1st PLANET Annual Report

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

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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.

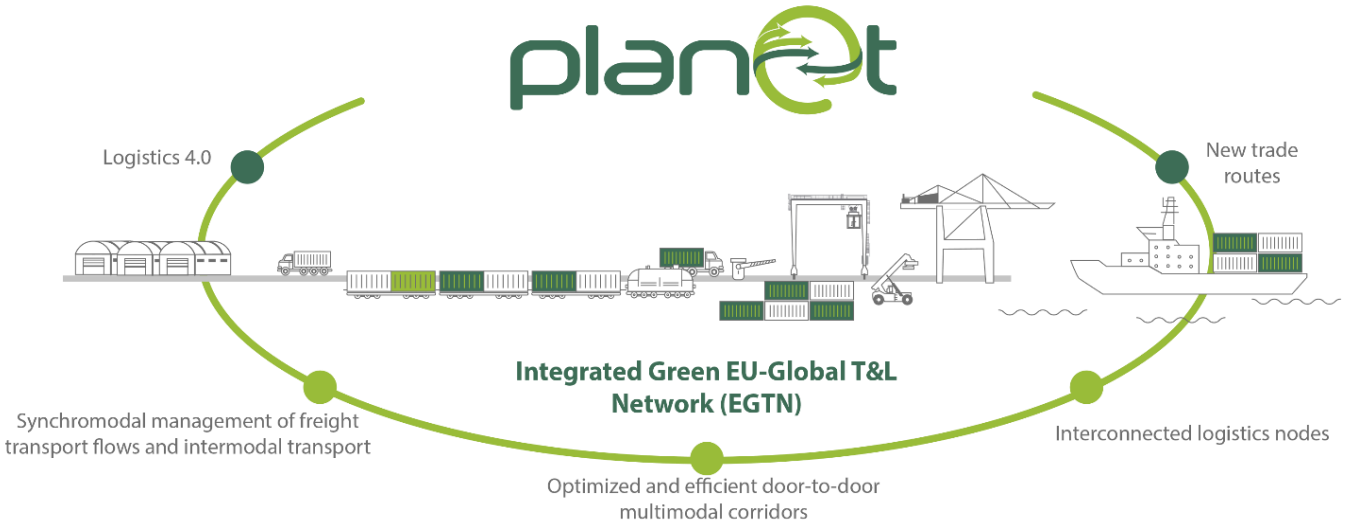
The 1st PLANET Annual Report is a compilation of the project's achievements accomplished by all members over the course of the initial first twelve months of the project (M1-M12). The report highlights the most relevant key achievements of the project supported with the assistance of the various tasks and deliverables that have been accomplished throughout this period, as well as the most significant milestones and communication and dissemination achievements.

As a reminder of the vision and objectives of the project, in the first part of the report an overview of the PLANET project is provided, explaining the challenges it faces and the approach it follows.

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**

PLANET also delivers 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.

Deliverables and Milestones

Deliverables

In the first year of the project, several deliverables have been realised, most of them dealing with the first aspects of the project on which to establish common ground for the integrated simulation and modelling capability of the project and realising the EGTN. At a public level deliverables ***D1.2, D5.1, D6.1*** and ***D6.3*** set out the first steps of the project, while ***D6.2***, ***D7.1***, ***D7.2***, ***D7.3*** and ***D7.4*** have made up a large part of the first deliverables in this first year of the project at a private dissemination level. Finally, an overview of those deliverables is presented in the following table.

No.	Deliverable Name	Lead Beneficiary	Dissemination Level	Due Date	Deliverable Description
D1.2	**Modelling & Simulation Capability**	ITA	Public	M12	It provides a detailed description of the available models for representing the freight transport processes in the intercontinental corridors examined in PLANET. It addresses the characteristics of those models along with their main functionalities, exploring complementarity and analysing the data necessary to assess the use cases as realized in the project's LLs.
D5.1	**Stakeholder Analysis Report**	PNO	Public	M6	It provides a stakeholder analysis, identifying important European stakeholders that are considered relevant for PLANET and gathering information used to mobilise them to support the project's exploitation objectives.
D6.1	**Project Management Handbook – Management Plan**	INLE	Public	M2	It provides an overview of the most relevant managerial aspects of the project, setting the rules and responsibilities of the partners aimed at ensuring a good quality and disciplined control of the work progress.
D6.2	**Project Quality Handbook and Annual Quality Reviews**	ILIM	Confidential	M1	It presents a handbook for the project partners. It aims to outline rules, mechanisms and processes that are established to maintain a certain quality level in the whole project structure and its outcomes.
D6.3	**Initial Data Management Plan**	INLE	Public	M6	It covers the PLANET's Innovation and Data Management procedures as well as internal General Data Protection Regulations compliancy policies.
D7.1	H – Requirement No. 1	ILIM	Confidential	M6	These deliverables analyse the project's objectives and Ethics considerations as well as an analysis of research actions involving human participants prevailing in the project. They cover aspects such as the procedures and criteria that will be used to identify/recruit research participants; how to handle the personal data collected in compliance with the policy and legal requirements of the EU General Data Protection Regulation and other applicable national and EU regulations with regard to research projects within the EU H2020 Research Programme; how the handling of data of the activities undertaken in non-EU countries in PLANET will be performed.
D7.2	PODP – Requirement No. 2	ILIM	Confidential	M6	
D7.3	NEC – Requirement No. 3	ILIM	Confidential	M6	
D7.4	EPQ – Requirement No.4	ILIM	Confidential	M6	

Milestones

In order to align with the proposed objectives of the project, a set of milestones that had been set for this time period was designed and the achieved milestone during the first of the project are presented below.

No.	Milestone Title	WP Number	Lead Beneficiary	Due Date	Means of Verification
MS1	Project Plan	WP6	INLE	M1	Detailed project plan (including KPIs for each 6-month period) documented and approved
MS2	Modelling and simulation capability for design and analysis of geo-economics aware EU Global Trade Logistics Network	WP1	CERTH	M6	Initial Simulation capability including models and test data available for simulation testing of research ideas/ from WP2 and LLs. First version of D1.2.
MS3	Reference specification of an Integrated Green EU-Global T&L Network [EGTN]	WP1	CERTH	M12	Detailed V1 EGTN specification including requirements for the support platform

The milestone **MS1** was directly related to WP6 Project Management and its deliverables, so the detailed plan of this milestone can be verified with the detailed project plan and the establishment of the various KPIs that have been made in the deliverable ***D6.2*** *Project Quality Handbook and Annual Quality Reviews*.

With regard to establishing the simulation and modelling capacity for the EU Global Trade Logistics Network situation analysis pursued by the **MS2**, it has been verified by the first simulation capabilities, models and data available for simulation (WP1 EU-Global T&L Networks) and supported by the first version of the deliverable ***D1.2*** *Modelling & Simulation Capability*.

And milestone **MS3** has been verified with the first version of the EGTN solution specifications and its requirements that have been gathered over the first year of PLANET.

Achievements

Over the first year of the project, a wide range of activities have been carried out with a focus on meeting the proposed PLANET objectives. The main achievements during the first phase of the project (M1-M12) were mainly related to WP1, WP2 and WP3. You will find all the details 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 identifying the Reference Specifications of Integrated Green EU-Global networks. During the first year of the PLANET project, significant progress has been achieved towards the goal of realising the EGTN. The major achievements related to this WP are listed as follows.

PLANET's Position Papers

The Position Papers (PPs) are a crucial element of the PLANET project as they will help to assess the impact of emerging trade corridors on the TEN-T network and to create an initial view of the EGTN. During this period, many efforts were focused on developing the PPs and defining the strategic scenarios to be considered based on LLs requirements and results obtained through the PPs. To do so, the research questions among the PPs were cross-validated and the value proposition of the PPs to the LL was identified. The preliminary outcomes in the definition of the list of policy and legislative initiatives expected to have an impact on the development of the EGTN were also incorporated into PPs.

As a result, the first drafts of the four PPs, focused on ***(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*, were finalized and consolidated towards drafting plausible future scenarios for the development of EGTN using a methodology developed within the project.

The testing of these scenarios will use the project's integrated simulation and modelling capability and will help define the specifications for realising the EGTN. To be able to do so, a mapping of the available modelling and simulation capability of the project was also performed through a series of workshops, defining the possible connections and synergies between models of same/different types and orientation.

PLANET'S approach towards the definition of the EGTN and EGTN Modelling & Simulation Capability

Initial discussions on the EGTN definition, its layers components and main characteristics took place. The EGTN Modelling and Simulation Capability was also formalised to facilitate comprehensive analysis of the impact of emerging trade routes, national strategies and technological concepts on trans-continental freight flows and modal split to/from Europe and on the required interfaces to the TEN-T. To achieve this, a compilation of all pre-existing simulation models was conducted, along with the evaluation of the necessary inputs and outputs for each model, to facilitate the integration and harmonization of data and results.

This work was captured in deliverable ***D1.2*** *Modelling & Simulation Capability*, where the representation models of the freight transport processes in the intercontinental corridor are collected and detailed, highlighting their key features and functionality, evaluating their needs. This has contributed further to achieve the description of as-is/to-be scenarios of the three PLANET living labs, aligning with EGTN systems scope, and ensuring complete alignment with the Living Lab users' aspirations.

TENT-T focused modelling and simulation

For the period in question, the 2019 baseline for the impact on TEN-T / EGTN of the upcoming trade routes was established and preparatory works were carried out for the simulation and analysis of emerging trade routes in the TENT-T and disadvantaged regions. This included the precise definition of the new trade routes to be analysed along with the key parameters for each one, as well as the preparation of the relevant models and datasets.

WP2 PLANET Cloud-based Open EGTN Infrastructure

Purpose of WP2 outputs is to provide open 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.

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

During this period the main requirements of the general EGTN platform have been properly established, in accordance with the specific requirements gathered for the sections related with Knowledge Graphs and IoT, Processing and Storage, Analytics and Blockchain. In addition to this, an analysis of the current Cloud Hosting providers and their offered services in order to identify the optimal according to these established EGTN requirements and capable of covering them.

Regarding the design for service integration, governance, privacy and cybersecurity, the architecture to be followed by the software components of the EGTN platform has been designed. In this process, connector components for data source from the stakeholders ILIM, INGS, DHL and COSCO have been developed.

These advancements have led to achieve some relevant milestones for the cloud-based open EGTN ICT Infrastructure Architecture over this first annual period, highlighting that by the end of month 12, the EGTN platform was set up and running with 6 main servers up in Hetzner's public cloud and AWS GPU node was initiated and available for running programming tasks. The deployment also covered a Kubernetes cluster to support the containerized services as well as others such as Grafana, Kafka & Zooleeper, Zeppelin & Spark. The supporting data source framework layer based on Kafka and Spark has also been fully commissioned.

The EGTN service has been left deployed and ready for the integration of new data sources that are still in the process of being defined.

IoT and connectivity infrastructure components of EGTN

The architecture of the IoT service operators and standardizing access has been defined alongside a proposed connectivity of the EGTN infrastructure, designed using IoT technologies and edge computing. In relation to LL1 and LL3, the requirements for a proper IoT connectivity have been detailed, agreeing to use GS1 standards

with the partners and investigating how the information from LL3 EPCIS and GS1 data will be consumed and processed in the EGTN PLANET platform. Regarding EPCIS, EPCIS V1 data modelling is complete and EPCIS V2 modelling close to completion. The data transformation from EPCIS XML/JSON to connectivity service compatible RDF format is also well progressed. The services to consume and process ILIM data from the EGTN Kafka part have been set up and an initial version of EGTN services has been deployed on the cloud.

Forecasting, optimisation and multi-actor multicriteria analysis

Flow forecasting models have been improved and through collaboration with the LL actors, the Use Cases are evolving also for the supplier collaboration storyboards and blockchain interoperability/integration. Initial predictive transport models have been prepared while working with DHL smart volume data for flow forecasting. The Multi-Actor Multi-Criteria Analysis task is researching auctioning methods, flow analysis models and the factorisation of network performance metrics. Also key to this task is examining MAMCA alternatives for technology and Physical Internet alignment. Investigations and research into Blockchain interoperability in Living Lab Use Cases is ongoing.

Blockchain EGTN distributed ledgers and Smart Contracts

Regarding the aspects of EGTN interoperability of the blockchain systems and smart contracts, workshops covering these topics have been organised to address some first approaches to identify the background and requirements for the transactional flows of smart contracts of each LLs use case and their several scenarios that will later be developed in the ***D2.15*** *Integration & Interoperability of Blockchain* and ***D.17*** *EGTN smart contracts and associated PI*. Investigations and research into Blockchain interoperability in Living Lab Use Cases is ongoing. Central to these investigations is the possible application of SOFIE interledger to enable secure transactions between participants and devices on different IoT platforms using different blockchains.

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 LL EGTN solution has different context and complementary business and technology focus with strong inter-LL knowledge exchange. Each LL is investigating and testing key elements of EGTN.

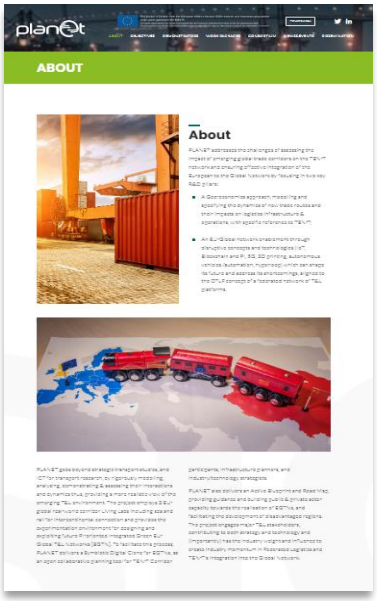
LLs' scope of work and AS-IS Business Process Analysis

The three real-world LLs have progressed in their current situation analysis (AS-IS Business Process Analysis) and future specifications. The main needs and problems affecting the actors of global transport corridors and nodes have been identified, and PLANET team works jointly on the definition of tests based on new disruptive technologies and concepts proposed and supported by PLANET's EGTN approach to overcome the selected problems.

The bases are being set to test the use of GS1 standards and IoT for a reliable, transparent, and connected Silk Road Route linking China with Poland, blockchain and other PI-related technologies and enablers for the maritime Asia-Spain and Mediterranean corridor, and a blockchain-enabled platform involving the Port of Rotterdam community and customers (and the potential of a Eurasian rail freight expansion) for enhanced synchromodality.

A review of Communication and Dissemination actions conducted

Aiming at maximizing the impact of project outputs as well as ensuring their sustainability, the C&D plan and strategy has been designed considering the status or phase of project. Accordingly, three phases in The External Communication and Dissemination (C&D) Strategy were identified: 1) Initial phase (M1-M12): presenting PLANET Project and objectives to attract attention to the project; Intermediate phase (M12-M24): disseminate PLANET's outputs/results and their value to increase engagement from external stakeholders of the PLANET Project; Closing phase (M24-M36): facilitating the exploitation of the PLANET results.



As a result, several actions have been conducted by the C&D Team. PLANET project visual identity (i.e., logo) was designed and defined from the beginning of the project, as well as the PLANET website and social media accounts. Focusing on communication materials, 39 press releases have been published, 21 on press and media professionals, 17 on partner's websites and 1 on PLANET website.

In terms of event, 4 partnership events took place. The first ones gave an overview of the project, while the last one organised by UIRR high level discussions with key railway actors on the current bottlenecks on the routs toward China were conducted. In addition, PLANET project participated in the webinar *Blockchain aplicado al transporte y la logística* hosted by Logistop and in 2 renowned R&D conferences: the *29th Plenary Meeting International Coordinating Council on Trans-Eurasian Transportation* organised by *CCTTT*, presenting PLANET, its goals and methodologies, and the event *Integration of global supply chains – monitoring of e-commerce shipments on the New Silk Road* organised by *PITD,* an online debate on identifying the needs of global e-commerce supply chains and how to address them as part of the PLANET international research project. Finally, PLANET presented the solutions used in LL3 at the *SITCIN Capacity Building Georgia* organised by UNECE, aiming at raising awareness among potential supply chain stakeholders along the New Silk Road.

Finally, the first PLANET Advisory Board (AB) members were selected, comprising a group of external advisors representing research and business interests from across the world and embracing a range of knowledge of the project's focus areas. More specifically, PLANET AB consists of IT and global trade logistics network experts aiming to offers scientific advice, provide guidance or recommendations to project consortium partners on social, environmental, technological, legal and economic factors that may influence the innovations of PLANET project.

Authors and main contributions

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