2nd PLANET Annual Report

DECEMBER 2022

COMMUNICATION

FUNDACIÓN VALENCIAPORT

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December 2022

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

This project is funded from the European Union´s Horizon 2020 research and innovation programme under grant agreement No 860274

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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.

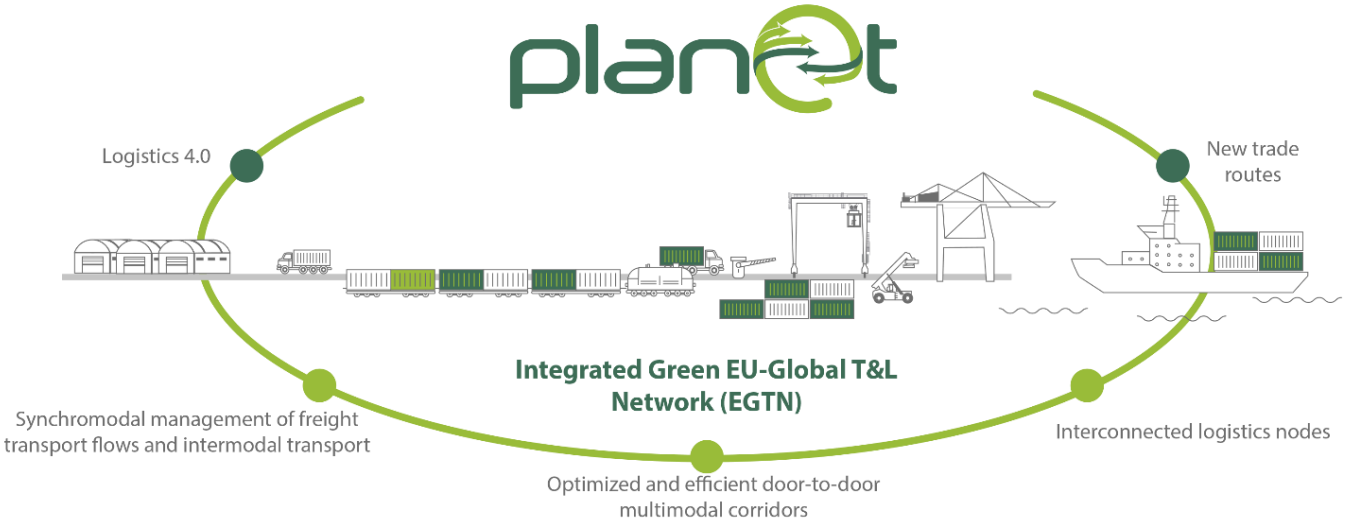
The 2nd PLANET Annual Report presents project's key achievements accomplished by its consortium members over the course of the second year of the project (M13-M24). In more detail, the report introduces and highlights the deliverables and other scientific outcomes and achievements of the PLANET project, 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 20 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., which are also 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 e commerce 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 second year of the project, several deliverables have been realised, most of them focusing on the EGTN and LLs definition, approach design and initial implementation. An overview of those deliverables is presented in the following table.

No.	Deliverable Name	Lead Beneficiary	Dissemination Level	Due Date	Deliverable Description
D1.1	EGTN Foundational Position Papers and Simulation Scenarios	ITA	Public	M14	It contains the description of the main aspects of the 4 foundational Position Papers of the PLANET project and the design of scenarios intended to assess their potential impact. The primary objective is to analyse, understand and assimilate the global, geopolitical, commercial, and economic imperatives of the main European trade routes.
D1.4	Simulation based impact of new trade routes on TEN T and disadvantaged region v1	PAN	Public	M15	It establishes the baseline scenario (year 2019) for the impact on TEN-T/EGTN of the upcoming trade routes (Belt and Road Initiative; Northern Sea Route; International North-South Trade Corridor).
D1.6	Legislation and EU Policy to impact EGTN v1	UIRR	Public	M15	It evaluates the potential impacts of ongoing and forthcoming legislative and policy initiatives on the EGTN implementation and to assess the key implementation barriers.
D1.8	Simulation-based analysis of T&L and ICT innovation technologies v1	EUR	Public	M15	It defines the impact of ICT and T&L innovation on EGTN, assess the impact of emerging concepts and technologies on freight transport corridors and hubs and positions emerging technologies as contributors to the PI.
D1.10	EGTN Reference Specification	CERTH	Public	M16	It provides a detailed description of the main components of the vision of the EGTN. The approach is made to define the EGTN specifications, considering the WP1 the analysis and bringing together the opinions and considerations of the consortium regarding the definition and components of the EGTN.
D2.1	Open EGTN Platform Architecture v1	ILS	Public	M16	It informs any stakeholder or consortium of stakeholders involved or interested in the design of innovative, cross-organisational EU-Global T&L networks by including a detailed specification of the platform based on stakeholder needs analysis and it is inspired by other logistics collaboration platforms from previous Horizon 2020 projects.
D2.3	EGTN IoT infrastructure v1	NGS	Confidential	M17	It presents the IoT infrastructure for increased automation in T&L operational management with automated localised data capture, processing and event-based transmission including registration of event through EPCIS. It also presents the hardware and software for the High-level gateway and battery powered IoT tracker.

D2.5	**EGTN Connectivity infrastructure v1**	SIR	Confidential	M17	It introduces the tools and services of data collection from heterogeneous sources including intelligent adaptors and translators to a shared corridor and Network Data Model/Ontology, and Knowledge Graph and cybersecurity data governance and privacy mechanisms.
D2.7	EGTN Transport Data and Knowledge Models v1	SIR	Public	M17	It covers in detail the work done on developing a transportation knowledge model for the EGTN Connectivity Infrastructure, i.e., on examining and utilizing widely-used standards, analysing and selecting data sources and combining and extending existing ontologies into a single harmonized data model.
D2.9	EGTN Support Services based on Big Data analytics Models	IBM	Public	M18	It describes the preliminary results of experimentation on AI based predictive models, using data made available in the project, to forecast the in-flow of pallets and containers to warehouses.
D2.11	Multi-Actor Multi-Criteria Analysis DSS v1	VLTN	Public	M18	It focuses on the implementation of MAMCA methodology for the development of the TEN-T network and its integration to global corridors considering both infrastructural and technological advances (including the ones developed in PLANET's LLs). It explores the application of MAMCA in the context of the PI to identify a fair investment roadmap with benefits across T&L stakeholders.
D2.13	Intelligent PI Nodes and PI Network services v1	VLTN	Public	M18	It focuses on developing algorithms that utilise the advantages of the PI and enable smart decision making at both network and node levels. It describes models and methods for integrating automated operations for T&L planning and collaboration, in alignment with the PI principles.
D2.15	Integration and Interoperability of proprietary Blockchain Systems for Seamless Global Trade Workflows v1	KNT	Public	M18	It reports on the integration and interoperability of proprietary Blockchain systems that have the potential empower organisations across the entire T&L supply chain to collaborate seamlessly.
D2.17	EGTN smart contracts and associated PI motivated workflows in the context of SLA management v1	KNT	Public	M18	It presents 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 Service Level Agreement (SLA).
D2.19	**Unified HMIs implementation and technical documentation v1**	EBOS	Confidential	M18	It delivers a unified HMI system to communicate with all the PLANET Cloud-based Open EGTN Infrastructure components via REST APIs including client-side security, access & authentication services including options for integration to Blockchain.
D3.1	LL1 Specification and Baseline measurements	COSSP	Public	M21	It provides a detailed description of LL1's specifications and the implementation plan for optimising door-to-door logistics in the connection between Asia and the Mediterranean corridor by using technologies such as blockchain, AI or IoT, as well as the PI concept. It also includes an overview of the assessment plan for the

					infrastructure corridor analysis and the simulation-based designs underdeveloped, and to be integrated as part of PLANET EGTN infrastructure.
D3.3	LL2 Specification and Baseline measurements	PAN	Public	M21	It introduces the work carried out during the first steps of this LL: Synchro modal dynamic management of TEN-T & intercontinental flows promoting rail transport: China – Rotterdam, USA/UK focusing on the role of rail transport. It includes detailed problem and goal definition, approach design, operationalization of impact assessment, and initial implementation.
D3.5	LL3 Specification and Baseline measurements	Lukasiewicz - ILIM	Public	M21	It provides an analysis of the current situation on the examined Asian-European transport corridor was made together with a detailed analysis of the logistic processes performed by the business partners Rohlig Suus and Polish Post. Based on the complete state-of-the-art picture the objectives for the Polish LL were proposed, which through the implementation of modern technologies and process innovations will positively influence the described operational, economic and environmental KPI's, as well as EGTN network.
D3.7	EGTN Generic use case v1	ZLC	Public	M17	It sets up and specifies the parameters of an EGTN Generic Use Case. It brings together elements from the 3 PLANET LLs under a common EGTN framework and employs the analysis of the effects of the new trade routes in the TEN-T network.
D5.2	Observations and Recommendations of the Advisory Board v1	ESC	Public	M18	It summarises the observations and recommendations of the Advisory Board members on the project. This version focusses on 3 key topics developed under PLANET: the Stakeholder analysis, the PLANET vision and EGTN; the modelling and simulation capabilities.
D5.4	Communications and Dissemination Report v1	FV	Public	M18	It identifies the relevant framework to effectively disseminate the projects outputs and maximize their outreach/impact and summarises the Communication and Dissemination activities carried out to date.
D6.2b	Project Quality Handbook and annual quality reviews (b)	ILIM	Confidential	M18	It provides a revised version of the D6.2a report that describes the quality assurance procedures, the associated participant roles and the resources provided to support the application of the quality assurance approach.

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
MS4	Cloud-based Open EGTN ICT Infrastructure V1	WP2	IBM	M17	Infrastructure components that are integrated in the architectural prototype ready for LL use.
MS5	Installation and technical validation of the EGTN Infrastructure in the LLs	WP3	ZLC	M21	Completed operational baseline measurements of the LLs.

The milestone **MS4** was directly related to WP2 PLANET Cloud-based Open EGTN Infrastructure and its deliverables, and the verification of achieving this first version of the EGTN ICT Infrastructure is supported with the infrastructure components that have been incorporated in the prototype. In more detail, already by the month 12 the EGTN platform was set up and running, all infrastructure tools were deployed (reusing SELIS and ICONET components), and interfaces were brought up. At the same time, several datasets from LL partners were also uploaded to the platform and provided for usage by the data aggregator.

Another milestone accomplished in this period and related to this technical part is the **MS5**, supporting a first version of the installation and technical validation of the EGTN Infrastructure. It relates to the WP3 PLANET Living Labs and verified through the operational baselines' measurements of the different LLs. In more detail, these activities included an AS-IS situation analysis for producing PLANET's LL specifications, innovative dimension and assessment plans for infrastructure corridor and simulation-based analysis for predicting and evaluating respectively the impact of the implemented innovations and actively support the design and definition of the EGTN solutions considering declared business and technical requirements as well as KPIs. Furthermore, once the EGNT open Cloud infrastructure and solutions are configured for the LLs, they will facilitate the monitoring of their performance as well as assessment of their results and impact according to KPIs.

Achievements

Over the second year of the project (M13-M24), 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. During the second year of the PLANET project, significant progress has been achieved towards identifying and producing the initial foundations of EGTN specifications. The major achievements related to this WP are listed as follows.

PLANET's Position Papers

The revision and delivery of the four Position Papers (PPs) [***(PP1)*** *Geo-economic developments impacting global corridors for trade*; ***(PP2)*** *New trade routes' impact on TEN-T Corridors and nodes*; ***(PP3)*** *Interconnection issues of railway transport-corridors to/from Europe*; ***(PP4)*** *Transition towards the Physical Internet paradigm*] took place during this second period.

In addition, the methodology for the calculation of the Corridor Connectivity Index (CCI) was finalised and the definition of the use of CCI for the scenario's simulation was ready.

This work was captured in deliverable ***D1.1*** *EGTN Foundational Position Papers and Simulation Scenarios*, where each PP analyses the (1) geo-economics impact of new trade routes for Europe; (2) new trade routes' impact on TEN-T Corridors and nodes; (3) interconnection issues of railway transport-corridors to/from Europe and (4) transition towards the Physical Internet paradigm, as well as the design of scenarios intended to assess their potential impact, taking into account long-term demand forecasting, technological alternatives, new transport infrastructures and strategic non-monetary factors. As a result, PLANET analyses, understands and assimilates the global, geopolitical, commercial, and economic imperatives of the main European trade routes, creating an initial view of the EGTN and, together with the LLs requirements, formulating the EGTN simulation scenarios.

TENT-T focused modelling and simulation

For the period in question, the deliverable ***D1.4*** *Simulation based impact of new trade routes on TEN T and disadvantaged region v1* was submitted, establishing the framework for impact analysis for TEN-T in next

report. More specifically, the results from the baseline analysis for the three most relevant new trade routes (Belt and Road Initiative; Northern Sea Route; International North-South Trade Corridor) were presented along with and the methodology and infrastructure analysis that are required for carrying out the simulation.

Legislation and EU policy to impact EGTN

During the reporting period the definition of the list of policy and legislative initiatives that are expected to have an impact on the EGTN development together with the initial assessment of the type of these expected impacts was conducted.

The analysis of EU policy initiatives involved activities carried out under the Digital Transport & Logistics Forum (DTLF) as well as initiatives related to sustainability (climate and financing), while the legislative initiatives analysis focused on European and international legislation that are expected to affect parameters such as costs, speed, the load factor and the location of terminals.

Moreover, an initial approach has been made on defining and classifying the key barriers for the implementation of the identified policy & legislative initiatives.

The approach and results of this work were detailed in ***D1.6*** *Legislation and EU Policy to impact EGTN v1*.

Development and validation of the first prototype of PLANET's Integrated Modelling Capability

The definition of the PLANET integrated modelling capability, based on scenarios from PPs, is a key achievement of the PLANET project and is capable to model a range of technologies (PI, blockchain, AI, optimization for decision-making and cargoloop). It is a framework to combine quantitative models in a pipeline, enabling the measurement of the impact of different ICT and T&L innovations on transportation use cases in an EGTN context.

The first prototype pipeline was based on LL1 use case, capturing, by using modelling scenarios, the impact of PI, AI, optimization for decision-making, and Blockchain on a corridor for containerized cargo between China and Madrid. The dry run results indicated that load factor and reliability for the China-Madrid corridor can be improved by 20% if optimization, AI and blockchain are implemented.

This work was described in ***D1.8*** *Simulation-based analysis of T&L and ICT innovation technologies v1*, resulted in a valuable thought experiment to further WP1's understanding and development of the EGTN concept – which is central in PLANET.

Definition of EGTN layers, components and strategic vision

An initial overview of the three interactive layers composing the EGTN was provided and preliminary answers to the questions regarding its physical and technological infrastructure as well as its governance form were provided. In addition, the simulation exercises which will provide the input for the definition of the infrastructure layer of EGTN concluded during this second period of the project. As a result, initial definitions of the following points were performed:

- Initial definition of the minimum required technological functionalities by the PLANET platform in order for the EGTN to be able to operate under the PI paradigm. These requirements guide the platform design.
- Initial definition of the appropriate governance model (bottom-up approach) for the development of the PI network. The simultaneous application of PI in the entire TEN-T is not feasible, therefore a governance model that can support the progressive development of the PI network is needed.

In the matter of defining the Physical infrastructure of the EGTN, significant progress was achieved on the methodology that will ensure that all significant parameters and uncertainties will be considered in future simulations. This will facilitate the rational allocation of funds for PI development in alignment to the progressive development of the PI network.

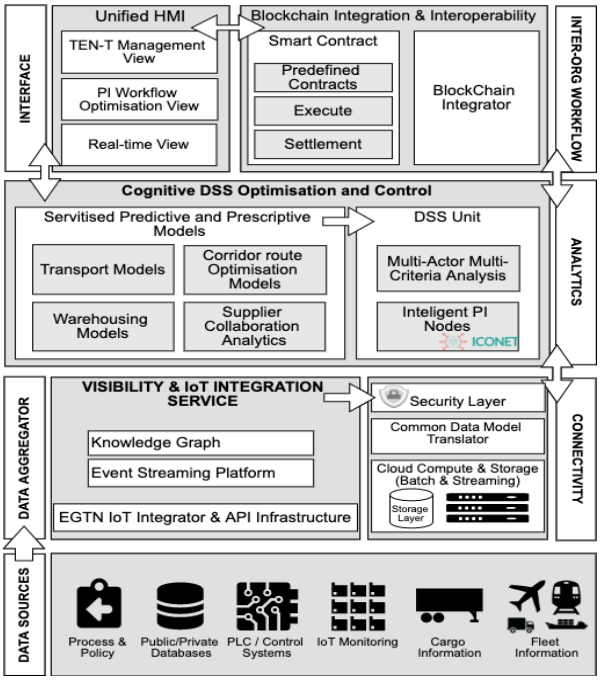
Deliverable ***D1.10*** *EGTN Reference Specification v1* provides an initial description of the EGTN vision for 2030 and details on its three constituting layers based on the results of the work undertaken by other WP1 tasks.

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

Part of the infrastructure specifications have been collected through the deliverable ***D2.1*** *Open EGTN Platform Architecture v1*, based on the stakeholders needs. This deliverable documented the open EGTN platform architecture and prototyped a cloud-based, low entry-cost collaboration platform to facilitate an integrated multimodal freight transport. To achieve this, specifications and requirements were collected from key PLANET actors driven by their business and technical needs and considered together with WP1's EGTN specifications and outputs from past Horizon 2020 projects. This input enabled the design of the architecture and definition of detailed deployment strategies. Finally, the proposed architecture ensures deployment of tools and interfaces in a secure manner and can facilitate seamless integration of logistic services.



PLANET EGTN platform High-Level Architecture

Furthermore, various datasets that had been obtained from Cosco, DHL, and CityLogin on the first year of the project haven been uploaded to the platform for testing its functionalities. Finally, A Kubernetes cluster is available to support containerized services, where an initial version of the connectivity service (T2.2), the DSS system (T2.4) and the blockchain interoperability service (T2.5) are already deployed in the Kubernetes cluster.

Additionally, other two additional datasets from FV and BlockLab were identified. Initial architectural diagrams have been created for the service layer interconnection. Work has been done related to the workflow between FV and BlockLab, as well as the integration of eCMRs from BlockLab to the Kafka system.

Finally, the integration of some of the early datasets such as the Cosco one was carried out as well as the blockchain and the PI Hub Choice services.

IoT and connectivity infrastructure components of EGTN

Main achievements recorded in this period are related to the deliverables ***D2.3*** *EGTN IoT infrastructure v1,* ***D2.5*** *EGTN Connectivity Infrastructure v1* and ***D2.7*** *EGTN Transport Data and Knowledge Models v1*, where these initial specifications are defined.

Starting with the deployment of the initial version of the EGTN Connectivity Infrastructure services and completion of the specifications of the EPCIS 2.0 on the initial months, the definition of multiple IoT service operators and standardised access have been achieved. The definition of the smart pallet service has been enhanced by the ICONET advancements and its standard representation is completed. The Kafka cloud platform for the IoT have advanced.

During this period, the EGTN platform was expanded with the ingestion capability of weather data and sensors. This IoT data ingestion process is also supported by SIRMA, collecting data from Kafka and extending the data model with weather and IoT sensors data support.

Forecasting, optimisation and multi-actor multicriteria analysis

Regarding the optimisation and prediction, the deliverable ***D2.9*** *EGTN Support Services based on Big Data analytics Models* has been submitted to get a general overview of the preliminary results of AI based predictive models.

The definition of interconnection services between data input/output have been defined based on setting an architecture footprint to interconnecting the services identified on the WP2 and the HMI dashboard.

Data from the LL3 for the application of CO_2 calculation footprint has been further acquired. Regarding this topic, evaluations to determine the availability of parameters in the new data to calculate higher resolution of CO_2 quantifications are being carried out. The implementation of pallet and container service pipeline modelling has been completed, achieving the subtask ST2.3.2. Work towards complete containerization (ST2.3.4) and an extended evaluation of the performance of this service is currently taking place. Collaborative work from all the WP2 project partners has taken place to determine further interconnections across services, their outputs and inputs towards the HMI dashboard.

Aligning with the part of the multi-criteria DSS analysis, two deliverables have been submitted. The deliverables ***D2.11*** *Multi-Actor Multi-Criteria Analysis DSS v1* and the ***D2.13*** *Intelligent PI Nodes and PI Network services v1* cover the implementation of MAMCA methodology for the development of the TEN-T network and its integration to global corridors considering both infrastructural and technological advances and the development of algorithms that utilise the advantages of the PI, enabling smart decisions for the T&L plannings.

Implementation of solutions DSS and Intelligent PI nodes in different use cases has been carried out, developing last mile logistics dynamic collaborative solution using datasets provided by CityLogin to run route optimization algorithms and processing Cosco datasets regarding containers and their destinations to measure optimal routes and estimate delivery destinations collaborating with FV.

Blockchain EGTN distributed ledgers and Smart Contracts

In this second period the deliverables ***D2.15*** *Integration and Interoperability of proprietary Blockchain Systems for Seamless Global Trade Workflows v1* and ***D2.17*** *EGTN smart contracts and associated PI motivated workflows in the context of SLA management v1* have been submitted, covering the integration and interoperability as well as the workflow of smart contracts and associated PI.

This has been complemented by the development of the blockchain front end initiated on the EGTN platform in order to unify the different back end blockchain systems that will help to facilitate and support workflows. For the purpose of gather the transactional requirements of smart contracts and their use in LLs, several workshops have been held.

To test the interoperability of smart contracts in the EGTN, a pilot test has been carried out with LLs' partners. A pilot to test the use of smart contracts and identify possible points for improvement was carried out in LL1. A general initial architecture for the use of these smart contracts has been established with WP2 partners.

The feedback received from LL1 partners (COSCO and DHL) has been used to refine the smart contract exchange requirements and the final architecture between LL1 and LL2 scenarios was established by KON, INLE and BlockLab.

Unified interface to EGTN Data and support Services

To establish an initial implementation of the Human Machine Interfaces and consolidate the results covering the technical specification, the deliverable ***D2.19*** *Unified HMIs implementation and technical documentation v1* has been submitted.

An initial prototype of the HMI has been developed and put online, the prototype dashboard includes a web-based solution enabling cross-browser and multi-device compatibility while at the same time it offers users' (with different access roles) flexibility and different filtering customizable capability to reinforce value-driven insights of the EGTN network.

The outputs of the EGTN services deployed have been collected and the initial APIs design. Regarding the security measures, the use of JSON Web Token and anonymisation and management techniques were

discussed. The effectiveness of using GPU nodes and servers has been also studied to determine how these technologies can enhance the outputs of WP2 Services and WP1 Simulations, resulting in increased visibility.

Mongodb and Kafka streaming services of the EGTN platform were initially connected and is expected to be perfected with data that is not yet available.

WP3 PLANET Living Labs

WP3 has been designed to provide both an experimentation/innovation environment and testbed for EGTN solutions along three global corridors. Each PLANET LL has different context and complementary business and technology focus with strong inter-LL knowledge exchange. Also, each LL is investigating and testing key elements of EGTN.

The first stage of LL1 has mainly focused on the technological part of the IoT, where the first devices were received in Valencia and the first tests and trials were carried out, from which it has been possible to collect an initial list of parameters and data from these IoT sensors in line with the use case. Although further iterations are pending regarding these tests, the technical solutions are becoming more mature and aligned with the business needs.

The HMI for the LL1 has been validated and tests regarding blockchain interoperability has been demonstrated by dummy events, that will be demonstrated in a real framework in the coming months.

For the LL2, its first two Use Case have been developed in close collaboration with WP2 ensuring the basic principles of alignment and integration with the EGTN infrastructure. This includes the sharing of data, as well as making publicly available the basic (Blockchain) technology developed and tested in them. The testing of this UC1 blockchain platforms was carried out with a real demo, and it is planned to be applied also in UC2. A couple of services have also been identified for UC1 from the EGTN platform related to the CO_2 emissions and the routing optimisation services.

In LL3, potential analytic solutions to be developed by EGTN for estimation and prediction of logistic KPI have been initially selected. It is also set that in both use cases the EGTN infrastructure will be integrated with EPCIS that will store the logistics events data from either IoT sensors or available data bases of business partners involved in the logistic flow. The first IoT tests have been carried out during this period. LL3 will integrate with PP by providing .xls sheets and scanned documents, with a software simulating the process and will use Apache Kafka's PUB SUB mechanism, which is the native way of passing data to EGTN platform. RS will provide data from sensor devices and their TMS. Also, a mitigation strategy has been put forwards to the impact of the war in Ukraine.

In relation to these three LLs of the project, a deliverable has been presented for each one of them where these first steps are collected, respectively speaking they are the deliverables ***D3.1*** *LL1 Specification and Baseline measurements,* ***D3.2*** *LL2 Specification and Baseline measurements* and ***D3.3*** *LL3 Specification and Baseline measurements*.

This WP also aims to develop a generic Use Case based on the PLANET's LLs in order to facilitate the adoption of the EGTN platform from other EU T&L stakeholders. This EGTN generic Use Case is under development, combining generic elements from the three Living Labs and the tools and services that the Open EGTN platform offers or will offer to the different T&L actors. The initial approach has been documented on the submitted deliverable ***D3.7*** *EGTN Generic use case v1*, offering a first analysis of the services hosted on the platform. During this period, an initial identification of the KPIs to be measured in the EGTN Generic Use Case have been completed and agreed in close collaboration with the PLANET Consortium as well as customizing a Value Network Analysis methodology according to the project's needs.

WP4 Steering innovation and building capacity towards EGTN

The work of this work package was kick at M18 as per project timeline and WP4 aims at building better understanding, provide support and build capacity toward EGNT development by raising awareness regarding EU role in the geo-economic context and technological innovations which can be adopted by T&L networks, business, and policy makers.

The team has performed a desk review and consulted with the WP4 team to determine the topics, structure, and format of the briefing sheets. These sheets will be designed to inform decision-makers about the significance of freight and how emerging technologies and concepts can help the freight sector transition to more sustainable practices. It also establishes internal synergies that have been found between WPs and Tasks. The development of these briefing sheets, case studies and policy guides are underway.

Regarding to the Open-Source libraries that this WP also addresses, PLANET's Gitlab has been set up and WP2 repositories have started to be upload, together with its code base.

From the second half of the annual period, tasks related to producing a roadmap for PI-facilitating technologies started along with the recommendations for PLANET standardisation and the structure to be followed in their respective deliverables ***D4.4*** *PI-facilitating technology Roadmaps for EGTN* and ***D4.5*** *Recommendations for PLANET standardisation* has been defined.

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, Advisory Board members had provided comments and guidance within three identified clusters, namely 'Stakeholder Analysis', 'PLANET vision and EGTN' (incl. position papers), and 'Modelling and Simulation'. In addition, three dedicated meetings were prepared by ESC and held to present PLANET's project and outputs to the Advisory Board members as well as discuss these topics with them. Other actions included individual interviews conducted to obtain observations and recommendations from the Advisory Board the overall activities around the Advisory Board and the recommendations obtained for the aforementioned clusters are summarised in Deliverable ***D5.2*** *Observations and Recommendations of the Advisory Board v1*.

On the other hand, the initial preparation phases for creating specific Business & Commercialisation strategies for the PLANET Key Exploitable Results (KERs) have been taken. PLANET Business Model Innovation Game has been tested, individual videoconferences and face to face meetings have been maintained with the partners of the results of PLANET and initial business model canvas' have been filled in by these partners. Currently, the information collected is being analysed by PNO to identify the relevant KERs of the project that have possibilities for market uptake in the future and follow-up is being done with those partners.

Finally, the main communication and dissemination actions, activities and materials carried out and performed during the second year of the PLANET project have been summarised in the following section of the report.

A review of Communication and Dissemination actions conducted

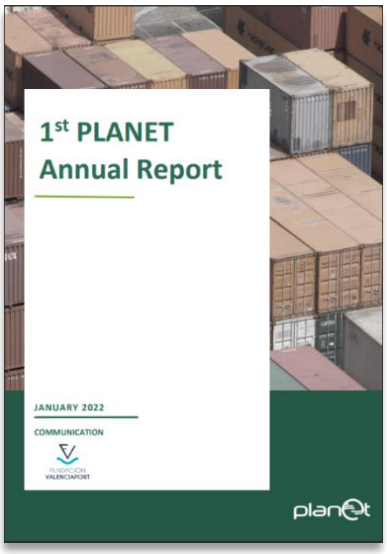
Several actions have been conducted by the Communication and Dissemination (C&D) Team during the second year of the PLANET Project. You can find all the C&D materials and related tools and resources **here**.

Focusing on C&D materials, the PLANET's promotional video and brochure, introducing the project objectives, its LLs and the value that the project brings, were produced and published, together with the five newsletters and five factsheets, which not only explain the project but also its achievements. Additionally, PLANET's First Annual Report was produced and published in January, summarising the main achievements of the first project period (M1-M12) and providing a recap of the deliverables submitted and milestones met.

H2020 PLANET project: Paving the way for smarter, more integrated transport and logistics

OPEN VIDEO

PLANET's brochure



PLANET's First Annual Report

C&D Material	Dissemination subject
Newsletter #1	The aim of the PLANET Newsletter #1 is to give you a first project approach and to present the latest project news and developments as well as the upcoming events.
Newsletter #2	The aim of the PLANET Newsletter #2 is to showcase the emerging global corridors considered in PLANET and to analyse the key drivers of these emerging corridors as well as their impact on the TEN-T network. It also includes information on the latest PLANET events and the main PLANET events that will take place in the near future.
Newsletter #3	The aim of the PLANET Newsletter #3 is to presents PLANET's 4 Foundational Position Papers for an EGTN, which pave the way for EGTN's initial vision and the simulation scenarios for assessing its potential impacts. It also includes a summary of the public deliverables submitted so far and information on the latest and upcoming PLANET events.
Newsletter #4	The aim of the PLANET Newsletter #4 is to provide the definition of the reference specifications for the future PI-oriented EGTN as well as an initial overview of the three interactive layers that will constitute it: the physical, the technological and the governance layer, and to explain the EGTN infrastructure and services. It also includes a summary of the new public deliverables submitted, information on the latest events attended by PLANET and on the article published in the Italian magazine *Il Giornale della Logistica*.
Newsletter #5	The aim of the PLANET Newsletter #5 is to present the projects PLANET has started to collaborate with, a summary of the new public deliverables submitted from Newsletter #4 to this latest edition and to give details on the upcoming events.
Factsheet #1	The aim of the PLANET Factsheet #1 is to describe in more detail WP5 partners, explaining their relevance for the project and their role within the project, as well as their main contributions made so far. Finally, at the end of the document the deliverables linked to WP5 were introduced, through which you will be able to deepen the work developed so far in this work package.
Factsheet #2	The aim of the PLANET Factsheet #2 is to describe in more depth the partners of WP4. The factsheets explain the relevance of each partner to the PLANET project and their role within it. They also address the main contributions WP4 partners have made so far.
Factsheet #3	The aim of the PLANET Factsheet #3 is to describe in more depth the partners of WP3. The factsheets explain the relevance of each partner to the PLANET project and their role within it. They also address the main contributions WP3 partners have made so far, as well as the deliverables linked to WP3, through which you will be able to deepen the work developed up to now in this WP.
Factsheet #4	The aim of the PLANET Factsheet #4 is to describe in more depth the partners of WP2, WP that addresses an essential part of the project. Within the factsheets, the relevance of each partner to the PLANET project and their role within it is detailed. And, as in previous cases, they describe the main contributions WP2 partners have made so far, as well as the deliverables linked to WP2, through which you will be able to deepen the work developed to date in this WP.
Factsheet #5	The aim of the PLANET Factsheet #5 is to describe in more depth the partners of WP1, explaining their relevance and role in this WP. In addition, as in previous cases, they describe the main contributions WP1 partners have made so far, as well as the deliverables linked to WP1, through which you will be able to deepen the work developed to date in this WP.

Finally, related to dissemination, it is also remarkable that PLANET partners have published numerous news about the project on their websites and social media accounts, and that 6 more press releases were published during this phase of the project, 5 on PLANET website and 1 on press and media professionals.

In terms of event, 6 partnership events took place. 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 the 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 7 R&D conferences as summarised in the following table.

Deliverable Name	Place	Date	Dissemination subject
8th International Physical Internet Conference (IPIC2021)	Virtual	16-jun-21	PLANET Project took part at the 8th International Physical Internet Conference (IPIC) between 15th-16th of June 2021 with a dedication session on its objectives and LLs.
International Summer School 2021: Logistics & Marketing: market innovations	Virtual	7-jul-21	During the presentation *Digitalization of supply chains – theory and practice* the PLANET project's basic assumptions and solutions used in LL3 was presented. A presentation of possibilities for standardising information monitoring in the intermodal supply chain (WP4) was also given.
BLMM2021 - Business Logistics in Modern Management Conference	Osijek, Croatia	07-08-oct-21	PLANET took part at the Session 2 - EFFICIENCY IN NETWORKS AND LOGISTICS PROCESSES – SUPPLY CHAIN TECHNOLOGY TRENDS presenting the paper *Review of intelligent solutions to optimise logistics processes and improve efficiency*. 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.
Webinar Artificial Intelligence in planning, simulation and forecasting	Virtual	26-oct-21	During the topic *Demand forecasting and intelligent planning based on AI*, PLANET was presented as a project that visualises the applications of implementing the AI in T&L, introducing, to that end, the LL.
European Intermodal Summit (2nd edition)	Virtual	30-nov-21	PLANET's vision and methodology, as well as the analysis PLANET Project is conducting on intermodal transport, with special emphasis on the Eurasian Corridor, were presented.
Intermodal transport and logistics: the roles of the government and business to make freight transport more sustainable	Virtual	10-dec-21	During the presentation *Intermodal supply chain digitalization – Presentation of solutions for information integration of business partners* a presentation of the solutions used in the PLANET project, mainly LL3 was given, aiming at raising awareness among potential supply chain stakeholders along the New Silk Road.
H2020RTR21 European Conference	Brussels	29-30-mar-2022	During the *ICT infrastructure for road transport session* the PLANET project was presented.

Finally, PLANET produced and published 2 articles and 1 scientific publication, all of them available on the PLANET website **here**.

The article about the PLANET project published in the Italian magazine Il Giornale della Logistica highlights the value of the project for European T&L. To that end, the piece presents the PLANET Project and its LLs through some EU research topics. It is also accompanied by short testimonies from PLANET partners. In addition, the EU Research magazine published another article about the PLANET project, emphasising the value of the PI and how PLANET is working in this area to help transport and logistics companies work in a smarter and greener way.

Regarding the scientific publication, the paper *Review of intelligent solutions to optimise logistics processes and improve efficiency* was published in the proceedings of the International scientific conference Business Logistics in Modern Management 2021, Osijek. In this paper, the authors focused on conducting a review of available modern and intelligent solutions that not only optimize logistics processes but also improve the competitive position of enterprises in supply chains.

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FUNDACIÓN VALENCIAPORT

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Acknowledgements

This project has received funding from the European Union's Horizon 2020 research and innovation programme under the Grant Agreement No 860274.

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