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Deliverable D 3.1

SPD use cases

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1 Executive summary

This deliverable is the first out of four deliverables reporting the work in WP3 SPD Implementation in the IMPACT-2 project within Shift2Rail. The deliverable describes the data collection planning for the mode choice analysis to be conducted within WP3 for the use cases adopted in IMPACT-2. The work performed and reported in this deliverable will serve as a basis for the continued work with data collection and development of mode choice models for the SPD use cases.

The content of this deliverable deviates somewhat from the description of deliverable D3.1 of IMPACT-2 stated in the Grant Agreement (GA): “Report describing the identified use cases for each of the four segments.” This is because the use cases were already described in deliverable D3.3 of IMPACT-1 [1]. A very important step for WP3 regarding the uses cases is to collect adequate data needed for mode choice modelling. Therefore, deliverable D3.1 has been dedicated to data collection planning for the use cases rather than a general description of the use cases.

2 Abbreviations and acronyms

Abbreviation / acronym	Description
CCA	Cross-Cutting Activities
GA	Grant Agreement
IMPACT-2	Indicator Monitoring for a new railway PAradigm in seamlessly integrated Cross modal Transport chains – Phase 2
IP	Innovation program
JU	Joint Undertaking
KPI	Key Performance Indicator
MAAP	Multi Annual Working Plan
S2R	Shift2Rail
SPD	System Platform Demonstrator
TD	Technical Demonstrator
TMT	Technical Management Team
WA	Work Area
WP	Work Package

3 Background

The present document constitutes the Deliverable D3.1 “SPD Use cases” in the framework of the WA 1.2 “System Platform Demonstrator” (SPD), which is part of WA1 “Long-term needs and socio-economic research” [2] within the Cross-Cutting Activity (CCA) project IMPACT-2.

Table 1: Work packages within IMPACT-2

WP	Name
WP1	Project management
WP2	Socio-economic impact
WP3	**SPD implementation**
WP4	KPI
WP5	Standardisation
WP6	Smart Maintenance
WP7	Integrated Mobility
WP8	Human Capital
WP9	Dissemination

IMPACT-2 constitutes of nine work packages (see Table 1), which are all activities cross-cutting the IP structure of Shift2Rail (see Figure 1). The work reported in this deliverable has been performed within WP3 “SPD implementation”.

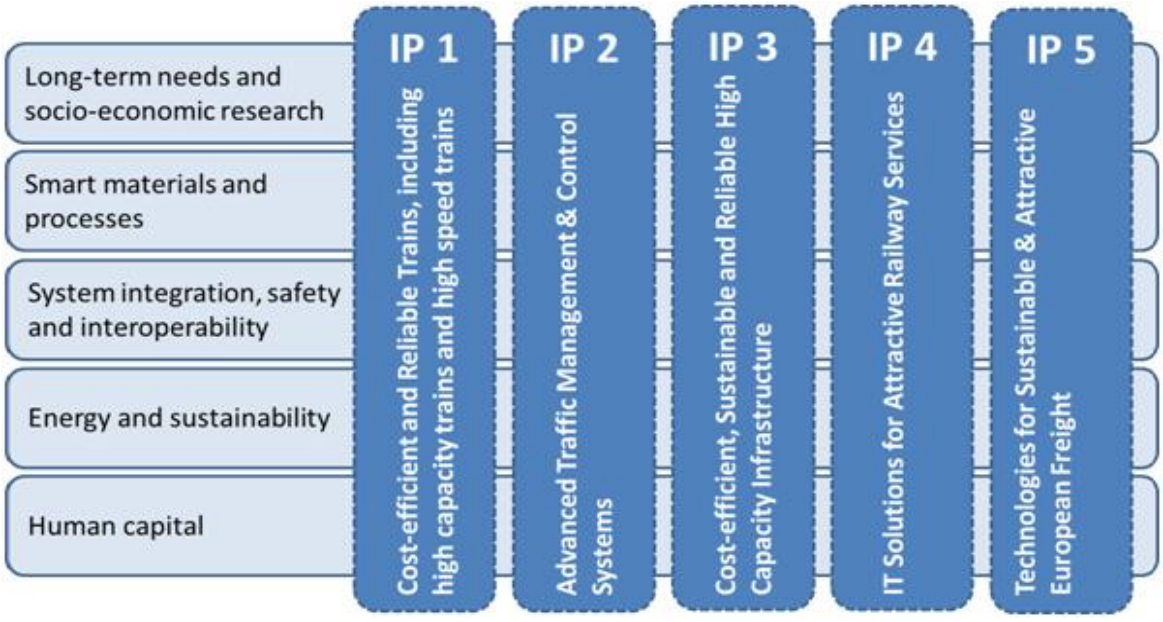

Figure 1: Overview of Shift2Rail Innovation Programmes and Cross-Cutting Activities.

4 Objectives/aims

This document has been prepared to provide a description of the data collection work to be done in WP3 SPD implementation within the project IMPACT-2. The data collection covers each of the four SPDs: SPD1 high-speed passenger rail, SPD2 regional passenger rail, SPD3 urban passenger rail (metro) and SPD4 rail freight, since these have partly different data collection needs.

The data collected should in the end provide a basis on which mode choice modelling can be conducted within WP3 in IMPACT-2. Shift2Rail innovations will have an effect on the Key Performance Indicators (KPIs) life-cycle-cost, capacity and punctuality. The effect on these KPIs are assessed in WP4 of IMPACT-2. The ultimate goal of WP3 is then to assess the effect on mode choice and demand for rail travel, given estimations of effects on KPIs and given collected data about the SPDs.

This Deliverable builds on the work done in IMPACT-1. General descriptions of the use cases can be found in deliverable D3.3 of IMPACT-1 “Use cases for SPDs” [1] and detailed descriptions of the reference scenarios of the use cases can be found in deliverable D4.1 of IMPACT-1 “Reference Scenario” [3].

5 Data collection planning for the use cases

The use cases in WP3 shall make it possible to conduct quantitative mode choice modelling depending on the improvements of the innovations of Shift2Rail. The results of the mode choice model will later on be the input to the societal benefit calculations in WP2 of IMPACT-2.

The IMPACT-1 Deliverable D3.4 "Road map for SPD implementation" [4] identifies two kinds of data needed for the mode choice modelling for passenger rail:

1. General elasticity values and weighting parameters
2. Use case specific data on current demand and service level

The second data kind is connected to the use cases and thereby to this deliverable. Table 2 shows which data are needed for the passenger use cases. The data source constitutes of information from relevant railway operators or travel survey data. For the passenger use cases, the demand model is calculated for peak hour, when in most cases the railway system is under highest pressure. Time-of-day is connected to which trip purpose modal choice is assessed for, e.g. work trips are mainly conducted during peak hour, whereas leisure trips are mainly conducted during off-peak hours. Given access to average daily values for the data items described in Table 2, this could also be usable, but is not highest priority. The travel time, delay, costs etc. of competing modes are not necessary for the elasticity mode choice model proposed for passenger transport modelling in Deliverable D3.2 of IMPACT-1 "SPD Specification" [5]. The cross-elasticities are however dependent on the characteristics of competing modes and therefore sensitivity analyses varying the cross-elasticities will be undertaken.

Table 2: Use case specific data needed to feed the mode choice model.

Data	Definition
Competing mode(s)	Relevant modes competing with rail for passengers for the corridor under study
Passenger demand	Peak hour average passenger demand in the baseline situation for rail and competing mode(s)
Access/Egress time	Peak hour average access and egress travel times for rail in the baseline situation
In-vehicle travel time	Peak hour average in-vehicle travel time for rail in the baseline situation
Frequency	Peak hour average frequency for rail in the baseline situation
Number of interchanges	Number of interchanges for rail in the baseline situation
Delay time	Peak hour average delay time for rail in the baseline situation
Travel cost	Average peak hour ticket price for rail in the baseline situation

For freight modelling Trafikverket's model Samgods [6] will be used. The data needs for this model are further described in section 5.4.

The data collection needed for WP3 will be aligned with the data collection process of WP4 of IMPACT-2. This is reasonable since WP3 and WP4 base their work on the same use cases for the SPDs.

5.1 SPD1: High-speed passenger rail

High-speed passenger rail is a competitive mode for long-distance trips. A typical European high-speed passenger rail corridor therefore competes mainly with the transport modes air and road. For the competing mode road, a differentiation can also be made between car and long-distance bus. Therefore, these modes have been identified as the competing modes to high-speed passenger rail (see Table 3). The competing modes are not stated in any particular order of precedence.

Table 3: Identified competing modes to high-speed passenger rail

	Competing mode to high-speed passenger rail
Identified competing mode #1	Air
Identified competing mode #2	Car
Identified competing mode #3	Long-distance Bus

For a typical high-speed passenger rail line, the data that needs to be collected is summarized in Table 4.

Table 4: Data collection needs for a typical high-speed rail corridor

Data item
Peak hour average access and egress travel time for rail in the baseline situation
Peak hour average in-vehicle travel time for rail in the baseline situation
Peak hour average frequency for rail in the baseline situation
Peak hour average delay time for rail in the baseline situation
Peak hour average ticket price for rail in the baseline situation
Number of interchanges for rail in the baseline situation
Distance
Peak hour average passenger demand in the baseline situation

Table 5 shows the data that needs to be collected for competing modes, which is mainly "peak hour average passenger demand in the baseline situation", from which the modal split of the baseline can be calculated. The primary data source is travel survey data.

Table 5: Data collection needs for competing modes to high-speed passenger rail

Competing	**Data item**

mode	
Air	Peak hour average passenger demand in the baseline situation → modal split
Car	Peak hour average passenger demand in the baseline situation → modal split
Bus	Peak hour average passenger demand in the baseline situation → modal split

5.2 SPD2: Regional passenger rail

Regional passenger rail is a competitive mode for medium-distance trips. A typical European regional passenger rail corridor therefore competes mainly with the transport mode road, for which a distinction can be made between car and long-distance bus. Therefore, these modes have been identified as the competing modes to regional passenger rail (see Table 6). The competing modes are not stated in any particular order of precedence.

Table 6: Identified competing modes to regional passenger rail

	Competing mode to regional passenger rail
Identified competing mode #1	Car
Identified competing mode #2	Long-distance Bus

For a typical regional passenger rail line, the data that needs to be collected is summarized in Table 7.

Table 7: Data collection needs for a typical regional passenger rail corridor

Data item
Peak hour average access and egress travel time for rail in the baseline situation
Peak hour average in-vehicle travel time for rail in the baseline situation
Peak hour average frequency for rail in the baseline situation
Peak hour average delay time for rail in the baseline situation
Peak hour average ticket price for rail in the baseline situation
Number of interchanges for rail in the baseline situation
Distance
Peak hour average passenger demand in the baseline situation

Table 8 shows the data that needs to be collected for competing modes, which is mainly "peak hour average passenger demand in the baseline situation", from which the modal split of the baseline can be calculated. The primary data source is travel survey data.

Table 8: Data collection needs for competing modes to regional passenger rail

Competing mode	Data item
Car	Peak hour average passenger demand in the baseline situation → modal split
Bus	Peak hour average passenger demand in the baseline situation → modal split

5.3 SPD3: Metro

Metro is a competitive mode for short-distance trips within cities, especially in high-density cities. A typical European metro corridor competes mainly with tram, road, bicycle and walk. Road can further be divided into car and bus. Therefore, these modes have been identified as the competing modes to metro (see Table 9). The competing modes are not stated in any particular order of precedence.

Table 9: Identified competing modes to metro

	Competing mode to urban passenger rail
Identified competing mode #1	Tram
Identified competing mode #2	Car
Identified competing mode #3	Bus
Identified competing mode #4	Bicycle
Identified competing mode #5	Walk

For a typical metro line, the data that needs to be collected is summarized in Table 10.

Table 10: Data collection needs for a typical metro corridor

Data item
Peak hour average access and egress travel time for rail in the baseline situation
Peak hour average in-vehicle travel time for rail in the baseline situation
Peak hour average frequency for rail in the baseline situation
Peak hour average delay time for rail in the baseline situation
Number of interchanges for rail in the baseline situation
Peak hour average ticket price for rail in the baseline situation
Distance
Peak hour average passenger demand in the baseline situation

Table 11 shows the data that needs to be collected for competing modes, which is mainly "peak hour average passenger demand in the baseline situation", from which the modal split of the baseline can be calculated. The primary data source is travel survey data.

Table 11: Average passenger demand in peak hour for a typical metro corridor and its competing modes

Competing mode	Data item
Tram	Peak hour average passenger demand in the baseline situation → modal split
Car	Peak hour average passenger demand in the baseline situation → modal split
Bus	Peak hour average passenger demand in the baseline situation → modal split
Bicycle	Peak hour average passenger demand in the baseline situation → modal split
Walk	Peak hour average passenger demand in the baseline situation → modal split

5.4 SPD4: Rail freight

Rail freight is a competitive mode especially for long-distance freight transport of mainly heavy goods, but also for extended market goods (e.g. food and beverages). A typical European rail freight corridor competes mainly with road (truck), waterways and air. Therefore, these modes have been identified as the main competing modes to rail freight (see Table 12). The competing modes are not stated in any particular order of precedence.

Table 12: Identified competing modes to rail freight

	Competing modes to rail freight
Identified competing mode #1	Road
Identified competing mode #2	Waterway
Identified competing mode #3	Air

Table 13 shows the data items that would be beneficial to calibrate the Samgods model against in the baseline situation. Data about number of freight trains need to be collected per part of the line. Share of freight trains of a certain train type[1] would be beneficial to be able to make particular train types longer (for which longer trains are reasonable). Furthermore, the Samgods model includes rail track capacity limitations within Sweden, but not for other countries in Europe. Data on delay times would make it possible to calculate delay costs in the baseline situation.

Table 13: Data collection needs for a typical rail freight corridor

Data item
Number of freight trains per part of track in baseline situation
Share of freight trains of a certain train type in baseline situation
Number of freight trains over Öresund bridge in baseline situation
Track capacity limitations in Germany and Denmark
Daily average delay time for rail in baseline situation

Regarding competing modes, the analysis will rely on data already available in the Samgods model concerning the network, transport costs and transport times for freight transport on road, waterways and in the air.

[1] The train types in Samgods are: combi trains, system trains (divided into three size classes, defined by the axle load limits: 22.5, 25 and 30 respectively), wagon load trains (divided into three size classes, defined by the total load capacity of the train: 550, 750 and 950 respectively) and shuttles.

6 Conclusions

This deliverable describes the data that need to be collected in order to conduct quantified rail demand modelling and to be able to assess the effects Shift2Rail innovations could have in the long-term on modal choice. The data collection description identifies for passenger rail SPDs level-of-service variables such as frequencies, travel times, interchanges, costs and demand in the present situation, representative for each SPD, as important data to collect. For rail freight mode choice modelling important data identified is data for calibration of the Samgods model.

References

[1] IMPACT-1, “Use cases for SPDs,” Deliverable D3.3 of IMPACT-1. Status: Final version., Nov. 2017.
[2] “Shift2Rail Multi-Annual Action Plan (MAAP),” Brussels, Nov. 2015.
[3] IMPACT-1, “Reference Scenario,” Deliverable D4.1 of IMPACT-1. Status: Final version., Apr. 2018.
[4] IMPACT-1, “Road Map for SPD implementation,” Deliverable D3.4 of IMPACT-1. Status: Final version., Feb. 2018.
[5] IMPACT-1, “SPD specification,” Deliverable D3.2 of IMPACT-1. Status: Final version., Feb. 2018.
[6] M. Bergquist, V. Bernhardsson, and E. Rosklint, “Representation of the Swedish transport and logistics system in Samgods v. 1.1.,” Sep. 2016.

7 Annexes

No content.

8 Antitrust Statement

While some activities among competitors are both legal and beneficial to the industry, group activities of competitors are inherently suspect under the antitrust/ competition laws of the countries in which our companies do business.
Agreements between or among competitors need not be formal to raise questions under antitrust laws. They may include any kind of understanding, formal or informal, secretive or public, under which each of the participants can reasonably expect that another will follow a particular course of action or conduct. Each of the participants in this initiative is responsible for seeing that topics which may give an appearance of an agreement that would violate the antitrust laws are not discussed. It is the responsibility of each participant in the first instance to avoid raising improper subjects for discussion, notably such as those identified below.

It is the sole purpose of any meeting of this initiative to provide a forum for expression of various points of view on topics

- (i) that are strictly related to the purpose or the execution of the initiative,
- (ii) that need to be discussed among the participants of the initiative,
- (iii) that are duly mentioned in the agenda of this meeting and
- (iv) that are extensively described in the minutes of the meeting.

Participants are strongly encouraged to adhere to the agenda. Under no circumstances shall this meeting be used as a means for competing companies to reach any understanding, expressed or implied, which restricts or tends to restrict competition, or in any way impairs or tends to impair the ability of members to exercise independent business judgment regarding matters affecting competition.

As a general rule, participants may not exchange any information about any business secret of their respective companies. In particular, participants must avoid any agreement or exchange of information on topics on the following non-exhaustive list:

1. Prices, including calculation methodologies, surcharges, fees, rebates, conditions, freight rates, marketing terms, and pricing policies in general;
2. any kind of market allocation, such as the allocation of territories, routes, product markets, customers, suppliers, and tenders;
3. production planning; marketing or investment plans; capacities; levels of production or sales; customer base; customer relationships; margins; costs in general; product development; specific R&D projects;
4. standards setting (when its purpose is to limit the availability and selection of products, limit competition, restrict entry into an industry, inhibit innovation or inhibit the ability of competitors to compete);
5. codes of ethics administered in a way that could inhibit or restrict competition;
6. group boycotts;
7. validity of patents;
8. ongoing litigations.