Revision history (including peer reviewing & quality control)

Disclaimer

Copyright message

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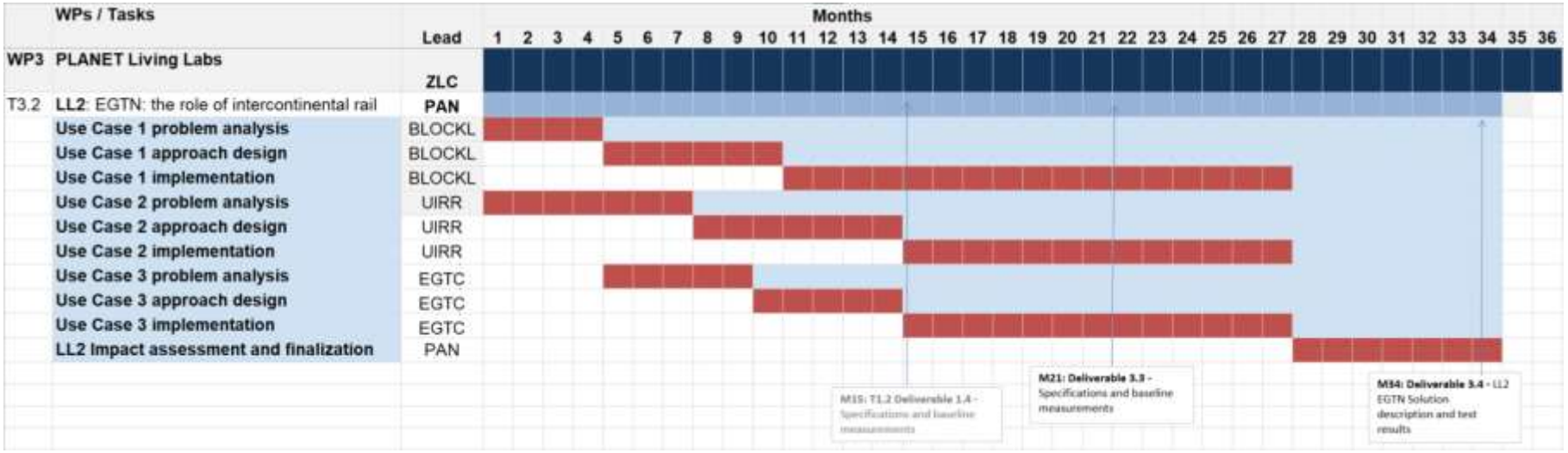
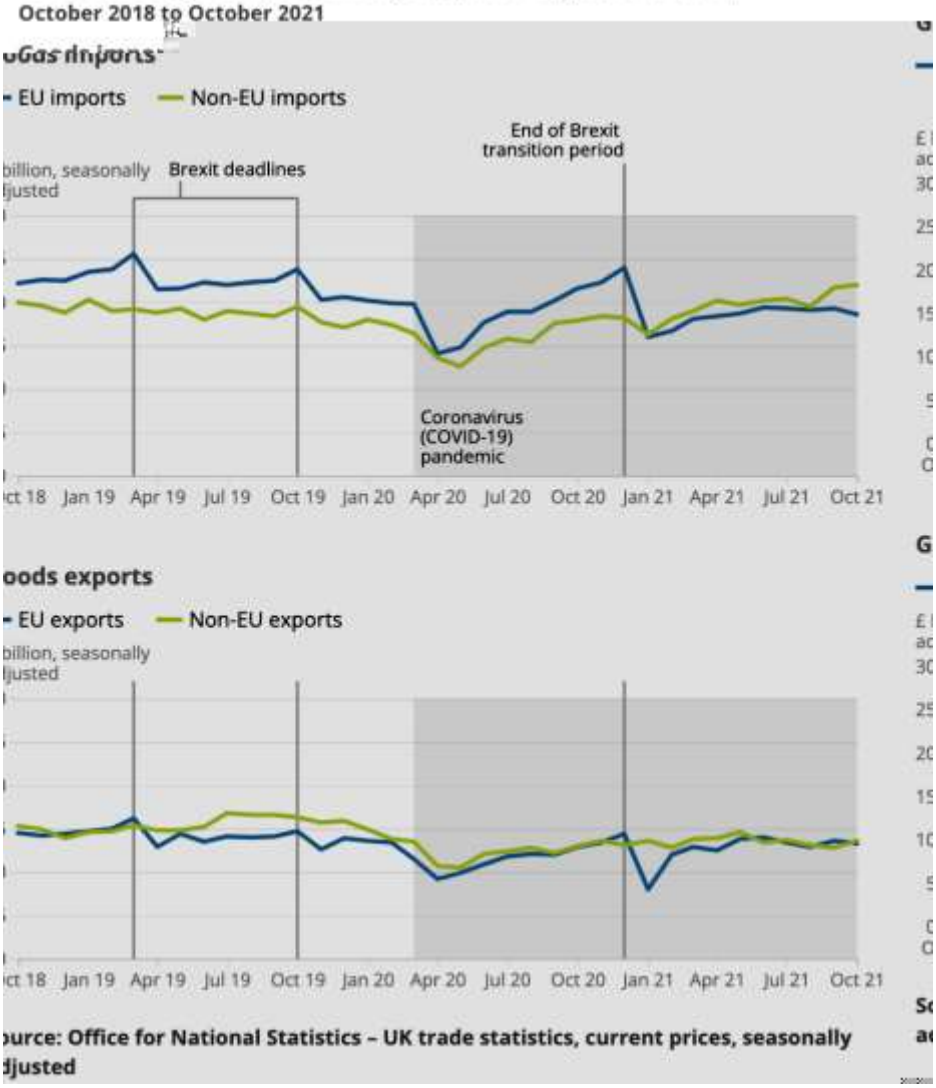

WPs / Tasks
Lead
Months
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36
WP3 PLANET Living Labs
ZLC
T3.2 LL2: EGTN: the role of intercontinental rail
PAN
Use Case 1 problem analysis
BLOCKL
Use Case 1 approach design
BLOCKL
Use Case 1 implementation
BLOCKL
Use Case 2 problem analysis
UIRR
Use Case 2 approach design
UIRR
Use Case 2 implementation
UIRR
Use Case 3 problem analysis
EGTC
Use Case 3 approach design
EGTC
Use Case 3 implementation
EGTC
LL2 Impact assessment and finalization
PAN
M15: T1.2 Deliverable 1.4 - Specifications and baseline measurements
M21: Deliverable 3.3 - Specifications and baseline measurements
M34: Deliverable 3.4 - LL2 EGTN Solution description and test results

EU and non-EU goods imports and exports, excluding precious metals, October 2018 to October 2021



Source: Office for National Statistics – UK trade statistics, current prices, seasonally adjusted

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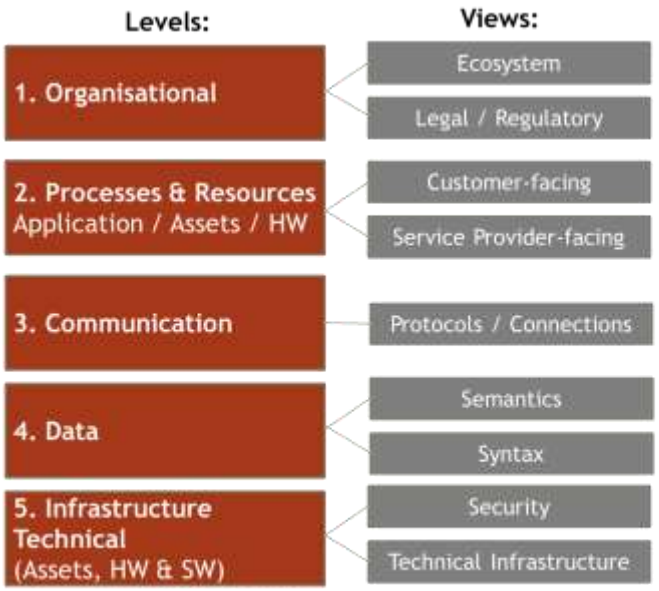

Source: Nair/Klüber (2020) DIGITAL CONTACT TRACING INTEROPERABILITY: BALANCING PRIVACY AND PUBLIC HEALTH CONCERNS TO FIGHT COVID-19, in Diplomatic Courier (25.09.2020) https://www.diplomaticcourier.com/posts/digital-contact-tracing-interoperability-balancing-privacy-and-public-health-concerns-to-fight-covid-19

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Norge
Suomi
Sverige
Россия
Беларусь
Deutschland
Україна
France
România
Italia
Türkiye
Ελλάδα
Казахстан
O'zbekiston
Türkmenistan
Монгол улс
中国
العراق
ایران
افغانستان
پاکستان
ليبيا
مصر
السعودية
عمان
اليمن
India
Niger
Tchad
تشاد
السودان
Nigeria
Cameroun
South Sudan
Philippines
Malaysia

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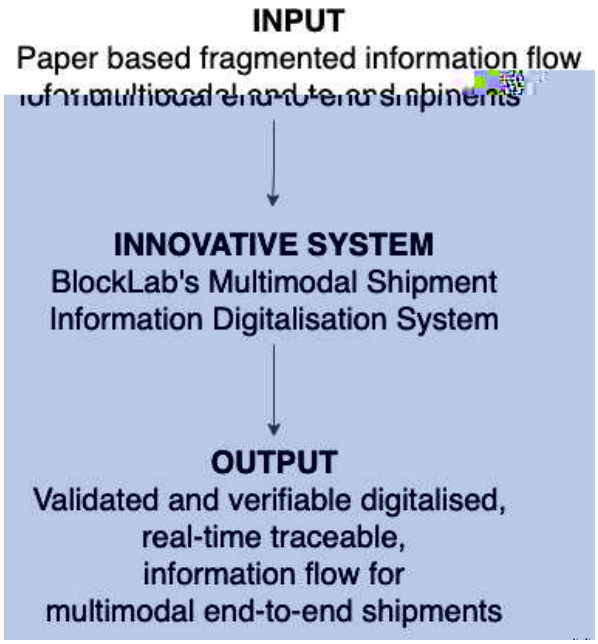
INPUT
Paper based fragmented information flow
for multimodal end-to-end shipments
INNOVATIVE SYSTEM
BlockLab's Multimodal Shipment
Information Digitalisation System
OUTPUT
Validated and verifiable digitalised,
real-time traceable,
information flow for
multimodal end-to-end shipments

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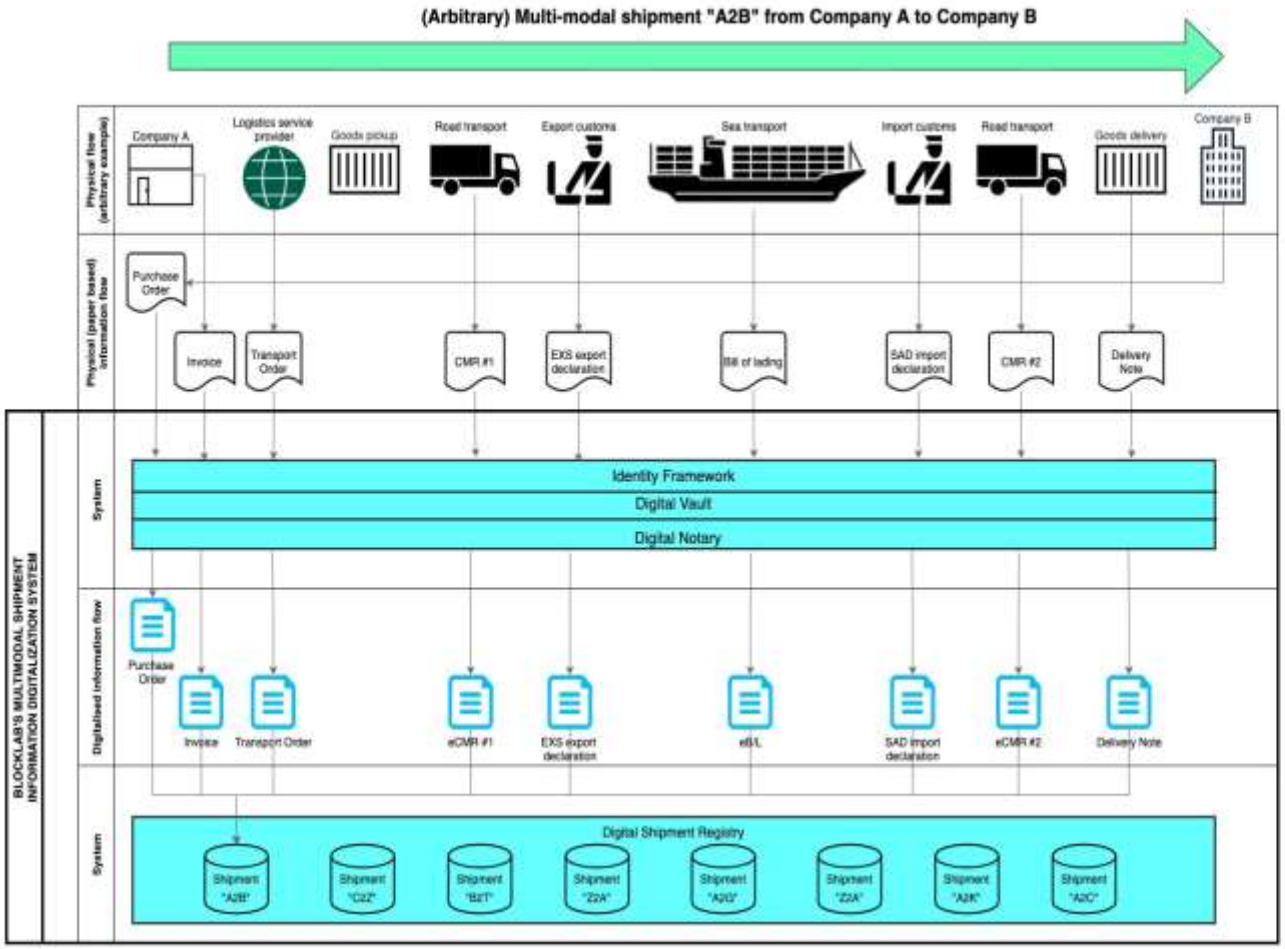


For each digitalised document, BlockLab's system provides:

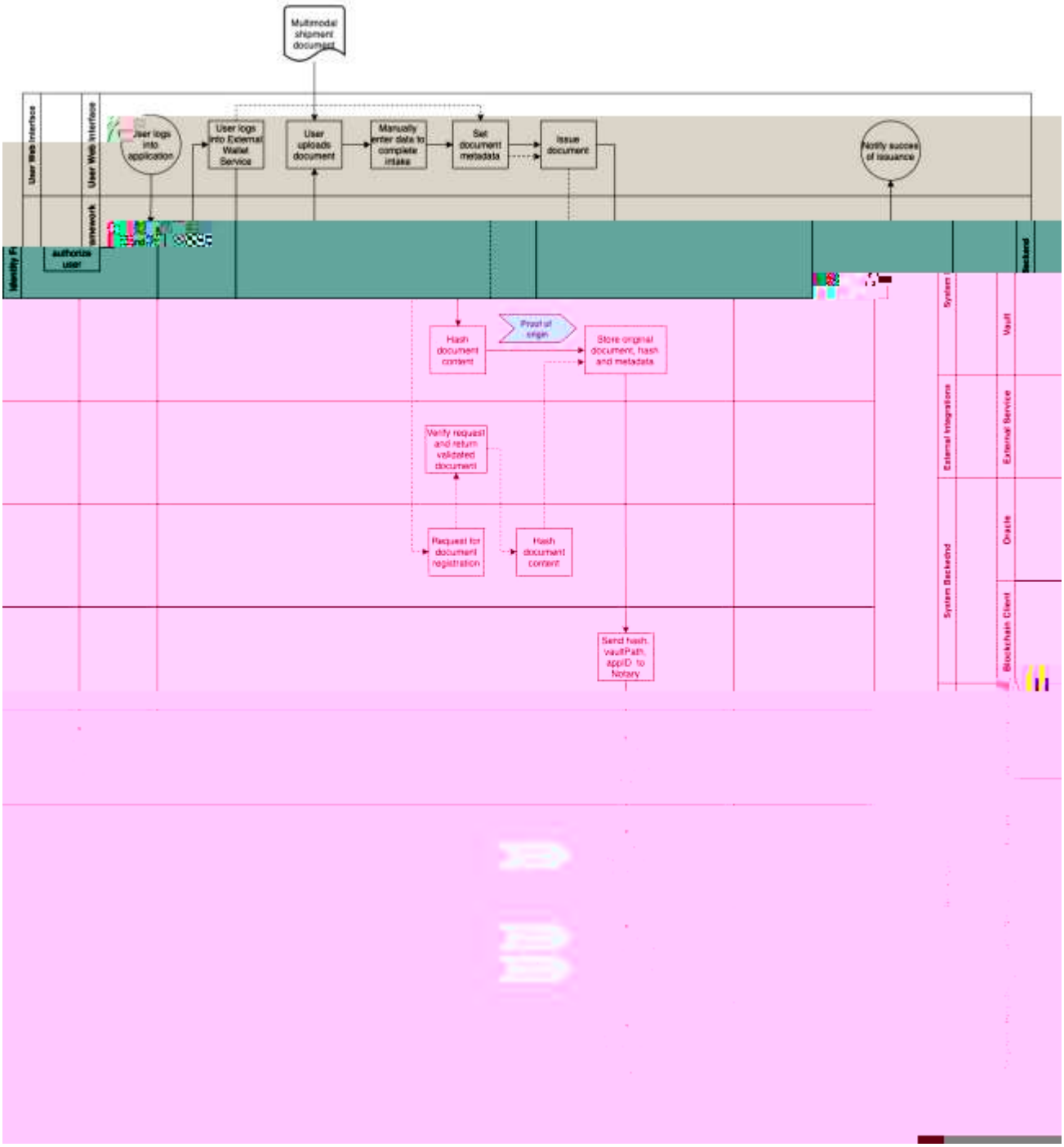
1. Cryptographical proof of existence
2. Cryptographical proof of origin
3. Cryptographical proof of ownership
4. Cryptographical proof of integrity

For each digitalised shipment, BlockLab's system provides:

1. Multi-stakeholder document upload and append capabilities
2. Multi-stakeholder end-to-end real time shipment progress tracking
3. Real-time access over validated information for authorities
4. Stakeholder document viewing capabilities
5. Stakeholder document signing capabilities
6. Stakeholder document ownership transfer capabilities

Blocklab's system supports digitalisation and configuration of any type of shipment, as long as:

- It is a business to business shipment
- The shipment involves at least a consignee, consignor and a logistic service provider
- Involved documentation is listed below:
  - Purchase order
  - Sales order
  - Commercial invoice
  - Transport order
  - (e)-CMRs
  - (e)-CIMs
  - (e)-B/Ls
  - Export declarations (EXS, ..)
  - Import declarations (SAD, ENS, EIDR)
  - Delivery Note
  - Phytosanitary certificates


Multimodal shipment document
User Web Interface
User Web Interface
User logs into application
User logs into External Wallet Service
User uploads document
Manually enter data to complete intake
Set document metadata
Issue document
Notify success of issuance
authorize user
Hash document content
Proof of origin
Store original document, hash and metadata
Verify request and return validated document
Request for document registration
Hash document content
Send hash, vaultPath, appID to Notary
Vault
External Service
Oracle
Blockchain Client

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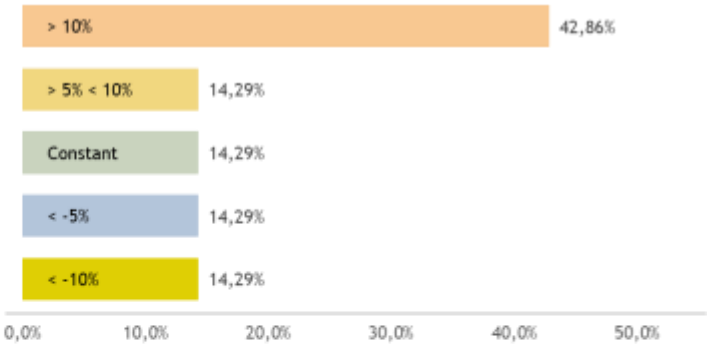
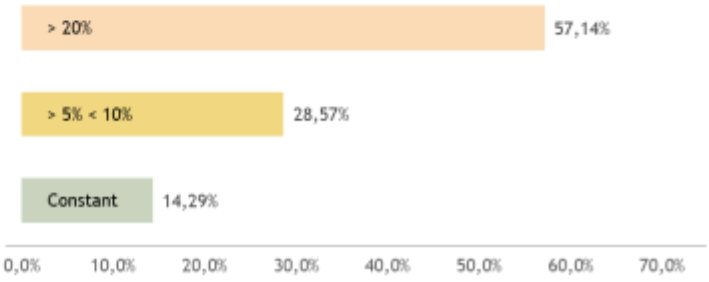
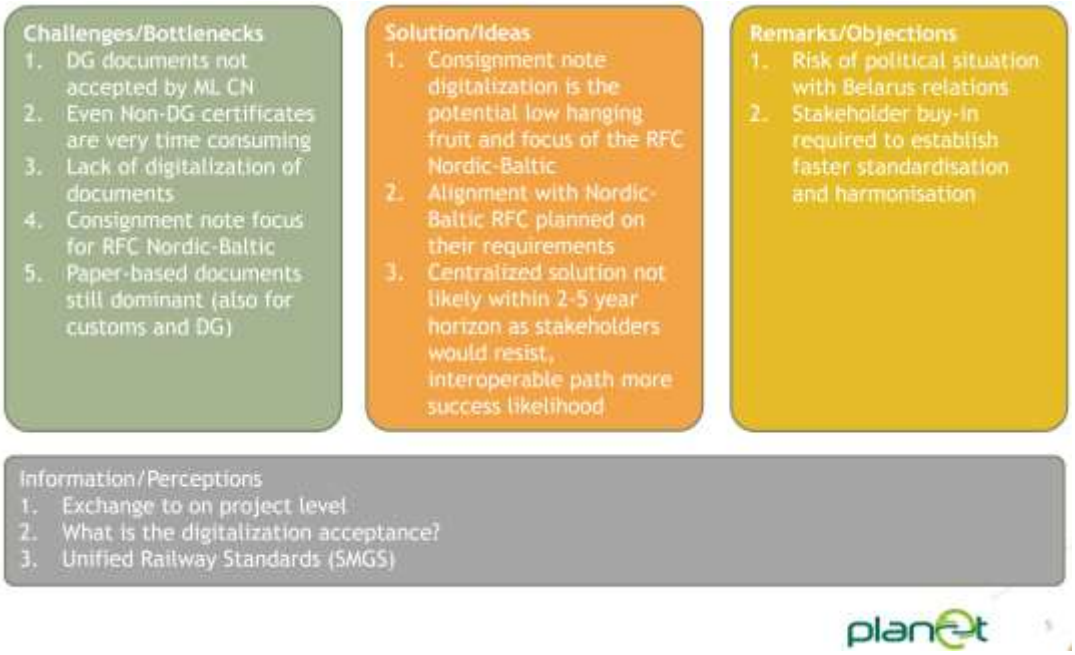
Evolution of shipping volume to / from China (last 2 years)



Expected average annual growth in rail-road transport to / from China (next 3 years)




Challenges/Bottlenecks
1. DG documents not accepted by ML CN
2. Even Non-DG certificates are very time consuming
3. Lack of digitalization of documents
4. Consignment note focus for RFC Nordic-Baltic
5. Paper-based documents still dominant (also for customs and DG)
Solution/Ideas
1. Consignment note digitalization is the potential low hanging fruit and focus of the RFC Nordic-Baltic
2. Alignment with Nordic-Baltic RFC planned on their requirements
3. Centralized solution not likely within 2-5 year horizon as stakeholders would resist, interoperable path more success likelihood
Remarks/Objections
1. Risk of political situation with Belarus relations
2. Stakeholder buy-in required to establish faster standardisation and harmonisation
Information/Perceptions
1. Exchange to on project level
2. What is the digitalization acceptance?
3. Unified Railway Standards (SMGS)
planet

Name	Description	Synchro-modality	Integr. Green EU-Global T&L Network	Interoperability innovation	New techno-logy	Growth (mid / long)	Economic viability & svc quality	Political change
1) CO2 calculator	Calculation of CO2 of intern. rail vs air vs sea	0	++	0	++	+	0	+
2) Customs document interoperability facilitation	Speed-up customs processing at the transshipment points	+	+	++	++	+	+	+
3) Commercial document interoperability facilitation	Improve processing speed structure (intern. consignment note)	+	+	++	++	+	+	+
4) Semi-trailer (partial)	Use of semi-trailers for EU-CN or partial only?	+	+	+	+	+	+	0
5) Tracking & Tracing	Improved T&T (incl. ETA) trimodal transit from EU to CN	++	+	++	++	+	+	0
6) Booking platforms	Missing end-to-end booking system vs air or seafreight	++	+	++	++	+	+	+

Legend: ++ very strong + positive, 0 neutral, - negative impact, -- very negative impact

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- ▶
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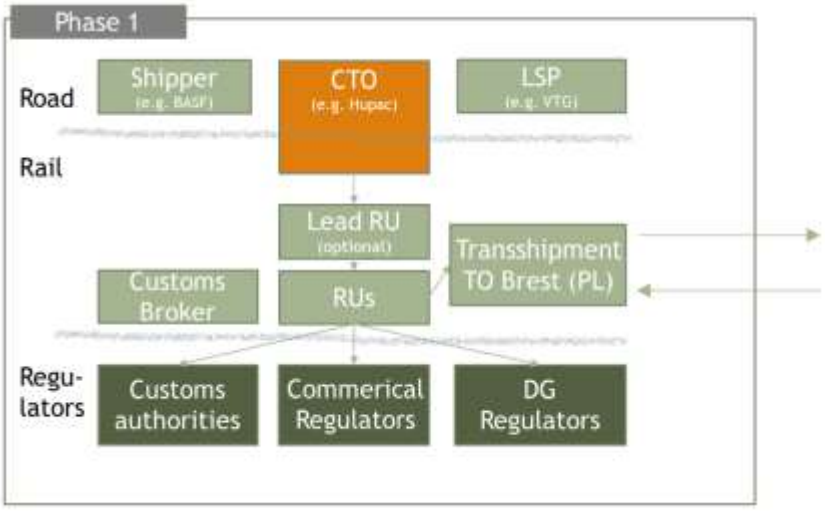
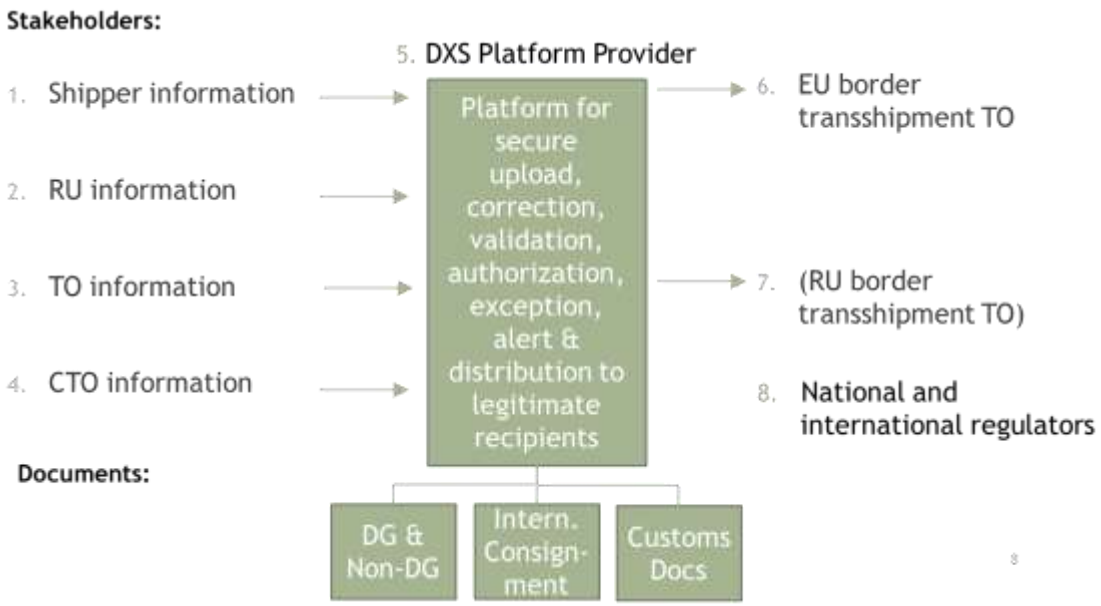
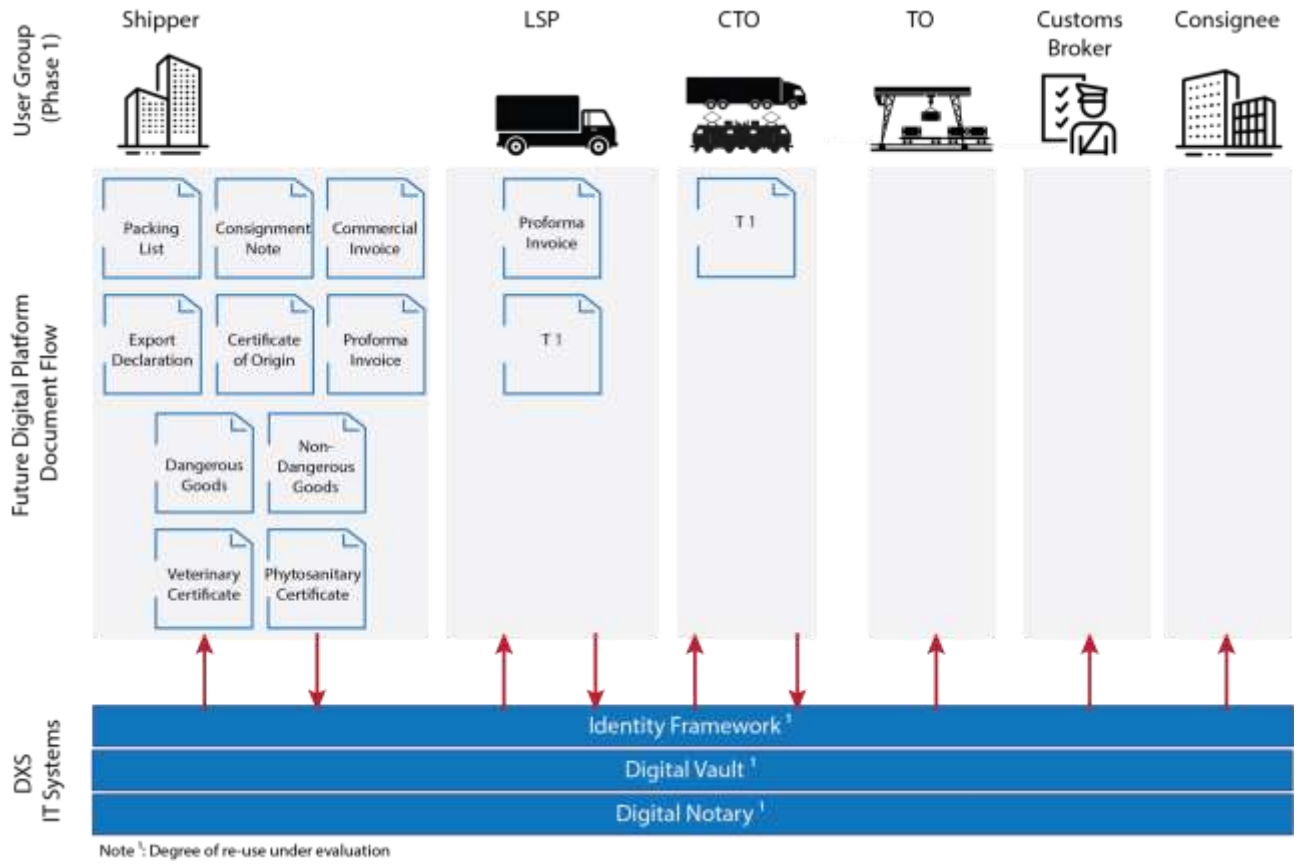

Phase 1
Road
Rail
Regu-
lators
Shipper
(e.g. BASF)
CTO
(e.g. Hupac)
LSP
(e.g. VTG)
Lead RU
(optional)
Customs
Broker
RUs
Transshipment
TO Brest (PL)
Customs
authorities
Commerical
Regulators
DG
Regulators


Stakeholders:
5. DXS Platform Provider
1. Shipper information
2. RU information
3. TO information
4. CTO information
Platform for secure upload, correction, validation, authorization, exception, alert & distribution to legitimate recipients
6. EU border transshipment TO
7. (RU border transshipment TO)
8. National and international regulators
Documents:
DG & Non-DG
Intern. Consign-ment
Customs Docs


User Group (Phase 1)
Shipper
LSP
CTO
TO
Customs Broker
Consignee
Future Digital Platform Document Flow
Packing List
Consignment Note
Commercial Invoice
Export Declaration
Certificate of Origin
Proforma Invoice
Dangerous Goods
Non-Dangerous Goods
Veterinary Certificate
Phytosanitary Certificate
Proforma Invoice
T 1
T 1
DXS IT Systems
Identity Framework [1]
Digital Vault [1]
Digital Notary [1]
Note [1]: Degree of re-use under evaluation

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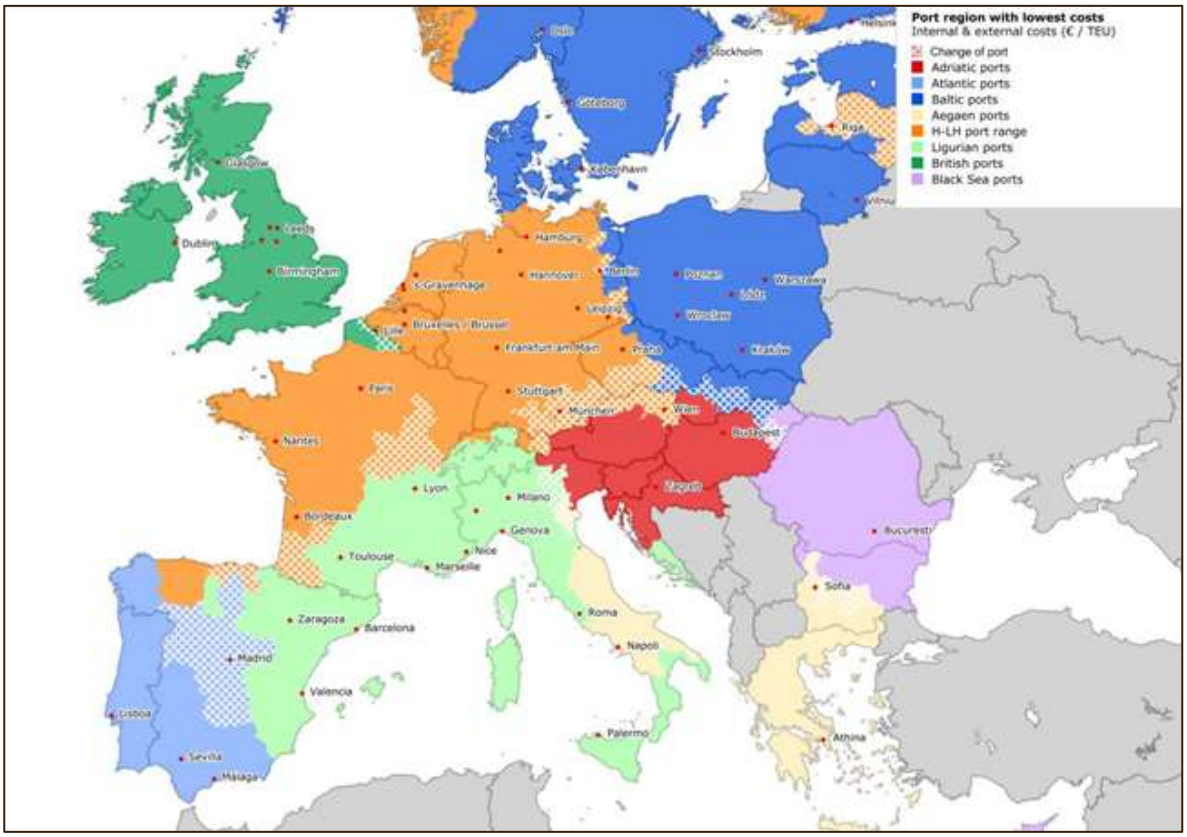
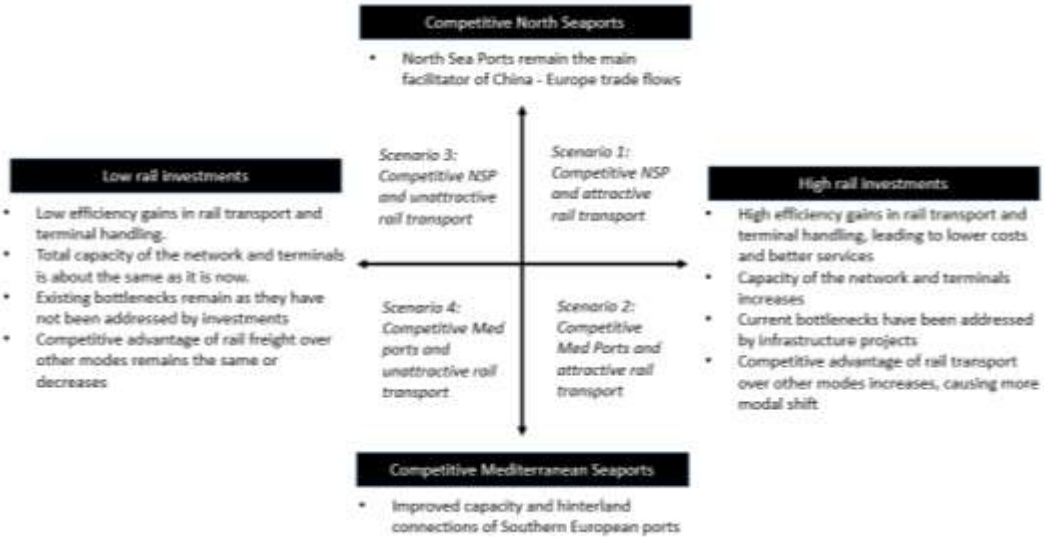

Port region with lowest costs
Internal & external costs (€ / TEU)
Change of port
Adriatic ports
Atlantic ports
Baltic ports
Aegaen ports
H-LH port range
Ligurian ports
British ports
Black Sea ports
Oslo
Stockholm
Helsinki
Göteborg
Riga
Kobenhavn
Vilnius
Glasgow
Leeds
Dublin
Birmingham
Hamburg
Hannover
Berlin
Poznan
Warszawa
Lodz
S-Gravenhage
Leipzig
Wroclaw
Bruxelles - Brussel
Lille
Frankfurt am Main
Praha
Krakow
Paris
Stuttgart
München
Wien
Budapest
Nantes
Lyon
Milano
Zagreb
Bordeaux
Genova
Bucuresti
Toulouse
Nice
Marseille
Sofia
Zaragoza
Barcelona
Roma
Napoli
Madrid
Valencia
Lisboa
Palermo
Athina
Sevilla
Malaga


Competitive North Seaports
North Sea Ports remain the main facilitator of China - Europe trade flows
Low rail investments
Low efficiency gains in rail transport and terminal handling.
Total capacity of the network and terminals is about the same as it is now.
Existing bottlenecks remain as they have not been addressed by investments
Competitive advantage of rail freight over other modes remains the same or decreases
Scenario 3: Competitive NSP and unattractive rail transport
Scenario 1: Competitive NSP and attractive rail transport
Scenario 4: Competitive Med ports and unattractive rail transport
Scenario 2: Competitive Med Ports and attractive rail transport
High rail investments
High efficiency gains in rail transport and terminal handling, leading to lower costs and better services
Capacity of the network and terminals increases
Current bottlenecks have been addressed by infrastructure projects
Competitive advantage of rail transport over other modes increases, causing more modal shift
Competitive Mediterranean Seaports
Improved capacity and hinterland connections of Southern European ports

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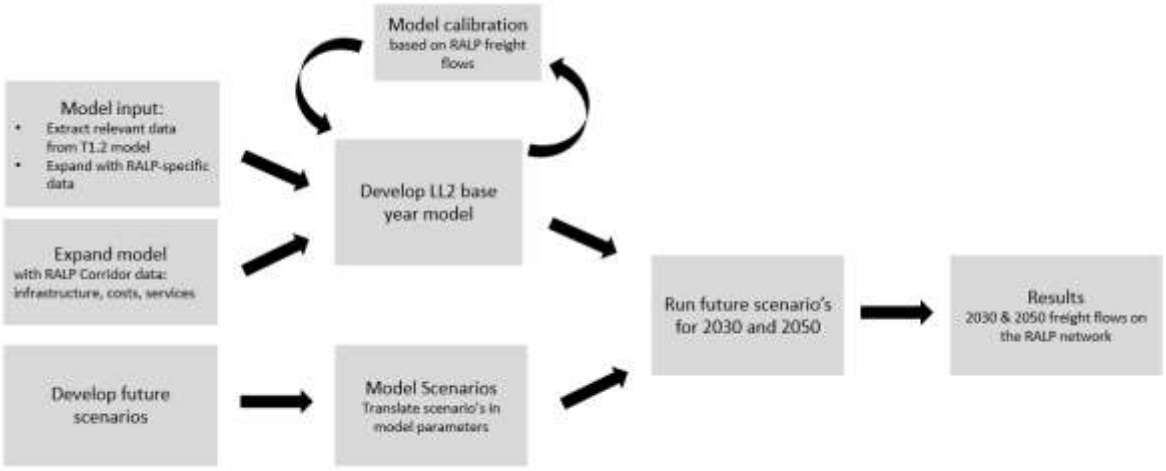
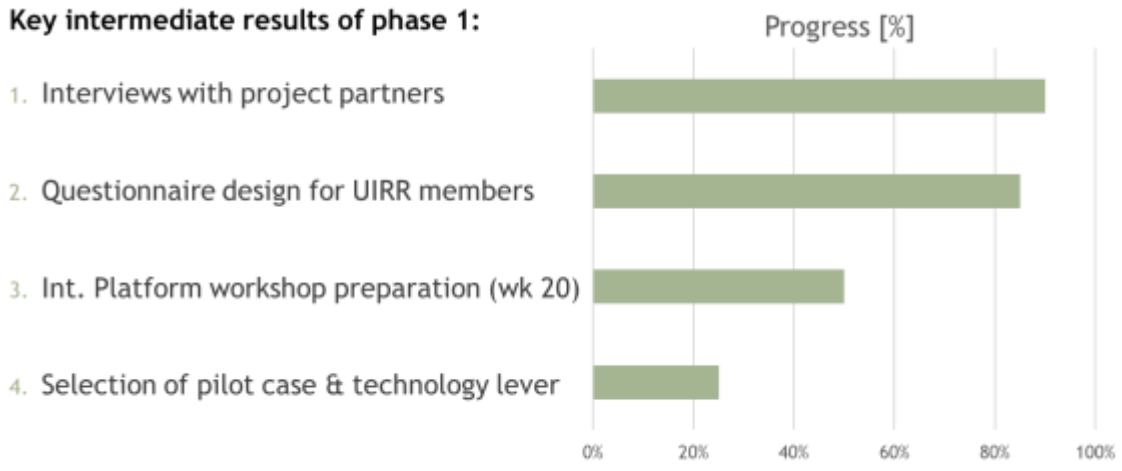
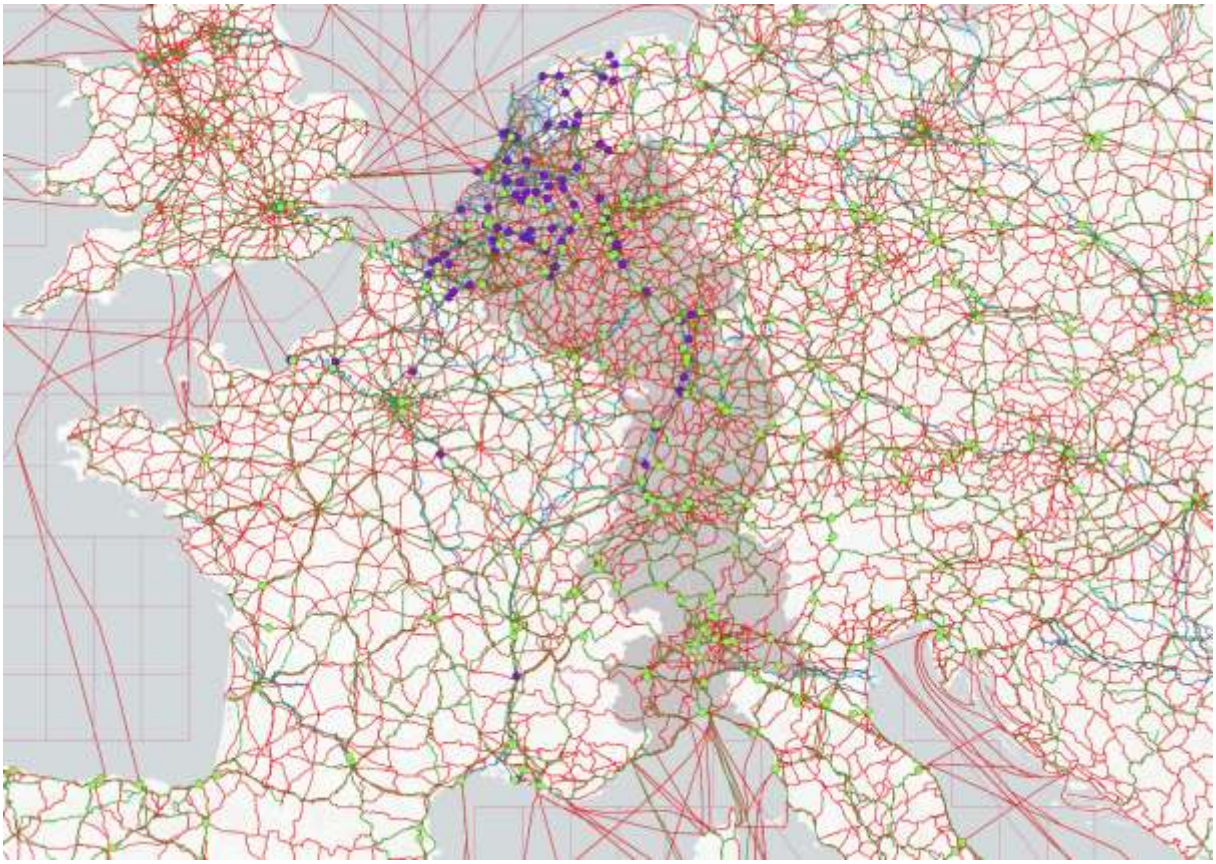
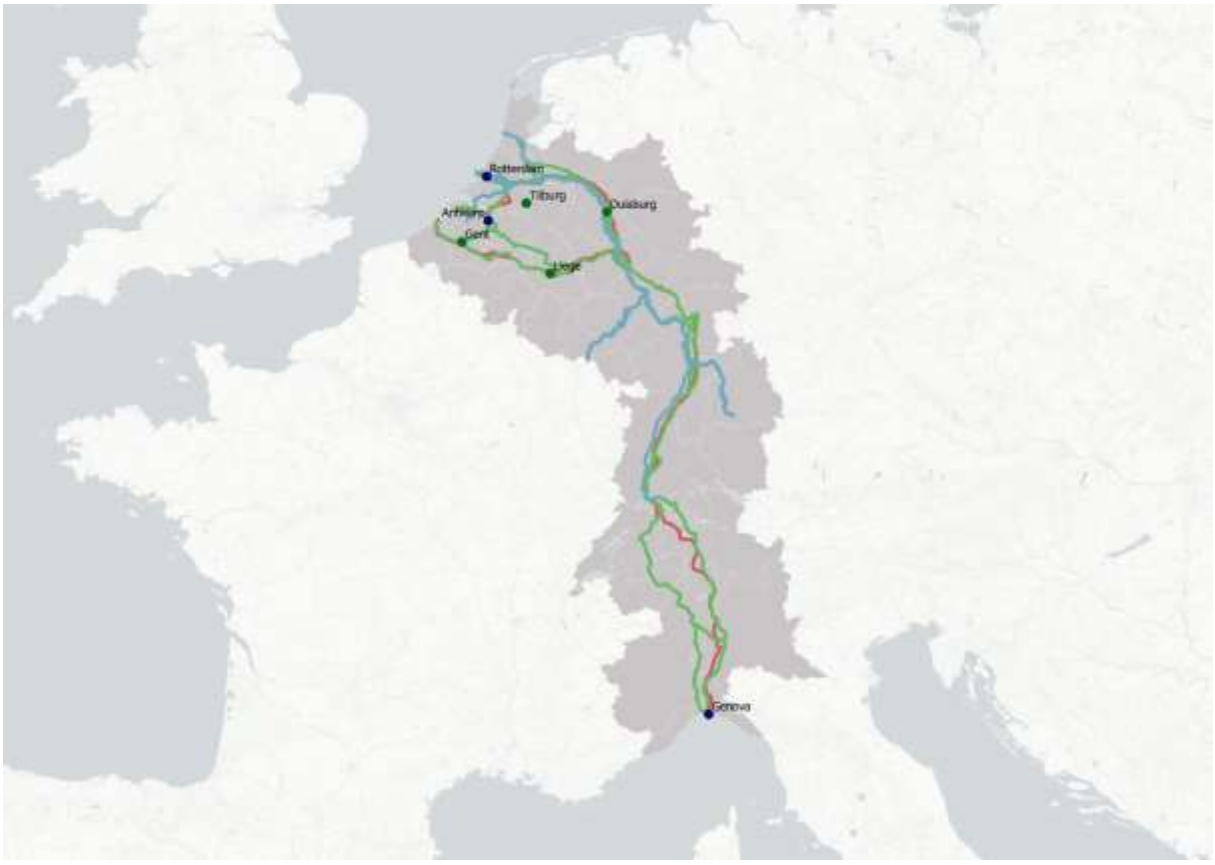
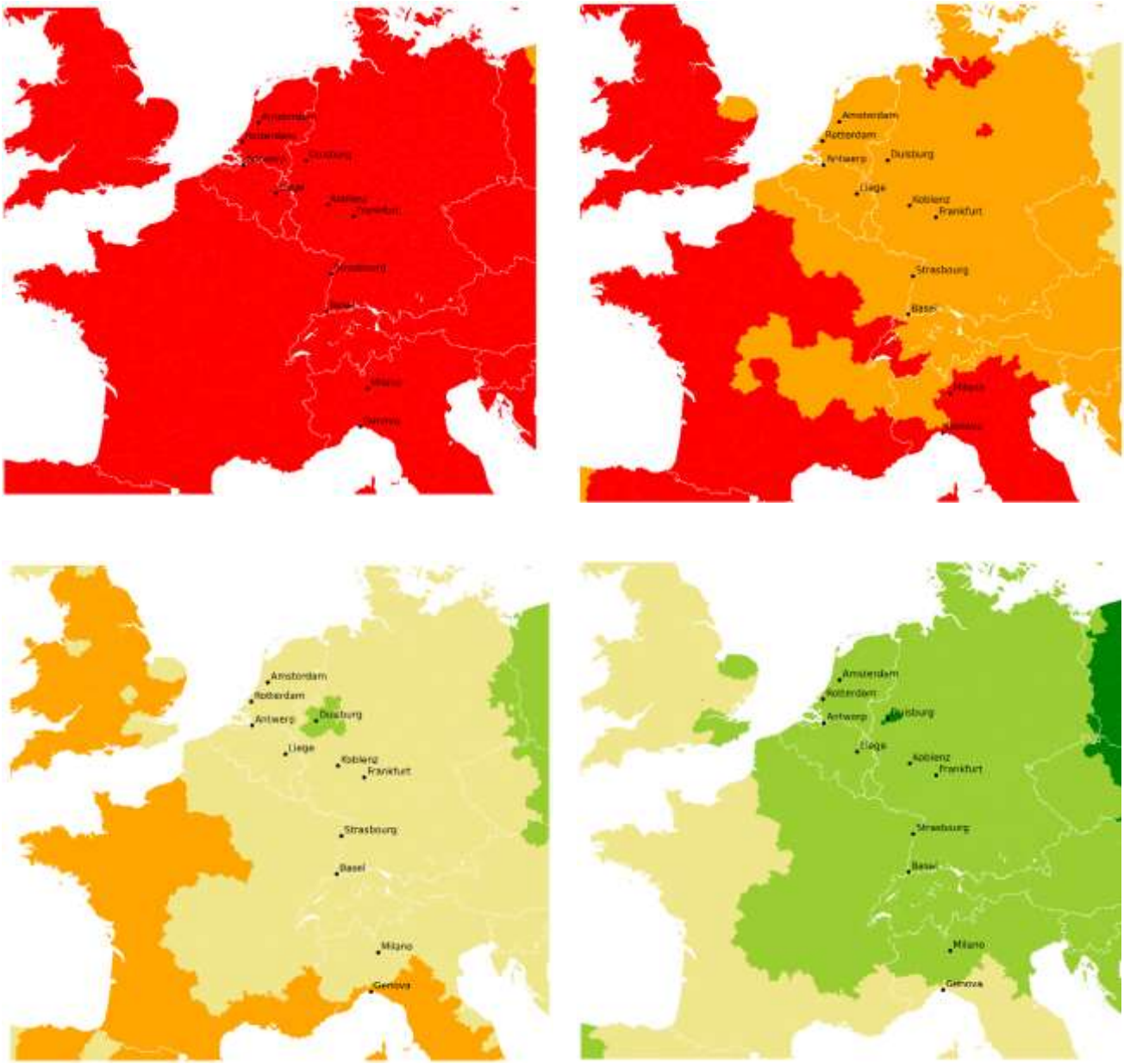

Model calibration
based on RALP freight flows
Model input:
Extract relevant data from T1.2 model
Expand with RALP-specific data
Develop LL2 base year model
Expand model
with RALP Corridor data: infrastructure, costs, services
Develop future scenarios
Model Scenarios
Translate scenario's in model parameters
Run future scenario's for 2030 and 2050
Results
2030 & 2050 freight flows on the RALP network

Key intermediate results of phase 1:






Rotterdam
Tilburg
Duisburg
Antwerp
Ghent
Liege
Genova



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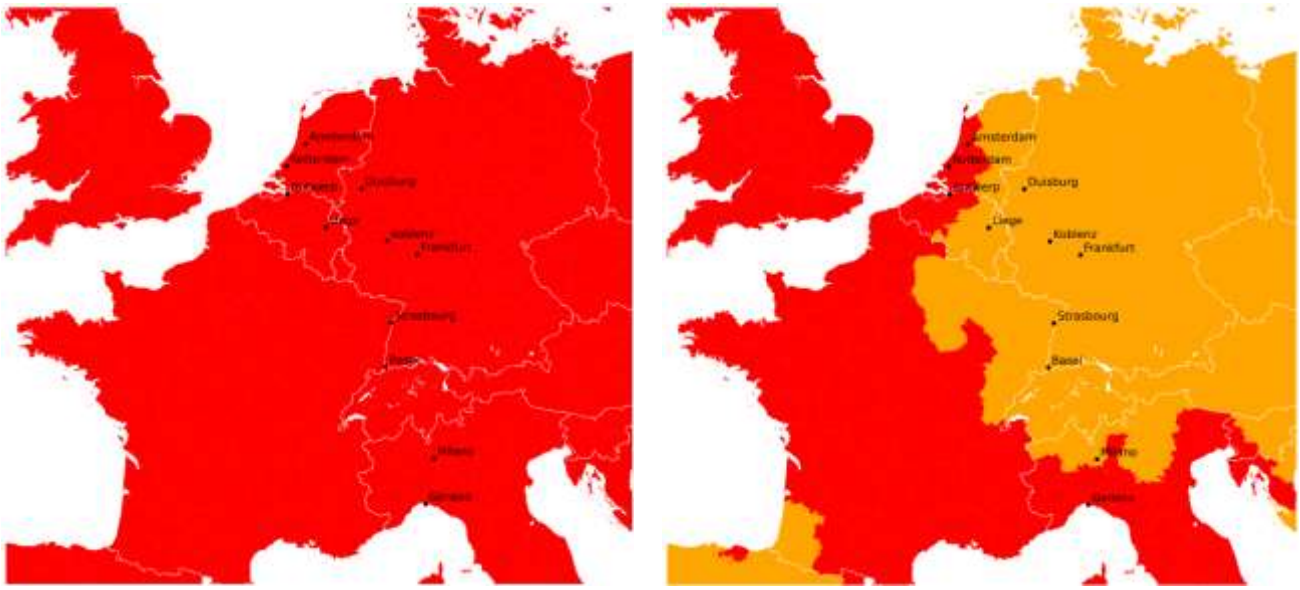
5 – 15%
-5 – +5%
-5 – -15%
> -15%



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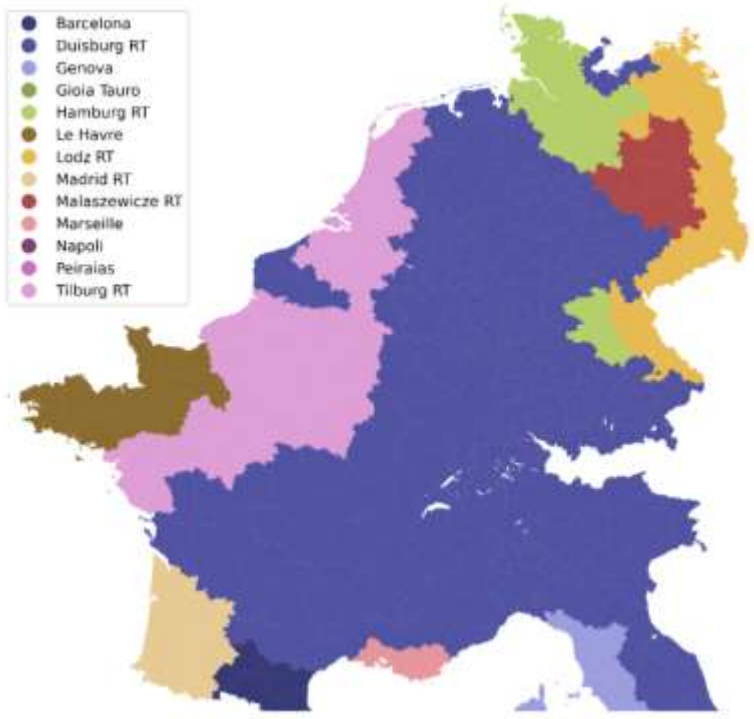
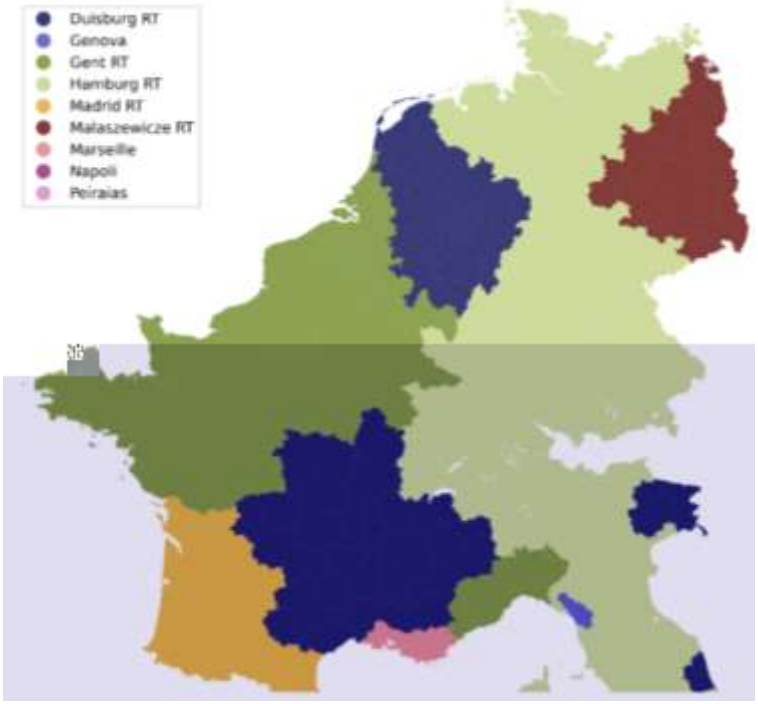
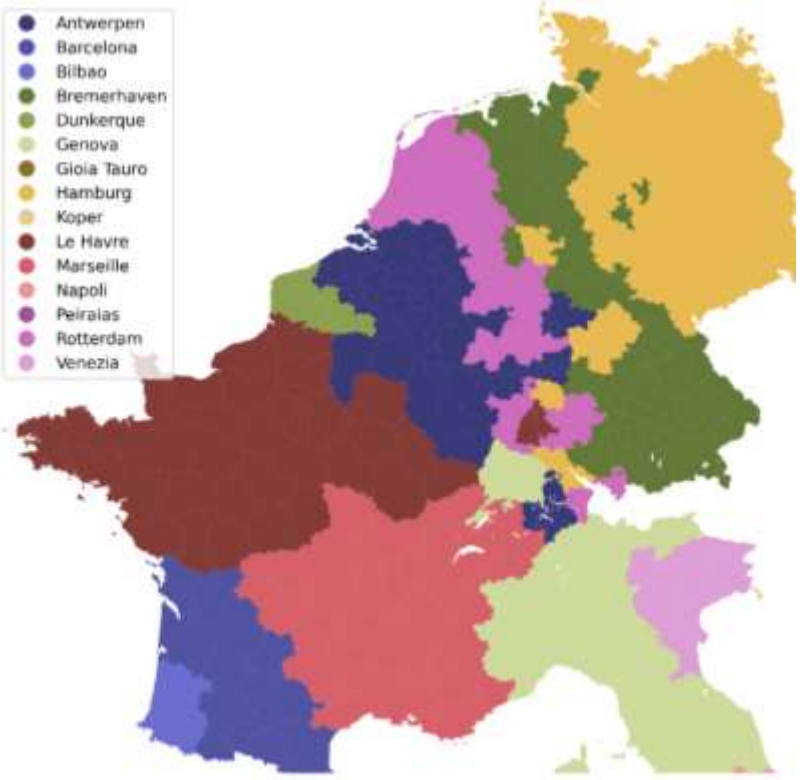
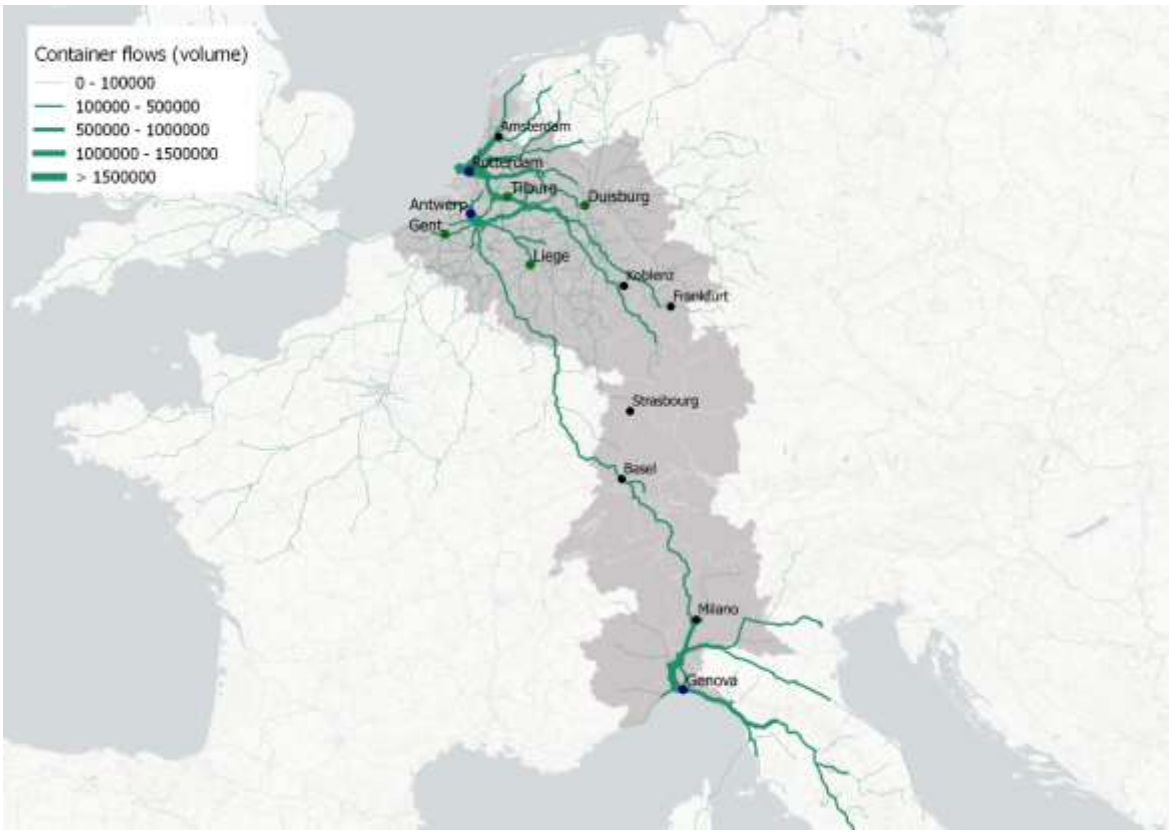
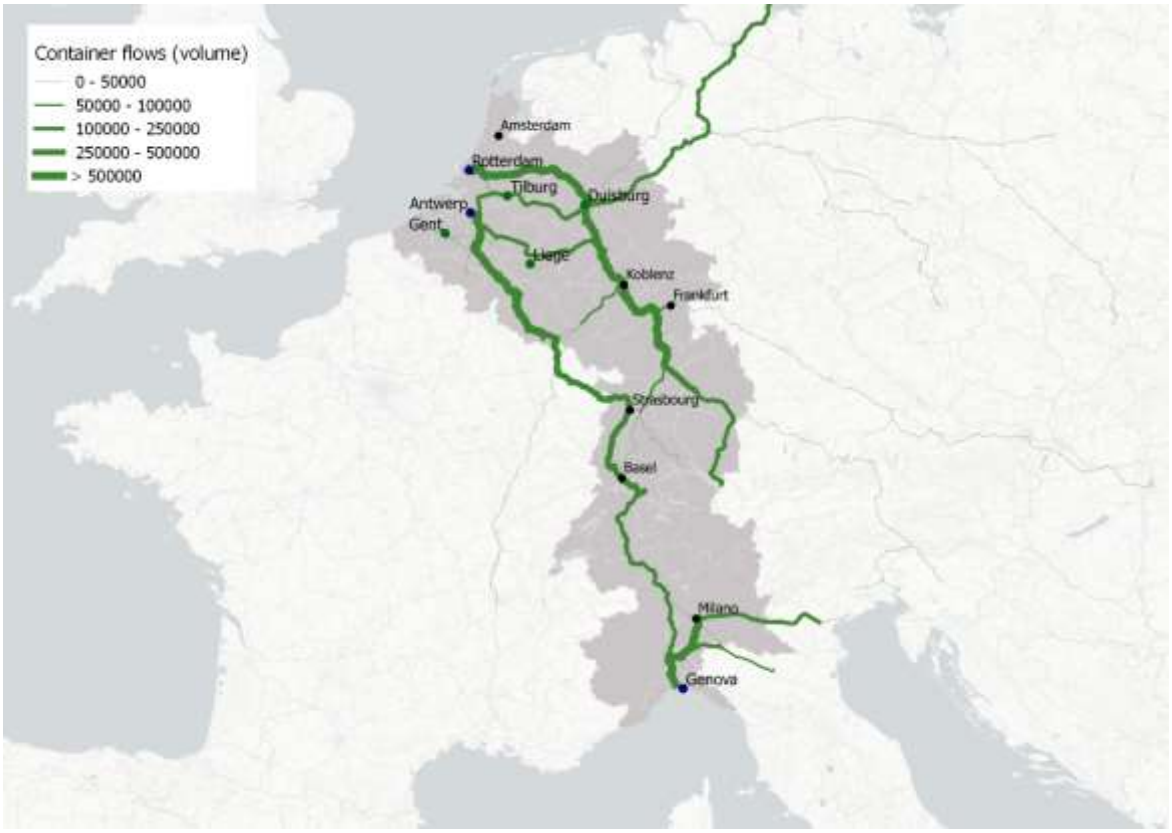
-5 – -15%
> -15%

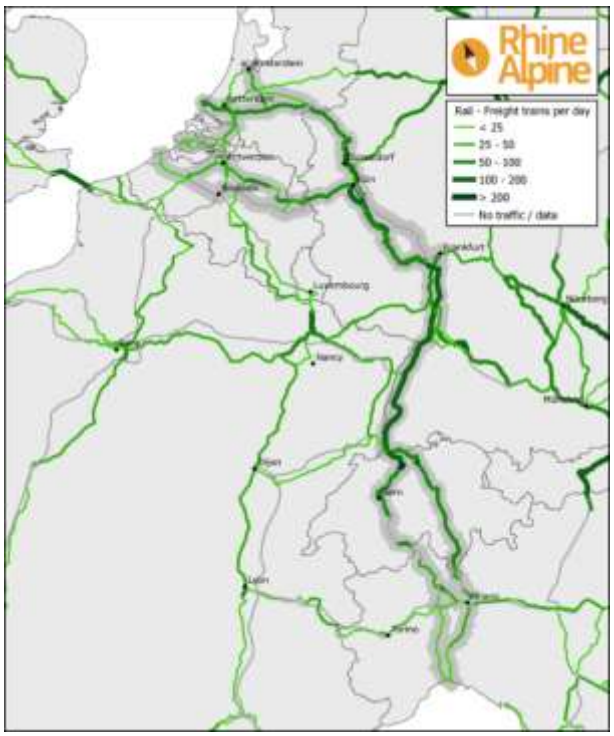

Barcelona
Duisburg RT
Genova
Gioia Tauro
Hamburg RT
Le Havre
Lodz RT
Madrid RT
Malaszewicze RT
Marseille
Napoli
Peiraias
Tilburg RT

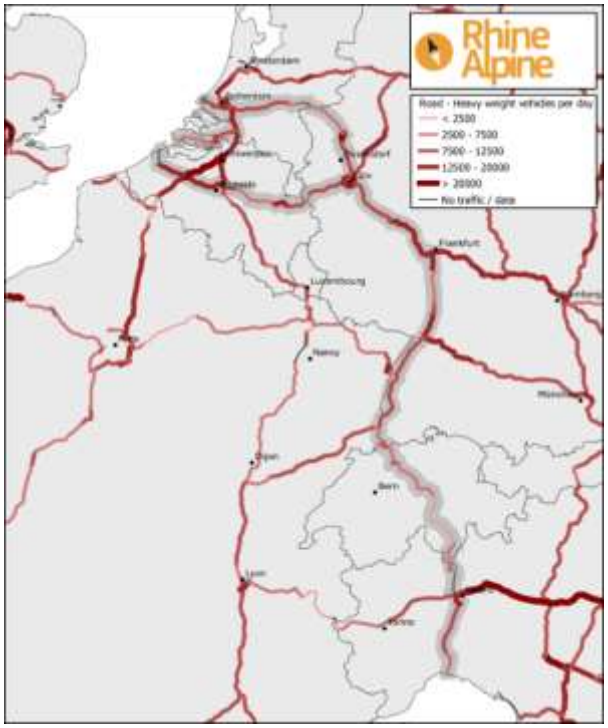

Duisburg RT
Genova
Gent RT
Hamburg RT
Madrid RT
Malaszewicze RT
Marseille
Napoli
Peiraias

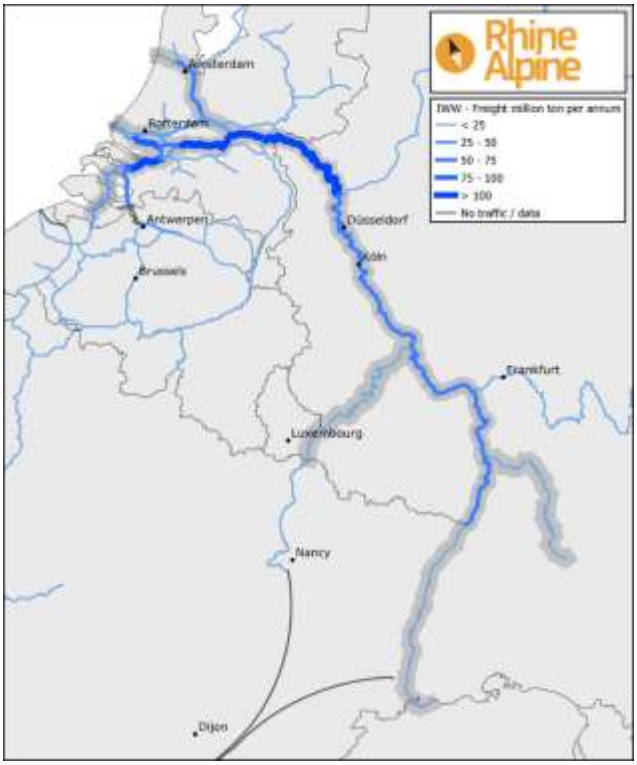

Antwerpen
Barcelona
Bilbao
Bremerhaven
Dunkerque
Genova
Gioia Tauro
Hamburg
Koper
Le Havre
Marseille
Napoli
Peiraias
Rotterdam
Venezia


Container flows (volume)
0 - 100000
100000 - 500000
500000 - 1000000
1000000 - 1500000
> 1500000
Amsterdam
Rotterdam
Tilburg
Duisburg
Antwerp
Gent
Liege
Koblenz
Frankfurt
Strasbourg
Basel
Milano
Genova


Container flows (volume)
0 - 50000
50000 - 100000
100000 - 250000
250000 - 500000
> 500000
Amsterdam
Rotterdam
Tilburg
Duisburg
Antwerp
Gent
Liege
Koblenz
Frankfurt
Strasbourg
Basel
Milano
Genova


Rhine Alpine
Rail - Freight trains per day
< 25
25 - 50
50 - 100
100 - 200
> 200
No traffic / data
Luxembourg
Nancy


Rhine Alpine
Road - Heavy weight vehicles per day
< 2500
2500 - 7500
7500 - 12500
12500 - 20000
> 20000
No traffic / data
Frankfurt
Luxembourg
Nancy


Rhine Alpine
IWW - Freight million ton per annum
< 25
25 - 50
50 - 75
75 - 100
> 100
No traffic / data
Amsterdam
Rotterdam
Antwerpen
Brussels
Düsseldorf
Köln
Frankfurt
Luxembourg
Nancy
Dijon

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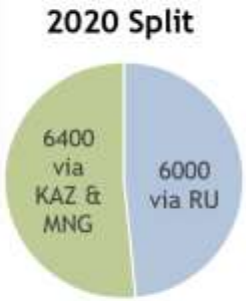
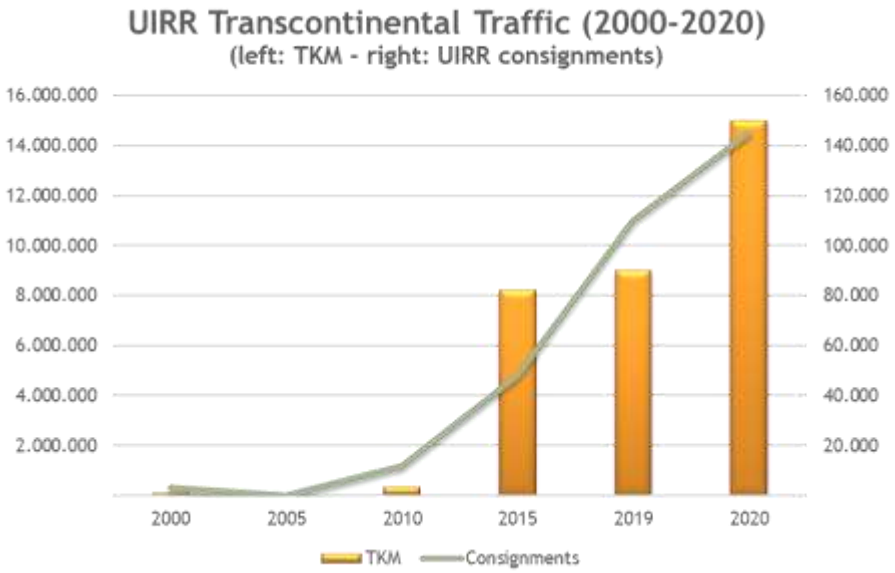
PROCESS		DESCRIPTION	BLOCKCHAIN'S ROLES	MECHANISMS INVOLVED	METRICS AFFECTED	
sD1.1	Process Inquiry and Quote	Receive and respond to general customer inquiries and requests for quotes	Provide order tracking data.	Detection, measurement and tracking of inventory with IoT	RS.3.100	Process Inquiry & Quote Cycle Time
					CO.3.14	Order Management Costs
			Blockchain's serves as a single consensus based source of truth.	Transaction data can be validated by Oracles before being permanently added to the blockchain.		

PROCESS		DESCRIPTION	BLOCKCHAIN'S ROLES	MECHANISMS INVOLVED	METRICS AFFECTED	
sD1.2	Receive, Enter and Validate Order	Receive orders from the customer and enter them into a company's order processing system. "Technically" examine orders to ensure an orderable configuration and provide accurate price. Check the customer	Elimination of paper records.	Cost-effective transmission of transactions in peer-to-peer networks (Korpela, Hallikas, & Dahlberg, 2017).	RL.3.33	Deliver Item Accuracy
					RL.3.34	Delivery Location Accuracy
					RL.3.35	Delivery Quantity Accuracy
					RS.3.94	Order Fulfillment Dwell Time
					RS.3.112	Receive, Enter & Validate Order Cycle Time
			Simplify business-to-business integration	Data security and cost-effective transmission of transactions in peer-to-peer networks (Korpela, Hallikas, & Dahlberg, 2017).		
			Enable fully automated order processing ("straight through processing").	Enable fully automated processing ("straight through processing") without human communication of interaction.		

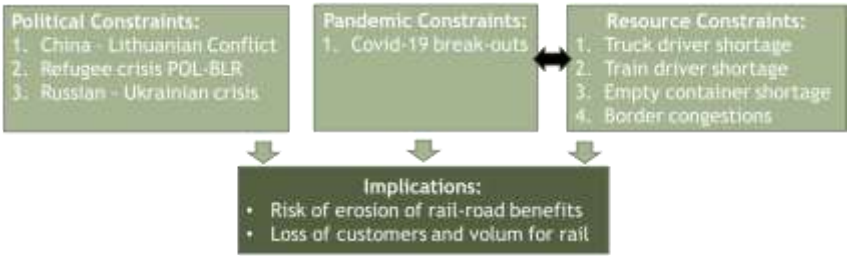
Number of departures CN-EU / RU-CN 2011 - 2020
12406
8225
6376
3673
1702
815
308
80
42
17
2011
2012
2013
2014
2015
2016
2017
2018
2019
2020
Source: UIC Webconf-Call presented by Jet Young, China Rail (10.06.2021)

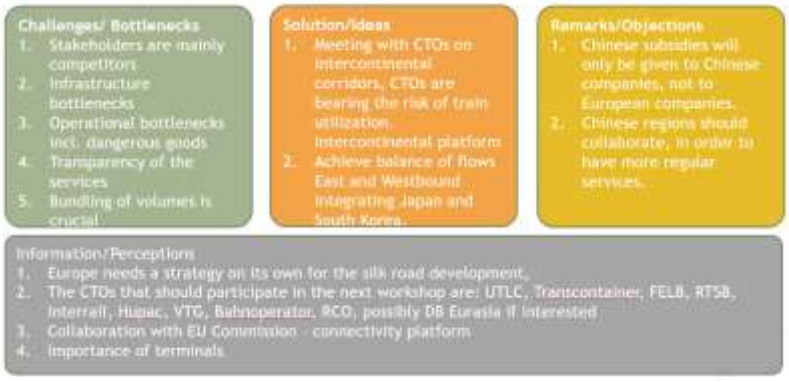

2020 Split
6400 via KAZ & MNG
6000 via RU


UIRR Transcontinental Traffic (2000-2020)
(left: TKM - right: UIRR consignments)
16.000.000
14.000.000
12.000.000
10.000.000
8.000.000
6.000.000
4.000.000
2.000.000
160.000
140.000
120.000
100.000
80.000
60.000
40.000
20.000
2000
2005
2010
2015
2019
2020
TKM
Consignments

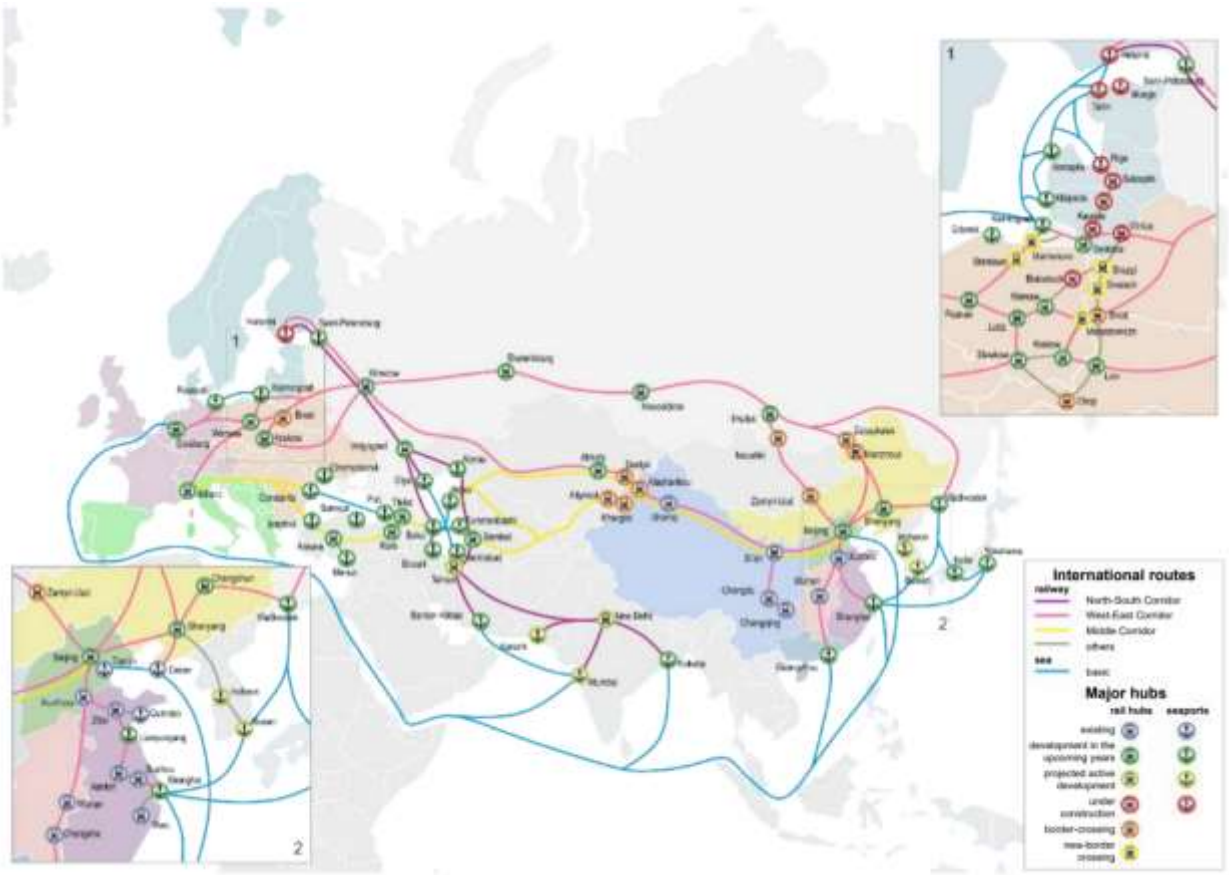
Mode	Vehicle/Vessel	Type of freight	CO_2 (g/tkm) (WTW)	PM_c (g/tkm) (TTW)*	NO_x (g/tkm) (TTW)*
Road	Tractor-semitrailer, heavy (2 TEU)	Med.-weight	121	0.003	0.30
Rail	Long train (electric 73%: diesel 27%)	Med.-weight	18	0.0018	0.08
Inland shipping	Rhine-Herne canal (RHC) vessel (96 TEU)	Med.-weight	52	0.019	0.55
	Large Rhine vessel (208 TEU)	Med.-weight	32	0.013	0.34
Maritime shipping	Short-sea: 1,000-1,999 TEU container ship	Med.-weight	32	0.013	0.57
	Deep-sea: 8,000-11,999 TEU container ship	Med.-weight	12	0.005	0.23

* The emission factors for air pollutants provide no indication of the potential health damage associated with the various modes, which depends on where the emissions occur.


Political Constraints:
1. China – Lithuanian Conflict
2. Refugee crisis POL-BLR
3. Russian – Ukrainian crisis
Pandemic Constraints:
1. Covid-19 break-outs
Resource Constraints:
1. Truck driver shortage
2. Train driver shortage
3. Empty container shortage
4. Border congestions
Implications:
• Risk of erosion of rail-road benefits
• Loss of customers and volum for rail


Challenges/ Bottlenecks
1. Stakeholders are mainly competitors
2. Infrastructure bottlenecks
3. Operational bottlenecks incl. dangerous goods
4. Transparency of the services
5. Bundling of volumes is crucial
Solution/Ideas
1. Meeting with CTOs on intercontinental corridors, CTOs are bearing the risk of train utilization, intercontinental platform
2. Achieve balance of flows East and Westbound integrating Japan and South Korea.
Remarks/Objections
1. Chinese subsidies will only be given to Chinese companies, not to European companies.
2. Chinese regions should collaborate, in order to have more regular services.
Information/Perceptions
1. Europe needs a strategy on its own for the silk road development.
2. The CTOs that should participate in the next workshop are: UTLC, Transcontainer, FELB, RTSB, Interrail, Hupac, VTG, Bahnoperator, RCO, possibly DB Eurasia if interested
3. Collaboration with EU Commission – connectivity platform
4. Importance of terminals

Challenges/ Bottlenecks
1. Improve train operations and processes (train to be managed as easy as road)
2. Better coordination and governance
3. Acceptance of all types of assets and goods
Solution/Ideas
1. Clear and transparent governance structure for Eurasian corridors (UN/ECE, OSJD, sector...)
2. Wagons: (1) electrification (2) need for refilling stations on specific cross-border points
3. ILUs: pool management, register, IT tools
Remarks/Objections
1. Community involvement needed (role of industry associations)
2. Too many political and/or regional approach
Information/Perceptions
1. Document management is also a prerequisite to improve train operations
2. Reefer / chemical goods: 'must' markets


1
2
International routes
railway
North-South Corridor
West-East Corridor
Middle Corridor
others
sea
basic
Major hubs
rail hubs
seaports
existing
developpment in the upcoming years
projected active development
under construction
border-crossing
new-border crossing

ACP

ACP L

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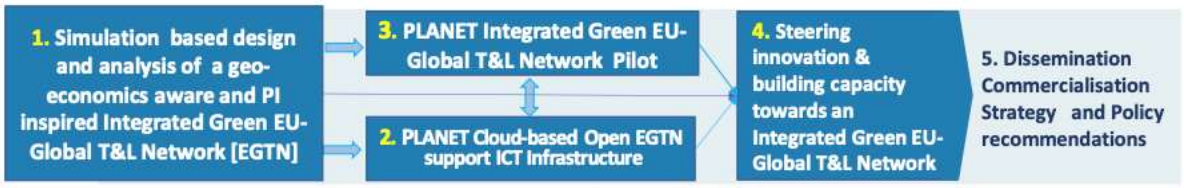
1. Simulation based design and analysis of a geo-economics aware and PI inspired Integrated Green EU-Global T&L Network [EGTN]
3. PLANET Integrated Green EU-Global T&L Network Pilot
2. PLANET Cloud-based Open EGTN support ICT Infrastructure
4. Steering innovation & building capacity towards an Integrated Green EU-Global T&L Network
5. Dissemination Commercialisation Strategy and Policy recommendations

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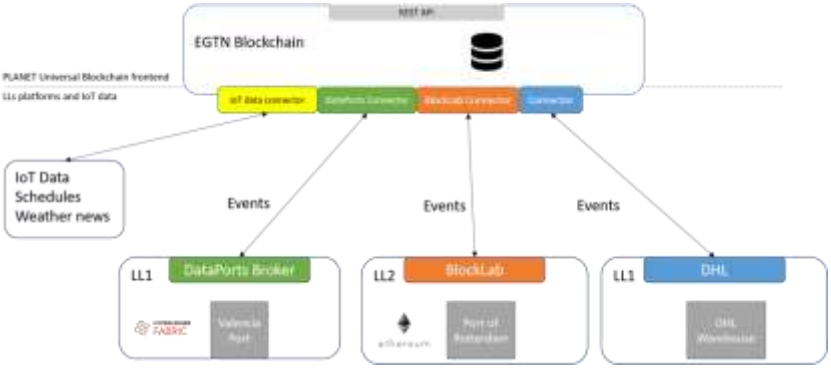
EGTN Blockchain
PLANET Universal Blockchain frontend
LLs platforms and IoT data
IoT Data
Schedules
Weather news
Events
Events
Events
LL1
DataPorts Broker
LL2
BlockLab
LL1
DHL

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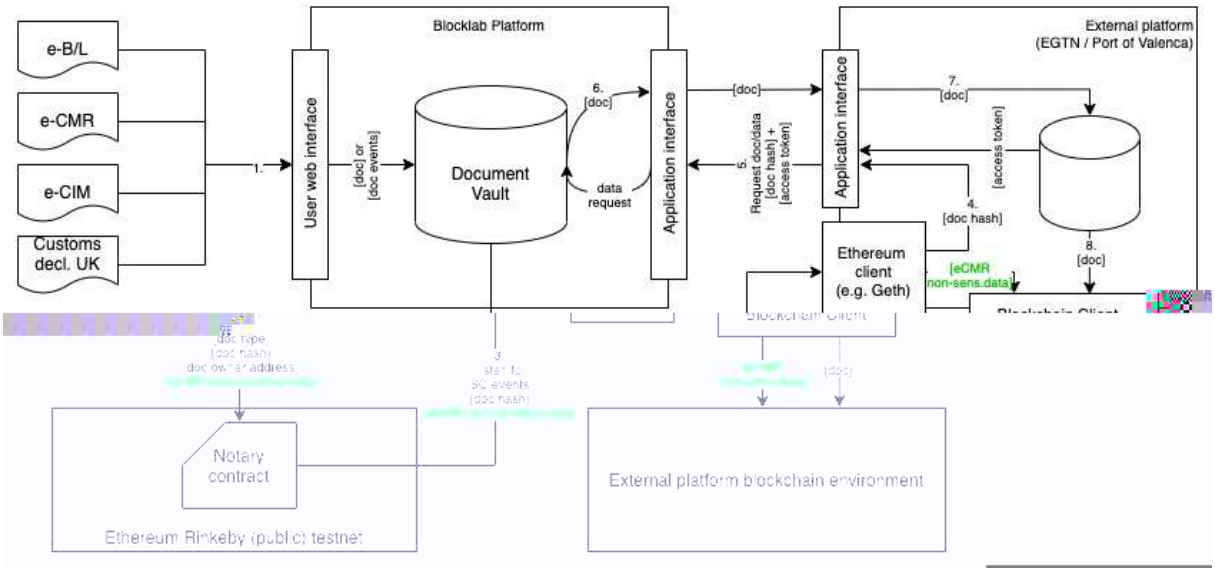
ACP

ACP


e-B/L
e-CMR
e-CIM
Customs decl. UK
Blocklab Platform
User web interface
[doc] or [doc events]
Document Vault
6. [doc]
data request
Application interface
{doc}
5. Request doc/data [doc hash] + [access token]
Application interface
External platform (EGTN / Port of Valenca)
7. [doc]
[access token]
4. [doc hash]
8. [doc]
Ethereum client (e.g. Geth)
[eCMR non-sens.data]
Notary contract
Ethereum Rinkeby (public) testnet
External platform blockchain environment

L R I N

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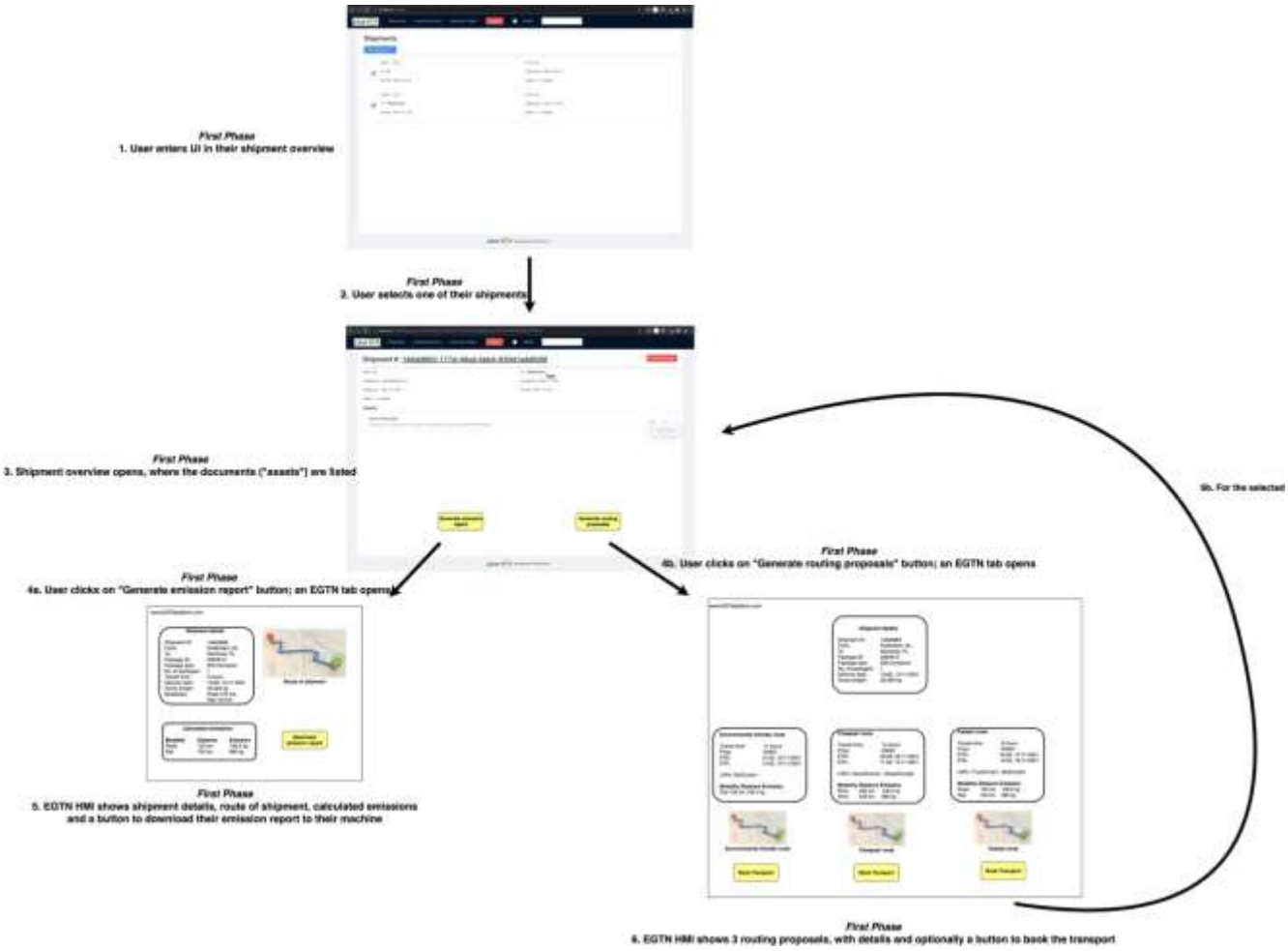
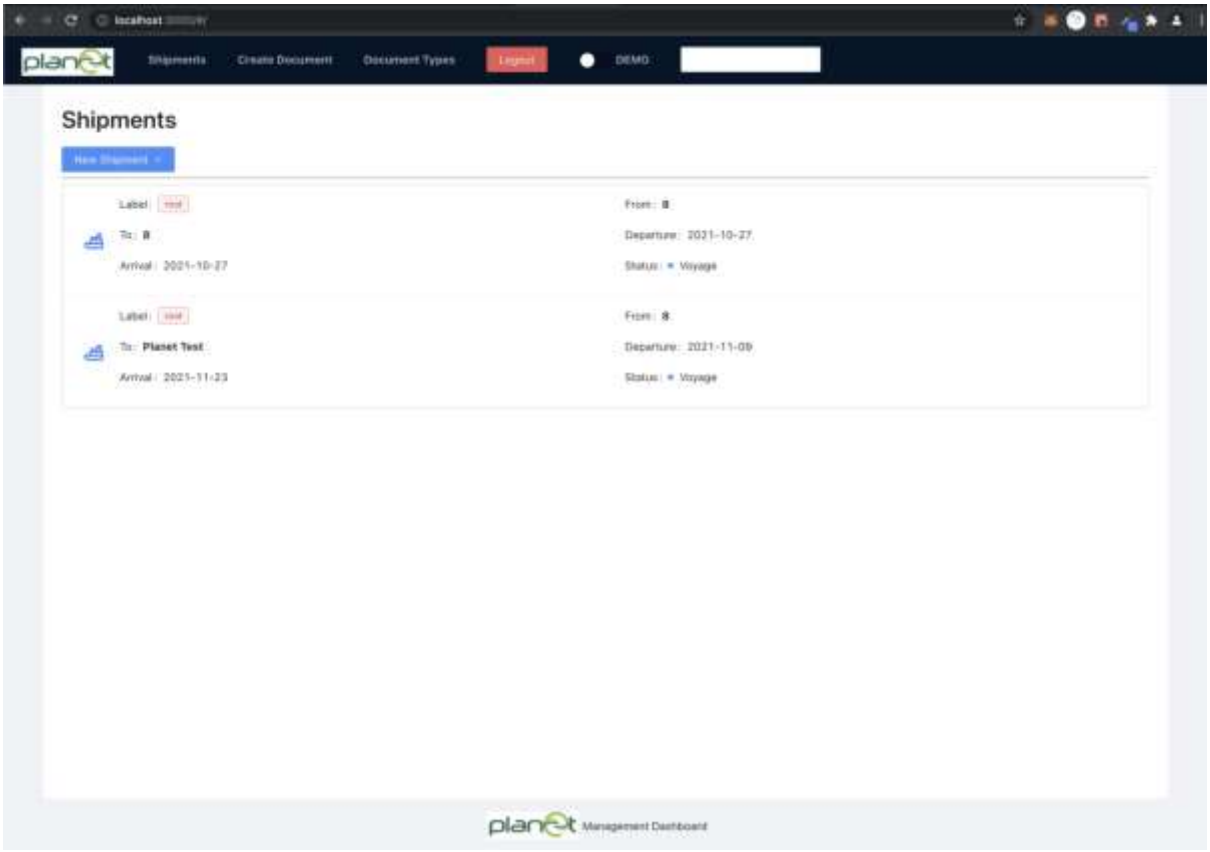
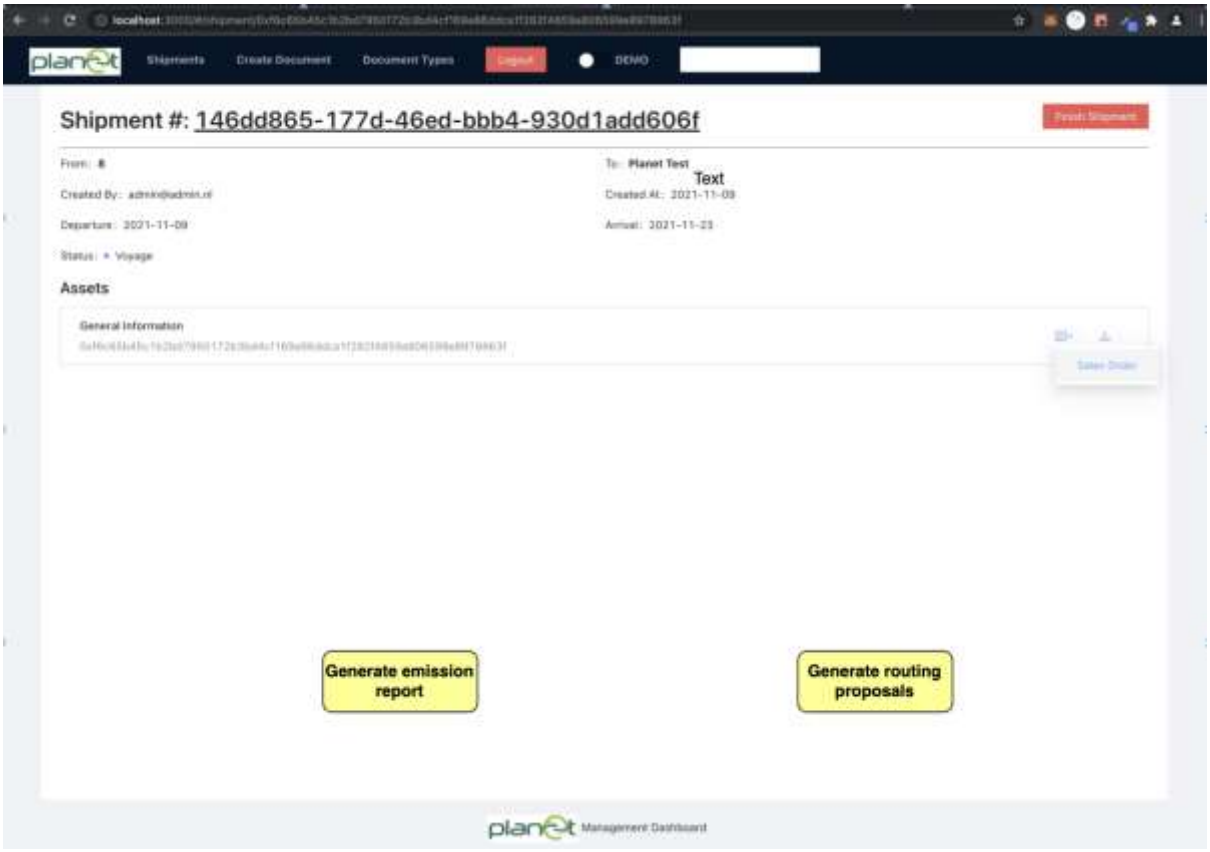
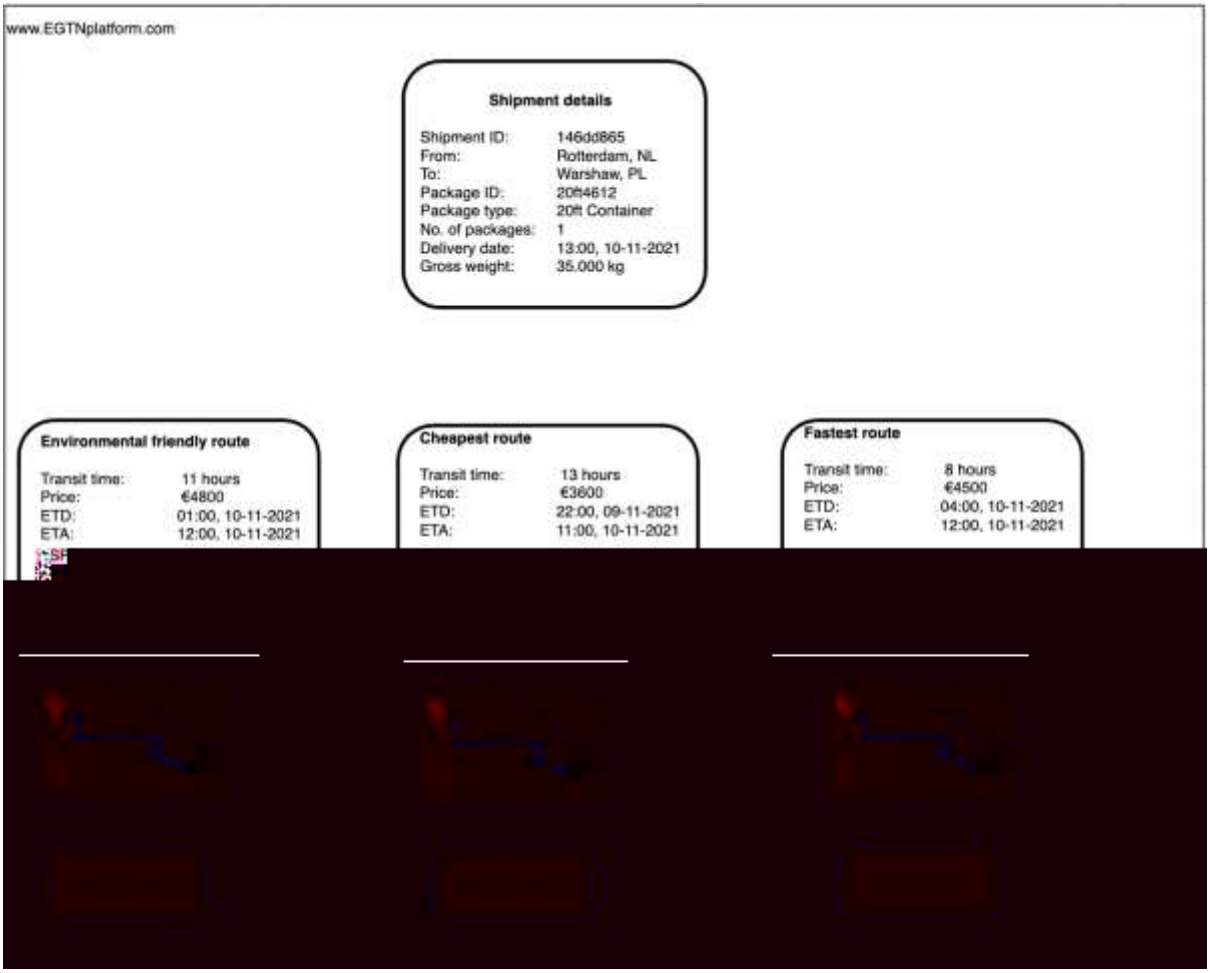

First Phase
1. User enters UI in their shipment overview
First Phase
2. User selects one of their shipments
First Phase
3. Shipment overview opens, where the documents ("assets") are listed
First Phase
4a. User clicks on "Generate emission report" button; an EGTN tab opens
First Phase
4b. User clicks on "Generate routing proposals" button; an EGTN tab opens
9b. For the selected
First Phase
5. EGTN HMI shows shipment details, route of shipment, calculated emissions and a button to download their emission report to their machine
First Phase
6. EGTN HMI shows 3 routing proposals, with details and optionally a button to book the transport


Shipments
Create Document
Document Types
Logout
DEMO
Shipments
Label:
From:
To:
Departure: 2021-10-27
Arrival: 2021-10-27
Status:
Voyage
Label:
From:
To: Planet Test
Departure: 2021-11-09
Arrival: 2021-11-23
Status:
Voyage
Management Dashboard


Shipments
Create Document
Document Types
DEMO
Shipment #: 146dd865-177d-46ed-bbb4-930d1add606f
To: Planet Test
Text
Created At: 2021-11-09
Departure: 2021-11-09
Arrival: 2021-11-23
Assets
General Information
Generate emission report
Generate routing proposals
Management Dashboard


www.EGTNplatform.com
Shipment details
Shipment ID: 146dd865
From: Rotterdam, NL
To: Warshaw, PL
Package ID: 20ft4612
Package type: 20ft Container
No. of packages: 1
Delivery date: 13:00, 10-11-2021
Gross weight: 35.000 kg
Environmental friendly route
Transit time: 11 hours
Price: €4800
ETD: 01:00, 10-11-2021
ETA: 12:00, 10-11-2021
Cheapest route
Transit time: 13 hours
Price: €3600
ETD: 22:00, 09-11-2021
ETA: 11:00, 10-11-2021
Fastest route
Transit time: 8 hours
Price: €4500
ETD: 04:00, 10-11-2021
ETA: 12:00, 10-11-2021

www.EGTNplatform.com

Shipment details

Shipment ID:	146dd865
From:	Rotterdam, NL
To:	Warshaw, PL
Package ID:	20ft4612
Package type:	20ft Container
No. of packages:	1
Transit time:	9 hours
Delivery date:	13:00, 10-11-2021
Gross weight:	35.000 kg
Modalities:	Road 120 km, Rail 740 km

Route of shipment

Calculated emissions:

Modality	Distance	Emission
Road	120 km	138.2 kg
Rail	740 km	680 kg

Download emission report

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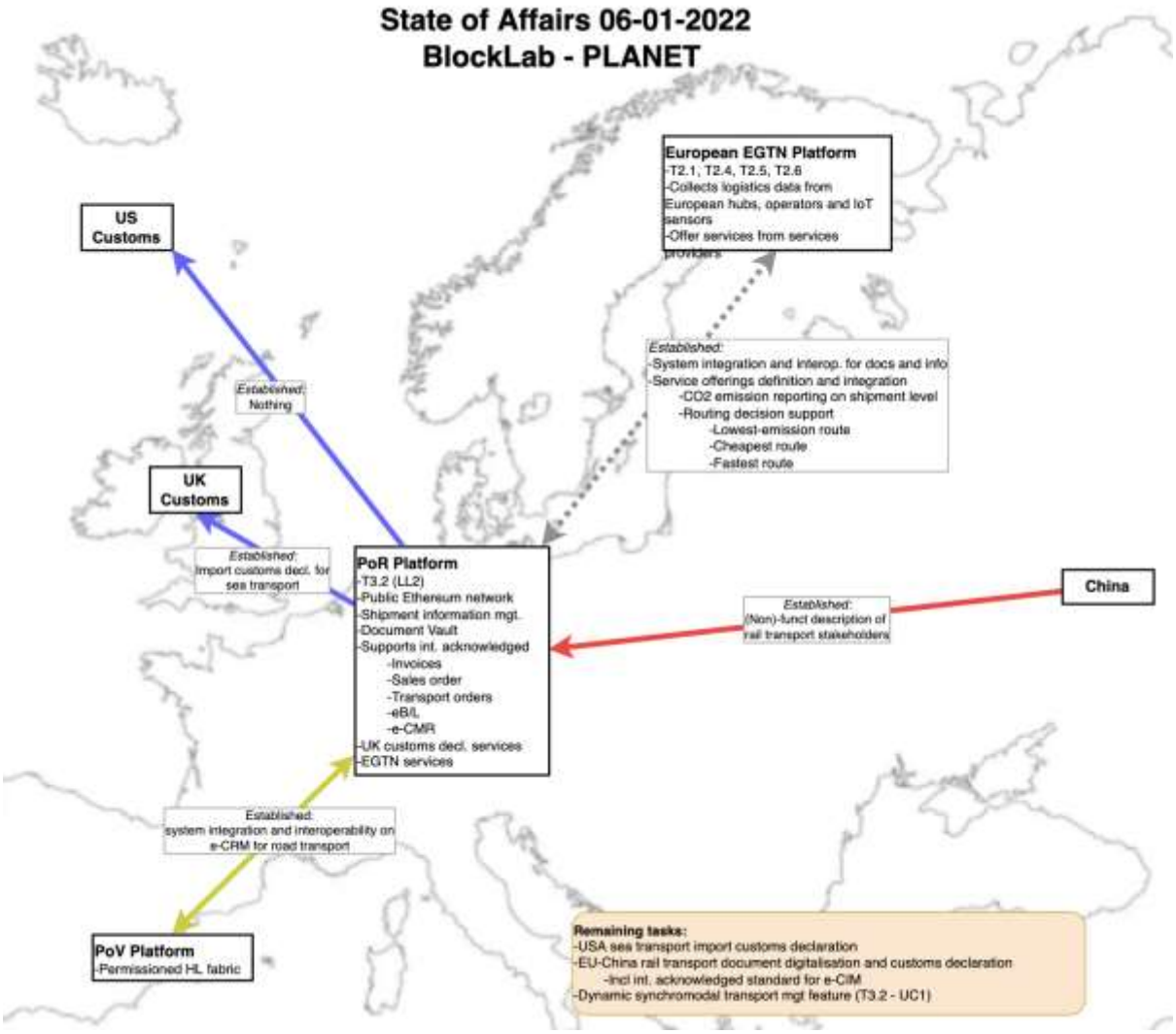
State of Affairs 06-01-2022
BlockLab - PLANET
European EGTN Platform
-T2.1, T2.4, T2.5, T2.6
-Collects logistics data from European hubs, operators and IoT sensors
-Offer services from services providers
US Customs
Established:
Nothing
Established:
-System integration and interop. for docs and info
-Service offerings definition and integration
-CO2 emission reporting on shipment level
-Routing decision support
-Lowest-emission route
-Cheapest route
-Fastest route
UK Customs
Established:
Import customs decl. for sea transport
PoR Platform
-T3.2 (LL2)
-Public Ethereum network
-Shipment information mgt.
-Document Vault
-Supports int. acknowledged
-Invoices
-Sales order
-Transport orders
-eB/L
-e-CMR
-UK customs decl. services
-EGTN services
China
Established:
(Non)-funct description of rail transport stakeholders
Established:
system integration and interoperability on e-CRM for road transport
PoV Platform
-Permissioned HL fabric
Remaining tasks:
-USA sea transport import customs declaration
-EU-China rail transport document digitalisation and customs declaration
-Incl int. acknowledged standard for e-CIM
-Dynamic synchromodal transport mgt feature (T3.2 - UC1)