ANNEX 13

DEMAND MODEL INPUT

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1. Introduction

1.1. Background

The modelling work was undertaken on behalf of the Consortium by DTU and Rapidis using the European TRANS-TOOLS V2 model (TT model), based on the validated 2020 outputs for the *TEN Connect Programme* undertaken for DG MOVE.

DTU were the contracting entity and were responsible for data preparation and analysis, while Rapidis ran the model.

1.2. Approach

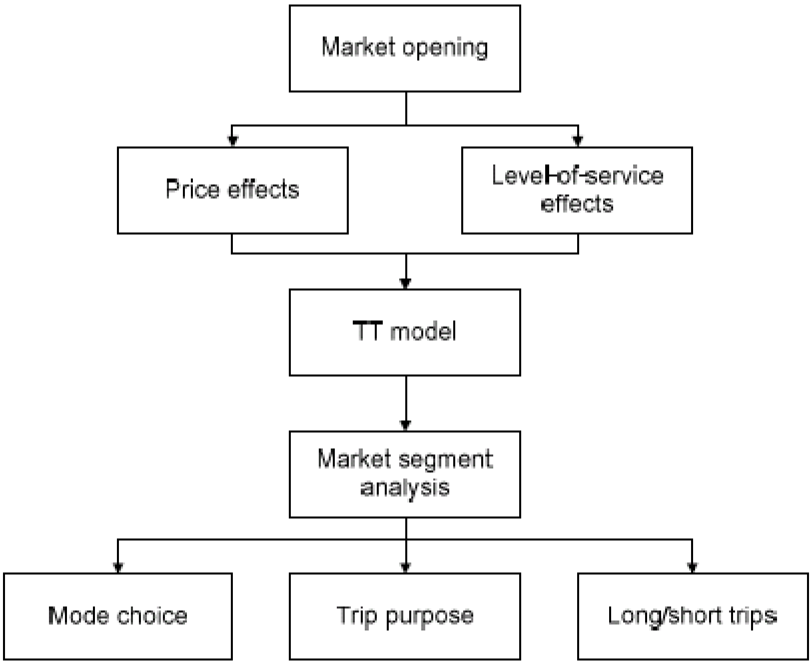
The Base Case input data was prepared by DTU in accordance with the specification given by the Consortium in 3.1.

The input data (in the form of state by state and model by model changes in key input parameters) was derived by the Consortium's core expert team of four people. Each member of whom produced his own set of input data independently using his own methodology, which were then compared and discussed to achieve consensus. The variation between the values for the model input parameters produced by each expert were surprisingly similar: in only a few cases was there any significant spread between the values that required discussion and reconciliation.

2. Input Data Required by Model

Market opening effects are measured as changes in the price of rail transport as well as changes in the level-of-service provided by operators (travel time, frequency, waiting time, etc.). The analysis uses a structure indicated by Figure 1 below.

Figure 1 Outline of analysis based on the TT model.



The effect of the market opening is quantified into price and level-of-service effects. These effects took form of scenarios which will be analysed by the TT model. Results were then extracted from the TT model and analysed according to mode-choice substitution, trip purpose, and a long- and short distance trip segment.

Accordingly, the model required the following input data:

- Cost effect: measures user cost changes; has been approximated by the Consortium by price changes.

- Travel time effect: measures changes in the total journey time (including ride time, waiting time, access and egress time); has been approximated by changes in speed.

- Frequency effect: measures changes in the number of trains within a given time interval; has been approximated by number of train-km per year.

The reference year or baseline scenario is 2020. The baseline scenario follows the setup of previous baseline scenarios in which prioritised projects has been implemented. With regard to road-pricing, the 2020 baseline is similar to the current picture for both cars and occupants. For lorries the 2020 baseline includes a fee per km for every road in the EU[1]. The fee is higher in cities than outside cities.

Specifically for this study, general trends for the Base Case have been estimated; e.g. for the above mentioned three input variables.

Only passenger rail instruments are analysed. Hence, the analysis includes cost effects or level-of-service effects represented by travel-time and frequency. In the TRANS-TOOLS model results area distinguished for three different trip distance classes:

- less than 100km;
- 100-600 km;
- more than 600 km;

and four different journey purposes:

- business;
- commuter;
- holiday
- private.

The model was used to assess all thirty states under consideration simultaneously accordingly input data had to be prepared for all thirty states. The TRANS-TOOL model also includes a small number other states that are not included in the thirty states included in the Study (Albania, Russia, Serbia, etc). The data for these states was not changed from the validated 2020 data used in the *TEN Connect Programme*.

[1] Freight is relevant because this impacts on the congestion impacts modelled.

3. Base Case Input Data

3.1. Modelling Basis

The Base Case reflects the position should no further action be taken to open domestic rail passenger markets. This is not the current *status quo*, however, as it includes both changes anticipated in the European rail industry, and also other changes anticipated to other modes that have already been incorporated into the TRANS-TOOLS model. The Base Case year for assessment is taken as 2020, in part this date has been chosen for compatibility with the TRANS-TOOLS models and in part because any market opening measures that are unconstrained by *soto voce* protectionism should reach maturity by then.

The anticipated changes to the European rail industry incorporated in the Base Case are:

- all states coming into compliance with current EU rail legislation (in both letter and spirit);
- further extension of the European high-speed rail network, planned for completion by 2020;
- full impact of international passenger market opening, including development of cabotage rights
- rail fares increase at 50% of the GDP growth rate, but capped at a 30% rise.

Changes anticipated to other modes incorporated within the Base Case, include:

- all transport infrastructure work agreed by Member States that is scheduled for completion within the next ten years is completed;
- oil price rises in line with IEA estimates;
- road fuel efficiency improves by 0.5% per annum;
- road passenger vehicle operation costs increase
- air fares unchanged in real terms.

3.2. Model Input Data

DTU developed the following input data for the Base Case (it should be noted that this data included some modifications to states outside the group of thirty states defined in the project specification, which DTU considered to be necessary, these were not subsequently altered for any of the other scenarios/regulatory models):

State	Cost Effect	Travel Time Effect	Frequency Effect
Albania	0%	0%	0%
Austria	-5%	0%	5%
Belarus	0%	0%	0%
Belgium	-10%	-1%	10%
Bosnia	0%	-3%	10%
Bulgaria	-1%	0%	3%
Croatia	0%	-5%	10%
Cyprus	0%	0%	0%
Czech Republic	-5%	-1%	5%
Denmark	-7%	0%	5%
Estonia	-1%	0%	15%
Finland	-5%	0%	3%
France	-4%	-1%	5%
Germany	-4%	-1%	3%
Greece	0%	-5%	10%
Hungary	-3%	0%	5%
Iceland	0%	0%	0%
Ireland	-5%	0%	5%
Italy	-2%	0%	5%
Latvia	0%	0%	15%
Liechtenstein	-5%	0%	-5%
Lithuania	0%	0%	15%
Luxembourg	-7%	0%	10%
Macedonia	0%	-5%	20%
Malta	0%	0%	0%
Moldavia	0%	0%	0%
Montenegro	0%	-5%	20%
Netherlands	-5%	0%	0%
Norway	-4%	0%	5%
Poland	-1%	-5%	4%
Portugal	-1%	0%	2%

State	Cost Effect	Travel Time Effect	Frequency Effect
Romania	-1%	0%	3%
Russia	0%	0%	0%
Serbia	0%	0%	0%
Slovak Republic	-2%	-1%	5%
Slovenia	-1%	0%	4%
Spain	-4%	0%	4%
Sweden	-5%	0%	5%
Switzerland	-5%	0%	-5%
Turkey	0%	0%	0%
Ukraine	0%	0%	0%
United Kingdom	0%	0%	0%

4. Input Data for Regulatory Models

4.1. Modelling Basis

4.1.1 Overview

The Consortium's expert team were unanimous in considering that that none of the possible regulatory models *per se* could be expected to have any impact on commercial speeds. Accordingly, the impact of market opening therefore needed to focus on quantifying price and level-of-service effects. In evaluation potential impacts of the different scenarios, several important assumptions were made.

4.1.2 Core assumptions

The core assumptions made were:

- PSO and non-PSO market segments will strongly differ and thus have to be distinguished;

- in each state the situation in each market segment was characterised in the Base Case according to the questions: are PSO contracts competitively tendered and is there an open access regime in the non-PSO market segment?

Broad picture: In most states under models that involve a significant degree of open access the situation in 2020 is likely to be characterised by a dominant incumbent, serving non-PSO segments, but smaller that smaller competitors will slowly emerge in the open access segment. In the case of states with clear plans for market opening (e.g. Italy, Germany, Austria) a slightly higher share of competitors has been assumed.

Concerning the impact of market opening, it was generally assumed, that

- The introduction of competitive tendering for public service contacts, where this forms a part of the regulatory model, would result in significant cost reductions in the PSO segment and that the cost reductions will be transformed into a higher frequency. If a scenario implies the competitive tendering of non-PSO segments, i.e. segments that were run under open access before or not opened at all, it has been assumed slight cost reductions, reflecting higher intermodal competition and a tendency to be profitable in this segment (and, thus, a higher efficiency compared to PSO segments).

- The introduction of open access, where this forms a part of the regulatory model, would result in a small increase in frequency and a small decrease in prices, reflecting the high barriers to entry and, accordingly, the disappointing experience of open access passenger models in recent years.

State specific effects have been taken into account to reflect institutional background, the ability to achieve the full benefits of competitive tendering, and compatibility with public rail policies, the level of access charges, fare levels, and general public support for the sector. For example open access options were projected to have a bigger impact where access charges are now and fare levels high.

4.1.3 Model specific assumptions

Model B

It was generally assumed that existing PSOs are changed into short-term contracts and that entry into non-PSO segments would be eased, e.g. by better access to supporting services (timetabling, information and so on).

In the PSO segment, a loss of efficiency was assumed if competitive tendering was used before under the Base Case, due to the problems of short-term contracts (higher risk of entry). If direct awarding was used previously in the Base Case, positive but (compared to Models E, G and H) smaller cost reductions were assumed, again due to the use of short-term contracts. In the non-PSO segment, market entry according to the general assumptions was assumed.

Model E

Under this model existing PSOs have to be tendered and the entry into non-PSO segments is eased in comparison to Model B.

In the PSO segment, no effect was assumed if competitive tendering was used before under the Base Case, but positive and significant cost reductions if direct awards were used before under the Base Case. In the non-PSO segment, market entry according to the general assumptions was assumed.

Model G

Under this model all PSO and non-PSO services are turned into PSOs and then they are competitively tendered, i.e. a public agency tenders the given (Base Case) timetable.

In the PSO segment, a higher efficiency was assumed if direct awards were used before under the Base Case; again, this was translated into an increase of frequency according to the general assumptions. If services were in a non-PSO segment before, it was assumed that this transformation of services results in lower costs (equivalent for the calculation: profits are “confiscated”) and that public authority uses this effect to buy a higher frequency. But, it was assumed that this effect is (i) generally lower than the effect of tendering instead of direct awards, (ii) depends on the importance of intra-modal competition in the Base Case.

Model H

This model closely resembles Model G, but there remains a group of defined services for that open access still prevails. Accordingly, the impacts for this scenario have been assumed to lie between Models E and G.

4.2. Model Input Data

The Consortium developed the following input data for the impact of each regulatory model:

State	Regulatory Model	Cost Effect	Travel Time Effect	Frequency Effect
Austria	Model B	0,0%	0%	-2%
Austria	Model E	-0,1%	0%	5%
Austria	Model G	0,0%	0%	20%
Austria	Model H	-0,1%	0%	13%
Belgium	Model B	0,0%	0%	7%
Belgium	Model E	-0,1%	0%	11%
Belgium	Model G	0,0%	0%	20%
Belgium	Model H	-0,1%	0%	16%
Bulgaria	Model B	0,0%	0%	0%
Bulgaria	Model E	0,0%	0%	2%
Bulgaria	Model G	0,0%	0%	7%
Bulgaria	Model H	0,0%	0%	5%
Croatia	Model B	0,0%	0%	0%
Croatia	Model E	0,0%	0%	6%
Croatia	Model G	0,0%	0%	20%
Croatia	Model H	0,0%	0%	13%
Czech Republic	Model B	0,0%	0%	0%
Czech Republic	Model E	0,0%	0%	6%
Czech Republic	Model G	0,0%	0%	9%
Czech Republic	Model H	0,0%	0%	8%
Denmark	Model B	-0,2%	0%	3%
Denmark	Model E	-0,3%	0%	9%
Denmark	Model G	0,0%	0%	40%
Denmark	Model H	-0,2%	0%	25%
Estonia	Model B	0,0%	0%	0%
Estonia	Model E	0,0%	0%	0%
Estonia	Model G	0,0%	0%	10%
Estonia	Model H	0,0%	0%	5%

State	Regulatory Model	Cost Effect	Travel Time Effect	Frequency Effect
Finland	Model B	-0,2%	0%	3%
Finland	Model E	-0,2%	0%	7%
Finland	Model G	0,0%	0%	30%
Finland	Model H	-0,1%	0%	19%
France	Model B	-0,2%	0%	4%
France	Model E	-0,3%	0%	7%
France	Model G	0,0%	0%	25%
France	Model H	-0,2%	0%	16%
Germany	Model B	0,0%	0%	-3%
Germany	Model E	0,0%	0%	0%
Germany	Model G	0,0%	0%	15%
Germany	Model H	0,0%	0%	8%
Greece	Model B	0,0%	0%	0%
Greece	Model E	-0,2%	0%	10%
Greece	Model G	0,0%	0%	20%
Greece	Model H	-0,1%	0%	15%
Hungary	Model B	0,0%	0%	0%
Hungary	Model E	0,0%	0%	4%
Hungary	Model G	0,0%	0%	15%
Hungary	Model H	0,0%	0%	10%
Ireland	Model B	-0,1%	0%	4%
Ireland	Model E	-0,3%	0%	10%
Ireland	Model G	0,0%	0%	20%
Ireland	Model H	-0,2%	0%	15%
Italy	Model B	0,0%	0%	0%
Italy	Model E	0,0%	0%	0%
Italy	Model G	0,0%	0%	25%
Italy	Model H	0,0%	0%	13%
Latvia	Model B	0,0%	0%	0%
Latvia	Model E	0,0%	0%	0%
Latvia	Model G	0,0%	0%	10%

State	Regulatory Model	Cost Effect	Travel Time Effect	Frequency Effect
Latvia	Model H	0,0%	0%	5%
Liechtenstein	Model B	-0,2%	0%	7%
Liechtenstein	Model E	-0,3%	0%	14%
Liechtenstein	Model G	0,0%	0%	20%
Liechtenstein	Model H	-0,2%	0%	17%
Lithuania	Model B	0,0%	0%	0%
Lithuania	Model E	0,0%	0%	0%
Lithuania	Model G	0,0%	0%	10%
Lithuania	Model H	0,0%	0%	5%
Luxembourg	Model B	-0,1%	0%	-1%
Luxembourg	Model E	-0,1%	0%	4%
Luxembourg	Model G	0,0%	0%	40%
Luxembourg	Model H	-0,1%	0%	22%
Macedonia	Model B	0,0%	0%	0%
Macedonia	Model E	0,0%	0%	6%
Macedonia	Model G	0,0%	0%	8%
Macedonia	Model H	0,0%	0%	7%
Netherlands	Model B	-0,1%	0%	0%
Netherlands	Model E	-0,1%	0%	2%
Netherlands	Model G	0,0%	0%	8%
Netherlands	Model H	-0,1%	0%	5%
Norway	Model B	-0,2%	0%	7%
Norway	Model E	-0,2%	0%	15%
Norway	Model G	0,0%	0%	40%
Norway	Model H	-0,1%	0%	28%
Poland	Model B	0,0%	0%	0%
Poland	Model E	0,0%	0%	4%
Poland	Model G	0,0%	0%	8%
Poland	Model H	0,0%	0%	6%
Portugal	Model B	-0,2%	0%	2%
Portugal	Model E	-0,2%	0%	7%

State	Regulatory Model	Cost Effect	Travel Time Effect	Frequency Effect
Portugal	Model G	0,0%	0%	30%
Portugal	Model H	-0,1%	0%	19%
Romania	Model B	0,0%	0%	0%
Romania	Model E	0,0%	0%	3%
Romania	Model G	0,0%	0%	8%
Romania	Model H	0,0%	0%	6%
Slovak Republic	Model B	0,0%	0%	0%
Slovak Republic	Model E	0,0%	0%	6%
Slovak Republic	Model G	0,0%	0%	9%
Slovak Republic	Model H	0,0%	0%	8%
Slovenia	Model B	-0,1%	0%	6%
Slovenia	Model E	-0,1%	0%	10%
Slovenia	Model G	0,0%	0%	15%
Slovenia	Model H	-0,1%	0%	13%
Spain	Model B	-0,2%	0%	3%
Spain	Model E	-0,3%	0%	11%
Spain	Model G	0,0%	0%	40%
Spain	Model H	-0,2%	0%	26%
Sweden	Model B	0,0%	0%	0%
Sweden	Model E	0,0%	0%	0%
Sweden	Model G	0,0%	0%	15%
Sweden	Model H	0,0%	0%	8%
Switzerland	Model B	-0,2%	0%	7%
Switzerland	Model E	-0,2%	0%	14%
Switzerland	Model G	0,0%	0%	20%
Switzerland	Model H	-0,1%	0%	17%
Turkey	Model B	0,0%	0%	0%
Turkey	Model E	0,0%	0%	4%
Turkey	Model G	0,0%	0%	15%
Turkey	Model H	0,0%	0%	10%
United Kingdom	Model B	-0,2%	0%	-30%

State	Regulatory Model	Cost Effect	Travel Time Effect	Frequency Effect
United Kingdom	Model E	-0,3%	0%	-20%
United Kingdom	Model G	0,0%	0%	0%
United Kingdom	Model H	-0,2%	0%	-10%