

AUTOMATED MOBILITY ON DEMAND

Guide for Public Transport
authorities and operators on
potential use cases for
AMoD.

Gemeente Almere



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1 Executive summary

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1.1 Introduction & Definition of AMoD

AMoD (Automated Mobility on Demand) is the name of independently driving vehicles for public transport. Instead of classic bus lines with a driver and timetable provides AMoD efficiency and reliability. An automated bus only comes if there are actual traveling passengers and only drives to the stop that passengers are going to.

There have been multiple AV projects in Europe through the last twenty years. The first AV for public transport in the Netherlands started in 1999. The ParkShuttle is a fully automated bus that connects a metro station in Rotterdam with a remote business park. Every day, 1.850 passengers use this system. At peak-hours the ParkShuttle has a fixed timetable and runs every 2,5 minutes. Off-peak, it's a driving on demand-service. You have to reserve online, at least 15 minutes before you want to use the service.

1.2 About this guide

During the Interreg NWE Project CAMINO the municipality of Almere had the assignment to create a guide on automated mobility on demand. This guide aims to assist PTAs and PTOs in defining, designing and evaluating potential use cases for AMoD. It is based on a detailed analysis of Almere Hout use case and provides a broader overview of AMoD deployment scenarios. The guide considers service designs, local mobility needs and provides practical advice on how to integrate AMoD into your strategic plans.



1.3 Expectations for AMoD

Automated mobility might be the core of the (city and regional) public transport networks in Northwest Europe in the long term. It secures the reliability, sustainability and profitability of the network in the future. The network will be less vulnerable for disruptions due to shortage of staff. Around 60% of total costs of a public transport network consist of labour-costs. Without a driver on every individual vehicle the profitability of a network will rise substantially. Another benefit for introducing AV are first and last-miles options for servicing low-density neighbourhoods. These areas can't always be cost-effective connected with the classical city networks with a high service level. AV with small shuttles on demand can fill this gap and provide an acceptable service-level at acceptable costs.

2 Why should PTA's and PTO's start planning for AMoD?

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2.1 Financial & Operational sustainability

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Present shortages of staff undercut the reliability of the network. Service-levels have been diminished due to staff shortage and on top of that PTA's are confronted with a considerable number of unexpected outage of buses, which causes long(er) waiting-times for travellers, overloaded buses and a low quality in general. This staff-shortage will quite likely remain in the near and distant future. So, AV is a necessity to be able to deliver an acceptable level of service. Budgets for public transport are under pressure. With the present system growth in PT-usage will require additional public funding. It's unlikely that these extra funds for PT will be available. So, to be able to fulfil the aspirations to double the PT-usage, it is necessary to substantially lower the operational costs. Since staff-costs make up for approx. 60% of total operational costs, reduction of staff is key to the solution.

2.2 Long term goals and PT contracts

For example, With the new public transport concession of Almere, starting in December 2028, the municipality asks potential operators to be open to set up one or more initiatives with AV. This can be based on a separate business case in which costs and benefits will be shared between operator and transit authority. Since it is uncertain when the technology has developed in such a way that AV are accepted by the road authorities, PTA's and PTO's can not set a fixed date to the introduction. In the next concession, starting in 2038 or 2040, the municipality expects a widespread introduction of AV throughout the network.

3 Use case Almere Hout

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3.1 Current public transport in Almere Hout

Almere is a city in the Netherlands about 20 kilometres from Amsterdam. In 1940 the Dutch government started to create new land in the former Zuiderzee (Southern Sea). The new land was intended to create more space for housing, farming and industry. In 1976 the first houses were completed in Almere. Almere has a unique infrastructure with dedicated bike lanes and almost 100% dedicated bus lanes.

Almere Hout is a district that is designed and laid-out differently from the rest of the city. The most houses here are built in a rural environment with a low population density. The BRT-system does not fit in here.

Currently, the Oosterwold and Vogelhorst neighbourhoods in Hout are only served by regional bus line 216, which is part of the Provincial concession, and therefore is not part of the concession Almere. Compared to the BRT-lines in Almere, this bus has a very low frequency of one to two buses per hour, per direction and only on working days. The number of residents who have a maximum distance of 400 meters to a bus stop, which is the usual benchmark in Almere, is less than half in

this area. For many residents, the distance is too big, especially in combination with the low number of buses per hour. This makes the current public transport in Hout unattractive and inaccessible for many residents. Only the Nobelhorst neighbourhood has a high-quality public transport connection thanks to the BRT-line that runs there four up to eight times per hour. From there, travellers can reach the city centre in about 20 minutes.

3.2 Mobility goals

The PTA team of the Municipality of Almere is currently creating policy on how areas such as Hout can be served by public transport. This is related to the tender for the next concession for the period from 2028 to 2037/2039, which is currently being prepared. A development direction for the area must be included in this concession. The general objective is to enable residents and visitors of Almere Hout to reach the area using sustainable means of transport.

Almere is currently investigating whether it is possible to have small local buses operated by volunteers with support from the concession holder on the short term. These buses would then take potential travellers to and from the final stop of the BRT-line in the Nobelhorst neighbourhood. Given the shortage of drivers, volunteer and employed, the high staff- costs, automated vehicles serving Hout could potentially be a future-proof solution in line with the transport demand. These AV could eventually replace the neighbourhood buses or buses on demand and increase the supply of public transport.

3.3 Proposed service model

The potential service model for this use case will be mainly based on small vehicles suitable for eight to sixteen passengers. It connects the Hout area with the main network by starting/ending at the final stop of BRT bus line M8. In order to match supply to demand, these AV's will only drive on demand during off-peak hours and during peak hours according to a fixed timetable with two fixed routes. The functioning of this distribution also depends on how many vehicles can be deployed. At times when a fixed timetable is used, the vehicle itself registers whether there are passengers at the stop. If this is not the case, there is no need to stop, so that delays due to traveling with other traffic can be absorbed.



Transfer to the M8 at the final stop.

3.4 Practical framework

In Hout, an automated vehicle could offer residents and visitors a connection to the existing regional line and the BRT line in Nobelhorst. This would eliminate the need for overlapping lines within Almere's existing network. By allowing automated vehicles to drive through the area via two routes, each approximately 9 kilometres long, more potential public transport travellers will have a stop within 400 meters. Unlike the other areas in Almere, there are no dedicated bus lanes in Hout (apart from Nobelhorst). An automated vehicle would therefore have to share the infrastructure with car traffic. The number of vehicles and therefore the frequency of an AV connection depends on the costs and the number of expected travellers. In theory, all residents and visitors of Hout could use the automated transport pilot. The target group mainly consists of travellers for whom cycling to the nearest BRT stop is not a realistic option. The vehicles must be able to accommodate at least one wheelchair user who can drive in and out of the vehicle independently.

3.5 Benefits of AMoD for Almere

Due to the highly segregated network, Almere is ideal for introducing automated vehicles. In the long run, AV will form the core of the public transport city-network in Almere. For the regional lines to Amsterdam, which run over high-ways with car-traffic, introduction is only foreseen when the technology has developed and traffic-regulations allow AV in co-habitation with regular vehicles.

Automated mobility secures the reliability, sustainability and profitability of the network in the future. The network will be less vulnerable for disruptions due to shortage of staff and since 60% of total costs of the network consist of labour-costs, the profitability of the network will rise substantially with automated driving.

A second option for introducing AV, are first-/last-miles concepts for servicing low-density neighbourhoods in Almere Hout. With existing, staffed, buses servicing this neighbourhood is extremely costly and therefor quite poor. AV with small shuttles on demand can fill this gap and provide an acceptable service-level at acceptable costs.

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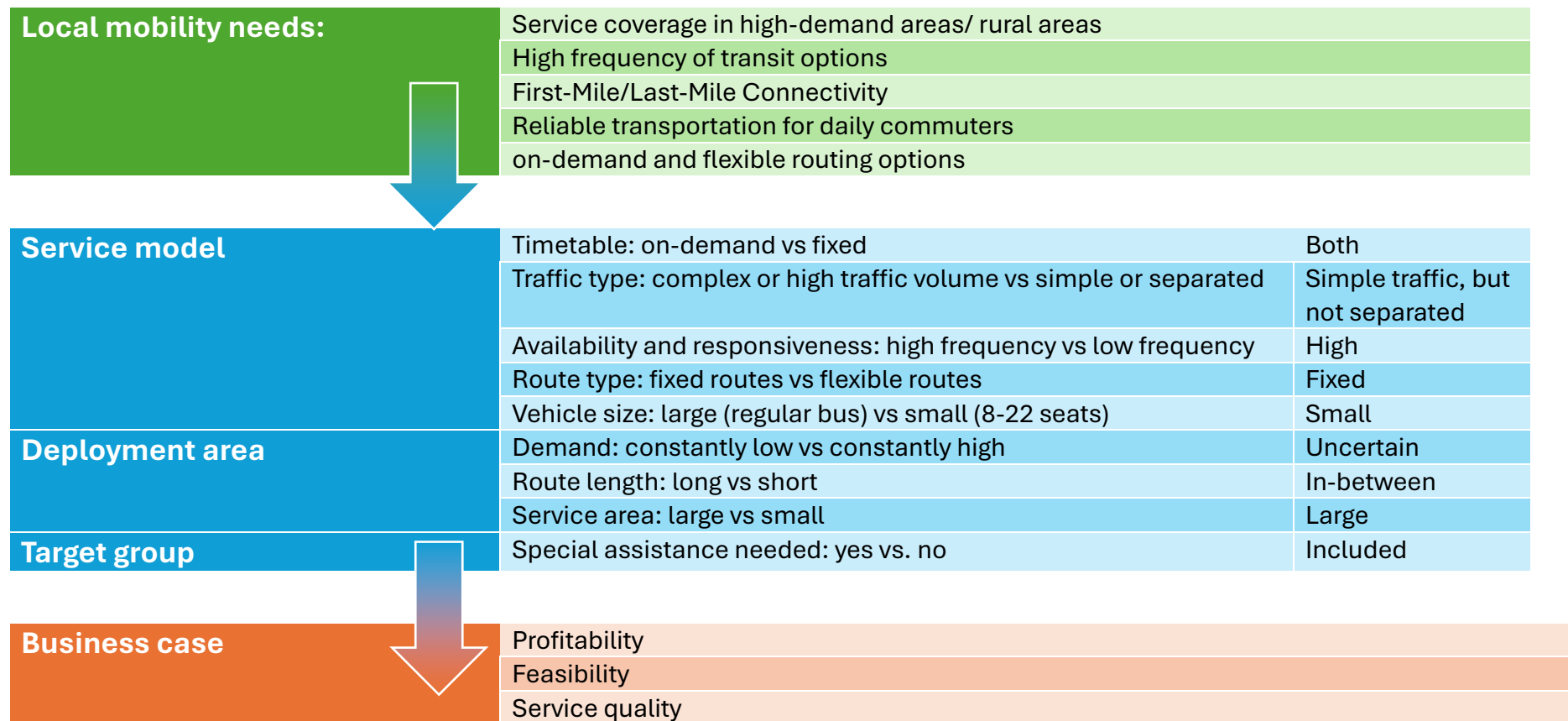
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4 Defining an AMoD use case

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4.1 Public Transport Use Case

This section provides an overview of the specific key points of defining an AMoD use case based on Almere Hout. For each local and regional mobility needs PTA's and PTO's can choose from one of the options in the underlying diagram.



4.2 Expectations towards the private sector

The private sector will be the driver of new innovations in AV with regards to new techniques and lobbying and influencing road authorities to accept AV on the roads and set up new legislation to accept AV in day-to-day traffic. Manufacturers need to be risk-taking in the process of getting approval of road authorities for their vehicles. The municipality expect from operators an open mind to introduction of AV in the network and an attitude whereby the financial benefits of AV are shared between operator and transit authority.

4.3 Final take-aways

This guide provided tools for defining, designing and evaluating potential use cases for AMoD. Our final advise would be to start early on planning for potential use cases. The upcoming start of a new concession contract could be an opportunity to think about the future of your public transport network and the benefits that would come with automated vehicles. Also, the development of new urban areas could be a chance to develop an AMoD pilot.