**Identifying Optimal Locations for the Development of Urban Greenspace (UGS)**

*Graded: 27/30*

**Contribution 9/10**

**Interesting project idea. Good, logical methodology with reasonable application and discussion.**

**Subject Knowledge 5/5**

**Evidence of research effort and initial thinking about how to resolve the proposed problem. Good integration of major concepts and geoprocessing tools that will aid in the spatial analysis of this project. Good integration of course context into the proposal.**

**Supporting Material 5/5**

**Excellent identification of relevant data sources to solve the proposed problem. Analysis considerations were well supported by the provided information. It might be worthwhile to look into using population density, land use and transportation network shapefiles/datasets as well.**

**Composition 3/5**

**Good organization. Structure and flow could be improved and there were a few minor grammatical errors. The underlying logic was clearly articulated and easy to follow.**

**Teamwork 5/5**

**The self-reflection indicated a high level of mutual respect and collaboration. Project work is equally divided and balanced for all group members. Evidence of in-depth thought and planning.**

**Group 12 Members:** Ziran Jeffrey Zhou 1002425477, Christian Geofroy 1003193723, Muhamad Muizzuddin Roslihuddin 1003277189, Jong Su Kim 1004410648, Gloria Lim 1003557741

**Problem Statement**

We are a city planner for Toronto Parks and Recreation and want to figure out the distribution of parks across the city. Some areas of the city don’t have any park whereas some areas have very large ones. New urban development hasn’t taken into account building enough UGS surrounding new buildings and we want to figure out where they should optimally be placed. UGS is defined by any public park within the city of Toronto.

To recommend the optimal location of these parks, we need to take the average walking time that people will deem worthy of going to the park and distribute that buffer across the city so the parks are located in an accessible place for as many people as possible.

**Background**

UGS is important for the sustainable development of a city. According to Russo & Cirella (2018), a city in Slovenia called Ljubljana, was awarded the 2016 European Green Capita was reported to have 560 m2 of UGS is available per inhabitant and most of its residential zones are within a 300 m radius from UGS (Russo & Cirella, 2018).

**Data**

The study area is Toronto city, and the data that will be used for this analysis include:

1. Toronto ward boundaries shapefile [1]
2. Toronto public parks shapefile [2], which will be filtered so that only public parks are used in the analysis.
3. Toronto sidewalk network shapefile [3]

**Goals**

* To analyze the spatial distribution of UGS in Toronto.
* Find the effective area of UGS in terms of distance to a person
  + We believe that the point of UGS is for people to enjoy nature without having to take a car or public transport to reach. Therefore ensuring that UGS is within reach by your average person is critical for both current and future urban development.
* Use ArcPy to develop a script to identify potential locations for the development of UGS so that they cover as much area as possible with minimal gaps and overlaps. The areas generated will be a general suggestion to where the UGS should be built, not a specific site.

**Methods**

* Identify the desirable walking distance to a park for the average person, and use this distance as a buffer for UGS to develop an effective area of UGS.
* Feature to point tool will be used to convert the centroids of the UGS feature class into points.
* Use the Thiessen polygon tool to divide the UGS area to visualize the current distribution of UGS.
* Use Spatial Autocorrelation to calculate Global Moran's I to determine whether the existing parks are clustered or dispersed.
* Use hotspot analysis to identify clusters of UGS, such as areas of high and low intensity.
* Use service area analysis to highlight the effective surrounding area of a park by setting the area to distance people are willing to walk to the park. This shows how much reach a park has, and highlights any area not covered by a park.
  + For example, if the average walking distance is 750m, then every UGSwill have an effective area of 750m. If another UGS is positioned 2000m away, then residents outside of these affective areas will have a harder time accessing a UGS.
* From the previous step, we can discover areas that are not covered by UGS. The following step is to use the Build Balanced Zones Tool from the Mapping Clusters toolset to create spatially contiguous zones to identify the optimal locations for the development of UGS. The tool will have parameters such as:
  + Must be at least X distance from buffers created by existing parks via the service area analysis tool
  + Size/extent of new UGS
  + Any other parameters deemed necessary for effective area coverage
* This will show the optimal areas to build parks, which can be applied to any city, not just Toronto, as well as determine optimal areas to build parks in a developing area.

**Tentative Timeline**

Friday, Nov 8: Complete research on walking distance and gather all necessary data. Determine the scale of study area i.e. all of Greater Toronto Area, or select wards.

Monday, Nov 18: Complete service area analysis on existing areas, and determine the parameters for placing new UGS in ArcPy.

Friday, Nov 22: Complete Build Balanced Zones Tools and ArcPy to automatically place new UGS and create a flowchart of illustrating data processing and programming

Thursday, Nov 28: Complete presentation slides and organizes presentation plan

Nov 28 - Dec 3: Prepare for presentation

**Tools**

The tools used for this study will be focused on the spatial analysis of UGS and identifying the zones requiring the development of UGS.

1. Feature to point tool will be used to convert the centroids of the UGS feature class into points.
2. Thiessen Polygons tool will be used to divide the area surrounding each UGS to identify zones within the proximity of each UGS.
3. Spatial Autocorrelation to calculate Global Moran's I (explore the global relationship)
4. Identify hotspots and coldspots using the Mapping Clusters toolset. Hot Spot Analysis identifies statistically significant spatial clusters of high values (hot spots) and low values (cold spots).
5. Service area analysis tool will be used to highlight the effective surrounding area of a park by setting the area to distance people are willing to walk to the park.
6. Use the Build Balanced Zones tool from the Mapping Clusters toolset to create spatially contiguous zones based on equal areas to identify the optimal locations for the development of UGS.

**Data Sources**

[1] <https://open.toronto.ca/dataset/city-wards/>

[2] <https://open.toronto.ca/dataset/parks/>

[3] <https://open.toronto.ca/dataset/sidewalk-inventory/>

[4]<https://www12.statcan.gc.ca/census-recensement/2011/geo/RNF-FRR/index-s-eng.cfm?year=19>

**References**

Russo, A., & Cirella, G. T. (2018). Modern compact cities: How much greenery do we need? International Journal of Environmental Research and Public Health, 15(10). <https://doi.org/10.3390/ijerph15102180>

Yang, Y., & Diez-Roux, A. V. (2012). Walking Distance by Trip Purpose and Population Subgroups. *American Journal of Preventive Medicine*, *43*(1), 11–19. doi: 10.1016/j.amepre.2012.03.015

<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3377942/>

GGR321 Group Project Self-Reflection Form

Group ID: 12

Describe the Team’s Progress:

We have completed the proposal with realistic goals and soft timelines. We will try to follow the timeline as close as possible but will work together to finish everything.

Describe the Contribution of Team Members:

*See Below*

Team Member’s Name: **Ziran Jeffrey**

Team Member’s Current Contribution: Group discussion on viable topic. Creation of methods and timeline, provide reference to walking distance and data source. Discussion of tool usage

Expected Future Contributions: Help in performing service area analysis and create optimal UGS place using build balance zone tool.

Team Member’s Name: **Christian**

Team Member’s Current Contribution: Created the problem statement and helped decide on the tools used and methods

Expected Future Contributions: Help develop the script and create the presentation

Team Member’s Name: **Muhamad**

Team Member’s Current Contribution: Involve with brainstorming topic or problem to solve and have some experience in network analysis (service area)

Expected Future Contributions: Know how to use service area and involve with develop pyton script

Team Member’s Name: **Gloria**

Team Member’s Current Contribution: Search for tools which can be used in the methods, contributed to the background based on a reference to a research paper.

Expected Future Contributions: Contribute to the script writing and presentation preparation.

Team Member’s Name: **Jong Su**

Team Member’s Current Contribution: Gave some ideas to the project.

Expected Future Contributions: I will help program python using my experience in programming from Computer Science courses and in the presentation.