Design and development

of ‘national country sheets’

related to intermodal transport

in the context of the ReMuNet project

Final Report

INTERMODAL COMPETENCE SGKV

KNOWLEDGE BASED PLANNING

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Summary

UIRR is partner of the ReMuNet project, an EU co-funded project under the Horizon Europe Research and Innovation Actions programme. ReMuNet - Resilient and adaptive multimodal transport networks – identifies and signals disruptive events and assesses their impact on multimodal transport corridors. ReMuNet orchestrates route utilization, suggests transshipment points and optimizes capacity allocation, minimizing damage and shortening the recovery time.

Within the task 1.2 of the project the intention of UIRR was to develop a catalogue of 'national country sheets' related to intermodal transport. This catalogue contains valuable information such as transport volumes, the active market stakeholders (Combined Trasport Operators, Railway Undertakings…), the key contacts for Authorities (Ministries, Parliament, Regulatory Bodies…), list of key legislations and national strategies and, funding schemes and non-financial support programs.

This report describes the methodology adopted by partners SGKV and KBP for identification of indicators, data collection, and visualisation, along with a brief overview of the results. As part of the project, after the identification of indicators together with UIRR, data for more than 100 indicators was collected for 17 countries bordering the two TEN-T corridors, North Sea - Baltic and Rhine - Danube. These are available for ReMuNet and beyond in an Excel spreadsheet. In addition, selected data has been converted into national country sheets, which provide a focussed insight into the freight transport market and combined transport in the respective countries.

The chapter on visualisations also shows how the country sheets can be made permanent. In the current version of the project, much of the information is singular and predominantly static. However, the current work provides a good basis for developing a more interactive format that is capable of time series.

1. Objectives and Methodology

The intention of this project was to develop a catalogue of 'national country sheets' related to intermodal transport. This catalogue would contain valuable information such as transport volumes, the active market stakeholders (Combined Trasport Operators, Railway Undertakings…), the key contacts for Authorities (Ministries, Parliament, Regulatory Bodies…), list of key legislations and national strategies, funding schemes and non-financial support programs. The work towards achieving these objectives were divided into three main stages as in the following:

a) Analysis of existing indicators and validation of feasibility of data collection
b) Data collection
c) Visualisation of the data

These work steps and their results are briefly described in the following chapters.

2. Analysis of existing indicators and validation of feasibility of data collection

The first step was to look at the indicators that were created by the UIRR during ReMuNet and similar previous projects. This set consisted of two hundred indicators, some of which were divided into further sub-indicators. As this enormous number of indicators could hardly be filled with data, due to availability and the resource available in ReMuNet, it was necessary to determine which indicators should be used for the country sheets.

To this end, the existing indicators were internally reviewed for their suitability. In doing so, we were guided by the ReMuNet project description (points T1.1, T1.2). The indicators had to be particularly suitable for meeting the requirements formulated there. At the same time, the data for the suitable indicators had also to be collectable, i.e. available, and accessible. Thus, data access, availability, automatization of data collection, coverage and resources needed for data acquisition were considered. For this purpose, numerous sources were checked for data and the aforementioned criteria. In addition to official statistics platforms such as Eurostat, this also included data from associations and companies such as SGKV Intermodal Map, UNECE, OpenRailwayMap, RNE, CLECAT, European Association for Forwarding, Transport, Logistics and Customs Services, European Logistics Association, and individual research on the websites of administrations and institutions in various countries.

Both evaluation strands, relevance, and collectability, were bundled together into an internal ranking. Both strands were given values, reaching from 0 to 3. In total, a maximum value of 6 was achieved. Taking the above criteria into account, it was decided to undertake the data collection for all indicators that received a score of 5 or 6 in the ranking. As a result of the process 112 indicators were classified as suitable for the country sheets. These indicators were once again validated by UIRR during the monthly review meetings.

Figure 1 gives an overview of the indicator categories that were used and for which data were collected. A detailed insight into all indicators can be found in the corresponding Excel file.

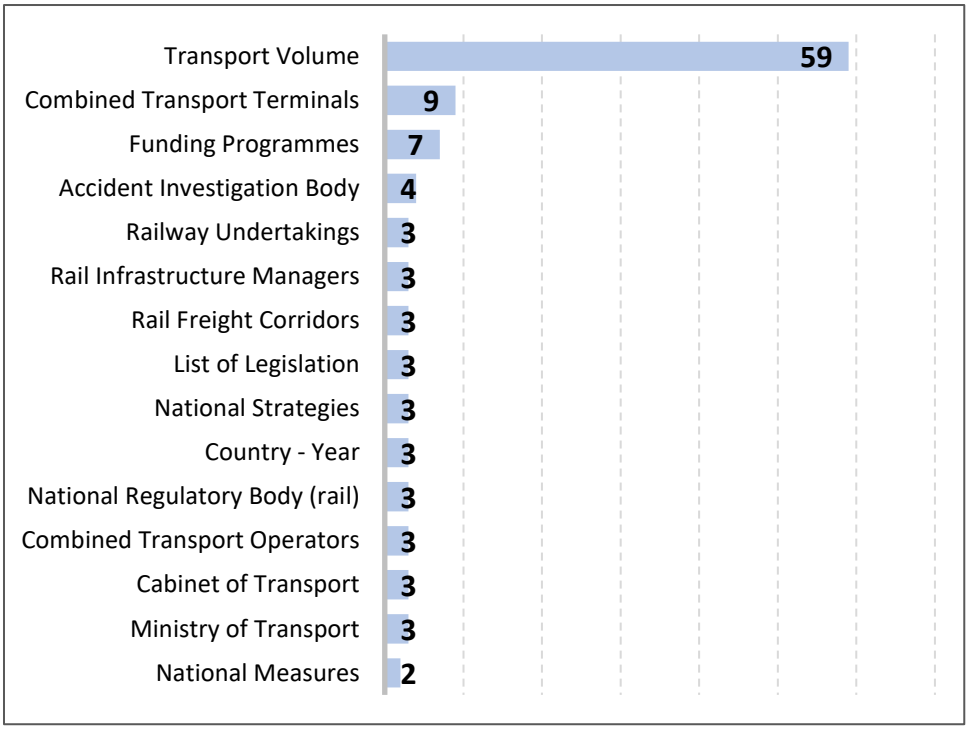

Figure 1: Overview of the indicator categories and the distribution of indicators

3. Data collection

As soon as the indicators, from which the country sheets are to be created, have been determined, the data collection was started. The collection was done in an Excel file based on the UIRR template. (For more details see the chapter on visualization.). The data was collected for EU Member States involved in the North Sea - Baltic and Rhine - Danube corridors. In total, data was collected on national scale for seventeen countries (see Figure 2 and Table 1).

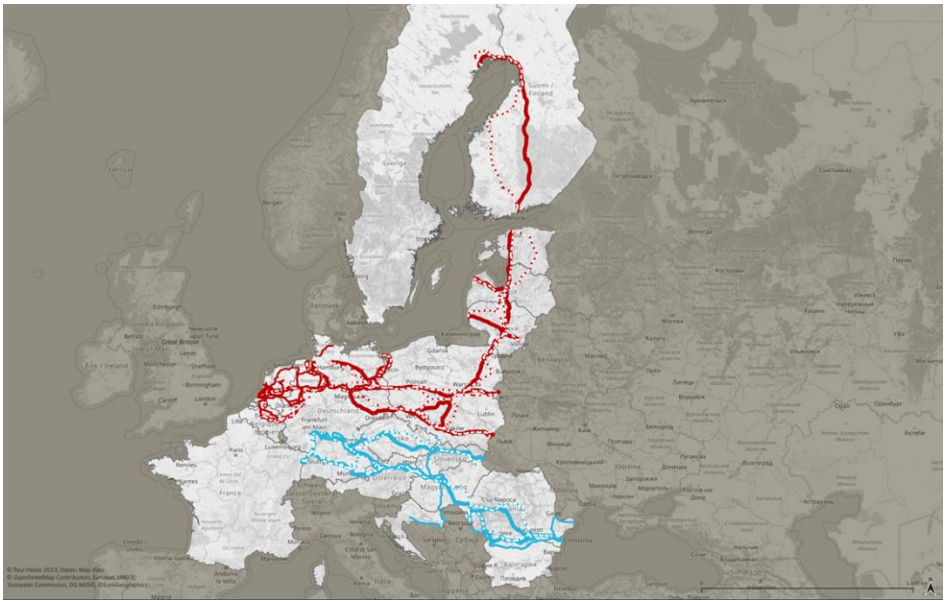

Figure 2: Seventeen countries in the North Sea - Baltic and Rhine - Danube corridors (Source: KBP)

Table 1: Countries and corridors considered

Country	TEN-T Corridor
Belgium	North Sea Baltic Corridor
Netherlands	North Sea Baltic Corridor
Germany	North Sea Baltic Corridor and Rhine-Danube Corridor
Poland	North Sea Baltic Corridor
Lithuania	North Sea Baltic Corridor
Latvia	North Sea Baltic Corridor
Estonia	North Sea Baltic Corridor
Finland	North Sea Baltic Corridor
Sweden	North Sea Baltic Corridor
France	Rhine-Danube Corridor
Austria	Rhine-Danube Corridor
Czech Republic	Rhine-Danube Corridor
Slovakia	Rhine-Danube Corridor
Hungary	Rhine-Danube Corridor
Croatia	Rhine-Danube Corridor
Romania	Rhine-Danube Corridor
Bulgaria	Rhine-Danube Corridor

The various sources mentioned in the previous passage were consulted during the research. In addition, both central information services (such as DG MOVE) and national websites were used. The latter occasionally required language skills, which were not covered in full by the project team. In addition to the English websites of the respective authorities, research also relied on browser-based translations to unlock a greater variety of information for the project.

While the data collection process as a whole went as expected and produced the desired results, a number of important issues were identified or became apparent, which are explicitly mentioned here.

In the course of data collection, the names and data type of individual indicators had to be adapted so that they better matched with the available data, for example when it came to transport volume and output. It also became apparent that some of the existing overviews of relevant topics and persons are not up to date. Contact persons and contact details appear to change too quickly in selected countries and areas of responsibility. One example of this is that of the Accident Investigation Body. In many cases, the information on https://eradis.era.europa.eu/public/organisations.aspx seem no longer up to date. Where possible, general organisation-related e-mail addresses have been considered.

In some cases, indicators contain several data points, such as names and email addresses. In the case of road freight transport standards, rail freight transport standards and Combined Transport support measures, there are even up to eleven entries, which further increase the information density of the more than 110 indicators. Particularly in the case of the standards to be researched in connection with the modes of transport and combined transport, it is clear how challenging it is to compile consolidated and comparable data for several countries.

The research into funding programmes also posed a major challenge. The research was based on existing UIRR work. The final list is now a selection and does not claim to be exhaustive. For details of funding opportunities, it is essential to contact the relevant authorities, such as the national transport ministries. The European Commission offers a variety of funding programmes aimed at the development and expansion of infrastructure in the member states. Programmes such as the European Regional Development Fund (ERDF, ESI Funds 2021-2027) and the Programme for the Environment, "Connecting Europe Facility" (CEF) and Climate Action (LIFE) could be relevant for projects in the field of combined or intermodal transport. These funds are not listed in the data collection, nor are regional programmes (such as INTERREG) or individual case funding (such as individual terminals). Similarly, national programmes for the expansion of rail infrastructure, research and development projects or economic development are not included if Combined Transport has not been a priority for these programmes.

As a result of the data collection there is a excel database table that contains all collected data and allows data to be filtered using a user interface developed specifically for this database. This also provided the basis for the visualization of the final project step.

4. Visualisation of the data

a. Implemented Solution

In addition to the Excel database table, there was the need for another form of visualization. On the one hand, this should be used for further work in ReMuNet. On the other hand, the visualization should represent a more accessible form for the large amount of data than is possible with a simple Excel table. Therefore, two additional products were delivered as in the following and attached as annexure to this final report:

a) Country sheets in the form of serial letters. These were designed and created in Word. The country sheets consist of two pages and hence, present a selection of indicators and data. The selection was chosen regarding the ReMuNet project context. The sheets combine visual elements and text passages as shown in Figure 3 below. The result is 17 individual files, one data sheet per country. They have been combined in one PDF file for an easy-to-use download. The layout was also finalised in collaboration with UIRR.

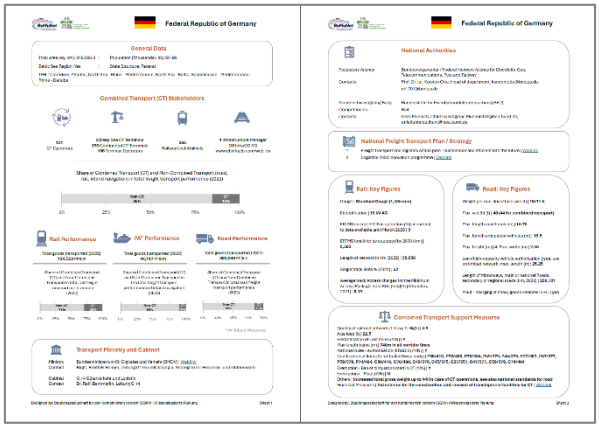

Figure 3: Sample of the country sheets – Federal Republic of Germany

b) A modified Excel database with a filtering interface that allows users to find and select data in a more user-friendly way, see Figure 4.

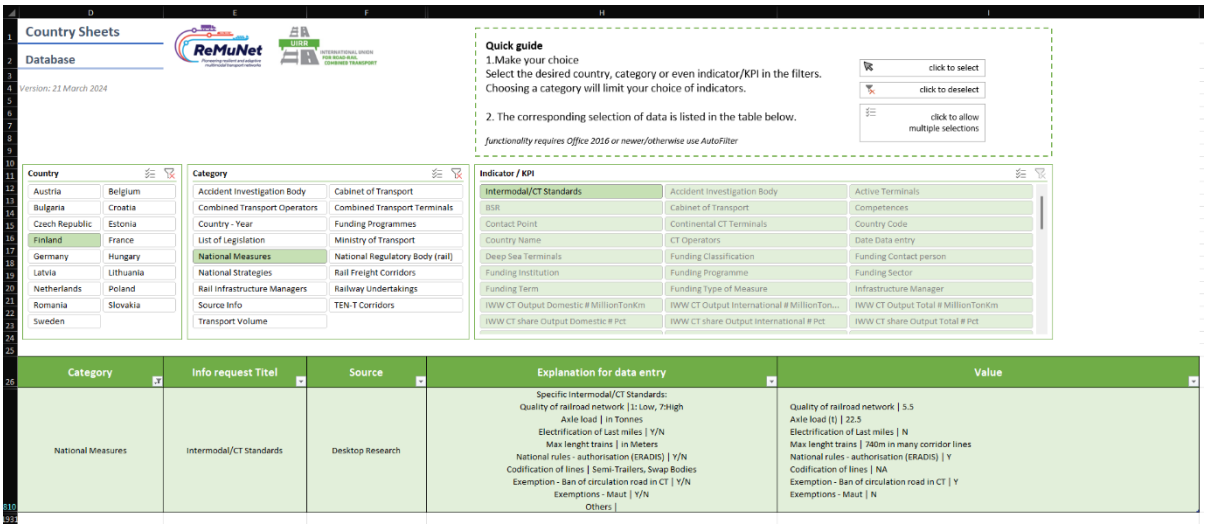

Figure 4: Sample of an Excel file with extended user-oriented interface

b. Possible future developments

The country sheets provide many stakeholders with a quick overview of freight transport and combined transport in selected European countries. They provide helpful information on the current status in 2022/2023 as well as addresses and links to further details.

The information has been collected and prepared as a small part of a comprehensive project. It is therefore static. It will not be automatically updated beyond the end of the project and therefore represents a unique status quo. Transport volumes and contact persons may change and data may become outdated.

Visualisation in Word or PDF files is a proven and accepted solution for the presentation and communication of information. It is largely low-threshold and files can be distributed manually or offered for download. However, there are also disadvantages associated with this form of visualisation. These include, for example

- Creator-based selection and visualisation of data or indicators, which must be accepted by users as a given
- A limit on the amount of information while at the same time the desire for greater clarity
- Obstacles to the automatic updating of data, but at least the need for intermediate IT steps
- Centralised storage by users on local computers

The additional offer of an Excel file with interactive filtering can overcome some of the disadvantages and challenges mentioned above. This is an important reason why this parallel visualisation solution was created for users in this project.

c. Interactive solution

Nevertheless, it seems legitimate to examine whether other visualisation solutions could be considered in the future. Interactive, web-based services in particular have been popular for years and are justified. Interactive online dashboards offer a dynamic, engaging, and efficient way to present and explore data, providing significant advantages over static data presentations in PDF files in terms of accessibility, interactivity, user experience, the depth of (real-time) analysis.

Following on from the disadvantages mentioned above, the following advantages can be mentioned in particular:

- **Real-time Data Updates:** Interactive dashboards can be connected to live data sources, allowing for real-time updates. This means the information displayed is always current, unlike static PDFs which may quickly become outdated.
- **User Interactivity:** Users can interact with the data presented in an online dashboard through filtering, sorting, and drilling down into the specifics. This interactivity enables users to explore the data according to their interests or needs, which is not possible with static PDFs.
- **Customizable Views:** Interactive dashboards allow users to customize their view of the data by selecting specific parameters or metrics they are interested in. This personalization helps users to focus on what's most relevant to them, improving the usability of the data.
- **Enhanced Data Visualization:** Online dashboards support a wide range of dynamic visualization tools, such as graphs, charts, and maps, which can be interactive themselves. These tools help in making complex data more understandable and engaging compared to static images in PDFs.
- **Accessibility:** An interactive dashboard hosted online can be accessed from anywhere at any time, provided there is internet connectivity. This is more convenient than PDFs, which need to be distributed and might not be readily accessible when needed.
- **Collaboration and Sharing:** Online dashboards facilitate easier sharing and collaboration. Users can share their findings or specific views of the data with others directly through the dashboard, enhancing collaborative decision-making.
- **Scalability and Integration:** Interactive dashboards can be scaled to handle large datasets and can be integrated with other web applications and services. This scalability and integration capability is limited in static PDFs.
- **Cost-effective Updates and Maintenance:** Updating a PDF requires re-editing and redistribution, which can be time-consuming and costly. In contrast, updates to an online dashboard can be made centrally and become instantly available to all users.
- **Reduced Risk of Misinterpretation:** The ability to interact with the data directly helps reduce the risk of misinterpretation. Users can explore the data themselves, understand the context better, and make more informed decisions.
- **Environmental Benefits:** Moving from PDFs to online dashboards reduces the need for printing, contributing to environmental sustainability efforts.

d. Need to adapt data structure

To enable such a visualisation in the future, to add and include older data for the purpose of the time series and also annually updated data, the current data structures would have to be adapted. They currently follow the original set-up of UIRR. The data structure allows a quick overview in the existing Excel file, which makes it easy to understand the origin, meaning and values of the data (see Table 2). However, it is not structured in the way a "classic" database should be structured to enable updates and links to interactive applications. However, the adaptation appears to be feasible without major problems. After a kind of pivoting of the data, a structure similar to that shown in Table 3 should be the desirable result.

Table 2: current data structure

Indicator Country	***Indicator 1***	***Indicator 2***	***Indicator y***
ID 1	*ID of indicator 1*	*ID of indicator 2*	*ID of indicator y*
Editor	*Source of indicator 1*	*Source of indicator 2*	*Source of indicator y*
Belgium	*Value 1-1 in 2022*	*Value 2-1 in 2022*	*Value y-1 in year zzzz*
France	*Value 1-2 in 2022*	*Value 2-2 in 2022*	*Value y-2 in year zzzz*
…	…	…	…

Table 3: Possible future data structure

Country	**Indicator**	**year**	**value**	**Source**
Belgium	Indicator 1	2022	yyy	yyy
Belgium	Indicator 1	2021	yyy	yyy
Belgium	Indicator 2	2022	yyy	yyy
Belgium	Indicator 2	2021	yyy	yyy
France	Indicator 1	2022	yyy	yyy
France	Indicator 1	2021	yyy	yyy
…	…	…	…	…

e. Visualization Tools

To create an interactive online dashboard, there are a variety of solutions available, ranging from Business Intelligence (BI) tools to open-source libraries. These solutions cater to different levels of technical expertise, from drag-and-drop interfaces to code-based frameworks. A vast overview of existing tools can be found here: https://visualisingdata.com/resources/

Figure 5: Charting Tools for the visualization of data.

Picture: Screenshot from https://www.visualisingdata.com/resources/

Below you will find a non-exhaustive selection that includes some of the tools listed at https://www.visualisingdata.com/resources/, as well as others. The selection tries to group the different solutions. Each of these solutions has its own set of features, strengths, and learning curves. The choice depends on the specific needs of the future project, the technical (external) expertise available, and the complexity of the data and interactions required. Business Intelligence tools offer a more straightforward, less technical path to dashboard creation, while open-source tools and custom development libraries provide greater flexibility and customization at the cost of a steeper learning curve.

Business Intelligence (BI) Tools

- **Tableau**: A leading BI tool known for its powerful data visualization capabilities. Tableau allows users to create interactive and shareable dashboards with a user-friendly interface, making it accessible for both technical and non-technical users. https://www.tableau.com/products
- **Power BI**: Developed by Microsoft, Power BI is a suite of business analytics tools that deliver insights throughout your organization. It enables users to connect to hundreds of data sources, simplify data prep, and drive ad hoc analysis. https://www.microsoft.com/en-us/power-platform/products/power-bi/
- **Qlik Sense**: Offers self-service data visualization, guided analytics apps and dashboards, embedded analytics, and reporting, all within a governed framework that offers enterprise scalability and trust for IT. https://www.qlik.com/us/products/qlik-sense
- **Looker**: Now part of Google Cloud, Looker supports data exploration and insights by providing an intuitive approach to data exploration. It's particularly strong in embedding analytics and providing a modern data development environment. https://lookerstudio.google.com/overview

Open Source Tools

- **Apache Superset**: An enterprise-ready web application for data exploration, data visualization, and dashboarding. It's easy to use and highly customizable, supporting a wide array of visualization types. https://superset.apache.org/
- **Metabase**: An open-source business intelligence tool that lets you ask questions about your data and displays answers in formats that make sense, whether that's a bar graph or a detailed table. Its simplicity and powerful analytics make it popular among startups and small businesses. https://www.metabase.com/
- **Redash**: Allows you to connect and query your data sources, build dashboards to visualize data, and share them with your company. It supports SQL, NoSQL, and API data sources and provides a flexible platform for data analysis. https://redash.io/

Custom Development Libraries

- **D3.js**: A JavaScript library for producing dynamic, interactive data visualizations in web browsers. It's powerful and flexible but requires a good understanding of JavaScript.
  https://d3js.org/
- **Plotly**: Plotly is a graphing library that makes interactive, publication-quality graphs online. It offers APIs in Python, R, MATLAB, Node.js, and more, and integrates seamlessly with frameworks such as Dash for building interactive web applications. https://plotly.com/graphing-libraries/
- **Bokeh**: A Python interactive visualization library that targets modern web browsers for presentation. It's great for creating interactive plots, dashboards, and data applications.
  https://bokeh.org/

Integrated Development Environments (IDEs) and Notebooks

- **Jupyter Notebooks**: While not a dashboard tool per se, Jupyter Notebooks are widely used for data analysis, visualization, and exploratory work. With extensions like Voilà, Jupyter notebooks can be turned into standalone web applications and dashboards.
  https://jupyter.org/
- **R Shiny**: A framework for building interactive web apps straight from R. It's an excellent tool for statisticians and data scientists who are familiar with R, allowing them to create compelling dashboards that leverage R's extensive statistical capabilities.
  https://www.rstudio.com/products/shiny/

Established Examples

There are already various applications from associations and at European level that are exemplary examples of how data in the transport sector can be processed, made accessible at a low threshold, and presented interactively in an appealing and customer-friendly way. In some cases, the data used is also offered as open data. In this way, data can be integrated into other systems of relevant stakeholders. This is an advantage that can also play an important role in the context of ReMuNet. The following three examples are intended as inspiration and can serve as a starting point for further discussions in the future.

1. ERA Railway Factsheets (https://www.era.europa.eu/content/era-railway-factsheets) uses a map as a starting point, an interactive list to break down data and present charts, e.g. time series. The data can also be downloaded in xlsx format, which allows the data to be reused.

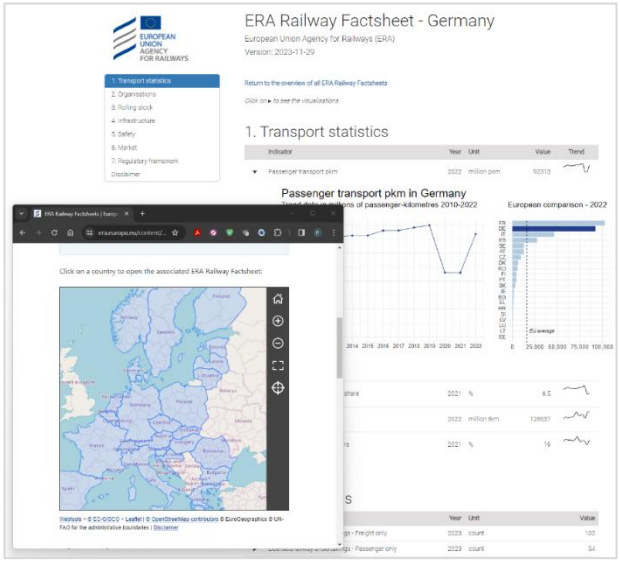

Figure 6: ERA Railway Factsheets

2. TENtec Interactive Map Viewer (https://ec.europa.eu/transport/infrastructure/tentec/tentec-portal/map/maps.html) interactively shows the European transport corridors and provides information on individual infrastructures. Users can search for and display the information they need.

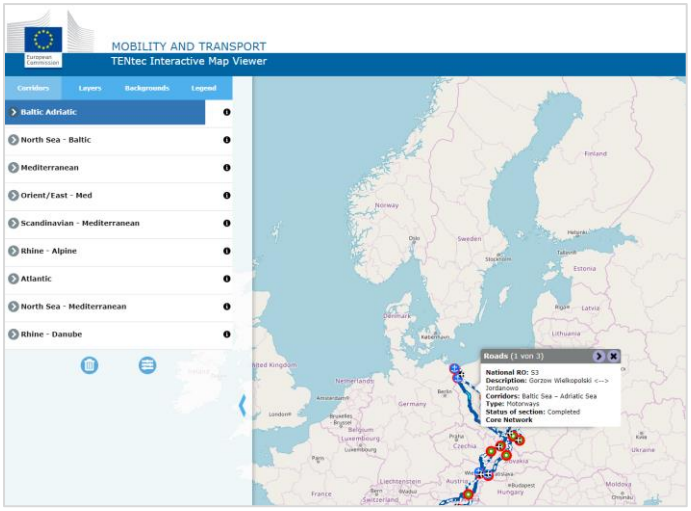

Figure 7: TENtec Interactive Map Viewer

3. Figures on combined transport - interactive (https://sgkv.de/der-kombinierte-verkehr/zahlen-zum-kv/) presents selected combined transport statistics in an interactive dashboard that allows users to choose between years of observation and transport performance and volume. Generated views can be exported as an image file, PDF or PowerPoint slide. So far, this is a German dashboard with data from Germany.

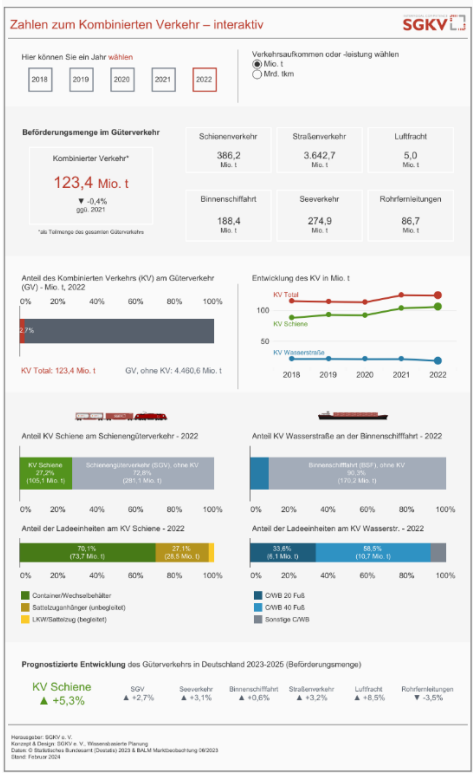

Figure 8: SGKV Figures on combined transport

5. Annexure

a) Excel database with filtering interface
b) Country sheets