

Grant Call: RCO-NPARKS-2024-01

Project Title: Determination of nutrient and water budgets and surface energy fluxes in urban and forest ecosystems

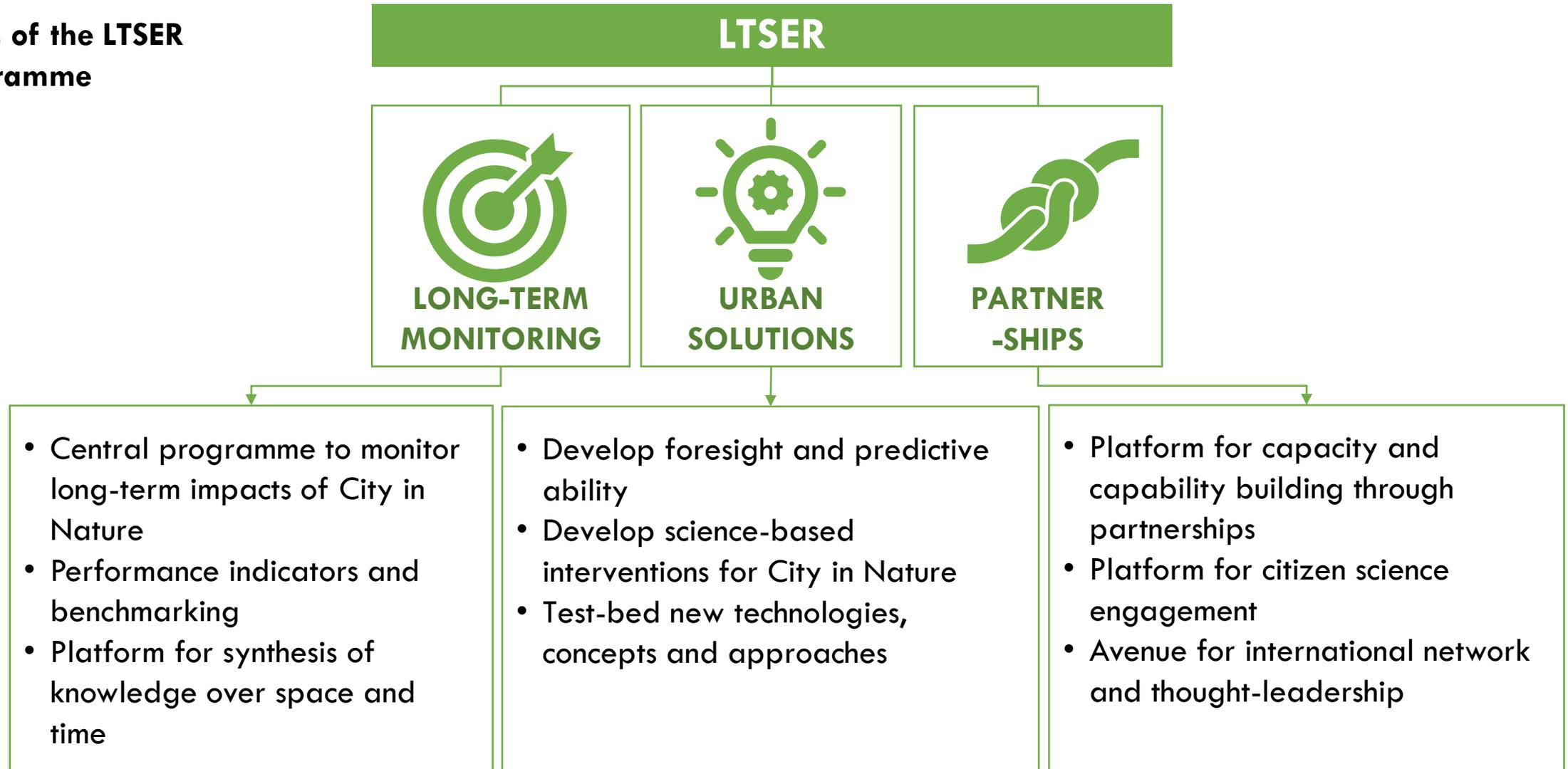
Budget: S\$ 2.675 Mil

Duration of Project: up to 3 years

Lead Agency: NParks

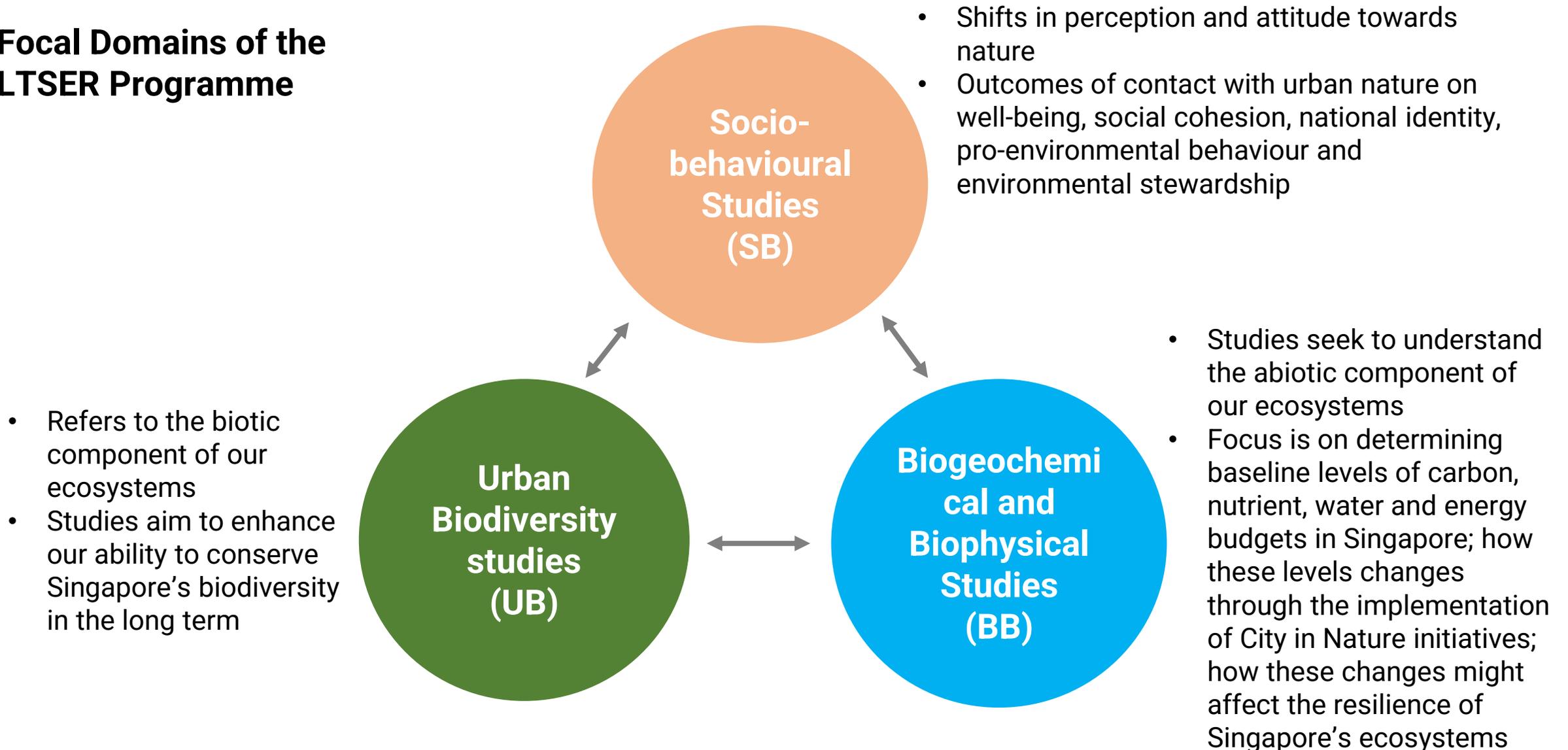
Long-Term Socio-Ecological Research (LTSER) Programme

Aims of the LTSER Programme



Long-Term Socio-Ecological Research (LTSER) Programme

Focal Domains of the LTSER Programme



Long-Term Socio-Ecological Research (LTSER) Programme

Studies at 3 spatial scales:

1. Site (Long-term Sites)
 - BTNR, CCNR, SBWR-Mandai Mangrove, SBG, Bishan-AMK, Jurong Lakeside District, Pulau Ubin, Bukit Batok-Tengah Nature Corridor, Sungei Kadut
2. Regional (comparative assessment along natural to urban gradient)
3. City



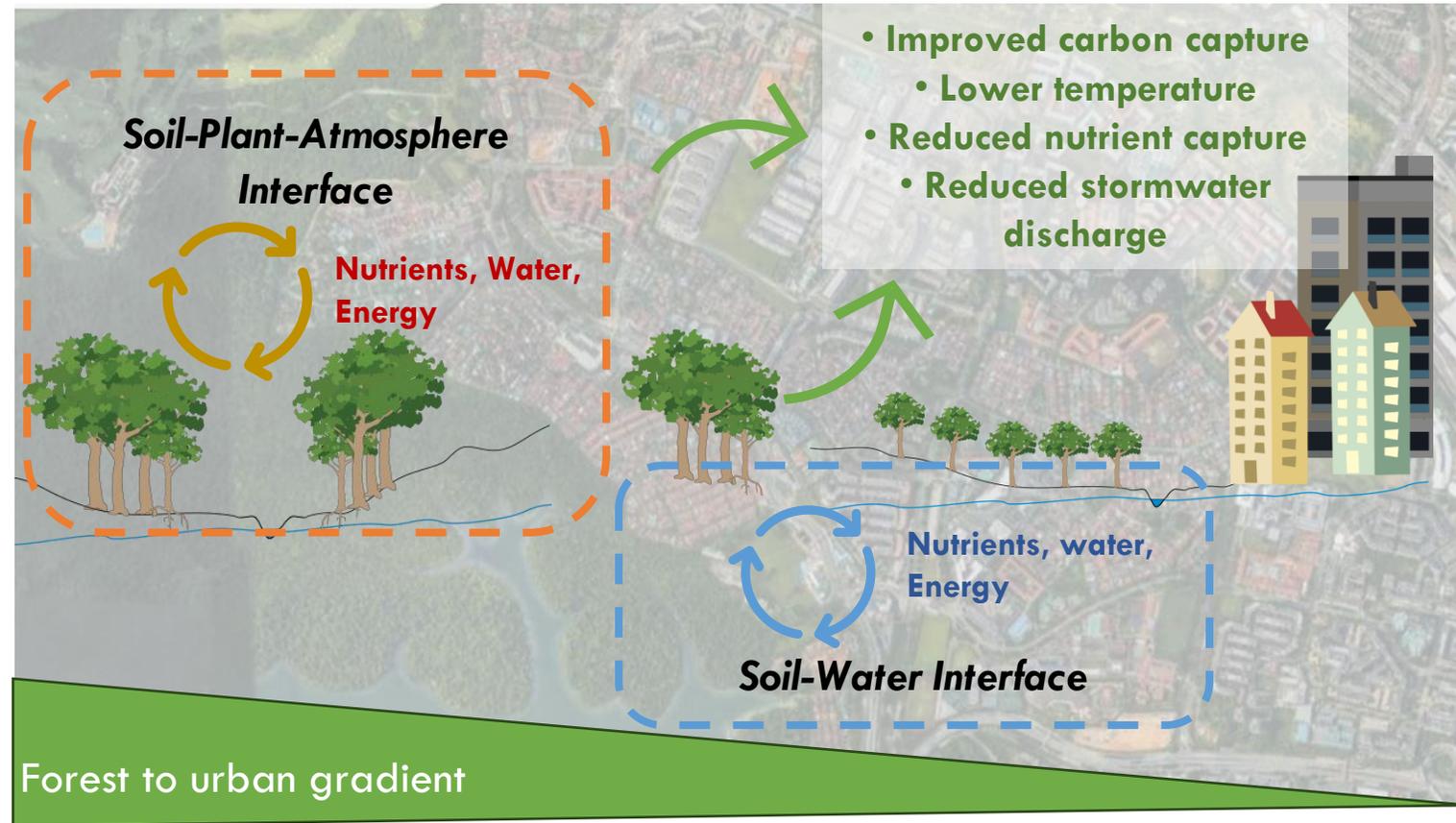
Examples of LTS that can be used to study forest to urban gradient

Remnant Forest	Large Urban Green Space	Built-Up Site
Bukit Timah Nature Reserve SBG Rainforest	Singapore Botanic Gardens	Bishan-Ang Mo Kio Trial Site
Central-Catchment Nature Reserve	Jurong Lake Gardens	Jurong Lakeside District

Determination of nutrient and water budgets and surface energy fluxes in urban and forest ecosystems

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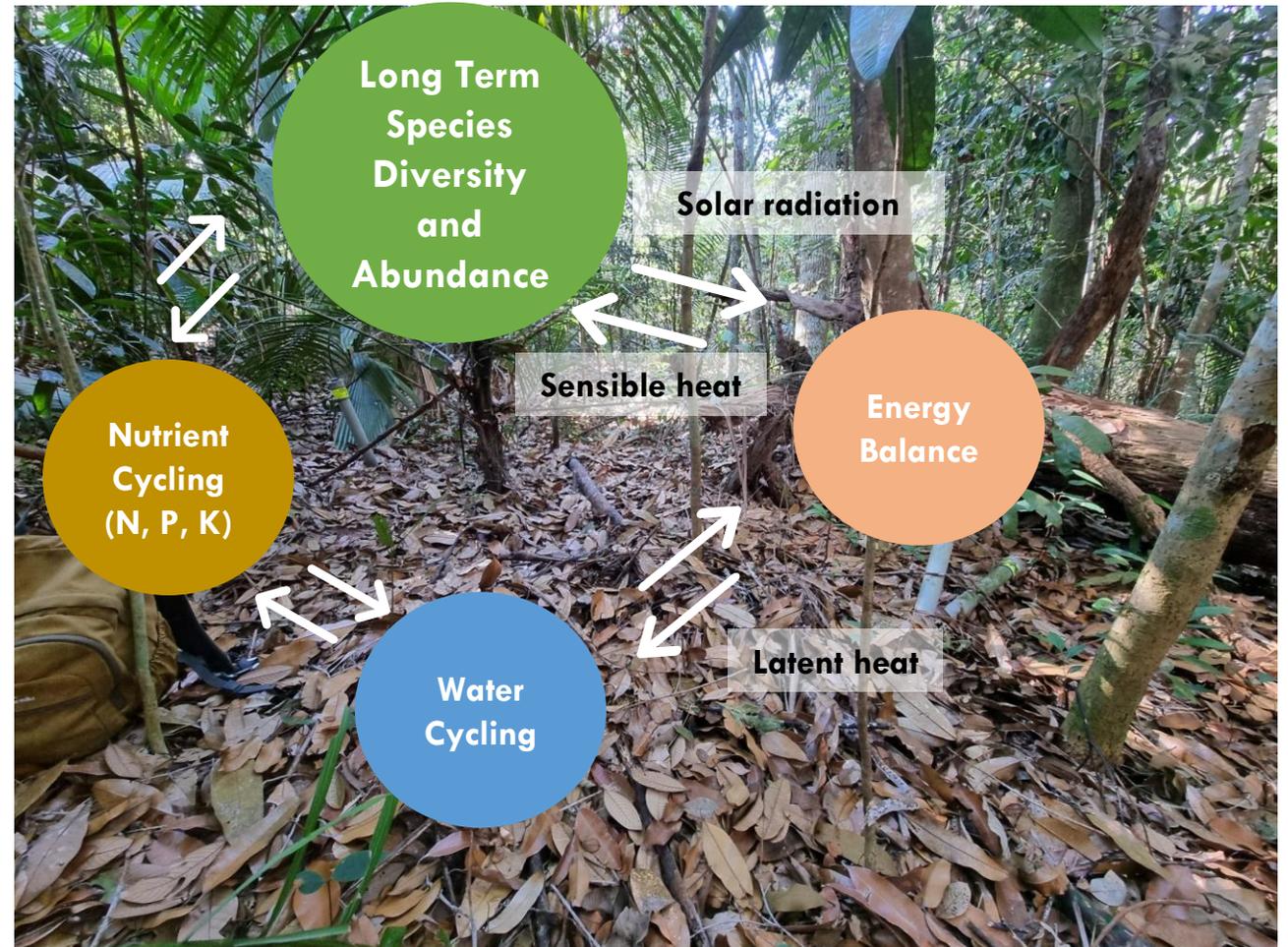
1. Greenery provides multiple benefits, e.g., heat mitigation, carbon sequestration, pollutant capture, etc.
2. Benefits underpinned by flows of nutrients, water and energy
3. Greenery restores these flows at soil-water-plant-atmosphere interfaces



Determination of nutrient and water budgets and surface energy fluxes in urban and forest ecosystems

Understanding these fluxes are important to:

1. Improve our ability to design and deploy greenery as nature-based solutions to enhance impacts of City in Nature
2. Improve our ability to enhance forest restoration and greenery management to enhance resilience to disturbances



Determination of nutrient and water budgets and surface energy fluxes in urban and forest ecosystems

Objectives

(a) To develop a cost-effective and robust long-term monitoring system for the nutrients and water fluxes at the soil-water interface and surface energy fluxes between the land surface, vegetation and atmosphere

(b) To determine and compare baseline rates of these nutrients, water and surface energy fluxes along a forest to urban gradient:

- i. Across major forest types: primary forest (as reference baseline) against native-dominated and exotic-dominated secondary forests
- ii. Between forest and urban greenspaces (parks and streetscapes)
- iii. Between naturalistic, high density/diversity plantings versus more conventional planting schemes in parks and streetscapes



Forest



Naturalistic/high
density/diversity plantings



Conventional
greenery/built-up areas

Projects are encouraged to further build upon the above-mentioned objectives, and/or propose additional research objectives.

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Vegetation categories		Potential Sites	
Forest	Primary forest	BTNR; CCNR; SBG Rain Forest	
	Secondary vegetation	Native-dominated	CCNR
		Exotic-dominated	Bukit Batok Nature Park; Windsor Nature Park
Urban greenspaces	Parks	Bishan-Ang Mo Kio Park; Jurong Lake Gardens; SBG	
	Streetscapes	Nature Ways	

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Objectives

(c) To identify and test suitable indicators/tools (e.g., Net radiation, Ground heat fluxes, Bowen's Ratio, Water Use Efficiency, Nutrient Use Efficiency, Mass Balance models) that can be used to quantify the suitable fluxes to allow monitoring of the long-term impacts of City in Nature on these fluxes:

- i. At different spatial scales, from plot to region and city
- ii. Between major forest types and urban greenspaces
- iii. Optional objective: Explore the development of a predictive tool which can predict changes in nutrient, water and energy fluxes arising from future changes in land cover, including in the types of green spaces.

(d) To develop guidelines for greenery planning and design to improve nutrient, water and surface energy cycling

Projects are encouraged to further build upon the above-mentioned objectives, and/or propose additional research objectives.

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Minimum Project Deliverables

- a. Set-ups and protocols for long-term monitoring of: (i) the hydrological pathways involved in transporting nutrients at the soil-water interface, and (ii) surface energy fluxes associated with the vegetation and atmosphere
- b. Hydrochemical and surface energy balance models for different vegetation types with diurnal and seasonal resolutions
- c. Development and validation of indicators to quantify the suitable fluxes to allow monitoring of the long-term impacts of City in Nature on these fluxes. At least one indicator (Bowen Ratio) should be tested
- d. Models for quantification of the relationships between nutrient, water and surface energy fluxes on the ecosystem performance (nutrient cycling, water cycling and surface energy balance) of forest and urban greenspaces

Projects are encouraged to further build upon the above-mentioned deliverables, and/or propose additional deliverables.

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Minimum Project Deliverables

- e. Final report with literature review, must cover all the above deliverables, integrate results of comparisons between forest and greenspace types, and provide guidelines for forest and urban greenery management, including which monitoring methodology to adopt that is most cost-effective in Singapore's context
- f. Publications in top scientific journals of relevant fields
- g. Workshops and presentations for demonstration of monitoring protocols, dissemination of information and other forms of knowledge transfer

Projects are encouraged to further build upon the above-mentioned deliverables, and/or propose additional deliverables.

Eligibility, Funding Support & Review Process

Eligibility

- Researchers from all Singapore-based research institutions or companies are eligible to apply.
- The Lead PI must be based in Singapore and all research work should be undertaken in Singapore, unless expressly approved by NParks. The Lead PI may involve researchers from other institutions or companies in the proposal.
- The research team should possess the necessary expertise to address the objectives of the proposal. The PI is encouraged to engage other researchers outside his/her lab to develop a comprehensive proposal that fully addresses the stated objectives. Partially addressed objectives will not be considered favorably.
- Collaboration with industry partners is encouraged to develop innovative solutions that demonstrate strong potential for real-world application within and beyond Singapore.
- Proposals already funded by other government agencies will not be considered for funding. Proposals with similar scope to proposals or projects currently under evaluation by other funding initiatives must be declared in the proposal submission and will not be considered until the results from the other funding initiatives are finalised. PIs are encouraged to describe the synergies between past or current projects and this proposal.

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 B of the RCO info sheet for the list of non-fundable direct costs of research.

Funding Support

- NParks will support 100% of the approved qualifying direct costs of a project for Singapore-based IHLs / public RIs. Private sector entities will qualify for up to 50% of the approved qualifying direct costs of a project, depending on the entities involved:
 - a) 30% for all non-Singapore entities based in Singapore (including non-Singapore not-for-profits) and Singapore-based Large Local Enterprises.
 - b) 50% for Singapore-based Small, Medium Enterprises and start-ups.
- Support for indirect costs, in the form of overheads, will only be provided for Singapore-based IHLs / public RIs. Funding support of 30% of the total qualifying approved direct costs will be allowed. Funded Institutions will be responsible for administering and managing the support provided by NParks for the indirect costs of research. Indirect costs must be specifically provided for in the grant and approved by NParks based on the nature of the research.

Funding Support

- The proposed budget should not exceed the funding support limit stated in the RCO Information Sheet. Proposals exceeding this limit will be regarded as ineligible.
- The proposed budget should be based on realistic costings with appropriate justifications. The reasonableness of the budget will be considered in the assessment of the proposal and may be subjected to amendments and revisions.
- When budgeting for funding, the total cost of the project should include all approved direct costs and indirect costs. All expenditures should be budgeted inclusive of any applicable Goods and Services Taxes (GST) at the prevailing rates, where applicable. No additional claims for GST will be reimbursed.
- For all direct cost items proposed for the project, please note that:
 - a) Funded Institutions must strictly comply with their own procurement practices
 - b) Funded Institutions must ensure that all cost items are reasonable and incurred under established policies and prevailing practices
 - c) All items/services/manpower purchased/engaged must be necessary for the R&D work

Funding Support

- The Lead PI should ensure that the proposed budget is correct and free from error.
- Proposed equipment to be purchased should be currently unavailable in the funded Institution or institution of collaborators. Necessary justifications for purchase must be provided, and NParks' explicit approval has to be obtained if similar equipment is available in a funded Institution.
- At the end of the project, NParks shall have the option to own any equipment purchased using NParks' funding support at no transfer cost.

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

Evaluation of Proposals

- Proposal submissions will be subject to evaluation by a Project Evaluation Panel appointed by NParks. NParks may also decide to send the research proposal to third-party reviewer(s) for comments.
- NParks reserves the right to not select any proposals for funding and may require revisions to enhance research outcomes and optimise funding resources. **NParks' decision on project and funding support will be final.**

Evaluation Criteria

Criteria

Strength & Quality of Proposal

A) Research approach

- Demonstrate clear relevance to addressing the research objectives and expected deliverables stated by NParks
- Utilise a technically sound methodology appropriate for addressing the research topic
- Build upon outcomes of published research and/or other ongoing/past research

B) Potential for application, Deployment or Commercialisation/Export

- Generate outcomes suitable for deployment or application, addressing policy, operational, and/or commercial needs in both Singapore and globally

c) Execution Plan

- Clearly outline plans to execute the research and facilitate the deployment or application of the research outcomes
- Ensure a reasonable and achievable timeline for producing project outcomes in a timely manner
- Base the proposed budget on realistic costings to achieve the research deliverables

Strength & Quality of Research team

- The proposed research team composition should have the relevant expertise and experience to effectively fulfil all project tasks

Value-Added Research Components

- Proposals demonstrating scientific novelty and potential for breakthrough or innovation, along with additional research outcomes exceeding those expected by NParks, will be favorably considered

Project and Funding Agreement

- Prior to project commencement, a Research Collaboration Agreement (RCA) or similar agreement will be signed between the Lead PI's institution and NParks, outlining full responsibilities and obligations of collaborators.
- Institutions party to the Singapore Public Sector Organisations Master Research Collaboration Agreement (MRCA) will sign a Project Agreement (PA) with NParks through the Lead PI's institution.

Instructions for Submissions of Proposals

Overview of Timeline

FOR APPLICANTS & INTERESTED PARTIES (SGT, UTC +08:00)

Grant Call Opens (for 11 weeks)	15 March 2024
Briefing Session & Networking	2 April 2024, 9.30am
Grant Call Closes (Proposal Submission Deadline)	31 May 2024, 2.00pm

FOR SHORTLISTED APPLICANTS ONLY

Notification of shortlisted applicants	August 2024*
Presentation to Project Evaluation Panel (2 or 3 days)	September 2024*

FOR SUCCESSFUL APPLICANT

Notification of successful applicant	November 2024 onwards*
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** Timings are indicative; shortlisted/successful applicants will be notified accordingly.*

Submission Instructions

- All project proposals must be submitted using the prescribed Project Proposal Template in Microsoft Word format to [Sorain Ramchunder@nparks.gov.sg](mailto:Sorain_Ramchunder@nparks.gov.sg) by **31 May 2024, 2:00pm, Singapore time (UTC +08:00)**. Late or non-prescribed submissions will not be entertained.
- Files must be named in the following convention: *FP_<RCO Number>_<Name of Lead PI>*.
- Full proposals and supporting documents will only be deemed submitted if all relevant forms with attachments are included. Incomplete or non-compliant submissions may be disqualified. Refer to the Project Proposal Template for details.

Contact Information

- For **general information**, please refer to the Grant Call FAQs document on the [RCO website](#).
- For transparency, no verbal enquiries will be entertained. However, if you require clarification, please contact Sorain Ramchunder at [Sorain RAMCHUNDER@nparks.gov.sg](mailto:Sorain_RAMCHUNDER@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.