



Senator

**Smart network operator platform
enabling shared, integrated and
more sustainable urban freight
logistic**

D6.15 Exploitation Plan (Public)



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List of abbreviations

AI	Artificial Intelligence
API	Application Programming Interface
BIDs	Business Development Districts
CONDOR	Customer order and Network Density OptimiseR
e.g	Exempli gratia
ETAs	Estimated Time of Arrival
GIS	Geographic Information System
KER	Key Exploitable Result
ICT	Information and Communications Technology
i.e.	Id est
IPR	Intellectual Property Rights
IT	Information Technology
KPI	Key Performance Indicator
LEZ	Low Emission Zone
ORION	On-road Integrated Optimisation and Navigation
PM	Particulate matter
RTD	Research and Technological Development
SCOT	Supply Chain Optimisation Technologies
SULP	Strategic Urban Logistics Plan
SUMP	Strategic Urban Mobility Plan
TRL	Technology Readiness Level
ULL	Urban Living Lab
UPS	United Parcel Service

1 Introduction

1.1 Aims & objective

This SENATOR Exploitation Plan has been developed to maximise the impact of the project beyond its completion at the end of February 2025. It summarises the partners' plans in relation to the future use of project results in marketable products or services, for further scientific work and in providing recommendations for policymakers.

1.2 Intended audience

This document is intended for publication.

1.3 What is exploitation & why is it needed?

Exploitation is defined in the Horizon 2020 Rules for Participation as “the use of results in further research activities other than those covered by the action concerned, or in developing, creating and marketing a product or process, or in creating and providing a service, or in standardisation activities”.

The exploitation of the project therefore ensures that the benefits from the results of the project are secured by the project partners, the European Commission and by wider society beyond the life of the SENATOR project itself.

The results from the project will be exploited in two main ways:

- **Direct exploitation:** The major key exploitable results from the project as a whole will be the SENATOR ICT platform (and its tools) and will be taken forward by the partners directly involved in their development during the project.
- **Indirect exploitation:** The key exploitable results of the project for each partner will be taken forward only by those individual partners.

1.4 Process in developing Exploitation Plan

The Exploitation Plan was developed via meetings of the Exploitation Board, which met about every 6 months during the project and sought to coordinate the project exploitation strategy, identify Key Exploitable Results (KERs) and promote economic and scientific exploitation of the results.

As well as plenary meetings during the project to discuss exploitation, the Chairman of the Exploitation Board also:

- Held one-to-one discussions with some partners on emerging KERs in mid-2023;
- Organised an on-line survey of partners to establish their individual KERs in September 2024.

The overall KERs from the project which were suitable for direct exploitation were discussed at the final project meeting in Madrid in November 2024 before the drafting of this Plan. Partners were then asked to contribute information on the key direct and their own indirect KERs in December 2024-January 2025, for inclusion in this Exploitation Plan.

1.5 Scope of Exploitation Plan

This Exploitation Plan is focused on how partners will use project results in marketable products or services, for further scientific work and in providing recommendations for policymakers in the future beyond the life of the project which concludes in February 2025.

The Business Plan for the potential direct exploitation of the SENATOR Platform is only summarised in this Exploitation Plan, but more detail is available in Deliverable 6.6.

1.6 Relation to other deliverables

This Exploitation Plan draws on the results from the SENATOR Business Plan (included in Deliverable 6.7), which in turn draws on data from the Urban Living Labs in Dublin and Zaragoza (WP5).

Related issues of how to protect the IPR generated in the project are addressed separately in the IPR and Knowledge Management Strategy (Deliverable D6.13).

2 Direct Key Exploitable Results from the SENATOR Platform

2.1 Summary of direct Key Exploitable Results

The key sources of innovation that are direct Key Exploitable Results are summarised in the following table. KER1 addresses the main objective of the SENATOR project, which was described on page 7 of the project proposal as the “development of a smart network operator supported on an ICT Platform for integrated logistics operation. It allows the optimisation of freight delivery services in urban areas...”. , leading to i) decrease the number and distance of delivery routes by real-time information, predictions & planning optimisation based on Artificial Intelligence (AI) algorithms; ii) shared-connected freight delivery services & collection points; iii) integrate all freight delivery requirements into urban planification”.

KER1, particularly in relation to facilitating collaboration between logistics operators, was the key objective of the project, but KER2 and KER 3 have emerged as potential opportunities as a result of the work carried out during the Urban Living Labs (ULLs) in Zaragoza and Dublin respectively.

Direct Result (KER)	Key Exploitable	Target stakeholders	Description of direct KER	TRL
1. Operational logistics planning tool		Logistics operators	As a prototype the SENATOR Platform allows logistics operators to plan daily deployment of vehicles and delivery staff based on optimised routings. Again, as a prototype, the SENATOR Platform also provides the technical capability for several different logistics operators to collaborate to make optimised deliveries.	7
2. Strategic planning tool/transport model for urban logistics		Logistics operators & city authorities	As a prototype, the SENATOR Platform has the potential to allow logistics operators to test the impact of new operational strategies or regulatory regimes on their operations before implementation at street-level in a particular city. Similarly, it allows city authorities to test the impact of new regulatory regimes on city logistics operations before implementation at street-level in a particular city as part of the development of the cities' Strategic Urban Logistics Plans (SULPs).	5
3. Route training tool for urban logistics		Logistics operators	The SENATOR Platform, with some further development, could also allow transport operators to train delivery staff on the optimal routes they should follow, both in advance of carrying out the deliveries at	5

			street-level, or on their delivery rounds, in a particular city ¹ .	
4.	Key policy lessons on collaboration in logistics	Policymakers	The SENATOR project highlighted some key policy issues that emerged during the attempted implementation of collaborative logistics approaches in the Urban Living Labs, highlighting some key commercial and legal barriers that technology cannot easily resolve.	N/A

KER1 has been developed in the project to prototype level (TRL7), whereas KER2 and KER3 (which were not the actual objectives of the project) have been validated in a relevant environment (TRL5). KER4 is related to policy and so no TRL is relevant.

Further details of each of these four KERs are provided below.

2.2 Operational logistics planning tool (KER1)

The work carried out in both the Zaragoza and Dublin ULLs demonstrated how the SENATOR Platform provides a prototype for an operational tool that could be used by logistics operators to optimise routes to minimise CO₂ emissions and/or costs on a daily basis. The platform could also be used to optimise routing for logistics operators when collaborating with each other, involving the transfer of parcels or other cargo between them.

The key technical issue that emerged was that the optimisation algorithm takes a lot of time when trying to optimize all the operators' networks at the same time for a day's operations at a city level, but when the optimization is applied to the zone of influence of one delivery unit the optimisation problem takes an hour or less to solve. It is believed, however, that, with further development, the optimisation algorithm could be made more efficient so that in the future it might be possible to use it as an operational planning tool at a city level.

The other technical barrier to implementation to allow collaborative working is likely to be the amount of time and effort required to ensure the integration of SENATOR with many other different IT systems, which have each been designed for only individual company operations. However, this barrier could be overcome if all the relevant parties were willing to engage in the process.

Overall, the project has developed the Platform for this purpose to Technology Readiness Level 7 (prototype).

¹ Although it should be noted that the Platform is designed to optimize delivery rounds depending on the distribution of deliveries on any given day and so the precise route will vary from day to day.

2.3 Strategic planning tool/transport model for urban logistics (KER2)

2.3.1 Strategic planning tool for urban logistics

The work carried out in both the Zaragoza and Dublin ULLs demonstrated how the SENATOR Platform could be used as a strategic planning tool by logistics operators to test the impact of new operational strategies or regulatory regimes on their operations before implementation at street-level in a particular city. This would allow the logistics operators to analyse the potential impact on their operations of significant interventions by the public sector, such as the introduction of pedestrianised (vehicle-free) zones or a zero emissions zone, so that lessons can be learned, and any unintended consequences can be raised with the city authorities before their implementation. The SENATOR Platform could also be used to test the impact of operational changes, such as the impact on costs and emissions of a potential change in the location of a delivery depot or of the introduction of a new fleet of electric vehicles.

The SENATOR Platform allows logistics infrastructure (e.g., depots, consolidation centres) to be added along with demand for urban logistics services (consignments to be delivered to or collected from particular locations within the city) and supply of urban logistics services (fleets of vehicles based at each depot and for each delivery company). This allows an optimised baseline of delivery routes to be modelled, which would seek to minimise the operator's costs and those of the delivery vehicles.

As the SENATOR Platform provides outputs in terms of operators' costs, carbon emissions, vehicle kilometres and time spent, it facilitates the appraisal of the quantified costs and benefits of the scenario compared to the status quo for the transport operator. The SENATOR Platform would therefore allow the logistics operators to test the impact of potential interventions or operational measures in a quantified way before making major operational decisions. It would also provide the logistics operators with quantified evidence to present to city authorities during stakeholder consultation on their Sustainable Urban Logistics Plans (SULPs).

Overall, the project has developed the Platform for this purpose to Technology Readiness Level 5 (validation in a relevant environment).

2.3.2 Urban freight transport model

The work carried out, in particular in the Dublin ULL, demonstrated how the optimization module within the SENATOR Platform could also be used as an urban freight transport model to simulate the impact of interventions by the public sector in the urban freight transport

market. This allows significant interventions, such as the introduction of pedestrianised (vehicle-free) zones or a zero emissions zone, to be tested in a digital environment so that lessons can be learned, and any unintended consequences avoided before their implementation.

Overall, the project has developed the Platform for this purpose to Technology Readiness Level 5 (validation in a relevant environment).

2.4 Route training tool for urban logistics (KER3)

The work carried out in the Zaragoza ULL demonstrated how the SENATOR platform could be used as a route training tool for new delivery staff when they do not know the geography of their route. This would help to speed up the process of learning a new route which can lead to faster use of an efficient route and minimise emissions and operator costs.

To this end, the SENATOR Platform could be used in this context in two ways:

- Depot-based training: The member of delivery staff has access to the SENATOR Platform and is allowed to input the demand for their delivery route and then the SENATOR Platform is used to propose an optimised delivery route, which the member of delivery staff can then visualise and follow on the GIS map of the relevant city.
- Street level training: The member of delivery staff has access to the SENATOR App via a smartphone and is able to follow at street level the optimised route suggested by the SENATOR Platform. This would allow the delivery staff member to learn a new route, while also following the proposed route which minimises emissions and operator costs until the route is learned. The ability of the SENATOR Platform to train delivery staff to deliver parcels and letters on a fixed route would be affected by the Platform's functionality, as the Platform seeks to optimise deliveries each day depending on the geographic distribution of demand on that day (which can vary significantly) the proposed route would also vary. However, even if the route varies day-to-day, having it predefined and being able to visualize the route on a smartphone app, makes it much easier for an inexperienced parcel delivery operative if he or she does not know the neighbourhood.

Overall, the project has developed the Platform for this purpose to Technology Readiness Level 5 (validation in a relevant environment).

2.5 Key policy lessons on collaboration (KER4)

The work carried out in the Urban Living Labs in Zaragoza and Dublin highlighted there were some key policy lessons to be learned from the attempt to use the SENATOR Platform as a

means to facilitate collaboration between operators to increase vehicle capacity utilisation and reduce impacts such as environmental emissions.

While the SENATOR Platform is designed for collaborative working and to allow for the switching of cargo between different logistics providers and cater for the concept of consolidation, there were barriers to this occurring in practice that could not easily be resolved directly through use of the technology in the SENATOR Platform. These barriers were as follows:

- Reluctance on the part of logistics providers to share information with competitors for commercial reasons;
- Concerns from logistics providers about the security of their parcel deliveries and the liability for damaged or lost parcels when working collaboratively and therefore handing parcels over to other logistics providers for last mile deliveries;
- Concerns from logistics providers about breaching competition law; and
- Data privacy issues related to delivery operatives and delivery addresses.

These policy-related issues will be considered in more detail in the Final Report for the project.

3 Exploitation Plan for Key Exploitable Results

3.1 Introduction to the “SENATOR Inc” Business Plan

Subject to the agreement of the relevant partners following completion of the project, a new entity (“SENATOR Inc”) could own the SENATOR Platform and market the Platform to potential customers based on its ability to create, deliver and capture value.

The Business Model for the SENATOR Platform (set out in more detail in Deliverable 6.6) adopts the business model canvas methodology, which is a strategic management template for documenting a new business model that was developed by Business Model Foundry AG in Austria. It summarises all the elements of a company’s business model, including its Value Proposition (its products and services and how they add value), along with its customers (called Customer Segments), how the company relates to them and delivers the product/service (Customer Relationships and Channels). It also highlights the Key Activities required to deliver the Value Proposition and the human, physical and digital resources (Key Resources), as well as the financial resources (Revenue and Costs) that would be required to run the SENATOR Inc.

The Business Model assumes that a future “SENATOR Inc” could sell licenses to use the Platform, mainly to city authorities and major logistics operators that wish to collaborate in European cities. This would be in a competitive environment and the nature and extent of the competition is described in the following section.

3.2 Competition

3.2.1 Introduction

Once commercialised, “SENATOR Inc” would be operating in a competitive marketplace where software is already available to allow the “last mile” deliveries of parcels to be carried out in an efficient manner. Some of the software that is available – starting with what the market leader has developed and uses – is described in outline below, along with a conclusion on where the prototype SENATOR Platform might have a competitive advantage.

3.2.2 Optimisation software used by Amazon

Amazon uses software called Supply Chain Optimisation Technologies (SCOT) to manage its demand forecasting, inventory placement and fulfilment for the efficient execution of its deliveries at scale, but then uses CONDOR (Customer order and Network Density Optimiser)

to optimise delivery routes in real time by constantly reassessing orders to minimise travel distances at scale. The Amazon software uses AI and machine learning to analyse real-time data such as traffic conditions, order clustering and customer proximity to plan optimal delivery routes for its delivery rivers.

The three main areas of optimisation for deliveries in order of priority are:

- Delivery reliability and speed, ensuring parcel delivery is on time;
- Distance and Transportation costs, minimising travel distances to reduce transport costs; and then
- Environmental impact, seeking to reduce carbon emissions by optimising routes and consolidating deliveries, supporting Amazon's Climate Pledge and its goal to achieve net-zero emissions by 2040.

The software was developed in house and is not available for external use or for sale to another entity. The software is effectively bespoke to the specific scale and logistical needs of Amazon's business. However, whilst the software is not available for purchase or use by another entity, Amazon's software is available for use by businesses for which Amazon sells and then carries out deliveries. It is also used by a large number of delivery operatives who are not directly employed by Amazon but are required to use the route optimisation software.

3.2.3 Other parcel operators

Federal Express (FedEx) relies on advanced route optimisation software which is also integrated with machine learning and real time data analysis. The FedEx software factors in traffic, weather and delivery density as well as package volume to create efficient routes.

UPS has software called ORION (On-road Integrated Optimisation and Navigation) which optimises delivery routes in real time. UPS offers their WorldShip Windows-based software which gives access to the complete portfolio of UPS small parcel and freight services. It has built in reporting and shipping profiles. WorldShip also provides automation and integration features such as offline shipping as well as access to aggregation services such as UPS Trade Direct.

ROYAL MAIL has an internal system called delivery route optimiser and also owns a subsidiary called Storefeeder which has software that streamlines picking, packing, and dispatch of parcels with software that adapts to multiple warehouses and stock locations.

3.2.4 Third Party Platforms

There are also third-party delivery software packages available for use, such as MyRouteOnline, EasyRoutes or Circuit. These platforms plan, optimise and assign routes

whilst adapting to last minute changes with live tracking and route management. The software allows drivers to share proof of delivery and provide automatic recipient notification along with ETAs and tracking.

Circuit, for example, supports automatic importing of delivery data via Excel spreadsheets and can be integrated with an API, Shopify, Zapier. Circuit also provides delivery analytics.

3.2.5 Conclusion

In summary, most if not all of the large parcel operators use software which utilizes AI and machine learning, using real time data such as traffic conditions to plan and optimise routes for their delivery drivers. The software aims to achieve on time delivery success, minimise transport costs by finding the most efficient route and also reducing carbon emissions by bundling orders by proximity. These providers can offer their shipping services to businesses however do not offer the software they use for deliveries, which can be found through some third-party operators.

This means that there is significant competition in terms of software that is already available in the market place which is focused on optimisation of the routing of 'last mile' parcel deliveries. However, the major parcel operators have their own internal systems, which are designed for their own operations (even if they can receive data from shippers and can also communicate with receivers of parcels).

There are also third-party software solutions available which can be purchased, although these appear to be focused solely on an individual logistics operator operations.

The unique selling points for the SENATOR platform would be its focus on:

- The ability of the software to allow collaboration between logistics operators to collectively optimise delivery routes and minimise their costs and environmental impacts; and
- The greater focus within the SENATOR Platform on the potential role of city authorities in facilitating sustainable urban logistics, including the ability to test the impact of potential regulatory interventions on the logistics efficiency of a city.

3.3 Marketing the SENATOR Platform

Developing awareness of the SENATOR Platform is likely to be via an initial approach to City Authorities, such as Dublin and Zaragoza in the SENATOR Urban Living Labs, or Logistics Operators, such as Correos and An Post, to develop communities of potential users in each city. These approaches would need to be based on case studies of the practical benefits of implementation that can then be marketed via a website, social media and a press campaign.

In order to allow other potential customers to carry out an evaluation of the benefits of the Platform, these case studies would need to include quantified benefits from implementation, such as reductions in costs for identified users and enhanced quality of service KPIs. These case studies could be based on the results of the Urban Living Labs. A simple financial evaluation model might need to be developed by “SENATOR Inc” to help stakeholders quantify the potential benefits, based on assumed levels of demand in a particular city.

The sales process would probably be carried out by in-house business development professionals or could also be outsourced to a network of specialist software distributors.

Purchasing the Platform would probably be based on one or both of three types of charging:

- One-off charge to a City Authority or Transport Provider for implementation, where the customer takes the demand-side risk, and the user community is then developed by that customer – perhaps with the assistance of a third-party independent contractor - with free access to the Platform based on authenticated logins; and/or
- A charge is applied for each use of the Platform by the customers, where “SENATOR Inc” takes the demand-side risk but perhaps has the regulatory support of the City Authority to introduce a regime which encourages the introduction of collaborative operations facilitated by a Platform to share data and collaborate based on mutual trust to complete ‘last mile’ deliveries;
- An annual license for use of the SENATOR Platform where the user (whether a City Authority or a large Transport Operator) is able to make use of the SENATOR Platform for as long as the license is valid. This is the unit of demand which is assumed for the “SENATOR Inc” Business Plan (see section 6 below).

The services provided by the SENATOR Platform would be delivered digitally via web-based applications, applications on mobile phones, via web-based dashboards and with system integration provided by APIs. After sales support would be provided by means of a centralised technical support team at “SENATOR Inc”, which would respond to enquiries by web chat, email and, if necessary, on the telephone.

4 Conclusions

The SENATOR Project has resulted in the following potential direct Key Exploitable Results:

- KER1: Operational logistics planning tool
- KER 2: Strategic planning tool/transport model for urban logistics
- KER3: Route training tool for urban logistics
- KER 4: Key policy lessons on collaboration

While KER4 will be disseminated by means of the project's Final Report and in discussion with the European Commission, the three other direct KERs are based on the SENATOR Platform which has been developed by partners over the four-and-a-half-year duration of the project. A quantified Business Plan has been developed for an entity which would be created after the end of the project ("SENATOR Inc") and which could commercially exploit one or more the KERs.

In addition, each of the project partners intends to exploit its own individual (indirect) KERs over the next few years following the completion of the project.