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Transport dialogue and interoperability

between the EU and its neighbouring countries and Central Asian countries

*TRACECA IDEA – Freight Model
Forecast Model - Input Data Assumptions*

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This project is implemented by
TRT Trasporti e Territorio, Alfen Consult GmbH, Dornier Consulting GmbH and PTV AG

1 Introduction

This document summarizes the main input data and assumptions for the TRACECA IDEA forecast freight model, which are:

- ▶ Population Data
- ▶ Economic Development
- ▶ Agricultural and Industrial Production
- ▶ Political Issues
- ▶ Proposed Network Measures

2 Population Data

The future freight demand is mainly driven by the consumption of the population. The same approach used in the base year model. Having different population groups with specific consumption rates, the demand development is highly influenced by population and economic development.

2.1 Population Development

The population development per country proposed for 2020 and 2030, which has been used as input for the forecast freight model, had already been sent to the National Secretaries for verification and is attached in the document *Forecast Land Use Data Assumptions_v8_2010_10_22.doc*.

The distribution of the national forecast population to traffic zone level has been done according to the base year distribution (both urban and rural population).

The resulting forecast population by traffic zone for 2020 is attached in the Excel file *CountrySheetsForecast_Population_2010_10_22.xls*.

2.2 Population Groups

The population per country (and traffic zone) is subdivided into 8 different population groups (each having a certain GDP per capita). Having differentiated consumption rates by population group for agricultural products and consumer goods, the generated demand is depending on both the total number of inhabitants and the economic wealth.

Forecast Input Data and Assumptions



For the base year the split into population group was derived from economic statistics. For the forecast year this base year split has been changed according to the proposed economic growth.

The resulting changes in the population groups by country for 2020 and 2030 are attached in the Excel file *CountrySheetsForecast_Population_2010_10_22.xls*.

2.3 Consumption Rates

For the commodities Machinery, Textile Products, White Goods and Other Consumer Goods in the base year and in the forecast model the following consumption factors by population group are applied to calculate the demand by multiplying the consumption factor with the number of inhabitants per population group and traffic zone.

Population Group [GDP in \$ per capita]	Consumption Factors [tons per capita per year]			
	Machinery	Textile Products	White Goods	Other Consumer Goods
50	0.015	0.004	0.0025	0.10
400	0.060	0.008	0.0050	0.20
1500	0.090	0.012	0.0075	0.40
3200	0.120	0.016	0.0100	0.50
6000	0.150	0.020	0.0125	0.60
14000	0.210	0.028	0.0175	0.85
45000	0.240	0.032	0.0200	1.00
80000	0.300	0.040	0.0250	1.50

Table 1: Consumption Rates per Population Group and Commodity

For agricultural products the consumption factors by population group were calculated from the base year model results and used to calculate the forecast demand based on the changes of the population distribution within the population groups.

3 Economic Growth

The economic growth per country proposed for 2020 and 2030, which has been used as input for the forecast freight model, had already been sent to the National Secretaries for verification and is attached in the document *Forecast Land Use Data Assumptions_v8_2010_10_22.doc*.

The economic development changes the population distribution within the 8 population groups (see section 2.2), which in turns causes changes of the generated demand.

4 Agricultural and Industrial Production

For the freight model calculation for the **base year** the following input data for each commodity is used:

1. Data on national level
 - ▶ Production in tons
 - ▶ Consumption in tons
 - ▶ Import in tons
 - ▶ Export in tons
2. Distribution of national production and consumption by traffic zones
 - ▶ Production capacities per traffic zone for each commodity
 - ▶ Consumption per traffic zone

If no detailed information about production capacities or regional consumption were available, the following assumptions were made:

- ▶ Production of agricultural products distributed by rural population
- ▶ Consumption of agricultural products distributed by urban population
- ▶ Production and consumption of industrial products distributed by mix of rural and urban population

For the **forecast model** the national production and consumption per commodity are increased according to the changes of population and economic development.

It is assumed that the import/export share for each commodity will be the same as in the base year model for each country.

Since there is no information about proposed production facilities, the same distribution of production capacities per traffic zones as in the base year is assumed.

Hence, the reliability of the forecast results highly depend on the reliability of the base year input data (both national production / consumption and its distribution to traffic zones).

5 Political Issues

The distribution model considers additional impedances between countries taking into account their political relations. In the base year model the relations Armenia – Azerbaijan and Georgia – Russia are charged with an additional impedance. The border between Armenia and Turkey is closed.

These base year assumptions are carried forward to the forecast models. However, a change of political relations and trade connections would lead to a significant change of freight flows.

6 Network

The TRACECA network model is designed to comprehend all network elements, both for base year and for the forecast horizons 2020 and 2030. Information on current and forecast link types and parameters are attached to all links and are subjected to change between the time horizons. Future links are part of the model but not activated in base year. In order to avoid further changes to the internal network model structure it is recommended to implement all potential measures (links) and to only change link parameters for a selection agreed upon between TRACECA member states.

6.1 TRACECA IDEA Projects

The TRACECA projects database as of March 2010 contains a set of 49 projects, ranging from road and rail measures to logistic centres and upgrade of ports and airports. Based on this database 24 infrastructure measures were implemented into the network model (see Table 2).

6.2 Additional Projects

In addition to the TRACECA projects, 9 other infrastructure measures, partly already under construction and considered to be important for international routes, were drawn from several publicly available sources and implemented into the network model (see Table 3).

Local experts most likely could provide useful input regarding **additional national as well as international infrastructure projects** not part of the model yet. Due to the large extension of the study area and the accordant size of the traffic zones only proposed large scale measures for road, rail and ferry networks will be implemented into the model. The

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following sections provide information about the criteria for selecting measures as well required information for each measure.

6.2.1 Criteria for Selection of Measures

Criteria for the selection of measures to be investigated and delivered by local experts are:

- ▶ Minimum capacity
 - ▶ Roads at least highway or arterial category
 - ▶ Rails – trains operating on regular basis
 - ▶ Ferries operating on regular basis at least once per week
- ▶ Scale
 - ▶ Road, rail and ferry connections on supra-regional distances (no infrastructure measures within individual traffic zones)
- ▶ Significance / importance
 - ▶ Effects and improvements for freight transport at least on national or international level
 - ▶ Planned in order to solve known large scale bottlenecks

6.2.2 Required Information for each Measure

Information needed for implementation of measures into the network model:

- ▶ Link alignment as detailed as possible
- ▶ Date of completion (at least information whether in operation by 2020 or by 2030)
- ▶ For road links: proposed speed limit and number of lanes
- ▶ For rail links: type of track (single or double, electrification) and number of trains per day
- ▶ For ferry links: transfer time, number of vessels per day / week, transshipment capacity

7 Appendix

Measure ID	Name	Country	Mode
105101	North-South Armenian Road Corridor	Armenia / (Georgia)	Road
105102	Armenian Railway Infrastructure Rehabilitation	Armenia / (Georgia)	Rail
110002	Varna-Ruse Rail Rehabilitation	Bulgaria	Rail
110003	Burgas-Varna "Cherno More" Motorway	Bulgaria	Road
110004	Sofia-Kalotina Motorway	Bulgaria	Road
126801	Zestaponi-Kutaisi-Samtredia Motorway Widening	Georgia	Road
126802	Samtredia-Grigoleti New Road	Georgia	Road
126803	Tbilisi-Rustavi Motorway Widening	Georgia	Road
139802	Tashkent-Shimkent Road Rehabilitation	Kazakhstan	Road
139803	Almaty-Aktagai Railway Electrification	Kazakhstan	Rail
139804	Bejneu-Shalkar Road	Kazakhstan	Road
139805	Beineu-Shalkar New Railway	Kazakhstan	Rail
139806	Dostyk-Aktagai Railway Electrification	Kazakhstan	Rail
139807	Zhyskazgan-Saksaulskaya Railway	Kazakhstan	Rail
139808	Aktagai-Mojinty Railway Electrification	Kazakhstan	Rail
141701	Osh-Batken-Isfana Road	Kyrgyzstan	Road
149802	Chisinau-Gurgiulesti Motorway: Porumbrey-Lomita Section	Moldova	Road
149803	Chisinau-Gurgiulesti Motorway: Comrat bypass	Moldova	Road
164201	Focsani-Albita Motorway	Romania	Road
176203	Kolhozabad-Masari Sharif Road	Tajikistan	Road
176204	Vakhdad-Kyrgystan Railway	Tajikistan	Rail
179501	Gerede-Merzifonn Road Upgrading	Turkey	Road
179502	Refahiye Junction–Erzurum-Gürbulak Road Upgrading	Turkey	Road
336401	Sarracks Border Bridge	Turkmenistan	Road

Table 2: TRACECA IDEA Infrastructure Projects implemented in the Forecast Model

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Measure ID	Name	Country	Mode
1051001	Reopening Border ARM - TUR	Armenia / Turkey	Road / Rail
1100001	Danube bridge 2	Bulgaria / Romania	Road / Rail
1100002	South Stream	Bulgaria / South Russia	Ship
1398001	Khromtau - Altynsarin Railway	Kazakhstan	Rail
1417001	PRC-Kyrgyz Republic-Uzbekistan Railway Developm.	Kyrgyzstan	Rail
1762001	Vahdat - Javan Railway	Tajikistan	Rail
1795001	Marmaray Rail Tube Tunnel	Turkey	Rail
2500001	Gazvin - Astara Railway	Iran / (Azerbaijan)	Rail
3300001	Sofia - Skopje Railway	Bulgaria	Rail

Table 3: Additional Infrastructure Projects implemented in the Forecast Model

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