Item 1a

7th National Coordinators Meeting
Data Collection Workshop

Location: Skopje, Republic of Macedonia

April 17 - 18, 2008

Analysis in MAP 2009-2013

The Goals are:
- the development of the multimodal Core Network (standards, infrastructure and condition)
- reduction of waiting times on borders
- shift of the existing balance of traffic among modes of transport for more environmentally friendly
- reduction of bottlenecks
- reduction of journey times and improved accessibility
- reduction of road accidents,
- sustainability of investments (relevance, efficiency, effectiveness, economic and social impacts)
- affordability and financial sustainability of investment projects,
- policy reforms on the transport sector within the frame of the European Acquis,
- regional harmonisation on technical, operational, management and institutional issues of the transport sector and of the Core Network itself.

1 THE MAIN ANALYSES

- **Infrastructure Technical and Operational Configuration**
- **Condition of Infrastructure**
- **Traffic and Forecasting**
- **Bottleneck Analysis**
- **Accessibility Analysis**
- **Accidents Analysis**
- **Border Crossing Analysis**
- **Status of Development**

1.1 Infrastructure Configuration (technical and operational)

	ROADS	RAILWAYS	PORTS	AIRPORTS	INL. WATER
Infrastructure Technical Configuration	Lengths No of lanes Gradients Radii Pavement type I/C types	Lengths No of tracks Gauge width Type of traction Signalling type Max. axle loads Radii Gradients	Areas Facilities No of berths Lengths Draughts (min / max)	Runways Lengths Terminal area Apron area	Lengths Widths Depths Bridge constraints
Infrastructure Operational Configuration	Design speeds Oper. speeds Level of service	Design speeds Oper. speeds Reliability / delays Train frequencies	Equipment Connections Dwell times	Equipment Connections Frequencies	Operating speeds

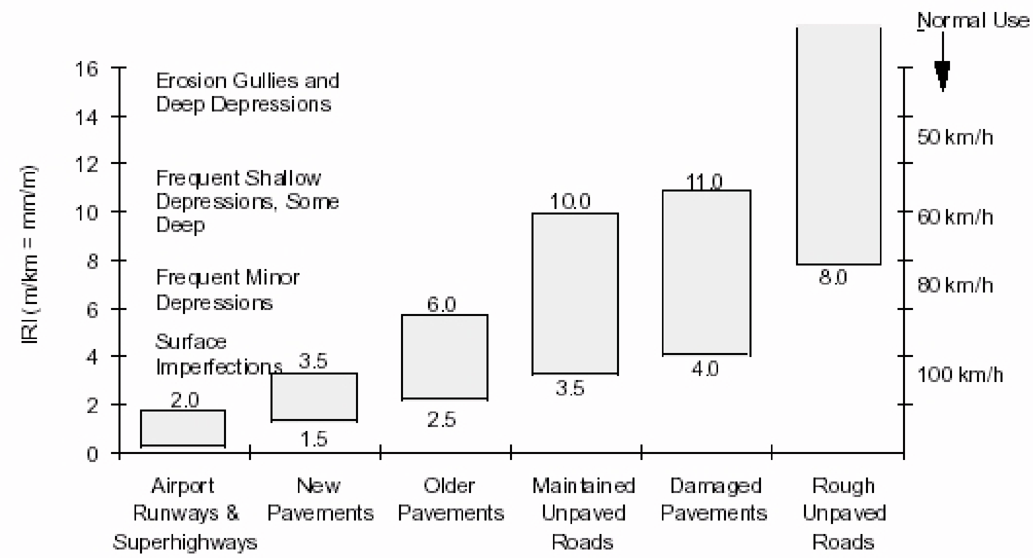
1.2 Condition of Infrastructure

	ROADS	RAILWAYS	PORTS	AIRPORTS	INL. WATER
Infrastructure Condition	Ratings based on IRI	Ratings per sub-system (track, signalling, telecoms, etc)	Ratings per facility / terminal	Ratings per facility / terminal	Ratings

- **Description of the Method**

Roads

1.	**Very Good,** describes the road without problems and completely comply with Standards - mainly new constructions,(IRI [0-1.24])
2.	**Good,** means that is a road without problems, (IRI [1.24 – 2.84])
3a.	**Medium NWC,** means that the road needs a New Wearing Course (NWC) (IRI [2.84- 5.09]),
3b.	**Medium PRH,** describes a road which needs Pavement Rehabilitation (PRH) (IRI [2.84 – 5.09]),
4.	**Poor,** means that the road needs a new Overlay and Wearing Course (OWC) (IRI [5.09 – 8.94]) and
5.	**Very Poor,** describes a road which needs a Completely New Pavement (CNP) (IRI [8.94 -])

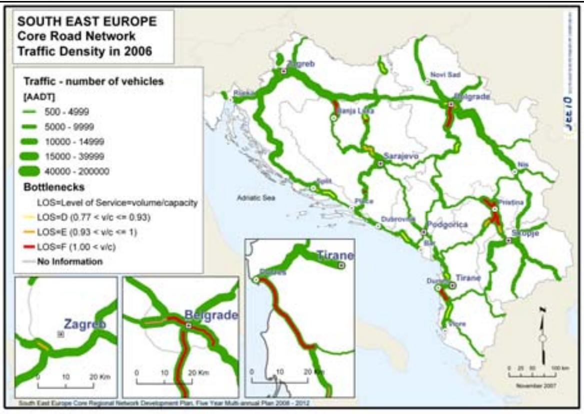


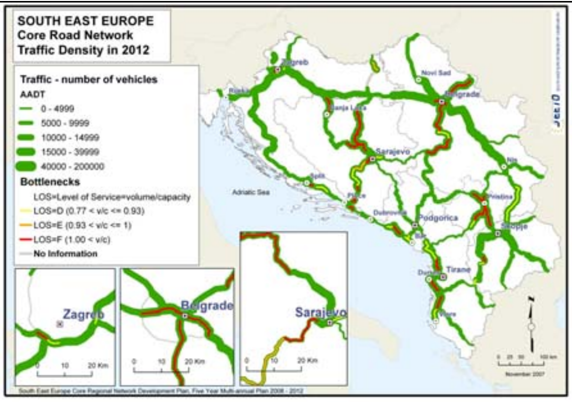
The methodology should ideally be based on the IRI measuring and be compared with the five scale rating of SEETO. The IRI score can be converted[1] to the 5 point scale with:

$$\text{Condition}_{[1\text{-}5]} = 5 * e^{-0.18*(IRI)}$$

Railways
Applying the scale from 1 to 5 and only describes the condition of track, without other systems.

1.3 Traffic and Forecasting





	ROADS	RAILWAYS	PORTS	AIRPORTS	INL. WATER
Traffic	AADT Composition % international	Pass / year Pass–km / year Tons / year Tons–km / year Trains / day Composition % international % transit	Pass / year Tons / year Vessels / year Composition by service type % international % transit	Pass / year Tons / year Flights / day % international % transit	Pass / year Tons / year Vessels / day % international

SEETO traffic forecasts are based on a) national socio-economic data and / or b) projections based on time series data per section that will be built up in the future. At present, traffic forecasts are based on GDP growth and elasticity of demand for each country / territory and are not disaggregated per transport section / component. Hence the same growth factor applies for the whole network.

Taking into account information on estimated yearly GDP growth for each country, and on yearly population growth, for the traffic forecast the same model was used as it was described in the REBIS study (REBIS Appendix 3).

[1] (Source: 1986 by Paterson, http://training.ce.washington.edu/wsdot/Modules/09_pavement_evaluation/09-2_body.htm)

The application of the model with the GDP to Demand elasticity assumed as 1.5, which is a representative figure for the region.

Applied model: ln(v2012) = A + 1.5*ln(GDP/capita)+1*ln(population)

The traffic estimates are given for the whole regional network and not for the Core Network itself. Some sections, mainly Corridors with considerable amount of international traffic, in some cases could result in higher growth from the results produced with the above.

1.4 Bottleneck Analysis

	ROADS	RAILWAYS	PORTS	AIRPORTS	INL. WATER
Capacity LoS Bottlenecks	LoS per section	Capacities per system component (track, signalling, etc)	Capacities per system component (berths, storage, terminals, etc)	Capacities per system component (runway, aprons, terminal, etc)	Capacities per system component

In general, bottlenecks can be classified by their nature. Generic bottlenecks are directly de-pendent on the transport system and the best way is to be resolved by general policy. Com-mon bottlenecks are occurring on multiple locations but with specific to their location, and the solution are combined with general policy and local solution. Specific bottlenecks are occur-ring at specific locations and requiring a local solution. MAP is only dealing with bottlenecks caused by capacity problems, due to constraints of the technical infrastructure. The generally adopted constraint in terms of capacity for a road without bottleneck is to assure the Level of Service (LoS) C as given by the US Highway Capacity Manual (HCM). Sections with Level of Service C or better are those roads where the ratio between traffic volume and capacity (v/c) is not higher than 0.77.

The HCM describes the LOS levels as follows:
Level of Service A (v/c <= 0.35):
Free flow, low volumes, high speeds (100 km/h or more), freedom to manoeuvre in the traffic stream is extremely high.
Level of Service B (0.35 < v/c <= 0.54):
Stable flow, freedom to select desired speeds is relatively unaffected; slight decline in the freedom to manoeuvre within the traffic flow.
Level of Service C (0.54 < v/c <= 0.77):
Stable flow, high volumes, operation of individual users becomes significantly affected by interaction with each other.
Level of Service D (0.77 < v/c <= 0.93):
Approaching unstable flow, fluctuating and relatively low volumes, speed and freedom to manoeuvre are severely restricted.
Level of Service E: (0.93 < v/c <= 1):
Operating conditions are at or near the capacity level, speeds are reduced to a low but relatively uni-form value.
Level of Service F: (1.00 < v/c):
Forced or breakdown flow, formation of queues, operations within the queue are characterized by stop-and-go waves, which are extremely unstable.

The capacity of roads is calculated by the basic rules of HCM. Converting hourly flow rates per lane, multiplying with the number of lanes and taking in consideration 16h daily traffic av-erages, road capacity for each road section is resulting.

By considering as bottleneck sections with LoS = D / E / F, 494km of such sections on 2 lane roads and 37 km on the 4 lane roads are resulting for 2006. The expected increase of road sections with bottlenecks as a result of traffic growth, between 2006 and 2012, is additional 836 km for 2 lane roads and 10 km for 4 lane roads. The forecasting of bottlenecks assumes existing infrastructure conditions.Improvements needed since the last plan

As in the case of roads, there are a great number of aspects determining a bottleneck and it is difficult to sum up all the elements affecting the capacity of the tracks and the associated bottleneck. The main elements affecting capacity are: single or double track, signalization type/telecommand, curves (radius), speed restrictions, track layout, number and length of sidings, train stopping points, type and location of signals etc.

The capacity of rail infrastructure has traditionally been measured in trains per day trough theoretical standard capacities based on its characteristics. This method is simplified as there are other complex parameters on the demand side, such as mix of traffic, usage over the day/frequencies, as well as operating issues such as train operating rules (e.g. priorities of specific trains), control systems etc.

This has led to select the capacity of a key parameter for a bottleneck criterion. The following rough figures were taken as capacity limits:

Single track main lines: 60 – 80 trains/day
Double track main lines: 100 - 200 trains/day

1.5 Accessibility Analysis

	ROADS	RAILWAYS	PORTS	AIRPORTS	INL. WATER
Accessibility	Travel times • city-port • city-city • b.c.-b.c. Time contours	Travel times • city-port • city-city • b.c.-b.c. Time contours			

Indicator of performance for the Core Network is presented in MAP 2008/2012, namely “Accessibility” in terms of travel time needed to reach a specific destination from a specific origin.

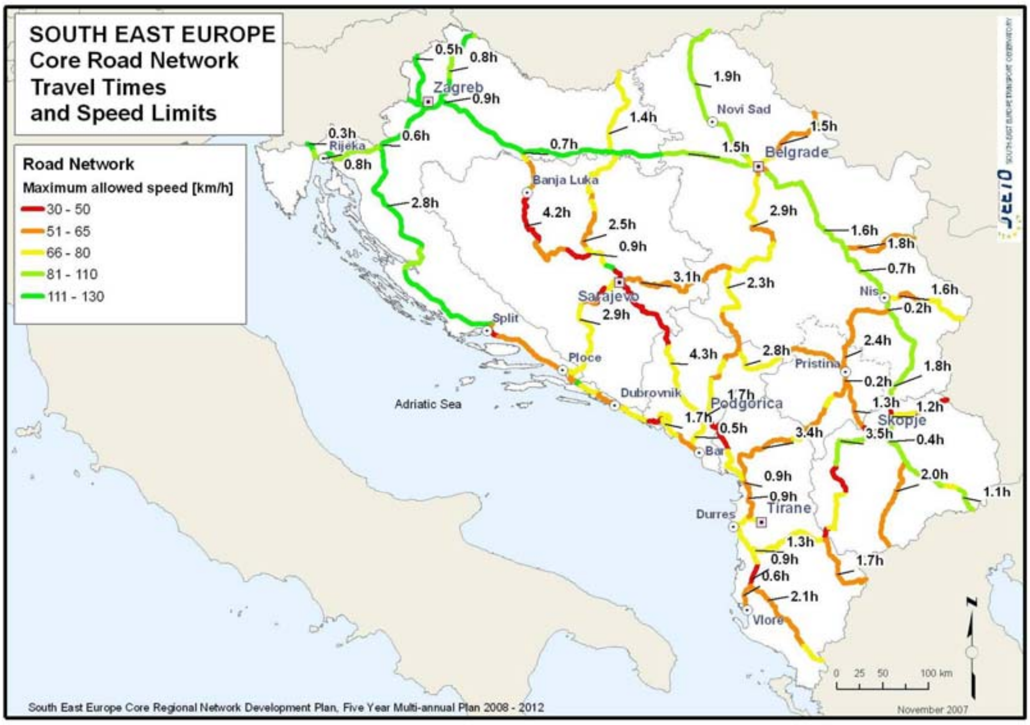
The purpose is to monitor year by year the improvement of accessibility (i.e. travel time reduction) along the Core Network as projects are gradually implemented. Accessibility can be measured:
- Along specific corridor and routes i.e. from start to end within the region,
- From border to border along Core Network,
- Between major poles of the region, along the Core Network, i.e. major cities and/or ports and airports,

The basis of information for accessibility assessment is SEETIS and more specially section distances and average speeds as reported by the countries. The basic analysis contains average travel times per section of Corridors or Routes, whereas as section is defined a link between main capitals, main cities, border and/or ports.

For road accessibility average travel time of passenger car is assumed, without taking into account cross-border delays as the objective to monitor infrastructure performance alone and not to introduce procedural/institutional barriers. Having compiled a basic table per section, a number of accessibility figures can derive, as stated previously, along the network.

Travel Times between Major Border Crossing Points in 2006

Travel times between major border crossing points. [h]	Croatia / Slovenia Rupa / Jelsane	Serbia / Romania Vatin / Moravita	Serbia / Bulgaria Vrska Cuka / Vrashka Tchuka	Serbia / Bulgaria Gradina / Kalotina	the former Yugoslav Republic of Macedonia / Bulgaria Deve Bair / Gyueschevo	the former Yugoslav Republic of Macedonia / Greece Gevgelia / Evzoni
Croatia / Slovenia Bregana / Obrezje		**5h** Corridor X and R4	**6.9h** Corridor X and R5	**7.4h** Corridors X and Xc	**9h** Corridors X and VIII	**9.8h** Corridor X
Croatia / Hungary Goričan / Letenye	**2.6h** Corridor Vb			**7.2h** Corridors X, Xc and Vb		**9.6h** Corridor X and Vb
Serbia / Hungary Horgos / Röszke			**5.3h** Corridor X, Xb and R5	**5.9h** Corridor X, Xb and Xc		**8.2h** Corridor X and Xb



Accidents Analysis

	ROADS	RAILWAYS	PORTS	AIRPORTS	INL. WATER
Road Safety	Accidents/ popul. Injuries / popul. Fatalities / popul. Same per: - reg. vehicles - veh. km				

Improvement of road safety becomes a very important issue in the region. Although the condition of roads is improving slightly since the REBIS study in 2002, the increased traffic growth requires improvements in overall road safety policy. There is a need to identify safety issues under these changing conditions. Across the region there is a similar procedure established where the police is systematically collecting accident data. This data is used for statistical and planning purposes and also to identify black spots. Still, accident data is not disaggregated by Corridor and Route, as it should be.

The analysis, at present, involves the following:

- Total accidents, injuries, fatalities per country / territory.
- Total population and registered vehicles per country / territory.
- Indicators: accidents / injuries / fatalities per 1 mil population and per 1 mil registered vehicles.

Data on accidents should be provided in the future by Corridor and Route in order to assess the relevant indicators in a more focused approach to the Core Network.

In that case the relevant indicators should derive as the ratio of number of accidents / injuries / fatalities per 1 bil vehicle – km, annually, along specific road section, route or corridor.

Number of Accidents, Injuries and Fatalities per 1,000,000 vehicles

	Number of accidents with fatalities or injuries per 1,000,000 vehicles			Number of Injured per 1,000,000 vehicles			Number of Fatalities per 1,000,000 vehicles		
	2004	2005	2006	2004	2005	2006	2004	2005	2006
Albania	2,904	2,997	3,178	3,092	3,074	2,416	932	1,078	865
Bosnia and Herzegovina									
Croatia	9,964	8,765	8,927	14,110	12,135	12,358	353	333	328
the former Yugoslav Republic of Macedonia									
Montenegro	11,287	11,740	13,354	16,190	16,927	19,395	842	828	730
Serbia	8,354	7,502	8,058	9,161	8,313	8,822	599	495	521
UNMIK/Kosovo	10,105	17,444	17,718	9,332	16,824	17,104	773	620	636
Total:	**8,855**	**8,456**	**8,842**	**11,105**	**10,358**	**10,701**	**531**	**482**	**476**

All calculations made without data from the former Yugoslav Re-public of Macedonia and Bosnia and Herzegovina

Traffic forecasting should be further developed in the future on the basis of transport modelling approach, so as to provide a more robust base for comparison of potential traffic against road capacity.

Data on accidents should be provided by Corridor and Route in order to assess the relevant indicators in a more focused approach to the Core Network.

Road safety information will be collected per section:

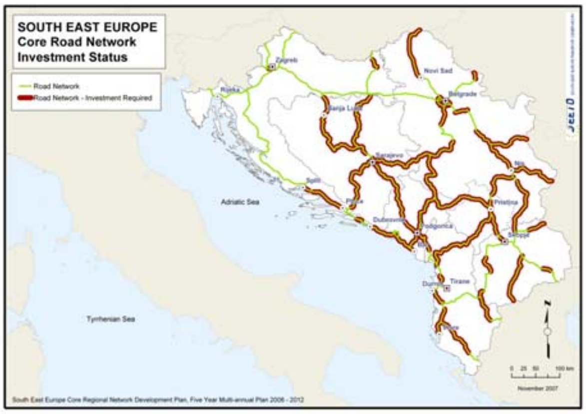
- Number of Accidents on section /year
- Number of accidents with fatality or hospitalized
- Number of Injured Persons
- Number of Fatalities (Persons)

Border Crossing Analysis

	ROADS	RAILWAYS	PORTS	AIRPORTS	INL. WATER
Border Crossings	Entry / exit time Time per procedure	Entry / exit time Time per procedure			

The TTFSE programme in the period 2001 – 2004 provided information for border delays in several posts. Since then information was practically unavailable from the national authorities, hence analysis has been concentrated only in recording and comparing delays at some limited border crossings without a systematic annual trend. To assess performance on border crossings, full data (in terms of locations and time) is needed. Moreover the analysis should concentrate on the specific reasons of delays by disaggregating entry / exit time into each procedural component (e.g. technical, operational, security / sanitary, etc).

Status of Development



SEETO has analysed the status of Development of the Core Network, firstly by looking at the sections that needed improvement in terms of infrastructure (condition analysis), having in mind internationally accepted standards such as TEN-T and secondly by the existence or not of bottleneck.

A section was considered as completed if it is in a “very good / good” condition and has no current bottleneck. A section was considered as requiring investment if it is in a “medium / poor / very poor” condition irrespective bottleneck or if it is in a “very good / good” condition but with bottleneck, leading thus to upgrading needs.

1.6 Monitoring Indicators

	2004 / 05 (MAP 2006/10)	2005 / 06 (MAP 2007/11)	2006 / 07 (MAP 2008/12)
Road Condition - Very Good / Good - Very Poor / Poor	- -	42.0% 20.0%	46.0% 15.0%
missing data (%)		12.0%	0.0%
Rail Condition - Very Good / Good - Very Poor / Poor	- -	8.0% 27.0%	7.0% 28.0%
missing data (%)		12.0%	0.0%
Road Traffic AADT (Core Network average)	-	7,760 vpd	8,220 vpd
Rail Traffic (total C.R.) - Pass - km - Ton - km	- -	- -	39.4 bil 76.7 bil
Road Bottlenecks in C.R. - LoS D - LoS E - LoS F	-	total 446 km (*)	total 531 km 144 km 116 km 271 km
Rail Bottlenecks in C.R.	-	825 km	389 km(**)
Status of Core Road Network Development - Completed - Requiring investment	- -	- -	2,440 km 3,504 km
Status of Core Rail Network Development - Completed - Requiring investment	- -	- -	322 km 4,262 km
Priority Projects having Secured Finance - Projects (No) - Sub-projects (No) - Respective length - Related investment cost	-	-	8 13 152 km 515.7 M€
Horizontal Measures - Adopted (number) - Implemented (number)	0 0	0 0	2 0