3rd PLANET
Annual Report

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3rd PLANET Annual Report

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Progress towards Federated Logistics through the Integration of TEN-T into A Global Trade Network (PLANET)

Contents

Report Scope

The PLANET project aims to addresses the challenges of assessing the impact of emerging global trade corridors on the TEN-T network and ensuring effective integration of the European to the Global Network by focusing in two key R&D pillars:

- A Geo-economics approach, modelling and specifying the dynamics of new trade routes and their impacts on logistics infrastructure & operations, with specific reference to TEN-T;
- An EU-Global network enablement through disruptive concepts and technologies (IoT, Blockchain and PI, 5G, 3D printing, autonomous vehicles /automation, hyperloop) which can shape its future and address its shortcomings, aligned to the DTLF concept of a federated network of T&L platforms.

The 3rd PLANET Annual Report presents project's key achievements accomplished by its consortium members over the course of the third year of the project (M25-M36). In more detail, the report introduces and highlights the deliverables and other scientific outcomes and achievements of the PLANET project, the interactions among the PLANET's project various tasks and Work Packages (WPs) as well as the most significant milestones and communication and dissemination achievements ensuring the dissemination of project's results and the engagement of project's stakeholders. Furthermore, it should be noted that more than 30 deliverables have been submitted from the different project WPs containing information on the project's under development services and technical outputs, project's Living Labs (LLs), EGTN concept specifications etc., most of them available at the project's website.

In the first part of the report an overview of the PLANET project vision and objectives and LLs demonstrators is provided as a reminder, explaining the business challenges facing or aiming to address as well as the overall project methodology being developed and implemented.

About the PLANET project

The Trans-European Transport Network (TEN-T) consists of hundreds of projects aimed at ensuring cohesion, interconnection and interoperability of all modes of transport across the EU. With TEN-T projects located in every EU member state, numerous challenges are associated with assessing the impact of emerging global trade corridors on the TEN-Ts.

PLANET's vision is to advance in the European Commission's strategy for Smart, Green and Integrated Transport and Logistics (T&L) by efficiently interconnecting infrastructure (TEN-T, Rail-Freight Corridors) with geopolitical developments and by optimising the use of current & emerging transport modes and technological solutions, while ensuring equitable inclusivity of all participants, increasing the prosperity of nations, preserving the environment, and enhancing Citizens' quality of life.
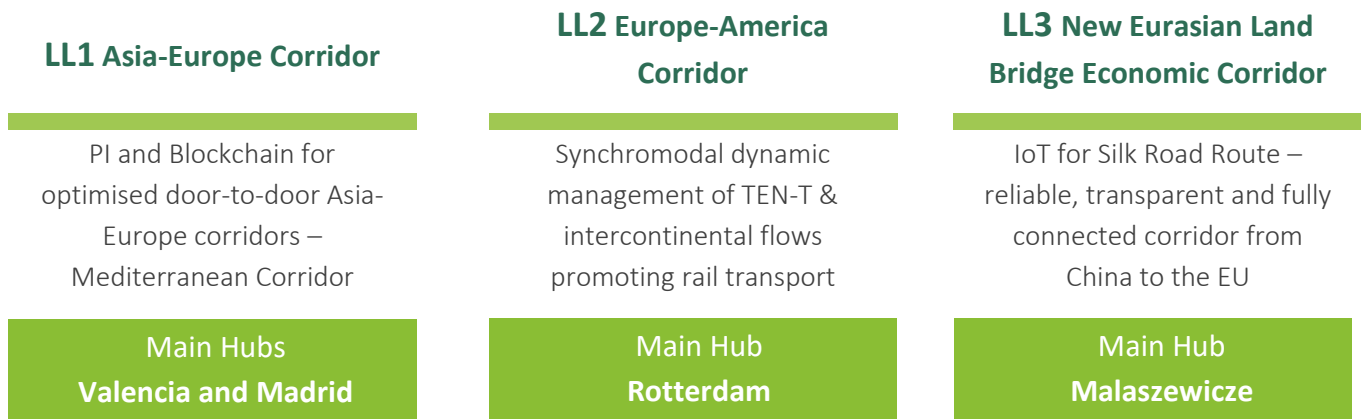

The realization of this vision is what PLANET calls the Integrated Green EU-Global T&L Network (**EGTN**), which are international logistics systems that: **(1)** make use of physical and digital infrastructures; **(2)** aim at **operational excellence** for customers and external stakeholders; **(3)** incorporate **geo-economic context**; **(4)** are enabled by (disruptive) transport & logistics (T&) concepts and technologies.

In order to achieve PLANET'S vision and the inherent objectives, PLANET aims to understand and analyse the global, geopolitical, commercial and economic imperatives as a way to assess the impact of these emerging global trade corridors on the TEN-T network and to ensure the integration of the European network into the global T&L network. For this purpose, PLANET researchers are investigating the new corridors, analysing the key drivers of these emerging corridors as well as their impact on the TEN-T network.

PLANET's Living Labs provide the close-to-reality innovation environment for the project. The three LLs (**LL1:** PI and Blockchain for optimised door-to-door Asia-Europe corridors – Mediterranean Corridor; **LL2:** Synchromodal dynamic management of TEN-T & intercontinental flows promoting rail

transport and **LL3: IoT for Silk Road Route – reliable, transparent and fully connected corridor from China to the EU)** address the corridor infrastructure issues and the investigation of integration of the respective global corridor with the TEN-T by demonstrating the emerging concepts of the **Physical Internet (PI)** and **technologies** such as the **Internet of Things (IoT)** and **Blockchain** in three EU–global real-world corridors (China–EU–US).

LL1 Asia-Europe Corridor	LL2 Europe-America Corridor	LL3 New Eurasian Land Bridge Economic Corridor
PI and Blockchain for optimised door-to-door Asia-Europe corridors – Mediterranean Corridor	Synchromodal dynamic management of TEN-T & intercontinental flows promoting rail transport	IoT for Silk Road Route – reliable, transparent and fully connected corridor from China to the EU
Main Hubs **Valencia and Madrid**	Main Hub **Rotterdam**	Main Hub **Malaszewicze**

- **LL1 PI and Blockchain for optimised door-to-door Asia-Europe corridors - Mediterranean Corridor.**

  LL1 evaluates how new technologies (IoT, AI and blockchain) and concepts (PI) can improve processes, operations and efficiency along the door-to-door transport chains linking the Maritime Silk Road with EU internal corridors, in two main Use Cases (UCs). UC1 focuses on import/export door-to-door transport chain of containerized cargo between China and Spain and evaluate how the combination of IoT (for real-time monitoring of logistics assets), AI (for better forecasts and intelligent decisions based on machine learning algorithms) and blockchain (for paperless transactions and the register of transport events), can contribute to a better management of the transport chain. The development of the PI paradigm will also be investigated. Finally, the UC2 focuses on warehouse operations and explores how new IoT, AI, AR and automation technologies can contribute to the development of intelligent automated logistics nodes of the EGTN PI network.

- **LL2 Synchromodal dynamic management of TEN-T & intercontinental flows promoting rail transport.**

  LL2 focuses on dynamic and synchromodal management (achieving synergies between) of TEN-T & intercontinental rail freight flows, utilising the Port of Rotterdam (PoR) as the principal smart EGTN node centering rail focused transport chains. This will focus on intercontinental rail freight between China and the EU, but also on linking China and Russia through Rotterdam to/from USA and the UK (shortsea and ocean freight). Specifically, this LL addresses improvements and growth in the transportation of rail freight between China-USA and the UK with the PoR as transshipment and modality shift point. Other close central transhipment nodes (e.g., Germany/Poland) located on a TEN-T or Rail Freight Corridors (RFCs) - in particular on the RFC8 – North Sea-Baltic corridor- will be also taken into account.

  The operations of this LL are structured around three UCs. The UC1 focuses on synchromodality in a Blockchain-enabled Platform involving the PoR community and customers to create the best multi-modal alternatives for logistics solutions within the LL2 corridors. The UC2 investigates improvements in rail

freight handling between China and Europe and potentially USA, focusing on investigate Eurasian rail freight expansion through community platforms in order to deal with the numerous stakeholders of international rail freight and foster international rail transport from EU to China on the selected emergent routes, and implements (in a test environment) the use of Blockchain on rail freight transport between China and Europe. Finally, the UC3 analyses LL2 corridor flows and assesses the implications for PoR and other TEN-T infrastructure. To this end, a dynamic simulation will be carried out for the 2030 and 2050 time horizons of the impact of the Belt and Road Initiative (BRI) on the R-ALP Corridor.

- **LL3** *IoT for Silk Road Route – reliable, transparent, and fully connected corridor from China to the EU.*

  LL3 focuses on streamlining logistic processes in flows from China to Europe along the Silk Road by implementing IoT technologies (based on the EPCIS platform) and GS1 standards that facilitate transmission of data between the partners involved in the e-commerce operations. The UC1 focuses on providing access to real time information on cargo coming from China to Poland along the entire supply chain of the Rohlig Suus through application of IoT and EPCIS to monitor process events and support operational optimisation. The UC2 addresses the standardization of information flows and digitalization of interactions between actors within the Polish Post network and the monitoring shipments on the New Silk Road, including rail transport, in terms of ecommerce parcel distribution from China to EU.

Finally, another ambition of PLANET project is also to deliver an **Active Blueprint and Road Map**, providing guidance and building public & private actor capacity towards the realisation of EGTNs, and facilitating the development of disadvantaged regions. The project engages major T&L stakeholders, contributing to both strategy and technology and (importantly) has the industry weight and influence to create industry momentum in Federated Logistics and TEN-T's integration into the Global Network.

Deliverables and Milestones

Deliverables

In the third year of the project, several deliverables have been realised, most of them focusing on the gathering of the results and reports obtained in the LLs as well as in EGTN platform and services. An overview of those deliverables is presented in the following table.

No.	Deliverable Name	Lead Beneficiary	Dissemination Level	Due Date	Deliverable Description
D1.3	Modelling & Simulation Capability final version	ITA	Public	M26	It presents the currently available models for representing freight transport processes in the intercontinental corridors, their enhancements performed during the project in relation to their key characteristics and functionalities, in order to fulfil modelling and decision-making support needs to the Living Labs' use cases. It also contains the description of the adaptation of the simulation models by the different partners, as well as the requirements gathered from the living labs' use cases.
D1.5	Simulation based impact of new trade routes on the TEN-T and disadvantaged regions final version	PAN	Public	M33	It discusses in more detail the potential impact of the BRI on TEN-T using several model simulations. This deliverable builds on work done in D1.4 by discussing the results of future simulations for 2030 and 2050 and two scenario simulations, namely the impact on disadvantaged regions and that of improved rail freight corridors. Based on these scenarios, the potential impact of TEN-T has been identified. Some ideas of leveraging the role of intermodal nodes, in particular the inland ones covering comprehensive logistic activities supporting local developments, are elaborated as well.
D1.7	Legislation and EU policy to impact EGTN final version	UIRR	Public	M33	It is the updated version of D1.6. The main subject of this deliverable is to evaluate the potential impacts of various legislative and policy initiatives on the EGTN layers, attributes and development and to assess the key implementation barriers. In addition, scenarios for 2030 and 2050 per transport mode were developed in order to evaluate the impacts of prioritized legal and policy initiatives on the simulation input parameters.
D1.9	Simulation-based analysis of T&L and ICT innovation technologies final version	EUR	Public	M33	It tests the PLANET integrated modelling capability developed in D1.8 through its application in various contextual scenarios based on the viewpoints of various modelling partners and foundational position papers. In sum, this deliverable demonstrates the concept of 'whole is greater than the sum of its parts' by highlighting the enhanced effect of integrating the features and potential of individual models developed across the PLANET project to model a range of operational contexts, emerging technologies, and future scenario logics.

D1.11	EGTN Reference Specification final version	CERTH	Public	M36	Ongoing. Revised version of D1.10.
D2.2	Open EGTN Platform Architecture final version	INLE	Public	M31	It explains the reasoning behind the development of the features provided, by mapping the requirements presented in the previous version with the final functionalities offered by the EGTN Platform. It materialises the platform specification defined in WP1 to an integrated architecture and a cloud-based instantiation of it on the cloud. A description of the components of the platform is presented together with detailed deployment strategies aiming to ensure that the platform can be easily adopted by any interested T&L party. The governance model of the platform defines processes for data ingestion and processing, integration and management of PI services and onboarding of users.
D2.4	EGTN IoT infrastructure final version	NGS	Confidential	M28	It ends a set of two started with PLANET deliverable D2.3. Starting from its requirements and findings, PLANET deliverable D2.4 aims at describing the final results for realising the EGTN IoT Infrastructure, thus providing an in-depth real-time visibility of the supply chain and integrating such an information within the EGTN platform environment toward a more efficient and greener logistics.
D2.6	EGTN Connectivity infrastructure final version	SIR	Confidential	M28	It purposes is to show how the integration of several heterogeneous datasets into the Connectivity Infrastructure's Knowledge Graph produces a new connected dataset and how this newly connected dataset can be queried to provide useful insights. The contents are focused on combining historical data with real-time streaming that is crucial for training and running prediction and analytics algorithms. The data can also be made available to end users through the HMI dashboards to support human decision making and analysis. The deliverable focuses on the services of the EGTN Cloud Infrastructure, their role and functionality within the overall framework and the details of their implementation as well as communication within the infrastructure itself.
D2.10	Cloud deployment of EGTN logistics services	IBM	Confidential	M30	It provides an updated description on the methodologies, implementations and deployments of services, based on AI and optimisation, first discussed in deliverable D2.9
D2.12	Multi-Actor Multi-Criteria Analysis DSS final version	VLTN	Public	M30	This report addresses the challenges associated to multi-stakeholder decision making in the context of Transport and Logistics (T&L). A Multi-actor multi-criteria analysis is undertaken considering the unique supply chain contexts of intercontinental corridors, warehouse and hinterland transport and last mile delivery. Operators with activity in all three supply chain sectors are found to have unique operational

					criteria and priorities, that indicate the need for separate instantiations of MACMA in each context.
D2.14	Intelligent PI Nodes and PI Network services final version	VLTN	Public	M30	It is the updated version of deliverable 2.13 and proposes methods and algorithms, that adapt legacy T&L practices to the operational principles of the Physical Internet. These methods have been identified based on the challenges identified in the Living Labs but have been developed in a Living Lab agnostic way into services, as part of a more generalized framework of T&L solutions. The deliverable focuses both on the algorithms and their performance, as well as the EGTN platform that embodies the algorithms, their interactions with other EGTN services and where applicable with the interaction with the user.
D2.16	Integration and Interoperability of proprietary Blockchain Systems for Seamless Global Trade Workflows final version	KNT	Public	M30	It is the second and final report on the integration and interoperability of proprietary Blockchain systems as part of the PLANET project. The report aspires to inform any stakeholder or consortium of stakeholders involved or interested in the design of innovative, cross-organisational EU-Global T&L networks, but also any stakeholders interested in the deployment of Blockchain interoperability solutions in T&L or any other field in which the use of smart contracts can be applied.
D2.18	EGTN smart contracts and associated PI motivated workflows in the context of SLA management final version	KNT	Public	M30	It is the final version of deliverable 2.17 and focuses on the design and structure of the Blockchain-enabled smart contracts which are called to facilitate, verify, or enforce the negotiation or performance of a contract or an aspect of the SLA. The report aims to inform any stakeholder or consortium of stakeholders involved or interested in the design of innovative, cross-organisational EU-Global T&L networks, but also any stakeholders interested in the deployment of Blockchain interoperability solutions in T&L or any other field where the use of smart contracts can be applied by replacing existing paper-based contracts.
D2.20	Unified HMIs implementation and technical documentation final version	EBOS	Confidential	M30	It is the final version of deliverable 2.19, detailing the final work on the Human Machine Interfaces (HMI) methodology, the mapping of the user requirements to the functionality of the dashboard visualities and the final technical design aspects. The report is also intended to be used as a user manual to further assist the community to easily and quickly adopt and re-use the platform's functionality.
D3.2	LL1 EGTN Solution description and test results	FV	Confidential	M34	It continues the work carried out in D3.1 and provides a detailed description of LL1 EGTN Solution and the tests results obtained as part of the assessment of EGTN LL1 implementation. For the obtained test results, the deliverable provides a business impact and technology validation analysis based on the execution of impact-based surveys and the validation of test results against specific KPIs previously defined in D3.1

D3.4	LL2 EGTN Solution description and test results	PAN	Confidential	M34	It builds upon the progress made in D3.3 and provides an extensive description of LL2 EGTN Solution along with the outcomes of the tests carried out during the evaluation of the LL2 implementation throughout its three use cases. The deliverable offers a comprehensive analysis of the business impact and technology validation of the test results and its validation against pre-defined KPIs established in D3.3.
D3.6	LL3 EGTN Solution description and test results	PP	Confidential	M34	It presents the EGTN solution with reference to the use cases activities of LL3 business partners Rohlig Suus and Polish Post. The EGTN platform is shown in the context of the solution implemented in logistics processes on the New Silk Road - IoT, EPCIS, GS1 standards and AI predictions. After defining the methodology, the execution of the tests and the results obtained have been thoroughly described, detailing all the technical steps carried out until the obtention of the test results. Once the test execution and results have been presented, the document provides a complete business and technology validation with the main objective of analyzing the impact of EGTN LL3 solution towards innovation. The business impact and innovation are analyzed through the execution of impact-based surveys, which have been oriented to the main stakeholders involved in LL3. Complementing this, technology validation is performed by comparing the results against the specific requirements and KPIs previously linked in the methodology section.
D3.8	EGTN Generic use case final version	ZLC	Confidential	M36	Ongoing. The EGTN Generic use case that brings together and expand the results of the three LLs and the simulation of selected TEN-T corridors covering financial, business, economic and social impacts.
D3.9	Application of EGTN generic Use Case in port of Sines	CPSI	Confidential	M34	It describes the application of the EGTN Generic use case to the Port of Sines to demonstrate the broader applicability of the PLANET concept. The EGTN Generic use case (D3.7) was built by bringing together and expanding the results of three LLs (D3.1, D3.3, and D3.5). A Digital clone has been produced to evaluate the impact of introducing the EGTN infrastructure and the new logistics concepts and technologies that were tested in the LLs, along selected TEN-T corridors. The assessment measures the performance under four broad categories: model shift, GHG emissions, transport costs, and transit time. The Port of Sines has been selected as a case study for the application of the EGTN generic Use Case for two main reasons: i) the rapid growth of Sines as a container hub, largely due the successful rail connection to the Iberian hinterland and beyond, provides a good testbed to the PLANET concept, and ii) being located in a EU disadvantaged region, the Sines use case may be replicated in other such regions, in line with EU's Cohesion Policy and Taxonomy objectives.

D3.10	EGTN impact assessment	CERTH	Public	M36	Ongoing. An overall EGTN impact assessment will be consolidated considering LLs technical/operational, financial & business and economic & social perspectives. KPI targets defined in section '2.1 Expected Impacts' will be used as a yardstick for the assessment of the Living Labs' impacts.
D4.1	Recommendations for TEN-T interfacing to Global Trade Routes	PAN	Public	M30	It identifies which funding mechanisms (HE and CE) can be applied to further develop the disruptive technologies or to fund the necessary infrastructural developments. It also synthesizes the funding and proposes new CEF and HE call topics that can serve as guidelines for the 2030 review of the programs aiming at contributing to the transition of TEN-Ts the next generation of PI enabling EGTNs.
D4.2	Policy guide, Briefing sheets and case study on freight transport for policymakers in emerging economies	WI	Public	M30	It provides information and tools for logistics and policymakers stakeholders policymakers. More specifically, the policy guide aims to promote technology and policy transfer from the experiences of the PLANET project in the EU to emerging economies by increasing decision-makers' awareness.
D4.3	Electronic Visualization Library of outputs from WP1-WP2 and WP3	KNT	Public	M36	Ongoing. Library of project outputs, and open source components structured in line with EGTN users classification, including innovative learning and teaching materials to support public and business stakeholders use the Library resources.
D4.4	PI-facilitating technology Roadmaps for EGTN	ZLC	Public	M36	Ongoing. In this report, the identified PI related advances in models and services from WP2 and WP3 and the outputs from related projects will be described, while the interdependencies between technology areas and sequence innovations for the facilitation of the PI will be presented. Finally, the incorporation of PI-facilitating technologies into current roadmaps will be assessed.
D4.5	Recommendations for PLANET standardisation	PIT	Public	M36	Ongoing. Recommendations for PLANET standardisation including report on impact of standardisation and merits of different standardisation routes and organisations.
D5.3	Observations and Recommendations of the Advisory Board final version	ESC	Public	M36	It is the final version of deliverable D5.2 and focus on presenting the most vital issues for stakeholders - members of the Advisory Board, how these issues are met by PLANET and which relationships were built with (which) key stakeholders to support PLANET´s life beyond the duration of the project, be it by providing advice and establishing relationships supportive of a commercialization plan, be it by proposing topics for future publicly or privately funded research and potential partnerships.
D5.5	Communications and Dissemination Report final version	FV	Public	M36	It is the second and final report on the PLANET's Communication and Dissemination plan and activities. The report summarises the actions taken during the entire duration of the project, addressing the objectives of the respective task T5.2 and WP5's goal to develop and implement a Communication and

					12	Dissemination plan purposed to enhance project branding and maximise its potential and outreach amongst industry segments and stakeholders.
D5.6	Business & Commercialisation plan	PNO	Confidential	M34	It gathers the business and exploitation plan of the main results obtained in the project PLANET whose main aim is to provide a Simulation Capability for analysing the impact of new trade routes and test emerging innovations and technologies (e.g. Blockchain, IoT etc.) on the TEN-T and European logistics operations, for designing a geo-economics aware and PI inspired Integrated EU Global Trade Logistics Network [EGTN]. This deliverable is prepared under PLANET's Work Package 5 - "Dissemination, Commercialisation, Policy recommendations", specifically the task T5.4 - "Business Model and Commercialisation strategy".
D5.7	Policy framework analysis	UIRR	Confidential	M36	Ongoing. Policy framework analysis leading to recommendations supporting TEN-T and industry transition to EGTN backed by Impact Assessment including simulation of potential policy impact on transition paths and associated economic, social and environmental KPIs. Policy recommendations on EU's strategic cooperation with China and the USA will be included.
D6.2c	Project Quality Handbook and annual quality reviews	INLE	Confidential	M36	Ongoing. It provides a revised version of the D6.2b report that describes the quality assurance procedures, the associated participant roles and the resources provided to support the application of the quality assurance approach.
D6.4	Data set made available	INLE	Public	M35	Ongoing. A detailed report on the available data sets, including data owners, data governance and data set descriptions.
D6.5	Innovation management report and Patent Filings	INLE	Confidential	M36	Ongoing. It focuses on pinpointing at an early stage the most promising project's innovative outputs.

Milestones

During the project preparation as well as the project lifecycle 9 milestones have been defined for different months. The milestones serve as checkpoints to ensure proper monitoring of project progress and outcomes. A summary of the milestones achieved during this time period can ben find in the following table.

No.	Milestone Title	WP Number	Lead Beneficiary	Due Date	Means of Verification
MS6	All Living Labs first phase testing complete	WP3	ZLC	M25	Phase 1 measurements and evaluation feedback.
MS7	Second phase testing in LLs initiated	WP3	ZLC	M29	Second version of PLANET components. Experiment plans updated.
MS8	Open-Source Libraries and Transferability Framework and Capacity Building Programme in place	WP4	EUR	M30	Dissemination Plan/Communication Program for early adoption activated. Extended participation in LLs available. Roadmaps and guides published.
MS9	Business Model Commercialisation Strategy	WP5	FV	M32	Consortium strategy and partner exploitation plan agreed.

The milestones **MS6** and **MS7** are related with the results obtained from the WP3 PLANET Living Labs and verified through its deliverables. Here, the **MS6** was accomplished with the first phase of measurements, evaluating the results obtained on the issues related with the EGTN Internet of Things (IoT) and connectivity components, predictive and optimisation analytics, group multicriteria Decision Support System (DSS) or the distributed ledgers and smart contracts. Then, this has been complemented later with the subsequent updates of the Living Labs (LLs) and their deliverables D3.2, D3.4, D3.6 where the final results extracted from the applications and solutions of all these components in the three LLs were collected, achieving the **MS7**.

Another milestone accomplished in this period and related to this technical part was the **MS8**, which involved the development and implementation of an Open-Source Libraries and Transferability Framework and Capacity Building Programme. The objective of this milestone related to WP4 Steering innovation & building capacity towards EGTN was to facilitate the transfer of knowledge and best practices across the different and to ensure that the EGTN solutions could be easily replicated and implemented in other contexts, projects and systems through the development of open-source libraries, APIs (Application Programming Interfaces) or frameworks.

Finally, PLANET also succeeded in achieving **MS9** linked to WP5 Dissemination Commercialisation Policy recommendations. Its objective was to identify and develop a sustainable business model that can support the commercialisation and uptake of the EGTN solutions. In more detail, the activities for this milestone included the identification of potential customers and market opportunities, as well as the development of a commercialsation strategy that takes into account the needs and requirements of these stakeholders. This involved the development of a value proposition and marketing plan, as well as the identification of potential partners and collaborators.

Achievements

Over the third year of the project (M25-M36), a wide range of activities have been carried out with a focus on meeting the proposed PLANET objectives. The most important activities by each WP are presented below.

WP1 EU-Global T&L Networks

WP1 aims at evaluating the expected impact of emerging trade routes, national strategies and technological developments on the TENT-T corridors and PENs interfacing TEN-T to global trade by establishing the required Simulation Capabilities and the Reference Specifications of Integrated Green EU-Global networks. PLANET's simulation modelling aims to capture the complexity of supply chains by bundling together and assessing multiple parameters which are expected to have a significant impact on future freight flows. The objective is to successfully blend different dimensions into a strategic model and formulate a realistic simulation of the future, designed to accurately forecast EU future needs. This is expected to enhance the ability to design a future transportation network & services that will be better aligned to the requirements for more efficient logistics operations in terms of environmental, economic and social sustainability.

Over the course of the previous and last year of PLANET, significant progress was made towards identifying and producing the initial foundations of EGTN specifications. The major achievements related to this work package will be discussed below.

TEN-T focused modelling and simulation

For the period in question, the deliverable **D1.3** *Modelling & Simulation Capability Final Version* was submitted, presenting an overview of the currently available models for representing freight transport processes in the intercontinental corridors, highlighting key characteristics and functionalities of these models, as well as the enhancements performed during the project to better meet the modelling and decision-making needs of the Living Labs' use cases. It also contains a detailed description of an adaptation of the simulation models by the different project partners with the different requirements and needs gathered for the different LLs Use Cases. Through this process, the models were refined to provide more accurate and relevant information for decision-making.

Related to this topic, the deliverable **D1.5** *Simulation based impact of new trade routes on TEN-T and disadvantaged regions Final Version* was also submitted, built over the final version of the previous deliverable **D1.4**. It discusses the results of future simulations for 2030 and 2050, as well as two scenario simulations. These include the impact on disadvantaged regions and the impact of improved rail freight corridors. Through these simulations, **D1.5** identifies the potential impact of the TEN-T and outlines some ideas for leveraging the role of intermodal nodes, particularly inland ones, to support local development through comprehensive logistic activities. The report highlights the importance of identifying and addressing the needs of disadvantaged regions in order to ensure that the benefits of the TEN-T are realized across all areas. This deliverable also outlines several ideas for leveraging the role of intermodal nodes, such as through the development of logistics clusters and the integration of transport modes. These strategies have the potential

to enhance the overall efficiency and sustainability of the transport system, while also supporting local economic development.

Legislation and EU policy to impact EGTN

The approach of the deliverable **D1.7** *Legislation and EU policy to impact EGTN Final Version* submitted is an updated version of **D1.6** and aims to evaluate the potential impacts of various legislative and policy initiatives on the European Green Transport Network (EGTN) layers, attributes and development. It assesses the key implementation barriers and identifies strategies for addressing these challenges.

To achieve these goals, **D1.7** develops scenarios for 2030 and 2050 per transport mode, in order to evaluate the impacts of prioritized legal and policy initiatives on the simulation input parameters. These scenarios provide valuable insights into how different initiatives, such as emissions regulations and incentives for sustainable transport modes, can impact the development and performance of the EGTN. Focused on this, the analysis of key barriers for the implementation of the identified policy & legislative initiatives has been performed.

Development and validation of PLANET's Integrated Modelling Capability

Tests of the modelling capability through its application in various contextual scenarios based on the viewpoints of various modelling partners and foundational position papers were executed, enhancing the effect of integrating features and potential of individual models developed across the PLANET project to model operational contexts, emerging technologies and future scenario logics.

Through the extension and refinement of this integrated modelling capability, PLANET has the goal to support the innovation, impact and integrated attributes of the EGTN concept by achieving research objectives such as defining the impact of different ICT and T&L innovations on the development of the EGTN or assessing the impact of these emerging concepts and technologies on the performance of freight transport corridors and hubs and their position as contributors to the PI paradigm.

This work was part of the submitted deliverable **D1.9** *Simulation-based analysis of T&L and ICT innovation technologies Final Version*, based on the previous **D1.8**, and resulted in a valuable output to demonstrate the relevance and added value that the services as a whole can bring, beyond the individual value of each of them.

## Definition of EGTN layers, components and strategic vision

Deliverable **D1.11** *EGTN Reference Specification Final Version* provides the final description of the EGTN vision for 2030 and its three constituting layers (EGTN physical specifications, governance of the EGTN and EGTN technological layer) based on the results of the work undertaken by other WP1 tasks and the LLs test results to produce refinements in the EGTN specification and ensure that the LLs cover corridors and/or nodes of European significance also for the future.

WP2 PLANET Cloud-based Open EGTN Infrastructure

Purpose of WP2 outputs is to provide open ICT solutions and services, that can be adopted by T&L stakeholders, including private and public (such as customs) organisations and used by the LLs for achieving global connectivity, international trade, and economic development. In addition, WP2 work includes defining the architecture and prototype components of an open ICT infrastructure compliant based on the requirements developed in WP1 and the specifications of the EGTN solutions purposed to serve the needs of PLANET's LLs.

Specification, design and deployment of the cloud-based open EGTN Infrastructure architecture

The final specifications of the EGTN's architecture have been defined within the ***D2.2*** *Open EGTN Platform Architecture Final Version*, based on the stakeholders needs. In this deliverable the architecture of the EGTN Platform is presented, which was developed to meet the specific needs of the T&L industry by providing a range of customised technologies and models. The ***D2.2*** outlines the rationale behind the development of the platform's features, which were derived from mapping the requirements presented in the previous version with the final functionalities of the EGTN Platform. It also provides a detailed description of the platform's components and their deployment strategies, with the aim of facilitating its easy adoption by interested T&L parties. The governance model of the platform is also explained, including processes for data ingestion and processing, integration and management of PI services, and onboarding of users. This platform specification defined in WP1 is explained as well as the integrated architecture and cloud-based instantiation of the EGTN Platform, providing a secure and collaborative means for T&L stakeholders to access tools and services for routing, node optimisation, shipping and encapsulation, among others.
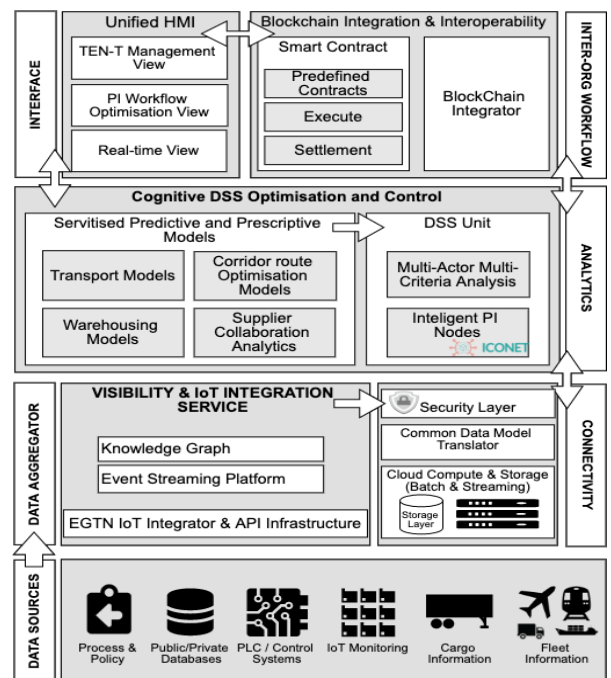
PLANET EGTN platform High-Level Architecture

This deliverable has been complemented by the following final versions of the WP2 deliverables of the different components/services of the EGTN that have been completed during this period.

IoT and connectivity infrastructure components of EGTN

In relation to connectivity and IoT of the EGTN, the following deliverables have been implemented in this last year of the project: ***D2.4*** *EGTN IoT infrastructure Final Version* and ***D2.6*** *EGTN Connectivity Infrastructure Final Version.*

The EGTN platform integrates various IoT and connectivity infrastructure components to provide real-time visibility of the supply chain and facilitate more efficient and greener logistics. The EGTN IoT Infrastructure is

described in PLANET deliverable **D2.4**, which provides the final results for realizing the infrastructure. The infrastructure offers real-time visibility of the supply chain, allowing for the integration of such information within the EGTN platform environment. This integration enables the platform to provide more efficient and effective logistics services to users.

Additionally, EGTN Connectivity Infrastructure is described in PLANET deliverable **D2.6**. The connectivity infrastructure integrates heterogeneous datasets into the Knowledge Graph, creating a new connected dataset that can be queried to provide useful insights. Historical data and real-time streaming data are combined to train and run prediction and analytics algorithms, with the results made available to end-users through the HMI dashboards to support human decision-making and analysis. The EGTN Cloud Infrastructure provides the services required to support the connectivity infrastructure, including their role and functionality within the overall framework, implementation details, and communication within the infrastructure itself. Together, the IoT and connectivity infrastructure components of EGTN offer a comprehensive and efficient logistics solution.

Forecasting, optimisation and multi-actor multicriteria analysis

Significant progress in developing and deploying services based on AI and optimisation, as described in previous deliverable **D2.9** and updated with the deliverable **D2.10** *Cloud deployment of EGTN logistics services* during this final period. This deliverable provides updated descriptions of the methodologies, implementations and deployments of services based on AI and optimization. The EGTN platform includes several AI and optimization-based services, such as route optimization, demand forecasting and inventory management and have been deployed and tested in the Living Labs, showing promising results in terms of cost savings, resource optimization, and environmental impact reduction.

Two more deliverables were submitted in this third period: **D2.12** *Multi-Actor Multi-Criteria Analysis DSS Final Version* and **D2.14** *Intelligent PI Nodes and PI Network Services Final Version*, as part of the multi-criteria DSS analysis. **D2.12** addresses the challenges associated with multi-stakeholder decision making in the context of T&L, considering the unique supply chain contexts of intercontinental corridors, warehouse and hinterland transport, and last mile delivery. It describes the implementation of Multi-Actor Multi-Criteria Analysis (MACMA) methodology that helps in identifying the specific operational criteria and priorities of operators with activity in all three supply chain sectors. The methodology indicates the need for separate instantiations of MACMA in each context, considering the unique operational criteria and priorities of each supply chain sector, enabling multi-stakeholder decision making by considering the preferences of different stakeholders and providing a rational framework for decision making in complex situations.

Following the same line, deliverable **D2.14** proposes methods and algorithms that adapt legacy T&L practices to the operational principles of the PI, a new paradigm in T&L that aims to create an open global logistics system. focuses both on the algorithms and their performance, as well as the EGTN platform that embodies the algorithms, their interactions with other EGTN services, and where applicable, with the interaction with the use.

Blockchain EGTN distributed ledgers and Smart Contracts

In the last period the deliverables **D2.16** *Integration and Interoperability of proprietary Blockchain Systems for Seamless Global Trade Workflows Final Version* and **D2.18** *EGTN smart contracts and associated PI motivated workflows in the context of SLA management Final Version* have been submitted, addressing the issue of integration and interoperability together with smart contracts in PLANET.

The methodology, design and development of the EGTN Interledger Service as well as its relationships with other PLANET solutions and technical components has been proposed in **D2.16**. Through this approach, the EGTN Interledger Service is classified as a potential great enabler for the PI paradigm and based on services of the EGTN Platform (i.e., AI or DSS) and has been able to integrate advanced functionalities for forwarding different logistics events between disconnected communities, cross-check the validity of events through IoT data and auto-generate smart contracts based on AI predictions.

The use of Smart Contracts as a technical solution to the PI workflows, defining the structure and interconnectivity of them has been verified by the deliverable **D2.18**. Moreover, the description of these Smart contracts, identifying and defining their terms and conditions as well as their structure and functions. Their deployment and close collaboration with other LLs involved offer a solution to the connectivity that provides integrity and immutability of the data through the entire supply chain supported by these smart contracts.

Unified interface to EGTN Data and support Services

The documentation of the final implementation of the Human Machine Interfaces (HMI) and the results covering the technical specification have been documented through the deliverable **D2.20** *Unified HMIs implementation and technical documentation Final Version*.

D2.20 is a comprehensive report that highlights the developments and efforts made towards the creation of a highly functional HMI under Task T2.6 of the PLANET project. The report covers a thorough investigation of the functional, non-functional, and performance requirements of the Logistics Locations. Additionally, it includes the final design elements produced based on the output and technical characteristics of the WP2 infrastructure components/services.

The main objective behind the development of the HMI in this project is to strengthen the decision-making processes of T&L actors by providing visibility to the assets, resources, and network conditions, all of which influence the T&L activities and the needed complex planning. The HMI is designed to provide a unified interconnection between the assets of the project and external information libraries. It offers a content-rich and function-rich interface, which provides a wealth of information and access to data lakes. The user can collect relevant data, formulate strategies and decisions, and adjust visualization of information, access roles and rights in a unified, easy-to-use module.

This HMI aimed at providing tools and APIs to the supply chain community, including logistics service providers, authorities and decision-makers. The work presented in this deliverable has been informed by collective research within the project, including the exchange of opinions to develop the appropriate solution.

WP3 PLANET Living Labs

WP3 has played a crucial role over the last period of PLANET, as it has provided a real-life experimentation environment to test and validate the EGTN solutions along three global corridors, focusing on investigating and testing key elements of EGTN in these three LLs. This has led to the development of tangible results and solutions and measurements that demonstrate the relevance of these technologies, allowing for the measurement of the KPIs. WP3 has been instrumental in providing a testbed for EGTN solutions and facilitating knowledge exchange among the three LLs, each with different contexts and complementary business and technology focuses.

During the las period, LL1 solutions have been successfully integrated different cutting-edge technologies such as IoT, blockchain and AI, to provide advanced functionalities and services in the two LLs use cases. One of the main solutions developed is the DSS that leverages intelligent forecasting, route optimization and smart contracts to support logistics and transport operations. Additionally, the EGTN platform offers enablers for real-time data ingestion, Track&Trace monitoring and logistics events based on blockchain technology, among others.

Through the integration of the LL1 AI models, EGTN provides services for routing optimization, predictive transport, demand forecasting, booking capacity and last-mile parcel reshuffling. The platform's functionalities have been tested and validated, mapping the responsible partners and specifying the nature, steps, KPIs and system requirements of each test case. The results of these tests have demonstrated the effectiveness of the LL1 EGTN solution and its ability to provide significant added value in the logistics and transport sector.

Based on the information obtained through the analysis of the LL1 EGTN solutions, some of the most significant benefits that these cutting-edge technological approaches can bring, including enhanced transport service levels, increased cargo traceability, reduced use of paper-based procedures and support for decision-making processes. Moreover, the solution improves the use of human resources and offers smart logistics services to optimize transport operations.
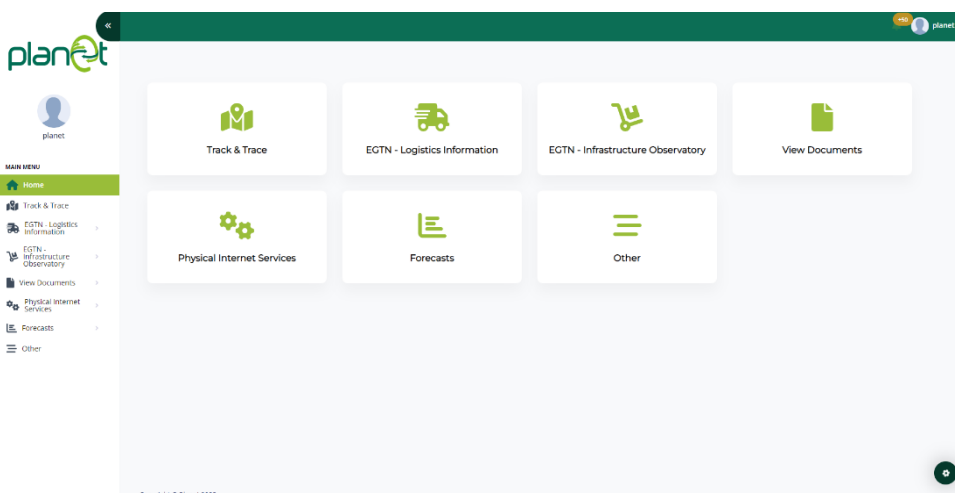
PLANET Platform Interface

The HMI has been improved over the last period and provides an intuitive interface that gathers together different functionalities based on the different technical solutions explored in PLANET, including forecasting, prediction, blockchain systems, track&trace, predictive transport models or

simulations, among other functionalities. These solutions have been integrated into the interface and are functional, enabling users to benefit from the results and outcomes of the project in a user-friendly and practical way.

Regarding LL2, it focused on the synchro modal dynamic management of TEN-T and intercontinental flows that promote rail transport between China, Rotterdam, and the USA/UK. This LL consists of three use cases to achieve transit time reduction goals and economically viable costs while increasing service frequency.

In Use Case 1, Blocklab developed a blockchain demonstrator to deal with post-Brexit customs processes between the Netherlands and the UK. The pilot showed proof for the business cases as identified for stakeholders, resulting in the development of an enterprise-grade solution inspired by the demonstrator.

In Use Case 2, the proof-of-concept for a document sharing application was successfully developed by BlockLab, and the UIRR ICP was launched with positive evaluation and publication of the manifesto summarizing the key hurdles and solutions on the new Silk Roads. Finally, a study on hydrogen was carried out to explore the opportunities and hurdles for railway on the Eurasian corridors.

For Use Case 3, the dynamic scenario simulation was carried out using the PLANET model to analyse the impact of Eurasian rail on freight flows in the RALP region. The model is specifically developed to simulate the impact of Eurasian rail on the European transport network. Additionally, LL2 was aligned with the wider purpose of EGTN development, supporting the EGTN services with a blockchain platform that summarizes unsensitive logistic data related to a certain shipment, allowing for synchromodal dynamic management and logistic optimizations. Overall, the advancements made in LL2 have contributed significantly to the Living Lab project, further promoting rail transport between continents.

LL3 made significant advancements in the logistics industry by developing and implementing innovative technological solutions. Post-implementation analysis revealed that the flexibility towards implementation of selected solutions should be considered during the testing stage, particularly in unforeseen situations such as the pandemic and war.

Process Analysis & Simulation based on BPMN proved to be a useful tool for mapping processes and identifying potential areas for improvement. An open repository of these processes together with simulations of changes can serve as a reference for the logistics market and be used widely by industry professionals as best practices. It also facilitated increased cooperation between business partners towards sharing real-time data, resulting in improvements in key business processes and customer satisfaction. The feasibility of implementing GS1 standards on the New Silk Road was examined, demonstrating clear benefits to the global supply chain. Decision-making algorithms were found to bring value to the transportation logistic network industry, enabling standardized data flow and access to relevant historic, present and future data. It also contributed to the development of IoT solutions and the creation of a digital connection between actors in the transport network, enabling real-time tracking of resources and standardized data flow. The integration of infrastructure, policy, technology and operational data available through the EGTN platform can be used

to assess infrastructure and rolling stock availability and inform investment decisions for the improvement of the operational efficiency of the network.

Following the initial specification and baseline measurements collected in each of the three LLs of the project, three deliverables were submitted, documenting the technical solutions developed and the KPIs achieved in each of the LLs: *D3.2 LL1 EGTN Solution Description and Test Results*, *D3.4 LL2 EGTN Solution Description and Test Results*, and *D3.6 LL3 EGTN Solution Description and Test Results*. Through these deliverables, it has been possible to provide a comprehensive overview of these EGTN solutions developed and tested in each LL, allowing for an evaluation of their technical viability and their ability to meet the KPIs set out in the project.

Through the deliverables *D3.8 EGTN Generic Use Case Final Version* and *D3.9 Application of EGTN Generic Use Case in port of Sines*, the proposed generic use case brings together and expand the results reported in the other three PLANET LLs. The *D3.8* explored this generic case and the simulation of TEN-T corridors aiming to cover economic, financial, business and social impacts. Along the same lines as the generic use case, the deliverable *D3.9* describes the application of the EGTN Generic Use Case to the Port of Sines, which was selected as a case study for two main reasons. Firstly, the rapid growth of Sines as a container hub, largely due to the successful rail connection to the Iberian hinterland and provides a good testbed for the PLANET concept. Secondly, being located in an EU disadvantaged region, the Sines use case may be replicated in other regions, in line with the EU's Cohesion Policy and Taxonomy objectives.

WP4 Steering innovation and building capacity towards EGTN

WP4 of the PLANET project aims to build a better understanding, provide support, and build capacity toward EGNT development by raising awareness regarding the EU's role in the geo-economic context and technological innovations that can be adopted by T&L networks, business, and policymakers. In the last period of the project, WP4 has made significant progress through the completion of five key deliverables.

The first deliverable *D4.1 Recommendations for TEN-T interfacing to Global trade routes* identified funding mechanisms that can be applied to further develop disruptive technologies or fund necessary infrastructural developments. It also proposes new CEF and HE call topics that can serve as guidelines for the 2030 review of the programs aiming to contribute to the transition of TEN-Ts to the next generation of PI enabling EGTNs.

The *D4.2 Policy guide, Briefing sheets and case study on freight transport for policymakers in emerging economies* is a collection of a Policy guide, briefing sheets and case studies related to PI. These documents *aim to* raise the awareness of government authorities (both local and national) in disadvantaged regions and emerging economies through examples from the PLANET project and the EU. By doing so, the envisaged impact is that future trade with the EU will be technologically more attractive.

The policy guide provides an overview of the freight innovations in the PLANET project. It suggests a methodological approach for decision-makers at national and local levels. The guide also provides policy recommendations to facilitate the adoption of concepts such as PI, synchromodality and blockchain technologies.

Developments of the PLANET project in WP1 through WP3 led to creation of seven briefing sheets on PI and Blockchain, Enablers of PI, Technologies in Logistics, Reducing emissions from Logistics, Implementing IoT and Blockchain, Synchromodality and Hyperconnected logistics. Each briefing sheet introduces the topic and cites examples. The briefing sheets provide information on the specific topic with policy suggestions relevant to the topic. The briefing sheets aim to introduce the policymakers in emerging economies to the innovative aspects of logistics developments in the EU in the areas of Physical Internet and Blockchain and facilitating knowledge transfer.

Three case studies have been developed on PI, logistics and operations Management and smart contracting in synchromodal transport. The case studies are developed using the case study method, a proven method to increase awareness using real-life examples. The case studies are developed in a conversational tone depicting a hypothetical situation that the policymakers can relate to. Each case study has questions posed for the reader to evoke their response.

In order to support the dissemination of knowledge generated and to assist stakeholders with resources, *D4.3 Electronic Visualization Library of outputs from WP1, WP2 and WP3* serves as a library of project outputs and open-source components structured in line with EGTN user classification. This library also includes innovative learning and teaching materials to support public and business stakeholders' use of the Library resources.

D4.4 PI-facilitating technology Roadmaps for EGTN describes the identified PI related advances in models and services from WP2 and WP3 and the outputs from related projects. This deliverable identified the interdependencies between technology areas and sequence innovations for the facilitation of PI. Finally, the report assesses the incorporation of PI-facilitating technologies into current roadmaps.

The technologies considered were blockchain, AI/ML, Hyperloop, AVs, Unmanned Aerial Vehicles "UAVs", Intelligent Modular Load Units "iMLUs", 5G, EGNOS, and 3D printing. The starting point of this document was the *ALICE Physical Internet Roadmap* (https://www.etp-logistics.eu/wp-content/uploads/2022/11/Roadmap-to-Physical-Intenet-Executive-Version_Final-web.pdf) and the methodology followed was based on a mix of desk research, individual technical expertise of project partners, services and solutions developed and/or tested in PLANET, outputs from related projects and workshops execution.

Beyond purely technological/business issues, PLANET roadmaps also take into account the aspects in the legislation and EU policy that potentially could impact EGTN technological layer.

Finally, the document examines how to facilitate the incorporation of PLANET results in the ETP's roadmaps such as ERRAC for Rail and WATERBORNE for Sea and Inland Waterways. Synergies among strategies could deliver benefits and accelerate time to market according to the PLANET roadmap. The methodology is based on the analysis of official ERRAC and WATERBORNE documents and synoptic comparison with PLANET for selected and most relevant aspects.

The last deliverable of this period, *D4.5 Recommendations for PLANET standardization*, provides recommendations for PLANET standardization, including a report on the impact of standardization and merits

of different standardization routes and organizations. This deliverable is crucial as standardization is essential to achieving interoperability, safety and security of EGNT solutions. The work was divided into three stages:

1) "Standardization preparation", which covers issues such as the territorial scope of research, and the investigated logistics processes.

2) "Standardization Strategy", which highlights the difference between the terms "standards" and "standardization." In the context of the PLANET project, standards are essential, and the project aims to identify existing standards that could be useful. However, the lack of adoption of data standards and awareness of existing standards hinders the seamless flow of data along supply chains and diminishes efficiency gains. This chapter provides information on GS1 and non-GS1 standards. Moreover, it presents an analysis of the opportunities and benefits arising from using smart contract in the supply chain and associated technologies, particularly blockchain, and identifies and analyses existing standards for smart contract, with particular focus on solutions dedicated to the flows of goods in international supply chains. The analysis includes implementations and problems encountered.

3) "Recommendations for PLANET standardization", which discusses the preparation and recommendation of standards for T&L processes including the use of smart contract and blockchain. It highlights the lack of use of identification and communication standards in LLs, which can hinder the seamless flow of data in the supply chain. The recommendation is based on the use of GS1 standards, which cover all identification and communication needs. This chapter also touches on the European Union regulations which indicate which GS1 standards should or must be used, for example EU Medical Devices Regulation (2017/745), EU Tobacco Products Directive (2014/40/EU), and EU Falsified Medicines Directive (2011/62/EU).

WP5 Dissemination Commercialisation Policy recommendations

WP5 aims at maximizing the impact of project outputs as well as ensuring their sustainability. This WP encompasses all the actions regarding dissemination, communication, as well as commercialization and exploitation of project results. Its main activities are the design and implementation of a Communication and Dissemination plan for communicating/branding PLANET project and reaching business and academic and policy stakeholders, the development of commercializing strategy for project results with a particular focus on IP protection and last but not least provide policy recommendations linking to impact assessment *D3.4*.

For the current reporting period, two Advisory Board Meetings were held with the main objective of improving the project's results, in interesting discussions and exchanges of perspectives, opinions and knowledge. The recommendations obtained for the aforementioned clusters are summarised in Deliverable *D5.3 Observations and Recommendations of the Advisory Board final version*.

The first one, held on the 29ᵗʰ of November 2022 proceeded with a presentation (per work package) of PLANET´s key achievements:

- Modelling international trade with a particular eye on the impact of the Ukrainian crisis;

- Understanding the impact of technology on the TEN-T. How will the digital TEN-T look in the future?
- Developing key technologies: integration of PI services in a single platform; secure tracking; load and route optimisation; warehouse optimisation and collaboration; automated decision-making;
- Aggregating the capacities of a vast multitude of partners under the European Global Transport Network (EGTN).

The second and last meeting took place the 8ᵗʰ of March 2023 centred on 2 key aspects of the PLANET project: commercialisation and experimentation. The purpose was to develop ideas & recommendations to improve the project´s business plan and support (possible) future implementation by fine-tuning the workings and modus operandi of the LLs. In this sense, the Advisory Board generated a solid set of ideas & recommendations and established a clear direction for maximising the impact and reach of final results.

On the other hand, the final phases for the Business & Commercialisation plan for the PLANET Key Exploitable Results (KERs) were taken. PLANET KERs are innovative, interdisciplinary knowledge exchange networks designed to foster collaboration and knowledge-sharing between different sectors. By facilitating the sharing of knowledge and experience obtained during the development of PLANET, KERs have offered an innovative vision for developing new solutions to complex challenges. During this period, a workshop to define the exploitation pathway of the 9 KERs was organised and the business model CANVAS and SWOT analysis were carried out for each KER. All this work is condensed in the deliverable *D5.6 Business & Commercialisation plan*. The KERs are as follows:

- KER1: Volume flow forecasting service for warehouses.
- KER 2: Hyper loop.
- KER 3: Intelligent Decision Support Algorithm for Just-In-Time (JIT) rail shuttle service.
- KER 4: Track & Trace Monitoring Services.
- KER 5: End-to-End Digital and Document Management.
- KER 6: New distributed ledger technology for smart contract blockchain interoperability.
- KER 7: Logistics Single Window (JUL).
- KER 8: PI routing Algorithm.
- KER 9: Smart and green Collaborative Platform (EGTN platform).

Throughout this period, PLANET also conduct an analysis of policy and legal developments affecting EGTN and formulated recommendations for further development to support industry transition to EGTN along with ang impact assessment for each recommendation. The final results were reported in the deliverable *D5.7 Policy framework analysis*.

Finally, the main communication and dissemination actions, activities and materials carried out and performed during the third year of the PLANET project have been summarised in the following section of the report. Also, all the actions and activities conducted have been summarises on *D5.5 Communications and Dissemination Report final version*.

A review of Communication and Dissemination actions conducted

Several actions have been conducted by the Communication and Dissemination (C&D) Team during the second year of the PLANET Project. You can find all the C&D materials and related tools and resources **here**.

Focusing on C&D materials, the PLANET's second promotional video was produced and published, together with the four newsletters and ten factsheets, which not only explain the project but also its achievements. Additionally, PLANET's Second Annual Report was produced and published in December, summarising the main achievements of the first project period (M13-M24) and providing a recap of the deliverables submitted and milestones met.

H2020 PLANET project: Moving Towards Smart, Green and Integrated Transport and Logistics

▶ OPEN VIDEO

PLANET's Second Annual Report

C&D Material	Dissemination subject
Newsletter #6	Presentation of the main progress and developments made in project's Living Lab 1 to date. It also included information on the latest events attended by PLANET and news.
Newsletter #7	Presentation of the main progress and developments made in project's Living Lab 2 to date. It also included information on the latest events attended by PLANET and news.
Newsletter #8	Presentation of the main progress and developments made in project's Living Lab 3 to date. It also included a summary of the new public deliverables submitted and information on the latest events attended and organised by PLANET.
Newsletter #9	Definition and presentation of the PLANET Open EGTN Platform, explaining its functionalities and innovation, as well as its value to the transport and logistics industry. It also included a summary of the new public deliverables submitted, information on the future and latest events attended by PLANET and new publications made by PLANET partners.
Factsheet #6	PLANET Project Factsheet.
Factsheet #7	Description in more detail LL1: short LL1 description, Objectives & Business benefits of the technologies implemented in LL1, Overview of use cases 1 and 2, as well as their overall activities and an in-depth 'AS IS' – 'TO BE' comparison.
Factsheet #8	Description in more detail LL2. Contents: short LL2 description, Objectives & Business benefits of the technologies implemented in LL2, Overview of use cases 1, 2 and 3, as well as their overall activities and an in-depth 'AS IS' – 'TO BE' comparison.
Factsheet #9	Description in more detail LL3. Contents: short LL3 description, Objectives & Business benefits of the technologies implemented in LL3, Overview of use cases 1 and 2, as well as their overall activities and an in-depth 'AS IS' – 'TO BE' comparison.
Factsheet #10	In-depth presentation of the EGTN Platform, including a description of its functional requirements and layers, services and value to the transport and logistics industry.
Factsheet #11	PLANET KER2 Hyperloop.
Factsheet #12	PLANET KER3 Intelligent Decision Support Algorithm for JIT rail shuttle service.
Factsheet #13	PLANET KER4 Track & Trace Monitoring Services.
Factsheet #14	KER6 New distributed ledger technology for smart contract blockchain interoperability.
Factsheet #15	PLANET KER9 Smart and Collaborative Platform.

Finally, related to dissemination, PLANET has published 3 white papers on PLANET website and 7 more press releases were published during this phase of the project, 5 on PLANET website and 2 on press and media professionals. It is also remarkable that PLANET partners have published more than 100 news, press releases and articles about the project on their websites and social media accounts.
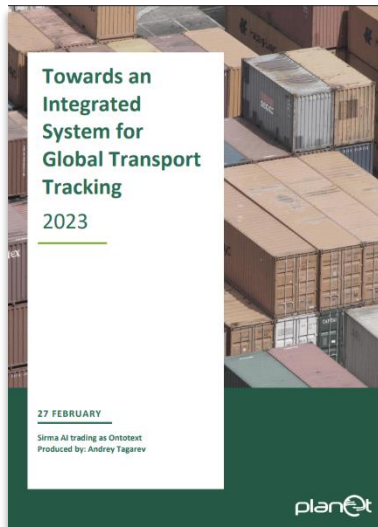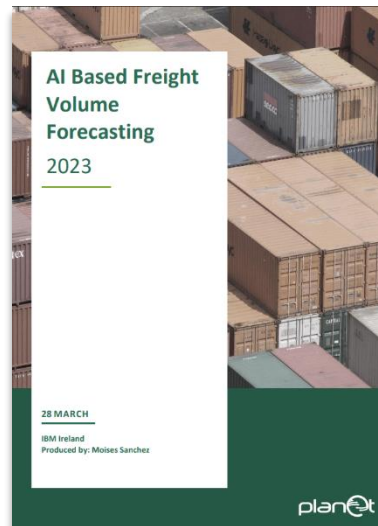
PLANET's first white paper: Towards an Integrated System for Global Transport Tracking

PLANET's second white paper: AI Based Freight Volume Forecasting

PLANET's third white paper: Decentralised management of logistics documentation

In terms of event, 6 partnership events took place during this period. Aiming at approximating shippers/industry to PLANET and energising them to the value-added of the project and its outcomes, three events were organised by ESC. Two partnership events were also conducted under the organisation of UIRR: 1) a Workshop to discuss with key railway actors on the current bottlenecks on the routs towards China; 2) A session to define altogether a possible PLANET pilot pr proof-of-concept that would support the intercontinental activities of all concerned stakeholders of LL2. Finally, during a session coordinated by ZLC, the PLANET project was presented, aiming at creating project awareness among T&L international audience.

In addition, PLANET project participated in 10 R&D conferences, congresses, forums, business exhibitions, webinars and workshops as summarised in the following table.

Deliverable Name	Place	Date	Dissemination subject
Intelligent Transport Systems European Congress 2022 (ITS2022)	Virtual	1-jun-22	PLANET Project took part at the Technical Programme 24 - Innovative logistics presenting the technical paper *Impact of EGTN T&L innovations at the micro-level on connectivity at the macro level*.
ePIcenter 3rd Annual Conference	Virtual	16-jun-22	During this conference PLANET gave a short presentation on the project and an introduction of the EGTC's contributions to LL2 since there are some synergies between both projects.
Acceleration event: The blockchain made easy for SMEs and European value chains	Tuscany, Italy	20-jun-22	PLANET took part at the Topic - The blockchain technology in railways and multimodal logistics: uses cases and challenges presenting *Blockchain-enabled Port: the Experience of the PLANET H2020 project and Blockchain interoperability*. NGS solution developed in the PLANET project was presented, as well as the EGTN results with special focus on the blockchain interoperability.
Porto Maritime Week 2022	Hybrid, virtual / Porto	27-sep-22	During the session Propostas de futuro para os portos nacionais, an overview of the PLANET Project was presented.
Business Logistics in Modern Management (BLMM2022)	Osijek, Croatia	6-oct-22	PLANET took part at the Session 2 - SUSTAINABILITY AND REGIONAL SUPPLY CHAINS – SUPPLY CHAIN AND LOGISTICS DIGITALIZATION presenting the paper *Data digitalisation in transport processes*. PLANET partners gave a presentation of the research results of the work carried out within LL3 as well as the research methodology and discussion of the potential for the project work to contribute to science, in the field of intermodal supply chain management.
9th Transport Research Arena Conference (TRA 2022)	Lisbon, Portugal	14/27-nov-22	During the presentation *A blockchain-based architecture and smart contracts for an interoperable Physical Internet* a presentation of the PLANET project and the EGTN platform was given.
European Freight and Logistics Leaders Forum	London, UK	16/17-nov-22	During this forum PLANET was introduced in Working Group D - Sustainability of Transport and Logistics. The overall objective was to identify the priorities of international supply chain and logistics decision-makers and to inform them of the added value of the project. The Session was moderated by 2 professional outside consultants who focused on real business cases. It was intervened various times opening a window on PLANET EGTN, and the project use cases, including the drivers and the KPIs associated.
ALICE Webinar: Physical Internet: synergizing efforts via the ALICE liaison program	Virtual	30-nov-22	This webinar was part of the ALICE liaison framework which facilitates knowledge sharing, advances market uptake of innovation, and boosts impact of R&I projects. Projects involved: PLANET, PILL, ePIcenter.

Conference Railway Systems and the 3rd Intermodal Forum - PLANET LL3 Workshop	Wisla, Poland	2-mar-23	The results and conclusions of the PLANET project were presented together with the main assumptions and result of the LL3 in a presentation entitled PLANET project – application of IoT on the New Silk Road.
Logistop: Observatory logistic | Aplicación de tecnologías 4.0 para la integración digital de las cadenas logístico-portuarias	Virtual	19-apr-23	Tree key solutions developed in the LL1 were presented: blockchain networks, AI based intelligent algorithm for planning and replanning set schedules for transportation across inland corridor routes, and simulation models for the optimisation of last mile distribution. Presentations: Tecnología Blockchain e interoperabilidad entre redes corporativas para la gestión de datos puerto-hinterland, Optimización del hinterland portuario mediante modelos y algoritmos de IA, and PI node y logística urbana colaborativa.

Furthermore, during this last phase of the project, PLANET partners organised 14 workshops, webinars and meetings presenting WPs results. The following 4 are worth highlighting:

Deliverable Name	Place	Date	Dissemination subject
Intercontinental Platform Kick-off Workshop	Frankfurt, Germany	7-jul-22	In the context of PLANET's LL2 on promoting railway transport, UIRR officially launched on 7th July 2022 in Frankfurt its platform on the Eurasian corridors for Combined Transport. The aim of this workshop was to gather the concerns of Combined Transport Operators and to validate the Demonstrator on the exchange of documents.
PLANET workshop on impacts of legal & policy initiatives on the transport modes (scenarios)	Virtual	25-nov-22	The target was to validate the relevant work undertaken within the project and to conclude on parameters that can enhance PLANET's strategic simulation model by considering the impacts of forthcoming legal and policy initiatives on future freight flows. More than 15 selected experts covering all transport modes were invited to the workshop and interactive tools were used to facilitate the process of collecting their feedback and comments. The workshop was divided into two main parts, during the first of which the results of the initial analysis were presented and discussed with the experts while in the second part the experts were invited to provide their impact estimation on selected legal and policy actions.
2nd workshop to explore regional and local impacts on the RALP Corridor of the global transport and logistics flow and implications for last and first mile connections	Virtual	2-dec-22	The 2nd workshop invited a broader audience beyond the EGTC members, to discuss simulation results and possible countermeasures from different perspectives of relevant stakeholders. Therefore, the event was organised as part of Rhine-Alpine Talks, a regular online and public event organised by EGTC to showcase their activities and facilitate discussions around pre-selected topics. The key aim of the workshop was to explore future challenges for the RALP Corridor in the face of increasing transport flows and logistics from emerging global trade corridors. Additionally, the workshop aimed to outline a series of actions to address the impact of emerging geo-economic trends on cities and regions located along the RALP Corridor.
PLANET LL1 Workshop	Virtual	27-apr-23	This workshop addressed logistic challenges and how new technologies (IoT, AI and blockchain) and concepts (Physical Internet) have been utilised to improve processes, operations and efficiency along the door-to-door transport chains linking the Maritime Silk Road with EU internal corridors.

Finally, in this phase PLANET produced 2 posters and 11 articles and scientific publications, 4 are pending to be published and 1 is waiting for approval. All the articles and scientific publications published are available on the PLANET website **here**.

Article / Paper / Poster Name	Event Associated	Type of publication	Status	Link
Physical internet points the way to a smarter future	NO	Journal publication - EU Research	Accepted and published	https://issuu.com/euresearcher/docs/digital_magazine_eur31_final/56
Impact of EGTN T&L innovations at the micro-level on connectivity at the macro level	ITS 2022	Conference proceedings	Accepted and published	https://2022.itseuropeancongress.com/congress-proceedings/
Data digitalisation in transport processes	BLMM 2022	Conference proceedings	Accepted and published	http://blmm-conference.com/wp-content/uploads/BLMM2022_Conference_Proceedings.pdf
Analysis of digitalisation needs improving the supply chain efficiency for New Silk Road transport corridor	BLMM 2022	Scientific journal - Economic Thought and Practice	Accepted and published	https://doi.org/10.17818/EMIP/2022/2.7.
A blockchain-based architecture and smart contracts for an interoperable Physical Internet	TRA 2022	Conference proceedings	Accepted and pending to be published	-
Dynamic collaboration for late last mile delivery rounds	NO	Chapter Book - Supply Chain and Disruptive Technologies	Accepted and pending to be published	-
Environmental impact assessment of intercontinental transport network with digital twin under PI framework (Paper)	IPIC 2023	TBD	Accepted	-
The impact of IoT implementation on shipments from Asia to Europe along the New Silk Road on the development of the Physical Internet in the receiving country (Paper & Poster)	IPIC 2023	TBD	Accepted	-
Automating Capacity Pre-Booking at Warehouse Nodes of the Physical Internet (Poster)	IPIC 2023	TBD	Accepted	-
An exploration of the potential benefits of Transportation and Logistics innovations in Last-Mile Urban Deliveries: A case study approach (Paper)	IPIC 2023	TBD	Accepted	-
Corridor connectivity index: a methodology to assess dynamics of trade routes and impact on existing TEN-T corridors	IAME 2023	TBD	Paper submitted, waiting for approval	-
Door-to-door più efficace? è possibile	NO	Journal publication - Il Giornale della Logistica	Accepted and published	https://www.calameo.com/read/0019579232ba1666a7961

Authors and main contributions

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