Technical Note

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Deliverable WP14 - D9: Impact Assessment

Element	Description
Title	Impact Assessment of Mobility as a Service
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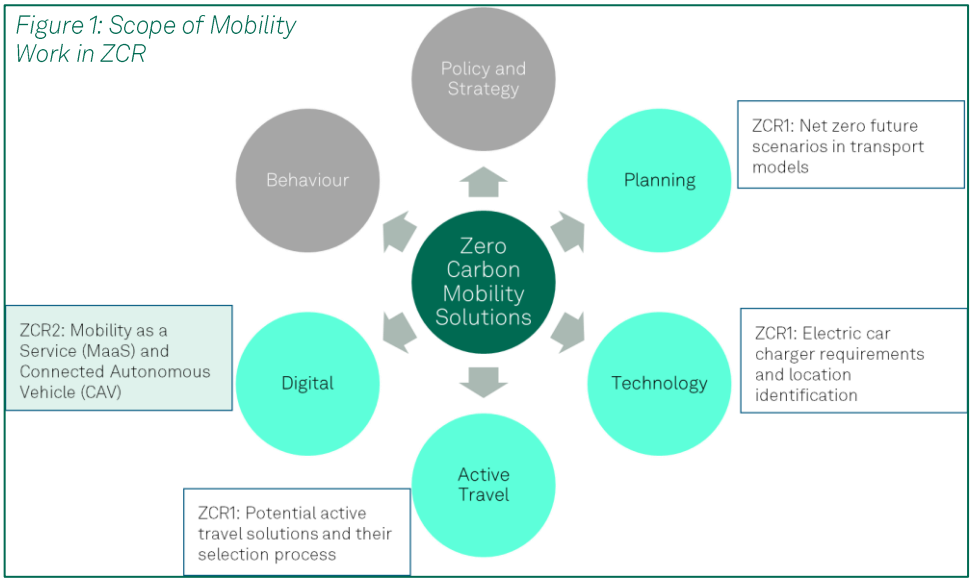
Background

Zero Carbon Rugeley is one of the pioneering programmes in the UK aimed at demonstrating how carbon emissions and energy costs can be reduced whilst also providing a boost for local generation[1]. While the mobility section in the first phase of the project aimed to investigate options to include sustainability in mobility scenarios, estimated energy demand for mobility and considered how it can be integrated into the energy system, the extension of the project is investigating two smart/ digital mobility solutions namely a Mobility as a Service (Maas) application and a Connected Autonomous Vehicle (CAV) (Refer Figure 1). This technical note describes the work done as part of assessing the impact of the MaaS application.

Figure 1: Scope of Mobility Work in ZCR



Context

Strategic priorities and actions at national regional and local level have all identified the need to accelerate modal shift to sustainable modes to achieve the climate goals for transport. While the Transport Decarbonisation Plan - Decarbonising Transport: A Better, Greener Britain[2] identifies accelerating modal shift, decarbonising road transport and decarbonising freight as the main strategic priorities, the core strategy[3] for Transport for West Midlands identifies three main actions to improve accessibility and encourage behavioural changes. These are: avoiding travel, shifting travel to more sustainable modes and improving transport by reducing emissions.

Some of the strategic actions provided In the Cannock Chase District Integrated Transport Strategy[4] include:

[1] Zero Carbon Rugeley | EQUANS UK & Ireland
[2] Decarbonising Transport – A Better, Greener Britain (publishing.service.gov.uk)
[3] wm-ltp-core-summary-v0-4.pdf (tfwm.org.uk)
[4] 2013cannockchasedistricttransportstrategy (staffordshire.gov.uk)

- Accommodating strategic housing development with a presumption in favour of sustainable development
- Support access to economic opportunities particularly at strategic employment sites
- Improve public transport connectivity to the West Midlands
- Maintain the current condition and safety of the highway network
- Improve public transport connectivity, infrastructure and quality of life for local communities
- Support Air Quality Management Area Action Plans along the A5(T)
- Improve and encourage sustainable access to Cannock Chase AONB
- Raise awareness of environmental issues and encourage people to lead more sustainable lifestyles

As explained in a research paper on mobility apps[5] for improving urban travel patterns, there can be two types of measures to achieve shift to sustainable modes - hard and soft measures. Hard measures, involving changes to transport infrastructures with high associated costs for public administrations, are sometimes controversial and might be politically infeasible. For this reason, public administrations have started to take an interest in soft measures, which try to persuade and make sustainable mobility more attractive for the traveller. MaaS is one of the soft measures being tried widely across the cities.

The transport committee[6] of UK parliament defines Mobility as a Service (MaaS) as a term for the digital platforms (often smartphone apps) through which people can access a range of public, shared and private transport, using a system that integrates the planning, booking and paying for travel.

The potential benefits of a MaaS application identified by the Committee include:

- reduces road congestion leading to improved air quality
- improves users' physical health by encouraging increased use of active modes of travel such as walking and cycling
- improves passenger travel experience by offering simplified ticketing and payment processes, and more bespoke and personalised journeys
- improves customer choice by facilitating awareness of, and access to, various transport modes and thereby empowering people to make better and more informed choices; and
- facilitates better management of travel demand and transport infrastructure: by utilising aggregated customer and travel data from the MaaS app, transport planners

[5] Future Transportation | Free Full-Text | Key Elements of Mobility Apps for Improving Urban Travel Patterns: A Literature Review (mdpi.com)
[6] Mobility as a Service (parliament.uk)

can both optimise use of existing transport networks and better plan necessary infrastructure enhancements.

A MaaS app for Rugeley was hence proposed to be designed and trialled.

Activities Planned

A Mobility as A Service (MaaS) application is being developed by Conigital[7] which would be rolled out in Rugeley soon. The main features of this application are as follows:

Single Journey Platform

The application will provide a single journey platform for the Rugeley user by advising on the end-to-end journey plan and including tariff and payment options to offer the traveller a complete package. The features planned to be included under this application are:

- Journey Features: Options to view current location, look up origin and destination points, use specific time and date, switch arrive/ depart options, use via points, payment, select number of passengers, return journey option etc.
- Mode Specific Features: All public transport mode options with schedules and fare information, wait times, links to book taxis, information on walking routes, cycling routes, shared modes (if available), real time travel information including service disruptions, persuasive messaging (encouraging users to shift to sustainable modes) etc.
- AV Features: Features to book an AV journey, check arrival times, view available capacity, cancel booking, view fare structure etc.
- Other Information: Some of the other features in single journey platform would be travel assistant, real time notifications, EV charging points, information on quieter travel times, cycle storage locations if any, weather etc.

Personalisation of Journeys

The application has been designed to offer personalised experience by including:

- Health related information: It would include calories burnt for selected journey option
- Environment related information: It would include emissions saved for various journey options
- Use of assistive technology for inclusivity: Voice over software/ Option to call and book journeys
- Personalised Dashboard: Option to save future journeys, view previous journeys, provide feedback on route suggestions, improvement etc.
- Other Journey Details: Option to book a seat, options for step free journey, information on well-lit walking routes/ routes with segregated cycle lanes

[7] https://www.conigital.io

- Games/ Challenges: Setting active goals, challenges, monetary rewards, competitions, motivational notifications and feedback elements are helpful for interactions with app.

Localisation
The application will provide local insights to the user by including:

- Information on local landmarks and events within Rugeley and its surrounding areas
- Information on nearby local businesses and options to avail offers from them or order take-away through the app
- Information on any specific new modes introduced locally
- Future options to build school trip/ business portals

The latest version of the app includes some of the above-mentioned features except a few others which would be included in the later versions.

An active travel road map as part of the MaaS application was also designed and is presented in Figure 2.

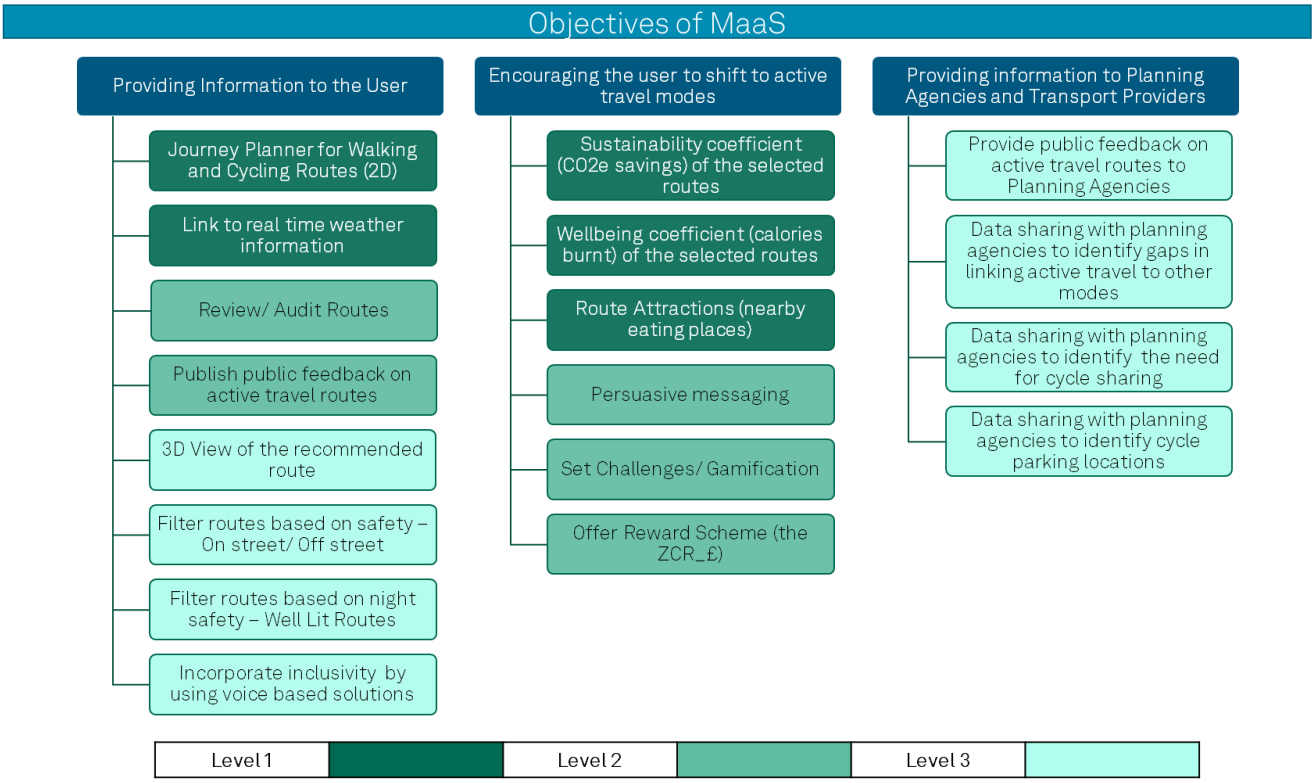


Figure 2: Active Travel Road Map using MaaS

Logic Map

A logic model was developed to understand the relationship between proposed interventions and their intended effects. It Is presented in

Figure 3.

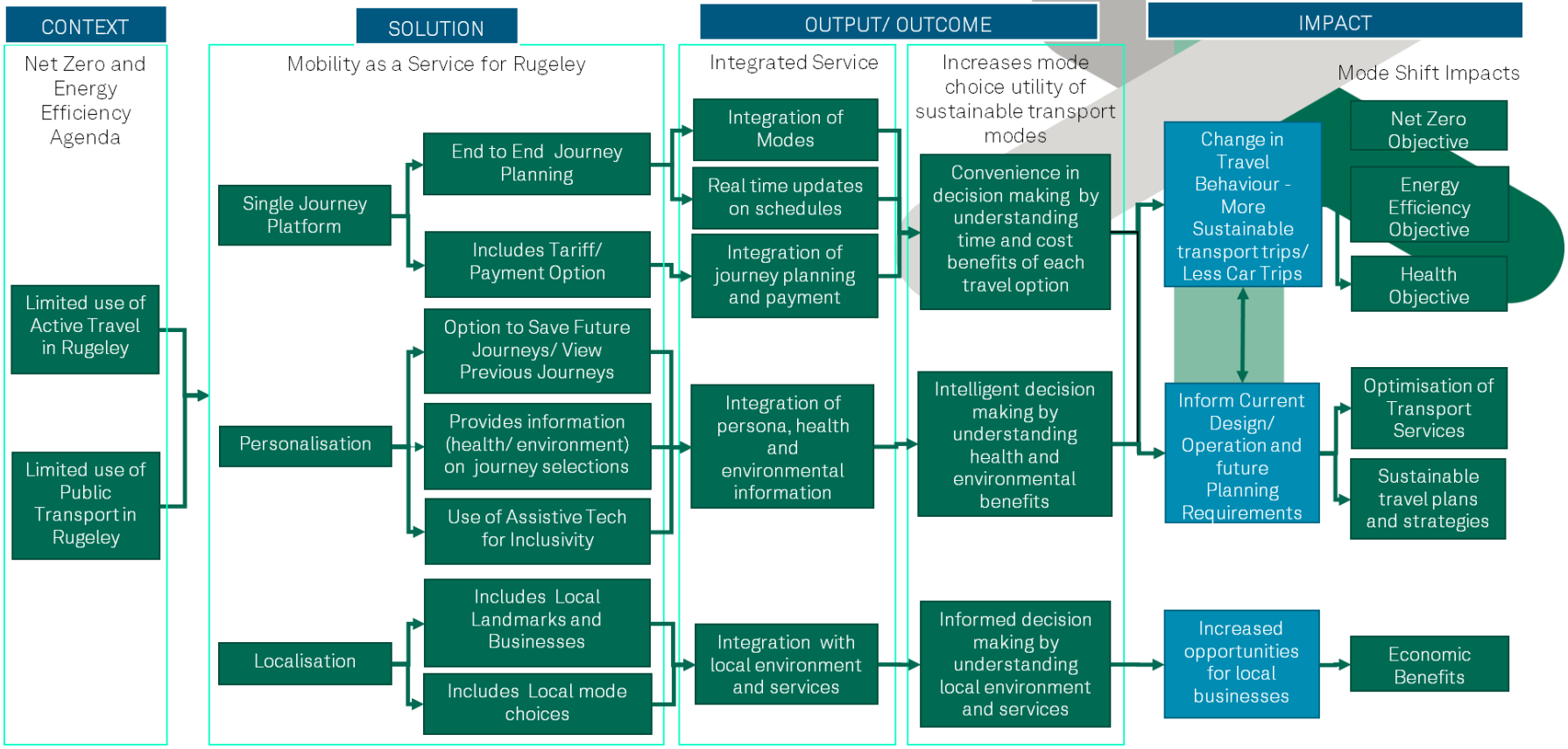


Figure 3 Logic Model

Estimated Outputs and Outcomes

The outputs and outcomes of the MaaS app were identified based on the logic model presented in

Figure 3. Based on the logic model, outcomes of all interventions through the MaaS app can be categorised into two main sections: convenience in decision making and informed decision making. Various studies and research have been conducted to assess the impacts of a MaaS app. The case studies in this section have mainly referenced the research paper titled 'Key Elements of Mobility Apps for Improving Urban Travel Patterns: A Literature Review'[8]

Convenience in Decision Making

Ability to view and select multimodal travel and payment options streamlines decision making for the user by understanding time and cost benefits of each option. Adding the real-time information for these options provides the flexibility required by most users today and reduces travel anxiety. This gets reflected through reduction in journey time as described through the case studies below:

- A study[9] carried out to test the travel app Metropia (a mobility management app in Austin, Texas), suggests that real-time traffic information enabled drivers to ***reduce their travel time*** by 5–10%
- The travel time savings were observed[10] to be over 15% when the smartphone was used to plan journeys (based on real-time information) on the transit network, mainly due to the ***reduction in waiting time*** at the origin stop.
- A recent literature review on transit apps[11] extracted two key findings: real-time information increases public transport users' ***perception of safety***, especially in night waits and at "unsavory" stops, and among women. Knowing the estimated time of arrival

[8] Future Transportation | Free Full-Text | Key Elements of Mobility Apps for Improving Urban Travel Patterns: A Literature Review (mdpi.com)

[9] Personalized incentive-based peak avoidance and drivers' travel time-savings - ScienceDirect

[10] Added value of a customized transit app for metropolitan bus trips - ScienceDirect

[11] The end-user benefits of smartphone transit apps: a systematic literature review: Transport Reviews: Vol 42, No 1 (tandfonline.com)

in real time ***reduces the anxiety*** associated with the uncertainty of waiting; and more up-to-date information implies greater user satisfaction as it is more reliable.

Intelligent Decision Making

Integrating information on emissions and health along with making the app more inclusive can help the user make informed decisions. The user is better equipped to understand the health and environmental benefits of sustainable modes and hence is more willing to try these options. Customised features in the app also attracts people as they reduce the anxiety aspect associated with the journey. This gets reflected in the changes in mode preferences. Some examples of this are provided below:

- DriveNow, a car-sharing service in Denmark, is seeing ***growth in the number of elderly people and women*** as they are increasingly considering the environmental impact of their travel option[12].
- Economic attractiveness through subscription packages can be of ***great help to people with reduced mobility***, especially if they can be customized[13]
- Interviews with the community transport sector (social care services) in Australia found an increase in the ***demand for more individualized services***[13]. This is mainly due to digital platforms (apps or websites) significantly helping users who can no longer move around the city autonomously due to physical or intellectual disabilities.
- UbiGo (Swedish MaaS app) offers a mobility broker that has acted as a ***mediator between service providers and users***, facilitating the use of transport modes. Participants' satisfaction with UbiGo's response to their problems was very high (Likert scale, 6.2/7)"[14]
- Another recent research[15] on Denmark found that although the conditions of the transport system are well perceived by the user, there is significant interest (one third of users) in ***sharing information on the transit level of service*** (crowding, arrival times, delays, etc.).

Informed Decision Making

Information on local businesses and events is not a highly explored feature in the MaaS apps. This is a new potential feature being proposed to be integrated within the mobility app as it can provide:

- Sustainable journey options to local events
- Link local businesses with the MaaS app to provide options to the user during their wait times (this helps the traveller stay safe/ warm and reduce anxiety), option to order take-away through the app (economic benefit for the business) and offer reward schemes for sustainable journeys through the local businesses (creates a win-win situation for both user and business)

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[12] What role does free-floating car sharing play for changes in car ownership? Evidence from longitudinal survey data and population segments in Copenhagen - ScienceDirect

[13] Community transport meets mobility as a service: On the road to a new a flexible future - ScienceDirect

[14] Implementing Mobility as a Service: Challenges in Integrating User, Commercial, and Societal Perspectives - Jana Sochor, Helena Strömberg, I. C. MariAnne Karlsson, 2015 (sagepub.com)

[15] Constructing a routable retrospective transit timetable from a real-time vehicle location feed and GTFS - ScienceDirect

- Sustainable journey options to the local landmarks
- Keep the users informed about new bike-sharing services or electric charging points being introduced in the area
- Provide information to the users on public facilities like restrooms, hospitals, pharmacies etc.

Potential Impacts

The main outcome of using a MaaS app is the changes it might bring to travel behaviour of users by removing pain points in journey planning and the holistic Information it provides. The changes in travel behaviour could result in the following potential impacts:

Mode Shift to Sustainable Modes

Greater usage of MaaS is predicted to not only have an impact of higher uptake of sustainable transport modes but also reduce car ownership. Changes in the travel pattern will reduce energy requirements, improve efficiency in energy usage and help with achieving the net zero objective in the transport sector. Sustainable travel has also been proven to make the users more active and hence contribute towards their and public health objectives. Some research and case study examples of this are provided below:

- Real-time information produces an upsurge in the number of public transport users and some studies claim that more than 30% of public transport app users increase their use of the bus[16]
- Real-time incident reporting can modify the user's travel behaviour in terms of their mode selection, route selection and time of travel. A recent survey of bus passengers revealed that 12% of the participants changed their route at least once due to incident notifications reported by other passengers[17]
- Travel apps have been observed to reduce car use by offering competitive alternatives. Based on user reporting, while UbiGo (Sweden) reported 44% decrease in car use, 21% of Smile (Austria) users reported the same. UMAJI (Taipei) also reported 3.2% Increase In public transport users only three months after the service became operational. 12.5% of the respondents of a survey in China use DIDI (Chinese car sharing app) instead of their own car due to car use limitations and parking problems in their cities. 81% of the trips registered in the BetterPoints system[18] were car-substituted trips

Optimisation of Transport Services

Changes in travel behaviour also help in optimising the current transport services (with reduction in car trips) and plan for future sustainable transport strategy.

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[16] The end-user benefits of smartphone transit apps: a systematic literature review: Transport Reviews: Vol 42, No 1 (tandfonline.com)

[17] Added value of a customized transit app for metropolitan bus trips - ScienceDirect

[18] A Data Driven, Segmentation Approach to Real World Travel Behaviour Change, Using Incentives and Gamification | SpringerLink

- Operational Efficiency: Real time Information on travel helps the user re-route and re-plan which not only reduces user's journey time but also helps decrease the congestion at the initial impacted location. This in turn increases resilience of the system which can then inform the transport policy and strategy requirements for the area.
- Sustainable Plans/ Strategies: Changes in travel behaviour will have a direct impact on the plans and strategies for sustainable travel. MaaS uptake can inform about the gaps in the service, strategic enablers and innovative technologies.

Economic Benefits

The two main economic beneficiaries of MaaS are:

- Users of the app: As discussed previously, journey planning benefits results in travel time savings and economic benefits for the user. Single platform informing the total journey costs provides direct cost benefit to the user. Subscription services offered by MaaS apps also bring economic efficiency in decision making especially if they are customised packages.
- Local Businesses: Local businesses involved in event planning, tourism and those enroute to travel stations can benefit economically if they are included in the MaaS apps in a well thought off way.

Enablers and Barriers

The enablers and barriers of a MaaS app can be categorised into demand and supply side features. These have been identified based on the research papers and Conigital's experience with ConApp development. Various components under these are described below:

Demand Side Features

1. Acceptance of MaaS would depend on its scope which would include its geographical coverage, modes of transport included and real time Information.
2. It is important for the application design to be easy to use and to protect user information. It should be intuitive for people with little command of the digital world. Apps which have flexibility to adapt based on user feedback provides a larger Impact.
3. Accessible and faster internet and data services provides choices to people in terms of how they communicate, find information and shop.
4. Customer Acceptance would depend on factors like:

- Inclusivity: Older generations and people with disabilities have less intention and ability to use new technologies unless the user interface is designed for specific use cases (Information on step free access, request a priority seat, integration with travel assistance, telephone option, voice over software can make the app more accessible for the user)
- Personalisation: Safety features (Location tracking)
- Data Protection: Personal data without a regulatory standard for processing can lead to trust problems of the customer and negative judgments against MaaS

- Convenience: Convenient and reliable journey planning which provides for transport information in different situations (unfamiliar journeys, service disruptions, information on well-lit routes)
- Willingness to change travel behaviour: Establishing the value of sustainable public transport travel against door-to-door travel using private modes based on time and cost efficiency and previous travel habits needs a focused approach.
- Rewards in the form of Incentives can have an impact on travel behaviour

5. Uniqueness in application including personalised, inclusive and localised app features add significant value to the uptake of these platforms.

Supply Side Features

1. MaaS is a public-private partnership (PPP) concept in which horizontal and vertical cooperation between public transport authorities and private companies must be significantly strong to have a successful adoption. This creates collaboration by taking care of data sharing and standardisation issues. This will then help towards providing access to real time data which is the main building block for developing this app.
2. Lack of efficient business models for MaaS leads to operational problems and uncertainty in the distribution of roles and profits (or losses). For e.g., though active travel is an important sub-component of MaaS, it does provide revenue generating opportunities for the MaaS provider.
3. The laws, regulations, and guidelines can be a barrier to successful MaaS adoption, such as ticket sales by third parties, subsidization of traffic, the uncertainty of the role of partners, competition laws, etc. In addition, MaaS should be legally supported on issues such as open data standards and security.
4. Integrated payment services which offer integration with existing railcards and concessionary fares are required for successful operation of MaaS services. However, the diversity within modes of transport along with various ticket types offered by operators is challenging to integrate and bringing onto a common platform. It has also been observed that due to low margins in public transport, offering concessionary services with regular ticketing becomes harder.
5. Absence of sustainable transport infrastructure (reliable, integrated and accessible multimodal transport supply) and good quality ICT infrastructure (like high levels of internet connectivity) could act as barriers to widespread penetration of the MaaS platforms.
6. Policies, Plans and Strategies related to decarbonisation objectives, sustainable transport options, discouraging car use, data sharing are also important for MaaS
7. App churn which is defined as percentage of users who uninstall or stop engaging with an app over time is also high in mobility apps which is believed to be due to slow/ lack of updates based on user feedback and ground conditions.