Autonomous Vehicles to Evolve to a New Urban Experience

DELIVERABLE 7.15

Dissemination of pilot data collection

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Acronyms

ADS	Automated Driving Systems
AI	Artificial Intelligence
AM	Automated Mobility
API	Application Protocol Interface
AV	Automated Vehicle
BM	Bestmile
BMM	Business Modelling Manager
CAV	Connected and Automated Vehicles
CB	Consortium Body
CERN	European Organization for Nuclear Research
D7.1	Deliverable 7.1
DC	Demonstration Coordinator
DI	The department of infrastructure (Swiss Canton of Geneva)
DMP	Data Management Plan
DSES	Department of Security and Economy - Traffic Police (Swiss Canton of Geneva)
DTU test track	Technical University of Denmark test track
EAB	External Advisory Board
EC	European Commission
ECSEL	Electronic Components and Systems for European Leadership
EM	Exploitation Manager
EU	European Union
EUCAD	European Conference on Connected and Automated Driving
F2F	Face to face meeting
FEDRO	(Swiss) Federal Roads Office
FOT	(Swiss) Federal Office of Transport
GDPR	General Data Protection Regulation
GIMS	Geneva International Motor Show
GNSS	Global Navigation Satellite System
HARA	Hazard Analysis and Risk Assessment
IPR	Intellectual Property Rights
IT	Information Technology
ITU	International Telecommunications Union
LA	Leading Author
LIDAR	Light Detection And Ranging
MEM	Monitoring and Evaluation Manager
MT	MobileThinking
OCT	General Transport Directorate of the Canton of Geneva
ODD	Operational Domain Design
OEDR	Object And Event Detection And Response
OFCOM	(Swiss) Federal Office of Communications
PC	Project Coordinator
PEB	Project Executive Board
PGA	Project General Assembly
PRM	Persons with Reduced Mobility
PSA	Group PSA (PSA Peugeot Citroën)
PTO	Public Transportation Operator
PTS	Public Transportation Services
QRM	Quality and Risk Manager
QRMB	Quality and Risk Management Board
RN	Risk Number
SA	Scientific Advisor
SAE Level	Society of Automotive Engineers Level (Vehicle Autonomy Level)
SAN	(Swiss) Cantonal Vehicle Service
SDK	Software Development Kit
SLA	Sales Lentz Autocars
SMB	Site Management Board
SoA	State of the Art
SOTIF	Safety Of The Intended Functionality
SWOT	Strengths, Weaknesses, Opportunities, and Threats.
T7.1	Task 7.1
TM	Technical Manager
TPG	Transport Publics Genevois
UITP	Union Internationale des Transports Publics (International Transport Union)
V2I	Vehicle to Infrastructure communication
WP	Work Package
WPL	Work Package Leader

Executive Summary

Within the H2020 Open Research Data Pilot's framework (which enables open access and reuse of research data generated by Horizon 2020 projects), selected portions of the data collected during the AVENUE project have been deposited in public data archives. This deliverable provides a description of the various datasets and provides details regarding their structure and composition.

The deposited datasets can be obtained on the following repository URL: https://yareta.unige.ch/home/detail/f75cd313-87ff-4688-aeee-c2f8268abc31

1 Introduction

AVENUE aims to design and carry out full-scale demonstrations of urban transport automation by deploying, for the first time worldwide, fleets of Automated minibuses in low to medium demand areas of 4 European demonstrator cities (Geneva, Lyon, Copenhagen, and Luxembourg) and 2 to 3 replicator cities. The AVENUE vision for future public transport in urban and suburban areas, is that Automated vehicles will ensure safe, rapid, economic, sustainable, and personalised transport of passengers. AVENUE introduces disruptive public transportation paradigms based on demand, door-to-door services, aiming to set up a new model of public transportation, by revisiting the offered public transportation services, and aiming to suppress prescheduled fixed bus itineraries.

Vehicle services that substantially enhance the passenger experience as well as the overall quality and value of the service will be introduced, also targeting elderly people, people with disabilities and vulnerable users. Road behaviour, security of the Automated vehicles and passengers' safety are central points of the AVENUE project.

At the end of the AVENUE project four-year period the mission is to have demonstrated that Automated vehicles will become the future solution for public transport. The AVENUE project will demonstrate the economic, environmental, and social potential of Automated vehicles for both companies and public commuters while assessing the vehicle road behaviour safety.

1.1 On-demand Mobility

Public transportation is a key element of a region's economic development and the quality of life of its citizens.

Governments around the world are defining strategies for the development of efficient public transport based on different criteria of importance to their regions, such as topography, citizens' needs, social and economic barriers, environmental concerns, and historical development. However, new technologies, modes of transport and services are appearing, which seem very promising to the support of regional strategies for the development of public transport.

On-demand transport is a public transport service that only works when a reservation has been recorded and will be a relevant solution where the demand for transport is diffuse and regular transport is inefficient.

On-demand transport differs from other public transport services in that vehicles do not follow a fixed route and do not use a predefined timetable. Unlike taxis, on-demand public transport is usually also not individual. An operator or an automated system takes care of the booking, planning and organization.

It is recognized that the use and integration of on-demand Automated vehicles has the potential to significantly improve services and provide solutions to many of the problems encountered today in the development of sustainable and efficient public transport.

1.2 Fully Automated Vehicles

A self-driving car, referred in the AVENUE project as a **Fully Automated Vehicle** (**AV**), or as Autonomous Vehicle, is a vehicle that can sense its environment and moving safely with no human input.

The terms *automated vehicles* and *autonomous vehicles* are often used together. The Regulation 2019/2144 of the European Parliament and of the Council of 27 November 2019 on type-approval requirements for motor vehicles defines "automated vehicle" and "fully automated vehicle" based on their autonomous capacity:

An "automated vehicle" means a motor vehicle designed and constructed to move autonomously for certain periods of time without continuous driver supervision but in respect of which driver intervention is still expected or required

"Fully automated vehicle" means a motor vehicle that has been designed and constructed to move autonomously without any driver supervision

In AVENUE we operate ***Fully Automated minibuses for public transport***, (previously referred as Autonomous shuttles, or Autonomous buses), and we refer to them as simply *Automated minibuses* or *the AVENUE minibuses.*

In relation to the SAE levels, the AVENUE project will operate SAE Level 4 vehicles.

SAE INTERNATIONAL SAE J3016™ LEVELS OF DRIVING AUTOMATION

	SAE LEVEL 0	SAE LEVEL 1	SAE LEVEL 2	SAE LEVEL 3	SAE LEVEL 4	SAE LEVEL 5
What does the human in the driver's seat have to do?	You are driving whenever these driver support features are engaged – even if your feet are off the pedals and you are not steering			You are not driving when these automated driving features are engaged – even if you are seated in "the driver's seat"		
	You must constantly supervise these support features; you must steer, brake or accelerate as needed to maintain safety			When the feature requests, you must drive	These automated driving features will not require you to take over driving	
	These are driver support features			These are automated driving features		
What do these features do?	These features are limited to providing warnings and momentary assistance	These features provide steering OR brake/ acceleration support to the driver	These features provide steering AND brake/ acceleration support to the driver	These features can drive the vehicle under limited conditions and will not operate unless all required conditions are met		This feature can drive the vehicle under all conditions
Example Features	• automatic emergency braking • blind spot warning • lane departure warning	• lane centering OR • adaptive cruise control	• lane centering AND • adaptive cruise control at the same time	• traffic jam chauffeur	• local driverless taxi • pedals/ steering wheel may or may not be installed	• same as level 4, but feature can drive everywhere in all conditions

Table 1: SAE Driving Automation levels (©2020 SAE International)

1.2.1 Automated vehicle operation overview

We distinguish in AVENUE two levels of control of the AV: micro-navigation and macro-navigation. Micro navigation is fully integrated in the vehicle and implements the road behaviour of the vehicle, while macro-navigation is controlled by the operator running the vehicle and defines the destination and path of the vehicle, as defined the higher view of the overall fleet management.

For micro-navigation Automated Vehicles combine a variety of sensors to perceive their surroundings, such as 3D video, LIDAR, sonar, GNSS, odometry and other types of sensors. Control software and systems, integrated in the vehicle, fusion and interpret the sensor information to identify the current position of the vehicle, detecting obstacles in the surround environment, and choosing the most appropriate reaction of the vehicle, ranging from stopping to bypassing the obstacle, reducing its speed, making a turn etc.

For the Macro-navigation, that is the destination to reach, the Automated Vehicle receives the information from either the in-vehicle operator (in the current configuration with a fixed path route), or from the remote-control service via a dedicated 4/5G communication channel, for a fleet-managed operation. The fleet management system considers all available vehicles in the services area, the passenger request, the operator policies, the street conditions (closed streets) and send route and stop information to the vehicle (route to follow and destination to reach).

1.2.2 Automated vehicle capabilities in AVENUE

The Automated vehicles employed in AVENUE fully and automatically manage the above defined, micro-navigation and road behaviour, in an open street environment. The vehicles are automatically capable to recognise obstacles (and identify some of them), identify moving and stationary objects, and automatically decide to bypass or wait behind them, based on the defined policies. For example, with small changes in its route the AVENUE minibus is able to bypass a parked car, while it will slow down and follow behind a slowly moving car. The AVENUE mini-buses are able to handle different complex road situations, like entering and exiting round-about in the presence of other fast running cars, stop in zebra crossings, communicate with infrastructure via V2I interfaces (ex. red light control).

The minibuses used in the AVENUE project technically can achieve speeds of more than 60Km/h. However, this speed cannot be used in the project demonstrators for several reasons, ranging from regulatory to safety. Under current regulations the maximum authorised speed is 25 or 30 Km/h (depending on the site). In the current demonstrators the speed does not exceed 23 Km/h, with an operational speed of 14 to 18 Km/h. Another, more important reason for limiting the vehicle speed is safety for passengers and pedestrians. Due to the fact that the current LIDAR has a range of 100m and the obstacle identification is done for objects no further than 40 meters, and considering that the vehicle must safely stop in case of an obstacle on the road (which will be “seen” at less than 40 meters distance) we cannot guarantee a safe braking if the speed is more than 25 Km/h. Note that technically the vehicle can make harsh break and stop with 40 meters in high speeds (40 -50 Km/h) but then the break would too harsh putting in risk the vehicle passengers. The project is working in finding an optimal point between passenger and pedestrian safety.

Due to legal requirements a **Safety Operator** must always be present in the vehicle, able to take control any moment. Additionally, at the control room, a **Supervisor** is present controlling the fleet operations. An **Intervention Team** is present in the deployment area ready to intervene in case of incident to any of the minibuses. Table 2 provides an overview of the AVENEU sites and ODDs.

	Summary of AVENUE operating sites demonstrators							
	TPG		Holo		Keolis	Sales-Lentz		
	Geneva		Copenhagen	Oslo	Lyon	Luxembourg		
Site	Meyrin	Belle-Idée	Nordhavn	Ormøya	ParcOL	Pfaffental	Contern	Esch sur Alzette
Funding	TPG	EU + TPG	EU + Holo	EU + Holo	EU + Keolis	EU + SLA	EU + SLA	EU + SLA
Start date of project	August 2017	May 2018	May 2017	August 2019	May 2017	June 2018	June 2018	February 2022
Start date of trial	July 2018	June 2020	September 2020	December 2019	November 2019	September 2018	September 2018	April 2022
Type of route	Fixed circular line	Area	Fixed circular line	Fixed circular line	Fixed circular line	Fixed circular line	Fixed circular line	Fixed circular line
Level of on-demand service*	Fixed route / Fixed stops	Flexible route / On-demand stops	Fixed route / Fixed stops	Fixed route / Fixed stops	Fixed route/Fixed stops	Fixed route / Fixed stops	Fixed route / Fixed stops	Fixed route / Fixed stops
Route length	2,1 km	38 hectares	1,3 km	1,6 km	1,3 km	1,2 km	2,3 km	1 km
Road environment	Open road	Semi-private	Open road	Open road	Open road	Public road	Public road	Main pedestrian road
Type of traffic	Mixed	Mixed	Mixed	Mixed	Mixed	Mixed	Mixed	Pedestrians, bicycles, delivery cars
Speed limit	30 km/h	30 km/h	30 km/h	30 km/h	8 to 10 km/h	30 km/h	50 km/h	20 km/h
Roundabouts	Yes	Yes	No	No	Yes	No	No	No
Traffic lights	No	No	No	No	Yes	Yes	Yes	No
Type of service	Fixed line	On demand	Fixed line	Fixed line	Fixed line	Fixed line	Fixed line	On Demand
Concession	Line (circular)	Area	Line (circular)	Line (circular)	Line (circular)	Line (circular)	Line (circular)	Line (circular)
Number of stops	4	> 35	6	6	2	4	2	3
Type of bus stop	Fixed	Fixed	Fixed	Fixed	Fixed	Fixed	Fixed	Fixed
Bus stop infrastructure	Yes	Sometimes, mostly not	Yes	Yes	Yes	Yes	Yes	Yes
Number of vehicles	1	3-4	1	2	2	2	1	1
Timetable	Fixed	On demand	Fixed	Fixed	Fixed	Fixed	Fixed	On-demand
Operation hours	Monday-Friday (5 days)	Sunday-Saturday (7 days)	Monday-Friday (5 days)	Monday-Sunday (7 days)	Monday-Saturday (6 days)	Tuesday & Thursday Saturday, Sunday & every public holiday	Monday - Friday	Monday – Saturday
Timeframe weekdays	06:30 – 08:30 / 16:00 – 18:15	07:00 – 19:00	10:00 – 18:00	7:30 – 21:30	08:30 – 19:30	12:00 – 20h00	7:00 – 9:00 16:00 – 19:00	11:00 – 18:00 11:00 – 18:00
Timeframe weekends	No service	07:00 – 19:00	No service	9:00 – 18:00	08:30 – 19:30	10:00 – 21:00	No Service	On Suterday only
Depot	400 meters distance	On site	800 meters distance	200 meters distance	On site	On site	On site	500 m distance
Driverless service	No	2021	No	No	No	No	No	No
Drive area type/ODD	B-Roads	Minor roads/parking	B-Roads/minor roads	B-Roads	B-Roads	B-Roads	B-Roads/parking	
Drive area geo/ODD	Straight lines/plane	Straight lines/ plane	Straight lines/ plane	Curves/slopes	Straight Lines/ plane	Straight lines/ plane	Straight lines/ plane	Straight lines / plane
Lane specification/ODD	Traffic lane	Traffic lane	Traffic lane	Traffic lane	Traffic lane	Traffic lane	Traffic lane	Open area
Drive area signs/ODD	Regulatory	Regulatory	Regulatory, Warning	Regulatory	Regulatory	Regulatory	Regulatory	Regulatory
Drive area surface/ODD	Standard surface, Speedbumps	Standard surface, Speedbumps	Standard surface Speedbumps, Roadworks	Frequent Ice, Snow	Standard surface, Potholes	Standard surface	Standard surface	Standard Surrface

Table 2: Summary of AVENUE operating site (+ODD components)

1.3 Preamble

The AVENUE project is set up to offer on demand door-to-door solutions integrated within existing public transportation services and evaluates the feasibility of operating autonomous AMs with routes and schedules based on real-time passenger demand, instead of following fixed itineraries and predetermined timetables. AVENUE's objective is to showcase these customized transport solutions at demonstrator sites in Copenhagen, Geneva, Luxembourg and Lyon, and later duplicate them in several other European cities. Work package WP7 aims to organize, run and evaluate these large-scale demonstrators of the autonomous vehicle services for public transport, targeting different user groups, and transport models. The goal is to validate a high quality, safe service, which will enhance acceptance and adoption of autonomous vehicles for public transport.

Within the H2020 Open Research Data Pilot's framework (which enables open access and reuse of research data generated by Horizon 2020 projects), some data collected during the project have been deposited in public data archives. This deliverable includes general information about the different data sets that have been collected during regular AMPT services and provides details regarding their content.

2 Pilot data collection

2.1 General information on the pilot data collection

A large set of data was collected by NAVYA and the local PTOs such as HOLO, SLA or TPG throughout the four and half year of service that the AVENUE project's AMs guaranteed. These data are made available online within the Open Research Data Pilot (ORDP) framework which aims to develop a Data Management Plan (DMP) and to provide open access to research data.

The data was therefore gathered from the Nordhavn and Slagelse-hospital demonstration sites (in Denmark) but also from the Ormøya (Norway), the Belle-idée (Switzerland) and the Contern (Luxembourg) sites. Please consult the other WP7 deliverables for more detailed information about the various AVENUE demonstration and replication sites. The set of data is separated into five different compressed archives, one for each of these demonstration sites. Within all these compressed archives are files of two different types, which consist of tables (in CSV format) containing all the events that occurred during the AM operation (giving precise information on all these events) and the vehicle states (giving various information about the state of the AM including the status of the vehicle's various sensors). For the Contern site, there is also a table recording all the issues, another reflecting the operational time and a last one for the passenger count. A set of data linked to the various surveys is also made available.

Here is a list of the different compressed folders composing the dataset with the specific files they contain.

The Holo dataset archive (2.09 GB):

- « Nordhavn Route.zip » (230 MB)
  - « Nordhavn_events.csv »
  - « Nordhavn_states.csv »

- « Slagelse Route.zip » (616 MB)
  - « Slagelse_events.csv »
  - « Slagelse_states.csv » (part1-3)

- « Ormoya Route.zip » (1.26 GB)
  - « Ormoya_events.csv »
  - « Ormoya_states.csv » (part1-7)

The SLA dataset archive (554 MB)

- « Contern Route.zip » (554 MB)
  - « Contern_events.csv »
  - « Contern_states.csv » (part1-4)
  - « Contern_issues.csv »
  - « Contern_operational time.csv »
  - « Passengers counting.csv »

The TPG dataset archive (8.97MB)

- « Belle idee Route.zip » (8.97 MB)
  - « Belle idee_states.csv »

A second dataset linked to the social survey is composed of two file:

- « Dataset_rep_Avenue_2021.sav »
- « Codebook-rep-Avenue-202.pdf »

2.2 Description of the data linked to the shuttle operation

This section describes the content of the different file types (events, states issues, operational time, passenger counting) of the pilot data collection linked to the AM operation.

2.2.1 « Events » files description

There is one such file (table) per demonstration site. Each entry line of these tables corresponds to a specific event and contains all the information related to that event. This information is concatenated and isolated by commas. The dataset consists of millions of these input lines (ie., 305,827 for Nordhavn, 671,970 for Slagelse, 1,048,576 for Ormøya).

For each of these input lines the following components can be found (given in the same order they appear within the sequence):

- ***Vehicle_id***: Vehicle identification number (VIN) specific to each AM (e.g. for Nordhavn AMs it will be VG9A2CB2CJV019109 and VG9A2CB2CJV019111, for Slagelse ones, VG9A2CB2CJV019109, VG9A2CB2CJV019111, VG9A2CB2CHV019066, etc. and for the Ormøya ones, VG9A2CB2CJV019112, VG9A2CB2CJV019064, VG9A2CB2CIV019084, etc.).
- ***Timestamp***: Precise date and time with associated time zone (in this particular format: 2021-01-23 08:22:09.652 UTC).
- ***Route***: Blank within this dataset.
- ***Id***: Event number unique to each event (e.g. 1611390738874083).
- ***Type***: Type of event, is it a defect or a service to be undertaken (DEFECT, SERVICE)?
- ***Category***: Category of event, whether it's a software, hardware, communication or supervision problem (SOFTWARE HARDWARE, COMMUNICATION, SUPERVISION, OTHER).
- ***State***: Where does the event stand, is it already over or still in progress (ACTIVE, OVER)?
- ***Level***: Importance level of the event (LOW, MEDIUM, HIGH).
- ***Info***: Concrete description of each specific event (e.g. IMU input reading, Stop request due to blackbox error, BlackBox PC2 communication).
- ***Code***: Code attributed to each type of event (e.g. A new session has been launched is linked to the code 401201017).
- ***Latitude***: Precise WGS84 latitudinal coordinates of the AM location when the event occurred.
- ***Longitude***: Precise WGS84 longitudinal coordinates of the AM location when the event occurred.
- ***Altitude***: Precise altitude (value in meters) of the AM at the time of the event.

- ***Bearing***: Lidar Bearing measurement value. It refers to the horizontal angle at which the laser beam is emitted or received by the sensor. It helps define the direction in which the LiDAR sensor is scanning or measuring distances (value given in degrees).
- **Timestamp_int**: Precise time at which the event took place in Timestamp value. The Timestamp (unix) designates the number of seconds elapsed since January 1, 1970 at midnight UTC (e.g.1577705054583 correspond to 31/08/2023 14:20:01).
- **Route_id**: A specific Id is assigned to each of the routes used in the different AVENUE demonstrations (ie., SEM-NOR for Nordhavn, SEM-SLA for Slagelse and SEM-ORM for Ormøya).

2.2.2 « States » file description

These files are divided into several parts (except for the Nordhavn site). They are also made up of millions of entry lines, providing a snapshot of the vehicle's status at any given moment. Here again, each entry contains a series of information separated by commas.

For each of these input lines the following components can be found (given in the same order they appear within the sequence):

- ***Vehicle_id:*** This is the vehicle identification number (VIN) specific to each AM (e.g. for Nordhavn AMs it will be VG9A2CB2CJV019109 and VG9A2CB2CJV019111, for Slagelse ones, VG9A2CB2CJV019109, VG9A2CB2CJV019111, VG9A2CB2CHV019066, etc. and for the Ormøya ones VG9A2CB2CJV019112, VG9A2CB2CJV019064, VG9A2CB2CIV019084, etc.).
- ***Timestamp****:* Precise date and time with associated time zone (in this particular format: 2021-01-23 08:22:09.652 UTC).
- ***Route***: Blank within this dataset.
- ***Door_status:*** Status of the doors, which may be open, closed or in the process of being opened or closed (OPENED, CLOSED, OPENING, CLOSING).
- ***Battery_status:*** Battery status, either charging or not (CHARGING, NO_CHARGE).
- ***Battery_level:*** Battery charge value in %.
- ***Speed_unit:*** Speed unit used. It is the Meter per second in all case (MPS).
- ***Speed_value:*** Value of the speed.
- ***Mileage_unit:*** Distance unit used for the odometer measurement. It is the Meter in all case (METER).
- ***Mileage_value:*** Odometer value (total AM mileage).
- ***Bearing:*** Lidar Bearing measurement value. It refers to the horizontal angle at which the laser beam is emitted or received by the sensor. It helps define the direction in which the LiDAR sensor is scanning or measuring distances (value given in degrees).
- ***Next_station:*** Name of the next station (blank within this dataset).
- ***Temperature_outdoor_unit:*** Unit used for outdoor temperature measurement. In all cases degrees Celsius are used (CELSIUS).
- ***Temperature_outdoor_value:*** Temperature value for the outdoor sensor.
- ***Temperature_indoor_unit:*** Unit used for indoor temperature measurement. In all cases degrees Celsius are used (CELSIUS).
- ***Temperature_indoor_value:*** Temperature value for the indoor sensor.

- ***Acceleration_unit*:** Unit used to measure acceleration. In all cases, it is the Meter per second^2 (MPSS).
- ***Acceleration_value*:** Value of the acceleration.
- ***Supervision_mode*:** Supervision or control mode under which the vehicle operates. AMPT operates here in stand-alone mode, i.e. in complete autonomy, without external assistance (STAND_ALONE).
- ***Service_mode*:** This is the service mode under which the vehicle operates, it could be demand responsive service or pre-scheduled one (METRO, ON_DEMAND).
- ***Vehicle_mode*:** Is the vehicle in use or awaiting (STANBY, USE)?
- ***Navigation_mode*:** Refers to the navigation mode under which the vehicle operates. When the vehicle is in automatic mode, this indicates that the vehicle is operating in autonomous navigation mode. Manual mode indicates that the safety driver is in manual control of the vehicle (AUTO, MANUAL).
- ***Steering_angle_unit*:** Unit used to measure the steering angle. Always given in radian (RAD).
- ***Steering_angle_value*:** Steering angle value.
- ***Steering_rate_unit*:** Unit used to measure the angular acceleration of the steering. Always given in radians per second (RADPS).
- **Steering_rate_value:** Value of the angular acceleration of the steering.
- **Hit_ratio:** Hit ratio value (%). Hit ratio is the ratio of the services retrieved from the Thrusted Third Party (TTP) in the cloud service area where an AM was predicted to be available in at a future time point over the total number of services requested using the location prediction technique.
- **Gnss_state:** Indicates the type of localization signal being employed. It could be REAL_TIME_KINEMATICS (RTK is the broader technique that involves using real-time corrections from a base station to achieve highly accurate positioning. Here the receiver achieves a "fixed" solution which can achieve the highest level of accuracy), FLOAT_RTK (refers to a mode within RTK where the accuracy is not as high as the "fixed" solution) or DGPS_FIX (DGPS is designed to correct GPS positioning errors, but the accuracy here is lower than RTK one).
- ***Latitude***: Precise WGS84 latitudinal coordinates of the AM location when its state is reported.
- ***Longitude***: Precise WGS84 longitudinal coordinates of the AM location when its state is reported.
- ***Altitude***: Precise altitude (value in meters) of the AM when its state is reported.
- ***Timestamp_int***: Precise time at which the AM information are gathered reported in Timestamp value. The Timestamp (unix) designates the number of seconds elapsed since January 1, 1970 at midnight UTC (e.g.1577705054583 correspond to 31/08/2023 14:20:01).
- ***Route_id***: A specific Id is assigned to each of the three routes used in the different Holo-supervised AVENUE demonstrations (SEM-NOR for Nordhavn, SEM-SLA for Slagelse and SEM-ORM for Ormøya).
- ***Soft_version*:** Navya Arma software version used (blank within this dataset).
- ***Temperature_engine_unit*:** Measurement unit used to quantify the motor temperature (blank within this dataset).
- ***Temperature_engine_value*:** Motor temperature value (blank within this dataset).

- ***Gnss_signal***: Strength of localization signal (blank within this dataset).
- ***Brake_light***: Status of the brake light (blank within this dataset).
- ***Reverse_light***: Status of the reverse direction indicator light (blank within this dataset).
- ***Blinkers_state***: Status of the blinkers (blank within this dataset).
- ***Driving_direction***: The AM operates in a multidirectional manner, with no fixed direction of travel. The direction in which it travels is stipulated here (blank within this dataset).
- ***Passengers_count***: Number of passengers on board (blank within this dataset).
- ***Passengers_state***: State of on-board passengers (blank within this dataset).

2.2.3 « Issues » file description

These files register the various issues encountered by the AMs during their service; it could for example be a harsh braking due to an obstacle on the path, an interruption due to a vehicle or bicycle on the path, a GNSS signal loss (this information is registered in the "description" category). Within these files there are also some records registered for each issue: the vehicle VIN, the exact time of the issue, location and altitude of the AM at the time of the incident etc. (see above for more information on it).

2.2.4 « Passenger counting » and « operational time » file description

These files include the number of passengers and hours of operation per day.

2.3 Description of the data linked to the social surveys

Various surveys have been carried out throughout several AVENUE demonstration sites across Europe (see deliverable 8.9 for more on this subject). The dataset made available on the Yareta sharing platform and commented in this deliverable is the one of the "Representative survey 2021" that took place during the Luxembourg demonstration.

The dataset in question consists of two files, one in the form of a matrix enabling statistical analysis of the data using tools such as SPSS ("Dataset_rep_Avenue_2021.SAV") and the other containing a description of the data in this model, from the multiple questions asked to the proposed answers and their encoding ("Codebook-rep-Avenue-2021.pdf").

The table contains 1816 entries corresponding to the number of respondents. The polls covered dozens of different surveyed points that can be classified into several major categories such as:

- **Satisfaction level**
- **Current Mobility behaviour/preferences**
- **Willingness to use it again**
- **Situations to use the AM**
- **Services**
- **Potential benefits**
- **Potential concern**
- **Local situation**
- **Awareness**

The respondents answers are encoded in a wide variety of formats; they can be numerical values, values enabling the respondent to position themselves in relation to a question, or to provide information about the him (see the codebook for more information).