

## Switching on the remote: a new perspective on accessibility in remote Australia

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### Abstract

In remote Australia, access to people, goods, services, information and places is difficult because of extreme distances and climates, sparse population, remoteness from markets, and complex economic and socio-cultural dynamics. Most of remote Australia remains disconnected from both the digital revolution and the national transport network due to a lack of adequate infrastructure, affordable and reliable services, and, for most, poor digital literacy. This impedes service delivery including education and health services, economic development and wellbeing of remote residents; contributing to inequalities between remote and non-remote Australians. Whilst the concept of accessibility in transport and telecommunication goods and services is relatively well defined in an urban context and can be measured accordingly, the way accessibility is currently measured fails to capture the complexity of the remote Australian context. The article discusses some of the current knowledge gaps associated with studying accessibility levels in remote Australia with a particular focus on Central Australia. The article presents indicators and tools which could be used to evaluate access issues with practical applications for remote Australia. Developing an accessibility index for remote areas would enable the reconsideration of minimal requirements for sustainable livelihoods in remote areas and the development of effective and appropriate regional development policies and initiatives.

### Background

Rodrigue, Comtois & Slack (2009) define accessibility as “the measure of the capacity of a location to be reached by or to reach different locations”. In this context remoteness could be understood almost as an antonym. Remote Australia is composed of different locations linked to each other and to non-remote areas domestically and internationally through a variety of complex economic and socio-cultural relationships. The ‘Desert Syndrome’ (Stafford Smith, 2008) is a concept that was developed under Ninti One co-funded research. The Desert Syndrome asserts remote Australia is characterised by a set of features that are not individually unique but which together cause it to function in ways that are fundamentally different to any other physical and social environments. Climate variability, scarce resources, sparse population, distance from markets and isolation from political power, social variability, limited research knowledge and cultural differences are the core common features of remote areas in Australia. Acting individually, these may not be significant but collectively they are. From an accessibility point of view, multiple layers of multicultural local connections, long-

distance links between people and places, including fly-in-fly-out practices, and dynamic international exchanges interact at different levels in the remote Australian context. Remote communities are privileged to be able to rely on a variety of spatial links but can also be particularly vulnerable when one of these links is disrupted. Indeed, Australia as a nation is no longer primarily defined by the “tyranny of distance” (Blainey, 1966) and is well positioned in terms of access to regional and global markets and population centres. However, for over 80% of landmass and 3% of population which constitute remote Australia, the ability of remote locations to sustain a reliable contact with the rest of the world is critical in order to reduce the impacts of the “desert syndrome” (Stafford Smith, 2008).

Demography reflects one reason remote Australia is still understood as a frontier space in contrast with urban settings. In fact, in urban Australia the very concept of accessibility refers to a wide range of specific fields. One common signification of accessibility in an urban setting is related to supplying those who have special mobility needs with appropriate goods and services. Another connotation refers to the ability to supply online information in a non-discriminatory and functional manner (Web Content Accessibility). These issues become increasingly topical in remote Australia, where access to reliable communication and appropriate transports is further impacted through those factors associated with the Desert Syndrome (Stafford Smith, Moran & Seeman, 2008).

However, there is a knowledge gap in terms of accurately measuring accessibility in a remote context. Currently the ARIA+ index “is based on road distance measurements from over 12,000 populated localities to the nearest Service Centres in five size categories based on population size” (Australian Bureau of Statistics 2011). This does not reflect the different levels of accessibility characterising people living in remote Australia. The concept of accessibility in a remote context is defined by complex elements which characterise different regional areas. For example, in some locations, there is access to excellent levels of air services, sealed roads, four wheel drive vehicles, high speed internet and 4G speed mobile internet, while in other places it is barely possible to have access to a public phone and the local unsealed road can be closed for a third of the year.

Inequalities affecting remote communities and enterprises are better understood when considering the cumulative effects of different forms of inaccessibility. For a large number of Aboriginal and Torres Strait Islander (ATSI) people living in remote communities, lack of or poor access to, essential infrastructures and services such as water, housing, education, health, transport and telecommunications have led to a situation of deep socio-economic exclusion and social injustice. Importantly, the inequality conferred by distance to other locations is mostly relative to the level of development of infrastructures and services, the availability of technological innovations, public versus private affordability and the local capacity building and overarching regulatory frameworks that drive regional policy. In order to measure how people can capitalise on an increased accessibility in a remote environment, we need to assess in a holistic way the impacts of improved physical or digital access, the associated benefits of human interactions, and the financial and socio-cultural dimensions allowing these interactions to be performed. Therefore, it is important to study new ways to more comprehensively evaluate accessibility.

This article discusses a variety of key attributes for assessing the level of accessibility of different locations in remote Australia. In this respect, it reviews referential attributes in a remote environment - including infrastructure, technologies, and policies - that offer transport and communication services which support local community and enterprise needs, and which have a scale of affordability. To evaluate accessibility in such a context, the article proposes a new index based on a range of indicators to measure the access to, and affordability of, effective

telecommunication and transport services. Finally, the article discusses how unwrapping the spatial relationships between remote locations through a new concept of accessibility leads to reconsidering the minimal requirements for sustainable livelihoods for people living in the bush, with positive outcomes in terms of economic and social opportunities as well as regional development projects.

### Infrastructures

The prohibitive costs of providing conventional access-enabling infrastructure in remote Australia have contributed to innovative and low-cost solutions developed to overcome isolation risks. The Royal Flying Doctor Service radio system is an iconic example that relied on a pedal-operated wireless generator radio designed by Alfred Hermann Traeger in the 1920s (Behr, 1990). However, the development of technological innovation reaching remote communities is plateauing; new innovative transport and telecommunication infrastructures are needed to sustain remote Australian communities.

#### *Transport infrastructures in remote Australia: the dilemma of supplying a vast land with a small population basis*

There are world class transport infrastructures in remote Australia even though on a kilometric density basis, the density is amongst the lowest in the world. For example, in the Northern Territory the road density is around 1km of road for every 39km<sup>2</sup> as a comparison, in Russia it is around 1km/12.2km<sup>2</sup>. Even though a series of key infrastructures are well positioned to support the main export industries in remote Australia, more targeted investments are required to increase economic development in remote and regional areas (Department of Infrastructure and Regional Development, 2014). Significant logistical improvements could be achieved in the area of intermodal platforms to better link existing networks. One of the biggest challenges in terms of infrastructures is related to supplying remote communities with appropriate transport options. Currently a vast majority of the 1,200 ATSI remote communities in Australia do not have access to sealed roads (Smoker, 2011). In a recent survey conducted in three very remote Aboriginal communities in Central Australia (Hermannsburg, Lajamanu and Santa Teresa), 42% of the respondents indicated they experience serious difficulties when travelling because of poor road conditions (Spandonide, 2015). In the Northern Territory, a large number of unsealed roads are typically closed for over a week, three to four times per year, due to extreme climatic events leaving very remote communities accessible only by air or maritime services. Road closure issues are even more problematic in such tropical regions of Northern Australian where road access for remote communities can be closed for several months during the wet season. This affects people's ability to travel to closest regional towns or neighbouring outstations, and impacts freight services which are only available by sea or air. Finally, sealed roads contribute to significant socio-economic benefits for remote communities: 15% more people commute for work in large very remote communities with sealed road access, than in communities which do not have access via sealed roads (Spandonide, 2015). However, providing sealed road access to sparse populations is not economically viable in most instances. While single lane roads could prove to be more cost effective in providing access to the largest very remote communities, the low population density is a structural issue in terms of capacity to sustain the costs of building and maintaining sealed roads through public revenue. In the Northern Territory, the road network includes 35,725 km of roads with 25% of these sealed. This represents a staggering ratio of 6.57 kilometres of road per person, which is more than any Organization for Economic Cooperation and Development (OECD) country (Organisation for Economic Co-operation and Development, 2013). Different investments might be more effective at improving transport access than costly sealed road infrastructures.

### *Meeting telecommunication infrastructure needs*

The findings of the 2011-2012 Regional Telecommunications Independent Review Committee (2012) show mobile communications are the most important telecommunication issue for remote and rural Australians. Indeed, access to broadband through mobile devices has become the medium of choice for all Australians. Currently, there is a very low penetration of cellular mobile coverage in rural and remote areas of Australia. Despite high demand, market failure means service providers will not independently invest in further terrestrial coverage. A key inhibitor for remote areas is that mobile delivery is currently not part of the National Broadband Network (NBN) business plan, limiting the option of satellite backhaul for mobile services. Recent partnerships between the Western Australia and Northern Territory governments and Telstra have enabled expansion of mobile coverage to additional remote communities where existing fibre optic backhaul permits. However, more is needed. For example, in September 2015, the Northern Territory Government announced a joint \$30 million three year agreement with Telstra to expand and improve telecommunications in remote locations. About eight new remote communities will benefit from this initiative (Northern Territory Government Department of Corporate and Information Services, 2015). The 2015 \$100 million Mobile Black Spots initiative of the Australian Government aimed at improving mobile coverage and competition in regional Australia was welcomed. Outcomes of Round 1 of the programme announced in June 2015<sup>1</sup> will deliver 499 new and upgraded mobile base stations across regional and remote Australia (Department of Communications and the Arts, 2015). It is estimated the 499 base stations will deliver coverage to approximately 3,000 nominated black spot locations. However, an analysis of the funded locations reveals most of the funding will benefit regional and outer regional areas. For example, only five remote Northern Territory locations and five remote South Australian localities will receive coverage under this round of funding. Through Round 1 of the programme, a database of 6,221 locations around Australia was developed from locations identified as needing improved mobile coverage. This excludes many more locations yet to be nominated. The further \$60M earmarked for proposed Round 2 in 2016, demonstrates the Federal government has an appreciation of the severity of regional and remote area cellular mobile service shortfalls. However, the scale of existing regional and remote mobile coverage scarcity clearly demonstrates such Federal support will long continue to be required. Governments need to further invest in remote region black spot programs to address the provision of telecommunication infrastructure where commercial telecommunication companies have insufficient incentive and therefore low priority to invest in new infrastructure. Importantly, the rational use of existing infrastructure and micro-cell (or similar) technology to lower the capital and operational costs can be considered. Indeed, the remote landscape is littered with large Telstra towers constructed to deliver voice services (via High Capacity Radio Concentrators or HCRC) and microwave links. A collaborative approach and commitment to corporate responsibility to remote Australia would unlock these assets in order to realise better connectivity to remote towns and communities.

Developing a national broadband policy is a tangible achievement at a national level. However, while it addresses fixed broadband issues, societal needs have progressed way beyond this. Government has largely ignored policy and program advancements outside the national broadband infrastructure. The need for continued upgrade and to expand remote telecommunications infrastructure is evident. The NBN implementation fails to connect remote towns and communities with proximity to existing fibre-optic infrastructure to the terrestrial NBN network. The NBN technology choice policy offers communities (and individuals) the

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1. See <https://www.communications.gov.au/what-we-do/phone/mobile-services-and-coverage/mobile-black-spot-programme>

opportunity to change the default policy choice for their premises. However, that places a financial burden on communities wishing to connect to NBN by way of terrestrial infrastructure. The Long Term Satellite Solution (LTSS) service has been marketed as the optimum solution for the 3% of Australians residing in remote areas who wish to access broadband services. Its success can only occur if end-user expectations match the reality of a fully loaded and utilised operational satellite service.

To date, implementation remains unknown despite the launch of Skye Muster on 1<sup>st</sup> of October 2015. Access to the new service will commence in 2016 but implementation plans have not been made public. Significant questions exist: Who will be covered first? How will the migration from the Interim Satellite Solution to the LTSS occur? Will the data restrictions impede on a families' ability to access online education, tele health services, or a movie on Netflix? The satellite life is fourteen years: What will happen next? Public Interest Premises (PIP), such as schools and health clinics, may have exemptions from this restriction but the price structure is unknown. Stakeholders need to be consulted in the design of services, and have forewarning of issues, such as the current uncertainty around future data allowances. Furthermore, consumers should be provided with information on these issues in a transparent way and remote communities would benefit from earlier engagement in the planning process.

### **Technology and innovations**

Appropriate technology includes equipment and knowledge promoting the self-sufficiency and sustainable development of specific places. Most often providing appropriate technological responses to remote areas consists of adapting existing components, and enlisting future innovations which best suit the specific socio-cultural and economic conditions of the locations they are introduced in.

#### *From the dealer's top of the range model to the wrecking yard*

The Australian society is heavily dependent on motorised transportation. This is even more the case in mainland remote Australia. The most problematic issue is inequality of vehicle access for transport. In a recent survey, a third of the respondents indicated they could not access a vehicle to travel (Spandonide, 2015). The research suggests there is a critical shortage of appropriate vehicles in remote communities for local residents to use. There is a striking contrast between externally based service providers, who only use top-of-the-range four wheel drive vehicles to access very remote communities, and the fact that four-wheel drive vehicles represent less than 10% of community member's vehicles (Spandonide, 2014). Poor private transport access is predominantly a financial issue. This is confirmed in the survey's results where a third of the respondents indicated they experience serious difficulties when travelling because of not being able to register a vehicle (Spandonide, 2015). This triggers a negative transport poverty cycle: a large number of vehicles in very remote communities have a very short life span because they are not appropriate for being driven on unsealed roads (Holcombe, 2006). As a result, in a majority of remote communities, wrecking yard landscapes define the community's boundaries where unusable vehicles are left to be used for sourcing parts (Young & Doohan, 1989; Lawrence, 1991). A large number of unregistered vehicles are vehicles in need of repairs. The results of the transport survey in Central Australia indicate participants consider access to a community mechanic workshop (37%) would greatly help them to stay more often and for longer periods in their community. This would also reduce their travel demand. However, the scale of the transport equipment issue is not limited to transport access with very substantial flow-on effects in terms of adverse impacts on wellbeing. A very significant proportion of the average income of ATSI people living in remote communities

is allocated to transport expenses. This creates a situation of financial transport stress (NT Council of Social Service Inc, 2014) and highlights a need for ATSI people living in remote communities to purchase more affordable and appropriate four-wheel-drive vehicles.

In terms of innovations, the ability to integrate transport and household energy systems could effectively decrease living costs and provide long term benefits in terms of increased community resilience in off-the-grid environments. Automated and driverless vehicles will be another transformative innovation in the transport industry in the next 50 years. However, as a large majority of the private vehicles used in remote ATSI communities are in (and beyond) the last stages of their viable life (Young, 2001) vehicles equipped with updated technologies tend to be particularly rare (Holcombe, 2006). To reach a market where second-hand vehicles play a central role in household motorisation, strong future incentives for switching to electric or driverless vehicles would be required to accelerate the current slow rate of penetration of new technologies. In order to fast track the access to new technologies in the bush, specific strategies could be implemented to evaluate the feasibility and the effectiveness of such incentives. This includes applied research and pilot projects focusing on business and social enterprises (Raicu, Taylor et al., 2011).

#### *The digital gap in Telecommunications*

Today broadband is a powerful force for change. Worldwide, mass connectivity with broadband is improving lives in many ways. For example, it provides online clinical health delivery; enriches education through online delivery and access to learning resources; drives economic growth; improves social inclusion; and encourages active citizenship. At current growth rates, half of the world's population will be online by 2017 (The Broadband Commission, 2014). In Australia, access to reliable digital communication technology is the norm and mobile broadband subscriptions have now outnumbered fixed ones by a ratio of 3:1. Australians have enthusiastically embraced the use of broadband in their professional and personal lives. Indeed, more than three quarters (77%) of Australian households have access to the internet via a broadband connection (Australian Bureau of Statistics, 2014). However, this is not the case in remote Australia, which remains largely disconnected from the digital revolution. The lack of suitable and reliable telecommunications in most parts of remote Australia impacts on delivery of government and health services and access to educational resources that most Australians take for granted. It is a major barrier for economic development. At present, due to over subscription of the Interim Satellite Solution, remote residents are struggling to even do their internet banking. Given the evidence residents of rural and remote communities continue to show poorer health outcomes, have lower incomes, display lower employment rates and education attainment than residents in metropolitan centres, access to reliable telecommunication services has the potential to make a significant difference in economic, health and education outcomes (Australian Institute of Health and Welfare, 2011). Innovative and localised infrastructure and service delivery solutions need investment to allow remote residents to benefit from the digital revolution and utilise new applications such as 3D printing and tele-health services.

#### **Services**

Transport and telecommunication services are undeveloped in remote Australia. In some large remote communities the potential for growth is particularly strong and could lead to greater opportunities to increase economic participation and improve wellbeing outcomes.

*Like a shag on a rock: regional public transport services as a way to avoid inaccessibility*

Access to transport services is the root of transport inequalities in remote Australia. Beyond the issue of vehicle shortage, not being able to drive is another problematic challenge for sustainable livelihoods and a barrier to economic participation. Dockery and Hampton (2015) identified having a license has a direct impact on employment in remote communities. A fifth of offenses in the remote communities in the Northern Territory are driving related offenses (Australian Institute of Health and Welfare 2007; Australian Bureau of Statistics, 2013) and yet the provision of public transport services is inadequate in remote communities (Finlayson & Auld, 1999; Dodson, Gleeson & Sipe, 2004). In remote areas, about half of ATSI people are left without any access to public transport (Australian Bureau of Statistics, 2010); the existing services operate on very low frequencies (a maximum of twice weekly for long distances), and concession tickets are expensive (Spandonide 2014). For example, in Central Australia, public transport service providers do not have any connection routes, timetable integration, interchange facilities or integrated booking system.

The combination of these transport barriers directly impact on the livelihood of ATSI people living in remote Australia. In remote communities, transport disadvantage tends to affect people who are already financially and physically disadvantaged and result in long term socio-economic exclusion. Older people (National Aged Care Alliance, 2007), people with disabilities (Gething, 1997), females and younger children (NSW Aboriginal Transport Network, 2006; Rosier & McDonald, 2011) and low-income households (Posselt, 2000; Lucas, 2012) are over-represented in the categories of people who do not have regular access to public transports (Currie and Senbergs 2007). The proportion of people with a disability is two times higher in remote ATSI communities (Australian Bureau of Statistics 2010, 2010a). In Central Australian remote communities, an estimated 80% of people with disability/low mobility have no regular access to appropriate transport services (Spandonide, 2015).

These public transport shortages represent a very significant economic burden for service provision in remote communities (Battellino, 2009). Additionally, people living in remote communities have specific mobility needs: a very substantial part of that mobility is directed to maintaining family links and connection to country between places which are often thousands of kilometres apart (Memmott, Long & Thomson, 2006). In the transport survey in Central Australia, visiting friends and family appears to be particularly significant for small trips (34% and 48% respectively, 82% combined) and is still an important reason to travel for big trips (respectively 28% and 29%, or 57% combined). Another major reason for travelling is the need for shopping in service centres located hundreds of kilometres away. The transport survey confirmed these results with small trips (76%), and big trips (32%) essentially related to shopping. High living costs in remote communities (NT Council of Social Service Inc, 2014) further exacerbate these needs. Indeed, with similar shopping baskets, the cost of shopping in the nearest service centre remains lower than shopping locally despite additional travelling costs.

This exacerbates the inequity of options for intense regional mobility and represents an operational challenge across service delivery industries (Taylor, 2002; Prout, 2008; Battellino, 2009). A better integration between communication and transport services would enable better goods delivery services and decrease mobility needs in remote communities. The results of the transport survey in Central Australia indicate people consider access to more services within communities (54%) and access to a system of affordable goods delivery (41%) (Spandonide, 2015, p. 35), would help them to stay more often and for longer periods in their community. This would significantly reduce their travel needs.

### *Make Telecommunication affordable and flexible*

Affordability is critical for the sustained take up of telecommunications services by vulnerable groups generally. Indeed, there are still a very significant number of households in Australia that do not have a home internet connection (17%) (Australian Bureau of Statistics, 2014). This level is much greater among certain consumer segments, for example, Indigenous Australians living in remote areas, people with a disability, seniors and single parent families. In remote Australia, 75% of Indigenous households do not have an internet connection, a lower penetration than a country like Sudan (The Broadband Commission, 2014). A research study among low income families across metropolitan and non-metropolitan Victoria showed 66% of mobile phone users had difficulty paying their account and 61.7% of clients with a pre-paid account ran out of credit sooner than expected (Wise, 2013). In remote Australia, pre-paid mobile and internet services are the preferred option for Indigenous and low-income people where coverage is available, as they enable people to manage usage costs. However, pre-paid mobile calls and data usage rates are significantly higher than for billed services. Mobile, data and pre-paid services are not covered under the Universal Service Obligation, which only provides cost equalisation for fixed line services and public phones. Indeed, the existing Extended Zones scheme assists by reducing the cost of fixed line voice calls within the caller's zone to the cost of a local call. There is potential to introduce a subsidised structure equivalent to the extended zones scheme for voice calls originating from mobile services registered at remote locations. The NBN satellite products now being designed currently have no pre-paid broadband options. Given, pre-paid services are the preferred option for the majority of remote Indigenous households, the Government and NBN should be encouraged to work with satellite Retail Service Providers to introduce pre-paid broadband tariff models within the NBN Long Term Satellite service. Content exempt investigations should also examine the potential for providing free data download for specified healthcare, education and government sites, and for some domestic services such as banking, in areas where no local service is provided. Zero-rating of data for these services will assist remote Australians. Content exemption models are already in operation with commercial carriers, covering both education and internet TV services.

### **Financial accessibility**

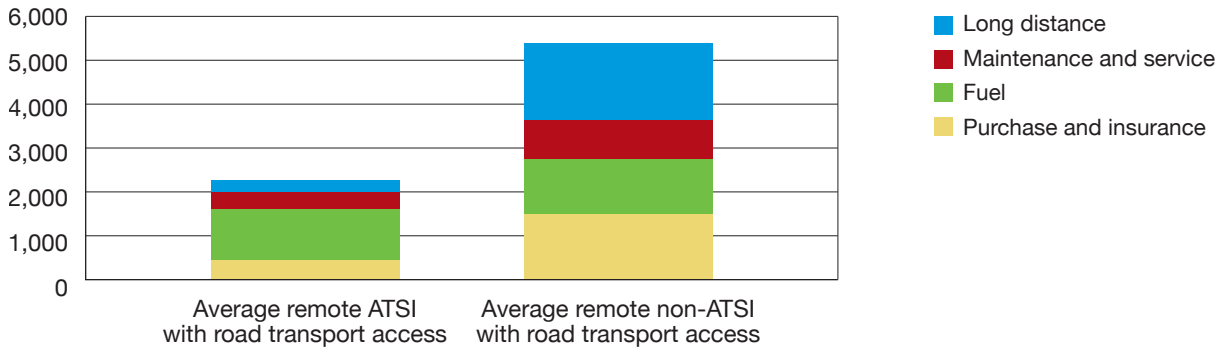
The ability to afford access to transport and telecommunication services in remote ATSI communities is problematic because of the associated expenses and the relative low level of average incomes.

Figure 1 describes transport cost allocation in Central Australia for remote ATSI people and non-ATSI people living in non-remote areas. On a per person basis, annual transport costs in Central Australia for remote ATSI people are half those for non-ATSI people living in non-remote areas. However this is predominantly caused by average vehicle occupancy rates being more than three times higher. On a vehicle basis, costs are greater for ATSI people living in remote areas.



**Figure 1:** Transport cost allocation in Central Australia for remote Aboriginal and Torres Strait Islander people and non-Aboriginal and Torres Strait Islander people living in non-remote areas

**Average non-remote with road transport access**

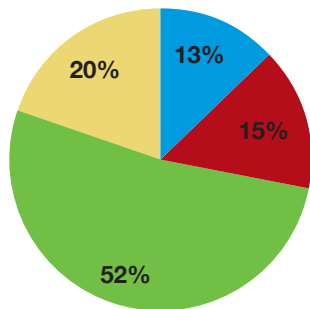


Figures 2a and 2b indicate the proportion of different types of transport costs in the annual transport expenditure for remote ATSI people and non-ATSI people living in non-remote areas.

**Figure 2a:** Proportion of different types of transport costs in the annual transport expenditure for remote Aboriginal and Torres Strait Islander people

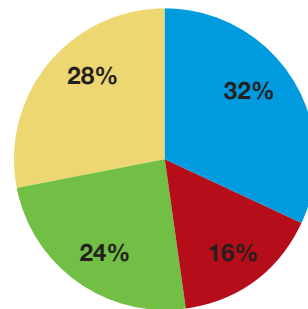
**Figure 2b:** Proportion of different types of transport costs in the annual transport expenditure for non-Aboriginal and Torres Strait Islander people living in non-remote areas

**Average remote ATSI with road transport access**



- Long distance
- Maintenance and service
- Fuel
- Purchase and insurance

**Average remote non-ATSI with road transport access**

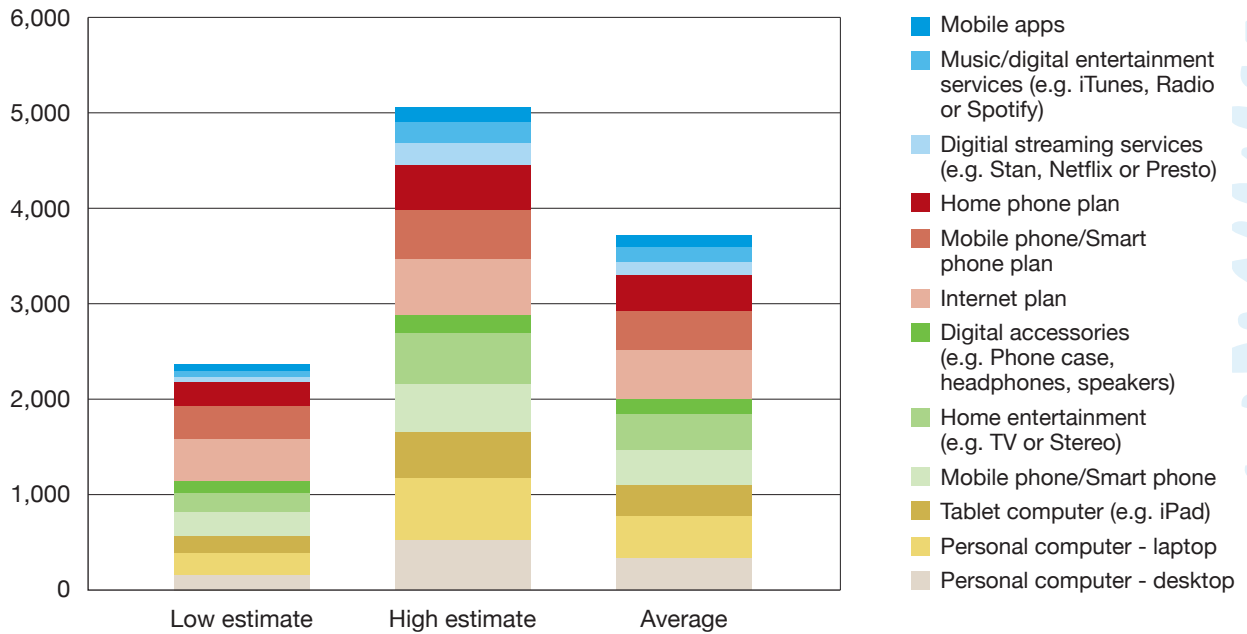


- Long distance
- Maintenance and service
- Fuel
- Purchase and insurance

There is a flagrant predominance of fuel costs in the annual transport cost expenditure for ATSI people living in remote areas. Furthermore, for people who do not have regular access to a motorised vehicle, public transport costs are much more significant. The fact that average incomes in remote ATSI communities are half to one-third the national average, means over 25% of the average household income is allocated to transport.

Figure 3 gives some indications of telecommunication costs in Australia. Remote ATSI people tend to correspond more to the low estimate profiles with most of the telecommunication expenditure allocated to mobile communication. Telecommunication costs can represent over 20% of the average household income in ATSI remote communities.

**Figure 3:** Telecommunication costs national averages



Source: Suncorp Bank, 2015

**Integrated accessibility, a way to increase economic participation and decrease living costs**

Integrated transport and communication systems are essential for local regional economies and could effectively reduce living costs. High costs of transport are challenging for the socio-economic development of very remote communities. Mobility is crucial in terms of livelihoods and wellbeing as a way to sustain communities in and between multiple homelands (Dockery, 2015). Local transport services will be increasingly important in a context of an aging population (Somenahalli & Shipton, 2013) as it will be critical to establish specific transport services for people in a situation of low mobility at a community level.

Developing basic transport access and services as low-cost alternatives to unaffordable infrastructures could increase community resilience. Additionally, the transport industry can be a reliable source of local employment in a remote context and contribute to closing the existing economic participation gap in remote ATSI communities (Deloitte Access Economics Pty Ltd, 2014).

While the provision of adequate broadband to regional and remote Australia is essential, the true social and economic benefit of that infrastructure will only be realised if its deployment is accompanied with appropriate education and training services. Many people in regional and remote Australia have effectively missed out on 20 years of learning that has taken place in areas where online services are readily available, including access to commercial services for participating in online markets for goods and services, and labour. The fact that many existing digital programs are targeted exclusively at NBN early release sites, explicitly

precluding towns and local governments not in these areas, is further impeding access to training for most remote Australians. There is a need to develop specific programs for remote Australians to ensure they have the opportunities to gain the skills to participate in the global digital economy. For example, 92% of Australians use the internet to look for product/service information, but only 64% of Small and Medium Enterprises (SMEs) have a website (Sweeney Research, 2014). There are over 40,000 SMEs in remote Australia and lack of website presence is impeding business growth. Only 54% of SMEs sell online and when asked what were the major concerns, a lack of expertise and knowledge with computers (25%) came second after security concerns relating to hacking (44%) (Sweeney Research, 2014).

There is also a need for targeted Indigenous programs as high levels of digital inequality still exist in many remote Indigenous communities around Australia. The Indigenous Remote Communications Association (IRCA) highlights this point saying, “most remote Indigenous people currently have limited access and usage of ICTs”, and further, “limited access to IT facilities, training, relevant on-line content and service delivery and affordable broadband services will increase the digital divide” (Indigenous Remote Communications Association, 2012, p. 12). There is an opportunity, through appropriate use of the NBN and targeted programs, to build digital literacy and engagement and significantly improve remote Indigenous communications and capacity.

### **New policies focusing on access to integrated transport and communication as a key to sustainable livelihoods in remote communities**

An appropriate specific policy framework recognising the unique characteristics of remote communities is required in order to improve transport and telecommunication access from both technical and financial perspectives. Policies and strategies aimed at the majority of Australians who live in major cities are not necessarily appropriate for remote and rural Australia which is characterised by very different circumstances and greater risks of market failure. Deploying services and effectively reducing access costs would have significant impacts on economic participation and livelihoods.

For transport policy developments, this would include the following considerations: reviewing registration concessions, supporting driver licensing, establishing appropriate concession levels for public transport, capping or discounting fuel prices, offering priority procurement for remote community members to be able to purchase discounted second hand government fleet vehicles with appropriate financial tools, setting up mobile workshop units to provide regular mechanic services at reasonable cost levels, supporting the development of specialised transport services involving local employment opportunities, encouraging fleet sharing strategies for service delivery providers and social and business enterprises in remote areas, and accommodating tendering tools for decreasing freight costs of goods delivery in very remote communities.

In order to tackle the challenges and issues described in this article, there is a need for a dedicated strategy for unlocking the digital potential of the bush. The call for a bespoke Remote Telecommunications Strategy has been made by the Broadband for the Bush Alliance (Broadband for the Bush, 2015) and is supported by all its members. It is time to act and commit the resources necessary to develop and implement a Remote Telecommunications Strategy, which will ensure remote Australians are not left behind. Such a strategy requires a multi-pronged approach addressing mobile coverage, appropriate infrastructure, pricing and digital literacy issues. It will need to be developed through a partnership approach, which would involve active collaboration between the Australian Government, NBN, telecom companies, businesses and service providers, regulators, state and local governments, community stakeholders and the Broadband for the Bush Alliance.

### **Proposed Local and Regional Index of Accessibility**

Remoteness can be defined by the level of access people have to information, services, infrastructures, goods, and other people and places. In this context, transport and communication enable access and ensure essential services for remote residents. As part of the chain linking people and essential services, access to transport and communication maintain the vital links between remote communities, enterprises and the rest of the world. They operate in conjunction rather than as substitutes: for instance there are no indications that an enhanced access to telecommunication technologies reduces mobility needs (Zander, Taylor & Carson, 2012).

Access to good transport and telecommunication infrastructure is a positive factor in economic participation. The availability of affordable and reliable transport and telecommunication equipment and services is essential in remote regions because it can decrease living costs and improve sustainable development options of local social and business enterprises.

To evaluate accessibility in a remote context, we suggest a move away from the current road distance based remoteness index and towards an accessibility index which would accurately reflect how local accessibility factors impact socio-economics. Such an index requires a range of measurable indicators that can be quantified and evaluated for access to, and affordability of, effective telecommunication and transport services. The index relies on a wide range of data and data sources, some of which are not publically available or uniform across remote areas at this time.

**Table 1:** provides a set of indicators, which could be used to measure accessibility levels in remote Australia for transport and telecommunication services.

<b>Indicators</b>	<b>Principles</b>	<b>Unit</b>
Access to appropriate vehicles	Percentage of registered and roadworthy four wheel drive vehicles for off- road environments and regular hatchback or sedans, people movers or vans for sealed roads	Percentages of vehicle types
Access to licence	Percentage of people with a license	Percentage of license per inhabitant
Cost of fuel	Average fuel cost and percentage of average income Average fuel consumption	AUD per litre Litre per kilometre
Cost of vehicles	Average purchase price cost per year over the life time of the vehicle and percentage of average income	AUD per vehicle Average number of passenger per vehicle
Public transport cost	Average cost of public transport and percentage of average income	AUD per year
Transport time/ integration	Average time and speed for travelling Average frequency of public transport Connectivity between transport routes	Hour per year Kilometre per hour Hours of wait per day
Mobile phone coverage	Availability of service Number of service providers (mobile carriers) Reliability of services	Existence of coverage Availability to choose service providers Connection failure
Access to the internet	Speed and reliability of services Number of service providers	Megabytes per second Connection failure Availability to choose service providers
Access to mobile internet coverage	Speed and reliability of services Number of service providers	Megabytes per second Connection failure Availability to choose service providers
Access to digital education	Number and added-value of programs available for digital education / level of digital use and awareness	Number of courses, students and degrees
Access to e-services	Access to e-government services Access to tele-health services	Connection failure Ability to access services
Cost of data	Average data cost and percentage of average income	AUD per megabyte
Cost of fixed phone communications	Average annual expenditure per person on fixed phone communications and percentage of average income	AUD per minute Average AUD per year
Cost of mobile phone communications	Average annual expenditure per person on mobile communications and percentage of average income	AUD per minute Average AUD per year
Money spent on internet	Average annual expenditure per person on internet and percentage of average income	AUD per year

Table 2 provides an example of several indicators for 2015 in Central Australian remote communities and some rankings. A simple weighting index is used to measure the gap between accessibility in remote Central Australian Aboriginal communities and national average levels.

**Table 2:** Example of indicators for evaluating accessibility in Central Australia and rankings

Indicators	Performance in Central Australia	Scoring (national average=1)
Access to appropriate vehicles	10% of registered and roadworthy four wheel drive for off road environments	National average over 90% Score of 0.125
Access to registered vehicles	1 registered vehicle (hatchback or sedans, people movers or vans) per 12 inhabitants for sealed roads	National average of 1.3 vehicle per inhabitant Score of 0.1
Access to licence		
Access to public transport	35% of people with a license	National average over 70% Score of 0.5
Integration of public transport routes	50% of people can regularly access public transports Average of one service per week Poor integration between transport service providers resulting in several hours of additional transport time	85% of people can access regularly public transport Average of one service per day Score of 0.55 Variable integration between transport service providers resulting in less than an hour of additional transport time Score of 0.3 Overall score 0.32
Cost of fuel	AUD1.8 per litre 14 litre per kilometre 7,000km per person Fuel cost of AUD1,600 per year per person 12% of per person income AUD3,500 per vehicle per year	National average of AUD1.3 per litre National average of 10 litres per kilometre 8,000km per person Fuel cost of AUD900 per year per person
Cost of registered vehicles	AUD800 per person per year 6% of per person income	2% of per person income Score of 0.16
Public transport cost	AUD1,500 per year 13% of per person income	Average of AUD2,000 per vehicle per year AUD1,300 per person per year 4% of per person income Score of 1.5 AUD1,500 per year 5% of per person income Score of 0.38 Overall score of 0.68
Transport time	2.5 hours per day	1.5 hours per day Score of 0.5 Overall score of 0.6

<b>Indicators</b>	<b>Performance in Central Australia</b>	<b>Scoring (national average=1)</b>
Mobile phone coverage	Low penetration of cellular mobile coverage in rural and remote areas of Australia	Mobile phone services currently reach 99 per cent of the Australian population 4G coverage is around 90% and 3G, is 99 per cent Score of 0.1
Number of service providers	One main service provider	Three main service providers Score of 0.3 Overall score of 0.2
Access to the internet	75% of remote Indigenous households have no internet connection - less than in Sudan 5% households with a computer, approx 40% of mobile device equipment	Less than 10% of Australians do not have access to internet Score of 0.13 90% households with a computer or mobile Score of 0.27
Number of providers	One main service provider	Lots of service providers Score of 0.1 Overall score of 0.16
Access to digital education	Number of courses, students and degrees <10/100,000 (1/10,000)	>20,000/22 million (1/1000) Score of 0.1
Access to e-services	Limited access to e-government services Limited access to tele-health services	Full access to e-government services Advanced access to tele-health services Score of 0.1 Overall score of 0.1
Cost of data Money spent on internet Mobile and fixed phone communications	AUD1,500 per person per year 13% of per person income	AUD2,000 per person per year 5% of per person income Score of 0.38 AUD2,000 per person per year 5% of per person income Score of 0.8
Cost of mobile and fixed phone and digital equipment	AUD500 per person per year 4% of per person income	Overall scoring of 0.6
Internet speed	Average less than 0.5 MB/s download Less than 100 kB/s upload Connection failure?	6 MB/s with 14% above 10 MB/s, 3.9 MB/S for mobile internet (South Korea has 81% above 10MB/s, 1 MB/s upload (Akamai, 2014)) Score of 0.1
<b>Average total scoring</b>		<b>0.375</b>

This scoring model is a preliminary compilation of some of the available data and gives an indication of how a scoring system could be set up to generate an accessibility index. However generating composite scores requires more research particularly into how to aggregate together with an equal weight. This could be undertaken through a factor analysis or principal components analysis to establish common factors and then assign weights to these.

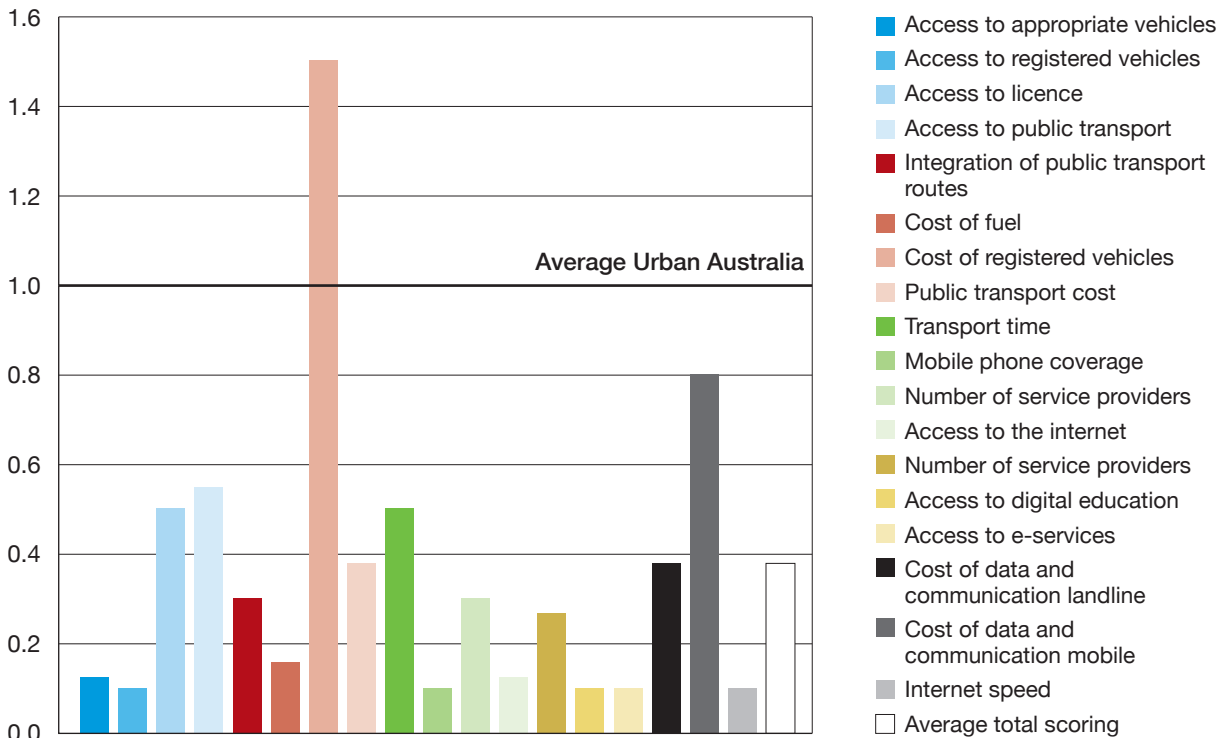
Using this preliminary model, the average accessibility level of Central Australian remote Aboriginal communities is 0.375 of the Australian average and less than 0.2 compared to well-connected urban areas in Australia.

Tables 1 and 2 provide an index of accessibility across a region defined as Central Australia. This index could be used in a systematic way across remote Australia at local and regional levels. At the local level this tool could assist in community development planning and prioritise current and future infrastructure and service delivery options. With additional data for more locations, and with the inclusion of regional, state, territory and national data an accessibility index for remote Australia would provide essential planning and development information on a scale useful to policy and public expenditure decision making.

Figure 4 provides a visual breakdown of the Accessibility Index for Central Australian remote communities.

**Figure 4:** Accessibility Index breakdown for Central Australian remote communities

**Accessibility Index Breakdown**



The Central Australian example is used in this article to showcase how a new index could evaluate accessibility in remote Australian communities, regional policy planning, and provide accurate information for local and locational decision making.

Priority areas to improve accessibility levels in remote Central Australian communities include internet access and speed, access to digital services and education programs, mobile phone coverage and access to appropriate and/or registered vehicles.



Evidence-based decision could support the development of scenario modelling integrating realistic objectives with measurable targets set accordingly. To achieve this, there is a clear need for more baseline research. This would require mapping existing telecommunications, transport infrastructures and services in remote Australia to maximise opportunities to leverage existing infrastructures and services, and improve transport and communication coverage. Incorporating in the index indicators of health, socio-cultural, economic and environmental externalities associated with different levels of accessibility would reinforce the rationality and the relevance of the model (Spandonide, 2014). Wider benefit indicators could include direct and indirect health outcomes, wellbeing perception, education outcomes, access to services, employment outcomes, and better use of public and private expenditure, as well as emissions.

Importantly, the impacts in increased participation in the local economy (in terms of poverty alleviation, increased household consumption, and direct and indirect employment creation) would be able to be more accurately quantified. The acquisition of suitable and appropriate data represents the main limitation, but could be overcome by undertaking additional research projects in remote communities on transport and telecommunication externalities. Market analyses of the different levels of economic participation in local industries could be then linked to the indicators discussed above.

## Conclusion

New elements of accessibility define remoteness more accurately and give a fresh perspective on the regional development priorities for remote Australian communities. The development of a relevant accessibility index will contribute to better regional development planning and assist in developing effective policies and strategies aimed at improving health, education, wellbeing and economic participation outcomes in remote areas. As discussed earlier, more local data baselines and further research are needed to develop an accessibility index.

The index would identify key priorities for improving transport in specific Central Australian remote communities as well as providing more regional snapshots of accessibility. From the Central Australian case, priorities include providing more roadworthy and suitable vehicles, decreasing fuel costs, and increasing public transport frequency/integration. This would result in significant financial and time savings and an increase in access to transport. For telecommunications, key priorities are: improving internet access and mobile phone coverage, increasing internet speed, offering digital education services and decreasing data costs, including data exemptions on education and health services. It is critical that current dedicated programs such as the Australian Government Mobile Black Spot Program, to improve telecommunications in rural and remote areas, continue to exist. Furthermore, complementary programs should be considered to ensure that remote Australians are not left behind. Indeed, as more services move to digital delivery, communities and individuals that are not online risk further social and economic exclusion. Emerging broadband and telecommunications offer real opportunities to grow and strengthen remote economies and transform local businesses.

The logic is not to provide similar infrastructure or services to metropolitan Australia. This would imply entering in an asymptotic race towards infrastructures which would create unsustainable financial pressures on remote areas. The aim is to develop transport and telecommunication resources capable of fostering livelihoods in thriving remote communities. While pledges are made by the United Nations for universal internet access by 2020 (Broadband Commission for Digital Development, 2015) a majority of Indigenous Australians living in remote communities are still disengaged from and cannot effectively participate in political and social debates because of poor online access and a lack of appropriate transport options.

More appropriate regional management in transport and telecommunication could result not only in directly improving quality of life in remote communities, but also assist in finding a cost-effective way to address some of the desert syndrome issues. Besides, the issue is not about developing areas which are comparatively underperforming as much as promoting vibrant livelihoods and overcoming obstacles affecting the availability of essential resources to achieve a high level of wellbeing. A holistic approach is required for ensuring remote areas are not left behind. We must avoid a 'one size fits all' approach and develop local solutions, which recognise the unique social and environmental local circumstances of remote communities, and are aligned with residents' needs and aspirations. This would also have significant wider benefits for the Australian society and economy. Improving access to transport and telecommunications will help to positively transform Australia's future.

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