Interreg North Sea Region ART-Forum
European Regional Development Fund

EUROPEAN UNION

PREPARING COMMUNITIES FOR AUTOMATED PUBLIC TRANSPORT

ROADMAP

A.R.T. Forum
Automated Road Transport

MOBILE ZEITEN
Mit Leidenschaft für Mobilität.

Imprint

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ART-Forum (Automated Road Transport-Forum) is a transnational EU funded project, co-funded within the North Sea Region (NSR) Programme, Interreg VB.

ART-Forum will create a debating ground for local/ regional authorities in the NSR, address risks and opportunities and help guide policy development with regard to the impact that automated transport could have on the entire road transport system and life in cities and regions in the NSR.

CONTENT

1. AUTOMATED ROAD TRANSPORT (A.R.T)

- GOOD REASONS FOR GETTING INVOLVED

This roadmap provides a framework for planners, as well as local government and policy makers, to prepare communities and regions for the start of AVs (Automated Vehicles). It is important to note that this framework reflects the current state of understanding the implications of automated vehicle technology for planning, which is still in its infancy. As such, it should not be viewed as definitive, but rather as a foundation upon which to build through additional research, development, and testing of planning practices and tools.

Move beyond the “wait and see” attitude

The way to full adoption of automated technologies will take a long time and market saturation with fully autonomous vehicles will be at least several decades in the future. Irrespective of this, stakeholders should leave behind the often prevailing “wait and see” attitude and act.

Just as the car has had a visible impact on the physical structure of public areas, in the future, automated vehicles will fundamentally shape the face of our communities. The potential of this change is diverse, such as better public transport services, increasing attractiveness of locations for transport-intensive economic sectors and the reclamation of public space. Automated vehicles offer both opportunities and risks and pose new challenges for administration and planning.

With the roadmap, we want to contribute to developing a sustainable understanding of planning for AVs that does not react to changes, but rather anticipates them. In this way, stakeholders should be able to see the upcoming changes as an opportunity to work together to make future mobility socially attractive and ecologically sustainable. Readers will learn about the need to plan for the potential benefits and negative impacts of autonomous vehicles and what steps they can take now to properly prepare their communities.

STEPS FORWARD

STEP 1 TO GET STARTED — There is a common understanding of how existing municipal mobility can be improved with AVs.

STEP 2 PILOT PROJECTS — Alternative mobility concepts, their embedding in the existing environment and their effects are tested and analysed.

STEP 3 INTEGRATE PROVEN PROCESSES — Offer differentiation, integrated timetable sychronization and system integration

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2. STAKEHOLDERS IN THE PLANNING PROCESS

The design of tomorrow's mobility as well as the development and implementation of automated vehicles is associated with challenges that take place on different levels. At a strategic level, for example, the question arises how AVs can sustainably improve future mobility and transport. At the operational level, roles and internal processes will have to be rethought and finally users will have to be convinced and their acceptance won. It will therefore be crucial to work on the issues together with all the relevant stakeholders in the planning process.

Cities and municipalities as a key factor

Local government officials as well as stakeholders of cities and municipalities will play a key role when it comes to integrating automated vehicles into public transport and shaping the opportunities of the new technology.

Local stakeholders are in demand in many ways when it comes to AVs:

- as initiator
- as planning authority
- as implementer
- as networking provider & integrator
- as operator/ service provider
- as sponsor

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3. HOW TO PLAN FOR AUTOMATED VEHICLES?

STEP 1:
TO GET STARTED

To start planning, local governments should consider how AVs can serve the community's vision and goals for the future. This process should include walking, cycling and public transport as part of an integrated mobility system. Goals such as affordable public mobility for all and sustainability should continue to be the basis for planning. Communities and cities should not repeat the mistakes of the post-war era, in which comfortable driving became the main mode of transport at the expense of other modes of travel. Good planning that prioritizes community goals should continue regardless of when AVs arrive and will help make the new mobility attractive and sustainable as part of an integrated mobility system.

1. Analysis of mobility conditions and development of future scenarios
2. Open discussion and involvement
3. Strategy and planning framework
   Excursus 1: Attractive and sustainable public transport
4. Capacity building in planning and administration
5. Encourage AV testing

ANALYSIS OF MOBILITY CONDITIONS AND DEVELOPMENT OF FUTURE SCENARIOS

WHAT IT IS ABOUT

Before planning can begin, a common understanding of the goals and opportunities to be achieved with AVs is required. Scenarios are a tool for helping us take a long view in a world of great uncertainty. Planners should use scenario planning to characterize the range of possible futures and corresponding policy responses that support the community vision and goals.

STAKEHOLDER
Operational level

TIME FRAME
Now

RELEVANCE
!!!

WHAT TO DO

- Analysis of the problems and possibilities of all means of transport (example: SWOT analysis)
- Developing scenarios about possible futures. Use scenario planning to assess impacts of different AV scenarios, focusing on early indications of who wins and who loses.

WHAT SUCCESS LOOKS LIKE

- Risk and opportunity analysis has been carried out.
- Scenario modeling has taken place.

WHAT ELSE

Different scenarios are important as a basis for formulating concrete goals for the introduction of AVs, pointing out risks and jointly searching for desirable solutions in the field of mobility, settlement and neighborhood development. The scenarios make clear that the future – at least within defined limits – can be shaped. Whether and how depends on local circumstances and the actors involved and their interests.

OPEN DISCUSSION AND INVOLVEMENT

WHAT IT IS ABOUT

Based on a change in the constellation of actors and the increasing knowledge advantage of IT companies, public capacity building is necessary. The future role of automated vehicles in the transport system and their benefits for communities should therefore be placed more at the centre of public discussion. Because social acceptance is an important success factor in creating trust in the new technology. In addition, there is a unique opportunity to use the transformation process associated with autonomous driving for fundamental changes.

STAKEHOLDER
Strategic, operational and user level

TIME FRAME
Now, continuously

RELEVANCE
!!!!

WHAT TO DO

- Involvement of different stakeholders, e. g. via workshops, future workshops or site visits, citizens' consultation hours.
- Discussion and evaluation of the scenarios by the stakeholders involved.

WHAT SUCCESS LOOKS LIKE

- Potentials and challenges of ART were made visible to the population and were discussed.
- There is a common understanding of how existing local mobility can be improved with AVs.

WHAT ELSE

Transparent communication with the public, which may not yet have sufficient knowledge of exactly what autonomous transport means is correspondingly important. This requires discussion and a change of perspective between stakeholders in planning, politics, science, economy, and civil society.

STEP 1

2. DISCUSSION

STRATEGY AND PLANNING FRAMEWORK

WHAT IT IS ABOUT

Comprehensive and other long-range planning processes with typical time horizons of 20 to 30 years (a period within which AVs are expected to become widespread) should address the implications of AVs for transportation and other community systems. It's about developing a common and realistic vision that does not require science fiction and creates appropriate expectations about the possibilities and limits of the technology.

STAKEHOLDER
Strategic and operational level

TIME FRAME
Now

RELEVANCE
!!!

WHAT TO DO

- Develop a mobility vision of how the future should look like and be improved with AVs.
- Develop a regional AV strategy coordinating infrastructure changes, regulatory mechanisms, effects on land use and employment.
- Integrate AVs in long-term planning instruments.

WHAT SUCCESS LOOKS LIKE

- There is an internal commitment to improving existing mobility with AVs and testing new technologies.
- A strategic framework was set that maintains the necessary flexibility. With customers as the focus and technology at its heart.
- AVs have been integrated into planning tools.

WHAT ELSE

It is necessary for the stakeholders at the local and regional level to develop appropriate strategies in order to be able to integrate AVs in their transport, mobility and regional development objectives in the best possible way. Above all, to prevent further attractiveness of motorized private transport through autonomous driving.

STEP 1

3. STRATEGY

EXCURSUS 1:
ATTRACTIVE AND SUSTAINABLE PUBLIC TRANSPORT OF THE FUTURE

The automation of public transport offers the chance to bring the presented objectives more into line, so that they compete less with each other. In this way, an attractive public transport system and a profitable development for everyone involved can be set in motion.

Social objectives

- Participation in social life for people without a car
- Services of general interest for as many citizens as possible
- Public transport offer for all population groups (seniors, teenagers, etc.)

Economic objectives

- Economic efficiency of the public transport offer
- Income security through attractive public transport offers
- Appropriate and efficient use of public funds

Transport planning objectives

- High accessibility with public transport
- Functionality of student transport
- Public transport integration
  - Implementation-oriented concept

Ecological objectives

- Reduction of motorized private transport
- Sustainable modal split

STEP 1

3. STRATEGY

EXCURSUS 1

CAPACITY BUILDING IN PLANNING AND ADMINISTRATION

WHAT IT IS ABOUT

The operation of self-driving vehicles will have an immediate impact on workers in the transport and logistics industry. Policy makers, transport companies and job-training organizations need to be aware of the impact on access to stable jobs, as well as the skills required by those. In addition, municipalities should network with players from industry and research in order to be able to include the upcoming changes in further planning at an early stage.

STAKEHOLDER
Operational level

TIME FRAME
Continuously

RELEVANCE
!!!

WHAT TO DO

- Assess training needs: compare current versus future skills and research current training opportunities
- Initiate exchange with industry and science
- Introduction of information management for automated transport.
- Visit pilot projects

WHAT SUCCESS LOOKS LIKE

- New cooperation is established to stay up to date.
- Awareness of forthcoming challenges in urban and regional planning is increased.
- An exchange with municipalities that are already testing AVs has taken place.
- Municipalities keep themselves informed about progress in automated transport in research and practice.
- Training in new job opportunities for those impacted by AV technology is identified and provided.

WHAT ELSE

Securing and recruiting skilled workers is an important future issue in the transport industry. Digital skills are already playing an important role in many areas. They will become even more important in the years to come. In the future, it will probably be more about enabling employees to monitor the software and to be able to understand system decisions.

STEP 1

4. CAPACITY

ENCOURAGE AV TESTING

WHAT IT IS ABOUT

Pilot projects offer great potential for testing automated vehicles in accordance with the goals of a modal shift in an audit-open process and integrating them into the existing transport system. In the short term, policies are needed for the pilot applications that will occur with increasing frequency over the next several years.

STAKEHOLDER
Strategic and operational level

TIME FRAME
Now

RELEVANCE
!!

WHAT TO DO

- Initiation of a feasibility study identifying possible routes for pilot projects.
- Provide and constantly update information for approval procedures, vehicles, and possible routes.
- Development of criteria, standards, and framework conditions for pilot projects.

WHAT SUCCESS LOOKS LIKE

- Policies for pilot applications are agreed upon.
- Suitable routes for pilot routes have been identified. It is clear where potential areas of application for AVs are to solve mobility problems in the future.

WHAT ELSE

Explorative approaches in the form of short-term living labs can serve to investigate transformation-related questions and to gain site-specific experience. Municipalities can become pioneers here and network at an early stage. The early identification of suitable areas of application for automated vehicles increases the willingness of local actors to take action and thus the chances of raising funds for joint projects.

STEP 1

5. ENCOURAGE

STEP 2:
GAIN EXPERIENCE WITH PILOT APPLICATION

The challenges associated with the introduction of AVs in historically grown cities and communities make it necessary to proceed in small steps. When used in the field of public transport, many projects can only be carried out in the form of a demonstration or with a pilot character. This applies to the operation of such transport in Germany as well as in neighbouring European countries.

In the context of pilot projects, alternative mobility concepts, their embedding in the existing environment and their effects can be tested and analysed in real life. Different scenarios show, that the “how” of the implementation is decisive for whether future mobility supports the current goals of sustainable development or whether the direct and indirect effects will be counterproductive.

In step 2, the measures for implementing a pilot project up to the start of operations are explained in detail.

1. Selection of site location (operational design domain ODD)
   Excursus 2: Assessment of transport infrastructure
2. Define operational requirements
   Excursus 3: Possible forms of operation
3. Vehicle procurement
4. Financing
5. Citizen Participation and Public Relations
6. Putting into operation

STEP 2

SELECTION OF SITE LOCATION (OPERATIONAL DESIGN DOMAIN ODD)

WHAT IT IS ABOUT

Due to technical limitations and legal framework conditions, automated buses cannot yet be used on all roads or in highly complex environments. The specific use case for which an automated function or system is designed to operate properly is also referred to as the Operational Design Domain (ODD). The use of the vehicles can be limited to certain road types, speed ranges or other environmental conditions (weather, time of day/night, etc.).

The digitization of the traffic infrastructure is an important step that makes automated traffic possible in the first place. This includes both upgrading the physical infrastructure with digital technology and providing needs-based bandwidth along the transport routes.

An individual assessment of the existing infrastructure must be carried out, especially for the demonstrational operation and the early introduction phase of automated (small) buses. In principle, simple, orderly traffic conditions with few potential disruptive factors are advantageous for operations, since the vehicles drive defensively and react to any potential disruption.

The following evaluation scheme (Excursus 2, p. 17) is suitable for an evaluation of the infrastructure, which enables municipalities and mobility providers to make an initial assessment of the existing infrastructure under the individual requirements and thus to identify the need for action in the infrastructure.

WHAT TO DO

- Assessment of existing transport infrastructure (Excursus 2, p. 17)
- Assessment of existing IT infrastructure: reliable network coverage, GPS, V2X communication

STAKEHOLDER
Operational level

TIME FRAME
Then

RELEVANCE
!!!

WHAT SUCCESS LOOKS LIKE

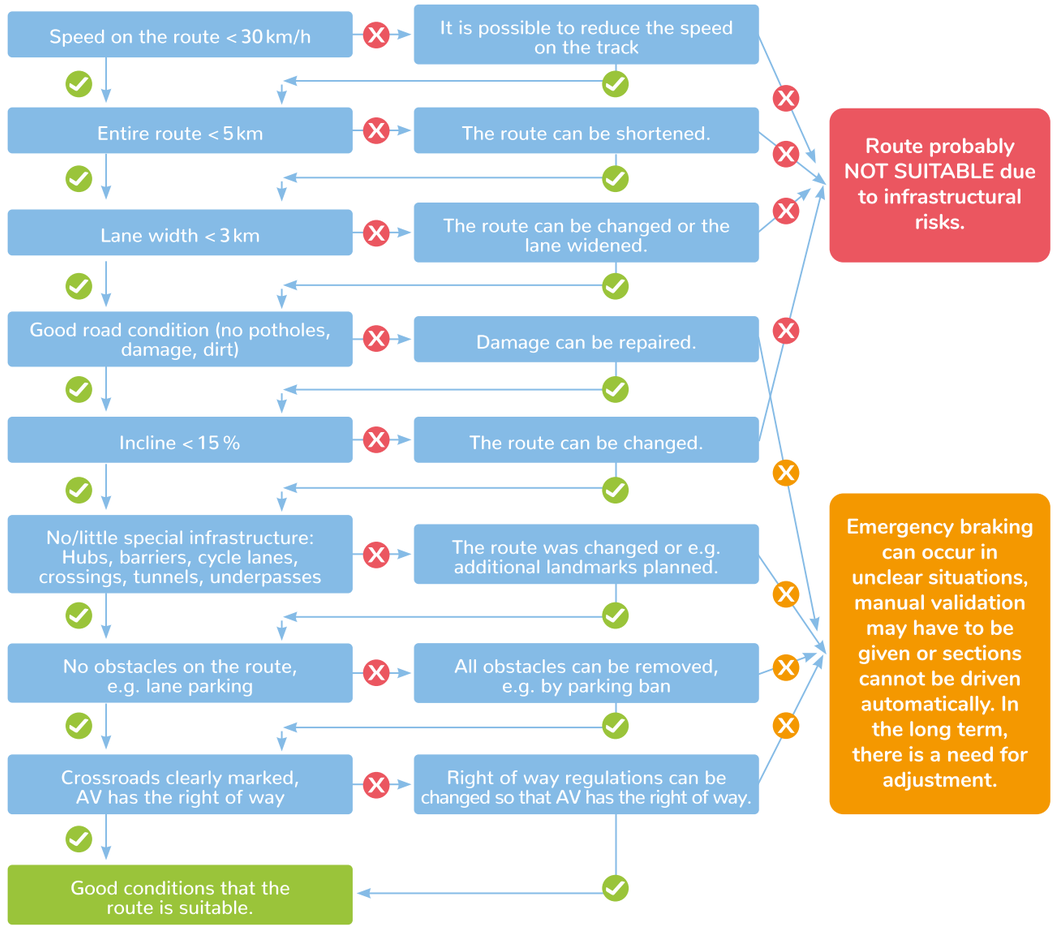
- Existing infrastructure was evaluated and the need for action identified.
- A suitable test track/test field was selected.

WHAT ELSE

Upgrading traffic infrastructures with digital technology (sensors, telematics, control technology) is a basic requirement for many aspects of automated transport.

STEP 2
1. LOCATION

Excursus 2:
Assessment of the transport infrastructure for the suitability of automated buses (Level 2+3)



STEP 2
1. LOCATION
EXCURSUS 2

DEFINE OPERATIONAL REQUIREMENTS

WHAT IT IS ABOUT

A pilot project for automated vehicles in public transport is not just about identifying interesting routes, but also about developing operating concepts that show the potential of the interaction of automated minibuses, conventional bus services and, if necessary, rail traffic. It should be made clear how automated minibuses can take on a function for the transport of passengers and how the entire public transport system can benefit from this.

STAKEHOLDER
Operational level

TIME FRAME
Then

RELEVANCE
!!!

WHAT TO DO

- **Infrastructure:** Adjustments to the road infrastructure to meet the needs of automated transport, such as e.g. reducing the maximum speed, setting up additional landmarks, extensive GPS coverage for the self-localization of the vehicles, etc.
- **Staff:** Define requirements for vehicle attendants and carry out training courses on technology, operation, safety, etc. at an early stage (often covered by vehicle manufacturers).
- **Define operating times:** It is important that the automated bus is integrated as part of the public transport service and that the travel time planning takes into account the connections to the existing public transport.
- **Define the form of operation:** see Excursus 3, page 19.
- **Set up parking and charging facilities:** The parking and charging of the vehicles used outside of operating hours should be set up in close proximity to the route. For this the use of a container is sufficient.
- **Bus stops:** The boarding options must be planned on site for the individual situations. The stops should be strategically chosen so that users have the shortest possible way to the new line. It must be clear to the user that the stop is a stop for the automated bus and that there is no regular bus service.

WHAT SUCCESS LOOKS LIKE

- An operating concept was developed for selected routes/for the application.
- The infrastructure was successfully adapted and stops, and parking facilities were installed.

WHAT ELSE

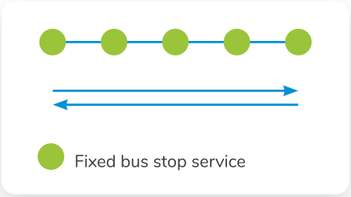
Automated driverless vehicles in public transport can be used to expand the transport offer in times and areas of weak transport demand or to reduce fares or generally improve their profitability.

STEP 2
2. DEFINE

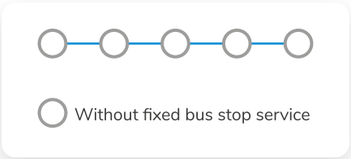
Excursus 3: Possible forms of operation

The automated buses currently available are prepared to implement various forms of operation known from local public transport.

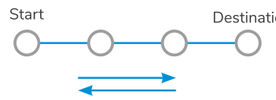
Scheduled regular service with fixed stops (Metro mode)
Timetabled operation is possible on the basis of the programmed routes and the defined stops. When planning the timetables, the specific restrictions resulting from the automatic control must be taken into account. With the mandatory service of stops, the bus stops at each stop listed in the timetable and opens the door. This is done independently of actual entry and exit requests.

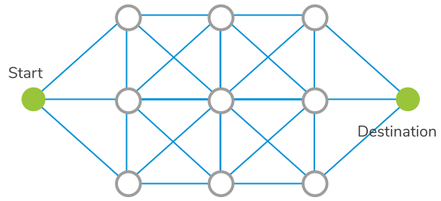


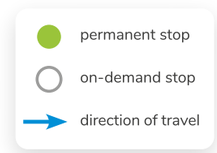
Timetable-based regular service with request-bus-stops (bus mode)
The operating form with request- stops differs only in the way the stops are approached. In the case of on-demand operation of the bus stops, the bus only stops when the need is reported and then opens the door. The passenger waiting at the bus stop registers the corresponding need using an app. In the bus, as in conventional bus services, the stop request button is simply pressed.

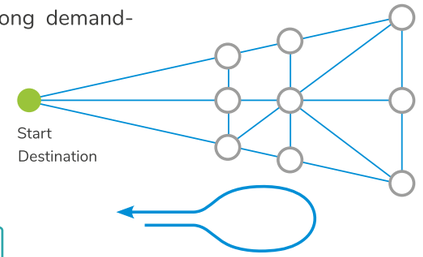


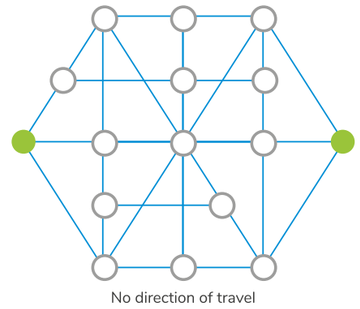
Call-a-bus-service, on-demand-service (taxi-mode)
The automated bus can be used in accordance with the call-a-bus operating modes of classic public transport. Operation without a timetable is possible based on a network of streets and defined stops approved for this bus. The software bundles registrations so that as many trips requests as possible can be concentrated on one ride. With this form of operation, passengers register their travel request via an app. The waiver of a timetable and line-bound operation enables a strong demand-oriented operation.











STEP 2
2. DEFINE
EXCURSUS 3

VEHICLE PROCUREMENT

WHAT IT IS ABOUT

Automated vehicles must be procured to implement the project goals. It is helpful to get a good overview of potential suppliers in advance and to describe the vehicle requirements in detail.

STAKEHOLDER
Operational level

TIME FRAME
Then

RELEVANCE
!!!

WHAT TO DO

- Clarification of a possible operator
- Define requirements for the vehicle
  (create specifications with MUST and CAN criteria)
- Market research
- Initiate tender procedures, if necessary
- Get offers
- Choice of manufacturer
- Obtain permits, licenses, and insurances

WHAT SUCCESS LOOKS LIKE

- Contract with vehicle manufacturer
- Vehicle has been delivered.
- Vehicle has received all permits, licenses, and insurances.

WHAT ELSE

Although automated vehicles can be operated in public areas today, it is often not possible to procure a vehicle with all the MUST and CAN requirements of public transport.

STEP 2

3. PROCUREMENT

FINANCING

WHAT IT IS ABOUT

From an economic perspective, financing without subsidies is very likely not possible at first. Due to the currently still high investment and implementation costs, it is advisable to consider the possibilities of the different funding guidelines.

STAKEHOLDER
Strategic and operational level

TIME FRAME
Then

RELEVANCE
!!

WHAT TO DO

- Estimating the costs and identifying sources for a financial support
- Development of a financing plan
- Agreement on the sharing of costs
- Apply for funding

WHAT SUCCESS LOOKS LIKE

- A financing plan was drawn up.
- All funding is secured. All costs and expenses of the overall calculation can be paid because appropriate funds are available or have been promised.

WHAT ELSE

The cost drivers in the experimental phase are the vehicles as small series with high acquisition costs, increased maintenance costs due to errors, infrastructure investments and personnel costs.

Experimental and research phase	Market launch	Autonomous public transport in practice
Cost-relevant factors • Vehicles as small series with high acquisition costs • Increased maintenance costs • Staff costs for safety driver **Revenue-relevant factors** • Limited uses, e.g. by low speed • Negative demand effects due to uncertainty about new technology • Lack of involvement in the financing structures of public transport • research funds		**Cost-relevant factors** • Standardized vehicles with low acquisition costs • Low-maintenance technology • Extensive application possibilities • Standard operation with no safety driver **Revenue-relevant factors** • Revenue effect of new offers • new financing/subsidies geared towards additional benefits

STEP 2

4. FINANCING

CITIZEN PARTICIPATION AND PUBLIC RELATIONS

WHAT IT IS ABOUT

Effective citizen involvement is a key to achieving sufficient community acceptance. It is therefore important to rely on extensive information on the background, motivation, goals, and structure of the project right from the start.

STAKEHOLDER
Operational and user level

TIME FRAME
Then

RELEVANCE
!!!

WHAT TO DO

- Creation of information material
- Work more closely with the local press
- Implementation of events such as citizens' consultation hours, citizens' dialogues

WHAT SUCCESS LOOKS LIKE

- Various public relations measures were carried out.
- Citizens were informed and had the opportunity to ask their questions at various events.

WHAT ELSE

Open communication about the current, actual capabilities of the automated vehicle, but also a classification of the project in the larger context of developments in the mobility sector and its challenges and opportunities, should be discussed openly with citizens to avoid possible conflicts

STEP 2

5. CITIZEN

PUTTING INTO OPERATION

WHAT IT IS ABOUT

After all preparations have been completed and all hurdles have been successfully cleared, the automated vehicle can be commissioned.

STAKEHOLDER
Operational level

TIME FRAME
Then

RELEVANCE
!!!

WHAT TO DO

- Mapping
- Carry out a test phase
- Setting up regular operations
- Official putting into operation with press conference

WHAT SUCCESS LOOKS LIKE

- Regular operation was successfully set up.

WHAT ELSE

With mapping, the (mini) bus drives along the route in manual mode and records the surroundings of the route. A digital map is created from this. The route that the vehicle will take later is defined in this map. Only after these steps are set, the vehicle will drive in automated mode.

STEP 2

6. OPERATION

OVERVIEW OF THE PROJECT STEPS IN A PROJECT UP TO THE START OF OPERATION

Municipality	Route	Vehicle manufacturer	Testing institute + authorities
	Route analysis	Market analysis	Market analysis
	Choice of route	Choice of manufacturer	Choice of testing institute
	Confirmation of feasibility		Conclusion of contract
	Contract negotiation		Compile documents
Information events	Conclusion of contract		
	Documents for the route	Vehicle delivery	
	Driving of the route		Vehicle inspection
	SAR	Improvement after assessment/ expert report	
Route adjustments			Expert report
Adjust documents			Special permit
Planning of (infrastructure) measures		Vehicle registration	
Determination of measures			Routing, planned bus stops, etc.
Traffic regulations			Operators manual
Implementation of measures			Route permit
Checking the measures			
	Mapping		
	Operator training		
	Test operation		
	Manufacturer's permission		
Start of operation			

STEP 3:
INTEGRATE PROVEN PROCESSES INTO FUTURE PLANNING

Automated and, in the future, driverless vehicles will increase the competitive pressure on public transport because the elimination of personnel costs will significantly reduce operating costs and the current driver shortage will be overcome. In particular, providers of ride pooling, taxis and other commercial transport services will benefit from this. Because with these offers, personnel costs have a particularly high proportion today due to the small number of seats. Their fares will very likely approach the fares of public transport and can thus become a competitor.

Against this background, public transport must be offered more attractively, produced more cheaply, and designed more effectively!

Driverless vehicles offer new opportunities for the availability and financing of mobility. In particular, autonomous minibuses have the potential to make an elementary contribution to micro-mobility, to make the connection of peripheral settlements affordable and thus to ensure public services.
Rural areas require intelligent solutions that ensure mobility without a car and ensure that everyone can participate in social and economic life, despite the great distances.

In step 3, planning principles for the integration of automated buses in public transport are explained in terms of user-friendly and sustainable mobility. The attractiveness and user acceptance of local public transport could be improved by differentiating the range of public transport offers in rural areas, building integrated timetable synchronization and system integrations.

STEP 3

1. Offer differentiation
2. Implementation of integrated timetable synchronization
3. Development of a feeder system

OFFER DIFFERENTIATION

WHAT IT IS ABOUT

The competitiveness of local public transport can be established particularly effectively on high-demand connections. For a usable public transport offer that makes life without a car possible for all, there will also have to be attractive public transport on cross connections with low demand and in the spaces between axes. This does not mean the development of small towns and remote districts in cities, but cross-connections in rural areas, such as between neighbouring basic or sub-centres, or tangential connections in cities or their surrounding areas.

STAKEHOLDER
Operational level

TIME FRAME
Now,
Continuous process

RELEVANCE
!!!

WHAT TO DO

- Development of strong system structures in public transport
- Expansion of public transport on high-demand axes
- Expansion of local public transport on low-demand cross-connections

WHAT SUCCESS LOOKS LIKE

- Due to their attractiveness, fast, direct and frequent connections achieve high market shares in the transport market.
- Differentiated, multi-level offer
- A higher-level basic network of train and bus lines that run at regular intervals and meet high quality requirements connects the central locations of a city or region and forms the basic structure of the transport offer. This is followed by the local bus service, which opens up the relevant destinations on a small scale.

WHAT ELSE

The timetable in regular service offers the maximum bundling of travel requests in one vehicle and thus minimum energy consumption per person transported. This is how the greatest effect for reducing CO2 emissions is achieved.

STEP 3

1. OFFER

IMPLEMENTATION OF INTEGRATED TIMETABLE SYNCHRONIZATION

WHAT IT IS ABOUT

The planning principle of integrated timetable synchronization improves the usability and attractiveness of public transport, especially in rural but also in urban and suburban areas. This is necessary to make public transport more competitive against the background of the upcoming competition **(see page 25)**.

Example:
Correspondence on the hour

STAKEHOLDER
Operational level

TIME FRAME
Now, precondition for later AV-integration

RELEVANCE
!!!!

WHAT TO DO

- The timetables of the individual train and bus lines are planned with regular departure and arrival times and aligned to hubs.
- The timetables of all train and bus lines are planned “symmetrically”.
- For this purpose, travel times are often shortened by changes to the route or extended by serving additional stops.

WHAT SUCCESS LOOKS LIKE

- Alignment to hubs allows for numerous new connections.
- Public transport is becoming more attractive and usable for many travel purposes.
- Direct connections can be omitted and allow savings.

WHAT ELSE

The costs of maintaining local public transport, especially in rural areas, are largely determined by the cost of student transport. To be able to finance future public transport, it is therefore important to integrate school transport into the Integrated Synchronized Timetable.

STEP 3

2. IMPLEMENTATION

DEVELOPMENT OF A FEEDER SYSTEM

WHAT IT IS ABOUT

Away from transport axes with a constant transport demand, there is a need for development and connection to relevant destinations, e. g. lower-order centers in rural areas, access points (railway stations) to fast rail transport or district centers in the city. The character of these feeder systems can vary but is characterized by access function.

STAKEHOLDER
Operational level

TIME FRAME
Then

RELEVANCE
!!!!

WHAT TO DO

- Expand micro-mobility and implement last-mile mobility.
- Creation of possible solutions not only for existing villages and settlements, but also for new development areas away from the main axes.

WHAT SUCCESS LOOKS LIKE

- The lower production costs with no personnel costs are used to create an extensive public transport offer.
- A feeder system to the hubs with correspondence to the main lines was implemented.

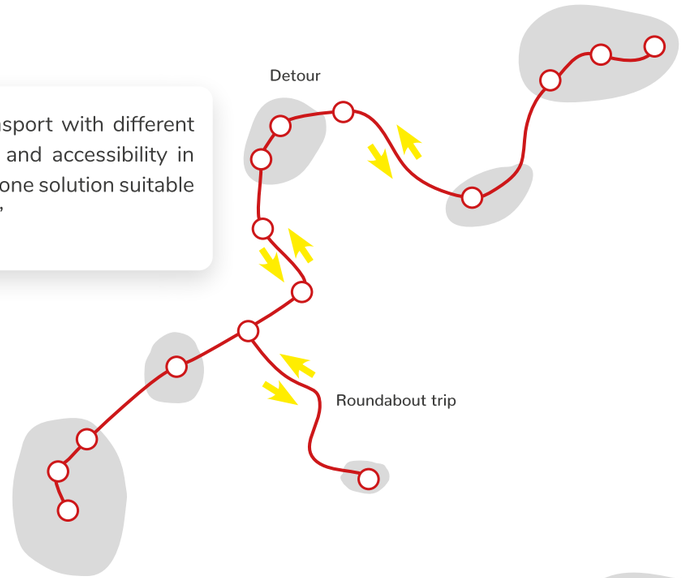
WHAT ELSE

The operating concept of these more detailed transport offers can be very different, spatially even within a district or a municipality or also in terms of time, e.g. at night or at the weekend.

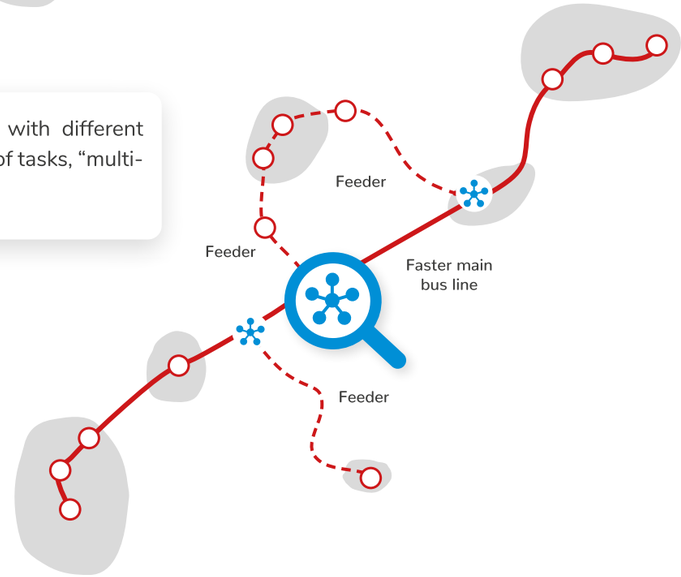
STEP 3

3. DEVELOPMENT

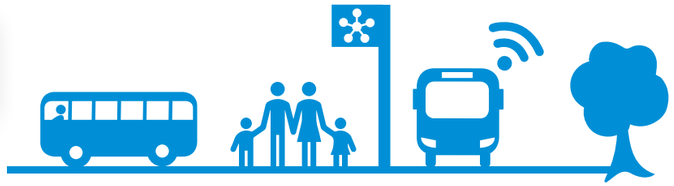
Regional bus transport with different tasks, connection and accessibility in one line “an all-in-one solution suitable for every purpose”



Regional bus services with different offers and assignment of tasks, “multi-level operation”



Linking of conventional and autonomous vehicles.



Interreg
North Sea Region
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4. RECOMMENDATIONS FOR ACTION

Be prepared! The time to begin planning is now.

Use the unique opportunity to comprehensively make mobility future-proof.

Use automation and transformation as an opportunity for groundbreaking changes and not just for isolated partial solutions.

Get a locational advantage in intercommunal and interregional competition.

Towards the future: Solve traffic problems with AVs and develop new mobility offers

Be sure to discuss the design of automated mobility with large parts of society and ensure that they play an active role in shaping it.

Start now with the development of future-oriented structures by differentiating offers and distributing tasks in the sense of a uniform system.

A.R.T.-FORUM IMPRESSIONS OF THE PROJECT

MOBILE ZEITEN
Mit Leidenschaft für Mobilität.