GREEN BELT

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**11th April 11, 2019**

**Request for Proposals: Examining the Role of Green Infrastructure and the Greenbelt's Urban River Valleys in Building Resilience to Climate Change and the Impacts of Extreme Heat**

## Background

The Greenbelt is 2 million acres of protected farmland and natural systems in the Greater Golden Horseshoe Area. In 2016, 21 Urban River Valleys were added to the Greenbelt. These vital natural connectors link Lake Ontario to the Greenbelt's regional natural heritage system. They are also important green infrastructure community assets, with 4 million people living within 2 km of one of the 21 URVs, and benefiting from the many ecological goods and services they provide.

The focus of this project is examining how the URVs help build resiliency in urban communities to the impacts of climate change, by examining their role during extreme heat events. The highly vegetated sections of URVs create significantly cooler air temperatures compared to those in densely built up areas of the cities, which experience the urban heat island effect. Given the negative health consequences associated with extreme heat, the URVs provide important climate adaption capacity in the form of heat refuge and a consistent supply of cooler air to nearby neighbourhoods.

The Greenbelt Foundation is commissioning this project to identify opportunities to help reduce the risk of illness and mortality during extreme heat events through the strategic use of green infrastructure and URVs. The results of this work should be informative for municipal and community climate adaptation / resiliency planning across the region, and provide specific recommendations for the two case study communities.

Practical opportunities will typically fall under two categories of activity:

1. Increasing service provision:
    a. Creating greater access to the URVs through trails, signposting and safe entry points
    b. Creating shaded rest areas inside the URVs and in close to nearby communities
2. Extending service provision
    a. Expanding the area of natural vegetation in the URV
    b. Installing networks of green infrastructure connected to the URV

## Study Focus

Changing land surface properties, from permeable and moist areas (e.g. vegetated lands) to dry and impermeable (e.g. roads and buildings), reduces evaporation and latent heat fluxes (Wong, 2008). Altering land use/land cover causes

higher surface and ambient temperature in the built-up environment and lead to the formation of an Urban Heat Island (UHI).

The main factors that contribute to the heat island effects are: large surfaces of materials (mainly asphalt and concrete) with low albedo and high emittance; reduced vegetation and permeable surfaces, which limit shade and evapotranspiration; tall buildings and narrow streets that modify overall wind speeds and create urban canyons; concentration of heat-generation released from human activities. UHI mitigation methods are to increase the reflectivity of surfaces (albedo) and greenery spaces (vegetation) on roofs, pavements and walls.

The UHI has been mapped across the Region of Peel as part of their climate adaptation planning, leading to the identification of several heat vulnerable communities. Two of these heat vulnerable communities are in close proximity to Greenbelt URVs, and are therefore ideal study locations to explore the role of the URVs in helping reduce heat related illness arising from the impacts of climate change and resulting extreme heat events. The URVs are known to mitigate the UHI and this study will assess the associated respite function by assessing temperature differences between URVs and their nearby heat vulnerable communities.

Given the large transformation and fast-growing population that the Greater Golden Horseshoe is facing, and in the context of climate change, it is crucial to investigate the urban design influences on ambient temperature and heat island intensity and furthermore to consider the benefits of strategies that could be implemented to mitigate the possible UHI effects.

This study will explore the potential impact of UHI mitigation methods, by modelling the micro-climatic changes resulting from incorporating new green infrastructure (including urban tree canopy) into the communities. The scenario modelling will also assess whether there is any additional cooling affect created by designing a connected green infrastructure network linked to the URVs, for example through tree planting on streets, parks and playgrounds.

The Foundation and partner organizations will provide the selected project team:

- Exact delineation of the study communities
- Geophysical data for the URVs intersecting with the study area
- Existing heat island mapping and reports produced through the Sustainable Neighbourhoods Action Program (SNAP) for the study communities
- Census data

Proposals should include any additional data requirements and strategies for how they will be collected.

Proposals should also address the following activities:

*Activity 1: Benchmark*

- Assess the current and future cooling service provision of the Greenbelt URVs by evaluating temperature differences between built up areas and natural areas during summer temperatures that cause negative health outcomes. Future scenarios will be based on existing Canadian climate models for Ontario.
- Output = assessment of the extent of the URV 'cooling shadow' in the context of extreme heat days & nights, overlaid with household population data

*Activity 2: Design Scenarios*

- Assess opportunities to expand the 'cooling shadow' provided by URVs through considering the impacts of changes in urban morphology by applying green infrastructure heat island mitigation techniques to the built up area connected to URV boundaries. The goal is to evaluate the effects of land use/land cover modifications with recent observational data, surface information, meteorological and photochemical models, emission inventories and improved simulation methodology.
- Output = modelled scenarios for the two heat vulnerable communities. Development scenarios (i.e. changes to urban form) will be established in consultation with project partners, and will be limited to the defined heat vulnerable communities

*Activity 3: Recommendations*

- Provide recommendations / guidance on:
    - how to optimize the function of URVs in terms of heat adaptation for the case study communities
    - general strategies for optimizing the heat adaptation function of all 21 Greenbelt URVs

**Proposals Requirements**

- Describe overall methodology for completing the project
- Outline of proposed modelling approach including variables, outputs, description of how it will meet the goals of this study, data requirements for constructing the model, and data acquisition responsibilities
- Include work plan, budget (including hours) and CVs for all named parties of the project team

**Project Timeline**

The project should be completed by November 2019.

The *Friends of the Greenbelt Foundation* reserves the right to choose any or none of the vendors responding to this request for proposals.

Any questions and completed proposals should be directed to:

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**Proposals must be received by email no later than 4pm on Friday 26<sup>th</sup> April 2019.**