Green Mark AAP for endorsement on CFD report</p> <p>Revised CFD Guide available <a href="#">here</a></p>
Energy audit or OSE report	PE (Mech) Or Registered Energy Auditor

## GREEN MARK: 2021 APPLICATION PROCESS



\*Projects subject to [Environmental Sustainability Regulations](#), including projects with major change of cooling system or major retrofit would be subject to GM: 2021 certification. Projects which are not subject to ES regulations, AND have been previously held a Green Mark certificate can use GM 2021 In-Operation

## GREEN MARK 2021 ASSESSMENT FRAMEWORK

The GM: 2021 certification framework covers:

- (1) **New developments**, at the design and completion (as built) stage
- (2) **Existing buildings in operation**, with no previous Green Mark certification
- (3) **Existing buildings with major retrofit** <sup>2</sup>

GM: 2021 In Operations would apply for:

- Existing buildings in operation that have previously held Green Mark certification, and with no major energy use change.
- Projects seeking Green Mark Re-certification

GM: 2021 In-Operation is a simplified version of GM: 2021 for projects that have previously been assessed and fully certified under Green Mark that have demonstrated their holistic environmental performance. GM: 2021 In Operation tracks the key performance indicators, based on actual operational data to ensure the building is performing in its operation to the same GM 2021 standard.

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<sup>2</sup> Major retrofit refers to 'major energy use change' as defined under Part IIIB of the Building Control Act 2012 and Building Control (Environmental Sustainability Measures for Existing Buildings) Regulations. These include the installation or replacement of air conditioning systems. For definition of major energy use change or major retrofit, please refer to the latest Environmental Sustainability regulatory requirement in BCA's website <https://go.gov.sg/regulations>

## GREEN MARK 2021 RATINGS

GM: 2021 is positioned to recognise performance that is above mandatory, regulated standards, that include robust levels of energy efficiency, indoor air quality, greenery provision, active mobility considerations, materials and waste management and water efficiency. Annex 1 provides a brief overview of some of the key mandatory standards.

		Green Mark Gold <sup>PLUS</sup> / Platinum	Green Mark Gold <sup>PLUS</sup> /Platinum + SLE
		Sustainability Sections	Sustainability Sections
Mandatory Sustainability Requirements <sup>[1]</sup>	Green Mark SLE	Energy Efficiency 50-60%	Energy Efficiency >60%
Energy Efficiency 40-50%	Energy Efficiency >60%		
Indoor Air Quality	Indoor Air Quality	Indoor Air Quality	Indoor Air Quality
Greenery Provision	Greenery Provision	Greenery Provision	Greenery Provision
Active Mobility	Active Mobility	Active Mobility	Active Mobility
Materials and Waste	Materials and Waste	Materials and Waste	Materials and Waste
Water Efficiency	Water Efficiency	Water Efficiency	Water Efficiency
High levels of holistic performance responding to climate change	Top tier energy efficiency built on high environmental performance foundation <sup>[1]</sup>	Addressing climate change with best in class holistic environmental performance	The peak of green building performance.

[1] Mandatory requirements are based on development control and building plan provisions for new buildings, for existing buildings under retrofit, the requirements would vary depending on the type and extent of the works being undertaken.

### Green Mark Certification

Project teams can choose either to follow the Green Mark Gold<sup>PLUS</sup> or Platinum certification, or Green Mark SLE certification.

GM Series	GM SLE Series
-	SLE, ZE, PE
Gold <sup>PLUS</sup>	Gold <sup>PLUS</sup> SLE
Platinum	Platinum SLE

For Green Mark In-Operation there is a Green Mark Gold level of certification, to encourage projects certified under our legacy Green Mark certification tools to continue to demonstrate their high levels of environmental performance.

### The GM: 2021 Badges

Where projects achieve at least 10 GM points in a sustainability section, the BCA GM: 2021 Certificate would have a special mention of the achievement via a 'badge' being awarded. The project team may use a combination of, or individually the associated logo or graphic along with the BCA Green Mark Logo and level of award in their marketing collaterals and materials related to the certified building, showcasing their exemplary performance in an area of sustainability.



	Energy Savings					Intelligence	Health & Well-being	Whole Life Carbon	Maintainability	Resilience
		>50%	≥55%	≥60%	ZE	<ul style="list-style-type: none"><li>15 points for each sustainability section</li><li>≥10 points in a section to qualify for a badge for exemplary performance</li></ul>				
A. Full GM: 2021 certification										
SLE (incl. ZE, PE)				✓	✓	N/A				
Platinum SLE (incl. ZE, PE)				✓	✓	40 points				
Gold <sup>PLUS</sup> SLE (incl. ZE, PE)				✓	✓	30 points				
Platinum			✓			40 points				
Gold <sup>PLUS</sup>		✓				30 points				
B. GM: 2021 In- Operation										
	Energy Saving					Intelligence	Health & Well-being	Whole Life Carbon	Maintainability	Resilience
	≥40%	≥50%	≥55%	≥60%	ZE	Option to be assessed to qualify specific badges to demonstrate exemplary performance in operation				
SLE (incl. ZE, PE)				✓	✓	N/A				
[Platinum/ Gold <sup>PLUS</sup> ] SLE (incl. ZE, PE)				✓	✓	<ul style="list-style-type: none"><li>Water consumption</li><li>Energy and Water Improvement Plan</li><li>Cooling Towers Cycles of Concentration</li><li>Indoor environmental Quality (IAQ Audit, CO2 Controls, Luminance and Noise Level)</li><li>Occupancy Evaluation</li><li>Waste audits</li><li>Tenants/ Occupancy enqagement</li></ul>				
Platinum			✓							
Gold <sup>PLUS</sup>		✓								
Gold	✓									

**Notes:**

- Off-site REC procurement is only applicable for projects meeting energy saving ≥60%. REC's must be generated in Singapore through renewables deployed within Singapore.
- GM: 2021 includes other sustainable requirement regulated by other agencies including BCA's Building Control (Environmental Sustainability) Regulations 2008 and Building Control (Environmental Sustainability Measures for Existing Buildings) Regulation 2013. Meeting these regulated requirements would have deemed meeting at least 50 GM points. Refer to Annex 1.
- Building projects that are subject to the Government Land sales, it is a mandatory requirement to also meet the Building Control (Environmental Sustainability) Regulations 2008 before Green Mark certification could be conferred.
- Gold rating is only applicable to projects applying for GM: 2021 In Operation

# GREEN MARK: 2021 CERTIFICATION CRITERIA

## Energy Efficiency (Operational Carbon)<sup>3</sup>

Energy efficiency (Operational Carbon) is required in the following:

1. New non-residential development
2. New residential development
3. Existing non-residential development

There are three pathways leading to greater energy efficiency, with each pathway describing the requirements to achieve an energy efficiency of 50%, 55% and 60% (SLE standard)<sup>4</sup>.

### Energy Efficiency Pathways

Energy Efficiency is the only prerequisite in GM: 2021, aimed at ensuring projects reduce their operational carbon and associated operating costs from the reduction in energy consumption.

The three pathways are designed to facilitate different types of buildings in fulfilling their respective energy efficiency requirements:

The Green Mark Energy Pathways are:

- Data driven and flexible – aligned to real project performance with validated data. Flexible routes for projects to demonstrate their performance.
- Outcome based – full recognition of passive design strategies and renewable energy systems contribution to energy savings.
- Supportive of innovation, encourage the use of new technologies, approaches and solutions to energy performance.

#### Pathway 1 – EUI

Total Building annual energy consumption over the gross floor area of the building (kWh/m<sup>2</sup>/yr). Based on:

- Energy modelling (Design)
- Energy Calculation and measured data (Retrofit)
- Measurement – In operation

#### Pathway 2 – Fixed Metrics

A prescriptive pathway where projects must demonstrate high levels of performance in each of the key building energy systems.

- Key performance metrics (ingredients) that make an energy efficient project. All aspects must be met individually.
- Any shortfall in performance can be made up with the use of onsite renewables, subject to the building typology multiplication factor.

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<sup>3</sup> Based on 2005 levels, this translates to 30%, 35% and 40% EE improvement over current codes at the time of writing (Q1 2021)

<sup>4</sup> Operational Carbon is a term to describe the amount of carbon emissions associated with energy used to operate the building or in the operation of infrastructure (World Green Building Council)

### Pathway 3 – Energy Savings

- Demonstrated energy savings following the Green Mark Energy Modelling guideline which looks at holistic energy performance against a reference model. Refer to *Energy Modelling Guideline* for details on how to complete the energy modelling simulation

All projects are required to comply with one of the energy efficiency pathways to demonstrate their energy efficiency levels.

Refer to the [\*Energy Efficiency Section Document\*](#) for details on the requirement for each pathway.

Refer to BCA's SLEB Smart Hub ([www.sleb.sg](http://www.sleb.sg)) for details on innovative EE solutions and services.

Off-site renewable energy, including those from purchased Renewable Energy Credits (REC), are applicable for projects going for Zero Energy Buildings (ZE). The REC's must be generated in Singapore through renewable energy generated within Singapore, in accordance with SS 673: 2021 Singapore Standard Code of practice for renewable energy certificates. The length of time of REC commitment is minimally three years with commitment of re-certification.

Table 2 shows the applicability for the three pathways.

**Table 2 – Energy Efficiency (EE) Pathway Applicability**

Building Type	PATHWAY 1 EUI	PATHWAY 2 Fixed Metrics	PATHWAY 3 Energy Savings
Commercial			
Office Buildings	•	•	•
Hotels	•	•	•
Retail Buildings	•	•	•
Educational			
IHL (University, Polytechnics and ITE)	•	•	•
Private Schools and Colleges	•	•	•
Junior Colleges (MOE)	•	•	•
Secondary Schools (MOE)	•	•	•
Primary Schools (MOE)	•	•	•
Healthcare			
Hospitals (Private and General)	•	•	•
Community Hospitals	•	•	•
Polyclinics	•	•	•
Nursing Homes/ Youth Homes	•	•	•
Other Non-Residential			
Mixed Developments	<i>by GFA mix</i>		
Community Centres	•	•	•
Civic Buildings	•	•	•
Cultural Institutions	•	•	•
Sports and Recreation Centres	•	•	•
Religious/ Places of Worship		•	•
Industrial			
High Tech Industrial Buildings		•	•
Light Industrial Buildings		•	•
Warehouses, Workshops and Others		•	•
Residential			
Non-Landed Residential (HDB, EC, condominiums, private apartments)		•	
Cluster Housing		•	
Landed Housing		•	
ALL OTHER BUILDING TYPES		Bespoke	•

EC – Executive Condominium

GFA – Gross Floor Area

HDB – Housing and Development Board

IHL – Institute of Higher Learning

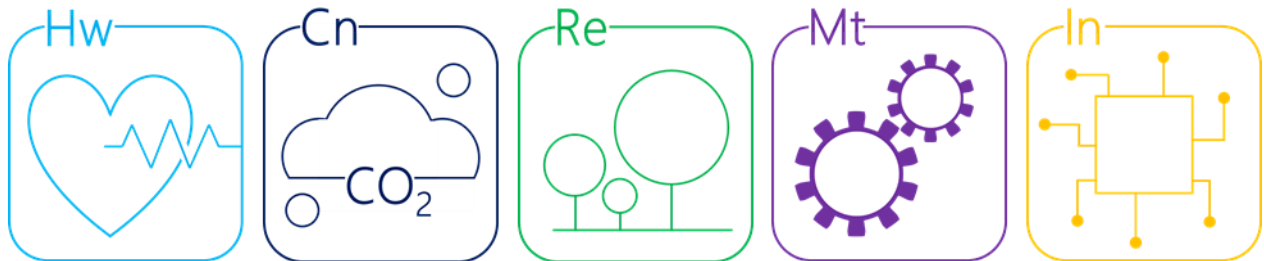
ITE – Institute of Technical Education

MOE – Ministry of Education



## Sustainability Sections

There are five environmental sustainability sections under GM: 2021 Framework. These sections are developed with various industry stakeholders and fulfil the relevant UN Global Goals for SDGs. There are 15 points available in each section – a project scoring 10 points and above from each section qualifies to get a badge which represents their exceptional performance in that area.

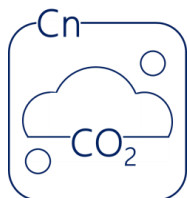


### Health and Well-being (Hw)



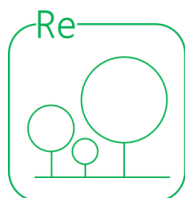
[The Health and Well-being section](#) will score buildings on how they are designed, retrofitted, constructed, and operated to facilitate the mental, physical, and social well-being of their occupants. This section has been developed jointly with the Ministry of Health Office for Healthcare Transformation (MOHT) and Centre for Liveable Cities (CLC).

### Whole Life Carbon (Cn)



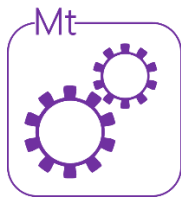
[The Whole Life Carbon section](#) will score buildings on their Whole Life Carbon performance based on international calculation methodologies, upfront (embodied) carbon (i.e., carbon footprint of the construction materials), use of sustainable construction methods, and the sustainable fitting-out of buildings. The section will also evaluate the plans, and delivery of those plans to transition the building towards zero carbon emissions.

### Resilience (Re)



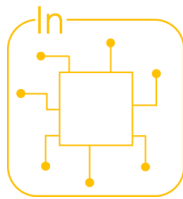
[The Resilience section](#) will evaluate buildings on their resilience and adaptation to climate change as well as the use of nature-based or natural climate solutions with actions to protect, sustainably manage, and restore natural or modified ecosystems.

## Maintainability (Mt)



[The Maintainability section](#) will score buildings on their Design for Maintainability (DfM), which refers to designing buildings for their safe and effective maintenance to optimise lifecycle performance of the asset. This section uses the Maintainability Framework (the DfM evaluation tool) and translates this into Green Mark points.

## Intelligence (In)



[The Intelligence section](#) will score buildings on the adoption of relevant smart technologies and systems, and data management environments within the building design, construction, retrofit and operation of the building, that enable fully integrated, automated, intelligent, and responsive buildings.



## BCA GREEN MARK LOGO and ENQUIRIES




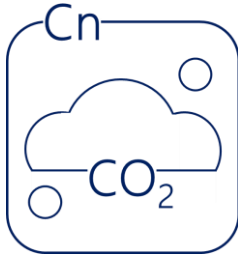
### The Green Mark Logo


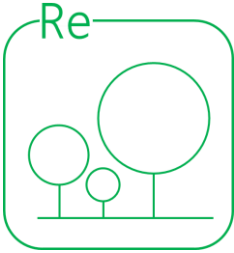

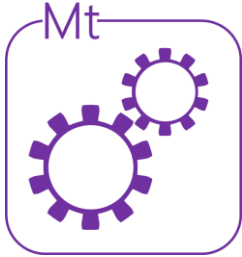

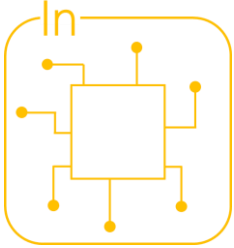


For enquires on the use of the Green Mark logo, go to: <https://www1.bca.gov.sg/docs/default-source/docs-corp-buildsg/sustainability/guidelines-for-usage-of-bca-green-mark-logo.pdf>

### The GM: 2021 BADGES





Where projects achieve a badge for exceptional performance in a sustainability section or sections, the project team may use a combination of, or individually the associated logo or graphic along with the BCA Green Mark Logo and level of award in their marketing collaterals and materials related to the certified building.

Section & Description of Use	Logo	Icon
Health and Wellbeing	<p>GREEN MARK 2021</p>  <p>Health &amp; Wellbeing</p>	
Whole Life Carbon	<p>GREEN MARK 2021</p>  <p>Whole Life Carbon</p>	

Resilience	<p>GREEN MARK 2021</p>  <p>Resilience</p>	
Maintainability	<p>GREEN MARK 2021</p>  <p>Maintainability</p>	
Intelligence	<p>GREEN MARK 2021</p>  <p>Intelligence</p>	



For Energy Performance Use along with the range of energy savings such as 50% or 55%, SLE, ZE or PE

Logo			Icon
<p>GREEN MARK 2021</p>  <p>Super Low Energy</p>	<p>GREEN MARK 2021</p>  <p>Zero Energy</p>	<p>GREEN MARK 2021</p>  <p>Positive Energy</p>	

A branding guide shall be developed to assist in the use of the BCA Green Mark Logo and Green Mark badges.

### Frequently Asked Questions (FAQ)

The FAQ section on the BCA website provide clear submission guidelines and additional technical assistance to project teams.

[https://www1-bca.gov.sg/admin.cwp.sg/docs/default-source/docs-corp-buildsg/sustainability/20211027\\_gm2021-faqs.pdf](https://www1-bca.gov.sg/admin.cwp.sg/docs/default-source/docs-corp-buildsg/sustainability/20211027_gm2021-faqs.pdf)

### Green Mark Training Courses

The BCA Academy also provides training courses to provide the necessary knowledge required in Green Mark assessment.

SGBC-certify Green Mark professionals such as GMAPs and GMAAPs to support Green Mark assessment. To be a certified GMAP/GMAAP, please refer to SGBC website <https://gmap.sgbc.online/public/about>

For information on Green Mark courses, visit the BCA Academy: <https://www.bcaa.edu.sg/>

### Feedback on GM: 2021

Please email [benjamin\\_towell@bca.gov.sg](mailto:benjamin_towell@bca.gov.sg) or [tracy\\_liu@bca.gov.sg](mailto:tracy_liu@bca.gov.sg) for any enquiries, comments or feedback on Green Mark 2021.

## ACKNOWLEDGEMENTS

The development of Green Mark 2021 (GM: 2021) is a result of an extensive industry collaboration across the built environment value chain. The Building and Construction Authority of Singapore would like to extend our sincerest gratitude to all internal and external stakeholders for their invaluable support and contribution towards the development of GM: 2021 that will enable us to develop a sustainable environment for our current and future generations to come. In particular, we would like to thank the co-leads and members of the following taskforces of the Singapore Green Building Masterplan review committee.

### Taskforce 1 Pushing Boundaries Towards Net Zero Energy members

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Dr. Gao Chun Ping (BCA)	Co-lead
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Mr. Daniel Lau (JTC)	
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Ms. Irene Yong GMAAP (Beca)	
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Ms. Gillian Oh (NEA)	
Mr. Beh Lean Hooi GMAP (CapitaLand)	
Ms. Lee Zhenyi GMAAP (C&W Services)	
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Mr. Kenny Lee (NUS)	
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### Secretariat and support

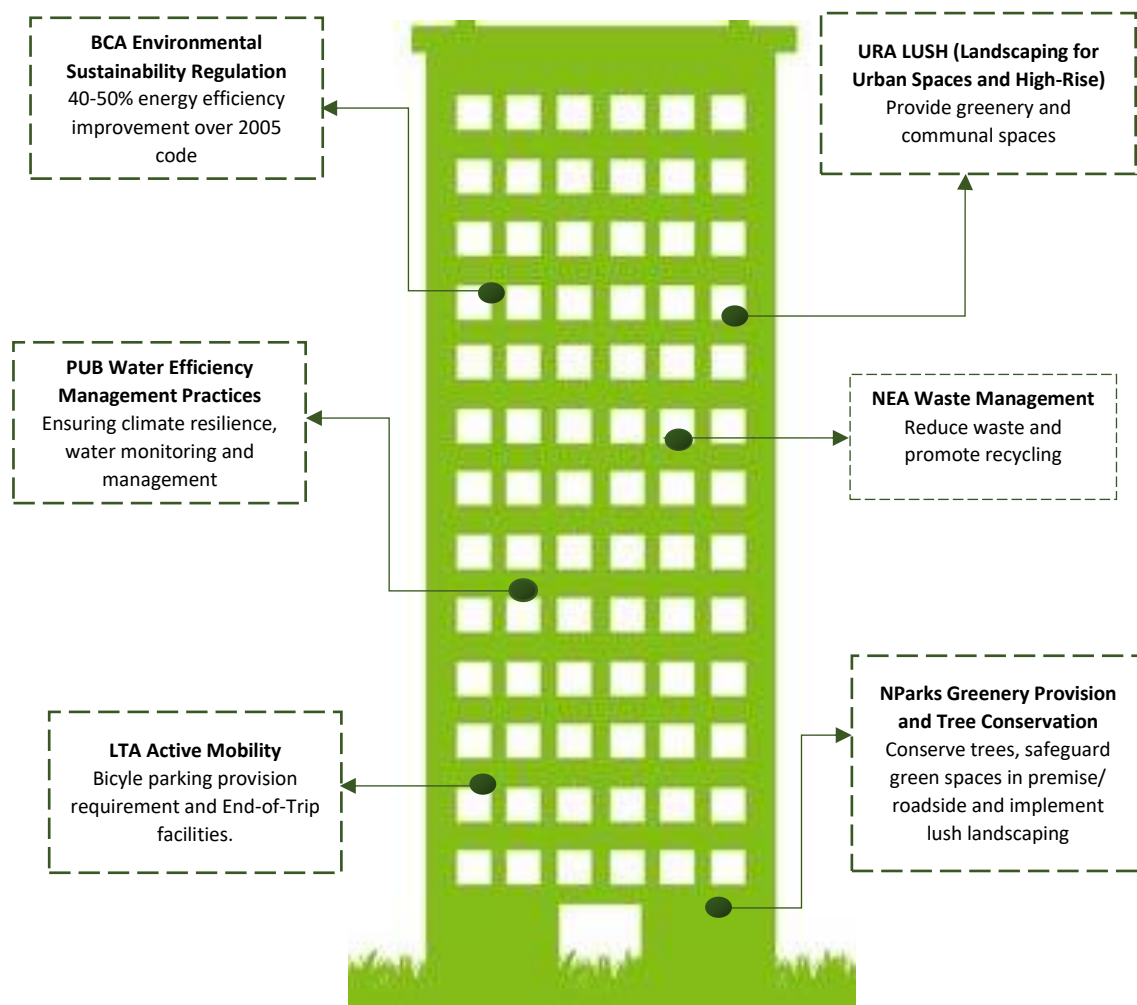
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Mr. Tan Yu Xuan (BCA)

## ANNEX 1: KEY REGULATORY ENVIRONMENTAL STANDARDS

### Minimum Green Requirements Governing Buildings

#### Regulatory green standards from other agencies form the base for a holistic green building

All Green Mark buildings shall comply with the minimum regulatory requirements stipulated by government agencies. These requirements form the base for a holistic green building and ensure that all sustainability angles are achieved. These include energy and water conservation, climate resilience, greenery provision and tree conservation, waste management and mobility.



## BCA Environmental Sustainability Measures for New and Existing Buildings



Under the BCA Environmental Sustainability Measures, a building shall be designed and constructed with energy performance that meets minimum energy performance improvement of 50% and 40% for new and existing buildings respectively, over the 2005 baseline. This will be done via a performance-based approach including energy modelling and energy audit methodology or a prescriptive approach through meeting energy performance standards of key building systems.

Key building systems include:

- 1) air-conditioning system
- 2) lighting system
- 3) mechanical ventilation system
- 4) vertical transportation system
- 5) envelope and roof
- 6) air tightness and leakage

In addition, a building shall be designed with three other environmental sustainability features in relation to energy and other carbon emission reduction measures. The environmental sustainability features for new developments are classified in the following three sections:

- 1) Sustainable design strategies – optimise the use of passive design strategies in response to local climate and site conditions to improve indoor environmental quality while minimising energy use
- 2) Sustainable construction – promotes the adoption of sustainable practices, material procurement and design which inculcate responsible use and conservation of resources during construction and building operation.
- 3) Sustainable technologies – encourages the provision of green building technologies that are oriented towards establishing low energy building consumption and smart control systems that could adapt to the users' needs and enhance building energy performance.

The environmental sustainability features for existing buildings with major change in energy use are classified in the following three sections:

- 1) Sustainable features – encourages incorporation of cost-effective green features and passive strategies when a building is upgraded so as to minimise the overall building energy consumption and to improve on indoor thermal comfort.
- 2) Sustainable operation and management – facilitate smart monitoring and integration of sustainability management practices to maximise operational efficiency and carbon reduction opportunities.
- 3) Sustainable technologies - encourage the provision of green building technologies that are oriented towards establishing low energy building consumption and smart control systems that could adapt to the users' needs and enhance building energy performance.

## URA – LUSH (Landscaping for Urban Spaces and High-Rise)

LUSH is a comprehensive urban and skyrise greening programme comprising both landscape replacement area (LRA) requirements and incentives to provide greenery and communal spaces.

The LRA requirements are calibrated by location, Gross Plot Ratio (GPR) and development type. A development may include Sky Terraces, Communal Planter Boxes and Covered Communal Ground Gardens amongst other features, towards meeting the LRA requirement.

### LRA Requirements for Developments in Strategic Areas

Location	Developments in Strategic Areas	Developments in Strategic Areas Outside Central Area, with Height Control $\leq 80\text{m}^1$
LRA (as a % of Site Area)	100%	70%
Minimum softscape requirement (as a % of Site Area)	40%	40%
Minimum GnPR requirement (Total Leaf Area/Site Area)	4.0	4.0

<sup>1</sup> Building height is based on Singapore Height Datum (SHD).

The **Strategic Areas** are as follows:

- Within Central Area: Downtown Core (part), Straits View (part), Marina South, and Orchard (part) Planning Areas, as well as 2 mixed-use parcels along Orchard Boulevard in Paterson Hill Subzone (see Plan 1-1);
- Outside of Central Area: Regional Centres and Growth Areas including the Jurong Lake District, Kallang Riverside, Woodlands Regional Centre, Punggol Creative Cluster, Tampines Regional Centre and Paya Lebar Central as well as commercial and commercial/residential developments within Town Centres (see Plans 1-2 to 1-26).

### LRA Requirements for Developments Outside Strategic Areas

LRA Requirements	GPR $\leq 1.4$	1.4 < GPR < 2.8	GPR $\geq 2.8$
Overall Greenery Provision (as % of Site Area)	30	35	40
Green Plot Ratio (Total Leaf Area/Site Area)	3	3.5	4

## **NParks – Greenery Provision and Tree Conservation for Developments**

To achieve the vision of a City in Nature, National Parks Board (NParks) works closely with developers, building owners, Qualified Persons (QPs), professionals and other public agencies. The handbook '*Greenery Provision and Tree Conservation For Developments*' seeks to provide a guide on the statutory and technical requirement for conserving trees, safeguarding green spaces within premises and roadside and implementing lush landscaping as part of development projects.

## **LTA – Bicycle Parking Provision Requirement and End-of-Trip Facilities**

LTA and URA aim to promote cycling as a mode of transport, to enhance liveability and support the 'car-lite' vision for Singapore. It is important for developments to provide sufficient and well-maintained bicycle parking spaces in order to facilitate more people to take up cycling as a commuting mode.

LTA introduced a new bicycle parking provision standard for all new development and buildings undergoing redevelopment or reconstruction. This mandatory requirement took effect from 8 May 2018 for any new application for new development, redevelopment and reconstruction works to URA. Mandatory bicycle parking requirements will be based on development type.

## **NEA – Waste Management**

### Mandatory Reporting of Waste Data

The environmental Public Health Act (EPHA) was amended on 1 April 2014 to enable the mandatory reporting of waste data and submission of waste reduction plans by any owner, occupier or lessee of a workplace, upon their receipt of a written notice. Currently the commercial premises that are served a notice include hotels with more than 200 rooms and shopping malls with more than 4,600 square metres of Net Lettable Area.

From 2020, factories with more than 20,000 square metres of Gross Floor Area (GFA), warehouses with more than 50,000 square metres of GFA, and convention/ exhibition centres with more than 8,000 square metres of GFA, will also be included.

### Provision of Recycling Bins and Recycling Collection Services

Under the National Recycling Programme launched in April 2001, the public waste collectors (PWCs) licensed by NEA are required to provide recycling bins and recycling collection services to all HDB estates, private landed properties and condominiums/ private apartments opted into the public waste collection scheme.

### Mandatory Segregation of Food Waste

From 2024 onwards, the Ministry of the Environment and Water Resources (MEWR) and the National Environment Agency (NEA) will make it mandatory for the owners and operators of commercial and industrial premises, where large amount of food waste are generated, to segregate their food waste for treatment.

### Dual Waste Chute and Pneumatic Waste Conveyance System

All new non-landed private residential development with more than four storeys will have two waste chutes – one for recyclables and the other for general waste (rubbish) that will be incinerated. In addition, development with at least 500 housing units must have a pneumatic waste conveyance system, which will transport waste from rubbish chutes to a central collection area via a network of pipes.

### Extended producer responsibility (EPR) system for e-waste management

NEA has introduced a regulated e-waste management that will ensure the proper collection and handling of e-waste and the extraction of valuable resources from e-waste. The regulated e-waste management system will be based on the Extended Producer Responsibility (EPR) approach, where producers bear the

responsibility for the collection and treatment of their products when they reach end-of-life. This EPR system will be implemented through the Resource Sustainability Act (RSA), administered by the NEA.

#### Mandatory packaging reporting

Under the mandatory packaging reporting (MPR) framework, producers of packaged products such as brand owners, manufacturers and importers, as well as retailers such as supermarkets, will be required to submit packaging data and 3R (reduce, re-use, recycle) plans to the NEA. Companies will have to provide information on the packaging placed on the Singapore market, broken down according to type of packaging material (e.g., plastic, paper, metal, glass), packaging form (e.g., carrier bags, bottles) and the corresponding weights.

### **PUB – Water Efficiency**

#### Water Efficiency Management Practices

Under the Water Efficiency Management Practices, it is mandatory for large water users with net water consumption of at least 60,000 cubic metres in the previous year to:

- 1) install private water meters at key water usage areas within their premises
- 2) appoint at least one water efficiency manager (WEM)
- 3) submit their water efficiency management plan (WEMP)

#### Mandatory WELS

With effect from 1 Apr 2019, all taps and mixers (basin, sink, bib and shower), dual-flush low-capacity flushing cisterns and urinal flush valves/ waterless urinals allowed for sale and supply in Singapore shall be of minimum 2-ticks or more rating under the MWELS. 1-tick water fittings are no longer allowed for sale and supply in Singapore from 1 Apr 2019 onwards.

#### Minimum Platform Level

The Minimum Platform Level (MPL) of a development site is the minimum ground level of the proposed development which is necessary for flood protection. Developments that do not comply with the MPL requirements will be subject to higher flood risks. Raising ground levels is the most effective way to protect new developments from flood risks as there be no risk of mechanical failure. The MPL of a development site can be found in the Code of Practice (COP) on Surface Water Drainage.