Overview

The Health Promotion Board (HPB) was established as a statutory board under the Ministry of Health in 2001 with a vision to build a nation of healthy people. HPB organises many Health Promotion programmes and requires many tools to assist them in planning to ensure efficient outreach and maximize public resources.

Motivation

The need for this GIS application came about as the current work processes at HPB is very time-consuming and they would like a custom-made application to assist in their planning. It is difficult for new colleagues to learn quickly as some technical knowledge is required, and hence very reliant on staff who are strong in using QGIS. The current process is manually intensive, as they are required to do analysis by selecting suitable areas for their outreach programmes and calculating their KPI on excel spreadsheets.

Objectives

Our objective is to build an interactive and visual web application that utilises GIS functions for geospatial planning and analysis. It will be able to compute and analyse HPB KPI reporting metrics. The web application should be easy to use to support the staff both technical and non-technical in their many Health Promotion programme and outreach planning. It will also assist the staff in clear and easy to understand presentations to the executives who have little or no background in GIS analysis so as to be able to plan their operations.

Scope of Work

Our scope of work includes building a web application that would run on a SVY21 projection. One of the key visualisation feature is allowing users to toggle, view and overlay map layers, on top of base layers from Open Street Map. Attributes of each location can be displayed on mouseover and users may customise the colours used to represent pointers on different map layers. The function to upload a GEOJson or KML would be included, to allow users to plot their own map layers.

To allow users to calculate the KPI, a form would be required to allow users to input the buffer radius and type of services to search for, within the radius. The application will also generate charts and graphs to visualise the KPI and related data.

Stakeholders

Issac Koh & Team, Health Promotion Board

Data

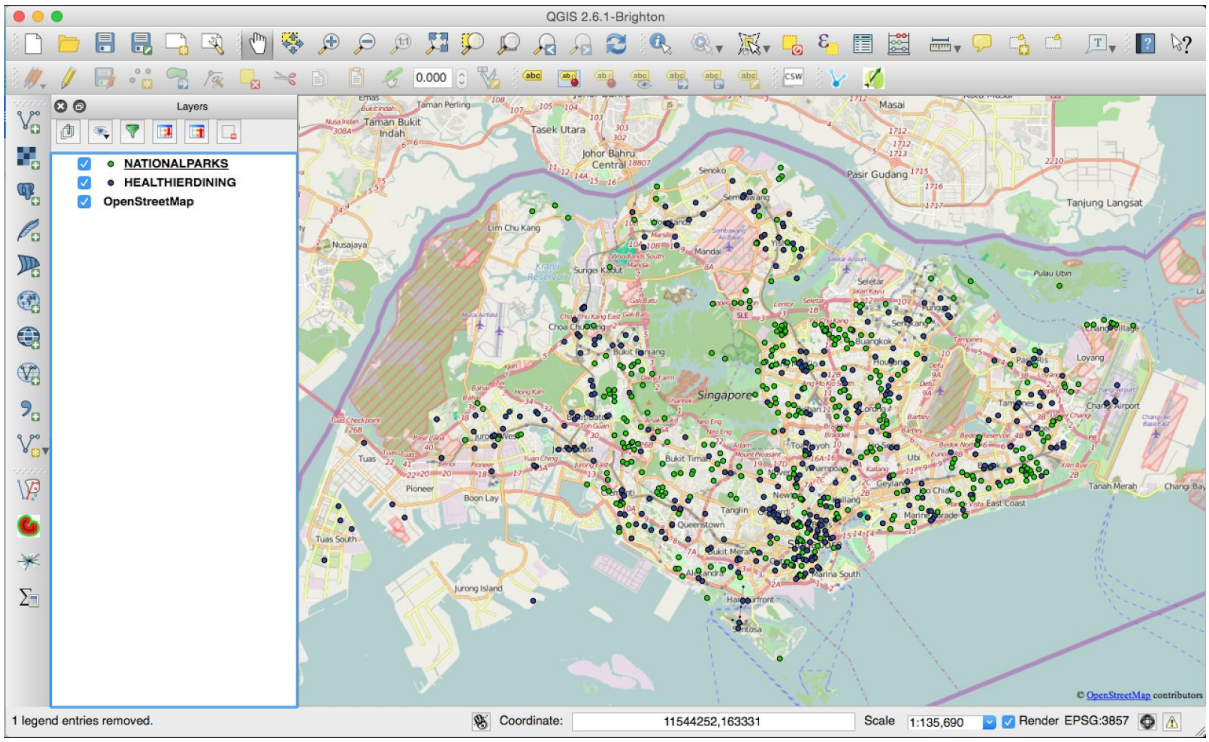
The following datasets would be required for this project

- Living dwellings,
- Healthier dining options(Restaurants, Fast Food Food Court, Coffeeshop)
- Sundays at the Park
- Physical Activity Malls
- Smoking Cessation Touchpoints
- GRC zones

The above datasets would all be represented in point form, with the exception of the GRC zones.

Datasets in the form of .csv, with only postal codes would have to be geocoded. This can be done via Google Geocoding API, but google has imposed a limit of 2,500 requests a day (footnote:1). Alternatively, we can use other geocoding api available online but using a government sourced API would be most ideal for the geocoding of postal codes.

Datasets in the form of KML would have to be converted to .shp or geoJSON and JSON formats. Shapefiles would allow us to explore the data on QGIS while geoJSON and JSON formats allow integration with javascript libraries like d3.js.



Parks and Healthier dining options in KML format on QGIS

Methodology

Before building the web application, we have to first process the data obtained. Data in .xlsx format with no coordinates given will have to be geocode prior. After which, it will be processed on R if necessary. Data will then be stored as json files and retrieved with Javascript.

Map layers in .kml or .shp formats will be plotted on QGIS. Within QGIS, a plugin, QGIS2Leaflet, would then be used to generate a basic template of the web application. New layers can be added on the fly to display on the map for users to add to their analysis computation. The data in the json files for the default layers can also be updated as needed.

The web application would use Javascript and turf.js for the necessary data to be processed and loaded. On the frontend, input fields will be created to take different criterias for spatial queries to compute a KPI result.

Spatial queries, such as searching for locational points within a buffer area of a selected location can be done. After which, on the d3.js would be used to plot charts and graphs linked to interaction on the map layers.

Technologies

Technology	Description
Bootstrap	An open-source framework for front-end development to add aesthetics to our web application.
D3.js	Manipulate data using HTML, SVG, and CSS to allow interaction and animation for our map.
GeoJSON	An open standard format designed for construction of simple geographical features with their non-spatial attributes based on JSON.
Leaflet.js	An open-source JavaScript library for interactive maps to help us add in the needed interactions.
OpenStreetMap.org	A free to use map of the world under an open licence which will be used for our mapping in our web application.
QGIS	A free and open sourced geographic information system to create, edit, visualise, analyse and edit geospatial information.

Deliverables

A lightweight, portable web application that can be easily brought over to different machines without installation. The interactive web application should show the Singapore map with many attributes for filtering to assist in HPB's daily planning needs. The user would be able to use the web application for presentations and also export the generated results into various file formats.

Limitations

We will have to find a method for getting coordinates from postal codes. Also we need to make the application portable as there is a need to run SQL queries and the database cannot be hosted online due to the confidentiality of data.

Project Timeline

Week No./ Date	**Tasks**	**Milestones**
Week 1 4/1/2016	Finalise our project sponsor Gather requirements	10 Jan 2359 Proposal & Wikipedia

Week 2 11/1/2016	Obtain data Familiarize with technologies	
Week 3 18/1/2016	Generate base layers for the web application	
Week 4 25/1/2016	Add new layers into web application	
Week 5 1/2/2016	Set up search feature	
Week 6 8/2/2016	Add upload files to layer feature	Client Review Session
Week 7 15/2/2016	Geocode data	Interim Report Update Wikipedia
Week 8 22/2/2016	Computation of input options	
Week 9 29/2/2016	Visualisation	
Week 10 7/3/2016	Create export results module	
Week 11 14/3/2016	Client Review Session Refine web application	
Week 12 21/3/2016	Refine web application	
Week 13 28/3/2016	Refine web application	Final Presentation & Report Update Wikipedia Poster submission

Gantt Chart

Project tasks are estimated based on an average of 10 hours a week per team member.
Total project hours: 390

We had over run our schedule while generating base layers as it took a while for our team to understand the concepts and how to achieve it. Our team had broke down all our tasks into bite-size portions to better handle it and we were still on track after that.

Project Planner

Period Highlight: 8

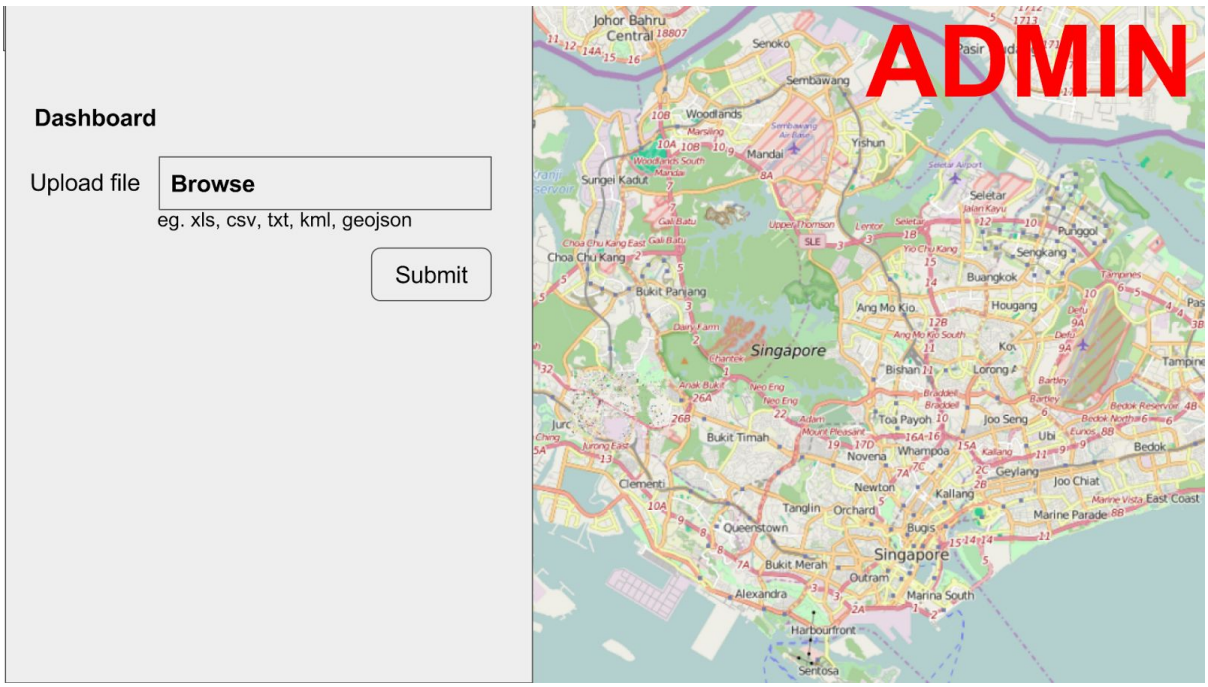
Plan | Actual | % Complete | Actual (beyond plan) | % Complete (beyond plan)

ACTIVITY	PLAN START	PLAN DURATION	ACTUAL START	ACTUAL DURATION	PERCENT COMPLETE
Gather requirements	1	1	1	1	100%
Proposal	1	1	1	1	100%
Create Wikipedia page	1	1	1	1	100%
Familiarize with technologies	2	1	2	1	100%
Generate base layers	3	1	3	2	100%
Add new layers	4	1	4	1	100%
Set up search feature	5	1	5	1	100%
Add upload files to layers	6	1	6	1	100%
Geocode data	7	1	7	2	100%
Interim Report	7	1	7	2	100%
Update Wikipedia page	7	1	7	2	100%
Computation of input options	8	1	0	0	0%
Visualisation	9	1	0	0	0%
Create export results module	10	1	0	0	0%
Refine Web Application	11	3	0	0	0%
Final Presentation	13	1	0	0	0%
Final Report	13	1	0	0	0%
Update Wikipedia page	13	1	0	0	0%
Poster Submission	13	1	0	0	0%

PERIODS: 1 2 3 4 5 6 7 8 9 10 11 12 13 14

Prototypes

To ensure the team and client are on the same page, we did mock-ups. This mock-up shows how that there will be a upload file feature for users to update the layers.



Risk Management

Risk Metrics

Impact	**Likelihood**			
		Low	**Medium**	**High**
	High	B	A	A
	Medium	C	B	A
	Low	C	C	B

“A” risks need the most attention and most well developed mitigation or recovery strategies
“C” risks can occur but require least amount of planning

Risk Assessment

Risk Description	Consequences	Likelihood	Impact	Level	Mitigation
Steep learning curve as team is unfamiliar with geospatial technology and d3.js, turf.js etc	Project may be delayed as time needed to explore the technology.	High	High	A	Start earlier to spend more time exploring the technologies. Find examples from seniors or online.
Client may request for changes to the project scope.	Project may over run due to adjustments	Medium	Medium	B	Team to email client every 2 weeks with latest information.
Team & client may have different visualisation of the application.	Misunderstandings may happen and time wasted to change.	High	Med	A	Create quick mock-ups.

References

https://developers.google.com/maps/documentation/geocoding/usage-limits

https://ir.library.oregonstate.edu/xmlui/bitstream/handle/1957/16305/Opfer_Essay.pdf?sequence=1