Service accessibility challenges faced by non-metropolitan South Australians aged 65 and over

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Presentation Outline

1. Setting the scene
    a) Mobility/accessibility challenges faced by older people aged 65 and over in non-metropolitan South Australia
    b) Spatial indices and accessibility approaches
2. Development of the Service Accessibility/Transport Disadvantage Index (SATDI)
    a) Methodology
    b) Results/findings
3. Summary and concluding remarks

Setting the Scene

- The movement of people, goods and services from one destination to another is a key component of everyday life
- Car travel in all western societies is not only the most common form of transportation, but also the most expected mode of transportation used
- In 2012, there were 12.7 million cars (passenger vehicles) registered in Australia – approx. 1.69 persons to every car

  (ABS, 2012)
- This poses a challenge to the older generation who due to medical reasons or others, may no longer be able to own or operate a car

- Research indicates non-accessible transportation for older people can result in:
  - Diminished physical/mental health and wellbeing
  - Social isolation/exclusion
  - Reduced quality of life

(Baster, 2012; Hess, 2009; Kim and Ulfarsson, 2004; Shergold and Parkhurst, 2012; Su, 2007; Ureta, 2008)

- Older people tend to drive for longer and reluctantly surrender their drivers licence since alternative transport options are: (1) too expensive; (2) infrequent/limited services; (3) live too far from the nearest transit stop; (4) overcrowded services – lack of seating; and (5) crime/safety concerns when waiting for public transport

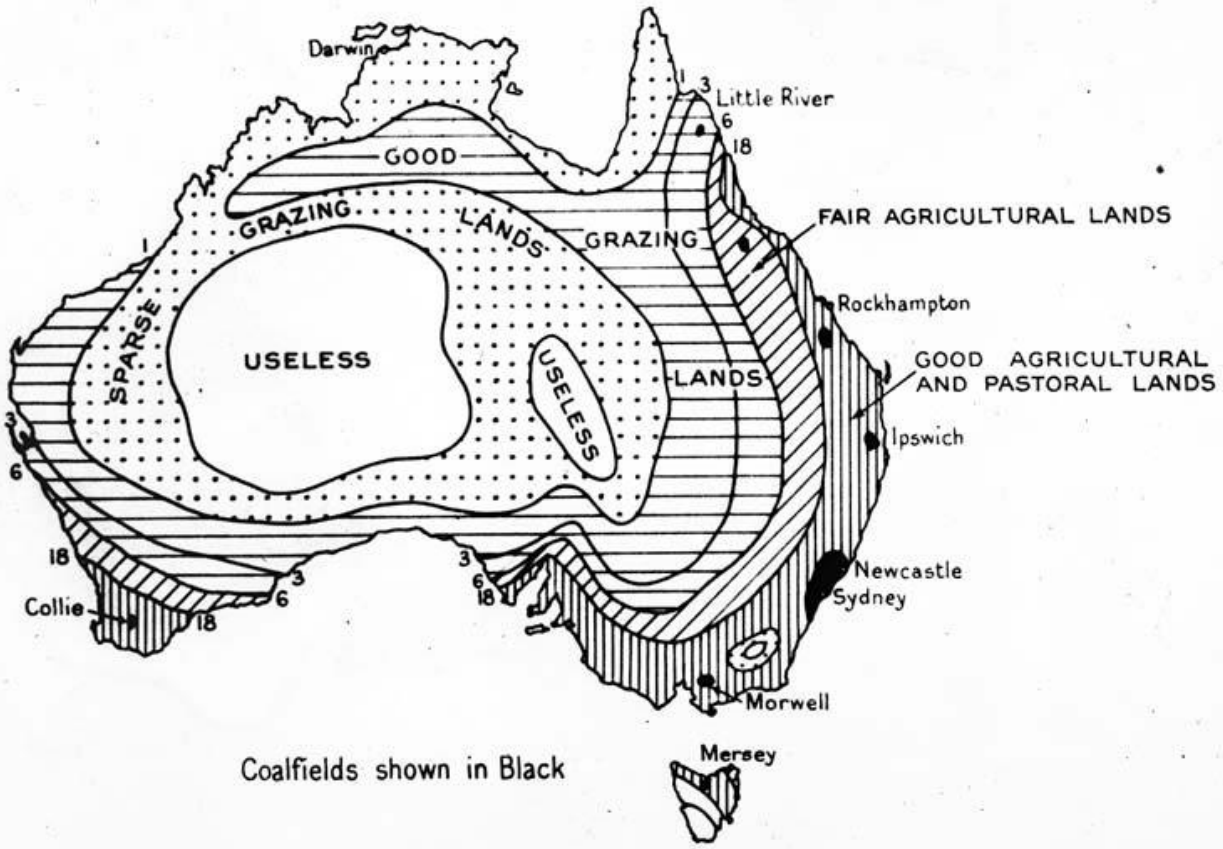
(Peck, 2010)

Spatial Indices and Accessibility Approaches

- Mobility/accessibility in the context of this research has been defined as the ease with which people can reach locations providing required goods and service
- In Australia, the importance of developing a composite index of accessibility to different service types has been ongoing for some time
- Geographical Information Systems (GIS) have an important role to play in this area

HABITABILITY MAP OF AUSTRALIA

After T. Griffith Taylor in "Limits of Land Settlement"

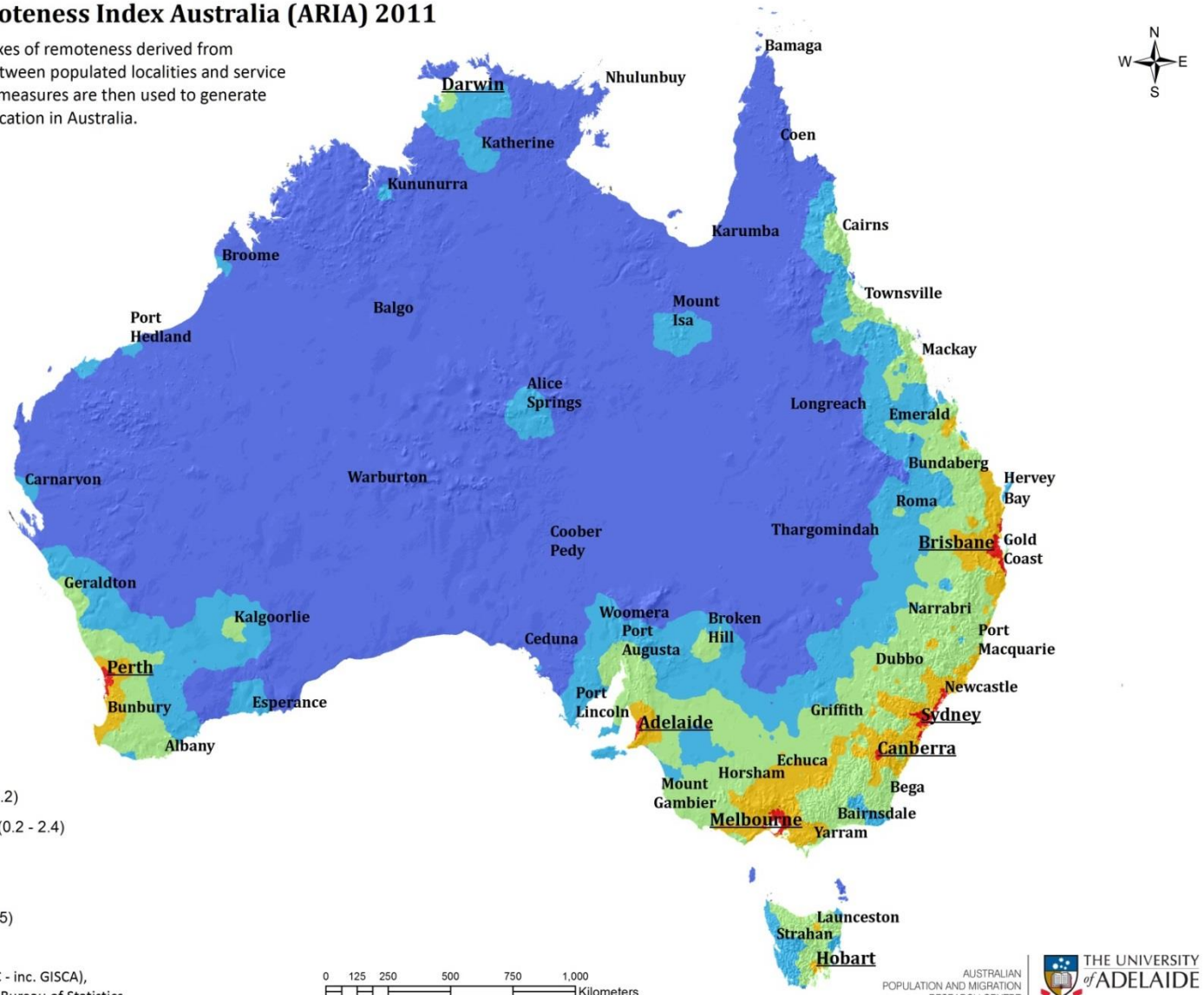


Coalfields shown in Black

N.B. The boundaries between regions represent lines of population density.

Accessibility/Remoteness Index Australia (ARIA) 2011

ARIA+ (and ARIA++), are indexes of remoteness derived from measures of road distance between populated localities and service centres. These road distance measures are then used to generate a remoteness score for any location in Australia.



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ARIA+ (2011) 1km grid

- Highly Accessible (0 - 0.2)
- Moderately Accessible (0.2 - 2.4)
- Accessible (2.4 - 5.92)
- Remote (5.92 - 10.53)
- Very Remote (10.53 - 15)

Data Sources:
The University of Adelaide (APMRC - inc. GISCA),
Geoscience Australia, & Australian Bureau of Statistics

0 125 250 500 750 1,000
Kilometers

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Transportation Accessibility Approaches

Indices	*Studies*	*Incorporated Performance Measure(s)*	*Reflecting Transit Availability?*	*Reflecting Transit Comfort and Convenience?*	*Reflecting Travel Demand Distribution?*
Transit Level of Service Indicator	Kittelson & Associates and URS, Inc. 2001	Service coverage, frequency, service span, population, jobs	Yes	No	No
Transit Service Accessibility Index	Polzin et al. 2002	Service coverage, service span, frequency, travel demand	Yes	No	Total # of trips
Local Index of Transit Availability	Rood 1997	Frequency, capacity, route coverage	Yes	No	No
Public Transportation Accessibility Level	Hillman 1997	Service frequency, service coverage	Yes	No	No
Service Quality Index	Hensher et al. 2004	13 variables (i.e., travel time, frequency, etc.)	Yes	Yes	No
Transit Travel Time	Dowling and Colman 1998	Transit travel time	Yes	Yes	No
Transit Travel Speed	St. Jacques et al. 1997	Transit speed	No	Yes	No
Mobility Index	Galindez and Mireles-Cordov 1999	Travel speed, average vehicle occupancy	Yes	No	No
Wait Assessment	MTA-NYCT 2001	Headway	No	Yes	No

(Fu and Xin, 2007)

- Land Use and Public Transport Accessibility Indexing Model (LUPTAI), 2007
- Composite Index of Public Transport Accessibility, 2011

Development of the Service Accessibility/Transport Disadvantage Index (SATDI)

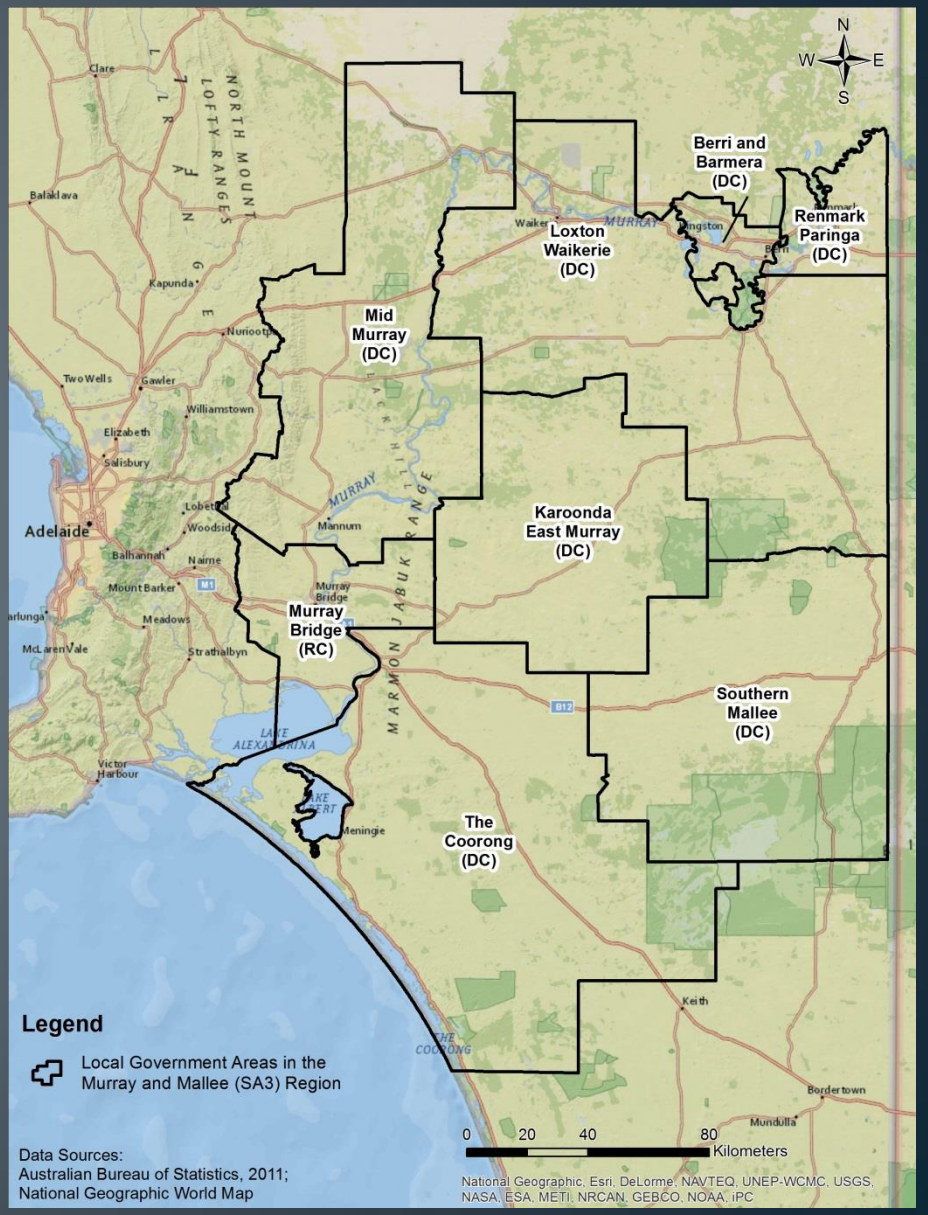
- Consists of two components:
  1. Accessibility to key services
  2. Public transport accessibility

The index has been designed for the Murray and Mallee Region of South Australia

The Murray and Mallee Region (SA3)

- Total area: 37,277 km^2
- Total Population in 2011 was 67,698 (18.1% aged 65+)
- Largest populated centre is Murray Bridge (15,968) followed by Renmark (4,389)
- Smallest centre is Blanchetown (210)
- Average motor vehicles per dwelling 1.9

(ABS, 2011)



SATDI Component 1: Service Accessibility

- Subset of primary data collected from the 'Linking rural older people through technology' survey (Hugo et al., 2010) to determine key services for people aged 65+ in the Murray Mallee region
- Responses to the survey question about accessing services outside of the home were re-coded into service categories:
  - Q: "List the name and location of any services that you use outside of your home?"
- Results to the above question were combined resulting in 2,174 individual responses
- Each service category was then ranked in order from the highest to the lowest number of responses for that service category

SATDI Component 1: Service Accessibility

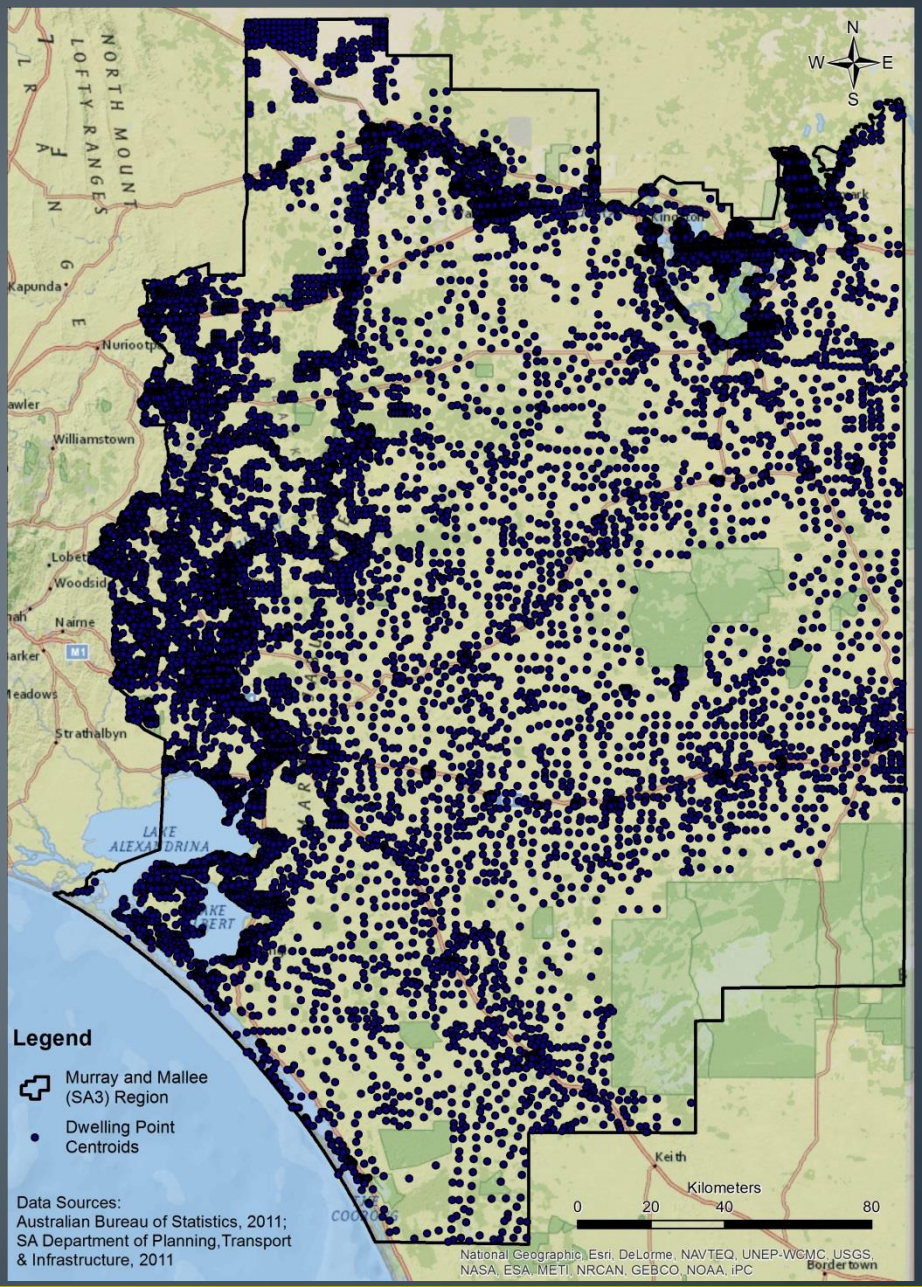
- The top 5 category responses were used for this component of the index, representing over 60% of all the participant subset responses

Rank	Service Type	Response Count	% of Total Responses	% of Top 5 Responses
1	Medical Clinic/GP	568	26.13	42.58
2	Groceries	350	16.10	26.24
3	General Shopping	196	9.02	14.69
4	Optometrist	122	5.61	9.15
5	Dentist	98	4.51	7.35
	Top 5 Responses	**1,334**	**61.36**	
	Total Responses	**2,174**		

SATDI Component 1: Service Accessibility

- Address data was manually acquired for all 5 key service types within the Murray and Mallee, including those within a 20km buffer of this region:
  - The Australian Yellow Pages
  - Pitney Bowes, Australian MapInfo Business Points, 2011
  - ABS Urban Centre/Localities dataset, 2011 (General Shopping)
- Land parcel dwelling centroids used to calculate distances to each service type
- A detailed road network (SA Dept. Planning, Transport & Infrastructure)
- ESRI ArcGIS 10.1 - Network Analyst tool used to calculate roads distances (Closest Facility)

SATDI Component 1: Service Accessibility



SATDI Component 1: Service Accessibility

Calculation for a land parcel dwelling centroid near the town of Meningie (38659)

- 55.41km from the nearest Dentist;
- 55.54 km from the nearest General Shopping location;
- 2.88 km from the nearest General Practitioner (GP);
- 2.90 km from the nearest Grocery Shopping location;
- 77.86 km from the nearest Optometrist.

Divide by the **average** distance to each service category type:

- Dentist = 55.41 / 13.28 = 4.17 {exceeds threshold so score = 3.00}
- General Shopping = 55.54 / 19.62 = 2.83
- General Practitioner (GP) = 2.88 / 13.78 = 0.21
- Grocery Shopping = 2.90 / 11.56 = 0.25
- Optometrist = 77.86/ 22.99 = 3.39 {exceeds threshold so score = 3.00}

The Service Accessibility score = **3.00 + 2.83 + 0.21 + 0.25 + 3.00**

Service Accessibility = 9.29

SATDI Component 2: Public Transport Accessibility

- Aims to quantify the degree of public transport accessibility available to people living in the Murray and Mallee region

- This component of the index is based on two aspects:
  1. Distance a person is likely to walk to access a public transit collection point (bus stop)
  2. Public transport services offered from each bus stop

SATDI Component 2: Public Transport Accessibility

- To determine the degree of public transport accessibility, two key criteria were derived:
  - The bus service must travel through the Murray and Mallee region and permit the collection and alighting of passengers along its route and be available to the public without restrictions (e.g. not for medical trips only)
  - Each bus route must intersect one or more of the 5 key service categories and these services must be within a 400 metre walking distance of at least one bus stop along that route
- Subsequent criteria developed to reflect the likelihood an older person would utilise available public transport

SATDI Component 2: Public Transport Accessibility

- Frequency scores were then assigned to each bus stop
- All bus stops incorporated into a single bus stop layer, with duplicate stops and their frequencies combined
- Circular buffers with a 400 metre radius around each bus stop were created for the purpose of identifying the likely distance a person would walk to access a bus stop
- Overlapping buffers were assigned the highest bus frequency score for the overlapping buffer areas

SATDI: Combining Components 1 & 2

- Weightings modify Component 1: Service Accessibility scores

Bus Index Score	Description	Bus Frequency Score
0	Very Infrequent - little to no services per week	0.00 to 0.50
1	Infrequent - up to one service per week	0.51 to 1.00
2	Frequent - one to three services per week	1.01 to 3.00
3	Regular - three to five services per week	3.01 to 5.00
4	Very Frequent - five to ten services per week	5.01 to 10.00
5	Highly Frequent - ten or more services per week	10.01 or greater

- ArcGIS 'Extract Values to Points' tool used to extract the unweighted bus frequency score for each land parcel dwelling centroid within the 400m circular buffer

SATDI Final Score

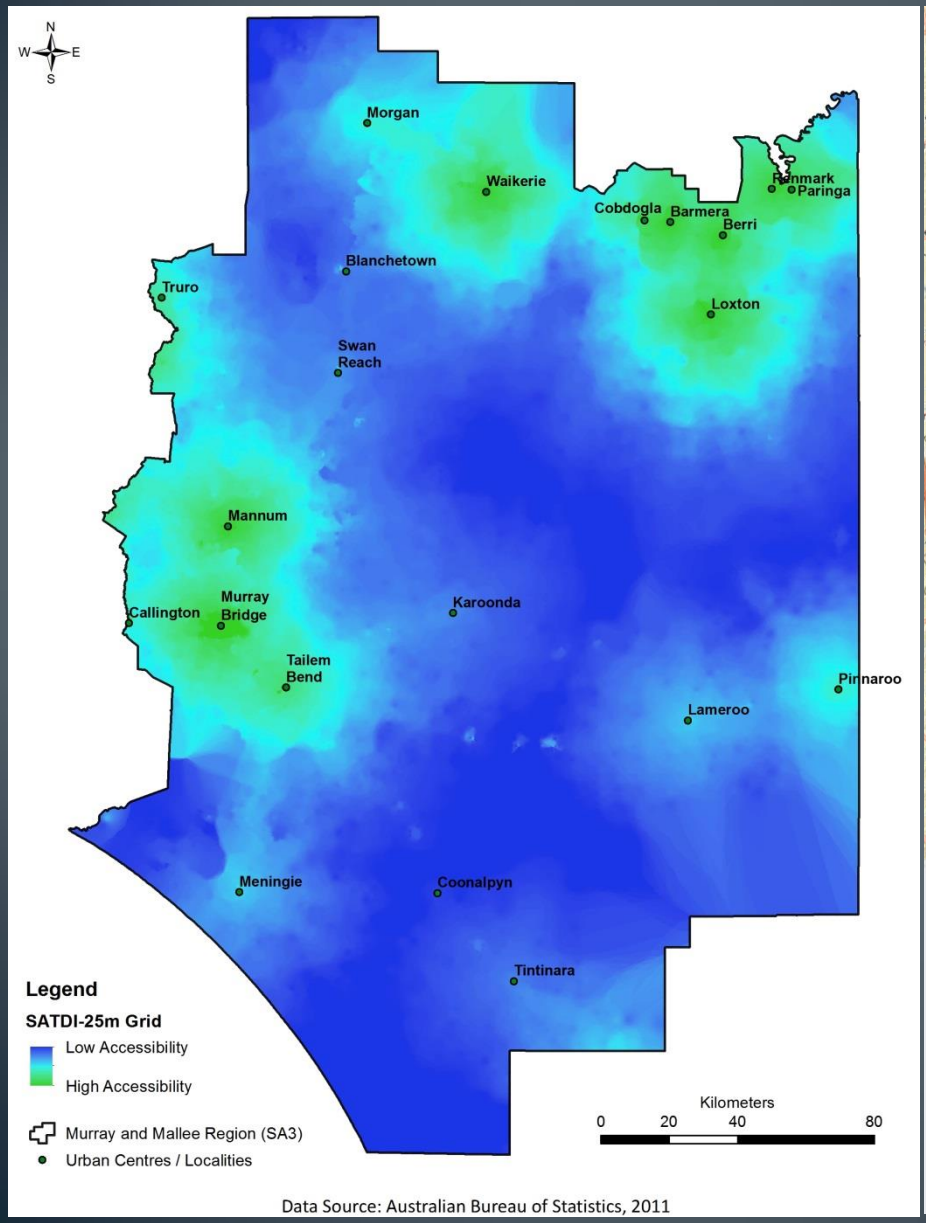
- Final scores derived by subtracting the Public Transport Accessibility score from the Service Accessibility score for each land parcel dwelling centroid in the Murray and Mallee region

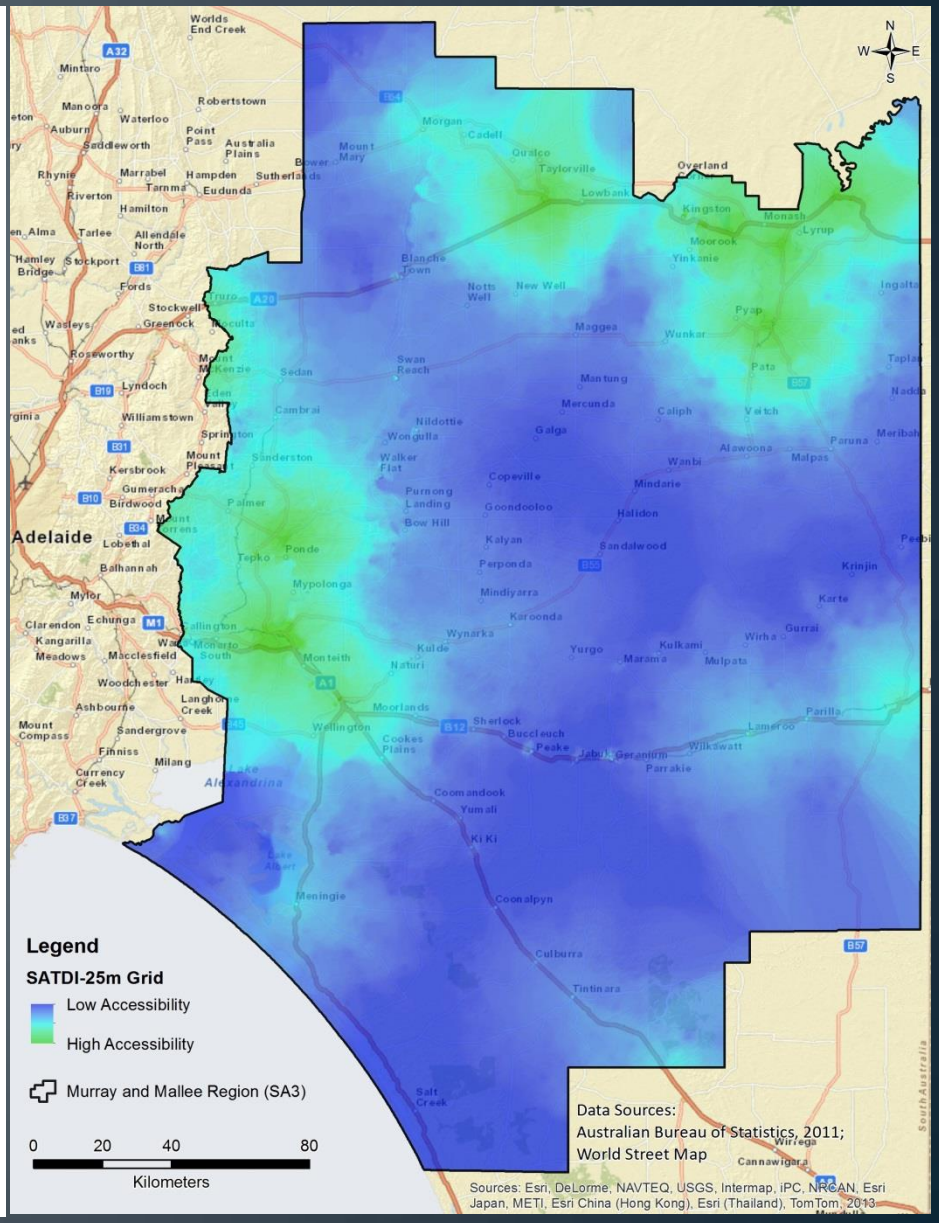
  (Component 1 – Component 2);

- Final scores less than zero were reset to zero

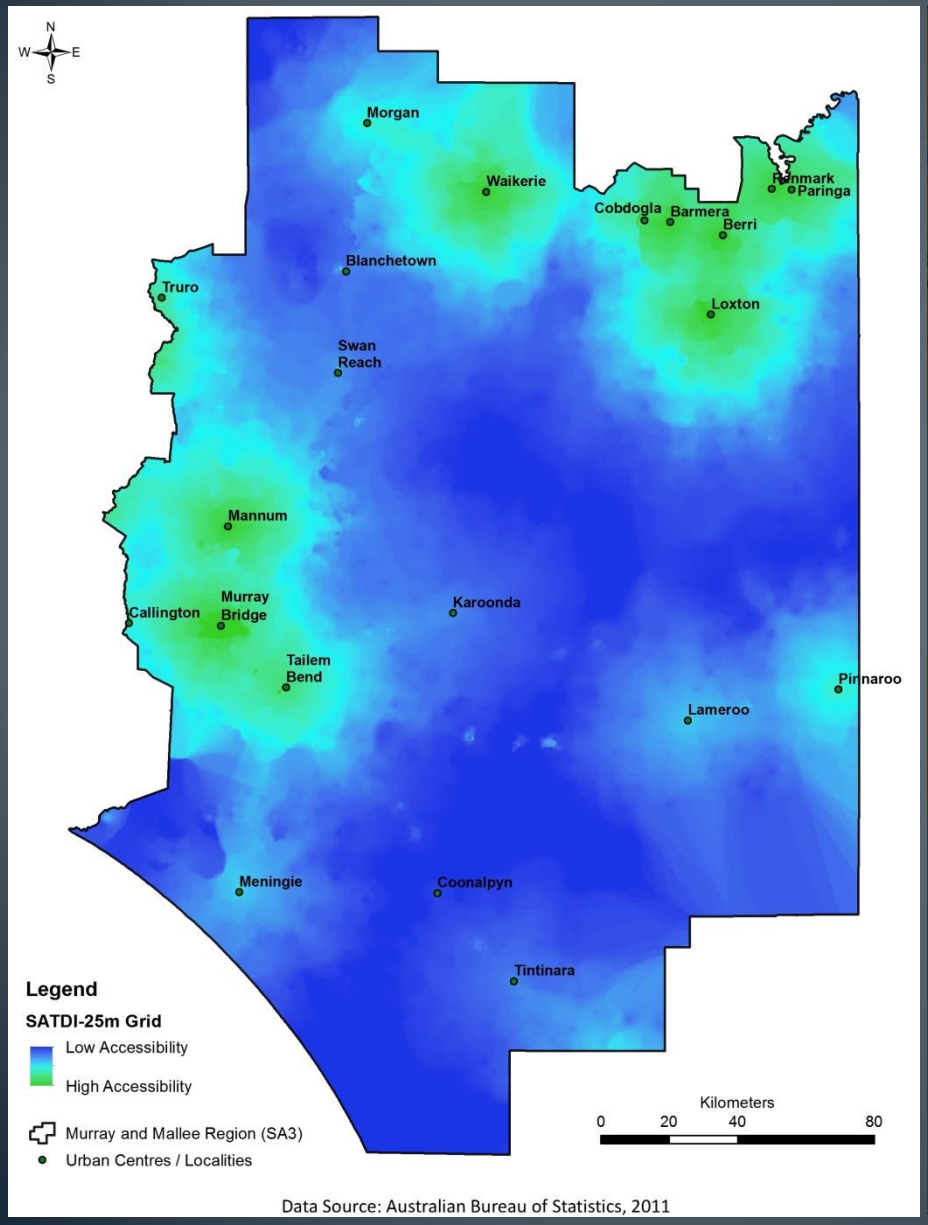
- An interpolation method (similar to the one used for ARIA+) was used to create a 25 metre square grid surface across the Murray and Mallee region.

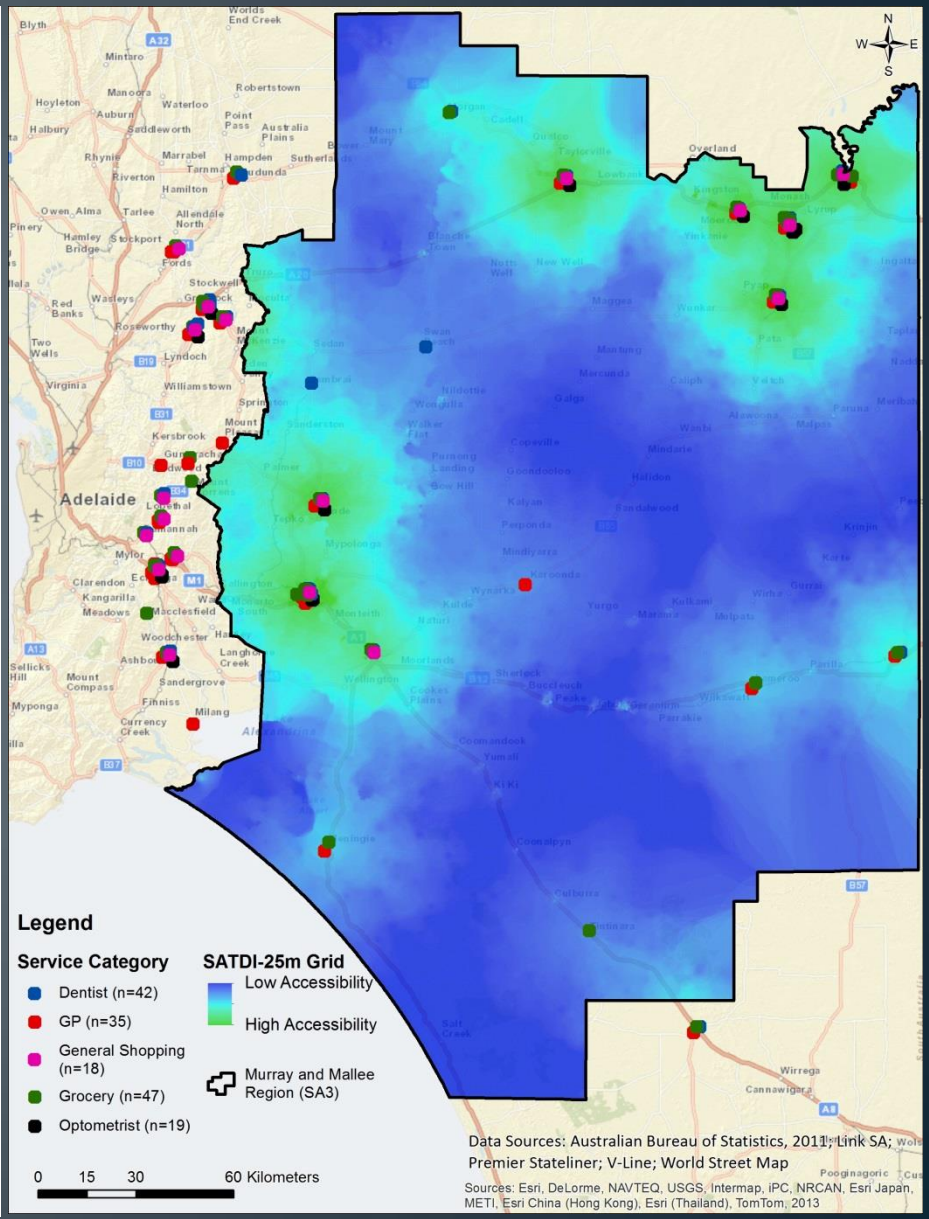
SATDI 25m Interpolated Surface



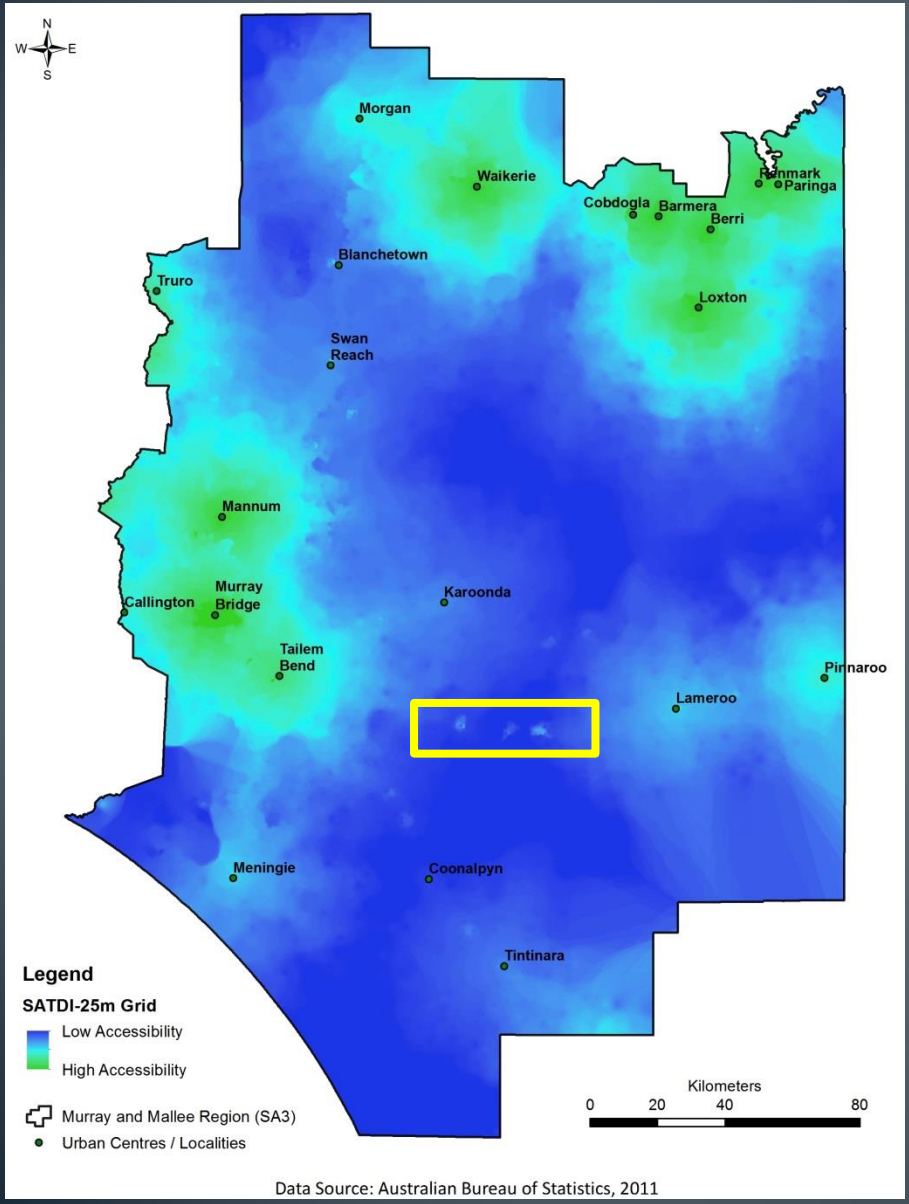


Influence of Service Accessibility Component

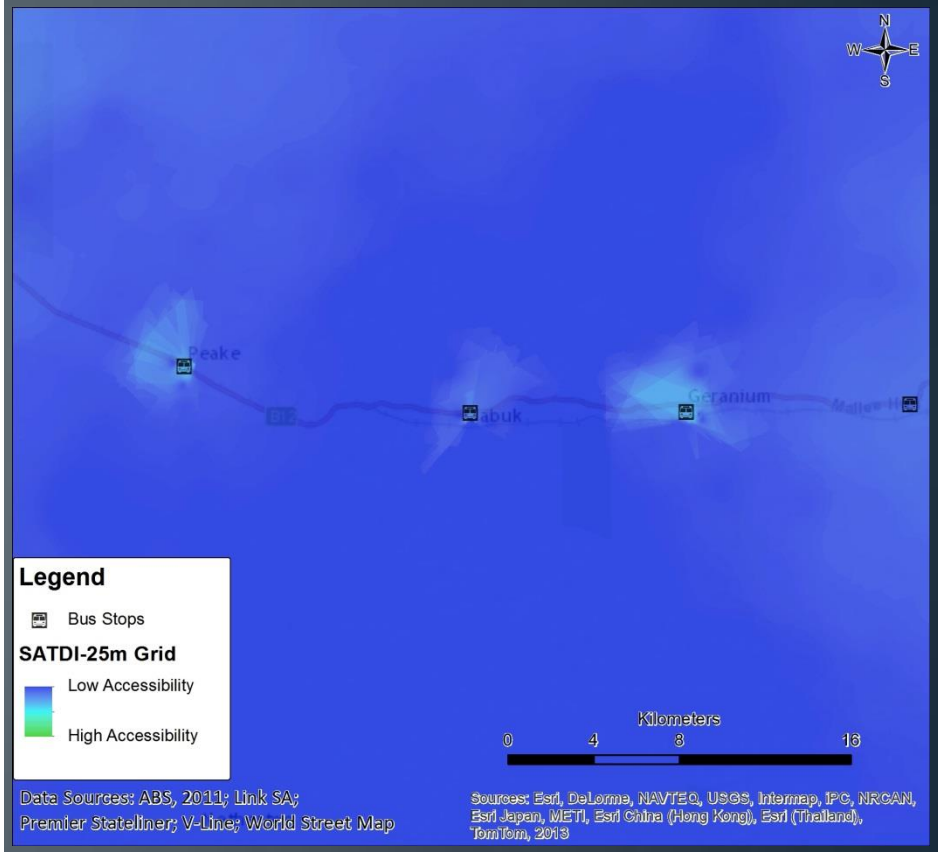




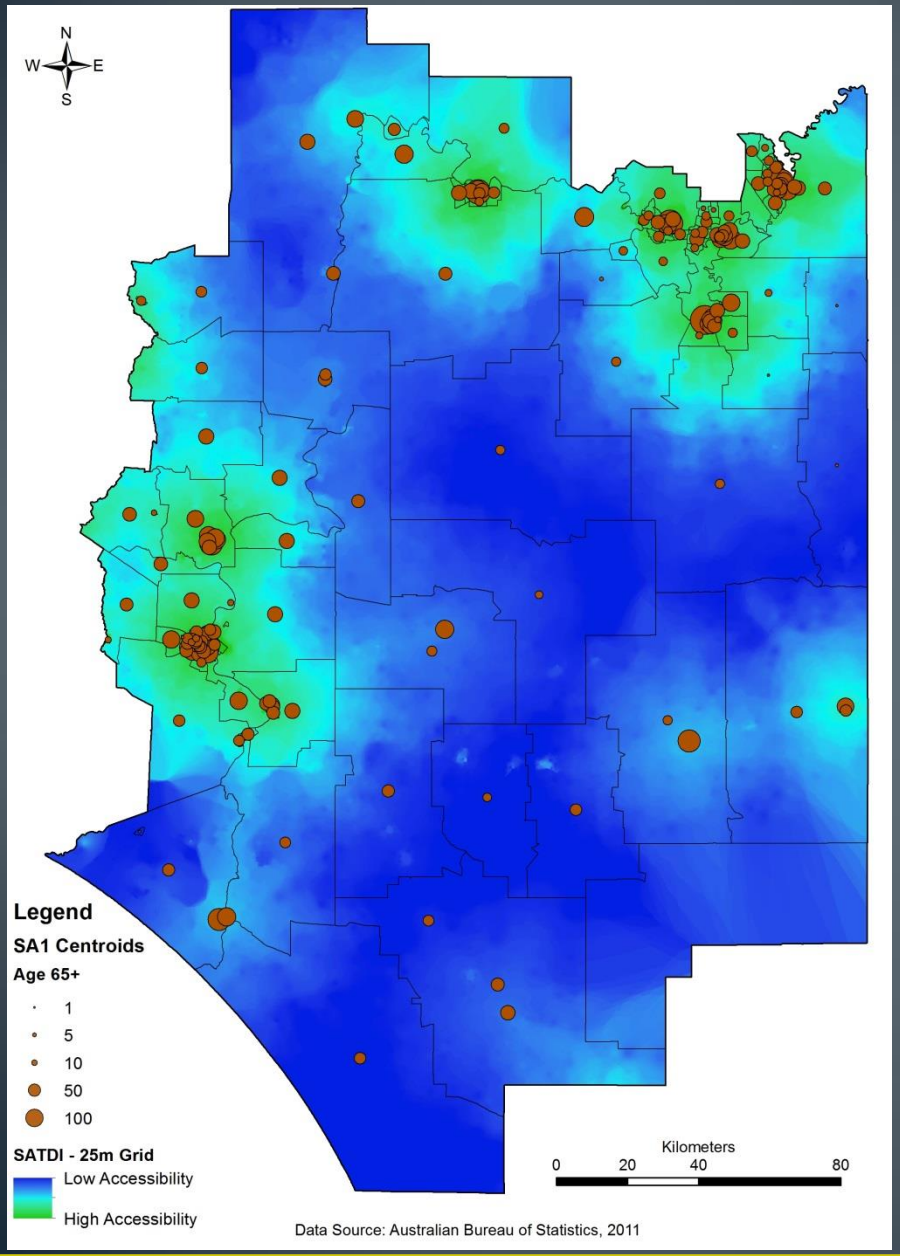
Influence of Public Transport Component



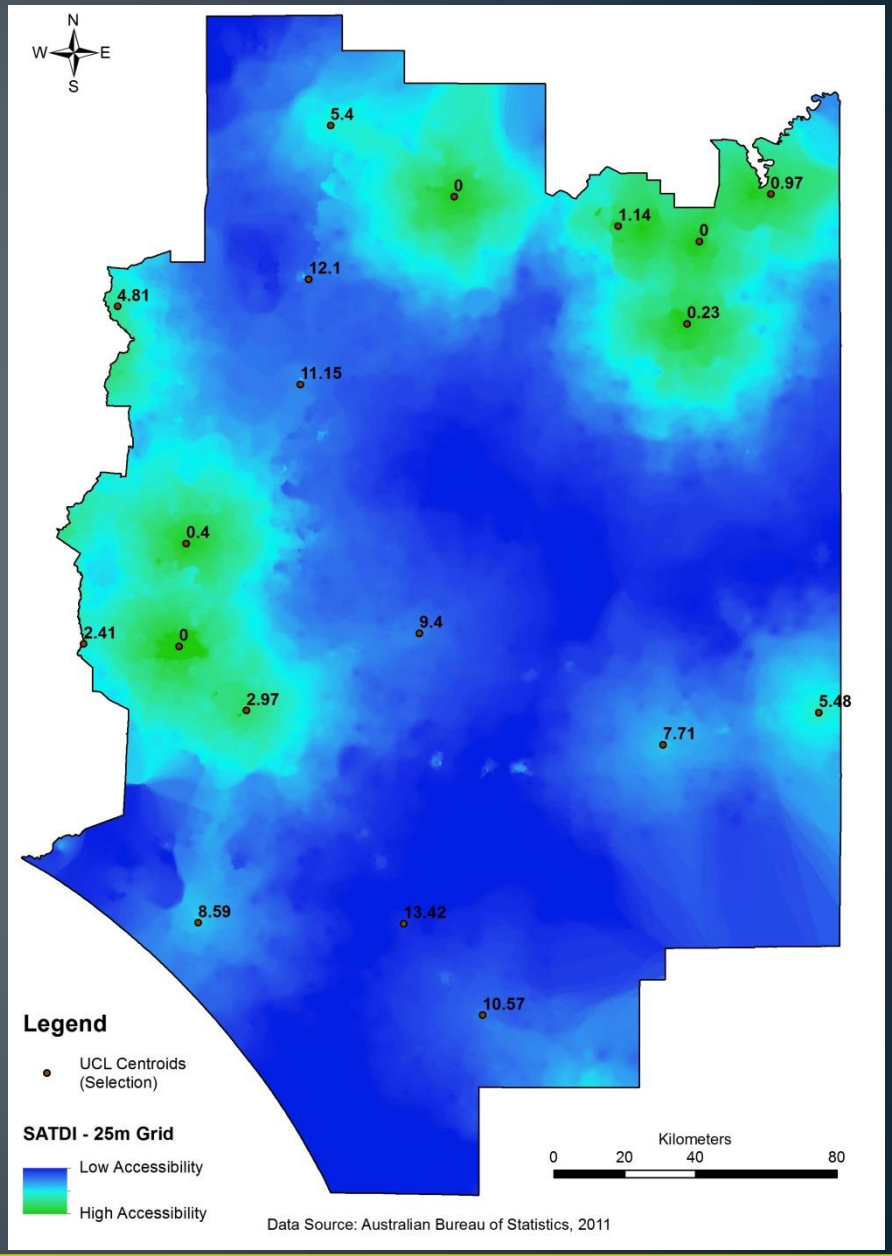
Data Source: Australian Bureau of Statistics, 2011



Overlaying Spatial Data

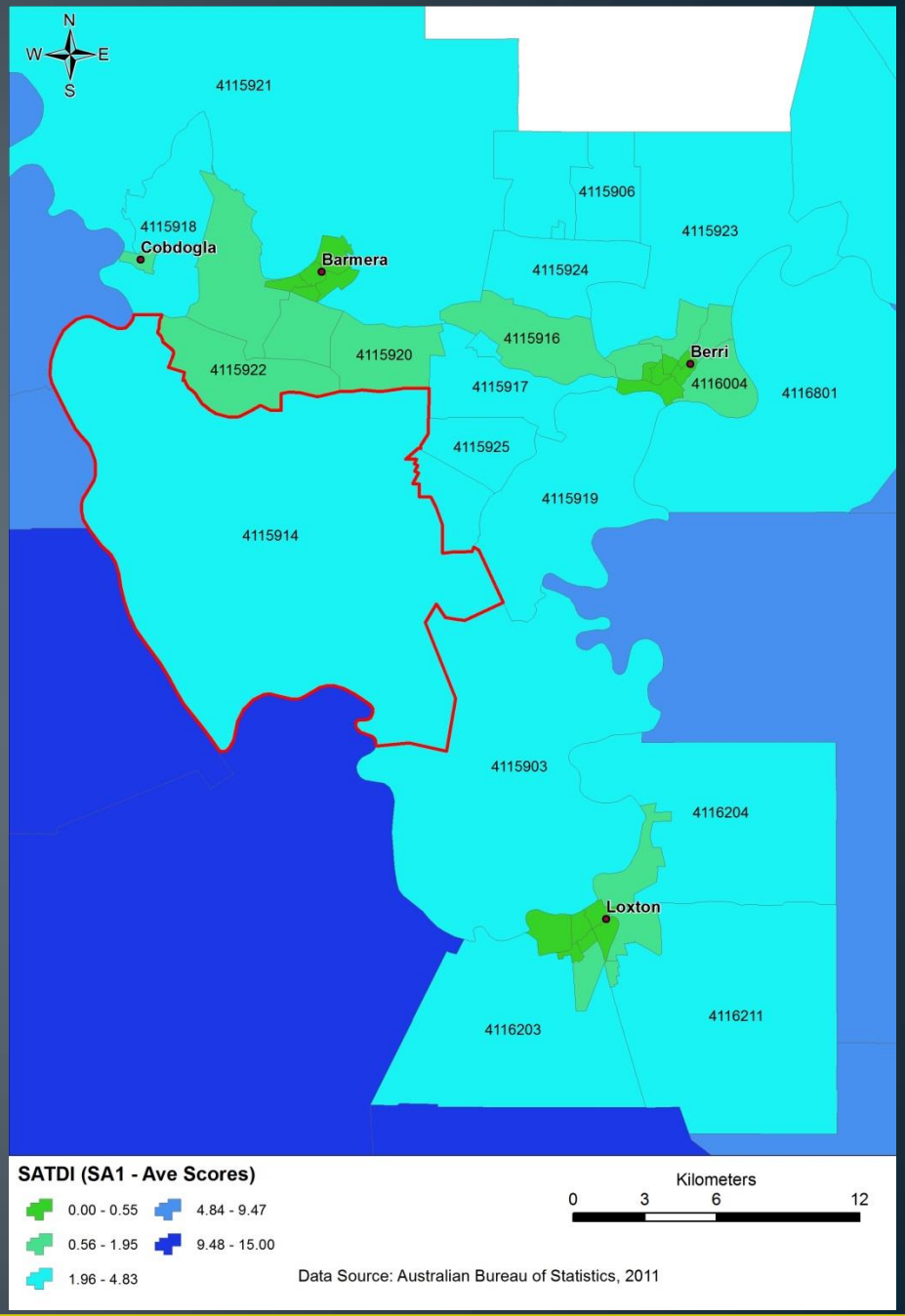


Extracting SATDI Scores



Generating Zonal Statistics (SATDI Categorisation)

SA1 Code	Average	Minimum	Maximum	Standard Deviation	Persons 65+	Total Pop
4115903	2.81	0.00	4.80	1.18	0	0
4115906	2.81	1.90	3.49	0.32	8	153
4115914	4.14	1.06	8.27	1.43	24	239
4115916	1.81	0.68	2.56	0.44	42	311
4115917	2.13	0.69	2.85	0.46	70	429
4115918	2.12	0.00	3.26	0.63	30	198
4115919	2.39	0.15	4.21	1.01	0	6
4115920	1.58	0.71	2.44	0.35	38	324
4115921	3.61	0.00	7.41	1.66	37	251
4115922	1.69	0.98	2.36	0.29	40	427
4115923	2.07	0.59	3.93	0.62	33	265
4115924	2.19	1.30	2.78	0.37	43	435
4115925	2.76	1.89	3.28	0.30	19	268
4116203	2.04	0.35	5.04	0.90	15	183
4116204	2.57	0.60	3.63	0.65	99	871
4116211	2.23	0.45	4.22	0.71	30	390
4116801	2.87	0.30	5.33	1.16	68	418



Assumptions & Limitations

- Assumes access to key services is based on the closest service which excludes any consideration of service quality/choice at an alternative location
- Index does not consider the ability to trip-chain and utilise more than one bus service to reach various service destinations
- Walking distance buffer (400m) does not take into account environmental barriers to access
- Key services were based on primary data not specifically designed to determine service usage by those aged 65+
- Assumes passengers board and alight from set bus stops

Assumptions & Limitations (cont.)

- Data sources could have been more comprehensive – e.g. Yellow Pages?
- Does not consider cost of travel beyond distance as a proxy measure for cost
- Assumes a person living within walking distance (400 metres) of two bus stops would most likely access the more frequent bus stop
- Does not consider other forms of available transportation services e.g. medical bus, hospital transportation services
- Weighting system for the bus layer

Summary

- Issues facing older people (65+) in a car dependant society
- Accessibility issues and transport disadvantage (non-metro context)
- Spatial indices that have been developed
- Development of the SATDI and its purpose…

  ….a tool for use with other spatial and non-spatial datasets to assist with decision making

Thank you

- Questions?

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