



Preferred transport futures in remote Australia

Bruno Spandonide

Working paper

CW026

2015



Australian Government
Department of Industry and Science

Business
Cooperative Research
Centres Programme



Citation

Spandonide B. 2015. *Preferred transport futures in remote Australia*. CRC-REP Working Paper CW026. Ninti One Limited, Alice Springs.

Acknowledgement

The Cooperative Research Centre for Remote Economic Participation receives funding through the Australian Government Cooperative Research Centres Program. The views expressed herein do not necessarily represent the views of CRC-REP or its Participants.

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The CRC-REP produces two series of reports: working papers and research reports. Working papers describe work in progress for the purposes of reporting back to stakeholders and for generating discussion. Research reports describe the final results of completed research projects.

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Executive summary

The ‘Transport Futures’ research focused on a survey investigating the transport preferences of community members in several discrete remote Aboriginal communities in Central Australia. The survey is the first attempt of its kind to provide specific transport information about very remote communities in remote Australia. The results can help in quantifying the specific needs of Aboriginal and Torres Strait Islander people living in remote communities and in understanding the cost-effectiveness of different transport options. Ultimately it can inform policymakers and people working in the service delivery sector so they can better identify key areas of investment to reduce transport costs and enhance community wellbeing.

The report highlights a series of key findings:

1. Mobility and transport needs in remote communities are twice the Australian average

In very remote Central Australian Aboriginal communities, mobility needs are greater than and significantly differ from the average Australian mobility needs. Local mobility needs are of multimodal and multipurpose nature and over two and a half times greater (30,000–40,000 km per year as opposed to 12,000–16,000 km per year) than the country’s average. Long-distance mobility needs contrast considerably: the average long-distance travel in Australia is composed of international flights (around 14,000–16,000 km per year per person) and domestic travel (around 4,000–6,000 km per year per person via air and road transport). In remote Central Australian Aboriginal communities, the majority of long-distance travel consists of regularly going by road to service centres located several hundreds of kilometres away (14,000–18,000 km per year per person). The community residents also travelled around 10,000–14,000 km per year per person in other types of very long-distance travel (including road and air transport).

2. Significant variation exists between remote communities, and transport needs increase with distance to service centres

People living in Lajamanu are in a situation of ultra-mobility and cover over 70,000–90,000 km yearly. There are some historical and cultural factors in such mobility practices, which are defined by the regional geography and determine the livelihoods of people in remote communities. A unique characteristic of transport in Lajamanu is that a large majority of annual travel requires transport on unsealed roads.

3. People living in very remote communities travel for a great variety of reasons

In very remote Central Australian Aboriginal communities, people achieve an outstanding level of mobility using a great variety of transport means, fitting very different purposes. Transport is essential for wellbeing, economic sustainability and quality of life for Aboriginal and Torres Strait Islander people in very remote communities. A significant proportion of transport is directed towards maintaining social wellbeing. Transport is therefore at the heart of the cultural identity of people living in remote communities.

4. Remote transport systems are operating in unsustainable socio-economic conditions

Access to transport is a major concern for people wishing to travel long distances. Transport affordability is rated very low as well. The results of the survey suggest that transport expenditure averages over 30% of household expenditure in very remote communities, while the national average is about 16% (Australian Bureau of Statistics 2012c, NT Council of Social Service Inc 2014b). Transport costs in very remote Central Australian communities are very high: for instance, household expenditure on fuel is 5–15% of average household incomes in very remote communities as opposed to 4.1% nationally (Australian Bureau of Statistics 2012c, NT Council of Social Service Inc 2014b). Despite average vehicle occupancy being three times higher in very remote communities, the average household fuel expenditure is

at least two times higher because of both high fuel prices (30–70% higher) and long driving distances. These results are consistent with recent transport cost studies in remote Australia (Spandonide 2014a). On the positive side, transport is perceived as being safe to very safe and relatively reliable.

5. Transport affordability is the number one issue before road conditions, vehicle registration and vehicle access

The principal barrier to mobility is the unaffordable cost of public transport, according to 70% of the respondents. Fuel is similarly considered to be particularly unaffordable, with 62% of the respondents declaring that high fuel costs are a major issue. Bad roads are also a very significant problem for 42% of the respondents. Not having a registered vehicle is also considered as a critical barrier. For 32% of the respondents, not being able to register a car was an issue. Finally, not being able to access a motorised vehicle or public transport is a critical issue for 31% of the respondents.

In terms of immediate solutions, people had very similar ideas about the transport-related use they would allocate money to if more disposable income were available (Figure A).

What would people do with more disposable income?



Figure A: Transport issues in Central Australian Aboriginal communities: what would people do with more disposable income?

A clear majority of people would prefer to register a vehicle, buy more fuel, repair a car and buy a public transport ticket (especially for a big trip). It is important to note that a large number of people will substitute their mode of transport, from private motorised transport to public transport, if public transport is available and if public transport costs are lowered (through subsidies or lower fares). Furthermore, registration and repair costs represent a critical issue as they trigger a negative cycle of wider exponential impacts: not being able to afford registrations is linked to a high likelihood of transport-related offences (aggravated by recidivism or inability to pay a fine). These problems crystallise structural transport access inequalities, exacerbating existing socio-economic exclusion issues (Spandonide 2014a).

6. Locational, generational and gender differences can lead to different types of transport preferences in Central Australian Aboriginal communities. This new understanding of transport needs leads to some suggestions for improvement:

i. *Developing more affordable, frequent and integrated long-distance public transport*

Transport costs to the nearest service centre are particularly expensive on a per kilometre basis. Increasing the subsidy for concession prices for the most disadvantaged people living in very remote Central Australian communities would require a relatively low level of public investment compared to the cost of road sealing. It would also provide strong returns in terms of financial stress relief and general wellbeing (Dockery 2015), as long-distance public transport is primarily used to supply the most financially vulnerable people (majority of young, elderly and female users) and keep family relationships active. More frequent and better integrated services could create opportunities for local employment both within the transport industry and for other industries via a more reliable access to work.

ii. *Implementing a more appropriate and comprehensive transport policy specific to the bush*

Appropriate transport regulations aimed at creating new systems for fuel distribution, vehicle distribution (more durable and fuel-efficient vehicles), registration, servicing and licensing would have immediate impacts on transport-related judicial issues, economic participation (by exponentially increasing local mobility options) and wellbeing (Dockery & Hampton 2015). Significant gains could have been made had action been taken almost 10 years ago (Australian Bureau of Statistics 2006a).

iii. *Systematising high benchmarks in regional planning for community services, freight and transport services in very remote communities*

The survey highlights an aspiration for more local services within communities. Additionally, developing a nationwide tendering system that provides remote communities and enterprises with more affordable goods delivery options would reduce transport needs and costs. Local operators would benefit from extending the catchment area of their businesses to new locations, which would also support local employment. Such a system would necessitate an appropriate governance body to coordinate actions on an appropriate remote Australian scale. The system would be more likely to effectively drive technological innovations and increase future resilience in communities.

1. Introduction

In remote Australia, transport systems are essential for the enabling of community cultural, social and business interactions (Altman & Kerins 2012, Battersby 2006, Biddle 2011, Dockery 2015, Leung & Tantirigama 2011, Prout 2007). In very remote locations, Aboriginal and Torres Strait Islander people represent half of the population (Figure 1).



Figure 1: Key facts about Aboriginal and Torres Strait Islander people living in remote Australia

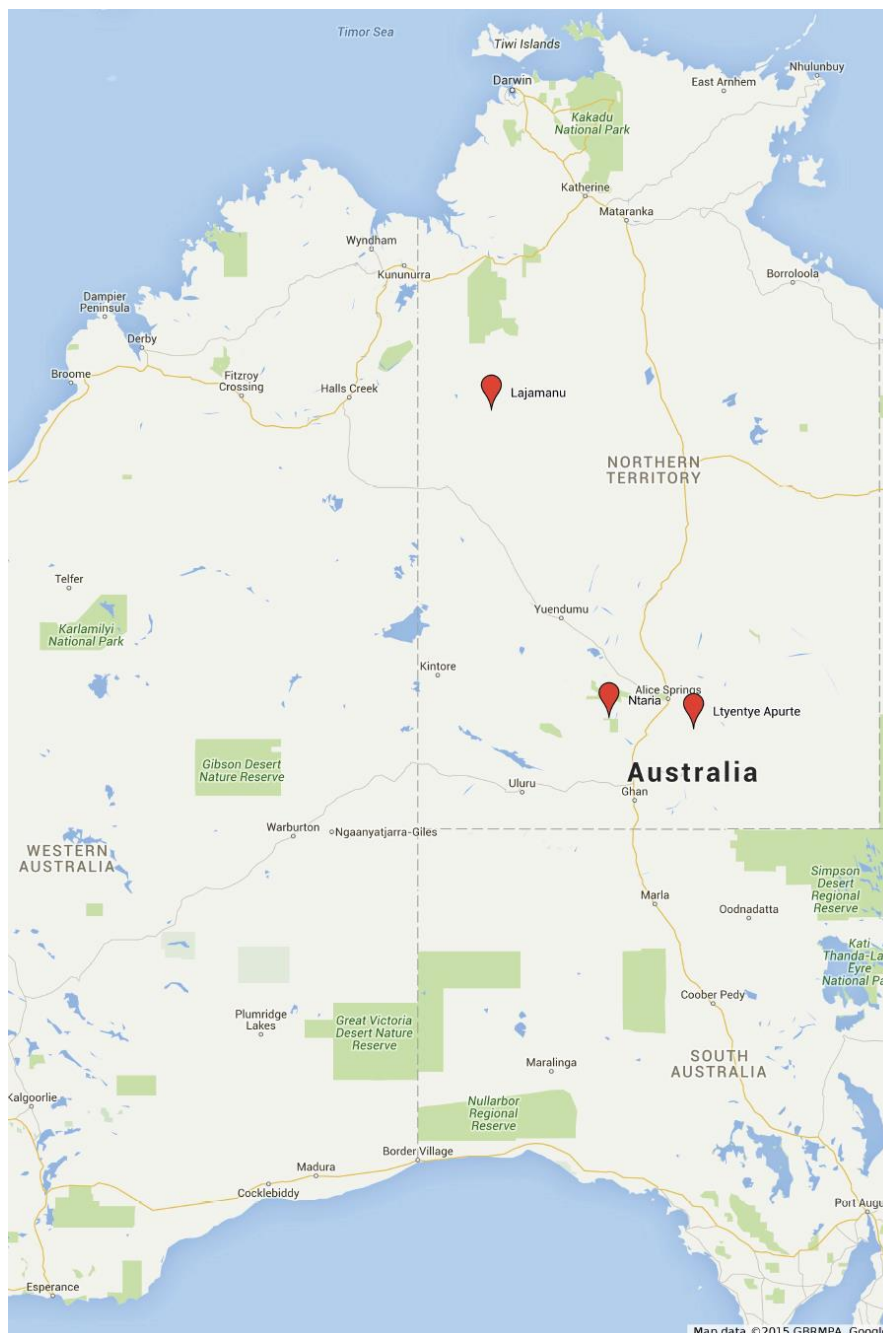
Source: (Australian Bureau of Statistics 2012a, 2012b, 2013a, 2013b, 2013c)

Transport issues have been identified for a number of years as being one of the biggest barriers for the sustainable development of remote communities (Raicu et al. 2011, Smoker 2011). Service provision is the leading industry in Aboriginal and Torres Strait Islander remote communities (Stoekl et al. 2007), and transport costs are very high for public and private social and business enterprises delivering services in remote communities.

Ideally, supplying large and medium-sized remote communities – which, according to the Australian Bureau of Statistics (2003), corresponds to communities with more than 200 inhabitants – with well-maintained sealed roads would decrease public service provision and community development project costs. However, sealing roads is rarely an economically viable option, considering the relatively small population sizes and the long distances that characterise remote Aboriginal and Torres Strait Islander communities: the average community has around 60–70 inhabitants and is located 200–250 km away from the nearest service centre (Australian Bureau of Statistics 2003, 2010, Taylor et al. 2006).

The Transport Futures research project has been designed according to the recommendations of the scoping study of Raicu et al. (2011), which determined a need for developing a comprehensive framework for studying current and alternative transport options in remote Australia. Transport practices and preferences in remote communities are not well documented. This research project is exploring current transport systems and future transport alternatives as well as assisting stakeholders to make informed decisions about transport initiatives.

2. Survey of current transport preferences and future alternatives in very remote Central Australia



Transport surveys at the household level are not common in remote Australia. The majority of census data and other types of transport-related studies do not provide information even at a community level, hence the need to collect new data. As part of the Transport Futures research, a first attempt to collect data took place in 2014–15 through a survey that asked community members in three discrete very remote Aboriginal communities in Central Australia (Lajamanu, Ltyentye Apurte and Ntaria) about current and future transportation alternatives (Figure 2).

Figure 2: Field sites of the Transport Futures survey

Source: Google Maps 2015



There are around 1,200 very remote communities in Australia. Large, very remote communities with more than 200 inhabitants are around 12% (150) of the total number of very remote communities and have almost 70% of the population (Australian Bureau of Statistics 2003, 2006a, 2007, 2009, 2012a, 2013c, 2014a). In the Northern Territory, 20 major remote ‘growth’ towns have been identified by the Northern Territory Government (Northern Territory Government 2012). Fifteen are located north of Elliott in the Top End region, and five are located south of Elliott in the Central Australian area. Lajamanu and Ntaria belong to this group of five large remote towns (population over 400 inhabitants), and Ltyentye Apurte is of a similar size, although it is not identified as a growth town (Figure 3).

Figure 3: Twenty major remote towns
Source: (Northern Territory Government 2012)

Working in Central Australia therefore allows studies to be undertaken at micro scales, within discrete communities, with the findings for Ntaria, Lajamanu and Ltyentye Apurte potentially applicable to other large Central Australian very remote communities.

The survey was developed with input from Aboriginal Community Researchers (ACRs), who also conducted the surveys. The surveys were face-to-face interview surveys with a computer tablet being used to help deliver the questions and record the responses. Ethics approvals, consent forms and permissions were obtained in accordance with the code of practice of the Business Development Unit (BDU) of Ninti One. A copy of the survey is provided in the Appendix.

This research project is exploring a range of strategies that people develop to interact with and use transport systems to travel outside their communities. This is achieved partly through the survey, which gathered data about travel behaviour and how people use transport systems within the very remote Australian context, which is characterised by a lack of transport resources (infrastructure, vehicles and services). Transport modes, travel characteristics and preferences for transport alternatives are examined in detail in the following sections.

The fieldwork involved undertaking 25 surveys (4–6% of the population) in each community. The survey sample (Table 1) was a diverse mix of adults reflective of community profiles as described by the Australian Bureau of Statistics (2012a, 2014a) in terms of:

- gender (39 females +/-3, 36 males +/-3)
- age (15 people aged 18–25 +/-2; 24 people aged 25–35 +/-2; 15 people aged 35–45 +/-2; 12 people aged 45–55 +/-1; 9 people aged 55+ +/-1)
- length of residency in the community.

Table 1: Age and gender characteristics of participants in the Transport Futures survey

	Ltyentye Apurte		Lajamanu		Ntaria		Total	
Age	Female	Male	Female	Male	Female	Male	Female	Male
18–25	4	3	1	0	3	6	8	9
25–35	3	7	4	5	4	1	11	13
35–45	3	2	1	1	4	2	8	5
45–55	1	0	4	3	3	1	8	4
55+	1	1	4	2	0	1	5	4
Total	12	13	14	11	14	11	40	35

In Lajamanu, age groups over 45 were significantly over-represented (over three times more than in Ltyentye Apurte and Ntaria), which relates to the fact that the ACRs doing the surveys there were older. In Ltyentye Apurte, males aged 25–35 and in Ntaria young males aged 18–25 were over-represented (two times more males than females).

In the literature it appears that Aboriginal and Torres Strait Islander people living in remote communities have very different mobility patterns from those of non-Aboriginal and Torres Strait Islander people (Biddle & Prout 2009, Centre for Remote Health et al. 2011, Denmark 2012, Dockery & Colquhoun 2012, Dockery & Hampton 2015, Elvin et al. 2010, Foster et al. 2005, Howard-Wagner & Kelly 2011, Kainz et al. 2012, Kinfu 2005, Memmott et al. 2004, Memmott et al. 2006, Pleshet 2006, Prout 2008, Taylor 2011, Young & Doohan 1989). For Aboriginal and Torres Strait Islander people living in remote communities, intense local, regional and extra-regional travel patterns exist, while for non-Aboriginal and Torres Strait Islander people, work-related forms of long-distance mobility are dominant; other forms of small distance mobility are very localised; and other forms of long-distance mobility are achieved through fly-in/fly-out practices (Biddle & Hunter 2005, Storey 2001). The complexity of mobility patterns of Aboriginal and Torres Strait Islander people living in remote communities has only recently been researched from a transport perspective (Dockery & Hampton 2015).

An ongoing situation of transport disadvantage affecting Aboriginal and Torres Strait Islander people living in remote communities has been well identified (Australian Bureau of Statistics 2004, 2006b, 2010, 2013e, 2014b, Berry et al. 2007, Currie & Senbergs 2007, Gething 1997, Holcombe 2006, Hunter 2012, Lawrence 1991, McFadden et al. 2000, Posselt 2000, Rosier & McDonald 2011, Young & Doohan 1989). Furthermore, the literature suggests that travelling to service centres is important both in terms of frequency and of access to services (Altman 2010, Berryman and Associates 2001, Coughlan 1991, Currie & Senbergs 2007, Fogarty 2005, Lawrence 1991, Musharbash 2008, NSW Aboriginal Transport Network 2006, Prout & Yap 2010, Raicu et al. 2011, Smith 2002, Taylor 2002, 2006, Taylor et al. 2006). However, there are no examples in the literature of a transport study dedicated to Aboriginal and Torres Strait Islander remote communities. Therefore, the survey in this research project aimed to study travel behaviour in detail to fill this research gap and acquire some primary data about transport uses.

In designing the survey, a general distinction was made between small trips of less than 200 km and big return trips over 1,000 km. A complementary survey from the Population Mobility and Labour Market

project (Dockery & Hampton 2015) also asked about the distances to the nearest service centres (190 km return for Ltyentye Apurte; 220 km return for Ntaria; 1,100 km return for Lajamanu). The original intention of the transport survey was to explore the individual definitions of ‘short’ and ‘long’ distances. The responses demonstrate a large range of understanding of what defined small and big trips. Trips to the nearest service centre were considered as small or as big trips depending on individual interpretations and circumstances.

Furthermore, while the open structure of the survey implied that variations of interpretations between small and big trips were defined in terms of distance, it created a certain level of confusion in the responses. For instance, the reported average number of small trips per day and associated distance does not necessarily mean that people will travel every day in the same way. However, the results analysed are limited by the fact that small trips’ distances include local commutes as well as trips to the nearest service centre. Furthermore, a large proportion of these trips may be combined (transits and multipurpose trips), so people tend to discount the local trips, which leads to underestimation of the number of trips. Summing the number of times travelled for each of the individual services would greatly overestimate the actual number of trips. Field validation allowed confirmation that the results of average small trip distances seem to better correspond to average trips of a regular day of travel and that a certain number of days without travelling could be discounted from overall annual distance travelled (15% as a conservative estimate or 55 days).

Finally, on-the-ground experience and observation helped the research team to further validate and understand different results and provided insight for the researchers in this study. For example, ACRs explained that when respondents in Ntaria and Ltyentye Apurte answered questions about average distances travelled, expenses and costs for small trips, they were usually referring to trips to Alice Springs; when they answered questions about number of trips, they were including local commuting and small local trips, but generally excluding the fact that multiple stops would be involved. In Lajamanu, the distinction between small trips and big trips closer corresponded to local transport as opposed to travelling elsewhere over longer distances.

Trips to the nearest service centre have been estimated and the results have been refined using a distinction related to a kilometric value and further determining the nature of small and big trips with detailed analysis.

Secondary data (population profiles, information about transport infrastructure road networks, fuel prices, network attributes and service costs) will be connected to the information extracted from this survey to undertake some modelling and design scenarios in 2016 for future transport options in remote Australia.

The survey itself was divided into four sections. The first section collected socio-demographic information and defined small and big trips. The second section gathered data about the characteristics of trips: types and availability of transport; trip purposes, lengths, durations and frequencies; number of passengers and costs, and number of night trips. The third section examined issues of transport access and sustainability: ease of making and completing trips; safety, reliability and affordability of infrastructure, vehicles, and service and transport alternatives. The last section was centred on future preferences for transport systems, which included questions about what respondents would do with an increase in disposable income and what transport-related community development project they would like to see.

The questions were uploaded to computer tablets, which were used to complete the surveys. The software used was iSurvey, which had the benefit of being familiar to the ACRs who conducted the research, as this software is already used in other research projects conducted by Ninti One. When previously tested in the field, a simple and user-friendly layout achieved a good overall success rate. The ACRs who performed the

surveys were able to give assistance to the survey participants in language and in a culturally appropriate way. The ground-level expertise of the research team meant that response rates were particularly good.

The results are presented for each community in the order they were surveyed. Surveys started in December 2014 and were completed in March 2015 in Ltyentye Apurte. The fieldwork started in March 2015 in Lajamanu and the last surveys were completed in May 2015. In Ntaria the survey was undertaken in April and May 2015.

In terms of data accuracy, around a third of the survey results revealed issues of over- or under-reporting of travel by survey respondents. Statistically inconsistent responses were identified. These issues occurred because people had different understandings of travel frequency and average travel distance. Largely disproportionate itemised figures in terms of distance, time, frequency or figures which did not correlate well with each other have been identified.

Similarly, answers about transport expenses and costs were not always consistent. As substantial use of collective payment towards transport activities was identified in the literature, for the purposes of this study ‘individual expenses’ were the payments made by an individual, and ‘group costs’ were the sum of all payments made by all passengers to undertake a trip. Some data needed to be removed to have a good level of data accuracy. In the three communities, the highest number of responses with relevance issues ranged from six (24%) to nine (36%), with an average of 28% (seven surveys). A manual data selection process helped address these issues – which are common to surveys: sampling, coverage, measurement and non-response errors (de Leeuw et al. 2008, Dillman & Bowker 2000) – by narrowing some observations and comparative analyses to a specific 72% sample of the most accurate, coherent and standard responses. The results could also be further examined through making different types of sensitivity analyses.

3. Travel behaviour and preferences in communities in very remote Central Australia

The results of the survey in terms of travel behaviour and preferences are presented for each community.

3.1 Ltyentye Apurte

In Ltyentye Apurte, small return trips (including local commutes and trips to the nearest service centre) are on average around 102–126 km and big trips around 1,302–1,308 km. Small trips occur around 2.44–3.68 times per day while big trips occur 6.11–7.24 per year. At the high end of the spectrum, about 20% of the respondents undertake more than 20 big return trips per year.

Table 2 provides information of estimated trips in Ltyentye Apurte.

Table 2: Estimated trip distance in Ltyentye Apurte

	Local	Service centre	Long distance
Number of trips	2–4 per day or around 1,050 per year	0.11 per day or 39 per year (1 trip every 10 days)	6–7 per year
Average distance per return trip	30–40 km	150–200 km	1,305 km
Average distance per day	100 km	19 km	24 km
Average distance per year	36,500 km	7,020 km	8,685 km
Total distance travelled per year	45,000–55,000		

People living in Ltyentye Apurte travel an estimated range of 45,000–55,000 km each year. Travel to Alice Springs represents over 7,000 km per year. The daily local commuting represents over 36,000 km per year, and big trips account for more than 8,500 km per year.

The estimated annual travel demand of people living in Ltyentye Apurte is illustrated in Figure 4.

Average travel demand in Ltyentye Apurte

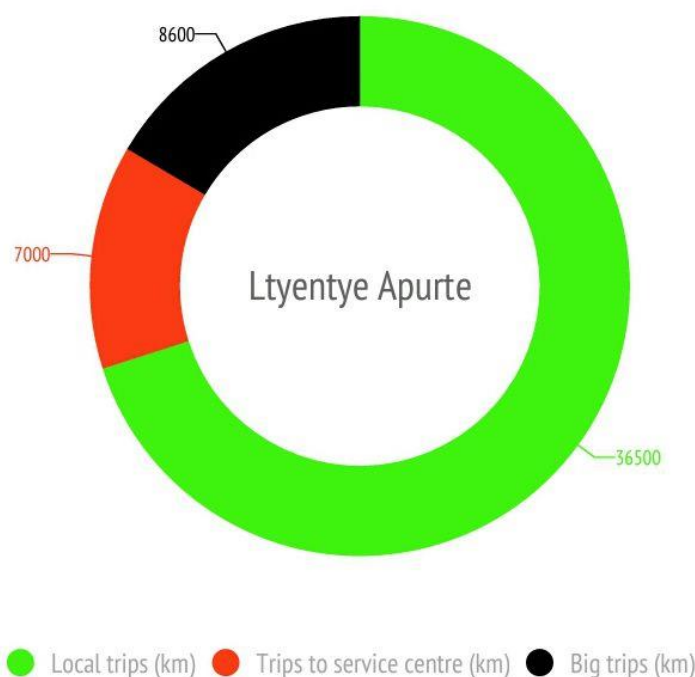


Figure 4: Estimated average annual travel demand in Ltyentye Apurte

On average a return trip to Alice Springs requires 4 hours of preparation time (consisting of organising activities for the travel, which are conducted prior to making the trip) and is performed in 2 hours. An average big trip takes 10 days of preparation time and is completed in around 11.6 hours. However, there are some large variations¹: in the 72% sample, people were taking only 1.5 hours to organise a small trip and 5–6 days to prepare for a big return trip. Table 3 provides information of estimated transport time in Ltyentye Apurte.

Table 3: Estimated time per trip and per year in Ltyentye Apurte

	Service centre	Long distance
Time of preparation and travel per trip	4 hours 2 hours	10 days 11.6 hours
Time per year	156 hours 72 hours	60 days 77.14 hours

People travel at night an average of 4 nights per year (with the 72% sample showing that respondents travel at night for around 6 trips per year).

¹ Variations are due to both inconsistencies in the survey results and trips corresponding to specific needs. When significant variations occur, the most consistent measure will be used by referring to 'the 72% sample', which was the selection of the most accurate, coherent and standard surveys.

The average number of people travelling together is 4.12 for small trips and 4.16 for big trips.

Reported expenses and costs for small trips in Ltyentye Apurte tend to closely correspond to the travel to Alice Springs; local travel is underestimated. To calculate the average annual travel and expenses and costs for small trips, the number of trips declared in the survey is adjusted up by the estimated proportion of trips to the closest service centre.

Expenses were the payments made by an individual, and costs were the sum of all payments made by all passengers to undertake a trip. Table 4 provides information of estimated expenses in Ltyentye Apurte.

Table 4: Estimated expenses per trip and per year in Ltyentye Apurte

	Local	Service centre	Long distance
Expense per adult traveller per trip	\$12	\$60	\$345
Expense per adult traveller per day	\$27	\$6.4	\$6.57
Expense per adult traveller per year	\$9,850	\$2,340	\$2,400

The average expense to individuals is around \$12 for small return trips, \$60 to go to Alice Springs and \$345 for big return trips (in the 72% sample, small trips were around \$8, trips to Alice Springs around \$40, while big trips were around \$250). The average total per trip cost is around \$18 for small return trips, \$100 for going to Alice Springs and \$450 for big return trips (this was closer to the averages in the 72% sample: around \$16, \$90 and \$410 respectively).

Figure 5 presents estimated breakdowns of annual travel expenses and costs in Ltyentye Apurte.

Average travel budget in Ltyentye Apurte

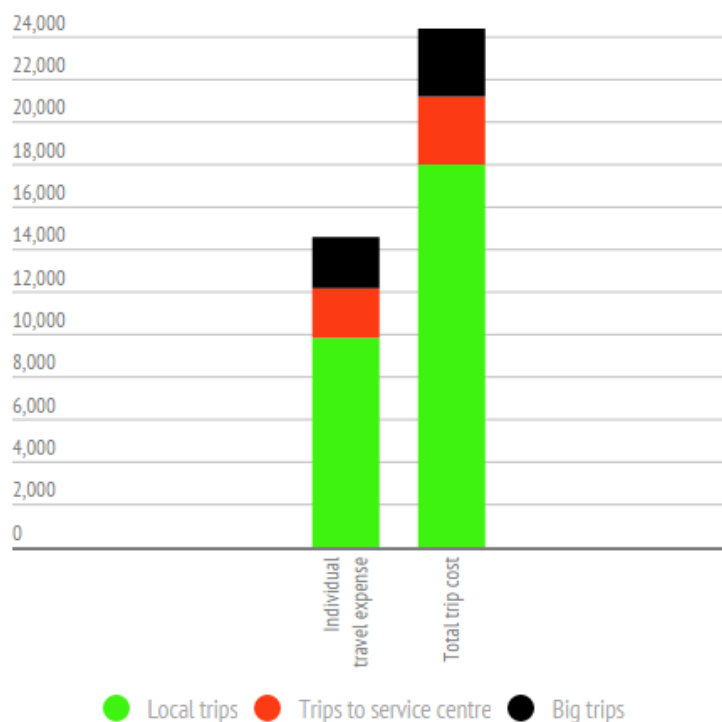


Figure 5: Estimates of annual individual travel expenses and total trip costs in Ltyentye Apurte

Small trips are primarily undertaken for the purpose of shopping, to visit family and friends and to go to work, attend sports events and go to the bank (trips are generally multipurpose and involve several stops). Long trips are more often performed to visit family and friends; attending sports activities, doing some shopping² and going to cultural activities are also very important in Ltyentye Apurte (big trips also involve a combination of different purposes).

The results show that many of these trips, both small and big, are difficult to complete. Some of the reasons for this may be the condition of roads for local trips, and poor access to vehicles for larger trips. Other reasons include problems with vehicle registration and weather conditions.

Future transport priorities are to improve local transport by improving roads and making fuel and parts more affordable. For public transport, priorities were more affordable fares and access to vehicles of government and non-government organisations going to the community.

Ways to reduce the requirement to travel would be setting up a community mechanics workshop and delivering more goods and services within the community. More efficient travel could be achieved by running a community bus. Table 5 provides information of trip characteristics in Ltyentye Apurte.

Table 5: Trip characteristics in Ltyentye Apurte

Ltyentye Apurte	Small/short trips	Big/long trips
Most common reasons to travel (whole dataset/72% sample)	Shopping (92%/83.5%) Visit family (56%/61%) Visit friends (28%/33%) Work (24%/16.5%) Sports events (24%/28%) Banking (28%/16.5%)	Visit family (40%/55%) Visit friends (28%/33%) Sports events (28%/33.5%) Shopping (20%/16.5%) Cultural reasons (15%/16.5%)
Travel at night? (72% sample values)	4 nights/year (6 nights/year)	
Average number of persons (including humbug) travelling	4.12	4.16
Road condition (full dataset/ 72% sample values)	Bad (56%/66.5%)	Average (28%/39%) Bad (24%/16.5)
Vehicle condition	Good (44.5%) Average (36%)	Good (44.5%) Average (36%)
Access to transport	Easy/Very easy (40%) Average (52%)	Average/Bad/Very bad (80%)
Vehicle safety (full dataset/72% sample values)	Very safe Safe Average (56%/40%)	Safe/Very safe (56%) Average (44%)
Transport reliability	Average (44%)	Reliable (48%)
Transport affordability (full dataset/72% sample values)	Average (52%/72%)	Average (44%) Unaffordable / very unaffordable (24%)

² The type of shopping might be different for small and big trips (i.e. large expensive items in long trips versus everyday needs in small trips). Similarly, other types of trip purposes, such as visiting friends and family, are likely to involve significant differences from small to big trips. However, these questions were not included in the survey as the focus was restricted to transport behaviour and preferences.

Ltyentye Apurte	Small/short trips	Big/long trips
Main problems with accessing and using transport	Road conditions (52%) Lack of lift/access to transport (36%) Extreme weather (i.e. hot days, floods) (28%) No registration (28%)	Road conditions (56%) Lack of lift/access to transport (44%)
Types of trips/journey most difficult to access/complete (whole dataset)	Shopping (56%) Cultural activities (40%) Family gathering (36%) Bank (24%)	Cultural activities (56%) Family gathering (56%) Shopping (28%) Bank (33.5%)
Transport improvements	Improving roads (80%)	More affordable fuel (40%)
Transport infrastructure priorities	Better maintained roads (84%) Upgrading unsealed to sealed roads (72%)	
Public transport priorities	Cheaper bus tickets (64%) Government vehicles giving more lifts to people of the community (40%)	Cheaper bus/plane tickets (84%)
Private transport priorities	Cheaper fuel (68%) Cheaper repairs (cheaper parts and cheaper road assistance) (52%) Free license/driving courses (32%)	Having four-wheel drive cars (24%) Cheaper fuel (48%) Cheaper repairs (cheaper parts and cheaper road assistance) (40%) Cheaper registration (28%) Comprehensive roadside assistance (24%)
Transport demand reduction	More services (shops, health, housing) (52%) A community mechanics workshop (56%) Affordable delivery of goods/shopping (48%) Community buses (32%)	
Increase in disposable income by \$2,000	I would repair a vehicle (72%) I would get a registration (56%) I would buy some fuel (44%)	I would get a registration (52%) I would take the plane (52%) I would repair a vehicle (44%) I would take the bus (36%)
Community development project preferences	Repairing roads (64%) Running a community bus (64%) Opening a workshop in the community (44%)	

3.2 Lajamanu

In Lajamanu, respondents reported that small return trips (including some of the local commute and parts of other regional trips, which will be evaluated below) are on average around 230–280 km and big trips around 500–600 km. Small trips occur around 1.66–1.72 times per day while big trips occur 5.04–11 times per year. Table 6 provides information of estimated trip distance in Lajamanu.

Table 6: Estimated distance per trip and per year in Lajamanu

	Small trips	Service centre	Long distance
Number of trips	1–2 per day or around 450 per year	0.05 per day or 18 per year (one trip every three weeks)	5–6 per year
Average distance per return trip	140–180 km	1,100 km	500–600 km
Average distance per day	130 km	55 km	8 km
Average distance per year	46,000 km	20,000 km	3,000 km

Small trips are made up of local commutes and travel to regional centres; but people perceived small and big trips very differently. A return trip to the closest community, Kalkarindji, is 190 km. A return trip from Lajamanu to Katherine, its nearest service centre, is around 1,150 km; Lajamanu to Darwin is 1,750 km return, and Lajamanu to Alice Springs is 1,800 km return.

For some people, going to the nearest community constituted a ‘small trip’ or daily commute, while annual ‘big trips’ meant going 3–4 times per year to Katherine and 6–7 times per year to destinations in a 200–500 km range from Lajamanu (over 200 km for a return trip). For other people, weekly trips to communities on the Tanami or to Katherine are classified as ‘small trips’ on top of regular local commuting.

Small return trips average 160 km and are undertaken daily: this masks a big disparity and it is not possible to accurately distinguish between local mobility occurring on a daily basis and trips to surrounding communities which would involve 190–550 km of travel and would occur weekly or twice weekly but could still be considered as small trips. Local mobility in Lajamanu typically involves one to two multi-stops and multipurpose return trips per day with a combined distance of 20–30 km (generally involving a range of different transport means). This means that in reality people go to several service centres and are in a situation of hyper regional mobility, travelling around 40,000–60,000 km per year to regional areas (trips to service centre and regional trips).

Trips to Katherine occur fortnightly or monthly, and other big return trips of more than 500 km would happen once every two months. At the high end of the spectrum, about 25% of the respondents take over 20 big return trips per year.

The estimated annual travel demand of people living in Lajamanu is shown in Figure 6.

Average travel demand in Lajamanu

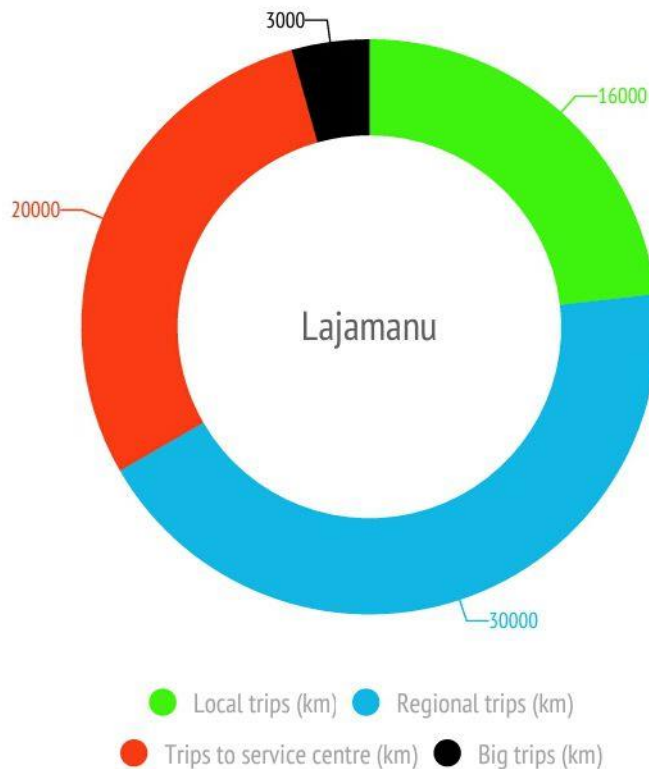


Figure 6: Estimated average annual travel demand in Lajamanu

On average a trip to a regional service centre requires 1.5–2 hours of preparation time and is performed in 3 hours. An average big trip takes 2–3 days of preparation time and is completed in around 13 hours (which decreases to 8 in the 72% sample). Small trips included trips to regional communities while big trips included trips to the main regional centre. Big trips could involve more of a time factor than in other communities (overnight stays, long-term transit). People travel an average of 4 nights per year. The average number of people travelling together is 5.32 for small trips and 7.12 for big trips. Table 7 provides further information of estimated trip time in Lajamanu for regional and long distance / service centre trips.

Table 7: Estimated time per trip and per year in Lajamanu

	Regional communities	Long distance / Service centre
Number of trips	100 per year (two trips per week)	25 per year
Average distance per trip	325 km	800 km
Time of preparation and travel per trip	1.5–2 hours 3 hours	2–3 days 13 hours
Time per year	150 hours 300 hours	75 days 325 hours

In Lajamanu, reported expenses and costs of transport included more trips that were not to the nearest service centre than in Ltyentye Apurte and in Ntaria. In a sense, the long distance to the service centre helped to distinguish local commuting and means that Kalkarindji and other communities in a 500 km radius around Lajamanu can act as regional hubs. The reported expenses and costs of a trip to Katherine

correspond to the average reported big trip expenses and costs, while trips to Kalkarindji closely correspond to reported average small trip expenses and costs.

The estimated average travel expense for individuals for small local trips is around \$7. Individual expenses for regional trips are \$100–\$120 and return trips to Katherine are \$300–\$500. The average individual expenses for other big trips are around \$200–\$250.

In Lajamanu people undertake on average 1.3 local trips per day (average of 25 km per day), which corresponds to an average annual expense of \$3,000 out of an average annual trip cost of \$4,500. In Lajamanu people undertake on average 18 trips per year to the nearest service centre which corresponds to around \$7,200 per year in individual trip expenses out of \$8,500 in total trip costs. Regional trips correspond to around \$10,000 per year out of \$14,000. Big trips represent an average annual expense of \$1,000 per person out of \$1,560 in total trip cost.

Figure 7 presents estimated breakdowns of annual travel expenses and costs in Lajamanu.

Average travel budget in Lajamanu

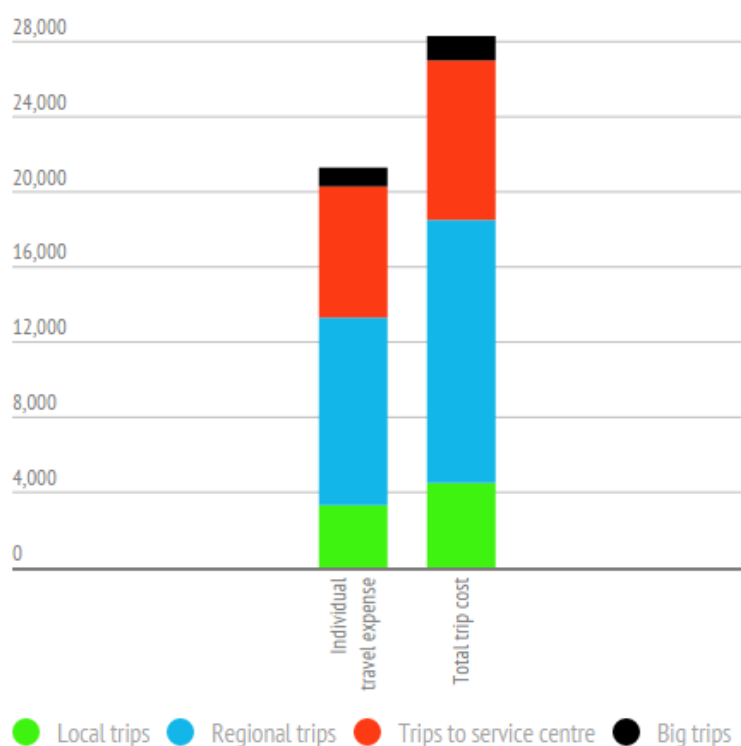


Figure 7: Estimates of annual travel expenses and costs in Lajamanu

Table 8 provides information of estimated trip expenses in Lajamanu.

Table 8: Estimated expenses per trip and per year in Lajamanu

	Local	Regional	Service centre	Long distance
Number of trips	1–1.5	2 per week	18 per year	5–6 per year
Average distance per return trip	25 km	325 km	1,100 km	550 km
Expense per adult traveller per trip	\$7	\$110	\$400	\$220
Expense per adult traveller per day	\$10	\$30	\$20	\$3
Expense per adult traveller per year	\$3,000	\$10,000	\$7,200	\$1,000

Small trips are primarily undertaken for shopping, visiting friends and family, going to work and for cultural or health reasons. Big trips are more often undertaken to do some shopping, attend sports and cultural events, and to visit family and friends.

The local and state roads are assessed as being in a good condition by the majority of participants; vehicles are mostly in good or average condition; and access to vehicles is easy for many people. For both small and big trips, the issues associated with transport included poor road conditions, extreme weather and not having a registration for vehicles. To improve small and big trips, most participants recommend improving roads (over 60%).

Respondents recommended that infrastructure improvements include better maintained roads, sealed roads and additional regional petrol stations. For improving both local and distance public transport, respondents see more affordable fares as the priority, and they also mentioned access to vehicles of government and non-governmental organisations and increasing the number of destinations supplied by public transport and the number of stops.

For private transport, respondents felt that priorities were more affordable road assistance and fuel as well as more fuel-efficient and robust vehicles and access to more affordable parts. People felt that travel demand could be reduced if there were more services in the community, a system of affordable goods delivery, a community bus and a mechanic workshop.

In Lajamanu, the number of responses being inconsistent was highest (39%) and the average age of people in the sample was also older than in the two other communities (three and four years respectively compared with Ntaria and Ltyentye Apurte) which relates to the fact that the ACRs undertaking the survey were older. Table 9 provides information of trip characteristics in Lajamanu.

Table 9: Trip characteristics in Lajamanu

Lajamanu	Small/short trips	Big/long trips
Most common reasons to travel	Shopping (56%) Visit friends (40%) Visit family (36%) Work (24%) Cultural reasons (24%) Health reasons (20%)	Shopping (36%) Sports events (32%) Visit family (28%) Cultural reasons (28%) Visit friends (20%)
Travel at night	4 nights/year	
Average number of persons travelling	5.32	7.12
Road condition	Good (60%)	Good (40%) Very good (24%) Bad (16%)

Lajamanu	Small/short trips	Big/long trips
Vehicle condition (full dataset/72% sample values)	Good (64%) Average (12%)	Good (60%) Very good (24%/11%)
Access to transport	Easy/Very easy (68%)	Easy/Very Easy (60%)
Vehicle safety	Good (84%)	Good (89%)
Transport reliability	Reliable (72%)	Reliable (64%)
Transport affordability	Relatively affordable (52%) Average (36%)	Average (48%) Unaffordable (44%)
Main problems with accessing and using transport	Road conditions (36%) Extreme weather (32%) No registration (28%) No access to spare parts (28%) No licence (24%)	Extreme weather (40%) No registration (32%) No access to affordable fuel (28%) Road conditions (24%) Multiple commitments (24%) Lack of lift/access to transport (24%)
Types of trips/journey most difficult to access/complete (whole dataset/72% sample value)	Shopping (44%) Bank (36%) Visiting friends (24%) Attending sports events (24%) Access car service (22%) Access health services (20%)	Shopping (48%) Bank (32%) Cultural activities (28%/39%) Visiting friends (28%) Access health services (24%)
Transport improvements	Improving roads (60%)	Improving roads (60%)
Transport infrastructure priorities	Better maintained roads (80%)	
	Upgrading unsealed to sealed roads (92%)	Upgrading unsealed to sealed roads (84%) Additional regional petrol stations (68%)
Public transport priorities	More affordable fares (76%) Government vehicles giving more lifts to people of the community (52%) Increase the number of destinations (40%)	More affordable fares (80%) Increase the number of destinations (40%) Increase the number of stops (36%) Government vehicles giving more lifts to people of the community (28%)
Private transport priorities	Cheaper roadside assistance (56%) Cheaper fuel (52%) More fuel-efficient vehicles (36%) More robust vehicles (32%) Cheaper parts (43%)	Cheaper fuel (60%) Having four-wheel drive cars (56%) More fuel-efficient vehicles (40%) Cheaper roadside assistance (28%) Cheaper registration (24%)
Transport demand reduction	More services (68%) Affordable delivery of goods/shopping (44%) Community buses (44%) A community mechanics workshop (24%)	
Increase in disposable income by \$2,000	I would get a registration (76%) I would buy some fuel (60%) I would repair a vehicle (56%) I would buy a bus ticket (40%)	I would get a registration (64%) I would buy some fuel (60%) I would repair a vehicle (56%) I would buy a public transport ticket (44%)
Community development project preferences	Running a community bus (80%) Affordable system of goods delivery (40%) Discounted fuel (40%) Repairing roads (32%)	

3.3 Ntaria

In Ntaria, small return trips average 135 km and big trips 1,616 km. Small trips occur around 1.88–2.12 times per day while big trips occur 2.16–2.48 per year. Ntaria is a 240 km return trip away from Alice Springs (26–52 trips per year) and is surrounded by over 70 outstations in a 50 km range. Table 10 provides information of estimated trip distance in Ntaria.

Table 10: Estimated trip distance per year in Ntaria

	Local	Service centre	Long distance
Number of trips	2 per day, or around 700 per year	0.14 per day, or 52 per year (one trip per week)	2.16–2.48 per year
Average distance per return trip	54 km	240 km	1,800 km
Average distance per day	100 km	34 km	12 km
Average distance per year	35,000 km	12,000 km	4,200 km

People take on average 2.1 small return trips per day composed of 0.14 trips to the nearest service centre and 2 local trips. People take around 2.25 big trips per year, but the range is large: from 2 to 10 per year. People living in Ntaria travel an estimated 12,000 km per year to Alice Springs, 35,000 km in local commute, and over 4,200 km per year in big trips. The estimated average annual travel demand in Ntaria is shown in Figure 8.

Average travel demand in Ntaria

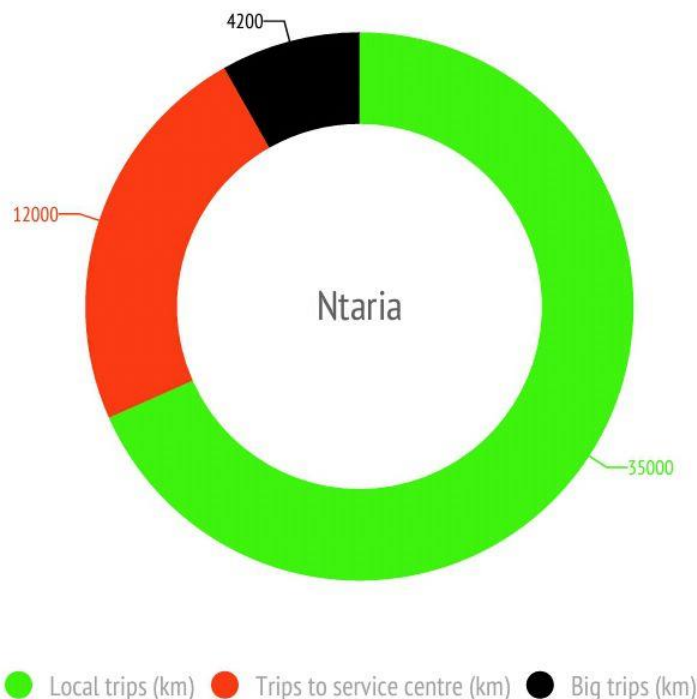


Figure 8: Estimated average annual travel demand in Ntaria

On average a return trip to Alice Springs requires 2 hours of preparation time and is performed in about 4 hours. An average big trip corresponds to less than 2 days of preparation time and is completed in around

10.5 hours. People travel an average of 5.8 nights per year, but this figure decreases to 2.4 in the 72% sample. Table 11 provides information of estimated trip time in Ntaria.

Table 11: Estimated time per trip and per year in Ntaria

	Service centre	Long distance
Time of preparation and travel per trip	2 hours	2 days
	4 hours	10.5 hours
Time per year	72 hours	4.5 days
	156 hours	23.5 hours

The average travel expense for individuals is \$15 for small trips, \$75 to go to Alice Springs and \$300 for big trips. The combined costs for small trips are around \$24 for small trips, \$115 to go to Alice Springs and \$330 (increasing to \$395 in the 72% sample) for big return trips. Table 12 provides information of estimated trip expenses in Ntaria.

Table 12: Estimated expenses per trip and per year in Ntaria

	Local	Service centre	Long distance
Expense per adult traveller per trip	\$15	\$75	\$300
Expense per adult traveller per day	\$28	\$8.5	\$1.8
Expense per adult traveller per year	\$10,500	\$3,000	\$635

The annual expense to individuals in Ntaria of their trips to Alice Springs is \$3,000 out of total annual trip costs of \$4,485. For local trips, the annual expense to individuals is \$10,500 out of \$15,800 in annual travel costs, and for big trips the average expense is \$635 out of \$800 in trip costs. Figure 9 (over page) shows estimates of annual travel expenses and costs in Ntaria.

Small trips are primarily undertaken for access to shopping, visiting family and friends and going to work and to the bank. Big trips are also for shopping, visiting friends and family and going to work.

Local and state roads are assessed as being in a very good or good condition by most participants; vehicles used for both big and small trips are assessed to be in good or very good condition; and access to vehicles is relatively easy for small trips but relatively hard for long trips.

For small trips, the main issues associated with transport were not having a vehicle registration or licence, nor access to a vehicle or to spare parts. For big trips, the main issues are poor road conditions, extreme weather, and not having a registration or access to a vehicle.

To improve local transport, most participants recommend being able to purchase better vehicles; while for big trips, half felt the priority is to provide more affordable public transport as well.

Recommendations to improve infrastructure highlighted a very positive perception of the current situation in Ntaria, with many respondents saying no changes were needed for small trips (almost half) or big trips (a third). Additional local roads and regional petrol stations were other ways suggested to improve transport infrastructure.

Average travel budget in Ntaria

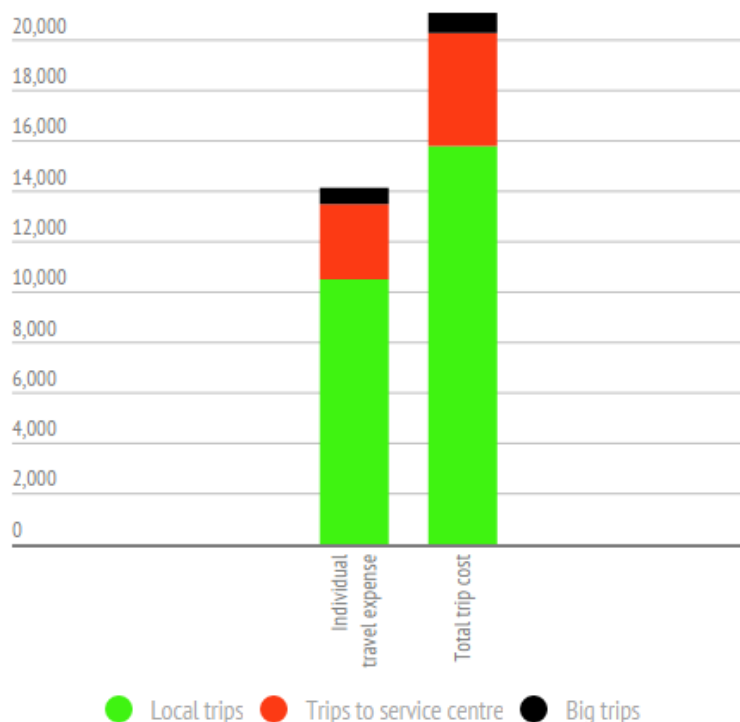


Figure 9: Estimates of annual travel expenses and costs in Ntaria

For public transport, most participants recommended more affordable fares. For private transport, the priorities were more affordable fuel, registration and vehicles.

To decrease travel demand, participants felt that having more services within the community and a system for affordable goods delivery as well as a community mechanic workshop would help. Many respondents said that the business-as-usual situation was good.

For a large community development project, people would like to see lower prices for fuel and registration and a community bus running. Table 13 provides information of trip characteristics in Ntaria.

Table 13: Trip characteristics in Ntaria

Ntaria	Small/short trips	Big/long trips
Most common reasons to travel	Shopping (80%) Visit family (52%) Visit friends (36%) Work (36%) Go to the bank (32%)	Shopping (40%) Visit friends (36%) Visit family (20%) Work (20%)
Travel at night (72% sample)	5.8 nights/year (2.4)	
Average number of persons travelling	4.5	6.3
Road condition	Very good (44.5%) Good (36%)	Good (56%) Very good (28%)
Vehicle condition	Good (64%) Very good (20%)	Good (60%) Very good (24%)

Ntaria	Small/short trips	Big/long trips
Access to transport (72% sample values)	Easy/Very easy (64%)	Average (36%) Hard/Very hard (24%) (Hard/Very hard: 44.5%)
Vehicle safety	Good/Very good (64%)	Good/Very good (64%)
Transport reliability	Reliable (60%)	Average (36%) Reliable/Very reliable (32%) Unreliable (28%)
Transport affordability	Relatively affordable (36%) Average (44%)	Average (44%) Affordable (24%) Unaffordable (16%)
Main problems with accessing and using transport	No registration (60%) No licence (40%) No vehicle access (36%) No access to spare parts (24%)	Road conditions (52%) Extreme weather (36%) No registration (32%) No vehicle access (32%)
Types of trips/journey most difficult to access/complete	Bank (48%) Shopping (44%) Going to work (20%) Going to Centrelink (20%)	Shopping (36%) Visiting friends (28%) Going to work (20%)
Transport improvements	Better/new cars (60%)	Better/new cars (30%) Cheaper public transport (30%)
Transport infrastructure priorities	No improvement required (44%) Make additional roads (44%)	No improvement required (32%) Additional regional petrol stations (48%)
Public transport priorities	More affordable fares (60%) Increase frequency (28%) Government vehicles giving more lifts to people of the community (24%)	
	More bus stops (28%)	More bus stops (24%)
Private transport priorities	Cheaper fuel (80%) More affordable registration (56%) More affordable vehicles (24%)	Cheaper fuel (68%) More affordable registration (52%) More affordable vehicles (32%) Free driving lessons and licence tests (28%)
Increase in disposable income by \$2,000	I would buy some fuel (64%) I would purchase a new vehicle (60%) I would get a registration (52%) I would repair a vehicle (44%) I would buy a bus ticket (40%)	I would buy some fuel (56%) I would purchase a new vehicle (32%) I would get a registration (44%) I would repair a vehicle (28%) I would buy a bus/plane ticket (28%)
Community development project preferences	Lower prices for fuel (60%) Lower prices for registration (60%) Running a community bus (36%)	

These results are further analysed in the subsection 4.2.

4. Combined analyses of preferred transport alternatives in very remote Central Australia

4.1 Common trends

There are many common trends in the three Central Australian communities where this research took place. The following sections describe and discuss key trends in transport preferences for these communities.

4.1.1 Travel characteristics

The characteristics of small trips, trips to the closest service centre and big trips are analysed in detail below.

4.1.1.1 Small trips

On average a return small trip is around 39 km; these figures are consistent with on-ground observations and include local and regional travelling. People undertake an average of 2 small trips per day. Small trips cost around \$11 per trip and people pay an average of \$21.5 per day or \$7,500 per year. Table 14 provides information of number of trips, estimated trip distance, and cost in the three communities for small trips.

Table 14: Number of trips, estimated trip distance, and cost in Ltyentye Apurte, Lajamanu and Ntaria

	Ltyentye Apurte	Lajamanu	Ntaria	Average
Number of trips	2.96 per day, ~ 1,050/year	1.3 per day, ~ 450/year	2 per day, ~ 700/year	2 per day, ~ 700/year
Average distance per return trip	35.6 km	25 km	54 km	39 km
Average distance per year	36,500 km	46,000 km	35,000 km	40,000 km
Average distance per day	100 km	130 km	100 km	110 km
Expense per adult traveller per trip	\$12	\$7	\$15	\$11
Expense per adult traveller per day	\$27	\$10	\$28	\$21.5
Expense per adult traveller per year	\$9,850	\$3,000	\$10,500	\$7,500

People living in Ltyentye Apurte are undertaking noticeably more small trips. However, average distance, average travel time, average number of people travelling and average costs are similar for the three communities.

4.1.1.2 Service centre trips

On average a return small trip is around 260 km; however, there are significant variations in trip lengths. The responses indicate that people travel away from the community to the closest service centre a minimum of twice a month and typically on a weekly basis. It usually takes over 3 hours to organise and another 3 hours to complete the trip. This gives an average speed of 82 km/h.

Respondents report that their travel expenses are around \$80 out of the \$110 full cost of return trips which is equivalent to an average of \$14.5 per day (\$5,100 per year).

An average of 5.5 people travel together, with the cost borne by 1.5 people and 4 people not contributing (ratio of 1:2.7). This suggests that a large number of passengers are young children or older adults who are not contributing towards the cost of the trip. In the case of Lajamanu a number of small trips could be defined as big trips (trips which are not further away than the nearest service centre for Lajamanu but

which are further away than Alice Springs from Ltyentye Apurte and Ntaria). They were included in trips to the nearest service centre while going to Katherine was included in big trips because of the great distance it involves.

Table 15 provides information of trip characteristics for each of the three communities.

Table 15: Number of trips, estimated trip distance, and cost Ltyentye Apurte, Lajamanu and Ntaria for trips to the nearest service centre

	Ltyentye Apurte	Lajamanu	Ntaria	Average
Number of trips	39 per year	100 per year	52 per year	60 per year
Average distance per return trip	180 km	350 km	240 km	260 km
Average distance per day	19 km	80 km	30 km	40 km
Average distance per year	7,020 km	30,000 km	12,000 km	16,000 km
Time of preparation and travel per trip	4 hours 2 hours	2 hours 2 hours	2 hours 4 hours	3.3 hours 3.3 hours
Time per year	156 hours 72 hours	1500 hours 2,000 hours	72 hours 156 hours	550 hours 750 hours
Expense per adult traveller per trip	\$60	\$110	\$75	\$80
Expense per adult traveller per day	\$6.4	\$30	\$8.5	\$14.5
Expense per adult traveller per year	\$2,340	\$10,000	\$3,000	\$5,100

4.1.1.3 Big trips

A big trip is around 1,080 km and occurs about 11 times per year. It takes about 2 weeks to organise and around 11.5 hours to complete the trip. This gives an average speed of 90 km/h. Respondents report that their travel expenses are around \$315 out of the \$349 full cost of the return trip. An average of 7.3 people travel together, with the ratio of contributing to non-contributing people being around 1.14 to 6.16 (or 1:5.4). For adult travellers the average travelling expenses correspond to around \$3,670 per year out of \$4,500. Table 16 provides information of number of trips, estimated trip distance, and cost in the three communities for big trips.

Table 16: Number of trips, estimated trip distance, and cost in Ltyentye Apurte, Lajamanu and Ntaria for big trips

	Ltyentye Apurte	Lajamanu	Ntaria	Average
Number of trips	6.65 per year	5.5 per year + 18 per year	2.25 per year	11 per year
Average distance per return trip	1,305 km	550 km + 1,100 km	1,800 km	1,080 km
Average distance per day	24 km	8 km + 55 km	12 km	33 km
Average distance per year	8,685 km	3,000 km + 20,000 km	4,200 km	12,000 km
Time of preparation and travel per trip	10 days 11.6 hours	3 days 13 hours	2 days 10.5 hours	5 days 11.5 hours
Time per year	60 days 77.14 hours	75 days 325 hours	4.5 days 23.5 hours	13.3 days 140 hours
Expense per adult traveller per trip	\$345	\$220–\$400	\$300	\$315
Expense per adult traveller per day	\$6.57	\$3–\$20	\$1.8	\$9.5
Expense per adult traveller per year	\$2,400	\$1,000–\$7,200	\$635	\$3,670

Significant variations are observed for big trips. While people living in Lajamanu make more trips, people living in Ntaria travel over longer distances but for shorter durations (which corresponds with the fact that people in Ntaria tend to fly more often). The big trips that people living in Ntaria take cost significantly less than the big trips people undertake from Lajamanu. These variations might be associated to specificities of each community.

Figure 10 illustrates travel expenses in the three communities.

Average travel expenses

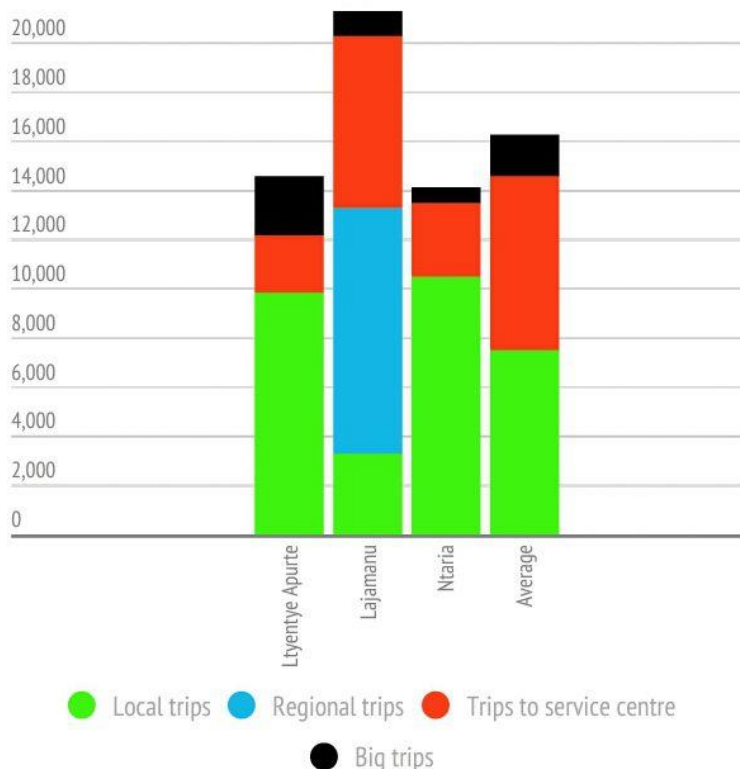


Figure 10: Estimates of annual individual travel expenses in Central Australia

4.1.2 Trip purpose

The main purposes of both small and big trips are shopping and visiting friends and family. For small trips, work and banking are other common reasons, and big trips are also undertaken to attend sport events.

The results suggest that people travel regularly to their homelands, with a very large proportion of family trips. Table 17 provides information about trip purpose in the three Central Australian communities.

Table 17: Trip purpose in Ltyentye Apurte, Lajamanu and Ntaria

	Small trips	Big trips
Purpose of trip	Shopping (76%) Visiting family (48%) Visiting friends (34%) Work (28%) Banking (24%)	Shopping (43%) Visiting family (29%) Visiting friends (28) Attending sports events (25%)
Difficulty to complete	Shopping (48%) Banking (33%)	Visiting family (38%) Shopping (37%) Cultural business (34%) Visiting friends (30%)

Figure 11 shows travel purpose preferences.

Travel purposes



79% of trips

to visit friends or family



54% of trips

to do some shopping



19% of trips

to go to work



18% of trips

to go to the bank



13% of trips

to attend cultural events



11% of trips

to access medical services



9% of trips

to attend sport events

Figure 11: Travel purposes in Ltyentye Apurte, Lajamanu and Ntaria, averaged across small and big trips

4.1.3 How people travel

A majority of respondents are car passengers (37%) or car owners who are driving (28%) for small trips. The alternative is most often using another owned car (21%), with a higher likelihood of it not being roadworthy.

Coach buses are the dominant form of transport for big trips (38%). The main alternatives include big buses (37%), cars (where the respondents were passengers) (24%) and planes (21%).

Table 18 provides information about small trips in the three Central Australian communities.

Table 18: Small trips per community

Small trips	Ltyentye Apurte	Lajamanu	Ntaria
Purpose	Visiting family and shopping	Visiting friends and shopping	Going to work, visiting family and shopping
Means	Car owned and driven	Multiple	Multiple
Number of people travelling	5	6	5.5

Table 19 provides information about big trips in the three Central Australian communities.

Table 19: Big trips per community

Big trips	Ltyentye Apurte	Lajamanu	Ntaria
Purpose	Multiple	Family and shopping	Family, shopping, sport
Means	Car owned and driven	Big bus / plane	Big bus / plane
Number of travellers	5	5	4.5

4.1.4 Perceptions about transport systems

In the guidelines of the Australian Transport Council, it states that transport systems should be efficient, safe, sustainable, accessible and competitive (Australian Transport Council 2006). In the current circumstances of transport shortage in remote Australia, questions about transport sustainability (emissions, climate change, pollution and energy management) appear to be less relevant than questions about perceived reliability, safety, accessibility and affordability (Spandonide 2014b).

Respondents were therefore asked to evaluate transport accessibility, safety, reliability and affordability. Vehicle access for a small trip is usually good (33%) and less often very good (24%) or average (26%). However, for big trips access to a vehicle varies from good (26%) and average (26%), to bad (21%) and is overall very average (Figure 12).

Small trips rating

● Accessibility ○ Safety ○ Reliability ○ Affordability



Big trips rating

● Accessibility ○ Safety ○ Reliability ○ Affordability



Figure 12: Transport accessibility rating in Ltyentye Apurte, Lajamanu and Ntaria

Note: -2 = very bad, 0 = average and 2 = very good

For big trips, transport is perceived to be particularly safe: 25% of respondents said it was very safe, 46% said safe and 28% said average. For small trips, 49% of the respondents said transport is safe and 30% said it was average (Figure 13).

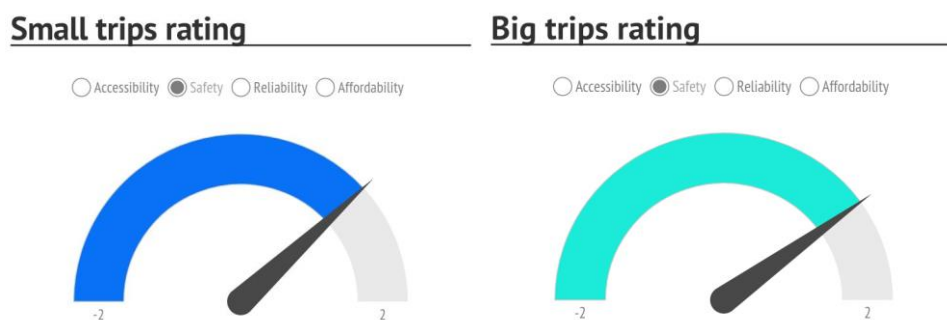


Figure 13: Transport safety rating in Ltyentye Apurte, Lajamanu and Ntaria

Note: -2 – very bad, 0 = average and 2 = very good

Transport is considered as being quite reliable for both small trips (58% reliable; 22% average; and 9% very reliable) and big trips (48% reliable; 25% average; and 17% very reliable) (Figure 14).



Figure 14: Transport reliability rating in Ltyentye Apurte, Lajamanu and Ntaria

Note: -2 = very bad, 0 = average and 2 = very good

Affordability varies; small trips are considered to be of acceptable/average affordability, big trips are considered average/unaffordable (Figure 15).

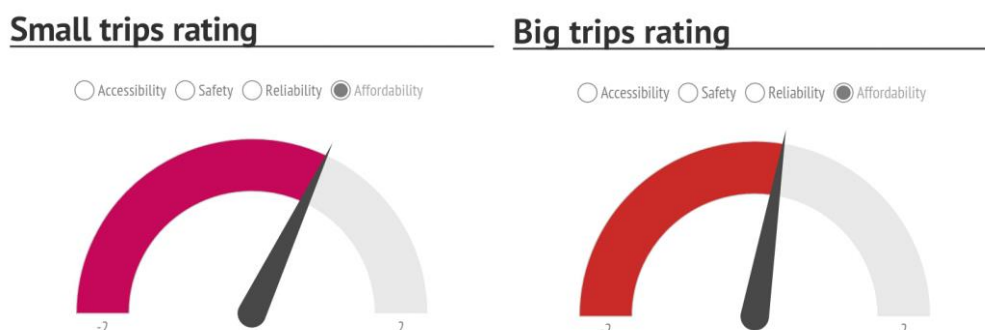


Figure 15: Transport affordability rating in Ltyentye Apurte, Lajamanu and Ntaria

Note: -2 = very unaffordable, 0 = average and 2 = very affordable

There is a high degree of variability of the perceived quality of local roads. For big trips, roads are considered as good overall, while local roads are perceived as being of very variable quality.

The vehicles used for big trips are usually in good (53%) to very good (21%) condition, while for small trips vehicles are usually in good (57%) to average (20%) condition.

These results are very insightful: they confirm that vehicle access and transport affordability are the dominant issues for travellers in remote Central Australia.

4.1.5 Perceived issues

A number of major barriers limit the amount of transport activities that can occur. For small trips, not having a registered vehicle (38%), poor road conditions (36%) and not being able to access a vehicle (29%) are the main issues. Extreme weather (26%) was also a significant issue. For big trips, poor road conditions (48%) is a major issue, while not being able to access a vehicle (33%), extreme weather (28%) and not having a registration (26%) cause a lot of problems. No access to affordable fuel was also mentioned as being significant (21%) (Figures 16a and 16b).

Perceived transport issues



42% of people

experience difficulties because of poor road conditions



27% of people

experience difficulties due to extreme weather

Figure 16a: Perceived climate-related transport issues in Ltyentye Apurte, Lajamanu and Ntaria

This is supported by the fact that unsealed roads in remote communities are typically closed more than four times per year for more than a week due to poor weather (Taylor et al. 2006).

Perceived transport issues



32% of people

would like to register a vehicle



31.5% of people

do not have access to a vehicle

Figure 16b: Other types of perceived transport issues in Ltyentye Apurte, Lajamanu and Ntaria

Health and age reasons can be a barrier to transport. In the three communities surveyed, this was true for respondents (small and big trips respectively) in Ltyentye Apurte (4%/8%), Lajamanu (8%/12%) and

Ntaria (4%/8%). This figure is particularly high and supports other findings that a large number of people experiencing mobility issues associated with age or disabilities do not have access to appropriate transport (Productivity Commission 2011). Table 20 provides information about transport preferences for small trips in the three communities.

Table 20: Transport preferences for small trips per community

Small trips	Ltyentye Apurte	Lajamanu	Ntaria
Road and vehicle ratings	Bad/good	Average/good	Very good/average
Rating	Average safety, reliability and affordability	Very easy access, safe and reliable	Multiple
Trips that are hard to make	Shopping and family gathering	Visiting friends	Multiple
Barriers to transport	Road conditions	Fuel price	Spare parts, licence and registrations

Table 21 provides information about transport preferences for big trips in the three communities.

Table 21: Transport preferences for big trips per community

Big trips	Ltyentye Apurte	Lajamanu	Ntaria
Road and vehicle ratings	Bad/good	Average/good	Very good/variable
Rating	Average affordability	Safe, reliable average affordability	Hard access
Trips that are hard to make	Visiting friends and fun stuffs	Visiting friends	Multiple reasons
Barriers to transport	Road conditions as well as affordable petrol	Extreme weather, road conditions, petrol price	Extreme weather and road conditions
Night-time driving	2	10	3

4.1.6 Preferred solutions

Better maintained roads (68% for both small and big trips) and road sealing (66% and 64% for small and big trips respectively) are major priorities to fix transport problems. Having more petrol stations is important for both big trips (50%) and small trips (37%), and more roads was significant as well (24% for big trips and 30% for small trips).

For public transport, the overwhelming majority of respondents identify more affordable fares as being the most effective way to fix transport issues (74% for big trips and 66% for small trips). More public transport destinations (29% for both small and big trips) and more frequent services (29% for small trips and 21% for big trips) are also considered highly. Access to lifts in vehicles from outside the community (38% for small trips and 22% for big trips) and more bus stops (24% for big trips and 18% for small trips) are also identified as potential solutions to improve public transport.

For improving private motorised vehicle travel, more affordable fuel is identified as the number one priority (66% of all respondents for small trips and 58% for big trips). More affordable registration is also critical (34% for big trips and 33% for small trips). Moreover, having a four-wheel drive vehicle is essential when there is no sealed road access (32% for big trips overall and 40% in communities without a sealed road access). Access to more affordable repairs (33% for small trips and 24% for big trips) is considered to be important, while having a more fuel-efficient car (24% for big trips and 21% for small trips), and access to road assistance (25% for small trips and 24% for big trips) is also mentioned.

Finally, people consider that access to more services within communities (54%), access to a system of affordable goods delivery (41%) and access to a community mechanic/workshop (37%) would help them to stay more often and for longer in their community and would reduce their travel demand. A community-owned bus could also help (34%). Figure 17 sums up preferences for travel reduction options.

Travel reduction options



Figure 17: Preferences for travel reduction options in Ltyentye Apurte, Lajamanu and Ntaria

While no responses were recorded in Ltyentye Apurte for specific needs for special transport services for disabled, young and elderly people, it was reported in Lajamanu (28% of participants) and Ntaria (16% of participants); this was an average of 14.5% across all participants in the survey. An average of 5% of people are reportedly in need of assistance in a core activity (Productivity Commission 2011) in remote Central Australian communities, and not being able to access specialised transport services represents a significant issue for carers and relatives at a community level.

4.1.7 Personal solutions

When asked what they would do with more disposable income, people responded that it would be used, for small trips and big trips respectively, to register a vehicle (61%/53%), fix a vehicle (57%/49%) and buy some fuel (61%/53%).

They also considered, for small trips and big trips respectively, buying a bus ticket (24%/36%) and buying a new car (33%/26%). For big trips, they considered buying a plane ticket (33%).

Registering/fixing a vehicle and buying some petrol would be the main priorities if people had more disposable income. Because these are necessary costs for transport, it is logical that people find transport unaffordable and hard to access. The results also indicate that fuel costs are highly inelastic. What is perhaps even more paradoxical is the fact that people perceive current transport as being particularly safe and quite reliable. This actually highlights the current situation of a financial transport crisis which has been normalised: as people do not have the means to pay for registration or repair of a vehicle, they have to compromise on the safety and legality of their travels in a temporary fashion until they have further disposable income. People will maintain their transport activities to meet their mobility needs and find ways to travel in relatively safe conditions in the meantime, despite waiting to fix and register vehicles. It also confirms that if people could meet the expenses to fix and register vehicles, they would (Figure 18).

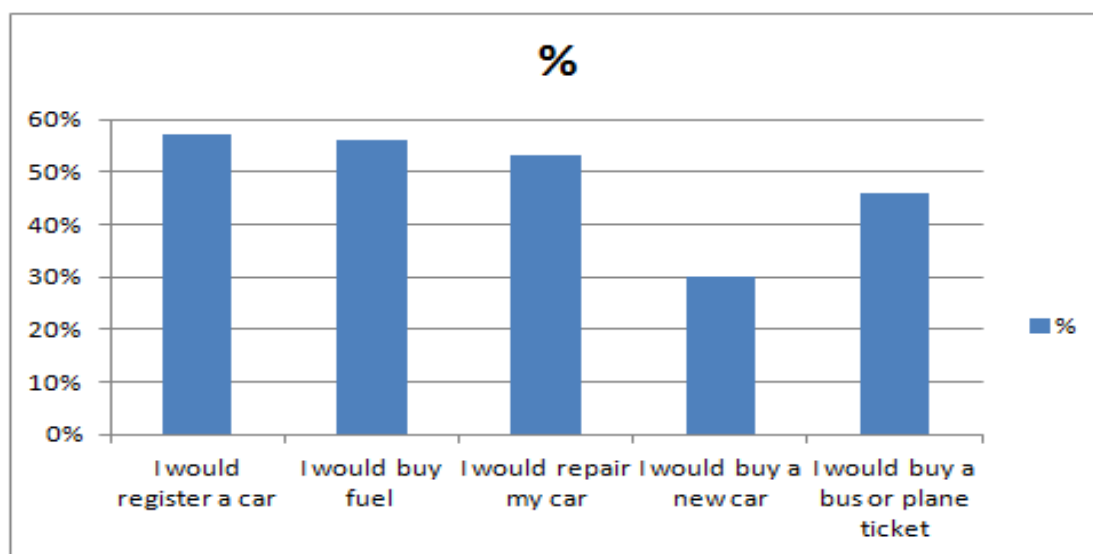


Figure 18: Transport issues in Ltyentye Apurte, Lajamanu and Ntaria: what would people do with more disposable income?

This is further clarified when looking at preferences for new types of projects at a community/council level: there is a strong desire for running a community bus (60%), while more affordable fuel (38%) and repairing roads (36% overall and 48% in communities without sealed road access) are perceived as essential. Having access to a community workshop/mechanic (28%), subsidies for discounted registrations (26%) or a system of community goods delivery (25%) were also mentioned, but not perceived as important.

Mobility in general is associated with high living costs in remote communities and by the necessity to interact with relatives and friends and maintain strong livelihoods. A community workshop/mechanic or a system of goods delivery would contribute to decrease the existing mobility pressure, while maintaining roads and providing less expensive fuel, registrations and community buses would help to address the most important structural transport needs.

There is a clear awareness of private and public duties and roles in delivering and maintaining sustainable transport: while registrations and vehicle condition could be managed by community members, public transport, road infrastructure and petrol prices are public service provision responsibilities.

Many of the survey respondents prioritise operational costs, such as transport running costs of fuel, repairs and public transport. Other types of running costs, such as registration or insurance costs, are met when more disposable income is available.

Table 22 shows transport preferences for small trips including transport rating, declared trips hard to complete, barriers to transport, suggestions for infrastructure, public transport and vehicle improvements and priorities which would be addressed with more disposable income available) in the three communities.

Table 22: Transport preferences for small trips per community

Small trips	Ltyentye Apurte	Lajamanu	Ntaria
Infrastructure improvements	Sealing and maintenance	Sealing and maintenance	Maintenance
Public transport improvements	Cheaper public transport fares	More frequent public transport, cheaper fares and access to external vehicles	More frequent and cheaper public transport
Vehicle improvements	Cheaper fuel	Cheaper fuel, road assistance, fuel-efficient vehicles and registrations	Cheaper fuel, cars and registrations
Personal priorities with more disposable income	Fix current vehicle	Buy fuel and buy a bus ticket	Buy fuel, a new vehicle and a new registration

Table 23 shows transport preferences for big trips including transport rating, declared trips hard to complete, barriers to transport, suggestions for infrastructure, public transport and vehicle improvements and priorities which would be addressed with more disposable income available) in the three communities.

Table 23: Transport preferences for big trips per community

Big trips	Ltyentye Apurte	Lajamanu	Ntaria
Infrastructure improvements	Sealing	Sealing, maintenance, regional stations	Sealing, maintenance and petrol stations
Public transport improvements	More affordable public transport	More affordable public transport, more frequent services and planes going to more places	More frequent and cheaper buses and going to more places
Vehicle improvements	Multiple options	Access to a 4x4, cheaper fuel and registration	Cheaper registration
Personal priorities with more disposable income	Repair current vehicle and buy fuel	Buy fuel, registration, bus ticket, food for trip and fix car	Buy bus ticket or plane ticket

Table 24 presents general information on transport preferences in the three communities. These questions are overarching the structural distinction between small and big trips.

Table 24: General information on transport preferences per community

General facts	Ltyentye Apurte	Lajamanu	Ntaria
Top priority to improve transport	Better roads	Better roads	Better car, more frequent buses
Initiatives to reduce transport demands	Affordable system of goods delivery	Multiple initiatives	Affordable system of goods delivery
Community initiatives to improve transport	Better roads and community bus	More affordable registration, fuel and public transport	More affordable fuel

An analysis of community profiles is discussed below.

4.1.8 Bottom line

The major barriers to transport in the three communities were problems getting access to a suitable vehicle (reliable and with a registration), poor road conditions and extreme weather.

Respondents clearly indicated preferences for solutions to these transport problems. The top five priorities were:

- road improvements
- more affordable long-distance public transport
- more affordable fuel (cheaper fuel mix)
- more services within communities and more affordable goods delivery
- more affordable vehicles, parts and vehicle registration and low cost technologies.

These types of transport solution will be used as the basis of future models and will be combined in a non-mutually exclusive way to assess and evaluate different scenarios and visualise their effect through Geographic Information System (GIS) mapping.

Infrastructure improvements are the number one priority in remote Australia for people living in most remote communities.

More affordable long-distance public transport and freight could be provided with a relatively low level of investment and would deliver high levels of returns (Bus Industry Confederation 2014). However, while a majority of public transport is subsidised and receives comprehensive operational support from public organisations, this is not systematic in remote Australia. This is a valuable type of transport alternative to consider in this context where costs in the supply chain are high.

Appropriate transport policy to reduce fuel prices, provide affordable, durable, fuel-efficient vehicles at competitive prices and discount registrations in very remote locations would also deliver very significant wellbeing improvements for relatively small public costs (Australian Competition and Consumer Commission 2012, Automobile Association of the Northern Territory 2005, Worth & Endean 2005).

While general recommendations were reviewed above, there are also numerous specific issues relevant to the different needs and characteristics of each of the three communities surveyed.

4.1.8.1 Ltyentye Apurte

What is unique about Ltyentye Apurte in terms of transport is that people typically drive private vehicles much more on roads that are perceived as being of poor quality.

In terms of transport preference, the number one priority would be to have better roads.

4.1.8.2 Lajamanu

In Lajamanu, vehicle access is considered to be very easy, particularly for small trips, but high fuel prices are challenging. Although people tend to make more big trips, the average distance of big trips is smaller than from the other two communities. This is not expected, as Lajamanu is the most distant community from its closest service centre. Big trips also require more organisation in Lajamanu than elsewhere (in particular for shopping for the trip itself); however, that might be due to the very long distance to the nearest service centre.

In terms of transport preferences, people would feel happy to make use of vehicles coming from outside the community to help with transport for small trips. More affordable fuel, access to more fuel-efficient vehicles, and better road assistance are seen as being very important in order to improve small trips.

Extreme weather events are a major issue, and having a four-wheel drive vehicle is perceived as being essential for big trips, as are more affordable public transport, more affordable fuel and registrations.

4.1.8.3 Ntaria

In Ntaria, people tend to travel to work more often. People also very commonly fly or take a coach bus for big trips. Finally, while transport infrastructure is seen as being of excellent quality, access to transport can be particularly hard.

In terms of transport preferences, additional income would be prioritised on purchasing a plane or a bus ticket. People would like to have access to more frequent public transport or more affordable vehicles as a priority.

4.2 Other types of preferences

Other types of preferences can be distinguished. For instance, generational factors may impact transport preferences. In a similar way, gender patterns can be identified both in the ways transport is used and which transport alternatives might be most suitable.

4.2.1 Gender patterns

In terms of the purposes of small trips, twice as many women as men travel to attend educational services and three times as many to go to the bank. Over three times more men travel to look for work, go to Centrelink and attend sports events. For big trips, men travel more often to visit family and undertake cultural activities (around 80% more) and four times more attend sport events and go to the bank (which might be a flow-on effect from other reasons travel has been undertaken).

However, women and men report very similar travel patterns for doing shopping, visiting friends, going to work and accessing medical services and car services.

The results of the survey indicate that men and women travel quite differently. More than three times more men than women drive their own vehicle, while women are more likely to be a passenger in their own vehicle for small trips. Twice as many women as men use buses for small trips, while three times as many men will walk as an alternative. For long distances, about three times as many men as women use planes.

Small trips are very similar for men and women in terms of average distances, preparation time, completion time, expenses and costs and number of people travelling together.

For big trips, men tend to travel over longer distances (average of 1,140 km for men compared with 871 km for women). This is further confirmed by the average expenses related to big trips (\$364 for men and \$257.50 for women). However, preparation and completion times and numbers of people travelling together are similar.

Men and women undertake a comparable number of night trips.

Men find much more than women that the vehicles used for small trips are in very average condition and that local roads are bad. However, women too experience difficulties: three times as many women as men find that it is difficult to access vehicles for small trips; for big trips it is the opposite: men find it difficult to access vehicles twice as often as women do. Both men and women find transport to be quite safe and usually reliable. Three times as many women as men find transport to be very affordable, and over three times more men than women find big trips to be unaffordable or very unaffordable.

About 60% more women find that visiting family, going to the bank and accessing health services through small trips is hard, while three times more men find it hard to attend sport activities. Furthermore, six times more men find trips to look for work as being hard to undertake.

For big trips, almost two times more men find family gatherings, sport events and cultural activity trips to be hard to complete, while 60% more women report difficulties in undertaking big trips to do shopping. Two times more women find going to the bank or Centrelink to be hard.

For other types of travel purposes, women and men find trips to be equally easy or hard.

In terms of transport issues, men tend to be three times more concerned with road conditions, spare parts and the lack of mechanics, and two times more by how unaffordable fuel is for small trips. Women are two times more concerned by vehicle access, licensed driver access, public transport access and public transport prices and three times more concerned by health issues affecting transport. For big trips, rather similar observations can be made; however, twice as many men as women are concerned with not having a registered vehicle and three times more with not having a licensed driver available. Not having access to a registered vehicle or a licensed driver or not being able to purchase a vehicle at a good price for small trips, as well as facing extreme climatic conditions or having access to a vehicle for big trips is equally a problem for both women and men.

For 40% more men than women, better maintenance is the key priority for improving road infrastructure for small trips, and sealing roads is the priority to improve big trips. Two times more women than men are happy with the current situation. Women and men feel the same way about having more petrol stations.

To improve public transport, two times more women would like to see more destinations and different timetables for small trips, while 60% more men would like to see increased frequencies and more affordable fares for both big and small trips. Noticeably, 80% more women than men would see having access to external vehicles from the community as a good way to improve access to big trips. Once again, about two times more women are happy with the current situation.

In terms of potential improvements to private motorised vehicles, two times more men would favour more affordable repairs (for both small and big trips), vehicles and registration (for big trips). Three times more women are happy with the current situation for small trips and about two times more for big trips.

Both women and men feel relatively the same way about having a four-wheel drive, vehicles that need less maintenance and fewer repairs, more affordable vehicles, fuel-efficient vehicles, more affordable fuel, better road assistance and free driving lessons.

Twice as many women as men would find having good access to the internet helpful in decreasing their transport needs. For other alternatives, similar responses are given by women and men (more services within the community, a system for more affordable goods delivery, a community bus, a community workshop/mechanics or specialised transport services for people with disabilities/medical conditions).

Women and men would make very similar choices with more disposable income for small and big trips. Remarkably, 60% more men would buy a plane ticket for a big trip (men already use air transport three times more than women do).

While women and men feel the same way about running a community bus, having discounted fuel and running a community workshop for large community projects, about two times as many women as men would like to have discounts for buses and twice as many men as women would like discounts for vehicle parts and registrations.

In conclusion, it appears that with men driving a private motorised vehicle more often than women, they are more likely to witness bad road conditions. Consequently, they are more likely to need more parts and feel that registration is more of a critical issue (with its financial consequences). Likewise, the fact that men find big trips to be more unaffordable than women might be due to some socio-cultural factors in the organisation of these trips. However, it could be an indication that private motorised vehicles are less competitive than public transport in terms of cost. Driving vehicles in poor conditions might be all right for small trips, but the costs of wear and tear, repairs and the cumulative impacts of having to drive a vehicle which is not roadworthy or registered are exponentially high for big trips. This is reflected in the importance men placed on being able to purchase affordable registration (and pay for repairs) for big trips. Women might be more aware of these constraints and costs as they mention more often access to a licensed driver using a registered vehicle as being a very significant problem. There might be broader implications from the difficulties that women have in accessing health services or going to Centrelink or shopping, and this would need to be further investigated.

For public transport, women report that prices are too high, yet having access to more destinations seems to be more of a priority: public transport is their dominant form of transport. For men, more frequent services and more affordable fares are more important: as men have more access to private motorised vehicles, public transport is often an alternative for them. If men switched to public transport, it would imply it had become more competitive model against private motorised vehicles. In other words, men might be more sensitive to time and price than women, who do not have the luxury of choice. This is further highlighted by the fact that women would be happy to have access to external vehicles going to communities, with all the time uncertainties that this would imply.

Figure 19 illustrates gender preference in the three Central Australian Aboriginal very remote communities.

Gender preference specificities



travel more than twice more

for education purposes or to go to the bank



travel more than twice more

as car passengers or in a bus



face more than twice more

vehicle access, license access and health issues as barriers to transport



are more than twice more

satisfied with current roads, public transports and private vehicles



aspire more than twice more

to have access to more public transport destinations



could reduce travel needs more than twice more

with a better Internet access



would use more than twice more

discounts for public transport services



travel three times more

to look for work, go to Centrelink and attend sport events



travel more than twice more

driving cars, walking, or by plane



face three times more

road conditions, spare parts access, fixing skills access issues



are more than twice more

dissatisfied with unaffordable fuel and registrations



aspire more than twice more

to more affordable registrations, repairs and vehicles



travel 30% more

for big trips and travel over longer distances



would use more than twice more

discounts on registrations, repairs, and vehicles

Figure 19: Gender preference specificities in Ltyentye Apurte, Lajamanu and Ntaria

4.2.2 Generational factors

There are also a number of specific issues in terms of trips characteristics and travel preferences which correspond to generational factors.

Transport characteristics of small trips for different age groups are displayed in Table 25.

Table 25: Transport characteristics of small trips by age group (aggregated local and service centre including trips from Lajamanu to Katherine otherwise considered as big trips)

Small trips	Older adults	Middle-aged adults	Young adults
Number of trips	2	2.4	2.4
Purpose	Shopping	Shopping and visiting family	Shopping, sport
Means	Driving own vehicle	Car passenger / walking	Driving own vehicle
Distance	200 km	150 km	100 km
Completion time	2 hrs	2 hrs	2 hrs
Number of people travelling	6	5.3	5.3
Daily estimated expenses and costs	\$35 / \$45	\$45 / \$90	\$40 / \$80
Road and vehicle ratings	Variable/good	Variable/average	Variable/good

Table 26 presents generational travel preferences for small trips in the three communities.

Table 26: Transport preferences for small trips by age group

Small trips	Older adults	Middle-aged adults	Young adults
Rating	Reliable	Average	Safe
Trips that are hard to make	Multiple	Multiple	Shopping
Barriers to transport	Extreme weather	Road conditions, vehicle access and registration	No spare parts
Infrastructure improvements	Maintenance	Sealing	Sealing
Public transport improvements	More frequent and affordable	More frequent and affordable	More frequent and affordable and more destinations
Vehicle improvements	More affordable registration and fuel	More affordable fuel and registration	More affordable repairs and fuel and better cars
Personal priorities with more disposable income	Buy some fuel	Repair current vehicle, buy a new one and a registration	Repair current vehicle and buy some fuel

Table 27 presents transport characteristics of big trips for different age groups.

Table 27: Transport characteristics of big trips by age group (excluding trips from Lajamanu to Katherine otherwise considered as big trips)

Big trips	Older adults	Middle-aged adults	Young adults
Number of trips	2.6	6	3
Purpose	Family and shopping	Family, cultural	Shopping
Means	Multiple	Car passenger, coach bus	Driving own vehicle
Distance	1,250 km	1,500 km	700 km
Completion time	10 hrs	9 hrs	8 hrs
Number of people travelling	5	5	4
Expenses and costs	\$350 / \$450	\$300 / \$500	\$150 / \$560
Road and vehicle ratings	Variable/good	Variable/variable	Variable/good

Table 28 presents generational travel preferences for big trips in the three communities.

Table 28: Transport preferences for big trips by age group

Big trips	Older adults	Middle-aged adults	Young adults
Rating	Safe, reliable and average affordable	Hard to access	Safe, very reliable and average affordable
Trips that are hard to make	Multiple	Visiting friends, housing	Visiting friends and attending cultural activities
Barriers to transport	Multiple	Road conditions	Road conditions and extreme weather
Infrastructure improvements	Maintenance	Sealing and maintenance	Sealing and more petrol stations
Public transport improvements	Variable	More affordable and frequent	More affordable and frequent and going to more places
Vehicle improvements	More affordable fuel and registration	More affordable registration and cars	More affordable fuel
Personal priorities with more disposable income	Variable	Repair current vehicle, buy fuel and a bus ticket	Repair current vehicle, buy fuel and a bus ticket

Table 29 presents some general information about transport preferences for different age groups.

Table 29: General information about transport preferences by age group

General facts	Older adults	Middle-aged adults	Young adults
Night-time driving per year	7	2	1.6
Top priority to improve transport	Better cars	Better roads, cheaper fuel	Better roads
Initiatives to reduce transport demands	Affordable system of goods delivery	Internet and an affordable system of goods delivery	More services
Community initiatives to improve transport	More affordable registration	More affordable fuel	More affordable bus and a community bus

Older adults tend to find that transport is safer and more reliable but also more unaffordable than younger adults find it. Extreme weather and registrations costs are of more concern to older travellers, who also take much more time to organise big trips and travel more often at night (possibly because they have more driving expertise in night-time conditions or specific needs to drive at night which could be related to family dynamics, cultural reasons and activities or legal issues).

Middle-aged adults travel more often as car passengers and tend to walk much more than people in the other age categories. They also undertake more big trips and travel over longer distances. They travel in vehicles which are reportedly in very average condition, and they experience ongoing issues of vehicle access for big trips. Fuel prices are a significant concern for middle-aged travellers. Housing is also problematic, with regards to both the purpose of the trip (access to housing services) and transport barriers (access to some form of accommodation during the trip). Finally, middle-aged adults would reportedly benefit the most from improved internet access in order to reduce their transport needs.

Young adults tend to travel over smaller distances (a third less than the average) and in good vehicles. They find transport to be particularly safe and quite affordable. However, not having spare parts is a big issue. Travelling to attend cultural activities tends to be harder for young adults. Young travellers would particularly appreciate getting access to more affordable and more frequent public transport, driving on sealed roads and having access to a community bus (which is possibly linked to sport events attendance). Younger adults also tend to pay slightly less for their travel.

Some interesting points arise from these data that warrant further research. In particular, as vehicle life cycles tend to be very short – from one to five years (Behrens et al. 2006, Currie & Senbergs 2007, Gething 1997, Posselt 2000, Rosier & McDonald 2011) – and there are generational factors that influence ownership, usage and general turnover of vehicles (Young 2001, Young & Doohan 1989), a young adult might have access to a good vehicle but not as often to secondary vehicles to access parts that would enable repairs. A middle-aged adult might not have access to a vehicle in good condition or a vehicle that would be able to be registered, and there might be a number of causal factors for this. Middle-aged travellers are possibly under more pressure when it comes to undertaking long-distance travelling: unlike younger adults who would be using public transport more often, their transport economic, time or social elasticity would be quite low because of greater family responsibilities. While elasticity values were not gathered through the survey itself, the range of total travel distance (50,000–70,000 km per year) is relatively similar in the different communities and does not correlate to the distance to the service centre, which suggests that incompressible transport demand is not easily reduced. Furthermore, the majority of the respondents (79%) regularly travel to maintain socio-cultural activities with a network of family and friends within and between communities. This is further confirmed by the recent findings of mobility studies in Central Australia (Dockery 2014, Dockery & Hampton 2015) and highlights the fact that the propensity to travel is strong in a remote context. Different economic and socio-cultural responsibilities (as carers, coordinators or facilitators for the transport of other community members) and limited transport choices are additional causes for the opportunity cost of transport to be particularly high; indeed, rather than transport modes being alternatives that can be substituted for each other, they tend to be mutually exclusive by nature, with different categories of people having access to different types of transport (Fogarty 2005, Raicu et al. 2011). In this sense, middle-aged travellers are dependent on the transport offers and needs of other groups for their transport options. The range of opportunities is reduced, which is shown by the fact that middle-aged travellers typically walk or travel as a vehicle passenger. Older adults might have access to more vehicles that may not be running but can be used to supply parts to other vehicles. They are also likely to be more experienced in how to undertake long-term repairs, which usually

involve higher costs, and aspire more to be compliant with transport regulations in order to avoid safety and legal risks.

There are also some common points across different generations: all the different age groups share common transport needs to go shopping. Furthermore, young and middle-aged travellers feel that their transport is generally safe. Finally, there is a strong consensus around the need for sealing roads and having access to more affordable and frequent public transport and more affordable fuel.

This research will be of use to a variety of stakeholders such as service providers and members of the transport industry that operates in remote areas in Australia. Service providers would include transport, housing, public infrastructure and water, power and waste management, health and education as well as social services that target key areas of socio-economic disadvantage (Australian Bureau of Statistics 2004). The service provision industry (including public services and services delivered by private social and business enterprises) is often the main source of employment and economic activity in very remote communities. Rationalising the transport system in very remote communities could provide savings at different levels (customer access, employee access, information access) to this industry. Transport integration would effectively decrease transport costs, potentially increase work productivity, and enhance collaboration opportunities in a resource-constrained work environment. Business models could integrate some of the transport preferences expressed in the survey to provide better services for specific population groups (young, middle-aged and older women and men).

5. Discussion

The results highlighted in this report demonstrate that in the remote communities surveyed there is a large range of mobility practices, and transport preferences are influenced by a great variety of parameters with increasingly relevant locational, generational and gender factors. The survey identified that different population groups travel differently yet experience similar issues: for instance, while men tend to use private motorised vehicles much more than women, they do not necessarily have better access to transport. Men reported using vehicles that were in poor condition much more often than women did, but this needs to be further analysed since it is likely that the vehicles are the only vehicles available. Indeed, women are using more public transport, and they report much better levels of transport access. As a result of this study, some important points can be considered in terms of transport issues.

The share of the local trips in the total transport of people living in very remote Central Australian Aboriginal communities is very important: on average 110 km per day in small trips (40,000 km per year). This is more than the 40 km per day in trips to service centres (16,000 km per year), combined with around 33 km per day (12,000 km per year) of long-distance trips. People travel around 70,000 km per year, which is more than twice the national average.

Lajamanu is characterised by a situation of hyper mobility, with people travelling up to 90,000 km per year (250 km per day) while in Ltyentye Apurte and Ntaria people travel less than 50,000 km per year. Figure 20 illustrates average travel distances in the three communities.

Annual travel distance in Central Australia

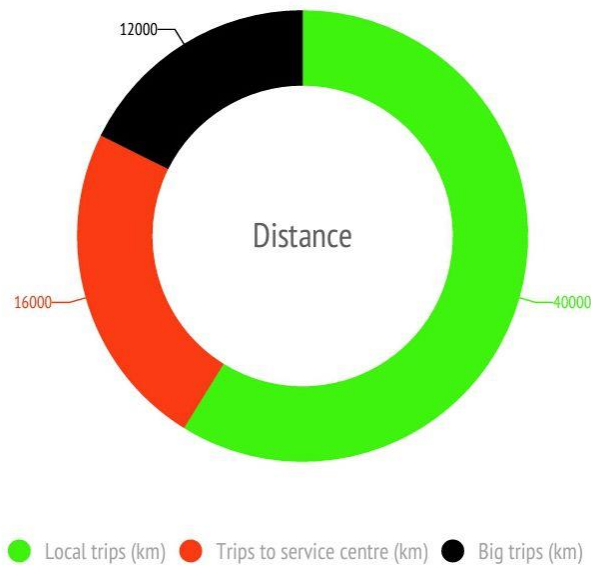


Figure 20: Average travelled distance in Ltyentye Apurte, Lajamanu and Ntaria

These results are much greater than previously estimated (Spandonide 2014a), mainly because of the lack of data and underestimation of local trips. Even if some of the travelling might have been overestimated by the respondents during the survey process, the results still indicate that both local and regional mobility needs are particularly important in very remote Aboriginal communities in Central Australia.

Table 30 illustrates some key facts about travel characteristics in the three communities.

Table 30: Travel characteristics in Ltyentye Apurte, Lajamanu and Ntaria

	Small trips	Service centre	Big trips	Total
Number of trips	2 per day, 700 per year	60 per year	11 per year	771
Average distance per return trip	39 km	260 km	1,080 km	88 km
Average distance per day	110 km	40 km	33 km	186 km
Average distance per year	40,000 km	16,000 km	12,000 km	68,000 km
Expense per trip per adult traveller	\$11	\$80	\$315	\$21
Expense per day per adult traveller	\$21.5	\$14.5	\$9.5	\$45.5
Expense per year per adult traveller	\$7,500	\$5,100	\$3,670	\$16,270

Expense and cost sharing practices are at the basis of the transport economy and the transport activities in very remote Central Australian Aboriginal communities. Figure 21 illustrates average transport costs in the three communities.

Annual travel expenses in Central Australia

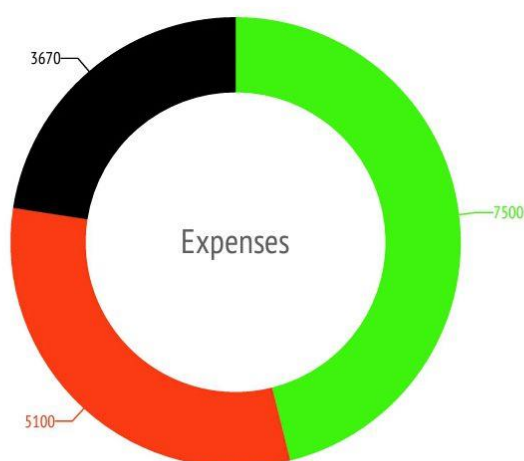


Figure 21: Average transport costs in Ltyentye Apurte, Lajamanu and Ntaria

Costs in terms of local mobility are particularly high.

There is a clear distance correlation for costs of the trips to the nearest service centre which indicates a similar level of transport demand in terms of access to services. Trips to the nearest service centre are the most expensive/unaffordable to undertake on a kilometric basis. Finally, community resilience and access to affordable long-distance transport options dictates long-distance travelling costs.

Another finding is that there is a strong correlation between both the frequency of trips to the nearest service centre and the travelled distances with the distance to the nearest service centre. Hence the further away a community is located from a service centre, the more people tend to need to travel in terms of annual distance.

As a conservative estimate, for small trips alone people pay around \$7,500 per year with a ratio of 1:2.7 payer/non-payer. This is equivalent to a budget of around \$2,778 per person per year (or \$7.5 per day, or \$20 per payer per day). Households pay on average around \$15,000 per year (\$42 per day) in travelling costs for small trips.

For trips to the nearest service centre, people pay an average of \$5,100 per adult traveller per year with a ratio of 1:3.8 payer/non-payer which corresponds to \$1,062.5 per person travelling per year. Average annual household expenses for trips to service centres are around \$5,500 or \$16 per day.

For big trips people pay an average of \$3,670 per adult traveller per year, or with a ratio of 1:3.9 payer/non-payer, or \$748.98 per person per year.

These results relate to annual transport expense per adult traveller and indicate an average transport expense of \$2,000 to \$7,000 per actual passenger per year which corresponds to the previously estimated transport market costs (Spandonide 2014a). The previous estimates were based on shorter travelled distances, which suggests that transport is cheaper than anticipated on a kilometric basis (registration and petrol costs in particular, while vehicle occupancy rates appear to be higher than previously estimated).

Average annual household costs are around \$4,600 per person (or \$12.5 per day). The average annual household transport cost is around \$27,000. While this level of cost might be very low in distance-travelled terms as people travel an average of almost 70,000 km per year, it represents a very high proportion of the median income in these communities (over 35%).

When increased capital and repair costs due to the faster decline in vehicle state for vehicles driven on unsealed roads are added in, it is clear that a vast majority of households which are in a situation of transport financial stress (over 30% of the household budget is allocated to transport) (Australian Bureau of Statistics 2013d, 2015) if similar criteria as housing stress is used (Rowley & Ong 2012, Yates 2007) are not able to meet basic maintenance costs for their vehicles. Indeed, one of the findings of the survey is that around half of the vehicles are not registered and half are in need of repairs.

Another critical aspect of the study shows that mobility appears to be essential to the livelihoods of Aboriginal people as it allows them to carry on a great variety of activities and have a better quality of life in areas that are physically isolated and supplied with a small number of services and goods. It is essential to understand a critical dilemma that exists in remote communities around transport: people will travel despite great challenges (such as unregistered, non-roadworthy or potentially dangerous vehicles). This is a major component of the current transport disadvantage in remote communities.

The results show a link between having access to good transport infrastructure and employment opportunities. The reported number of trips undertaken to go to work is around 15% higher in Ntaria, which has well-maintained sealed road access. Transport is a significant barrier to economic participation; Dockery and Hampton (2015) have identified that sealed roads have a positive impact on access to jobs. Similar issues (such as unregistered or non-roadworthy vehicles) limiting the use of available vehicles are likely to adversely affect economic participation.

While it might not be economically viable to seal roads in the immediate future, other alternatives such as supplying more affordable and frequent public transport services and lowering fuel and vehicle registration costs would be particularly welcomed by a vast majority of people living in very remote Central Australian communities. Considering that a large number of Aboriginal people living in remote communities are already experiencing very high living costs as well as an ongoing situation of socio-economic disadvantage (Access Economics Pty Limited 2008, Currie & Senbergs 2007, Currie et al. 2007, Kapuscinski 2013, NSW Aboriginal Transport Network 2006, NT Council of Social Service Inc 2014a, 2014b, Phillips et al. 2013, Posselt 2000, Rosier & McDonald 2011) and that a vast majority of the participants of this survey would prioritise fixing or registering a vehicle and would purchase some fuel or a public transport ticket if more disposable income were available, it appears that there is an urgent need to provide people with better vehicle services and bring some financial relief to the current high cost of transport.

Providing more affordable long-distance public transport requires extending coverage and frequency of services with a specific effort to better link them with each other. About half of the 1,200 remote communities in Australia do not have access to public transport services (Australian Bureau of Statistics 2010). People living in border regions of states and territories are also more often left marginalised from public transport access. The survey research suggests that around 30% of the population living in Lajamanu – the most isolated very remote community of the survey – would like to see services to destinations other than just the nearest service centre.

Furthermore, in the communities that do have access to public transport, the average frequency is limited to a weekly service (Raicu et al. 2011). Due to the current monopolistic environment of transport service, it should be theoretically possible to reduce transport costs by increasing the competition on different routes. However, in practice, the fact that there are limited services in remote Australia suggests that the fares are

already close to a price optimum. It should be understood that in the context of a low income, public transport fares are a financial barrier to travel. Therefore, the solution consists of regulating prices and increasing the level of subsidies for concession prices, which would benefit the most disadvantaged people living in very remote communities. This option would require a relatively low level of public investment when compared to road sealing. Furthermore, long-distance public transport is primarily used by the most financially vulnerable people (young, elderly and female users) to keep family relationships active, which is a critical aspect of general wellbeing (Dockery & Hampton 2015). Potential targeted transport initiatives could include providing transport to undertake specific cultural obligations and intra-community commuting for the largest communities. Such transport services could be run by current public transport providers or by Aboriginal organisations, further contributing to local employment opportunities.

Fuel cost might also be questionable in terms of socio-economic equity. Very remote communities are disadvantaged by both high supply chain costs of distribution and high retailer profit margins (Automobile Association of the Northern Territory 2005). Freight costs to deliver fuel in remote locations contribute an additional 5–15% of the overall price of petrol (Spandonide 2014b). Yet people living in very remote communities pay 30–70% more than people living in large remote locations (NT Council of Social Service Inc 2014a). This difference is made up partly in retailer surcharges and profit margins and partly in the fuel excise, which is a proportionate increase on fuel prices that are already high in very remote communities. The excise is 38.5% of the overall cost and 10–20% higher in very remote communities than in other places because of the higher base price. As a result the average household expenditure on fuel represents 5–15% of average household incomes in very remote communities as opposed to 4.1% nationally (Australian Bureau of Statistics 2012c, NT Council of Social Service Inc 2014b). People are trapped in an extreme situation with a very low elasticity in terms of travel demand, with the majority of trip purposes being to visit relatives and friends (79% of respondents) and to go shopping (54% of respondents), which are both perceived as essential activities in the socio-cultural context of very remote livelihoods. There are limited transport alternatives for these types of travel purposes, which indicates a high level of vulnerability to potential fuel price increases. Fuel prices in remote communities tend to have a low level of response to terminal gate price fluctuations (particularly not to terminal gate price falls). Indeed, discounting or capping fuel prices could positively rebalance mobility practices and increase the economic viability of petrol stations in remote areas and result in more resilient community businesses involved in fuel distribution.

Registration concessions exist in every state and territory for pensioners and people with disability support. South Australia is the only state that provides a 50% concession reduction for people living in very remote areas. This initiative could be extended to remote communities in other states and in the Northern Territory. Furthermore, to improve people's opportunities to have vehicles assessed for roadworthiness, mobile vehicle registration units that could travel to different communities and positively engage with community members are likely to be successful. This could follow the model of the DriveSafe NT work on licensing in remote areas (Northern Territory Government 2013).

For people with age- or disability-related mobility issues, there seems to be a real lack of access to specialised transport, which has negative consequences beyond the disability service issue: almost 15% of the respondents of the survey reported that they would be able to travel less if such services were available. This is supported by the literature on this topic describing the lack of transport services accommodating the needs of remote Australians living with a form of disability (Gething 1997, National Disability Services 2004, Physical Disability Council of Australia Ltd 2007, Productivity Commission 2011, Tregenza 2002).

For communities located further away from service delivery centres, it might be more economically viable to support the use of affordable fuel-efficient and longer lasting four-wheel drive vehicles. Service providers already use these vehicles to access communities with unsealed roads; people living in very remote communities are therefore familiar with these vehicles and many also drive them. Moreover, the transport preferences of people in the most remote community in the survey, Lajamanu, demonstrate a high degree of adaptation towards four-wheel drive vehicles and awareness of fuel consumption issues. These observations mean that fuel-efficient four-wheel drive vehicles might well be a viable long-term alternative in some of the most inland remote communities.

The living costs associated with new standards of living based on access to global markets and goods could be effectively decreased in a remote context by providing more affordable delivery systems in remote communities and better services both within (intra-communities) and as connections with the outside world (inter-communities) through roads and telecommunication networks. For instance, there might be some good business opportunities to develop online shopping with a linked delivery system. Developing a nationwide tendering system providing remote communities with more affordable goods delivery options would reduce transport needs and costs. A majority of the local mobility is triggered by poor access to affordable goods and services and creates a detrimental resource-constrained cycle with direct impacts on livelihoods and supply chain costs. Local operators could also benefit from extending the catchment area of their businesses to new locations, which could support local employment. Existing logistics platforms in different industries could be extended in use: for instance, mining companies could share loads for goods utilising web-based collaboration tools. Similarly, because a major area of cost for the service provision industry itself in very remote areas is transport, fleet sharing could deliver significant savings (over 10% of transport costs, wages included) for public agencies and non-governmental organisations.

In terms of long-term alternatives in order to finance a shift to localised service provision, mining and pastoral leases could be utilised in a more intentional way for community development projects, leading to decreased transport demands and increased community resilience. Finally, for long-term planning, while continuing the ongoing efforts in building new road infrastructure is essential, new technologies could have potential for new improving economic development projects in very remote communities; these would include electric vehicles, 3D printing, drone and self-driving technology, ultra-efficient zeppelins and inflatable airships for freight.

6. Conclusion

The community members' self-awareness and technical knowledge about transport issues expressed throughout the Transport Futures survey analysed in this report contribute to knowledge about transport in Central Australian Aboriginal very remote communities in particular, but with a strong potential for extrapolation to other very remote Aboriginal and Torres Strait Islander communities.

Remote Australia is characterised by a two-tiered transport system: in the current situation, most Aboriginal and Torres Strait Islander people living in very remote areas have significant transport needs and systemic transport shortages both in terms of infrastructure and services, whereas a majority of non-Aboriginal and Torres Strait Islander people living or working in very remote communities have access to well-maintained four-wheel drive vehicles and state-of-the-art fly-in/fly-out support.

The Transport Futures survey findings demonstrate and quantify the degree of magnitude of the transport issues affecting remote communities and enterprises. Poorly maintained roads and high fuel and public

transport costs are major transport limitations that act as a systemic barrier to economic development and sustainable livelihoods.

While sealing roads is the most effective step towards the socio-economic development of the largest remote communities, where over half of the Aboriginal and Torres Strait Islander remote population is living, for the smallest and most distant remote communities, other practical options could prove to be more appropriate and viable.

Appropriate transport regulations aimed at reducing fuel prices with a discounted or capped excise, discounted registrations and targeted incentives for the acquisition of appropriate durable and fuel-efficient vehicles at reduced prices for low-income earners in very remote locations would deliver potentially strong returns: it would have immediate impacts on transport-related judicial issues, economic participation (by exponentially increasing local mobility options) and wellbeing (Australian Bureau of Statistics 2006a). Initiatives designed at reducing transport needs such as a better access to telecommunication and services within communities appear to be particularly well suited for improving the resilience of Aboriginal very remote communities in Central Australia.

The next steps of the research will focus on detailed transport modelling exercises, with the objective to visualise different scenarios of future transport alternatives. Future mobility scenarios will include assessing the possible evolution of transport networks, local enterprises and technologies and the influence of weather.

These scenarios will integrate different statistical relationships related to travel behaviour and mobility, energy consumption and emissions estimation, cost-benefit and multi-criteria analyses as well as micro- or macro-scale simulations for remote Australian communities. Scenario forecasting will be built on community surveys and transport stakeholder interviews and completed by Australian Bureau of Statistics census data. Comprehensive data management treatment with a GIS spatial component will be used to forecast and evaluate a set of transport options for remote Australian communities.

Appendix: Transport Futures survey

Table A1: Transport Futures Survey

Preliminary Information: Would you like to participate in the Transport Futures survey today? Name and signature Gender Age Length of time of residency in the community	Y/N F/M Years Years	
Questions for small and long trips: For the next questions, think about the small and the long trips you do.	Small/short trips	Big/long trips
Q1. Travelling purposes: What are the three most common reasons to do travel between the following options?	Work Visiting Family Shopping Recreational activities Cultural reasons Education Health Housing Sport Looking for work Banking Car services Centrelink Others:	Work Visiting Family Shopping Recreational activities Cultural reasons Education Health Housing Sport Looking for work Banking Car services Centrelink Others:
Q2. Type of transport: What is the most common type of transport you use?	Car (owned and driving) Car (owned and not driving) Car (not owned and driving) Car (passenger) Small bus Big bus Walking Others:	Car (owned and driving) Car (owned and not driving) Car (not owned and driving) Car (passenger) Plane Small bus Big bus Others:
Q3. Transport alternatives: Which other types of transport can you use?	Car (owned and driving) Car (owned and not driving) Car (not owned and driving) Car (passenger) Small bus Big bus Walking Others:	Car (owned and driving) Car (owned and not driving) Car (not owned and driving) Car (passenger) Plane Small bus Big bus Others:
Q4. Distance: What is the average distance of the (return) trips you do?	Km/trip	Km/trip
Q5. Frequency: How often do you do a trip?	Number of small trips per day or week	Number of long trips per year

Questions for small and long trips: For the next questions, think about the small and the long trips you do.	Small/short trips	Big/long trips
Q6a. Time (preparation): How long does it take to organise small trips?	Hrs/trip	Hrs/trip
Q6b. Time (preparation): How long does it take to organise big trips?	Hrs/trip	Hrs/trip
Q6c. Time (preparation and travel): How long does it take to make the trip?	Hrs /trip	Hrs or days /trip
Q7a. Number of passengers: Average number of persons (including humbug) travelling with you?	Average number of person/trip	Average number of person/trip
Q7b. Number of night travel per year?		
Q8a. Conditions of transport: In which conditions are the roads you are travelling on?	Very good Good Average Bad Very bad	Very good Good Average Bad Very bad
Q8b. Conditions of transport: In which conditions are the vehicles you are travelling with?	Very good Good Average Bad Very bad	Very good Good Average Bad Very bad
Q9a. Cost: How much do you spend on a trip (average fuel or ticket expenses)?	\$/trip	\$/trip
Q9a. Cost: What is the full amount of the cost of the trip including chucking in from other people (fuel/ticket costs)?	\$/trip	\$/trip
Q10. Overall access to transport: How easy is it for you to access and use your most common type of transport?	Very easy Easy Average Hard Very hard	Very easy Easy Average Hard Very hard
Q11. Transport Safety: Is it safe for you to access and use your most common type of transport?	Very safe Safe Average Unsafe Very unsafe	Very safe Safe Average Unsafe Very unsafe
Q12. Transport Reliability: How reliable is it for you to access and use your most common type of transport?	Very reliable Reliable Average Unreliable Very unreliable	Very reliable Reliable Average Unreliable Very unreliable

Questions for small and long trips: For the next questions, think about the small and the long trips you do.	Small/short trips	Big/long trips
Q13. Transport Affordability: How affordable is it for you to access and use your most common type of transport?	Very affordable Affordable Average Unaffordable Very unaffordable	Very affordable Affordable Average Unaffordable Very unaffordable
Q14. Key transport issues: What are the three main problems with accessing and using transport (1 to 3)?	Extreme weather (i.e. hot days, floods) Road conditions Lack of lift/access to transport Suitable driver/driving skills Spare parts Fixing skills Affordable petrol/diesel fuel Public transport access/accessible hours Public transport price No registration No license Buying a good vehicle at a good price Commitments (work, family, cultural activities or education) Medical reasons Others:	Extreme weather (i.e. hot days, floods) Road conditions Lack of lift/access to transport Suitable driver/driving skills Spare parts Fixing skills Affordable petrol/diesel fuel Public transport access/accessible days Public transport price No registration No license Buying a good vehicle at a good price Commitments (work, family, cultural activities or education) Medical reasons Others:
Q15. Key access issues: What are the three types of trips/journey which are the most difficult to go to/access (1 to 3)?	Work Family gathering Visiting friends Shopping Recreational activities Cultural activities Education Health Housing Sport Looking for work Bank Car services Centrelink Others:	Work Family gathering Visiting friends Shopping Recreational activities Cultural activities Education Health Housing Sport Looking for work Bank Car services Centrelink Others:
Q16. Transport Improvements: How could transport be improved?	Response:	Response:
Q17. Transport infrastructures preferences: What do you think would be the three main priorities (1 to 3) for transport infrastructures?	More roads Upgrading unsealed to sealed roads Better maintained roads Petrol stations Others:	More roads Upgrading unsealed to sealed roads Better maintained roads More airstrips Petrol stations Others:

Questions for small and long trips: For the next questions, think about the small and the long trips you do.	Small/short trips	Big/long trips
Q18. Transport services preferences: What do you think would be the three main priorities (1 to 3) for public transport?	Buses going to more places with more bus stops More frequent bus services with better connections Cheaper bus tickets A different timetable Government vehicles giving more lifts to people of the community Others:	Buses going to more places with more bus stops Planes going to more places with more planes stops, More frequent bus services with better connections More frequent plane services with better connections A different timetable Cheaper bus tickets Cheaper plane tickets Government vehicles giving more lifts Others:
Q19. Transport vehicles preferences: What do you think would be the three main priorities (1 to 3) for cars?	Having four wheel drive cars Cars with less maintenance/repairs More fuel-efficient cars Cheaper fuel Cheaper cars Cheaper repairs (cheaper parts and cheaper road assistance) Free license/driving courses Cheaper registration Others:	Having four wheel drive cars Cars with less maintenance/repairs More fuel-efficient cars Cheaper fuel Cheaper cars Cheaper repairs (cheaper parts and cheaper road assistance) Free license/driving courses Cheaper registration Others:
Q20. Transport demand management: What do you think would be the three main options (1 to 3) to reduce your need to go to different places?	An Internet connection More services (shops, health, housing, Banking, administration and Centrelink) available in the community A system to improve the community coordination to organise transport A community mechanics workshop Affordable delivery of goods/shopping Transport services for people with disabilities, young and old people Community buses Others:	An Internet connection More services (shops, health, housing, Banking, administration and Centrelink) available in the community A system to improve the community coordination to organise transport A community mechanics workshop Affordable delivery of goods/shopping Transport services for people with disabilities, young and old people Community buses Others:
Q21a. Transport preferences: If you received \$2,000 what would you do (1 to 3) to improve your transport options?	I would use it to buy a new vehicle I would use it to take the bus I would use it to repair a vehicle I would use it to buy some fuel I would use it to get a registration	I would use it to buy a new vehicle I would use it to take the bus I would use it to repair a vehicle I would use it to buy some fuel I would use it to get a registration I would use it to take the plane

Questions for small and long trips: For the next questions, think about the small and the long trips you do.	Small/short trips	Big/long trips
Q21a. Transport preferences: If your community received a grant (\$50,000+) how do you think transport could be improved (1 to 3)?	Repairing roads Storing some petrol Delivering goods/shopping Vouchers to take the bus Running a community bus Getting discounts on vehicles Getting discounts on parts Opening a workshop in the community Vouchers for petrol Vouchers for registration	

References

- Access Economics Pty Limited. 2008. *An overview of the economic impact of Indigenous disadvantage*. Reconciliation Australia.
- Altman JC. 2010. What future for remote Indigenous Australia? Economic hybridity and the neoliberal turn. In *Culture Crisis: Anthropology and Politics in Aboriginal Australia*. Ed. Altman JC and Hinkson M. pp. 259-80. UNSW Press. Sydney, NSW.
- Altman JC and Kerins SP. 2012. *People on Country: Vital Landscapes Indigenous Futures*. Federation Press. Sydney.
- Australian Bureau of Statistics. 2003. *Australian Social Trends, 2003*. ABS. Canberra. Retrieved from <http://www.abs.gov.au/AUSSTATS/abs@.nsf/7d12b0f6763c78caca257061001cc588/2e1d3b9176cc05b6ca2570eb00835394!OpenDocument>.
- Australian Bureau of Statistics. 2004. *Measures of Australia's Progress*. ABS. Canberra. Retrieved from <http://www.abs.gov.au/AUSSTATS/ABS@.nsf/94713ad445ff1425ca25682000192af2/2b2d7742b4059b04ca256e7d00002658!OpenDocument>.
- Australian Bureau of Statistics. 2006a. *Population Characteristics, Aboriginal and Torres Strait Islander Australians, 2006*. 4713.0. ABS. Canberra. <http://abs.gov.au/ausstats/abs@.nsf/Lookup/78CD1EFFC8A28042CA2578DB00283CB6?opendocument>.
- Australian Bureau of Statistics. 2006b. *Survey of Motor Vehicle Use Australia, 01 Nov 2004 to 31 Oct 2005*. ABS. Canberra. Retrieved from <http://www.abs.gov.au/ausstats/abs@.nsf/mediareleasesbyTopic/66E24E957EB09229CA2571E10077D71D?OpenDocument>.
- Australian Bureau of Statistics. 2007. *Population Distribution, Aboriginal and Torres Strait Islander Australians*. 4705.0. ABS. Canberra. <http://www.abs.gov.au/AUSSTATS/abs@.nsf/Lookup/4705.0Main+Features12006?OpenDocument>.
- Australian Bureau of Statistics. 2009. *National Aboriginal and Torres Strait Islander Social Survey*. ABS. Canberra. <http://www.abs.gov.au/AUSSTATS/abs@.nsf/allprimarymainfeatures/AD174BBF36BA93A2CA256EBB007981BA?opendocument>.
- Australian Bureau of Statistics. 2010. *The Health and Welfare of Australia's Aboriginal and Torres Strait Islander Peoples, Oct 2010*. 4704.0. ABS. Canberra. <http://www.abs.gov.au/ausstats/abs@.nsf/Latestproducts/4704.0Main%20Features2Oct%202010?opendocument&tabname=Summary&prodno=4704.0&issue=Oct%202010&num=&view=>.
- Australian Bureau of Statistics. 2012a. *Australian Demographic Statistics, Aboriginal and Torres Strait Islander Population Estimates, 2011 - Preliminary*. 3101.0. ABS. Canberra. <http://www.abs.gov.au/ausstats/abs@.nsf/featurearticlesbytitle/DB52AB9278B0C818CA257AD7000D1067?OpenDocument>.
- Australian Bureau of Statistics. 2012b. *Regional Population Growth, Australia* 3218.0. ABS. Canberra. <http://www.abs.gov.au/AUSSTATS/abs@.nsf/Lookup/3218.0Main+Features12012-13?OpenDocument>.

- Australian Bureau of Statistics. 2012c. *Year Book Australia, Income and Welfare*. 1301.0. ABS. Canberra. <http://www.abs.gov.au/ausstats/abs@.nsf/Lookup/by%20Subject/1301.0~2012~Main%20Features~Household%20income,%20expenditure%20and%20wealth~193>.
- Australian Bureau of Statistics. 2013a. *Australian Social Trends, Aboriginal and Torres Strait Islander Peoples' Labour Force Outcomes*. 4102.0. ABS. Canberra. <http://www.abs.gov.au/ausstats/abs@.nsf/Lookup/4102.0Main+Features20Nov+2013>.
- Australian Bureau of Statistics. 2013b. *Census DataPacks*. ABS. Canberra. <https://www.censusdata.abs.gov.au/datapacks>.
- Australian Bureau of Statistics. 2013c. *Estimates of Aboriginal and Torres Strait Islander Australians, June 2011*. 3238.0.55.001 ABS. Canberra. <http://www.abs.gov.au/ausstats/abs@.nsf/mf/3238.0.55.001>.
- Australian Bureau of Statistics. 2013d. *Survey of Income and Housing 2011-12*. 6523.0. ABS. Canberra. <http://www.abs.gov.au/AUSSTATS/abs@.nsf/Lookup/6553.0Main+Features12011-12?OpenDocument>.
- Australian Bureau of Statistics. 2013e. *Survey of Motor Vehicles Use, Australia, 12 months ended 30 June 2012* 9208.0. ABS. Canberra. <http://www.abs.gov.au/AUSSTATS/abs@.nsf/allprimarymainfeatures/6B45893797BE8177CA257EDE0013B9A8?opendocument>.
- Australian Bureau of Statistics. 2014a. *Australian Social Trends, Exploring the Gap in Labour Market Outcomes for Aboriginal and Torres Strait Islander Peoples*. 4102.0. ABS. Canberra. <http://www.abs.gov.au/ausstats/abs@.nsf/Lookup/4102.0main+features72014>.
- Australian Bureau of Statistics. 2014b. *Motor Vehicle Census, Australia*. 9309.0. ABS. Canberra. <http://www.abs.gov.au/ausstats/abs@.nsf/mf/9309.0>.
- Australian Bureau of Statistics. 2015. *Average Weekly Earnings, Australia, Nov 2014*. 6302.0. ABS. Canberra. <http://www.abs.gov.au/ausstats/abs@.nsf/mf/6302.0>.
- Australian Competition and Consumer Commission. 2012. *Fuel facts: What Drives Fuel Prices in Regional Australia?* ACCC. Canberra.
- Australian Transport Council. 2006. *National Guidelines for Transport System Management in Australia 1: Introduction to the Guidelines and Framework*. ATC. Canberra.
- Automobile Association of the Northern Territory. 2005. *Inquiry into Fuel Prices in the Northern Territory*. AANT Submission to the Northern Territory Government <http://www.aaa.asn.au/storage/Inquiry%20into%20Fuel%20Prices%20in%20the%20Northern%20Territory.pdf>.
- Battersby B. 2006. *Does distance matter? The effect of geographic isolation on productivity levels*. Treasury Working Paper OECD Economic Studies 42, 2006/1. Australian Government. Canberra http://archive.treasury.gov.au/documents/1113/HTML/docshell.asp?URL=TWP_03_2006.htm.
- Behrens K, Gaigné C, Ottaviano GIP and Thisse J-F. 2006. Is Remoteness a Locational Disadvantage? *Journal of Economic Geography*. 6, 3. pp. 347-68.
- Berry J, Nearmy D and Harrison J. 2007. *Injury of Aboriginal and Torres Strait Islander people due to transport, 1999-00 to 2003-04*. INJCAT 100. Australian Institute of Health and Welfare and Australian Transport Safety Bureau. Canberra.

- Berryman and Associates. 2001. *Central Australian Aboriginal Transport Scoping Study*. Tangentyere Council. Alice Springs.
- Biddle N. 2011. *Measures of Indigenous wellbeing and their determinants across the lifecourse*. 2011 CAEPR Online Lecture Series: Lecture 5 Income, work and Indigenous livelihoods. 10 March 2011 Centre for Aboriginal Economic Policy Research. Canberra.
- Biddle N and Hunter B. 2005. *Factors Associated with Internal Migration: A Comparison between Indigenous and Non-Indigenous Australians*. Working Paper 32. Centre for Aboriginal Economic Policy Research. Canberra.
- Biddle N and Prout S. 2009. *Indigenous temporary mobility: An analysis of the 2006 Census snapshot*. CAEPR Working Paper No. 55/2009. Centre for Aboriginal Economic Policy Research. Canberra. <http://caepr.anu.edu.au/sites/default/files/Publications/WP/CAEPRWP55.pdf>.
- Bus Industry Confederation. 2014. *The role of public transport in delivering productivity outcomes*. Submission by the Bus Industry Confederation to the Senate Regional and Regional Affairs and Transport References Committee. Canberra. http://www.aph.gov.au/Parliamentary_Business/Committees/Senate/Rural_and_Regional_Affairs_and_Transport/Public_transport/Submissions.
- Centre for Remote Health, Flinders University, Charles Darwin University and Tangentyere Council. 2011. *Aboriginal Population Mobility in Alice Springs: Analysis of Public Housing*. Desert Knowledge CRC Report Number 57. Ninti One Limited. Alice Springs, NT.
- Coughlan F. 1991. 'Aboriginal Town Camps and Tangentyere Council The Battle for Self-Determination in Alice Springs'. Master of Arts. La Trobe University. Victoria. pp. 151.
- Currie G and Senbergs Z. 2007. Indigenous Communities: Transport Disadvantage and Aboriginal Communities. In *No Way to Go: Transport and Social Disadvantage in Australian Communities*. Ed. Currie G, Stanley J and Stanley J. pp. 09.1-09.12. Monash University Press. Melbourne.
- Currie G, Stanley J and Stanley J. 2007. *No Way To Go - Transportation and Social Disadvantage in Australian Communities*. Monash University ePress. Melbourne.
- de Leeuw ED, Hox JJ, Dillman DA and European Association of Methodology. 2008. *International Handbook of Survey Methodology*. Lawrence Erlbaum Associates. New York, NY.
- Denmark D. 2012. *Transport and Mobility in Tennant Creek and the Barkly*. Northern Territory Council of Social Service. NT. http://www.ntcoss.org.au/wp-content/uploads/2014/09/Transport-and-Mobility-in-Tennant-Creek_0.pdf.
- Dillman DA and Bowker DK. 2000. The Web Questionnaire Challenge to Survey Methodologists. In *Online Social Sciences*. Ed. Batinic B, Reips U-D, Bosnjak M and Werner A. pp. 53-72.
- Dockery AM. 2014. 'Population Mobility and Labour Markets Project Update - November 2014'. CRC for Remote Economic Participation. Alice Springs. <http://us5.campaign-archive2.com/?u=db0c44a0a4db4cce9a3dccec0&id=d249f688f4>.
- Dockery AM and Colquhoun S. 2012. *Mobility of Aboriginal and Torres Strait Islander people: A Literature Review*. Working paper CW004 Cooperative Research Centre for Remote Economic Participation, Ninti One Limited. Alice Springs.

- Dockery M. 2015. *On the Move: A Key to Remote Australian Success*. Ninti One Limited. Alice Springs.
http://crc-rep.com/sites/default/files/upload/crc-rep_mobility_2jun15.pdf.
- Dockery M and Hampton K. 2015. *The dynamics of services, housing, jobs and mobility in remote Aboriginal and Torres Strait Islander communities in central Australia*. Working Paper CW023. Ninti One Limited. Alice Springs.
- Elvin R, Peter S, Porter R and Young M. 2010. *Discordance, Mobility and Agency: Dilemmas for housing Reform in Northern Territory Aboriginal Settlements*. Ninti One Limited. Alice Springs.
- Fogarty W. 2005. 'You got any Truck?' *Vehicles and decentralised mobile service provision in remote Indigenous Australia*. Working Paper No. 30/2005. Centre for Aboriginal Economic Policy Research. Canberra.
- Foster D, Mitchell J, Ulrik J and Williams R. 2005. *Population and Mobility in the Town Camps of Alice Springs*. DK-CRC Report Number 9 Tangentyere Council Research Unit, Desert Knowledge Cooperative Research Centre. Alice Springs.
- Gething L. 1997. Sources of Double Disadvantage for People with Disabilities Living in Remote and Rural in Australian Desert Aboriginal Development. *The Rangeland Journal*. 30, 1. pp. 55-65.
- Holcombe S. 2006. Indigenous Australians and Transport—What can the NATSSIS tell us? In *Assessing the Evidence on Indigenous Socioeconomic Outcomes: A Focus on the 2002 NATSISS*. Ed. Hunter B. pp. 183-96. ANU E Press. Canberra.
- Howard-Wagner D and Kelly B. 2011. Containing Aboriginal Mobility in the Northern Territory: From 'Protectionism' to 'Interventionism'. *Law Text Culture*. 15 Under the Eye of the Law: Mobile Peoples in the Pacific, Art 7. pp. 35.
- Hunter B. 2012. *Selected Issues for Closing the Income Gaps between Indigenous and other Australians, 2001–11*. CAEPR Topical Issue No. 1/2012. Centre for Aboriginal Economic Policy Research. Canberra.
- Kainz T, Carson DA and Carson DB. 2012. Temporary Indigenous Mobility in Remote South Australia: Understanding the Challenges for Urban Based Health and Social Service Delivery. *Journal of Rural and Community Development*. 7, 1, pp. 16–36.
- Kapuscinski CA. 2013. *Indigenous disadvantage in an historical perspective: the evidence of the last thirty years*. Department of Education Employment and Workplace Relations. Canberra.
- Kinfu Y. 2005. *Spatial Mobility among Indigenous Australians: Patterns and Determinants*. Working Paper in Demography No. 97 ANU Demography & Sociology Program, Research School of Social Sciences. Canberra.
- Lawrence R. 1991. Motorised Transportation in Remote Aboriginal Australia. *Australian Aboriginal Studies*. 2. pp. 62-66.
- Leung J and Tantirigama T. 2011. Contribution of transport to economic growth and productivity in New Zealand. In *Proceedings of 34th Australasian Transport Research Forum* Adelaide, Australia. 28-30 September. pp. 15 pp.
- McFadden M, McKie K and Mwesigye S-E. 2000. *Estimating Road Trauma in the Australian Indigenous Population*. Australian Transport Safety Bureau. Canberra.

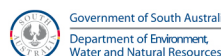
- Memmott P, Long S, Bell M, Taylor J and Brown D. 2004. *Between Places: Indigenous Mobility in Remote and Rural Australia*. AHURI Positioning Paper No. 81 Australian Housing and Urban Research Institute, Queensland Research Centre Aboriginal Environments Research Centre, Queensland Centre for Population Research, University of Queensland. Brisbane.
- Memmott P, Long S and Thomson L. 2006. *Indigenous Mobility in Rural and Remote Australia*. Australian Housing and Urban Research Institute Queensland Research Centre. Brisbane.
- Musharbash Y. 2008. *Yuendumu Everyday: Contemporary life in Remote Aboriginal Australia*. Aboriginal Studies Press. Canberra.
- National Disability Services. 2004. *Aids and Equipment Improving Quality of Life for People with a Disability*. NDS. Canberra.
- Northern Territory Government. 2012. *Fact sheet: Major Remote Towns*. NTG. Darwin.
- Northern Territory Government. 2013. *DriveSafe NT Remote fact sheet*. NTG. Darwin.
- NSW Aboriginal Transport Network. 2006. *Transport Disadvantage in Aboriginal Communities*. Northern Rivers Social Development Council. NSW. http://www.nrsdc.org.au/publications/doc_view/54-transport-disadvantage-in-aboriginal-communities.html.
- NT Council of Social Service Inc. 2014a. *Cost of Living Report. Tracking changes in the cost of living, particularly for vulnerable and disadvantaged Northern Territorians: The cost of food in the Territory*. 6. NTCOSS. Darwin.
- NT Council of Social Service Inc. 2014b. *Cost of Living Report. Tracking changes in the cost of living, particularly for vulnerable and disadvantaged Northern Territorians: The cost of transport in the Territory* 3. NTCOSS. Darwin.
- Phillips B, Miranti R, Vidyattama Y and Cassells R. 2013. *Poverty, Social Exclusion and Disadvantage in Australia*. National Centre for Social and Economic Modelling, UnitingCare. Canberra.
- Physical Disability Council of Australia Ltd. 2007. Submission to Review of the Disability Standards for Accessible Public Transport 2002. NSW.
- Pleshet N. 2006. *Viability Analysis for Desert Settlement and Economy: The Transport and Mobility Interface*. Working Paper 2. Desert Knowledge CRC. Alice Springs.
- Posselt H. 2000. Socio-Economic Disadvantage across Urban, Rural and Remote Areas. *10th Biennial Conference of the Australian Population Association Population and Globalisation: Australia in the 21st Century*. 28th November to 1st December 2000. Melbourne.
- Productivity Commission. 2011. Disability within the Indigenous Community. In *Disability Care and Support Inquiry*. Ed. pp. 531-61. Productivity Commission. Melbourne.
- Prout S. 2007. *Invisible Mobilities? Engaging with Statistically 'Uncaptured' Indigenous Population Dynamics*. Centre for Aboriginal Economic Policy Research. Canberra. http://www.aiatsis.gov.au/_data/assets/pdf_file/8612/Session_17_ALTMAN_1_4_2_.pdf.
- Prout S. 2008. *On the move? Indigenous temporary mobility practices in Australia*. CAEPR Working Paper No. 48/2008. Centre for Aboriginal Economic Policy Research. Canberra.
- Prout S and Yap M. 2010. *Indigenous Temporary Mobilities and Service Delivery in Regional Service Centres: A West Kimberley Case Study*. CAEPR Working Paper No. 66/2010. Centre for Aboriginal Economic Policy Research. Canberra.

- Raicu R, Taylor M, Meng L and Currie G. 2011. *Scoping Study on Regional Transport in Desert Australia*. Desert Knowledge CRC Working Paper Number 84 Ninti One Limited. Alice Springs.
- Rosier K and McDonald M. 2011. *The Relationship between Transport and Disadvantage in Australia*. Australian Institute of Family Studies. Melbourne.
- Rowley S and Ong R. 2012. *Housing affordability, housing stress and household wellbeing in Australia*. AHURI Final Report 192. Australian Housing and Urban Research Institute. Melbourne.
- Smith BR. 2002. *Decentralisation, Population Mobility and the CDEP Scheme in Central Cape York Peninsula*. No. 238/2002. Centre for Aboriginal Economic Policy Research and the School of Australian Environmental Studies, Griffith University. Canberra.
- Smoker JF. 2011. 'The Terra Nullius of Infrastructure: Roads to Remote Indigenous Towns'. Ph.D. Curtin University. School of Humanities Curtin University of Sustainability Policy (CUSP). pp. 263.
- Spandonide B. 2014a. *Transport systems in remote Australia: Transport costs in remote communities*. CRC-REP Working Paper CW017 Ninti One Limited. Alice Springs.
- Spandonide B. 2014b. *Transport systems in remote Australia: Transport costs in remote communities*. Technical Document Ninti One Limited. Alice Springs (available from author).
- Stoeckl N, Stanley O, Brown V and Stoeckl W. 2007. *Regional Economic Multipliers in Australia's Tropical Savanna*. Tropical Savannas CRC. Townsville.
- Storey K. 2001. Fly-in/Fly-out and Fly-over: Mining and Regional Development in Western Australia. *Australian Geographer*. 32, 2. pp. 133-48.
- Taylor J. 2002. *The Spatial Context of Indigenous Service Delivery*. CAEPR Working Paper No. 16/2002. Centre for Aboriginal Economic Policy Research. Canberra.
- Taylor J. 2006. *Population and Diversity: Policy Implications of Emerging Indigenous Demographic Trends*. Discussion Paper No. 283/2006. Centre for Aboriginal Economic Policy Research. Canberra.
- Taylor J. 2011. Beyond the Pale: Measures of Mobility in Postcolonial Australia. *Law Text Culture*. 15 Under the Eye of the Law: Mobile Peoples in the Pacific, Art 5. pp. 30.
- Taylor J, Brown D and Bell M. 2006. *Population Dynamics and Demographic Accounting in Arid and Savanna Australia: Methods, Issues and Outcomes*. DKCRC Report 16. Desert Knowledge Cooperative Research Centre. Alice Springs. <http://www.desertknowledgecrc.com.au/publications/dkcrc-0114>.
- Tregenza J. 2002. *Review of the delivery of services to people with disabilities on the Anangu Pitjantjatjara Lands*. Department of Human Services, South Australian Government. Adelaide.
- Worth D and Endean C. 2005. Indigenous Communities Working Group. Flow-on economic and social impacts in Australia from continuing rises in the price of transport fuel and potential reductions in oil supply. Australian Association for the Study of Peak Oil and Gas. Canberra. http://www.aph.gov.au/~media/wopapub/senate/committee/rrat_ctte/completed_inquiries/2004_07/oil_supply/submissions/sub48_pdf.ashx.
- Yates J. 2007. *Housing affordability and financial stress*. NRV3 Research paper 6. Australian Housing and Urban Research Institute. Melbourne.
- Young D. 2001. The Life and Death of Cars: Private Vehicles on the Pitjantjatjara Lands South Australia. In *Car Cultures*. Ed. Miller D. pp. 35-58. Berg Publishers. Oxford, UK.

Young E and Doohan K. 1989. *Mobility for Survival. A Process Analysis of Aboriginal Population Movement in Central Australia*. Australian National University North Australia Research Unit. Darwin.

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