Cities of Tomorrow R&D Programme – Vertical 5 City in Nature (CoT V5)

5th Grant Call Briefing

30 May 2025

Overview of the Cities of Tomorrow R&D Programme – Vertical 5 City in Nature (CoT V5)

CoT V5 – Launch of 5th Grant Call

- The 5th grant call for Vertical 5 – City in Nature (under the Cities of Tomorrow R&D Programme) (CoT V5) has been launched as of **14 May 2025**.

- We invite interested researchers to submit suitable full proposals for potential funding support under **1 Call Topic:**

    1) Efficacy of nature-based interventions on human well-being

- Interested parties are strongly encouraged to form research teams that collaborate across public research institutes and the private sector (including industry), and support translation of research outcomes to real-world applications.

Schedule

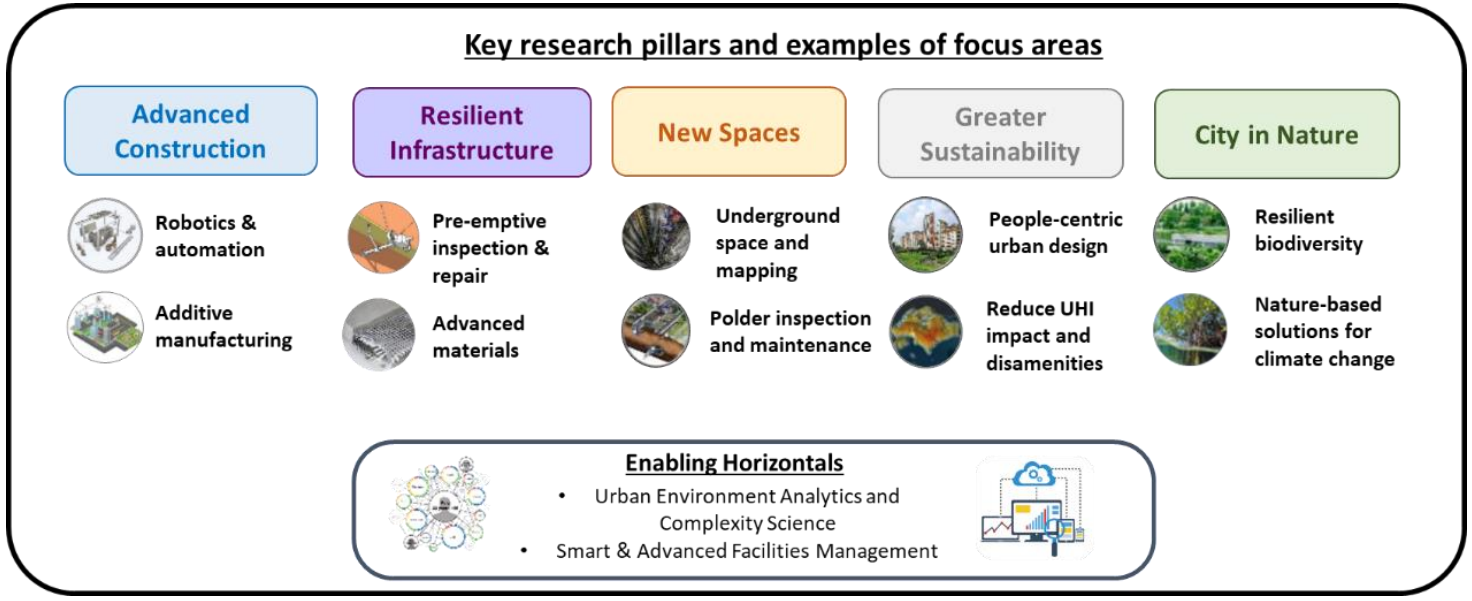
4:00pm	<u>Overview of CoT V5 5th Grant Call</u> • Grant Call conditions and eligibility criteria • Review process • Instructions for submission of proposals
4:20pm	Call Topic 11: "Efficacy of nature-based interventions on human well-being"
4:40pm	Q&A
5:00pm	End of Programme

Cities of Tomorrow R&D Programme

- Launched in 2017, the Cities of Tomorrow (CoT) R&D programme is MND's flagship R&D programme under the Urban Solutions and Sustainability (USS) domain

- The vision of CoT is to establish Singapore as a highly liveable, sustainable and resilient city of the future, and as a vibrant urban solutions hub

- In RIE2025, CoT comprises 5 key verticals and 2 enabling horizontals, including the new Vertical 5 on City in Nature



Vertical 5 – City in Nature *(under Cities of Tomorrow R&D programmme)*

- New NRF-funded Funding Initiative (FI), and 5th research vertical under CoT R&D Programme, totaling $17.9M to support a 5-year programme under the USS domain under RIE2025
  - Led by NParks as Implementing Agency

- Multi-stakeholder research programme which seeks to provide scientific foundation to support Singapore's transformation into a City in Nature

- Aims to enhance:
  - Climate resilience – by improving ecosystem capacity to adapt and respond to disturbances brought about by climate change (e.g., higher temperatures, inland flooding due to extreme rainfall events) using nature-based solutions
  - Ecological resilience – by adopting an evidence-based approach to plan, design and monitor biodiversity conservation outcomes more effectively
  - Social resilience – by gaining a better understanding of how dimensions and detailing of landscape elements affect mental and physical health, which allows more effective planning and design of public spaces towards enhanced health outcomes and social cohesion

Vertical 5 – City in Nature *(under Cities of Tomorrow R&D programmme)*

- 4 research themes, in support of the FI's overall outcomes of enhancing climate, ecological and social resilience:

1 Safe, productive, and multifunctional urban greenery

To develop new solutions to improve urban greenery operations and management, and its integration with the built environment

2 Biodiversity monitoring to improve adaptive management of urban biodiversity

To develop tools and techniques to improve the efficiency of biodiversity monitoring

3 Managing human-nature relationships

To improve our understanding of human-nature relationships, so as to inform policies and solutions that further enhance the physical and mental well-being benefits of urban nature

4 Nature-based solutions for inland climate change adaptation

To inform the planning and design of blue-green infrastructure for the provision of climate-related ecosystem services

Grant Call Eligibility & Funding Criteria

Grant Call Eligibility

- All Singapore-based public research institutes (RIs) (e.g., Institutions of Higher Learning (IHLs) and A*STAR RIs), companies, company-affiliated research laboratories or institutions and not-for-profit entities are eligible to participate in the call.

- The Lead PI who leads the Research must be based in Singapore. Collaboration with Singapore-based and foreign organisations and experts, in the capacity of Co-Investigator (Co-I) or as Collaborator, is allowed.

- All funding awarded must be used to carry out the research work in Singapore, unless expressly approved by the grantor.

- Grant applicants are strongly encouraged to collaborate with industry partners to develop innovative solutions that can address the call objectives and demonstrate strong potential for real-world application within and beyond Singapore.

- R&D proposals already funded by other government agencies will not be considered. R&D proposals with similar scope, which are currently under evaluation by other funding initiatives, will not be considered until the results from the other funding initiatives are finalised. Lead PIs, Co-Is, and Collaborators will need to declare other funding sources as well as participation in other funding initiatives during application.

Grant Call Eligibility

Additional notes for private sector entities

- Funding for private sector entities would be conditional on collaboration with a public research performer for:
  - Research projects with a total project budget more than S$500,000;
  - Test-bedding/demonstration/scale-up projects with a total project budget more than S$2.0mil.

- For projects funding non-Singaporean entities (i.e., companies registered in Singapore with less than 30% local shareholding, determined by the ultimate individual ownership), a Singapore Technology Licensing Office (STLO) must be appointed regardless of the involvement of public research performer.

Funding Criteria

Direct Costs*

- Supportable direct costs are incremental cost required to execute the programme; can be classified into the following cost categories:-
  - Expenditure on manpower (EOM);
  - Equipment;
  - Other Operating Expenses (OOE); and
  - Overseas Travel

Indirect Costs (i.e. "overheads")

- Costs that are incurred for common or joint objectives and therefore cannot be identified readily and specifically with a particular sponsored research project, but;
- Contribute to the ability of the Institutions to support such research projects (e.g., providing research space, research administration and utilities), and not through the actual performance of activities under the sponsored projects.

** Please refer to the Annex D of the Grant Call info sheet for the list of non-fundable direct costs of research.*

*** According to National Supercomputing Centre (NSCC) Singapore policies, research projects will be charged for access to NSCC's High Performance Computing (HPC) resources. Applicants are required to budget for their compute requirements and associated costs in grant applications, where necessary.*

Funding Criteria

Singapore-based IHLs/public research institutes	• Lead PI or Co-I will qualify for:
	  • **[Direct costs] 100%** of the approved qualifying direct costs of a project;
	  • **[Indirect costs] 30%** of the total qualifying approved direct costs of a project.

Singapore-based private sector entities (incl. not-for-profit organisations)	• Lead PI or Co-I will qualify for:
	  • **[Direct costs] Up to 70%** of the approved qualifying direct costs of a project
	  • 30% for all non-Singaporean entities (incl. non-Singaporean not-for-profits);
	  • 50% for Singapore Large Local Enterprises (LLEs);
	  • 70% for Singapore Small Medium Enterprises (SMEs), start-ups and not-for-profits.

Overseas organisations	• **Not** permitted to receive, directly or indirectly, any part of the funding, whether in cash or in the form of assets acquired using the funding or otherwise unless expressly approved by the grantor. • Exception: **Travel expenses** for Visiting Professors/Experts (e.g., overseas-based Co-Is and Collaborators) **to come over to Singapore**, which should be identified and budgeted for upfront in the Other Operating Expenses vote to be incurred by the Host Institution.

Funding Criteria

Additional notes on Collaborators

- Collaborators are **not** permitted to receive, directly or indirectly, any part of the funding, whether in cash or in the form of assets acquired using the funding or otherwise unless expressly approved by the grantor.

Additional notes on funded assets

- All assets acquired using the funding must be located in Singapore and maintained within the control of the grantees.

Please refer to the Grant Call info sheet for detailed information on the guidelines for the grant call.

Data/Cybersecurity Risk Management

- To safeguard against data leaks/breaches and depending on the nature of the Research, the Host Institution, Partner Institutions and/or Collaborators may be required by the CoT Directorate to:
  - Attain one of the data and/or cybersecurity standards certification listed below as a pre-requisite to start the project, receive data requested or execute the data collection (e.g., survey) for the Research.
  - Conduct an independent exit external audit assessment upon completion or termination of the Research.

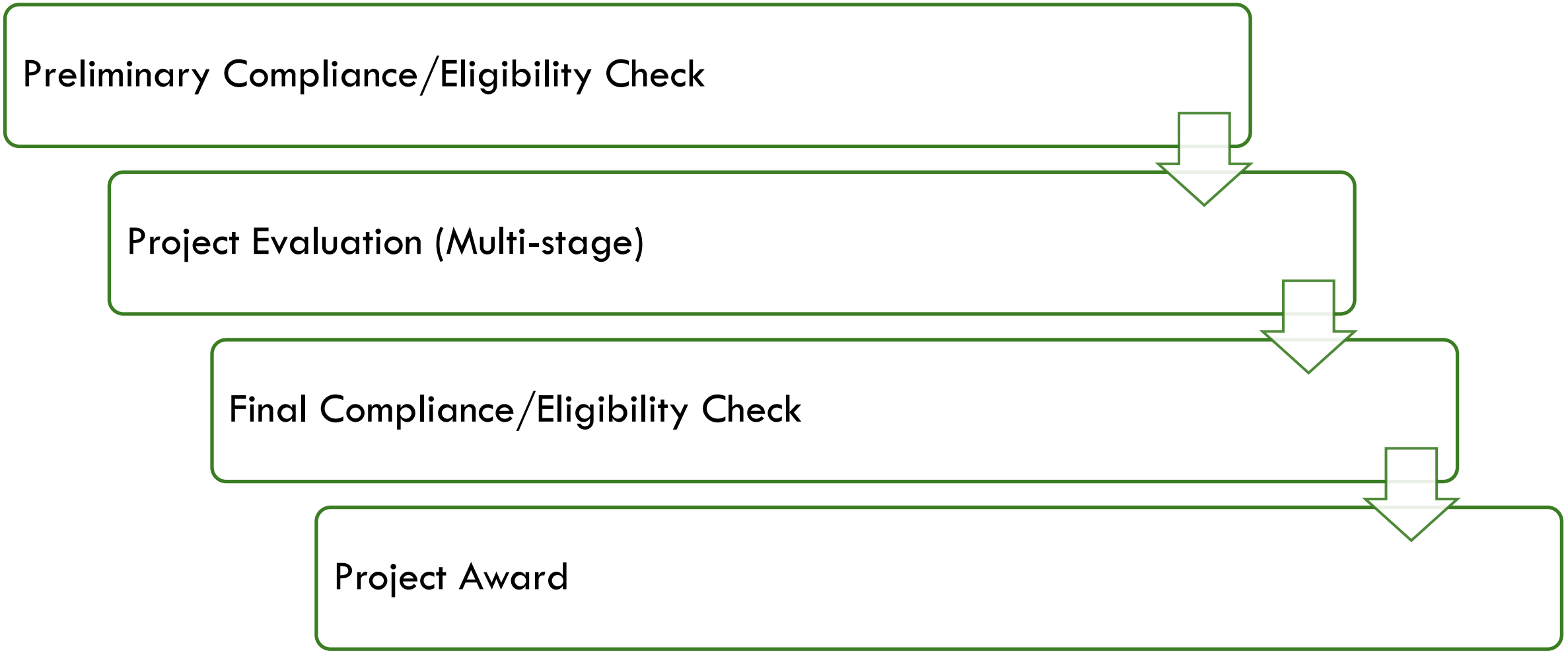
Cyber Security Agency (CSA) Cybersecurity Standards	**Infocomm Media Development Authority (IMDA) Data Security Standards**
Cyber Essentials Mark (CEM)	Data Protection Essentials (DPE)
Cyber Trust Mark (CTM) *Note: There are a few tiers under CTM, Institutions will only have to attain certification for one tier for the project, if required.*	Data Protection Trust Mark (DPTM)

- Exact requirements will be determined after evaluation and CoT Directorate will officially inform the applicants selected for award in writing.

* *Applicants may check in with their respective IT departments for existing or equivalent certifications (e.g., applicants with ISO/IEC 27001:2022 certification may use that to meet CEM and all tiers of CTM).*

Review Process

Review Process – at a glance



Evaluation of Proposals

Evaluation of proposals will include:

1. Technical Peer Review

Proposals will be subject to a round of technical peer review by domain experts* with relevant expertise, to ensure excellent science in proposals.

2. Project Evaluation Panel

Shortlisted applicants will be invited to present their proposals to a Project Evaluation Panel, consisting of relevant agency representatives, the Programme Director, and other external experts (where relevant).

Successful applicants will be informed by the CoT Directorate on the award of the grant. The CoT Directorate's decision on project and funding support will be final.

** Research teams applying for the grant call are invited to recommend potential suitable peer reviewers for the CoT Evaluation Committee's consideration, as part of the proposal submission process. The final decision on the peer reviewers will be decided by the Evaluation Committee.*

Evaluation Criteria

Criteria

Potential Contribution to CoT Objectives

- Relevance of proposed research in contributing to objectives/targets stated for the CoT Call Topic.

Potential for Breakthrough and Innovation

- Quality and significance of proposed research, including value for money, and the potential for breakthrough/innovation to advance knowledge and understanding within its own field or across different fields.

Potential for Application and Deployment in Singapore and Commercialisation/Export

- Potential for application of research outcomes in Singapore by a public agency and potential for solutions to be replicated in Singapore beyond a single site/project.
- Feasibility for commercialisation/ export in areas where Singapore has a competitive advantage.

Execution Strength and Technical Competency of Research Team

- Quality of plans for execution and delivery of the research programme and goals, including the appropriateness of the proposed milestones and deliverables (specific to evaluation of full proposal applications)
- Quality, significance, and relevance of the recent research record of the Lead PI and Co-Is and the strength of the applicant group, including likely synergy in delivering research and potential for international leadership.

Instructions for Submissions of Proposals

Overview of Timeline

FOR APPLICANTS & INTERESTED PARTIES (SGT, UTC +08:00)	
Grant Call Opens (for 10 weeks)	14 May 2025, 2.00pm
Virtual Briefing for CoT V5 5th Grant Call	10 January 2025, 9.30am
Grant Call Closes (Proposal Submission Deadline)	23 July 2025, 2.00pm

FOR SHORTLISTED APPLICANTS ONLY	
Notification of shortlisted applicants	Q3 2025*
Presentation to Project Evaluation Panel (2 or 3 days)	Q3 2025*

FOR SUCCESSFUL AWARDEEES ONLY	
Approval and Letter of Award	Q4 2025 onwards*

** Timings are indicative; shortlisted/successful applicants will be notified accordingly.*

Grant Call Details

Grant call information and relevant documents at:

- CoT V5 5th Grant Call website
- IGMS

Application only through IGMS:

- See section on "Application Guidelines". All funded proposals should follow the prevailing Research Grant Terms and Conditions and NR Fund Guide.

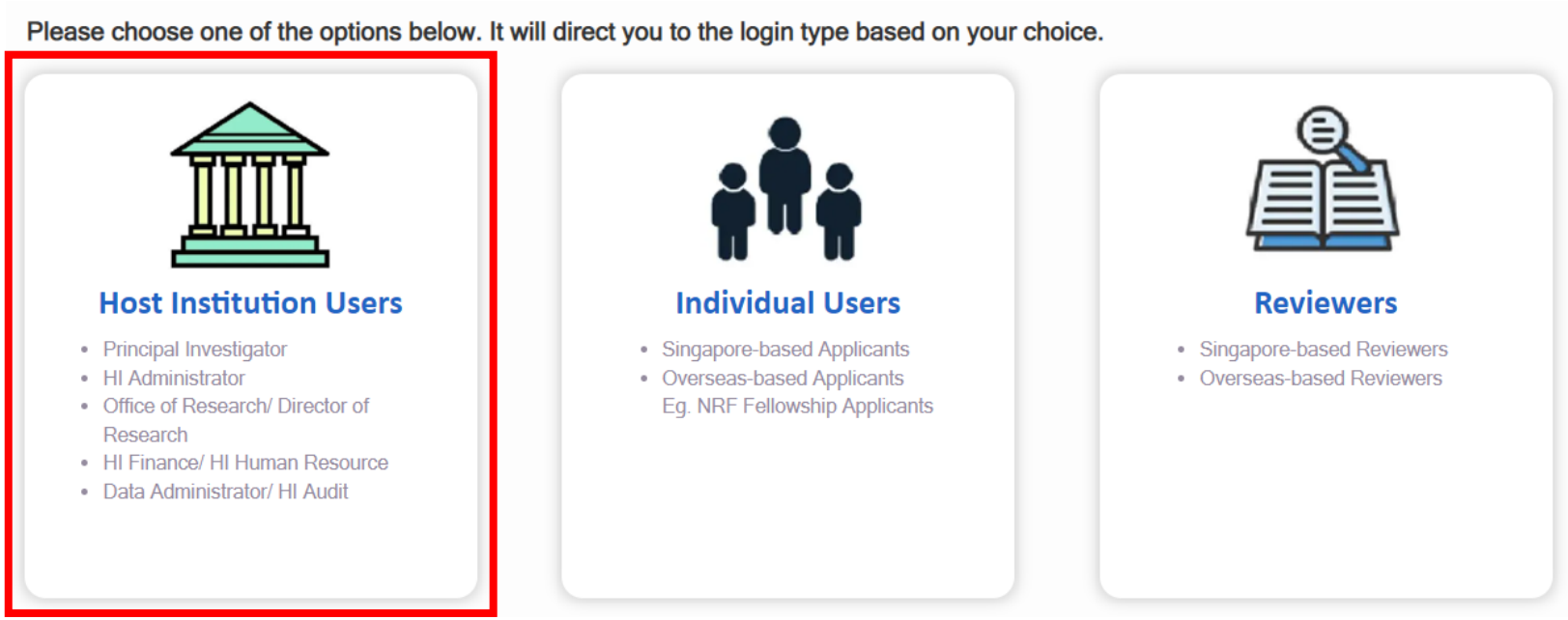
- The application will only be considered valid if the submission of the full proposal is completed in IGMS, including endorsement by the Director of Research (also in IGMS) by the proposal submission deadline **(23 July 2025, 2.00pm)**.
  - A copy of the application should also be sent via email to the CoT Directorate (CoTV5@nparks.gov.sg) after this.

- E-mail or walk-in applications will not be accepted.

- Late submissions will not be considered. Incomplete submissions may also be rejected. Applicants are advised not to submit their application at the last minute in case of technical errors with the IGMS website.

- The following slides outline steps for "Using IGMS" and "Full Proposal Submission".

Application Guidelines



Using IGMS:

<u>Key details for first time users</u>

- Under the landing page, select the **"Host Institution Users"** option. This option will lead you to "Login with Singpass (Logging in as Business User)". Login or register using your Singpass.
- **Authorise ORCID ID** before any grant application.
- Fill up mandatory fields.
- Update user profile.

Application Guidelines

Full Proposal Submission:

- Login to the system using the "Host Institution Users" option and subsequently, via "Login with Singpass (Logging in as Business User").
- Click on grant call topic of interest under “Open Opportunities” and click “Apply”.

For detailed steps, please refer to:

- Quick guide for Potential Applicants; and
- Help guide for Potential Applicants

(also available on the IGMS “Training Guides” page: https://www.researchgrant.gov.sg/Pages/TrainingGuides.aspx)

Contact Information

- For **general information**, please refer to the Grant Call FAQs document in either:
  - CoT V5 5th Grant Call website
  - Under "Related Documents" under the grant call topic of interest on IGMS

- For transparency, no verbal enquiries will be entertained. However, if you require clarification, please email the CoT Directorate at CoTV5@nparks.gov.sg. Answers to all received queries will also be reflected in the Grant Call FAQs document (see above), which will be updated periodically to ensure that all applicants have equal access to additional information.

- For any queries on the **use of IGMS**, please contact the IGMS helpdesk.
  Tel No: (65) 6556 8807 or (65) 6556 6971
  E-mail: helpdesk@researchgrant.gov.sg

Call Topic for CoT V5 5th Grant Call

Vertical 5: City in Nature
Grant Call No. 5

Project Title

Efficacy of nature-based interventions on human well-being

Agencies involved:	National Parks Board
Estimated Duration:	3 years
Estimated Budget:	$2.15m
Grant Call Period:	14th May to 23rd July

BACKGROUND

Nature Exposure and Wellbeing

Active Nature Exposure requires active physical or cognitive engagement by individuals
e.g. gardening

- Current research in Singapore has provided clear evidence that active nature interventions—such as gardening, therapeutic horticulture, and green exercise—deliver significant wellbeing benefits, including improved mood, mental resilience, reduced anxiety, and enhanced cognitive function.

Sia, A., Tan, P.Y., Wong, J.C.M., Araib, S., Ang, W.F., Er, K.B.H. (2022). The impact of gardening on mental resilience in times of stress: A case study during the COVID-19 pandemic in Singapore. *Urban Forestry & Urban Greening*, Volume 68.

Sia, A., Tam, W.W.S., Fogel, A., Kua, E. H., Khoo, K. and Ho, R. C. M. (2020). Nature-based activities improve the well-being of older adults. *Sci Rep* 10, 18178.

Petrunoff, N. A., Yi, N. X., Dickens, B., Sia, A., Koo, J., Cook, A. R., Lin, W. H., Ying, L., Hsing, A. W., van Dam, R. M., & Müller-Riemenschneider, F. (2021). Associations of Park Access, park use and physical activity in parks with wellbeing in an Asian urban environment: A cross-sectional study. *International Journal of Behavioral Nutrition and Physical Activity*, 18(1).

BACKGROUND

Passive Nature Engagement

Relational Nature Therapy session

- Passive nature interventions involve the intentional noticing of nature without requiring physical or cognitive exertion.
- “Relational Nature Therapy,” developed by the Association of Nature and Forest Therapy (ANFT) in 2012, is one such practice designed to help individuals slow their minds and mindfully engage with nature.
- Anecdotal reports suggest that these interventions can improve mental wellbeing.
- Passive nature exposure can be easily incorporated into daily routines.
- It is important to systematically examine the effects of passive nature interventions.

BACKGROUND

Nature Connectedness as an Outcome

Being connected to nature is the sense and level of belonging an individual has with the natural world (Schultz et al., 2004).

- A stronger connection with nature has been shown to amplify wellbeing effects. This connection also promotes positive attitudes and behaviors towards the environment.
- A sense of connection with nature is positively associated with more biodiverse environments.
- A useful outcome to investigate.

BACKGROUND

Do all types of nature offer the same well-being benefits?

- Singapore is transforming to be a City in Nature, featuring a diverse range of natural environments with distinct characteristics.
- For example,
  - Forests are highly biodiverse, hosting a vast array of plant, animal, and microbial species;
  - Urban parks offer recreational opportunities and a welcome respite within the city.

BACKGROUND

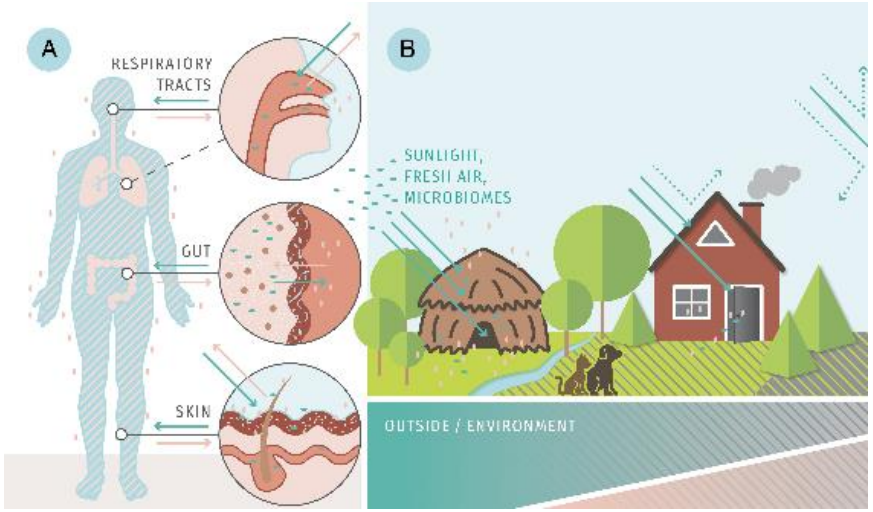
Phytoncides in Natural Environments

- Temperate forests are reported to release phytoncides with anti-microbial, anti-fungal and anti-inflammatory properties and this has been linked to improved human health, such as stress reduction and better immune function.
- However, the phytoncides profile of tropical natural environments and how they affect human health are relatively unknown.

Phytoncides are volatile organic compounds (VOCs) produced by plants and have natural antimicrobial and antifungal qualities. They may be constitutive (emitted through normal metabolic processes) or induced (released in response to stress or injury). Exposure to phytoncides is recognized for its positive impacts on psychological and physiological well-being and have begun to be investigated for their immunotherapeutic potential (Lew & Fleming, 2024).

BACKGROUND

Microbiome and Nature Exposure



Credit: The potential importance of the built environment microbiome and its impact on human health. Bosch, T.C.G. Wigley, M., Colomina, B., Melby, M.K. *Proceedings of the National Academy of Sciences* (2024).

- Exposure to nature environments has also been linked to positive changes to human microbiome composition.
- However, less is known about the microbial composition in Singapore's natural environments, and how they affect users' physiological health.

A scoping review reported evidence for biodiversity interventions to diversify human microbiota (Tisher, 2022).

Key Information Gaps

1. Need for evidence on the benefits of passive nature intervention; its effects on health, well-being and increased sense of connection with nature.
2. Need for knowledge on the phytoncides and microbial profile of natural environments in Singapore, including forests, and how this influences human health and wellbeing.

Study Objectives

Primary

1. Determine the effects of a passive nature intervention[1]. The intervention should comprise at least five weekly sessions and be designed with the goal of increasing Nature Connectedness, enhancing Physiological (e.g., higher HRV measurements and microbiome diversity during predetermined phases of the study compared to baseline) and Psychosocial Health (e.g. higher mental wellbeing and pro-social behaviour scores than control group, and pre-post increases).
2. Determine if the effects are different when carried out in three different nature environments[2], including forest.
3. Develop the profile of phytoncides and microbial composition in three test sites with different nature characteristics (e.g. primary forest, nature park, urban park) and determine how this affects human health.

Secondary

4. Determine the effect of the intervention in increasing subjects' Intrinsic Motivation for Nature Exposure and promoting Pro-Environmental Behavior.

Examples of passive nature interventions are (1) Relational Nature Therapy, a practice comprising a standard sequence of invitations that promotes intentional noticing of nature (commonly termed forest bathing) and (2) Mindful Walking.
As the environmental data will be linked to plant species, it is advantageous (in terms of knowledge base) to select sites with rich but diverse plant species.

Technical Deliverables

1. Rigorous evidence on the impact of the intervention on Nature Connectedness, Physiological and Psychosocial Health , and the contributing effects of the physical properties of the nature sites.
2. A technical report on the phytoncide and microbial profiles of the nature sites, to be linked to plant species.
3. The findings will include evidence derived from psychometric instruments, qualitative data and physiological markers such as heart rate variability, as well as nasal and gut microbiome composition.
4. Recommendations on the application and translation of research insights (e.g. for the intervention to be integrated into social prescriptions.)

Q&A

Thank you

For further enquiries, please contact: CoTV5@nparks.gov.sg