

Capturing the Synergy of Geospatial and Statistics

Singapore Land Authority

17 November 2016

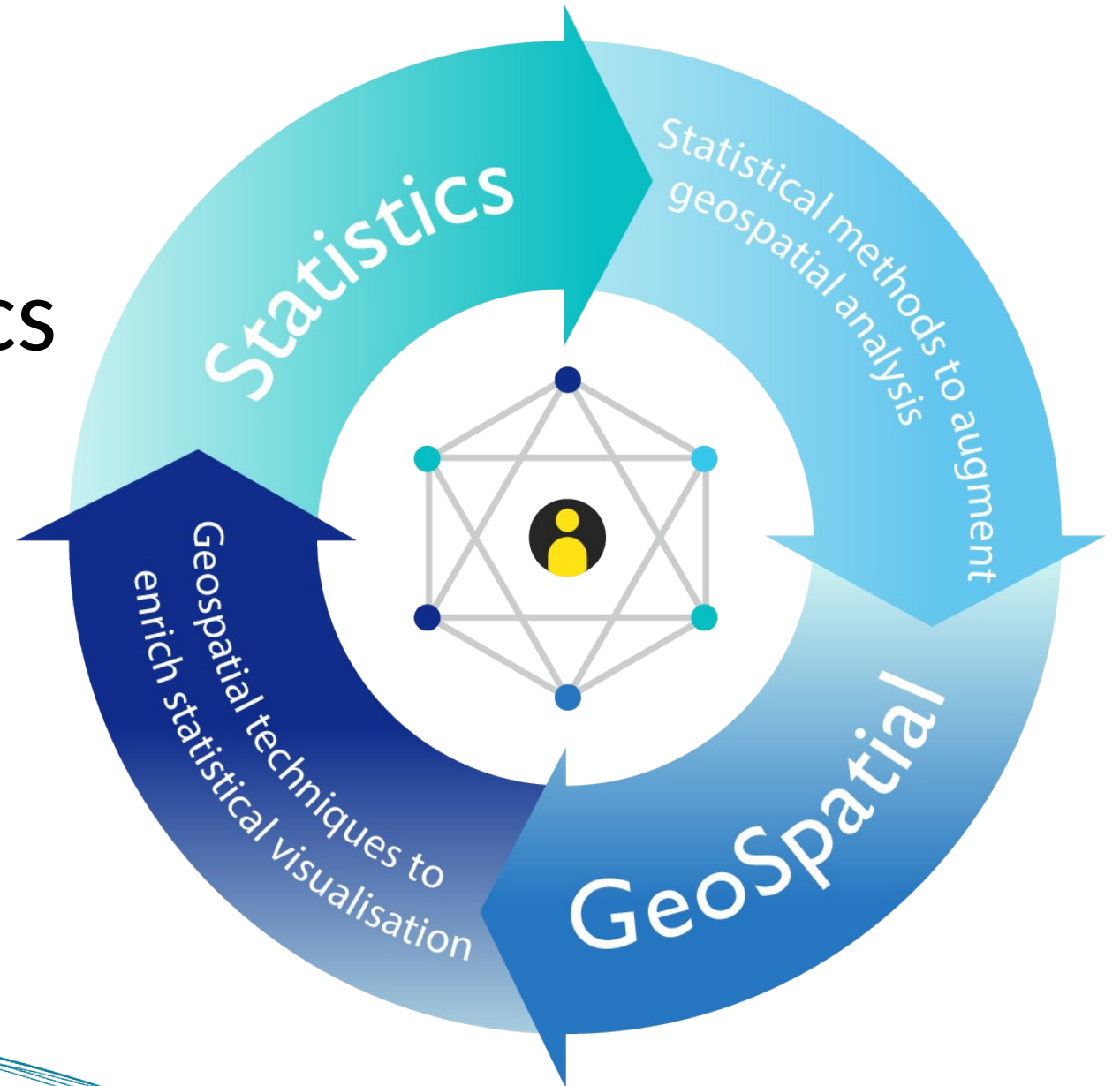
Ng Siau Yong

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Angelinie Winarto

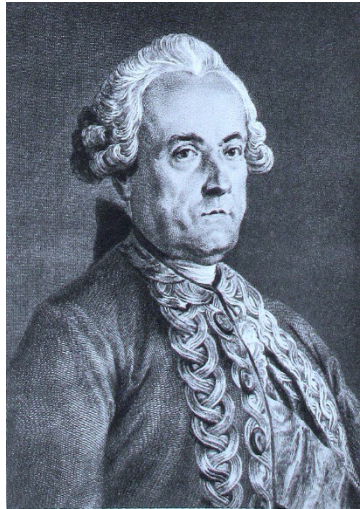
Angelinie_winarto@sla.gov.sg

Integration of Statistics and Geospatial for Mutually Beneficial Collaboration

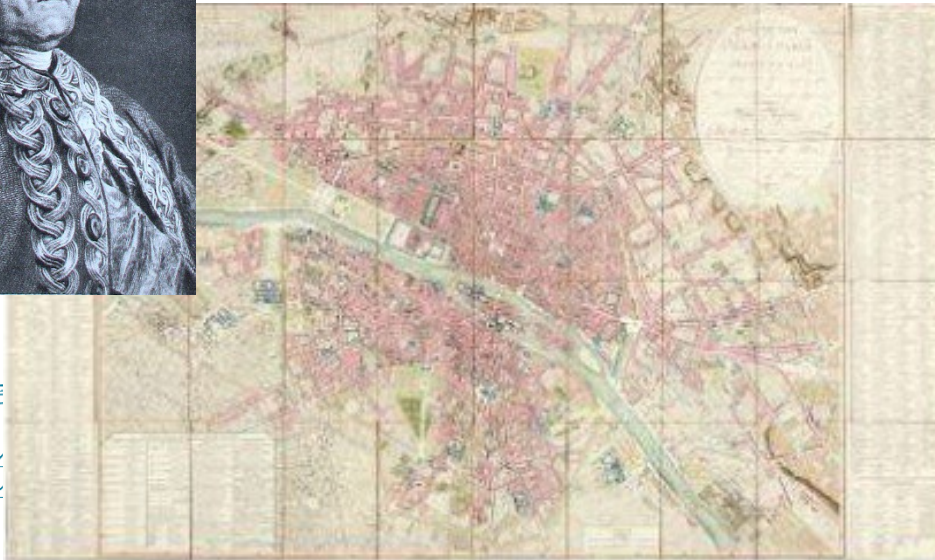


Wave of Cholera Epidemic and the emergence of mapping in 1832

“Rapport sur la marche et les effets du choléra dans Paris et le département de la Seine” by Charles Picquet in 1832



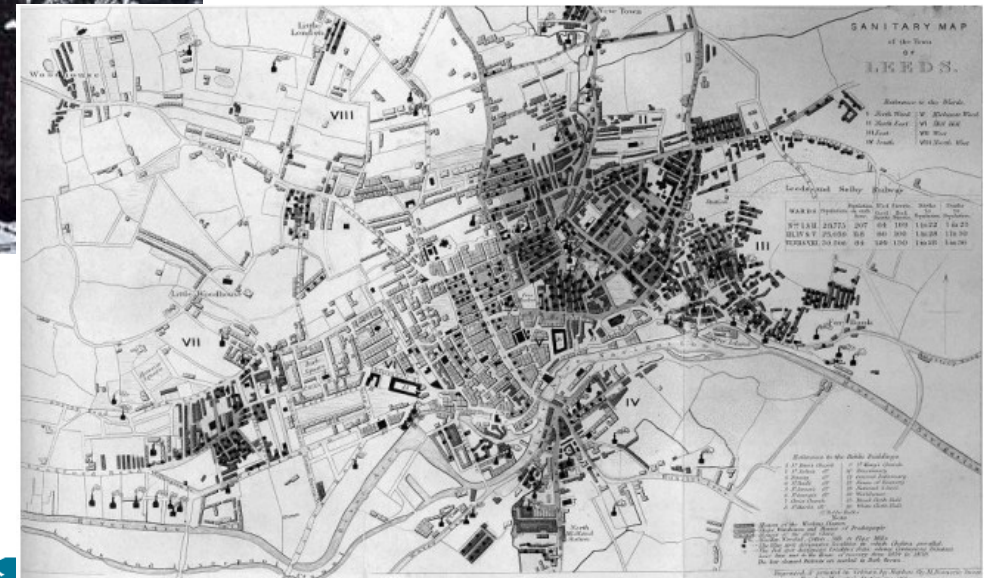
Source: www.wikiwand.com



Robert Baker's sanitary map of Leeds, based in his original 1833 Cholera plan. The less cleansed districts were shown by dark shading.



Source: John Brooke, A tidal wave of disease



Dr. John Snow and the 1854 Cholera outbreak in London's Broad Street region



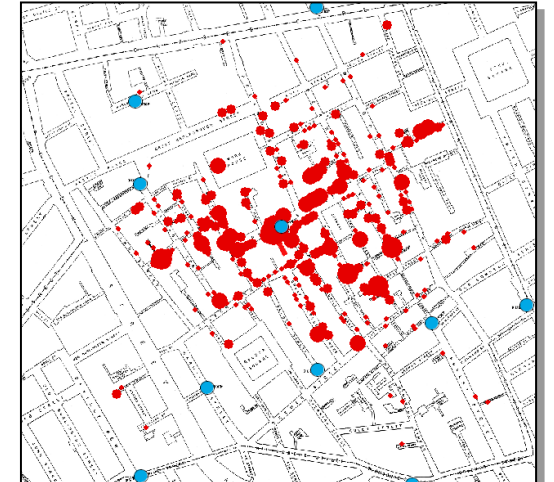
Source: John Snow Inc. www.jsi.com

‘Father of modern epidemiology’

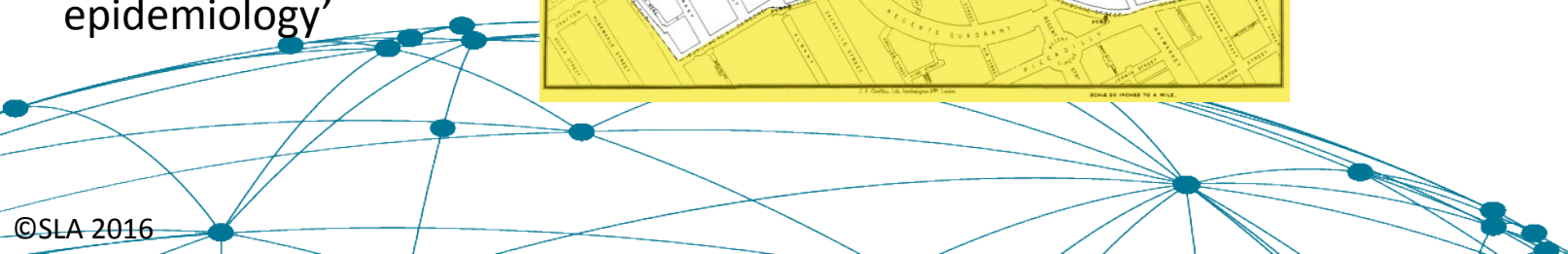
Source: UCLA http://www.ph.ucla.edu/epi/snow/snowmap1_1854_lge.htm



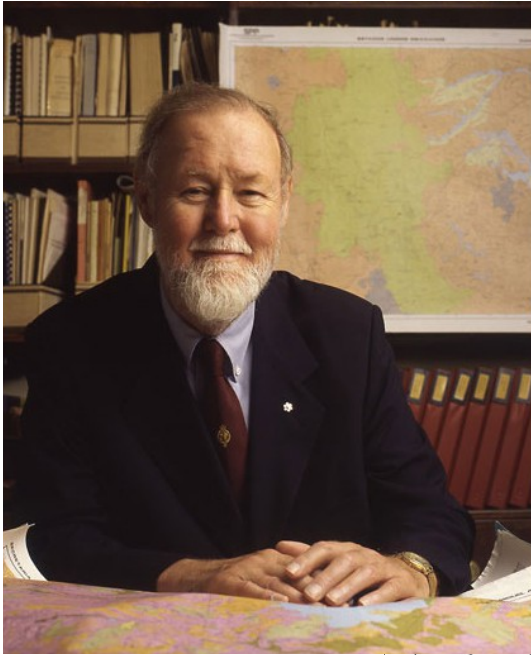
Red highlight for Cholera cases



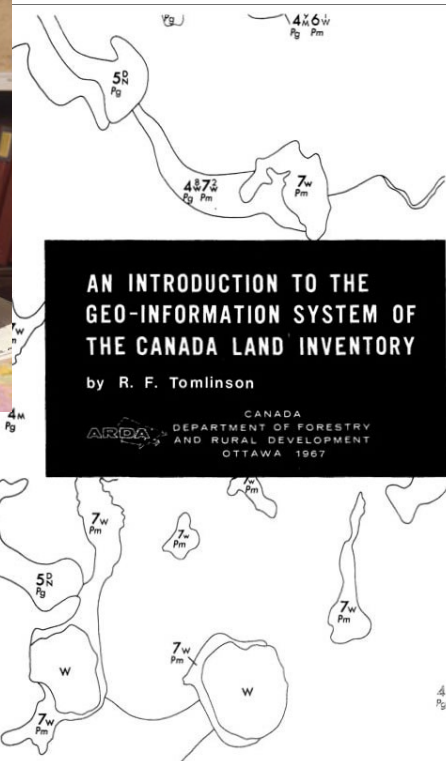
Blue dots for the water sources



Roger Tomlinson the “Father of GIS”, the inventor of computer-based GIS



Source: <http://www.ucgs.org>



The first operational GIS (Canada G.I.S.- CGIS) was developed in 1962 by Roger Tomlinson (“father of GIS”) for land inventory and planning.

“Store, analyse and manipulate data collected – an effort to determine the land capability for rural Canada by mapping information about soils, agriculture, recreation, wildlife, waterfowl, forestry and land use at a scale of 1:50,000” Source: Bondo University College

GIS capabilities go beyond mapping. GIS offers a rich set of analytical functions.

Geospatial and its uses

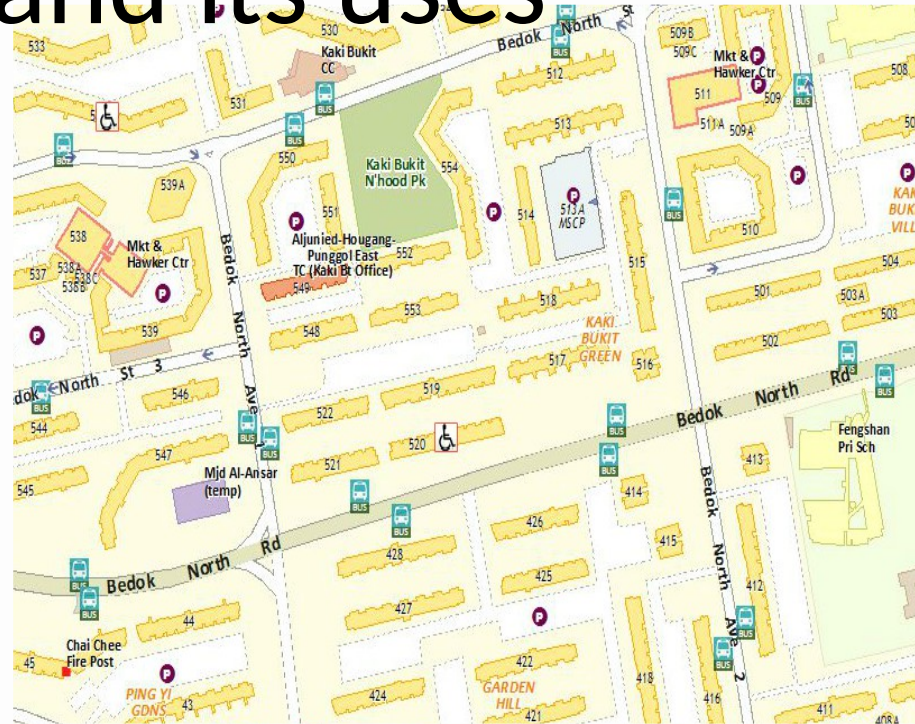
Urban
Planning



Infrastructure
Planning



Asset
Management



Environmental
Management



Defense
& Security



Business
Services



Social
Services

Layer 5: Facilities (point)
Layer 4: Addresses (point)
Layer 3: Roads (line)
Layer 2: Parks (polygon)
Layer 1: Buildings (polygon)
Raster Image – Base Map

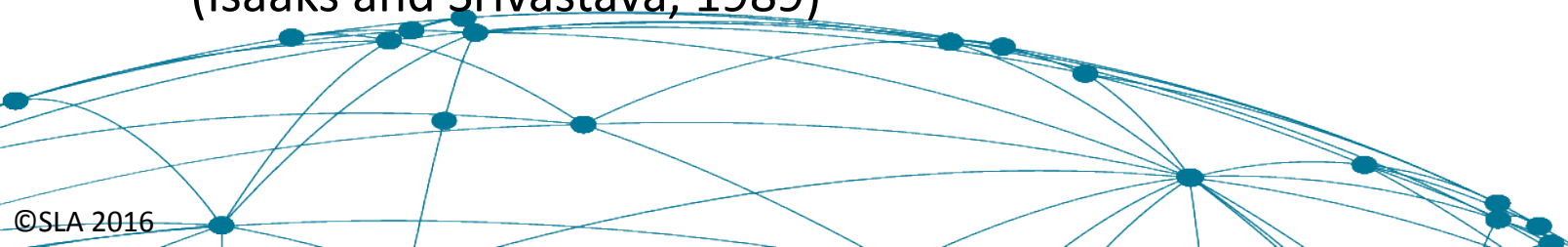


GeoStatistics: Amalgamation of Statistics and Geospatial

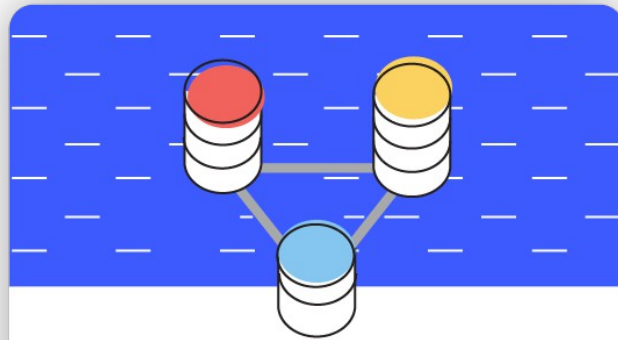
“In its broadest sense, geostatistics can be defined as the branch of **statistical sciences** that studies spatial/ temporal phenomena and capitalizes on spatial relationships to model possible values of variable(s) at unobserved, unsampled locations.” (Caers, 2005)

“Geostatistics can be regarded as a **collection of numerical techniques** that deal with the characterization of **spatial attributes**, employing primarily random models in a manner similar to the way in which time series analysis characterizes temporal data” (Olea, 1999)

“Geostatistics offers a way of describing the **spatial continuity** of natural phenomena and provides adaptations of **classical regression techniques** to take advantage of this continuity.” (Isaaks and Srivastava, 1989)



GeoAnalytics as bridge for statistical and spatial communities



Statistical Data

1. Census
2. Demographic
3. Immigration
4. Healthcare
5. Social welfare
6. Unemployment
7. Family Support
8. ...

Statistical Community



Geostatistics / GeoAnalytics



GeoSpatial Data

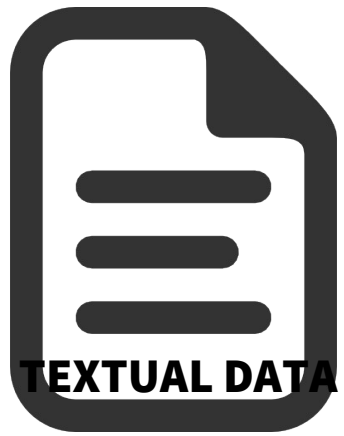
1. Admin Boundary
2. Address
3. Transport
4. Water Network
5. Elevation
6. Imagery
7. Property and Land
8. ...

Spatial Community

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[illegible]

Geotagging – Data Collected with Location Information



- Address
- Postal code
- XY coordinates

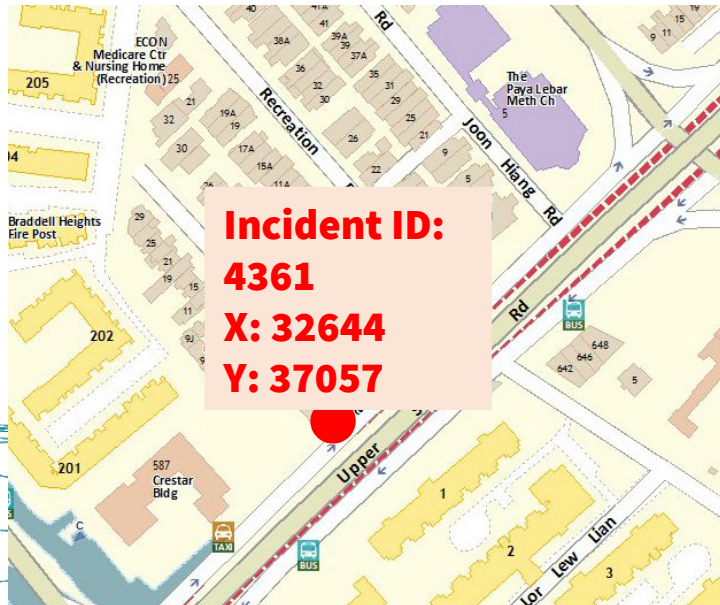


VISUALISATION



GEOANALYTICS,
SIMULATION

V.S.



Eg: Incident ID: 4361

Location: Along
Upper Serangoon
Road near bus stop
between Crestar
Building and The
Paya Lebar
Methodist Church

GeoSpace, OneMap and Data.gov.sg : Platforms for Textual and Geospatial Data



Launched in 2011

1057

Datasets

47

Contributing
Agencies



Launched: 2010

110

Datasets

34

Contributing
Agencies



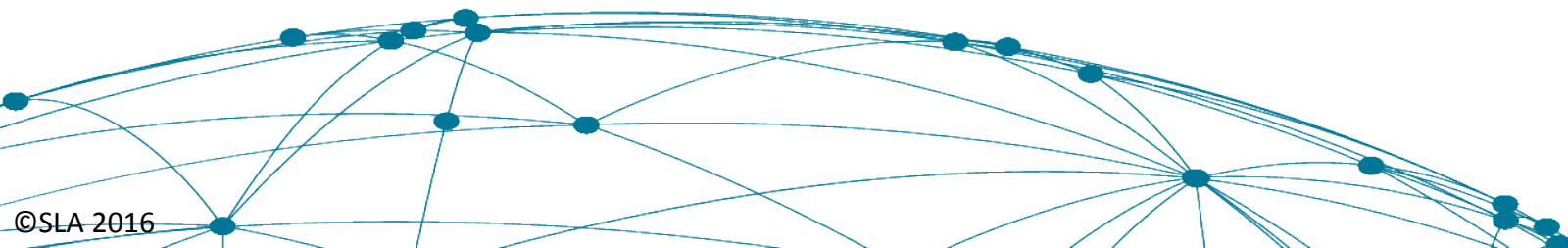
Launched in 2011

11992

Datasets

71

Participating
Agencies



Synergistic use of Data and Statistics: GeoAnalytics

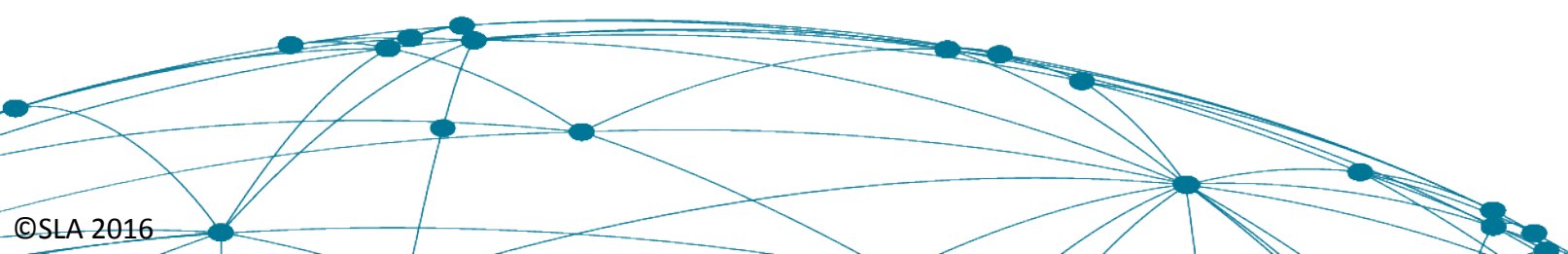
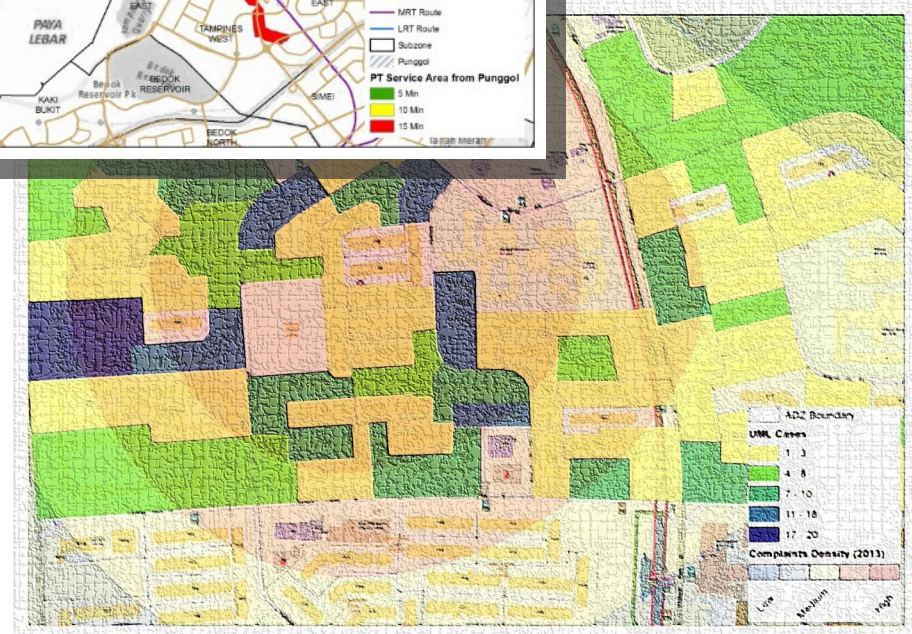
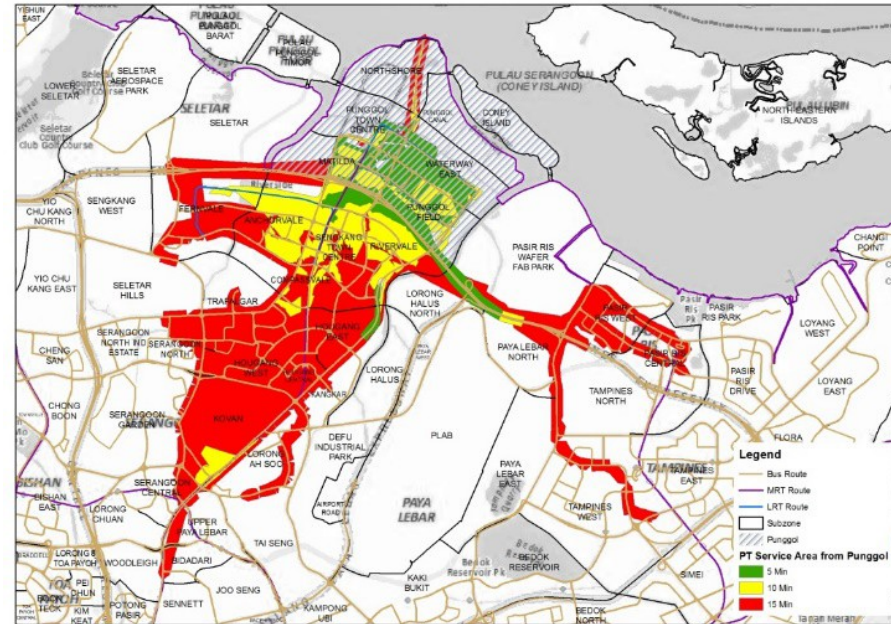
- Facility Management

- Operation & Monitoring

- Outreach Planning

- Policy Review

Analysis
Example



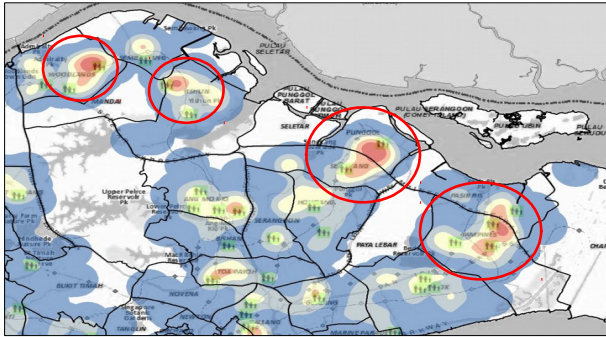
Collaboration use of GeoAnalytics in Singapore

40+ Agencies

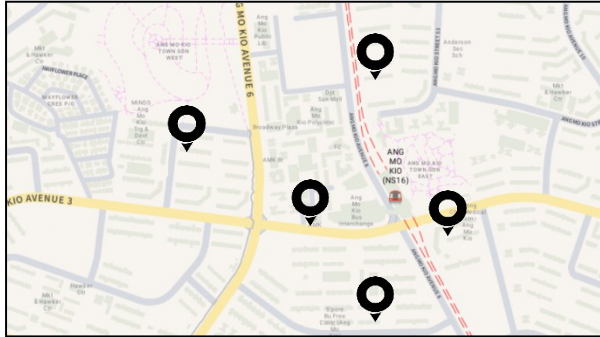


80+ Pilot Projects

Identifying 'Hot Spots'



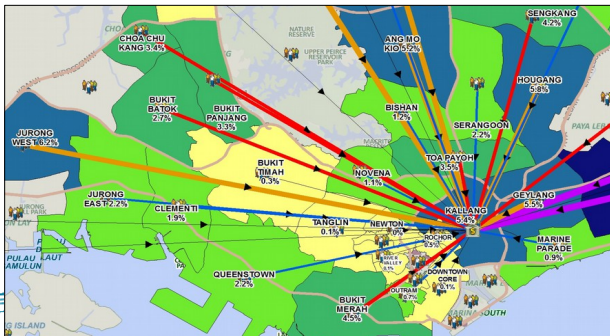
Selecting Ideal Site



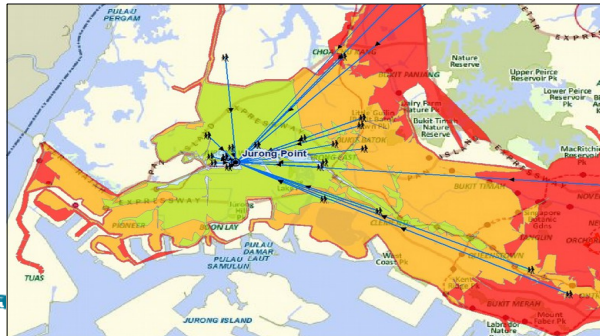
Testing Correlation



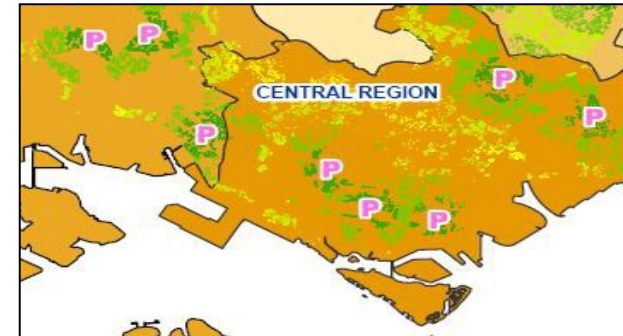
Understanding Customers' Origins



Defining Catchment Area



Monitoring Outreach Programs

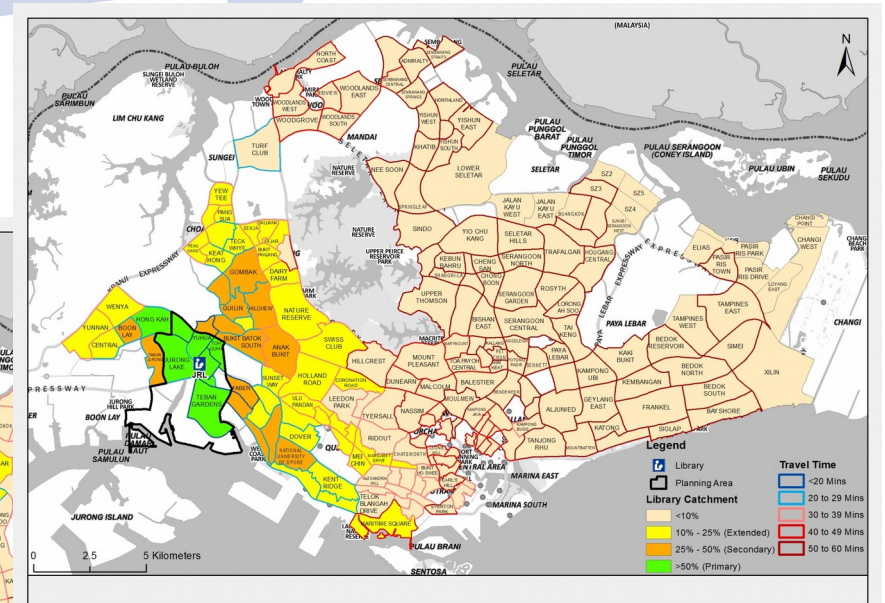
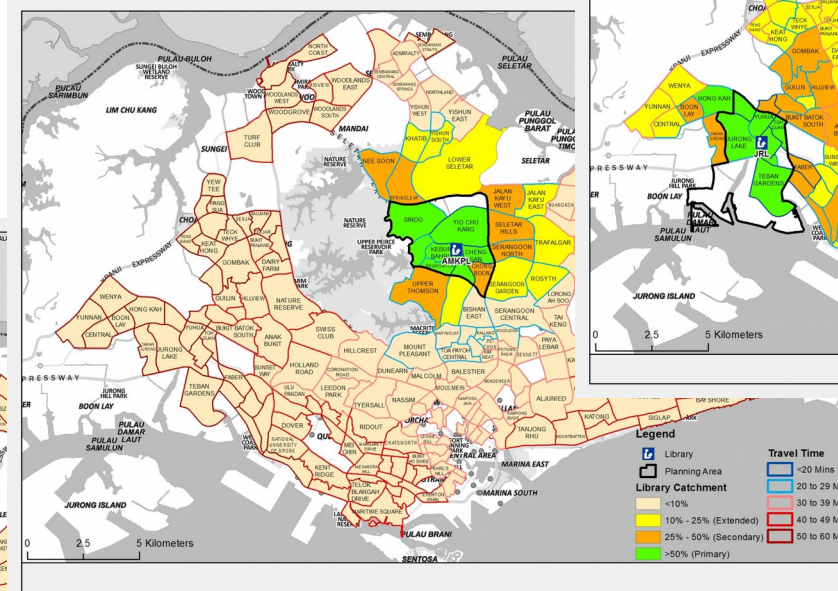
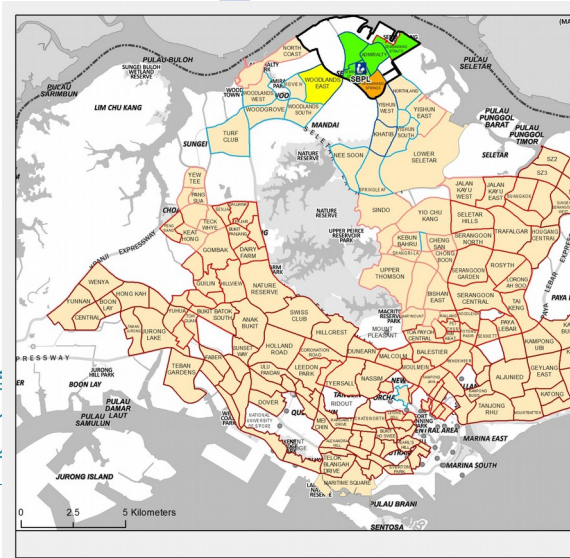


Some Libraries are more attractive than others ...

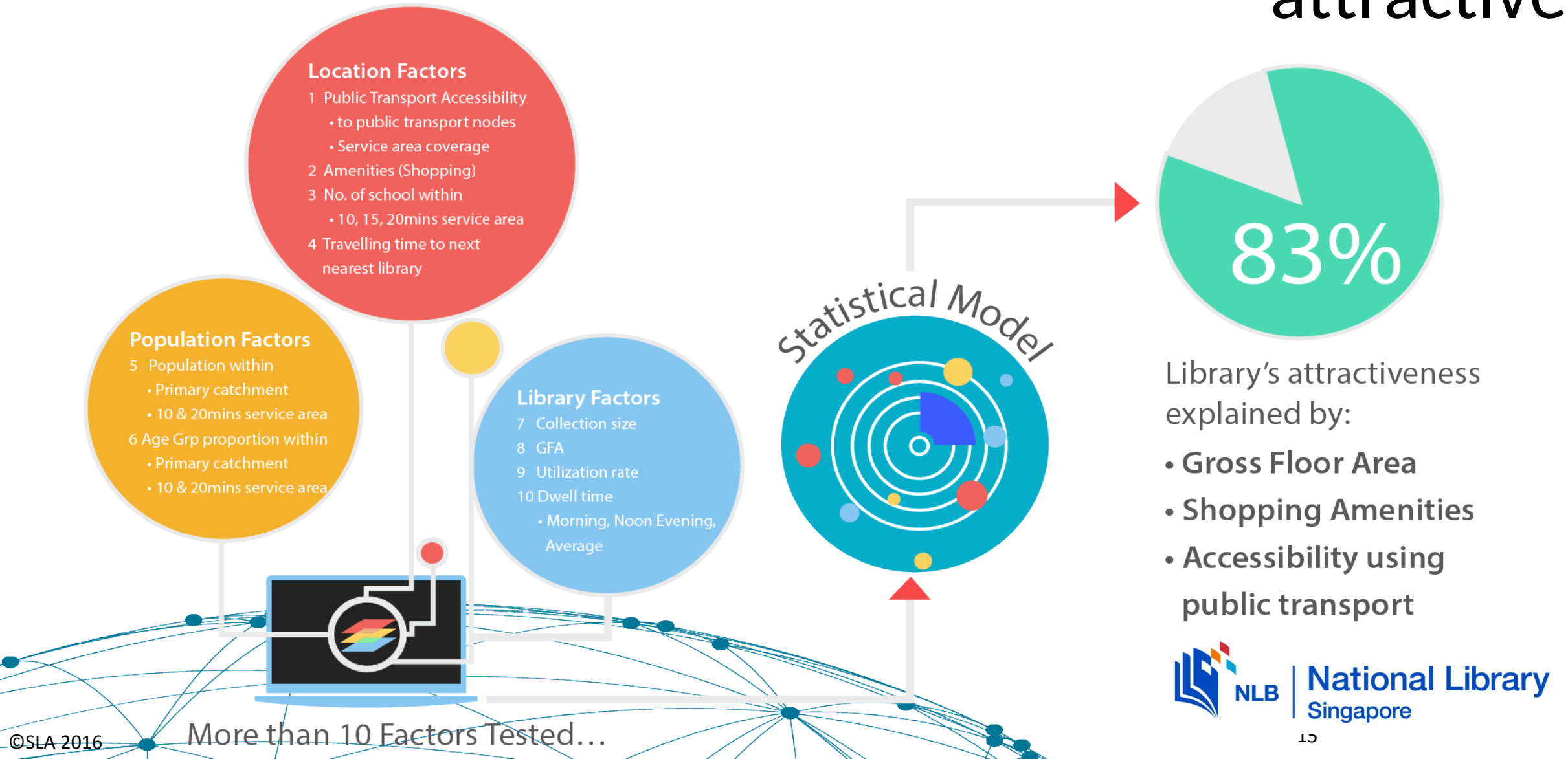
Library C
105,000 Patrons

Library B
70,000 Patrons

Library A
43,000 Patrons



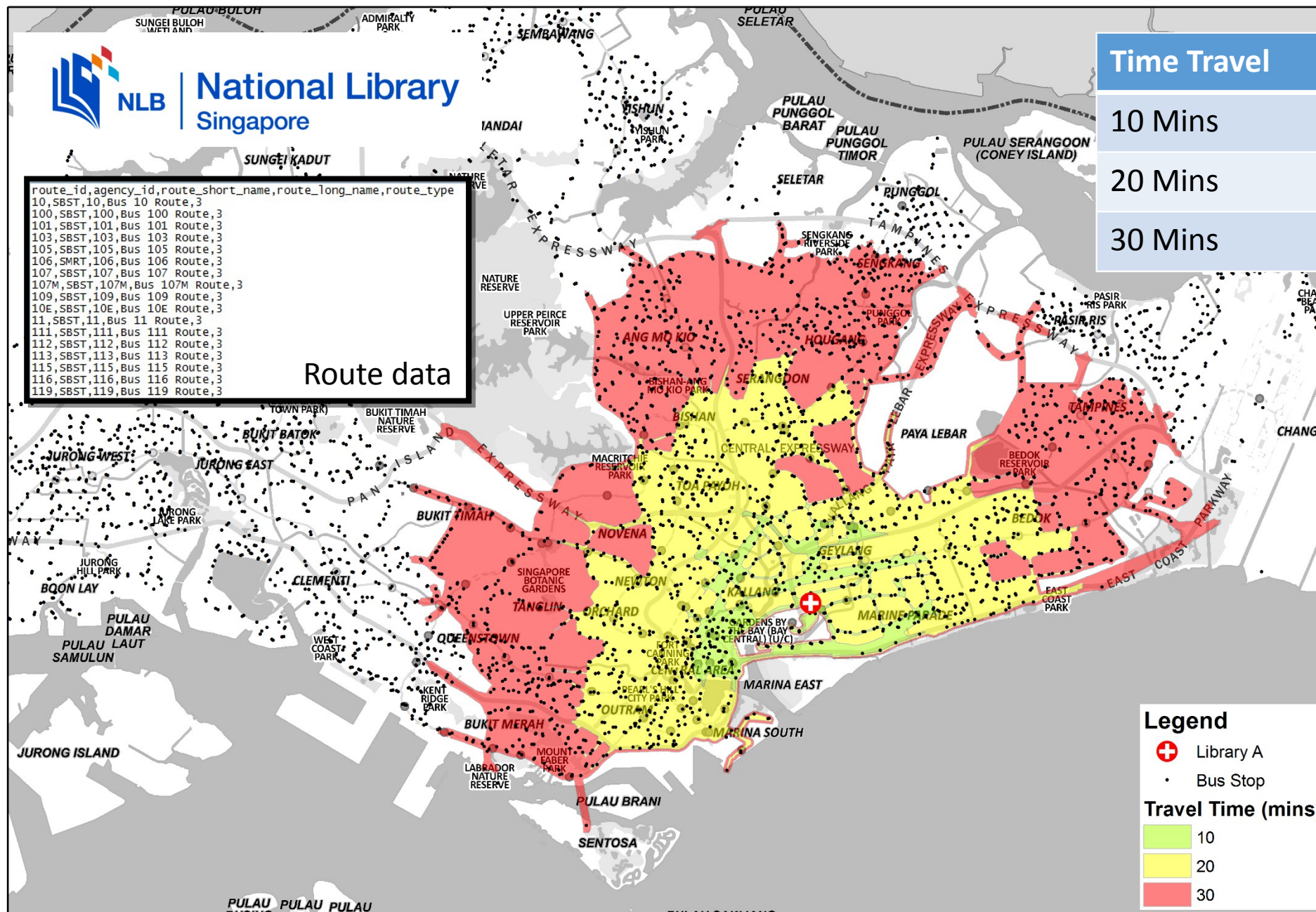
What are the factors that makes a library more attractive?




```
route_id,agency_id,route_short_name,route_long_name,route_type
10,SBST,10,Bus 10 Route,3
100,SBST,100,Bus 100 Route,3
101,SBST,101,Bus 101 Route,3
103,SBST,103,Bus 103 Route,3
105,SBST,105,Bus 105 Route,3
106,SMRT,106,Bus 106 Route,3
107,SBST,107,Bus 107 Route,3
107M,SBST,107M,Bus 107M Route,3
109,SBST,109,Bus 109 Route,3
10E,SBST,10E,Bus 10E Route,3
11,SBST,11,Bus 11 Route,3
111,SBST,111,Bus 111 Route,3
112,SBST,112,Bus 112 Route,3
113,SBST,113,Bus 113 Route,3
115,SBST,115,Bus 115 Route,3
116,SBST,116,Bus 116 Route,3
119,SBST,119,Bus 119 Route,3
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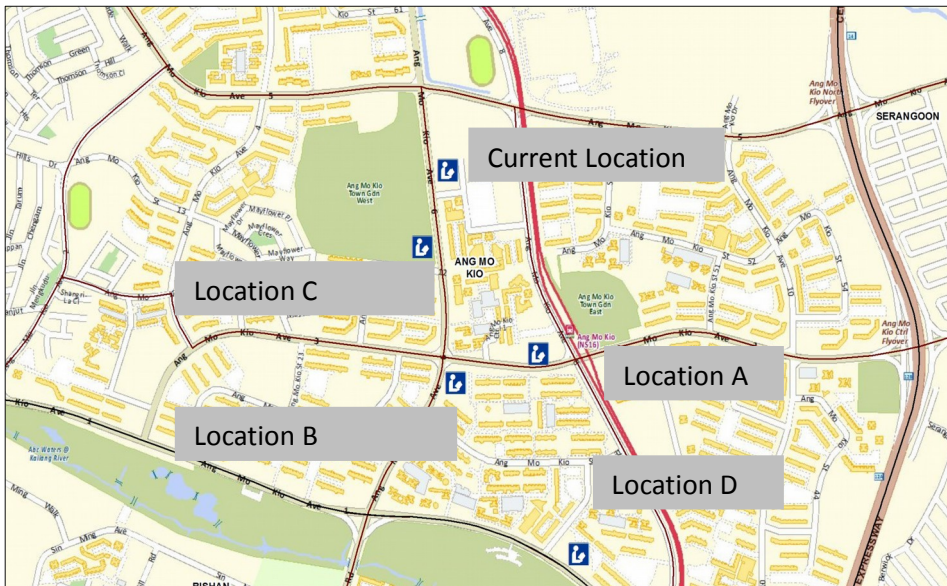
Route data

Time Travel	Bus Stops
10 Mins	142
20 Mins	706
30 Mins	1098

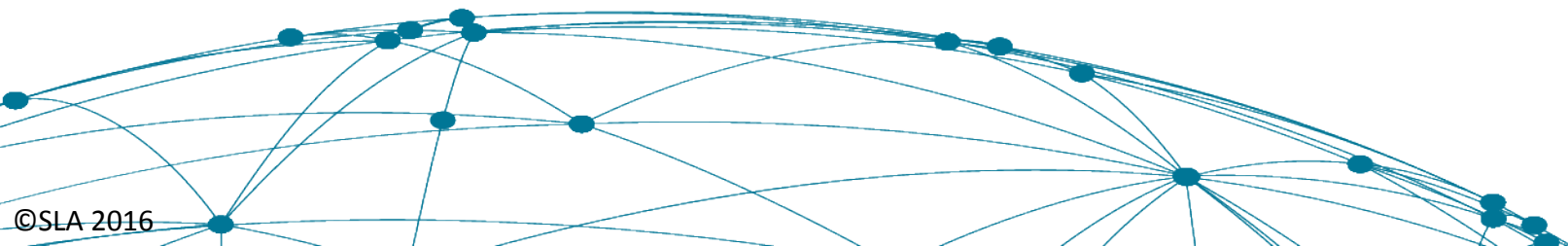


General
Transport
Feed
Service
(GTFS) for
schedule-
aware
analysis

Scenarios for re-allocation of Library



Site	Factors				Modelled Patron	
	Public Transport Accessibility	Location Index	GFA	Attractive Factor	Estimated Patron (Primary+Secondary)	Up to 60 mins
Current Location (Actual)	30	1.0	4500	-	30,000	70,000
Location A	85	3.0	3000	9.9	30,000	100,000
Location B	80	1.8	3000	8.5	30,000	85,000
Location C	65	1.0	3000	6.8	15,000	50,000
Location D	80	1.0	3000	7.4	10,000	65,000



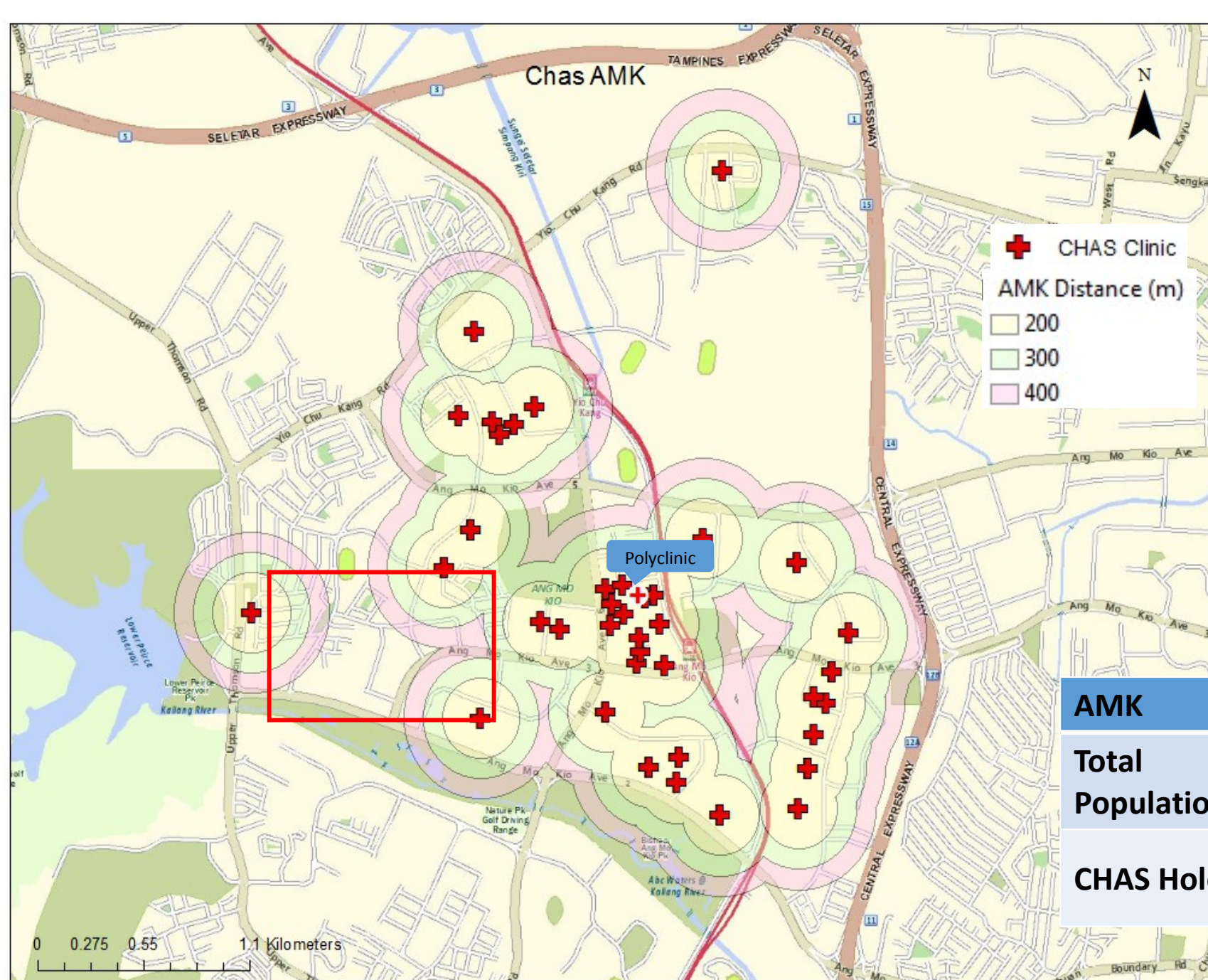
Coverage of Community Health Assistance Scheme (CHAS) for Singaporeans

- A scheme that enables Singapore Citizens from lower- and middle-income households to receive subsidies for medical and dental care at participating General Practitioners (GPs) and dental clinics near their homes.



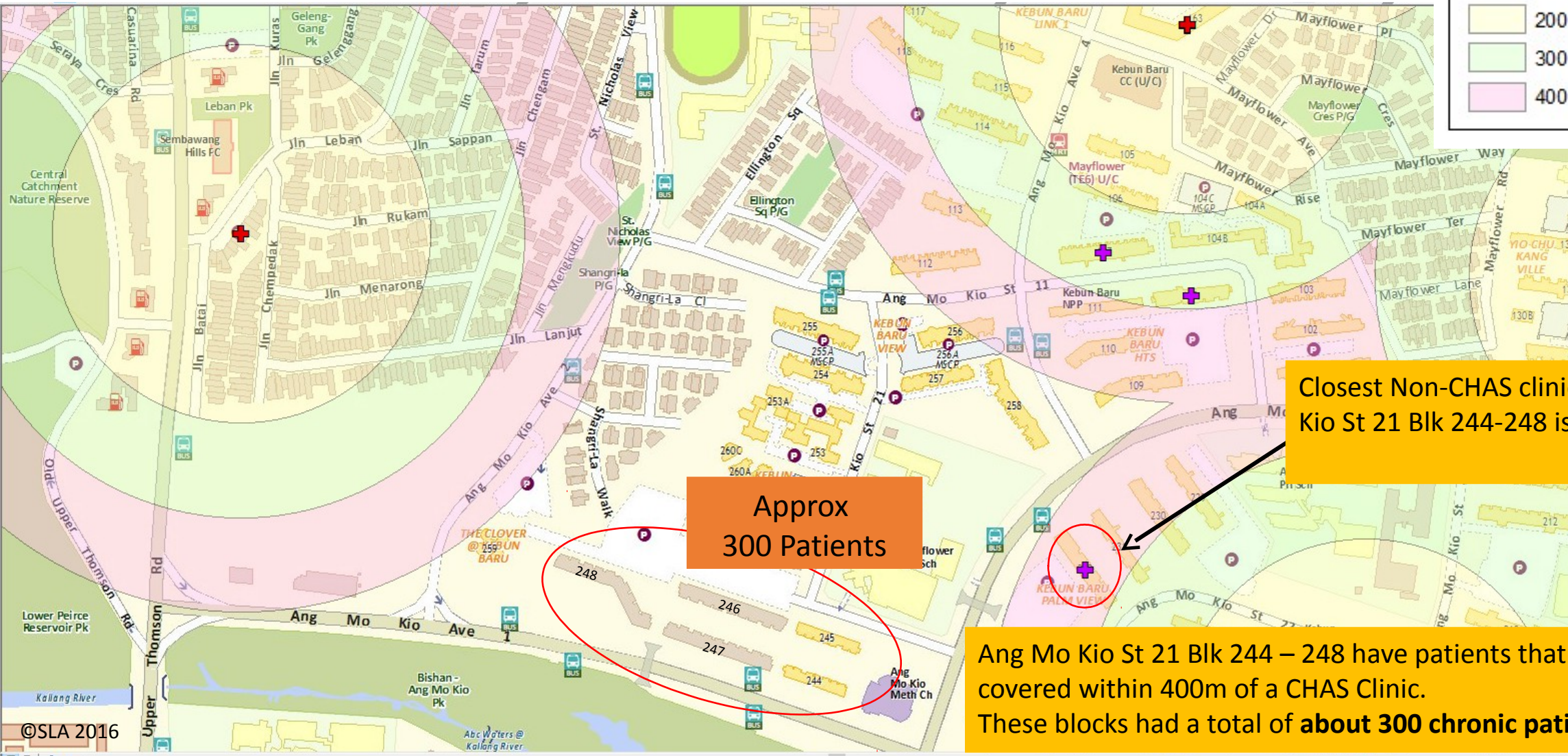
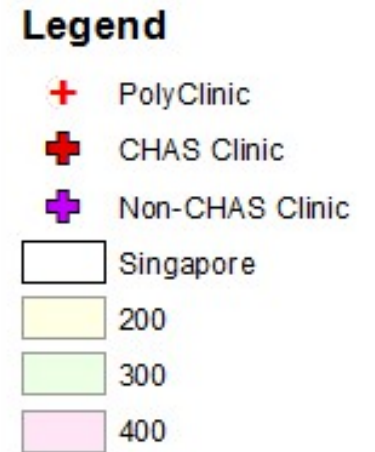
Source: Chas.sg

Coverage of CHAS Clinics in Ang Mo Kio (AMK)



AMK	Total
Total Population	178,000
CHAS Holders	30,000 (17%)

CHAS Clinic and Non-CHAS Clinic Coverage in AMK Street 21

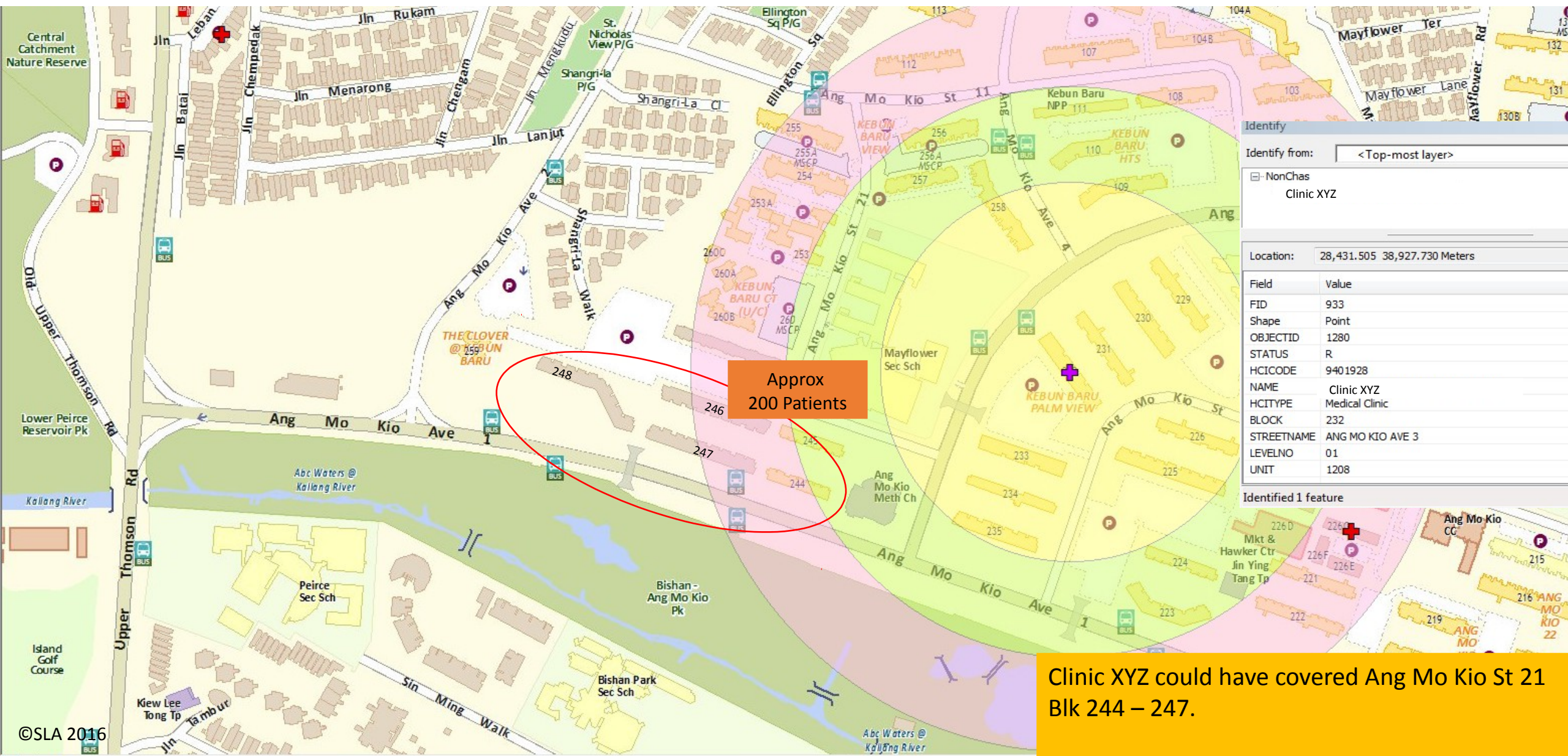


Closest Non-CHAS clinic to Ang Mo Kio St 21 Blk 244-248 is in Blk 232.

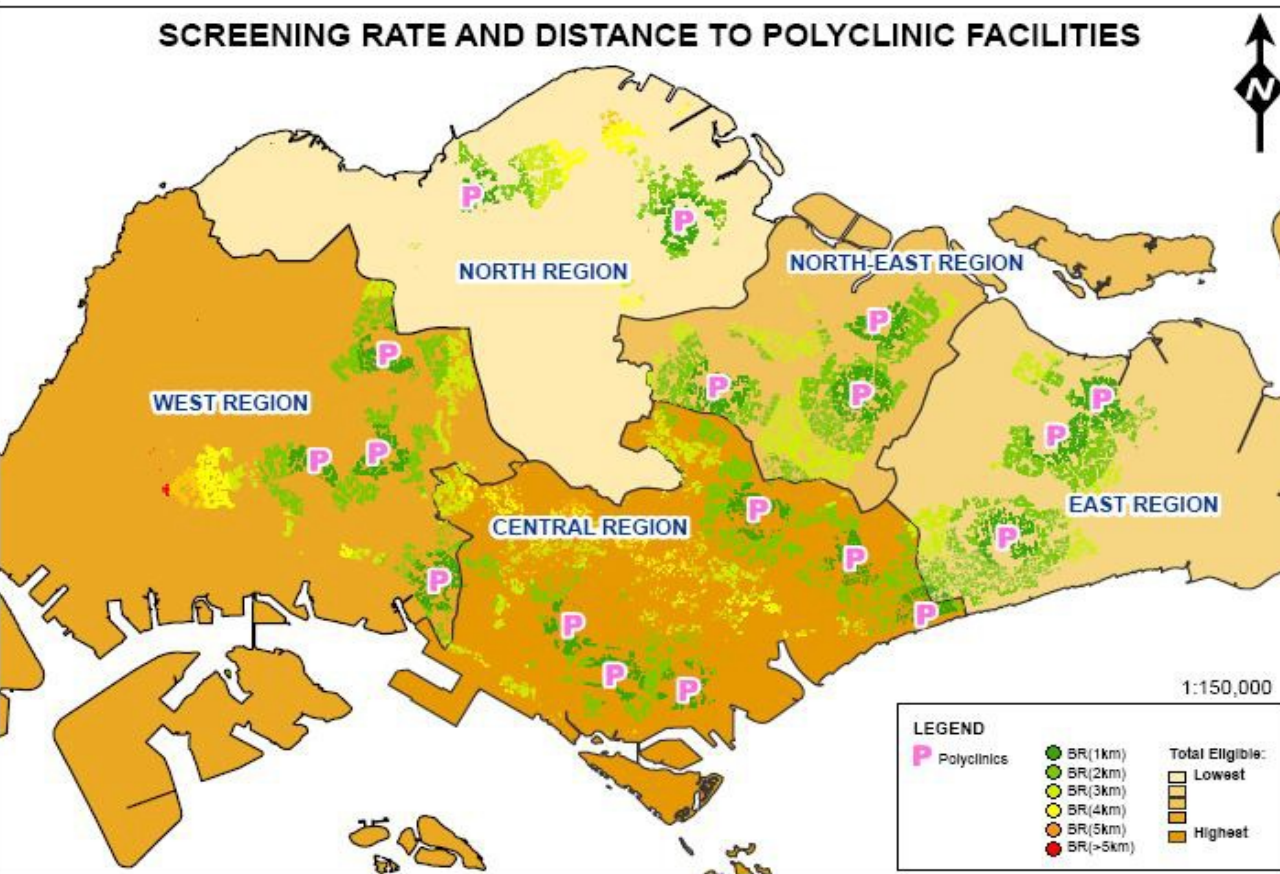
Approx
300 Patients

Ang Mo Kio St 21 Blk 244 – 248 have patients that are not covered within 400m of a CHAS Clinic. These blocks had a total of **about 300 chronic patients**.

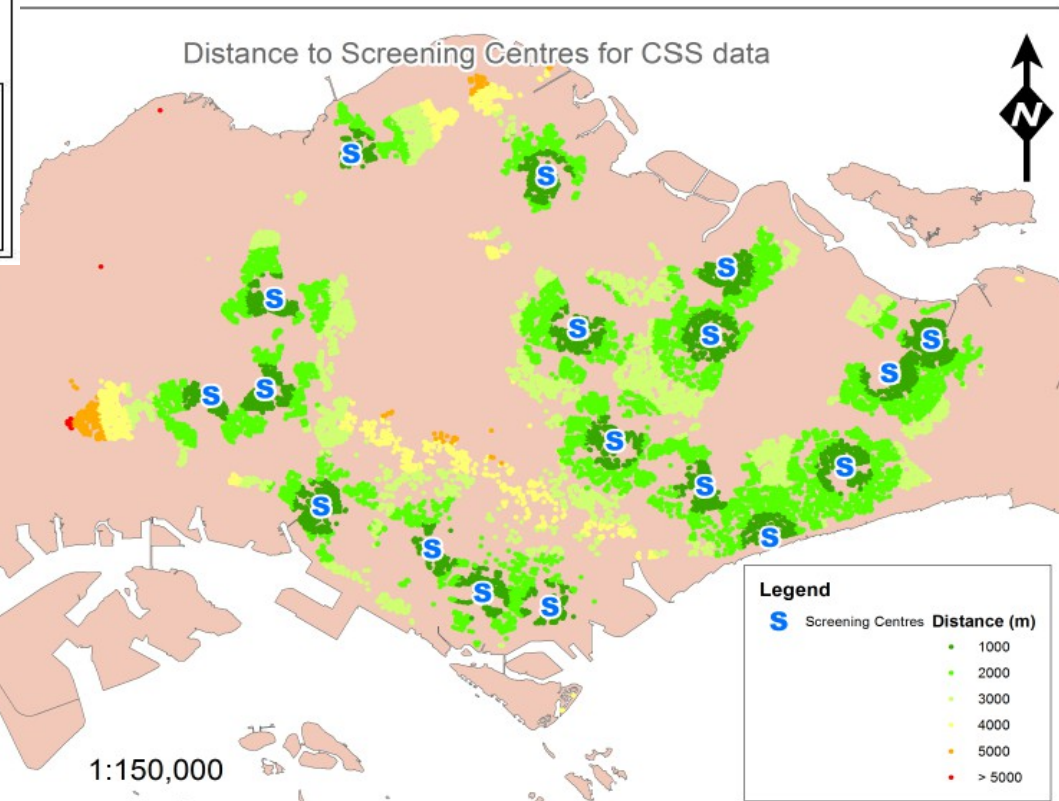
Non-CHAS Clinic coverage in AMK Street 21



SCREENING RATE AND DISTANCE TO POLYCLINIC FACILITIES

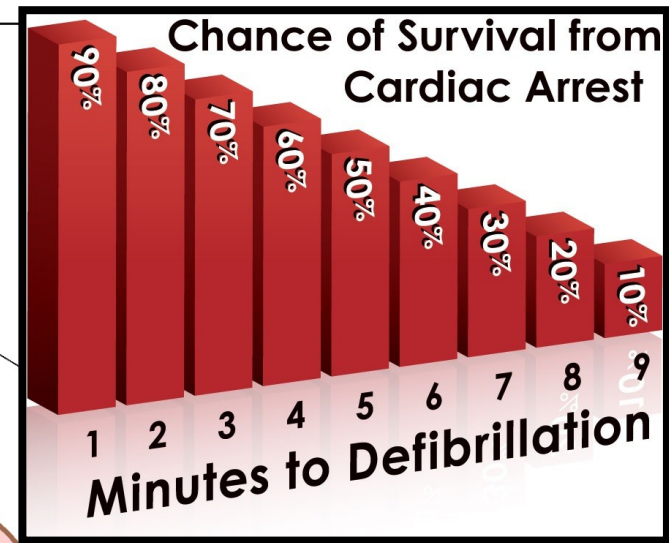
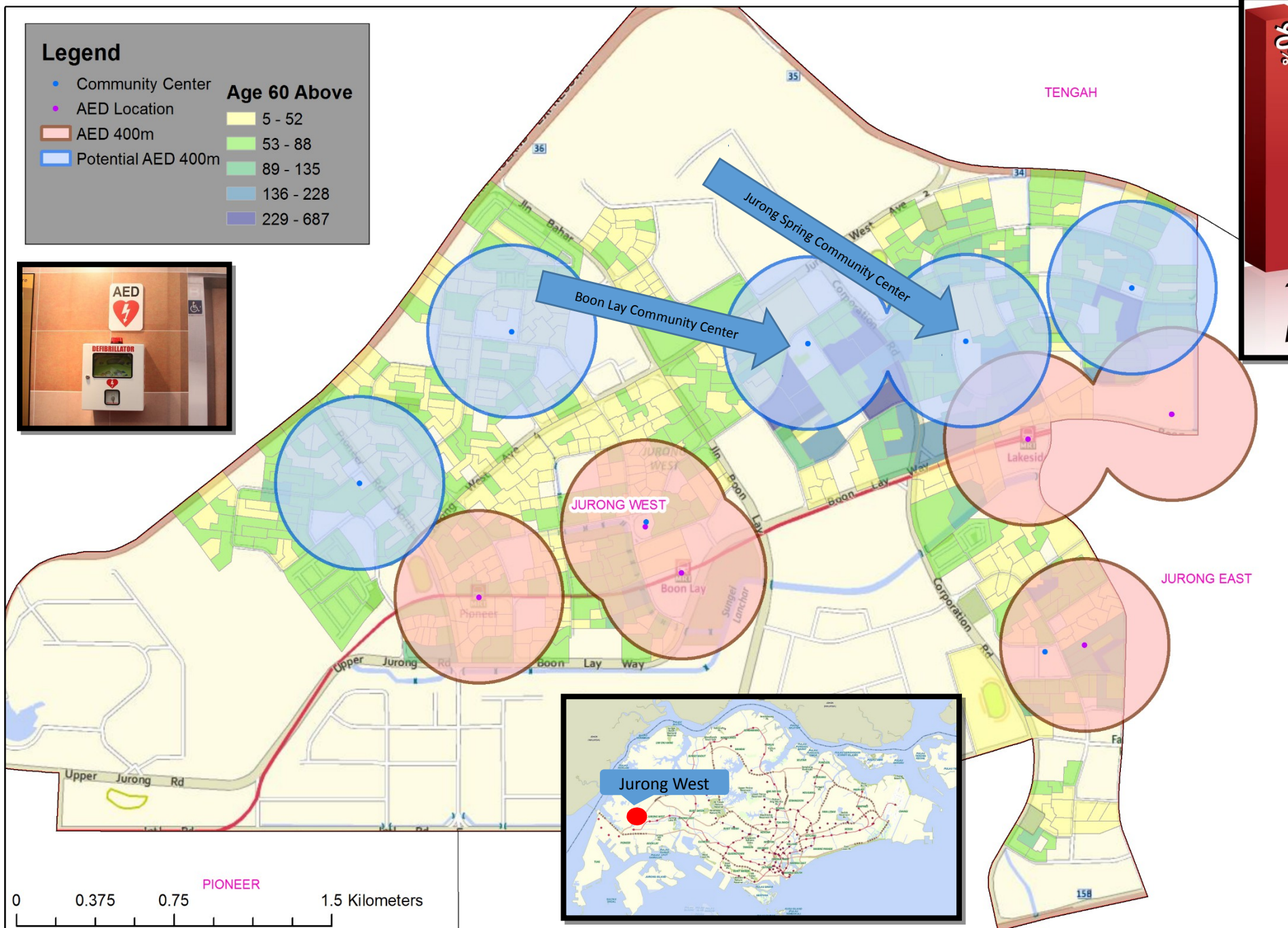


Continue monitoring screening rates using GIS to determine if targeted and specifically tailored promotion programme can make a difference in reaching the “right women” for the breast and cervical cancer screening.



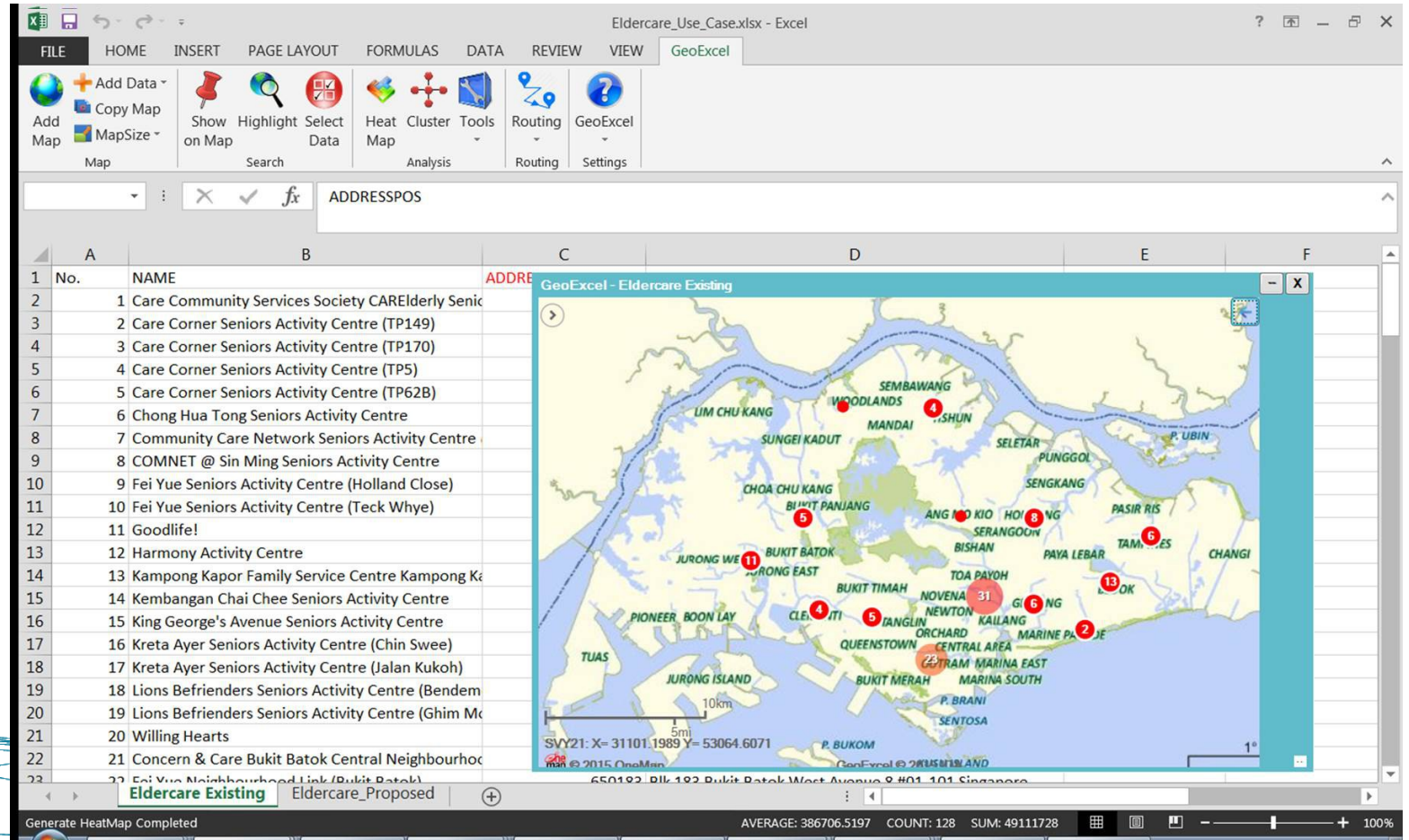
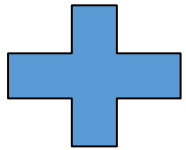
Legend

- Community Center
 - AED Location
 - AED 400m
 - Potential AED 400m
- Age 60 Above**
- 5 - 52
 - 53 - 88
 - 89 - 135
 - 136 - 228
 - 229 - 687



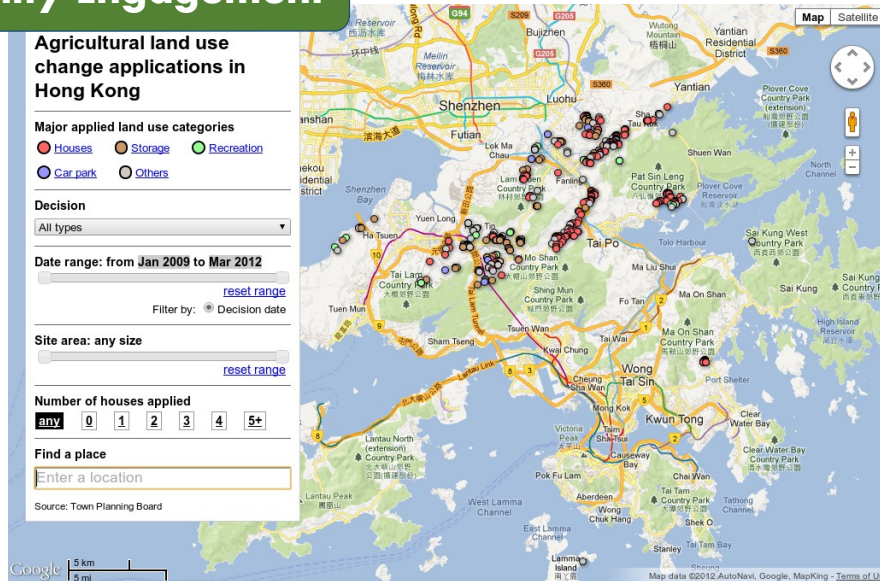
Potential
AEDs
Installation
location in
Jurong West

GeoExcel: Add-in for MS Office to create awareness and proliferate the use of Geospatial tools



Agencies worldwide are leveraging on GIS in their operation

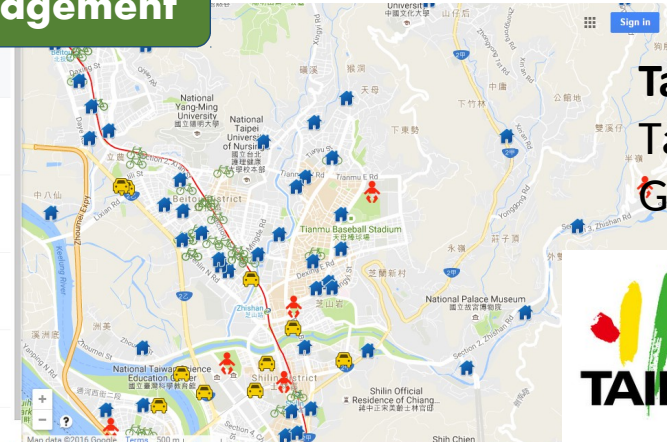
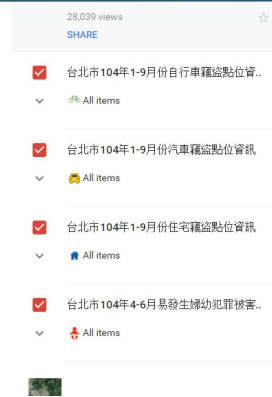
Community Engagement



Land Use Change

Open Government Project, Hong Kong University

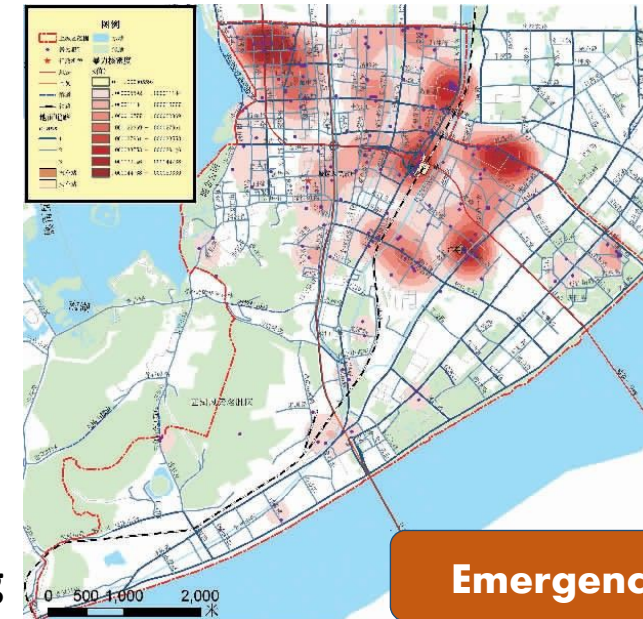
Community Engagement



Taipei “安心地圖”
Taipei City Government



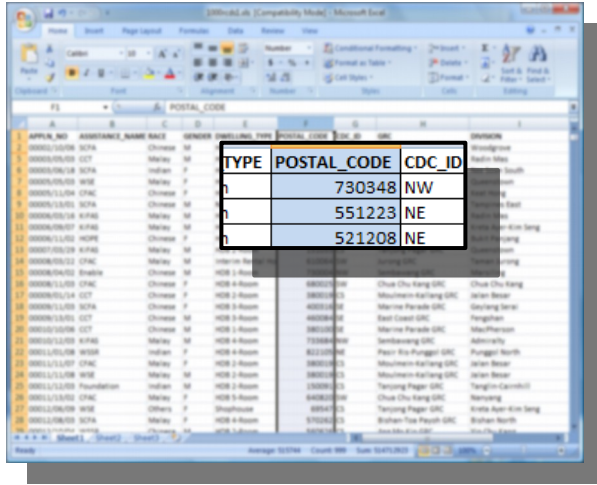
臺北市政府警察局刑事警察大隊



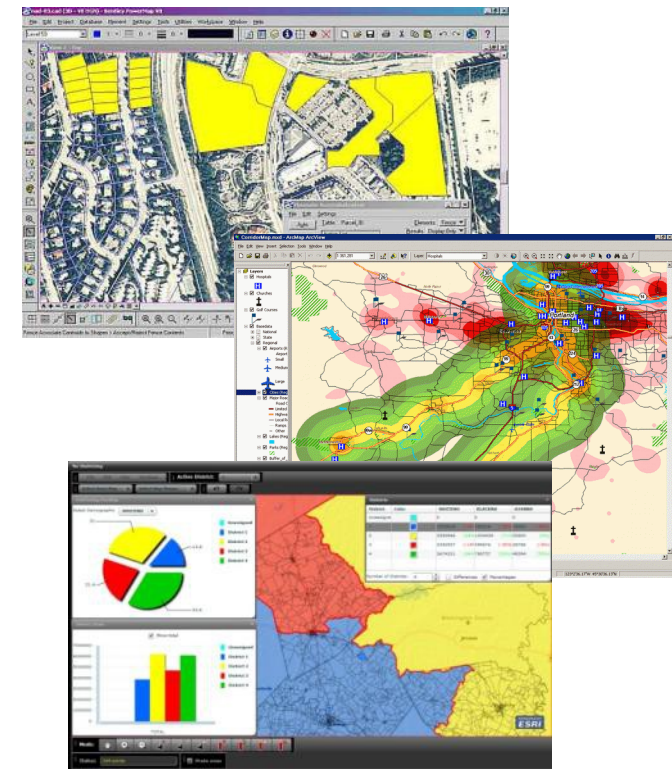
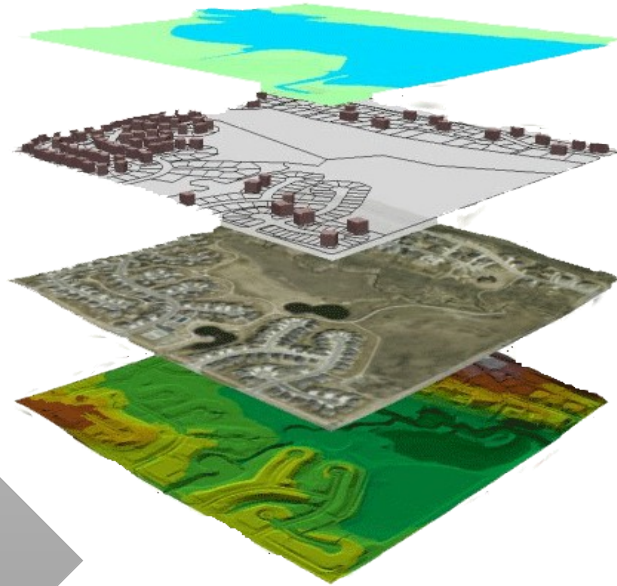
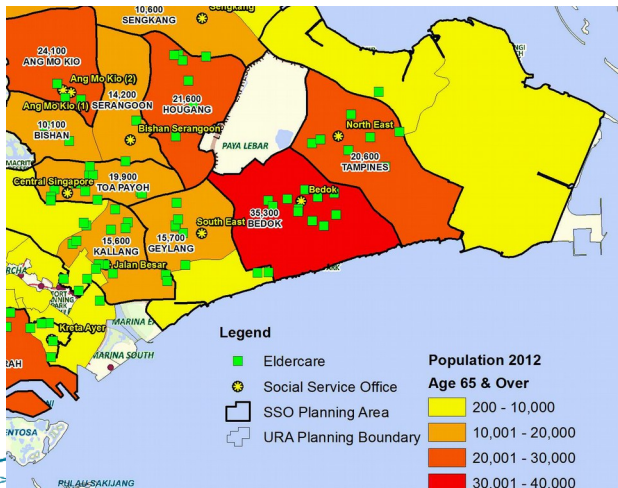
Predictive-Policing
China Police Department

Emergency Planning

Collaboration, Coordination and Harmonisation to Break the Boundaries of Data



TYPE	POSTAL_CODE	CDC_ID
1	730348	NW
1	551223	NE
1	521208	NE

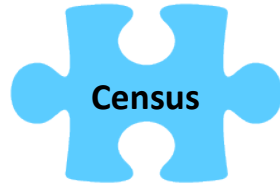


Integration of Geospatial and Statistics for Enhanced Analysis and Informed Decision Making

Statistical data



Statistical Data



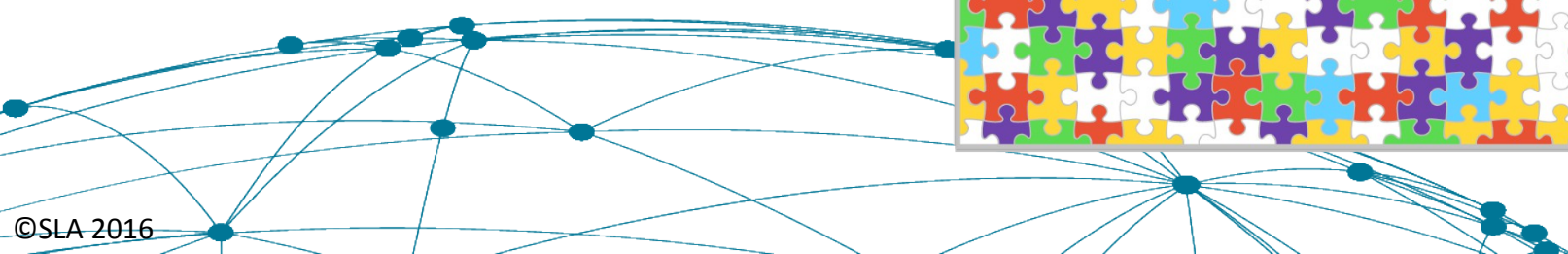
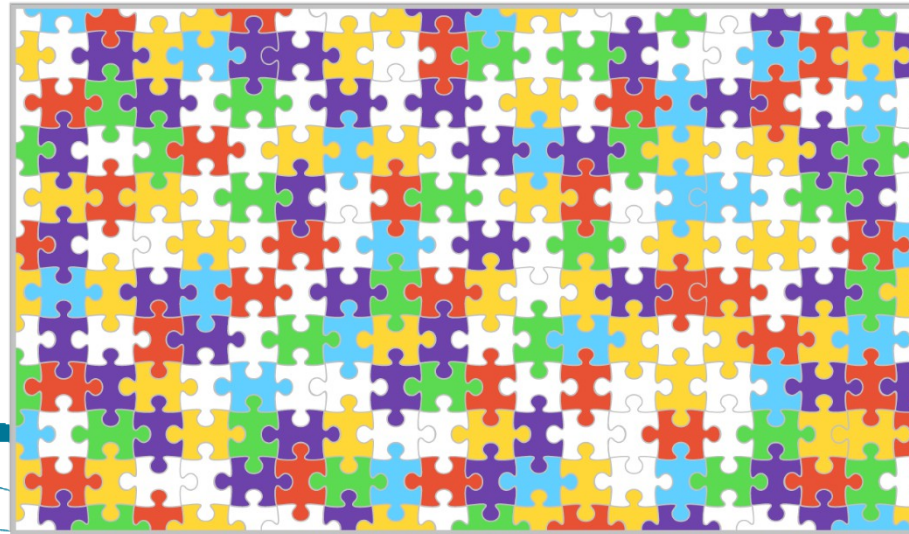
Geospatial Data



Geospatial Data



Statistical Data



Capturing the Synergy of Geospatial and Statistics

Singapore Land Authority

17 November 2016

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