RESEARCH COLLABORATION OPPORTUNITY

Research Collaboration Opportunity Ref No.: RCO-CUGE-2020-02

Project Title: Effects of Planting Schemes on Particulate Pollution Exposure Along Tropical Urban Streets

1. Key Challenges and Objectives

1.1 Vegetation is generally beneficial to urban air quality, although they do not represent the complete solution to air quality problems in a city. The ways in which vegetation in tropical urban areas buffer airborne pollutants is poorly understood, with limited definitive observational evidence.

1.2 However, the research in temperate climates so far, does indicate that urban trees can help improve air quality, and the wellbeing of city dwellers. Research in the United States has shown that the combined effects of vegetation on air pollution are significant enough that urban vegetation could provide a viable means to improve air quality and help meet clean air standards in the US (Nowak et al., 2006). Research has also shown that vegetation is suitable as a barrier (close to a pollution source), allowing concentrations immediately behind the barrier to be reduced by a factor of two (Gayle et al., 2011).

1.3 Existing simplified models on the mitigating effects of vegetation on air pollution may not have taken into account the complexity of the physical and chemical environment in urban areas (such as, airflow regimes, presence of urban structures and variable emission sources). More can be achieved through detailed field measurements, and by modelling involving combined systems, such as a vegetative heterogeneous canopy model coupled with high detail aerodynamic geometric models, computational fluid dynamic models and computer simulations with inputs on important biophysical parameters like canopy architecture, and leaf area index.

1.4 ***This project seeks to measure the variable abilities of different planting schemes in buffering particulate matter (e.g. PM, including $PM_{2.5}$) from urban traffic. It includes quantifying the effects of different planting schemes/typologies on PM pollution. Overall, the objective is to understand the mitigating effects of vegetation on the exposure of pedestrians to particulate pollution at the street level.***

2. Minimum Project Deliverables

The deliverables described here represent the minimum outcomes arising from the proposed project. **Additional relevant deliverables that are proposed will be favourably considered during project evaluation**.

(i) Assess on road near-source air quality gradients and characterise exposure zones through heat maps.

(ii) Roadside or on-road measurements with post processing of the sensor readings to evaluate $PM_{2.5}$ concentrations (amongst other pollutants) with geo-referencing (temperature, humidity and traffic related data to be included).

(iii) Fine-grained spatio-temporal contamination profiles (less than hourly averages required in contrast to hourly profiles from existing fixed monitoring stations)

(iv) Measured data on the effectiveness of different planting schemes/typologies and suitable controls to study vegetation as a barrier to airborne $PM_{2.5}$ particulates and/or other pollutants.

(v) The model(s) should be validated against time series $PM_{2.5}$ (amongst other pollutants) raw measurements from sections of major roads (with 300 to 400 vehicles passing within an hour) that are no less than 250 m in length.

(vi) A project report, including practical recommendations on how plants could be used along urban roads to improve air quality for pedestrians.

3. Budget Limits

3.1 The proposed budget, including GST, cannot exceed **$420,000.00**. Proposals that exceed this limit will not be considered. Please note that this amount is simply an indication of budget availability, not an estimate of expected project cost.

3.2 The project duration should also not exceed **18 months.**

3.3 Please note that NParks' decision on the funding support to be awarded for the project is final.

4. Submission Instructions

Proposals for the Research Collaboration Opportunity as stated above must be submitted to vivek_govindasamy@nparks.gov.sg by 17 July 2020, 1200 hrs.

5. Enquiries

For transparency, all enquiries and associated clarifications will be published (without details on the identity of the person making the enquiry) on the Research Collaboration Opportunity page on the CUGE website. We regret that phone enquiries will not be entertained.

For enquiries, please contact vivek_govindasamy@nparks.gov.sg for enquiries.