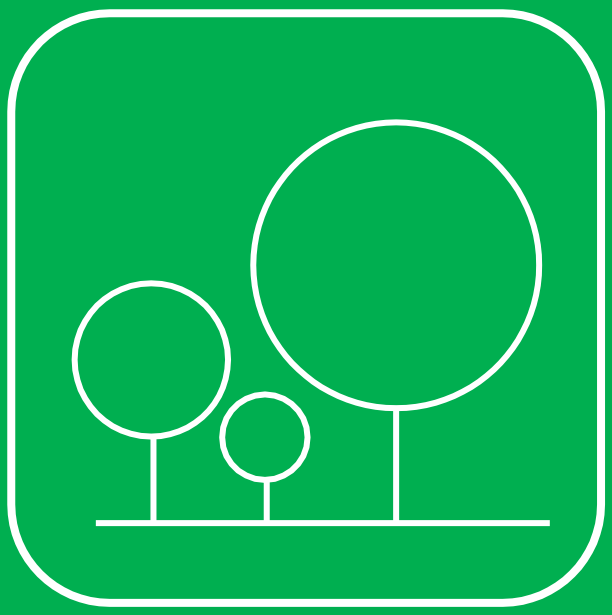


Green Mark 2021

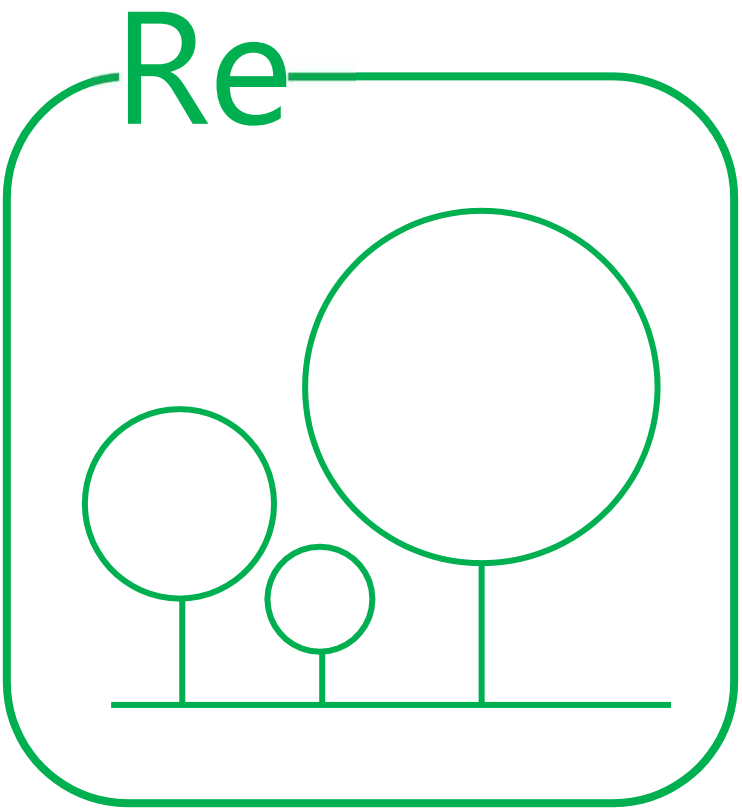
Re

Resilience

The GM: 2021 Resilience (Re) section evaluates buildings on their climate mitigation and adaptation strategies and encourages the use of nature-based solutions and a greater approach to circularity. It focuses on the protection of place, people and habitat, management of resources and climate risks aligned with the recommendations of the Taskforce for Climate Related Financial Disclosures (TCFD), and the restoration of ecology and implementation of natural climate solutions.

The Resilience section has been created leveraging on the leading urban studies, including the work and recommendations of the Urban Heat Island Mitigation Workgroup, which is mapping the national strategies for reducing urban heat island and improving outdoor thermal comfort.

Projects that are certified under the Living Future Institute Living Building Challenge will receive recognition under the Green Mark 2021 Re section. Refer to Table RE 0.1 Living Future Institutes Certification for the details.



Helps projects meet targets under the following UN SDGs

Revision	Description	Effective Date
R0	Launch for Pilot	22 April 2021
R1	1st Edition	1 November 2021
R2	2nd Edition with minor updates	1 January 2024

RESILIENCE		
RE1 Protect	**Green Mark Points**	
RE 1.1 Conservation	**New**	**Existing**
RE1.1a Habitat and Ecology		
(i) A comprehensive EIA to identify the anticipated effects on the environment a proposed development or project may have. The EIA shall identify design measures to mitigate negative impacts to the site's environment with a focus on climate change and ecological systems. It should describe how the project can contribute positively to the overall ecology and biodiversity of the site and its wider context.	1 Point	1 Point
(ii) Implementation plan that outlines key actions that need to be undertaken to maintain the ecological integrity of biodiversity on the site, whether this is existing biodiversity or created as a part of the development works.	1 Point	1 Point
RE1.1b Resources		**(Cap at 3 Points)**
(i) Asset Sustainable Policy and Action Plan shall include:	N/A	
a) Energy Management Policy and Energy Improvement Plan		1 Point
b) Water Management Policy and Water Improvement Plan		1 Point
c) Waste Management Policy and 3R Plan		1 Point
(ii) Water Efficiency		
a) PUB Water Efficient Building (Basic) certification	N/A	0.5 Point OR
b) PUB WELS "3-ticks" rating for 90% of all relevant water fittings	1 Point	1 Point

RE1.2 Urban Heat Island Mitigation	New	Existing
RE1.2a Outdoor Thermal Comfort To conduct environmental modelling of the site to demonstrate that outdoor thermal comfort is maintained or improved and UHI effect minimized or reduced. Developments should identify and implement suitable interventions to mitigate the urban heat island (UHI) effect through massing, material selection, the landscape, (hardscape, softscape) and building surfaces. The model should be conducted using simulations over the site area, based 12pm (noon) readings for a typical day in April and October. Model shall show **one** of the following: • Physiological Equivalent Temperature (PET) of ≤34°C • Universal Thermal Climate Index (UTCI) of ≤32°C • TSV <+2	2 Points	2 Points
RE1.2b Urban Heat Island Mitigation Adoption of UHI mitigation measures such as: • Green and blue spaces for landscaping and roof • Roofing materials or coatings or cool paints with high Solar Reflectance Index (SRI) > 40 • Unshaded hardscape areas with SRI > 39, inclusive of unshaded carparks, internal roads, plazas, and pedestrian walkways • Use of permeable paving strategies such as gravel or open paving systems. • Other performance-based strategies that demonstrate URH effect mitigation. The site plan shall be used to calculate the site coverage, at plan view, of mitigation measures adopted.	1 Point 0.5 point for ≥ 50% site coverage, 1 point for ≥ 80% site coverage	1 Point 0.5 point for ≥ 50% site coverage, 1 point for ≥ 80% site coverage
RE1.3 Contextual Response	**New**	**Existing**
To demonstrate how the site topography, microclimate, access and connectivity has informed the design of the urban form and site layout. A site analysis should be conducted to identify the relationships between human and physical geography of the site and inform how the building responds to these factors. Details should include the response to the urban grain, site connectivity and access, provisions and locations of amenities, and opportunities for green corridors. A series of simulations and studies of the project should also be undertaken that look at the microclimate and the response of the urban form generated, including, shading analysis, wind analysis and solar insolation studies.	2 Points	N/A
RE1 Protect	**5 Points total**	

<table>
<tr><th colspan="3">RESILIENCE</th></tr>
<tr><th>RE2 Manage</th><th colspan="2">Green Mark Points</th></tr>
<tr><th>RE2.1 Leadership</th><th>New</th><th>Existing</th></tr>
<tr><td>RE2.1a Project Team

The appointment of environmental specialists at building design, construction, operation and retrofit stages to drive and coordinate the environmental design approach.

(i) Accredited professionals
GM AP / GM AAP
GM AP(FM) / GM AAP(FM) [1]

(ii) Firms certified under Singapore Green Building Services (SGBS)[2] certification scheme and Certified FM Company (CFMC)[3] accreditation scheme

[1]https://gmap.sgbc.online/public/about
[2]https://www.sgbc.sg/sgbc-certifications/sgbs-certification
[3]https://www.sifma.org.sg/accreditation/certified-facilities-management-company-cfmc/</td><td>

0.5 Point
[GM AP = 0.25 Point
GM AAP = 0.5 Point]

0.5 Point
[1 firm = 0.25 Point]</td><td>

1 Point
GM AP(FM) = 0.5 Point
GM AAP(FM) = 1 Point

0.5 Point
[1 firm = 0.25 Point]</td></tr>
<tr><td>RE2.1b Procurement

(i) Sustainable procurement policy including commitment to procuring accredited or labelled green services, utilities, venues, products and systems related to the building operations and business activities.

Includes standing requirements for products (building and operations such paper, cleaning materials etc), services (consultants, catering with non-disposables etc) and business activities such as green vehicle fleets, venues such as procurement of hotels etc. The commitment would depend on what is under the building owners' control (e.g. owner occupied or part of green leasing requirements). Utilities includes green electricity tariffs.

(ii) Energy performance contracting to implement and deliver energy efficiency, renewable energy and/or energy recovery project with an energy performance contract wherein the EPC firm's remuneration is based on demonstrated energy savings or maintained efficiency levels. Contract length to be minimally 3 years.

The external EPC firm may be a company that provide one of more of these services:
• Provision of energy efficient technology and services including financing, design, implementation, and management of projects
• Supply, installation, and commissioning of cooling and/or heat-recovery systems
• Supply, installation and commissioning of CHP or tri-gen power generation
• Supply, installation and commissioning of solar PV or thermal systems
• Solar leasing
• M&E contracting</td><td>

<u>For Non-Residential Buildings</u>
1 Point

<u>For Residential Buildings</u>
0.5 Point for 1st year operation under developer's control.

<u>For Non-Residential Buildings</u>
1 Point

<u>For Residential Buildings</u>
N/A</td><td>

<u>For Non-Residential Buildings</u>
1 Point

<u>For Residential Buildings</u>
1.5 Points for MCST procurement of replacement common area systems, and AGM venues

<u>For Non-Residential Buildings</u>
1 Point

<u>For Residential Buildings</u>
N/A</td></tr>
</table>

RE2.2 Circularity	**New**	**Existing**
Tackling the 3 priority waste streams and adopting a circular economic approach to close resource loops. i. Provision of dedicated recycling facilities and receptacles at convenient and accessible locations for a. **E-waste** in collaboration with the Producer Responsibility Scheme (PRS) Operator**,** and b. **Packaging waste** including used beverage containers ii. **Food waste** systems for proper segregation (as detailed within the food waste segregation requirements under the Resource Sustainability Act), pre-treatment (such as grinding) and on-site treatment, **or** direct conveyance for off-site treatment. iii. Waste audits and engagement a. Annual waste audits to identify areas of wastage, and uncover opportunities to reduce, reuse or recycle waste materials b. Provide waste management/3R training/education for staff/tenants and cleaners at least twice a year.	**(Cap at 1 Point)** 0.5 Point 0.5 Point 0.5 Point 0.5 Point for (iii)	 0.5 Point 0.5 Point 1 Point 1 Point for (iii)
RE2.3 Resilience Strategy	**New**	**Existing**
A comprehensive ***project specific*** climate change risk and adaptation assessment, aligned to principles outlined by the Taskforce for Climate Related Financial Disclosures (TCFD), that: i. Use various climate scenarios and impact on weather, including rainfall, temperature, sea level rise, flooding, drought and public health pandemics, to assess project's climate-related physical and transition risks and opportunities; ii. Conceptualise clear environmental sustainability targets and design approaches early at the onset of the project to be included in project brief to manage identified risks; **or** iii. Develop an action plan that addresses how the building would be resilient to these events, through current or future design interventions. *Reference - The Use of Scenario Analysis in Disclosure of Climate-related Risks and Opportunities - TCFD Knowledge Hub* *https://www.tcfdhub.org/scenario-analysis/*	 2 Points 1 Point N/A	 2 Points N/A 1 Point
RE2 Manage	**5 Points total**	

RESILIENCE		
RE3 Restore	**Green Mark Points**	
RE3.1 Buildings in Nature	**New**	**Existing**
Improving the ecology and quality of the natural environment on site through the incorporation of a well-considered planting strategy. (i) High GnPR (>5 for New Developments, >3 for Existing Buildings) (ii) Diverse range of plant species - of which 50% shall be native to Southeast Asia (iii) Provision of 'Wild landscape areas' (10% of site area) to create habitat pockets on the site	 1 Point 1 Point 1 Point	 1 Point 1 Point 1 Point
RE3.2 Natural Climate Solutions	**New**	**Existing**
Natural Climate Solutions, or Nature Based solutions refer to climate mitigation that harness natural processes to reduce or remove greenhouse gases. They are actions to protect, sustainably manage, and restore natural or modified ecosystems (i) Restoration of ecology equivalent to the GFA of the development through either, or a combination of: a. Reforestation programme b. Marine/ Aquatic ecosystem restoration programme (such as mangrove forests, seagrass beds, salt marshes, coral propagation) With a 10-year commitment to investment and/ or management (ii) Investment, production, or purchase of nature-based credits (including blue carbon and REDD+) equivalent to the estimated carbon impact of the construction/ retrofit **and** normal operation of the development over a 10-year period, certified by a recognised third party	 2 Points 2 Points	 2 Points 2 Points
RE3 Restore	**5 Points total**	

Resilience - INNOVATION		
	Green Mark Points	
	New	Existing
Where projects can demonstrate substantial performance to a specific Resilience indicator or outcome, innovation points can be awarded on a case-by-case basis. Points shall be awarded based on the strength of evidence of benefits and potential impact. <u>Process:</u> **At Design / Pre-retrofit stage:** The project team is to submit a concise summary that articulates: • The nature of the environmental benefit of their intervention • Justify the impact of the intervention through detailed calculations and comparisons with industry norms. • Substantiate the calculations and comparisons with evidence and data. **At In-Operation / Verification stage:** Details of the implemented intervention including measurements and monitoring of the environmental performance, and lessons learnt if the intervention does not perform as expected.	2 Points	2 points

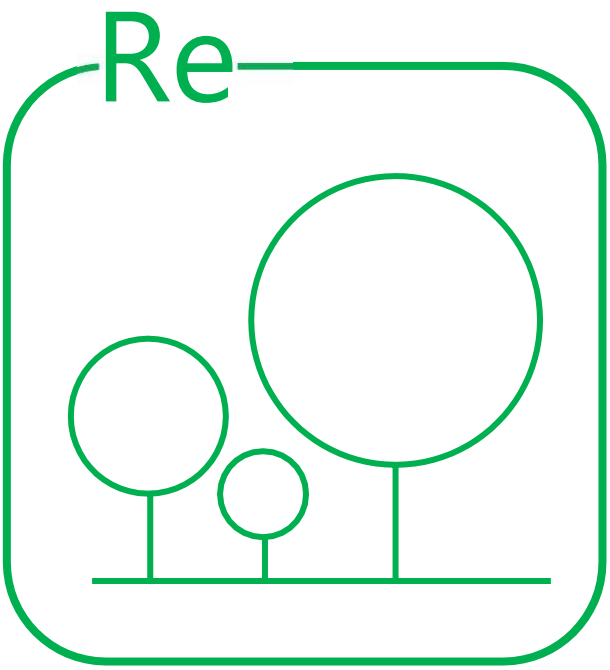


TABLE RE 0.1 Living Future Institute Certifications	
Living Future Institute Certifications	**Green Mark Points**
Core Certification	5 Points
Petal Certification	10 points
Living Certification	15 points

International Living Future Institute Certifications

- *Core Green Building Certification:*
  Core Green Building Certification (Core Certification) is for projects seeking a high aspiration certification that is verified, holistic and readily achievable. Projects must meet the requirements of the ten Core Imperatives – up to two Core Imperatives per Petal – and verify performance for water and energy through a twelve-month performance period.

- Living Building Challenge Certifications:
  The Living Building Challenge is a holistic standard, requiring projects to strive for the ideal across the seven Petals (Place, Water, Energy, Health and Happiness, Materials, Equity and Beauty).

  Petal Certification:
  Petal Certification is for projects that want to do a deep dive into one issue area, or Petal of the Living Building Challenge. This certification requires the achievement of all the Core Imperatives, in addition to all Imperatives in either the Water, Energy, or Materials Petal.

  Living Certification:
  Living Certification is for projects striving for the highest level of sustainability and regenerative design. A project achieves Living Certification by attaining all Imperatives assigned to its Typology.

Refer to https://living-future.org/lbc/ for more information.

Note:

- Projects that have attained Living Future Institute certifications would be accredited the respective Green Mark points in the Resilience section.
- Projects that have attained Living Building Challenge Petal Certification or Living Certification will also be awarded the Resilience badge.
- For projects that have attained the Core Green Building Certification, additional points can be attempted within the Resilience section to achieve the Resilience badge, that are not duplicated in the Core Green Building Certification criteria.

Developed by:

In collaboration with: