Deliverable D 1.2

Data collection

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Executive Summary

This document corresponds to Deliverable 1.2 (D1.2) of Work Package 1 (WP1) of the ESEP4Freight project. This deliverable comprises the outputs of Task 1.4 (T1.4).

The project will support a simple, cost-effective and sustainable modal shift of freight flows to rail and contribute to the European Union's target of reducing greenhouse gas emissions by 55% by 2030 compared to 1990 levels and decarbonising transport. The overall objective of ESEP4Freight is to contribute to the provision of open, high quality and user-friendly information for all actors in the supply chain and to test innovative new tools to promote modal shift to rail.

With the aim of making information available to the various stakeholders, ESEP4Freight will develop an online Web Platform as part of WP3. T1.4 is therefore dedicated to collecting the data required to develop the Web Platform, after assessing the required information in line with the defined data collection plan. The information required for the development of the web platform was collected from various sources, e.g. the functionalities of the Web Platform, the collaboration with the stakeholder group (SG) and the key performance indicators (KPIs) defined in task 1.1. The data were then collected using a developed plan that includes a detailed description of the data sources and data for each component for each functionality. An initial introduction to the required data format, the procedures for obtaining and updating the data, and the options for data collection are then described.

As the data formats and update procedures may change during the development of the Web Platform, the current version of the data formats and collection processes will be described in detail and updated in the documentation as part of the D3.2 ESEP4Freight Web-based platform.

Keywords: Rail Freight, Web platform, Functionalities, Development, Data collection,

Abbreviations and acronyms

Abbreviation / Acronym	Description
Adv	Advanced
CCS	Common Component System
CIP	Customer Information Platform
CIS	Charging Information System
CO2	Carbon Dioxide
CO2e	Carbon Dioxide equivalent
D1.2	Deliverable 1.2
e-CMR	Electronic version of the CMR – the contract for the international carriage of goods
ECMT	European Capacity Management Tool
ESEP4Freight	European Shift Enabler Portal for Freight
ETCS	European Train Control System
EU	European Union
FERRMED	A multisectoral non-profit Association to promote rail freight in Europe
GA	Grant Agreement
GIS	Geographic Information System
IWW	Inland waterway
KPIs	Key Performance Indicators
NCI	Network and Corridor Information System
NUTS2	Nomenclature of Territorial Units for Statistics
PCS	Path Coordination System
RFP	Rail Facility Portal
RINF	Registers of Infrastructure
RIS	Railway Infrastructure System
RNE	Rail Net Europe
SG	Stakeholder Group
St	Standard
TCR	Temporary Capacity Restriction
TEN-T	Trans-European Transport Network
TEU	Twenty-foot equivalent unit
TIS	Train Information System
WP1	Work Package 1

1 Background

Rail freight transport should play a key role in achieving the Union's target of reducing greenhouse gas emissions by 55% by 2030 compared to 1990 levels and decarbonising transport. This objective can be achieved by promoting the shift from a highly polluting mode of transport to efficient and clean transport solutions.

In order to promote the modal shift to rail, freight customers need to have access to comprehensive information, which is essential for the development of rail freight supply chains. With the aim of providing customers with comprehensive information, the ESEP4Freight project is developing a user-oriented online platform in.

This document presents Deliverable D 1.2 Data Collection in the European Shift Enabler Portal for Freight (ESEP4Freight) project. The project is funded by is the EU-RAIL within the call HORIZON-ER-JU-2022-02.

2 Objective

The objective of Deliverable 1.2 is to present the outputs of the Task 1.4 Identification and collection of operational and infrastructure data. This includes the collection of all the relevant data to feed the Web Platform for the Standard and the Advanced data levels. The process of data collection is broken down in several phases such as:

1) Identification of the information needs of the logistics sector,

2) Formulation of a data collection plan, and

3) Collection of data.

Task 1.4 started in the first month of the ESEP4Freight project and the outputs of this task are included in this document. The identification of information needs is presented in Chapter 4 and the formulation of a data collection plan is presented in Chapter 5.

3 Introduction

Reducing CO2 emissions in the transport sector is crucial to achieving the targets set by the European Union (EU). A significant part of CO2 emissions is caused by freight transport and in particular from road transport (Eurostat, 2023). Therefore, shifting freight transport to more sustainable modes of transport such as rail or intermodal transport, where the train covers medium and long distances, is considered an appropriate measure to reduce emissions.

To facilitate the shift to rail, supply chain actors must have access to relevant information at the decision-making stage. There are freely available online tools that can provide static information (detailed information about these tools can be found in D3.1 *ESEP4Freight reference architecture* – Chapter 5 - section 5.2). As this information is limited, the ESEP4Freight project has developed a Web Platform with additional functionalities around an interactive map to provide logistics actors with static information and facilitate the modal shift of freight transport to rail.

The most important prerequisite for the development of the Web Platform in ESEP4Freight as the main requirement and basic step is the provision of a sufficient data set. Therefore, this report presents the data collection plan for Task 1.4. The general objective of Task 1.4 is to collect relevant data to provide the Web Platform with data for the Standard and the Advanced levels of data. The main purpose of this document is to describe the processes for data collection required for use within the Web Platform that will be developed in WP3. To this end, this document first provides an overview of the information needed and the requirements that guided the design of the data collection. This is followed by a detailed description of the data sources for each component and functionality. In particular, a detailed description of the overall data collection process is given, as well as the required data format and how the data should be updated. In addition, the purpose of each data group for a specific area is explained in this deliverable. Finally, the plan for data archiving and data protection is presented. The relationship between WP1 and WP3 is close and the development of the Web Platform in WP4 is partly driven by the results of the research activities carried out in WP1 and in particular by the data collection in Task 1.4. The results of WP1 will be a complement and input for WP3. The timeframe for data collection and compilation in Task 1.2 is twelve months and provides a baseline of knowledge for the start of WP3 activities.

4 Identification of information needs

The first step in data collection is to identify the information that is needed in addition to the data in the SGKV Intermodal Map (SGKV, 2024). The SGKV Intermodal Map data include location attributes of the combined transport terminals, their contact information, operator name, type of facility (modes of transport), equipment, and services. Besides this, three different sources were considered to identify the requirements:

- The functionalities of the Web Platform,
- The logistic sector in close collaboration with the Stakeholders Group (SG) and
- The KPI defined in the WP1 tasks.

The modules of the future Web Platform are depicted in Figure 1 below. The module Interactive Map includes the information on the corridors.

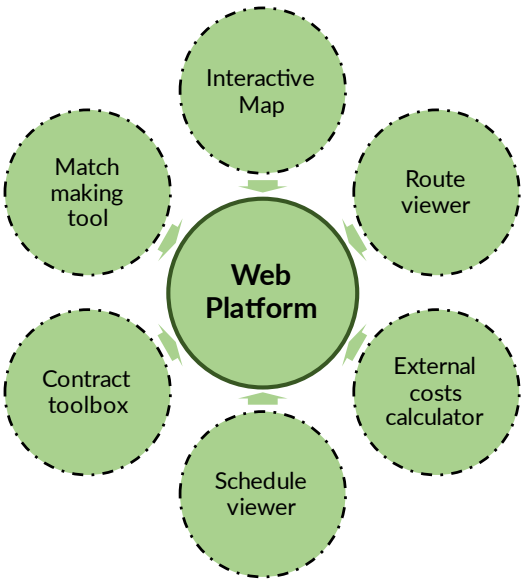

Figure 1 Web Platform modules

4.1 Description of the Web Platform functionalities

The following description of the Web Platform functionalities is based on the description in the Grant Agreement (GA). It is also complemented by the results of internal discussions during the project meetings, which also include the results from the specific meeting to present the project to the SG. The SG's contribution is detailed in the next subsection.

The functionalities of the Web Platform are the following:

a) The interactive map and corridors

The interactive map is based on a Geographical Information System (GIS) that shows the transport network. It is based on the SGKV Intermodal Map. The transport network consists of the rail network, the motorways and main roads, and the inland waterway network. Freight terminals (rail, multimodal) should be included in the map, along with detailed information about their services and connections.

b) The corridors

The initially, focus is on the Trans-European Transport Network (TEN-T) corridors, but other main corridors for modal shift need to be identified. Information about the corridors will include:

- Current and estimated future flows
- Main origin-destination cities to highlight potential routes
- The data should be presented on the interactive map, and the relevant data should be shown in the form of a table

c) The route and schedule viewer

The critical point in this module is to obtain the schedules from the terminals and operators:

- For the terminals, the opening and closing time
- For rail operators, frequency, departure, and arrival time, closing and picking up time
- First/last mile connections for specific regions, with basic information about trucking companies
- Data broken down into nodes and direct arcs for the 'Crow Flies' visualisation on the platform map

For the route calculator, an arc-node decomposition of the network is required with the following data:

- Origin-destination,
- Suitable modes,
- Estimated travel time for each mode,
- Load gauges admitted: container – P400 – others,
- Calculation of travel time: from rail operator schedule and road travel time estimation (plus first/last mile travel time when available)
- Origin-destination search function interface, along with multi-operator offers, will be developed by integrating schedules from different operators across Europe

d) The external cost calculator

Initially limited to a CO2 calculator, this module will provide comprehensive information on the main external costs associated with the selected freight transport route selected. It will be based on normalised values for different transport modes but will include the weight of the loading units, distances, and transport modes. The costs will be calculated from the distances and characteristics of the route selected in the Route Viewer Module

e) The contract toolbox

This toolbox is considered a repository of documents from the results obtained in WP2. To complement the work done in WP2, a proof of concept for blockchain solutions will be shown on the Web Platform. This proof of concept will demonstrate some transport use cases where users will be able to interact with them and personalise some aspects of the transport chain.

f) The match-making tool

A repository that aims to collect data on CT actors across Europe, offering a detailed directory with basic contact information. It involves comparing terminals (where data is available) to make evaluations based on factors like capacity, efficiency, and location. This comparison helps users make informed choices about their freight transport plans and logistics practices. Furthermore, the repository provides a selected list of possible first and last mile services. A detailed description of the Web Platform functionalities will be included in the D3.1 *ESEP4Freight reference architecture.*

4.2 Stakeholders Group perspective

During the project meeting in Verona (26-27 February 2024), the Stakeholder Group (SG) was asked to give their views on the project. Below is a summary of the meeting results, grouped by functionality.

a) The interactive map

The SG suggests that complementing terminal information should be supplemented with data on transport services, available connections, and terminal services offered and, if possible, showing some performance KPIs.

They are also interested in finding terminals located near a selected location, possibly with additional criteria.

b) The corridors

It is necessary to clarify the criteria for selecting high-potential routes. For instance, one could be those routes that need to cover empty return trips. Another could be to define new corridors for routes currently only covered by road.

It may be difficult to collect enough valid and valuable data for first/last mile connections. It is suggested to start with only a short list of the leading trucking companies for first/last mile connections to/from selected terminals.

c) The route and schedule viewer

One of the most noted aspects is the need for a single place for consulting timetables and possible connections for rail freight services. It is of the utmost interest to have a Web Platform where this data is available free of a charge to help the shift from road to other more sustainable modes of transport.

The SG recommends working with associations in the different sectors to obtain data rather than working on a company-by-company basis. This recommendation could be of interest to get data related to timetables and terminals.

During the different meetings, the possibility of adding a cost estimation with an interval approximation as part of the route information was discussed. However, it was not clear how to obtain the data (it is sensitive data), and poor-quality data could generate results far from the real costs. This was rejected.

d) The external cost calculator

The proposal to estimate external costs without limiting them to CO2 consumption was well received. It was suggested that showing the total consumption for each mode is better than showing only the savings; it is clearer.

e) The contract toolbox

No comments were collected for this functionality.

f) The match-making tool

The initial idea of getting data from shippers/operators/providers is not clear: the majority of the data may be considered sensitive, and most of the companies involved may be reluctant to share it.

Instead, SG proposed to present a comparative overview of selected terminals (Timetable, connections, terminal services, transport services, and others) as part of the information required to decide which route could be of interest.

4.3 KPI's to complement data visualisation

In task T1.1, a list of KPIs in rail freight transport was presented. One of the goals for preparing the list of KPIs in task T1.1 was to develop a catalogue of possible KPIs to complement the requirements for the different functionalities of the Web Platform. The list of the KPIs required by the Web Platform and their correspondence with the functionalities are detailed in the following summary. Those KPIs that may not be useful or are challenging to obtain for all the cases are highlighted in italics.

a) The interactive map

- Network characteristics
  - Number of tracks
  - Length of tracks
  - *Length of electrified line and type of current*
  - *Type of signalling system*
  - *Maximum allowable speed*
  - *Maximum train length*
  - *Maximum axle load*
  - *Track gradient*
  - Track gauge

- Basic information of terminals
  - Working time
  - Terminal name
  - Terminal operator
  - Coordinates, address and website of terminal
  - Available mode of transport
- Terminal characteristics
  - Capacity of terminal
  - Capacity of storages
  - Capability of terminal
  - Available services
  - Facilities type
  - Number of truck posts
  - Various other services (technical inspections, customs, commercial inspections, etc.)
- Terminal productivity
  - Total length of tracks/Total usable length
  - Number of trains on rail line
  - Operational unavailability
  - Loading unit acceptance
  - Cargo type transshipment / handling
  - Availability of an additional service in case of special needs (e.g., additional train load)
  - *Frequency of the first mile (last mile) service*
  - Number of departures per day and per destination
- Terminal connectivity
  - Number and type of destinations which can be reached from an origin
  - Distance of connections
  - Destinations served by the terminal or by the whole network
  - *Connection with main rail lines (name/bounds)*
  - *Connection with waterways (name)*
  - *Connection with main motorways (name)*
  - Rail access/ (private) access line (if applicable)
  - Access to rail services in terminal / SF infrastructure

b) The corridors

- Operational information for selected corridors
  - Rail transport volume
  - Road transport volume
  - IWW transport volume
  - Total transport volume
  - Payload
  - IN/OUT transhipment
  - *Number of containers (TEU) moved*
  - *Number of swap bodies moved*
  - *Number of trailers moved (piggyback)*
  - *Number of cars moved*
  - *Number of trains and wagons moved*
  - *Number of trucks moved*
  - *Number of vessels moved*
  - *Number of barges moved*
  - *Unitisation in the different modes of transport - tonne-kilometre for gross weight of goods*
  - *Unitisation in road freight transport - tonne-kilometre for gross weight of goods*
  - *Unitisation in rail freight transport- tonne-kilometre for gross-gross weight of goods*
  - *Unitisation in inland waterways freight transport - tonne-kilometre for gross-gross weight of goods*
  - *Unitisation in maritime freight transport - tonnes for gross weight of goods*

c) The route and schedule viewer

- Route description
  - Number of phases required to complete a journey
  - Number of connections
  - *Dwell times (mins) during stops*
  - Station of departure or arrival
  - Number of options to make a trip
  - Number of modes used to complete a journey
  - *Sum of costs to complete a journey*

- Terminal connections
    - Mode of transport
    - Access time
    - Time of connections
    - Number and type of destinations which can be reached from an origin (connectivity)

d) The external cost calculator

- **CO2 calculator**
    - Average CO2 emissions
    - kg CO2e/TEU
    - CO2 emissions

It should be noted that at the time the KPI catalogue was developed, the aim was to create a CO2e calculator only. However, during the project implementation, the scope was expanded to include other externalities and therefore, the KPIs for other external costs will be extended in WP3.

e) The Contract toolbox

No specific KPI defined in D1.1 related to contract toolbox

f) The match-making tool

No specific KPI defined in D1.1 related to the match-making tool

This list of KPIs will be further refined in WP3 once the data required for their representation and their availability have been confirmed.

5 Data collection plan

This chapter provides a detailed description of the data sources for each component for each functionality. It also gives a first introduction to the data format required and the processes for obtaining and maintaining data up-to-date. Given that data formats and procedures to obtain and update data may change along the development of the Web Platform process, the current version of the data formats and capture processes will be detailed and updated in the documentation that will be part of the D3.2 ESEP4Freight Web-based Platform.

5.1 Data sources description

Table 1 summarises the data sources required to feed the components, following the same structure of functionalities as in the previous section. It is grouped by functionality (first column) and components (second column). The components are broken down into modules (third column). The fourth column indicates whether the data used to feed the module are available at the European level (Standard) or whether they are only restricted to specific geographic areas (Advanced). The next column, “Data source”, indicates the source of the data that will be used to feed the modules and provides a first assessment of the automation possibilities by using APIs. The last column, "Updating data," indicates how often the data is updated: "P" for periodically, "API" for data coming from an API, "N" for data uploaded once and not updated from the initial source[1], and "TBD" (to be defined) for cases that require further development and clarification for the Web Platform.

Table 1 Data vs Functionalities

Funct.	Components	Modules	Level	Data source	Updating data
Interactive Map	Network	Rail Network basic definition	St	RINF	P
				OpenRailwaymap	API
		Motorways and main roads	St	Openstreet map	API
		Inland Waterway Network	St	Openstreet map	API
		Terminals	St	RINF	P
	Terminal main data	Contact, location Open/closing/pick up time	St	Intermodal Map	TBD
				Ferrmed	N
	Terminal services	List of services and main data of selected terminals displayed in the network	Adv	Intermodal Map	TBD
				Ferrmed	N
				RNE	TBD

[1]The source is used only for the initial definition, the data will be updated via the ESEP4Freight Web Platform own functionalities

Funct.	Components	Modules	Level	Data source	Updating data
	Terminal productivity	Productivity data	Adv	Intermodal Map	N
				Ferrmed	N
	Terminal operator schedules	Operator Schedules associated with the terminal	Adv	Operator schedules	P
Corridors	Operational information	TEN-T Rail Corridors	Adv	Ferrmed	N
				RINF	P
		High potential routes	Adv	T1.3	N
				Ferrmed	N
		Freight flows of selected routes	Adv	T1.3	N
				Ferrmed	N
Route and schedule Viewer	Route description	Origin/destination selection	St	Openstreet map	API
		Route order criteria	St	Data from Terminals	TBD
		Multi-mode multi-operator route calculator	St	Operator schedules	TBD
		Data from the route	St	External costs calculator	API
External costs	External cost calculator	Load characteristics	St	Route O/D	N
		CO2 calculator	St	EU handbook from 2019 - Industry nominal values	TBD
		External costs calculator	St	EU handbook from 2019 - Industry nominal values	TBD
Contract toolbox	Document database			T2.1	TBD
	Blockchain contract proof of concept			T2.2	N
	Results from SWOT analysis			T2.1	N
Match-making tool	Contact directory	List of contacts associated to complementary services for a terminal	Adv	Stakeholders Group	TBD
	Terminal comparison	Selection criteria and results from comparison	Adv	Terminal services	N

The description of the sources is detailed below:

- **OpenStreetMap**
  It is a free, open geographic database updated and maintained by a community of volunteers. It is freely license under Open Database License (OpenStreetMap, 2024). It will be the basis for the interactive map.
- **OpenRailwayMap**
  This is a detailed map of the railway infrastructure based on the OpenStreetMap (2024) database. As the OpenStreetMap, it is freely license under Open Database License. It will help to interact with the railway system
- **RINF – Register of Infrastructure**
  The RINF system (European Union Agency for Railways, 2024) is a web-based application at European level that facilitates the access to the data of national registers of railway infrastructure.
- **Intermodal map**
  The Intermodal map (SGKV, 2024) is a representation of combined transport terminals in Europe. It shows a range of terminal information, the most basic such as location, contact details, opening hours, complemented with infrastructure characteristics, handling equipment, terminal services. It is free of charge use, based on OpenStreetMap.
- **Ferrmed**
  Ferrmed is a non-profit organisation non-profit multisectoral association founded in Brussels in August 2004 promotes studies and cooperation among rail stakeholders in Europe (and recently, in Asia via the Euro-Asian Corridor). They have recently published the Study of Traffic and Modal Shift Optimisation in the EU (Ferrmed, 2023). In this study, they have compiled data from the rail networks and terminals. KTH, as project coordinator, and Ferrmed, as collaborating entity, have signed a Data Use Agreement that allows ESEP4Freight to use the results of the "Study of Traffic and modal Shift Optimisation".
- **Operator schedules**
  The operators` schedules are collected according to the uniform timetable template defined with the minimum requirements of the combined transport industry in the German feasibility study EiFa (SGKV, 2023). The template has 21 fields as shown in Table 5 in section 5.3. The schedules for the platform would be collected from the major intermodal operators in Europe through desktop research and, if necessary, also through direct contact with the operators.
- **RailNetEurope (RNE)**
  RNE (2024) is an umbrella association of European rail infrastructure managers that is committed to facilitating international rail transport. Within the RNE, data and information are collected and stored, such as the Path Coordination System (PCS), the Train Information System (TIS), the Customer Information Platform (CIP), the Charging Information System (CIS), the Common Component System (CCS), the Network and Corridor Information System (NCI), the Rail Facility Portal (RFP), the Temporary Capacity Restriction (TCR), the European Capacity Management Tool (ECMT) and the Railway Infrastructure System (RIS).

KTH and EUX, as project coordinators, submitted a data application form to RNE for access to the data required for the ESEP4Freight project. Through several iterations with RNE, data on TIS, RFP and CIP were obtained from RNE for the purposes of the project.

- **EU Handbook on the external costs of transport Version 2019 – 1.1.2019**
  This report (European Commission, 2019) provides an overview of the methodologies and input values that can be used to provide state-of-the-art estimates for all main external costs of transport. All the main transport externalities such as accidents, air pollution, climate change, noise, congestion, well-to-tank emissions, habitat damage and other external cost categories (e.g. soil and water pollution) are covered in this handbook. The handbook also provides the average external cost values for different transport modes across European regions. This would form the basis of the proposed external costs calculator module on the Web Platform.
- **Outputs from T1.3**
  Task 1.3 analysed the freight market trends on the freight market and the freight market flows on the European transport market. This task analysed the goods with a higher potential to shift freight transport from road to rail. This task also analysed infrastructure expansions and other improvements that could enable better rail operations in Europe. The potential of introducing faster and longer trains on the rail freight corridors is analysed, and the impact of the technologies identified in T1.2 on the operational performance of the corridors, such as terminal service time and time at border crossings.
  As part of the task, demand and supply in rail freight transport at nodes and links on the European rail freight corridors were determined using the cluster model. This will allow the identification of current freight flows to be complemented by the identification of future freight flows with higher modal shift potential to rail. Therefore, this task will provide the current and future freight flows and the type of freight with high modal shift potential to rail. The results of this task will be used for the development of the interactive map in WP3.
- **Outputs from T2.1**
  In Task 2.1 an inventory of the current international and European legal and policy actions at international and European level has been created. The most relevant piece of legislation and the interactions between them are identified in this task by consulting international organisations. The contractual framework of various key intermodal contractual relationships is analysed as well. To perform this, a literature review is undertaken, and direct interviews are conducted with pre-selected operators and inputs from the various TGs involved in the SG are considered. The aim is to identify the current types of contracts and clauses and to evaluate their short-medium and long-term impacts with a focus on the flexibility of the transport system.

- **Outputs from T2.2**
  A conceptual framework and potential architecture for intermodal transport using blockchain technologies and smart contracts is developed in Task 2.2. A SWOT analysis of the use of these technologies is carried out to understand if the implementation for these technologies should be eased by focusing on new digitalisation technologies. Based on the output of task 2.1, a conceptual framework of smart contacts and a potential architecture

for implementation tailored to the sector's own characteristics is proposed. To this end, two possible implementations will be assessed: a first one based on e-CMR (the electronic consignment note) and a second one based on blockchain.

5.2 Data collection process

Each type of data requires the definition of a data collection process for the initial upload and for the future updates of the data. The process required for each data source is detailed below, following the previous list:

- **OpenStreetMap**
  The Web Platform will use the overpass API, which means no need of maintain local data and implies using the last version of the maps at all times.
- **OpenRailwayMap**
  As for the OpenStreetMap, the Web Platform will use the overpass API for the railway maps (OpenRailwayMap, 2024).
- **RINF – Register of Infrastructure**
  RINF (European Union Agency for Railways, 2024) provides a complete database of the rail infrastructure network in Europe. The database is accessible via scripts using the RINF Web Platform. There will be an initial automated process to download the data infrastructure required for the web platform. It is expected that the data will be updated periodically, initially twice a year, given that the data infrastructure does not change frequently. An automated process will be built to download the data from RINF and update the data in the ESEP4Freight Web Platform.
- **Intermodal map**
  The data from the Intermodal Map (SGKV, 2024) will be used to create the initial version of the terminal data. The data from the Intermodal Map will be downloaded from the current database by its owners in Excel files. The Excel files will be the starting point from which the data from the terminals will be uploaded to the ESEP4Freight databases. Thus, the data from the Intermodal maps will be used to feed ESEP4Freight terminals data. The data exchange between the Intermodal Map and the ESEP4Freight Web Platform for future updates will be defined during the development process.
- **Ferrmed**
  The data provided by the Ferrmed study (Ferrmed, 2024) will be used to complement the terminal data, jointly with data from the Intermodal Map and RINF. Moreover, the Ferrmed files also contain data on the corridors. The data are stored in an Excel file. No future updates are required: no changes are expected in the Ferrmed original files.
- **Operator schedules**
  Initially, data schedules from selected operators are collected manually and filled into Excel files with a standard format as defined by the EiFa project (https://sgkv.de/portfolio/projekte/eifa/). An automatic process will upload the

ESEP4Freight database from the Excel files. It is foreseen to give the operators the option to create and update their corresponding schedules in the same format. In this case, an automated process will update the ESEP4Freight schedules in the database.

- **EU Handbook on the external costs of transport Version 2019 – 1.1**
  The recommendations of this handbook would be used to create the structure of the External Costs calculator module for the ESEP4Freight Web Platform. The reference values for the external costs of accidents, air pollution, climate change, noise, congestion, well-to-tank emissions, habitat damage and others would be based on the average external cost values for different transport modes across European regions as specified in this handbook. Depending on the model of sustenance adopted for the management of the Web Platform after the project period, these industry nominal values would be updated in the future in line with the updates of the handbook (European Commission, 2019).
- **Outputs from T1.3**
  As part of task 1.3, the nodes and links with the highest and lowest freight flows, as well as origin destination flows were clustered. The results of this activity will be used for the Web Platform in WP3. Therefore, the data from the analysis of freight market trends and freight flows are uploaded to the ESEP4Freight Web Platform, where they are used for visualisation in the interactive map.
  The content of freight train flow information to be represented in the Web Platform will be the current and estimated yearly until 2025, at NUTS2 level, clustered by volume, origin, destination, and volume links from origin to destination. The content of freight flow information (all modes) will be the current flows at country level.
- **Outputs from T2.1 and T2.2**
  These tasks will provide the conceptual framework and potential architecture´s specifications of two possible smart contracts implementations (e-CMR and Blockchain) in both layers, the informative one and the contractual one to be incorporated in the module developed in WP3.

5.3 Data sets description and templates – initial proposal

This section provides a summary of the fields that are initially required for the ESEP4Freight Web Platform. It is an initial proposal, since the database will be defined and built during the development of the Web Platform, in WP3, and it will change during the development lifecycle. The current version of the data sets description with the field formats and the relationships between the datasets will be detailed and updated in the documentation that will be part of the D3.2 *ESEP4Freight Web-based Platform*. This is the first version of the templates for collecting the required data.

Table 2 Intermodal map data

Group	Field description	Field format	Comments
Location	Terminal Name	String	
	Terminal Latitude	WGS 84	
	Terminal Longitude	WGS 84	
	BIC Facility Codes	String	
	Terminal Street Number	String	
	Terminal Additional Address	String	
	Terminal State/Province/Region	String	
	Terminal Postal Code	String	
	Terminal City	String	
	Terminal Country	String	
Contact	Contact Person	String	
	Contact Person E Mail	String	
	Terminal General E Mail	String	
	Telephone	String	
	Fax	String	
	Website	String	
	Opening hours	HH:MM	
Operator	Terminal Operator	String	
	Terminal Operator Street Number	String	
	Terminal Operator Additional Address	String	
	Terminal Operator Postal Code	String	
	Terminal Operator City	String	
	Terminal Operator Country	String	
Type	Type of Facility	String	
	Sea Port	String	
	Loading Units	String	Container/Swap Body/Semi Trailer (Cranable)/Semi Trailer (Non Cranable)
Equipment	Gantry Cranes	String	
	Container Bridges	String	
	Reach stacker	String	
	Straddle Carrier	String	
	Mobile Crane	String	
	Empty Stackers	String	
	Number of Loading Tracks	String	
	Total length of Loading Tracks in m	String	
	Storage Area for Loading Units in m^2	String	
	Storage Capacity (LU)	String	
Services	Loading Unit Fumigation	String	

Group	Field description	Field format	Comments
	Loading Unit Cleaning	String	
	Loading Unit Ventilation	String	
	Loading Unit Repair	String	
	Brake Test	String	
	Carrier Repair	String	
	Loading Unit Weighing	String	
	Rolling Highway (RoLa)	String	
	Track Weighing	String	
	Roll on/Roll off	String	
	Dangerous Goods Handling	String	
	Rail access with momentum	String	
	Dangerous Goods Storage	String	
	Shunting	String	
	Loading Unit Storage	String	
	Reefer Storage	String	
	Empty Depot	String	
	Stuffing/Stripping	String	
	Commissioning	String	
	Packaging	String	
	OCR	String	
	Customs Office	String	
	Trucking Services	String	

Table 3 RINF Operational Point data

Field description	Field format	Comments
Unique OP ID	String	Code composed of country code and alphanumeric OP code, format AA+AAAAAAAAAA]
Name	String	Name of Operational Point
Type	String	Possible values: station small station passenger terminal freight terminal depot or workshop train technical services passenger stop junction border point shunting yard technical change switch private siding domestic border point
Geographical coordinates	WGS coordinates	[Latitude (NN.NNNNNNN) + Longitude (±NN.NNNNNNN), following standard World Geodetic System (WGS)

Table 4 RINF - Section of line data

Field description	Field format	Comments
responsible IM	string	The Code is a unique identifier for the Infrastructure Manager, format AAAA
National Line Id	string	National line identification. Each SoL can belong to only one national line
OP Start	string	RINF code of the Operational Point of the start of the line section.
OP End	string	RINF code of the Operational Point of the end of the line section
OP Length	numeric	Lenght of the line section. The distance is given in kilometres with decimals of 0,001. Format NNNN.NNN
Number of Tracks	numeric	Number of tracks that conforms the SoL
USAGE	string	Type of usage: passenger, freight, both. Extracted for each track
Electrified	List of strings	Type of contact line system. Possible values : Overhead contact line (OCL) Third Rail Fourth Rail Not electrified. In case of having different systems for different tracks in the same line section, all of them will be collected

Field description	Field format	Comments
Type of current	List of strings	Energy supply system (Voltage and frequency). Only in case of electrified. In case of having different systems for different tracks in the same line section, all of them will be collected. Possible values: AC 25kV-50Hz AC 15kV-16.7Hz DC 3kV DC 1.5kV DC (Specific Case FR) DC 750V DC 650V DC 600V DC 850V other
Signalling system	string	ETCS level OR Train protection legacy systems if ETCS not applied?
Maximum length		Trains maximum length allowed - Operational data - Not defined in RINF data - To be obtained from other sources, like RNE
Gauging	string	Gauge allowed in the section line. In case of having different loading gauge for different tracks in the same line section, all of them will be collected.
Speed	numeric	Maximum speed allowed in the section line. In case of having different speeds for different tracks in the same line section, all of them will be collected. Format NNN, in km/h
Gradient	string	Gradient profile of the section line. Need to be refined.
Nominal track gauge	list of charstrings	Possible values: 750 1000 1435 1520 1524 1600 1668 other. For each track. A list of values for each track is presented, if different
Maximum axle load		Maximum axle load allowed - Operational data - Not defined in RINF data – To be obtained from other sources, like RNE
Corridor	list of strings	List of TENT-T or other freight corridors to which the section line belongs. Extracted for each track of the SoL
ProfileNumSwapBodies	string	Standard combined transport profile number for swap bodies
ProfileNumSemiTrailers	string	Standard combined transport profile number for semi-trailers

Table 5 Schedules data

Field description	Field format	Comments
Timetable valid from Date	Date-time	
Timetable valid until Date	Date-time	
UIRR Code Origin Terminal	Numeric	
Name of Origin Terminal	String	
Origin Country	String	Country code
UIRR Code Destination Terminal	Numeric	
Name of Destination Terminal	String	
Destination Country	String	Country code
Closing for LU at Origin Terminal [Days]	String	Values A-B-C-D-E
Closing for LU at Origin Terminal [Time]	Time	Example: 14:00:00+01:00
Days of Departure from Origin Terminal	String	XXXXXXX - one for each day with values 0 (no departure) / 1 (departure)
Provision of LU at Destination Terminal [Day]	String	Values A-B-C-D-E
Provision of LU at Destination Terminal [Time]	Time	Example: 14:00:00+01:00
Clearance Gauge for Railway Network	String	List of admitted gauges
CT Operator Name	String	
CT Operator RICS Code	Numeric	
CT Operator Contact Person Name	String	
CT Operator Contact Phone Number	String	format phone number
CT Operator E-Mail Address	String	format email
CT Operator Web Link	String	format web page name
Others	Text	

5.4 Data review process

The data review process will be based on the review process being currently carried out in the existing SGKV Intermodal Map. The data in the SGKV Intermodal Map are classified in two categories of basic critical data and additional infrastructure / service data. Both data are obtained as much as possible directly from the website of the terminal or the terminal operator. In case such sources are not available, the plausibility of the data is ensured by relying as much as possible only on trusted websites or government publications during desktop research.

Furthermore, the basic critical data comprising of the name of the terminal, geo-location, address, contact information, operator, and type of facility are verified yearly to maintain an updated database. Moreover, since the coverage of the database is now being actively extended to a global level, the additional infrastructure / service data is verified and added to the database only at the beginning. Depending on the model of sustenance adopted for the Web Platform management after the project period, these updates could also be transferred to the ESEP4Freight Web Platform.

However, it is important to note that although the quality of the data is maintained as high as possible by carrying out annual checks of the most important parameters of the terminals, databases of this size almost always contain some errors and gaps.

The review process will be further developed in T3.1 and T3.2 and its final version in form of guidelines will be included in the D3.2.

6 Conclusions

Deliverable 1.2 is dedicated to the data collection part of WP1 on “data collection, innovation, assessment and analysis of freight flows”. Data collection is one of the key elements for the success of this project for developing the interactive map as the core of the Web Platform. This deliverable covered Task 1.4: Identification and collection of operational and infrastructure data.

The functionalities of the Web Platform were defined including a) the interactive map, b) the corridors, c) the route and schedule viewer, d) the external cost calculator, e) the contract toolbox, f) the match-making tool. The stakeholder group feedback based on the physical workshop held in Verona in February 2023 on all of these functionalities wase summarised and incorporated into the selected KPIs for data visualisations on the interactive map functionalities.

The data collection plan was presented for all functionalities in the interactive map by specifying the data sources for each component in each functionality. The data collection plan described the data sources, the data formats, the processes to maintain and update the data.

Due to the common security, commerciality, or even unavailability data issues common in rail freight transportation in Europe, it is worth mentioning that the data collected to develop the final interactive map were based on the most reliable and available data found by the project. Future overcoming of the data limitations may improve the functionalities of the interactive map.

During the project and the development of the interactive map, data formats and procedures will be updated. These updates will be documented in D3.2 ESEP4Freight Web-based platform and the final version of the data collection plan will be finalised in D6.2 Data Management Plan.

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