

**Nature-based Climate Adaptation Programme  
for the Urban Areas of Penang Island**

**GEORGE TOWN AND BAYAN LEPAS  
URBAN GREENING GRANTS PROGRAMME**

**Terms of Reference**

Developed by

**thinkCITY**

Making Cities Liveable, Together.

With Support from



ADAPTATION FUND

In Collaboration with



UN-HABITAT



MINISTRY OF NATURAL RESOURCES,  
ENVIRONMENT AND CLIMATE CHANGE



JABATAN PENGAIRAN  
DAN SALIRAN MALAYSIA



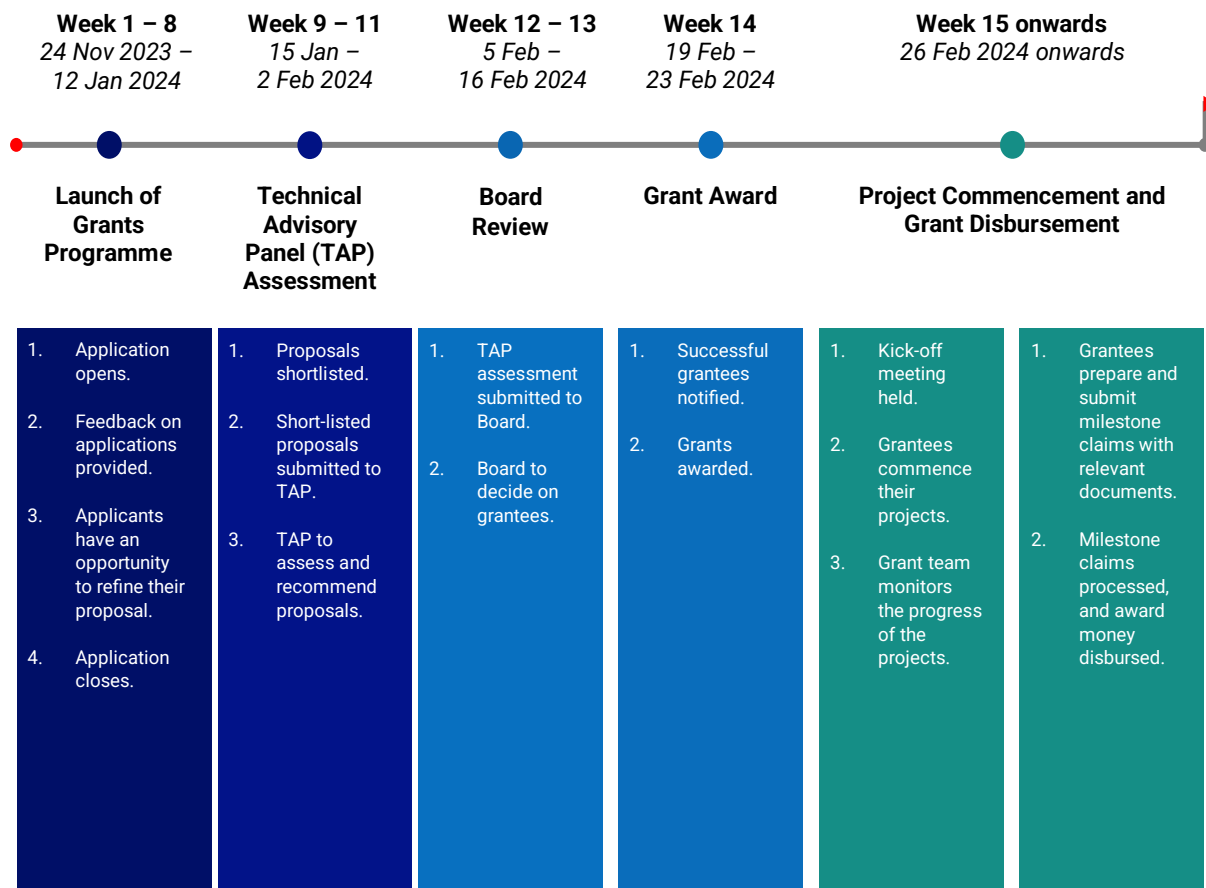
YAYASAN  
HASANAH

A foundation of Khazanah Nasional

## TERMS OF REFERENCE

### GEORGE TOWN AND BAYAN LEPAS URBAN GREENING GRANTS PROGRAMME

#### OVERVIEW



#### **1. What is the Nature-based Climate Adaptation Programme for the Urban Areas of Penang Island?**

In 2019, Think City, in collaboration with the United Nations Human Settlements Programme (UN-Habitat), then-Ministry of Environment and Water (now known as Ministry of Natural Resources, Environment and Climate Change), Penang State Government, City Council of Penang Island, Department of Irrigation and Drainage and Yayasan Hasanah, initiated the first urban climate adaptation programme for Malaysia, the *Nature-based Climate Adaptation Programme for the Urban Areas of Penang Island*, which was subsequently supported by the Adaptation Fund for implementation.

The Nature-based Climate Adaptation Programme is to enhance urban resilience and reduce human and ecosystem health vulnerability to climate change impacts and extreme weather events by implementing nature-based solutions (NbS) to reduce surface temperatures and stormwater runoff, as well as to increase social resilience and build institutional capacity.

## TERMS OF REFERENCE

### GEORGE TOWN AND BAYAN LEPAS URBAN GREENING GRANTS PROGRAMME

George Town and Bayan Lepas, the two urban areas in Penang Island have been selected as the focus areas of the Programme based on a combination of their likely climate change impacts, land use and community vulnerabilities. The goal of the Programme in these two areas is to use NbS to:

- i) Reduce the climate change impacts of increasing temperature and stormwater runoff, including threats to human life, infrastructure and property associated with extreme weather events; and
- ii) Strengthen social resilience and institutional capacity.

The Programme includes a community-focused approach as well as a strong knowledge transfer component to ensure the methodology can be scaled and adopted in the future by other cities in Malaysia and the region.

#### **2. What is the George Town and Bayan Lepas Urban Greening Grants Programme?**

The George Town and Bayan Lepas Urban Greening Grants Programme forms part of the Nature-based Climate Adaptation Programme for the Urban Areas of Penang Island. It seeks to encourage the greening of existing building facades and rooftops to increase the uptake of vertical green structures and green roofs to reduce temperatures on the streets and inside buildings and the Urban Heat Island (UHI) effect. It also seeks to promote urban greening to help build sustainable and resilient practices that are based on the use of nature, such as gardening.

#### **3. What are the objectives of the George Town and Bayan Lepas Urban Greening Grants Programme?**

The Urban Greening Grants Programme will provide successful applicants with funding to introduce green facades or green roofs. Central to the objectives of reducing temperatures and the UHI effect, the Grants Programme aims to achieve the following:

- Demonstrate the effectiveness of vertical and rooftop greenery in reducing air temperature in adjacent spaces and heat gain in buildings whilst improving indoor and outdoor thermal comfort;
- Demonstrate innovative NbS for both existing contemporary and heritage building facades to improve thermal performance;
- Involve and empower communities in implementing strategic vertical and rooftop greening; and
- Increase urban greening in general and biodiversity in particular, promoting nature-related activities such as gardening.

## TERMS OF REFERENCE

### GEORGE TOWN AND BAYAN LEPAS URBAN GREENING GRANTS PROGRAMME

#### **4. What projects are eligible for the George Town and Bayan Lepas Urban Greening Grants Programme and where is the Programme's geographical focus?**

The Grants Programme is seeking projects in George Town and Bayan Lepas (see attached map below) that satisfy all the following criteria:

- The proposed projects shall include retrofitting of existing facades or rooftops to introduce vertical greening or green roofs;
- The proposed project site shall be privately owned buildings located in George Town or Bayan Lepas for commercial, industrial, institutional or other types of use. The buildings shall be physically existing and occupied at the time of application;
- For vertical greenery, the facade to be retrofitted shall be on ground and/or elevated level, fronting public street or space with tangible/measurable benefit for all;
- For green roofs, the design shall be low maintenance, lightweight systems;
- The proposed projects shall comply with relevant building control requirements set out by the City Council of Penang Island, i.e., application for additions of building elevation/repair/restore permit for listed heritage buildings in George Town World Heritage Site;
- The proposed projects shall not involve any Category I listed building\*; and
- The proposed projects have not commenced prior to the date of grant notification.

*\*Category I listed buildings are (a) buildings, monuments, objects and sites of exceptional interest, (b) buildings and monuments declared as ancient and gazetted formerly under the Antiquities Act 1976 now under the National Heritage Act (2005), (c) buildings and monuments registered as National Heritage under the National Heritage Act (2005). Source: George Town Historic Cities of the Straits Malacca Special Area Plan, D4-1, 2016.*



## TERMS OF REFERENCE

### GEORGE TOWN AND BAYAN LEPAS URBAN GREENING GRANTS PROGRAMME

#### **5. Who can apply for the George Town and Bayan Lepas Urban Greening Grants Programme?**

The Grants Programme is open to individuals, collectives, community-based organisations and non-governmental organisations\* with projects that fulfil the Grants Programme's eligibility criteria. The lead applicant must assume full administrative responsibility as well as be actively involved in the whole process.

*\*Organisations registered under the Registrar of Companies, Registrar of Societies and Registrar of Businesses are welcome to apply.*

#### **6. What does the George Town and Bayan Lepas Urban Greening Grants Programme support?**

The George Town and Bayan Lepas Urban Greening Grants Programme supports direct expenses for you to implement your proposed green façade or green roof project which may range from RM25,000 to RM100,000 per application.

It is important to note that the Grants Programme:

- prioritises projects that have a high co-investment;
- prioritises projects with community involvement and/or public access;
- prioritises projects with biodiversity benefits;
- prioritises projects with high impact potential;
- prioritises projects that are high quality and promote innovation; and
- prioritises projects that can be completed by September 2024.

#### **7. What are the expected outcomes for the George Town and Bayan Lepas Urban Greening Grants Programme?**

The eligible projects are expected to deliver the following outcomes:

- i) Introduce a green façade/roof with substantial vegetation cover and visual appeal for the benefit of the general public (refer to Appendix 1);
- ii) Reduce air temperature in adjacent spaces and heat gain in building, cooling demand/energy use and demonstrate evidence through valid data points/records; and
- iii) Promote good practice in vertical and horizontal greening implementation, which includes long-term sustainability. The proposed project must include a maintenance manual submitted in the final report upon completion and a commitment to maintaining the green façade/roof for at least 3 years.

## TERMS OF REFERENCE

### GEORGE TOWN AND BAYAN LEPAS URBAN GREENING GRANTS PROGRAMME

**8. What is the scope of activities/works that the George Town and Bayan Lepas Urban Greening Grants Programme support?**

<b>Scope of Activities/Works Supported</b>	
<b>Professional Consultancy Fees</b>	Landscape architect/architect/structural engineer/facade specialist/certified arborist
<b>Administrative</b>	Permit application processing fee etc.
<b>Construction</b>	All necessary labour and construction activities to complete the project
<b>Supplies and Material</b>	Plants, soil/mulch, irrigation lines, waterproofing membranes, supporting structures/modular panels, and planter boxes

**9. What are examples of activities/works that the George Town and Bayan Lepas Urban Greening Grants Programme does not support?**

- i) Tools (e.g., shovel, wheelbarrow);
- ii) Personal protective equipment;
- iii) Travel;
- iv) Structural renovation;
- v) Maintenance; and
- vi) And other costs unrelated to building the green façade/roof.

These examples are non-exhaustive and submissions will still be evaluated on a case-by-case basis.

**10. What are the requirements to apply for the George Town and Bayan Lepas Urban Greening Grants Programme and what documents should be submitted with your application?**

Interested applicants are required to attend grant briefing sessions organised by Think City, to fully understand the necessary criteria, objectives and proposal preparations.

Applications must be accompanied by a proposal that clearly identifies the project site, the proposed green façade/roof system and vegetation coverage (in square metres) and the process of collecting data to measure the impact of the green façade/roof (e.g., energy bills one year before construction and three years after, monthly pictures, etc.). Other required documents to include in your submission (in PDF format) are the below:

- Completed application form;
- Applicant's CV/profile/portfolio;
- Project cost – a detailed breakdown of costs, including any third-party costing;
- Project timeline with key milestones;
- A copy of the property title or written consent from the property owner to show proof of ownership/consent;
- Letter of Undertaking for a minimum 3-year maintenance period after project completion;
- Proof of mailing address if applicable;
- Company details – Certificate of Registration with Registrar of Companies/ Societies/ Business – Form 9, 13, 24, 44, 49, M&A if applicable; and
- Other supporting documents – photographs of the project site, design drawings and specifications detailing the type of green façade/roof proposed etc.

*Note: Applicants should be aware that, should an application be accepted for funding, we will request a post-grant assessment.*

**11. How can you apply for the George Town and Bayan Lepas Urban Greening Grants Programme?**

Interested applicants can download the application form at [www.thinkcity.com.my/PNBCAPUrbanGreeningGrants](http://www.thinkcity.com.my/PNBCAPUrbanGreeningGrants) and submit their application and relevant documents to the official email [pnbcap@thinkcity.com.my](mailto:pnbcap@thinkcity.com.my).

Please note that it is a requirement for you to attend at least one of our grant briefing sessions. Dates and venues for these sessions will be announced on the Think City website and communicated through all relevant Think City platforms.

**12. How will the applications be assessed?**

Applications will be assessed against the following criteria:

Criteria	Weightage
<b>Impact</b> <ul style="list-style-type: none"> <li>Public benefit and community involvement</li> <li>Alignment with UHI effect objective</li> <li>Location in high urban heat island (UHI) effect areas (refer to Appendix 2)</li> <li>Biodiversity benefits</li> </ul>	60
<b>Suitability and Feasibility</b> <ul style="list-style-type: none"> <li>Stakeholder support</li> <li>Compliance with policies</li> <li>Greening considerations (refer to Appendix 3)</li> <li>Realistic budget</li> <li>Value for money</li> </ul>	20
<b>Sustainability</b> <ul style="list-style-type: none"> <li>Impact evaluation methodology</li> <li>Maintenance strategy</li> </ul>	20

**13. What happens after the applications are assessed?****Successful Applications**

Successful applicants will receive an official email notification with the Letter of Offer (LOO). The offer will be valid for seven (7) days from the time the official email notification is sent out. If you do not accept the offer within this period of time, the offer will lapse.

As a successful grantee, you will be required to be present at an Approved Application Workshop with Think City to confirm the terms and conditions of the grants.

Once the milestone deliverables are agreeable by both the successful grantee and Think City, you will receive a Letter of Award (LOA) stating:

- Approved grant amount;
- Terms & Conditions of the project; and
- Scope of works and list of milestone deliverables.

**Unsuccessful Applications**

Unsuccessful applicants will receive an email notification if the application is not shortlisted.

**Appeals**

Think City will not accept appeals. All decisions are final.



**14. How will you receive funding?**

Funding will be disbursed upon completion of agreed milestones and deliverables. The funding will be banked in within 30 days of approved submissions and sign off of milestone report to the recognised bank account of the grantee.

**15. What are the expectations for deliverables and reporting requirements from successful applicants?**

Throughout the grant period, you will be required to:

- Deliver the proposed project within the grant period outlined in the Letter of Award (LOA) and adhere to the agreed reporting requirements;
- Keep in regular contact with Think City to update on project progress or should there be any changes in the scope of work or timeline; and
- To acknowledge Think City's support through relevant media platforms and adhere to Think City's brand guidelines.

Milestone Reports must be submitted, and a site assessment be arranged at the end of every agreed milestone. A Project Closure Report would be required at the end of the project, along with:

- An Outcome Assessment Survey that is to be submitted within fourteen (14) days upon completion of the project (provided by Think City);
- A financial statement that outlines actual budget utilisation (template provided by Think City);
- Documentation of process, outcomes and data collected for the project, accompanied by a maintenance manual for the green façade/roof; and
- Any other form of supplementary materials such as photography, videography and/or collaterals created.

*Note: Think City will provide thermal imagery of the surrounding area before and after the installation of the green rooftop/façade.*

Think City reserves the right to revoke any applications/ approvals should there be:

- Changes in the scope of the project without notifying and getting approval from Think City;
- Unable to complete the project as per the submitted proposal without valid justification; or
- Breach of terms and conditions specified and agreed in the Grant Agreement.

**16. Are there any maintenance requirements after project completion?**

The project's green façade/roof shall be a permanent installation and be maintained for at least 3 years after completion. The grantee shall ensure the green façade/roof is maintained even if there is a change in building ownership within the minimum maintenance period. Should the installation be removed before the minimum maintenance period, the full grant amount provided by Think City will be recovered.

## TERMS OF REFERENCE

### GEORGE TOWN AND BAYAN LEPAS URBAN GREENING GRANTS PROGRAMME

#### ***17. Who can you contact if you have any questions?***

If you have any questions or wish to discuss your application in detail, please contact Think City at +6011-3790-7803 or email [pnbcap@thinkcity.com.my](mailto:pnbcap@thinkcity.com.my) with your enquiries or secure an appointment.

#### **About Think City**

Think City is an impact organisation established in 2009 to create more sustainable and equitable places for the benefit of all. Our knowledge, skills and strategies focus on urban solutions, the environment, social communities and the cultural economy. Think City is a wholly owned subsidiary of Khazanah Nasional Berhad (the sovereign wealth fund of the Government of Malaysia). For more information, log on to [www.thinkcity.com.my](http://www.thinkcity.com.my).

TERMS OF REFERENCE

GEORGE TOWN AND BAYAN LEPAS URBAN GREENING GRANTS PROGRAMME

**APPENDIX 1: General Reference Images**



Image Source: Vo Trong Nghia Architects

TERMS OF REFERENCE

GEORGE TOWN AND BAYAN LEPAS URBAN GREENING GRANTS PROGRAMME



Image Source: Sihl City Shopping Centre



Image Source: Vo Trong Nghia Architects



## TERMS OF REFERENCE

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Image Source: DIE UMWELTBERATUNG



Image Source: Vo Trong Nghia Architects

## TERMS OF REFERENCE

### GEORGE TOWN AND BAYAN LEPAS URBAN GREENING GRANTS PROGRAMME



Image Source: Vo Trong Nghia Architects



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## TERMS OF REFERENCE

### GEORGE TOWN AND BAYAN LEPAS URBAN GREENING GRANTS PROGRAMME



Image Source: Vo Trong Nghia Architects



Image Source: Villa M - Triptyque



Image Source: Vo Trong Nghia Architects

## TERMS OF REFERENCE

### GEORGE TOWN AND BAYAN LEPAS URBAN GREENING GRANTS PROGRAMME

#### APPENDIX 2: Priority Areas within George Town and Bayan Lepas with High UHI Effect

Interactive land surface temperature maps for George Town and Bayan Lepas can be found here:

1. <https://maps.thinkcity.com.my/think-city/maps/114370/Land-Surface-Temperature-of-George-Town#>
2. <https://maps.thinkcity.com.my/think-city/maps/114831/Land-Surface-Temperature-of-Bayan-Lepas#>

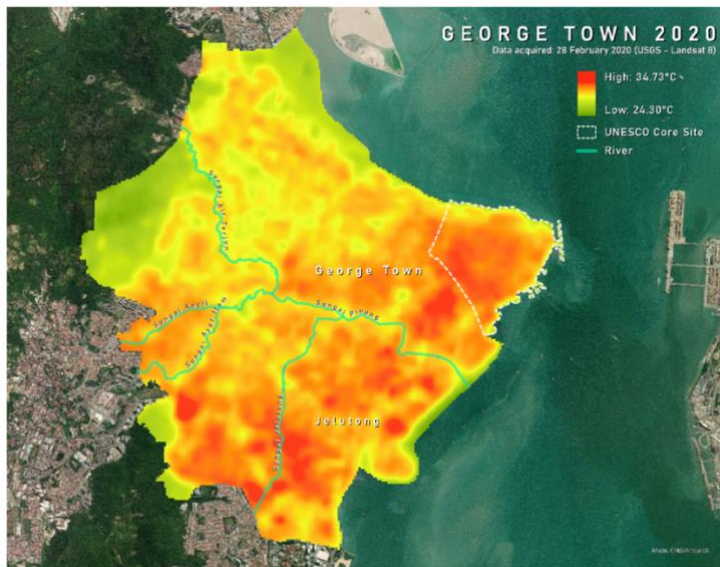


Image Source: Think City

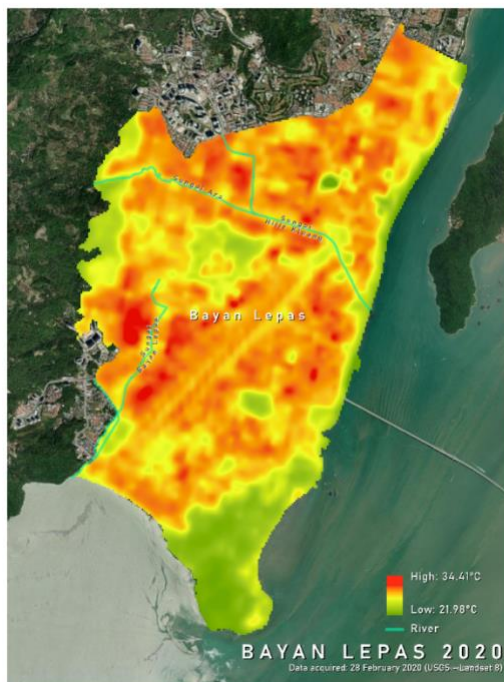


Image Source: Think City



### **APPENDIX 3: Technical Guidelines/Guidance Notes (For Reference Only)**

#### Vertical Greening

Vertical greening typically involves the integration of vegetation on building envelopes. It offers benefits such as improved air quality, increased urban biodiversity, reduced UHI effect and reduced energy consumption. As a passive cooling system, vertical greening or green facades facilitate the process of evapotranspiration, casting of shadow and provision of insulation<sup>1</sup>.

In recent years, the types and forms of vertical greening have evolved, providing various alternatives and means to incorporate vegetation onto building surfaces. Vertical greening can be divided into two categories, both of which apply to this grants scheme:

#### 1) Direct Green Facade

Defined by the use of plants with self-clinging mechanisms, attaching themselves directly to the building surface. In a direct green facade, climbing plants are rooted in the ground, facilitating irrigation. As a result, this type of green façade is usually cheaper to install and maintain.

However, there is a risk of damage to the wall of the building, given the growth pattern of some climbing plants and their weight<sup>2</sup>.

#### 2) Indirect Green Facade

An indirect green facade requires vertical structural support to guide the growth of selected plants along the wall of the building. In an indirect green facade, plants are grown from a trench below or planter boxes at intermediate levels and would have an integrated irrigation system and damp-proof backing/membrane.

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<sup>1</sup> Briz J. Felipe Boente M. I. de & Köhler Manfred. (2019). *Multifunctional urban green infrastructure*. Editorial Agrícola Española.

<sup>2</sup> Al-Kayiem, H.H.; Koh, K.; Riyadi, T.W.B.; Effendy, M. A Comparative Review on Greenery Ecosystems and Their Impacts on Sustainability of Building Environment. *Sustainability* **2020**, *12*, 8529.

## TERMS OF REFERENCE

### GEORGE TOWN AND BAYAN LEPAS URBAN GREENING GRANTS PROGRAMME

The following are types of vertical structural support typically used<sup>3</sup>:

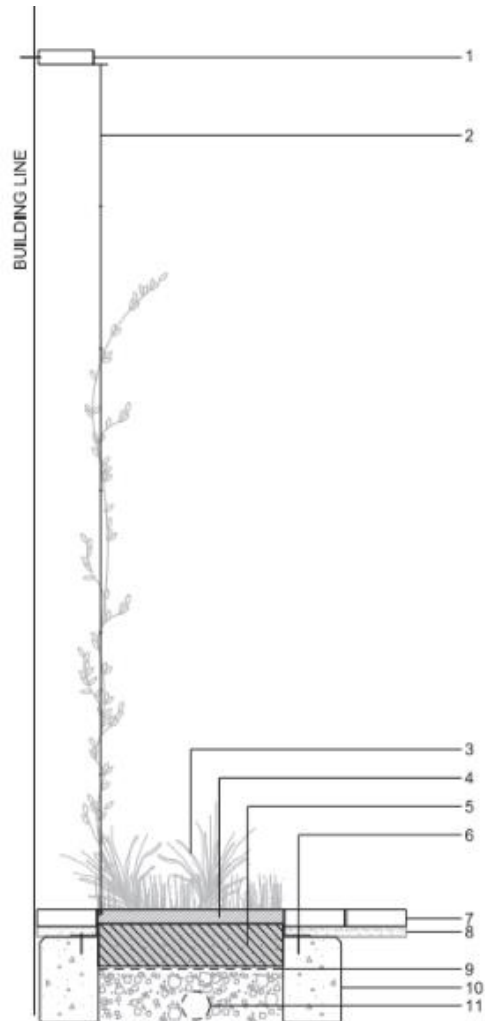
#### 1) Cable and wire net system

##### CABLE AND WIRE NET SYSTEM

###### NOTE:

- Planting can be integrated into footpath or building apron or in an above ground planter box.

1	BUILDING ANCHOR AND BRACKET SYSTEM
2	STAINLESS STEEL CABLE OR WIRE NET
3	PLANTING
4	MULCH (50mm)
5	SOIL TYPE 1
6	GALVANISED STEEL ANGLE
7	PAVING
8	BEDDING COURSE
9	GEOFABRIC FILTER LAYER
10	CONCRETE HAUNCH
11	SUBSOIL DRAINAGE PIPE WITHIN 20mm GRAVEL (NO FINES)



<sup>3</sup> State of New South Wales and Office of Environment and Heritage (2015) Urban Green Cover in NSW.

TERMS OF REFERENCE

GEORGE TOWN AND BAYAN LEPAS URBAN GREENING GRANTS PROGRAMME

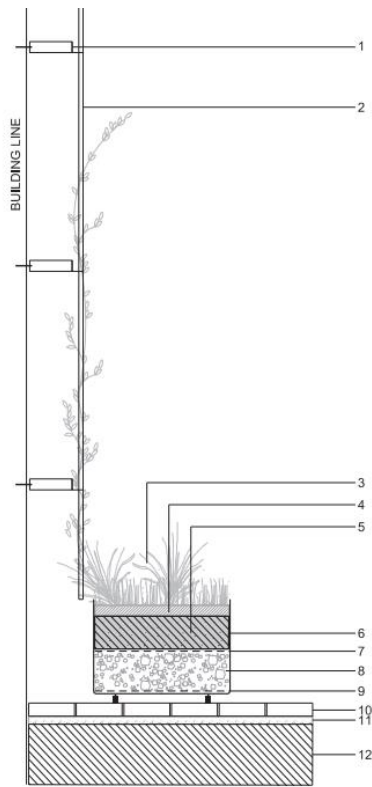
2) Trellis and container system

**TRELLIS AND CONTAINER SYSTEM**

**NOTE:**

- Planting can be integrated into footpath or building apron or in an above ground planter box.

- |    |  |
|----|--|
| 1  | BUILDING ANCHOR AND BRACKET SYSTEM       |
| 2  | TRELLIS SYSTEM FIXED TO BUILDING ANCHORS |
| 3  | PLANTING                                 |
| 4  | MULCH (50mm)                             |
| 5  | SOIL TYPE 1                              |
| 6  | GALVANISED STEEL PLANTER                 |
| 7  | GEOFABRIC FILTER LAYER                   |
| 8  | 20mm GRAVEL (NO FINES) LAYER             |
| 9  | GEOFABRIC FILTER LAYER                   |
| 10 | PAVING                                   |
| 11 | BEDDING COURSE                           |
| 12 | EXISTING PAVING SUBSTRATE                |



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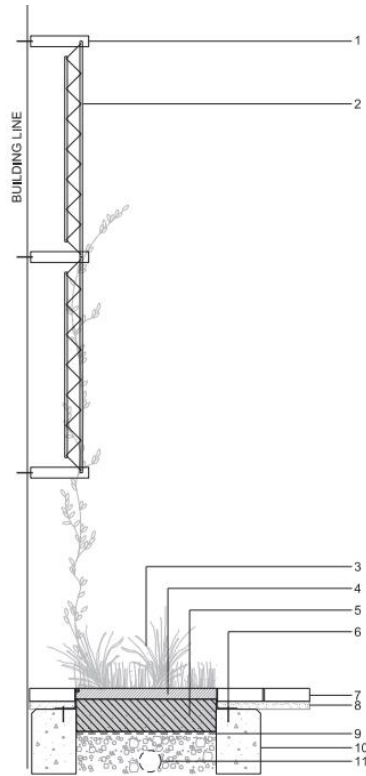
3) Modular trellis panels

**MODULAR TRELLIS PANELS**

**NOTE:**

- Planting can be integrated into footpath or building apron or in an above ground planter box.

- |    |   |
|----|---|
| 1  | BUILDING ANCHOR AND BRACKET SYSTEM                  |
| 2  | STAINLESS STEEL CABLE OR WIRE NET                   |
| 3  | PLANTING  |
| 4  | MULCH (50mm)  |
| 5  | SOIL TYPE 1   |
| 6  | GALVANISED STEEL ANGLE                              |
| 7  | PAVING  |
| 8  | BEDDING COURSE                                      |
| 9  | GEOFABRIC FILTER LAYER                              |
| 10 | CONCRETE HAUNCH                                     |
| 11 | SUBSOIL DRAINAGE PIPE WITHIN 20mm GRAVEL (NO FINES) |



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# TERMS OF REFERENCE

## GEORGE TOWN AND BAYAN LEPAS URBAN GREENING GRANTS PROGRAMME

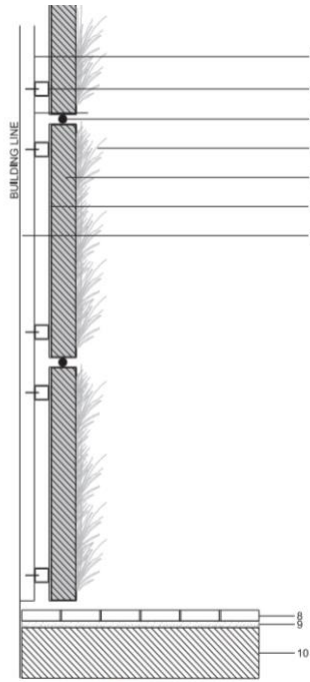
### 4) Modular panel system

#### MODULAR PANEL SYSTEM

**NOTE:**

- Planting can be integrated into footpath or building apron or in an above ground planter box.

- |    |  |
|----|--|
| 1  | STAINLESS STEEL WALL CHANNEL                 |
| 2  | STAINLESS STEEL PURLIN FIXED TO WALL CHANNEL |
| 3  | IRRIGATION LINE                              |
| 4  | PLANTS                                       |
| 5  | GROWING MEDIUM                               |
| 6  | WALL PANEL                                   |
| 7  | WATERPROOF MEMBRANE                          |
| 8  | PAVING                                       |
| 9  | BEDDING COURSE                               |
| 10 | EXISTING PAVING SUBSTRATE                    |



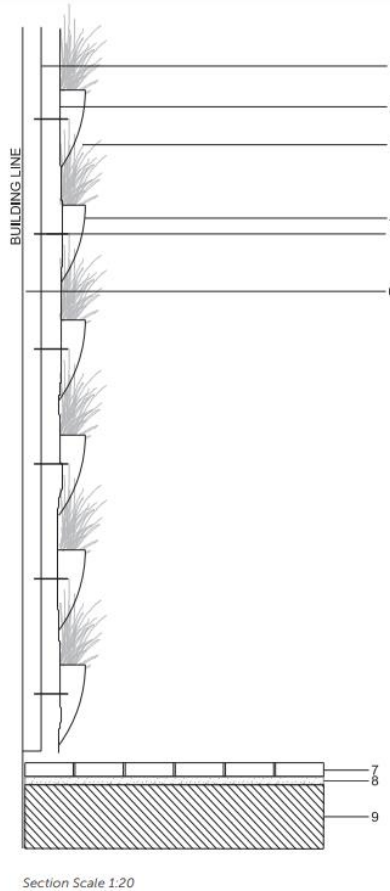
### 5) Felt/ Mat system

#### FELT/MAT SYSTEM

**NOTE:**

- Planting can be integrated into footpath or building apron or in an above ground planter box.

- |   |                              |
|---|------------------------------|
| 1 | STAINLESS STEEL WALL CHANNEL |
| 2 | FELT LAYER                   |
| 3 | PLANTS                       |
| 4 | POCKET                       |
| 5 | TIE                          |
| 6 | WATERPROOF MEMBRANE          |
| 7 | PAVING                       |
| 8 | BEDDING COURSE               |
| 9 | EXISTING PAVING SUBSTRATE    |



## TERMS OF REFERENCE

### GEORGE TOWN AND BAYAN LEPAS URBAN GREENING GRANTS PROGRAMME

#### Technical Notes

- High-maintenance solutions such as Patrick Blanc's vertical garden are discouraged and should not be proposed;
- Plant boxes can be used if aligned with the façade;
- Easy access for watering and maintenance must be ensured; and
- The main type of plants to be used are vines, although herbaceous plants and small shrubs could be considered for plant boxes.

#### Rooftop Greening

Rooftop greening refers to a vegetated landscape built from a series of layers that are loosely grown or modularly placed on a roof surface (installed layer by layer on the roof or as pre-prepared layers in trays and planter boxes). When appropriately designed, rooftop greening can significantly improve building performance, which includes improved air quality, better acoustic insulation, enhanced durability of waterproof barriers, reduced urban heat island effect, improved rainwater retention, and increased energy efficiency.<sup>4</sup>

'Biodiverse green roofs' are roofs specially built and planted to enhance local plant variety and provide wildlife with habitat (food and protection).<sup>5</sup>

In the case of existing buildings for which a roof garden is being proposed, the load-bearing capacity must be considered. Only accessible roofs should be considered, as these have higher load capacities. The load capacity of the roof and building should be verified, ideally should be approximately 400 kg/m<sup>2</sup>. If the load capacity is lower (the minimum admissible is 200kg/m<sup>2</sup>), the proposal should be adjusted accordingly, particularly the height of topsoil in the planters (wet topsoil weighs approximately 1,600kg/m<sup>3</sup><sup>6</sup>). The planters should not be distributed in a continuous manner, in order not to place them on top of expansion joints, for them to be accessible for maintenance and also for their load to be distributed by the structure.

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<sup>4</sup> National Parks Board – Skyrise Greenery Incentive Scheme (2022) <https://www.nparks.gov.sg/skyrisegreenery/explore/rooftop-greenery>

<sup>5</sup> State of Victoria through the Department of Environment and Primary Industries (2014) Growing Green Guide: A guide to green roofs, walls and facades in Melbourne and Victoria, Australia

<sup>6</sup> University of Delaware (2015) Analysis of the Weight of the Smart Roof Deck Garden.

## TERMS OF REFERENCE

### GEORGE TOWN AND BAYAN LEPAS URBAN GREENING GRANTS PROGRAMME

#### Technical Notes

- Only roofs with a minimum load capacity of 200kg/m<sup>2</sup> should be considered;
- The integrity of the structure is a major concern, so the load-bearing capacity should not be exceeded. The materials of planters to be placed on the roof should be light in weight, such as wood or recycled plastic. Heavy materials such as concrete or stone should be excluded;
- Plants are to be introduced in plant boxes (except in the case of new construction\*);
- Plant boxes should not be placed on top of expansion joints;
- The drainage system should not be obstructed in any way;
- Plant boxes must have a maximum of 0.30m height of soil except for isolated plant boxes placed on top of pillars (with no expansion joints), in which case they can have a maximum of 0.60 m height of soil. The volume of soil and its distribution should be calculated according to the load capacity of the roof; and
- The type of planting should be herbaceous plants and vegetables and for the bigger plant boxes, shrubs or vines.

\*It is possible that buildings under construction are considered under the grants programme. The rules will differ for these cases, but coordination will be needed with the waterproofing works and the structure and drainage engineering projects. The grant should only pay for plants and soil, with no reinforcement of structure or associated works covered.

#### Plant Selection

A careful selection of plants is integral to the success of vertical and rooftop greening. When selecting plant species, consider characteristics and traits such as growth rate, density, leaf area and coverage, climbing pattern, predisposition to parasites/ infections and maintenance requirements. Crucially, selecting plant species will also depend on their availability in local nurseries and the desired design intent and visual effect<sup>7</sup>. Plants that are beneficial for urban biodiversity are encouraged.

The following recommended list of plants for green facades and green roofs can be used as a reference when selecting suitable species according to the specific context and environmental factors:

Suggested Plant Species by National Parks Board, Singapore for Skyrise Greenery  
<https://www.nparks.gov.sg/skyrisegreenery/resources/plant-resources>

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<sup>7</sup> Al-Kayiem, H.H.; Koh, K.; Riyadi, T.W.B.; Effendy, M. A Comparative Review on Greenery Ecosystems and Their Impacts on Sustainability of Building Environment. *Sustainability* **2020**, *12*, 8529.