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5GLOGINNOV

Deliverable 5.4

Exploitation Plan

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List of abbreviations and acronyms

Abbreviation	Meaning
4G/5G	4th/5th Generation (of cellular networks)
ADAS	Advanced Driver Assistance System
AI	Artificial Intelligence
API	Acceleration Performance Index
ATP	Automated Truck Platooning
CAD	Connected Automated Driving
CAN	Controller Area Network
CNF	Cloud Native Functions
CSF	Critical Success Factor
DoA	Description of the Action
E2E	End-to-End
eMBB	Enhanced Mobile BroadBand
EPI	Energy Performance Index
FTED	Floating Truck & Emission Data
GDPR	General Data Protection Regulation
GLOSA	Green Light Optimal Speed Advisory
GNSS	Global Navigation Satellite System
HMI	Human-Machine Interface
IoT	Internet of Things
ITS	Intelligent Transportation Systems
KER	Key Exploitable Result
KPI	Key Performance Indicator
LCMM	Low Carbon Mobility Management
LL	Living Lab
MANO	MAnagement and Network Orchestration
MCA	Multi Criteria Analysis
MEC	Mobile Edge Computing
ML	Machine Learning
MNO	Mobile Network Operator
N/A	Non Applicable
NFV	Network Functions Virtualization
NSA	Non-Standalone (5G network operation)
OEM	Original Equipment Manufacturer
ORDP	Open Research Data Pilot
SA	Standalone (5G network operation)
SDK	Software Development Kit
TEU	Twenty-foot Equivalent Unit

TOS	Terminal Operating System
UC	Use Case
UHD	Ultra-High Definition
WLTP	Worldwide-harmonized Light vehicles Test Procedure
WP	Work Package

EXECUTIVE SUMMARY

The purpose of this deliverable is to describe the plans and strategies to ensure that results are properly exploited. Results can be clustered in three groups, corresponding to different IPR agreements: Living Labs' results, "horizontal" Project's results, Partners' results. Accordingly, the objective is to describe the strategies to exploit them.

The document includes an overview of the exploitation approach and methodology to be used in the project: the global exploitation approach, the methodology used to define the plans and initial strategies, and the planned activities for the second part of the project are provided.

The exploitation strategy of the three Living Labs is described together with the Key Exploitable Results (KERs) for each area. The description of each KER emphasizes the stakeholders' and users' needs to be addressed, the potential benefits of the deployed results and if any Intellectual Property Right (IPR) issue is foreseen. The same approach has been used to describe the "horizontal" project results, i.e., those KERs generated by project activities not strictly related to Living Labs implementations.

The document also provides the exploitation strategy planned by each partner of the 5G-LOGINNOV consortium and the KERs that are going to be developed by each of them.

Finally, annexes include detailed descriptions of each KER mentioned in the document.

At the level of Hamburg Living Lab, the results identified as relevant are mainly linked to the foreseen use cases implementations during the project, which imply a joint effort by several actors in terms of development.

In the case of Koper, the common result of all contributing partners is know-how gain on putting building technological blocks together to bring up an added value service for the port. In terms of technological results, it has been agreed to address their exploitation strategy at the individual partners' level, due to the fact that their development is clearly linked to a specific partner.

In Athens, KERs correspond mainly to expertise (know how) gain in 5G, IoT and relevant ecosystem technologies; development of services tailored to port operations; and collaborations and network of partnerships built for further collaborations and opportunities (which have also been discussed to define partners individual plans).

Considering the horizontal project's results, they mainly consist of knowledge and methodologies that can be transferred to other contexts. It must be noted that the 5G-LOGINNOV project will help to create a considerable network effect by connecting actors at two levels, both between start-ups (to get engaged with each other) and between several «5G players» (including established companies). The horizontal project results are expected to have an impact at the economic level, thanks to enhanced approaches for business making, and at policy level, in terms of recommendations for policy making.

1 INTRODUCTION

1.1 Project intro

5G-LOGINNOV will focus on seven 5G-PPP Thematics and support to the emergence of a European offer for new 5G core technologies in 11 families of use cases. 5G-LOGINNOV main aim is to design an innovative framework addressing integration and validation of CAD/CAM technologies related to the Industry 4.0 and ports domains by creating new opportunities for LOGistics value chain INNOVation. 5G-LOGINNOV is supported by 5G technological blocks, including new generation of 5G terminals notably for future Connected and Automated Mobility, new types of Internet of Things (IoT) 5G devices, data analytics, next generation traffic management and emerging 5G networks, for city ports to handle upcoming and future capacity, traffic, efficiency and environmental challenges. 5G-LOGINNOV will deploy and trail 11 families of use cases beyond TRL7 including a GREEN TRUCK INITIATIVE using CAD/CAM & automatic trucks platooning based on 5G technological blocks. Thanks to the new advanced capabilities of 5G relating to wireless connectivity and Core Network agility, 5G-LOGINNOV ports will not only significantly optimise their operations but also minimise their environmental footprint to the city and the disturbance to the local population. 5G-LOGINNOV will be a catalyst for market opportunities build on 5G Core Technologies in the Logistics domains, thus being a pillar of economic development and business innovation and promoting local innovative high-tech SMEs and Start-Ups. 5G-LOGINNOV will foster the integration of SMEs and Start-Ups in new markets using its three Living Labs as facilitators and ambassadors for innovation on ports. 5G-LOGINNOV promising innovations are key for the major deep-sea European ports in view of the mega-vessel era (Hamburg, Athens), and are also relevant for medium sized ports with limited investment funds (Koper) for 5G.

1.2 Purpose of the deliverable

The objective of this deliverable is to describe the 5G-LOGINNOV Exploitation Plan. Therefore, the deliverable aims to clarify which are the main KERs of the project and the linked IPR issues. The objectives related to this deliverable have been achieved in full and as scheduled.

1.3 Intended audience

This deliverable is public and therefore any stakeholder interested in the 5G-LOGINNOV exploitation approach can make use of it. It is specifically addressed to the 5G-LOGINNOV partners to be used as a reference for their exploitation activities within the 5G-LOGINNOV project duration and beyond.

1.4 Structure of the deliverable and its relation with other work packages

This deliverable is the primary source of information for the project partners' exploitation activities. The document is structured as follows:

- Chapter 2 explains the 5G-LOGINNOV exploitation approach and the methodology chosen to perform exploitation planning and monitoring;
- Chapter 3 provides an overview of the Living Lab contexts and, specifically, of the Living Labs' related KERs;
- Chapter 4 provides an overview of the other 5G-LOGINNOV KERs, mainly not those linked to Living Labs implementations, but those jointly developed by the project's "horizontal" activities;
- Chapter 5 provides the 5G-LOGINNOV exploitation strategies and defines the KERs developed individually by specific partners.

Annex 1, 2 and 3 provide the detailed description of each KER described in Chapter 3, 4 and 5, respectively.

This deliverable is strongly connected with other project activities, specifically:

- The products and services register developed within the continuous market analysis in task T4.1 ("Strategy supporting next generation logistics operations") has been consulted.
- Task T4.3 ("Boosting economic opportunities") will consider the KERs developed in this deliverable as relevant items of the sets of Business Model Canvas to boost the uptake of 5G-enabled logistics innovations.
- Task T5.4 ("Standardisation and Spectrum") will refer to this document to verify if any standard will be used by or generated through KERs.
- The KERs represent the objects to be monitored, in terms of innovation potential, competition and state of the art analysis, in task T6.3 ("Innovation Management"). This document provides the initial IPR agreements that the IPR management activities of T6.3 will continuously monitor.

Therefore, deliverable D5.4 will be used as a reference to monitor exploitation activities up to the end of the project and will be used as a reference to create the deliverable D5.5 ("Exploitation Report"), due in M36.

2 5G-LOGINNOV EXPLOITATION AND COMMERCIALISATION APPROACH

2.1 Global approach to exploitation

The objective of 5G-LOGINNOV's exploitation strategy is to use project results efficiently through industrial, scientific, economic, political, or societal exploitation routes aiming to turn the project's actions into concrete value and impact for society. The exploitation of 5G-LOGINNOV will relate to the use of results by targeted stakeholders in various ways for:

- the creation and provision of new services;
- the development, creation and marketing of new products, processes, or policies;
- further research activities other than those covered by the project;
- standardisation activities.

Exploitation activities will be running during the duration of task T5.3, starting in M16 and ending in M36. During this period, an exploitation strategy will be developed and the actions to drive market adoption of 5G-LOGINNOV's solutions and results during and beyond the project will be initiated. This task aims to develop:

- A set of KERs of the project, based on the real needs of the logistics sector and on the outcomes of the Living Labs;
- The list of the involved stakeholders, both public and private, in the logistics process (i.e., logistics operators, firms, public authorities, port authorities, etc.), with the definition of the potential benefits (for each type of stakeholder) deriving from the adoption of the proposed solutions;
- A set of potential risks and blockers to be considered for the emergence of new actors in the market (also taking into account the rules and policies in the different countries);
- The transferability analysis for the solutions validated at the three Living Labs;
- The individual business plans aiming to integrate specific project outcomes into the own business of each partner.

Risk management will play an important role at all stages of the exploitation process.

Exploitation and innovation management activities are developed by two separate tasks in 5GLOGINNOV, namely task T5.3 ("Exploitation") and task T6.3 ("Innovation Management"), respectively. However, the two tasks provide input to each other, by clarifying the results developed by the project and identifying their market opportunities, monitoring the state-of-the-art and competition, seeking collaborations with related initiatives to create synergies, seeking opportunities to fund activities beyond the project's duration, and attracting/involving stakeholders into the project to pave the way to market. Moreover, in 5G-LOGINNOV exploitation activities use relevant input by WP4 ("Marketplace and new actors") which is strongly based on the analysis of the business status and potential opportunities in Living Labs areas, with focus on the stakeholders' engagement to boost the new marketplace facilitated by 5G technologies in Living Labs and beyond. T4.1 has identified the stakeholders needs to be addressed (in D4.1) and task T5.3 represents a complement since it aims to provide a clear framework for the commercialization of 5G-LOGINNOV solutions, with the goal of satisfying these needs.

Two main gaps have been identified in D4.1 with relevance to exploitation: first, few projects have running solutions or a specified product fully operational after the pilot phase. Thus, a greater attention to the design of the business model and its scalability is needed. Second, port-terminal logistics needs to be better aligned with an urban freight transport and city logistics perspective. Moreover, D4.1 highlights a high interest of the 5G-LOGINNOV stakeholders to improve the effectiveness of the logistics processes, with direct connections with continuous monitoring and optimisation of the resource usage,

to improve service quality and reduce costs. All the stakeholders declare a very high level of knowledge and implementation of the enabling technologies, but the low trust in data sharing technologies can act as a barrier to the development of collaborative business models for the implementation of innovative services. For these reasons, the need to enforce the trust in data sharing between different actors of the supply chain is the most relevant actors' need to be addressed by 5G-LOGINNOV to exploit the developed 5G-enabled solutions.

2.2 Approach to develop the 5G-LOGINNOV Exploitation Plans

In period 1, exploitation activities are focused on establishing exploitable results, investigating exploitation opportunities among project partners, and developing an initial exploitation action plan. The exploitation plan will include an agreement-based selection of exploitable results and the means to achieve them. The initial exploitation plan will be submitted through this document (D5.4).

Therefore, the main goal, in this phase, consists in understanding and clarifying which the project results are and in pushing the project partners to initiate discussions linked to the ownership of the developed results. The preliminary list of KERs of the project has been developed considering that some results are expected to be developed jointly (i.e., they are developed by the group of Living Labs partners, or they are developed within WP activities) and other relevant results will be developed by individual partners. Therefore, the 5G-LOGINNOV Consortium has been asked to brainstorm on:

- Living Labs related KERs: their development and planned route for exploitation is expected to be managed by the Living Labs contexts. Therefore, the Joint Ownership and Exploitation will apply;
- "Horizontal" KERs: their development and planned route for exploitation is expected to be managed by the 5G-LOGINNOV consortium or by groups of partners. The development of these KERs is not strictly linked to specific Living Labs implementations. Therefore, the Joint Ownership and Exploitation will apply, and each sub-group of partners involved will register the IPR title and will be able to exploit the results;
- Individual Partners related KERs: their development and planned route for exploitation is expected to be managed by the single partner (or small groups of partners).

The preliminary plan for exploitation has been therefore clarified around the above mentioned KERs and – in this project phase – the plan has been developed specially to push the project partners to establish the scopes and strategies for the long-term sustainability of the results. Therefore, the exploitation plan includes, for each result:

- General description, including:
  - a short description;
  - the 5G-LOGINNOV WP(s) in which the KER will be generated;
  - the application area (e.g., commercial/ industrial/further research);
  - the type of exploitable result (e.g., knowledge, methods, agreements, networks, technologies);
  - the 5G-LOGINNOV partners involved in the development.
- Expected benefit of the results: the direct and/or indirect value and benefit for different stakeholders provided by the KER
- Users of the KER, including:
  - the identification of potential users of the KER (groups and entities that are expected to make concrete use of results);
  - the user need(s) tackled by the KER;
  - the KER uptake strategy (planned measures to ensure the KER is uptaken by potential users).

- Routes for use/exploitation: e.g., use for further research, developing and selling own products/services, spin-off activities, cooperation agreement/joint ventures, selling IP rights/selling the (IP based) business, licensing IP rights (out-licensing), standardisation activities (new standards/on-going procedures).
- Risks and Barriers: the potential risks and barriers for the exploitation of results, also keeping into account the rules and policies in the different countries, and the related mitigation strategies.

IPR issues have also been preliminary identified, specifically:

- Background IPR, including:
  - the name of the background IPR related to the KER;
  - the owner of background IPR;
  - the subject matter of the background IPR (e.g., a software, a hardware, a firmware, an invention, a scientific article, the design of a product, the name of a technology or of a product, know how, a website);
  - potential conditions and limitations for implementation and exploitation of the background IPR.
- Foreground IPR, including the definition of:
  - a title for the IPR;
  - the owner(s) of the IPR;
  - if the foreground IPR has been jointly developed and by whom;
  - country of establishment of the owner(s);
  - the subject matter of the foreground IPR (e.g., a software, a hardware, a firmware, an invention, a scientific article, the design of a product, the name of a technology or of a product, know how, a website);
  - if control rules of third-owners software, hardware or IPR apply (if yes, identification of commercial software and licensor, identification of open-source software and licensor, identification of commercial hardware, third owner intellectual property rights);
  - the protection plan, if any (e.g., patent, utility model, industrial design, copyright, trademark, confidential information);
  - if any access right is going to be established (i.e., any licenses and users' rights given to beneficiaries of the project if it is needed to enable those parties to carry out their own work under the project);
  - available support (e.g., email, website, info).

As a general approach, it has been agreed that the foreground intellectual property shall be owned by the project partner carrying out the work leading to such result. If any result is created jointly by at least two project partners and it is not possible to distinguish between the contributions of each of the project partners, such work will be jointly owned by the contributing project partners.

2.3 Planned exploitation activities

In the second phase, each KER will be monitored to specify the best form of exploitation (direct industrial use, patenting, technology transfer, publication, input to policy making, etc.) and issues such as identification of IPR and commercialisation-related needs of each partner will be more and more discussed. The exploitation strategy will be further refined with analyses of market requirements, competition & product differentiation, and business models for the commercialisation of each KER, through joint meetings performed in collaboration with Task T4.3 ("Boosting economic opportunities") and task T6.3 ("Innovation Management"). Based on the final results and on the feedback from the stakeholders involved, the 5G-LOGINNOV consortium will re-evaluate the overall exploitation potential of the deployed services and tools towards the end of the project. The transferability analysis for the solutions validated at the three Living Labs will also be done.

In the second half of the 5G-LOGINNOV project, 5 start-ups will be fully active in the three Living Labs and will interact with the project. These new actors will be engaged in the set-up of their exploitation plans, and the preliminary plan will be integrated with their expectations. The monitoring of exploitation activities will address also the new actors' strategies.

An exploitation report will be drafted to include an analysis of continuing the activities and seeking additional ways to reach a wide market, as well as tools for auditing and analysing the market potential of the project results, an analysis of the required research activities by the partners and a related budget, a clear time-plan for the contribution of each partner, and IPR management. The final phase will culminate in a detailed exploitation strategy report to be submitted as deliverable (D5.5) in M36.

The second half of the 5G-LOGINNOV project will see the set-up of periodical interactions with the Consortium and the 5 start-ups that have won the Open Call to update each other on the exploitation strategy and – if needed – small-groups meetings to discuss specific issues. Common meetings will occur during each project General Assembly, in which an exploitation update will be added to the agenda.

The drafting of the table of content of the second deliverable due by task T5.3, deliverable D5.5 ("Exploitation Report", due in M36), will occur in collaboration with task T6.3 (Innovation Management) and task T4.3 (Boosting economic opportunities) to avoid overlapping and emphasising the complementarity of these activities.

3 LIVING LABS' EXPLOITATION PLANS

In this Chapter, the KERs related with the Living Lab activities are analysed in order to define their development and planned route for exploitation. In particular, the exploitation activities are expected to be managed within the Living Labs contexts, with joint ownership and exploitation by small groups of partners.This chapter provides the overview of the LLs plans and Annex 1 provides the detailed description of each KER.

3.1 Overview of the 5G-LOGINNOV implementations in Living Labs

5G-LOGINNOV provides three Living Lab port areas (Hamburg, Koper, Piraeus) with the possibility to develop and implement innovative logistics applications thanks to the usage of the 5G-enabled network. To do so, the project is designed around 11 innovative use cases (UCs):

- UC1 - Management and Network Orchestration platform (MANO)
- UC2 - Device Management Platform Ecosystem
- UC3 - Optimal selection of yard trucks
- UC4 - Optimal Surveillance Cameras and Video Analytics
- UC5 - Automation for Ports: Port Control, Logistics and Remote Automation
- UC6 - Mission Critical Communications in Ports
- UC7 - Predictive Maintenance
- UC8/9 - Floating Truck & Emission Data (FTED)
- UC10 - 5G GLOSA & Automated Truck Platooning (ATP)-under 5G-LOGINNOV Green initiative
- UC11 - Dynamic Control Loop for Environment Sensitive Traffic Management Actions (DCET)

For the Hamburg Living Lab, UCs 8 and 9 are aimed at collecting Floating Truck & Emission data (FTED) by 5G-IoT devices, on-board units and nomadic devices, whereas UC11 will use this data for sustainable traffic management purposes. Analysing FTED data according to the ISO-23795-1 [1] standard leads to emission models per vehicle for the air pollutants CO_2, NO_x, PM and noise, all directly linked to acceleration and energy performance index (API, EPI). Applying the ISO-23795-1 standard for carbon footprint monitoring requires stable data transmission and precise positioning, even more when using the standard for NO_x, PM and noise, where Newtonian Physics turned out to be non-linear relative to fuel consumption detection per floating car. Additionally, UCs 8, 9 and 11 include real-time tracking and enhanced visibility features for traffic managers by monitoring FTED speed profiles and congested road segments, services which once again require stable data transmission and precise positioning (5G prerequisite).

Green Light Optimal Speed Advisory (GLOSA) helps drivers to avoid harsh braking, which is one of the main causes for increased fuel consumption and CO_2 emissions. In 5G-LOGINNOV, it is planned to use GLOSA for truck platoons and to showcase a mid-term migration path for using GLOSA in automated truck platoons based on 5G technology. From 5G projects and publications [2], it is well-known that Vehicle-to-Infrastructure (cellular V2I) for vehicle platooning has End-to-End (E2E) latency requirements of 20ms time frames and up to 350m minimum ranges, prerequisites which can only be achieved with the URLLC functionalities of the 5G network. Performance requirements for advanced driving including collision avoidance (10ms E2E latency) and cooperative lane change (25ms E2E latency) have the same low latency communication characteristics and cannot be implemented without 5G mobile networks. In 5G-LOGINNOV, GLOSA based truck platoons will demonstrate a migration path towards higher SAE levels of automation starting with basic functionalities including 5G test cases and test runs foreseen in UC10, GLOSA based automated truck platoons.

Figure 1 Hamburg Living Lab: port overview

In the Koper Living Lab, NFV-MANO was selected as the orchestrator as it provides means to efficiently provision, deploy and manage 5G network infrastructures and Industrial IoT services in UC1. NFV-MANO supports OpenStack/Kubernetes and some public cloud providers and can be used on private or public mobile network systems, as both are required for reliable port operation. Furthermore, NFV-MANO also supports network slicing, which is another requirement for efficient port logistic operation, as it can provide different network capabilities in terms of performance and QoS/QoE per user segment (e.g., real-time communication, IoT, M2M, UHD video streaming in real-time). To enable more advanced port logistics services, such as automation control of the container management system or real-time AI-powered video surveillance, 5G MEC components will be established along with high-performance CCTV applications (as showcased in UC5/UC6). Such applications (e.g., body worn camera, drone-assisted video streaming) will significantly benefit from low-latency provided by the 5G mobile network and its MEC enhancements while the complexity of the system is abstracted through the orchestration system powered by NFV-MANO.

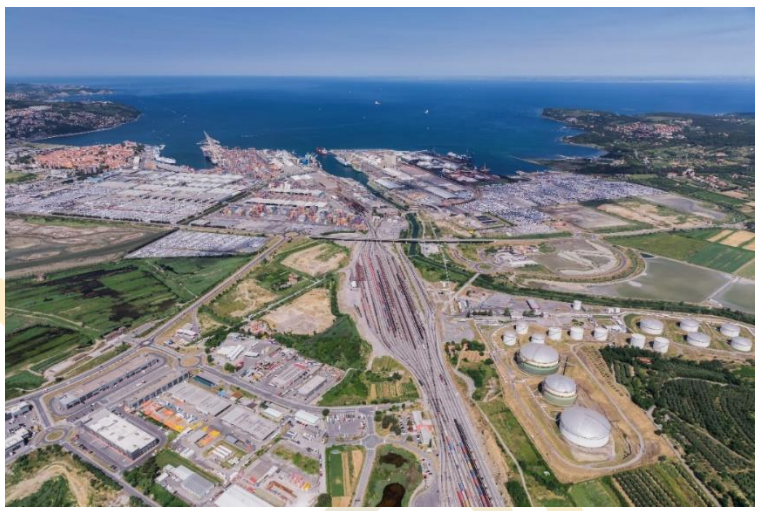

Figure 2 Koper Living Lab: port overview

The Athens Living Lab at the Piraeus Container Terminal (PCT) will develop a set of use cases and platforms that communicate over the deployed 5G network with different types of end devices. It includes communication with external trucks around the port (UC2: Device Management Platform Ecosystem),

yard trucks dedicated to port operations (UC3: Optimal selection of yard trucks, UC7: Predictive Maintenance) as well as novel 5G-IoT devices (UC4: Optimal surveillance cameras and video analytics, UC5: Automation for ports: port control, logistics and remote automation). 5G technologies will enable the use case innovations exploiting the eMBB service and low latency transmissions of the cellular infrastructure at the port premises, for live 5G yard truck coordination and management, including MANO-based services and orchestration, pioneering far-edge computing services, computer vision and AI/ML video analytics.

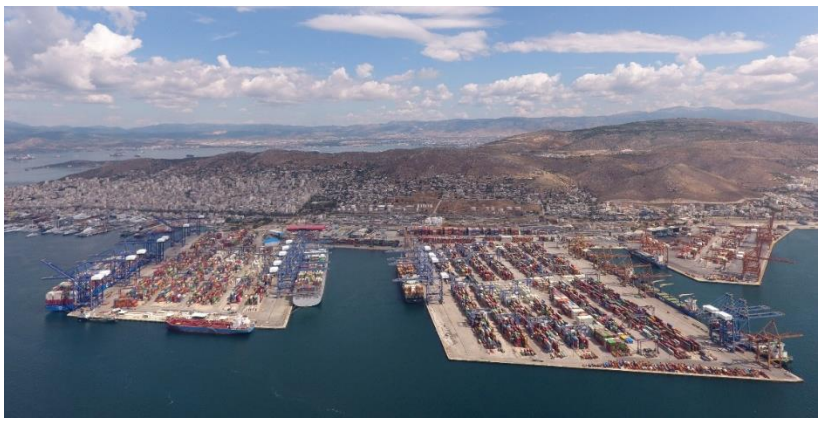

Figure 3: Athens Living Lab: port overview

3.2 Exploitation plans in Hamburg

The Hamburg field trial partners are working jointly to implement the use cases described in the deliverables of WP1 ("Living Labs requirements and specifications"). There are certain use cases which can be implemented only by all partners together. Therefore, it is necessary to have an agreement and an alignment of all partners for a joint go to market strategy. Such agreements can be fulfilled by different steps of sharing customers and revenues. In the period of the field trial and later the different possibilities will be elaborated based on the market feedback as well as on the strategic alliances with the public authorities. One possibility is bringing the solution to further markets via telecom operators and to other partners as subcontractors in case public authorities want to do business with only one of them. In Hamburg, partners plan to develop five main KERs that are expected to be transferable in other contexts:

- H.1-5G enabled Floating Truck Emission Data (FTED)
- H.2-5G enabled GLOSA
- H.3-5G enabled Collision Warning
- H.4-5G enabled Carbon Emission Trading

The first solution **(H.1)** is linked to UC8 and UC9. Both use cases consist of collecting speed profiles and linking them to the driving reference cycle (WLTP) measuring the deviation relative to the cycle. The methodology is described in detail in the ISO-23795-1 standard. In Hamburg, there are two fleets from the logistics sector planned to run as vehicle platoons in the test field for autonomous driving (TAVF). One group comes from a taxi fleet with approximately 80 vehicles driving inside the city road network of Hamburg. The fleet is collecting the carbon emissions as well as stop-and-go, acceleration and energy demand of the vehicle. Based on the speed profiles per vehicle, a classification of the trip congestion and driving behaviour is given as well as the quantity of additional carbon emissions relative to the standard. Together with the traffic volume known and published by the City of Hamburg, this allows to quantify the emissions of carbon dioxide in an urban road network. Additionally, involvement of vehicles from CEP-fleets (Amazon delivery partner) is planned. The usefulness of the collected data will be analysed within the project duration and the potential of fuel and carbon savings will be quantified. The Living Lab Hamburg partners will discuss how to use the results for future data sharing platforms,

currently under examination in marketplaces known as Mobility Data Spaces. Based on the results from 5G enabled Precise Positioning technology, Continental, SWARCO, tec4u and T-Systems will discuss how to transfer the UC8 and UC9 methodologies to their customers and joint market opportunities. Floating truck emission data is directly linked to another solution for the traffic management centre in charge of traffic control on an intersection level. Usually, cities which have defined environmental zones regulate the amount of pollution by banning certain vehicle types, mostly Diesel engines (UC11). The biggest challenge of environmental zones lies in the fact that residential areas, tourist spots and shopping malls need good access to alternative, ideally to public and greener transport, e.g., bicycles. To have an optimum fit with park and ride strategies as well as with speed adaptions in high-risk zones of air pollution, a city needs reliable traffic and pollution data, not only close to the measurement stations of air pollution but also in neighbouring road networks. To set up sustainable traffic management strategies based on microscopic energy demand, the combination of intelligent transport systems and vehicle-to-infrastructure platforms is needed. Measuring the exact CO_2 emission is of high interest in megacities and high-density traffic hot spots. In this context, reductions of fuel consumption and carbon emissions will be studied by the Living Lab Hamburg consortium for setting up new projects for Bus Rapid Transportation including LCMM based eco-drive trainings. Here the go-to-market and exploitation interest, targets the climate protection mechanism, which was established within various UN Climate Change (Bureau of COP) agreements. The four Hamburg Living Lab partners have the expertise to set up such projects and plan to examine how to proceed in this domain using the momentum of the B2C-5G mobile network deployment.

As second KER **(H.2)**, the Hamburg Living Lab partners will study how to exploit UC10, targeting Green Light Optimum Speed Advisory (GLOSA) using cellular V2X communication exchange transferring "traffic light forecast" to vehicles in motion, once the vehicle and its SIM-ID is registered in the 5G Mobile Edge Infrastructure. The technology gives drivers some advice for best speed choices when crossing intersections using timeframes of "green, yellow and red". Additionally, GLOSA allows the vehicle to choose speed ranges which helps to avoid collisions caused by crossroads, a challenge for any automated vehicle moving in an urban and complex road network. The starting point for GLOSA and KER H.2 refers to level 3 (SAE-L3) autonomous driving scenarios and needs interaction of the driver in case of unforeseen incidents along the trip. Nevertheless, the results and the technology used in the test-field for autonomous and connected driving in Hamburg are the basis for developing Level 4 and 5 solutions in urban driving conditions. A direct transferable result and solution is related to measuring the progress GLOSA can bring relative to fuel consumption and CO_2 emissions. This also allows road authorities, cities, or operators of HUBs for autonomous vehicle fleets, to estimate the fuel reduction and carbon emissions. The four Hamburg Living Lab partners plan to exploit 5G-enabled GLOSA towards Hamburg and other road authorities elaborating the best go-to-market strategy.

Solution **(H.3)** is related to the usage of 5G technology in the context of collision warning. This technology, which was developed and deployed by Continental and T-Systems in the two projects (NPM + 5G-LOGINNOV) in the context of the 27th ITS Congress in Hamburg, applied for collision alerts for vulnerable road users approaching the intersection as well as for collision alerts for vehicles platooning. In combination with GLOSA, a direct message is sent to the 5G smartphone App via MobileEdge computing ensuring ultra-reliable low latencies possible only in the 5G network. With this information, accidents known from other autonomous vehicle experiments can be reduced towards zero collision. The technology is urgently needed in all kinds of urban environments where autonomous vehicles are connected to a given road infrastructure existing from variable message signs, traffic lights or other traffic management functions and features (cellular V2X). As more and more test fields develop across Europe and worldwide, Continental and T-Systems are optimistic to further deploy the software and hardware modules developed within the 5G-LOGINNOV project.

Solution **(H.4)** is the exact measurement of fuel consumption and carbon emissions for net zero strategies (at e.g. airports, ports, industries, and cities). The base for this is a voluntary commitment for net zero emission strategies by airports and ports which is related to the key challenge of measuring the scope 3 emitting parties involved in the operation of ports and seaports. Here it is reasonable to equip vehicles using the port and hub road infrastructure with the Continental IoT Gateway using the

5G infrastructure for communication and the database. The database allows to exactly determine the amount of carbon emissions caused by the logistics fleets working on the supply chain in the maritime and aviation sector. By measuring the trip-based amount and by knowing the influence of certain traffic management activities (e.g., gate control, access control or park guidance management), the infrastructure operator has the opportunity to improve the overall emission situation and to clearly identify the carbon emissions caused by certain traffic and traffic management activities. By knowing the scope 3 emissions, an infrastructure operator can offset them by buying carbon credits on the carbon market.

3.2.1 Key Exploitable Results developed in Hamburg

Table 1 KERs developed in Hamburg (summary)

KER ID	KER name	Stakeholder needs addressed	Users' to be addressed/ stakeholders	Potential benefit per stakeholder	IPR
H.1	5G enabled Floating Truck Emission Data (FTED)	• Information gap about traffic situation • No efficient fleet data • Need for energy saving	• Fleet owners (commercial, transportation) • Traffic engineers • Cities/ Municipalities	Two fleets combined can analyse the carbon emissions within a daily time frame including rush- and off-peak hours. The procedure itself is well known in traffic engineering and can easily be transferred to emission modelling per region.	No IPR issues defined yet.
H.2	5G enabled GLOSA	• Road safety • Less road congestion • Development of autonomous vehicles	• Road authorities • Cities • Operator of HUBs	The starting point for GLOSA and KER H.2 refers to level 3 (SAE-L3) autonomous driving scenarios and needs interaction of the driver in case of unforeseen incidents along the trip. Nevertheless, the results and the technology used in the test-field for autonomous and connected driving in Hamburg are the basis for developing Level 4 and 5 solutions in urban driving conditions. A direct transferable result and solution is related to measuring the progress GLOSA can bring relative to fuel consumption and CO_2 emissions. This also allows road authorities, cities, or operators of HUBs for autonomous vehicle fleets, to estimate the fuel reduction and carbon emissions.	No IPR issues identified so far
H.3	5G enabled Collision Warning	• Road safety • Development of autonomous vehicles & services	• Cities • Municipalities • Traffic Management Centres	With the provided information, accidents known from other autonomous vehicle experiments can be reduced towards zero collision. The	No IPR issues identified so far

				technology is urgently needed in all kinds of urban environments where autonomous vehicles are connected to a given road infrastructure existing from variable message signs, traffic lights or other traffic management functions and features (cellular V2X).	
H.4	5G enabled Carbon Emission Trading	• Sustainability • Cost reduction • Emission trading	• Sea-ports • HUB operators • Logistics	By measuring the trip-based amount and by knowing the influence of certain traffic management activities (e.g., gate control, access control or park guidance management), the infrastructure operator has the opportunity to improve the overall emission situation and to identify the carbon emissions caused by certain traffic and traffic management activities. By knowing the scope 3 emissions, an infrastructure operator can offset them by buying carbon credits on the carbon market.	No IPR issues identified so far

3.3 Exploitation plans in Koper

On the level of the Koper Living Lab, the common output of all contributing partners is the know-how on putting building technological blocks together to bring up an added value service for the port. Koper Living Lab's partners will mainly develop KERs individually, as specified in Chapter 5 and described in detail in Annex 3. However, the Koper Living Lab agrees in considering two KERs as overarching joint results.

- K.1-Supporting security and logistics processes in port environment based on 5G, IoT and related technologies;
- K.2-Establishing local partnerships in logistics domains.

The first KER **(K.1)** includes results from UCs 1, 5 and 6, representing the complete know-how on building holistic digital services based on 5G, IoT and related technologies, aimed at supporting logistics processes as well as security in a port environment. The KER is the sum of the partners' specific knowledge and has the potential to be replicated in other contexts and widely adopted in the market. As anticipated, the Koper LL partners are developing KERs that plan to be exploited by individual strategies, as described in detail in Annex 3. Therefore, this KER primarily consists of the know-how gain on design, implementation, testing and operating specific technologies with the goal of building complex added-value services.

The second KER **(K.2)** extends the first KER in multiple directions relevant for the contributing partners' future growth. As mentioned, partnerships may cover different aspects representing at least potential customers, and potential partners for future collaboration on research and development on products and technologies, as well as business development-wise.

3.3.1 Key Exploitable Results developed in Koper.

Table 2 KERs developed in Koper (summary)

KER ID	KER name	Stakeholder needs addressed	Users' to be addressed/ stakeholders	Potential benefit per stakeholder	IPR
K.1	Supporting security and logistics process in port environment based on 5G, IoT and related technologies	• Consultations and training on specific cases • Test and verification environment • Tools • Methodology • SLA/QoS tools and methodology	• Port operators • Freight forwarders • Mobile network operators • IT vendors and integrators • App developers	The knowledge gained will allow for: • future improvements in the product portfolio • custom solutions co-design • test/verification solutions design and implementation • improving and broadening spectrum of topics provided in customer consulting, training and educational services • business development	Background Foreground
K.2	Establishing local partnerships in logistics domain	• Port/logistics digitalization • Reduction of the carbon footprint	Companies such as: • Port operators • Freight forwarders • Mobile network operators • IT vendors and integrators • App developers	Partnerships, including potential new ones, will: • facilitate entering the market • get potential customers • improve design of efficient solutions • bring ideas/topics for further research	Foreground

3.4 Exploitation plans in Athens

In Athens Living Lab a set of KERs have been identified that correspond to:

- expertise (know how) gain in 5G, IoT and relevant ecosystem technologies;
- development of services tailored to port operations;
- collaborations and network of partnerships built for further collaborations and opportunities (which will be discussed in the partners' individual plans).

Particularly, the following KERs have been identified:

- A.1-5G IoT Platform in Port Operations
- A.2-Logistics Service: Container Seal Detection
- A.3-Security/Safety Service: Human Presence Detection
- A.4-5G Truck Fleet Management Platform

The first KER **(A.1)** describes the 5G IoT system (design, implementation, testing and operation) built to support UCs 4 and 5. It is considered both as a standalone solution to be exploited, but it is also considered as part of the service outcome for KER **A.2** and **A.3**. This KER corresponds to expertise

gain (know how) in 5G technological blocks and key enabling technologies in the IoT domain, exploited in daily port operations, targeting logistics services and service automation, operations efficiency, safety and security.

The KERs **A.2** and **A.3** target logistics and safety/security services, respectively. **A.2** exploits **A.1** in order to provide the container seal detection service in UC5 through computer vision analytics. Automating the seal checking process has a direct effect in several work chains at the port of Piraeus (i.e., reduces vessel stay at the port premises, removes human personnel from a risk area, allows for more efficient use of human resources). It is expected that the service will be exploited by the port of Piraeus, and further researched beyond the 5G-LOGINNOV project.

A.3 exploits the 5G IoT platform **(A.1)** targeting safety/security applications in UC4. This service will enable the continuous monitoring/surveillance of port areas, aided with an AI/ML vision alert system. It is expected that the service will be exploited by the Living Lab in order to reduce the risk of serious bodily injuries (e.g., in areas with heavy truck traffic or continuous crane operations etc.) addressing safety applications at specified areas, as well as security services, providing respective alerts when a person enters a prohibited area.

The KER **(A.4)** focuses on the enhancement of the real-time fleet management, and improvement of efficiency of personnel. Potential benefits for the actors rely in reduction of waiting times for trucks, and of the risk of crashes within the port area.

3.4.1 Key Exploitable Results developed in Athens

Table 3 KERs developed in Athens (summary)

KER ID	KER name	Stakeholder needs addressed	Users' to be addressed/ stakeholders	Potential benefit per stakeholder	IPR
A.1	5G IoT Platform in Port Operations	• Familiarity/knowledge of relevant ecosystem technologies and future trends • Solution design, testing and validation of implementation on a real environment • Methodology, tools, services, consultation, training	• Port operators • Terminal operators • Freight forwarders • Mobile operators • IT vendors and integrator • Application developers • Research institutes (for follow-up research)	Expertise gained will allow for: • Future improvements in the product portfolio, business development and planning • Custom solutions co-design, testing and validation of implementation	Background Foreground
A.2	Logistics Service: Container Seal Detection	• Automation of the container seal checking process • Reduce vessel stay at port premises	• Port operators • Terminal operators • Freight forwarders	• Expedite the loading/unloading process of cargo containers to/from vessels, and thus reduce the vessel stay at the port premises.	Background Foreground

		• Reallocation of human personnel in other tasks/jobs • Expedite the unloading process of vessels.		• Remove personnel from risk area, by automating (no human interaction needed) the service of seal detection • Experience in devising computer vision models for object detection.	
A.3	Security/Safety Service: Human Presence Detection	• Increase port security • Increase port safety • Efficient human resource utilization	• Port operators • Terminal operators • Freight forwarders	• Reduce risk of serious bodily injuries • Increase security in private areas • Reallocate human resources from patrol swifts to other tasks/jobs	Background Foreground
A.4	5G Truck Fleet Management Platform	• Need to have minimum training to end users, the fleet management portal is an intuitive web application; including more sensor data will not affect the user experience.	• port operators • terminal operators • freight forwarders • fleet managers • logistics companies.	Expertise gained will allow for: • future improvements in the product portfolio, business development and planning • include new types of sensor data for fleet management operators	Background

4 EXPLOITATION OF HORIZONTAL RESULTS OF THE 5G-LOGINNOV PROJECT

4.1 Overview of 5G-LOGINNOV horizontal results

The present section describes all the KERs of the project that are not directly connected to a specific Living Lab or to a specific use case. In particular, the KERs listed below can be seen as tools and methodologies to analyse the potential markets and applications of the project's results, with the aim to find the correct way to exploit them and foster their market adoption. They are mainly created within project Work Packages and their development and planned route for exploitation is expected to be managed by the 5G-LOGINNOV consortium or by groups of partners. Therefore, the Joint Ownership and Exploitation will apply, and each sub-group of partners involved will register the IPR title and exploit the results. The so called "horizontal" results of the 5G-LOGINNOV project are:

- P.1-Data handling procedures
- P.2-Evaluation methodology
- P.3-Technology Gaps Analysis
- P.4-5G-enabled Products & Services register
- P.5-5G-LOGINNOV Open Call for Start-ups methodology
- P.6-5G-LOGINNOV Network of Start-ups
- P.7-5G-LOGINNOV Business models
- P.8-5G-LOGINNOV Position Papers
- P.9-Network of 5G enabled and innovative players

4.1.1 5G-LOGINNOV horizontal Key Exploitable Results

The horizontal project results mainly consist of knowledge and methodologies that can be transferred to other contexts. It must be noted that the project will make a great networking effect by connecting actors at two levels, both between start-ups (to get engaged with each other) and between several *5G players* (including established companies). The horizontal project results are expected to have an impact at the economic level, thanks to enhanced approaches for business making, and at policy level, in terms of recommendations for policy making.

Table 4 summarises all the horizontal KERs of the 5G-LOGINNOV project, as well as the groups of stakeholders interested, their needs, and how the KER will address these needs. More details about the KERs and the IPR issues are reported in Annex 2.

Table 4 5G-LOGINNOV "horizontal" KERs (summary)

KER ID	KER name	WP	Stakeholder needs addressed	Users' to be addressed/ stakeholders	Potential benefit per stakeholder	IPR
P.1	Data handling procedures	WP1	Provide time-tested solutions for experimental research and innovation projects.	• Scientific communities • Governmental institutions • Public administrations, authorities, and universities • Private sector • Partner's clients	• Genericity and replicability to ensure the application in other projects. • Pragmatic and scalable set of solutions for handling personal data in-	No IPR issues identified so far

					line with GDPR regulation.	
P.2	Evaluation methodology	WP1/ WP3	Quantification, through a set of KPIs, of the impacts of the technologies in terms of efficiency, performance, environmental and economic impact.	• Companies (private/public) • Research institutions • Consultancy companies	• Provide a simple and complete methodology for the evaluation of 5G applications and services that will be tested in the context of the project.	No IPR issues identified so far
P.3	Technology Gaps Analysis	WP4	Need to cover the knowledge gap linked to port stakeholders' attitude towards innovative technologies, especially towards 5G applications, in the port logistics arena.	• Research community • Industrial actors	• Improved understanding on stakeholders' needs, gains, and pains, as well as the interactions between the different actors linked to innovative technologies in port logistics.	No IPR issues identified so far
P.4	5G-enabled Products & Services register	WP4	Common and shared register of the best practices on products and services used in ports logistics. Clear vision and information on winning strategies and products/services that provide benefit in ports' logistics.	• Port community • Product and service providers	• Provide a comprehensive outlook on the most impacting 5G-enabled products and services for port operations, including an assessment of the potential impact on current business models.	No IPR issues identified so far
P.5	5G-LOGINNOV Open Call for Start-ups methodology	WP4	Cover the knowledge gap on how to implement open calls in EU projects, ensuring the compliance with policies at local and community level.	• EU projects consortia	• Provide guidelines for the design and implementation of open calls or similar activities involving startups.	No IPR issues identified so far
P.6	5G-LOGINNOV	WP4	• Need for startups to be engaged in	• Start-ups aiming to enter	• Foster networking opportunities	No IPR issues

	Network of Start-ups		sectors in which usually big players have leadership positions. • Traditional actors and stakeholders need to be enriched with innovative ideas and solutions.	the port-logistics market	between the network members, with relevant experts and associations. • Increase knowledge of potential applications in port areas of 5G-enabled technologies.	identified so far
P.7	5G-LOGINNOV Business models	WP4	• Definition and planning of an economically viable strategy for the take up of innovative technologies. • Need for start-ups to join a new market (ports logistics) and the EU projects arena. • Improve the connection to ports managers to avoid negative externalities coming from port operations.	• Living Labs actors • Start-ups • Wider community around LLs areas	• Business models will help stakeholders and actors in the definition of the strategy and of the action plan to implement the innovative services and solutions developed and tested in the project.	Background
P.8	5G-LOGINNOV Position Papers	WP4/ WP5	Lack of real-life experiences and use cases on 5G applications in the logistics sector.	• Industry associations • Policy makers in the transport domain	• Focus on the potentials of 5G technology innovations to enrich roadmaps, policies and strategies for sustainable logistics.	No IPR issues identified so far
P.9	Network of 5G enabled and innovative players	WP5	Communication of the added value of 5G enabled services for the optimisation of port and logistics operations.	• Mobile Network Operators • SMEs • Innovative startups	• Establish a network of 5G and innovative players able to liaise with potential customers,	Background

					presenting ready-to-take solutions or customised projects.	

5 INDIVIDUAL EXPLOITATION PLANS OF 5G-LOGINNOV PARTNERS

This chapter reports the 5G-LOGINNOV exploitation strategies and defines the KERs developed individually by specific partners. A detailed description of these KERs is reported in Annex 3, as well as the individual business plans aiming to integrate specific project outcomes into the business of each partner.

Table 5 Exploitation plans by 5G-LOGINNOV Partners

Partner	Exploitation objectives and overall strategies	Individual KERs
ERTICO	The ERTICO's partnership network includes representatives from the logistics industries, MNOs, service providers, public authorities, etc., who could be keen to exploit such results. ERTICO is involved in a number of large projects related to 5G (5G-MOBIX, 5G-DRIVE, 5GMETA) where it is focused on raising awareness of 5G's benefits for CAM through its dissemination activities. ERTICO is also part of large logistics projects (COREALIS, FENIX) that consider the ecosystem around ports and has high interest in the improvement of port connections to the hinterland. ERTICO envisages continuing and expanding its series of Port of the Future sessions in ITS European/World conferences, maximising its visibility internationally and attracting more decision makers. ERTICO aims at expanding his network of Start-Ups and also the scope of the Start-Ups market opportunities in the ERTICO Start-Ups Initiative.	• ERTICO.1-Maximizing international visibility, attracting decision makers, expanding network of Start-Ups
AKKA	AKKA, as a consulting and engineering company, expects to use the results as a set of reference solutions when proposing the development and integration of smart and collaborative systems for connected and automated operations in smart cities, railway stations, airports, and harbours. These operations constraints can be coupled with our expertise in addressing possible extension to management of smart grids and energy flexibility sources, the further development of innovative data exchange and processing platforms based on open industrial standards (e.g., oneM2M, OGC Features and Sensor Things services, etc.). AKKA will design and establish specific partnerships with start-ups or selected SMEs in order to accompany them in new markets (abroad and/or targeting other vertical markets) thanks to AKKA's scaling factor (+20k engineers, worldwide implantation, with strong presence in the EU) and expertise in numerous vertical industry sectors	• AKKA.1-Data handling and cyber security policies • •AKKA.2-Data collection architecture and tools
CIRCLE	CIRCLE is a consultancy and engineering company providing process and management consulting services, innovative technological solutions and digital marketing support for the transport and logistics sector. Within its ICT solutions portfolio, Milos is a cutting-edge solution for the operational management of inland and port terminals, shippers (multinational companies, MTOs) and port authorities. Thanks to its flexible architecture, Milos is continuously improving its interoperability with field sensors and actuators (IoT); in this context, CIRCLE aims at leveraging the experience gained within the project in order to integrate new services based on 5G in its product portfolio (traceability, terminal operations, etc.), and to establish new business relationships and partnerships with stakeholders, SMEs and start-ups involved in the project (also through the coordination of the Open Call).	• CIRCLE.1-Awareness development and expansion of the Docks of the Future Network of Excellence

CONTI	Continental develops pioneering technologies and services for sustainable and connected mobility of people and their goods. The aim of Continental as part of the 5G-LOGINNOV project is to showcase the applicability of its 5G telematics products in the logistics sector, as well as to evaluate the performance of its devices in various network conditions, with a particular focus towards 5G-SA networks. The project will also allow Continental to strengthen existing partnerships, as well as establish new ones.	• CONTI.1-Use of 5G telematics products in logistics sector • CONTI.2-Results of exploitation of telematics products in various network conditions
ICCS	ICCS as a research institute has applied recent research on smart systems and operations optimisation in the transport and logistics sector. It will benefit from 5G-LOGINNOV: • By expanding its expertise in evaluation frameworks for ITS and tailor them into a freight transport context; strengthening its scientific impact (through publications, patents etc.); • At an industrial/market opportunities level, it will acquire in depth knowledge for emerging 5G networks and port and multimodal processes and supply chain challenges while collaborating with strategic industry players; • At an R&D project level, the gain of experience and increased reputation in the field will make it easier for ICCS to successfully participate in future projects, extending its portfolio in the 5G, logistics and transport infrastructure domain. This is absolutely in line with the ICCS strategy in further exploiting research project results into applied domain such as process optimization, logistics platform integration and port-city development planning.	• ICCS.1-Partnership establishment with key industry stakeholders • ICCS.2-Acquisition of further expertise and know-how in the field of 5G, logistics and transport infrastructure • ICCS.3- Computer Vision Analytics Services, Research and Development
ICOOR	ICOOR will use the knowledge generated through 5G-LOGINNOV for: • Generating new research and innovation projects related to 5G, ITS, transport and logistics, smart city; opportunities within Horizon Europe and Digital Europe. Other EU programmes addressing SMEs will be also considered (1 project proposal is under development at the time of the deliverable writing). • Establishing new strategic partnerships with industry actors (especially SMEs and start-ups): the objective of this goal will be facilitated thanks to the development of a customised approach of the GUEST methodology[1] that is enriched with 5G and start-ups' related lessons learnt. • Proposing new educational initiatives to third parties' university students, for instance by organising training sessions in the different locations of the Interuniversity Consortium, mainly in Politechnic of Turin and in University of Modena and Reggio Emilia. Students will get in touch with the project and will be offered the possibility to carry out master's theses on different aspects related to the project; • Establishing further connections with the LLs stakeholders' groups.	• ICOOR.1-Customised GUEST Methodology

[1] http://www.theguestmethod.com/

ININ	ININ's exploitation plan focuses on knowledge gain aiming at future technological improvements of its products and specific technologies built in those products, i.e., private 5G mobile system, industrial 5G IoT and quality assurance for 5G networks and cloud infrastructure within ports and industry 4.0 environments. The knowledge/know-how will also include collecting valuable technology insights in the areas of interest, as stated above, for further research and IPR exploitation. Based on the common outputs of the Koper Living Lab, ININ will benefit from exploitable know-how on supporting complex processes in logistics and port domain by the use of 5G, IoT and related technologies. As well, ININ will benefit from LL outputs with new partnerships established, primarily in the EU logistics and port operation research domain. Thus, setting grounds for further cooperation and possible commercial partnerships for the exploitation of the opportunities arising from the 5G-LOGINNOV.	• ININ.1-Improvements of Private 5G mobile system • ININ.2-Improvements of Industrial 5G IoT System • ININ.3-Improvements of Quality assurance services for 5G networks and cloud-infrastructure designed for ports and industry 4.0 environment
LK	Luka Koper's exploitation plan focuses on new technologies and processes that will expectedly substitute today's business models. Specific exploitation goals are: technological knowledge in the 5G environment focusing on critical communications and useful technologies and applications for the seaports and multimodal hubs; customising existing business processes to future state-of-the-art technologies and business models by setting up the corresponding time-aligned approach; strategic partnerships with stakeholders, including in the research field in EU; to exploit opportunities for future commercial collaborations.	• LK.1-Collaborations and Lessons Learned from 5G-LOGINNOV Consortium
PCT	The Athens Living Lab at Piraeus Container Terminal (PCT) will develop a set of use cases and platforms that communicate over the 5G network with different types of end devices. It includes communication with external trucks around the port (UC2: Device Management Platform Ecosystem), yard trucks dedicated to port operations (UC3: Optimal selection of yard trucks, UC7: Predictive Maintenance) as well as novel 5G-IoT devices (UC4: Optimal surveillance cameras and video analytics, UC5: Automation for ports: port control, logistics and remote automation). PCT will benefit from 5G-LOGINNOV through the utilization of 5G and relevant cloud/edge ecosystem technologies to improve several aspects in daily port operations; improve the efficiency of port operations (including various port assets, e.g., trucks, quay side cranes), improve safety/security within the port premises of people and assets, reduction of yard vehicles costs, automation of operations aided though computer vision and AI/ML solutions at the far-edge. Additional, collaboration with relevant stakeholders will open new research and commercial opportunities/collaborations, enabling the port of Piraeus to further expand its expertise and market opportunities.	• PCT.1-Collaborations and Lessons Learned from 5G-LOGINNOV Consortium • PCT.2-5G-IoT Platform and Computer Vision Service Exploitation in Daily Port Operations

SWARCO	By its high bandwidth and low latency, 5G enables the exhaustive, real-time and bidirectional communication between traffic management infrastructures and road users without the need for dedicated devices like specialised onboard units. Consequently, SWARCO will use 5G to improve the road users travel experience by making it faster, safer and more environmentally friendly and to provide road operators with more detailed and up to date insight into the traffic situation.	• SWARCO.1-Traffic light forecast as a data service for external applications like GLOSA • SWARCO.2-Enable city traffic management to work with emission data originating from vehicles
TEC4U	TEC4U is a successful development and research partner of the automobile and commercial vehicle industry in the field of requirement-based product design for more than 20 years. One of the main research topics of tec4U is the cost and emission optimization of commercial vehicle fleets. tec4U combines here engineering expertise in vehicle dynamics and competence in the field of hardware and software development. tec4U owns the vendor neutral and open telematics and telemetry system Entruck, that serves as a telematics and analytics platform for commercial fleets, commercial tyre manufacturers and tyre dealers with the goal to reduce emissions and wear of commercial vehicles during their use phase and so to increase the efficiency of logistic operations. As Entrucks serves as an analytics platform and hub that connects vehicles with backend stakeholders with various interests, tec4U is interested in the implementation of 5G functionalities in their hard- and software to increase and optimize the connectivity with the moving asset – the vehicle. The main focus lies on a high band width, a low latency and high reliability of the connection.	• TEC4U.1-Updated FTED model • TEC4U.2-Data Exchange and joint development with T-Systems LCMM • TEC4U.3-Implementation of ISO-23795 • TEC4U.4-5G Improved hardware and software for V2X communication
TSLO	Telekom Slovenije is a global expert and leading provider of mobile broadband critical communications in Slovenia with a strong interest in consolidating itself as an expert and advanced 5G provider. The results of 5G-LOGINNOV will be directly used as input for planning TS's future architecture including access, core, and service networks topology, as input for product development, to plan further services and to establish verticals partnerships, and as marketing activities to early engage and motivate existing and potential customers for new services. The latter will be implemented from the diversity of internal audiences, end business customers and verticals business partners.	• TSLO.1-Improvments of Public 5G mobile network • TSLO.2-New business models for campus 5G networks • TSLO.3-Gaining further expertise in the field of 5G networks, logistics and transport industrial vertical

T-SYS	T-Systems, along with SWARCO, is a partner in the Hamburg ITS dialogue stakeholder group since the application of Hamburg to become the 2021 host city for the ITS World congress expecting more than 10.000 visitors and transportation experts from all over the world. As 5G use case and service rollout is an important element of Telekom with its 100% ICT subsidiary T-Systems, 5G-LOGINNOV is considered by Telekom as an important strategic approach for addressing vertical industries, i.e. in the hub logistics domain. T-Systems is also the ICT provider in large airport operators, e.g. Frankfurt a. M. and the Beijing's new 2nd capital airport. Additionally, T-Systems is in charge of innovative pre-port parking solutions in Hamburg and the development of Dynamic Slot Booking solutions in Bremerhaven. Working with SWARCO on GLOSA traffic management solutions along logistics corridors and 5G will allow us to expand our product portfolio and to increase our international market share.	• T-SYS.1-FTED deployed in Use Case 8/9 • T-SYS.2-GLOSA and LCMM out of Use Case 10 • T-SYS.3-5G-IOT Gateway for Saving Fuel and Emissions Applying ISO-23795 LCMM • T-SYS.4-5G enabled City-Logistics and eXtended BRT for C-I.T.S. Emission Trading (CDM) • T-SYS.5-Sustainable traffic systems based on 5G cellular V2X (under construction with SWARCO)
VICOM	VICOM generates structure and employment by creating new technology-based companies wherever there is a market opportunity that cannot be covered by means of technological transfer mechanisms to already existing businesses. Thus, one of VICOM's objectives is the creation of spin-offs. VICOM is also interested in: the integration of new functionalities and APIs in SDKs that are currently licensed and exploited in different success stories involving products from Tier 1 automotive companies and logistics systems for airports and public transport hubs; maintaining an active position as reference agent in Spain in research and development activities in sensor fusion based position calculation for automotive domain. As a private non-for-profit research centre, VICOM transfers technologies to the ICT industry, through licensed SDKs and will exploit outputs in commercial relationships with its customers. VICOM's goal is to extend their expertise in computer vision and sensor fusion with leading edge technology and scientific developments, and also to strengthen the competitiveness of their customers (SMEs) in the global market.	• VICOM.1-Knowledge gain in AI/ML applied to logistics

VODAFONE INNOVUS	Vodafone Innovus is an innovative end-to-end IoT solutions provider and a fully owned Vodafone subsidiary. Always pushing the boundaries of innovation by developing cutting edge solutions, Vodafone Innovus is widely recognised by several market intelligence providers as a significant partner of Vodafone Global IoT, offering IoT customer solutions on a global scale. 5G-LOGINNOV will reinforce Vodafone's solutions portfolio by offering specialized edge-supported services that are not yet present in Vodafone's portfolio. This is a direction that has already been initiated through commercial collaborations aiming at the commercial roll-out of 5G in Greece and in the EU. Our vision is to specifically focus on: 1) exploiting 5GLOGINNOV S/W components, individually or in collaboration with the other consortium partners, sold to interested customers; 2) offering 5G-LOGINNOV as a service in collaboration with the rest of the consortium partners (i.e. customisation, maintenance, installation, service provision, training); 3) developing an internal team that could support the required consultancy services in the edge-based IoT solutions for customers that are interested in deploying similar infrastructures; 4) cooperating with the leading research institutes and software developers participating in 5G-LOGINNOV that may lead to strategic alliances in the field of commercialization and technology transfer of innovative aspects of technology.	• VFI.1-Fleet Management Platform know how with 5G edge enabled devices

6 CONCLUSION

This deliverable represents the outcome of the initial activities performed within T5.4 “Exploitation” and also represents the primary source of information for the project partners’ exploitation activities. The document explains the 5G-LOGINNOV exploitation approach, and the methodology chosen to perform exploitation planning and monitoring. It provides an overview of the Living Lab contexts and, specifically, of the Living Labs’ related KERs. Moreover, it addresses the other 5G-LOGINNOV KERs, i.e. those jointly developed by the project’s “horizontal” activities. The document also provides the 5G-LOGINNOV individual partners’ exploitation strategies and defines the KERs developed by specific partners. Preliminary IPR issues have been described for each result presented in the document.

The exploitation approach in 5G-LOGINNOV consists of two phases: the first phase aims to address the plans and preliminary agreements, while the second phase aims to monitor the implementation of such strategies and to support partners in this. This document provides an overview of decision taken in the first phase; later, D5.5 (“Exploitation Report”) will provide a detailed report of activities done in the second phase. As a general approach, it has been agreed that the foreground intellectual property shall be owned by the project partner carrying out the work leading to such an IPR relevant result. If any result is created jointly by at least two project partners and it is not possible to distinguish between the contributions of each of the project partners, such work will be jointly owned by the contributing project partners.

The Living Labs stakeholders have been engaged to discuss their exploitation plans. As a result, the Hamburg Living Lab has identified 4 KERs, Koper has identified 2 and Athens 4: the exploitation strategy therefore will be linked to these results. The results identified as relevant for the Hamburg Living Lab are mainly linked to the planned Use Case implementations during the project, which imply a joint effort by several Living Lab actors in terms of development. In the case of Koper, it has been defined that the common output of all contributing partners is the know-how gain in putting building technological blocks together to bring up an added value service for the port. In terms of technological results, it has been agreed to address exploitation strategies at an individual partners’ level, due to the fact that their development is clearly linked to a specific partner. In Athens, KERs correspond mainly to expertise (know how) gain in 5G, IoT and relevant ecosystem technologies; development of services tailored to port operations; and collaborations and network of partnerships built for further collaborations and opportunities (which have also been discussed to define partners individual plans).

The 5G-LOGINNOV project plans to develop other relevant results generated by work packages and tasks that are not strictly linked to Living Lab implementations but are relevant at the *global* level. For this reason, we refer to such results as *horizontal* KERs. The horizontal project results mainly consist of knowledge and methodologies that can be transferred to other contexts. It must be noted that the project will make a great networking effect by connecting actors at two levels, both between start-ups (to get engaged with each other) and between several *5G players* (including established companies). The horizontal project results are expected to have an impact at the economic level, thanks to enhanced approaches for business making, and at policy level, in terms of recommendations for policy making.

The individual exploitation strategy of each partner has been updated and – specifically – the KERs have been clarified. As expected, organisations from the private sector will benefit from 5G-LOGINNOV due to the fact that, through project implementations, they will be able to upgrade their existing products and services or to develop new ones. Another common exploitation option is related to the increased collaboration and networking opportunities. Specifically, it is worth to mention that during the project, several partners are already collaborating to develop a joint project proposal to exploit 5G-LOGINNOV results.

7 REFERENCES

1. ISO/DIS 23795-1: Intelligent transport systems - Extracting trip data via nomadic device for estimating CO2 emissions - Part 1: Fuel consumption determination for fleet management, https://www.iso.org/standard/76971.html
2. Chandramouli, Liebhart, Pirskanen, 5G for the Connected World, WILEY, December 2018

ANNEX 1: DETAILED DESCRIPTION OF LLS' RELATED KERS (AND LINKED IPR ISSUES)

Hamburg

H.1 - 5G enabled Floating Truck Emission Data (FTED)

General description	Short description	FTED consists of collecting speed profiles, linking them to the driving reference cycle (WLTP) and measuring the %-deviation relative to the cycle. The methodology is described in detail in the ISO-23795 standard. The fleets are collecting data about carbon emissions as well as information about stop-and-go, acceleration and energy demand of the vehicle. Based on the speed profiles per vehicle, a classification of the trip, congestion and driving behaviour is reported as well as the quantity of additional carbon emissions relative to the standard. Together with the traffic volume known and published by the City of Hamburg, this allows to quantify the emissions of carbon dioxide in each area and road network.
	Linked 5G-LOGINNOV WPs	WP2/WP3/UC8 and UC9
	Application area	Commercial/Industrial In Hamburg, there are two fleets from the logistics sector using this technology. One category is using taxi fleets with 77 vehicles driving inside the city road network of Hamburg. In UC8 and UC9, these taxi-fleets are complemented with scheduled logistics vehicles inside the city, namely the CEP-fleets from Amazon.
	Type of exploitable result	Knowledge based 5G technologies
	5G-LOGINNOV partners involved in the development	Continental, SWARCO, tec4u and T-Systems
Expected Benefit of the results	Both fleets combined can analyse the carbon emissions within a daily time frame including rush- and off-peak hours. The procedure itself is well known in traffic engineering and can easily be transferred to emission modelling per region.	
Users of the KER	**Potential users of the KER** • Fleet owners (commercial, transportation) • Traffic engineers • Cities/ Municipalities	
	Users needs • Information gap about traffic situation • No efficient fleet data • Need for energy saving	

		Uptake strategy The Living Lab Hamburg partners will discuss how to use the results for future data sharing platforms, currently under examination in marketplaces known as Mobility Data Spaces.
Routes for use/exploitation		Use for further research
		Developing and selling own products/services
		Licensing IP rights (out-licensing)
		Standardisation activities (new standards/on-going procedures)
Risks and Barriers		**Potential risks and barriers for exploitation** Risk 1. Floating car data has the general risk of spatial and temporal coverage leading to unreliable statistics. Risk 2. Floating car data is delivered by competitors, fleet operators and public authorities which prefer their own data types e.g., from Google Maps.
		Mitigation strategy for risk 1. Define the road segments and time windows properly, and find regular scheduled vehicles. **Mitigation strategy for risk 2** Other floating car data sources have no direct link to the test field of autonomous driving in Hamburg and use time and distance for navigation criteria. As our Telematic data is complete and linked with the traffic management infrastructure, other data sources can be used jointly.
Background IPR: No IPR issues defined so far		
Foreground IPR: No IPR issues defined so far		

H.2 - 5G enabled GLOSA

General description	Short description	The KER H.2 is targeting Green Light Optimum Speed Advisory (GLOSA) using cellular V2X communication exchange transferring "traffic light forecast" to vehicles in motion, once the vehicle and its SIM-ID is registered in the 5G Mobile Edge Infrastructure. The technology gives drivers some advice for best speed choices when crossing intersections using timeframes of "green, yellow and red". Additionally, GLOSA allows the vehicle to choose speed ranges which help to avoid collisions caused by crossroads, a challenge for any automated vehicle moving in an urban and complex road network.
	Linked 5G-LOGINNOV WPs	WP2/WP3/UC10
	Application area	Commercial/Industrial Road authorities, cities, or operator of HUBs for autonomous vehicle fleets, to estimate the fuel reduction and carbon emissions.
	Type of exploitable result	Knowledge based 5G technologies
	5G-LOGINNOV partners involved in the development	Continental, SWARCO, tec4u and T-Systems

Expected Benefit of the results	The starting point for GLOSA and KER H.2 refers to level 3 (SAE-L3) autonomous driving scenarios and needs interaction of the driver in case of unforeseen incidents along the trip. Nevertheless, the results and the technology used in the test-field for autonomous and connected driving in Hamburg are the basis for developing Level 4 and 5 solutions in urban driving conditions. A direct transferable result and solution is related to measuring the progress GLOSA can bring relative to fuel consumption and CO_2 emissions. This also allows road authorities, cities, or operator of HUBs for autonomous vehicle fleets, to estimate the fuel reduction and carbon emissions.
Users of the KER	**Potential users of the KER** • Road authorities • Cities • Operator of HUBs
	Users needs • Road safety • Less road congestion • Development of autonomous vehicles
	Uptake strategy The 4 Hamburg Living Lab partners plan to exploit 5G-enabled GLOSA towards Hamburg and other road authorities elaborating the best go-to-market strategy. GLOSA can only be deployed by Infrastructure to vehicle communication. In Hamburg this is guaranteed in the test field for autonomous driving. The following risks are mainly related to political changes which can occur anytime in a public sector market environment.
Routes for use/exploitation	Use for further research
	Developing and selling own products/services
	Standardisation activities (new standards/on-going procedures)
Risks and Barriers	**Potential risks and barriers for exploitation** Risk 1. The city of Hamburg might give up the investment and the priorities defined in the intelligent transport system policy framework.
	Mitigation strategy for risk 1. Clarify that there are joint research and employment opportunities in the area of 5G, logistics and transport. Find out stakeholders to support the synergies in these three important market areas.
Background IPR: No IPR issues identified so far	
Foreground IPR: No IPR issues identified so far	

H.3 - 5G enabled Collision Warning

General description	Short description	This technology, developed and deployed by Continental and T-Systems in the two projects (NPM + 5G-LOGINNOV) in the context of the 27th ITS Congress in Hamburg, is applied for collision alerts for vulnerable road users approaching the intersection as well as for collision alerts for vehicles platooning. In combination with GLOSA a direct message is sent to the 5G smartphone App via MobileEdge computing ensuring ultra-reliable low latencies possible only in the 5G network
	Linked 5G-LOGINNOV WPs	WP1/WP2/WP3
	Application area	Commercial/Industrial

	Type of exploitable result	Knowledge based 5G technologies
	5G-LOGINNOV partners involved in the development	Continental and T-Systems
Expected Benefit of the result	With the provided information, accidents known from other autonomous vehicle experiments can be reduced towards zero collision. The technology is urgently needed in all kinds of urban environments where autonomous vehicles are connected to a given road infrastructure existing from variable message signs, traffic lights or other traffic management functions and features (cellular V2X).	
Users of the KER	**Potential users of the KER** Cities Municipalities Traffic Management Centres	
	Users needs Road safety Development of autonomous vehicles & services	
	Uptake strategy As more and more test fields develop across Europe and worldwide, Continental and T-Systems are optimistic to further deploy the soft – and hardware modules developed within the 5G-LOGINNOV project.	
Routes for use/exploitation	Use for further research	
Risks and Barriers	**Potential risks and barriers for exploitation** Collision warning has a lot of support in the automotive, telecommunication and traffic management market sectors. Nevertheless, complex implementation has to take place which requires an economic breakthrough and a joint go to market strategy. This leads to the following risk: Risk 1. In order to have a strong impact of collision warning technology, it is necessary to enable mass market and commodity smart phones with features of collision alerts. The implementation of components in mobile devices takes several months, sometimes years to be accepted.	
	Mitigation strategy for risk 1. Within the consortium there are good contacts to standardisation bodies in telecommunication and mobile devices. The technical committee in charge of standardisation for nomadic devices will be contacted to find out their deadlines and start the procedure as early as possible.	
Background IPR: No IPR issues identified so far		
Foreground IPR: No IPR issues identified so far		

H.4 - 5G enabled Carbon Emission Trading

General description	Short description	The exact measurement of fuel consumption and carbon emissions for net zero airport and port strategies. The base for this is a voluntary commitment for net zero emission strategies by airports and ports which is related to the key challenge of measuring the scope 3 (indirect emissions that occur in a company's value chain) emitting parties

		involved in the operation of ports and seaports. Here it is reasonable to equip vehicles using the port and hub road infrastructure with the Continental IOT Gateway using the 5G infrastructure for communication and the database. The database allows to exactly determine the amount of carbon emissions caused by the logistics fleets working on the supply chain in the maritime and transport sector.
	Linked 5G-LOGINNOV WPs	WP4/WP5
	Application area	Commercial/Industrial
	Type of exploitable result	Knowledge based 5G technologies
	5G-LOGINNOV partners involved in the development	Continental, SWARCO, TEC4U and T-Systems
Expected Benefit of the result	By measuring the trip-based amount and by knowing the influence of certain traffic management activities (e.g., gate control, access control or park guidance management), the infrastructure operator has the opportunity to improve the overall emission situation and to find out the carbon emissions caused by certain traffic and traffic management activities. By knowing the scope 3 emissions, an infrastructure operator can offset them by buying carbon credits on the carbon market.	
Users of the KER	**Potential users of the KER** • Sea-ports • HUB operators • Logistics	
	Users needs • Sustainability • Cost reduction • Emission trading	
	Uptake strategy CDM (Clean Development Mechanism) NAMA (National Appropriate Mitigation Action) policy	
Routes for use/exploitation	Developing and selling own products/services	
	Cooperation agreement	
Risks and Barriers	**Potential risks and barriers for exploitation** Emission trading is a well-established mechanism which was set up in the Kyoto contracts and the year by year climate conferences. The emission trading offers a wide range of go to market opportunities. Risk1. Emission training needs an approval by national climate agencies or United Nations climate project board. Developing relevant projects includes time and effort and knowledge linked to the expertise of climate policy.	
	Mitigation strategy for risk 1. As emission trading projects are rather complex, experts from climate agencies and project officers dealing with such type of projects will be contacted as early as possible during the project duration to find out how realistic this type of project deployment is.	
Background IPR: No IPR issues identified so far		

Foreground IPR: No IPR issues identified so far

Koper

K.1 - Supporting security and logistics process in port environment based on 5G, IoT and related technologies

General description	Short description	New knowledge and add-on to the existing knowledge will be gained in the course of the project, which will be later exploited in stakeholders' processes.
	Linked 5G-LOGINNOV WPs	WP1, WP2, WP3
	Application area	Future development and research
	Type of exploitable result	Knowledge related to the design, implementation, methodology, testing and operating 5G, IoT and related technologies (e.g., AI/ML) for port and logistics domain
	5G-LOGINNOV partners involved in the development	Internet Institute, Telekom Slovenije, Luka Koper, VICOMTECH, Continental
Expected Benefit of the result	Knowledge gained will allow for: • future improvements in the product portfolio • custom solutions co-design • test/verification solutions design and implementation • improving and broadening spectrum of topics provided in customer consulting training and educational services • business development	
Users of the KER	**Potential users of the KER** Port operators, freight forwarders, mobile operators, IT vendors and integrators, App developers	
	Users needs Consultations and training on specific cases, Test and verification environment, Tools, Methodology, SLA/QoS tools and methodology.	
	Uptake strategy Include the knowledge gained into own product/business development and disseminate at relevant industry and scientific events activities.	
Routes for use/exploitation	Use for further research	
	Developing and selling own products/services	
	Cooperation agreement/Joint Ventures	
Risks and Barriers	**Potential risks and barriers for exploitation** Risk 1. Considerable infrastructure investments for 5G Risk 2. Potential customers may not be yet ready or willing to adopt new technologies Risk 3. Market entrance barriers Risk 4. Specific regulation requirements in different regions	
	Mitigation strategy for risk 1. Initial deployments can be completed using Private 5G mobile system. Also, in case of very limited needs (e.g., IoT required only), LTE network can be used as well.	

	Mitigation strategy for risk 2. Using Private 5G mobile systems, it can be relatively easy to make a PoC on a small scale for showcasing benefits of 5G and related technology. **Mitigation strategy for risk 3.** Make strategic alliances with other players in the market. **Mitigation strategy for risk 4.** Cooperate with local partners to better understand the issues and, based on the technological knowledge, (re)design the solution to fit/avoid specific requirements.	
Background IPR		
Title	Prior knowledge/know-how	
Organisation	Involved in the deployment of Koper LL, i.e., Internet Institute, Telekom Slovenije, Luka Koper, VICOMTECH, Continental	
Subject Matter	Scientific article	
	Know How	
Description	Partners' background knowledge is related to the design, implementation, methodology, testing and operating 5G, IoT and related technologies (e.g., AI/ML).	
Conditions and limitations for implementation of the background IPR	NA	
Conditions and limitations for exploitation of the background IPR	NA	
Foreground IPR		
Title of IPR	Technological know-how	
IPR Owner(s)	Internet Institute, Telekom Slovenije, Luka Koper, VICOMTECH, Continental	
Jointly developed	Yes (Internet Institute, Telekom Slovenije, Luka Koper, VICOMTECH, Continental)	
Country of establishment of the owner(s)	Slovenia, Spain, and Romania	
Subject Matter	Scientific article	
	Know How	
Control of Third Owners Software, Hardware or IPR (select and describe the relevant option)	Identification of Commercial Software and Licensor:	NA, not relevant
	Identification of Open Source Software and Licensor:	NA, not relevant
	Identification of commercial hardware:	NA, not relevant
	Third Owner Intellectual Property Rights:	NA, not relevant
Protection Plan	Copyright	
Description of foreground IPR	Partner's foreground knowledge related to design, implementation, methodology, testing and operating 5G, IoT and related technologies (e.g., AI/ML) for port and logistics domain	
Access Rights	NA, Open	

Available Support (email, website, info)	NA

K.2 - Establishing local partnerships in logistics domain

General description	Short description	New partnerships in logistics domain will be established to foster stakeholders' business development.
	Linked 5G-LOGINNOV WPs	WP4, WP5, WP6
	Application area	Industry, further research
	Type of exploitable result	Knowledge of the market, its status and players
	5G-LOGINNOV partners involved in the development	Internet Institute, Luka Koper, Telekom Slovenije, Vicomtech, Continental
Expected Benefit of the result	Partnerships, including potential ones, will facilitate entering the market, get potential customers, improve the design process to develop more efficient solutions and bring ideas/topics for further research.	
Users of the KER	**Potential users of the KER** Partnerships will include companies such as port operators, freight forwarders, mobile operators, IT vendors and integrators, App developers, and others interested.	
	Users needs Partnerships will pursue for partners that are aware of the need and/or play active role in port/logistics digitalization and reducing carbon footprint.	
	Uptake strategy Active dissemination and demonstrations	
Routes for use/exploitation	Use for further research	
	Developing and selling own products/services	
	Cooperation agreement/Joint Ventures	
Risks and Barriers	**Potential risks and barriers for exploitation** Risk 1. Potential customers may not be yet ready or willing to adopt new technologies. Risk 2. Considerable infrastructure investments for 5G. Risk 3. Market entrance barriers. Risk 4. Specific regulation requirements in different regions.	
	Mitigation strategy for risk 1. Using Private 5G mobile systems, it can be relatively easy to make a PoC on a small scale for showcasing benefits of 5G and related technology. **Mitigation strategy for risk 2.** Initial deployments can be completed using Private 5G mobile system. Also, in case of very limited needs (e.g., IoT required only), LTE network can be used as well. **Mitigation strategy for risk 3** Make strategic alliances with other players in the market. **Mitigation strategy for risk 4** Cooperate with local partners to better understand the issues and, based on the technological knowledge, (re)design the solution to fit/avoid specific requirements.	
Background IPR: No IPR issues identified so far		
Foreground IPR		

Title of IPR	Domain know-how	
IPR Owner(s)	Internet Institute, Luka Koper, Telekom Slovenija, Vicomtech, Continental	
Jointly developed	Yes: Internet Institute, Luka Koper, Telekom Slovenija, Vicomtech, Continental	
Country of establishment of the owner(s)	Slovenia, Spain, Romania	
Subject Matter	Know How	
Control of Third Owners Software, Hardware or IPR (select and describe the relevant option)	Identification of Commercial Software and Licensor:	NA, not relevant
	Identification of Open Source Software and Licensor:	NA, not relevant
	Identification of commercial hardware:	NA, not relevant
	Third Owner Intellectual Property Rights:	NA, not relevant
Protection Plan	Confidential information	
Description of foreground IPR	Partnerships with stakeholders interested in utilising 5G in port and logistics domains	
Access Rights	NA	
Available Support (email, website, info)	NA	

Athens

A.1 - 5G IoT Platform in Port Operations

General description	Short description	Design and implementation of the 5G-IoT platform including software and hardware components
	Linked 5G-LOGINNOV WPs	WP1, WP2, WP3
	Application area	Future development, research, internal use in the port.
	Type of exploitable result	Expertise, methodology, technologies, software In more detail: Research/knowledge/innovation in the design, implementation, methodology, testing and operating 5G, IoT and related technologies (e.g., computer vision) for port and logistics domain.
	5G-LOGINNOV partners involved in the development	PCT, ICCS
Expected Benefit of the result	Expertise gained will allow for: • future improvements in the product portfolio, business development and planning • custom solutions co-design, testing and validation of implementation	

Users of the KER	**Potential users of the KER** Port operators, terminal operators, freight forwarders, mobile operators, IT vendors and integrators, application developers research institutes (for follow-up research).
	Users needs • Familiarity/knowledge of relevant ecosystem technologies and future trends • Solution design, testing and validation of implementation on a real environment • Methodology, tools, services, consultation, training
	Uptake strategy Include the knowledge gained into own product/business development, planning, and dissemination at relevant industry and scientific events / activities.
Routes for use/exploitation	Use for further research
	Developing and further enhancing own products/services
	Cooperation agreement/Joint Ventures
Risks and Barriers	**Potential risks and barriers for exploitation** Risk 1. Considerable infrastructure investments for 5G and IoT system. Risk 2. Potential customers may not be yet ready or willing to adopt new technologies. Risk 3. Market entrance barriers. Risk 4. Specific regulation requirements in different regions.
	Mitigation strategy for risk 1. The design and architecture of the IoT platform is based on open source software, and can be applied on commodity hardware, hence significantly reducing costs. Additionally, small scale solutions (with limited needs) can be tested/validated in 4G networks as proof of concept scenarios. **Mitigation strategy for risk 2.** A proof of concept scenario can be demonstrated on a small scale for showcasing the benefits of the 5G IoT platform and related technologies at the ICCS or other 5G testbeds. **Mitigation strategy for risk 3.** Make strategic alliances with other players in the market. **Mitigation strategy for risk 4.** Cooperate with local partners, and relevant authorities to better understand the issues (and legislation), and potentially (re)design the solution to fit/avoid specific requirements.
Background IPR	
Title	5G and IoT technologies know how (before)
Organisation	ICCS, PCT
Subject Matter	Know how
	Scientific article
Description	Partners' background knowledge related to the design, implementation, methodology, testing and operating 5G, IoT and related technologies (e.g., AI/ML and computer vision analytics).
Conditions and limitations for implementation of the background IPR	N/A

Conditions and limitations for exploitation of the background IPR	N/A	
Foreground IPR		
Title of IPR	5G and IoT technologies know how (after)	
IPR Owner(s)	ICCS, PCT	
Jointly developed	ICCS, PCT	
Country of establishment of the owner(s)	Greece	
Subject Matter	Scientific article	
	Know How	
Control of Third Owners Software, Hardware or IPR	Identification of Commercial Software and Licensor:	N/A
	Identification of Open Source Software and Licensor:	OpenSource MANO, Openstack, Kubernetes, Docker, Helm
	Identification of commercial hardware:	N/A
	Third Owner Intellectual Property Rights:	N/A
Protection Plan	Confidential information	
Description of foreground IPR	Partners' foreground knowledge related to the design, implementation, methodology, testing and operating 5G, IoT and related technologies (e.g., AI/ML and computer vision analytics).	
Access Rights	ICCS, PCT	
Available Support (email, website, info)	N/A	

A.2 - Logistics Service: Container Seal Detection

General description	Short description	Container seal detection service at the loading/unloading phase of vessels. This service exploits the 5G-IoT platform that is explained in KER A.1
	Linked 5G-LOGINNOV WPs	WP1, WP2, WP3
	Application area	Further research, internal use by PCT
	Type of exploitable result	Software: computer vision model for detecting container seals. Know-how
	5G-LOGINNOV partners involved in the development	ICCS, PCT

Expected Benefit of the result	• Expedite the loading/unloading process of cargo containers to/from vessels, and thus reduce the vessel stay at the port premises. • Remove personnel from risk area, by automating (no human interaction needed) the service of seal detection. • Experience in devising computer vision models for object detection tasks.
Users of the KER	**Potential users of the KER** Port operators, terminal operators, freight forwarders
	Users needs • Automation of the container seal checking process • Reduce vessel stay at port premises • Reallocation of human personnel in other tasks/jobs • Expedite the unloading process of vessels
	Uptake strategy • Once the inference engine of the computer vision model reaches sufficient accuracy, it will be potentially deployed in a number of quay side cranes at Piraeus terminal, as it directly addresses the port's needs, to support load/unload operations. • Include the knowledge gained into own product/business development and disseminate at relevant industry and scientific events activities.
Routes for use/exploitation	Use for further research
	Developing and further enhancing own products/services
	Cooperation agreement/Joint Ventures
Risks and Barriers	**Potential risks and barriers for exploitation** Risk 1. The computer vision algorithm is trained based on private dataset obtained from PCT. Risk 2. Computer vision algorithms suffer (in general) from adversarial attacks, which may confuse the inference engine.
	Mitigation strategy for risk 1. Once the methodology (as a proof of concept approach) reaches sufficient levels of accuracy, it can be tailored to other datasets obtained by other ports. **Mitigation strategy for risk 2.** Patterns of adversarial attacks can be identified and mitigated for subsequent attacks. For both risks, as the service is deployed and managed by the 5G-IoT platform (KER A.1), it can be redeployed effortlessly with the new retrained model.
Background IPR	
Title	Computer vision know how (before)
Organisation	ICCS, PCT
Subject Matter	Know How
Description	Background knowledge on computer vision analytics services, i.e., computer vision aided object detection. .
Conditions and limitations for implementation of the background IPR	N/A

Conditions and limitations for exploitation of the background IPR	N/A	
Foreground IPR		
Title of IPR	Container seal detection method/algorithm	
IPR Owner(s)	ICCS, PCT	
Jointly developed	ICCS, PCT	
Country of establishment of the owner(s)	Greece	
Subject Matter	Software	
	Invention (method)	
	Scientific article	
	Know How	
Control of Third Owners Software, Hardware or IPR	Identification of Commercial Software and Licensor :	N/A
	Identification of Open Source Software and Licensor :	OpenCV, CUDA, other open libraries/software
	Identification of commercial hardware :	N/A
	Third Owner Intellectual Property Rights :	N/A
Protection Plan	Confidential information	
Description of foreground IPR	Further knowledge gain on computer vision analytics services. Service (software) to detect container seals on containers.	
Access Rights	PCT, ICCS	
Available Support (email, website, info)	N/A	

A.3 - Security/Safety Service: Human Presence Detection Service

General description	Short description	Human presence detection service at specified areas within the port premises. This service exploits the 5G-IoT platform that is explained in KER A.1
	Linked 5G-LOGINNOV WPs	WP1, WP2, WP3
	Application area	Further research, internal use by PCT
	Type of exploitable result	Software: computer vision model for detecting objects, e.g., human presence, in risk/prohibited areas. Know how

	5G-LOGINNOV partners involved in the development	ICCS, PCT
Expected Benefit of the result	• Reduce risk of serious bodily injuries • Increase security in private areas • Reallocate human resources from patrol swifts to other tasks/jobs	
Users of the KER	**Potential users of the KER** Port operators, terminal operators, freight forwarders	
	Users needs • Increase port security • Increase port safety • Efficient human resource utilization	
	Uptake strategy • Once the inference engine of the computer vision model reaches sufficient accuracy, it will be potentially deployed in a number of areas of interest at Piraeus terminal, to address safety and/or privacy issues. • Include the knowledge gained into own product/business development and disseminate at relevant industry and scientific events activities.	
Routes for use/exploitation	Use for further research	
	Developing and further enhancing own products/services	
	Cooperation agreement/Joint Ventures	
Risks and Barriers	**Potential risks and barriers for exploitation** Risk 1. Object detection algorithms like the one exploited in this service, work in general in a context aware fashion (i.e., it takes also into consideration image background features). Hence the resultant accuracy might deviate in cases. Risk 2. Computer vision algorithms suffer (in general) from adversarial phenomena, which are rare, but crucial in safety critical applications.	
	Mitigation strategy for risk 1. The accuracy of the model can be increased by introducing datasets specific to the area of interest. **Mitigation strategy for risk 2.** Inference accuracy of the overall system can be enhanced by the introduction of additional methods to account for specific such cases. For both risks, as the service is deployed and managed by the 5G-IoT platform (KER A.1), it can be redeployed effortlessly with an enhanced version of the model.	
Background IPR		
Title	AI/ML analytics services know how (before)	
Organisation	ICCS, PCT	
Subject Matter	Know-how	
Description	Background knowledge on AI/ML analytics services, i.e., human/object presence detection services	
Conditions and limitations for implementation of the background IPR	N/A	

Conditions and limitations for exploitation of the background IPR	N/A	
Foreground IPR		
Title of IPR	Object detection; Human presence detection methodology	
IPR Owner(s)	ICCS, PCT	
Jointly developed	ICCS, PCT	
Country of establishment of the owner(s)	Greece	
Subject Matter	Software	
	Scientific article	
	Know How	
Control of Third Owners Software, Hardware or IPR	Identification of Commercial Software and Licensor:	N/A
	Identification of Open Source Software and Licensor:	OpenCV, CUDA other open libraries/software
	Identification of commercial hardware:	N/A
	Third Owner Intellectual Property Rights:	N/A
Protection Plan	Confidential information	
Description of foreground IPR	Further knowledge gain on AI/ML vision analytics services. Service (software) to detect human presence.	
Access Rights	ICCS, PCT	
Available Support (email, website, info)	N/A	

A.4 - 5G Truck Fleet Management Platform

General description	Short description	Design and implementation of the 5G-IoT platform including software and hardware components
	Linked 5G-LOGINNOV WPs	WP1, WP2, WP3
	Application area	Future development, internal use in the port.
	Type of exploitable result	Expertise, methodology, technologies, software In more detail: Enhance the existing VFI Fleet Management Platform with information from processed video feed. It augments the existing sensors provided by the current devices with information from processed video.
	5G-LOGINNOV partners involved in the development	VFI, ICCS

Expected Benefit of the result	Expertise gained will allow for: • future improvements in the product portfolio, business development and planning • include new types of sensor data for fleet management operators
Users of the KER	**Potential users of the KER** End user customer such as port operators, terminal operators, freight forwarders, fleet managers, logistics companies.
	Users needs • Minimum training to end users, the fleet management portal is an intuitive web application; including more sensor data will not affect the user experience.
	Uptake strategy Include the knowledge gained into own product.
Routes for use/exploitation	Developing products and services
	Cooperation agreement/Joint Ventures
	Standardisation activities (new standards/on-going procedures)
Risks and Barriers	**Potential risks and barriers for exploitation** Risk 1. Considerable infrastructure investments for 5G and IoT system. Risk 2. Considerable infrastructure investments for 5G. Risk 3. Specific regulation requirements in different regions.
	Mitigation strategy for risk 1. The design and architecture of the IoT platform is based on open source software, and can be applied on commodity hardware, hence significantly reducing costs. Additionally, small scale solutions (with limited needs) can be tested/validated in 4G networks as proof of concept scenarios. **Mitigation strategy for risk 2.** A proof of concept scenario can be demonstrated on a small scale for showcasing the benefits of the 5G IoT platform and related technologies at the ICCS 4G/5G testbed. **Mitigation strategy for risk 3.** Cooperate with local partners, and relevant authorities to better understand the issues (and legislation), and potentially (re)design the solution to fit/avoid specific requirements.
Background IPR	
Title	Vodafone Innovus IoT Platform (Includes fleet management platform)
Organisation	Vodafone Innovus
Subject Matter	Software
	Hardware
	Website
	Design of a product
Description	Vodafone Innovus has developed in house a Fleet Management Platform for the last 14 years. The latest version (Vodafone Innovus IoT Platform) is capable to incorporate multiple IoT sensors. This KER will enhance this platform with new sensor types from complex devices (like processed video).
Conditions and limitations for implementation of the background IPR	N/A

Conditions and limitations for exploitation of the background IPR	N/A
Foreground IPR: No IPR issues identified so far	

ANNEX 2: DETAILED DESCRIPTION OF 5G-LOGINNOV HORIZONTAL KERS (AND LINKED IPR ISSUES)

P.1 - Data handling procedures

General description	Short description	A set of requirements and guidelines to handle the project's data regarding access, storage, sharing and disposal, considering specific handling for personal data.
	Linked 5G-LOGINNOV WPs	WP1
	Application area	Further research
	Type of exploitable result	Knowledge, methods and associated demonstration solution
	5G-LOGINNOV partners involved in the development	AKKA
Expected Benefit of the result	• Genericity and replicability: allow for smooth reuse in other projects for the management of experimental data, evaluation data for data management endeavours in similar a project • Pragmatic and scalable set of solutions for handling personal data in-line with GDPR regulation	
Users of the KER	**Potential users of the KER:** • Scientific communities, clusters, and technology parks • Governmental institutions that support developmental projects • Public administrations, authorities, and universities • Private sector with different business • The partner's clients	
	Users needs Data Managers need to rely on and adopt time-tested solutions for their experimental research and innovation projects.	
	Uptake strategy Implement a traceability strategy of the requirements linked to the technical implementation of solutions and ensure the solutions are managed as a product/service that will be further improved and maintained beyond the project's life, e.g., as a SaaS solution. Enforce the commitment of 5G-LOGINNOV partners for managing future requirements, developments and studies to be conducted for Return-On-Investment plans based on a market study. A CreativeCommons licence could be used for documentation parts and an Open-source licence for the software parts.	
Routes for use/exploitation	Use for further research	
	Developing and selling own products/services	
	Standardisation activities (new standards/on-going procedures)	

Risks and Barriers	**Potential risks and barriers for exploitation** Risk 1. Procedures are not exhaustive enough to cover all use cases. Risk 2. Requirements are not exhaustive enough to design a data management tool.
	Mitigation strategy for risk 1. New use cases need to be evaluated, resulting in updated data management procedures. **Mitigation strategy for risk 2.** Additional requirements analysis to identify the functional requirements for a data management tool tailored to the considered project's data management methodology and planned governance of the data at stake.
Background IPR: No IPR issues identified so far	
Foreground IPR: No IPR issues identified so far	

P.2 - Evaluation methodology

General description	Short description	The evaluation methodology consists in the approach to define the impacts of 5G-LOGINNOV Use Cases. However, this methodology can be further deployed when the objective is to implement similar services and applications in other ports or transportation platforms.
	Linked 5G-LOGINNOV WPs	WP1, WP3
	Application area	Further research, industrial
	Type of exploitable result	Knowledge, methodology
	5G-LOGINNOV partners involved in the development	ICOOR, AKKA
Expected Benefit of the result	The direct benefit of the evaluation methodology for the stakeholders consists of the possibility to take advantage of a simple and complete methodology for the evaluation of 5G applications and services that will be tested in the context of the 5G-LOGINNOV project.	
Users of the KER	**Potential users of the KER** The evaluation methodology can be deployed by companies or research institutes to assess whether a 5G application or service is worth to be implemented in a particular area. These companies could apply the methodology to evaluate the impact and to show the benefits that these innovations bring to the entire logistic process. The developed methodology could be further refined by combining it with other approaches. This can be the subject of further research to extend the evaluation methodology presented in 5G-LOGINNOV. Consultancy companies could perform the methodology to evaluate the 5G applications and services they want to sell. Furthermore, the companies that want to sell their 5G applications and services could also propose the 5G evaluation methodology to demonstrate their impacts on the different areas.	
	Users needs The needs of the users are related to the possibility to have innovative ICT services that can improve the flow of information or can also perform tasks that	

	were historically performed by humans (i.e., control the presence of humans in restricted areas thanks to the use of cameras and machine learning algorithms). On the other hand, the users also need to quantify which are the impacts of these technologies in the entire system in terms of efficiency, performance, environmental impact and on the economy. The evaluation methodology addresses these impacts by measuring a set of KPIs.
	Uptake strategy The strategy to ensure that the evaluation methodology is uptaken by potential user is to show that it is concretely able to measure the impact of the 5G applications and services on several areas. In this way, potential users will take advantage of the evaluation methodology developed in the context of 5G-LOGINNOV. Therefore, the methodology will be disseminated through scientific articles and in sectorial conferences.
Routes for use/exploitation	Use for further research
	Developing and selling own products/services
Risks and Barriers	**Potential risks and barriers for exploitation** The potential risks related to the exploitation of the evaluation methodology are related to the outcomes of its implementation. Risk 1. After, the evaluation methodology has been applied, the stakeholders realise that the results are not relevant for their businesses or are not interesting for them.
	Mitigation strategy for risk 1. During the definition of the evaluation methodology, the KPIs have been carefully selected based on what the participants claimed they could provide in terms of data. In this way, it is possible to prevent that these identified KPIs will not be measured.
Background IPR: No IPR issues identified so far	
Foreground IPR: No IPR issues identified so far	

P.3 - Technology Gaps Analysis

General description	Short description	Technology Gaps Analysis in the 5G-LOGINNOV LLs context, resulting from the taxonomy analysis of existing 5G projects, questionnaire data and discussions with LLs' actors.
	Linked 5G-LOGINNOV WPs	WP4
	Application area	Further research
	Type of exploitable result	Knowledge, methodology
	5G-LOGINNOV partners involved in the development	ICOOR/ CIRCLE/ ICCS/ T-System/ ININ
Expected Benefit of the result	Improved understanding on stakeholders' needs, gains, and pains, as well as the interactions between the different actors linked to innovative technologies in port logistics	

Users of the KER	**Potential users of the KER** • Research community • Industrial actors willing to understand the current approach of ports' stakeholders towards innovative technologies.
	Users needs Need to cover the knowledge gap linked to port stakeholders' attitude towards innovative technologies, especially towards 5G applications, in the port logistics arena.
	Uptake strategy The KER will be uptaken by research by means of generating scientific articles and disseminating the knowledge to the scientific community. Moreover, the applied methodology can be adapted and applied in other projects.
Routes for use/exploitation	Use for further research
Risks and Barriers	**Potential risks and barriers for exploitation** Risk 1. Low dissemination of the linked scientific publications and results.
	Mitigation strategy for risk 1. Knowledge linked to this KER will be spread also through the EU Cordis Portal, being included in D4.1.
Background IPR: No IPR issues identified so far	
Foreground IPR: No IPR issues identified so far	

P.4 - 5G-enabled Products & Services register

General description	Short description	Register of 5G enabled Products/services used in LLs areas and beyond, with impact on port operations and business models.
	Linked 5G-LOGINNOV WPs	WP4
	Application area	Further Research / Commercial
	Type of exploitable result	Knowledge
	5G-LOGINNOV partners involved in the development	ICOOR / LL partners
Expected Benefit of the result	LL actors and the wider port community will be provided with a comprehensive outlook on the most impacting 5G-enabled products and services for port operations, including an assessment of the potential impact on current business models.	
Users of the KER	**Potential users of the KER** LL actors and the wider port community willing to use innovative 5G-enabled products and services for port operations Products/services providers willing to put in the market innovative 5G-enabled products and services for port operations	
	Users needs The scarce habit of sharing best practices on products/services that are used to renovate ports logistics defines the need for stakeholders to have more	

	symmetric information on winning strategies and to have good examples of products/services that provide benefit in ports' logistics.
	Uptake strategy A public register will be created and shared online to allow interested actors to assess the current technologies used in the logistics field.
Routes for use/exploitation	Use for further research
Risks and Barriers	**Potential risks and barriers for exploitation** Risk 1. LLs actors unwilling to share information on some products and services that they use.
	Mitigation strategy for risk 1. In case of confidentiality constraints, the public version of the register will hide specific products/services names.
Background IPR: No IPR issues identified so far	
Foreground IPR: No IPR issues identified so far	

P.5 - 5G-LOGINNOV Open Call for Start-ups methodology

General description	Short description	Methodology used to engage new actors, (5 start-ups for 5G-LOGINNOV), in an EU Project Consortium through an Open Call for start-ups.
	Linked 5G-LOGINNOV WPs	WP4
	Application area	EU Projects
	Type of exploitable result	Knowledge, Methodology
	5G-LOGINNOV partners involved in the development	CIRCLE/ICOOR/ERTICO
Expected Benefit of the result	The 5G-LOGINNOV methodology to design and implement an Open Call for Start-ups provides guidelines for future implementations of similar activities.	
Users of the KER	**Potential users of the KER** EU Projects Consortia aiming to implement Open Call initiatives in future projects	
	Users needs Need to cover the knowledge gap on how to implement an Open Call within EU projects.	
	Uptake strategy The methodology is described in a public 5G-LOGINNOV deliverable (D4.2). Therefore, it will be disseminated according to the 5G-LOGINNOV dissemination strategy. 5G-LOGINNOV partners will promote the approach and the lessons learnt in future opportunities.	
Routes for use/exploitation	Use for further research	
Risks and Barriers	**Potential risks and barriers for exploitation** Risk 1. The methodology may not be replicated due to specific actors' regulations.	
	Mitigation strategy for risk 1. The 5G-LOGINNOV approach respects the EU level regulations and –ensures the open access to this result.	
Background IPR: No IPR issues identified so far		

Foreground IPR: No IPR issues identified so far

P.6 - 5G-LOGINNOV Network of Start-ups

General description	Short description	The group of start-ups that will be reached by 5G-LOGINNOV engagement strategies addressed to new actors will be invited to be part of a real Network.
	Linked 5G-LOGINNOV WPs	WP4
	Application area	Commercial / Industrial
	Type of exploitable result	Network
	5G-LOGINNOV partners involved in the development	CIRCLE/ERTICO
Expected Benefit of the result	New actors will be provided with networking opportunities between the network members, with relevant experts and associations; they will be also provided with an increased knowledge of potential applications in port areas of 5G-enabled technologies.	
Users of the KER	**Potential users of the KER** EU (and beyond) start-ups aiming to enter the port-logistics market by proposing products and services enabled by 5G and other innovative technologies	
	Users needs Need of start-ups to be engaged in sectors where often big players are leaders. On the other hand, traditional actors of the port domain need to be enriched with new ideas and new solutions that start-ups could bring.	
	Uptake strategy During the 5G-LOGINNOV project, T4.2, in collaboration with WP5, will promote the 5G-LOGINNOV network of start-ups, starting with the engagements of start-ups linked to the three LLs, the members of the ERTICO start-up initiatives and the ALICE network. The 5G-LOGINNOV project will also set-up the requirements and organisational framework to make the Network survive after the end of the project.	
Routes for use/exploitation	Cooperation agreement/Joint Ventures	
Risks and Barriers	**Potential risks and barriers for exploitation** Risk 1. Low interest of start-ups in the promoted network	
	Mitigation strategy for risk 1. The 5G-LOGINNOV project aims at promoting the network by reaching 100-1000 start-ups through the dissemination strategy (the Logistics Initiative in Hamburg, the ERTICO Start-up Initiative, the ALICE members).	
Background IPR: No IPR issues identified so far		
Foreground IPR: No IPR issues identified so far		

P.7 - 5G-LOGINNOV Business models

General description	Short description	8 sets of business models for 5G core innovation technologies in port operations will be designed, for the following business cases: Maintenance, Operation efficiency (with minimum 2 Business cases for seaports and hubs), Environment-oriented traffic management (with minimum 2 Business-to-City Business cases), 5G-logistics corridors (with minimum 3 Business cases for logistics service operators).
	Linked 5G-LOGINNOV WPs	WP4
	Application area	Commercial / Industrial / Further research
	Type of exploitable result	Knowledge / Methodology
	5G-LOGINNOV partners involved in the development	ICOOR, LLs' actors
Expected Benefit of the result	The traditional actors of Living Labs will benefit from the proposed business models as they will get a strategy for improving their current businesses thanks to the uptake of 5G-enabled technologies in various application scenarios. The 5 start-ups will be relevant key partners of the developed business models: the defined value proposition will focus on satisfying their needs. The areas where the LLs are located will also see benefits at the environmental, economic and social level, thanks to the impact of the developed business models on the implementation of solutions.	
Users of the KER	**Potential users of the KER** Living Labs existing actors The 5 start-ups winning the Open Call Wider community around LLs areas	
	Users needs LLs' traditional actors need to define and plan an economically viable strategy for the take up of innovative technologies. Start-ups need to join a new market (ports logistics) and the EU projects arena. The wider community needs to have an improved connection to port managers to avoid negative externalities coming from port operations.	
	Uptake strategy The business modelling phase will be a continuous process following the involved actors up to the end of the project. The GUEST approach allows complementing business models with the solution canvas, a tool designed to address the practical aspects linked to the actual uptake of the developed business models, in order to explain the main resources, the activities to implement to adopt the solution, and the related costs and revenues.	
Routes for use/exploitation	Use for further research	
	Cooperation agreement/Joint Ventures	
Risks and Barriers	**Potential risks and barriers for exploitation** Risk 1. There is a modification of the LLs stakeholders' group, some of them do not accept the 5G-LOGINNOV business model. Risk 2. There is a modification in local laws and regulations, making it more difficult or impossible to put in place innovative technologies or to follow-up with the planned business strategy. Risk 3. The innovative solutions described in the business models and solution canvas are hard to integrate with the existing processes and procedures of the actors involved in port logistics.	

	Mitigation strategy for risk 1&2. The creation of business models considers a number of possible future scenarios that may occur in LLs, and beyond (developed in T4.1). The future scenarios will address several possible occurrences. Different Business Models will be defined accordingly. **Mitigation strategy for risk 3.** The development process of new products and services is based on deep collaboration between existing actors and potential new entrants. Integration aspects between existing and new processes are addressed from the early stages of the project.
Background IPR	
Title	GUEST Methodology
Organisation	ICOOR/POLITO
Subject Matter	Invention: method Scientific article Know How
Description	GUEST is a lean business methodology that provides firms and institutions with an innovative structure for the business development. The methodology controls the process of development, from the original idea to its implementation, and provides a conceptual and practical tool to the various stakeholders, enabling them to communicate their vision, difficulties, and opportunities within the same structure.
Conditions and limitations for implementation of the background IPR	N/A
Conditions and limitations for exploitation of the background IPR	N/A
Foreground IPR: no foreground IPR is foreseen so far	

P.8 - 5G-LOGINNOV Position Papers

General description	Short description	At least 2 position papers containing business-driven feedbacks and recommendations for 5G-PPP initiative and EU bodies will be developed. They will include: 1) Recommendations to key stakeholders, including public authorities and policymakers, to support the emergence of a European offer for new 5G core technologies enhancing next generation logistics hubs and ports in Europe and beyond. 2) Recommendations and deployment options for post-project replication partners as crystallisation points for taking up project results towards policy makers, industry and services.
	Linked 5G-LOGINNOV WPs	WP4/WP5
	Application area	Industrial / Further research
	Type of exploitable result	Knowledge

	5G-LOGINNOV partners involved in the development	ERTICO, 5G-LOGINNOV Consortium
Expected Benefit of the result	Existing roadmaps, policies and strategies for sustainable logistics will be enriched with a complementary focus on the potential of 5G core technologies innovations. Explicit rules concerning intellectual property rights will be also provided.	
Users of the KER	**Potential users of the KER** Europe-wide industry associations and policymakers in the transport domain.	
	Users needs Few real-life experiences of 5G-enabled technologies: 5G-LOGINNOV will provide recommendations coming from experimentations occurring in 3 ports.	
	Uptake strategy T4.4 will continuously monitor 5G and logistics industries development processed for policies and roadmaps; at the same time policy and industry actors will be engaged in the project in order to influence future policies.	
Routes for use/exploitation	Influence to new EU roadmaps	
Risks and Barriers	**Potential risks and barriers for exploitation** Risk 1. Low acceptance of 5G-LOGINNOV recommendations by the EU policy and industry community	
	Mitigation strategy for risk 1. The recommendations included in the 5G-LOGINNOV positions paper will be developed through the continuous interaction with both LLs and external to the project stakeholders and they will be actively promoted to EU policy actors and industry communities.	
Background IPR: no background IPR is foreseen so far		
Foreground IPR: no foreground IPR is foreseen so far		

P.9 - Network of 5G enabled and innovative players

General description	Short description	5G and innovative players involved in the project (MNOs, technology providers, innovative start ups and SMEs) will be invited to create a network able to accelerate the adoption of 5G innovative applications in ports and logistics industries.
	Linked 5G-LOGINNOV WPs	WP5
	Application area	Commercial/Industrial, EU Projects
	Type of exploitable result	Networks, Knowledge, Agreements
	5G-LOGINNOV partners involved in the development	CIRCLE / ERTICO / T-SYSTEMS / ININ/ / ICCS / VODAFONE INNOVUS / TELEKOM SLOVENIJE / 5G-LOGINNOV Open Call Winners
Expected Benefit of the result	Accelerate the adoption of 5G innovation in ports thanks to a well established network of 5G and Innovative players able to liaise with potential customers, presenting ready-to-take solutions or customised projects.	

Users of the KER	**Potential users of the KER** • MNOs • SMEs • Innovative start ups
	Users needs Communicate to the market the added value of 5G-enabled services for the optimisation of port and logistics operations
	Uptake strategy • Presentation of 5G and Innovative Players' solutions and achievements related to 5G-LOGINNOV and beyond to a targeted audience of innovative port and logistics industry related actors during the Docks the Future Network of Excellence (NoE) member gatherings. The Docks the Future Network of Excellence is the voluntary cooperative network managed by Circle gathering innovative ports and logistics players willing to team up and take actions to support the maritime community achieving the UN 2030 Sustainable Development Goals. The players involved at the date are APDL Leixoes, Bulgarian Ports, IMDO - Irish Ports, Kvarken Ports - Vaasa and Umea, Malta Freeport Corporation Ltd, Port of Aveiro, Port of Bar, Port of Barcelona, Port of Civitavecchia, Port of Gijon, Port of Malaga, Port System Authority of the Eastern Adriatic Sea, Port of Taranto, Port of Valencia, Port of Ystad, AIVP (Association Internationale Villes et Ports), Maritime Transport Agency of Georgia • Promote one to one meetings with the Docks the Future Network of Excellence Members
Routes for use/exploitation	Use for further research
	Developing and selling own products/services
	Cooperation agreement/Joint Ventures
	Standardisation activities (new standards/on-going procedures)
Risks and Barriers	**Potential risks and barriers for exploitation** Risk 1. Low Interest of the 5G and Innovative Players in being part of the Network Risk 2. Low interest of the Docks the Future Network of Excellence members in the contents presented by the 5G and innovative players network
	Mitigation strategy for risk 1. Free of charge presentation slots during the Docks the Future Network of Excellence meetings for the first phase of the activity **Mitigation strategy for risk 2.** Definition in advance of the ports and logistics actors' needs related to 5G and innovative solutions in order to deliver targeted presentations
Background IPR	
Title	Docks the Future Network of Excellence
Organisation	Circle SpA
Subject Matter	Know How
	Network

Description	The Docks the Future Network of Excellence (NoE) is the voluntary cooperative network managed by Circle gathering innovative ports and logistics players willing to team up and take actions to support the maritime community achieving the UN 2030 Sustainable Development Goals. It includes at the date APDL Leixoes, Bulgarian Ports, IMDO - Irish Ports, Kvarken Ports - Vaasa and Umea, Malta Freeport Corporation Ltd, Port of Aveiro, Port of Bar, Port of Barcelona, Port of Civitavecchia, Port of Gijon, Port of Malaga, Port System Authority of the Eastern Adriatic Sea, Port of Taranto, Port of Valencia, Port of Ystad, AIVP (Association Internationale Villes et Ports), Maritime Transport Agency of Georgia
Conditions and limitations for implementation of the background IPR	Signature of the Docks the Future Network of Excellence affiliation form
Conditions and limitations for exploitation of the background IPR	Signature of the Docks the Future Network of Excellence affiliation form
Foreground IPR: No IPR issues identified so far	

ANNEX 3: DETAILED DESCRIPTION OF KERS GENERATED BY INDIVIDUAL PARTNERS

ERTICO

ERTICO.1 - Maximizing international visibility, attracting decision makers, expanding network of Start-Ups

General description	Short description	ERTICO aims at maximizing its (and 5G-LOGINNOV) visibility internationally, at attracting more decision makers, and at expanding its network of Start-Ups as well as the scope of Start-Ups market opportunities.
	Linked 5G-LOGINNOV WPs	WP4 / WP5
	Application area	Commercial
	Type of exploitable result	Knowledge, international communication networks, publications and promotions
	5G-LOGINNOV partners involved in the development	ERTICO with all 5G-LOGINNOV partners contributing through their project involvement
Expected Benefit of the result	ERTICO partners and followers will benefit from the experiences made in 5G-LOGINNOV through the dissemination of said results in conferences and webinars and through their re-use and onward development in future project participations.	
Users of the KER	**Potential users of the KER** ERTICO partnership, all 5G-LOGINNOV partners	
	Users needs Information on the successful deployment of 5G-based services in the freight and logistics field is needed.	
	Uptake strategy Establishment of communications channels to extend the reach and impact of the project in the EU and beyond by defining a tailor-made communication strategy to reach the relevant target groups through adequate communication channels.	
Routes for use/exploitation	Developing and selling services	
	Cooperation agreements	
	Dissemination and marketing activities	
Risks and Barriers	**Potential risks and barriers for exploitation** None identified	
	Mitigation strategy Not applicable	
IPR issues		
Note	IPR issues do not apply to this KER	
Available Support (email, website, info)	• Public 5G-LOGINNOV website (https://5g-loginnov.eu/) as main information platform • Publication of periodic newsflashes reporting on the 5G-LOGINNOV activities, results and events	

	• Social media presence (e.g., on Twitter, LinkedIn) for awareness raising and continuous information on 5G-LOGINNOV • Leaflets and other information/publicity materials (e.g., posters/banners, videos) for 5G-LOGINNOV presentation at conferences and congresses

AKKA

AKKA.1 - Data handling and cyber security policies

General description	Short description	A set of requirements to ensure safe handling of shared data with guidelines to address the cybersecurity aspects
	Linked 5G-LOGINNOV WPs	WP1
	Application area	Industrial
	Type of exploitable result	Methods, Expertise
	5G-LOGINNOV partners involved in the development	AKKA
Expected Benefit of the result	Valuable to any data producer willing to handle its data safely (safe access, storage, sharing, disposal) Valuable to any data management tool designer, could be used as requirements to frame specifications It will help develop AKKA's expertise on data and cybersecurity.	
Users of the KER	**Potential users of the KER:** This KER will directly impact AKKA's consultants and engineers (direct users) by mastering 5G technologies and indirectly impacting AKKA's clients (indirect users) as they will benefit from innovative offers and services.	
	Users needs As an innovative accelerator for its clients, AKKA's consultants must know and master all new technologies relevant to digital transformation and mobility.	
	Uptake strategy AKKA works on promoting exploitable results achieved by its research projects to the concerned users, such as: • A strategy based on a consultant turnover between research and business projects • Communications on the AKKA group scale • Recurrent client presentations and events tackling significant results from Research projects • Training of the AKKAdemy's participants based on lessons learned when working on European research projects.	
Routes for use/exploitation	Developing and selling own products/services	
	Standardisation activities (new standards/on-going procedures)	
Risks and Barriers	**Potential risks and barriers for exploitation** Risk 1. A Multiplicity of available standards and policies makes it difficult to identify the most relevant ones and cope with all of them.	

	Risk 2. Differences of policies between the countries make it difficult to cope with cross-border use cases.
	Mitigation strategy for risk 1. Maintain an updated state of the art on the data handling and cybersecurity standards, follow-up on the latest recommendations from the corresponding specialized organisms. **Mitigation strategy for risk 2.** Follow-up on international efforts to harmonize policies and standards in particular regarding cross-border data exchange.
Background IPR	
Title	CTS: A Web-based application based on a 3-tier architecture for management of test data records (Centralized Testdata System – CTS) as developed in the AUTOPILOT project.
Organisation	AKKA
Subject Matter	Software
	Design of a product
	Know How
Description	CTS: A Web-based application based on a 3-tier architecture including PostgresSQL, Java Springboot, Angular, Nginx technologies: for management of test data records (Centralized Testdata System – CTS) as developed in the AUTOPILOT project featuring: 1) Parsing, filtering and quality-based selection functions piloted by a task manager module 2) Data enrichment functions leaning on standardized metadata, 3) Data storage modules 4) Data query components providing various web interfaces supporting user&roles management and access
Conditions and limitations for implementation of the background IPR	Access Rights to AKKA's Background is only granted to the extent that is needed for implementation of the action (5G-LOGINNOV project) being agreed that limited access rights to source code or object code will be granted by AKKA. All Background IP rights included is subject to the terms described in this Consortium Agreement and cannot be used for commercial purposes or any other economic purposes without the prior authorization of AKKA
Conditions and limitations for exploitation of the background IPR	AKKA's Background is not needed by the other parties for exploitation of their own results thus no access rights will be granted by AKKA for exploitation, unless otherwise agreed between the parties concerned
Foreground IPR: no foreground IPR is foreseen so far	

AKKA.2 - Data collection architecture and tools

General description	Short description	An architecture framing the data collection from 5G-LOGINNOV Living Labs hosting multiple data sources with a centralised data management for evaluation purposes. A centralised data management tool that can ingest data in a flexible way from multiple data sources while performing quality checks on received data offers data visualisation features and allows data export to other systems such as open data repositories.
	Linked 5G-LOGINNOV WPs	WP2

	Application area	Industrial
	Type of exploitable result	Knowledge, methods, technologies
	5G-LOGINNOV partners involved in the development	AKKA

Expected Benefit of the result	• Reuse of the architecture for any projects relying on multiple data sources to collect data for evaluation purposes, including KPIs calculation.
	• Reuse of the architecture for developing and implementing data management tools.
	• Reuse of the tool and any of its components for
	  • Data ingestion from various data sources
	  • Data quality check
	  • Data indexing
	  • Data visualisation
	  • Data sharing
	  • Reuse of the knowledge constituted during the development of the tool to design data management solutions
	  • Experience on open source solutions	

Users of the KER	**Potential users of the KER** This KER will directly impact AKKA's consultants and engineers (direct users) by mastering 5G technologies and indirectly impacting AKKA's clients (indirect users) as they will benefit from innovative offers and services.	
	Users needs As an innovative accelerator for its clients, AKKA's consultants must know and master all new technologies relevant to digital transformation and mobility.	
	Uptake strategy AKKA works on promoting exploitable results achieved by its research projects to the concerned users, such as: • A strategy based on a consultant turnover between research and business projects • Communications on the AKKA group scale • Recurrent client presentations and events tackling significant results from research projects • Training of the AKKAdemy's participants based on lessons learned when working on European research projects	
Routes for use/exploitation	Use for further research	
	Developing and selling own products/services	
Risks and Barriers	**Potential risks and barriers for exploitation** Risk 1. Difficulty to cope with the variety of use cases. Risk 2. Difficulty to support multiple data sources with different data production technical solutions. Risk 3. Scaling of the data collection tools to cope with high volumes of data ingestion and storage.	
	Mitigation strategy for risk 1. Clear identification of the use case requirements so that the tools and deployment can be adapted.	

	Mitigation strategy for risk 2. Usage of flexible data ingestion components, which are able to cope with different data ingestion techniques with minimal configuration. **Mitigation strategy for risk 3** Include big data components into the architecture as they are designed to support the high volume, variety, and velocity of data.
Background IPR	
Title	Know-how on the design, development and deployment of data collection services based on scalable message broker RabbitMQ deployed in cloud environment (public, hybrid, private).
Organisation	AKKA
Subject Matter	Design of a product Know How
Description	Know-how on the design, development and deployment of data collection services based on scalable message broker RabbitMQ deployed in cloud environment (public, hybrid, private). Such system contains following components: 1. A message collection Module based on RabbitMQ for connection of several tier systems that produce data. 2. Interoperability interfaces for connection to a OneM2M compatible system 3. A data staging module based on Apache Nifi capable of coping with various data sources (incl. from Message Collection Module) and ensuring data transformation and generation of standard meta-data descriptions.
Conditions and limitations for implementation of the background IPR	Access Rights to AKKA's Background is only granted to the extent that is needed for implementation of the action (5G-LOGINNOV project) being agreed that limited access rights to source code or object code will be granted by AKKA. All Background IP rights included is subject to the terms described in this Consortium Agreement and cannot be used for commercial purposes or any other economic purposes without the prior authorization of AKKA.
Conditions and limitations for exploitation of the background IPR	AKKA's Background is not needed by the other parties for exploitation of their own results thus no access rights will be granted by AKKA for exploitation, unless otherwise agreed between the parties concerned.
Foreground IPR: no foreground IPR is foreseen so far	

CIRCLE

CIRCLE.1 - Awareness development and expansion of the Docks the Future Network of Excellence

General description	Short description	Development of a B2B service dedicated to the Docks the Future Network of Excellence: an online matchmaking platform to foster the development of innovative applications in ports. The Docks the Future Network of Excellence is the voluntary cooperative Network managed by Circle gathering innovative ports and logistics players willing to team up and take actions to support the maritime community achieving the UN 2030 Sustainable Development Goals
	Linked 5G-LOGINNOV WPs	WP5
	Application area	Commercial, EU projects

	Type of exploitable result	Networks Services
	5G-LOGINNOV partners involved in the development	CIRCLE / ERTICO / T-SYSTEMS / ININ / ICCS / VODAFONE INNOVUS / TELEKOM SLOVENIJE / 5G-LOGINNOV Open Call Winners
Expected Benefit of the result	Potential increase of the affiliated entities to the Docks the Future Network of Excellence thanks to the new added value service At a later stage new revenues from the commission on the contracts signed thanks to the matchmaking platform	
Users of the KER	**Potential users of the KER** Affiliated entities to the Docks the Future Network of Excellence MNO's SME's Innovative Start ups	
	Users needs Increase the networking and go-to-market opportunities Find new technological providers Find innovative solutions	
	Uptake strategy Development of a specific section of the Docks the Future Network of Excellence web site (www.docksthefuture.eu) dedicated to both the submission of company profiles and applications by innovative technological providers and the publication of the strategic needs for innovative services by Ports and Logistics players (members of the Docks the Future Network of Excellence). B2B presentation by technological providers during all the Docks the Future Network of Excellence member gatherings. Promotional campaigns to the SME's Networks involved in the 5G-LOGINNOV project.	
Routes for use/exploitation	Developing and selling own products/services	
	Cooperation agreement/Joint Ventures	
	Affiliation	
Risks and Barriers	**Potential risks and barriers for exploitation** Risk 1. Low level of applications from innovative technological providers Risk 2. Low level of interest of the Docks the Future Network of Excellence members in the solutions presented by the innovative technological providers	
	Mitigation strategy for risk 1. Free of charge presentation slots during the Docks the Future Network of Excellence meetings for the first phase of the activity **Mitigation strategy for risk 2.** Distribution of a periodic survey to the Docks the Future Network of Excellence members in order to assess the real technological needs of ports and industry players and to select of the most suitable providers	
Background IPR		
Title	Docks the Future Network of Excellence	
Organisation	Circle SpA	
Subject Matter	Know How	
	Network	

Description	The Docks the Future Network of Excellence (NoE) is the voluntary cooperative Network managed by Circle gathering innovative ports and logistics players willing to team up and take actions to support the maritime community achieving the UN 2030 Sustainable Development Goals. It includes at the date APDL Leixoes, Bulgarian Ports, IMDO - Irish Ports, Kvarken Ports - Vaasa and Umea, Malta Freeport Corporation Ltd, Port of Aveiro, Port of Bar, Port of Barcelona, Port of Civitavecchia, Port of Gijon, Port of Malaga, Port System Authority of the Eastern Adriatic Sea, Port of Taranto, Port of Valencia, Port of Ystad, AIVP (Association Internationale Villes et Ports), Maritime Transport Agency of Georgia
Conditions and limitations for implementation of the background IPR	Signature of the Docks the Future Network of Excellence affiliation form
Conditions and limitations for exploitation of the background IPR	Signature of the Docks the Future Network of Excellence affiliation form
Foreground IPR: No IPR issues identified so far	

CONTI

CONTI.1 - Use of 5G telematics products in logistics sector

General description	Short description	Use of 5G telematics products in logistics sector to optimise the driving patterns through the collection of real time data
	Linked 5G-LOGINNOV WPs	WP1, WP2, WP3
	Application area	Vehicle telematics for commercial vehicles
	Type of exploitable result	Telematics product better tailored to commercial vehicle operators
	5G-LOGINNOV partners involved in the development	Continental
Expected Benefit of the result	• Better understanding of specific use cases relevant for commercial vehicle operators, with a particular focus on the logistics sector, in and around the port area • Tailoring of products to commercial vehicles	
Users of the KER	**Potential users of the KER** • Commercial vehicle OEMs • Commercial vehicle operators	
	Users needs Provide additional information to commercial vehicle operators, that allow a better understanding of driving patterns, more accurate fuel consumption data (based on various driving conditions), real-time data that can be used for predicting potential issues	

	Uptake strategy Promote products and potential benefits, based on project results	
Routes for use/exploitation *(select)*	Use for further research	
	Developing and selling own products/services	
Risk and Barriers	**Potential risks and barriers for exploitation** Risk 1. Overlap with existing fleet management systems, already on the market Risk 2. Low margin for commercial vehicle operators	
	Mitigation strategy for risks 1 & 2. Properly identify added value brought by Continental solution (such as more accurate, real-time data, leveraging 5G)	
Background IPR		
Title	Telematics products provided by the Company on the market (both for passenger and commercial vehicles)	
Organisation	Continental AG	
Subject Matter	Software	
	Hardware	
	Firmware	
	Design of a product	
	Name of a technology or of a product	
	Know How	
	Website	
Description	Large range of devices developed and produced by Continental, integrated in 30+ million vehicles. Continuous telematics development, up to and including 5G technology	
Conditions and limitations for implementation of the background IPR	Background IPR can only be used for own (Continental) development.	
Conditions and limitations for exploitation of the background IPR	Wide range of vehicles, with proprietary communication protocols and interfaces, requiring manufacturer-tailored implementation in some cases	
Foreground IPR		
IPR Owner(s)	Continental AG	
Jointly developed	No	
Country of establishment of the owner(s)	N/A	
Subject Matter	Software	
	Hardware	
	Design of a product	
	Know How	
Related Background	Existing telematics know-how and products (see background IPR)	
	Identification of Commercial Software and Licensor:	Continental-developed software

Control of Third Owners Software, Hardware or IPR	Identification of Open Source Software and Licensor:	N/A
	Identification of commercial hardware:	Continental-developed hardware
	Third Owner Intellectual Property Rights:	N/A
Protection Plan	Copyright	
	Confidential information	
Description of foreground IPR	Tailoring of existing product to 5G-LOGINNOV project needs (SW & HW changes, to adapt to vehicles used in LLs)	
Access Rights	N/A	
Available Support (email, website, info)	N/A	

CONTI.2 - Results of exploitation of telematics products in various network conditions

General description	Short description	Results of exploitation of telematics products in various network conditions
	Linked 5G-LOGINNOV WPs	WP1, WP2, WP3
	Application area	Vehicle telematics for passenger and commercial vehicles
	Type of exploitable result	Telematics projects with a better fit to more types of networks (especially 5G-SA networks, which currently have limited availability on the market)
	5G-LOGINNOV partners involved in the development	Continental
Expected Benefit of the result	Telematics products which support a higher range of network types (especially in regards to 5G-SA networks)	
Users of the KER	**Potential users of the KER** Vehicle OEMs	
	Users needs Telematics products that can operate in large range of network deployed in their targeted markets	
	Uptake strategy Promote products, based on project results	
Routes for use/exploitation	Use for further research	
	Developing and selling own products/services	
Risk and Barriers	**Potential risks and barriers for exploitation** Risk 1. Slow increase of 5G use in automotive sector	
	Mitigation strategy for risk 1. Disseminate advantages of 5G in the automotive sector	
Background IPR		

Title	Telematics products provided by company on the market (both for passenger and commercial vehicles)	
Organisation	Continental AG	
Subject Matter	Software	
	Hardware	
	Firmware	
	Design of a product	
	Name of a technology or of a product	
	Know How	
	Website	
Description	Large range of devices developed and produced by Continental, integrated in 30+ million vehicles. Continuous telematics development, up to and including 5G technology	
Conditions and limitations for implementation of the background IPR	Background IPR can only be used for own (Continental) development.	
Conditions and limitations for exploitation of the background IPR	Wide range of vehicles, with proprietary communication protocols and interfaces, requiring manufacturer-tailored implementation in some cases	
Foreground IPR		
IPR Owner(s)	Continental AG	
Jointly developed	No	
Country of establishment of the owner(s)	N/A	
Subject Matter	Software	
	Hardware	
	Design of a product	
	Know How	
Related Background	Existing telematics know-how and products (see background IPR)	
Control of Third Owners Software, Hardware or IPR	Identification of Commercial Software and Licensor:	Continental-developed software
	Identification of Open Source Software and Licensor:	N/A
	Identification of commercial hardware:	Continental-developed hardware
	Third Owner Intellectual Property Rights:	N/A
Protection Plan (select)	Copyright	
	Confidential information	
Description of foreground IPR	Tailoring of existing product to 5G-LOGINNOV project needs (SW & HW changes, to adapt to vehicles used in LLs)	
Access Rights	N/A	

Available Support (email, website, info)	N/A

ICCS

ICCS.1 - Partnership establishment with key industry stakeholders

General description	Short description	Partnership establishment with key industry stakeholders for the implementation and sustainability of solutions and further collaboration in future research/technical initiatives in Greece and beyond
	Linked 5G-LOGINNOV WPs	WP4, WP5, WP6
	Application area	Further development and research
	Type of exploitable result	Knowledge of the market and potential (new) partnerships
	5G-LOGINNOV partners involved in the development	5G-LOGINNOV Partners
Expected Benefit of the result	• Potentially establish new collaborations (within and outside the 5G-LOGINNOV consortium) for further research, innovation actions, new products/services, expand market outreach/scope • Improve solutions/services based on input from partners	
Users of the KER	**Potential users of the KER** Research institutions, port operators, terminal operators, freight forwarders, mobile operators, IT vendors and integrators, application developers	
	Users needs • Open/expand market opportunities • Knowledge gain, lessons learned exchange • Further research and innovation actions • New products/services	
	Uptake strategy Active participation in dissemination and demonstration activities/events	
Routes for use/exploitation	Use for further research	
	Cooperation agreement/Joint Ventures	
	Developing/exploiting new services/products	
Risks and Barriers	**Potential risks and barriers for exploitation** Risk 1. Considerable infrastructure investments for 5G and IoT system. Risk 2. Potential customers may not be yet ready or willing to adopt new technologies. Risk 3. Market entrance barriers. Risk 4. Specific regulation requirements in different regions.	
	Mitigation strategy for risk 1. The design and architecture of the IoT platform is based on opensource software, and can be applied on commodity hardware, hence significantly reducing costs. Additionally, small scale solutions (with limited needs) can be tested/validated in 4G networks as proof of concept scenarios.	

	Mitigation strategy for risk 2. A proof of concept scenario can be demonstrated on a small scale for showcasing the benefits of the 5G IoT platform and related technologies at the ICCS or other 5G testbeds. **Mitigation strategy for risk 3.** Make strategic alliances with other players in the market. **Mitigation strategy for risk 4.** Cooperate with local partners, and relevant authorities to better understand the issues (and legislation), and potentially (re)design the solution to fit/avoid specific requirements.
Background IPR: No IPR issues identified so far	
Foreground IPR	
Title of IPR	Partnerships/collaborations
IPR Owner(s)	N/A
Jointly developed	Yes: 5G-LOGINNOV consortium, dissemination events/activities
Country of establishment of the owner(s)	N/A
Subject Matter	Know how
Control of Third Owners Software, Hardware or IPR	Identification of Commercial Software and Licensor: N/A Identification of Open Source Software and Licensor: N/A Identification of commercial hardware: N/A Third Owner Intellectual Property Rights: N/A
Protection Plan	Confidential information
Description of foreground IPR	Establishment of potential collaborations with relevant stakeholders interested in 5G enabling technologies in port and logistics domain.
Access Rights	N/A
Available Support (email, website, info)	N/A

ICCS.2 - Acquisition of further expertise and know-how in the field of 5G, IoT and relevant ecosystem technologies in logistics and ports domain

General description	Short description	Know how in the design and implementation of the 5G-IoT platform including software and hardware components, and relevant ecosystem technologies
	Linked 5G-LOGINNOV WPs	WP1, WP2, WP3
	Application area	Further development and research
	Type of exploitable result	Knowledge related to the design, implementation, methodology, testing and operating 5G, IoT and relevant technologies.

	5G-LOGINNOV partners involved in the development	ICCS
Expected Benefit of the result	To be used for further research and innovation actions, as well as participation to other project calls.	
Users of the KER	**Potential users of the KER** ICCS and other projects that ICCS participates in.	
	Users needs Expertise in the design, implementation, methodology, testing and operating 5G, IoT and relevant ecosystem technologies.	
	Uptake strategy ICCS already participates in several Horizon Europe Framework Programme innovation research actions/proposals. Knowledge gained by 5G-LOGINNOV actions/technologies will be exploited for further research results and innovation actions. Exploitations of this KER is already part of the following projects • ICT-41-2020: 5G-IANA • HORIZON-CL6-2021-COMMUNITIES-01: XGAIN and will also be exploited for further research projects.	
Routes for use/exploitation	Use for further research	
	Developing own products/services	
	Cooperation agreement/Joint Ventures	
Risks and Barriers	**Potential risks and barriers for exploitation** Risk 1. Considerable infrastructure investments for 5G and IoT system. Risk 2. Potential customers may not be yet ready or willing to adopt new technologies. Risk 3. Market entrance barriers. Risk 4. Specific regulation requirements in different regions	
	Mitigation strategy for risk 1. The design and architecture of the IoT platform is based on opensource software, and can be applied on commodity hardware, hence significantly reducing costs. Additionally, small scale solutions (with limited needs) can be tested/validated in 4G networks as proof of concept scenarios. **Mitigation strategy for risk 2.** A proof of concept scenario can be demonstrated on a small scale for showcasing the benefits of the 5G IoT platform and related technologies at the ICCS 4G/5G testbeds. **Mitigation strategy for risk 3.** Make strategic alliances with other players in the market. **Mitigation strategy for risk 4.** Cooperate with local partners, and relevant authorities to better understand the issues (and legislation), and potentially (re)design the solution to fit/avoid specific requirements.	
Background IPR		
Title	5G IoT platform know how (before)	
Organisation	ICCS	
Subject matter	Scientific article	
	Know How	
Description	ICCS's background knowledge related to the design, implementation, methodology, testing and operating 5G, IoT and related technologies.	

Conditions and limitations for implementation of the background IPR	N/A	
Conditions and limitations for exploitation of the background IPR	N/A	
Foreground IPR		
Title of IPR	5G IoT platform know how (after)	
IPR Owner(s)	ICCS	
Jointly developed	ICCS, PCT	
Country of establishment of the owner(s)	Greece	
Subject matter	Scientific article	
	Know How	
Control of Third Owners Software, Hardware or IPR	Identification of Commercial Software and Licensor:	N/A
	Identification of Open Source Software and Licensor:	OpenAirInterface, OpenSource MANO, Openstack, Kubernetes, Microk8s, Helm, Docker
	Identification of commercial hardware:	N/A
	Third Owner Intellectual Property Rights:	N/A
Protection Plan	Confidential information	
Description of foreground IPR	ICCS's foreground knowledge related to the design, implementation, methodology, testing and operating 5G, IoT and related technologies.	
Access Rights	ICCS	
Available Support (email, website, info)	N/A	

ICCS.3 - Computer Vision Analytics Services, Research and Development

General description	Short description	Know how in computer vision analytics/ML applications tailored (but not limited) to ports and logistics.
	Linked 5G-LOGINNOV WPs	WP1, WP2, WP3
	Application area	Further research and innovation
	Type of exploitable result	Know how, methodology: computer vision development and deployment for detecting container seals and human presence

	5G-LOGINNOV partners involved in the development	ICCS, PCT
Expected Benefit of the result	Knowledge gain and further expertise in computer vision and AI/ML tasks	
Users of the KER	**Potential users of the KER** ICCS and potential collaborators in future research innovation actions.	
	Users needs Know how and further expertise acquisition in key enabling technologies and tools used in computer vision analytics (research and innovation), to provide services tailored to relevant environments such as ports.	
	Uptake strategy ICCS already participates in several Horizon Europe Framework Programme innovation research actions/proposals. Knowledge gained by 5G-LOGINNOV actions/technologies will be exploited for further research results and innovation actions. Exploitations of this KER is already part of the following projects • ICT-41-2020: 5G-IANA • HORIZON-CL6-2021-COMMUNITIES-01: XGAIN Proven expertise in such domains will render ICCS competitive and key partner for innovation actions in computer vision tasks, with relevant research projects.	
Routes for use/exploitation	Use for further research	
	Developing and further enhancing own products/services	
	Cooperation agreement/Joint Ventures	
Risks and Barriers	**Potential risks and barriers for exploitation** Risk 1. Specific regulation requirements in different regions Risk 2. Market entrance barriers	
	Mitigation strategy for risk 1. Cooperate with local partners, and relevant authorities to better understand the issues (and legislation), and potentially (re)design the solution to fit/avoid specific requirements. **Mitigation strategy for risk 2.** Make strategic alliances with other players in the market, with potential demonstration events for showcasing the technology and their added value.	
Background IPR		
Title	Computer vision and AI/ML know how (before)	
Organisation	ICCS, PCT	
Subject Matter	Know how	
Description	Background expertise in development of computer vision and AI/ML analytics tasks	
Conditions and limitations for implementation of the background IPR	N/A	
Conditions and limitations for exploitation of the background IPR	N/A	
Foreground IPR		

Title of IPR	Computer vision and AI/ML know how (after)	
IPR Owner(s)	ICCS, PCT	
Jointly developed	ICCS, PCT	
Country of establishment of the owner(s)	Greece	
Subject Matter	Software	
	Invention (method)	
	Scientific article	
	Know How	
Control of Third Owners Software, Hardware or IPR (select and describe the relevant option)	Identification of Commercial Software and Licensor :	N/A
	Identification of Open Source Software and Licensor :	OpenCV, CUDA, other open libraries/software
	Identification of commercial hardware :	N/A
	Third Owner Intellectual Property Rights :	N/A
Protection Plan	Confidential information	
Description of foreground IPR	Foreground expertise in development of computer vision and AI/ML analytics tasks, tailored to port operations and logistics	
Access Rights	ICCS	
Available Support (email, website, info)	N/A	

ICOOR

ICOOR.1 - Customised GUEST Methodology

General description	Short description	The traditional GUEST methodology will be customised for the 5GLOGINNOV project context.
	Linked 5G-LOGINNOV WPs	WP4
	Application area	Commercial and research
	Type of exploitable result	Methodology
	5G-LOGINNOV partners involved in the development	ICOOR
Expected Benefit of the result	The customised GUEST methodology follows the development of innovative solutions, products, and services in the project LLs and starts from the analysis of the current needs of the stakeholders and actors involved in the project, thus facilitating the adoption of the proposed solutions. The Business Model Canvas, resulting from the GUEST methodology, is a visual tool to communicate in a clear and effective way the proposed solutions, allowing actors and stakeholders to understand how the solutions will meet their needs.	
Users of the KER	**Potential users of the KER**	

	• Stakeholders and actors involved in the project. • Research institutions. • Innovative startups involved in the project. • External stakeholders and actors, potentially interested in the adoption of products and services developed within the project.
	Users needs • Direct involvement in the development process of innovative solutions from the earliest stages. • Understand how the innovative solutions, products, and services will affect the existing business models (addressed needs, required changes, expected benefits).
	Uptake strategy Potential users are directly involved in the development process starting from the early stages, in order to minimise the potential impact of the innovative solutions on the existing businesses.
Routes for use/exploitation	Use for further research
	Cooperation agreement/Joint Ventures
Risks and Barriers	**Potential risks and barriers for exploitation** Risk 1. Low interest in the adoption by the partners Risk 2. Inertia in changing the existing business models
	Mitigation strategy for risk 1. Partners are directly involved from the early stages, analysing their needs to develop as customised as possible solutions. **Mitigation strategy for risk 2.** New business models are developed taking into account the importance of integration with existing products and services used by the stakeholders.
Background IPR	
Title	GUEST Methodology
Organisation	ICOOR/POLITO
Subject Matter	Invention: method
	Scientific article
	Know How
Description	GUEST is a lean business methodology that provides firms and institutions with an innovative structure for the business development. The methodology controls the process of development, from the original idea to its implementation, and provides a conceptual and practical tool to the various stakeholders, enabling them to communicate their vision, difficulties, and opportunities within the same structure.
Conditions and limitations for implementation of the background IPR	N/A
Conditions and limitations for exploitation of the background IPR	N/A
Foreground IPR: no foreground IPR is foreseen so far	

ININ

ININ.1 - Improvements of Private 5G mobile system

General description	Short description	Improved private 5G mobile system set up to suit specific needs of the ports/logistics domain
	Linked 5G-LOGINNOV WPs	WP1, WP2, WP3
	Application area	Future development and research
	Type of exploitable result	Improvements in design, implementation, testing and operating Private 5G mobile system for port and logistics domain
	5G-LOGINNOV partners involved in the development	ININ
Expected Benefit of the result	Improvements will allow for: • improvements in the product portfolio; • custom solutions co-design; • broadening spectrum of topics provided in customer consulting, training and educational services; • business development.	
Users of the KER	**Potential users of the KER** Port operators, mobile operators, IT vendors and integrators	
	Users needs consultations and training on specific cases, test and verification environment	
	Uptake strategy Improve the product, and then disseminate at relevant industry and scientific events activities.	
Routes for use/exploitation	Use for further research	
	Developing and selling own products/services	
	Cooperation agreement/Joint Ventures	
Risks and Barriers	**Potential risks and barriers for exploitation** Risk 1. Considerable infrastructure investments for 5G. Risk 2. Potential customers may not be yet ready or willing to adopt new technologies. Risk 3. Market entrance barriers. Risk 4. Specific regulation requirements in different regions.	
	Mitigation strategy for risk 1. Initial deployments can be completed using Private 5G mobile system. In case of very limited needs (e.g., IoT required only), LTE network can be used as well. **Mitigation strategy for risk 2.** Using Private 5G mobile systems, it can be relatively easy to make a PoC on a small scale for showcasing benefits of 5G and related technology. **Mitigation strategy for risk 3.** Make strategic alliances with other players in the market. **Mitigation strategy for risk 4.** Cooperate with local partners to better understand the issues and, based on the technological knowledge, (re)design the solution to fit/avoid specific requirements.	
Background IPR		
Title	Designing and implementing 5G mobile system	

Organisation	ININ	
Subject Matter	Software	
	Hardware	
	Firmware	
	Design of a product	
	Know How	
Description	Partner's background know-how related to design, implementation, and operating of 5G systems, as well as customizing a 5G SA mobile system to a unique small-scale portable product.	
Conditions and limitations for implementation of the background IPR	NA	
Conditions and limitations for exploitation of the background IPR	NA	
Foreground IPR		
Title of IPR	5G private networks technology, technical data and know-how	
IPR Owner(s)	ININ	
Jointly developed	NO	
Country of establishment of the owner(s)	Slovenia	
Subject Matter	Software	
	Hardware	
	Firmware	
	Design of a product	
	Know How	
Control of Third Owners Software, Hardware or IPR	Identification of Commercial Software and Licensor:	N/A
	Identification of Open Source Software and Licensor:	N/A
	Identification of commercial hardware:	N/A
	Third Owner Intellectual Property Rights:	N/A
Protection Plan	Copyright/Software Registration	
Description of foreground IPR	Partner's foreground knowledge related to design, implementation, testing and operating 5G mobile systems in Port and Industry 4.0 environments.	
Access Rights	Based on the mutual agreement following fair technological and commercial principles.	
Available Support (email, website, info)	Yes. Prior commercial agreement needs to be established.	

General description	Short description	Industrial grade 5G IoT System product improvements to suit specific needs of the ports/logistics domain
	Linked 5G-LOGINNOV WPs	WP1, WP2, WP3
	Application area	Future development and research, Commercial
	Type of exploitable result	Improved product, i.e., Industrial grade 5G IoT System and IoT backend system components.
	5G-LOGINNOV partners involved in the development	ININ
Expected Benefit of the result	Improvements will allow for: • improvements in the product portfolio; • custom solutions co-design; • increased number of end devices supported by the Industrial grade 5G IoT System and backend solution; • new test/verification solutions design and implementation; • broadening spectrum of topics provided in customer consulting, training and educational services; • business development.	
Users of the KER	**Potential users of the KER** Port operators, freight forwarders, mobile operators, IT vendors and integrators, App developers	
	Users needs Consultations and training on specific cases, test and verification environment, utilization in business process	
	Uptake strategy Improve the product, then enhance business development, and disseminate at relevant industry and scientific events activities.	
Routes for use/exploitation	Use for further research	
	Developing and selling own products/services	
	Cooperation agreement/Joint Ventures	
Risks and Barriers	**Potential risks and barriers for exploitation** Risk 1. Potential customers may not be yet ready or willing to adopt new technologies. Risk 2. Potential customers not recognizing value of the technology. Risk 3. Market entrance barriers. Risk 4. Specific regulation requirements in different regions.	
	Mitigation strategy for risks 1 and 2. PoC on a small scale for showcasing benefits of the product/technology. If needed, use Private 5G mobile system network to enable 5G network. **Mitigation strategy for risk 3.** Make strategic alliances with other players in the market. **Mitigation strategy for risk 4.** Cooperate with local partners to better understand the issues and, based on the technological knowledge, (re)design the solution to fit/avoid specific requirements.	
Background IPR		
Title	5G IoT services and product design and implementation	
Organisation	Internet Institute	

Subject Matter	Software	
	Know How	
Description	Partner's background knowledge related to design, implementation, and integration of IoT GWs.	
Conditions and limitations for implementation of the background IPR	NA	
Conditions and limitations for exploitation of the background IPR	NA	
Foreground IPR		
Title of IPR	5G IoT technology and know-how	
IPR Owner(s)	Internet Institute	
Jointly developed	NO	
Country of establishment of the owner(s)	Slovenia	
Subject Matter	Software	
	Hardware	
	Design of a product	
	Know How	
Control of Third Owners Software, Hardware or IPR (select and describe the relevant option)	Identification of Commercial Software and Licensor:	N/A
	Identification of Open Source Software and Licensor:	N/A
	Identification of commercial hardware:	N/A
	Third Owner Intellectual Property Rights:	N/A
Protection Plan	Copyright/Software Registration	
Description of foreground IPR	Partner's foreground know-how, and certain technological improvements, related to design, implementation, and integration of the Industrial grade 5G IoT System.	
Access Rights	Based on the mutual agreement following fair technological and commercial principles.	
Available Support (email, website, info)	Yes. Prior commercial agreement needs to be established.	

ININ.3 - Improvements of Quality assurance services for 5G networks and cloud-infrastructure designed for ports and industry 4.0 environment

General description	Short description	Quality assurance services improvements to better suit specific needs of the ports/logistics domain

	Linked 5G-LOGINNOV WPs	WP1, WP2, WP3
	Application area	Future development and research, Commercial
	Type of exploitable result	Improved product/service, i.e., quality assurance services solution and related test methodologies.
	5G-LOGINNOV partners involved in the development	ININ
Expected Benefit of the result	Improvements will allow for: • improvements in the product portfolio; • custom solutions co-design; • new test/verification solutions design and implementation; • new test/verification methods; • broadening spectrum of topics provided in customer consulting, training and educational services; • business development.	
Users of the KER	**Potential users of the KER** Port operators, freight forwarders, mobile operators, IT vendors and integrators, App developers	
	Users needs Consultations and training on specific cases, test and verification environment, utilization in business process	
	Uptake strategy Improve the product, then enhance business development, and disseminate at relevant industry and scientific events activities.	
Routes for use/exploitation	Use for further research	
	Developing and selling own products/services	
	Cooperation agreement/Joint Ventures	
Risks and Barriers	**Potential risks and barriers for exploitation** Risk 1. Potential customers may not be yet ready or willing to adopt new technologies. Risk 2. Potential customers not recognizing value of the technology. Risk 3. Market entrance barriers. Risk 4. Specific regulation requirements in different regions.	
	Mitigation strategy for risks 1 and 2. PoC on a small scale for showcasing benefits of the product/technology. If needed, use portable Private 5G mobile systems to enable 5G network. **Mitigation strategy for risk 3.** Make strategic alliances with other players in the market. **Mitigation strategy for risk 4.** Cooperate with local partners to better understand the issues and, based on the technological knowledge, (re)design the solution to fit/avoid specific requirements.	
Background IPR		
Title	Quality assurance services and products	
Organisation	ININ	
Subject Matter	Software	
	Hardware	
	Design of a product	

	Know How	
Description	Partner's background knowledge related to design, implementation, integration and utilization of monitoring solutions.	
Conditions and limitations for implementation of the background IPR	N/A	
Conditions and limitations for exploitation of the background IPR	N/A	
Foreground IPR		
Title of IPR	5G Quality assurance technology and know-how	
IPR Owner(s)	ININ	
Jointly developed	NO	
Country of establishment of the owner(s)	Slovenia	
Subject Matter	Software	
	Hardware	
	Know How	
Control of Third Owners Software, Hardware or IPR	Identification of Commercial Software and Licensor:	N/A
	Identification of Open Source Software and Licensor:	N/A
	Identification of commercial hardware:	N/A
	Third Owner Intellectual Property Rights:	N/A
Protection Plan	Copyright/Software Registration	
Description of foreground IPR	Partner's foreground know-how, and certain technological improvements achieved within the project, related to design, implementation, integration and utilization of quality assurance solutions used in port and Industry 4.0 environments.	
Access Rights	Based on the mutual agreement following fair technological and commercial principles	
Available Support (email, website, info)	Yes. Prior commercial agreement needs to be established.	

LK

LK.1 - Collaborations and Lessons Learned from 5G-LOGINNOV Consortium

General description	Short description	Partnership establishment with key industry stakeholders for the implementation and sustainability of solutions and further collaboration in future research/technical initiatives in Greece and beyond

	Linked 5G-LOGINNOV WPs	WP1, WP5, WP6
	Application area	Further research and development
	Type of exploitable result	Knowledge of the market and of new technologies, potential (new) partnerships
	5G-LOGINNOV partners involved in the development	5G-LOGINNOV Partners
Expected Benefit of the result	• Potentially establish new collaborations (within and outside the 5G-LOGINNOV consortium) for further research, innovation actions, new products/services • Improve solutions/services for port operations and security services	
Users of the KER	**Potential users of the KER** Research institutions, port operators, terminal operators, freight forwarders, port authorities, critical infrastructure operators, mobile operators, IT vendors and integrators, application developers	
	Users needs • Speed up work processes, reduce operating costs • Knowledge gain, lessons learned exchange • Further research and innovation actions • New ICT technologies tailored for port needs	
	Uptake strategy Participation in dissemination and demonstration activities/events	
Routes for use/exploitation	Use for further research	
	Cooperation agreement/Joint Ventures	
	Developing/exploiting new services/products	
Risks and Barriers	**Potential risks and barriers for exploitation** Risk 1. New technologies not sufficiently adapted to the needs or requirements of the complex port environment Risk 2. New technologies incompatible with existing ICT infrastructure or not adaptable to port operating systems. Risk 3. Specific regulatory requirements and lengthy implementation procedures	
	Mitigation strategy for risk 1. Participate in R&D projects to gain insights and better understand new 5G technology, its strengths, weaknesses, opportunities and potential threats. **Mitigation strategy for risk 2.** Collaboration in R&D projects to gain additional technological knowledge for a better understanding of emerging 5G technologies and solutions by participating in the process of testing and implementing the design solutions for seaports **Mitigation strategy for risk 3.** Maintain good connections and make new alliances with local and regional ICT experts and research institutes, mobile operators, IT integrators, application developers, equipment vendors, etc.	
Background IPR: N/A		

Foreground IPR		
Title of IPR	Partnerships/collaborations	
IPR Owner(s)	N/A	
Jointly developed	Part (or all) of 5G-LOGINNOV consortium	
Country of establishment of the owner(s)	N/A	
Subject Matter	Know how	
Control of Third Owners Software, Hardware or IPR	Identification of Commercial Software and Licensor:	N/A
	Identification of Open Source Software and Licensor:	N/A
	Identification of commercial hardware:	N/A
	Third Owner Intellectual Property Rights:	N/A
Protection Plan	Confidential information	
Description of foreground IPR	Establishment of potential collaborations with relevant stakeholders interested in 5G enabling technologies in port and logistics domain.	
Access Rights	N/A	
Available Support (email, website, info)	N/A	

PCT

PCT.1 - Collaborations and Lessons Learned from 5G-LOGINNOV Consortium

General description	Short description	Partnership establishment with key industry stakeholders for the implementation and sustainability of solutions and further collaboration in future research/technical initiatives in Greece and beyond
	Linked 5G-LOGINNOV WPs	WP4, WP5, WP6
	Application area	Further development and research
	Type of exploitable result	Knowledge of the market and potential (new) partnerships
	5G-LOGINNOV partners involved in the development	5G-LOGINNOV Partners
Expected Benefit of the result	• Potentially establish new collaborations (within and outside the 5G-LOGINNOV consortium) for further research, innovation actions, new products/services, expand market outreach/scope • Improve solutions/services based on input from partners	

Users of the KER	**Potential users of the KER** Research institutions, port operators, terminal operators, freight forwarders, mobile operators, IT vendors and integrators, application developers	
	Users needs • Open/expand market opportunities • Knowledge gain, lessons learned exchange • Further research and innovation actions • New products/services	
	Uptake strategy Active participation in dissemination and demonstration activities/events	
Routes for use/exploitation	Use for further research	
	Cooperation agreement/Joint Ventures	
	Developing/exploiting new services/products	
Risks and Barriers	**Potential risks and barriers for exploitation** None identified	
	Mitigation strategy for risk 1. N/A	
Background IPR: N/A		
Foreground IPR		
Title of IPR	Partnerships/collaborations	
IPR Owner(s)	N/A	
Jointly developed	5G-LOGINNOV consortium, dissemination events/activities	
Country of establishment of the owner(s)	N/A	
Subject Matter	Know how	
Control of Third Owners Software, Hardware or IPR	Identification of Commercial Software and Licensor:	N/A
	Identification of Open Source Software and Licensor:	N/A
	Identification of commercial hardware:	N/A
	Third Owner Intellectual Property Rights:	N/A
Protection Plan	Confidential information	
Description of foreground IPR	Establishment of potential collaborations with relevant stakeholders interested in 5G enabling technologies in port and logistics domain.	
Access Rights	N/A	
Available Support (email, website, info)	N/A	

PCT.2 - 5G-IoT Platform and Computer Vision Service Exploitation in Daily Port Operations

General description	Short description	Exploitation of the software suite developed (5G-IoT, computer vision/ML) in daily port operations.

	Linked 5G-LOGINNOV WPs	WP1, WP2, WP3
	Application area	Internal use of the 5G IoT system and services, research
	Type of exploitable result	Knowledge, methods, technologies, services
	5G-LOGINNOV partners involved in the development	PCT, ICCS
Expected Benefit of the result	• Knowledge gain on 5G, IoT and related technologies; • Expedite the loading/unloading process of cargo containers to/from vessels, and thus reduce the vessel stay at the port premises; • Remove personnel from risk area, by automating (no human intervention needed) the service of seal detection; • Reduce risk of serious bodily injuries; • Increase security in private areas; • Reallocate human resources from patrol swifts or container seal checks to other tasks/jobs.	
Users of the KER	**Potential users of the KER** Port operators, terminal operators, freight forwarders	
	Users needs • Knowledge gain/future trends on 5G, IoT and related technologies; • Increase port security; • Increase port safety; • Reduce the cost of operations; • Improve efficiency of port operations; • Automation of port operations/services.	
	Uptake strategy Exploitation of the 5G-IoT system and computer visions services in daily port operations. Understanding of 5G relevant technologies and future trends.	
Routes for use/exploitation	Use for further research	
	Developing products/services	
	Cooperation agreement/Joint Ventures	
Risks and Barriers	**Potential risks and barriers for exploitation** Risk 1. Dependency on hardware/software components Risk 2. Difficulties in updating/upgrading software and services	
	Mitigation strategy for risk 1. The IoT system is built on top of opensource (upgradable) software that can be deployed on commodity hardware (i.e., not hardware specific), reducing costs and potentially enabling the seamless transferability of deployed solutions. Coping with the underlying HW/SW (even in the unfavourable case of future updates in the port containers specs/materials) can be feasible with relative minimum coding effort. **Mitigation strategy for risk 2.** The software suite of the IoT platform is based on state-of-the-art/pioneering virtualization technologies, such as kubernetes and open source MANO, that follow standardization groups (e.g., ETSI), and can inherently (if needed) be replaced by other solutions that follow common standards.	

	Additionally, the exploitation of such cloud native technologies with inherent characteristics of service monitoring and life-cycle-management for day0 to day2 operations, will enable on the fly service upgrades including new (updated) computer vision models (or other features) that offer more efficient solutions in terms of performance and accuracy.	
Background IPR		
Title	Know how - 5G-IoT system and relevant technologies design and implementation	
Organisation	ICCS, PCT	
Subject Matter	Software	
	Know How	
Description	Expertise, methodology, technologies In more detail: Knowledge/expertise in the design, implementation, methodology, testing and operating 5G, IoT and related technologies (e.g., computer vision) for port and logistics domain.	
Conditions and limitations for implementation of the background IPR	N/A	
Conditions and limitations for exploitation of the background IPR	N/A	
Foreground IPR		
Title of IPR	5G IoT system and services in daily port operations	
IPR Owner(s)	PCT, ICCS	
Jointly developed	Yes: PCT, ICCS	
Country of establishment of the owner(s)	Greece	
Subject Matter	Software	
	Invention (e.g. device, process, method)	
	Scientific article	
	Know How	
Control of Third Owners Software, Hardware or IPR	Identification of Commercial Software and Licensor :	N/A
	Identification of Open Source Software and Licensor :	OpenAirInterface, OpenSource MANO, Openstack, Kubernetes, Microk8s, Helm, Docker
	Identification of commercial hardware :	N/A
	Third Owner Intellectual Property Rights :	N/A
Protection Plan	Confidential information	
Description of foreground IPR	Exploitation of the 5G IoT platform and computer vision services in daily port operations.	

Access Rights	PCT
Available Support (email, website, info)	N/A

SWARCO

SWARCO.1 - Traffic light forecast as a data service for external applications like GLOSA

General description	Short description	Traffic Light Forecast (TLF): Process current traffic light status and traffic data to calculate a forecast (prediction) of the future signalling states and make this prediction accessible to external applications
	Linked 5G-LOGINNOV WPs	WP3
	Application area	Industrial / traffic management
	Type of exploitable result	Technology
	5G-LOGINNOV partners involved in the development	SWARCO
Expected Benefit of the result	Reduce energy consumption, CO2, NOx, pollution in general Increase comfort	
Users of the KER	**Potential users of the KER** • Citizens • Road transport operators • Vehicle operators (logistic companies, public transport operators)	
	Users needs Clean air, reduction of energy costs, continuous traffic flow	
	Uptake strategy • Produce and provide data in standardised format. • Present benefits to both road operators and implementers in vehicles (e.g. logistic industry). • Act as entrepreneur to bridge gap between city traffic light operation and service usage in traveller services.	
Routes for use/exploitation	Developing and selling own products/services	
Risks and Barriers	**Potential risks and barriers for exploitation** Risk 1. Actors in value chain don't want to engage (e.g. avoid extra work load) Risk 2. Willingness to pay / to invest for each actor in the value chain Risk 3. Technical barriers (access to data, difficulty to produce specific forecast, coverage)	
	Mitigation strategy for risk 1. Presentation of benefits for each actor in value chain **Mitigation strategy for risk 2.** Layout of suitable business model **Mitigation strategy for risk 3.** Service design shall allow benefits even with limited coverage	
Background IPR		

Title	Computation of a traffic light forecast
Organisation	SWARCO
Subject Matter	Software
	Invention (e.g., device, process, method)
	Know How
Description	Business fields of the SWARCO companies are, among others, traffic light controllers (TLC), traffic management centres (TMC), software for planning and evaluation of the traffic logic controlling intersections as well as the generation of traffic logics. This expertise enables us to access the traffic logic process data either locally (TLC) or centralized (TMC) and to calculate a prediction locally e.g., inside the TLC or a C-ITS-roadside unit, or inside the TMC and disseminate the forecast as required for external usage.
Conditions and limitations for implementation of the background IPR	N/A
Conditions and limitations for exploitation of the background IPR	N/A
Foreground IPR: No IPR issue identified so far	

SWARCO.2 - Enable city traffic management to work with emission data originating from vehicles

General description	Short description	Receive emission data from probe vehicles and combine it with other sensor data to derive a traffic management strategy
	Linked 5G-LOGINNOV WPs	WP3
	Application area	Industrial / traffic management
	Type of exploitable result	technology / knowledge
	5G-LOGINNOV partners involved in the development	SWARCO, T-SYSTEMS
Expected Benefit of the result	Mitigate highly polluting traffic situations to improve air quality	
Users of the KER	**Potential users of the KER** Cities (traffic management authorities)	
	Users needs Reduction of traffic impact on air quality	
	Uptake strategy The KER is a key building block in traffic management for ensuring EU pollution thresholds	
Routes for use/exploitation	Developing and selling own products/services	
	Cooperation agreement	

Risks and Barriers	**Potential risks and barriers for exploitation** Risk 1. Motivation for vehicle operator / or driver to participate Risk 2. Limited alternatives for cities to impose effective measures
	Mitigation strategy for risk 1. 1) Motivate: participate in sustainable and eco friendly mobility 2) Stimulate: e.g., combine with other services (e.g. TLF / GLOSA see KER above) to achieve comfort and cost savings **Mitigation strategy for risk 2.** Enable cities with suitable traffic control programs and control actions which can be activated by strategies
Background IPR	
Title	Definition and implementation of traffic management strategies; existing traffic management software
Organisation	SWARCO
Subject Matter	Software
	Know How
Description	SWARCO has a long history in the field of traffic management software, especially traffic management centres (TMC). Part of their functionality is to identify potential problematic situations, like e.g., traffic jams or critical roadside environmental sensor data, and to suggest a predefined strategy to the road operator to handle these situations.
Conditions and limitations for implementation of the background IPR	N/A
Conditions and limitations for exploitation of the background IPR	N/A
Foreground IPR: N/A	

TEC4U

TEC4U.1 – Updated FTED model

General description	Short description	The TEC4U FTED model covers already many aspects of mobility data that can be used for analytics. However, the innovative approach of the 5G-LOGINNOV LL Hamburg and the capabilities of 5G enhance the TEC4U model developed more than 15 years ago.
	Linked 5G-LOGINNOV WPs	FTED (WP3: Use Case 8/9) planned for pilot service deployment in 2022
	Application area	Advanced Vehicle Telematics for LCV and HCV
	Type of exploitable result	Vehicle centric hardware and 5G enabled telematics

	5G-LOGINNOV partners involved in the development	TEC4U, T-Systems, SWARCO and Continental
Expected Benefit of the results	Enhanced data model for analytics to increase efficiency by monitoring fuel and carbon emissions based on in-depth analysis of fleet behaviour.	
Users of the KER	**Potential users of the KER** Light and heavy commercial vehicle fleets with the goal to increase efficiency in logistic operations.	
	Users' needs Each commercial fleet has its own and individual prerequisites when it comes to (inter alia) client structure, area of operations, service level, fleet composition. Those variables have a major impact on the cost structure of a fleet while some can be influenced and some not. Additionally, logistic operations go along with high time pressure for drivers that – in combination with traffic and road conditions – leads to aggressive and harsh driving manoeuvers. 5G enhanced FTED can help to identify variables that can be influenced to increase the efficiency of a fleet reducing fuel consumption and other emissions.	
	Uptake strategy Cooperation with T-Systems and Continental for feasible fleet implementation, inclusion of commercial fleet partners TAXI-AD and e-Shuttle, both winners of the Open Call in Hamburg. Additionally, approach transfer to tec4U activities with existing partners on innovation days and client presentation.	
Routes for use/exploitation (common with T-System for this KER)	• Close cooperation with existing client fleets and logistics service providers (including new actors, such as e-Shuttle and TAXI-AD) proving the potential savings in everyday life operation • Defining OPEX/CAPEX for commercial roll-out within these two costumer groups and segments • Joint Go-to-Market strategy with T-Systems and Continental based on the Cost-Benefit-Analysis from the pilot operation in 2022 • Marketing activities within tec4U 's existing client base	
Risks and Barriers	**Potential risks and barriers for exploitation** Any roll-out strategy includes the following risks: Risk 1. Traditional rFMS product portfolio out of the OEM market (Fleetboard, MAN-RIO, etc.) Risk 2. Threshold for cost savings on fleet-side too low Risk 3. 5G costs to high	
	Mitigation strategy for risk 1. Cooperation with existing mobility applications (e.g. RIO) to implement Entruck analytics on their platforms as micro services. Additionally, in-depth cooperation with T-Systems and Continental offering in-vehicle telematics with the traditional hardware suppliers. **Mitigation strategy for risk 2.** Address highly competitive application areas with low margins and prove benefits with reliable figures. Additionally, apply a TCO considerations by including fleet managers from purchasing departments of fleet and taxi operators, telecommunication costs, etc. **Mitigation strategy for risk 3.** Define long and short term roll-out strategies with low and high specification levels of hardware and services.	
Background IPR		
Title	ENTRUCK	

Organisation	tec4U-Ingenieurgesellschaft
Subject Matter	Open telematics and telemetry platform, own development
	Since 15 years in service with continuous development and improvement, 2 M Euro own investment
	Backend applications as cloud application
	Onboard applications for various 3rd party hardware
	https://www.entruck.de
Description	One of the main solutions of tec4U is Entruck, an open IoT telematics and telemetry platform that acts as data hub, V2X communication and analysis platform for logistics, traffic management and automotive R&D. On the one hand, Entruck connects vehicles with their environment (e.g. logistic back office, fleet owner, traffic management) for a two way communication, and on the other hand it collects available sensor data from the vehicles, analyses and enriches it with third party or unspecific big data to gather valuable information for all traffic, wear, profitability and emission related questions. By this, Entruck is able to describe cause and effect of vehicle operations in an innovative degree of detail although using standard sensors only.
Conditions and limitations for implementation of the background IPR	Entruck has been development and is provided and maintained completely by tec4U, so no limitations.
Conditions and limitations for exploitation of the background IPR	Entruck has been development and is provided and maintained completely by tec4U, so no limitations.
Foreground IPR: Non applicable (see T.SYS.1)	

TEC4U.2 - Data Exchange and joint development with T-Systems LCMM

General description	Short description	Entruck requires additional hardware as e.g. the Entruck onboard unit connected to the CAN Bus of the vehicle while LCMM works on mobile phones without any additional hardware requirements. The implementation of LCMM collected data in Entruck opens additional market potential in cost sensitive markets.
	Linked 5G-LOGINNOV WPs	GLOSA and LCMM (WP3. Use Case 10) planned for pilot service deployment in 2022
	Application area	Advanced Vehicle Telematics for LCV and HCV
	Type of exploitable result	Vehicle centric hardware and 5G enabled telematics service offering
	5G-LOGINNOV partners involved in the development	TEC4U, T-Systems
Expected Benefit of the result	Establish API with LCMM to open data collection capabilities without the requirement of additional hardware.	
Users of the KER	**Potential users of the KER** LCV fleets with low budgets and HCV fleets that need low cost monitoring solutions with low implementation barriers	

	Users' needs Each commercial fleet has its own and individual prerequisites when it comes to (inter alia) client structure, area of operations, service level, fleet composition. Those variables have a major impact on the cost structure of a fleet while some can be influenced and some not. Additionally, logistic operations go along with high time pressure for drivers that – in combination with traffic and road conditions – leads to aggressive and harsh driving manoeuvers. tec4U has established a two-step approach for monitoring of the fleet efficiency. First step is to analyse the individual use case with high level tec4U onboard units and secondly to monitor the fleet efficiency with a low level and low cost solution. This KER addresses the second step of the tec4U approach.
	Uptake strategy Cooperation (TEC4U and T-Systems) for feasible fleet implementation and services by implementing a LCMM interface.
Routes for use/exploitation	Cooperation agreement/Joint Ventures
	Developing and selling own products/services
	Enhance and broaden existing products/services
Risks and Barriers	**Potential risks and barriers for exploitation** Describe the potential risks and barriers for the exploitation of results, especially by the new actors, also keeping into account the rules and policies in the different countries: Risk 1. Technical barriers to high for the implementation Risk 2. Professional drivers of LCV / HCV not willing to install monitoring apps as LCMM on their devices.
	Mitigation strategy for risk 1. Direct contact between LCMM and Entruck developers and use of open and common standards for the data exchange. **Mitigation strategy for risk 2.** Open and transparent communication about the use of the system, the reliability of the analytics and the GDPR compliance of the data processing.
Background IPR: see TEC4U.1	
Foreground IPR: Implementation of an API will not touch Foreground IPR of each partner	

TEC4U.3 - Implementation of ISO-23795

General description	Short description	Entruck provides innovative and detailed analytics of mobility data in relation to fuel consumption, tread wear and other aspects of vehicle emissions and vehicle use. However, these analytics are mostly linked to hardware that has to be purchased by vehicle owners and installed in vehicles. The implementation of the upcoming ISO 23795 will enable Entruck to use also GPS information for analytics.
	Linked 5G-LOGINNOV WPs	GLOSA and LCMM (WP3, Use Case 10) planned for pilot service deployment in 2022
	Application area	Advanced Vehicle Telematics for LCV and HCV
	Type of exploitable result	Vehicle centric hardware and 5G enabled telematics service offering

	5G-LOGINNOV partners involved in the development	TEC4U, T-Systems
Expected Benefit of the result	Monitor fuel and carbon emissions based on ISO Standard with GPS data only and with the requirement to install additional hardware.	
Users of the KER	**Potential users of the KER** Existing client of Entruck and new potential clients of Entruck looking for a reliable basis for CO_2 calculation without high investments in hardware.	
	Users needs The method of calculating the fuel consumptions varies from use case to use case is not comparable. The current Entruck functionality allows to address this issue but only with a high investment into hardware. The ISO standard allows a harmonisation and acts as reference basis for the evaluation of the fuel consumption.	
	Uptake strategy Use the implementation of the ISO standard in Entruck as an easy entry into cost sensitive fleets. This implementation allows us to address those fleets with a low cost solution based on existing 5G mobile phones.	
Routes for use/exploitation	Use for further research	
	Developing and selling own products/services	
	Enhance existing products and services	
Risks and Barriers	**Potential risks and barriers for exploitation** Describe the potential risks and barriers for the exploitation of results, especially by the new actors, also keeping into account the rules and policies in the different countries: Risk 1. ISO Calculation of fuel consumption is not realistic for fleet Risk 2. ISO standard stays draft and will not published	
	Mitigation strategy for risk 1. Use existing and more accurate Entruck data and analytics to calibrate and prove the reliability of the ISO standard. **Mitigation strategy for risk 2.** Use an improved version of the ISO calculation method with existing confirmed calculation methods.	
Background IPR: No IPR issues identified so far		
Foreground IPR: No IPR issues identified so far		

TEC4U.4 - 5G Improved hardware and software for V2X communication

General description	Short description	The Entruck system has been developed over the last 15 years and is based on V2X communication by earlier cell phone technologies. The hardware covers currently only 2G, 3G and 4G standards. The development will improve hardware and software to be used in a 5G environment.
	Linked 5G-LOGINNOV WPs	WP2: Development and Improvement of tec4U contribution to the LL Hamburg trials.
	Application area	Enhanced 5G onboard units for V2X communication

	Type of exploitable result	Optimization and improvement of existing hard- and software infrastructure to cope with 5G functionalities as eMBB, URLLC and mMTC.
	5G-LOGINNOV partners involved in the development	All partners of Living Lab Hamburg
Expected Benefit of the result	Prepare Entruck for the next generations V2X communication within the 5G infrastructure.	
Users of the KER	**Potential users of the KER** Existing and new potential clients of Entruck, i.e. commercial tyre OEMs, fleet operators and tyre distributers. Additionally, other telematic systems that use analytics provided by Entruck.	
	Users' needs With the deactivation of the 3G technology in various European countries, we face more and more questions about the sustainability of our Entruck OBUs. While most of our hardware already covers 4G, the preparation and improvement of our OBUs for 5G is a big competitive advantage for us, as it provides sustainability for our clients.	
	Uptake strategy Cooperation with our hardware supplier for a more specific and dynamic implementation of 5G in all of our OBUs and a step-by-step rollout of the improved software applications all over Entruck.	
Routes for use/exploitation	Use for further research	
	Developing and selling own products/services	
	Cooperation agreement/Joint Ventures	
	Enhance existing products and services	
Risks and Barriers	**Potential risks and barriers for exploitation** Risk 1. 5G hardware is not available for existing tec4U products Risk 2. Parts of the Entruck system architecture is able to process high amounts of data and does not provide the required latency and connectivity	
	Mitigation strategy for risk 1. Replace current Entruck hardware by complete new 5G hardware and implement new devices into the Entruck connectivity scheme (e.g. 5G IoT box of partner Continental. **Mitigation strategy for risk 2.** Cooperate with partner T-Systems in providing new IT-Infrastructure that is able to cope with 5G. Replace old code by new developments.	
Background IPR: No IPR issues identified so far		
Foreground IPR: No IPR issues identified so far		

TSLO

TSLO.1 - Improvements of Public 5G mobile network

General description	Short description	Improved and tailored public 5G mobile network to address specific needs of the ports and logistic industry vertical.
	Linked 5G-LOGINNOV WPs	WP1, WP2, WP3
	Application area	Future development and research

	Type of exploitable result	Improvements in design, implementation, testing and operating of Public 5G mobile network for port and logistics vertical.
	5G-LOGINNOV partners involved in the development	Telekom Slovenije, Internet Institute
Expected Benefit of the results	Improvements will allow for : • improvements in the product portfolio; • custom solutions co-design; • new test/verification solutions design and implementation; • broadening spectrum of topics provided in customer consulting, training and educational services; • business development.	
Users of the KER	**Potential users of the KER** • Port operators • Mobile operators • IT vendors • Integrators	
	Users needs Consultations and training on specific cases, test and verification environment	
	Uptake strategy Improve the product/service, then disseminate at relevant industry and scientific events activities.	
Routes for use/exploitation	Use for further research	
	Developing and selling own products/services	
	Cooperation agreement/Joint Ventures	
Risks and Barriers	**Potential risks and barriers for exploitation** Risk 1. Considerable infrastructure investments in 5G equipment. Risk 2. Delays in purchasing 5g network equipment Risk 3. Strong dependence of customers on competitive connectivity technologies (wifi, fixed) Risk 4. Potential customers are not ready for new technology (5G)	
	Mitigation strategy for risk 1 and 2. Initial deployments can be completed using Private 5G mobile system or established 5G NSA public network can be used as well. **Mitigation strategy for risk 3.** Customer education and support. **Mitigation strategy for risk 4.** Cooperate with local partners to better understand the issues and design the solution to fit specific requirements.	
Background IPR		
Title	Know-how of 5G mobile network	
Organisation	Telekom Slovenije	
Subject Matter	Software	
	Hardware	
	Firmware	
	Know How	

Description	TS's background know-how related to planning, deployment and management of 5G mobile network.	
Conditions and limitations for implementation of the background IPR	N/A	
Conditions and limitations for exploitation of the background IPR	N/A	
Foreground IPR		
Title of IPR	Know-how of 5G mobile network	
IPR Owner(s)	Telekom Slovenije	
Jointly developed	No	
Country of establishment of the owner(s)	Slovenia	
Subject Matter	Software	
	Hardware	
	Firmware	
	Know How	
Control of Third Owners Software, Hardware or IPR (select and describe the relevant option)	Identification of Commercial Software and Licensor:	N/A
	Identification of Open Source Software and Licensor:	N/A
	Identification of commercial hardware:	N/A
	Third Owner Intellectual Property Rights:	N/A
Protection Plan	Copyright	
Description of foreground IPR	TSLO's foreground knowledge related to design, implementation, testing and operating 5G mobile systems in Ports and Industry 4.0 environments.	
Access Rights	Based on the mutual agreement.	
Available Support (email, website, info)	Yes. Prior commercial agreement needs to be established.	

TSLO.2 - New business models for campus 5G networks

General description	Short description	Living Labs will serve as reference business model and their roll-out and trials as laboratories to investigate and shape the future of the vertical with 5G network technologies.
	Linked 5G-LOGINNOV WPs	WP1, WP2, WP3, WP4
	Application area	Future development and research
		Developing and selling own products/services

	Type of exploitable result	Improving existing and implementing new business models for industrial verticals such as ports and logistics.
	5G-LOGINNOV partners involved in the development	5G-LOGINNOV Partners
Expected Benefit of the result	Improvements will allow for: • improvements in the product portfolio; • custom solutions co-design; • broadening spectrum of topics provided in customer consulting, training and educational services; • business development.	
Users of the KER	**Potential users of the KER** • Port operators • Mobile operators • IT vendors • Integrators	
	Users needs • New products and services • Expand market opportunities • Lessons learned exchange • Further research and innovation actions	
	Uptake strategy • Active participation in dissemination and demonstration activities/events • Promotion of services and products based on project results	
Routes for use/exploitation	Use for further research	
	Developing and selling own products/services	
	Cooperation agreement/Joint Ventures	
Risks and Barriers	**Potential risks and barriers for exploitation** Risk 1. Potential customers are not ready for new technology (5G) Risk 2. Market entrance barriers.	
	Mitigation strategy for risk 1. Cooperate with local partners to better understand the issues and design the solution to fit specific requirements. **Mitigation strategy for risk 2.** Make strategic alliances with other players in the market.	
Background IPR		
Title	Business models Know-how	
Organisation	Telekom Slovenije	
Subject Matter	Software	
	Hardware	
	Design of a product	
	Know How	
Description	TSLO's background knowledge and know-how related to the design and implementation of new business models and solutions in the field of mobile services for the needs of industrial verticals, such as ports and logistics.	

Conditions and limitations for implementation of the background IPR	N/A	
Conditions and limitations for exploitation of the background IPR	N/A	
Foreground IPR		
Title of IPR	Business models Know-how	
IPR Owner(s)	Telekom Slovenije	
Jointly developed	No.	
Country of establishment of the owner(s)	Slovenia	
Subject Matter	Software	
	Hardware	
	Design of a product	
	Know How	
Control of Third Owners Software, Hardware or IPR	Identification of Commercial Software and Licensor:	N/A
	Identification of Open Source Software and Licensor:	N/A
	Identification of commercial hardware:	N/A
	Third Owner Intellectual Property Rights:	N/A
Protection Plan	Copyright	
Description of foreground IPR	TSLO's foreground knowledge and know-how related to the design and implementation of new business models and solutions in the field of mobile services for the needs of industrial verticals, such as ports and logistics.	
Access Rights	Based on the mutual agreement.	
Available Support (email, website, info)	Yes. Prior commercial agreement needs to be established.	

TSLO.3 - Gaining further expertise in the field of 5G networks, logistics and transport industrial vertical

General description	Short description	Know-how in designing and implementation of the 5G network and IoT with edge (MEC) capabilities for campus networks, such as ports and logistics.
	Linked 5G-LOGINNOV WPs	WP1, WP2, WP3
	Application area	Future development and research
	Type of exploitable result	Knowledge related to the methodology, design, deployment, testing and validation of 5G network with edge capabilities.

	5G-LOGINNOV partners involved in the development	Telekom Slovenije (TSLO)
Expected Benefit of the result	Improvements will allow for : • improvements in the product portfolio; • custom solutions co-design; • broadening spectrum of topics provided in customer consulting, training and educational services; • business development.	
Users of the KER	**Potential users of the KER** TSLO and other partners, participating in R&D projects	
	Users needs • New products and services • Expand market opportunities • Lessons learned exchange • Further research and innovation actions	
	Uptake strategy TSLO participates in other Horizon projects (e.g. ICT-41-2020: 5G-IANA) where knowledge and know-how from 5G-LOGINNOV will be exploited for further actions.	
Routes for use/exploitation	Use for further research	
	Developing and selling own products/services	
	Cooperation agreement/Joint Ventures	
Risks and Barriers	**Potential risks and barriers for exploitation** Risk 1. Considerable infrastructure investments in 5G equipment. Risk 2. Potential customers are not ready for new technology (5G) Risk 3. Market entrance barriers. Risk 4. Specific regulation requirements in different regions.	
	Mitigation strategy for risk 1. Initial deployments can be completed using Private 5G mobile system or established 5G NSA public network can be used as well. **Mitigation strategy for risk 2.** Cooperate with local partners to better understand the issues and design the solution to fit specific requirements. **Mitigation strategy for risk 3.** Make strategic alliances with other players in the market. **Mitigation strategy for risk 4.** Cooperate with local partners to better understand the issues and, based on the technological knowledge, (re)design the solution to fit/avoid specific requirements.	
Background IPR		
Title	5G network and IoT Know-How	
Organisation	Telekom Slovenije	
Subject Matter	Software	
	Hardware	
	Design of a product	
	Know How	

Description	TSLO's background know-how related to planning, deployment and management of 5G mobile system.	
Conditions and limitations for implementation of the background IPR	N/A	
Conditions and limitations for exploitation of the background IPR	N/A	
Foreground IPR		
Title of IPR	5G network, MEC and IoT Know-How	
IPR Owner(s)	Telekom Slovenije	
Jointly developed	No	
Country of establishment of the owner(s)	Slovenia	
Subject Matter	Software	
	Hardware	
	Design of a product	
	Know How	
Control of Third Owners Software, Hardware or IPR	Identification of Commercial Software and Licensor:	N/A, not relevant
	Identification of Open Source Software and Licensor:	N/A, not relevant
	Identification of commercial hardware:	N/A, not relevant
	Third Owner Intellectual Property Rights:	N/A, not relevant
Protection Plan	Copyright Confidential information	
Description of foreground IPR	Further expand TSLO's expertise on ecosystem technologies relevant to 5G networks, edge capabilities (MEC) and IoT for future innovation actions.	
Access Rights	TSLO	
Available Support (email, website, info)	N/A	

T-SYS

T-SYS.1 - FTED deployed in Use Case 8/9

General description	Short description	IoT gateway and vehicle telematics service tool for fleet operators to save and monitor fuel and carbon emissions
	Linked 5G-LOGINNOV WPs	FTED (WP3.4 : Use Case 8/9) planned for pilot service deployment in 2022
	Application area	Future development and research

	Type of exploitable result	Vehicle centric hardware and 5G enabled telematics service offering
	5G-LOGINNOV partners involved in the development	T-SYS, tec4u and Continental
Expected Benefit of the result	Save and monitor fuel and carbon emissions based on in-depth analysis of fleet behaviour and potential savings of fuel costs, basis for eco-drive training based on smartphone apps	
Users of the KER	**Potential users of the KER** Commercial vehicle fleets (taxi, shuttle as well as urban CEP delivery, e.g. Amazon), data for green navigation	
	Users needs Driving behaviour of professional drivers often goes with time pressure leading to aggressive and harsh driving manoeuvers. Traffic and road conditions often foster harsh driving manoeuvers due to time losses caused by external delays and nervous reactions. Pre-, On- and Post-trip analysis of tours, comparing indicators of driving behaviour allows strategic measure to save fuel up to 10% as found in different projects. Additionally, it becomes possible to re-design the existing vehicle park towards lower emissions models, tyres, etc.	
	Uptake strategy Cooperation with tec4u and Continental for feasible fleet implementation, inclusion of commercial fleet partners TAXI-AD and e-Shuttle, both winners of the Open Call in Hamburg	
Routes for use/exploitation	• Close cooperation with two fleet and logistics service providers (e-Shuttle and TAXI-AD) proving the potential savings in everyday life operation • Defining OPEX/CAPEX for commercial roll-out within these two costumer groups and segments • Joint go-to-market strategy with tec4u and Continental based on the Cost-Benefit-Analysis out of the pilot operation in 2022 • Joint marketing activities including 5G marketing by telecom industry targeting verticals	
Risks and Barriers	**Potential risks and barriers for exploitation** Any roll-out strategy includes the following risks: Risk 1. Traditional rFMS product portfolio out of the OEM market (Fleetboard, MAN-RIO, etc.) Risk 2. Threshold for cost savings on fleet-side too low	
	Mitigation strategy for risk 1. In-depth cooperation with tec4u and Continental offering in-vehicle telematics with the traditional hardware suppliers **Mitigation strategy for risk 2.** Define operation of FTED in the right cost-benefit mix, including fleet managers from purchasing departments of fleet and taxi operators, telecommunication costs, etc.	
Background IPR		
Title	Low Carbon Mobility Management (LCMM)	
Organisation	T-Systems International GmbH	
Subject Matter	Software based on ISO-23795	
	Procedure for Carbon Footprint Monitoring using Nomadic Devices	

	Ayyildiz K., Cavallaro F., Nocera S., Willenbrock R. (2017). Reducing fuel consumption and carbon emissions through. Transportation Research Part F, 46, 96-110. https://www.sciencedirect.com/science/article/abs/pii/S1369847816302212?via%3Dihub
	5G smartphone APP
	10 years, 5 M€ project invest
	Website
Description	ISO-23795 Intelligent transport systems — Extracting trip data via nomadic device for estimating CO_2 emissions — Part 1: Fuel consumption determination for fleet management
Conditions and limitations for implementation of the background IPR	Nomadic or in-vehicle telematics device, speed per second information and knowledge of vehicle configuration
Conditions and limitations for exploitation of the background IPR	Use cases 8 and 9 are based on a number of research projects which took place between 1990 and 2000. At that time the usage of satellite data and mobile communication was linked to collect data directly from floating cars equipped with mobile devices and GPS.
Foreground IPR: Smart phones and satellite receivers in smart phones became an important input for traffic information. A lot of background IPR with regards to offloading car data were fixed before the year 2000. As patent claims available only four maximum duration of 18 years background IP hours are nowadays no longer in place and floating car data can be used in the market. The usage of well-established floating car data technology that's also not allowed to claim for foreground patents, therefore they cannot be applied in this context.	

T-SYS.2 - GLOSA and LCMM out of Use Case 10

General description	Short description	IoT gateway and vehicle telematics service tool for fleet operators to save and monitor fuel and carbon emissions
	Linked 5G-LOGINNOV WPs	GLOSA and LCMM (WP3.: Use Case 10) planned for pilot service deployment in 2022
	Application area	Future development and research
	Type of exploitable result	Vehicle centric hardware and 5G enabled telematics service offering
	5G-LOGINNOV partners involved in the development	T-SYS, tec4u and Continental
Expected Benefit of the result	Save and monitor fuel and carbon emissions based on in-depth analysis of fleet behaviour and potential savings of fuel costs, basis for eco-drive training based on smartphone apps	
Users of the KER	**Potential users of the KER** Commercial vehicle fleets (taxi, shuttle as well as urban CEP delivery, e.g. Amazon), data for green navigation	
	Users needs	

	Driving behaviour of professional drivers often goes with time pressure leading to aggressive and harsh driving manoeuvers. Traffic and road conditions often foster harsh driving manoeuvers due to time losses caused by external delays and nervous reactions. Pre-, On- and Post-trip analysis of tours, comparing indicators of driving behaviour allows strategic measure to save fuel up to 10% as found in different projects. Additionally, it becomes possible to re-design the existing vehicle park towards lower emissions models, tyres, etc.
	Uptake strategy Cooperation with tec4u and Continental for feasible fleet implementation, inclusion of commercial fleet partners TAXI-AD and e-Shuttle, both winners of the Open Call in Hamburg
Routes for use/exploitation	Use for further research
	Licensing IP rights (out-licensing)
	Standardisation activities (new standards/on-going procedures)
Risks and Barriers	**Potential risks and barriers for exploitation** The combination of these two innovative services is unique, especially when it comes to Cobham footprint and the potential reduction of carbon footprint, with no comparison in the existing market. Nevertheless, there are risks and barriers which result from the need for scalable solution design. Risk 1. Scalability is well known in the market of mobile devices and app platforms, but it is difficult to imagine how operators of traffic management technology can be included into this market. As traffic management is under control of traffic police and traffic authorities, all solutions depending on public sector, support is needed in terms of public engagement and specific regulatory frameworks
	Mitigation strategy for risk 1. In order to overcome these barriers, the advantage of using mass market technology in close combination with pragmatic use cases turned out to be the best way to market.
Background IPR : No IPR issues identified so far	
Foreground IPR : No IPR issues identified so far	

T-SYS.3 - 5G-IOT Gateway for Saving Fuel and Emissions Applying ISO-23795 LCMM

General description	Short description	The Continental IOT Gateway uses 5G for communicating commercial vehicle telematics on Big Data level
	Linked 5G-LOGINNOV WPs	WP1 / WP2 / WP3 5G-IOT Gateway for Saving Fuel and Emissions Applying ISO-23795 LCMM
	Application area	Develop joint 5G Cloud based IOT Gateway product for Logistics Corridor Management and CO_2 reduction for Smart Cities and C-ITS including impact assessment
	Type of exploitable result	Vehicle centric hardware and 5G enabled telematics service offering
	5G-LOGINNOV partners involved in the development	T-SYS, tec4u and Continental
Expected Benefit of the results	Save and monitor fuel and carbon emissions based on in-depth analysis of fleet behaviour and potential savings of fuel costs, basis for strategic reduction recommendations by analysing Light Commercial Vehicle (LCV) data	

Users of the KER	**Potential users of the KER** LCV OEMs, Continental as contact point and trusted electronic supplier of OEM, T-Systems as long-year telematics partner of Daimler, VW-Truck and MAN
	Users needs LCV OEMS have the problem that fleet customers are complaining finding in the same truck and for the same routes different fuel consumption figures for different telematics device. AEOLIX ISO-23795 standard allows harmonising the calculation methodology using standardized GPS and CAN-Bus data input.
	Uptake strategy Cooperation with tec4u and Continental for feasible fleet implementation, support measures by sales and pre-sales teams and their good B2B relationship with German truck and LCV OEMs
Routes for use/exploitation	Use for further research
	Licensing IP rights (out-licensing)
	Standardisation activities (new standards/on-going procedures)
Risks and Barriers	**Potential risks and barriers for exploitation** Risk 1. The IoT Gateway and the T-Systems solution can only be successfully deployed after standardisation is finished and can be rolled out on a European, better international scale
	Mitigation strategy for risk 1. Nevertheless, standardization is a long-term task and needs management support of both large-scale enterprises, linking the use case to vehicle telematics and 5G/ 6G deployment campaigns.
Background IPR : No IPR issues identified so far	
Foreground IPR : No IPR issues identified so far	

T-SYS.4 - 5G enabled City-Logistics and eXtended BRT for C-I.T.S. Emission Trading (CDM)

General description	Short description	CDM project development based on UNFCCC project implementation regulation for transportation projects in the area of extended BRT und taxi-fleets
	Linked 5G-LOGINNOV WPs	WP4 / WP5 5G enabled City-Logistics and eXtended BRT for C-I.T.S. Emission Trading (CDM)
	Application area	Future development and research
	Type of exploitable result	The development and exploitation of projects under the umbrella of UN climate protection board needs reliable and authorized fleet data to apply the carbon trading mechanism. So far, only BRT projects were accepted. Nevertheless, vehicle centric IOT-Gateways allow to transfer BRT CDM projects to logistics corridor management, i.e. whenever traffic light optimization is applied. Given the good contacts to Hamburg traffic authorities, the mechanisms and the communication channel to UNFCCC officers through the German Emissions Trading Agency will be established.
	5G-LOGINNOV partners involved in the development	All partners of Living Lab Hamburg

Expected Benefit of the result	Roadmap towards UNFCCC project implementation under COP26 agreements
Users of the KER	**Potential users of the KER** Hamburg and an international partner city, e.g. SolutionsPlus partner cities
	Users needs UNFCCC can only accept project proposals under COP26 agreement when CO_2 savings can be quantified and deployed in certified way of authorized data source input. Therefore, public transport, logistics and taxi fleets need a certified IOT Gateway and 5G technology for measuring mileage, improve positioning and savings due to a) electrification, b) traffic corridor management by using GLOSA, improved traffic light forecast and network slicing. From reference projects in Munich potential savings of maximum 50% were found, giving cellular 5G-V2X access to carbon trading and CDM
	Uptake strategy Cooperation with SolutionsPlus partners and Hamburg authorities, implementation of 5G GLOSA and precise positioning, presentation to a world-wide audience (I.T.S. conferences Toulouse and Los Angeles)
Routes for use/exploitation	Developing and selling own products/services
	Cooperation agreement
Risks and Barriers	**Potential risks and barriers for exploitation** Risk 1. Emission training needs an approval by national climate agencies or United Nation climate project board. Developing emerging trading relevant projects includes time and effort and knowledge linked to the expertise of climate policy
	Mitigation strategy for risk 1. As emission trading projects are rather complex, experts from climate agencies and project officers dealing with such type of projects will be contacted as early as possible during the project duration to find out how realistic this type of project deployment is
Background IPR : No IPR issues identified so far	
Foreground IPR : No IPR issues identified so far	

VICOM

VICOM.1 - Knowledge gain in AI/ML applied to logistics

General description	Short description	Know-how in computer vision analytics/ML applications tailored (but not limited) to ports and logistics
	Linked 5G-LOGINNOV WPs	WP1, WP2, WP3
	Application area	Future development and research
	Type of exploitable result	Knowledge related to design, implementation, methodology and testing AI/ML based algorithms for ports and logistics domain
	5G-LOGINNOV partners involved in the development	Vicomtech

Expected Benefit of the result	Knowledge gained will allow Vicomtech for future improvements in the technologies provided to the industry, improving the SDK for future developments.	
Users of the KER	**Potential users of the KER** Port operators, IT vendors and integrators, app developers	
	Users needs Training on specific domain and adjusting the setup (HW and sensors) to the specific environment	
	Uptake strategy Include the knowledge gained into own SDK and disseminate at relevant scientific events and journals.	
Routes for use/exploitation	Use for further research	
	Developing own SDKs	
	Licensing IP rights (out-licensing)	
Risks and Barriers	**Potential risks and barriers for exploitation** Risk 1. Potential customers may not be yet ready or willing to adopt new technologies. Risk 2. Specific regulation requirements in different regions.	
	Mitigation strategy for risk 1. Some initial adaptation to implement to evolve in the digitalisation process. **Mitigation strategy for risk 2.** Cooperate with local partners to better understand the issues and, based on the technological knowledge, (re)design the solution to fit/avoid specific requirements.	
Background IPR		
Title	Viulib®	
Organisation	Owner of background IPR - Vicomtech	
Subject Matter	Software	
	Know How	
Description	Viulib® is a software library, a solution that collects, processes and analyzes real-time video images.	
Conditions and limitations for implementation of the background IPR	N/A	
Conditions and limitations for exploitation of the background IPR	N/A	
Foreground IPR		
Title of IPR	Knowledge gain in AI/ML applied to logistics	
IPR Owner(s)	Vicomtech	
Jointly developed	No	
Country of establishment of the owner(s)	Spain	
Subject Matter	Software	
	New knowledge	
	Identification of Commercial Software and Licensor:	N/A

Control of Third Owners Software, Hardware or IPR	Identification of Open Source Software and Licensor:	N/A
	Identification of commercial hardware:	N/A
	Third Owner Intellectual Property Rights:	N/A
Protection Plan	Other, specify: Include in the existing SKD (Viulib)	
Description of foreground IPR	Vicomtech's knowledge related to design, implementation, methodology, testing and operating AI/ML based systems for logistics and security applications in ports.	
Access Rights	N/A	
Available Support (email, website, info)	N/A	

VODAFONE INNOVUS

VFI - 1. Knowledge gain in ML capabilities on 5G enabled edge devices

General description	Short description	Design and implementation of the 5G-IoT platform including software and hardware components
	Linked 5G-LOGINNOV WPs	WP1, WP2, WP3
	Application area	Commercial
	Type of exploitable result	Expertise, methodology, technologies, software In more detail : Enhance the existing VFI Fleet Management Platform with information from processed video feed. It augments the existing sensors provided by the current devices with information from processed video.
	5G-LOGINNOV partners involved in the development	VFI
Expected Benefit of the result	Expertise gained will allow for : • Future improvements in the product portfolio, business development and planning • Include new type of sensor data for fleet management operators	
Users of the KER	**Potential users of the KER** Transfer knowledge to the engineering team working on the platform	
	Users needs Knowledge improvement, collection and integration of information from different sources	
	Uptake strategy Include the knowledge gained into own development life cycle and product in general	
Routes for use/exploitation	Developing products and services	
	Cooperation agreement/Joint Ventures	

Risks and Barriers	**Potential risks and barriers for exploitation** Risk 1. Considerable infrastructure investments for 5G and IoT system. Risk 2. Considerable infrastructure investments for 5G. Risk 3. Learning curve and current expertise level
	Mitigation strategy for risk 1. The design and architecture of the IoT platform is based on opensource software, and can be applied on commodity hardware, hence significantly reducing costs. Additionally, small scale solutions (with limited needs) can be tested/validated in 4G networks as proof of concept scenarios. **Mitigation strategy for risk 2.** A proof of concept scenario can be demonstrated on a small scale for showcasing the benefits of the 5G IoT platform and related technologies at the ICCS 4G/5G testbed. **Mitigation strategy for risk 3.** Train engineers and support continuous learning to enhance their skills and include ML technologies.
Background IPR	
Title	Vodafone Innovus IoT Platform (Includes fleet management platform)
Organisation	Vodafone Innovus
Subject Matter	Software
	Hardware
	Website
	Design of a product
Description	Vodafone Innovus has developed in house a Fleet Management Platform for the last 14 years. The latest version (Vodafone Innovus IoT Platform) is capable to incorporate multiple IoT sensors. This KER will enhance this platform with new sensor types from complex devices (like processed video).
Conditions and limitations for implementation of the background IPR	N/A
Conditions and limitations for exploitation of the background IPR	N/A
Foreground IPR	
Title of IPR	Acquired knowledge in ML technologies on edge devices
IPR Owner(s)	VFI
Jointly developed	No
Country of establishment of the owner(s)	GREECE
Subject Matter	Software
	New knowledge
	Identification of Commercial Software and Licensor: N/A

Control of Third Owners Software, Hardware or IPR	Identification of Open Source Software and Licensor	N/A
	Identification of commercial hardware	N/A
	Third Owner Intellectual Property Rights:	N/A
Protection Plan	N/A	
Description of foreground IPR	Vodafone Innovus existing IoT Platform, online with 15K of live connected vehicles.	
Access Rights	VFI	
Available Support (email, website, info)	N/A	