SMT483 Project Proposal

Measuring and Mapping "Car-Lite" Levels in Neighbourhoods Through a Geographic Information System

MapSmoo

Smart City Management and Technology

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Faculty Supervisor:
- Name[1]

Sponsor:
Urban Redevelopment Authority (URA)
- Miss Joyce Lim, Planner, URA
- Miss Lim Li Fang, Planner, URA

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[1] To be assigned by course coordinator

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Project Overview

1.1 Project Description:

An over-reliance on motorized vehicles has negatively impacted the liveability of Singapore, especially with urbanization and a rapidly increasing population. The transport sector contributes to 15% of Singapore's greenhouse gas emissions, contributing significantly to air pollution and deterioration of the environment. Traffic congestion also imposes economic costs on the country. This has prompted the government to work towards a vision of a car-lite[2] city.

Therefore, understanding the level of 'car-lite'ness of neighbourhoods is of paramount importance for the government and agencies to better take steps to focus future developments towards making neighbourhoods more car-lite. As such, this project aims to develop a set of matrices to measure the car-lite level of each neighbourhood in Singapore. These matrices, in union with a GIS mapping application, will enable better planning and prioritization of resources, to enable each neighbourhood to attain a minimum car-lite score.

1.2 Stakeholders:

Sponsor	Miss Joyce Lim, Miss Lim Li Fang
User	Urban planners
Advisors/ Practitioners/ Mentors	Nil

1.3 Deliverables:

Outcomes	1. Set of matrices to measure car-lite level in neighbourhoods in Singapore 2. ArcGIS map layers that can be used to calculate the car-lite level of neighbourhoods 3. Car-lite mapping application prototype and documentation (school requirement) 4. Presentation and report (school requirement)
Value Statement	To identify car-lite levels in Singapore's neighbourhoods so as to manage the negative environmental and infrastructural impact of vehicles on our roads

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[2] Car-lite is defined as reducing the number of motor vehicles on roads

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1.4 Scope:
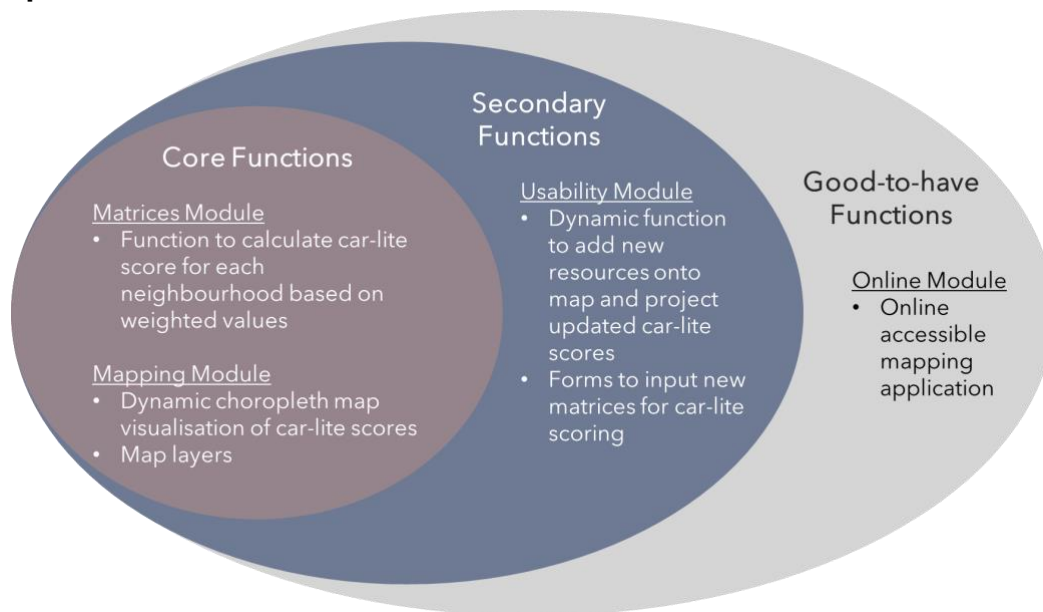
There are 2 phases to this project: (1) research and development of car-lite matrices, and (2) development of a GIS tool to access car-lite scoring in Singapore. Phase 1 will cover the Matrices Module, while Phase 2 will cover the Mapping, Usability and Online Modules.

1.4.1 (1) Research and Development of Car-Lite Matrices

The first step to becoming more car-lite will be to understand how the current urban environment promotes or dissuades motorized vehicle usage. Existing research on transit-oriented development espouses developing urban infrastructure with the aim to increase public transport ridership, by reducing the use of private cars and by promoting sustainable urban growth. These studies provide various matrices on measuring the success of transit-oriented development. However, these matrices must be further adapted to fit Singapore's socio-economic landscape.

As such, a further literature review will be undertaken to ascertain the variables (e.g. distance from public transport, number of carparks) that should be considered in the matrices for measuring the car-lite scores. The car-lite score will aim to provide an aggregated view of the level of motorized vehicles and of infrastructures that promote or dissuade their usage in a neighbourhood.

As the calculation of car-lite scores is the core function of the application, the first phase of the project will be to develop a set of matrices by identifying relevant variables and assigning appropriate evidence-based scores that can be aggregated into a consolidated car-lite score.

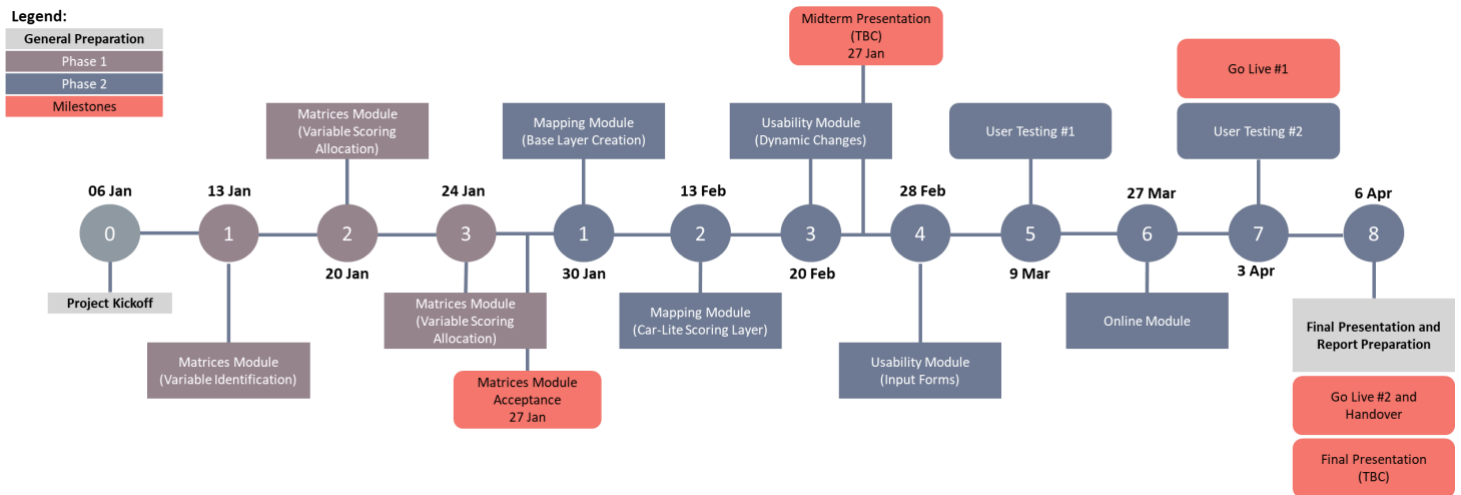### 1.4.2 (2) Development of GIS Tool to Access Car-Lite Scoring of Neighbourhoods in Singapore

Utilizing the matrices developed in phase 1, the second phase will be to develop a tool that can be employed by users to score the 'car-lite'ness of neighbourhoods. At the core, the application will utilize a Geographic Information System to visualize and map out car-lite scores in 311 neighbourhoods in Singapore (e.g. Bukit Batok, Serangoon Garden) based on the matrices developed.

Additionally, the application should allow for modifications in terms of new matrices and variable scoring changes. It should also allow the inclusion of new urban infrastructure (e.g. bus stops, cycling paths etc.) and as such dynamically provide amended car-lite scores.

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1.5   Project Plan

This plan describes the resource, schedule and major risks of the project based on current knowledge of the project.

1.5.1   Project milestones and Timeline:

1.5.2   Risks:

Risks/Assumptions	Mitigation steps
URA utilizes ArcGIS as its GIS tool however the project team does not have ArcGIS licenses (Technical Risk)	- Use QGIS, an open-source GIS tool for development purposes - Shapefiles must be exported from QGIS in a format that can be imported into ArcGIS
Main mapping application development can only start after matrices are identified and confirmed with URA	- Gather data required for mapping layers in tandem with research on matrices
The users utilizing this application will be urban planners and domain experts	- User Acceptance Testing (UAT) should be carried out with these domain experts

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1.5.3   Resource and Reference:

Research and References for Creation of Car-lite Matrices	**Libraries**: Emerald Insight, Gartner **Journals & Publications**: Transit-Oriented Development Standard (TODS), IEEE **Web Sites**: smartcitiesdive.com, citylab.com, fm.smart.mit.edu

Tech Stack for Car-Lite Mapping Application	Technology to be Used
GIS Tool	QGIS (Layers to be converted to ArcGIS format)
Programming Language	Python, R
Data Source/API	URA Propriety Data, Data.gov.sg, LTA Data Mall, OneMap API, OpenStreetMap, Google Maps API
Web Mapping Tool	Leaflet, R Shiny