RESEARCH REPORT

MOBILITY AS A SERVICE REGIONAL RESEARCH

(Project No. TMR04720)

March 2021

Griffith UNIVERSITY
Queensland, Australia

Cities Research Institute

griffith.edu.au

Mobility as a Service Regional Research

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This report outlines the findings of the independent research undertaken by Griffith University. The contents of the report do not reflect Queensland Government policy.

Cities Research Institute

March 2021

Executive Summary

Mobility as a Service (MaaS) is a rapidly developing field in transport. MaaS embodies a shift away from personally-owned modes of transportation, towards aggregated mobility solutions that are consumed as a service. It is a combination of public and private transportation services accessed via an application that provides personalised journey planning, booking, and payment. MaaS enables individual mobility budgeting through single payment or subscription models; MaaS offers choice and dynamic travel options; and, MaaS provides a platform to incentivise and influence behaviour to better optimise the transport network. Despite the promises it holds, the development of MaaS remains nascent in urban settings. Guidance is even more limited in regional areas due to lower critical mass and limited transport offerings.

To support the development of MaaS in Queensland, Griffith was engaged by the Queensland Department of Transport and Main Roads in June 2020 to understand the key barriers and success factors to enable MaaS in regional centres across Queensland.

The findings and opinions contained in this report represent the independent views of the researchers.

International Experiences: MaaS presents an opportunity to improve regional or rural transport by offering on-demand, door-to-door transport solutions while integrating multiple public and/or shared modes. An international literature review was conducted to look at global examples of MaaS for regional or rural areas in Europe and Asia.

- *Finland* has had successes with MaaS in rural and regional contexts. This was spurred by early efforts to reform their transport legislation to encourage data sharing, integration, and to create an ecosystem for mobility services by public and private MaaS operators. A number of MaaS offerings also have a strong focus in non-mobility services, including in freight such as social services or parcel delivery.
- *Denmark's* public transport-based MaaS offer was first trialled in a regional area, then expanded to the rest of the county. It features an improved journey planner and payment system. Denmark has also developed innovative community transit systems (e.g. FlexDanark) that are highly relevant to Queensland's community transit sector, with a strong focus on sharing rides and increasing vehicle occupancy to achieve cost efficiency.
- *Japan* recently embraced MaaS at a national level with a centrally planned, top-down approach. One of the key foci of Japanese MaaS is to offer transport (and non-transport/transport-plus) services for declining regions outside their metropolitan areas. Depopulation and ageing is limiting capacity of Transport Service Providers (TSPs) to provide conventional public transport in these locations. Despite being centrally guided, a common backend is ensured that allows for various local MaaS systems to be connected up nationwide. Rural on-demand transport services have also been trialled in some prefectures.
- *North American* approaches are often referred as "Mobility on Demand", which places more emphasis on modes being demand responsive and tend to be more limited in terms of intermodal integration. However particular regional developments do have insights for Queensland, given the similar transport and land use conditions.

Many international examples are found in jurisdictions with greater population density than Queensland's regions, and often concentrate on services in regional townships with better regional public transport offerings to start with. While their learnings are still valuable, caution needs to be exercised as the local contexts are vastly different in Queensland, with relatively low levels of bus service provision in many Queensland towns. Queensland regional cities have lower rates of public transport use, walking, and cycling than in Finland or Japan.

Interviews and Workshops in Queensland's Regions: The international review findings helped prepare a set of interviews and workshops in three case study sites – Townsville, Rockhampton (including Yeppoon), and Gladstone. This regional assessment was guided by TMR's (Forthcoming) *MaaS and Mobility Assessment Framework* (co-developed with Mott McDonald) that focuses on transactional, informational, and operational integration, and enabling environments and mobility ecosystems.

From the interviews, regional stakeholders expressed interest in and support for MaaS in general, but with some specific reservations on how to achieve it. There were particular perceptions of deficiencies in current services and overlapping mobility roles. Interview participants expressed concerns about 'silos' in transport policy and practices that will likely inhibit inter-modal collaboration if left unaddressed. The commercial viability of MaaS in a car-dependent setting like these regional cities was also questioned. Policies will be needed to ensure fair competition on a level playing field. On a technical level, suggestions were provided to improve current transport service contracts to foster better collaboration between providers. Reforms in how transport services are subsidised and service contracts are created may be needed to encourage MaaS more broadly across Queensland's regions.

Trialling these changes and proving these concepts in a regional city, then expanding these learnings more broadly, appears a useful way forward. There is a greater mix of modes and TSPs in some regional cities than others, and opportunities to provide bespoke MaaS solutions for particular markets, including tourism.

The institutional actors and TSPs in Townsville appear particularly supportive of MaaS and look to be best situated to trial a MaaS offer in Queensland's regions. This includes their local government, their bus operator and e-scooter hire operators. With a demand-responsive transit system also promised for Townsville as part of their City Deal, there may be opportunities to cost-effectively introduce MaaS as part of that investment. Integration with non-transport services (e.g. dining, entertainment, events and tourism) should also be considered, possibly when transport-focused MaaS are proven successful. The interview and workshop participants in Townsville feel they are ready to try MaaS in their city while participants in Rockhampton and Gladstone were far more reticent.

Key Recommendations: Based on this comparative assessment of MaaS readiness and the definition of success as outlined in the TMR *MaaS and Mobility Assessment Framework*, the following recommendations are made:

Overall vision:

- The TMR vision needs to be the guiding principle of MaaS development across Queensland, including in the regions, so as to avoid multiple competing MaaS constructs and to maintain public interests.
- TMR needs to play an important overarching guidance role to ensure all actors are moving in alignment with TMR's vision – to create a single integrated transport network accessible to everyone. This includes in any regional trials;
- The focus of any regional MaaS offer should not just be to reduce single-occupant trips. There is a much broader rationale for MaaS and a wider set of objectives in a Queensland regional setting, including potentially to:
    - Increase efficiency and utilisation rates of vehicle fleets
    - Maintain sufficient service levels for those without access to private motoring
    - Support demand-responsive transit and community transport
    - Improve accessibility, including to key services such as health and to key regional employers
    - Improve first- and last-mile accessibility
    - Support tourist travel

Transaction and payment technology and standards

- Deploying new generation platform technology is a key prerequisite for regional MaaS. This is facilitated by TMR's recent investments in a state-wide platform that helps unlock the transactional and informational integration layers;
- A MaaS consortium or alliance is recommended to bring TSPs (both incumbent and emerging) together to drive the development of MaaS in the regions and ensure strong collaboration;
- Townsville is the recommended location for any first large MaaS trial in regional Queensland, given the preparedness of its TSPs, the promise to introduce demand-responsive transit as part of the City Deal, and the support and interest of its local government.
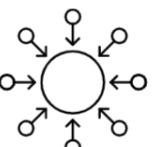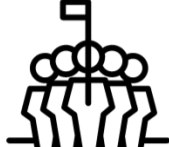
<u>Social considerations</u>

- The social function and transport needs of the disadvantaged should be considered as part of any Townsville MaaS trial. The inclusion of non-mobility services should also be explored (e.g. social services and parcel deliveries).
- Rockhampton and Gladstone have more limited opportunities for corporate MaaS offers, focused on organising travel for workers at these cities' largest employers.

A table outlining a summary of the key barriers, enablers, and potential solutions is provided below.

Table 1: Concise summary of barriers, enablers, and potential solutions for MaaS uptake in Townsville, Gladstone, and Rockhampton

For a more detailed version see Table 13 on page 48.

Themes	Key Barriers	Key Enablers	Potential Solutions / Actions
Land use and transport integration	Car dependence, driving culture, lack of congestion.	Travel demands for public transport exists (e.g. tourism, workplace based travel).	MaaS centric land use and transport policies, infrastructure and modes.
Infrastructure and planning	Infrastructure priorities are often road focused.	State strategic and local plans are in place with clear directions and intent to develop MaaS.	Commence MaaS trials.
TSP ecosystem	"Silos" and a "turf mentality", subsidisation in transport, level playing field concerns.	Most transport service providers in the regions are supportive of MaaS concept.	A regional MaaS consortium or alliance to steer MaaS development with conflict resolution mechanisms.
Transaction	Some uncertainty about the reliability and cost of new MaaS related hardware and software.	Next generation ticketing is continuing to roll out, unlocking transaction and information integration barriers.	Development of common MaaS standards and requirements for data interoperability and sharing.
Active and e-mobility travel	Hotter and more humid weather may discourage active travel or waiting for public transport outdoors.	Emerging e-mobility may help to make some outdoor travel less physically challenging.	Explore possibilities to incorporate active travel, improve infrastructure design and provision
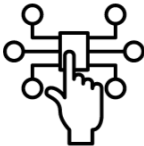
Themes	Key Barriers	Key Enablers	Potential Solutions / Actions
Long distance travel	Longer travel distances between regional settlements. Could be more difficult to integrate into MaaS than local transport services.	Potential to incorporate long distance travel (e.g. coach, QR, air) in MaaS, and it could be attractive for tourists or corporate users.	Investigate the potential inclusion of long distance travel options in MaaS.
Social aspects	Ageing population and social disadvantage in some regional localities. Community transport and the NDIS are and are generally currently not considered in general public transport policy decisions.	Various operators exist to provide community transit in current PT service gaps with important social benefits.	Develop mechanisms to assess social impact when planning and providing MaaS. Include non-transport governmental departments (e.g. health, human services, indigenous peoples).
COVID-19	COVID-19 normalised flexible working arrangements, travel patterns became more irregular	Some regional areas have experience strong population growth, especially post-COVID	Monitor and capitalise the regional growth due to COVID.
Digital readiness	General public are not aware of MaaS yet. Internet blackspots exist in rural areas.	Most (but not all) people are digitally ready. Free public Wi-Fi services available in many regional cities.	Further improve digital connectivity. User interface and experience needs to be intuitive.
Demographic and workforce	Transient workforce (e.g. fly-in-fly out and drive-in-drive out), especially for Rockhampton and Gladstone.	Universities provide natural markets for MaaS. Some employers already provide transport services	Potential area/market for MaaS trial with a strong employment/transient population focus. Explore corporate MaaS options with employers.

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1. Introduction

Griffith University's Cities Research Institute was engaged by the Queensland Department of Transport and Main Roads (TMR) to investigate the key barriers and success factors to enable Mobility as a Service (MaaS) in regional centres across Queensland. Three regional cities were chosen as a focus for the research, being Townsville; Rockhampton (including Yeppoon); and, Gladstone, covering the jurisdictions of four local government areas (see Figure 1).

1.1 Study drivers and scope

Mobility as a Service (MaaS) describes a shift away from personally owned modes of transportation and towards mobility provided as a service (Figure 2). MaaS is enabled by combining transportation services from public and private transportation providers, improving the integration of multi-modal trips and providing a single payment for each journey.

Importantly, MaaS encourages shared mobility. Shared private transport services such as micro-mobility, car sharing, and ride-hail services have the potential to reduce the need to own a personal car. These new services also risk unintended consequences such as additional road congestion, if they are not managed appropriately.

Figure 1: Study Areas

MaaS presents an opportunity for the Queensland Government to take a lead in enabling a shared economy and assisting private Transport Service Providers (TSPs) to deliver service offerings that present greater choice to the Queensland public. The concept of MaaS is relatively mature, but the adoption of MaaS in practice is in its infancy. Though urban-scale roll-outs exists, a complete MaaS solution has not yet been implemented across a jurisdiction comparable to Queensland.

In the long term there is significant opportunity for emerging vehicle technologies (especially automated vehicles) to be deployed by private TSPs within the MaaS ecosystem. The greatest benefits for transport agencies of emerging vehicle technologies will be gained from shared mobility. MaaS provides the launch-pad for progressing the behavioural shift towards shared mobility.

There is much opportunity to be gained from MaaS practices in providing optimised transport solutions for customers both in metropolitan areas and in regional areas. Queensland's transport networks are forecast to face significant increases in private vehicle demand in the wake of population growth, development expansion, and transitioning economic activities. Proactive intervention and management solutions, including MaaS, need to be explored to promote and enhance long term network efficiency. But how should we develop MaaS in regional contexts in Queensland? Where might we start?
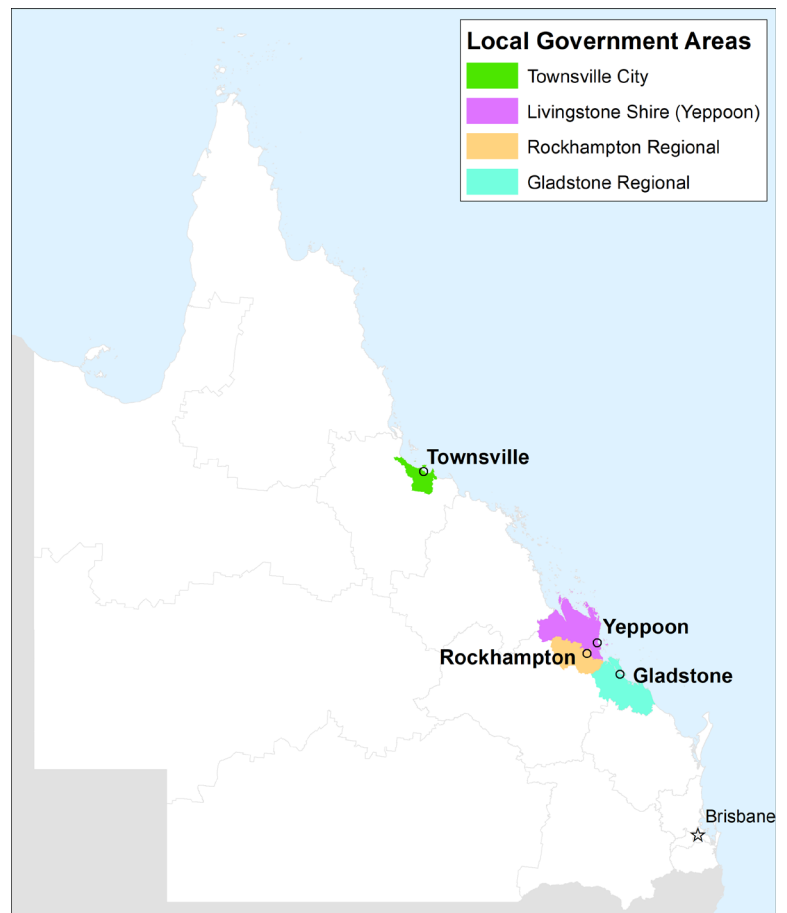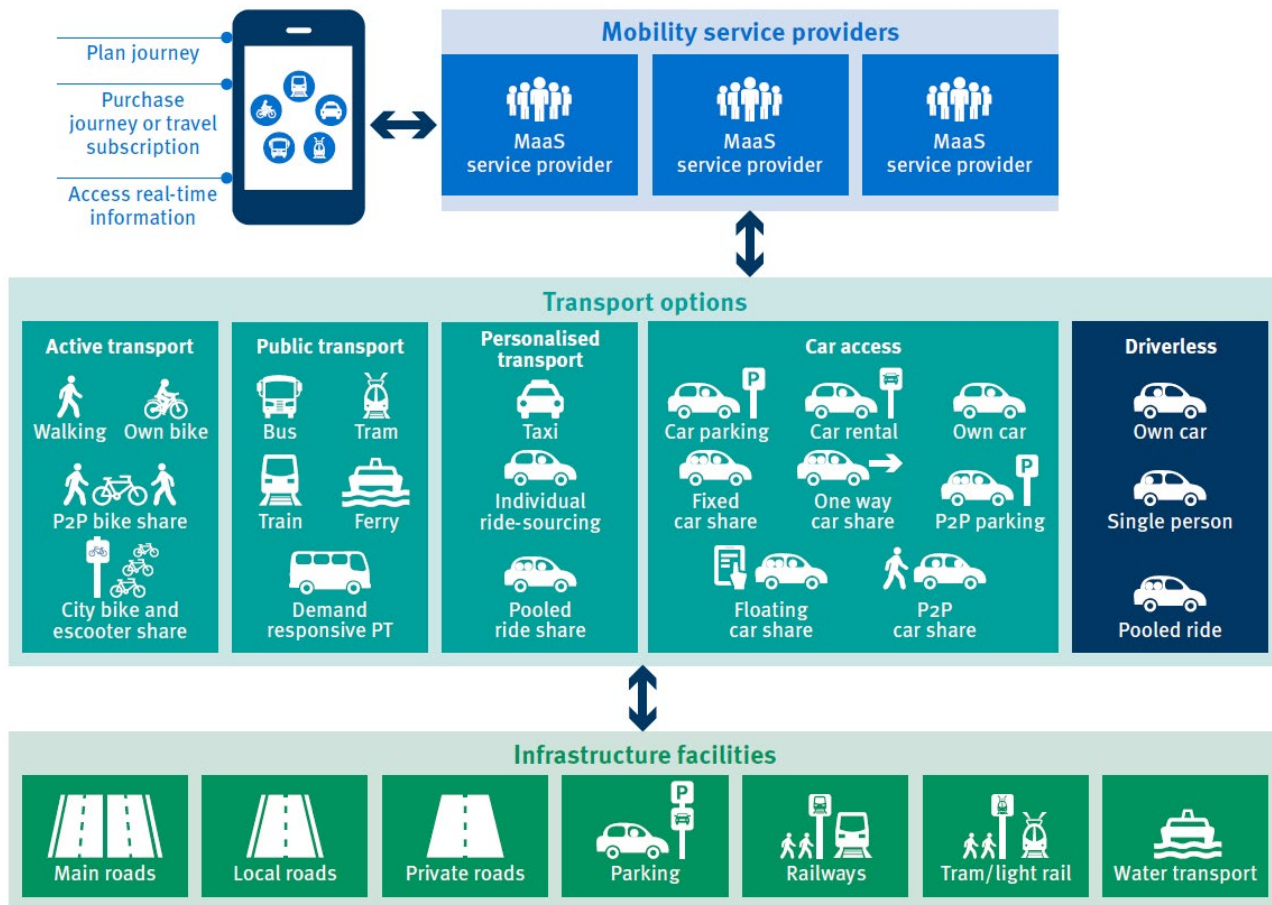
Figure 2: Overview of Mobility as a Service (Source: Modified from MaaS Australia, and Qld Transport Strategy, 2020)

1.2 Research Objectives

The objectives of this research study were to:

- Improve departmental understanding of the policy options and success factors for MaaS in the regions of Queensland; and
- Identify a preferred approach for a pilot proof-of-concept trial in at least one Queensland regional centre.

The following research gaps has been investigated in this report:

- Policy Objectives: what can and should TMR and its partners seek to achieve from public and shared transportation, both now and into the future?
- Regional Context: what conditions specific to Queensland's varied regional centres require consideration?
- Definition of Success: what does "success" look like for MaaS in regional Queensland?
- Policy Options: what are the available policy and planning options for MaaS in regional centres, now and into the future?
- Success Factors: what are the success factors (or, the necessary conditions for success) for MaaS in such locations?
- Key Opportunities: what are the most promising opportunities to start developing MaaS in regional Queensland?

2. Review of emerging global practices of MaaS in regions

To help answer the first research objective, the research team conducted a literature review to search for and interrogate published research on MaaS in regional contexts. This explored not just the academic literature, but especially the 'grey literature' of government, consultancy, and industry reports and trade publications where most information on the roll-out of MaaS trials and services is located.

A systematic approach was employed. This used a comprehensive literature search on various databases such as *Transportation Research International Documentation (TRID), Google* and *Google Scholar,* and *ScienceDirect*. In addition, direct requests for input and materials were made to English language list-servers such as the *Universities' Transport Study Group (UTSG)* from the UK and the *Transport-Travel Demand Management (TRANS-TDM* lists*)*, and via *LinkedIn* professional networks. The review is summarised in the following sections.

2.1 Key differences of MaaS in regional cities/towns vs. other contexts

In contrast to urban areas, where transport initiatives often focus on environmental or congestion concerns, rural transport initiatives tend to have accessibility as the primary focus (OECD, 2009). A key challenge for rural and regional areas is finding cost-effective ways to increase accessibility for all residents regardless their socio-economic and health status. This is especially so in regional towns and cities where there is lower provision of conventional public transport services than in metropolitan areas.

At the national level, analysis of central government MaaS strategies suggests a slightly different approach is needed for developing MaaS in regional or rural areas (Eckhardt et al., 2018; OECD, 2015). Lower population density and more dispersed settlement patterns result in longer travel distances and fewer public transport offerings (in terms of service availability and frequencies). These make regional residents more car dependent, reflected by higher levels of car ownership. Some regional areas can also experience an ageing population and in some cases, a declining population.

Table 2 shows the differences in what MaaS generally tries to achieve across different contexts, highlighting the broader set of objectives MaaS may be used for in regional cities and towns. As the table explains, the value proposition of MaaS in regional areas is different. As car ownership levels are already high in the regions, shared occupancy modes (including public transport, ride-sharing, and car sharing) are more difficult to operate due to higher time cost/distance involved. MaaS is unlikely to be economical on a purely commercial level in regional areas without subsidy and public support. Citizens in the regions need the integration of multiple modes of transport and alternative options to the private car, but they also need greater accessibility to ensure quality of life and help accessing specific services, such as health. Internationally, there is a greater emphasis on demand responsive transit services (DRT) in regional townships, a form of public transport that is particularly suited to MaaS. Due to ageing demographics, community transport is also in greater demand, especially services dedicated to seniors and the disabled. Regional cities and towns, especially in Queensland, tend to have tourism assets and a reliance on the tourist economy.

Table 2: Key differences in what MaaS may achieve across various settings (Adapted from Aapaoja et al., 2017):

Setting	Objectives / Value proposition	Based on
Regional cities and towns	- Increase efficiency and utilisation rates of vehicle fleets - Maintain sufficient service levels for those without access to private motoring - Support demand-responsive transit and community transport - Improve accessibility, including to key services such as health - Provide first/last-mile accessibility - Support tourist travel	- On-demand transport, taxis, buses, private (e.g., local community engagement) and commercial sharing services - Connections to long-distance transport services - Additional services: patient travel, parcel deliveries, library services, and food and medicine distribution, etc. - Tourist travel needs
Major Cities	- Reduce the use private of cars (congestion, parking) - Reduce emissions - Seamless travel experience	- Existing public transport (buses, trams, local trains, city bikes etc.) - Extended with rental and sharing services and new modes (private and commercial; e-scooters, etc.)
Suburban areas	- To increase the sharing of vehicles and of trips - Reduce need for second or third cars in households - Reduce need for young adults to pursue license holding and car ownership - Provide first/last-mile accessibility for conventional public transport	Park & ride services, on demand transport, sharing services, and other transport service connecting suburban to city transport services
Rural areas	- Increase efficiency and utilization rates - Maintain sufficient service levels - Improve accessibility	- Limited on-demand transport, taxis, and commercial sharing services - Connections to long-distance transport services - Additional services: parcel deliveries, etc.
National/ international	Offer easy all-in-one packages	- Long-haul transport including air traffic - Additional non-transport services: accommodation, event tickets, activities, etc.

2.2 International exemplars of MaaS in regional or rural areas

The review identified a number of more successful MaaS implementations in regional cities and towns, and in more rural areas around the globe. This section attempts to summarise key learnings from these international examples.
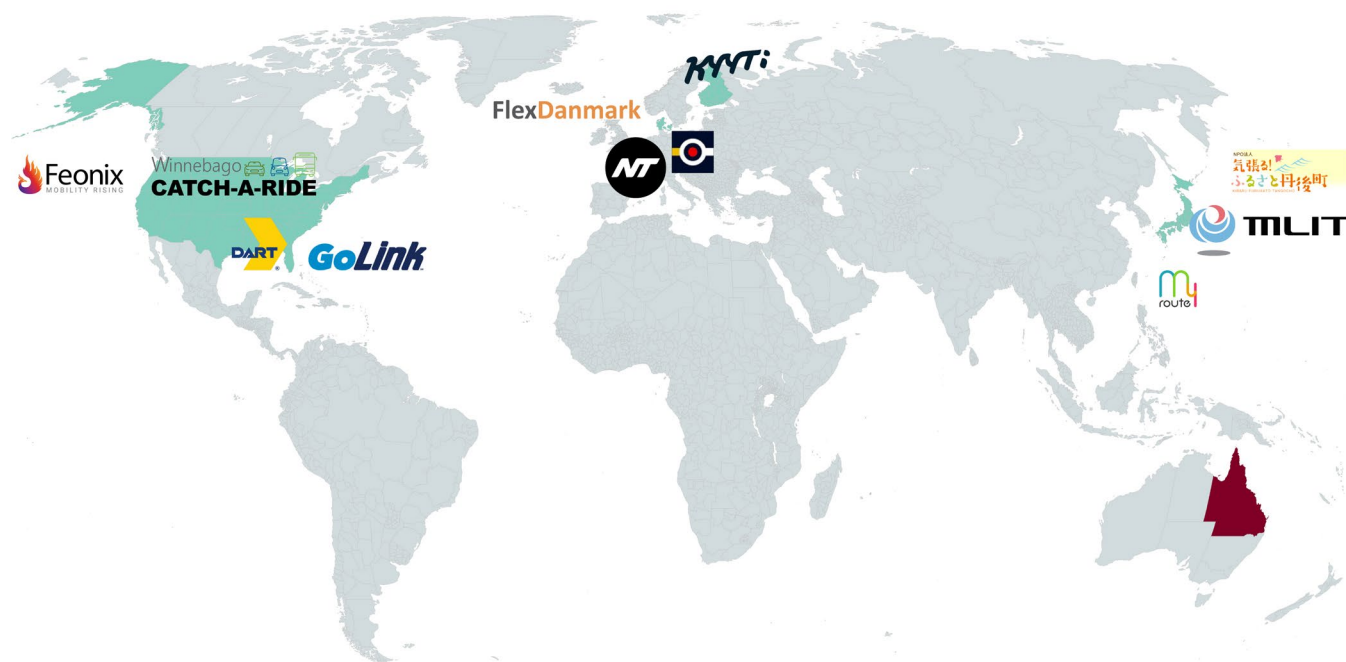
Figure 3: International examples of regional or rural MaaS cases reviewed in this report

2.2.1 Finland

Finland is widely seen as a pioneer of MaaS, with some relatively mature implementation across metropolitan settings (the capital Helsinki) and rural locations (including Arctic Lapland). MaaS is being used in Finland to improve social accessibility as well as support economic development through tourism.

The idea of MaaS was conceived in Finland in 2009 but it really accelerated after several legislative reforms, included the *Act on Transport Services* (Finnish Government, 2017). These reforms require all transportation services to share their data and allow for inter-platform interoperability. A 2018 amendment further added an obligation on TSPs, no matter whether public or private, to provide information and access to sales interfaces of their ticket and payment systems. These changes created a level playing field and enabled MaaS platforms to flourish across Finland. One of the emergent providers was the ambitious Rural-MaaS (*Maaseutumaas*) project supported and funded by the Finnish Ministry of Agriculture and Forestry (2016–2017). This Finnish Rural MaaS vision is to:

> "*Ensure for everyone adequate mobility services and accessibility relative to well-being, cost efficiently with an appropriate service level*" (Eckhardt et al., 2018).

In view of the unique situation in sparsely populated areas, the key solutions identified by the project includes three headline strategies:

1. **Combine:**
   - Mobility of people and goods (in Finland the regional bus operator *Matkahuolto* is also a courier company (Cochrane, 2012))
   - Publicly subsidised and market-based transport services

2. **Create:**
   - Travel chains
   - On-demand transport services
3. **Share:**
   - Ridesharing for people and goods
   - Sharing services (cars, taxi rides…)
   - Peer-to-peer rental services
   - Ridesourcing
   - Organised hitchhiking

Further, a so-called "4P (Public-Private-People Partnership)" is used to deliver MaaS in the regional areas, with a main focus on identifying and creating potential business models for both commercial and publicly supported transport services for passenger mobility and delivery of goods and services in rural areas. This is shown in Figure 4. Experiences with Finland's rural MaaS are summarised in the following SWOT analysis table (strengths, weaknesses, opportunities and threats; see Table 3).
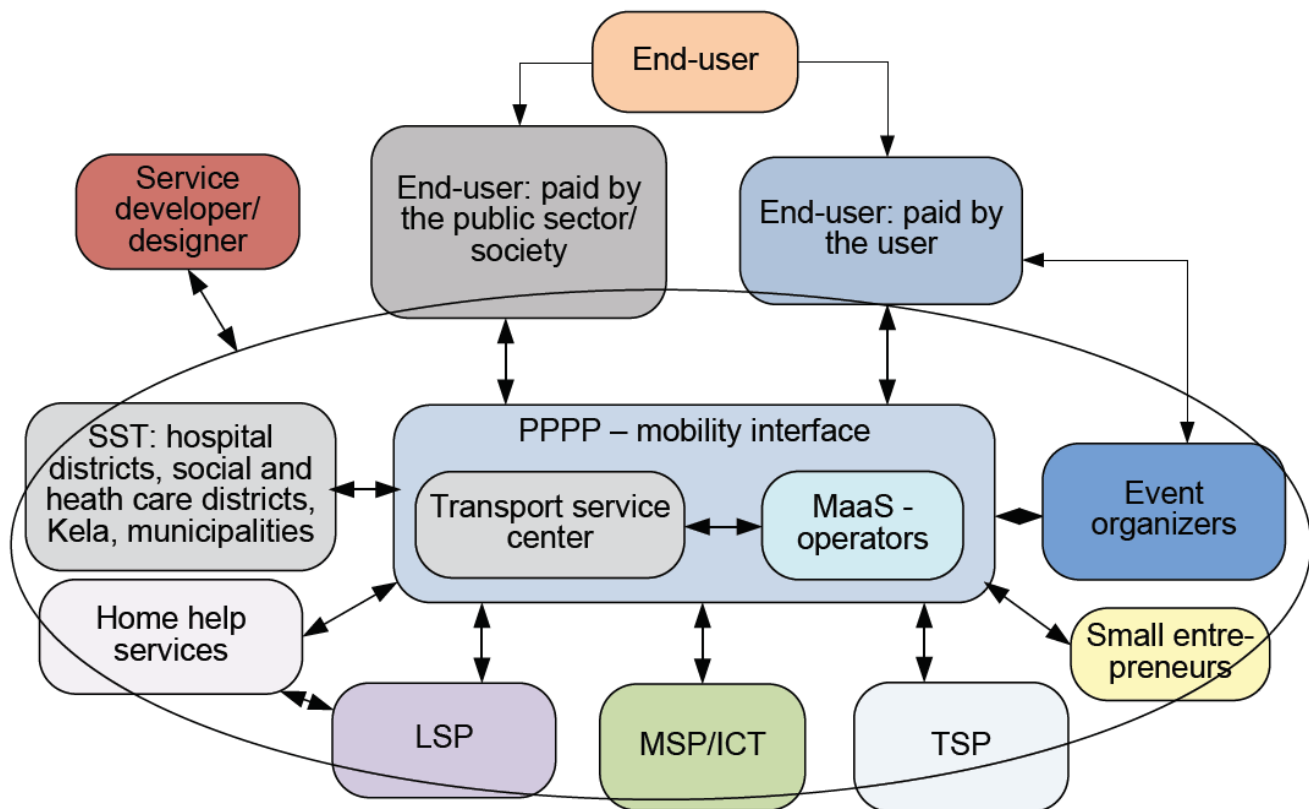
Figure 4: 4P model for rural areas (Eckhardt et al., 2017)
(LSP = logistic services provider, MSP = mobile service provider, ICT = information communication technology, TSP = transport service provider, SST = social service transportation

Table 3: SWOT analysis of Rural MaaS in Finland (Based on Eckhardt et al. (Eckhardt et al., 2018, p. 80)

Strengths	Weaknesses
• Decision-makers are development oriented • ICT: extensive infrastructure, digitalisation • Local stakeholders and knowledge • Stable situation (population and services) • Trust (sharing and peer-to-peer services) • Subsidised transportation (as backbone)	• Silo effect of stakeholders • Procurement processes • Expensive current system • Lack of IT systems and information • Concentration to population centres • Inefficiency (flows, distances, occupancy rates) • Limited infrastructure • Lack of travel chains and interoperability of modes
Opportunities	**Threats**
• Collaboration of public stakeholders • Reform and changes in legislation • Needed technology exists + Open data • Combine rides and create travel chains • Improved accessibility • Bringing services to customers	• The new transport legislation will benefit large companies only • Uncertain future → development stops • Lack of collaboration and separate visions • Support and funding decreasing • Condition of the road network • Urban-rural migration, aging population in the countryside • No new market-based services • People with limited means stay outside full fee-paying services → Inclusive transport system?

Finland MaaS Case Study:
Kyyti – pooled ridesharing of subsidised taxis in rural Finland

- An innovative solution is offered for rural areas in Finland by Kyyti, a MaaS operator in Finland.
- Health or social service users are eligible for subsidised taxi travel. But very often these are low occupancy trips, often a single passenger.
- Kyyti offers a matching service to allow non-subsidised riders to use the vacant seats and share costs.
- There are challenges though; the provider has limited drivers available and limited numbers of vehicles in service.
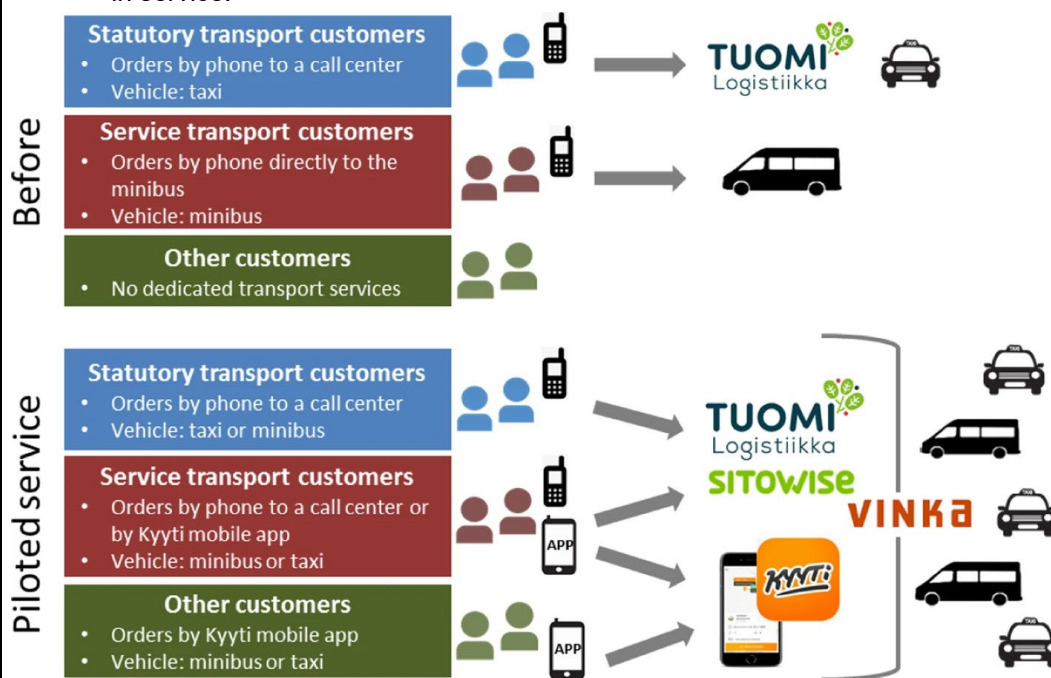
Figure 5: Illustration of how Kyyti added more services for different user groups by grouping subsidised and non-subsidised trips in Kuru and Vammala, Finland (Eckhardt, 2020)

See more: https://www.kaikkikyytiin.fi/en/

2.2.2 Denmark

Denmark has also promoted MaaS. The first deployments were in the Northern Jutland region (where the largest city is Aalborg), guided by the Mobility Plan 2017-2020 of the regional transport authority *Nordjyllands Trafikselskab* (NT) (2017).

Based on the original national multi-modal journey planner (which only offers travel information) a new pilot MaaS service *MinRejseplan* ("My travel plan") was launched in May 2018. The key impetus of the project was the closure of numerous rural bus routes that had suffered a drop in patronage. This new app-based service not only provided information about the cheapest or quickest transport solution available, but also a common payment platform allowing users to pay for the trip. The app was part of a rural MaaS project to improve mobility by offering more responsive solutions for mobility-impaired users (e.g. seniors) while improving coordination with public transport. Despite originally being offered for the northern region only, the app has proven highly successful, and was expanded to the rest of the country, *MinRejseplan* has been downloaded by more than 3.5 million people and with more than 1 million journey searches made through it every day.

In addition to conventional public transport, Denmark also provides a MaaS-based DRT services branded as *Flextrafik* (the Danish term for coordinated DRT) to meet health care and social transport needs. This is part of the nationalwide MaaS solution – the Connected Journey, funded jointly by FlexDanmark and Danish Ministry of Transportation in 2018. What is special about the Danish system is it tries to allocate passengers travelling at the same time to the same destination in the same vehicle where possible. *FlexDanmark* is the national planning centre acting as a MaaS broker and trip planner that "auctions" demand responsive transport services via a central dispatch system. This assigns each trip request to a TSP, who then sends an appropriate vehicle to the customer's door. More than 550 different public and private TSPs are integrated into the *FlexDanmark* system, which serves both urban and rural customers throughout Denmark and five regional transport authorities (including NT).

FlexDanmark doesn't just serve passengers; it also provides booking services for medical and social service agencies to organise face-to-face appointments via the portal, integrating health services and travel in helpful ways. In addition to scheduling and dispatching, the *FlexDanmark* operation centres also monitor real-time traffic conditions and reroute drivers to avoid delays, helping to minimise travel time and disruptions. The sophisticated level of coordination is possible because all providers in the system adopted a common transactional data specification, *Standardiserat Utbyte av Trafik Information* (commonly referred to as SUTI) that allows as many as 20,000 trips daily to be booked and completed in Denmark.

FlexDanmark is also integrated with traditional (fixed-route) public transportation services with demand responsive transportation in the most rural regions of the country, enabling customers to identify options for affordable door-to-door service in rural areas. Transfers between the fixed-route system and one of the SUTI-compliant demand responsive transportation providers can be integrated in one single payment. The system is unique as it focuses on using ICT to lower transaction cost and gain efficiency improvements, rather than depending on government subsidies – private transport operators working for FlexDanmark must cover the costs of the dispatched services accepted. Some of the typical schemes in each transport region are shown below:

Special needs and subsidised (with eligibility requirements):

- *Flexpatient/Flexsygehus/Flexkommune* – This service is for those who are going to see a doctor, for medical treatment, or examination at the hospital and cannot use conventional public transport.
- *Flexhandicap* A travel scheme for the disabled, blind and severely visually impaired.
- *Flexroute/Flexskole/Flexlaege/Flexaktivitet* A travel scheme for students and users who needs to visit special schools, day care and sheltered workshops.

Open to public:

- *Flextur/Plustur* are door-to-door DRT services offered to the public. *Plustur* service is usually provided in addition to conventional public transport in sparsely populated areas.

Denmark Case Study 1:
MinRejseplan – a journey planner with expanded multimodal trip booking and payment functions

MinRejseplan can be regarded as a "public transport as backbone" MaaS service, as it is developed by the transport authority to connect public transport to other private services. Denmark is a geographically challenging country, composed of islands and peninsulas, with mostly small cities other than Copenhagen. TSPs are geographically dispersed and parochial. The development of a common app-based payment system was not only a technical feat, but also challenging for the transport authority to implement as it required TSPs to share data about their customers and to allow packaged travel solutions.

NT emphasised to the service providers that MaaS will not increase competition against their operations; instead it promotes competition with the private car. MaaS allowed better transfer between various services with planning and payment becoming more seamless and more reliable (Randall et al., 2020). New legislation regulating travel packages (*Rejsepakkeloven*), and the integration of the *Rejseplan* journey planner and travel smartcard (*Rejsekort*) were also important building blocks for the Danish MaaS rollout. This ensured privacy of users and government oversight of personal and financial information while allowing key data flow between transport operators.

MinRejseplan integrates regular bus services with *Flextur* (a bus service for seniors started in 2003), a rural only feeder taxi service *Plustur* (launched at the same time to support *MinRejseplan*), and *GoMore* (a carpooling service). While such rural-focused MaaS deployment can be expensive, it can be justified by saving from reducing operations of empty bus services and using it to subsidise flexible modes (e.g. taxis) in low density areas (Sørensen, 2017). On-demand connecting services such as *Plustur* are able to offer a convincing alternative to car ownership in rural Denmark with positive user feedback (Kjærup et al., 2020).
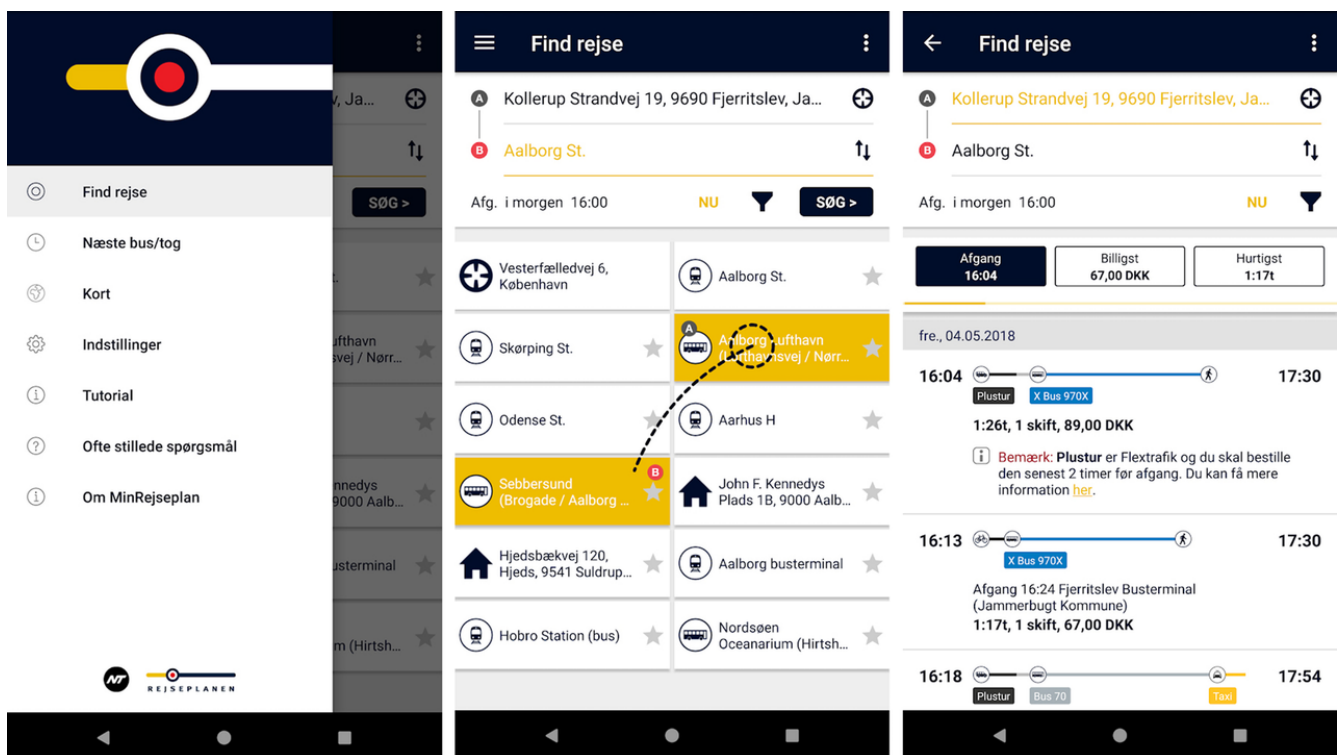
Figure 6: Screenshots of *MinRejseplan* app. Flexible DRT services such as *Plustur* can be integrated into conventional public transport trips

Denmark Case Study 1 (continued):

With the *Flextur* DRT services, Denmark has successfully converted traditional route and corridor bus services into on demand taxi-like services and have resulted in massive cost savings even before *MinRejseplan* was introduced.
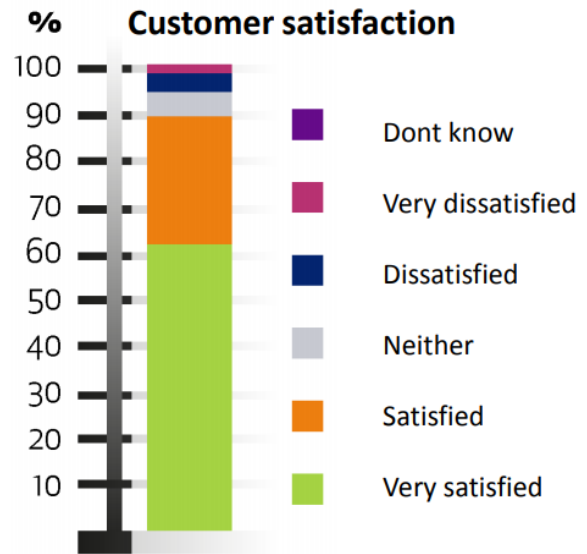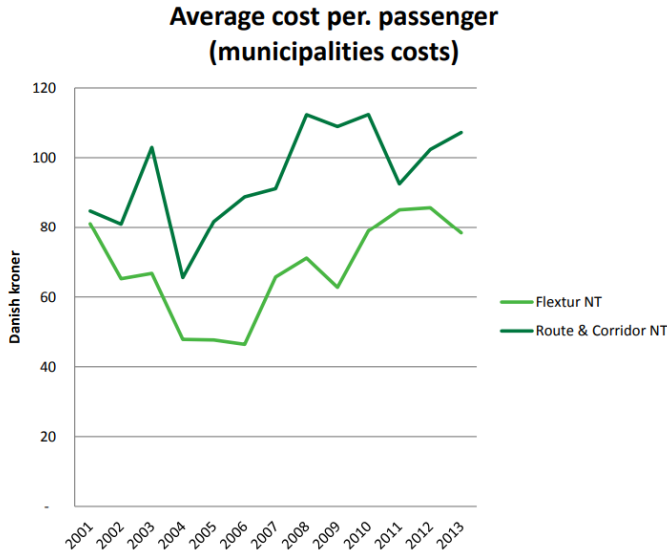
Denmark Case Study 2:
FlexDanmark – The Danish approach to provide health and social transport

Modes offered in the FlexDanmark (FLX) platform
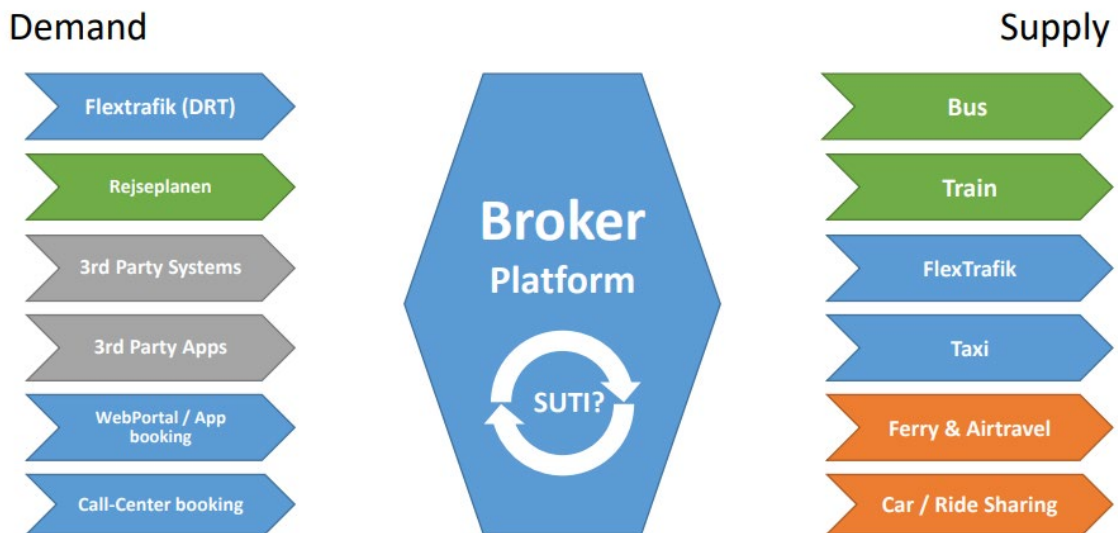
Blue: In operation; Grey: trials; Green: under development Orange: future plans

Left: Total Provider (siloed) Model; Right: Broker (integrated DRT) Model

Transport Utilisation in the time of day

FlexDanmark aims to combine scheduled and individual variable (on demand) services
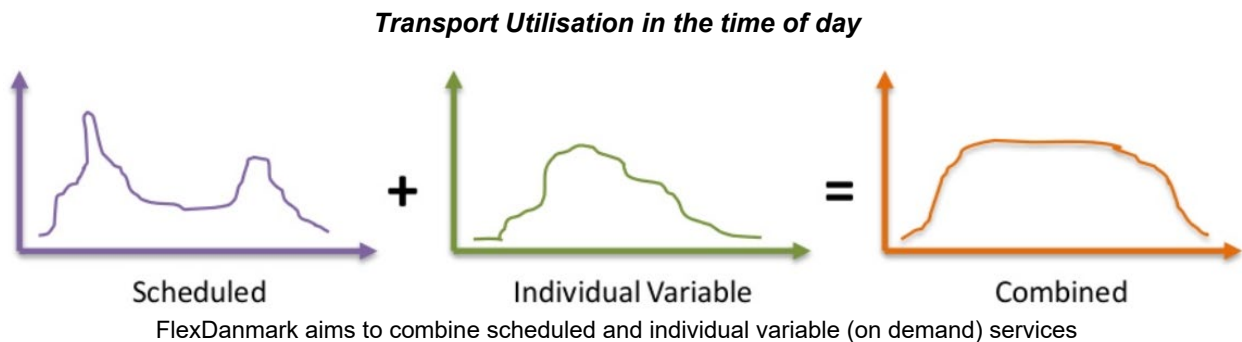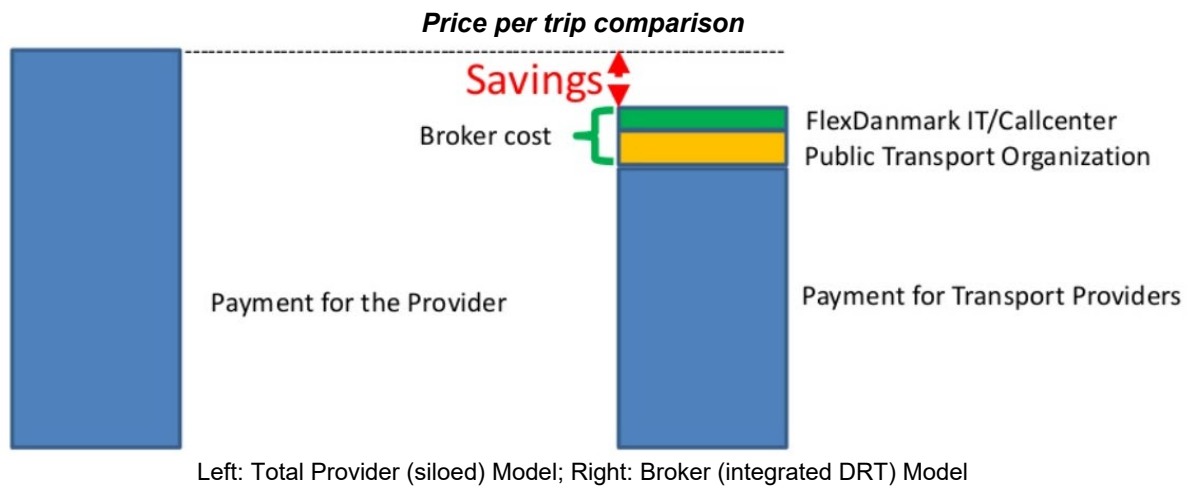
Figure 7: Illustrations of the key feature of the FlexDanmark platform
(Larsen, 2016; Sørensen, 2018)

For further information of FlexDanmark, see this video by the AARP (American Association of Retired Persons) - FlexDanmark: Transportation for All https://vimeo.com/319568690

2.2.3 Japan

Japan is facing an ageing population and rural depopulation. Existing public transport services outside metropolitan regions are increasingly unprofitable due to reduced patronage. Increasing numbers of older persons are unable to drive and are at risk of being stranded in these areas.

The Japanese government has put forward a MaaS vision focusing on:

i)   universal usability (across regions and user groups, with a focus on rural areas, elderly and disabled);

ii)   high added-value (coordination between mobility and supporting services); and,

iii)   development of transport nodes though land use planning. The New Mobility Service Division was established by the Ministry of Land, Infrastructure, Transport and Tourism (LITL) in July 2019, with close collaboration of the Ministry of Economy, Trade and Industry (METI).

It is envisaged that urban-based MaaS surrounding large metropolitan regions (e.g. Tokyo, Osaka or Nagoya) will be run by existing transport operators, especially Japan's railway companies (i.e. JR East), who dominate a particular metropolitan area's transport services. In the regions the rail companies have less influence; public transport is sparse, and less profitable. This has necessitated greater local and national government involvement in

the provision of MaaS, rather than relying on the large profitable rail companies to deliver. MaaS is therefore being developed for individual areas (cities, regions or prefectures). This difference is highlighted in Figure 8.
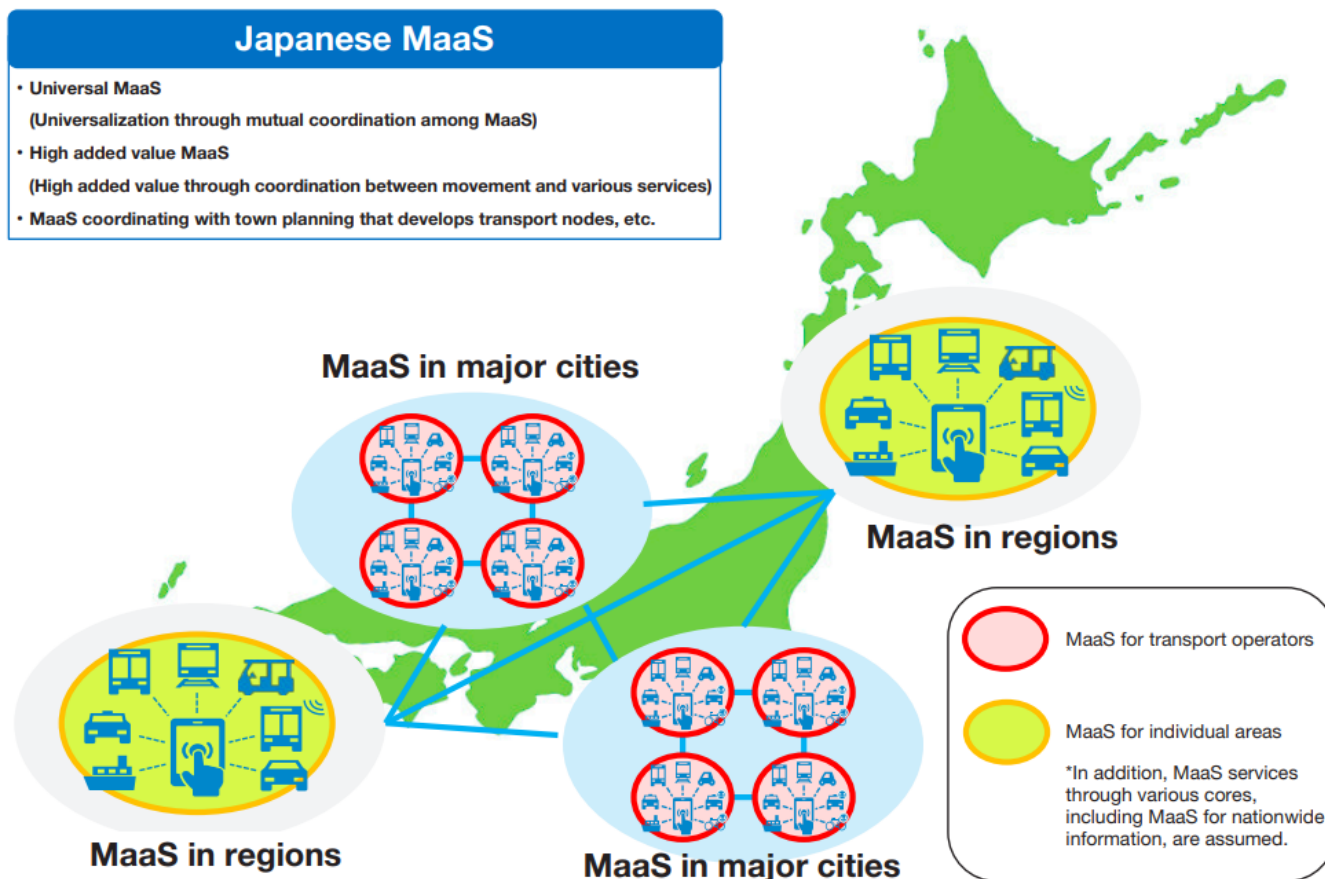
Figure 8: Japanese National MaaS Framework

A typology has also been developed that provides five locational types for MaaS across Japan. As shown in Table 4, this includes MaaS for Regional Towns and for Rural areas, which are reliant on car-based modes and demand responsive transit systems. There is also recognition of a need for tourism-specific MaaS in appropriate locations, which will especially need to provide English-language and other language services.

A national standardised API is being developed to allow interoperable payment and data transfer between various urban and regional MaaS. The Japanese MaaS solution will be based on their existing integrated card (IC, or smartcard) payment infrastructure with a strong focus to deliver non-transport value-adding services, such as tourism, commerce and social services (see Figure 9). The legal basis of Japanese MaaS is based on the *Act on Revitalization and Rehabilitation of Local Public Transportation Systems (Amendment)*. Local governments are also encouraged to submit grand bids for the *Smart Mobility Challenge* incorporating use of latest *Internet of Things* (IoT) and artificial intelligence technology, some of which are related to MaaS.

Table 4: Five locational types of MaaS in Japan (Ministry of Land, Infrastructure, Transport and Tourism (Japan), 2019, p. 49)

Typology:	Metropolitan core	Suburban	Regional Town	Rural	Tourism
Density:	Very high	High	Medium	Low	Varies
Dominant Mode:	Railways	Railways and motor vehicles (incl. bus)	Motor vehicles	Motor vehicles	Varies
Issues:	- Peak hour over-demand	- Lack of first/last mile connection and accessibility - Congestion	- Car dependence - Government budgetary constraint and reduction of services	- Car dependence - Depopulation - Ageing population - Declining transport options - Transport exclusion of those without cars	- Seasonal demand - Mixed needs - Language barrier for foreign tourists
MaaS goals:	- Divert peak hour rail to other modes - Door-to-door services - Super-small taxi that is suitable for urban traffic	- Provide first/last mile connection - Offer taxi-like services - Reduce car use	- Provide non-car travel options	- Make rural area more liveable - Attract younger demographics	- Connect between airport, accommodation, and tourist destinations
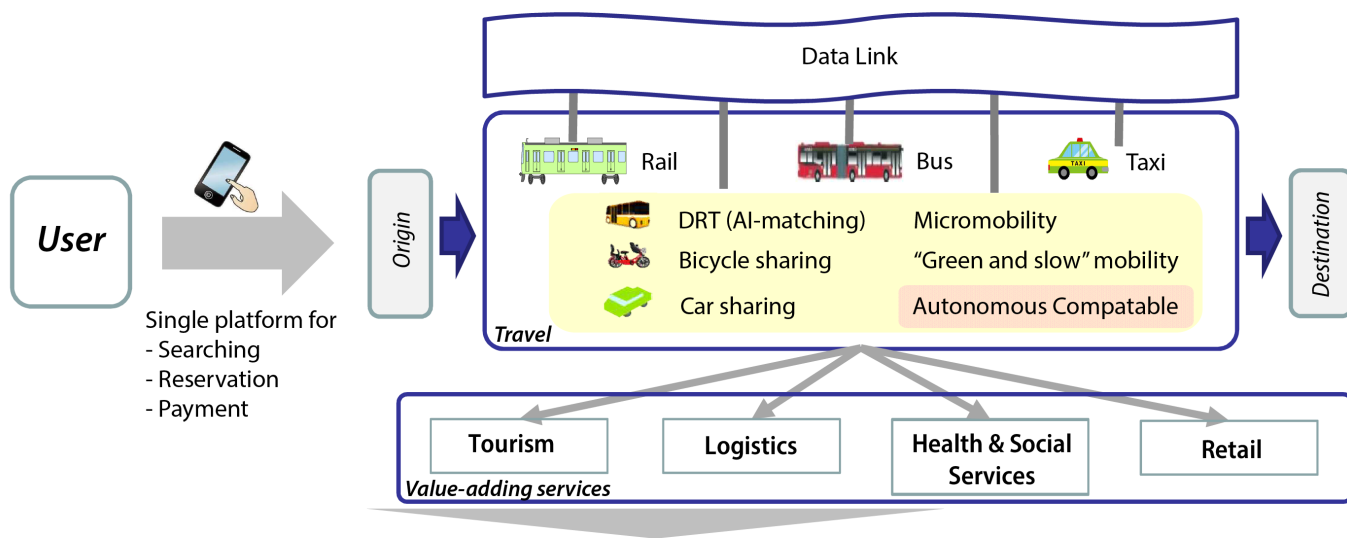
Figure 9: MaaS as a solution of regional development problems in Japan (Ministry of Land, Infrastructure, Transport and Tourism (Japan), 2019, p. 26)

Japanese MaaS Case Study 1:
Not for profit Uberisation in rural Japan: *Sasaeai Kotsu*
A case of community transport in Tango Peninsula, Kyoto Prefecture

Community based transport is very different in Australia as compared to Japan. In Japan, in 2016, Uber entered the Tango area where the population is ageing, along with depopulation (Nomura & Takahashi, 2017). Conventional taxi operators abandoned operation. Uber started operations with a local non-governmental organisation (NGO), supported by local government under the *Sasaeai Kotsu* (lit. Mutual support transport) scheme.

This provides a somewhat unique operation for Uber (which is normally not permitted to operate for ridehailing in Japan). The NGO matches drivers to passengers (targeted towards local residents or tourists) using the Uber Japan system and provides support through subsidy to drivers with their own private cars. All operations are regulated under national legislation. Against a background of declining taxis and buses in rural areas, this service model could be used elsewhere to support rural communities (Mulley and Kronsell, 2018). (See more: http://kibaru-furusato-tango.org/)

Figure 10: Flyer of the *Sasaeai Kotsu service and user photos*

Japanese Case Study 2:
Fukuoka's *Myroute – MaaS* integration with transport, dining and tourism services

There are already up to 50 MaaS demonstrator projects in Japan. One of the better examples is *Myroute* located in the regional city of Fukuoka on the southern island of Kyushu. The project was developed by Toyota and is now expanded to Yokohama in the Kanto Region, with expectations of being rolled out further elsewhere. Seven modes of transport are included, plus dining and tourism services.
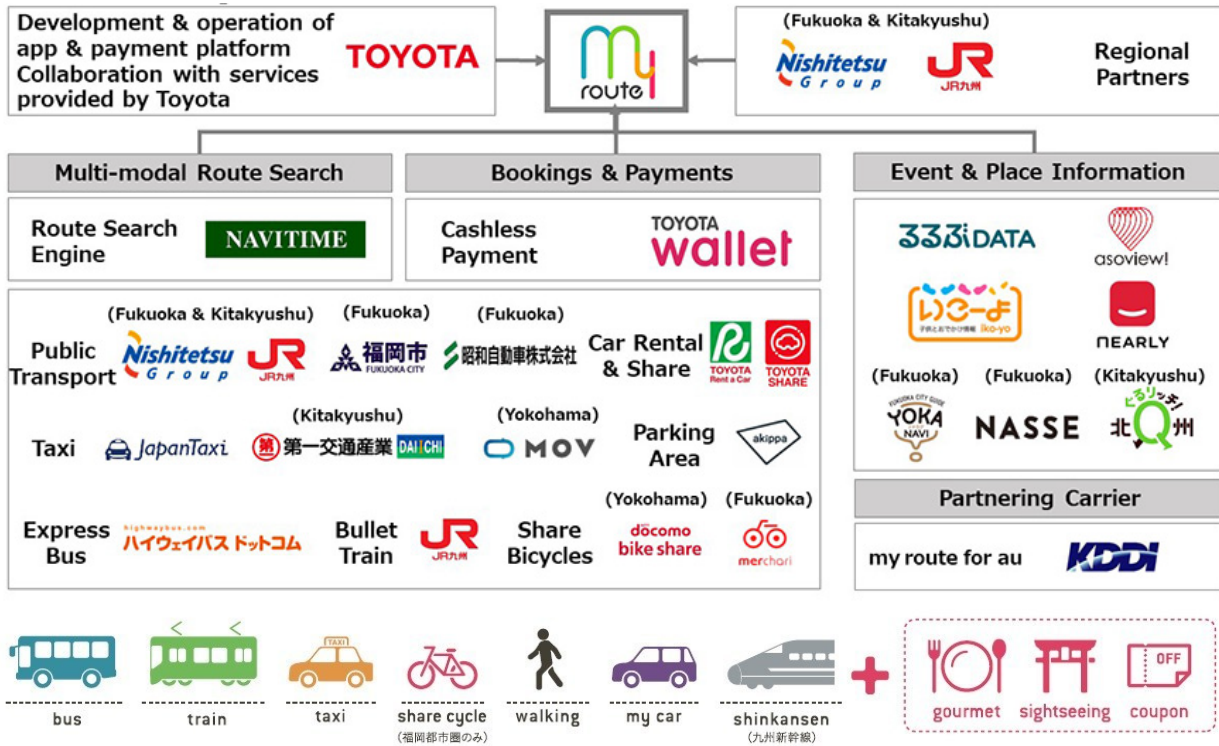
Figure 11: *Myroute* MaaS system and partners
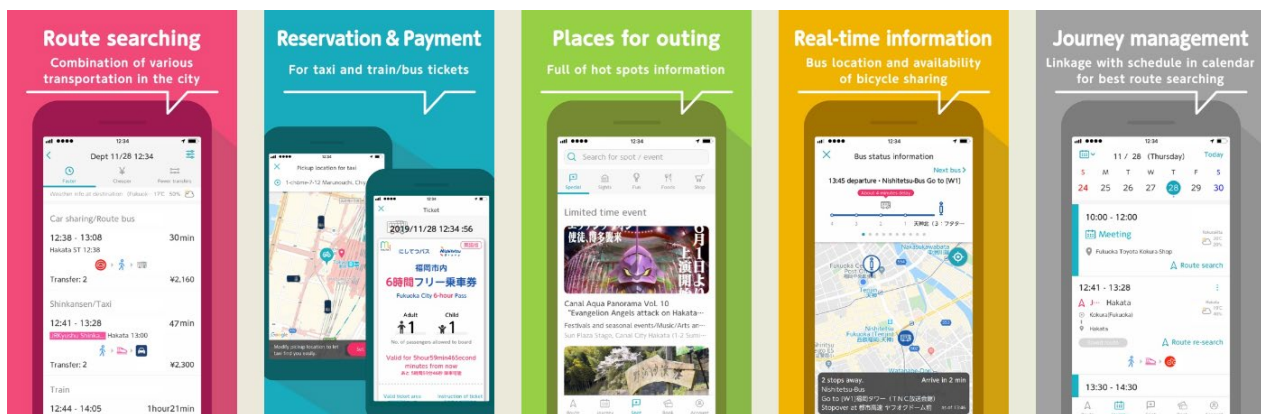
Figure 12: Screenshots of *Myroute* (Myroute App page)

See more: https://www.myroute.fun/en/

2.2.4 North America

MaaS development in North America is sometimes referred to as *Mobility on Demand* (MoD), though the latter is often focused on just one mode of transport, and does not necessarily offer intermodal operation. MoD can cover what in Australia is described as demand-responsive transportation/transit (DRT). We try to focus in this section on initiatives in North America that meet the MaaS definition outlined earlier in this report. Looking at North American examples is of interest to Australia, especially as North American levels of car use and population patterns are more similar to ours than traditional European or East Asian settlements.

In Canada, MaaS is developing slowly. There have been limited advances such as Translink Vancouver moving to allow their *Compass Card* to be used for bikeshare and carshare operator payments. Toronto's *Metrolinx* established an official rideshare partnership with Lyft at four GO Transit stations, offering reduced cost rides in a six-month pilot program. But nothing as large as the scale of *Whim* has yet been attempted in Canada.

The regional city DRT scheme in Dallas, *Golink* (similar to early models of Danish Flextur) and the social employment connector services, *Winnebago Catch and Ride* are selected for detailed showcasing.

USA MaaS Case Study 1:
GoLink by DART: A public facing "mobility on demand" solution for low density suburbs in Dallas

There have been very few expansive MaaS projects in the USA at the time of writing, despite a clear push by the Federal DoT for MoD via grants and sandbox trials. A preliminary MaaS trial attempted to produce a large, multi-modal MaaS offer involving microtransit, bike share, car share, and carpooling options in Dallas. *Dallas Area Rapid Transit (DART)* is somewhat unusual among public transport agencies in the US for having:
- A very extensive service area, with continuous low-density development without rural area gaps
- A large service area population (2.3 million)
- A large network but without much all-day high-frequency service

While Dallas is much larger than many Queensland's regional cities, it faces similar transport challenges.

The *DART MoD Sandbox Project* placed strong emphasis on some MaaS features such as intermodal integration (Lyft, Uber, and taxis), carpooling, and app-based booking of trips. The Sandbox Project did bring a demand-responsive microtransit solution supported by an upgraded version of DART's *GoPass* app. It created booking and payment integration. A *GoPool* carpooling app was developed, but attracted too few drivers to be continued (Parks and Moazzeni, 2020, p. 5).

Other difficulties throughout the project meant they were not able to develop the full multi-modal operations they had hoped for. The flexible transit service, branded as *Golink*, a personalized, on-demand, curb-to-curb service, has proven quite successful and is now expanding to 16 sites across Dallas. DART's new bus network plan is also providing options for residents to decide on more coverage services (provided by *Golink*), more ridership (focus on high frequency services), and a combination of both (Dallas Area Rapid Transit, 2020). Figure 13 shows the existing *Golink* and bus coverage. As seen in the experience in Dallas, an on-demand MaaS solution can help to connect existing bus networks and improve accessibility for residents or visitors across a large urban area.
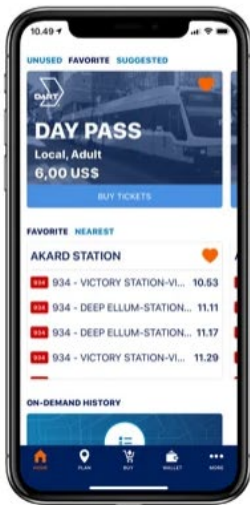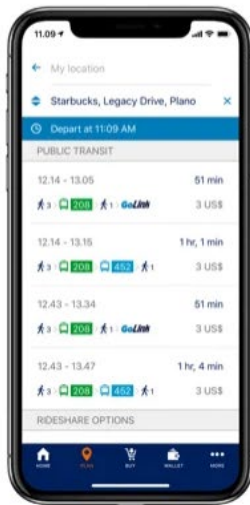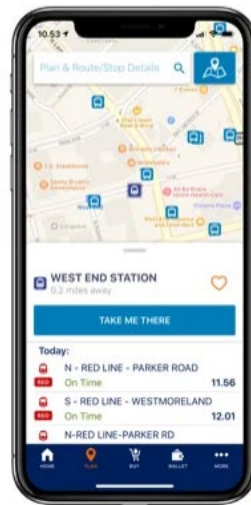
USA MaaS Case Study 1 (continued):

Figure 13: GoLink App screenshot and on-demand service flyers
See More: https://www.dart.org/riding/golink.asp

USA MaaS Case Study 1 (continued):
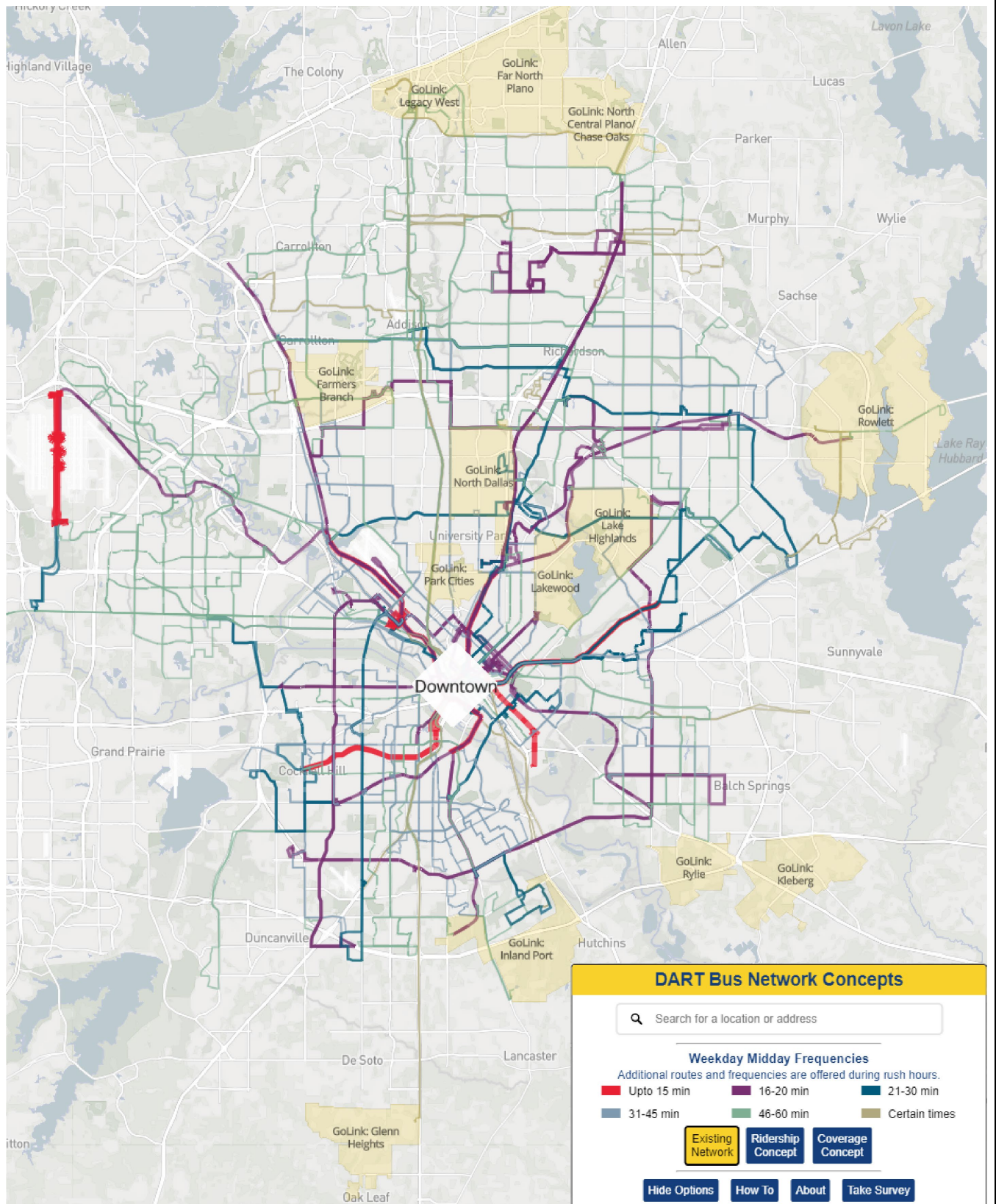
Figure 14: Existing Network of DART Bus Network and GoLink on-demand service areas
(See http://dart-concepts-viewer.s3.amazonaws.com/index.html for an interactive map)

USA MaaS Case Study 2:
Winnebago Catch-a-Ride – an employment-related MaaS initiative in Wisconsin

The *Winnebago Catch-a-Ride (WCAR,* for further information see https://winnebagocatcharide.com/) system is a collaboration of an NGO MaaS provider, *Feonix*, the East Central Wisconsin Regional Planning Commission, the Greater Oshkosh Economic Development Corporation, Lutheran Social Services and the Oshkosh Area Community Foundation, supported by grants from agencies including the Wisconsin Department of Workforce Development and the Department of Transportation. The system seeks to offer commuting on conventional bus routes and on ridesharing for individuals who meet key criteria. These inclusion/exclusion criteria for particular service types may include being at 150% of the Federal Poverty Level, being currently unemployed, or not having a motor vehicle available. Bus travel, taxi services, and low-cost rides to work are all potentially available under the scheme, which also extends to petrol vouchers and contributions towards vehicle repairs. Riders pay only US$0.25 per mile for low cost rides, drivers are volunteers compensated at the federal rate. *Qryde* provides a cost-effective backend support for booking and ride dispatching (see Figure 15). *WCAR* uses opportunities unique to the US context and demonstrates what might be possible for those looking to pursue workforce development and to address labour shortages or worksite accessibility in rural/regional locations (Godavarthy et al., 2019). The *Feonix* NGO MaaS provider is also interesting as a possible model for MaaS brokers in rural settings where commercial offerings (such as Uber) are unavailable.
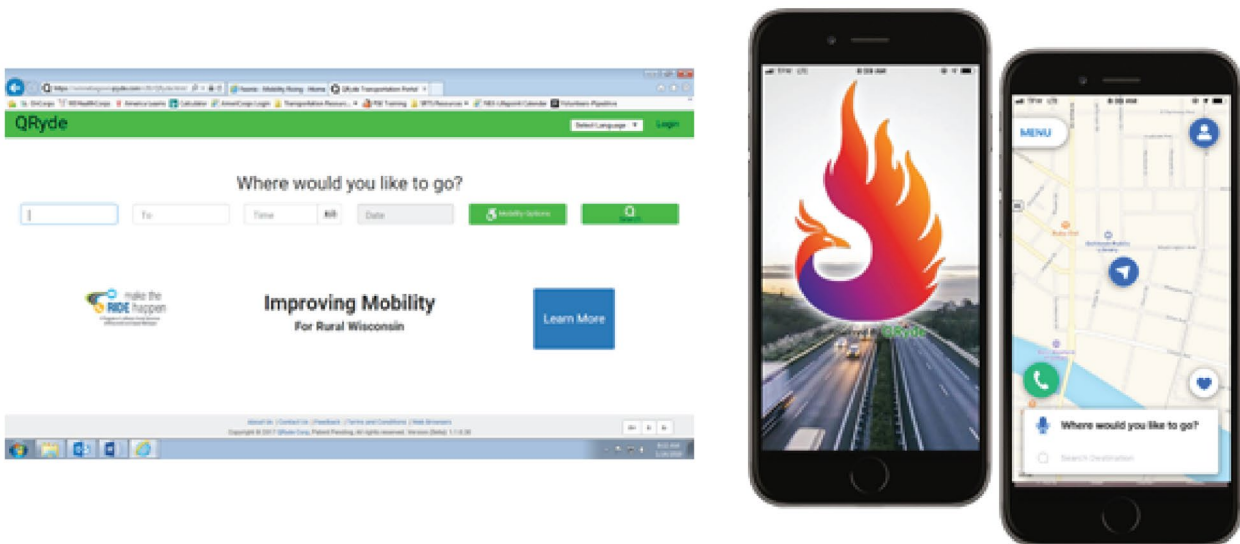
Figure 15: Screenshot of the *Winnebago Catch-a-Ride* ridebooking interface website or app

Despite the relatively fragmented development. There are several pilot initiatives in regional or rural areas that are worthy of note, which include:

- A large grant awarded in mid-2020 to advance a pilot MaaS system in Tomkins County, New York State, which will be worth watching as it develops.
- A small grant was awarded through the *Michigan Mobility Challenge Grants* program for MaaS in rural Michigan. Just under US$1m was awarded to Bosch and SPLT to improve their demand responsive transit and healthcare transport services in Grand Traverse, Benzie and Allegan Counties. This aims to reduce trip cancellations, health visit no-shows, and increase rides. No outcomes are available at time of writing.

2.2.5 Summary discussion of international exemplars

The international experience offers many learnings for Queensland (Table 5). There are clearly a number of MaaS pilot programs in Europe, Japan and North America that have relevance to the regional Queensland context. There is significant diversity within these programs. While MaaS is being developed by some of the largest rail operators in the world (i.e. JR East in Japan) there are examples where MaaS is being developed by small service-oriented NGOs specifically for rural and regional applications (i.e. Feonix in Wisconsin). Finland shows the importance of legislation to define roles and responsibilities, and that one does not have to rely on large automobile or rideshare companies to achieve MaaS solutions for regional locations. The Danish examples shows a more mature MaaS and integration with health and social transport needs under their national *FlexDanmark* coordination centre.

Table 5: Key learnings from the international cases

Country	Case study / policies	Key learnings for Queensland
Finland	Rural-MaaS (*Maaseutumaas*) project (2016)	- The MaaS concept has strong origins in Finland and already plays a key role in the national transport policy. - Finland is adopting a national level approach to the development of MaaS. - The development of the *Transport Code* has helped to place Finland at the forefront of MaaS. - The 4P (Public-Private-People Partnership) approach focuses on the needs of the local communities. - Looked beyond passenger travel, such as freight and services.
	Kyyti – combining subsidised and fee-paying trips	- ICT and mobile apps can help coordinate subsidised travel and reduce transport costs for everyone. - Requires new regulations and frameworks to reduce silos in transport provision that allows for trip aggregation and cost savings.
Denmark	*MinRejseplan* journey planner	- Extension from existing journey planner and payment systems. - Getting different TSPs to join the system is paramount. - Importance of DRT services for low density areas and regional services. - Integration with the national *FlexDanmark* booking and dispatch coordination system.
	FlexDanmark DRT coordination and planning centre	- A national hub serving as the IT backend and call centre for DRT services in Denmark's five major regional transport authorities. - Similar to *Kyyti*, subsidised trips can be grouped with fee-paying trips to archive cost savings. - Strong focus of efficiency and IT solutions to match passenger by their time and location under five major "Flex" services. - With economies of scale, the Danish social DRT service is taxpayer funded, and it does not rely on volunteer drivers.
Japan	National MaaS policy by the Ministry of Land, Infrastructure, Transport and Tourism	- Demarcated the role of metropolitan, regional and rural MaaS and a special category of tourism. - A nationally consistent approach and standardised backend that works with existing payment systems while acknowledging local needs and differences. - Encourage local prefectures to experiment with MaaS trials.
	Sasaeai Kotsu, Tango Peninsula, Kyoto	- An NGO run service that uses Uber technology to provide taxi-like services in a rural township with declining population. - Operations are regulated under national legislation with a focus on supporting rural communities for its transport needs, and also to serve incoming tourists.

	Myroute, Fukuoka	• A large number of collaborating partners, and is developed by Toyota after the first-hand experience of partnering with Whim in Finland to provide car-share and rental services. • On top of transport modes (rail, bus, car sharing, bike hire and walking), it also offers guides for attraction and discounts bundles for dining and shopping. • Strong focus on tourism information.
USA	GoLink by DART, Dallas	• An example of Mobility on Demand (US MaaS definition) service that won an US Federal Sandbox Grant. • Offers DRT services in lower density suburban areas in Dallas. • Intermodal integration (bus and Uber) and with monthly pass packages. • Service to be expanded as indicated in the recent bus reform plan, to meet efficiency (ridership) and coverage needs.
	Winnebago Catch-a-Ride, Wisconsin	• A social oriented DRT service in a rural township in Wisconsin where Uber does not enter due to low population. • A mix of volunteer and paid drivers and passengers connected by a ridehailing platform provided by Feonix and Qryde. • Strong focus on providing access to employment with funding support by local and state economic development agencies.

Though this is a rapidly developing field, there are both place/region-based MaaS models and more targeted MaaS options focused just on key employers or tourism that can be harnessed in the Queensland context. Unfortunately, no off-the-shelf MaaS 'solutions' that can be copied across directly into Queensland are readily available. Significant thought will be needed into where and how any MaaS initiatives could be developed in Queensland, to tailor MaaS to our local conditions. The next sections of this report attempt to answer these questions by documenting the outcomes of research undertaken with stakeholders in three key Queensland regions.

3. Assessment of MaaS for regions in Queensland

Our review suggests MaaS is worth considering in regional Queensland. This section outlines an assessment of regional considerations based on a series of semi-structured interviews. We seek to understand "what conditions specific to Queensland's varied regional centres require consideration?"

The first starting point is to understand the Queensland context. Queensland is a vast state that is relatively decentralised, with up to 30% of the population located outside of South East Queensland (SEQ). Economic opportunities and the COVID-19 pandemic have been driving population growth in many coastal regional areas. Most of the state's population is concentrated along the Eastern coast, from Cairns to the NSW border. The Australian Bureau of Statistics (ABS) classifies cities and towns such as Bundaberg, Gladstone, Emerald, Mackay, Townsville and Cairns as regional, under their remoteness index (see Figure 10). Those areas west of Emerald, Roma and Moranbah are all classified as either remote or very remote.

Transport and Main Roads regions align with the spread of these population centres along the east coast (Figures 16 and 17).
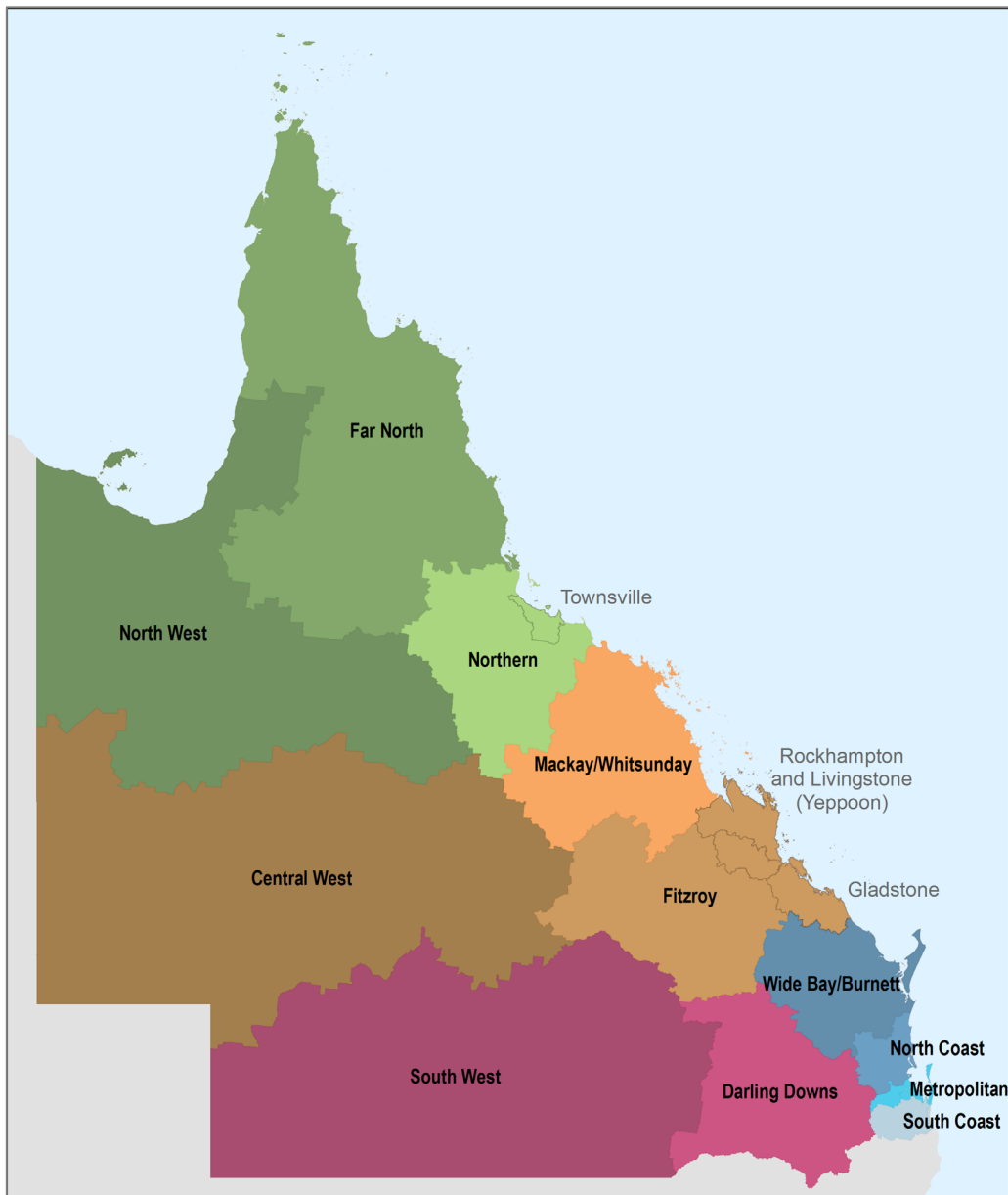
Figure 16: TMR Administrative Districts (left) and remoteness and major populated areas in Queensland.
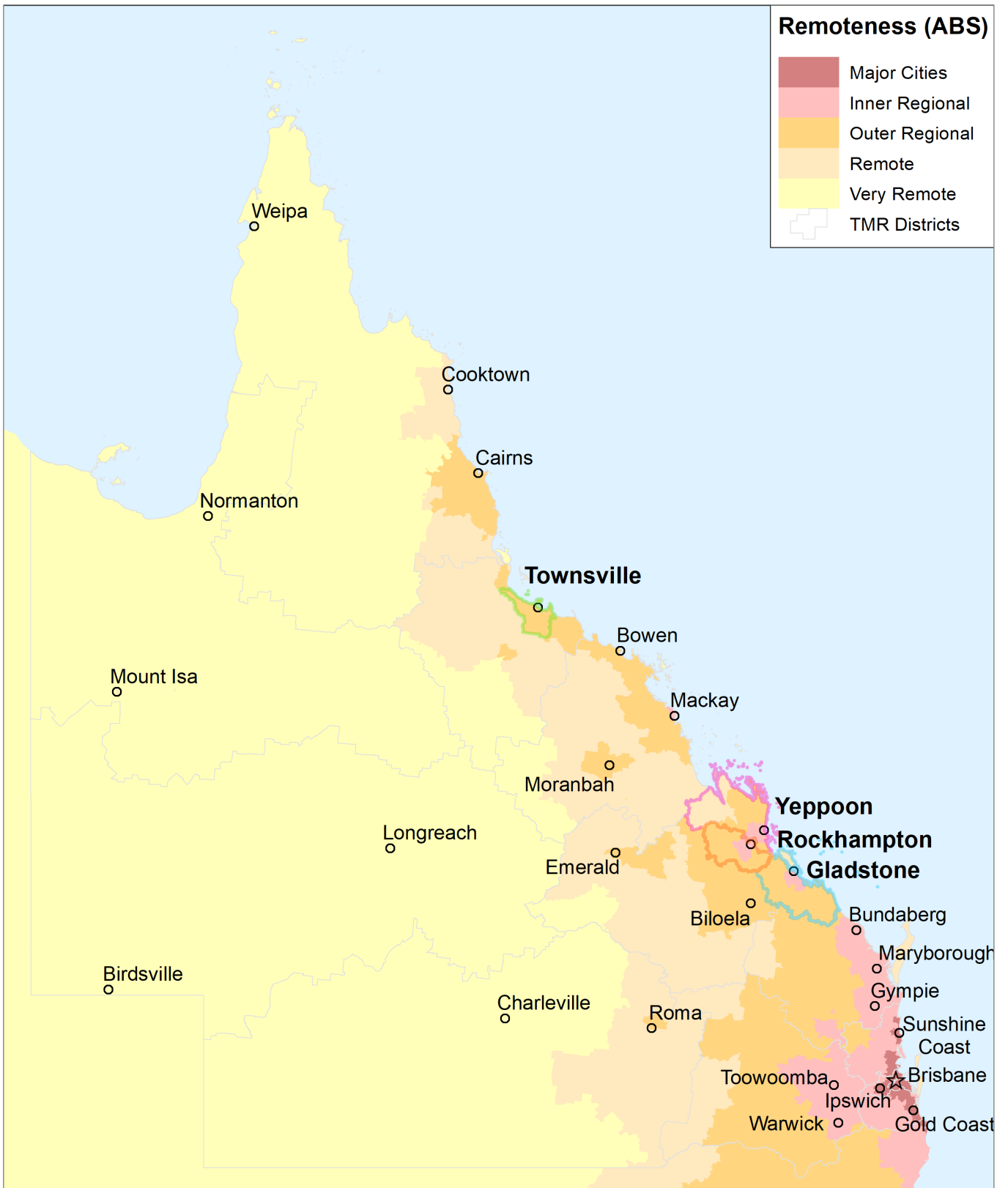
Figure 17: Remoteness of major populated areas in Queensland

3.1 Selection of the three study regions

This research sought to explore opportunities for MaaS in at least three regional cities/towns within at least two different TMR regions. In order for MaaS to be a viable option in a regional context in Queensland, there are certain conditions that must be in place. These conditions are hypothesised to be:

1.   A minimum population of 10,000 people
2.   A public transport offering (that may be improved by MaaS)
3.   A transient workforce (for example; mining workers or defence force employees) who do not necessarily require a personally owned vehicle or a second personally owned vehicle; and, or
4.   A reasonable level of demand for mobility from tourism (for example; a transient population who do not necessarily have a personally owned vehicle)

Based on these criteria, three case study sites were selected:

1.   Townsville
2.   Rockhampton (incl. Yeppoon)
3.   Gladstone

Table 6 provides the main population and travel behaviour characteristics of these regional cities.

Table 6: Key population and travel characteristics of the three study regions

	Townsville	Rockhampton (incl. Yeppoon)	Gladstone
Demographics and land use			
Population (2019, estimated)	195,032	119,590	63,412
Area	3,731 km^2	18,328 km^2	10,484 km^2
Population density	52.27 persons/km^2	6.52 persons/km^2	6.05 persons/km^2
*Travel characteristics**			
Trips per day	573,359	304,196	163,843
Average distance per trip	7.94 km	9.57 km	8.18 km
Mode Split - Commuting			
Car as driver	61.3%	59.6%	62.5%
Car as passenger	28.1%	28.3%	28.3%
Public Transport	2.7%	2.0%	2.5%
Cycling	2.1%	1.0%	1.2%
Walking	5.7%	9.1%	5.5%

*Data from 2011 Queensland Household Travel Survey

All three regional cities have a typically low population density, making it a challenge to provide high frequency public transport services. Where cycling once comprised around 6% of all journeys to work this has now fallen to 2.1% in Townsville and around 1% in Rockhampton/Yeppoon and Gladstone. Townsville is the regional area with the largest population of the three. Townsville and Rockhampton/Yeppoon both have significant tourist visitation. While the international visitations numbers were lower in 2019 (pre-Covid-19), spending per trip for domestic tourists was comparable with urban centres, especially in Townsville – this indicates regional areas can still attract tourists to spend while visiting.

3.2 Region analysis and stakeholder engagement

To understand the current transport challenges and how MaaS can be an opportunity for regional areas, stakeholder engagement was conducted for three selected study areas. To ensure richer insights, most of the engagement was done by one-on-one interviews. Due to COVID travel restrictions, nearly all of these interviews were conducted using online conferencing protocols (e.g. MS Teams or Zoom). One workshop was held with multiple participants at the request of the agency involved.

With a focus on the barriers, enablers, and future opportunities, the process of stakeholder engagement included:

- 13 guided interviews and one workshop (with 5 participants), with a total sample size of 18 participants across Townsville, Rockhampton (including Yeppoon) and Gladstone. In addition to regional Queensland stakeholders, two external experts from the New South Wales and United Kingdom respectively were interviewed. **The total sample size including external experts is 20.**
- The participants included State Government (*Translink*), local governments, various transport service providers, key transport users/destinations (e.g. universities) and transport academics/professionals who are well versed in MaaS.
- The interviews were generally of 1 hour duration.

Table 7: Participant location and types

Type of participant	Townsville	Rockhampton (incl. Yeppoon)	Gladstone	Outside Study Regions
State Government (Qld)	Translink			
Local Government(s)	Townsville City Council (Workshop)	Rockhampton Regional Council*	Gladstone Regional Council	n/a
Transport provider	Public and private transport service providers, including bus and personalised booking services (incl. on-demand transit and community transport)			
Users	n/a	University	n/a	n/a
Academic/Experts				Other Australian States (NSW) and UK

*Local government area of Yeppoon, which is under the jurisdiction of Livingstone Shire Council were unable to be interviewed after multiple requests

The interviews and the workshop (conducted between September 2020 and March 2021) explored the following key questions about MaaS:

- Understanding and definitions of MaaS
- MaaS models (in particular views about the possible model for implementation)
- Unique mobility needs in the study area regions
- Opportunities for MaaS (both for communities and transport service providers)
- Enablers and barriers to implementing MaaS in the study area regions
- Suggestions and recommendations

Interviews were recorded and partially transcribed to allow for further analysis. The transport text was interrogated and then grouped into a set of key themes. The themes were based on an extension of Lyons, Hammond and Mackay's (2019) level of MaaS integration framework, and the "Definitions of Success" they developed with TMR. Table 8 provides a summary of these themes.

Workshop participants of Townsville City Couicil were also asked to 'vote' on key items to reveal their preferences in terms of certain MaaS issues in their region using online polling technology. This allowed the research team to capture particular views in a consistent manner and report consensus views, and disparities, at a regional level.

Table 8: TMR MaaS and Mobility Assessment Framework (Adapted from Queensland Department of Transport (Forthcoming))[1]

Assessments	Layers	Definitions of success
User 'Mobility Integration'	Transactional Integration	Users are able to book, pay, and obtain 'tickets' for door-to-door multi-modal transport options through a single platform and across multiple providers.
	Informational Integration	Users are able to interrogate the availability of door-to-door mobility services, to plan door-to-door journeys and access support in journey execution through a single platform, in real time.
	Operational Integration	Public, active, and shared transport options are available and are competitive for multi-modal door-to-door journeys.
Services 'Enabling Environment'	Mobility intermediary	MaaS operators aligned with the TMR vision are active in Queensland.
	Transaction	An efficient and effective transaction model from customer through to Transport Service Provider.
	Information services	Real time multi-modal trip information and support available to all customers.
	People, culture, communications	People, culture, and communications across TMR supports the establishment of the enabling environment; industry, community and other stakeholders have confidence in this.
Supply 'Mobility Ecosystem'	Mobility services	Public, active, and shared transport options are efficient, reliable, and competitive with private vehicle travel and offer high levels of amenity.
	Infrastructure and vehicles	The transport and land use asset and infrastructure base supports and encourages public, active, and shared transport use.
	Capability and capacity	TMR has the capability and capacity to support transport system foundations which enable travel without the need to use a private vehicle; industry, community, and other stakeholders have confidence in this.

3.2.1 The perceived level of "mobility integration" for the user and the enabling environment

Most interviewed stakeholders expressed positive views about MaaS in promoting integration of transport services in the regional areas for more seamless travel. The interview participants highlighted current deficiencies of integration of transaction, information and operations.

The following sections summarise the three main integrations of MaaS, and at various levels (user, environment and ecosystems).

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[1] TMR's (Forthcoming) MaaS and Mobility Assessment Framework (co-developed with Mott McDonald) is yet to be published.

Table 9: Location assessment of <u>mobility integration</u>

Layers and definition of success:	Townsville	Rockhampton (incl. Yeppoon)	Gladstone
Transactional Integration: Users are able to book, pay, and get 'tickets' for door-to-door multi-modal transport options through a single platform and across multiple providers.	**Bus and ferry for Magnetic Island:** Return ferry and 1 day bus pass package available. **Other modes:** Transactions to allow journey booking, payment and execution are mode specific and separate.	**Most modes:** Transactions to allow journey booking, payment and execution are mode specific and separate.	**Most modes:** Transactions to allow journey booking, payment and execution are mode specific and separate.
Information Integration: Users are able to interrogate the availability of door-to-door mobility services, to plan door-to-door journeys and access support in journey execution through a single platform in real time.	**Bus and Ferry:** Translink platform allows intermodal journey planning, but without real time information. Google Transit allows for intermodal journey planning. **E-scooters:** Available devices can be seen on apps in real time. *Non-public transport modes are not visible on Google.*	**Bus:** Google Transit allows for some intermodal journey planning across the two bus companies in the region. *Non-public transport modes are not visible on Google.*	**Bus:** Google Transit allows for some intermodal journey planning across the in the region but there is only one public transport provider. *Non-public transport modes are not visible on Google.*
Operational Integration: Public, active, and shared transport options are available and competitive for multi-modal door-to door journeys.	Only the Magnetic Island bus and ferry have some operational integration.	No evidence of operational integration.	No evidence of operational integration.
Summary	Bus and ferry (Magnetic Island) attained close to Level 2, otherwise at Level 1. Other are modes at Level 0.	Bus attained Level 1. Other modes are at Level 0.	Bus attained Level 1 (but there is only one public transport operator to start with). Other modes are at Level 0.

Not all quotes obtained in the research process are included in this report. Attempts have been made to de-identify respondents where quotes are used in the following sections, as per the requirements of the Griffith University Human Research Ethics Committee.

3.2.1.1 Transactional layer

Perceived user experience by stakeholders

Currently, users in all the study regions are unable to book and pay for multimodal transport options in a single platform for most journeys, except for some specific services, such as to/from Magnetic Island.

> *"People now can already do multimodal travel, just it is over different platforms, for payment or booking." (Private transport operator)*

Many respondents expressed a strong desire to improve transaction integration through the introduction of MaaS. Indeed, when asked to vote on the key benefits of MaaS in the Townsville City Council workshop, the top ranked benefit was "seamless payment and mobility packages" (see Figure 18).
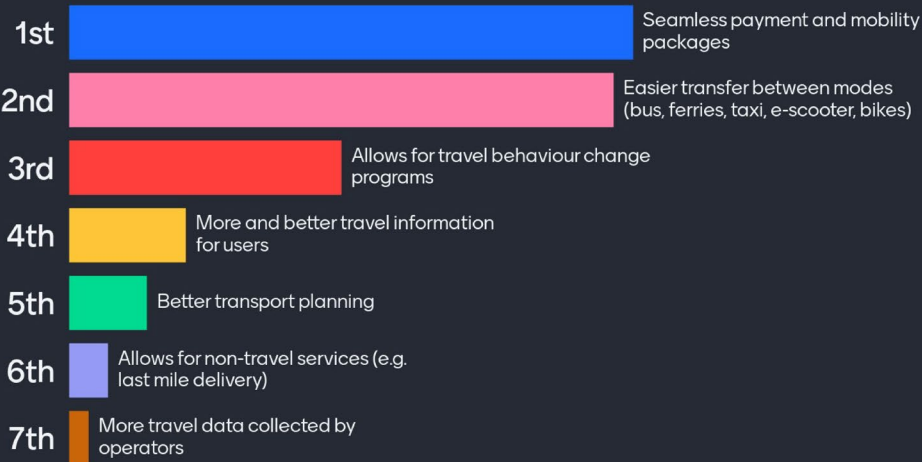
Figure 18: Screenshot of participant voting results in Townsville City Council stakeholder workshop

Enabling Environment

Participants were mostly aware of the introduction of new ticketing systems across Queensland. This next generation ticketing solution, Smart Ticketing, is to be introduced across Queensland is being trialled on the G:link light rail on the Gold Coast, some regional bus services (Bowen, Hervey Bay, Innisfail, Maryborough and Minjerribah (North Stradbroke Island) and on the Queensland Rail network in SEQ. Smart Ticketing will allow transport users to pay for transport using credit/debit cards and mobile devices (e.g. smartphones or wearable devices). Most importantly it allows for account-based payment systems, a prerequisite for full transactional integration across various modes.

Mobility Ecosystem

Go-card ticketing is currently not available in the three study areas. Stakeholders reported that visitors often expressed frustration of not being able to use it after purchasing Go-cards in SEQ. It is hoped the next generation ticketing system can allow for more payment choices and booking across various mobility services. As from the local government perspective reflecting users:

> *"…. All you can buy (in Rockhampton) now is your own individual ticket or a daily pass… I think it would be beneficial if you can have them all together…, especially if you came as a tourist." (Local government respondent)*

And from the State government perspective, new ticketing could unlock more types of services and also on-demand transit options for areas with lower density.

> *"At the moment, we generally purchase (payment machines) and pay for that bus operators. But now it is too expensive (to serve public transport), whereas when you have the next generation ticketing, you can have smaller vehicles, having an extra layer, making it cheaper to serve, such as the Logan DRT model, putting in a bunch of taxies with a bunch of Cubic DCs (new payment machines)" (State government respondent)*

It should be noted there is a privately run contactless payment card system (Easy-Travel card) in place for Young's bus services in Rockhampton since 2007. This is linked with the informational layer covered in the next sections. The card has uses beyond ticketing, as it provide automatic notification to drivers that a student patron may have travelled beyond usual school routes, as a safety precaution. The local operator hoped the future ticketing system can retain such functionality.

There are also complications about how transactions on MaaS can be operationalised across different operators and how service reliability to maintained in multimodal trips. TSPs were not yet sure how it would all work.

> *"From a commercial perspective, if someone's booked and paid for a trip and it cost him $15.00 and it's in two portions (modes); what happens if one portion of that service falls down? What happens with the commercial implications for that other provider who may have already directed resources to fill that job, which then is not actually consumed because the first leg of the journey failed to deliver to the customer. So how does that work?" (Private transport service provider)*

There are a range of technical options to resolve such issues. But there would clearly need to be significant stakeholder engagement and learning in the development of a MaaS option in regional Queensland, and work to resolve these detailed issues. One such solution for this particular problem was suggested by a non-Queensland expert:

> *(For missing legs) "I think it needs to be a sort of service level agreement or minimum service guarantee, so that if an end user gets into a mode and it is not delivered, say it is a capacity shortfall or just network unreliability, then the user should be cascaded up to a higher ranked mode on that hierarchy that would transfer the passenger (to the intended destination). It could be like an insurance, like how much you pay determines the level of minimum service guaranteed" (MaaS and public transport expert)*

3.2.1.2 Informational layer

Transport information includes services (routes, hours of services, frequencies, etc.), pricing/fares and eligibility. The informational layer is therefore essential to the success of MaaS.

Perceived user experience

Currently, the transport service provider is the main location where transport information is disseminated in the three regions. Most information provided is mode specific and disjointed.

For public transport with GTFS, Google Transit provides some form of Level 1 intermodal integration. In conjunction with the recent completion of the Townsville City bus hub, Translink branded services, and website information are being rolled out there.

For non-public transport, the service providers own channel remains the place for users to obtain fares or service information. Better information integration, especially from the private TSPs, is seen as an important element for improving services.

> *"How do we encourage the private operators to be in it (MaaS)? If it ends up just like the Translink journey planners - there just only us and the ferries on it, there (MaaS) is not much difference than what you currently got." (Public transport service provider)*

Enabling Environment

The role of government as the MaaS broker will to be set up protocols of transport data standards that allow for common information sharing between operators. Also, the amount of the information needed to be shared needs to be specified. This needs to be more than static information (e.g. pre-trip), but also real-time updates while a passenger is en route.

> *"If we want people to use (MaaS), the customer is going to have a little certainty and reliability that if they if they book and pay for multimodal journey, that is mechanisms in place that have one leg that journey was disrupted or changed. There's some natural flow on update that would then reconfigure that journey. So what I'm saying is if I catch a scooter and a bus and then a ride share at the end and if the bus is late for whatever reason. That my book rideshare should need to be automatically updated so that I don't have to keep on updating my trip and journey based on one segment or one mode not delivering on its on its promises. This is why it is complex" (Private transport service provider)*

While significant work needs to be done to ensure the reliability of information, it is likely to be a technological issue and it could be overcome with the right policy and planning.

> *"There's just a lot of technological integration works that would be achieved as well, such as the payment integration, trip planning again, and reliability that the feeds of information are correct, and in the way they interact with each other for multimodal journeys. Again, none of these are insurmountable, each one just needs to be attached and worked through." (Private transport service provider)*

Mobility Ecosystem

Next generation ticket systems will also enable infrastructure and vehicles that allow for real time information (e.g. GPS tracking and sensors)

> *"Townsville is such a hot place, you want to know if you walk out in 10 minutes, the bus is going to be there. You don't want to be sitting in the heat and rather be inside. (You need a GPS tracker?) Yes, that would be part of the ticket machine and will be rolled out a part of the next gen ticketing." (Public transport service provider)*

Further from the transport information, the information of assets used by various operators in the mobility ecosystems can also assist more efficient use of transport resources.

> *"One thing is just better and the ability to coordinate different assets to use it in a way that is available to people, not only the physical availability, but the informational availability as well. So if we can do that through MaaS and other integration initiatives and organising integration if you can pull different community assets together. I think a one-stop-shop kind of manner. "The whole will be more than the sum of its parts". You can enhance the service offering to a lot of people." (MaaS and public transport expert)*

Finally, there was no preference across stakeholders on whether it would be better to have "one MaaS application for whole state" or multiple local apps, as long as the app is functional, or there is a common backend that supports the transaction across different MaaS applications.

> *"It think it should be same app for each city in Queensland but you have to be aware with where you rolled it out. (You) need to do a lot of market testing with the app, pricing, how would people use it – even if it is a same price now but all in one place. And would you use it if it is a subscription model, etc." (Public transport service provider)*

> *"I personally think the back-end definitely has to be one constant. But maybe from a marketing point of view, you might want to be a bit gimmicky, and have a certain name for the app that a bit associated with the local town. But I know that one of the big whinges from people traveling on urban buses in Gladstone is they can't use their GoCards that they brought up from Brisbane. So you get a lot of retirees who catch the train up and want to travel around. There needs to be compatibility, and I think that's at the back end … ultimately, the simplest is going to be consistent" (Public transport service provider)*

There are concerns about the possibility of selective information being shown by future MaaS intermediaries.

> *"If you look at the Uber situation in NSW and elsewhere in Australia with ingesting public transport information, so that people in the Uber app can also see what public transport options there are to make better connections with Uber and their public transport. If you keep on playing that out. If that the likes of Uber could continue to choose who came into their platform, that could create a market dominant situation and then they could have computed attention where they would only let those that play by their rules or integrating the commercial terms actually be in it. And if that got a critical mass, that might prevent other players and other innovations from actually being available to people. Because you (have) created a monopoly." (Private transport service provider)*

"Brokers seems to want people to use ridehail or car-share because it is more lucrative for them – and give more incentives to use personalised modes that are more or less sustainable. Not an issue when MaaS is niche but could be a problem when MaaS has scale." (MaaS and public transport expert)

This is particularly an issue if a MaaS actor became a large player with anti-competitive behaviour. Further discussion of the role of government in ensuring a level playing field is offered in the next section.

3.2.1.3 Operational layer

Perceived user experience

Currently the dominant way to travel in the regions is by private vehicle. There is also a strong car culture and public transport are often unable to provide services that can compete with private vehicles.

"There's a car dependency in regional areas and then once somebody has made the investment into a vehicle, it's very difficult to convince them to leave that for what is a poor public transport option or any other options" (Private transport service provider)

The level of modes available varies in the three regions studied. The current transport offerings in the study regions are summarised in Table 10. As summarised earlier in Table 9, the level integration that allows for multi-modal travel is limited.

Table 10: Transport offerings available to users in the study areas

	Townsville	Rockhampton (incl. Yeppoon)	Gladstone
Bus	*Sunbus (Townsville)* 14 routes 10 fare rates 15 fare zones	*Sunbus (Rockhampton)* 9 routes (3 fare zones) *Young's bus* 10 routes (8 fare rates, 17 fare zones)	*CDC (Gladstone)* 8 routes 4 fare rates 5 fare zones (No weekend/ public holiday services)
Personalised travel (taxi or ride-booking)	Taxi: *13 Cabs* Ride booking *Uber* *Didi* *Ola* *Shebah* DRT (proposed)	Taxi: *13 Cabs* Ride booking: *Uber* *Didi* *Shebah*	Taxi: *13 Cabs* Ride booking: *Uber* *Didi* *Shebah*
Ferry	*Sealink –* Magnetic Island and Palm Island	*Freedom Fast Cats –* Great Keppel Island	*Sealink -* Curtis Island *Curtis Ferry -* Curtis and Facing Islands
Micromobility	E-scooters *Neuron and Beam*	E-scooters N/A (Council has been approached)	E-scooters N/A
Community Transport (examples)	- *St Johns* - *TransitCare*	- *Aboriginal & Islander Rockhampton Community Transport Central QLD* - *CentacareCQ Community Transport Central QLD*	- *Gladstone Aboriginal and Islander Community Transport Central QLD*
Rail (QR)	*Spirit of Qld.* (Brisbane – Gladstone – Rockhampton – Townsville – Cairns (coastal))		
	The Inlander (Townsville – Mt. Isa (inland))	*Tilt Train* (Brisbane – Gladstone – Rockhampton (coastal)) *Spirit of the Outback* (Brisbane – Gladstone – Rockhampton – Longreach (inland))	
Air	*Townsville Airport* (8 airlines, 11 destinations	*Rockhampton Airport* (2 airlines, 5 destinations)	*Gladstone Airport* (2 airline, 1 destinations)

Townsville being a larger centre offers more options than others. However, there is no real integration between modes for seamless multi-modal travel. While an introduction of a MaaS platform is important, the backbone of MaaS remains the services themselves:

It doesn't matter that we're going to put them in this cool app and make them able to be booked from one platform. There's still rubbish services. Make sure that when you launch MaaS you launch it with quality transport options that people will actually want to use. Otherwise you're going to get really not helpful feedback not because the MaaS app is rubbish, but because the solutions are." (Private transport service provider)

"Once MaaS is happening, bus services need to be increased." (Public transport service provider)

Due to smaller settlement size, trips in regional cities are often short distances, which may present a good opportunity to replace car-based trips with active transport or micromobility.

"Additionally if we're talking about a lot of micromobility or the modes that are coming online, regional areas, I can see you know within these townships. Firstly, like 60% of all trips are 5 miles or less…there's only a few arterials pretty much all travel you do can be done by non-motorized modes, or at least not lugging a ton of metal going around in a single occupancy vehicle. There's a lot of opportunity just because of the much shorter spatial distances." (MaaS and public transport expert)

PT is a bit hard, but we are trying to work in that space to increase at least more on walking and cycling (active transport) side of things to increase mode use and patronage in those areas. A lot of potential in short trips that can be taken up, instead of private vehicles in the network." (Local government respondent, Rockhampton)

Most of the respondents agreed that MaaS could open the possibility for door-to-door service done by on-demand services using smaller vehicles than could be competitive to private car ownership. The question is how to make it happen, and who to perform this role.

Well, obviously to provide this service you want to be reimbursed for. And that's where I guess in regional centres on demand gets a bit interesting because you don't have the high density housing. And let's be honest, on-demand buses in country areas are probably borderline taxis, but in saying that, whilst I'm obviously a bus operator and we want to naturally grow like any other operator. You've got to ask the question in a regional area: Should taxis be trying to grown into MaaS more than buses grown into MaaS?" (Public transport service provider)

As NSW has started on-demand services in regional areas already, perhaps some guidance in their experience can be offered to Queensland.

"Many of the operators (of on-demand) don't believe it will work. They just do it so they can win the next contract. Still there was a lot of effort (of the government) to talk with different operators, e.g. BtoC businesses, to help with providing tech and interface. But there were many issues regarding branding – bus operators now only run contracts with little actual control, branding is the only thing they got these days. The government sets all the schedules and plans. Some even have government livery and interchanges. So on-demand is important for them (bus operators) to stand out. However, bus operators tend to feel like the market is fixed, a captive market that you go and serve and there is nothing else. All they think about is doing some maths, cutting your margin to win government contracts. It is only about to deal with the that fixed, say 20% public transport ridership, not to think how to get the other 80% who are in cars or other modes. This is why innovation in the bus sector has been lacking. But there are also smaller players who wanted to do innovative things but not limited by current contracts." (MaaS and public transport expert)

Enabling Environment

On top of the previous summarised transactional and informational layer, it is evident that how the market is set up will play an important role in MaaS enabling competition in the operational layer. Transport service providers will also need to adjust their operations in the new MaaS transport marketplace. People, culture, and communication will play a main role in this regard, and these are manifested by transport policy and planning. A key roadblock is how transport contracts are being drawn, and how transport is being financed. Throughout the interviews, there is a recurring theme of the current transport situation in Queensland, and especially in regions, existing in "silos" and with a culture of "turf mentality", which significantly contribute towards the current disjointed mobility supply environment.

> *"The market operates in silos – the different modes "do not talk to each other, MaaS forces people (operators) to think about the consumer – it starts to think about what actually starts to shape thinking around the way that consumers see service and start to think about whole of journey solutions for consumers." (Private transport services provider)*

> *"I believe in the regions we are guilty of probably having the silo effect in that you've got normal school buses, special school buses, community buses, nursing home buses, taxis….. know it's not that simple and you're talking different transport providers, different companies. You just have to wonder, is it possible to throw them all into the mix and get a better level of service?" (Public transport services provider)*

> *Each of them (the various personalised booked modes) is very, very protective of their own turf … I think there's always gonna be some fender rubbing when you start talking with other players within the industry because they want to protect their turf. And some of these institutions have been around for a long time and have made a lot of money, so it is natural to be defensive about it" (Community transport service provider)*

The nature of subsidised transport might be contributing to the lack of service integration and overlapping of services. Profit-seeking nature of transport are also an issue to impediments inter-modal integration.

> *"The way to run and fund public transport, it is subsidised and many operators run in silos – government select winners – it is often decided that big buses on fixed routes are worthy of taxpayer subsidy even if their farebox recovery is only around 20%. And anyone else has to fend for themselves and do things in a more on-demand fashion, or less costly and less labour-intensive, such as micromobility. Maybe there is a need to change how we fund transport. For example, multimodal, mode-agnostic contracts so operators can decide how to deliver MaaS and so they have more incentive to integrate." (MaaS and public transport expert)*

However, subsidises may also be a necessity in public transport

> *"Subsidies distort markets, but the bus which takes feeder customers won't exist without subsidies" (Rockhampton user group).*

The MaaS vision of TMR is to adopt an open ecosystem approach to MaaS – various services are complementary to each other rather than competitive. A fine balance is also needed on how to induce healthy competition surrounding service quality instead of monopolistic behaviour. There are concerns regarding the role of transport subsidies and their role when future transport systems progress to MaaS.

Mobility Ecosystem

Service Delivery

As the coordinating agency, TMR will have to continue to play an important role to define each mode's purpose based on their strengths and a "public transport as backbone" type of MaaS may justify changing subsides to

reduce congestion. Currently *Translink* develops and specifies the contract of public transport and taxi services. There regional conditions offer both opportunities and challenges:

> *"You need a system-wide approach. In my opinion, you want input from all the stakeholders and all the actors, but I don't believe it can necessarily be operator-led and I don't necessarily think it can be industry lead - I mean bus versus taxi versus e-bikes or whatever. It makes it easier in regional centres because you probably have less actors and you have less bus companies." (State government respondent)*

Most respondents agree competition will bring positive effects and benefit users. However, there is also a need to promote collaboration between actors in order to achieve better efficiency and sustainability.

> *"Operators do have a profit motive, sometimes competition that reduces incentive for collaboration. We need to draw contracts that enable cooperation rather than competition." (State government respondent)*

The challenge for MaaS is how to introduce multimodal cooperation and more players. Currently some less conventional transport providers are feeling excluded.

> *"MaaS would benefit us if we were to become integrated into the entire public transport network .. because there's an awful lot of assets that are sitting around that are not deployed that are just chewing up organisation's money….. aggregate services to make best use of vehicles and save cost of clients." (Community Transport service provider)*

But with more actors and the need for cooperation, it may complicate how transport service contracts and regulations are being drawn.

> *"I think the government's role is to facilitate and encourage the right outcomes and lead the way… But how do you create an environment and ecosystem where there's some fair play opportunities for those that can get across? Maybe some reliability in commercial hurdles to actually be part of an ecosystem and have that facilitated? Getting it right is inherently complex and cut a lot of aspects of commercial, legal, competition law, what (is) the government's regulations, etc." (Private transport service provider)*

Ideally speaking, MaaS could "grow the pie", drawing new users away from driving their own cars and onto transit. However, in practice this may not be easy to realise and commercial viability remains a concern for transport service providers.

> *"I think in the case of MaaS, if the substantive part of the journey is going to occur on a mass transit vehicle, so they do the heavy lifting as it were, and they do the large kilometres and we're talking about things like taxis, Ubers, scooters, bike shares to do the last kilometre. Where the government historically has paid for a subsidy to those bus rides? Then what does it do with the last kilometre now?" (Private transport operator)*

The issue of subsides and contract drawing appears to be a stumbling block for MaaS in the operational integration layer. Current contracts are likely inhibiting transport competition in some areas – while it does not specify exclusivity, in some ways it is designed to provide a certain level of opportunity and commercial viability to service providers. Changes in contract of service provisions causes disruption to the transport sector. This warrants further collaboration and consultation with all parties, delivery partners, local governments, stakeholders, and community. This is a very sensitive area than needs careful planning. What happened in personalised booking transport reform serves a lesson.

> *We do not want to see a repeat of the Uber situation – the way deregulation was led was disruptive – while there was public support to deregulate, a perception that Uber offers better service or being innovative, but it is at the expense of those (taxies) who pay a lot of money to meet those rules and to make a profit. There was a perception of guaranteed investment but at the end it is not. The government set the rules, they abided them but got punished for it." (State government respondent)*

Infrastructure and vehicles

In addition to contract and service design, physical infrastructure and vehicles may also affect operational integration. While there may not be a shortfall of service vehicles in regional areas, infrastructure suitable for multimodal transfers are lacking and this is contributing to car use.

> *"If you build more infrastructure, destination infrastructure in and around and above nodal points, like train stations, then if you live near a train station on the same network, catching a train is actually potentially going to be better, easier, cheaper, and faster than driving yourself. At the moment, though, you know we have too many journeys where that's not the case and consequently people enjoy the joy, the freedom of a private motor vehicle"* (Private transport service provider)

In some cases , the lack of infrastructure is due to funding issues. This could also be lack of policy guidance and forward planning, especially in newly developed Priority Development Areas (PDAs). Funding from government is limited and new sources, such as private infrastructure contribution, should be explored.

> *"Council is more caught between the two, (we are) a bit of a stakeholder and infrastructure owner. We provide the infrastructure and education aspect, to highlight to people that there are other options, provide info (to the residents) … But the Council is limited in their ability to provide of lot of this infrastructure. There is a significant budget constraint. Also there is low or no current demand, hard to justify "build it and they will come". Needs to check on the priority of infrastructure spending. We tend to spend on what is being used the most and it does not always favour PT/active [transport]. Although councillors started to see the benefits of funding alternative infrastructure. Can private transport providers or State help in funding? SEQ seems to have more guidance on infrastructure funding arrangements."* (Local government respondent, Rockhampton)

New infrastructure designs for multimodal interchanges are also needed.

> *"For future infrastructure, it must be able to accommodate MaaS options – not just a single mode – should be multimodal, and we explore need ways to fund infrastructure, such as transport levy"* (State government respondent).

There are also concerns about the fit of purpose and suitability in local conditions when planning for new infrastructure.

> *"We worry about spending money for big ticket items with little effectiveness. It needs to be the right infrastructure and be fit for purpose – and that can encourage people to change travel behaviour … SEQ's view tends to be focused on commuter cyclists – the proposed Principal Cycle Network (in Townsville) are along railway without shade and it is hostile, it has very close distances from active trains. This is top-down thinking that drives network development despite objections from the regions"* (Local government respondent, Townsville)

Finally, there are concerns about unexpected new problems might arise from the development of MaaS.

> *"We are also concerned also on what impact MaaS will have on our infrastructure, say roads, footpaths. There might be higher demand so we have to investment more in those networks. Maybe more e-scooters then more expectations to improve footpaths but a lot of people are still using private vehicles. The in-between period might make it difficult for us. Political pressure of stopping road funding all in a sudden. This depends on the ability to get our elected members around to get them on board for MaaS and its arrangements. Having evidence to show how many people are using current service and how MaaS can change that."* (Local government respondent, Rockhampton)

There are many concerns about infrastructure and travel concerns in the operational layer, which are summarised in Table 11.

Table 11: Summary of specific issues in the regional study areas

Mode	Common	Townsville	Rockhampton (incl. Yeppoon)	Gladstone
Private vehicles	Car culture in regional areas	"Double car ownership" observed (having two cars, one for the island and one for mainland).	Drive-in, drive-out jobs in the mines may promote car use.	Many are working in odd hours.
Ferries	n/a	Magnetic Island route is well patronised.	n/a Plays some tourism role but it is not integrated.	
Bus	New development infrastructure issues for bus stops, esp. PDA no specific funding requirements for PT, only high level statements Large buses do not suit cul-de-sacs Bus stops and transfer facilities not in the right location and lack of funding Uncertainty on how school bus service contracts be integrated to MaaS	Townsville has a semi-subsidised funding model – some are from farebox and the rest by contract payment with a cap and collar mechanism – It is a complicated arrangement and MaaS might make it more complicated.	No bus services on Sunday, half day services in Saturday due to trading hours restrictions.	Does not have a transit hub. The closest one is Stockland Shopping Centre. Bus services "Fails the old lady test" – old lady sees the bus comes along but does not know how to catch it. "Set-down" only services in some suburbs (destination on-demand). Lack of bus stop infrastructure due to competing priorities .
Personalised booking services (taxi, DRT or community transport)	DRT offers more direct network, less walking/waiting unlike PT. Taxi/ridehailing to cater for more flexibility while DRT does more limited flexibility. Cater for special needs (e.g. wheelchair users).		Limited ridehailing due to lack of drivers, often no drivers matched.	
Autonomous vehicles	Unsure how CAV will work in regions, e.g. cost of new infrastructure but there were discussions about it. .			
Cycling and e-mobility	Climate issues (heat and humidity).	Lack of safe and dedicated pathways for e-scooters. Removal of roads for bike lanes not politically possible (TCC). Principle Cycling Network needs better consideration of local conditions. Education for safety needed for e-scooter user (must follow road rules).	Old part of city has wide corridors road reserves, some are like 40m wide, maybe there are avenues to put infrastructure on these roads that could support e-scooters or cycling (RCC). Currently doing a walking and cycling strategy for the region. Active travel network needs to be comfortable, needs to have shade, end of trip facilities (RCC).	Lack of active travel provisions.

3.2.2 Specific regional transport issues and needs

While there is overall agreement among the respondents that MaaS will likely help improve overall transport services, there are specific concerns for certain users. This section summarises four type of users that may require special attention in the development of MaaS.

3.2.2.1 Social function of transport

Social benefits of MaaS are still highly uncertain as many people do not have bank accounts and may be digitally-illiterate with smartphones and different applications (Pangbourne et al., 2020). Overseas examples such as

FlexDanmark in European and the Japanese MaaS development offer some guidance, but local contexts still needs to be considered. Several respondents observed the more tight-knit communites in many regional areas. People tend to know each other in the same place and are "bus buddies". The human interaction offered in public or community transport play an important role in the health and wellbeing of the passenger. Future introduction of MaaS, and regulation needs to ensure how these social functions be maintained or even improved.

> *"Public transport is a basic social responsibility. I do not expect that MaaS may suddenly transform services into massively productive routes – it is going to help, but I do not think it is going to be that transformative" (State government respondent)*

Currently, community transport depends on charity or government funding grants that have limited security or longevity. In some cases, there is lack of public knowledge about these services, and the eligibility for these services can be limited. NDIS services are also constrained only to those who are unable to access public transport.

There are also concerns of certain segments in the society, such as the less technologically savvy, are less likely to fully utilise MaaS.

> *"MaaS would present no advantage to a cohort of older people – MaaS is under the premise that they've got access to the internet or smartphone and they're happy to use that and place bookings via apps whilst the technology has been around for quite a while" (Community transport service provider)*

Most respondents agree some form of legacy options (e.g. phone, SMS, printed flyers) will need to be provided for the booking and marketing of MaaS services.

> *"(The issue of) ageing population, using apps, call vehicles, and pay cashless, these could be tricky. Anecdotally, older people seem to struggle more with QR code sign-ins (COVID contact tracing). Maybe it could be resolved over time when they got used (to it), or the providers, or their grandkids to help them. Maybe something like a phone to get them phased through." (Local government respondent, Rockhampton).*

3.2.2.2 Tourism

Most respondents agree tourists could be an important market for MaaS and it helps to resolve transport issues during peak tourism seasons, with overcrowding of services, and also better airport connections. Tourism specific applications can also be developed to offer multilingual support, attraction, dining, or accommodation recommendations, which can help disperse tourists to more local destinations.

> *"I think (MaaS) could really assist with people who are coming here from overseas, or even from interstate. If they don't have a car, MaaS can definitely assist them in getting around, beyond the public transport network, taxis and rideshare. Maybe there could be a tourism kind of private services, or airport shuttle that could be part of that same ecosystem and (users) without going on Google to looking up every transport provider in the region and not sure what's out there. I think a big benefit of MaaS is that it will reduce the transfer penalty on the information side and also the connection side. Potentially, if you can get other operators on board, they can provide the services." (State government respondent)*

The potential tourist MaaS markets identified by the respondents are:

- Townsville: Magnetic island and proximity to Great Barrier Reef, with younger and international backpackers.
- Rockhampton: Yeppoon: In 2019 the tourism growth was up to 17% and was driven by intrastate visitors. For now Rockhampton region tends to draw older age groups and they tend to prefer point-to-point or car rental modes.

- Gladstone: Tannum Sands and Agnes Water are some of the tourism offerings in the region.

Comparatively speaking, Townsville is the largest tourist destination for the three regions compared, but still dwarfed by Gold Coast or Cairns (Table 12).

Table 12: Key demographic and tourism statistics of the case study areas

	Regional Study Areas			Comparative Urban Region
	Townsville	**Rockhampton (incl. Yeppoon)**	**Gladstone**	Gold Coast
Number of tourism businesses	1,658	1,043	491	8,960
Visitations per year ('000)				
International	125	66	55	1,037
Domestic (overnight)	952	745	476	3,730
Domestic (day)	1,069	1,105	441	7,456
Total	*2,146*	*1,916*	*972*	*12,224*
Spending per trip ($)				
International	616.00	363.64	363.64	1,232.52
Domestic (overnight)	760.50	542.28	495.80	870.99
Domestic (day)	138.45	150.23	113.38	102.06

(Tourism data from Tourism Research Australia, Local Government Area Profiles 2019)

3.2.2.3 Corporate MaaS

Townsville, Rockhampton, and Gladstone have unique employment structures in industrial, tourism, mining, and defence sectors. "White collar" employee MaaS solutions have been offered by some MaaS operators dedicated for corporate users to manage their employees' travel. An example in Australia is Skedgo's MaaS solution for Optus "GoOptus" app. The app integrates the company's own bus services with public transport, which was useful to connect its Macquarie Park offices before Sydney Metro was complete. But in these regional cities is likely that a more "blue collar" employee MaaS solution would be more appropriate. The *Winnebago Catch-a-Ride* MaaS solution is a distinctly blue-collar MaaS solution developed to meet local challenges in rural Wisconsin, in getting workers to the major employers in these counties. With a much greater focus on regional economic development and on provision of an essential social service for low-SES households, a similar type of MaaS partnership could potentially be developed in a place like Gladstone.
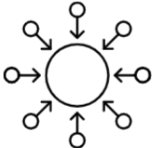
> *"A lot of them (industry employers in Gladstone) do have their own bus services to do it. So they don't have to provide mass parking on their site. They would shuttle people in from the various regions to the terminals that they were working at. And they incentivised their employees so if they did get knocked off early it is all financially paid to them if they took the bus as opposed to driving their own cars." (Local government respondent, Gladstone)*

Stakeholders in both Gladstone and Rockhampton suggest there has been corporate organised travel operating previously, as many of large employers operate odd shift hours, further suggesting a market opportunity for this form of MaaS.

3.3 The key barriers and enablers

Based on the research and stakeholder engagement, the following key learnings can be summarised. Key barriers and opportunities are summarised below, followed by a set of potential solutions.

Table 13: Detailed summary of barriers, enablers and potential solutions for MaaS uptake in Gladstone, Rockhampton and Townsville

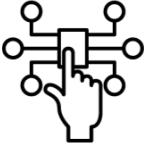| Themes	Key Barriers	Key Enablers	Potential Solutions/Actions
Land use and transport integration	• More sparsely populated areas with a lack of economies of scale for mobility services and infrastructure. • Industrial and agricultural work often require vehicles to carry tools or equipment. • Large-scale, out of town, car-centric shopping centres reduce the need of travel to traditional town centres. • Strong car ownership and driving culture (many have grown up with the car and are not used to alternative modes). • Parking is easy and often free; there is a lack of congestion to discourage driving.	• Some local bus routes or ferry services are relatively well patronised, with opportunities to develop connections to these services. • Tourism and corporate travel demands exist that are suitable for MaaS offerings. • High car ownership in the regions may also be an untapped opportunity. This implies the potential for people to drive ride-hire trips, including for employment-centred MaaS services targeting those without private transport options. • Localised congestion during peak hours may help promote non-car travel.	• MaaS centric land use and transport policies such as multimodal transfer hubs needs to be earmarked and provided for. • Better infrastructure for non-car modes (e.g. busways or bikeways). • MaaS-based car sharing and car pooling as alternative to parking and driving.
Infrastructure and planning	• Infrastructure priorities are often road focused. • Some areas with rapid growth have urgent transport needs. Priority Development Areas (PDAs) lack PT provision and funding for infrastructure. • Sometimes there is a perception of misaligned interests between local and state policy development. • Public transport offerings are limited and with concerns of public safety (especially in Townsville). • Bus services tends to be coverage focused. High frequency services are not generally available. • Shortfall of infrastructure for modes other than private vehicle (e.g. bus stops, low-risk scooter/cycling infrastructure). • (Rockhampton) Multiple local government areas (i.e. Rockhampton and Livingstone), which requires better coordination. • Limited local funding for bus stops, some bus services are hail and ride based (Gladstone).	• Strategic plans are in place with clear directions and intent to develop MaaS (e.g. Queensland Transport Strategy, regional plans (Northern or Fitzroy). • Some local governments have (or are developing) transport plans that are supportive of multimodal travel (e.g. Townsville Integrated Transport Plan and the Rockhampton Cycling and Walking Strategy). • The current political climate encourages regional development and funding of regional services. • New bus hub opened 2019 (Townsville). • There are already key commitments to improving public transport and other sustainable transport options in the regions, such as the commitment to deliver a DRT service in Townsville under the City Deal, and the willingness to allow e-scooters on Townsville streets, that would be assisted by MaaS.	• Ensure new MaaS-related initiatives are specified and planned for in upcoming policy revision and developments. • Commence DRT trials alongside MaaS. • Encourage governments at various level to participate in MaaS development across their jurisdictions. • Consider intermodal interchanges with MaaS information and connectivity.
TSP ecosystem	• "Silos" and a "turf mentality" exist across both public transport policy and where transport service providers overlap. • Public transport and taxi contracts are limiting and not very flexible, and tend to discourage competition. • Public transport is already highly subsidised. • Concerns about potential regulatory changes. • Concerns on whether there will be a level playing field – e.g. some large operators will form a more exclusive and private MaaS ecosystem or limit intermodal information being shown in their own interfaces.	• Most transport service providers in the regions are supportive of MaaS concept. • Personal ridebooking or on demand TSPs expressed interest to provide first/last connections in a future MaaS setting. • Current Translink journey planner app/platform (only in Townsville at this moment) can be a starting point for MaaS interface development. • This may allow opportunities to provide locally run DRT services supported by MaaS. • (Townsville) Some intermodal integration already exists (e.g. bus and ferry package for Magnetic Island). Relatively good bus and ferry timetable matching.	• Encourage operators to join into MaaS and integrate services on MaaS platforms. • Optimise services and avoid service duplication. • Using MaaS to create hub and spoke services - buses to serve high frequency services at hubs, flexible on-demand services for first/last mile connection to hubs. • New regulations to specific roles and responsibilities of each transport service provider. • Create a regional MaaS consortium or alliance to steer MaaS development

	• Some multinational ride hailing operators have low driver sign up rates and operations in the regions. • (Rockhampton) Two bus companies exist with boundary restrictions for cross service contract area services. • (Gladstone) Lowest urban bus capacity amongst the three study areas and lacks weekend and public holiday services.	• (Rockhampton) Bus services considered efficient and operators strive for service optimisation. • (Gladstone) Orbital route is relatively well patronised.	with representation of transport service providers, users, local governments, major trip attractors (e.g. universities). • Development of new standards for intermodal MaaS hubs with consideration of local needs and context. • Conflict resolution mechanisms for service provision issues between MaaS operators, brokers and transport service providers.
Transaction	• No GoCard use currently (in Townsville, Rockhampton and Gladstone). • (Rockhampton) Young bus uses own smartcard (easy-travel Fare Card). • Some uncertainty about the reliability and cost of new MaaS related hardware and software.	• Next generation ticketing is continuing to roll out for trial in regional areas, unlocking transaction and information integration barriers.	• Development of common MaaS standards and legal requirements for data interoperability and sharing and transaction integration. • Enforce real-time travel information data collection and sharing.
Active and e-mobility travel	• Hotter and more humid weather may discourage active travel or waiting for public transport outdoors. • Localised air quality issues in industrial areas (especially in Gladstone).	• Emerging e-mobility (e.g. e-scooters) may help to make some outdoor travel less physically challenging and more comfortable in coastal Queensland. • Active travel potential can be higher than in some urban areas, due to shorter distances to local attractors in regional settlements. • E-scooter sharing services are available in Townsville and are being considered in Rockhampton.	• Explore possibilities to incorporate e-scooters (or micromobility offerings in MaaS. • Improve infrastructure design (e.g. shaded bus stops and active travel corridors) and provision at more locations.
Long distance travel	• Longer travel distances between regional settlements. • Limited frequencies of inter-city rail services are not attractive. • Some long distance services (e.g. regional air or rail) are currently subsidised and with complex contract terms. • Airport services are usually not well connected by public transit. • Could be more difficult to integrate into MaaS than local transport services.	• Intercity coaches offer long distance travel, which could be incorporated in MaaS and it could be attractive for tourists or corporate users. • Rail and air options are available in many regional cities	• Investigate the potential inclusion of long distance travel options in MaaS.
Social aspects	• Ageing population and social disadvantage in some regional localities. • Indigenous travel needs are underserviced and less well understood**. • Community transport and the NDIS are complex; there is a lack of certainty for community transport funding. • Community transport currently not considered in wider public transport policy. • NDIS services can only be offered to those who are not able to travel by public transport, which may limit MaaS uptake.	• If done right, MaaS can help address transport disadvantage and social exclusion. • Closer-knit communities in regions and social interaction opportunities for public/community transport. • Various operators exists to provide community transit in current PT service gaps with important social benefits.	• Develop mechanisms to assess social impact when planning and providing MaaS. • Include non-transport governmental departments (e.g. health, human services, indigenous peoples).

COVID-19	• COVID-19 normalised flexible working arrangements and may make work travel more irregular for certain populations.	• Some regional areas have experience strong population growth, especially post-COVID, increasing transport demand.	• Monitor and capitalise the regional growth due to COVID.
Digital readiness	• Internet blackspots exist in rural areas. • Does not have free public Wi-fi services (Gladstone). • General public are not aware of MaaS yet.	• Relatively high phone/internet ownership in regional cities, most (but not all) people are digitally ready. • Free public Wi-fi services available in 17 city locations in Townsville, CBD area in Rockhampton.	• Further improve digital connectivity. • Expansion of free public Wifi access to more areas. • User interface of MaaS needs to be very simple and intuitive to the user. • Need to use personal travel experiences to explain (e.g. one ticket to travel from A to B).
Demographic and workforce	• Transient workforce (e.g. fly-in-fly out and drive-in-drive out), especially for Rockhampton and Gladstone.	• Universities in Townsville (James Cook University) and Rockhampton (Central Queensalnd University) provide natural markets for MaaS (lack of car ownership). • Some employers already provide transport services (e.g. shuttles) for workers to travel to workplaces. • Townsville: Larger population. Relatively young median age, rapidly growing city.	• Potential area/market for MaaS trial with a strong employment/transient population focus. • Explore corporate MaaS options with employers.

4. Developing MaaS in Queensland's regions

4.1 Driving Principles for MaaS in regional Queensland

Based on the findings in Section 3, the research team has put together the following set of principles to guide the development MaaS for regional Queensland. The principles are interdependent and are not offered in any order of priority or relative importance:

An effective, farsighted, and fair MaaS for regional Queensland should provide:

Better travel choices

- Meaningful reduction of private vehicle dependence
- Coordinate travel options, including new and emerging services
- Improve accessibility for everyone

A supportive environment

- Encourage collaboration between transport service providers
- Healthy competition for better services and innovation

Fairness and equity

- Support equity
- Pricing is fair
- Availability of MaaS services meets user needs

Other Considerations

- Protect individual privacy
- Support goals for regional growth and environmental gains
- Ongoing engagement with the stakeholders and the community

4.2 Necessary Conditions for success

The stakeholder engagement and research of international exemplars of regional MaaS development, confirms the need that MaaS cannot be "a one-size fits all approach" and will look different across the state, based on community needs, availability of transport options and infrastructure. Table 14 summarises some necessary conditions of success for MaaS development in regions, which can also be read as suggestions.

Table 14: Necessary conditions for success of MaaS in regions (Adapted from Mackay (Forthcoming))

Assessments	Layers	Necessary conditions for success of MaaS in regions
Services 'Enabling Environment'	Mobility intermediary	Create and enforce standards and requirements MaaS intermediaries that ensures: • Minimum guaranteed services • Conflict resolution mechanisms
	Transaction	• Roll out of Smart Ticketing • Develop a MaaS back-end transaction clearing house • Mechanisms that safeguard the interests of users, service providers, and MaaS operators
	Information services	• Develop and mandating data sharing standards and principles • Develop a MaaS back-end (information sharing)
	People, culture, communications	• Establish a consortium or alliance for MaaS development, incorporating a range of stakeholders • Mechanisms in place to facilitate collaboration and promote positive competition (user-centric and service focused) • Fostering a culture for constant innovation and improvement • Introduce fare box risk as a way to promote competition of better services • Marketing MaaS services to users • Considering local contexts and needs as opposed to a "one size fits all" approach

Supply 'Mobility Ecosystem'	Mobility services	• New ways to manage multimodal and integrated mobility services and contracts (more flexibility and promote innovation and competition)
		• Principles of transport subsidisation (for social goals)
		• Roles of different modes demarcated by their advantages (e.g. bus for high frequency corridors, on-demand services for lower density areas)
		• Contract flexibility could to be induced in the form of:
		  o Reducing the time period of contracts (5 year currently)
		  o Open up service areas (with consideration of efficiency and coverage of services)
		  o From mode specific to mode agnostic (operators can use different types of vehicles as long as it meets user needs or safety requirements)
		• Changes in subsidy basis (e.g. consider intermodal incentives on top of current kilometric (distance-based) or patronage ones)
		• Promote multimodal booking, third stream – contract compliance and regulation needs to be considered

	Infrastructure and vehicles	• Develop and provide transport infrastructure to promote various modes • Multimodal interchanges with real time information for users • Vehicles are equipped for new generation transaction ticketing and real time information collection and sharing
	Capability and capacity	• Skillsets and knowledge • Ongoing funding commitment • Public and political support

4.3 Next Steps - Illustrative MaaS Concepts

As a research project, the research team started off by reviewing and analysing international MaaS policy and exemplars for regional or rural areas and their key learnings for reginal Queensland.

Should regional MaaS go forward, the next phase of research should focus on studying the more detailed implementation of MaaS in regional areas. It is important to better understand what might happen when MaaS is introduced. This involves creating new approaches to analyse where, when, and how MaaS can be applied for the best results. To understand the various impacts of MaaS, we suggest use of accessibility and transport modelling and a range of other analysis methods (e.g. demographic analysis).

It might takes considerable time and effort to develop and analyse these models and methods, and to make the adjustments needed to test these different approaches. For this reason, it was necessary to narrow down the number of possible policy tools and MaaS concepts that will be most feasible and illuminating studying Queensland's Regions.

By studying three regional areas (Townsville, Rockhampton -Yeppoon, and Gladstone), we learned about the current situation and transport needs in the study areas, and also the barriers and opportunities faced by various stakeholders, from government to transport service providers. We also developed the key driving principles for MaaS in regional Queensland, and the necessary conditions for success. Based on these findings, we suggest two more feasible MaaS concepts:

1. A broad-spectrum regional MaaS to augment with existing services and meet current needs in Townsville
2. A workplace focused MaaS for Gladstone (and possibly Rockhampton)

4.3.1 Broad-spectrum regional MaaS

This type of MaaS may work well in a region with a more multimodal setting, such as Townsville (Figure 19). Using the Government enabled "open-ecosystem" MaaS model, a possible MaaS concept could be a public-facing broad-spectrum MaaS. Key target users may include local residents, students, visitors and people with special needs (e.g. patients, seniors, disadvantaged, indigenous peoples, etc.). Initially transport services are included but non-transport services could also be invited to join for supportive services. In this way, customers can book and pay for both transport and non-transport (or "transport-plus") services. While "pay-as-you-go" is the baseline option, subscriptions, bundles and packages could also be included. Some illustrative examples of how MaaS for different end users are outlined below:

- **Residents:** MaaS can help to integrate various transport offerings with better information. Packages may help to provide alternatives to driving personal vehicles. The current e-scooter operator in Townsville already provides dining or shop discount for customers, such can be expanded in the MaaS ecosystem and multitude of opportunities (more information provided below at *non-transport service providers*).
- **Students:** MaaS can be offered to students to include kilometric student fares (e.g. School Transport Assistance Scheme (STAS). Additional features may include car-pooling for school journeys that could not be aggregated in a large bus (50+ seats), and MaaS could also act as location tracing as a safety measure.
- **Visitors** to Townsville can benefit by using MaaS to arrange long distance and local travel (e.g. airport pickups). Bookings can be planned and paid using the same interface. Non-transport services may include information and bundles of attractions, accommodation, events and guided tours. Multilingual versions can also be developed for major tourism markets.
- **People with special needs:** Personal door-to-door transport can be booked using a MaaS system similar to what is being offered in Denmark. Aggregation of various trips can be used to improve efficiencies and reduce cost.

In the regional MaaS ecosystem, these following are some typical actors:

- **MaaS operators' (MO)** role is to provide an "one-stop shop" for customers to access information - including real time events, such as disruptions. MO could be new entrants (who may not provide transport services), but they could also be run by government (possibly Translink) and also existing TSPs.
- **Government:** State government (TMR) sets the MaaS vision and provide regulatory and policy guidance to MaaS operators and service providers, both transport and non-transport. Translink may play a greater role in transport related matters, e.g. mobility data broker and MaaS-oriented transport contracts. Local government may also play a role in policy, planning and infrastructure provision.
- **Transport Service Providers (TSPs)** supply core mobility services for the MaaS ecosystem in the form of various modes. The introduction of DRT in Townsville should be incorporated in the MaaS system as a testbed. The real challenge here is to balance the interests of subsidised modes (e.g. urban buses) and for-profit modes. The aim should be "grow the pie" by converting previous car users to use modes offered in MaaS. In addition to passenger transport, freight and delivery services can also be incorporated in MaaS, which may be useful in some regional or rural settings and are already in existence now[2].
- **Non-Transport Service Providers (NTSPs)** are often overlooked in MaaS. Transport can be seen as a "derived demand" - a purpose that needing travel creates the demand for travel. By combining both transport and non-transport services, more trips can be created, and also more service can be consumed, thus generating wider business and economic benefits. As an example, a sporting event in Townsville Stadium could be sold as a package, which includes admission, venue transport and associated dining for the day/night. Governments can also provide public services through MaaS and this is found as an important value proportion in rural Finland. Examples may include social, municipal services or health care.

Based on the interviews and our own conclusion, there is a consensus that **Townsville** is the most suitable site for any first broad-spectrum or tourist-focused MaaS trial in the three study areas, given the city has:

- A highly supportive local government, interested in MaaS and on-demand transport and a local transport plan in place to support multimodal travel.
- The largest population of the study areas and a relatively contiguous urban area.
- A younger population that may be more receptive to MaaS uptake.
- Some forms of intermodal integration already (e.g. Bus and ferries to/from/on Magnetic island).
- More modes available for MaaS to integrate, including e-scooters.
- The most potential for tourism-focused MaaS and higher airport passenger turnover than in the other regions.
- Specific corridors in the city with decent public transport patronage, to which other first/last-mile services can connect.
- Translink branding already in place.
- Some intermodal hubs already in place (e.g. the newly built Townsville City bus hub, which is served by all routes in the city. The Breakwater Ferry Terminal the hub for long-distance coach and ferries to Magnetic and Palm Islands).
- Bold transport proposals of trackless trams or the reuse of rail corridors

For **Rockhampton**, there may be opportunities for MaaS servicing major nodes, such as the Central Queensland University campuses, after learning from outcomes in sites like Townsville. There may also be opportunities for tourist-focused MaaS.

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[2] Note: Young's Bus already offers deliveries between bus stops (https://youngsbusservice.com.au/need-a-parcel-delivered/) 13Cabs also offer parcel deliveries. UberEats is an example of app-based food ordering and delivery services.
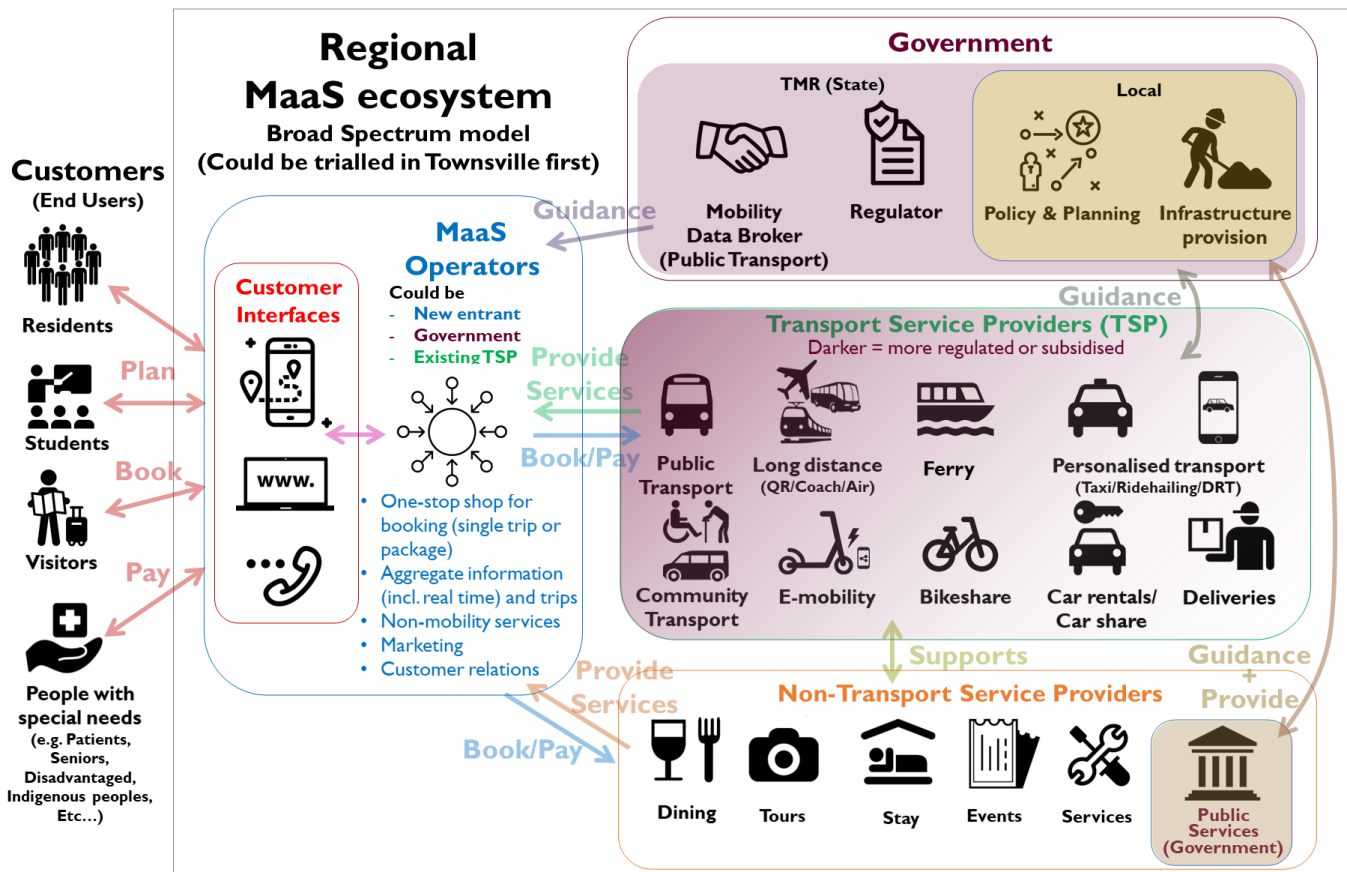
Figure 19: Illustration of a broad spectrum regional MaaS concept

4.3.2 Workplace focused MaaS

Despite not being quite as ready to move forward with MaaS at this point in time, Rockhampton and Gladstone are also suitable for trialling more limited, bespoke MaaS services in the near future. Of particular interest are MaaS services that target workplace development and labour availability for key employers.

For **Gladstone**, a blue-collar employee focused MaaS solution (Figure 20) similar to the *Winnebago Catch-a-Ride* MaaS service covered in Section 2.2.4 earlier may work well. This provides ridesharing/carpooling operations to/from key employers in a rural area with a few major employers. Run by an NGO MaaS operator, in partnership with local industries, social service agencies and the local economic development board, the Wisconsin system helps low income workers and those without private transport options access major employment sites. Though the underlying tax and regulatory frameworks differ in Australia, exploring such MaaS options in Gladstone could lead to services that help both a particularly disadvantaged sector of society, and employers in the city.

Such workplace focused MaaS is proposed to build on existing industry-run workplace shuttles, but incorporates MaaS to provide real time travel information and bookings. Smaller vehicles can be used for medium or small enterprises that does not have the scale to use larger buses.
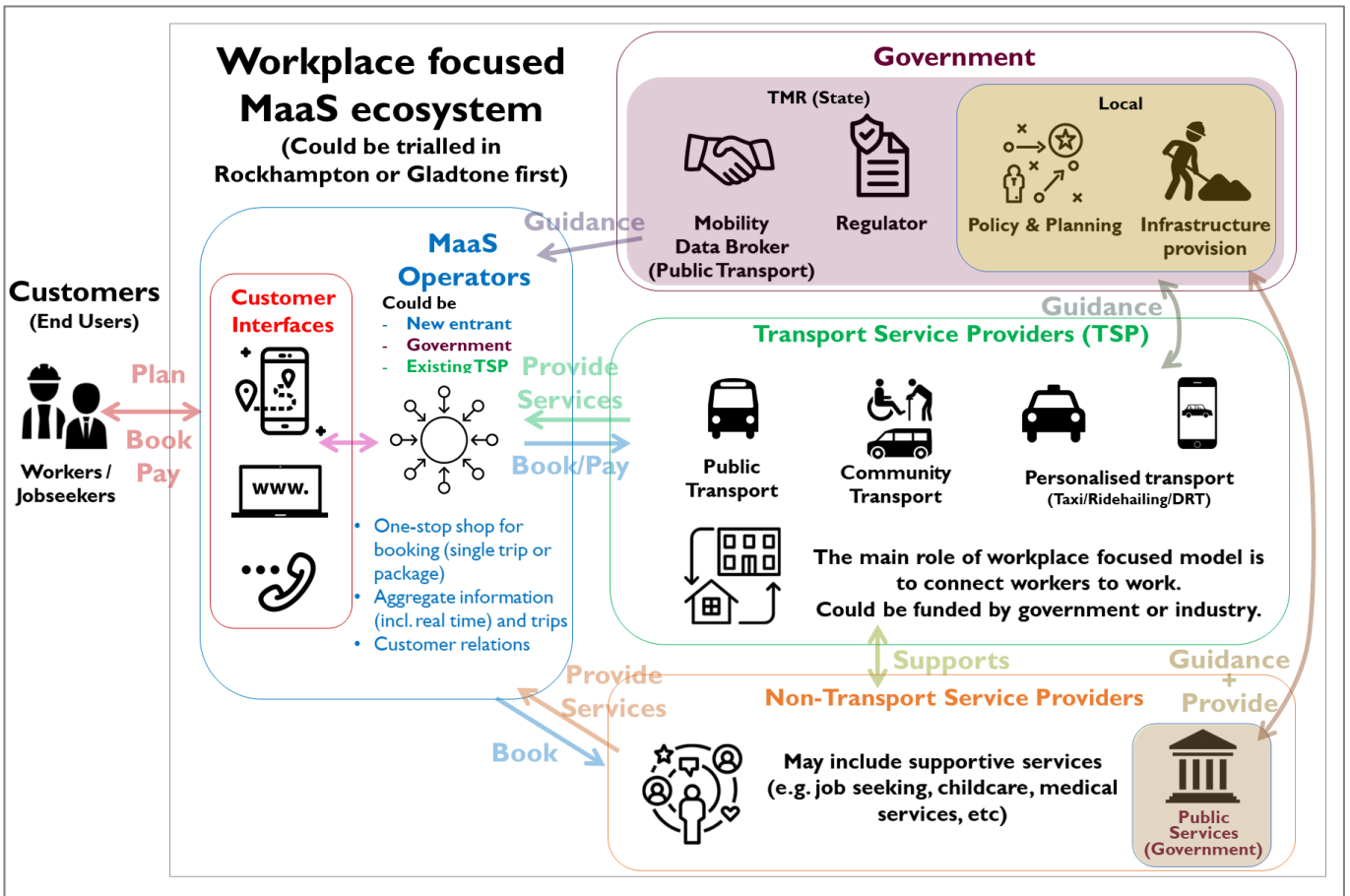
Figure 20: Illustration of a workplace focused MaaS concept

4.3.3 Proposed indicators of MaaS Readiness

In addition to the TMR (Forthcoming) Mobility Assessment Framework, and based on the international examples and data availability in Queensland, we proposed the following metrics in Table 15 for MaaS readiness measuring. This will help determine the best location for a future MaaS trial and rollout staging.

Table 15: Proposed regional MaaS readiness index for future detailed analysis (based on Goulding)

Dimension	Data type	Variable	Data source for Qld regions
Transport operator's openness and data sharing	Data collection	Static data	Translink / Transport operators (GTFS)
		Realtime data	
	APIs	Open API availability	
		Private API availability	
	Open source	Open source API	
	Raw data	Raw data availability (under agreement)	
		Open raw data	
		Raw data common and open standards	
		Realtime raw data	
Policy, regulation and legislation	Transaction and payment standards	Recommended open standard	Government (local or State)
		Data security and privacy	
		Right to data portability	
		Third party ticket sales	
		Commercial viability/subsidisation	
Citizen familiarity and willingness	Smart technology familiarity	Smartphone penetration	Telecommunication service providers
		Contactless debit/card penetration	Banks or financial institutions
	Travel behaviour	Modal split	ABS census / TMR household travel survey
		Car ownership	
ICT infrastructure		Wifi / internet access	Telecommunication service providers Internet: ABS census
		Mobile network coverage	Telecommunication service providers
		Mobile network download speed	
		Smart ticketing infrastructure	Translink / TSPs (ticketing machines) (MaaS could reduce the need for dedicated machines)
Transport services and infrastructure	Variety	Model alternatives	MaaS operators
	Density	Rail	QR – station data
		Bus	Bus operators (local and intercity)
		Taxi	Taxi numbers per capita
		Bike/e-scooter sharing	Operators
		Car sharing	
	Frequency of public transport	Overall	GTFS
		Peak time	
	Integration	Transfer penalty of travelling	Translink, various TSPs

4.3.4 Maximising the learnings from future trials

Once a trial or pilot is decided, an evaluation framework is required to monitor the performance of the trial. Based on the best practices of transport research, a cohort of potential users are recruited to allow for longitudinal surveys - before, during and after the trial. MOs, TSPs and even NTSPs all should agree a data collection protocol so as to collect necessary monitoring metrics while protecting the privacy of users.

Should trials are successful, the MaaS offering should remain and be further improved and expanded.

5. Concluding Remarks

MaaS is currently a global transport trend and it has great potential to address existing inefficiencies of the transport system and produce transformative changes. While it is attractive to introduce MaaS in metropolitan areas first, trialling MaaS in a regional context may also be beneficial, as seen in the example of Northern Jutland of Denmark, where its population density of 74 persons/km^2 is only slightly higher than Townsville (52 persons/km^2.

As uncovered in this report, various global exemplars of regional MaaS for different users and local settings also helped to illuminate the possible model for Queensland regions. This work identified the emerging regional MaaS research and practice development.

While the promises of MaaS are many, there are also numerous hurdles ahead and needs to be tackled with. The driving principles proposed in section 4.1 helps to guide the future of MaaS development in regional areas. While TMR is likely to play a leadership role in MaaS developing in Queensland, meaningful consultation and collaborative partnerships are needed to move forward. Existing transport services may also need to be augmented and incorporated into MaaS, so as non-transport service offerings. More importantly, ground rules are needed to define responsibilities and create incentives for service providers and MaaS operators to form MaaS ecosystems in an open setting.

A future MaaS pilot is recommended so as to further understand the level of acceptance and develop best practice. We proposed a broad spectrum MaaS for Townsville and a workplace focused MaaS for Gladstone for initial feasibility of future trials. Rockhampton may also follow with a combination of two pending on the results of trials. While this study only looked at three regional settings, MaaS for various user market can also be developed depending on local contexts. While not examined in this report, Cairns could also be a good candidate of a tourist focused MaaS with an ecosystem dedicated for visitor travel and service offerings. The "Gladstone" model may work well in other resource or agricultural-based settlements.

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