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ON
THE TRANSPORT MASTER PLAN
IN
BOSNIA AND HERZEGOVINA

FINAL REPORT

VOLUME II: SECTOR PLANS & PRE-FEASIBILITY STUDIES

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Study Area Map

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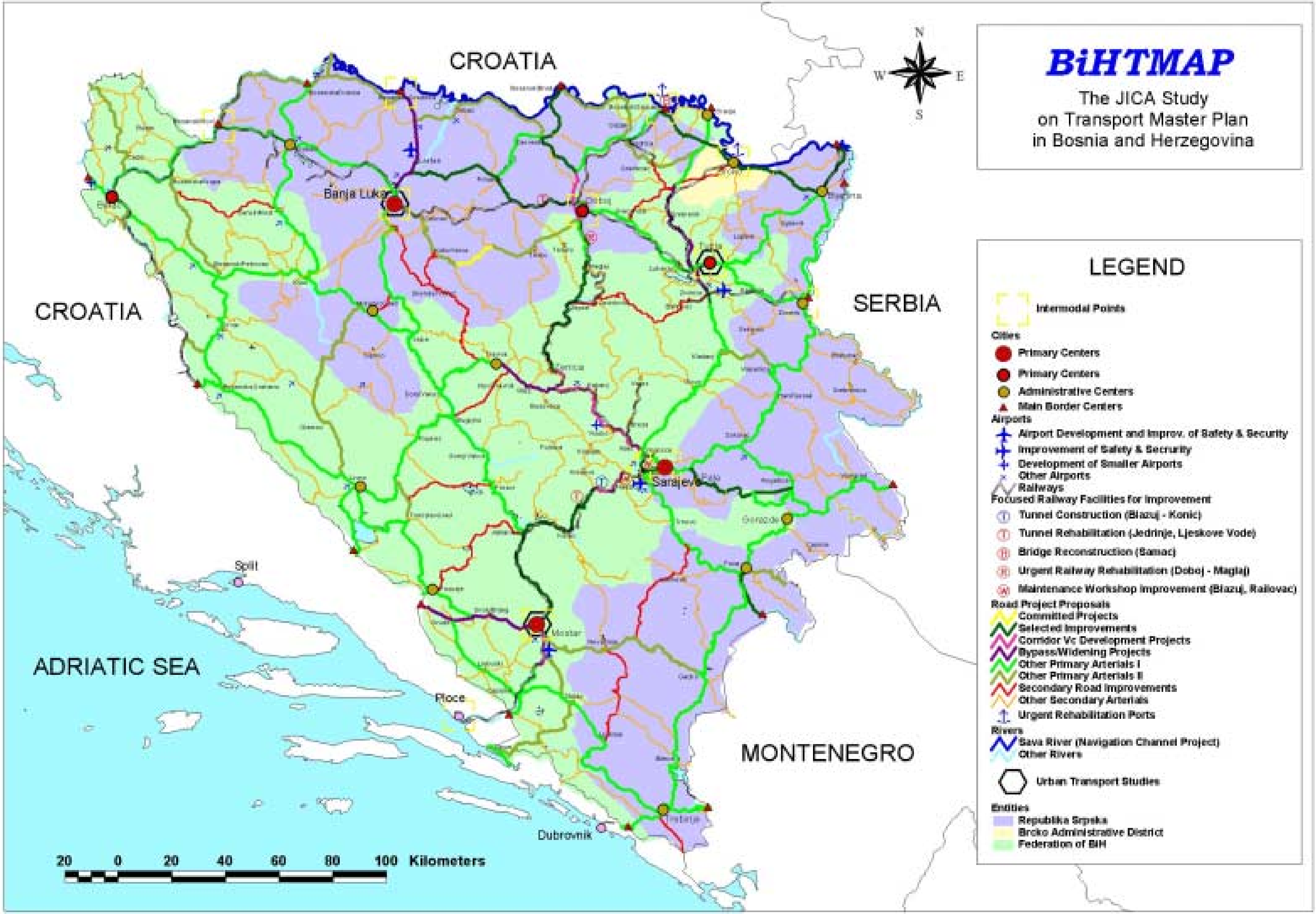
List of Abbreviations

AGR	European Agreement on Main International Traffic Arteries
ANS	Air Navigation System
ASG	Assignment Group
ATC	Air Traffic Control
ATS	Air Traffic Services
AWZ	Section Waterways and Sea Affairs
BiH	Bosnia and Herzegovina
BiHTMAP	Bosnia and Herzegovina Transport Master Plan
BiHDCA	Department of Civil Aviation
BOT	Build-Operate-Transfer
BR	Brcko Administrative District
BRIC	Joint Road Infrastructure Public Corporation
BHZJK	Joint Railway Public Corporation
B/C	Benefit Cost Ratio
CAA	Civil Aviation Authority
CB	Central Bank of Bosnia and Herzegovina
CEE	Communanté Economipac Européenne (Albania, BiH, Bulgaria, Croatia, FYR Macedonia, Romania and Yugoslavia)
CEEC	Central and Eastern European Countries
CEMT	Conference of European Ministers of Transport
CFR	Crash/ Fire/ Rescue
CIS	Commonwealth of Independent States
CTT	Combined Transport Terminals
CTP	Common Transport Policy
DEM	German Mark
DvS	Dienst voor de Scheepvaart
DOTS	IMF Direction of Trade Statistics
EBRD	European Bank for Reconstruction and Development
EC	European Commission
EDI	Electric Data Interchange
EDS	Economic Development Strategy
EIB	European Investment Bank
EIA	Environmental Impact Assessment
EMMP	Environmental Management and Monitoring Plans
ESCAP	Economic and Social Commission for Asia and the Pacific
ETRP	Emergency Transport Reconstruction Program
EU	European Union
EUR	Euro
FAA	Federal Aviation Authority
FBiH	Federation of Bosnia and Herzegovina
FDI	Facilitating Foreign Direct Investment
FED	Federal Institute of Statistics, Federation of Bosnia and Herzegovina
FDI	Foreign Direct Investment
FYR	Former Yugoslav Republic
FYROM	Former Yugoslav Republic of Macedonia
GDP	Gross Domestic Product
GRDP	Gross Regional Domestic Product
GPS	Global Positioning System
HDM-4	Highway Development and Maintenance - 4
HST	Hypersonic Transport
IATA	International Air Transport Association
ICAO	International Civil Aviation Organization
ICB	International Competitive Bidding
IEE	Initial Environment Examination

ILS	Instrument Landing System
IMF	International Monetary Fund
IMG	International Management Group
INTERBUS	International Passenger Transport by Road
ISO	International Organization for Standardization
ITT	Intermodal Transport Terminals
JICA	Japan International Cooperation Agency
JPY	Japanese Yen
KM	Konvertibilna Marka
LOS	Level of Service
MAC	Mine Action Center
MOTC	Ministry of Transport and Communications
MTEF	Medium Term Expenditure Framework
NATO	North Atlantic Treaty Organization
NIS	National Institute for Statistics
NGO	Non Governmental Organization
NVZ	NV Zeekanaal en Watergebonden Grondbeheer Vlaanderen
OBB	Austrian Railways
OSCE	Organization for Security and Cooperation in Europe
OHR	Office of High Representatives
PCU	Passenger Car Unit
PD	Project Descriptions
PFI	Private Finance Initiatives
PPP	Public Private Partnership
ROI	Return on Investment
RS	Republika Srpska
RPC	Railway Public Corporation
RUC	Road User Charges
SAA	Stabilization and Association Agreement
SD	Site Descriptions
SEE	South East European
SECI	Southeast European Cooperative Initiative
SFOR	Security Force
SME	Small and Medium Enterprise
TEM	Trans European Motorways
TEN	Trans-European Transport Network
TEN-T	Trans-European Network for Transport
TINA	Transport Infrastructure Needs Assessment
TIR	Transport Internationale Rouliere
TOR	Terms of Reference
TSM	Transportation System Management
UIC	Union Internationalle der Chemines du Fer (International Union of Railways)
UIRR	International Union of Rail – Road Transport Companies
UK	United Kingdom
UN	United Nations
UNECE	United Nations Economic Commission for Europe
UNDP	United Nations Development Program
UNHCR	United Nations High Commission for Refugees
USAID	United States Agency for International Development
USD	United States Dollar
VAL	Value Added Logistics
VAT	Value Added Tax
V/C	Volume to Capacity Ratio
WB	World Bank (International Bank for Reconstruction and Development)
WTO	World Trade Organization
ZBH	The Bosnia and Herzegovina Railways
ZRS	The Republika Srpska Railways



BiHTMAP
The JICA Study
on Transport Master Plan
in Bosnia and Herzegovina
CROATIA
CROATIA
SERBIA
MONTENEGRO
ADRIATIC SEA
N
S
W
E
Banja Luka
Sarajevo
Mostar
Split
Ploce
Dubrovnik
LEGEND
Intermodal Points
Cities
Primary Centers
Primary Centers
Administrative Centers
Main Border Centers
Airports
Airport Development and Improv. of Safety & Security
Improvement of Safety & Security
Development of Smaller Airports
Other Airports
Railways
Focused Railway Facilities for Improvement
Tunnel Construction (Blazuj - Konic)
Tunnel Rehabilitation (Jedrinje, Ljeskove Vode)
Bridge Reconstruction (Samac)
Urgent Railway Rehabilitation (Doboj - Maglaj)
Maintenance Workshop Improvement (Blazuj, Rajlovac)
Road Project Proposals
Committed Projects
Selected Improvements
Corridor Vc Development Projects
Bypass/Widening Projects
Other Primary Arterials I
Other Primary Arterials II
Secondary Road Improvements
Other Secondary Arterials
Urgent Rehabilitation Ports
Rivers
Sava River (Navigation Channel Project)
Other Rivers
Urban Transport Studies
Entities
Republika Srpska
Brcko Administrative District
Federation of BiH
20 0 20 40 60 80 100 Kilometers

CHAPTER 1: INTRODUCTION

1.1 BACKGROUND

The Japan International Cooperation Agency (JICA), in cooperation with the Bosnia and Herzegovina Ministry of Civil Affairs and Communications; the Ministry of Transport and Communications, Republika Srpska as well as the Ministry of Transport and Communications, Federation of Bosnia and Herzegovina have conducted the Bosnia and Herzegovina (BiH) Transport Master Plan (BiHTMAP), based on the *Scope of Work* agreed upon between the Governments of BiH and Japan on 27 November, 1998. Pacific Consultants International, headquartered in Tokyo, Japan, was the designated lead consultant for the study, which was initiated during November, 1999.

A basic premise of all investigations is that the BiHTMAP shall be comprehensive in nature, that is, address transport needs within each Entity, between Entities and between the country and her European neighbors[1]. Two key products form the foundation upon which planning efforts are based:

- Formulation of an integrated, multi-modal (road, rail, inland waterway, air) transport master plan extending over a twenty year planning horizon to year 2020; and,

- Identification, within the overall master plan framework, of high-priority projects whose implementation is to be achieved by year 2005, and whose merit is determined via pre-feasibility studies.

The transport strategy embedded in the Master Plan must concurrently contribute to an efficient economic structure of the country, strengthen trade relations with national neighbors and other areas of Europe, and provide a base for market-oriented transport

[1] Further detail regarding scope of work, Study Team composition and technical framework is contained in *Inception Report – The Study on the Transport Master Plan in Bosnia and Herzegovina*, prepared for the Japan International Cooperation Agency, Ministry of Civil Affairs and Communications (Bosnia and Herzegovina), Ministry of Transport and Communications (Federation of Bosnia and Herzegovina) and Ministry of Transport and Communications (The Republika Srpska), by Pacific Consultants International, November 1999.

activity. Post-war economic recovery within BiH is well underway; continuing improvements in productivity and well-being are expected. As economic recovery continues, changes in transport activities and behavior will follow suit. Thus, the foci of transport planning must gradually shift from alleviation of war damage to realization of a transport system founded upon mutual cooperation and free-market principles. This strategy is particularly valid given the 20-year planning horizon adopted by the current study.

These challenges, especially when viewed through the prism of existing realities, required innovative, yet practical approaches to problem solving. Analytical efforts therefore focus, in the case of high priority projects, on transport system inadequacies catalyzed by the war and maintenance shortfalls, thus reflecting present, observed transport patterns, preferences and deficiencies. In the longer term, however, transport activities and demand are anticipated to gradually evolve and diversify according to European norms and practices.

1.2 REPORTING APPROACH

The Study Team produced four reports during the course of the study. The content of each report can best be described by considering typical steps associated with deductive technical analysis:

- The *Inception Report*, which was submitted during November, 1999, contained detail regarding study methodologies, staffing plan and study outputs. This document was finalized in close cooperation with counterpart committees and other governmental representatives.

- The *Progress Report*, which was submitted during March, 2000, quantified and clarified study progress to near conclusion of what, in study terms, had been categorized as Phase I efforts. The content of the *Progress Report* amplified, as necessary, technical techniques and methodologies, presented findings as to existing conditions, documented major surveys and identified early opportunities and constraints.

- The *Interim Report* was submitted near end of November, 2000. It contained results of technical analyses, findings of designated surveys, evaluation of alternative approaches, demand forecasting/modeling, sectorial improvement strategies, and preliminary conclusions as to Master Plan content.

- The *Final Report* was submitted in two versions, a draft during January, 2001 and, following receipt of comments, the current document which was submitted during

March, 2001[2]. The *Final Report* documents the Master Plan, details sector plans and describes results of pre-feasibility reviews for selected high-priority projects.

In line with mutually accepted procedures, a pre-agreed number of copies of each report were provided to the studies Coordinating Committee, as well as to each of the two Entity Technical Committees.

The scope of the work encompasses a wide variety of technical components as appropriate to a comprehensive transport study such as BiHTMAP. As part of road transport modeling efforts, a country-wide survey consisting of traffic counts and roadside origin-destination (OD) interviews was completed during June and July, 2000. In summary, 86 points were surveyed, 62 of which included both traffic count (24 hours) and roadside interview (12 hours) surveys. Sixteen hour traffic counts were collected at remaining locations. The roadside OD program queried major items such as trip origin, trip destination, number of passengers, trip purpose and, in case of trucks, type and amount of commodities carried. On a composite BiH-wide basis, some 35 percent of passing traffic was surveyed resulting in a data pool of roughly 89,000 interviews.

This survey was the first since the end of the war to provide traffic data on a uniform, country-wide basis and therefore represents a unique reference source for the transportation community in BiH. The Study Team, in recognition of this fact, therefore issue a supplementary report:

- *Traffic Survey Report*, dated July, 2000, which provides full detail regarding survey locations, data collection methodologies as well as site by site traffic volumes stratified by clock hour, two directions and ten vehicle types.

Roadside OD survey results were also made available in original hardcopy (survey) format, as well as processed format (expanded daily trip matrixes at the 54 zone level of detail, by four vehicle types).

1.3 STRUCTURE OF THE FINAL REPORT

The structure of the *Final Report* is consistent with essential formats and tenets voiced in the *Inception Report*, as well as directives received from the studies Coordinating Committee[3]. The *Final Report* consists of five separate volumes:

- *Executive Summary*;

[2] In line with established procedures, Pacific Consultants International submitted the *Final Report* to the Japan International Cooperation Agency in Tokyo, Japan during latter March, 2001. JICA then forwarded all documents to the BiH side via diplomatic channels.
[3] The Coordinating Committee, as documented in the *Minutes of Meeting on the Draft Final Report* dated 7 February, 2001, instructed the Study Team to prepare the *Final Report* in such a manner as to document the BiHTMAP as well as prepare, as separate volumes, reports for each Entity. The Entity reports are to be project and implementation oriented.

- *Volume I: Transport Master Plan* presents the Transport Master Plan in Bosnia and Herzegovina in such a manner as to address substantial discussions related to and necessary for seeking the transport sector policies and development directions from a long-term perspective, including not only hardware elements (infrastructure-specific items), but also software elements (technology and institution) and the human aspect (organizational issues, human resources training). Ultimate accession to the European Union is an essential element of the Master Plan.

- ***Volume II: Sector Plans* (this report) presents individual sector plans for road, railway, waterway and air, based on analytical and technical arguments obtained through surveys and investigations conducted by the Study Team. The sector plans contain a wide variety of technical issues so that the relevant agencies responsible for each transport sector may deepen their insights into future visions and tasks.**

- *Volume III: Entity Report-Federation of Bosnia and Herzegovina;* and, *Volume IV: Entity Report-Republika Srpska,* each contain sector-specific and project-oriented documentation to assist each Entity in finalizing implementation strategies and administrative approvals thereof. In addition, results of pre-feasibility analyses of high-priority projects in each Entity are documented.

The current volume, that is, *Volume II: Sector Plans*, structures discussions as follows:

- Chapter 2: Road Sector;

- Chapter 3: Rail Sector;

- Chapter 4: Air Sector; and,

- Chapter 5: Waterway Sector.

Within each of these chapters the sector-specific plans are presented, whose integration into a multi-modal Transport Master Plan is documented in *Volume I* of the *Final Report*. Each of the sector plans generally addresses key topics to include demand forecasts, infrastructure plans, operational aspects, costing, implementation phasing, and culling of priority projects.

1.4 THE PARTICIPATORY PLANNING PROCESS

The final structure of BiHTMAP, and the successful reception thereof, was achieved as a direct result of cooperative efforts and close liaison between the Study Team and local experts. Considerable efforts were expended in gathering information, reviewing previous studies and holding numerous discussions to enhance knowledge of, and sensitivity to, local transport conditions, norms and practices.

A partial listing of governmental contacts include various experts within the BiH Ministry of Civil Affairs and Communications (whose representatives participated in the

Coordinating Committee for this study), the FBiH Ministry of Transport and Communications (whose representatives chaired and coordinated the FBiH Technical Committee) and the Republika Srpska Ministry of Transport and Communications (whose representatives chaired and coordinated the Republika Srpska Technical Committee). Close liaison was also maintained with Kantonal authorities in all ten FBiH Kantons, various Ministries within both Entities, the BiH Railways Public Corporation and railway companies, members of the waterway community, airport and civil aviation authorities, statistical agencies at both the state and Entity levels, as well as various Institutes in both Entities. Representatives of municipal governments were, as reasonable and practical, consulted regarding sector-specific issues. In addition, on-going contact was maintained with the BiH Ministry of Foreign Affairs as well as the Japan International Cooperation Agency.

Likewise, on-going and effective consultations were carried out with various international agencies, donors, and consultant groups in order to obtain an overview of previous, current, and likely future activities and/or involvement in BiH. A partial listing of contacts includes the Office of the High Representative, International Management Group, European Bank for Reconstruction and Development, World Bank, SFOR, European Commission, OSCE, Private Sector Development Task Force, USAID, ICAO, various institutions of the United Nations, the European Intermodal Association, Shipping and Transport College-Rotterdam, Communaute des Chemins de Fer Europeens, and the European Dredging Association. Contacts had also been arranged with representatives of the transport community and industry in neighboring countries.

Additional information dissemination methodologies were also employed. These included, over the entire extent of the study, conduct of four workshops with a primarily technical orientation in each Entity, conduct of three seminars with a primarily country-wide and international focus, publication of a periodic BiHTMAP newsletter, submittal of monthly progress reports to the Chairmen of the Coordinating and Entity Technical Committees as well as the Ministry of Foreign Affairs, and frequent progress reports to JICA.

CHAPTER 2: ROADS AND ROAD TRANSPORT

This chapter sets forth the road infrastructure and transport plan. This is derived within the 20 year (to year 2020) planning horizon adopted by the current study, to include specification of high-priority projects whose implementation is considered essential over the coming five-year period. Four major topics are contained in this chapter:

- Section 2.1 describes the development, calibration, and application of the road transport model. The role of data collected via the countrywide origin-destination and traffic counting survey is addressed, as are characteristics of the integrated and cascading sub-models of trip generation, trip distribution, and trip assignment. The model and its analytical forecasting capability is the principal tool via which the road infrastructure plan was derived, projected, tested and refined.

- Section 2.2 details procedures used in the derivation of a road functional classification and priority corridors network, and describes the nested techniques used to gradually refine a road infrastructure improvement plan. Important contributory and intermediate issues such as road maintenance, facility sufficiency, design standards, and European norms are also discussed. Staged implementation potentials are presented, to include the status of high-priority projects.

- Section 2.3 presents a profile of road operators, that is, inter-city and long distance bus and truck operators. Various activity, operational and institutional issues are examined, as are likely future prospects based on observed European experiences. A sector modernization strategy is presented, whose underlying theme is privatization and operations founded upon market mechanisms.

2.1 ROAD TRANSPORT MODEL AND DEMAND FORECASTS

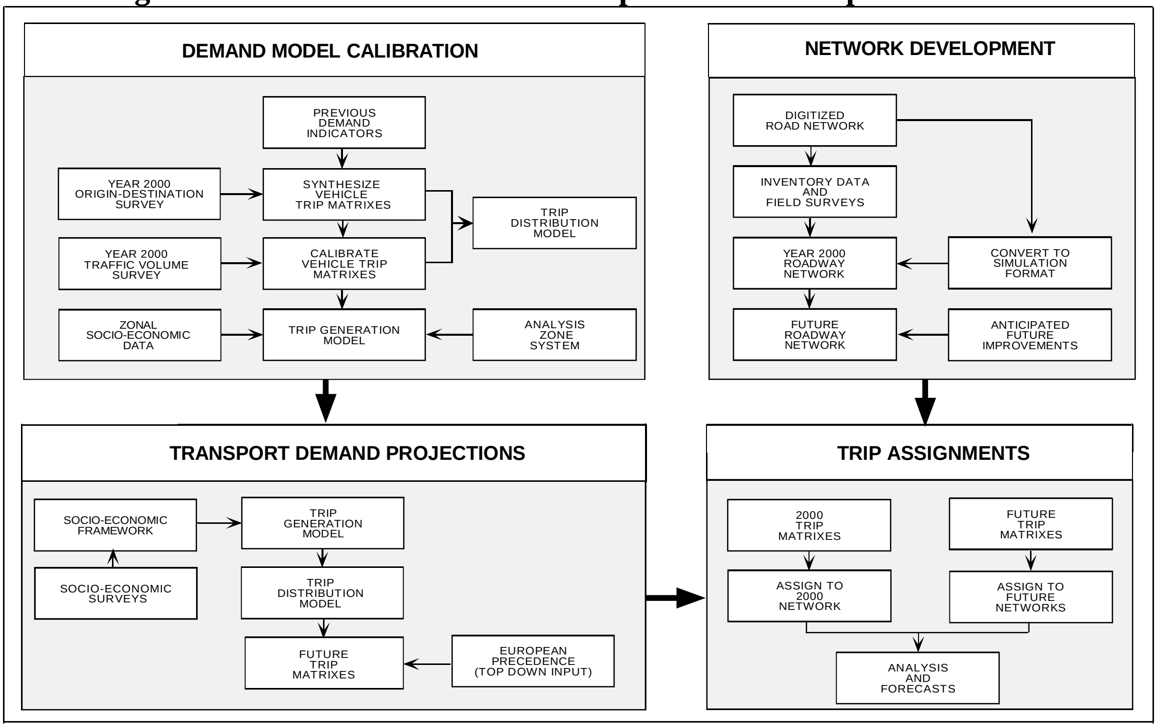
The road transport model, to include demand calibration, demand projections, network development, and sufficiency analyses are addressed in this section.

2.1.1 Overview of Modeling Approach

A computerized road transport model was developed as part of the BiHTMAP process. A cascading and nested series of sub-models are included in this effort among them network simulation, trip generation, trip matrixes and traffic assignments. This section provides and overview of the entire process, and achieved modeling results.

The modeling process can, in it's most basic sense, be summarized as consisting of four essential steps (Figure 2.1.1):

Figure 2.1.1 Overview of Road Transport Model Components



- Network development: road inventory data was assembled and a simulated year 2000 highway network constructed. Inclusion of anticipated improvements such as upgrading of existing sections or construction of new segments led to development of future (to year 2020) networks.

- Demand model calibration: vehicle trip matrixes were calibrated to year 2000 conditions via information derived from the data collection program. Transport demand was linked with socio-economic data.

- Transport demand projections: future demand was correlated with demographic and economic evolution as quantified in the study's socio-economic framework. Whilst year 2020 serves as the ultimate planning horizon, the demand forecasting process also addressed intermediate years 2005 and 2010.

- Trip assignments: Trips were loaded onto the base and future years networks, thus providing the basis for sufficiency analyses and projection of roadway utilization.

Following sections of this chapter describe techniques and methodologies employed in building the transport model, as well as principal findings and conclusions of the simulation process. It is recognized that the estimation of future socioeconomic and transport activity is fraught with uncertainties given the on-going and anticipated continued massive restructuring of the BiH economy, as well as changing political relationship with national neighbors. Transport activity will, correspondingly, be affected and thus innovative, yet practical, approaches to demand forecasting are required.

The transport model[1] is therefore founded on a two-tier technique, which synthesizes "top down" and "bottom up" approaches:

- Top Down Process. The top-down technique focuses on estimation of likely levels of countrywide and Entity development based on macro-economic and socio-political parameters which, in turn, are compared to indicators of historic transport evolution experienced by other European nations. Thus, in the longer term, BiH transport behavior, modal choice, and mobility can gradually be expected to transition to European norms. A key determinant in this process is provided by the socio-economic framework; that is, change in the BiH unit national income over the next 20 years.

- Bottom Up Process. The bottom-up technique focuses on relative travel patterns experienced within each area of economic activity (analysis zone). It is expected that sizable shifts in demand will occur in future as the economy continues to diversify as well as expand. However, while some focused, capital-intensive improvements in road infrastructure are expected over the next two decades, existing locational aspects such as cities, international borders and natural terrain features will remain. Thus, relative distribution patterns are, to reasonable degrees, expected to evolve from existing patterns. This lends credence to linking changes in trip demand with available socioeconomic variables to include population and unit national income.

Extensive technical liaison was maintained throughout the modeling process. Numerous valuable comments were received from counterpart staff and others regarding transport strategies and concepts, and likely resulting impacts upon forecasting procedures. A partial listing of governmental contacts include the BiH Ministry of Civil Affairs and Communications, various sectorial experts within the Federation Ministry of Transport and Communications, as well as various sectorial experts within the Republika Srpska Ministry of Transport and Communications. Effective and on-going consultations were also maintained with various international agencies, donors, technical institutes, and consultant groups in order to obtain an overview of their on-going technical reviews, analyses, and studies. A partial listing of contacts includes the Office of the High Representative, International Management Group, European Bank for Reconstruction and Development, World Bank, SFOR, European Commission, OSCE, Private Sector

[1] Note: The development of the software transport model makes use of two internationally recognized planning packages namely TRANPLAN and TRIPS

Development Task Force, USAID and the United Nations. In addition, other specialists of the Study Team conducted independent sectorial reviews, findings of which were cross-correlated with results of the road transport "top down" and "bottom up" techniques to ensure consistency of effort among all study participants.

2.1.2 Study Area and Zone System

All Bosnia and Herzegovina is included within the study area. However, transport simulation should, in order to properly fulfill its assigned role within the overall framework of the Master Plan study, be based on a more refined system of analysis zones. Discussions with representatives of the Coordinating and Technical Committees, and others, clearly confirm that modeling at the Kanton (Federation) or Functional Region[2] (Republika Srpska) level of detail is too coarse to permit proper evaluation of the inter-city road network (however, these precincts retain importance in terms of data aggregation). Concurrently, modeling at the 151-municipality level of detail is impractical due to constraints associated with availability of socio-economic data as well as the number of data collection points incorporated within the roadside traffic counting and origin-destination survey program[3].

Nevertheless, transport analysis zones must be based in the first instance on the minimum "building block" for which population data can readily be obtained; that is, municipalities. In defining a zone system based on combinations of municipalities, several issues were considered:

- The largest cities (Sarajevo, Banja Luka, Mostar, Tuzla, Doboj, Zenica, Bijeljina, Bihac) were designated as separate zones.
- Zone boundaries must permit aggregation to Kanton (Federation), Functional Region (Republika Srpska), Brcko Administrative District, Entity, and country.
- Zones should, as practical and possible, achieve reasonable internal population balance and be centered on a dominant settlement.
- Zones should be so structured to ensure a reasonable distribution of traffic volume over all parts of the simulated road network
- Zone structure should be conducive to the integration of new future road infrastructure and socio-economic patterns.

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[2] Functional regions in Republika Srpska conform to those designated in *Prostorni Plan Republike Srpske; Etapni Plan 1996-2001*; for Republika Srpska Vlada Ministarstvo za Urbanizam, et. al., by Urbanisticki Zavod Republike Srpske, Banja Luka, Juli 1996.

[3] Calibration of base-year matrixes can only be achieved through availability of traffic volume and/or traffic OD patterns at key locations; that is, where roads crosszone boundaries. Adoption of a 151-zone system would require data collection at several hundred locations, a task beyond budgetary and temporal limitations imposed upon the current study.

The resulting system includes 41 internal zones (that is, located within the boundary of BiH) (Figure 2.1.2). Equivalencies for municipalities, zones, and Kantons/Regions are depicted in Table 2.1.1. For summary and presentation purposes, a "superzone" system was adopted which permits aggregations to the Kanton, Functional Region and Brcko AD level of detail (Figure 2.1.3).

In addition to internal zones, a series of external zones were designated which simulate border-crossing points along the periphery of BiH. Discussions with representatives of state, Entity, and Kantonal governments confirm that some 50-border crossings exist. These include major crossing points as well as minor locations used only by the local populace. In addition, crossing points are arrayed by whether or not goods, persons, or both may cross, and within what hours. Other constraints include destroyed bridges along the Sava River, political restrictions as well as incomplete agreements with neighboring countries as to the status of certain border points. The adopted modeling approach must be sufficiently flexible to mirror both existing conditions and future situations under which constraints are likely to be ameliorated, at least in terms of crossings associated with main roads. External zones are therefore depicted in terms of geographical areas; thus, trips between BiH and other parts of Europe are free to choose the most convenient crossing point as dictated by internal road network condition and availability of crossing points. In summary, an additional 13 external zones were designated. (Figure 2.1.4). These include (Table 2.1.2):

Table 2.1.2 Designation of External Analysis Zones

Zone Number	Geographic Region
42	Croatia Southeast (including Ploce and Dubrovnik)
43	Croatia South (including Split)
44	Croatia West (including Zagreb)
45	Croatia Northeast (including Osijek)
46	Yugoslavia North (Vojvodina)
47	Yugoslavia Central (Serbia)
48	Yugoslavia South (Montenegro)
49	Slovenia
50	Austria and Italy
51	Europe West
52	Europe Center and East
53	Europe Southeast
54	Other

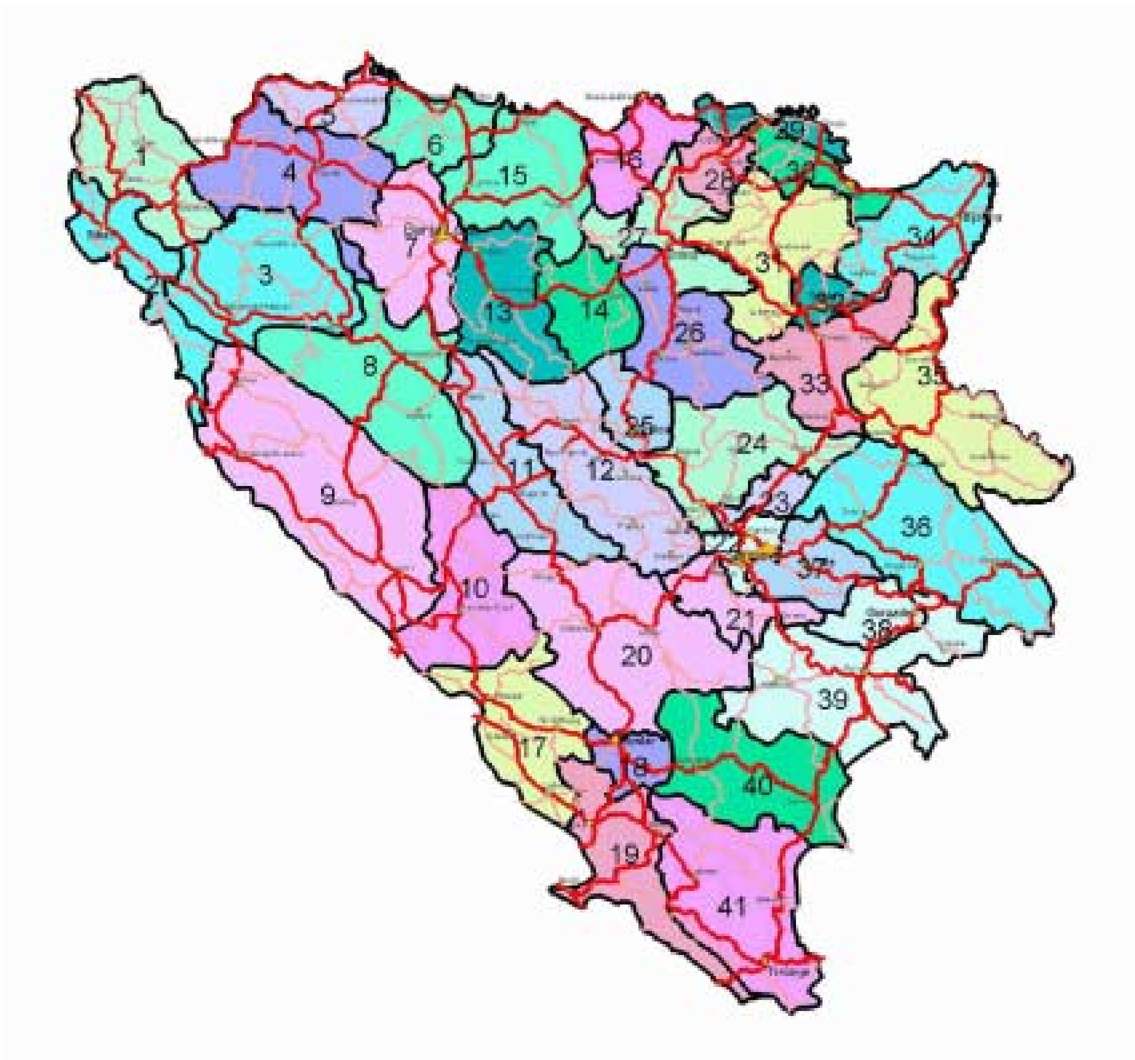

Figure 2.1.2 Internal Zone System

Table 2.1.1 Municipality, Zone, and Kanton/Region Equivalencies

Municipality Name	Entity	Zone Number	Kanton or Functional Region	Municipality Name	Entity	Zone Number	Kanton or Functional Region
Banja Luka	Republika Srpska	7	Banja Luka	Mostar South West	Federation	18	Hercegovacko-Neretvanski
Banovici	Federation	33	Tuzlansko-Podrinjski	Mostar West	Federation	20	Hercegovacko-Neretvanski
Berkovici	Republika Srpska	41	Trebinje	Mrkonjic Grad	Republika Srpska	8	Mrkonjic Grad
Bihac	Federation	2	Unsko-Sanski	Neum	Federation	19	Hercegovacko-Neretvanski
Bijeljina	Republika Srpska	34	Bijeljina	Nevesinje	Republika Srpska	40	Trebinje
Bileca	Republika Srpska	41	Trebinje	Novi Grad	Republika Srpska	4	Prijedor
Bosanska Krupa	Federation	1	Unsko-Sanski	Novi Grad	Federation	22	Sarajevo
Bosanski Petrovac	Federation	3	Unsko-Sanski	Novi Travnik	Federation	12	Srednjebosanski
Bosansko Grahovo	Federation	9	Herceg-Bosanski	Novo Sarajevo	Federation	22	Sarajevo
Bratunac	Republika Srpska	35	Zvornik	Odzak	Federation	29	Velezupa Posavska
Brcko	Brcko Adm Dist	30	Brcko Adm Dist	Olovo	Federation	24	Zenicko-Dobojski
Brcko Town	Brcko Adm Dist	30	Brcko Adm Dist	Orasje	Federation	29	Velezupa Posavska
Breza	Federation	24	Zenicko-Dobojski	Osmaci	Republika Srpska	35	Zvornik
Buzim	Federation	1	Unsko-Sanski	Pale	Republika Srpska	37	Serb Sarajevo
Bugojno	Federation	11	Srednjebosanski	Pale	Federation	38	Bosansko Podrinjski
Busovaca	Federation	12	Srednjebosanski	Pelagicevo	Republika Srpska	28	Brcko
Cajnice	Republika Srpska	39	Srbinje	Petrovac	Republika Srpska	8	Mrkonjic Grad
Capljina	Federation	19	Hercegovacko-Neretvanski	Petrovo	Republika Srpska	27	Doboj
Cazin	Federation	1	Unsko-Sanski	Posusje	Federation	17	Zapadno-Hercegovacki
Celic	Federation	31	Tuzlansko-Podrinjski	Prijedor	Republika Srpska	4	Prijedor
Celinac	Republika Srpska	13	Banja Luka	Prnjavor	Republika Srpska	15	Banja Luka
Centar	Federation	22	Sarajevo	Prozor	Federation	20	Hercegovacko-Neretvanski
Citluk	Federation	19	Hercegovacko-Neretvanski	Ravno	Federation	19	Hercegovacko-Neretvanski
Derventa	Republika Srpska	16	Doboj	Ribnik	Republika Srpska	8	Mrkonjic Grad
Doboj	Republika Srpska	27	Doboj	Rogatica	Republika Srpska	36	Serb Sarajevo
Doboj Istok	Federation	31	Tuzlansko-Podrinjski	Rudo	Republika Srpska	36	Serb Sarajevo
Doboj Jug	Federation	26	Zenicko-Dobojski	Samac	Republika Srpska	28	Brcko
Dobretici	Federation	11	Srednjebosanski	Sanski Most	Federation	3	Unsko-Sanski
Domaljevac - Samac	Federation	29	Velezupa Posavska	Sapna	Federation	33	Tuzlansko-Podrinjski
Donji Vakuf	Federation	11	Srednjebosanski	Sekovici	Republika Srpska	35	Zvornik
Drvar	Federation	9	Herceg-Bosanski	Sipovo	Republika Srpska	8	Mrkonjic Grad
Foca	Federation	38	Bosansko Podrinjski	SirokiBrijeg	Federation	17	Zapadno-Hercegovacki
Fojnica	Federation	12	Srednjebosanski	Skelani	Republika Srpska	35	Zvornik
Gacko	Republika Srpska	40	Trebinje	Sokolac	Republika Srpska	36	Serb Sarajevo
Glamoc	Federation	9	Herceg-Bosanski	Srbac	Republika Srpska	15	Banja Luka
Gorazde	Federation	38	Bosansko Podrinjski	Srbinje	Republika Srpska	39	Srbinje
Gornji Vakuf	Federation	11	Srednjebosanski	Srebrenica	Republika Srpska	35	Zvornik
Gracanica	Federation	31	Tuzlansko-Podrinjski	Srebrenik	Federation	31	Tuzlansko-Podrinjski
Gradacac	Federation	31	Tuzlansko-Podrinjski	Srpska Ilidza	Republika Srpska	37	Serb Sarajevo
Gradiska	Republika Srpska	6	Banja Luka	Srpska Kostajnica	Republika Srpska	5	Prijedor
Grude	Federation	17	Zapadno-Hercegovacki	Srpski Brod	Republika Srpska	16	Doboj
Hadzici	Federation	21	Sarajevo	Srpski Drvar	Republika Srpska	8	Mrkonjic Grad
Han Pijesak	Republika Srpska	36	Serb Sarajevo	Srpski Kupres	Republika Srpska	8	Mrkonjic Grad
Ilidza	Federation	22	Sarajevo	Srpski Mostar	Republika Srpska	40	Trebinje
Ilijas	Federation	23	Sarajevo	Srpski Sanski Most	Republika Srpska	4	Prijedor
Jablanica	Federation	20	Hercegovacko-Neretvanski	Srpski Stari Grad	Republika Srpska	37	Serb Sarajevo
Jajce	Federation	11	Srednjebosanski	Srpsko Gorazde	Republika Srpska	39	Srbinje
Jezero	Republika Srpska	8	Mrkonjic Grad	Srpsko Novo Sarajevo	Republika Srpska	37	Serb Sarajevo
Kakanj	Federation	24	Zenicko-Dobojski	Srpsko Orasje	Republika Srpska	28	Brcko
Kalesija	Federation	33	Tuzlansko-Podrinjski	Srpsko Trnovo	Republika Srpska	37	Serb Sarajevo
Kalinovik	Republika Srpska	39	Srbinje	Srpsko Trnovo	Republika Srpska	39	Srbinje
Kiseljak	Federation	12	Srednjebosanski	Stari Grad	Federation	22	Sarajevo
Kladanj	Federation	33	Tuzlansko-Podrinjski	Stolac	Federation	19	Hercegovacko-Neretvanski
Kljuc	Federation	3	Unsko-Sanski	Teocak	Federation	33	Tuzlansko-Podrinjski
Knezevo	Republika Srpska	13	Banja Luka	Tesanj	Federation	26	Zenicko-Dobojski
Konjic	Federation	20	Hercegovacko-Neretvanski	Teslic	Republika Srpska	14	Doboj
KotorVaros	Republika Srpska	13	Banja Luka	Tomislav Grad	Federation	10	Herceg-Bosanski
Kozarska Dubica	Republika Srpska	5	Prijedor	Travnik	Federation	12	Srednjebosanski
Kresevo	Federation	12	Srednjebosanski	Trebinje	Republika Srpska	41	Trebinje
Krupa na Uni	Republika Srpska	4	Prijedor	Trnovo	Federation	21	Sarajevo
Kupres	Federation	10	Herceg-Bosanski	Tuzla	Federation	32	Tuzlansko-Podrinjski
Laktasi	Republika Srpska	15	Banja Luka	Ugljevik	Republika Srpska	34	Bijeljina
Livno	Federation	9	Herceg-Bosanski	Usora	Federation	26	Zenicko-Dobojski
Ljubinje	Republika Srpska	41	Trebinje	Vares	Federation	24	Zenicko-Dobojski
Ljubuski	Federation	17	Zapadno-Hercegovacki	VelikaKladusa	Federation	1	Unsko-Sanski
Lopare	Republika Srpska	34	Bijeljina	Visegrad	Republika Srpska	36	Serb Sarajevo
Lukavac	Federation	31	Tuzlansko-Podrinjski	Visoko	Federation	24	Zenicko-Dobojski
Maglaj	Federation	26	Zenicko-Dobojski	Vitez	Federation	12	Srednjebosanski
Milici	Republika Srpska	35	Zvornik	Vlasenica	Republika Srpska	35	Zvornik
Modrica	Republika Srpska	28	Doboj	Vogosca	Federation	22	Sarajevo
Mostar District	Federation	18	Hercegovacko-Neretvanski	Vukosavlje	Republika Srpska	28	Brcko
Mostar North	Federation	20	Hercegovacko-Neretvanski	Zavidovici	Federation	26	Zenicko-Dobojski
Mostar Old Town	Federation	18	Hercegovacko-Neretvanski	Zenica	Federation	25	Zenicko-Dobojski
Mostar South	Federation	18	Hercegovacko-Neretvanski	Zepce	Federation	26	Zenicko-Dobojski
Mostar South East	Federation	18	Hercegovacko-Neretvanski	Zivinice	Federation	33	Tuzlansko-Podrinjski
				Zvornik	Republika Srpska	35	Zvornik

(1) Functional regions in Republika Srpska conform to those designated in *Prostorni Plan Republike Srpske, Nacrt Plan 1996-2001*; for Republika Srpska Vlada Ministarstvo za Urbanizam, et.al., by Urbanisticki Zavod Republike Srpske, Banja Luka, Juli 1996. Appropriate modifications have been made permitting insertion of the Brcko Administrative District.

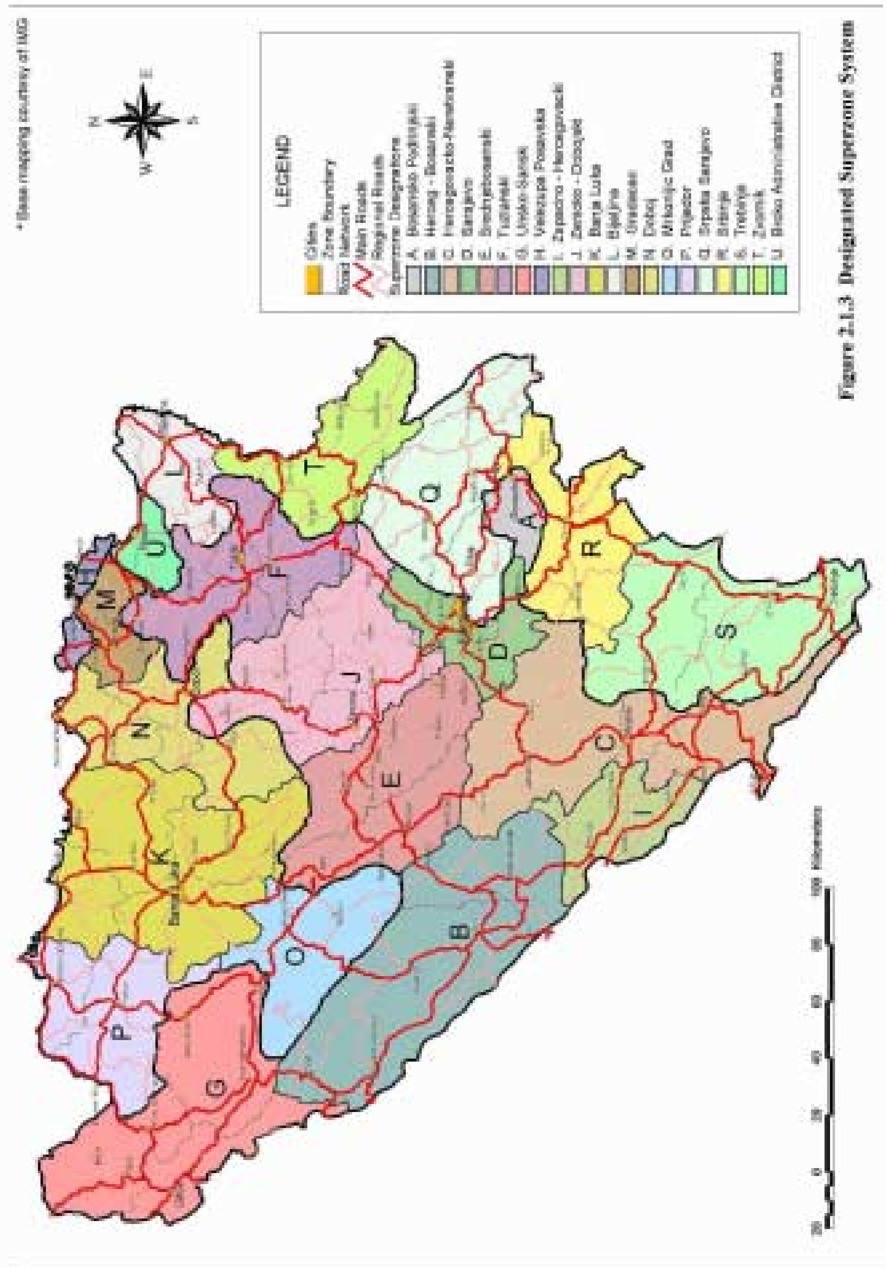

Figure 2.1.3 Designated Superzone System

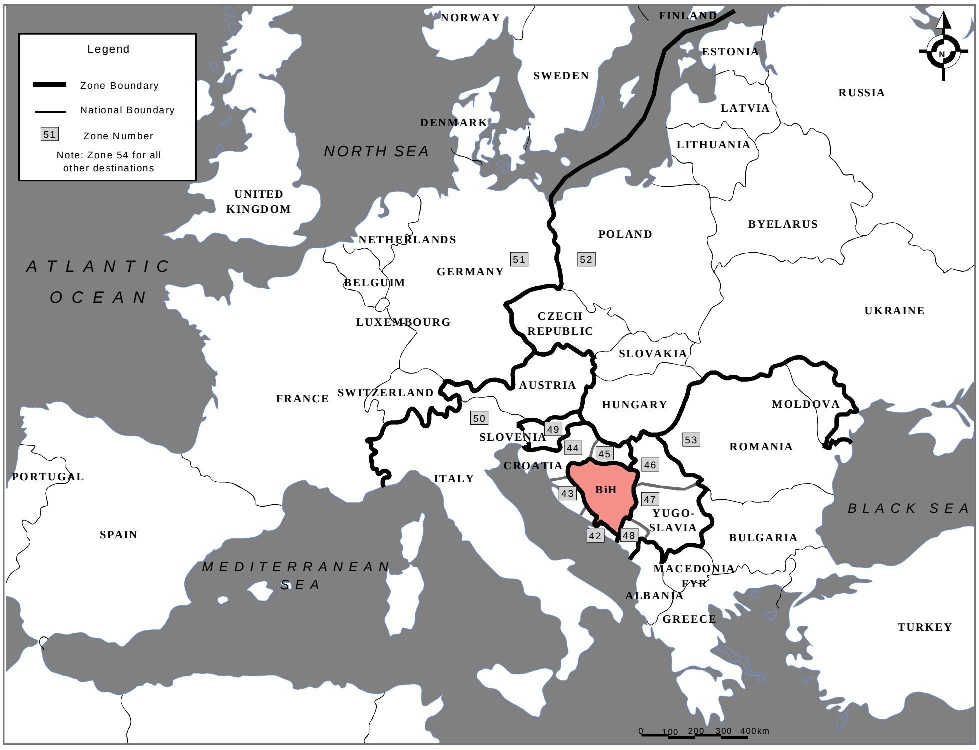

Figure 2.1.4
External Analysis Zone System

The adopted system therefore includes 41 internal zones and 13 external zones. Thus, the resultant 54 x 54 trip matrixes contain journeys both of whose trip ends fall within the study area (internal-internal trip), one of whose trip ends falls within the study area (internal-external or external-internal trip), and trips without a trip - end in BiH (external-external trip).

2.1.3 Aggregation and Definitions

Simulation techniques as described in the previous sections rely on various terminologies. The following introductory descriptions are provided so that a more accurate and complete appreciation of transport modeling procedures may be obtained. Certain descriptions have been included in other sections of this report but are repeated here in order to make the presentation complete.

- The study area is subdivided into a series of analysis zones, the use of which implies that all movement to and from a zone can be adequately represented s starting or ending at a single point in the zone – the centroid. This point represents the zonal center of transport activity.

- The defined zone structure includes 41 internal zones (municipalities or combinations of municipalities), as well as 13 external zones representing international trip activity with Croatia and Yugoslavia, among others. Thus, trips between all combinations of zones are contained in a matrix featuring 54 x 54 elements, or 2,916 interchanges.

- Trip matrix, as completed, contains balanced daily travel demand, segregated by four vehicle types: passenger cars, buses, rigid trucks, and articulated trucks.

- A trip is defined as a one-way vehicle movement from an origin zone to a destination zone. In this manner consistency is maintained with BiH road capacity under which the basic analysis unit is the vehicle, not a passenger car unit (pcu).

- A trip matrix contains trips which cross a zone boundary. The zone structure adopted for the study area is designed to encompass as many “over the road” trips as possible; however, intra-zonal trips (such as those entirely within Sarajevo or Banja Luka) are not included in trip matrixes.

- The adopted base year for modeling purposes is 2000, while year 2020 serves as the ultimate planning horizon. Trip matrixes using the demand forecasting model are developed for both of these years, as well as years 2005 and 2010. Forecasts for other needed intermediate years are derived by interpolating years 2000, 2005, 2010, and 2020 modeled demand.

2.1.4 Development of Road Network

A road network was developed from existing limited inventory data and observations of the Study Team members. In effect the road network is a database of existing roads but it also includes statistics on travel speed and capacity. This is normally estimated via a Highway Capacity Manual or similar document.

There does not, at present, exist a manual in BiH which quantitatively describes the interplay of speed, volume, and capacity under local conditions. Sources external to BiH must therefore be employed for this purpose. The calculation of roadways speed and capacity appears to have been, during previous studies, largely based on comprehensive capacity manuals whose content reflects European or American traffic conditions. However, there is some evidence that direct application of such methodologies may produce misleading results. The reasons for this are diverse, but would include considerations such as differing composition of the traffic stream, varying acceptance of conventional right-of-way and gap acceptance theory, as well as more liberal passing patterns.

Recent evaluations conducted by the University of Belgrade[4] and the University of Sarajevo (Traffic Institute)[5] have achieved significant progress toward the formulation of capacity techniques appropriate to local conditions. Highlights of findings for multi-lane inter-urban highways are that maximum capacity per lane, under ideal conditions, may be estimated at 2,200 vehicles per hour. Various adjustment factors are applied to account for number of lanes, lane width, roadside clearance to fixed objects, roadside friction due to moving objects, heavy vehicle content in the traffic stream, terrain impacts, presence or absence of a central median and driver ability. Methodologies include five traffic density categories, whose intent is very similar to the *US Highway Capacity Manual*[6] level of service (LOS) concept. Thus, highest performances are achieved at Density Categories I and II (LOS A/B) within which operating speed gradually declines from free-flow condition to some 60 km/hr. Maximum through-put is achieved at Density Category III (LOS C/D) and typical speeds of 50-60 km/hr. Beyond that point and within Density Category IV, both throughput and density deteriorate gradually with operating speed dropping to some 10 km/hr (LOS E); thereafter, (Density Category V) flow becomes completely unstable and is subject to extensive queuing (LOS F).

Analyses are also presented on the impacts of terrain upon road performance. Thus, under ideal conditions, operating speed will invariably decline as length of grade increases, and as terrain becomes more difficult. Under what can generally be termed flat terrain conditions, operating speed is shown as being close to a free flow speed of 80 km/hour. However, operating speed rapidly declines under more rolling and mountainous terrain conditions (Figure 2.1.5).

The country-wide network used for modeling purposes is extensive; thus, the derivation of link-specific speed and capacity parameters is impossible to achieve, particularly in light of time constraints associated with the current study as well as the absence of a uniform, country-wide and up-to-date road data base[7]. The adopted approach therefore relies on road condition data collected as part of the current study[8], and combined into generic road categories structured by road type (motorway, multi-lane arterial[9], two-lane

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[4] *Vrednovanje U Upravljanju Razvojem I Eksploatacijom Putne Mreze*, by Prof. Drl L Kuzovic, Saobracajni Fakultet Univerziteta U Beogradu, Beograd, Yugoslavia, 1994.

[5] Technical discussions, including reviews of unpublished work, conducted during November and December, 1999.

[6] *Highway Capacity Manual, Special Report 209*, Transportation Research Board, National research Council, Washington D.C., USA 1998

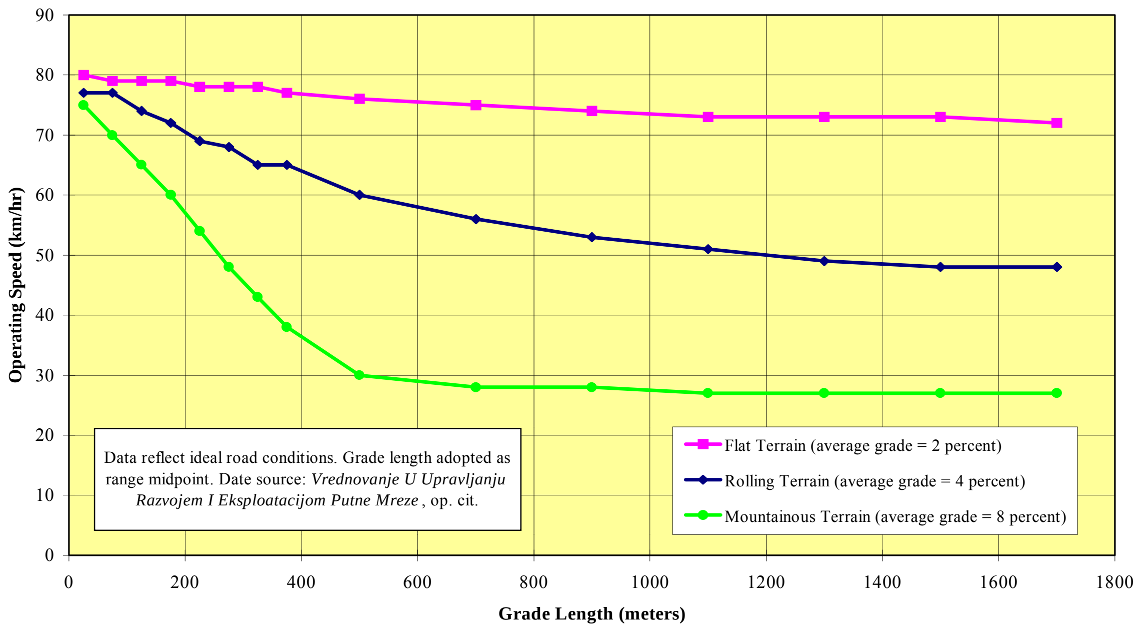
[7] However, it is anticipated that such a road database may, under IMG sponsorship, be developed in the near future. Thus, the current network could readily serve as a platform onto which such additional data are layered. An increasingly sophisticated road model will therefore evolve which may be used uniformly and consistently as part of future feasibility and demand evaluations.

[8] Data sources include surveys commissioned by the Study Team using local consultants, field inspections by members of the Study Team, as well as information obtained from files of Entity Ministries of Transport and Communications, Traffic Institute of the University of Sarajevo, and Kantonal Ministries of Transport and Communications.

[9] Motorways and access controlled multi-lane arterials do not currently exist as part of the BiH inter-urban road network. Some urban and semi-urban multi-lane sections exist near Sarajevo and Banja Luka.

arterial of varying widths, terrain condition (flat, rolling, mountainous) and type of operation (roadside development proxy). In the latter case, this includes:

Figure 2.1.5 Relationship of Speed and Grade



- Uninterrupted conditions; that is, facilities whose operation and design generally reflects rural conditions.

- Semi-interrupted conditions; that is, operations are impacted somewhat by roadside development. Observations suggest that most roads between cities in BiH would fall into this category in that the main highway has priority of movement, but passes through settled areas and is thus subject to interference from roadside activity including driveways.

- Interrupted conditions; that is, roadside interruptions are of sufficient magnitude to impact the main highway priority. This condition is frequently observed within larger towns or denser settled areas.

Further, for modeling purposes, capacity can be expressed in terms of practical capacity and assignment capacity.

- Practical capacity represents an absolute limit regarding the number of vehicles which can be accommodated on a given road section under realistic operating and terrain conditions. Calculations in this regard are based on previous work by the University of Belgrade and the University of Sarajevo, augmented by findings of the *US Highway Capacity Manual* and similar documents.

- Assignment capacity represents a trip-making threshold for modeling purposes at which alternative route choices (as possible) are likely. Assignment capacity, free flow speed and traffic loadings are integrated via speed-decay curves which dynamically decrease link attractiveness (speed) as the volume to capacity ratio (V/C) increases.

- Practical capacity is calculated in terms of hourly vehicles per lane or section, assignment capacity (about 80 percent of practical capacity) is expressed as daily link vehicle capacity, total both directions of travel, based on an average eight percent peak hour factor.

Capacity, as used in the current report, is assignment capacity.

In combination, assignment capacity (under flat terrain conditions) is shown as ranging from 79,400 vehicles per day for a four-lane motorway, to 14,700 vehicles per day for a narrow (six meter) two-lane arterial (Table 2.1.3). It is noted that a typical example of a wide two-lane arterial of more than seven meters width is the Sarajevo-Zenica highway.

Table 2.1.3 Representative Capacity Under Varying Operating Conditions Inter-urban Highways

Road Type	Carriageway Width (m)	Daily Assignment Capacity		
		Flat	Rolling	Mountainous
Four-lane Motorway	14	79,400	62,400	*
Four-lane Arterial	14 (w. median)[1]	66,700	50,100	33,400
Two-lane Arterial	> 7.0	19,900	13,200	7,700
	6.0 – 7.0	16,700	11,500	6,900
	6.0	14,700	10,500	6,600

[1] Controlled roadside development.

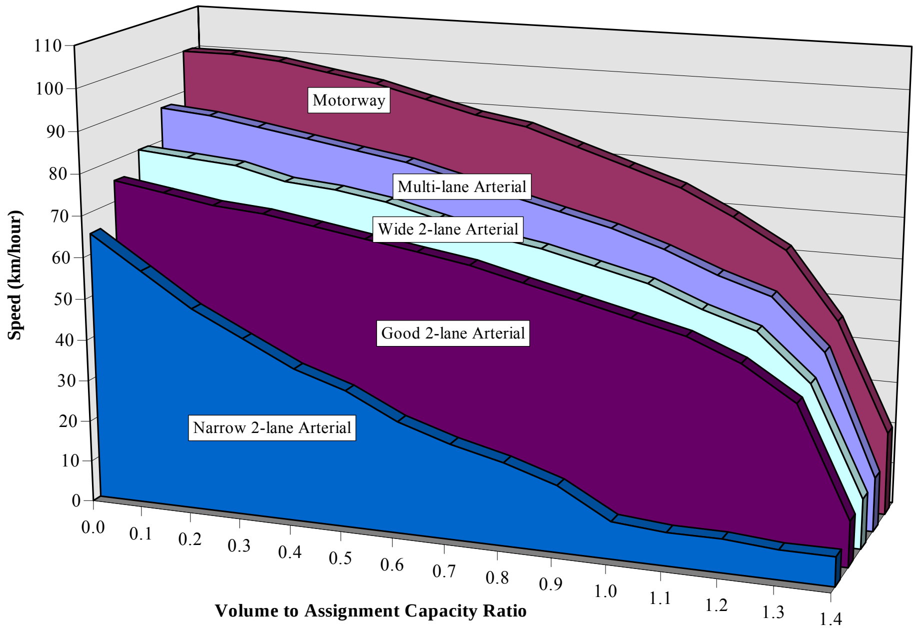
Link free flow speed is the safe speed at which a vehicle would travel along a road segment in the absence of other traffic and within the physical conditions unique to that particular segment. Free flow speed should not exceed a realistic maximum legal speed limit. For the BiH network under ideal conditions, an upper constraint of 80 km/h is adopted for dual-lane inter-urban arterials, more for higher-order facilities such as multi-lane arterials or motorways (Table 2.1.4).

Table 2.1.4 Representative Free Flow Speed Under Varying Operating Conditions Inter-urban Highways in Flat Terrain

Road Type	Carriageway Width (m)	Free Flow Speed (km/h)		
		Uninterrupted	Semi-interrupted	Interrupted
Four-lane Motorway	14	100	*	*
Four-lane Arterial	14 (w. median)	88	72	61
Two-lane Arterial	> 7.0	80	68	55
	6.0 – 7.0	75	64	52
	6.0	65	54	45

Assignment capacity, free flow speed and traffic loadings are integrated via speed-decay curves which dynamically decrease link attractiveness (speed) as the volume to capacity ratio (V/C) increases. The decay is shown as being particularly rapid for narrow two lane roads where interaction of opposing traffic streams, roadside activities and limited cross-section combine to adversely impact speed performance (Figure 2.1.6).

Figure 2.1.6 Speed Decay Function by Representative Road Type
Inter-urban Highways, Flat Terrain, Uninterrupted Flow Conditions



(1) Base Year Network

The simulated road system must include all roads required to achieve modeling of inter-zonal trip demand. The level of detail to which the zone structure and highway network are built must be in balance; thus, not all existing roads need be included since zonal stratification extends to a 54-zone level of detail. The road network is a computerized simulation of highways located within BiH and consists of numerous links (road segments) and nodes (intersection points), with each link being embedded with a unique set of indexes describing its operating capabilities. Parameters for each link include:

- A and B nodes, which are numeric values that identify the "from" and "to" ends of a link. Node locations are defined by their X and Y coordinates, which are derived from GIS records[10] and thus permit monitor displays of network content, performance and operation.

[10] For the current study, the composite road network contained in the IMG data base was de-built from GIS format, and reconstructed for use in transportation planning software.

- Link distance defining the length of a link in kilometers.

- Free flow speed, which is defined as the safe speed at which a vehicle would travel on a link in the absence of other traffic. The average free flow speeds are based on research conducted by the University of Sarajevo and the University of Belgrade, augmented by speed studies conducted throughout BiH.

- Link capacity is defined as assignment capacity. Derivation details are contained in the previous section.

- Assignment group (ASG) code is used to identify links to which a common capacity restraint function is to be applied, that is, link speed is reduced by a pre-determined function as the link volume to capacity ratio increases (refer Figure 2.1.6). Conditions are:

  - Link type groupings are in accordance with facility type and/or facility width.

  - Free flow speed represents the V/C = 0.0 condition, while V/C = 1.0 simulates full utilization of assignment capacity.

  - A V/C of approximately 1.4 represents very congested flow prior to operational breakdown.

  - Link group code is a numeric code which identifies links with common characteristics for subsequent referencing, updating, and reporting. Identification of highway subsections is achieved via three link group codes which describe the internal zone in which the link is located; the route (M) number for what are currently termed main roads; and terrain/environment code.

The total length of the base (year 2000) network is some 10,600 kilometers including external links to Croatia and Yugoslavia, and encompasses 3,200 links as well as 54 centroids (Figure 2.1.7). Network content is sensitive to ASG coding as well as inherent terrain and operating conditions (Table 2.1.5).

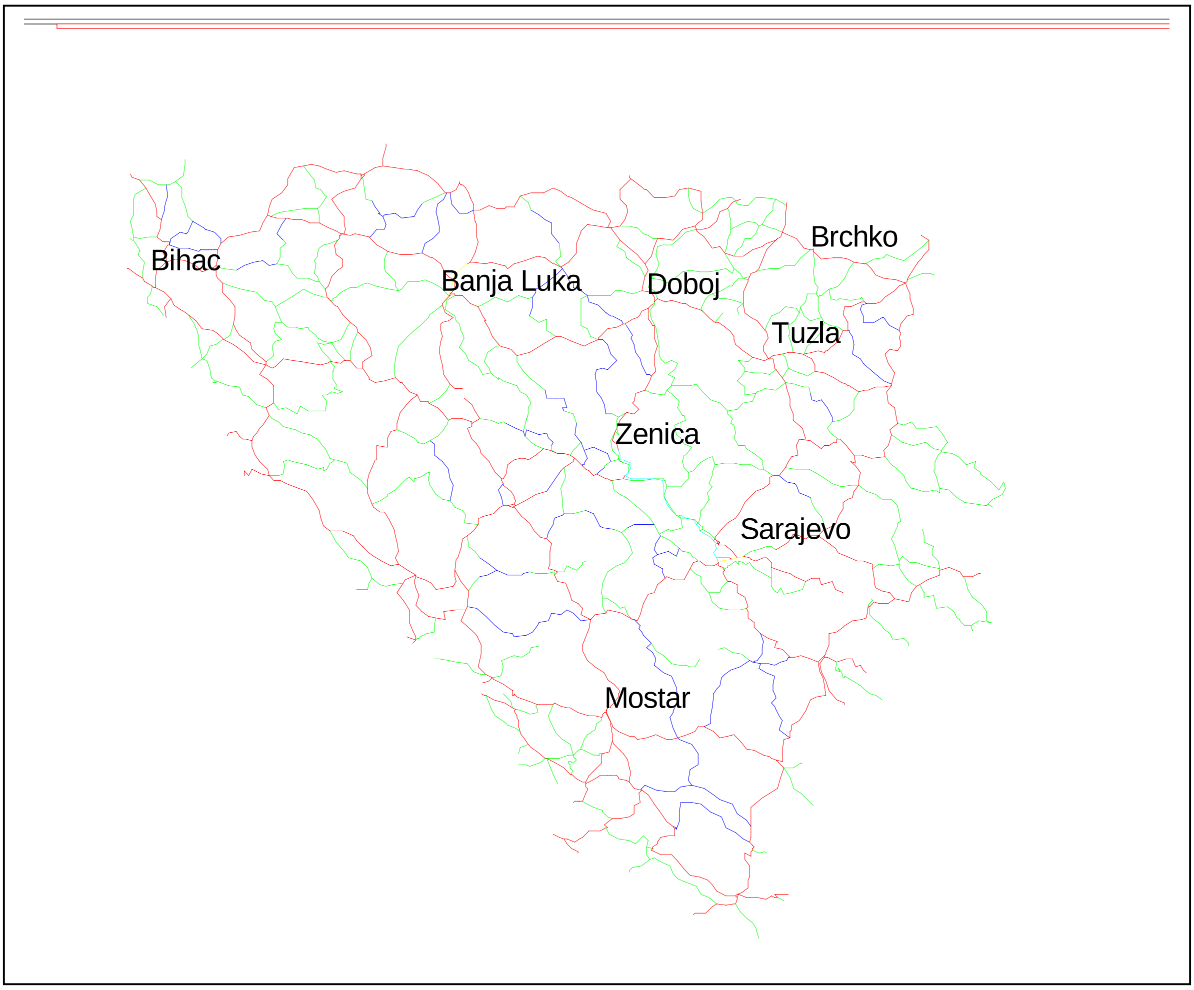


Figure 2.1.7 Year 2000 Base Year Road Network

Table 2.1.5 Year 2000 Roadway Network Content

Assignment Group Code (1)	Road Type (2)	Averages and Totals (3)			
	Link Type	Length (km) (5)	Speed (km/hr) (6)	Capacity (Vehicles/day) (7)	Number of Links Two-Way
0	Centroid Connectors (4)	571.3	60.0	*	45
1	Motorway	0	*	*	0
2	Multi Lane Arterial	25.1	72.3	62,600	17
3	Wide Two lane Arterial	73.7	78.4	23,500	36
4	Two Lane Arterial	3487.5	61.4	14,800	1,396
5	Narrow Two Lane Arterial	3412.7	50.5	11,400	1,239
6	Unpaved Road	1026.3	30.0	6,000	352
8-9	External Links(8)	2,035.0	62.4	*	100
Total (9)		10,631.6	53.0	12,500	3,185

(1) Transport planning software designation to identify links to which a common capacity constraint is to be applied.
(2) The term “arterial” refers to a non-motorway facility, and should not be confused with functional classifications
(3) All averages are weighted by link length
(4) Internal centroids
(5) Number of link kilometers
(6) Free flow speed, or speed at which a vehicle would safely travel in the absence of other traffic
(7) Two-way daily vehicle capacity per road section (assignment capacity)
(8) External centroids and road linkages within Croatia and Yugoslavia
(9) Speed and capacity averages for ASG codes 2-6

(2) Committed Improvements

Over time, the base-year road network well change as improvements are implemented. The current study will nominate and evaluate certain road improvements; it is therefore necessary to formulate a consistent “committed network” whose operating criteria and content (existing plus committed road facilities) form the basis against which proposed improvements are tested.

The impact of network enhancements is, of course, direct in the case of new construction: road kilometers increase as does the ability of the network to absorb additional demand. In case of road upgrading, impacted network kilometers remain constant. However, link free flow speeds will increase as roughness is decreased and/or carriageway width increases. Likewise, assignment capacity increases as lane width increases. Link ASG could also change if carriageway width thresholds are exceeded.

The term “committed road improvement” implies upgrades beyond those currently programmed/on-going. Thus, for example, the on-going construction of Samac Bridge is, in network terms, an existing situation. The designation of committed projects is, in BiH, most problematic as there do not, at present, exist any plans which detail officially approved, funded, and scheduled projects, such as typically found in a five-year road improvement plan. Furthermore, the status of funding in BiH is extremely complex as virtually all major projects require the assistance of donors or international lending institutions. Conflicting information and bureaucratic uncertainty regarding the status of loans abounds.

Nevertheless, following extensive discussions with local experts and representatives of the international community, following projects are termed as being committed, and are thus included in the "existing plus committed" road network:

- Sarajevo Bypass, part of the Corridor V motorway project. Construction of this 10-kilometer section (Josanica - Blazuj) began before the war, and was stopped as a result of the war. The adopted cross-section is four-lane motorway, including within the partially completed tunnel sections. Available estimates suggest the remaining cost will be on the order of 120 – 130 million KM.

- Sarajevo Bypass access highway linking Sarajevo with the Sarajevo Bypass. The cross-section is urban four lane high-order arterial, with a total length of about six kilometers. The initial phase (3.7 kilometers) has been constructed using Kanton Sarajevo funding, and was opened to traffic during September, 2000. The remaining 2.3-kilometer section is expected to cost some 27 million KM.

- Maslovare – Privilic road upgrading within the Banja Luka – Doboj corridor. The improvement extends over some 16 kilometers, and is intended to rehabilitate a landslide area. Efforts are expected to get underway during year 2001.

It has been confirmed that two main efforts regarding foreign participation in road infrastructure construction (BOT) were initiated during latter 1999. These include the Sarajevo – Zenica and the Banja Luka – Gradiska corridors. While the Study Team has not been informed of exact status of these projects, they are understood to be, in the most optimistic of terms, on-going. Serious concerns have apparently surfaced regarding the viability of these projects. Therefore, at time of writing (November, 2000) there is insufficient evidence to support the inclusion of these projects as committed projects.

2.1.5 Analysis of Traffic Survey Results

The traffic counting program[11] was undertaken at some 86 sites, 43 in each of the Republika Srpska (RS) and Federation of Bosnia and Herzegovina (FBiH). At 35 sites in RS and 27 sites in FBiH roadside interviews of a sample of all passing vehicles (except military and special vehicles) were undertaken to provide data for the estimation of future travel patterns within BiH.

At the sites of the roadside interview stations, the surveys were conducted over a 12-hour period whilst traffic counting was done over a 24-hour period. At all other survey stations, the traffic counts were undertaken over a 16-hour period. All traffic counts were expanded to 24-hour counts with appropriate seasonal adjustment factors.

The drivers selected for interview were asked to provide the following information regarding the characteristics of their trip:

[11] For full detail modeling survey locations, data collection methodologies as well as site volumes by hour, direction and vehicle type, refer *Traffic Survey Report*, authorized by the Study Team in July, 2000.

- Origin of trip;
- Destination of trip;
- Trip purpose;
- Trip frequency; and for trucks
- Type of commodity;
- Amount of commodity.

The following characteristics were observed by the interviewer:

- Vehicle type;
- Number of passengers; and
- Origin of license Plate.

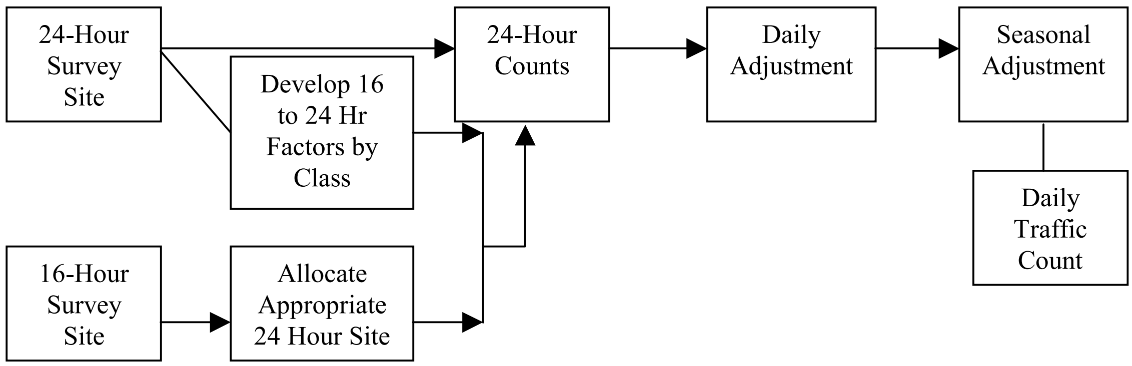
Before analyzing the roadside interview data it was necessary to clean the data via processed depicted in Figure 2.1.8. A total of 88,346 interviews were collected at the 62 sites. These survey data from all sites were merged into a single database. After a process of checking for basic errors such as miscoding, 87,825 interviews were accepted as usable, a total of 99.4 percent of the original survey.

The objective of data cleaning was to accept as many interviews as possible. Only those whose origin or destination could not be coded from the survey form or whose vehicle occupancy were outside maximum ranges were removed from the database. A systematic error in which a large number of non-passenger vehicle types were coded with zero occupancy was corrected by replacing the occupancy with the average of non-passenger vehicle types. A further systematic error in which empty trucks were coded with a loading code of "0" for empty was fixed by applying the correct empty code to the relevant survey records.

The roadside interview sample was expanded to the observed count and adjusted for seasonal factors. The following expansion factors were initially applied to each record, namely:

- Expansion factor from the survey to 24 hour count;
- Expansion factor for daily variation in traffic; and
- Expansion factor for seasonal variation.

(a) Development of Daily Traffic Volumes



(b) Development of Consistent Roadside Survey Data

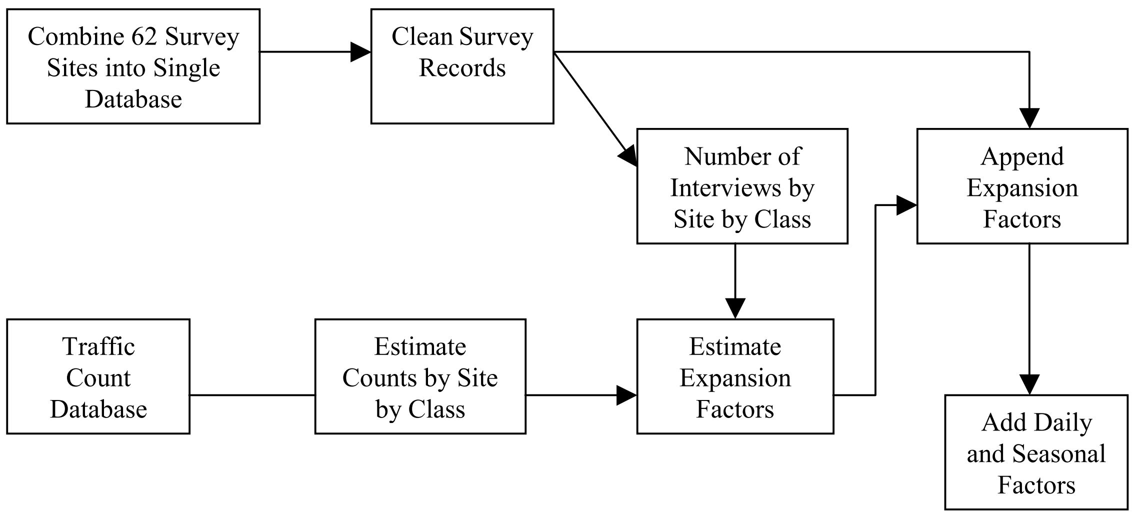


Figure 2.1.8 Survey Data Expansion and Checking Procedures

As this analysis is geared at the development of a four vehicle class transport model for daily traffic, expansion factors were developed by vehicle class and site.

The four vehicle classes are defined as shown in Table 2.1.6.

Table 2.1.6 Vehicle Type Classification

Vehicle Type	Vehicle Class	Vehicle Class Description
Passenger Cars Pickups 2 wheelers	1	Passenger Vehicle
Minibuses Buses	2	Bus
2 Axle Trucks 3 Axle Trucks	3	Rigid Truck
> 3 Axle Trucks	4	Articulated Truck

Note: Special vehicles (agricultural vehicles) and military vehicles, approximately 3 percent of all traffic was excluded from the analysis. Also the two-wheel vehicle (0.5 percent of all traffic) was weighted by a factor 0.25

The daily variation factor, that is, expected statistical deviation in traffic flow between days of the week, is presented in Table 2.1.7.

Table 2.1.7 Daily Variation Factor

Day	Factor
Monday	1.05
Tuesday	1.03
Wednesday	1.01
Thursday	1.00
Friday	0.82
Saturday	1.05
Sunday	1.01

Source: *Road User Charges in Bosnia and Herzegovina*, op. cit.

In fact, field surveys were only undertaken on a Tuesday, Wednesday, or Thursday. The summer seasonal factor of 0.91 (from the same source) was applied to the surveys and traffic counts. Less than one percent of all survey interviews were performed during rainy weather. The final daily traffic volumes are presented in Table 2.1.8 with survey locations depicted in Figure 2.1.9. The highest traffic count of some 19,000 vehicles was recorded at site 17 in FBiH, adjacent to Sarajevo. However, some 28 percent of these trips were not long distance but rather intra-zonal trips[12].

[12] Geographic constraints and roadside safety concerns frequently prevented the exact placement of survey locations at zonal boundaries. Thus, some proportion of interview data collected at these locations contains intra-zonal trip patterns. These distortions were subsequently corrected during the trip calibration process.

Figure 2.1.9 Traffic Count and Origin-Destination Survey Locations

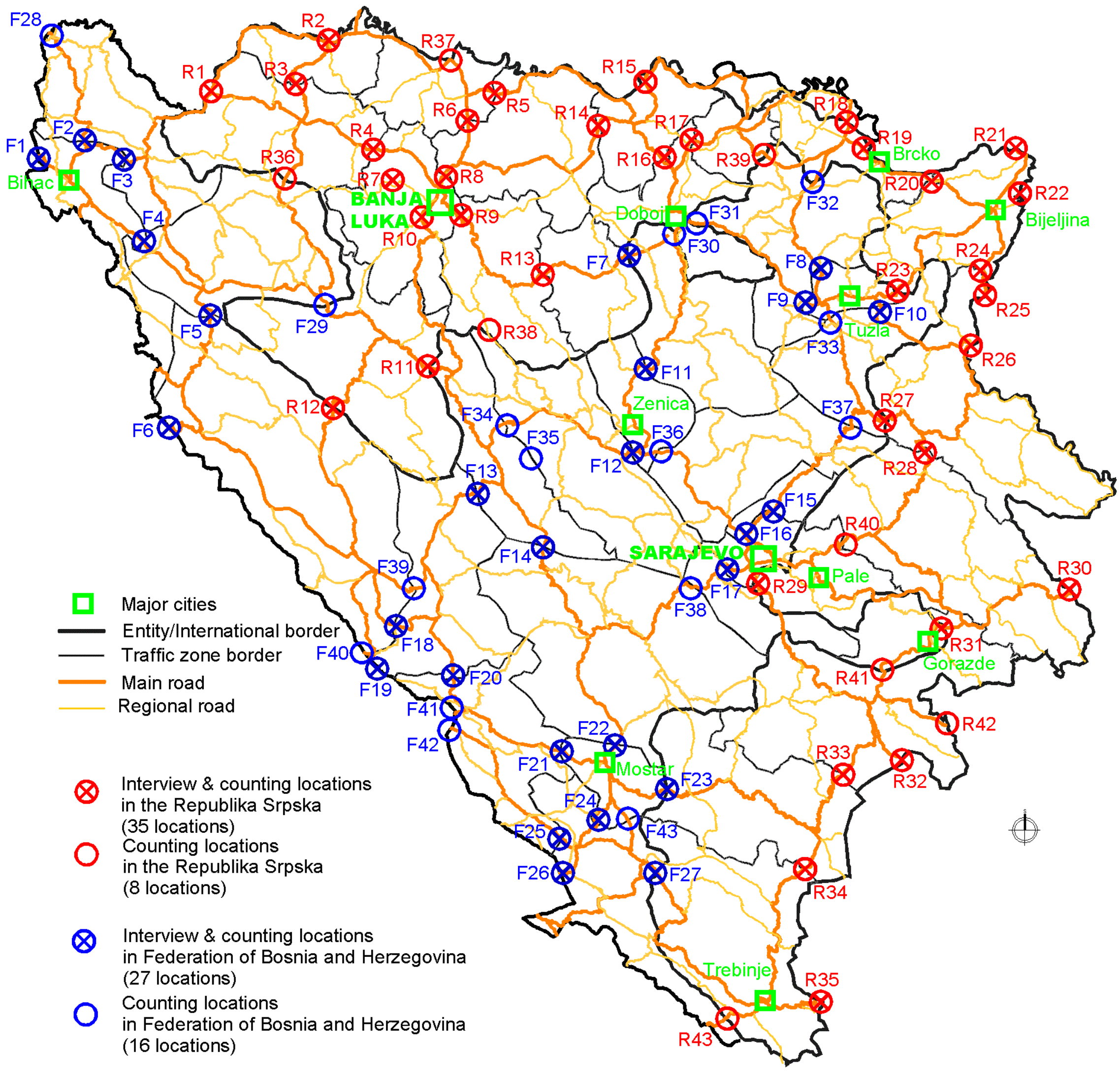


Table 2.1.8 (a)
Average Daily Traffic Count (vehicles per day): Federation of Bosnia and Herzegovina

Location No.	Location Description	Vehicle Class				
		1	2	3	4	Total
F01	Kamenica-Karlovac	1,053	31	27	143	1,254
F02	Cazin-Srbljani	3,868	47	171	71	4,157
F03	Srbljan-Bosanska Krupa	1,565	26	99	46	1,736
F04	Ripač-Bosanski petrovac	1,496	47	122	146	1,811
F05	B. Petrovac-B. Grahovo	646	6	52	66	769
F06	Strmica-Knin	329	2	9	23	363
F07	Teslić-Jelah	4,012	36	133	40	4,221
F08	Tuzla-Srebrenik	6,881	214	637	217	7,949
F09	Doboj-Lukavac	6,876	212	317	118	7,523
F10	Simin Han-Medas	5,263	91	287	76	5,716
F11	Zepče-Zenica	5,462	186	448	318	6,413
F12	Travnik-Lašva	6,239	137	578	157	7,112
F13	Bugojno-Kupres	1,744	29	316	113	2,202
F14	Gornji Vakuf-Prozor	1,432	34	172	47	1,684
F15	Semizovac-Olovo	4,291	93	382	113	4,879
F16	Semizovac-Podlugovi	11,157	198	742	474	12,571
F17	Ilidza-Blazuj	16,022	1,022	1,743	627	19,414
F18	Livno-Karlov Han	1,015	37	247	110	1,409
F19	Arzano-Makarska	491	2	5	0	497
F20	Tomislav grad-Posušje	1,967	31	362	160	2,520
F21	Mostar-Široki Brijeg	4,313	77	328	127	4,845
F22	Potoci-Mostar	4,394	121	376	183	5,073
F23	Gnojnice-Nevesinje	409	10	61	7	487
F24	Zitomislići-Domanovići	3,574	74	271	99	4,018
F25	Ljubuški-Čapljina	2,348	70	365	120	2,904
F26	Dračevo-Opuzen	3,110	91	94	68	3,363
F27	Stolac-Ljubinje	567	13	76	26	682
F28	Velika Kladuša-Maljevac	905	15	13	36	969
F29	Ključ-Cadavica	1,162	54	92	94	1,402
F30	Doboj-Karuše	5,421	100	303	256	6,080
F31	Doboj-Gracanica	2,996	75	275	160	3,506
F32	G.Zabari-Cerik	5,787	99	529	100	6,514
F33	Tuzla-Zivinice	8,528	265	705	114	9,612
F34	Donji Vakuf-Travnik	2,214	87	226	108	2,634
F35	Bugojno-Novi Travnik	198	8	24	0	230
F36	Lašva-Kakanj	5,660	150	349	365	6,524
F37	Kladanj-Olovo	1,786	84	243	77	2,190
F38	Tarčin-Konjic	2,924	105	337	101	3,467
F39	Livno-Šuica	1,834	31	161	65	2,091
F40	Raseljke-Kamensko	1,285	41	35	119	1,480
F41	Posusje-Imotski	1,777	20	53	50	1,899
F42	Gorica-D.Vinjani	4,853	38	114	93	5,098
F43	Buna-Stolat	845	72	107	20	1,044

Table 2.1.8 (b)
Average Daily Traffic Count (vehicles per day):
Republika Srpska

Location No.	Location Description	Vehicle Class				
		1	2	3	4	Total
R01	B. Novi-Dvor	3,499	153	248	68	3,968
R02	B. Dubica-H. Dubica	1,095	8	8	49	1,160
R03	Prijedor-B. Dubica	1,628	36	146	38	1,848
R04	Kozarac-Ivanjska	3,797	182	300	176	4,455
R05	Nova Topola-Srbac	1,801	27	195	111	2,134
R06	Laktasi-Nova Topola	6,002	149	519	276	6,945
R07	B. Majdan-Banja Luka	983	56	76	8	1,123
R08	Banja Luka-Klasnice	14,440	309	1,213	454	16,416
R09	Banja Luka-Celinac	3,391	121	221	75	3,807
R10	Karanovac-Crna Rijeka	3,494	208	406	254	4,362
R11	Jajce-Mrkonjic Grad	1,493	72	188	213	1,965
R12	Baraci-Glavica	175	7	21	30	233
R13	Maslovare-Klupe	559	24	72	24	679
R14	Prnjavor-Derventa	2,868	130	324	303	3,625
R15	B. Brod-S. Brod	1,500	27	52	249	1,828
R16	Derventa-Seslije	4,173	337	650	727	5,887
R17	Seslije-Jakes	3,710	216	491	642	5,059
R18	Loncari-Orasje	3,845	74	259	279	4,456
R19	Loncari-Brcko	6,206	167	577	447	7,397
R20	Vrsani-Bijeljina	3,800	156	392	343	4,690
R21	B. Raca-Bosut	4,262	107	146	228	4,742
R22	Bijeljina-Badovinci	3,136	47	256	132	3,571
R23	Simin Han-Priboj	1,544	51	145	21	1,760
R24	Sepak-Janja	3,101	67	278	133	3,579
R25	Sepak-Loznica	3,535	35	27	92	3,688
R26	Zvornik-Loznica	4,268	55	47	161	4,531
R27	Kladanj-Tisca	373	15	35	36	458
R28	Han Pijesak-Vlasenica	1,664	44	178	228	2,113
R29	Krupac-Trnovo	1,458	65	131	89	1,744
R30	Dobrun-Kotroman	657	38	69	38	802
R31	Gorazde-Ustipraca	1,214	42	105	159	1,520
R32	Bostasi-Scepan Polje	189	10	29	103	330
R33	Cemerno-Tjentiste	503	35	30	14	582
R34	Avtovac-Plana	654	31	94	28	807
R35	Lastva-Vilus	658	20	38	24	740
R36	Sanski Most-Prijedor	1,855	43	82	35	2,014
R37	B. Gradiska-S. Gradiska	971	37	98	158	1,264
R38	Skender Vakuf-Travnik	344	6	32	11	391
R39	Modrica-Gradacac	2,043	18	162	38	2,260
R40	Mokro-Podromanija	1,493	57	145	55	1,749
R41	Foca-Gorazde	763	29	82	95	969
R42	Dragozava-Pljevlja	162	1	21	8	192
R43	Ivanica-Trebinje	257	4	23	1	284

In addition to these expansion factors, a fourth expansion factor was developed, as described in the next section of this report, which incorporates an allowance for double counting. This is the technique which ensures that a trip path between an origin and destination zone which could pass through more than one survey station will only be counted once. This factor is developed prior to the creation of the base year trip matrixes.

In analyzing the expanded data, it was found that the majority of vehicles were passenger cars (85.8 percent) with an average occupancy of 2.0 people. Only 4.4 percent of vehicles were in the big (articulated) truck category. (Table 2.1.9)

Table 2.1.9 Distribution of Vehicles by Class and Occupancy

Vehicle Class	Description	Percentage	Average Occupancy
1	Passenger Car	85.8	2.0
2	Bus	2.6	17.1
3	Rigid Truck	7.2	1.4
4	Articulated Truck	4.4	1.3
Total		100.0	2.3

Some 44 percent of passenger car occupant trips were business or work related whilst 53 percent were for personal matters. Most passenger car trips were internal to BiH, only 21 percent had an origin or destination outside of BiH. Whereas with articulated trucks 48 percent had an origin or destination outside BiH and two percent had both their origin and destination outside BiH.

Additional discussions regarding truck characteristics is presented in Section 2.3.1.4, while summaries for passenger trips are contained in Section 2.3.2.7.

2.1.6 Development of Base Year Trip Matrixes

The calibration of the base year trip matrix is derived from the roadside interviews and traffic count data. The final trip matrixes contain balanced daily travel demand segregated by four vehicle types: cars, buses, rigid trucks, and articulated trucks[13].

An individual trip is defined as a one-way vehicle movement from and origin to a destination zone. In this manner consistency is maintained with BiH road capacity practices (discussed earlier) in which the basic unit of analysis is the vehicle, not a passenger car unit (pcu) as used in some other countries.

For this countrywide study, the trip matrix will contain only trips which cross a zone boundary. The zone structure as determined for this study is designed to encompass as many intercity trips as possible. However intra-zonal trips (such as those entirely within Sarajevo or Banja Luka) are not be included in the trip matrixes.

[13] An articulated truck is defined as having more than three axles, i.e. vehicle class 4

The trip table is developed in two stages namely.

- Elimination of double counting; and
- Matrix calibration vis-à-vis traffic counts.

In all, roadside interviews were conducted at some 62 sites. It is possible that a trip from any given origin to any given destination could pass through one or more survey sites. A particular trip maker of course will not necessary be interviewed at each site due to statistical sampling procedures and given the fact that the survey was conducted over several days. This phenomenon of a trip passing through several sites is known as "double counting." A double counting correction factors is estimated as the number of sites a trip will pass through whilst traveling between trip origin and destination.

This was done in two steps namely:

- With the use of transport planning software, the number of sites that a trip passes through was estimated for each origin-destination pair. A dummy matrix was assigned to the network using the stochastic assignment procedure[14]. This procedure allows the inclusion of all possible paths in the network.

- Even though trips may theoretically pass through several sites, the sampling procedure may not register the trip at all sites. Thus this is a correction on the theoretical procedure. In some cases it may registered at only some sites or in the extreme case the registration occurs at several site but the total trips is less than the number of sites. In the first of these cases it is better to record the lower number of sites to represent "double counting." Whilst in the second the application of the "double counting" factor would reduce the trip number for an origin – destination pair to less than unity after double counting correction. In the latter case it is desirable not to apply the double counting factor rather than loose the trip.

As it is expected the trip length decreases with the application of the "double correction." A longer trip for example is more likely to be counted at one or more sites. Independently it has been estimated the average bus trip length within BiH is some 90-95 kilometers compared with the final survey estimation of 89.9 kilometers (Table 2.1.10).

[14] The stochastic assignment emphasizes the variability in driver's perception of travel time. The stochastic method not only considers the best route, but the second and third best route where alternative routes are possible.

Table 2.1.10
Changes in Trip Length (km) with Application of Double Counting Factor

Vehicle Class	Prior to Double Counting		After Double Counting	
	All Trips[1]	Internal Trips Only	All trips[1]	Internal Trips Only
Car	109.0	86.1	103.4	80.8
Bus	147.1	94.3	143.4	89.9
Rigid Truck	116.1	104.2	110.9	98.7
Articulated Truck	189.4	132.4	185.1	124.2

(1) Internal plus external trips. These totals should be viewed with caution as external trip length reflects the external link structure, not necessarily actual long-distance journey length.

Even after the allowance for the effect of double counting, there is a need to calibrate matrixes vis-à-vis existing traffic count data. During the surveys additional traffic counts were undertaken with the intention of fine-tuning the matrixes for each vehicle class. This process is called “matrix calibration.”

The volume on any traffic link in the network consists of traffic from numerous origin and destination pairs. The traffic often also includes local traffic or intra-zonal traffic. The survey location should be chosen to avoid intra zonal traffic. This is sometimes not possible for logistic reasons as was the case in BiH. In case of surveys in BiH the proportion of intra-zonal traffic varies from almost zero percent up to fifty percents at various sites. In the case of traffic counts where there was no corresponding roadside survey, an average estimation of intra-zonals was adopted in the analysis. The matrix estimation procedure calibrates the traffic matrix against traffic counts after the exclusion of intra-zonal trips from the counts.

Ideally it is possibly to match all traffic counts with estimated flows on each link. In this case however the border crossings were grouped into six groups namely:

- Western;
- North-West;
- Northern;
- North-Eastern;
- Western; and
- South Western

Each individual link and these six groups are called screen lines. For the matrix calibration there were 71 screen lines.

A useful simple statistic to determine the closeness of fit between traffic count and link estimate is the MAD ratio which is defined as:

$$\text{MAD ratio} = \Sigma \left| \frac{\text{Count - Estimate}}{\text{Count}} \right| * \frac{1}{n}$$

Where

MAD Ratio = Mean absolute difference ratio
Count = Traffic count
Estimate = Estimate from matrix calibration process
N = Number of observations, in this case the number of screen lines

For this analysis the MAD ratio was 0.1 or less for all vehicles classes except bus where it was 0.15. In essence, this implies that for three of the four vehicle classes on average the estimate is within one percent. This is considered an acceptable calibration of matrixes.

The final number of calibrated internal trips aggregates to 88,700. If external trips are also included, the overall total number of trips for all vehicle classes in the final year 2000 matrix is 125,200 vehicle trips indicating that 29 percent of all trips made in BiH are external (of these external trips, 45 percent are to or from Croatia and 41 percent are to or from Yugoslavia). Of the total 125,211 vehicle trips calculated as occurring on a typical day, some 88 percent of that are by passenger cars (110,417 trips), two percent by buses (2,682 trips) and ten percent by trucks (12,112 trips) (Table 2.1.11).

Table 2.1.11 Final Internal and External Year 2000 Vehicle Trip Totals

Vehicle Type	Trip Type			Percent Of Trips	Average Trip Length (km)
	Internal	External	Total		
Car	77,597	32,820	110,417	88.2	92.1
Bus	1,907	775	2,682	2.1	97.1
Rigid Truck	7,104	984	8,088	6.5	108.5
Articulated Truck	2,093	1,931	4,024	3.2	125.1
Total	88,701	36,510	125,211	100.0	94.3
Percent of Trips	70.8	29.2	100.0	*	*

2.1.7 Trip Generation Model

The trip generation process, that is, the propensity of any internal zone to generate trips in future, is particularly sensitive to "top down" and "bottom up" processes discussed earlier in this chapter.

External trips, or those without or one trip end in the study area, are not only impacted by the socioeconomic evolution of BiH, but also by activities in other regions of Europe. These trips are therefore correlated with broader aspects of BiH and international development.

(1) Top Down Controls

The top-down technique focuses on estimation of likely levels of aggregate BiH and Entity socio-economic development which, in turn, is compared to indicators of historic transport evolution experienced by other European nations. Thus, in the longer term, BiH transport behavior, modal choice and mobility can gradually be expected to transition to

European norms. A key determinant in this process is provided by the socio-economic framework; that is, change in the unit national income over the next 20 years.

A review of vehicle ownership patterns was conducted to obtain a general understanding of pre- and post-war fleet size and composition. A more complete discussion was previously presented in the *Progress Report*[15] and only key summations, as well as new information, will be elaborated at this juncture.

A total of 471,312 four-plus wheeled vehicles were shown as being registered in BiH during 1991, some 91 percent thereof being passenger cars. The number of registered motorcycles was minor. The BiH population totaled, per findings of the national census, approximately 4.38 million persons. When compared to the number of registered vehicles, this equates to some 108 vehicles per 1,000 persons. (Table 2.1.12).

Table 2.1.12 1991 Unit Vehicle Ownership: Bosnia and Herzegovina

Vehicle Type	Registered Vehicles		
	Number	Percent	Per 1,000 Persons
Car	429,461	91.1	98.1
Bus	5,234	1.1	1.2
Truck	36,617	7.8	8.4
Total	471,312	100.0	107.7
Motorcycle	2,875	*	0.7

Latest available[16] vehicle registration statistics were obtained to ascertain an overview of current vehicle ownership. The relative pattern appears very similar to pre-war vehicle registration data, that is, passenger cars are dominant, followed by trucks and then buses. The role of motorcycles continues to be minor. A total of 423,562 vehicles, 90.7 percent thereof being cars, are registered in the Federation, and a further 275,731 in Republika Srpska (90.0 percent thereof being cars), resulting in a countrywide total of some 699,300 vehicles. Comparing to population[17] results in unit ownership of 175, 187 and 180 vehicles per 1,000 persons in the Federation, Republika Srpska, and BiH, respectively (Table 2.1.13).

[15] *The Study on The Transport Master Plan in Bosnia and Herzegovina – Progress Report*, prepared for the Japan International Cooperation Agency, Ministry of Civil Affairs and Communications (Bosnia and Herzegovina), Ministry of Transport and Communications (Federation of Bosnia and Herzegovina) and Ministry of Transport and Communications (The Republika Srpska), by Pacific Consultants International, March 2000.
[16] End of 1999 for Federation, first half of 2000 for Republika Srpska.
[17] Source: UNHCR 1999 data

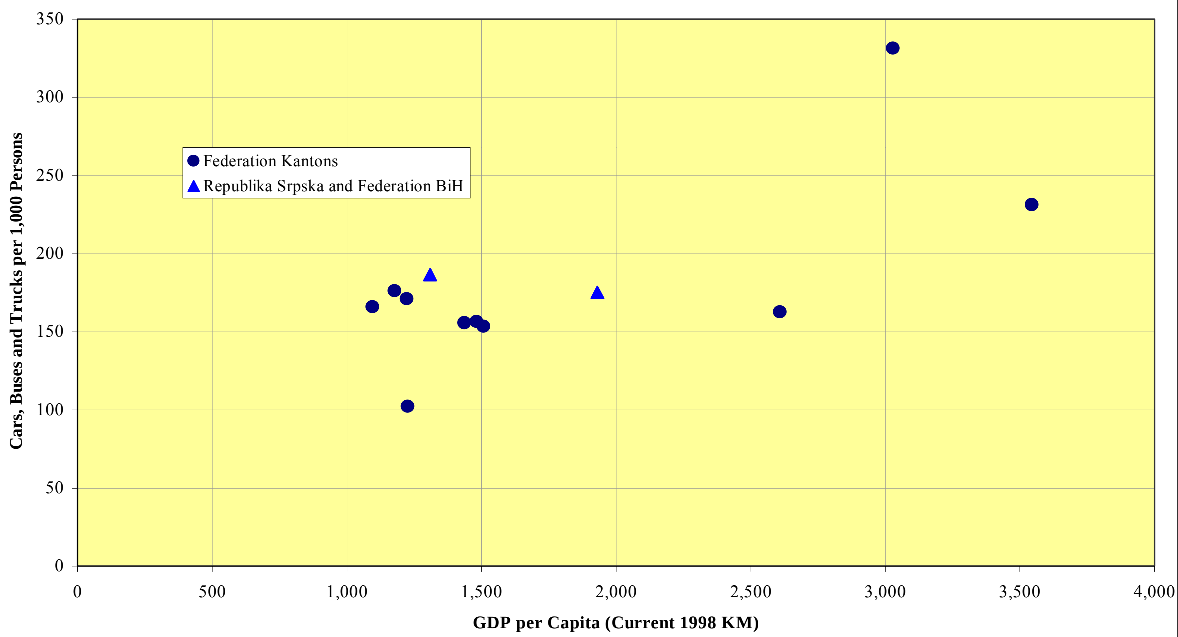
Table 2.1.13 Current Unit Vehicle Ownership: Bosnia and Herzegovina

Vehicle Type	Registered Vehicles		
	Number	Percent	Per 1,000 Persons
Federation of BiH			
Car	384,184	90.7	158.9
Bus	3,069	0.7	1.3
Truck	36,309	8.6	15.0
Total	423,562	100.0	175.2
Motorcycle	1,764	*	0.7
Republika Srpska			
Car	248,277	90.0	168.1
Bus	1,473	0.5	1.0
Truck	25,981	9.5	17.6
Total	275,731	100.0	186.7
Motorcycle	1,085	*	0.7
Total BiH			
Car	632,461	90.4	162.4
Bus	4,542	0.6	1.2
Truck	62,290	9.0	16.0
Total	699,293	100.0	179.6
Motorcycle	2,849	*	0.7

Data sources: Entity Ministries of Transport and Communication as derived from data made available by Republika Srpska Ministry of the Interior and Kantonal (Federation) Ministries of the Interior.

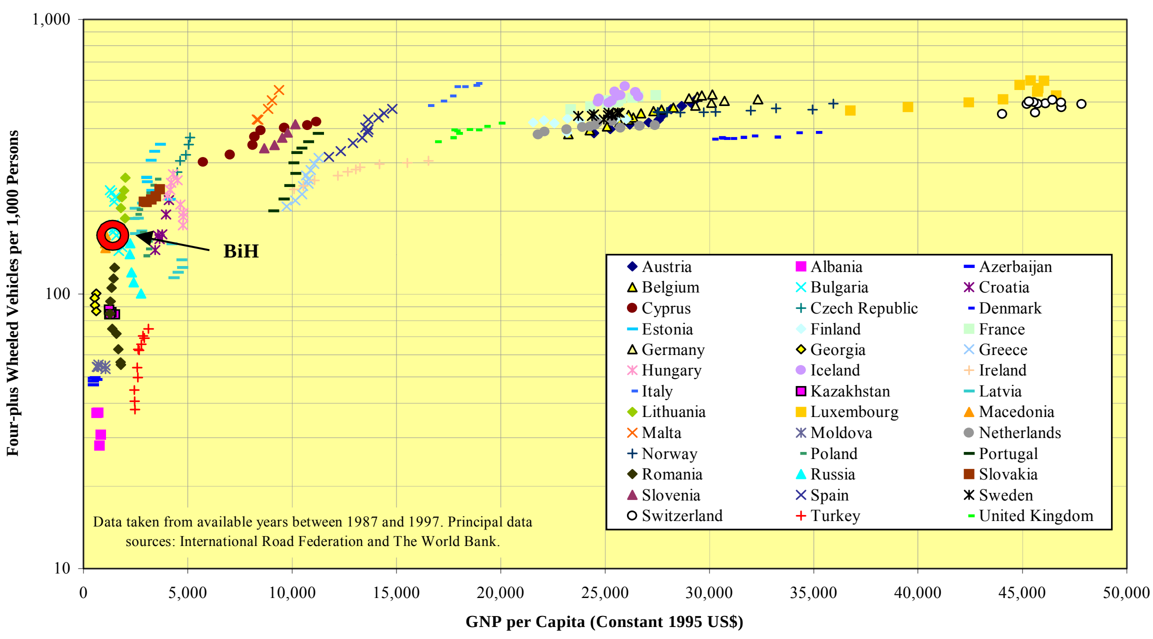
A review of unit vehicle ownership and recent GDP per capita data for both Entities and Kantons within the Federation confirms that vehicle ownership is strongly correlated with income (Figure 2.1.10).

Figure 2.1.10 Overview of BiH Unit Vehicle Ownership



Vehicle ownership is considered an excellent surrogate measure for road traffic growth; that is, likely levels of future traffic activity may be estimated based on forecast rates of growth in four-plus wheeled vehicle (cars, buses, trucks) registrations. Within a European context, unit ownership, that is, registered four-plus wheeled vehicles per 1,000 persons, is highest in western European countries. Vehicle ownership in all of Europe varies from amongst the lowest to near the highest in the world. This pattern is inexorably linked to national economic well-being, that is, GNP per capita. A review of data available over the past ten years reveals several clear trends. At lower income ranges, say GNP per capita of less than $2,500 (in constant 1995 terms), unit vehicle ownership increases very rapidly with, and at an elasticity of considerably greater than, the rate of growth of unit national income. Vehicle ownership continues to increase but at a more moderate rate until GNP per capita reaches about $15,000. Above that total, the ownership rate of growth slows considerable mirroring the GNP per capita growth rate (Figure 2.1.11).

Figure 2.1.11 Overview of European Vehicle Ownership



Unit vehicle ownership in BiH has, as indicated above, grown from a prewar total of some 108 vehicles per 1,000 persons to about 180 vehicles per 1,000 persons. Thus, one may conclude that a more modest unit national income places BiH into that group of nations whose vehicle ownership rate is anticipated to grow at considerably more than increases in unit national income and that the absolute level of BiH vehicle ownership will conform to, but likely somewhat exceed, expected European norms.

(2) Bottom Up Analysis

The formation of regression models was constrained by current socioeconomic data availability, as well as the reliability with which forecasts of zonal data can be prepared for future years. For these reasons the process was restricted to using population and unit national income (GRDP); other promising variables such as employment are not available.

A linear regression of the form:

$$Y = a + bx_1 + cx_2 + \dots + nx_n$$

Where Y = zonal vehicle trips
a = constant
b, c, … , n = coefficient
$x_1, x_2, \dots, x_n$ = zonal socioeconomic data

was therefore developed as a trip generation model. A number of different combinations involving regression parameters, trip rates, unit trip population, GRDP and GRDP per capita were explored with the objective of establishing the best possible fit between dependent and independent variables. The trip ends as input to the regression analysis were the internal trips as estimated from the base year matri2.1.

In the development of the analysis procedure, the best results were achieved by excluding zone 21 from the analysis. The trips generated from zone 21 had majority destination in the adjacent zone 22, Sarajevo. In essence this zone was behaving as an extension of the major adjacent city. For future years, the overall generation equations are still applied to zone 21.

For a country-wide study the results from the regression analysis as expected are closely related to zonal population and zonal gross regional development product (Table 2.1.14)

Table 2.1.14 Results of Regression Analysis

Vehicle Class	Dependent Variable	Constant	Population	GRDP (000 KM)	R^2
Cars	Trips	118	0.0118	0.00261	0.70
Bus	Trips	0	0.000184	0.000116	0.70
Rigid Trucks	Trips	43.8	0.0009	0.00018	0.60
Articulated Trucks	Trips	25.5	-	0.000114	0.67

Note: In all cases zone 21 is excluded from the regression analysis

Only in the case articulated trucks vehicle was the best regression analysis not obtained with the independent variables of population and GRDP. In this case, the best results were obtained with the independent variable of GRDP only.

The future socioeconomic framework describes the economic evolution of BiH. The base forecast data suggest is in 2020 summary that the total population of BiH will grow from 3.9 million in 2000 to 4.2 million with a corresponding increase in GRDP per capita from 2,261 (constant year 2000 KM) to up to 6,501 KM in 2020.

Thus the use of the base and future socioeconomic variables results in the calculation of a relative rate of growth against the observed status; that is,

$$T_F = T_B * \frac{T_{RF}}{T_{RB}}$$

Where for each zone,
T_F = Estimated future year trips;
T_B = Base year i.e. year 2000 trips;
T_{RF} = Regression trip estimates derived from future socioeconomic variables; and
T_{RB} = Regression trip estimate derived from base year socioeconomic variables.

The findings of the bottom up approach, coupled with the top down approach, are presented in Section 2.1.10, Future Demand.

2.1.8 Trip Distribution

At this stage of the model development it is necessary to estimate the travel patterns between origin and destination pairs, this is the trip distribution model.

The general form of the trip distribution or gravity model is as follows:

$$T_{ij} \propto Pi\ A_j\ F(t_{ij})$$

Where Tij = Trip between any pair of zones i and j.

The format of the impedance function is:

$$F(t_{ij}) = t_{ij}^{\ x_1} \exp(x_2\, t_{ij})$$

Where x_1 and x_2 are calibration constants.

The calibration constants are estimated from the base year trip table. The trip length distribution of the base year trip table is used as an input to the automatic calibration procedure. This is done for each vehicle class. The values of the constant for each vehicle class are presented in Table 2.1.15 together with the difference between observed and estimated average trip time.

Table 2.1.15 Gravity Model Co-efficient

Vehicle Class	x_1	x_2	Percent Variation from Observed Travel Time
Car	-3.2957	0.00143	0.0
Bus	-7.0969	0.03214	-0.2
Rigid Truck	-3.359	0.00609	-0.1
Articulated Truck	-2.571	0.004144	0.0

The reproduced trip length distribution does not fully correspond with the Entity boundary. In general trip distribution models are often derived for places where some areas are more or less attractive than others, but for reasons not wholly reflected in travel time distributions. This phenomena is integrated via the use of K-Factors, which are normally applied to groups of such traffic zones.

In the case of the current study, K Factors were calibrated for inter-entity travel for the year 2000; however are assumed to approach unity over the next 20 years as BiH reverts to a more European norm for travel patterns.

The K-Factors are presented in Table 2.1.16 whilst the final percentage of difference in travel patterns between the estimated year 200 matrix and the final observed matrix are produced in table 2.1.17. All movements are within 10 percent of the observed data.

Table 2.1.16 K-Factors for Trip Distribution Model

Movement Description	Vehicle Type			
	Car	Bus	Rigid Truck	Articulated Truck
Internal FBiH	1.2	1.2	1.2	1.2
Internal RS	1.2	1.2	1.2	1.2
FBiH - RS	0.5	0.4	0.4	0.4
FBiH - Brcko	0.5	0.8	0.8	0.8
RS - Brcko	1.5	1.0	1.2	1.0

Table 2.1.17 Percentage Difference between Base Year Trip Table and Synthesized Gravity Model Trip Table

Movement Description	Vehicle Type			
	Car	Bus	Rigid Truck	Articulated Truck
Internal FBiH	1	0	-1	0
Internal RS	2	0	-2	1
FBiH - RS	-6	0	9	1
FBiH - Brcko	9	6	2	4
RS - Brcko	-4	5	-1	-3

The discussion of the trip distribution model has included trips internal to BiH but no external trips. The external trips correspond to those developed for the base year matrixes.

2.1.9 Year 2000 Traffic Assignment

The last step in the base year analysis is the assignment of the synthetic year 2000 matrix to the base year network. All five vehicle matrixes are combined into a single matrix and then assigned to the existing road network using an equilibrium analogy.

Equilibrium, in the context of transport assignments, occurs when no trip can be made by an alternate path without increasing the total travel time of all trips in the network. All-or-nothing assignments determine the desired routings and can effectively measure demand over capacity. In practice, most regional areas have roadway facilities which become heavily utilized during the day. To model such regional areas, link loading techniques are required which reflect demand (volume) and modeled capacities. One such technique is the equilibrium assignment process.

Equilibrium assignment consists of an iterative series of all-or-nothing traffic assignments with an adjustment of travel times reflecting delays encountered in the associated iteration. The load from each assignment after the first iteration is combined with the previous load in such a way as to minimize the impedance of each trip and thus reducing the number of iterations to find the equilibrium loads. Equilibrium assignment is multi-path because the final loads are a linear combination of the all-or-nothing loads of each iteration.

In the final calibration of the network it is often necessary to modify various link attributes to refine the network assignment. The link assignment is compared with existing traffic counts on an individual link basis and across screen lines. For the whole year 2000 network, a comparison was made for, some 100 two-way links achieving an excellent MAD ratio[18] of 0.28. This includes all links with traffic volume in excess of 500 vehicles per day. Good correlation was also achieved across all BiH border sections. (Table 2.1.18)

Table 2.1.18
Comparison of Observed and Modeled Year 2000 Demand
Inter-Zonal Trips Crossing the BiH Border

Border Segment	Observed Traffic Volume	Simulated Traffic Volume	Percent Difference
Western	14,400	13,700	-4.8
Northern	13,800	14,800	4.4
Eastern	8,700	9,100	4.6
South-Eastern	1,200	1,300	8.3
Total	38,100	38,900	2.1

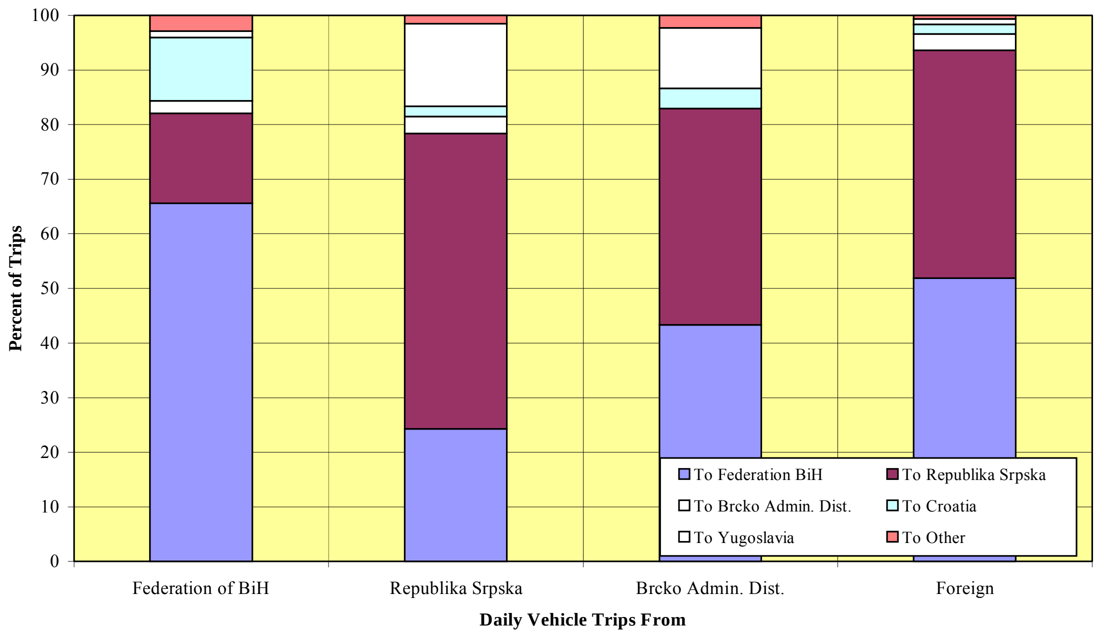
The composite year 2000 vehicle trips, internal plus external, assigned to the base year highway network encompass 125,211 trips, of which 110,400 are by passenger cars (88.2 percent), 2,682 by buses (2.1 percent), 8,088 by rigid trucks (6.5 percent) and 4,024 by

[18] The MAD ratio is defined in Section 2.1.6.

articulated trucks. To provide and overview of trip patterns, the 54 zone matrixes were aggregated to superzones consisting of Kanton's in the Federation, Functional Regions in Republika Srpska, the Brcko Administrative District and principal foreign destinations (the complete 54 zone matrixes, by vehicle type, are contained in Volume III of this *Interim Report*)[19]. As expected, Sarajevo and Tuzlanski Kantons in the Federation, and in the Banja Luka Functional Region, are the precincts with highest absolute numbered trips. On a relative scale, rigid trucks are highest in Zapadno-Hercegovacki and Herceg-Bosanski Kantons (Table 2.1.19).

The interplay of vehicle trips among the superzones is shown in Table 2.1.20. An even broader summation of trips isolates the origin-destination relationship pattern of year 2000 total daily vehicle trips among major geographic elements (Figure 2.1.12).

Figure 2.1.12 Distribution of Year 2000 Inter-zonal Trips
Daily Vehicle Trips by Cars, Buses and Trucks



[19] It should be noted that aggregating to superzones will invariable imply that larger regions have a large number of trips, and vice versa. Nevertheless, superzone summaries provide a useful overview of trip patterns.

Table 2.1.19 Simulated Year 2000 Daily Inter-zonal Vehicle Trip by Superzone

Superzone		Number of Trips					Percent of Modal Trips					Percent of Region Trips				
Designation	Region	Car	Bus	Rigid Truck	Artic Truck	Total	Car	Bus	Rigid Truck	Artic Truck	Total	Car	Bus	Rigid Truck	Artic Truck	Total
Bosansko Podkinjski	FBiH	480	18	32	23	553	0.4	0.7	0.6	0.6	0.4	83.2	3.3	9.4	4.2	100.0
Herceg-Bosanski	FBiH	1,750	29	241	76	2,096	1.6	1.1	3.0	1.9	1.7	83.5	1.4	11.5	3.6	100.0
Hercegovacko-Neretvanski	FBiH	7,509	141	629	136	8,415	6.8	5.3	7.8	3.4	6.7	89.2	1.7	7.5	1.6	100.0
Sarajevo	FBiH	14,466	575	1,110	458	16,609	13.1	21.4	13.7	11.4	13.3	87.1	3.5	6.7	2.8	100.0
Srednjebosanski	FBiH	3,748	70	411	132	4,361	3.4	2.6	5.1	3.3	3.5	85.9	1.6	9.4	3.0	100.0
Tuzlanski	FBiH	10,670	238	783	193	11,884	9.7	8.9	9.4	4.8	9.5	89.9	2.0	6.4	1.6	100.0
Unsko-Sanski	FBiH	5,333	100	263	169	5,865	4.8	3.7	3.3	4.2	4.7	90.9	1.7	4.5	2.9	100.0
Velenpa Posavska	FBiH	1,257	14	131	40	1,442	1.1	0.5	1.6	1.0	1.2	87.2	1.0	9.1	2.8	100.0
Zapadno-Hercegovacki	FBiH	2,407	42	380	99	2,928	2.2	1.6	4.7	2.5	2.3	82.2	1.4	13.0	3.4	100.0
Zenicko-Dobojski	FBiH	6,728	96	452	212	7,488	6.1	3.6	5.6	5.3	6.0	89.9	1.3	6.0	2.8	100.0
Banja Luka	RS	16,233	420	1,342	437	18,432	14.7	15.7	16.6	10.9	14.7	88.1	2.3	7.3	2.4	100.0
Bijeljina	RS	4,782	115	415	209	5,521	4.3	4.3	5.1	5.2	4.4	86.6	2.1	7.5	3.8	100.0
Oradacac (Brcko)	RS	2,122	28	146	96	2,392	1.9	1.0	1.8	2.4	1.9	88.7	1.2	6.1	4.0	100.0
Doboj	RS	3,352	105	318	196	3,971	3.0	3.9	3.9	4.9	3.2	84.4	2.6	8.0	4.9	100.0
Mrkonjic Grad	RS	886	40	63	51	1,040	0.8	1.5	0.8	1.3	0.8	85.2	3.8	6.1	4.9	100.0
Prijedor	RS	3,264	114	238	127	3,743	3.0	4.3	2.9	3.2	3.0	87.2	3.0	6.4	3.4	100.0
Srpsko Sarajevo	RS	1,212	36	115	73	1,436	1.1	1.3	1.4	1.8	1.1	84.4	2.5	8.0	5.1	100.0
Srbinje	RS	421	4	33	13	471	0.4	0.1	0.4	0.3	0.4	89.4	0.8	7.0	2.8	100.0
Trebinje	RS	1,008	23	130	28	1,189	0.9	0.9	1.6	0.7	0.9	84.8	1.9	10.9	2.4	100.0
Zvornik	RS	3,234	39	155	134	3,582	2.9	1.5	1.9	3.8	2.9	90.3	1.1	4.3	4.3	100.0
Brcko Administrative District	BAD	2,897	44	200	82	3,223	2.6	1.6	2.5	2.0	2.6	89.9	1.4	6.2	2.5	100.0
Croatia	Foreign	7,665	161	225	322	8,373	6.9	6.0	2.8	8.0	6.7	91.5	1.9	2.7	3.8	100.0
Yugoslavia	Foreign	6,832	189	201	391	7,613	6.2	7.0	2.5	9.7	6.1	89.7	2.5	2.6	5.1	100.0
Western Europe	Foreign	1,944	34	63	167	2,208	1.8	1.3	0.8	4.2	1.8	88.0	1.5	2.9	7.6	100.0
Eastern Europe	Foreign	217	7	12	140	376	0.2	0.3	0.1	3.5	0.3	57.7	1.9	3.2	37.2	100.0
Total		110,417	2,682	8,088	4,024	125,211	100.0	100.0	100.0	100.0	100.0	88.2	2.1	6.5	3.2	100.0

(1) Functional regions in Republika Srpska conform to those designated in *Prostorni Plan Republike Srpske; Ekspert Plan 1996-2001*; op. cit. Kanton and Functional Regions have been adjusted to account for the Brcko Administrative District.

Table 2.1.20 Simulated Year 2000 Daily Inter-zonal Vehicle Trips (Cars, Buses and Trucks)

From Superzone		Superzone Designation	To Superzone A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Total
A	FBiH	Bosansko Podrinjski	0	5	15	109	9	14	5	1	8	13	17	8	2	1	1	3	165	124	18	12	3	8	5	6	1	553
B	FBiH	Herceg-Bosanski	6	277	148	94	178	13	58	2	280	47	179	16	9	8	37	21	11	2	32	9	7	623	9	24	1	2,898
C	FBiH	Hercegovacko-Neretvanski	13	149	1,662	1,085	122	63	32	4	1,742	184	126	27	14	17	17	28	35	20	415	25	14	2,610	58	32	9	8,415
D	FBiH	Sarajevo	108	93	1,080	8,067	783	615	69	34	158	2,568	362	133	69	102	42	48	610	138	110	186	87	660	205	288	20	16,609
E	FBiH	Srednjebosanski	10	178	122	787	598	89	63	18	74	862	411	27	31	49	88	37	25	13	28	29	18	761	45	83	23	4,381
F	FBiH	Tuzlanski	14	22	59	618	89	5,996	44	226	21	488	457	409	478	517	11	36	38	11	28	512	572	571	306	375	64	11,864
G	FBiH	Unsko-Sanski	4	57	34	69	68	45	2,177	6	25	41	653	27	23	23	64	478	14	3	18	18	26	1,327	25	638	6	5,885
H	FBiH	Velenopa Posavska	2	3	5	33	8	227	8	0	4	26	78	100	245	31	3	9	3	1	1	21	689	12	10	2	1	1,442
I	FBiH	Zapadno-Hercegovacki	7	288	1,744	160	75	23	25	2	0	28	88	13	8	10	10	11	12	7	116	11	5	284	2	14	3	2,928
J	FBiH	Zenicko-Dobojski	14	45	105	2,561	881	408	40	23	27	1,158	517	54	149	748	29	29	37	17	24	56	55	295	66	138	48	7,488
K	RS	Banja Luka	16	178	127	366	415	467	652	78	80	525	9,823	145	388	1,079	578	1,828	38	16	58	102	148	232	726	268	36	18,452
L	RS	Bijeljina	9	11	27	134	28	407	29	108	14	51	142	0	89	44	5	17	24	4	12	605	672	88	2,025	63	67	5,521
M	RS	Gradacac (Brcko)	3	7	12	71	34	472	18	344	5	148	384	90	8	311	5	28	7	2	5	41	288	161	78	9	3	2,382
N	RS	Doboj	2	14	18	98	48	518	25	31	8	758	1,077	38	312	270	11	41	8	1	7	38	62	78	440	48	28	3,871
O	RS	Mrkonjic Grad	1	37	18	44	91	18	65	3	11	27	575	5	4	12	8	32	5	1	5	4	4	15	38	32	1	1,848
P	RS	Prijedor	5	20	17	42	37	36	477	8	12	29	1,929	18	25	42	33	619	7	4	6	10	16	192	128	38	1	3,743
Q	RS	Srpsko Sarajevo	166	13	29	608	24	40	13	4	11	36	39	25	9	9	3	5	4	41	29	31	8	18	272	5	2	1,436
R	RS	Srbinje	123	2	28	135	12	18	2	0	6	17	34	6	3	3	1	2	43	8	25	5	2	2	32	6	0	471
S	RS	Trebinje	21	34	415	110	27	19	17	1	117	23	55	14	9	4	6	7	24	28	39	11	4	11	190	4	1	1,189
T	RS	Zvornik	11	10	27	189	38	515	17	21	11	58	104	683	41	34	3	12	33	6	12	0	97	23	1,614	26	5	3,582
U	BAD	Brcko Administrative District	4	7	15	85	21	575	23	610	5	56	148	672	259	68	3	18	9	2	5	97	8	119	357	58	17	3,223
V	Foreign	Croatia	7	623	2,614	657	788	570	1,325	12	282	294	233	61	157	79	17	190	12	3	12	22	128	206	76	18	29	8,373
W	Foreign	Yugoslavia	7	8	58	288	49	307	28	11	0	66	723	2,821	73	443	38	127	270	31	190	1,617	357	77	35	63	12	7,813
X	Foreign	Western Europe	7	25	33	279	83	376	638	1	12	131	261	64	11	51	31	32	4	5	4	25	56	9	65	8	5	2,288
Y	Foreign	Eastern Europe	0	1	9	19	22	45	5	0	3	48	34	67	3	29	1	2	1	8	1	6	18	27	11	4	0	378
Total Matrix			560	2,897	8,409	16,628	4,375	11,885	5,853	1,433	2,916	7,498	18,421	5,523	2,481	3,978	1,037	3,748	1,439	478	1,188	3,573	3,222	8,371	7,614	2,283	381	125,211

(1) Functional regions in Republika Srpska conform to those designated in *Prostorni Plan Republike Srpske; Etapni Plan 1996-2001*; op. cit. Kanton and Functional Regions have been adjusted to account for the Brcko Administrative District.
Trip matrix includes following totals: passenger cars - 110,417 trips, buses - 2,682 trips, rigid trucks - 8,088 trips, and, articulated trucks - 4,024 trips.

- In case of Federation trips, some two-thirds have both origin and destination within the Federation, and almost 17 percent have one trip end within Republika Srpska. Slightly more than two percent have a trip end within the Brcko Administrative District, almost 12 percent in Croatia, slightly over one percent in Yugoslavia, and about three percent in other nations.

- In case of Republika Srpska trips, some 55 percent have both trip ends within the Republic, and a further 24 percent have one trip end within the Federation. Three percent have a trip end within the Brcko Administrative District, almost two percent in Croatia, slightly over 15 percent in Yugoslavia, and almost two percent in other nations.

- In case of Brcko Administrative District trips, some 43 percent have one trip end within the Federation and 40 percent in Republika Srpska. Almost four percent of trips have one end in Croatia, slightly over 11 percent in Yugoslavia, and over two percent in other nations.

Foreign trip destinations are dominantly destined to the Federation (52 percent) and Republika Srpska (42 percent).

The transport model, as confirmed earlier, is based on the replication of inter-zonal trips. Intra-zonal trips, such as those within Sarajevo, are not included in trip matrixes. However, it is accepted that road capacity will, to varying degrees, be impacted by intra-zonal demand in sense that some proportion of available capacity is absorbed by these trips. Thus, in terms of the current study, the only relevance is that intra-zonal trips catalyze a restriction vis-à-vis road capacity. Data on intra-zonal demand is limited, but some insight is available from existing traffic counts and results of the roadside origin-destination survey. For modeling purposes, a simulated reduction in road capacity is achieved via a pre-load function involving road links. The amount of pre-load is estimated as a percent of link capacity in major cities (Sarajevo, Banja Luka, Mostar, Zenica, Tuzla, Doboj) and, along other road segments, by a small absolute total (averaging about 500 vehicles). It is assumed that the pre-load volume remains constant over time, and that growth in intra-zonal demand will be absorbed via construction of new local facilities, or implementation of TSM measures.

A spider diagram depicts lines of demand between various zone centroids independent of road system configuration. A spider diagram of internal BiH trips is shown in Figure 2.1.13, with relative line width proportional to absolute demand. As expected, heaviest trip concentrations are noted near to, and between, major cities (among them Sarajevo, Banja Luka, Zenica, Tuzla, Doboj and Mostar). A spider diagram of external trips (scale different from internal trip spider) is depicted in Figure 2.1.14. Activity corridors crossing the BiH border are noted, particularly between northeast BiH and Yugoslavia, as well as between south BiH and Croatia.

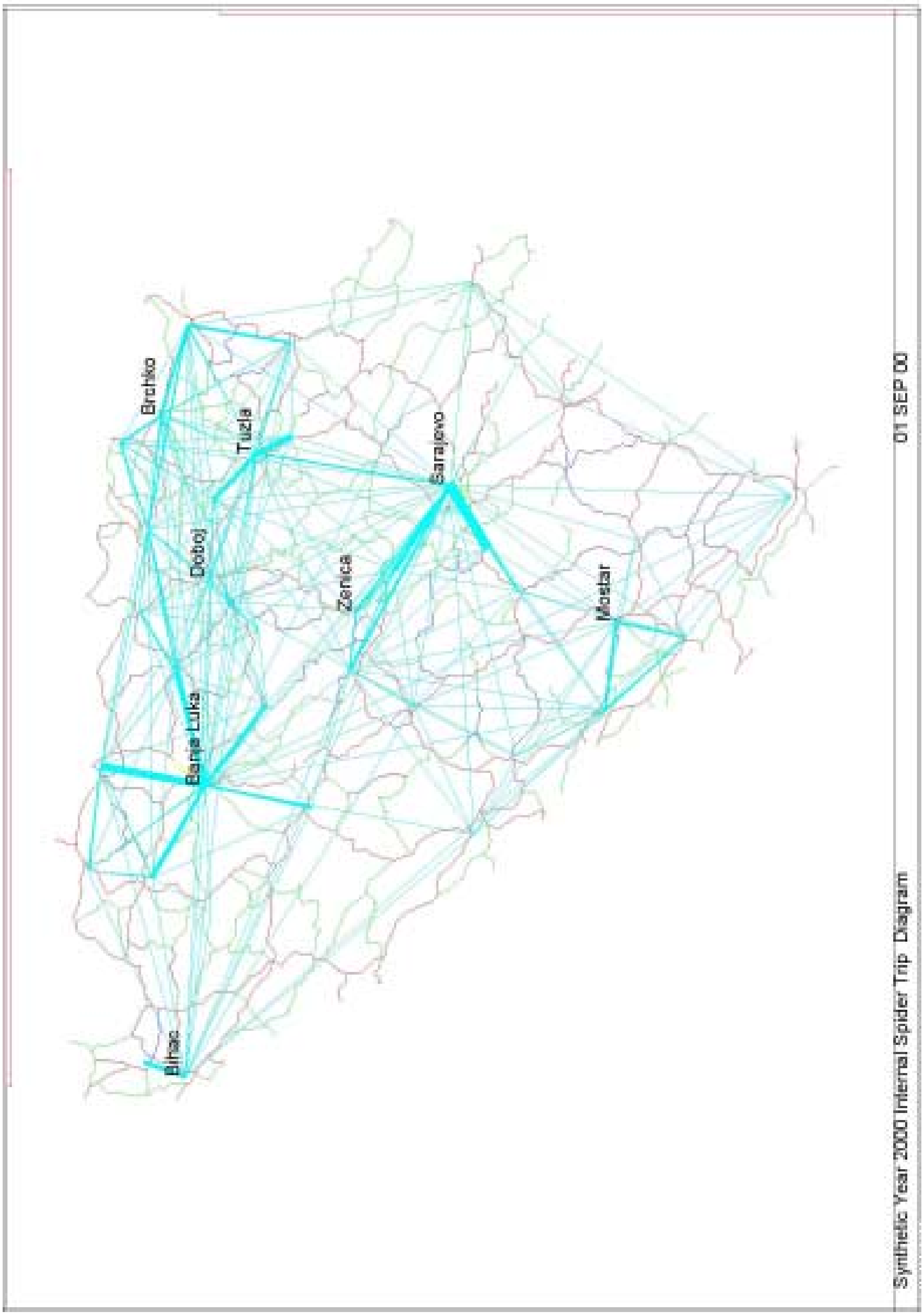


Figure 2.1.13 Demand-Line Diagram Year 2000 Internal Vehicle Trips

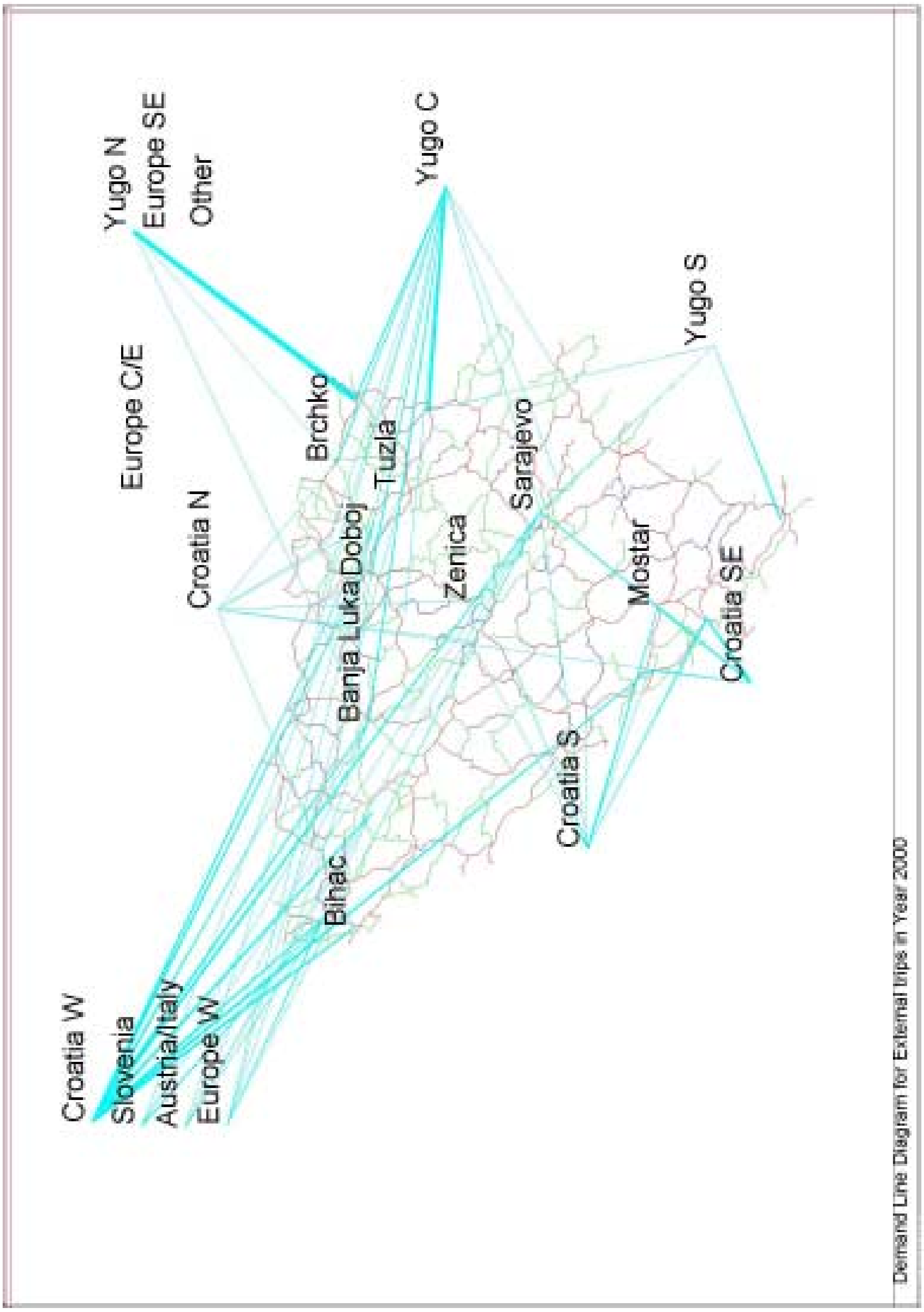


Figure 2.1.14 Demand-Line Diagram Year 2000 External Vehicle Trips

The final step in the year 2000 analysis is the assignment of your 2000 trip matrixes onto the base year network. Thus, demand contained within the matrixes is permitted to interact with the network and its parameters; that is, principally speed, time and capacity. The resulting loadings are depicted in Figure 2.1.15, with line thickness proportional to demand. Also, color coding is provided for presentation purposes which breaks the absolute vehicle totals into four ranges, with the highest range (shown in red color) reaching up to some 20,000 vehicles per day, total both directions of travel. Thus, as expected since the synthesized assignment process is based on a calibrated application of measured demand, highest demand is found near Sarajevo and Banja Luka although, in general, typical demand on BiH roads is modest.

2.1.10 Future demand

The final compilation of future modal demand involves two components (a) internal trips spawned by socio-economic changes in the study area (synthesized top down and bottom up processes) and (b) external trips with at least one trip end outside of the study area.

(1) Internal Trips

Future year zonal trip ends for internal trips (both trip ends within the study area) were derived utilizing the trip generation model presented in the previous report section. The future element of the macro-economic frame includes population and GRDP forecasts which reflect future land-uses and development within the study area. A full description of the framework derivation is presented in Volume I of this *Interim Report*; however, in summary, two economic growth scenarios were selected for road demand testing: the base case and the high economic growth case. In addition, at later stages, a sensitivity analysis was employed to measure the eventuality should population totals exceed those forecast within the economic framework. Under both scenarios, BiH population is shown as increase from 3.9 million persons in year 2000 to some 4.2 million persons by year 2020. Economic growth (GDP), totaling 8,800 million KM in year 2000, is forecast to increase to some 22,700 million KM and 27,400 million KM by year 2020 under the base case and high growth scenarios, respectively. GDP per capita would correspondingly increase from 2,300 KM in year 2000 to 5,400 KM and 6,500 KM by year 2020 under the base case and high growth scenarios, respectively (all monetary values in terms of constant year 2000 KM). Population and GRDP forecasts were initially entered, stratified by zone, into the “bottom-up” regression equations. This approximates a relative shift in trip making among study area zones based on changes in residential distributions as well as economic evolution. Subsequently, “top down” controls based on European vehicle ownership-income relationships were applied to superimpose an absolute change on trip-making propensity based on forecast levels of vehicle ownership.

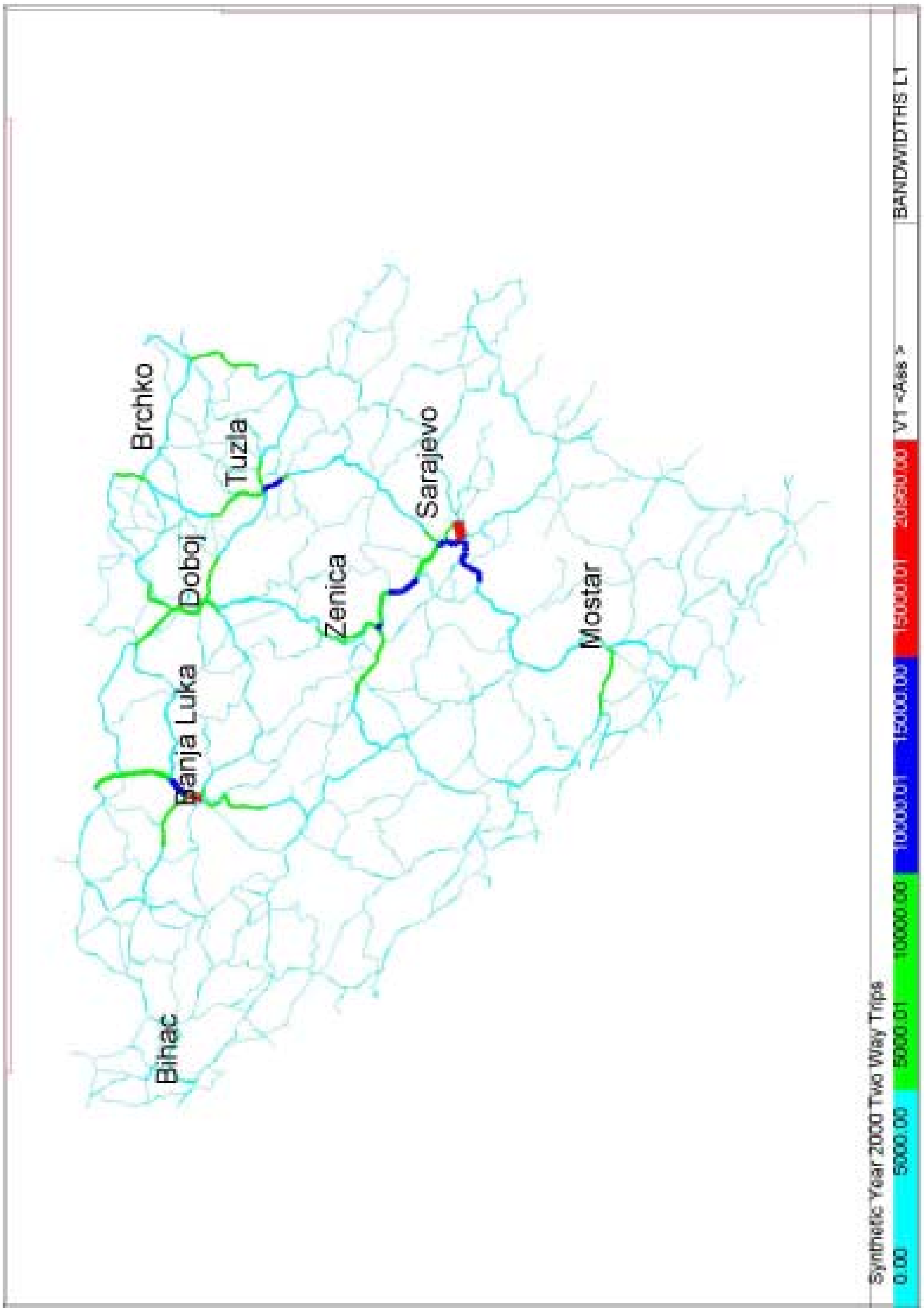
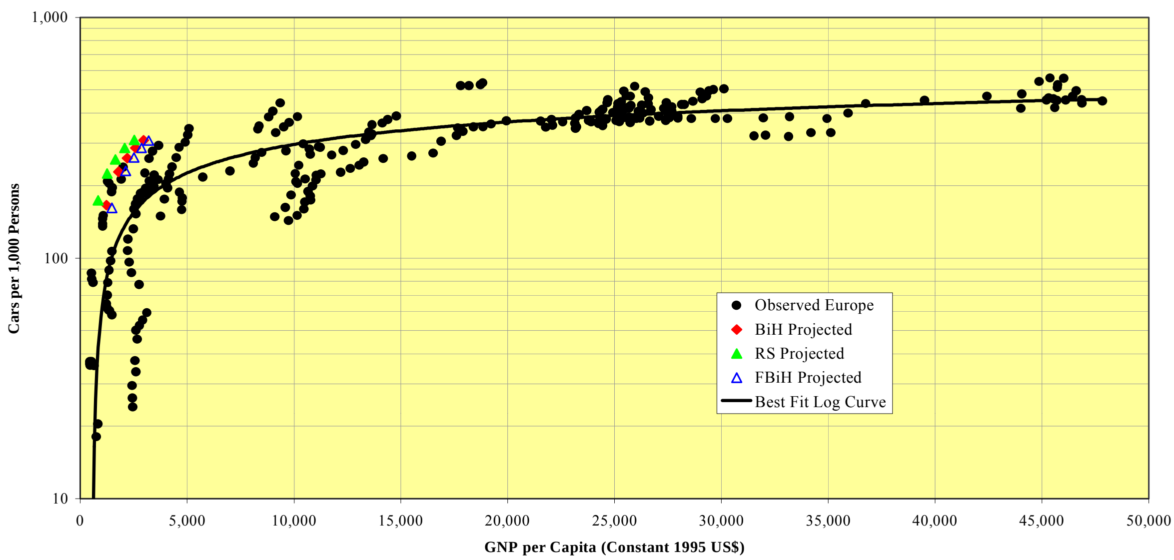


Figure 2.1.15 Assignment of Year 2000 Total Daily Vehicle Trips Onto Base Year Network

In the case of vehicle ownership in year 2000, RS has a higher car ownership per capita than FBiH but a lower GRDP per capita. Over the next twenty years both Entities will approach the state average under the base case (Figure 2.1.16).

Figure 2.1.16 Comparison of Forecast BiH Car Ownership with European Norms



Application of similar analogies for buses and trucks leads to “Top Down” controlled growth in internal, inter-zonal vehicle trips as presented in Tables 2.1.21 and 2.1.22 for each vehicle class. Thus, under the base case economic growth scenario, car trips are shown as increasing from some 77,600 in year 2000 to 156,200 in year 2020. Under the high economic growth scenario, on the other hand, future car trips are expected to reach 187,100.

Table 2.1.21 Existing and Forecast Internal Trips by Vehicle Type: Base Case Economic Growth Scenario

Vehicle Type	Originating Precinct	Internal Daily Trips by Year			
		2000	2005	2010	2020
Car	FBiH	45,528	64,968	78,286	96,997
	RS	29,666	38,328	44,499	54,245
	Brcko AD	2,404	3,322	3,967	4,907
	Total	77,598	106,619	126,753	156,148
Bus	FBiH	1,130	1,136	1,208	1,277
	RS	745	747	758	772
	Brcko AD	35	35	37	38
	Total	1,910	1,918	2,003	2,087
Rigid Truck	FBiH	4,151	5,209	6,126	7,511
	RS	2,762	3,566	4,262	5,621
	Brcko AD	191	242	285	357
	Total	7,105	9,018	10,673	13,489
Articulated Truck	FBiH	1,172	1,653	1,986	2,437
	RS	880	1,135	1,322	1,623
	Brcko AD	42	58	69	85
	Total	2,094	2,846	3,377	4,145

Note: totals may differ from earlier presentations due to rounding.

Table 2.1.22 Existing and Forecast Internal Trips by Vehicle Type: High Economic Growth Scenario

Vehicle Type	Precinct	Internal Daily Trips by Year			
		2000	2005	2010	2020
Car	FBiH	45,528	65,742	83,295	109,949
	RS	29,666	39,485	48,014	71,599
	Brcko AD	2,404	3,387	4,248	5,582
	Total	77,598	108,615	135,557	187,130
Bus	FBiH	1,130	1,136	1,209	1,283
	RS	745	747	759	775
	Brcko AD	35	35	37	39
	Total	1,910	1,918	2,005	2,096
Rigid Truck	FBiH	4,151	5,214	6,387	8,424
	RS	2,762	3,569	4,447	6,310
	Brcko AD	191	242	298	401
	Total	7,105	9,025	11,131	15,135
Articulated Truck	FBiH	1,172	1,670	2,109	2,753
	RS	880	1,165	1,419	1,844
	Brcko AD	42	59	73	97
	Total	2,094	2,894	3,602	4,693

Note: totals may differ from earlier presentations due to rounding.

(2) External Trips

A recently study examined in detail existing, and forecast, levels of passenger and cargo activity in eastern Europe[20]. Forecasts in traffic levels to year 2015 considered economic growth (low, moderate, high); infrastructure development; and, speed of harmonization

[20] *Traffic Forecast of the Ten Pan European Corridors of Helsinki*, for European Commission, by NEA Transport Research and Training, et. al., August, 1999.

of transport markets, more extensive detail is provided in Sections 2.3.1.5 and 2.3.2.8 of this chapter; however, in summary growth in international (as opposed to domestic) demand was estimated at around 5-6 percent per annum.

External traffic is important in the context of the BiH road transport. However as well as the external influences, domestic considerations will be important in determination of external traffic. The proportional split in external traffic is therefore linked to the growth in domestic potential for development.

External trips are shown as increasing from 36,500 in year 2000 to 71,600 and 96,000 trips in 2020 under base and high growth economic scenarios, respectively. Thus, total internal plus external trips are forecast to reach 305,000 per day in year 2020 under the high economic growth scenario (Table 2.1.23).

Table 2.1.23 Observed and Forecast Total Trips

Trip Type	Vehicle Type	Daily Vehicle Trips by Year				
		2000	2005	2010	2020	2020 High
Internal	Car	77,598	106,619	126,753	156,148	187,130
	Bus	1,910	1,918	2,003	2,087	2,096
	Rigid Truck	7,105	9,018	10,673	13,489	15,135
	Artic Truck	2,094	2,846	3,377	4,145	4,693
External	All	36,513	49,288	58,330	71,616	96,014
Total		125,218	169,687	201,136	247,485	305,068

(3) Trip Distribution

The internal trips are then distributed between zones using the gravity model previously described. The external trips are distributed throughout BiH using the Furness Growth Factoring technique. In this method, the trip end control totals are supplied. An iterative balancing approach is then used to match all the trip ends within the matrix.

(4) Trip Assignment

The composite year 2020 vehicle trips, internal plus external, assigned to the committed highway network encompass some 306,000 daily trips. To provide an overview of trip patterns, the 54 zone matrixes were aggregated to superzones consisting of Kanton's in the Federation, Functional Regions in Republika Srpska, the Brcko Administrative District, and principal foreign destinations (the complete 54 zone matrixes, by vehicle type, are contained in Volume III of this *Interim Report*)[21]. In terms of interzonal trip demand Sarajevo Kanton and the Banja Luka Functional Region have emerged as leading generators, followed by Tuzlanski Kanton and Hercegovacko-Neretvanski Kanton. The strong performance of trips between BiH and Croatia as well as Yugoslavia is noted, aggregating to some 22,000-26,000 per day for each country (Table 2.1.24).

[21] It should be noted that aggregating to superzones will invariable imply that larger regions have a large number of trips, and vice versa. Nevertheless, superzone summaries provide a useful overview of trip patterns.

The traffic assignment results for future years are presented in Figures 2.1.17, 2.1.18, 2.1.19, and 2.1.20 for years 2005, 2010 and 2020 under the base case economic scenario, and for year 2020 under the high growth economic scenario, respectively. The corresponding spider diagrams representing major internal zonal vehicle movements are depicted in Figures 2.1.21, 2.1.22, 2.1.23, and 2.1.24.

Table 2.1.24 Simulated Year 2020 Daily Inter-zonal Vehicle Trips (Cars, Buses and Trucks): High Economic Growth Scenario

From Superzone		Superzone Designation	To Superzone A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Total
A	FBiH	Bosansko Podrinjski	0	8	29	204	15	28	6	2	10	28	29	15	4	4	2	4	273	198	29	11	5	15	18	12	1	1,019
B	FBiH	Herceg-Bosanski	7	440	320	252	291	43	94	4	404	75	395	24	16	25	64	41	18	5	57	17	12	1,614	9	43	0	4,367
C	FBiH	Hercegovacko-Neretvanski	38	321	4,451	3,184	247	182	68	11	4,078	212	388	70	32	37	35	42	62	40	943	64	39	6,269	85	83	14	28,943
D	FBiH	Sarajevo	204	252	3,185	17,884	2,223	2,465	194	94	453	6,708	1,398	453	240	348	127	132	1,557	480	315	585	288	2,805	468	789	37	42,888
E	FBiH	Srednjebosanski	15	291	247	2,223	796	185	108	14	127	1,355	1,037	54	62	95	153	74	42	20	48	51	38	2,020	93	168	36	9,348
F	FBiH	Tuzlanski	28	42	183	2,464	188	14,465	97	472	52	357	1,198	1,136	1,205	1,209	25	89	94	24	45	1,382	1,412	1,470	888	928	110	38,877
G	FBiH	Unsko-Sanski	6	97	67	194	188	98	4,352	12	43	63	1,423	57	37	58	113	905	18	5	28	33	48	2,729	57	1,257	7	11,885
H	FBiH	Velezupa Posavska	2	5	13	94	14	473	13	8	4	48	159	199	493	63	3	17	6	1	5	39	1,198	27	18	4	1	2,884
I	FBiH	Zapadno-Hercegovacki	9	484	4,078	453	127	51	43	5	0	58	195	27	11	18	19	24	22	12	210	22	12	654	2	30	4	6,568
J	FBiH	Zenicko-Dobojski	19	75	211	6,708	1,356	337	64	41	50	1,688	1,088	99	302	1,508	46	59	58	29	40	101	188	801	135	387	77	15,189
K	RS	Banja Luka	28	394	365	1,393	1,035	1,201	1,423	158	195	1,079	23,790	355	952	2,498	1,331	4,718	82	28	120	238	358	848	1,749	858	65	44,841
L	RS	Bijeljina	15	23	78	454	53	1,196	58	199	28	100	354	0	222	97	11	41	51	10	26	1,516	1,582	114	6,440	138	91	12,881
M	RS	Gradacac (Brcko)	5	14	32	248	62	1,204	38	493	11	302	951	222	0	728	14	56	18	4	10	89	613	342	216	28	10	5,696
N	RS	Doboj	5	21	39	338	96	1,210	58	64	16	1,500	2,488	97	727	635	23	88	15	4	13	79	139	147	1,036	118	44	9,000
O	RS	Mrkonjic Grad	2	63	35	127	153	23	113	4	19	47	1,332	11	34	22	8	62	6	2	10	7	8	35	89	82	0	2,246
P	RS	Foča	4	41	42	138	74	87	908	17	24	68	4,718	41	57	87	61	1,308	12	3	17	24	34	474	268	71	2	8,563
Q	RS	Srpsko Sarajevo	272	17	62	1,558	43	94	19	8	23	58	82	51	18	15	6	11	4	78	51	84	18	25	604	12	3	3,192
R	RS	Srbinje	198	5	41	399	19	25	5	2	12	28	28	9	4	5	3	4	77	8	44	12	4	6	68	14	0	1,018
S	RS	Trebinje	29	57	943	377	48	46	27	4	210	39	119	26	12	12	11	16	58	44	71	21	12	37	391	15	4	2,561
T	RS	Zvornik	19	17	63	585	52	1,383	33	39	21	101	238	1,516	89	77	7	24	84	11	22	0	288	47	5,053	65	8	8,534
U	BAD	Brcko Administrative District	6	12	37	281	38	1,412	48	1,198	12	109	358	1,582	613	148	8	34	18	4	13	208	8	234	860	138	31	7,384
V	Foreign	Croatia	15	1,664	6,480	2,061	2,079	1,501	2,790	28	674	614	661	118	345	151	37	485	25	8	38	51	239	3,392	1,535	227	358	25,574
W	Foreign	Yugoslavia	18	10	87	481	96	891	58	20	3	139	1,885	6,889	221	1,078	93	277	624	69	399	3,970	889	1,541	465	1,142	116	21,285
X	Foreign	Western Europe	12	43	85	809	171	946	1,289	3	30	313	674	135	27	122	64	72	13	13	15	87	142	228	1,141	25	59	8,496
Y	Foreign	Eastern Europe	1	1	15	38	37	110	8	1	3	78	66	95	18	46	1	3	3	8	4	9	32	349	114	62	0	1,084
Total Matrix			1,021	4,417	21,188	42,951	9,417	30,156	11,988	2,883	6,582	15,621	44,927	13,261	5,711	9,039	2,257	8,586	3,218	1,818	2,573	8,659	7,428	25,019	28,571	6,388	1,878	305,068

(1) Functional regions in Republika Srpska conform to those designated in *Prostorni Plan Republike Srpske, Region Plan* 1996-2001; i.e. FBiH Kantons and Functional Regions have been adjusted to account for the Brcko Administrative District.

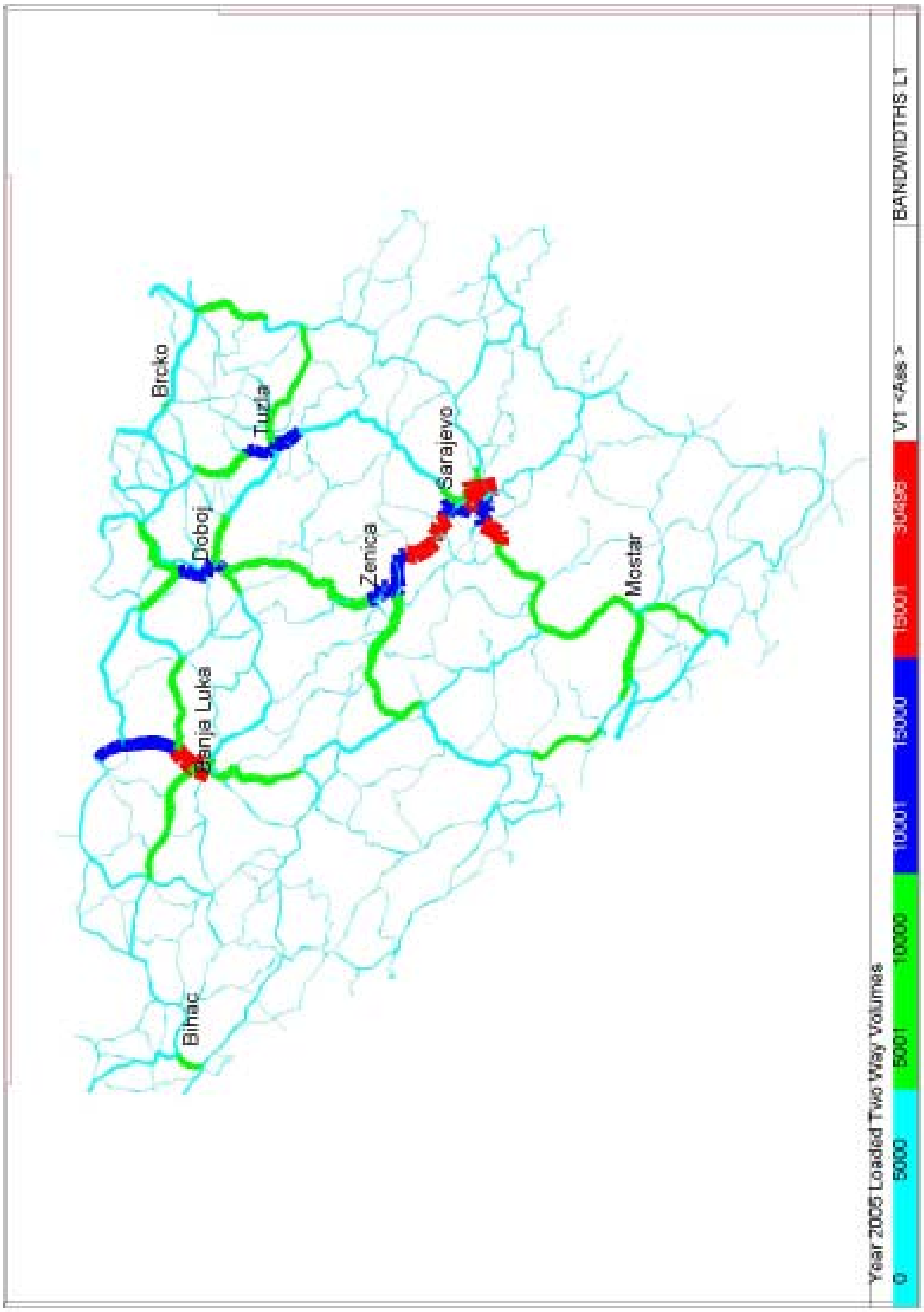


Figure 2.1.17 Assignment of Year 2005 Total Daily Vehicle Trips onto Committed Network: Base Case Economic Growth Scenario

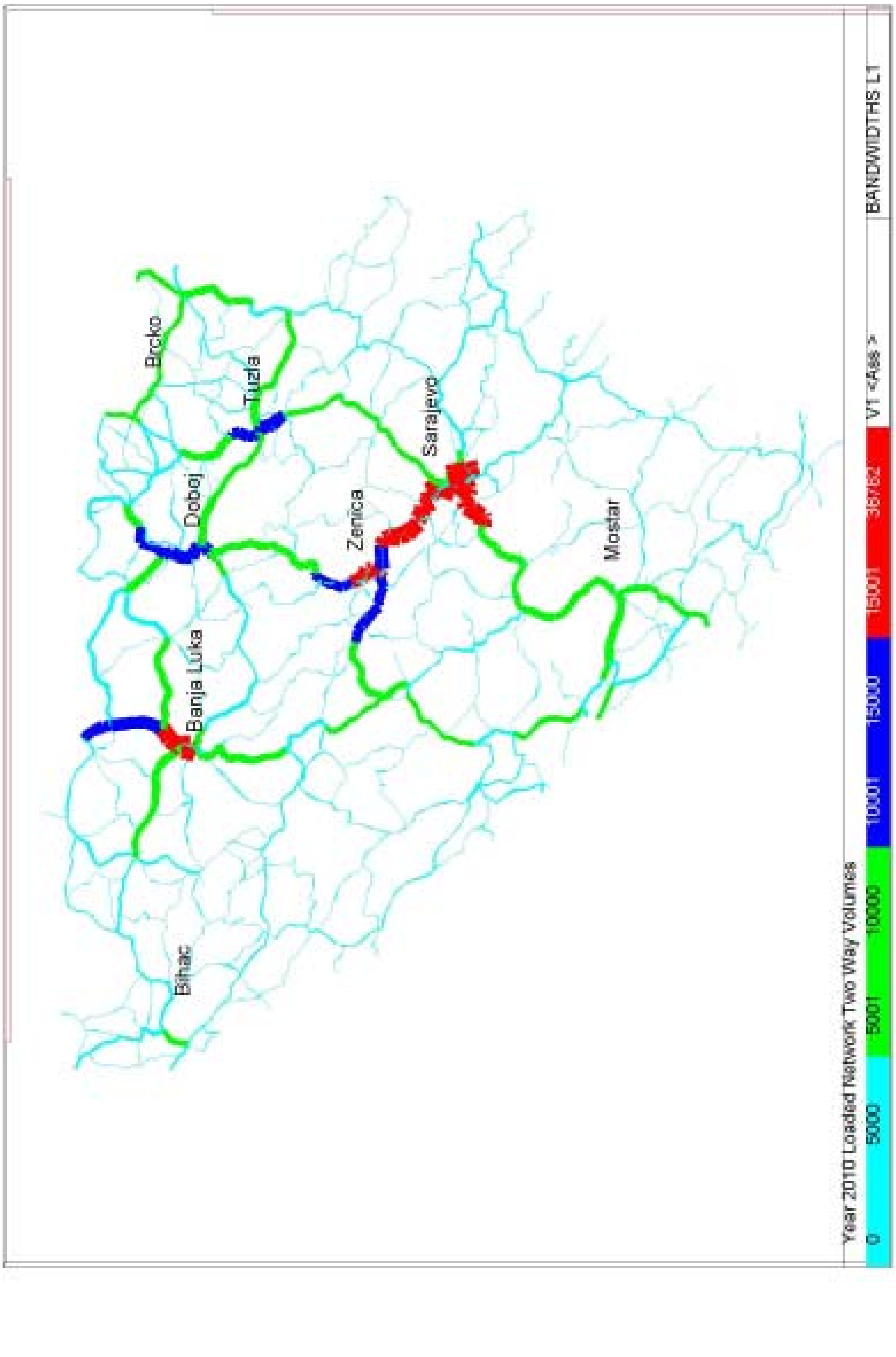


Figure 2.1.18 Assignment of Year 2010 Total Daily Vehicle Trips onto Committed Network: Base Case Economic Growth Scenario

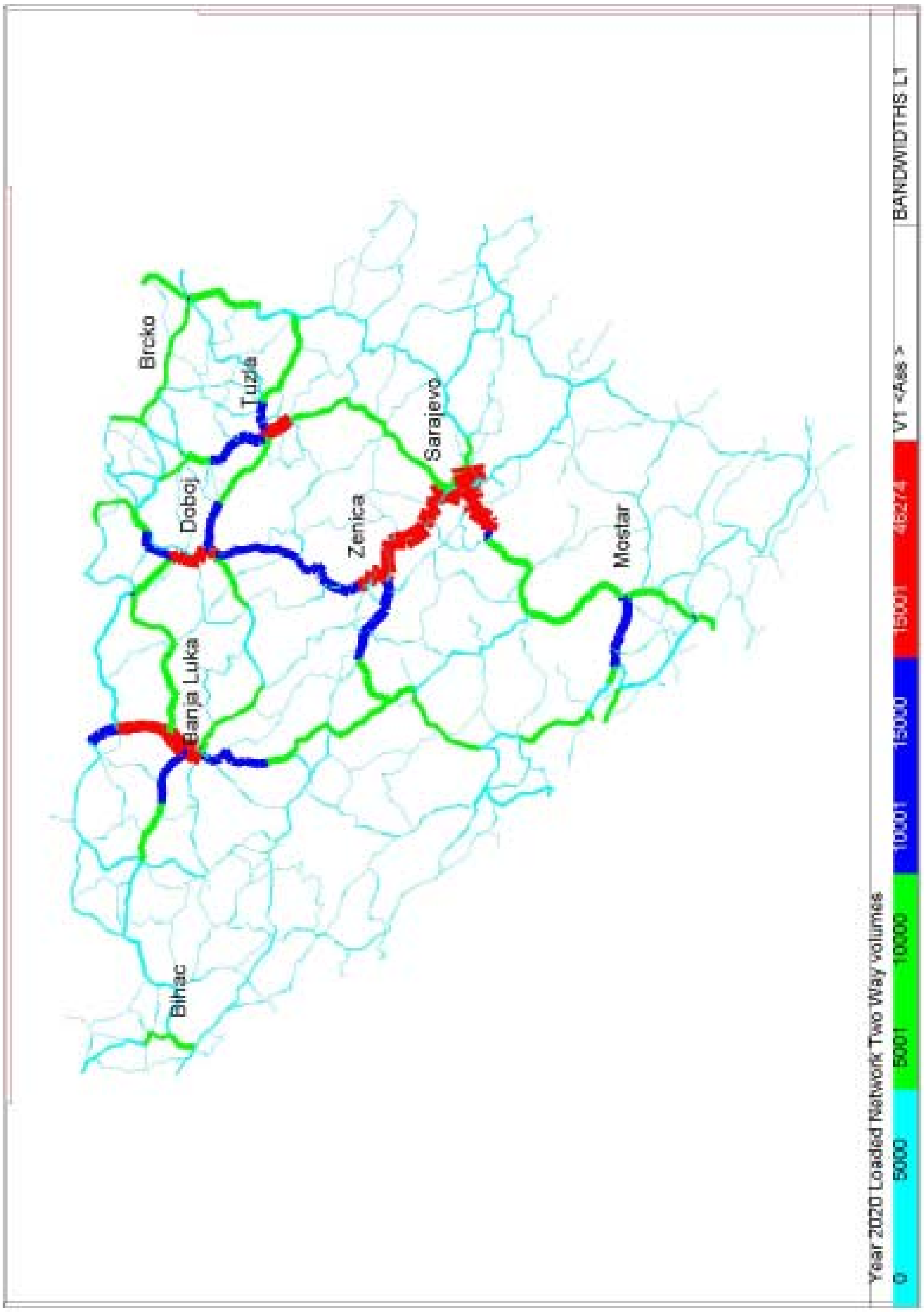


Figure 2.1.19 Assignment of Year 2020 Total Daily Vehicle Trips onto Committed Network: Base Case Economic Growth Scenario

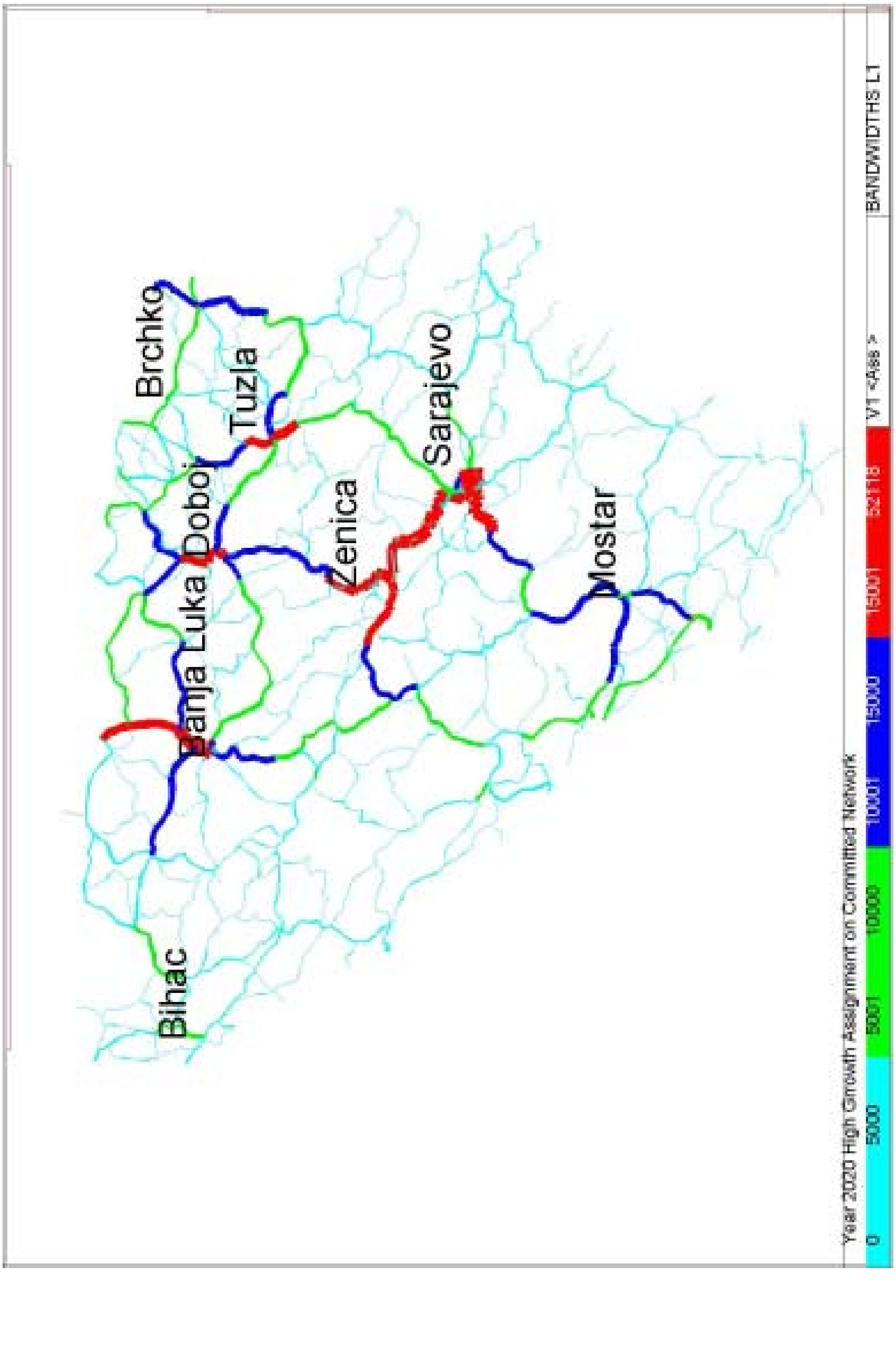


Figure 2.1.20 Assignment of Year 2020 Total Daily Vehicle Trips onto Committed Network: High Economic Growth Scenario

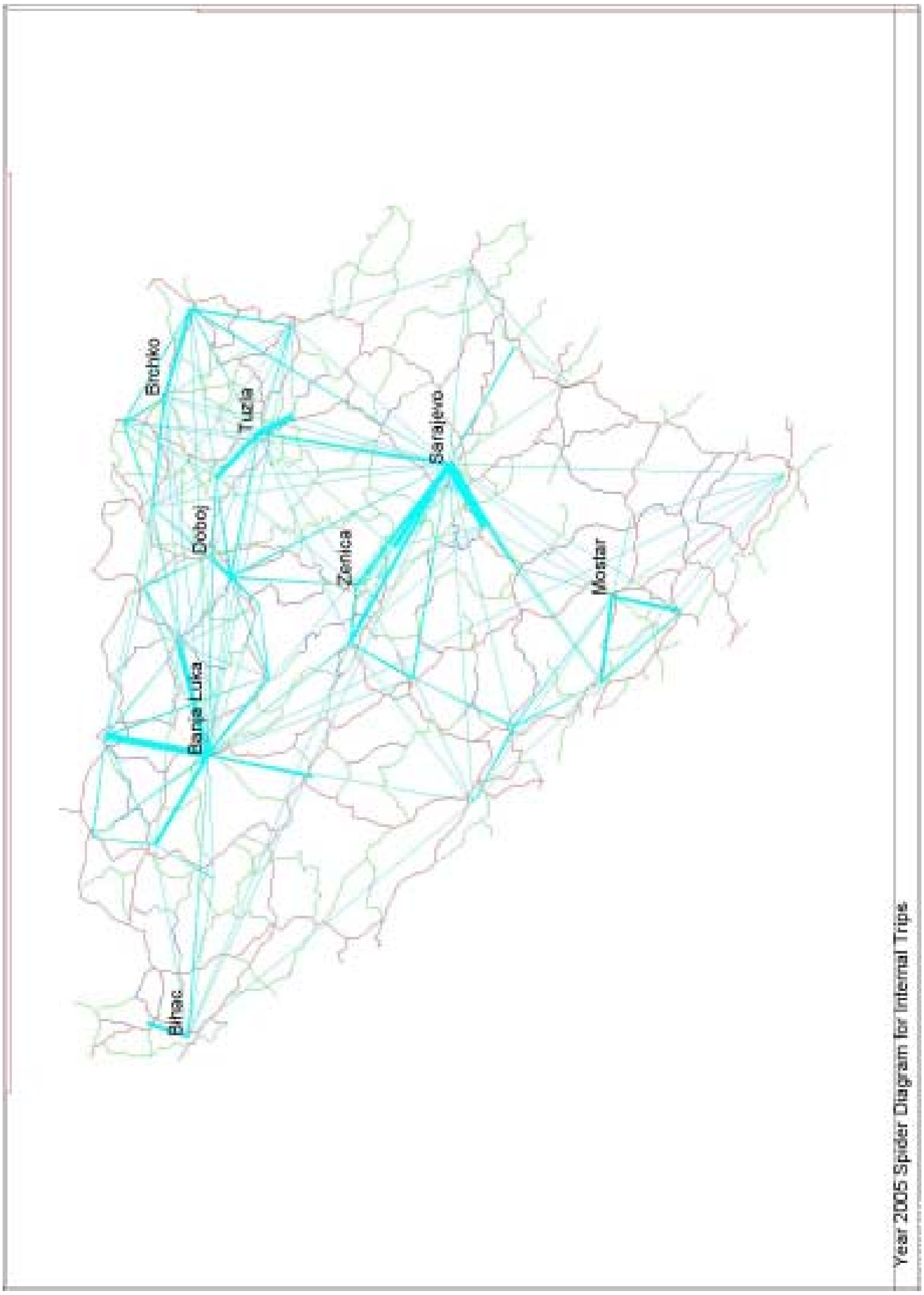


Figure 2.1.21 Demand Line Diagram Year 2005 Internal Vehicle Trips: Base Case Economic Growth Scenario

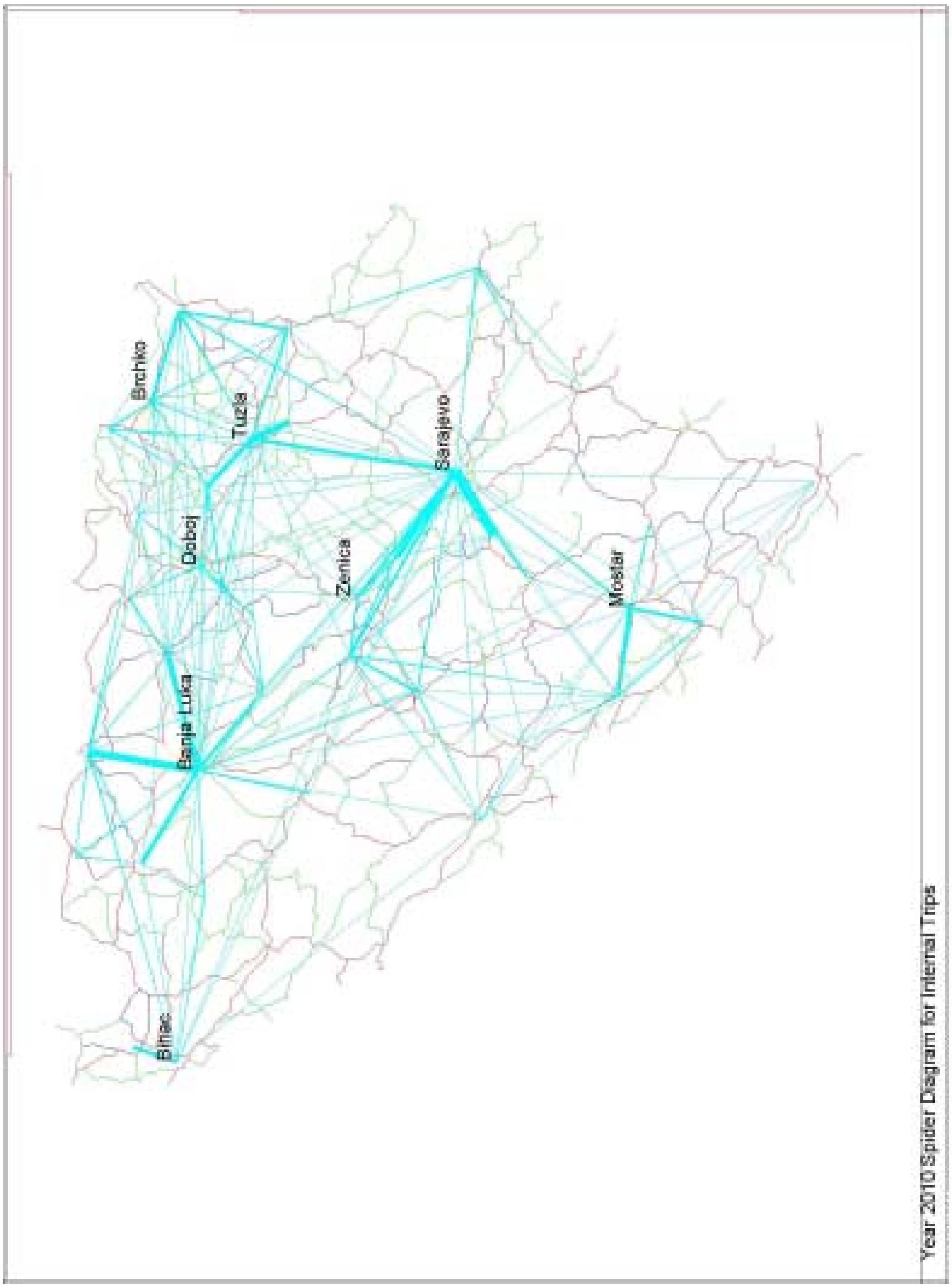


Figure 2.1.22 Demand Line Diagram Year 2010 Internal Vehicle Trips: Base Case Economic Growth Scenario

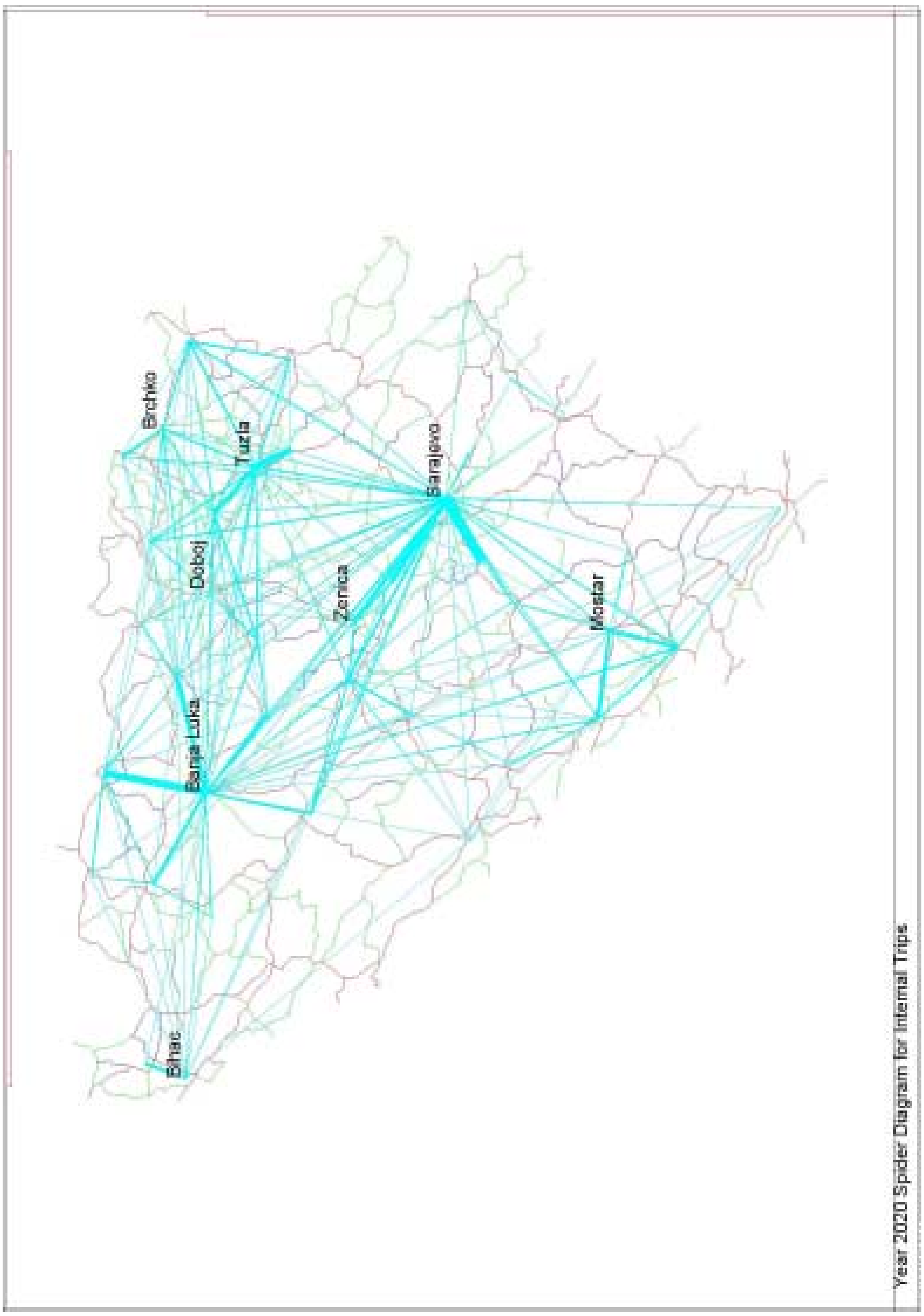


Figure 2.1.23 Demand Line Diagram Year 2020 Internal Vehicle Trips: Base Case Economic Growth Scenario

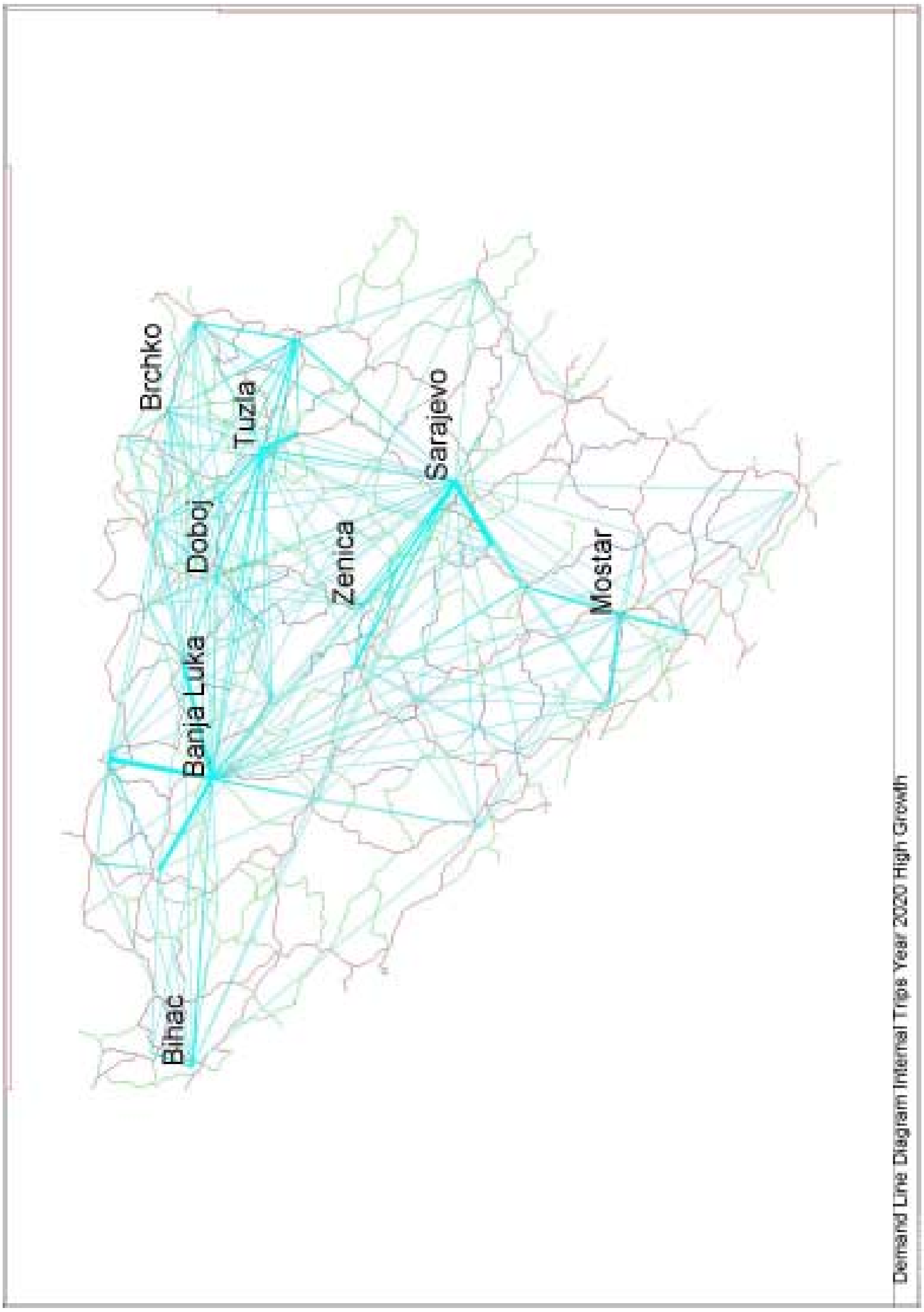


Figure 2.1.24 Demand Line Diagram Year 2020 Internal Vehicle Trips: High Economic Growth Scenario

2.1.11 Deficiency Analysis

In the last section, network volumes from the years 2005 to 2020 were presented as network plots. This traffic volume alone does not necessarily imply a need for a new road. The traffic volume can be high and the road will still perform its designated function provided that the capacity is adequate.

The volume to capacity (v/c) ratio is plotted for each year including the 2020 high economic growth case in Figures 2.1.25 through 2.1.28. Once the volume to capacity ratio has increased beyond 0.8, significant delays are likely on the road. Beyond a v/c ratio of 1.1, there is a complete breakdown in traffic flow with expected long delays. Conclusions are that, under the base case economic growth scenario:

- By year 2005, congestion (V/C greater than 0.8) is evident on road links near Banja Luka, and Corridor Vc south of Sarajevo. In fact, sections of Corridor Vc south of Sarajevo are shown as having a V/C in excess of 1.1.
- By year 2010, congestion is expected to worsen in vicinity of Banja Luka, Sarajevo, and Tuzla. Critical segments (V/C > 1.1) are north of Banja Luka (beyond current terminus of four laning) and south of Sarajevo in Corridor Vc.

As expected, V/C conditions on the committed network under the year 2020 high economic growth scenario are much more critical. Considerable parts of the network are shown as having reached V/C of greater than 0.8, while critical segments (V/C > 1.1) are identified north of Banja Luka (the Gradiska corridor), Corridor Vc near Doboj, several road segments near Tuzla, segments of Corridor Vc north of Zenica, Highway 5 between Zenica and Travnik, Corridor Vc between Sarajevo and Zenica as well as most of Corridor Vc between Sarajevo and Konjic.

Under the above testing, future year vehicle trip matrixes were assigned to the committed (year 2000 existing network plus committed road improvements) road network. This can, in simplistic terms, be considered a “do nothing” scenario; that is, if the committed road network remains as at present, how will it be able to cope with growing future demand? As a result of this testing, a series of deficiencies were identified. Appropriate strategies must now be defined as to how these shortcomings may be addressed via changes in the road network (that is, the formulation of future year alternative networks), the iterative testing of those networks using the capabilities of the transport model, and the derivation of a cohesive approach toward formulating solutions.

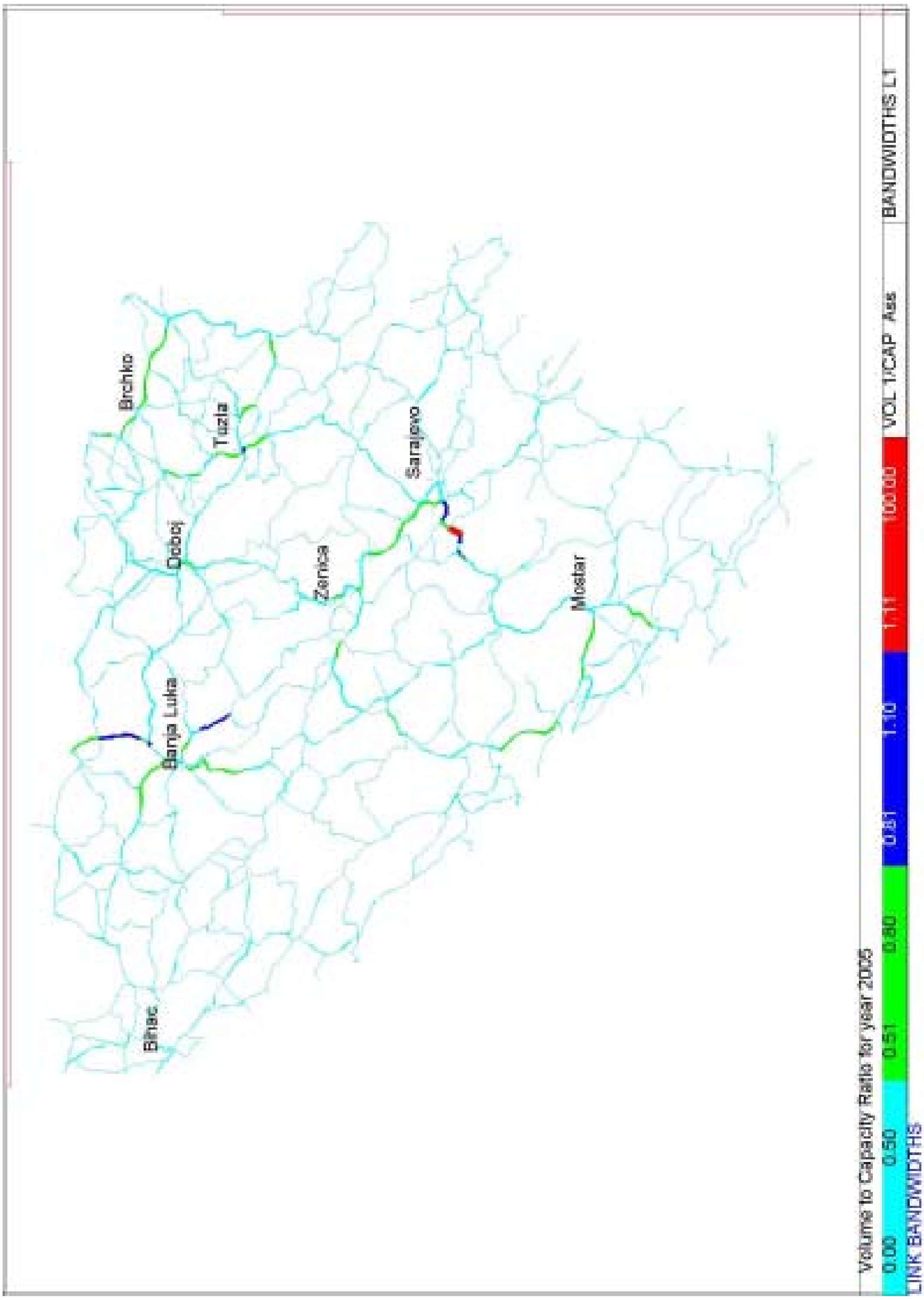


Figure 2.1.25 Volume to Capacity Ratio Year 2005 Trips on Base Year Network: Base Case Economic Growth Scenario

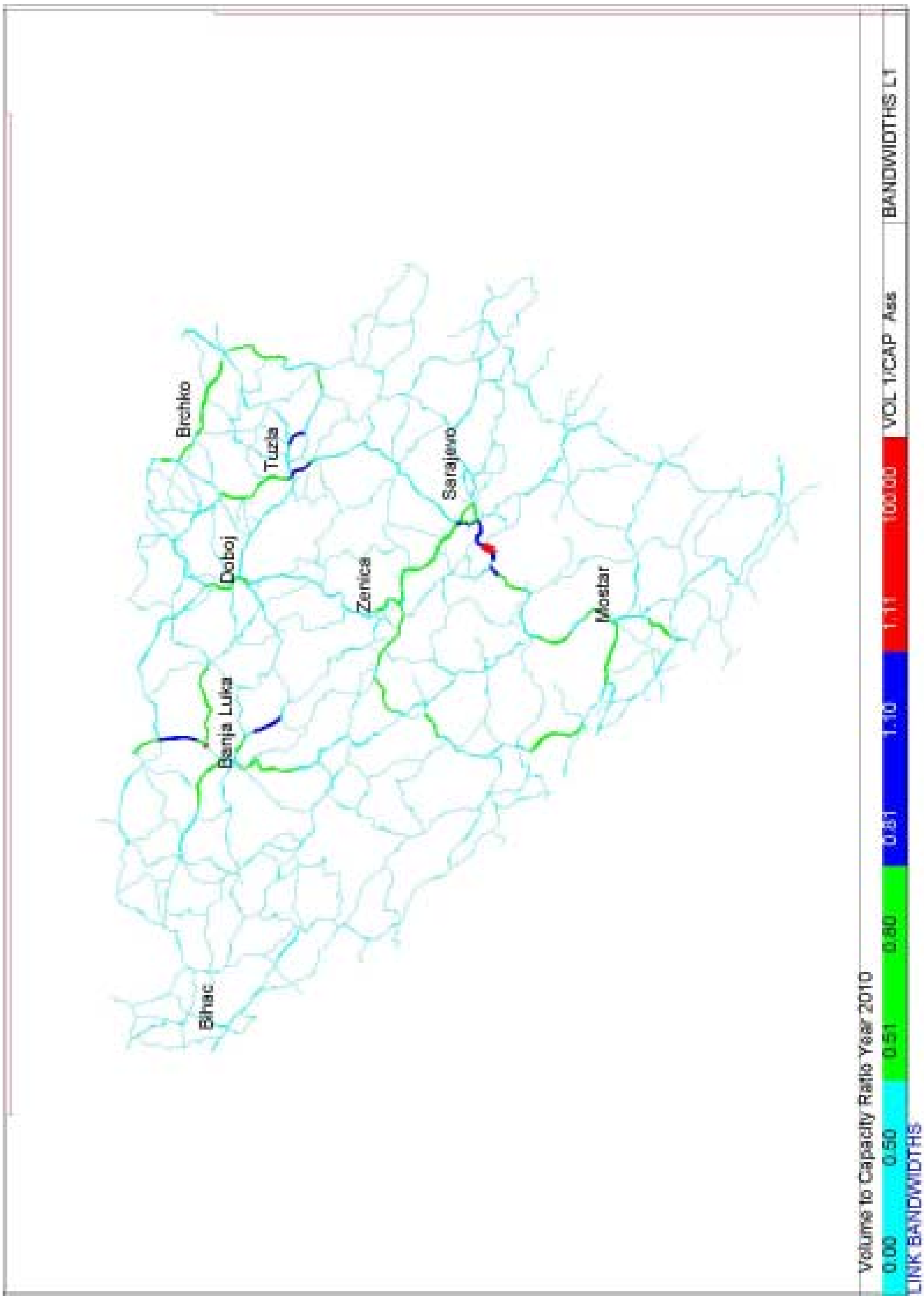


Figure 2.1.26 Volume to Capacity Ratio Year 2010 Trips on Base Year Network: Base Case Economic Growth Scenario

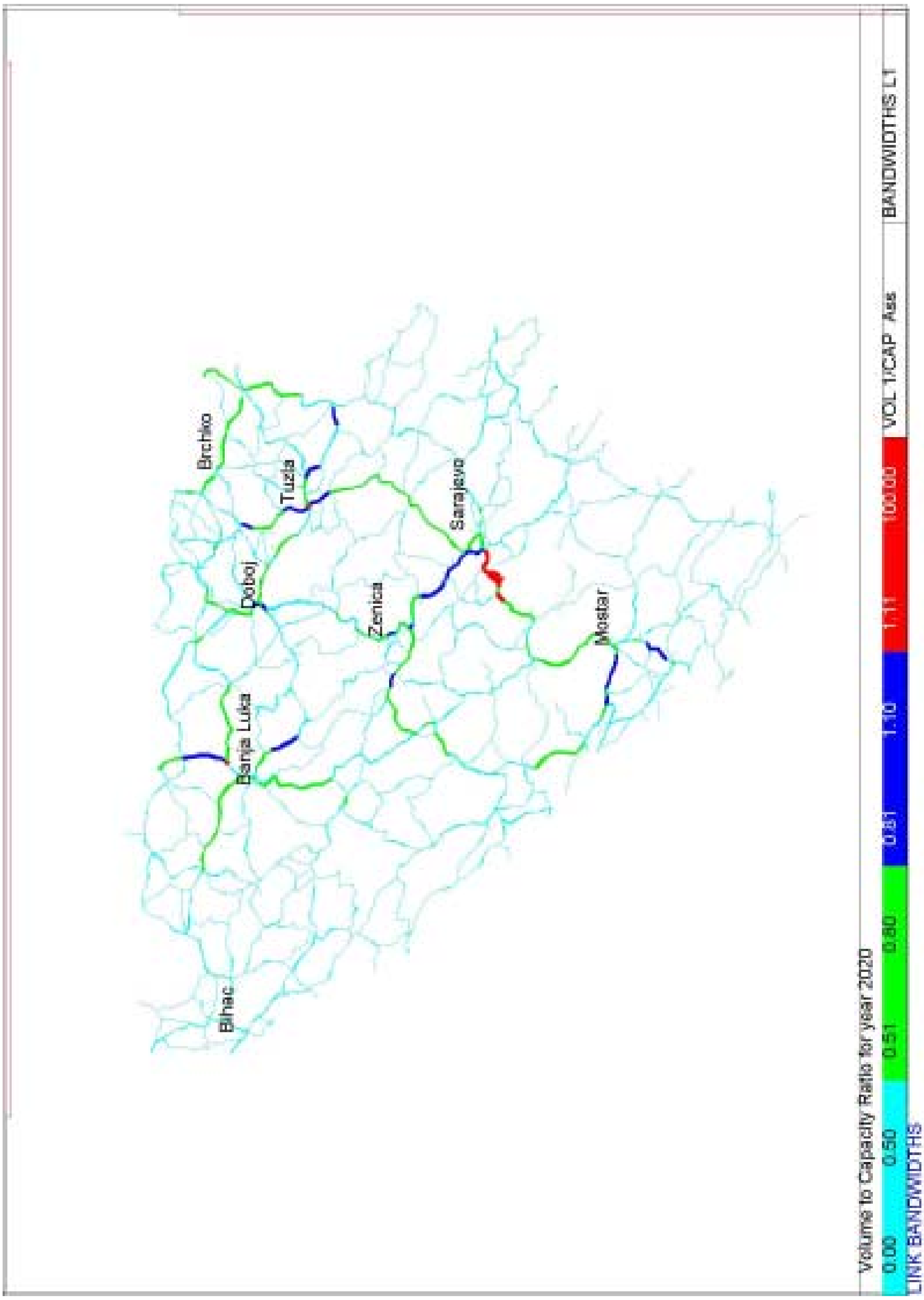


Figure 2.1.27 Volume to Capacity Ratio Year 2020 Trips on Base Year Network: Base Case Economic Growth Scenario

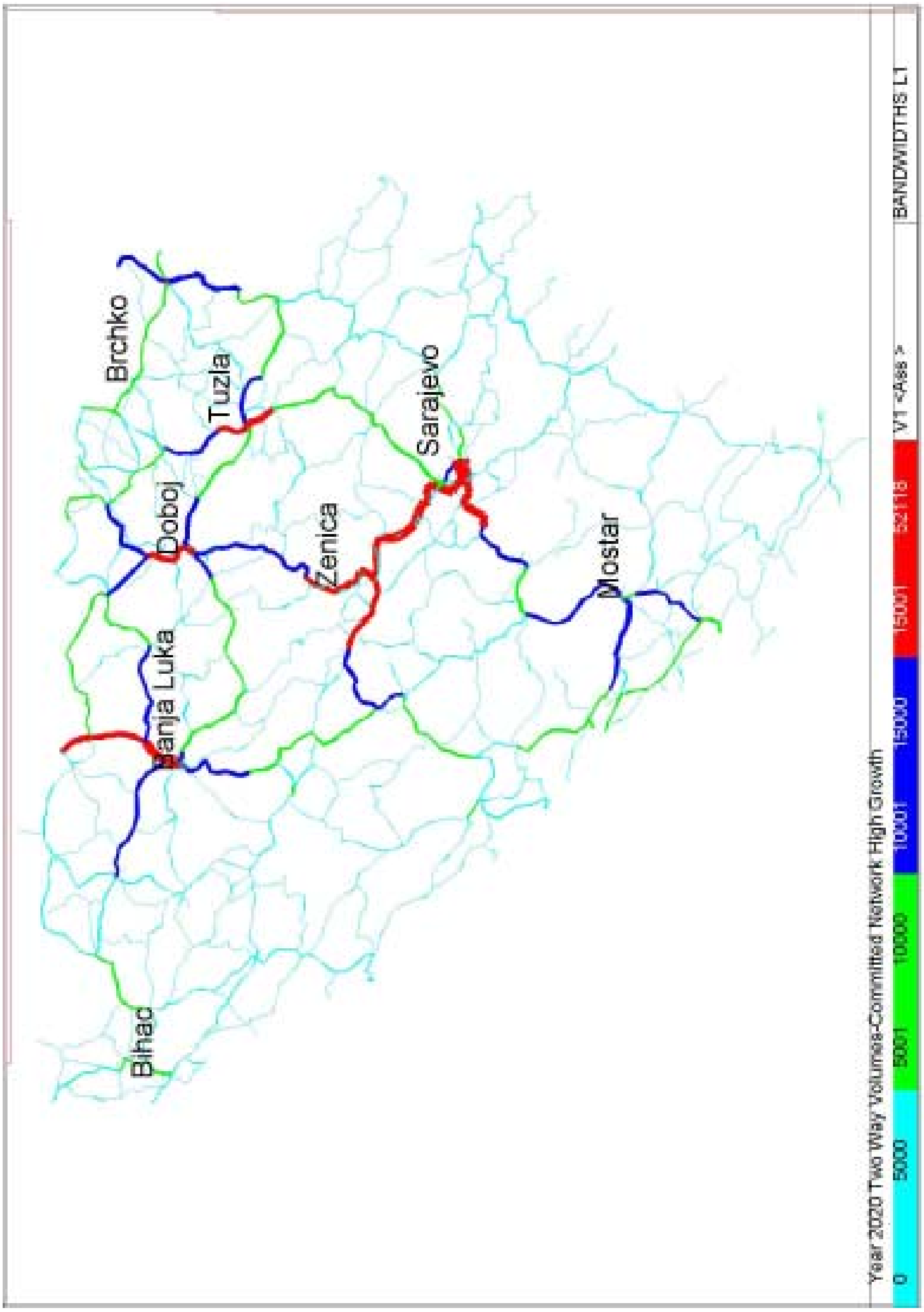


Figure 2.1.28 Volume to Capacity Ratio Year 2020 Trips on Base Year Network: High Economic Growth Scenario

2.2 ROAD INFRASTRUCTURE DEVELOPMENT PLAN

2.2.1 Current Road Network

The road network can be considered within three distinct temporal stages; that is, prior to the war, during the war, and after the war.

Prior to the war, the road system within BiH evolved as one designed to meet the need for movement within and between Republics of the former Yugoslavia. Toward that end, the *Law of Roads* classified roads into three types: main (national) roads, regional roads, and local roads. This designation is retained to the present day. The *Republic Public Funds for Roads* was the mechanism through which main and regional roads were managed. It is understood that, in an attempt to maximize paved surface, modest technical standards were at times employed, while deferred maintenance was often practiced. Road maintenance and rehabilitation efforts were focused on main roads, thus leading to more rapid deterioration of the secondary road system.

The declaration of independence of Bosnia and Herzegovina at the end of 1991 was quickly followed by an exhausting war that lasted three and one-half years. The war completely shattered the economy and left extensive human and physical devastation. Large-scale transport infrastructure damage occurred as a result of the hostilities. Transport links leading to or near confrontation lines suffered the most extensive damage; over 2,000 kilometers of the main road network were partially or totally destroyed including more than seventy major bridges. Most railway lines were rendered inoperable, public transport facilities and vehicles were damaged or run down, and civilian aviation ceased to function. Transport institutions lost premises, records, staff, funds, and, in many instances, were forcibly fragmented.

Since the end of hostilities transport improvement programs have understandably focused on the immediate alleviation of physical war damage and the re-activation of basic transport services and facilities. Toward that end, significant improvements to transport infrastructure have been achieved, mainly within the framework of the Emergency Transport Reconstruction Project[22], with support provided by various donor nations, groups, or organizations. These efforts were typically coordinated with the Ministries of Transport and Communications of each Entity, who assumed authority of main roads after the war. In case of Republika Srpska, this authority also extends over regional roads, a function fulfilled by Kantonal Ministries of Transport and Communications in the Federation of Bosnia and Herzegovina.

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[22] Refer *Bosnia and Herzegovina Emergency Transport Reconstruction Project*, authored by The World Bank, March 1996; *Bosnia and Herzegovina Second Emergency Transport Reconstruction Project*, authored by The World Bank, August, 1997 and *Bosnia and Herzegovina Emergency Transport Reconstruction Program – Roads, Bridges, Railways and Civil Aviation,* by International Management Group, October 1999 - September 2000, for further detail.

The main road network within Republika Srpska extends over 1,764 kilometers and within the Federation BiH over 2,024 kilometers[23]. Of the total 3,788 main road kilometers, some 96 percent are asphalted, however, quality varies based on the amount of accumulated deferred maintenance prior to the war, impacts of the war, type of post-war rehabilitation and unique impacts such as road usage by heavy military vehicles. The regional road network totals some 4,842 kilometers, 2,724 thereof being in the Federation of BiH, and 2,157 in Republika Srpska. The composite main and regional road network therefore extends over some 8,630 kilometers. Local roads, whose quality is often considerably below that of main and regional roads, offer an additional approximate 14,000 kilometers; thus, the BiH road net encompasses a total of near 22,600 kilometers, all road categories combined (Figure 2.2.1). With the exception of length and surface covering, there exist no records in BiH which contain up-to-date (cadastral information dates from pre-war times) and uniform information regarding road status, certainly not any systematic detail regarding surface and sub-surface conditions. Efforts have been initiated to create a database with a view toward establishing a maintenance management system; however, considerable time will likely be required to completion of efforts.

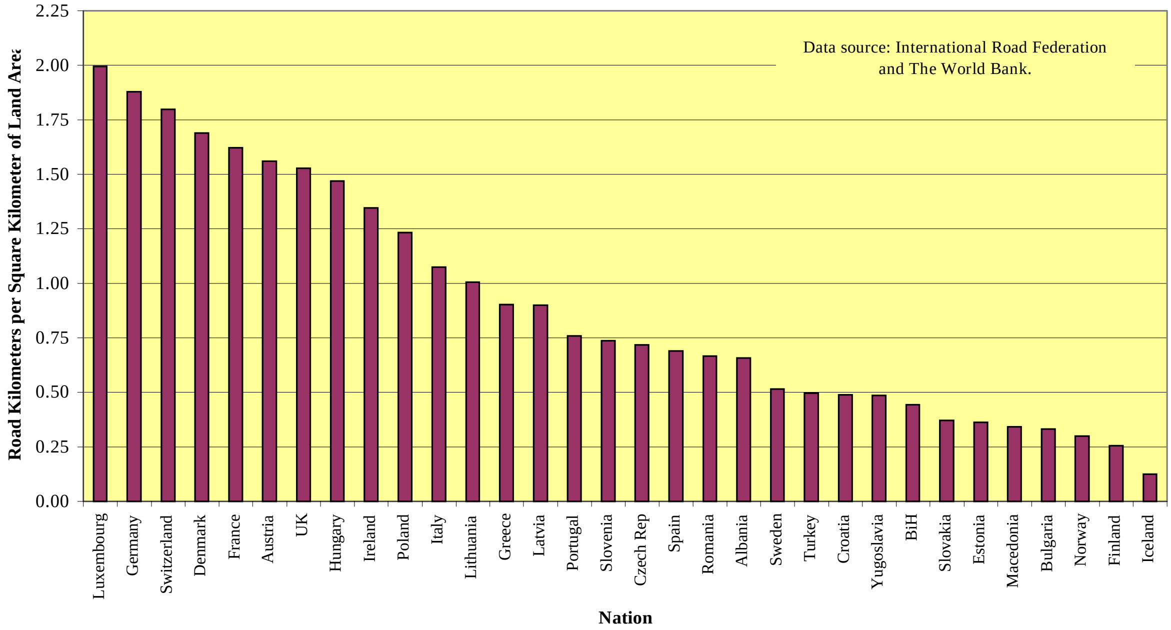
European nations, in particular those in western Europe, feature extensive road networks. Germany's network, for example, extended over almost 660,000 kilometers in 1996 including 11,300 kilometers of motorways, 41,500 kilometers of main highways and 86,800 kilometers of secondary highways. On a unit area basis, Germany achieved almost two road kilometers per square kilometer of national land area. This total is consistent with that observed in other west European nations. The BiH network extends over roughly 22,600 kilometers, although much of this (including bridges) is still impacted by war damages. On a comparative basis, the resultant 0.43 road kilometers per square kilometer of land area is similar to road supply noted in Yugoslavia, Croatia, and Macedonia FYR (Figure 2.2.2).

Six European (E) roads pass through BiH which offer continuation to both the Federal Republic of Yugoslavia and Republic of Croatia. These roads (E-59, E-65, E-73, E-661, E-761, E-762) extend over 995 kilometers and are superimposed upon, and conform to design standards of, the main road network. An important north-south corridor in BiH is formed by Pan European Corridor Vc, whose designation was adopted at the Third Pan European Transport Conference in Helsinki, 1997. Corridor Vc, the only Pan European Corridor located within BiH, links Budapest, Hungary; Osijek, Croatia; major cities in BiH (Doboj, Zenica, Sarajevo, Mostar) and Port Ploce, Croatia. A direct intersection with east-west Pan European Corridor X is also made in Croatia, just north of the Sava River. Corridor Vc is seen as a critically important transport link for BiH. To the south, Ploce Port is the country's main access point to the Adriatic Sea and maritime markets beyond. To the north, Corridor Vc offers direct access to central and eastern Europe and, perhaps more importantly, the intersection with east-west Corridor X offers multi-modal (road, rail) access to Western Europe and, direction east, direct connection with Belgrade.

[23] Source: Entity Ministries of Transport and Communications; data as of November, 1999.

Figure 2.2.1 BiH Road Network

Figure 2.2.2 Year 1996 European Road Network Coverage



Corridor X direction Western Europe features motorway-class facilities through Croatia and Slovenia to Austria. Within BiH, the multi-modal (road, rail) Corridor Vc links important cities including the country's capital, two Entities and three ethnic nations. It provides modal interchange opportunities at several points, including Sava River inland waterway

2.2.2 The Emergency Transport Reconstruction Program

Since the end of hostilities significant improvements to transport infrastructure have been achieved, mainly within the framework of the Emergency Transport Reconstruction Program (ETRP). This program was launched in 1995 within two major phases; its major focus being rehabilitation (not reconstruction or new construction) of roads, reconstruction of bridges, as well as supply of needed road construction equipment.

Through August 2000, the majority of ETRP projects (81 out of 104 pledged; 86.4 % by monetary amount) have been completed. These include 1,600 main road kilometers and 332 regional road kilometers. Additional 81 kilometers and 152 kilometers are under rehabilitation along the main and regional road networks, respectively. Approximately $92.0 million have been pledged toward that end, with largest amounts pledged during years 1996 and 1997 (Table 2.2.1).

Table 2.2.1 Status of ETRP Road Rehabilitation Projects

Item	Year					
	1996	1997	1998	1999	2000	Total
	Number of Projects					
Pledged/Financed	29	26	22	3	14	104
Completed	29	26	21	2	3	81
Ongoing	0	0	1	1	8	10
	Amount (Million US Dollars)					
Pledged/Financed	25.65	36.32	13.98	2.32	13.70	91.97
Completed	25.65	36.32	13.16	1.50	2.87	79.50
Ongoing	0.00	0.00	0.82	0.82	6.69	8.34
	Expended Funds for Completed Projects					
Percent	100.0	100.0	99.4	98.2	28.1	89.2

Source: Emergency Transport Reconstruction Program: Roads, Bridges, Railways and Civil Aviation-September 2000, op. cit. Progress through August 2000.

Principal financial contributors toward this effort have been the World Bank (48.5 percent), EBRD (15.1 percent), USAID (12.0 percent), European Commission (10.9 percent), and Japan (10.7 percent).

For road bridges, through August 2000, 48 projects out of a pledged 60 have been completed. Additional 10 projects are on-going, while financing for the reconstruction of two bridges has been provided but works not yet started. Approximately $ 83.85 million have been pledged toward that end, with largest amounts pledged during years 1996 and 1997 (Table 2.2.2). Principal financial contributors toward this effort have been the European Commission (50.9 percent), World Bank (26.8 percent), USAID (13.3 percent), and the EBRD (7.2 percent).

Table 2.2.2 Status of ETRP Road Bridge Reconstruction Projects

Item	Year					
	1996	1997	1998	1999	2000	Total
	Number of Projects					
Pledged/Financed	25	11	21	1	1	60
Completed	23	9	15	1	0	48
Ongoing	2	1	6	0	1	10
	Amount (Million US Dollars)					
Pledged/Financed	37.57	21.40	11.26	6.50	7.11	83.85
Completed	21.45	10.30	3.78	6.50	0.00	42.03
Ongoing	16.12	10.86	7.49	0.00	0.50	25.97
	Expended Funds for Completed Projects					
Percent	71.5	53.4	37.5	100.0	3.9	58.8

Source: Emergency Transport Reconstruction Program: Roads, Bridges, Railways and Civil Aviation-September 2000, op. cit. Progress through August 2000.

At completion of the ETRP, 1,681 main road and 484 regional road kilometers, for a total of 2,165 kilometers, will have been rehabilitated. This completes the mandate of the ETRP. On a relative basis, some 57 percent of the main road system and ten percent of regional road system will have been rehabilitated. It may be concluded that the ETRP successfully fulfilled its goal of completing the most urgent repairs on the highest-priority segments of roads in BiH. However, it is equally obvious that large parts of the network still require improvement; further, rigorous and systematic maintenance practices are needed to overcome accumulated neglect from deferred pre-war maintenance, impacts of the war itself, and growing post-war traffic volumes (particularly heavily loaded commercial vehicles). Since financing mechanisms of the Entity Governments are limited, it is clear that on-going efforts in road improvements and maintenance require the continuing strong support of the international community.

2.2.3 Road Maintenance

(1) Issues on Road Maintenance

Currently, road maintenance is organized and implemented differently in the two Entities. In the Federation of Bosnia and Herzegovina (FBiH) the administrative responsibility of main road resides in the Road Directorate of the Ministry of Transport and Communications at the Entity level, whereas that of regional roads resides in the Ministries of Transport of the ten Kantons. Each Kanton ministry has its own budgets, planning and implementation authority for regional roads in FBiH. In Republika Srpska (RS) the administrative responsibility for both main and regional roads resides solely in the Road Directorate of the Ministry of Transport at the Entity level. Regional roads are managed centrally in RS.

As the result of the ETRP projects the road and bridge conditions on main roads look fairly good. The smooth pavement surface and bridge connections have enabled decent level of road transport. The nice-looking surface conditions, however, does not necessarily mean the pavement is good enough to carry even near future heavy traffic. Since the purpose of ETRP was an urgent rehabilitation in nature, more focus was given to overlays, and the structural improvement was not well performed. It is therefore expected that many of the road sections, particularly those with more heavy vehicle routes, begin to expose structural defects in the near future. It is even more serious and dangerous for substandard bridges on the main roads since failure of bridges will cause serious accidents and traffic interruption.

This means it is indispensable to continue and strengthen rehabilitation and improvement of the road network particularly in terms of durability of the roads and bridges. In addition, deferred maintenance for road safety is causing increasing traffic accidents. The cost of these works is much more than normal maintenance works. These are particularly serious in slope protection and tunnel lighting. Proper road signs for both safety and proper guidance are also in urgent necessity.

(2) Maintenance Cost and Expenditure

The Road User Charges Study conducted by EBRD[24] (RUC Study) contains data about road maintenance cost and expenditure for both Entities of BiH. The RUC Study analyzed normative maintenance costs in BiH based on cross-country analysis as well as the present condition of BiH. In their definition in road maintenance "Cost" means a necessary amount of money for performing maintenance, whereas " Expenditure" means the actually spent money by road authorities. According to the RUC Study the expenditure on roads are estimated as in Table 2.2.3.

Table 2.2.3 Expenditure on Roads, average 1996 - 1998

Entity	Road Network	Expenditure (KM million)
Federation of BiH	Main Roads	15
	Kanton Roads	20
Republika Srpska	Main Roads	15
	Regional Roads	10

Source: The Road User Charges Study, op. cit.

On the cost side, maintenance works consist of routine maintenance (pavement repair, cleaning, grass cutting, signaling and winter maintenance) and periodic maintenance (resurfacing, etc.). The RUC Study made a distinction between fixed and variable maintenance (traffic dependent) costs, and identified that the following maintenance costs will be necessary for main and regional road network in BiH including routine and periodic maintenance.

Table 2.2.4 Fixed and Variable Maintenance Costs (KM/km/year)

Road Category	Routine Maintenance	Resurfacing		Overlays		Total Cost (Rounded)
		Periodicity	Per Year	Periodicity	Per Year	
Main (Core 3,500)	4,250	7.5	4,000	15	7,333	15,500
Regional	3,000		1,500		3,000	7,500

Source: The Road User Charges Study, op. cit.

It is understood that local authorities broadly agree on the level of this maintenance cost, given that the road condition is decent as a result of necessary rehabilitation. A substantial part of the road network in BiH still suffers from the war damage in spite of the ETRP Projects. Though the surface of the pavement has been rehabilitated in many of the main road network, the underlying structure may still be deficient. Substantial rehabilitation for structural improvement particularly for pavement and bridges will still be required in addition to these costs.

[24] Road User Charges in Bosnia Herzegovina, Emergency Transport Reconstruction Project, European Bank for Reconstruction and Development; May 2000

By quoting the costs indicated in Table 2.2.4, the estimated total maintenance cost for each entity is summarized as in Table 2.2.5. The estimated annual costs for maintenance for BiH is about KM100 million per year. This means over the 20 years, the study's planning horizon, KM2,000 million will be required for maintenance in Year 2000 monetary terms.

A comparison between "cost" and "expenditure" shows that the required maintenance cost is in the range of 1.5 to 2.0 times actual expenditure of 1996-1998. It is, however, quickly improving in Republika Srpska. The expenditures of the Road Directorate in RS are steadily increasing during the last five years. The Year 2000 budgetary plan shows the Road Directorate total expenditure will be KM50 million, which is slightly exceeding the required maintenance cost. In the Federation it is difficult to assess the budgetary framework and its yearly changes since the road administration is divided into the Entity level and the Kanton level, and it is difficult to obtain consolidated data on road maintenance.

Table 2.2.5 Estimated Maintenance Cost

Entity	Road Category	Length [1)]	Annual Maintenance Cost (KM million)
Federation of BiH	Main Roads	2,024 km	31.4
	Kanton Roads	2,724 km	20.4
	Total	4,748 km	51.8
Republika Srpska	Main Roads	1,990 km	30.8
	Regional Roads	2,157 km	16.2
	Total	4,148 km	47.0
Total BiH	Total	8,896 km	98.8

Source: JICA Study Team based on Data by the Road User Charges Study
1) Main Roads in RS includes "Other Roads": 227km designated by the local authority

2.2.4 Integration with European Highway Network

(1) European Agreement on Main International Traffic Arteries (AGR) and E-Road

The concept of E-Road, the international European-road network was formulated in 1950. The United Nations Economic Commission for Europe (UNECE) announced the Declaration of Construction of Main International Traffic Arteries on September 16, 1950, and asked to sign for the agreement. It was reorganized on November 15, 1975 when the European Agreement on Main International Arteries (AGR) was formulated, and enacted on March 15, 1983.

As the design standard for the E-Road system, the Annex II of the AGR recommends basic design parameters as in Table 2.2.6 (1) - (3). It recommends a paved or surface treated stopping lane of more than 2.5 m, and more than 3.0 m for heavy traffic sections on motorway or expressway, and surface treated shoulder of more than 0.7 m for ordinary road. The vertical clearance is recommended to be 4.5 m.

Table 2.2.6 (1) Recommended Design Standard for E-Road (Design Speed)

Motorway	80 km/h - 140 km/h
Expressway	60 km/h - 120 km/h
Ordinary Road	60 km/h - 100 km/h

Source: AGR Annex II

Table 2.2.6 (2) Recommended Design Standard for E-Road (Alignment Parameters)

Design Speed	60 km/h	80 km/h	100 km/h	120 km/h	140km/h
Min. H-Curve	120 m	240 m	425 m	650 m	1,000 m
Max. Grade	8 %	7 %	6 %	5 %	4 %
Min. Sight Distance	70 m	100 m	150 m	200 m	300 m

Source: AGR Annex II

Table 2.2.6 (3) Recommended Design Standard for E-Road (Minimum Lane Width)

Road Category	Motorway Expressway	Ordinary Road (Divided)
Lane Width	3.50 m	3.50 m
Shoulder (Special Case)	3.25 m (1.50 m)	2.50 m (1.50 m)
Median	3.00 m	3.00 m

Source: AGR Annex II

In Bosnia and Herzegovina the following six routes are clarified as E-Roads:

E-59: (Croatian Border) Izacic-Bihac-Ripac-Uzljebic
E-65: Passing through Neum
E-73: (Croatian Border) Samac-Doboj-Lasva-Sarajevo-Mostar-Doljani (Croatian Border)
E-661: (Croatian Border) Gradiska-Banja Luka-Jajce-Lasva
E-761: Bihac-Petrovac-Jajce, Sarajevo-Visegrad-Vardiste (Yugoslavian Border)
E-762: Sarajevo-Brod na Drini-Scepan Polje (Yugoslavian Border)

Among the above routes, E-59 and E-65 are basically short transition routes between Croatia and BiH. The major E-Roads in terms of network are the other four routes in the BiH context.

(2) Trans European North-South Motorway (TEM) and European Transport Corridor

Trans European Motorways (TEM) is a network of eastern European international road network in the regions from the Baltic Coast to the Adriatic and Black Sea Coasts. Nine international multimodal corridors were initially identified and agreed at the 2nd Pan-European Transport Conference of Transport Ministers in Crete in 1994. A new corridor of Corridor X (ten) through Former Yugoslavia was added in the 3rd Conference held in Helsinki in June 1997.

In the same Helsinki Conference, a branch of Corridor V was also included as **Corridor Vc**, which is the direction of Ploce-Sarajevo-Osijek-Budapest. Corridor V consists of the following routes:

Corridor V: Venice (I) - Trieste (I)/Koper (SLO) - Ljubljana (SLO) - Budapest (HU) - Uzgorod (UA) - Lviv (UA)
Branch A: Bratislava (SK) - Zilina (SK) - Kosice (SK) - Uzgorod (UA)
Branch B: Rijeka (HR) - Zagreb (HR) - Budapest (HU)
Branch C: Ploce (HR) - Sarajevo (BiH) - Osijek (HR) - Budapest (HU)

Corridor Vc coincides with E-73 in Bosnia and Herzegovina as the existing routes. However, the E-Road network specifies not only motorway or expressway level but also ordinary highways as part of their network. On the other hand, the Trans European Network aims at higher level of highway development, which eventually aims at motorway or expressway quality of road infrastructure.

Figure 2.2.3 shows the E-Road network and Corridor Vc in BiH as on the existing road network.

Figure 2.2.3 E-Roads and Corridor Vc in BiH

2.2.5 Functional Classification and Priority Corridors

(1) Assessment and Issues of the Existing Road Network in BiH

As is already discussed in Section 2.2.1, the public road system in BiH is formed under the three categories: (1) main roads; (2) regional roads; and (3) local roads. The main road network, which consists of 3,788 km in total, covers the entire BiH with basically a grid pattern. Even though it has severe topographic constraints, the network was formed to efficiently cover urban areas, local towns and villages. The regional road network is also efficiently formed to complement the main road network. Most of the main roads have paved surface, the conditions of which vary section by section due to war damages and backlog of maintenance. The regional roads still have many unpaved sections, simply because maintenance and improvement of the main roads have been allocated higher priority within the budget constraints.

The objective of the road sector master plan for future BiH road system, therefore, is not for primitive level of network construction, but for how the existing network should be utilized, improved, and strengthened to satisfy the future demand. It includes development of limited new road sections, but yet such new road sections should be considered as extended improvements of the existing links due to traffic congestions and topographic constraints.

(2) Functional Classification and Establishment of Priority Corridors

The road network classification of main, regional, and local roads is regarded as an administrative or jurisdictional classification, which focuses on responsibility of maintenance and development of the roads. In contrast, the road classification by function is the indicator of importance of roads for planning/design purposes.

The functional classification of roads typically consists of four major categories: Primary Arterial Road, Secondary Arterial Road, Collector/Distributor Road, and Local Road. As a countrywide transport master plan, BiHTMAP will put higher focus on primary arterial road network analysis.

The primary road system in BiH has two important functions. The first is to ensure the social and economic development in each of the Entities. The second is to ensure the freedom of movement of persons, goods services, and capital throughout BiH without any impedance, which is a requirement of the Constitution. These two functions must be included in both inter-entity connections and intra-entity connections. The policy to satisfy these functions must be kept in the analysis of primary road network identification.

The analysis begins with classifying urban areas into three hierarchical levels of **Primary Center**, **Administrative Center**, and **Main Border Center**. The classification is shown in Figure 2.2.4. The Primary Centers form future cores in terms of political, financial, and industrial context of BiH. Administrative Centers consist of Kanton Capitals in

FBiH or focal points of Functional Regions in RS. Main Border Centers are expected to be major border gates for interstate (international) person trips and trades from ultimate network viewpoints.

The primary arterial network was sub-divided into two categories, Primary I and Primary II for highlighting their roles and to identify efficient primary arterial system for entire BiH region. Primary Arterial I (International Routes) is defined as coinciding with the existing E-Roads and Corridor Vc designations. The criteria for functional road classification in BiHTMAP is as follows:

Primary Arterial I (International Routes)

- The highest level of international and inter-entity corridor which carries major portion of long distance trips with higher travel speed and minimum mileage attained by higher design standard and higher control of access.
- Carries major portion of international travel, as well as major portion of inter-entity travel among Primary Centers and Main Industrial Centers.
- Designated E-Roads and Corridor Vc.

Primary Arterial I

- The highest level of inter-entity and intra-entity corridor which carries major portion of long-distance trips with higher travel speed and minimum mileage attained by higher design standard and higher control of access.
- Carries major portion of inter-entity and intra-entity travel among Primary Centers, Main Industrial Centers as well as Administrative Centers and complementary international travel.

Primary Arterial II

- The primary level of inter-entity and intra-entity corridor which provides direct access to primary I corridors with relatively high design standard and control of access.
- Carries complementary inter-entity and intra-entity travel among Administrative Centers and other urban centers.

Secondary Arterial

- Interconnects and augments the primary arterial system.
- Provides services to trips of moderate length at a somewhat lower level of traffic mobility.

Table 2.2.7 shows idealized network and traffic characteristics for each functional road category.

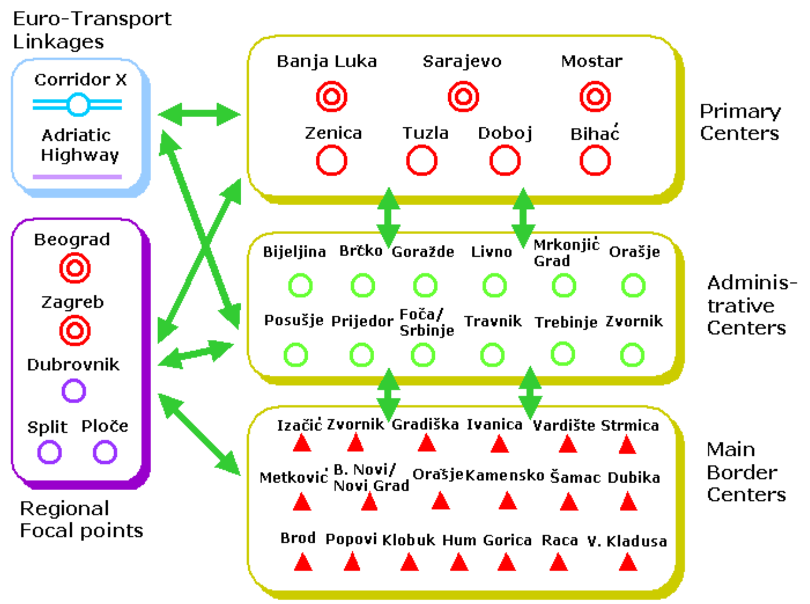


Figure 2.2.4 Hierarchy of Urban Centers

To efficiently connect the hierarchical urban centers, priority transport corridors were identified as shown in Figure 2.2.5. The thick green lines show the category of **Primary I (International Route)**, and the thinner green lines show **Primary I** category for entire BiH. Primary I (International Routes) corridors consist of three major east-west links and three major north-south links. The description of Primary I (International Route) corridors are shown in Table 2.2.8.

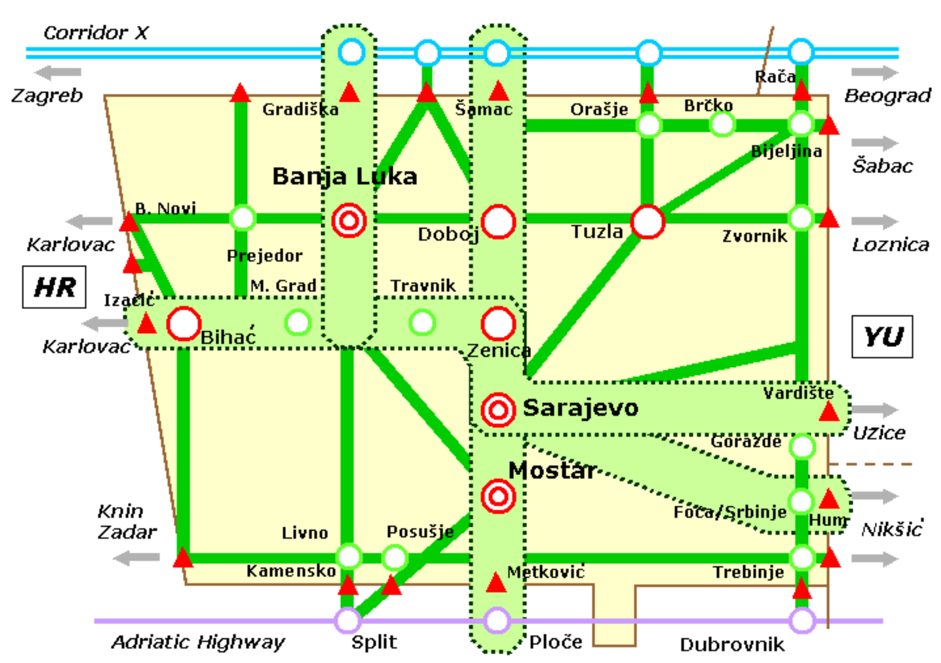


Figure 2.2.5 Priority Transport Corridors

Table 2.2.7 (1) Proposed Functional Classification Criteria (Inter-city)

Classification of Roads	Network Characteristics					Traffic Characteristics								
	Travel Activity to be Served			Administrative Classification		Trip Length			Traffic Volume			Speed		
	Primary Centers	Adminis-trative Centers	Main Border Centers	Main Road	Regional Road	Long	Medium	Short	High	Medium	Low	High	Medium	Low
Primary I (Int'l Routes)	◎	○	◎	◎		◎	○		◎	○		◎	○	
Primary I	◎	◎	◎	◎		◎	○		◎	○		◎	○	
Primary II	○	◎		◎	○	○	◎		○	◎	○	○	◎	
Secondary				○	◎		○	◎		◎	○		◎	○

Source: JICA Study Team ◎: Main Responsibility ○: Additional Responsibility

Table 2.2.7 (2) Typical Characteristics of Classified Roads (Inter-city)

<table>
<tr><th>Classification of Roads</th><th>Function</th><th>% of Total Length</th><th>% of Total Trip</th><th>Typical Design Class *</th><th>Roadside Activity & Accessibility</th></tr>
<tr><td>Primary I (Int'l Routes)</td><td rowspan="2">1. Highest Mobility
2. Limited Access</td><td>3 - 5 %</td><td rowspan="2">30 - 40 %</td><td rowspan="2">Class 1 - 2</td><td rowspan="2">Highly Controlled</td></tr>
<tr><td>Primary I</td><td>5 - 10 %</td></tr>
<tr><td>Primary II</td><td>1. High Mobility
2. Controlled Access</td><td>5 - 10 %</td><td>20 - 30 %</td><td>Class 2 - 3</td><td>Controlled</td></tr>
<tr><td>Secondary</td><td>1. Medium Mobility
2. Medium Access</td><td>10 - 20 %</td><td>15 - 20 %</td><td>Class 3 - 4</td><td>Partly Controlled</td></tr>
</table>

Source: JICA Study Team * By Former-Yugoslavian Road Design Standard

Table 2.2.8 Primary I (International Routes) Corridors

No.	Corridor	Major Cities on the Corridor	International Network	
			Corridor Vc	E-Road
East-West Corridor				
E-761	Izacic - Vardiste	Bihac, M. Grad, Travnik, Sarajevo		○
E-762	Sarajevo - Hum	Sarajevo, Foca/Srbinje		○
North-South Corridor				
E-661	Gradiska - Kljuc	Banja Luka		○
E-73	Samac - Metkovic	Doboj, Zenica, Sarajevo, Mostar	○	○

Source: JICA Study Team ○: belong to the network

The description of Primary I corridors are shown in Table 2.2.9.

Table 2.2.9 Primary I Corridors

No.	Corridor	Major Cities on the Corridor	International Network	
			Corridor Vc	E-Road
East-West Corridor				
P-1	Samac - Popovi	Orasje, Brcko, Bijeljina		
P-2	B. Novi - Zvornik	Prejedor, Banja Luka, Doboj, Tuzla, Zvornik		
P-3	Sarajevo - Podromanija	Sarajevo		
P-4	Strmica - Klobuk	Livno, Posusje, Capljina, Trebinje		
P-5	Jajce - Mostar	Mostar		
P-6	Gorica - Mostar	Mostar		
North-South Corridor				
P-6	B. Novi - Strmica	Bihac		
P-6’	V. Kladusa - Srbljani			
P-7	Dubica - Kljuc	Prijedor, S. Most		
P-8	Brod - Prnjavor	Brod, Derventa		
P-9	Brod - Seslija	Brod, Derventa		
P-10	Orasje - Sarajevo	Orasje, Tuzla, Sarajevo		
P-11	Bijeljina - Tuzla	Bijeljina, Tuzla		
P-12	Raca - Visocnik	Bijeljina, Zvornik, Gorazde, Foca/Srbinje, Trebinje		△

Source: JICA Study Team ○: belong to the network △: partly belong to the network

Figure 2.2.6 shows Primary I (International Routes), Primary I and Primary II corridors on the actual network. On the actual network these corridors will share some part on the existing roads. As is discussed previously, the main road network in BiH is efficiently established to satisfy the necessary functions. In the consideration of its needs and functions as well as financial constraints expected in our planning horizon, it is recommended that the corridor development follow the existing road network as much as possible. In fact, no significant detour is observed when the priority corridors are identified on the exiting network with a proper recognition of topographic constraints.

Figure 2.2.7 and Figure 2.2.8 shows the same Primary I (International Routes), Primary I and II network for each Entity with major inter-Entity connection points.

(3) Governmental Administrative Responsibility

Article III of the Constitution provides that the regulation of inter-Entity transportation is the responsibility of the state-level institutions of BiH. It also provides that all governmental functions and powers not expressly assigned in the Constitution to the state-level institutions of BiH shall be those of the Entities. In the respect of these provisions it is clear that economic development and its planning authority in the territory of each Entity remains in each Entity governments. Since road network is an important tool for the economic development, the authority in road development and maintenance is the right and responsibility of the Entities in this respect.

In this regard the Entities would have the responsibility for the establishment and implementation of the master plan. The Entity master plans, however:

- must not impede the freedom of movements between the Entities, in practical terms it means that these Entity master plans must be compatible;
- must take into account the common standards and regulations between the Entities; and
- should take into account the needs of the other Entity to sustain both economies to develop effectively.

When each Entity has its own master plan, some parts of the plan may only concern its own Entity and may have no interest to the other Entity. However, it is significant that:

- inter-Entity road transport has a strong and direct impact on the road system of both Entities;
- the Entities must comply with the rules and regulations established by the institutions of BiH as indicated above; and
- the co-ordination of policies on road network development would produce mutual economic benefit which would meet the needs of expanding economies.

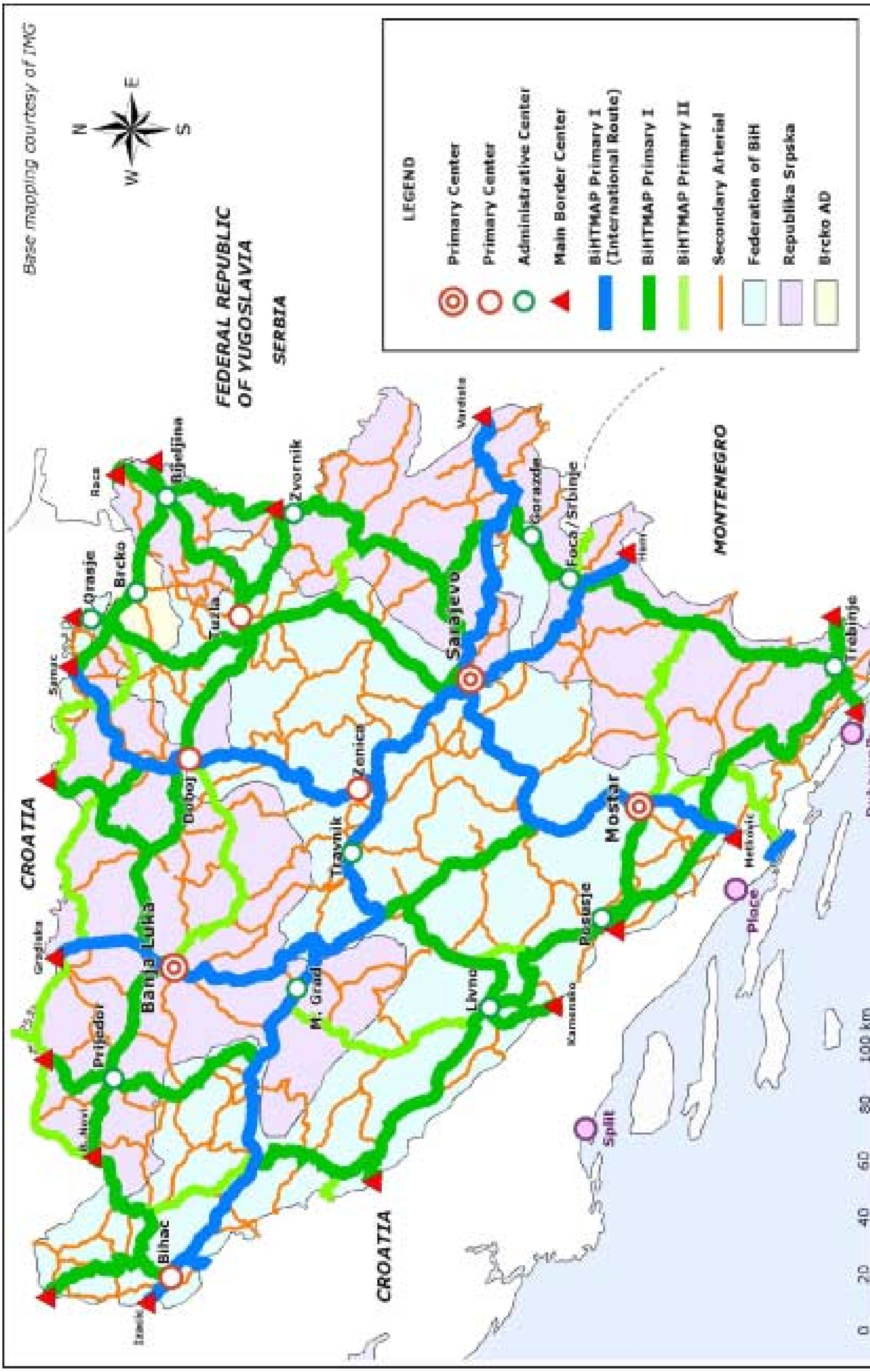


Figure 2.2.6 BiHTMAP Priority Corridors

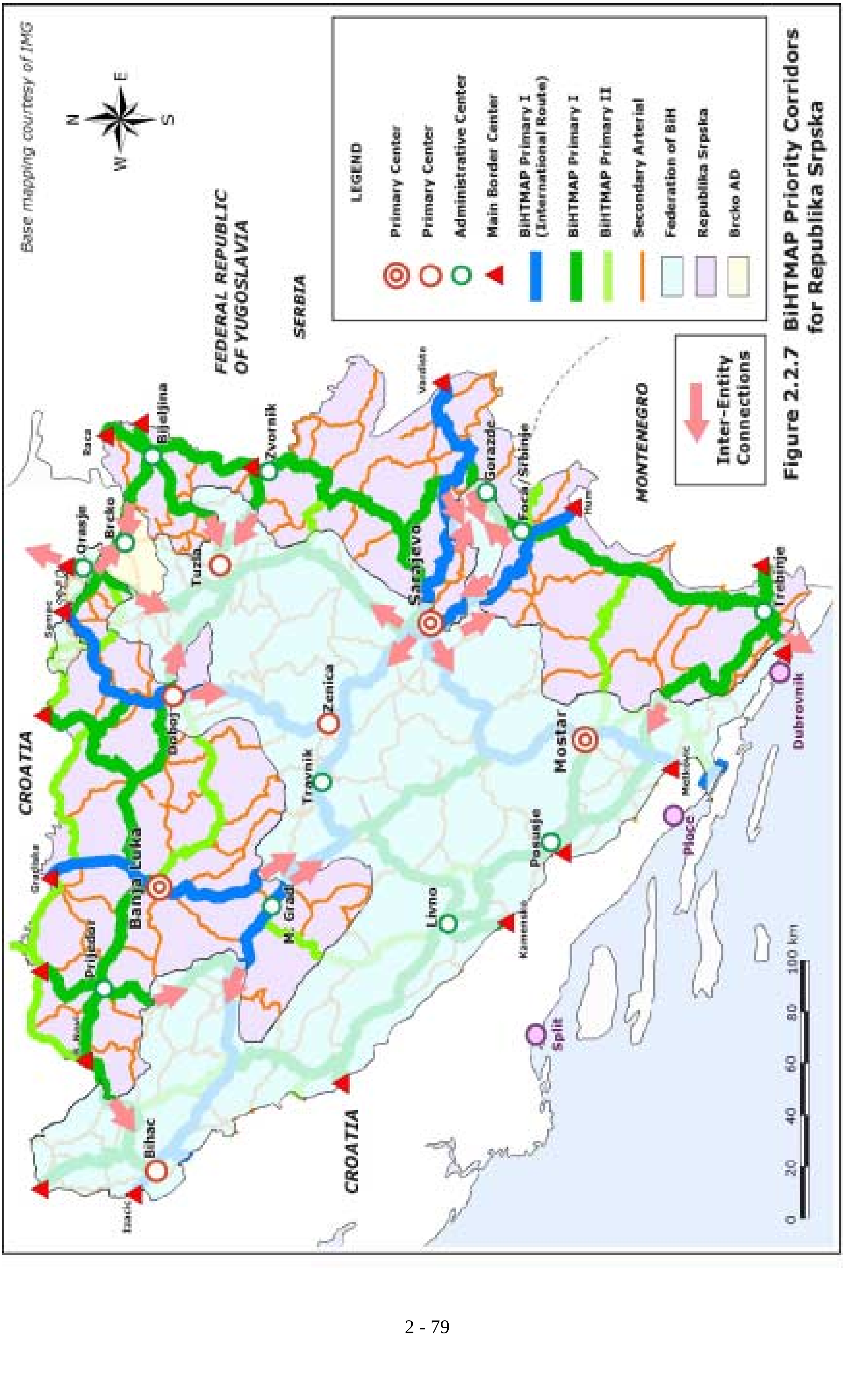


Figure 2.2.7 BiHTMAP Priority Corridors for Republika Srpska

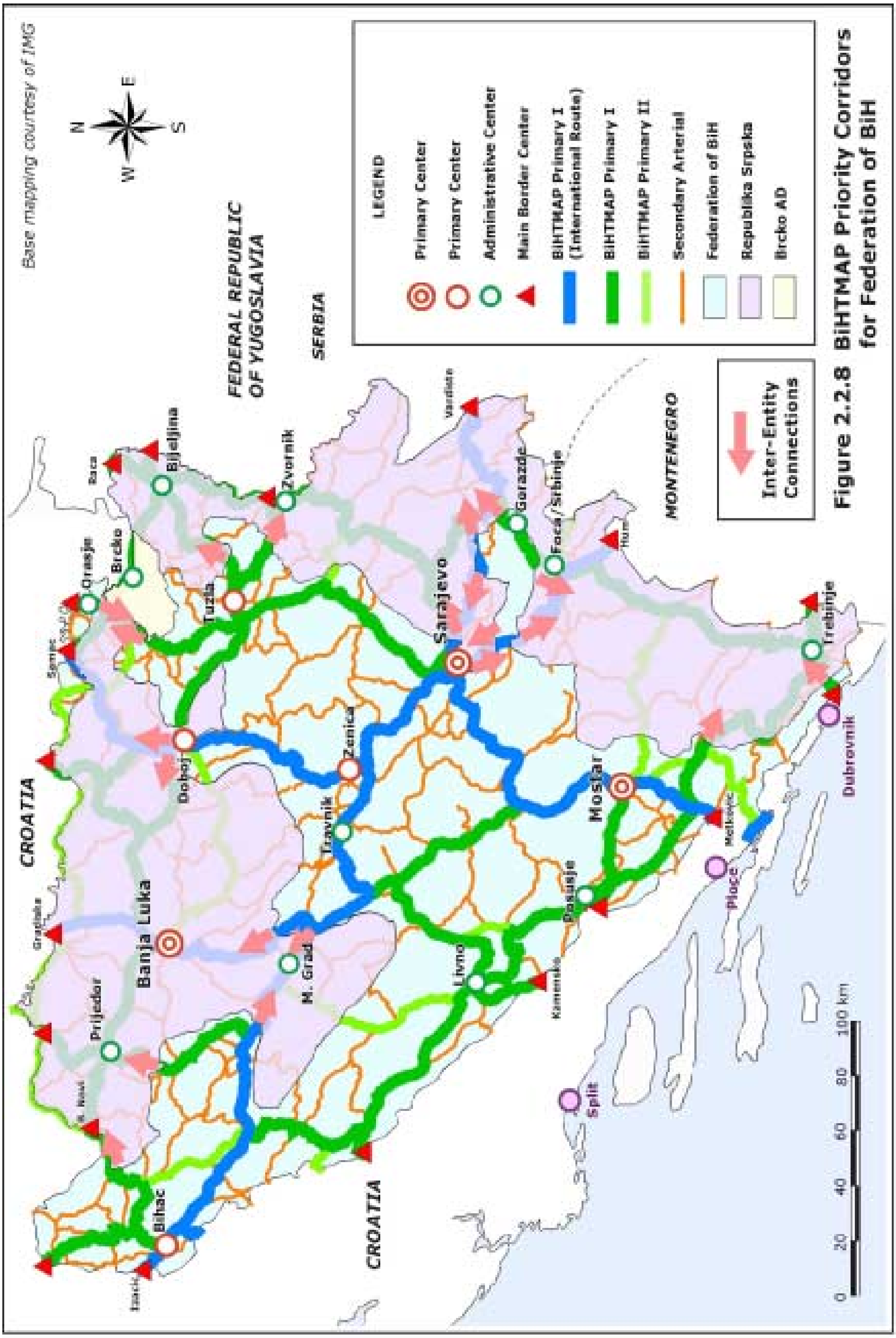


Figure 2.2.8 BiHTMAP Priority Corridors for Federation of BiH

These beneficial coordination can be achieved by exercising the responsibility of the state-level institutions of BiH, or in terms of physical infrastructure, those of the Bosnia and Herzegovina Public Corporations as agreed to in Annex 9 of the Dayton Agreement[25]. Figure 2.2.9 shows the proposed governmental administrative responsibilities for the functionally classified road system.

	Current Administrative Responsibility		Proposed Responsibility and Function				
	Main Road	Regional Road	Primary I (Int'l Routes)	Primary I	Primary II	Secondary	Border Facilities
State or Public Corp.			◎	○	○		○
Entity (RS)	◎	◎	◎	◎	◎	◎	◎
Entity (FBiH)	◎		◎	◎	◎		◎
Kanton (FBiH)		◎				◎	

Source: JICA Study Team

◎: Responsibility
○: Coordination for Inter-Entity Connections (Design Standard, Improvement Timing, etc.)

Figure 2.2.9 Current and Proposed Administrative Classifications

Table 2.2.10 shows the length of Primary I and Primary II for each responsible Entity.

Table 2.2.10 Length of Primary Arterial Network by Entity

	FBiH	RS	BR	Total
Primary I (Int'l Routes)	526 km	469 km	---	995 km
Primary I	981 km	943 km	29 km	1,953 km
Primary II	517 km	578 km	---	1,095 km
Total	2,024 km	1,990 km	29 km	4,043 km

Source: JICA Study Team

[25] Refer Chapter 5, Volume I of the Final Report for further discussion of institutional issues.

2.2.6 Road Rehabilitation and Priority

(1) Issues on Road Rehabilitation

ETRP projects have been contributing to normalization of road conditions in BiH. The rehabilitated sections are summarized in Table 2.2.11.

Table 2.2.11 ETRP Projects: Summary

	Road Rehabilitation		Bridge Rehabilitation
	Main Road	Regional Road	Road Bridges
Completed	1,600 km	332 km	48
On-going	55 km	140 km	10
Not Yet Started	26 km	12 km	2
Total	2,165 km		60

Source: Emergency Transport Reconstruction Program: Roads, Bridges, Railways and Civil Aviation-September 2000, op. cit. Progress through August 2000.

Total length of ETRP projects for roads is 2,165 km, out of which:

- 1,480 km in FBiH, and
- 685 km in RS.

One of the issues in road rehabilitation is how to implement the remaining rehabilitation works on the road. During the last five years the most urgent priority sections have been rehabilitated step by step. There are many other road sections which need rehabilitation. It is particularly true in RS if it is considered that the length of rehabilitated road sections in RS is far behind that of FBiH even if the balance of road length between the two Entities is taken into account. How to prioritize the next step of rehabilitation is an important issue.

The other issue is the durability of the rehabilitated road sections. The main purpose of the ETRP was to urgently rehabilitate the damaged roads, and the speed and length of rehabilitation was of higher importance. This resulted that the most of rehabilitation was no more than overlay and surface dressing. It means that the rehabilitated surface looks fine at this moment, but the quality of the rehabilitated road sections including bridge conditions in many sections cannot sustain future traffic volume for longer term, particularly where more number of heavy loading vehicles are expected.

(2) Proposed Rehabilitation Programs - BiHTMAP Priority Corridors

Road rehabilitation is an iterating process. Rehabilitated roads need another rehabilitation in due course of time even though they are well maintained during that period. Rehabilitation can be categorized as an extended part of road maintenance in that sense. In the present BiH context, however, stronger concerns should be put on the necessity of rehabilitation due to the damages of the roads caused by the war and backlog of maintenance.

It is highly required to continue the rehabilitation program for remaining major road sections. For prioritizing the rehabilitation projects, it is recommended that higher priority be given to the sections of **Primary I** and **Primary II** corridors which were not yet rehabilitated in the ETRP during the last five years. Figure 2.2.10 shows the completed and on-going rehabilitation sections under ETRP projects, and proposed BiHTMAP priority rehabilitation projects selected by this criterion. Figure 2.2.11 and Figure 2.2.12 show the sections for each Entity.

Table 2.2.12 summarizes the length of proposed rehabilitation sections for each Entity with estimated cost. The same level of unit cost as in ETRP was assumed for estimating the cost of the rehabilitation projects. In the ETRP projects the average cost for road and bridge rehabilitation was US$81,200/km (KM175,400/km). If it is considered that the total length of the rehabilitation sections for each period is 80 % of the ETRP projects, it is considered reasonable that these rehabilitation projects can be implemented during the next five-year period (2001 - 2005).

Table 2.2.12 BiHTMAP Priority Rehabilitation Projects

	FBiH	RS	BR	Total
Priority Rehabilitation for Primary I				
Length	543 km	702 km	---	1,768 km
Cost (KM mil.)	95.2	123.1	0.0	218.3
Priority Rehabilitation for Primary II				
Length	223 km	300 km	---	523 km
Cost (KM mil.)	39.1	52.6	0.0	91.7

Source: JICA Study Team

The remaining question is whether this rehabilitation is enough or not. As rehabilitation is an iterating process, it is quite reasonable to assume the rehabilitated road sections will deteriorate in due course of time. The level of deterioration, which determines the necessity of the "next rehabilitation," will highly depend on the traffic volume on the road section. As it will be discussed in Section 2.2.6, the strategy of BiHTMAP is to properly guide the major portion of vehicle trips on Primary I corridor. If it is successfully achieved, the necessity of the iterating process can be concentrated on Primary I network, given that the remaining primary arterial and secondary arterials will be maintained properly.

The life cycle of rehabilitation highly depends on traffic volume; however, very roughly speaking it can be assumed that about 7 to 8 years is a life cycle for one rehabilitation to survive on the highest level of primary arterial corridors. This means in the next 15 years (2006 - 2020) after ETRP and the priority rehabilitation for Primary I have achieved, the additional two-time rehabilitation will be necessary on average for Primary I corridors.

This "next rehabilitation" is estimated and shown in Table 2.2.13. The length of roads for rehabilitation is the total length of Primary I minus the length of "Selected Improvements," which is a separate road quality improvement proposed in the following Section 2.2.7 (2).

Table 2.2.13 The "Next Rehabilitation" (2006 - 2020)

	FBiH	RS	BR	Total
Total Length (Primary I)	1,462 km	1,412 km	29 km	2,903 km
BiHTMAP Selected Improvements 1)	84 km	280 km	29 km	393 km
Length for Rehabilitation	1,378 km	1,132 km	0 km	2,510 km
Cost (KM mil.) 2)	483.4	397.1	0.0	880.5

Source: JICA Study Team
Note: 1) Refer to Table 2.2.17 for details.
2) Two-time rehabilitation cost for the designated road length during 2006 - 2020

(3) Proposed Rehabilitation Programs - Secondary Arterial Roads

In addition to these priority rehabilitation projects, rehabilitation for secondary arterial roads must be taken into account. In the BiHTMAP road classification, the length of secondary arterial roads is mostly the same as regional roads. So the rehabilitation cost for secondary roads are based on the regional road length in prospective. Since the number of bridges are much less than that of the main roads, and the level of rehabilitation can be less than that of the main roads due to the less traffic volume characteristics of the secondary arterial, the unit cost for rehabilitation was assumed to be the half of the cost for that of the primary arterial (i.e. KM88,000/km). Table 2.2.14 shows a summary of rehabilitation costs for secondary arterial roads.

Table 2.2.14 Rehabilitation Costs for Secondary Arterial Roads

	FBiH	RS	BR	Total
Secondary Road Length	2,724 km	2,157 km	33 km	4,914 km
ETRP Length 1)	330 km	140 km	14 km	484 km
Rehabilitation Length	2,394 km	2,017 km	19 km	4,430 km
Cost (KM mil.)	210.8	177.5	1.7	390.0

Source: JICA Study Team
Note: 1) Entity proportion was estimated by JICA Study Team based on ETRP Report

(4) Rehabilitation Program and Cost - Summary

The rehabilitation program and its cost are summarized in Table 2.2.16 with the implementation schedule in Table 2.2.15 as a summary of the discussion presented in the previous sections.

Table 2.2.15 Implementation Schedule for Rehabilitation Program

Period	2001 - 2005	2006 - 2010	2011 - 2015	2016 - 2020
BiHTMAP Priority Rehabilitation Projects (Primary I + Primary II)				
The Next Rehabilitation				
Secondary Arterial Rehabilitation				

Source: JICA Study Team

Table 2.2.16 (1) Rehabilitation Cost Summary for RS

Period	2001 - 2005	2006 - 2010	2011 - 2015	2016 - 2020
BiHTMAP Priority Rehabilitation Projects (Primary I + Primary II)	175.7	---	---	---
The Next Rehabilitation	---	397.1		
Secondary Arterial Rehabilitation	177.5			
Totals for Each 5-year Period	220.2	176.7	176.7	176.7
Total (2001 - 2020)	750.3			

Source: JICA Study Team

Table 2.2.16 (2) Rehabilitation Cost Summary for FBiH

Period	2001 - 2005	2006 - 2010	2011 - 2015	2016 - 2020
BiHTMAP Priority Rehabilitation Projects (Primary I + Primary II)	134.3	---	---	---
The Next Rehabilitation	---	483.4		
Secondary Arterial Rehabilitation	210.8			
Totals for Each 5-year Period	186.9	213.8	213.8	213.8
Total (2001 - 2020)	828.5			

Source: JICA Study Team

Table 2.2.16 (3) Rehabilitation Cost Summary by Entity

	FBiH	RS	BR	Total
Rehabilitation Cost	828.5	750.3	1.7	1,580.5

Source: JICA Study Team

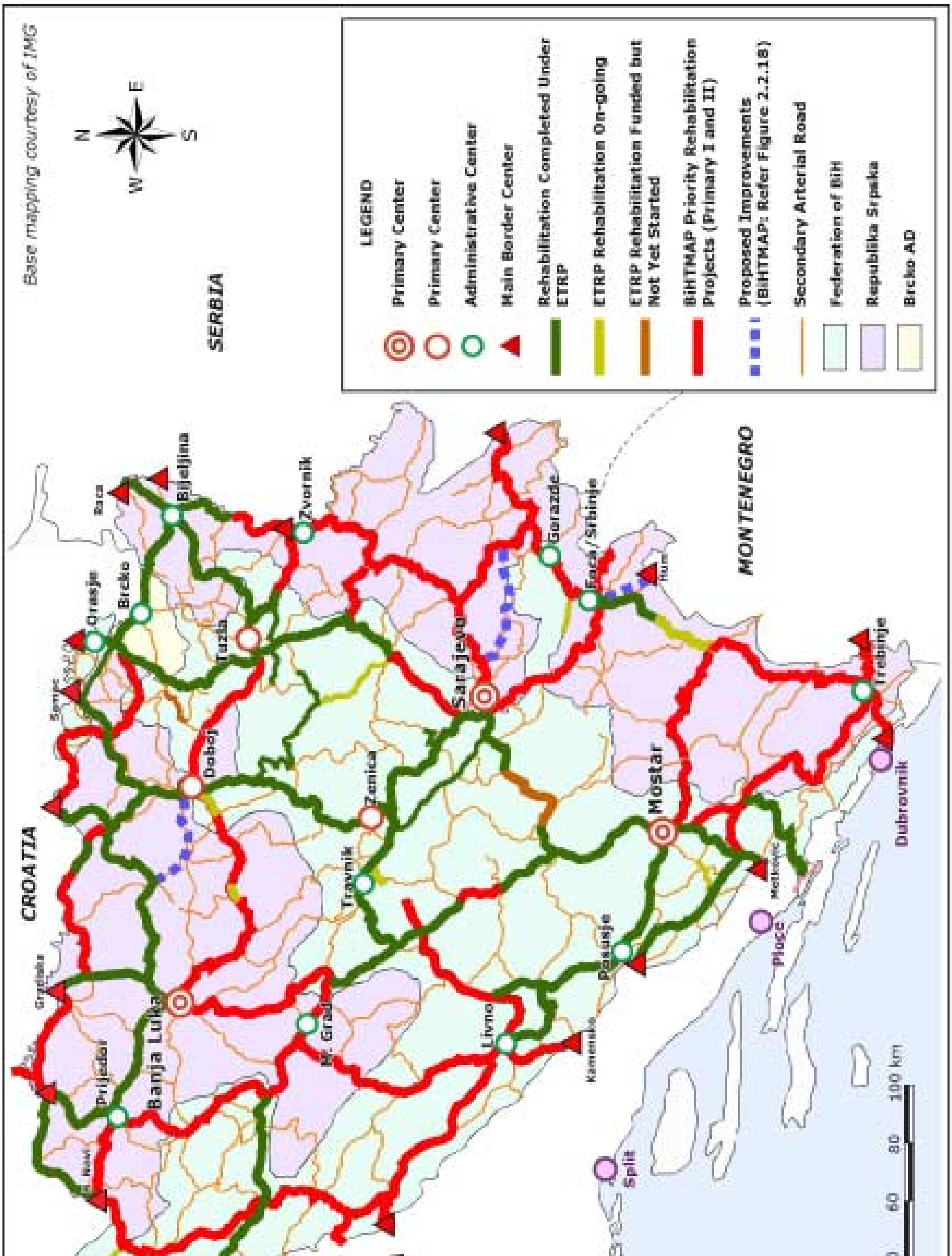


Figure 2.2.10 Proposed BiHTMAP Priority Rehabilitation Projects

Figure 2.2.11 Proposed BiHTMAP Priority Rehabilitation Projects for Republika Srpska

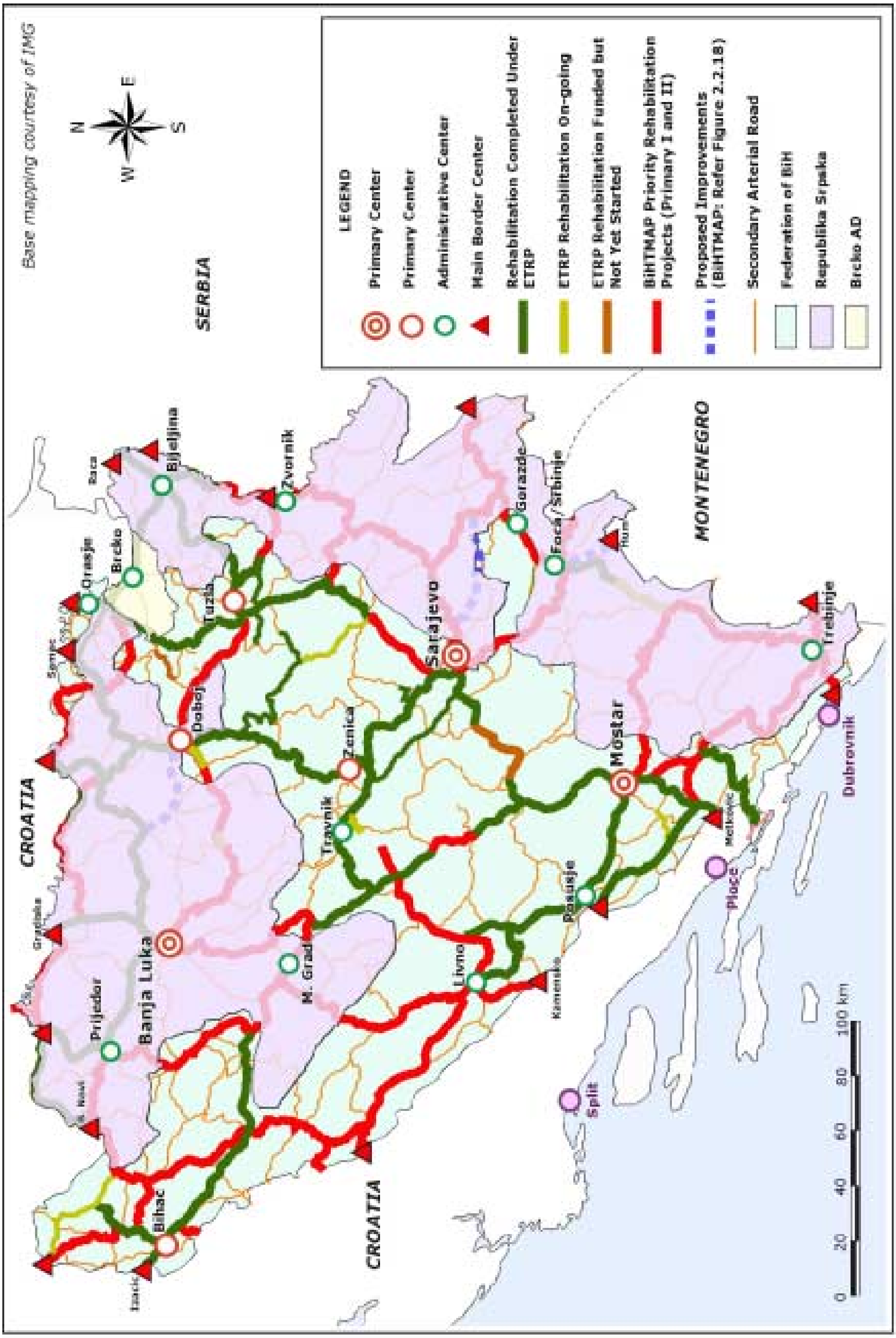


Figure 2.2.12 Proposed BiHTMAP Priority Rehabilitation Projects for Federation of BiH

2.2.7 The Year 2020 Road Network Scenarios

(1) Analysis of Future Road System

The analysis of future road system in BiHTMAP consists of ***qualitative approach*** and ***quantitative approach***. The qualitative approach is to functionally classify the arterial road network and make recommendations about its future improvements. It includes an analysis of quality of specific road links, necessity of particular rehabilitation and long-term design goals. The functional classification of the road network is also an important identification for the Entities to share the same view toward the future road system.

The quantitative approach, in simpler term, is a capacity analysis. Future traffic volume on the entire main and regional road network in BiH was forecast as a result of traffic assignment. The assignment is given in the form of Year 2020 traffic volume on Year 2000 road network, which is often called "Do-Nothing Scenario." The Do-Nothing Scenario will identify the deficiency of the existing road network. A basic approach then is to increase the capacity of the road links to satisfy the traffic demand of the planning horizon. However, there will be alternative solutions in this approach since the traffic flow can be analyzed in the simulation network model. In the real road system the traffic volume on a road link will be often affected by improvements on other competing or complementing links in the network. The strength of the study team's approach is to be able to test this network effect in the simulated network model.

As an alternative solution, Corridor Vc motorway scenario was tested. The other alternative solution is a sufficiency scenario, which is to search for a minimum investment to satisfy the traffic demand of the planning horizon. The sufficiency scenario will be a proposal of specific projects and programs, which includes proposals from qualitative analysis on the road network as well as quantitative (capacity) analysis.

(2) Deficiency Analysis with Do-Nothing Scenario

The Do-Nothing Scenario was identified in the analysis made in Section 2.1. The actual existing Year 2000 road network still has many urgent problems, such as deteriorated pavements and missing bridges due to the war damage and deferred maintenance. Most of these problems are currently under rehabilitation by the ETRP projects. In addition to the ETRP, there are a limited number of new infrastructure projects on-going or committed to be implemented. These projects are accepted as given conditions regardless of master plan recommendations, and are included as being committed in the do-nothing network. This means that the base year (Year 2000) Do-Nothing network includes all missing links. (A more detailed discussion of the committed improvements in the modeling is contained in Section 2.1.4.2)

Figure 2.2.13 shows Year 2020 total daily vehicle trips, and Figure 2.2.14 shows volume to capacity ratio in the Do-Nothing Scenario by the high economic growth scenario.

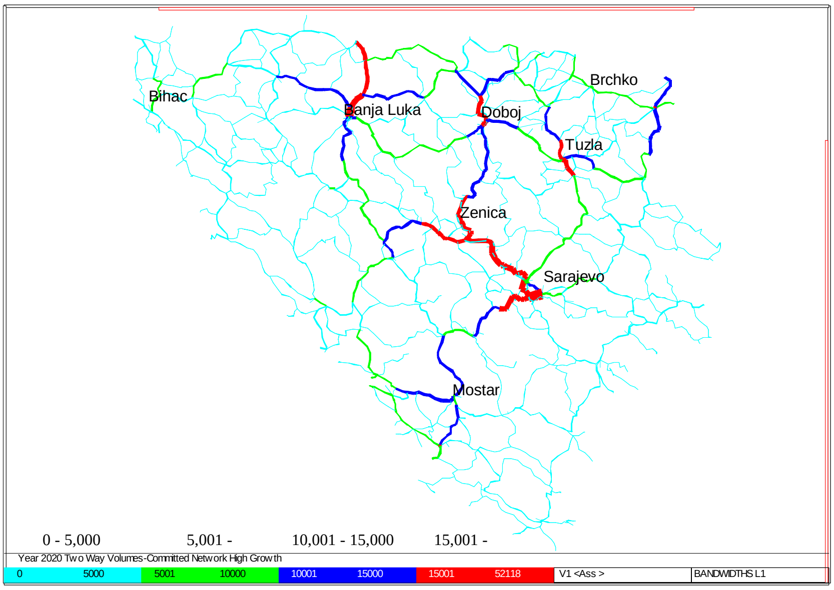


Figure 2.2.13 Year 2020 Total Daily Vehicle Trips (Do-Nothing Scenario) (High Economic Growth)

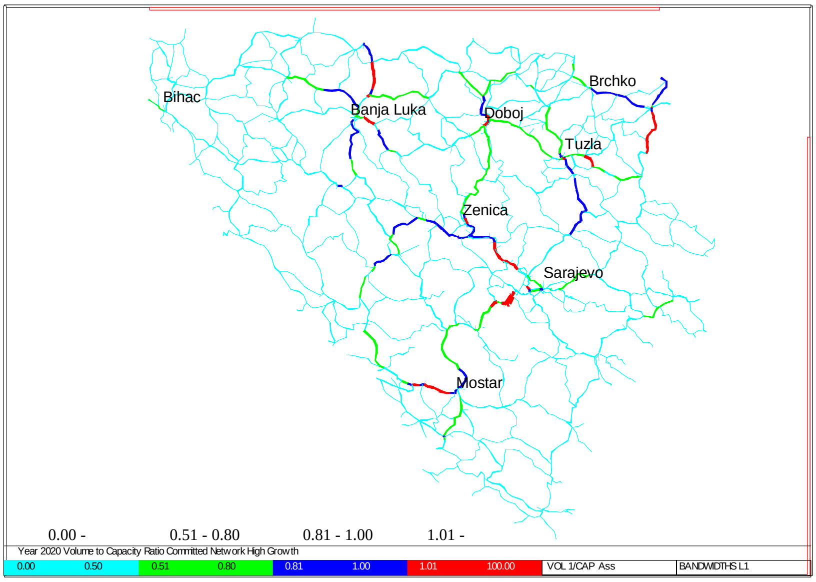


Figure 2.2.14 Year 2020 Volume to Capacity Chart (Do-Nothing Scenario) (High Economic Growth)

The analysis on Figure 2.2.13 and Figure 2.2.14 shows that the major road sections with lack of capacity are basically as follows:

- M16 (E-661): Banja Luka (Klasnice) - Gradiska
- M17 (E-73): Doboj and vicinity
- M14-1: Bijeljina - Zvornik
- M1-8, M18: Tuzla and vicinity
- M5 (E-661): Zenica (Lasva) - Travnik
- M17 (E-73): Sarajevo - Zenica

- M17 (E-73): Sarajevo - Konjc
- M6, M6-1: Mostar - Gorica (Croatian Border)

However, this does not necessarily mean all of the above sections need capacity build-up. For example, problems in some sections could be solved by properly guiding the traffic flow to other alternative routes by capacity build-up in the alternative routes. These analyses will be done in the discussion of the following alternative development scenarios.

(3) Corridor Vc Motorway Scenario[26]

Corridor Vc development is one of the highlighted potential projects in BiH since it was defined as one of the Trans European Corridors. Several studies have been conducted in the last few years, and the affordability of motorway development from Samac to Ploce has come to be one of the issues in the road sector in BiH.

As a master plan study for entire BiH, it is considered to be one of the assignments to make an analysis on the Corridor Vc motorway development. The approach is to use the traffic model, add new motorway links in the road network, and test it with future traffic assignments.

The tested motorway scenario is to develop a hypothetical four-lane divided motorway with free flow speed of 100 km/hr for the designated corridor as an additional facility to the existing highway. The designated corridor was Corridor Vc (E-73) from Samac (Northern Border to Croatia) to Metkovic (Southern Border to Croatia). Since the model can test any additional motorway scenario, an additional hypothetical branch motorway link of Zepce-Tuzla-Orasje was also tested.

The result of the assignment is shown in Figure 2.2.15. The influence of the motorway is so strong that it would divert most of the traffic from neighboring corridors. It could almost solve most of the capacity problems in central BiH without doing anything else.

The schematic alignment and Year 2020 traffic demand on the hypothetical motorway are shown in Figure 2.2.16. Two economic growth cases were tested, namely, the basic scenario and the high growth scenario. The nodes (cities) are designated for presentation purposes only; in the simulated network there are more than 20 interchanges. The volumes represent the maximum volume on motorway segments; the expected traffic volume actually varies link by link, however, inter-interchange variation is modest except near Sarajevo.

[26] The motorway concept, to include alignment, configuration and interchange locations, tested as part of the modeling effort of the current study was taken from two previous PHARE-sponsored Corridor V investigations.

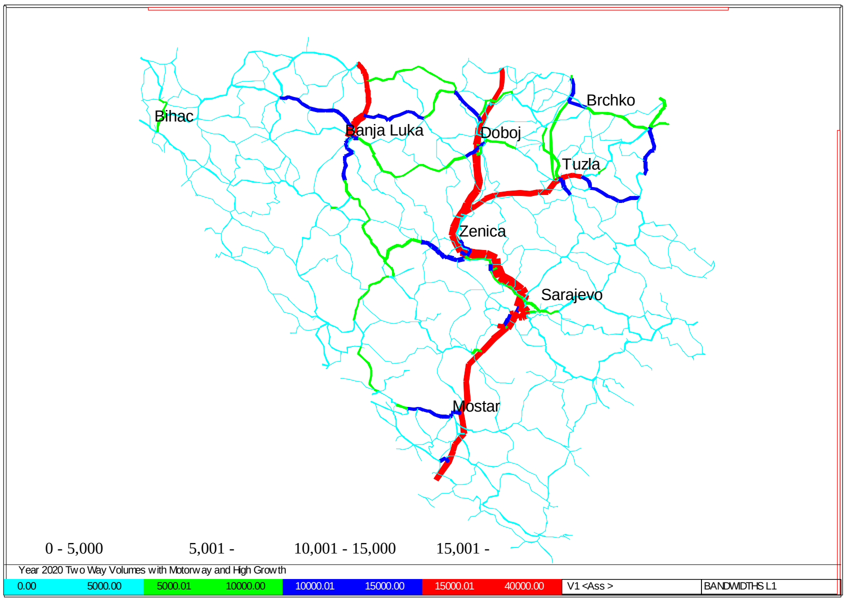


Figure 2.2.15 Year 2020 Total Daily Vehicle Trips
(Corridor Vc Motorway Scenario) (High Economic Growth)

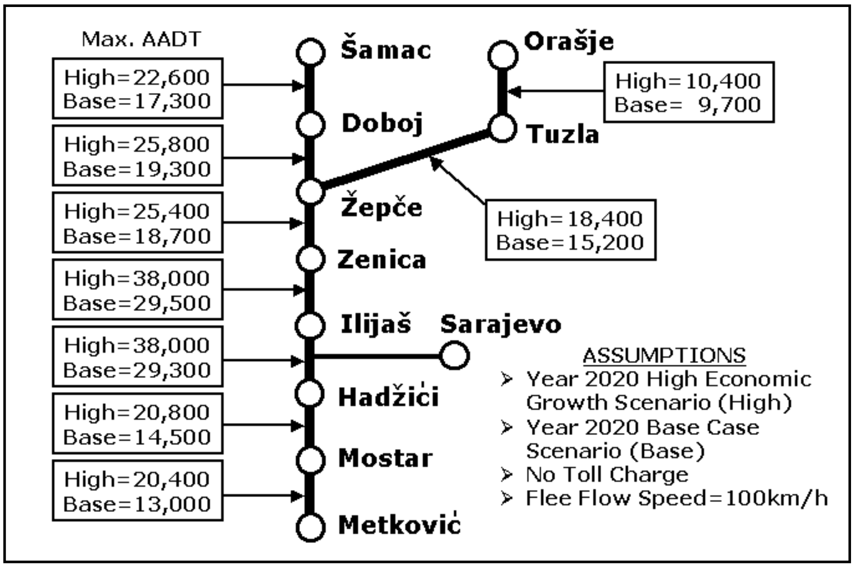


Figure 2.2.16 Expected Motorway Traffic Volume in Year 2020
(Corridor Vc Motorway Scenario) (High Economic Growth)

A comparison is made between approximate design capacity of the motorway versus the assigned traffic volume, as shown in Figure 2.2.17. The designated capacity of both motorway and four-lane rural arterial varies depending on the topography.

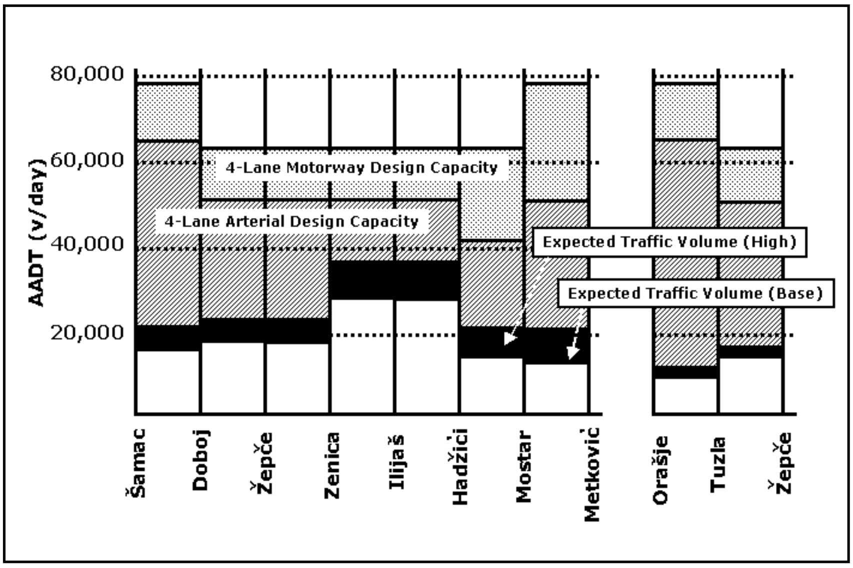


Figure 2.2.17 Volume to Capacity Comparison: Year 2020 (Corridor Vc Motorway Scenario) (High Economic Growth)

The comparison shows that the expected volumes on most of the motorway links are far less than capacity. In fact, they are even much less than the capacity of four-lane rural arterial (un-interrupted flow conditions). Also, it should be taken into account that the estimated approximate implementation costs for the motorways are roughly KM6,100 million for Samac-Metkovic, and KM1,500 million for Orasje-Zepce.

These figures show that generally it is highly unlikely that a multi-lane motorway-class facility will be required in Corridor Vc in BiH within the current study's planning horizon.

However, there is a reason to believe that the section between Zenica and Hadzici, which is actually the link between Sarajevo and Zenica, requires more detailed analysis to assess the feasibility of a motorway-class facility on this link. Firstly, it has more pronounced volumes than any other section of the assumed motorway. Secondly, it should also be considered that this section of E-73 (Sarajevo - Zenica) was constructed to a higher level of design standard, and was clearly intended to function as a motorway in future with minimal widening. This means the investment cost for improving this section to a four-lane motorway-class facility would be much less than a new motorway. At the same time, the "widened motorway" can expect even more traffic volume than that shown in Figure 2.2.17 because most of the volume left on the existing E-73 would be added together in this case, which is roughly in the range of 5,200 to 11,600 veh./day (Year 2020 High Economic Growth).

On the other hand, if the widened motorway is constructed by toll road system, the traffic volume will drop in inverse proportion to the imposed toll. Normally a toll analysis will determine the optimum toll for the best financial performance, but the traffic volume will be in any case lower than no-toll case.

2.2.8 Sufficiency Scenario with Project Proposals

(1) Sufficiency Scenario Formulating Process

A sufficiency scenario is a combination of project proposals to satisfy the traffic demand on the road network with minimum investment for capacity build-up. The analysis begins with identification of road sections with insufficient capacity under the Do-Nothing Scenario. The next step is to analyze what would be the likely solutions to ameliorate the insufficient capacity. There are basically two methods to achieve this. One is simply to build up the capacity of the road section itself. The other is to guide the overflowing traffic to other corridors. In this sense, an alternative solution may exert a larger influence on the network particularly when the alternative solution has a larger impact on capacity. For example, let us assume a road section with restricted capacity due to topographic constraints, and traffic volume at or near capacity. The problem could be solved by enhancing capacity in a competing corridor since a driver may well divert to the enhanced corridor in search of the minimum time path.

Because of its complicated causes and effects relationship, the process of searching for a sufficiency scenario is an iterative trial. After analyzing alternative solutions for insufficiency of future capacity, improvement projects on the road sections are proposed. The proposed projects are tested in the model, but the result should be analyzed carefully since it might catalyze multiple effects.

(2) BiHTMAP Project Proposals for Sufficiency Scenario

The road network assumptions for proposing new project proposals are as follows:

- Appropriate maintenance activities will be implemented by the local authorities (refer to Section 2.2.3 for discussion on maintenance);
- Reasonable pavement and bridge rehabilitation on Primary I and Primary II corridors will be implemented gradually in addition to specific projects proposed by BiHTMAP (refer to Section 2.2.6 for more discussion on rehabilitation); and
- Improvements due to committed projects are a given condition in the road network (refer to Section 2.1.4.2. for more discussion on committed improvements)

BiHTMAP project proposals consist of several categories of projects. A brief description of each category and the projects are given below. These proposed projects are shown in Figure 2.2.18, and the list of projects with responsible Entity, length, indicative costs and proposed implementation periods are shown in Table 2.2.17. It should be noted that the costs indicated in Table 2.2.17 is indicative only, and further clarification for each project will be necessary when the projects are studied or designed more in detail.

1) Selected Improvement Projects

Selected improvement projects are proposed mainly in the view of two aspects. One aspect is the fact that there are substandard road links than others on Primary I network. These are and will be more serious bottlenecks when traffic volume grows. Such link improvement is indispensable to absorb the temporarily increasing volume of vehicle trips on the arterial network. The candidate projects in this category are:

- Velika Kladusa – Srbljani Road Improvement: This road has a function of the shortest link with Karlovac and further European network westward. A major pavement improvement will be necessary for satisfying the expected needs of the road.

- Bihac – Bosanska Novi Road Improvement: This road is a part of Bihac – Banja Luka road link, but particularly in bad condition compared with other part of the link due to the severe topography and deferred maintenance. A major pavement improvement will be important to upgrade the condition of the road.

- Sanski Most – Kljuc Road Improvement: This is a poor part of Prijedor – Kljuc road link. A major pavement improvement to function as a Primary I level function will be necessary.

- Banja Luka - Doboj Road Improvement: This road link is a substandard east-west segment, and an important link to connect two major cities in Republika Srpska. However, as alternative routes for the connection exist, an alternative route study will be necessary to identify which is the best future alignment[27].

- Ljubogosta - Mesici Road Development: It was planned as a bypass for E-761 through Pale and Praca. The project was already begun before the war, but was suspended by the war. A new tunnel near Gorovici was suspended in the middle of construction and left until now. This project consists of improvement of existing road between Ljubogosta and Renovica (L = 40 km), and new road development between Renovica and Mesici (L = 20 km)

- Foca/Srbinje - Hum (Montenegrin Border): This road link is a part of the main route to Montenegro and part of primary network. However, this section is particularly in poor quality, and major pavement improvement will be necessary before trade with Montenegro will grow.

- Tarcin - Mostar Road Improvement: This is a poorest road section among Corridor Vc existing road sections due to its hilly nature of the terrain. It requires a quality

[27] Refer Chapter 7 of this volume for a more detailed discussion.

improvement for capacity and safety viewpoints. It will also sustain many important functions between Sarajevo and Mostar.

- Sarajevo – Tuzla Road Improvement: This road has a bypass function against Corridor Vc in the eastern part of BiH. However, it passes through a hilly terrain, and its road condition is poorer than it should be for its function. The local authority has already investigated the improvement possibility of this section in detail. The expected improvement plans are:

  - Srednje – Olovo (L=24km): Additional climbing lane (4 km)
  - Olovo – Kladanj (L=23km): Minor alignment improvement + Climbing lane
  - Kladanj – Djurdjevik (L=32km): Additional climbing lane (13 km)
  - Djurdjevik – Zivinice (L=4km): Pavement improvement

- Foca/Srbinje – Gacko Road Improvement: This is one of the poor sections of the major north-south link in the eastern part of BiH in terms of its expected function versus the existing condition. A major pavement improvement will be necessary.
- Stolac – Neum Road Improvement: This is a strategic road link from Stolac to the Adriatic coast of Neum, the only coast line of BiH, and the expectation for the function of this link is a country-wide interest. A major pavement improvement will be necessary.

The second aspect is the durability of the road. There are some road sections which can expect larger numbers of heavy truck traffic than other routes. These routes can be called "heavily loaded roads." The proposed improvement on these routes involves pavement and bridge durability. The candidate projects in this category are:

- Kamensko – Kupres Road Improvement: This road is a poor part of the link which has an important role of the major north-south axis in the western part of BiH, and a major connection from Banja Luka to Split through Livno and Kamensko (Border with Croatia).

- Brod - Seslija Road Improvement: New industrial developments in Brod will necessitate a sustainable road link to major cities. Considerable truck activity associated with the Brod refinery is likely.

- Zenica - Maglaj Road Improvement: This route is quickly deteriorating because of higher number of heavy vehicle traffic. It requires a major pavement improvement in near future, which should focus on heavily loaded aspects of the road.

- Samac - Brcko - Bijeljina - Raca Road Improvement: This route is strategically important from several viewpoints. First is the unique role of the city of Brcko in BiH. Second is the importance of the current connection between BiH and Yugoslavia through Bijeljina and Raca (border). Third is the sustainable function of inter-modality to connect inland waterway platforms of Samac and Brcko[28]. This improvement should be seen more as a durability improvement rather than capacity build-up because of its industrial characteristics of the traffic along this corridor.

- Bijeljina – Zvornik Road Improvement: This link shows a higher future traffic volume in the north-east part of BiH. The function of the link is expected to be particularly for the heavy truck traffic, and a pavement improvement focused on the heavily loaded aspect will be required.

- Donji Vakuf – Jajce Road Improvement: This is also a weak pavement section on one of the major truck route. The pavement improvement should focus on the accommodation of the heavy track traffic.

- Grude – Stolac Road Improvement: This is a part of Livno – Posusje – Capljina – Stolac – Trebinje link, and a heavy track traffic is particularly prominent in this section. Therefore the pavement improvement for this section should focus on the heavily loaded aspect of the road.

2) Corridor Vc Development Projects

These projects are proposed as capacity build-up within key segments of Corridor Vc, and in that sense the characteristics are the same as the New Bypass/Widening Projects. However, in view of importance of Corridor Vc vis-à-vis the Trans European Corridors, these projects are categorized separately.

- Sarajevo - Zenica Motorway Project: Capacity improvements are proposed between South Zenica and Josanica, and between Vlakovo and Tarcin. These sections will perform together with the Sarajevo Bypass Project (committed four-lane motorway-class facility between Josanica and Vlakovo). A widening to high-order four lane expressway or motorway is recommended for Zenica - Josanica section, and a new motorway-class facility is recommended between Vlakovo and Tarcin as an extension of the Sarajevo Bypass Project.

- Doboj Bypass: Existing E-73 road section passing through Doboj is expected to be congested within the current study's planning horizon. A high-order two-lane bypass facility will most probably be required. This bypass can be planned in the view of future expressway/motorway class facility and right-of-way acquisition should proceed accordingly. However, facility cross-section, whether motorway/expressway or high-order rural arterial, should be studied more in detail when the project implementation is more imminent.

- Mostar Bypass: Existing E-73 road section near Mostar is also expected to have a lack of capacity in future. A high-order two-lane bypass facility will most probably be required. The bypass should be planned in the close coordination with the

[28] Refer Chapter 5 of this volume for a more detailed discussion of the inland waterway sector plan.

Mostar-Gorica Road Improvement project, particularly for good connectivity. The actual location and alignment of the bypass need more detailed and careful study. Same as in Doboj, the design details should be finalized when implementation is imminent[29].

3) New Bypass/Widening Projects

New bypass or widening projects are proposed in the view of lack of future capacity. These are major links in primary arterial corridors, and expected to carry higher traffic volumes in the future. The current roads are all two lanes on these routes and it is proposed to widen to four-lane capacity. However, if the road is urbanized, or is expected to be urbanized, or is difficult to avoid future urbanization, new bypass construction would often be a better alternative than widening. The candidate projects in this category are:

- Banja Luka (Klasnica) - Gradiska Road Improvement: A lack of capacity on this road link necessitates a four-lane capacity in the future. However, the existing two-lane road is already highly urbanized, and widening to four lanes is considered a difficult alternative. Also, even if the four lane widening is possible, the urbanized characteristics of this road section cannot be changed. It means the side friction is very high, and it cannot carry the expected rural four lane arterial traffic capacity. It is therefore recommended that a new bypass alignment be selected for this project.

- Zivinice - Celik Road Improvement: This road section will be the busiest section between Tuzla (Zivinice) and Orasje. A four lane widening is recommended. Even if it is a future project, it is highly recommended that the right-of-way acquisition be initiated at the earliest opportunity.

- Lasva - Travnik Road Improvement: The traffic volume on this road section is expected to increase due to the generated traffic particularly in Travnik, Novi Travnik and on-going commercial development along the road. Some section of this road already shows a tendency toward urbanization, and a new bypass is considered preferable. The new bypass is recommended with right-of-way acquisition and road side land use control to be initiated at the earliest opportunity.

- Mostar - Gorica (Croatian Border) Road Improvement: This link is increasingly important as a major route from the Croatian coast (Split) to Mostar and Sarajevo, due in part to the difficulty of expanding the customs facility at Metkovic on E-73 (Corridor Vc). A combination of widening to four lanes and new bypass on this corridor is proposed, including a new link between Grude and Privalj (L = 10 km). Since the major border customs facility between Croatia and BiH in this area is provided at Gorica, this new link will be necessary to connect existing Gorica - Grude and Privalj - Mostar road links[29].

[29] Refer 5) Urban Transport Studies of this section for a more detailed discussion.

4) Secondary Road Improvement Projects

In the secondary arterial network, which consists of other main roads and regional roads, there are effective links if they are properly improved. This does not mean they are proposed to be part of the primary arterial network, but if the road has a decent pavement condition, it will work as a quite good secondary bypass in the road network. Fifteen links are identified by BiHTMAP by careful network analysis and site survey. This does not mean these are the only secondary roads to be improved. Many other secondary roads have their local needs. These projects are recommended from total BiH network viewpoints.

5) Urban Transport Studies

The focus of BiHTMAP is, as indicated previously, country-wide in nature. Thus, the ability of the study to focus on regional and/or urban issues is limited. Urban and regional transport issues should be studied separately with more focused and refined techniques as well as methodologies. For example, more detailed zone system, refined network content and approaches commensurate with local requirements. Nevertheless, some urban/regional traffic problems may be observed via the BiHTMAP transport model and, of course, in the field. Proposals to solve such problems, and address underlying issues, should be achieved via more careful studies rather than simple recommendations derived from an inter-city transport point of view. BiHTMAP recommends that separate follow-on transport studies be conducted possibly under the auspices of JICA. At time of writing, such needs can be observed particularly for Banja Luka, Tuzla, and Mostar. Independent transport studies for other urban areas should also be considered in due course of time.

Mostar Regional Transport Study

Technical reviews, coupled with extensive local liaison, have identified regional issues in the Mostar area which should be addressed via a more detail via a follow-on regional transport study. While this follow-on study is expected to formulate a scope of work that meets the needs of the local populace, the Study Team suggests that a series of issues be integrated into the work plan. These are illustrated schematically in Figure 2.2.17 (2).

BiHTMAP has noted the need for a Mostar ring road. This is composed of several segments:

- The northwest quadrant, linking roughly M-17 (north of Mostar) with M-6.1 (Mostar-Siroki Brijeg Road) west of Mostar. This segment is part of BiHTMAP project R-32, Mostar-Gorica Road Improvement which, in a broader sense, strengthens the Mostar-Split, Croatia, axis.
- The eastern half, linking M-17 (north of Mostar) with M-17 (south of Mostar) along the previously designated alignment of the Corridor Vc motorway.

- The southwest quadrant, linking roughly M-6.1 (Mostar-Siroki Brijeg Road) west of Mostar with M-17 (south of Mostar). It is understood that, at time of writing, discussions are proceeding with the EIB for financing of this project. It is further understood that site preparatory works have begun over a portion of the southwest quadrant alignment.

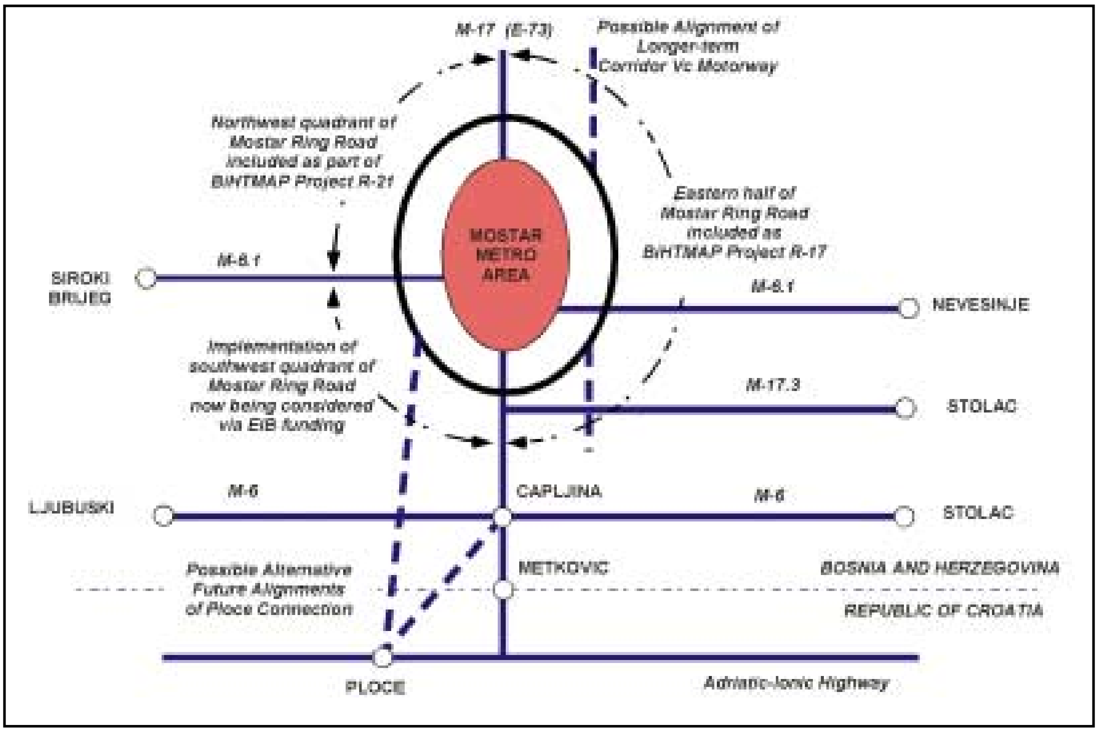


Figure 2.2.17 (2) Potential Issues for Mostar Regional Transport Study

All segments of the Mostar Ring Road are seen as initially consisting of a two-lane cross-section, with adequate right-of-way reserve to permit future upgrading to high-order multi-lane status.

The capacity of existing border facilities along M-17 (Corridor Vc) near Metkovic is limited; thus, several alternative improvement options within a corridor extending roughly from Mostar to Port Ploce, Croatia, have been proposed. These include:

- Upgrading of the existing M-17, within or near to the current alignment;
- Constructing a new road (and border facilities) along a new alignment which extends roughly north from Port Ploce and intersects the southwest quadrant of the Mostar ring road; and,
- Constructing a new road (and border facilities) along a new alignment which extends roughly north/northeast from Port Ploce and intersects M-17 vicinity of Capljina.

Other options are understood to being currently considered, including upgrading of border facilities near Gorica.

In addition to these regional issues, urban issues should be noted. These include:

- Linkages between the ring road and Mostar itself, to include bridge crossings of the Neretva River;
- Road capacity within Mostar, particularly the central business district;
- Transverse corridors of demand, such as Nevesinje-Mostar-Siroki Brijeg and Mostar-Medjugorje; and,
- Mode interchange points (such as truck and inter-city bus terminals), logically located along the ring road, which foster cargo and passenger transfers, thus minimizing the need for heavy commercial vehicles to penetrate the more historical Mostar precincts.

The resolution of these challenges will entail detailed consultations at both regional and metropolitan levels, as well as focused site investigations.

Banja Luka Transport Study

Technical reviews, coupled with extensive local liaison, have identified a series of issues which should, depending upon local requirements, be included within the analytical framework of the Transport Study. Synoptic elements are:

- Banja Luka has been thrust, over the last few years, into a traumatic post-war transition from municipality to capital city of Republika Srpska. Existing spatial planning, which dates from pre-war years, has proven totally inadequate in light of such unexpected and quantum changes. On-going and future intensification of demographic and economic patterns within the metropolitan area are likely to continue worsening this situation. An orderly growth pattern and development strategy is vital if Banja Luka is to provide a reasonable quality of life for its citizens.
- The absence of a reliable transport and land use data base, as well as reliable and up-to-date indicators of transport demand, renders effective planning for transport facilities and services practically impossible.
- A linear development pattern, coupled with severe geographic constraints posed by surrounding mountains as well as the Vrbas River, has resulted in north-south focus for traffic flow, with significant shortfalls in east-west movement corridors. Through traffic movements along major corridors must mingle with local traffic, all focused in the central business district. A bypass and/or ring road is likely needed to solve this conflict.
- An action-oriented plan which addresses traffic management schemes, including TSM (Transportation System Management), parking schemes (to include locational and tariff issues), operational optimization, and other relevant topics is urgently needed. In addition, effective strategies related to traffic safety, enforcement procedures, staff training, and public education/information dissemination are required.

- Both near and long-term strategies need to be devised for public transport services. While near term issues are likely to focus on optimization of the existing fleet, medium and longer term strategies need also to consider alternative modes, among them para-transit and light rail.

Tuzla Transport Study

Tuzla is the industrial heart of BiH. A concentration of light and heavy industries, as well as a historic evolution astride strategic multi-modal transport corridors, ensures that a follow-on Transport Study must be tailored to the unique needs of the Tuzla area.

BiHTMAP has clearly confirmed that the traffic zone in which Tuzla is located represents one of the premier generators of trips, both within BiH and to/from international destinations. Trips by heavy commercial vehicles are pronounced. As a result, the north-south corridor has been strengthened to multi-lane status (BiHTMAP Project R-30), as has linkage to Sarajevo (BiHTMAP Project R-12). Other issues remain which should, following detailed consultations with local authorities, be integrated within the framework of the Tuzla Transport Study. A partial listing of issues includes:

- Existing spatial and transport planning, which largely dates from pre-war years, has proven totally inadequate in light of recent changes. On-going and future intensification of demographic, industrial and economic patterns are likely to continue worsening this situation, particularly as the economy continues its transition toward free-market status.
- The absence of a micro-scale transport and land use data base, as well as up-to-date indicators of transport demand, renders effective planning for transport facilities and services problematic.
- An action-oriented plan which addresses traffic management schemes, including TSM (Transportation System Management), parking schemes, operational optimization, and other relevant topics is urgently needed. In addition, effective strategies related to traffic safety, enforcement procedures, staff training, and public education/information dissemination are required. Due to the proliferation of industrial trip generators in the area, any TSM strategy must be particularly sensitive to the needs of heavy commercial vehicles.
- While the industrial status of Tuzla is undeniable, other uses have historically played a prominent role and will influence transport planning. Nearby Lake Modracko, for example, has a strong history in domestic (and possibly future international) tourism, yet transport linkages remain substandard.
- The east-west road axis which bisects Tuzla (Lukavac-Tuzla-Simin Han, with onward linkage to Doboj and Bijeljina) has been shown to carry heavy traffic. It is tempting to recommend, as part of BiHTMAP, a multi-lane capacity along this corridor; however, solutions are more complex. For example, the interplay of through (inter-zonal) with local (intra-zonal trips), extensive roadside (strip) development, home-to-work commutation patterns, right-of-way availability, and

expansion/intensification of urban land uses. A more locally focused approach is required, with a likely recommendation being, among others, consideration of an urban bypass/ring road along a new alignment.

- Both near and long-term strategies need to be devised for public transport services.

The resolution of these challenges will entail detailed consultations at both regional and metropolitan levels, as well as focused site investigations.

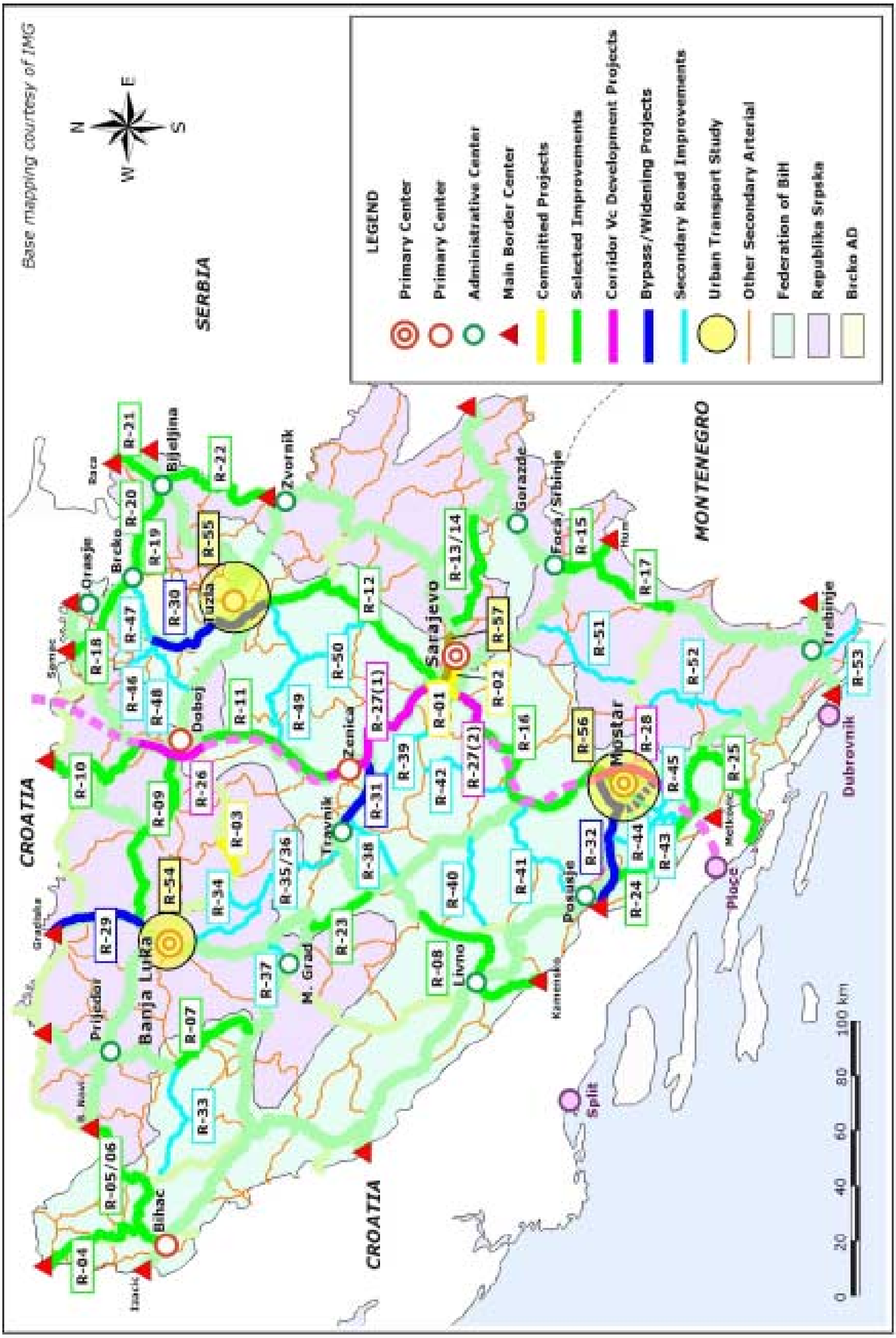


Figure 2.2.18 Project Location Map for BiHTMAP Project Proposals

Table 2.2.17 Road Infrastructure Improvement Projects

ID No.	Project Name	Description	Entity	Length	Cost * (KM mil.)	Implementation Period		
						2001-2005	2006-2010	2011-2020
Committed Projects								
R-01	Corridor Vc Sarajevo Bypass (Josanica-Vlakovo)	New Bypass	FBiH	13.6 km	** 135.0	O		
R-02	Sarajevo Bypass Access Highway (Phase II)	New Bypass	FBiH	2.3 km	** 26.7	O		
R-03	Maslovare-Pribilic Road Improvement	Improvement	RS	6 km	** 9.1	O		
Selected Improvements								
R-04	Velika Kladusa-Srbljani Road Improvement	Improvement	FBiH	45 km	18.0		O	
R-05	Bihac-B. Novi Road Improvement (FBiH)	Improvement	FBiH	51 km	35.7		O	
R-06	Bihac-B. Novi Road Improvement (RS)	Improvement	RS	17 km	11.9		O	
R-07	Sanski Most - Kljuc Road Improvement	Improvement	FBiH	32 km	12.8		O	
R-08	Heavily Loaded Road Improvement (Kamensko-Kupres)	Improvement	FBiH	81 km	56.7			O
R-09	Banja Luka-Doboj Road Development	Improvement	RS	86 km	168.7	O		
R-10	Heavily Loaded Road Improvements (B.Brod-Seslija)	Improvement	RS	50 km	35.0	O		
R-11	Heavily Loaded Road Improvements (Zenica-Maglaj)	Improvement	FBiH	53 km	37.1	O		
R-12	Sarajevo-Tuzla Road Improvement	Improvement	FBiH	98 km	102.3		O	
R-13	Ljubogosta-Mesici Road Development (RS)	Improvement	RS	54 km	187.8			O
R-14	Ljubogosta-Mesici Road Development (FBiH)	Improvement	FBiH	6 km	4.2			O
R-15	Foca/Srbinje-Hum Road Improvement	Improvement	RS	21 km	172.2		O	
R-16	Tarcin-Mostar Road Improvement	Improvement	FBiH	93 km	67.7	O		
R-17	Foca/Srbinje-Gacko Road Improvement	Improvement	RS	64 km	25.6			O
R-18	Heavily Loaded Road Improvements (Samac-Loncari)	Improvement	RS	27 km	18.9			O
R-19	Heavily Loaded Road Improvements (Loncari-Vrsani)	Improvement	BR	29 km	20.3			O
R-20	Heavily Loaded Road Improvements (Vrsani-Bijeljina)	Improvement	RS	25 km	52.7			O
R-21	Heavily Loaded Road Improvements (Bijeljina-Raca)	Improvement	RS	23 km	9.2			O
R-22	Heavily Loaded Road Improvements (Bijeljina-Zvornik)	Improvement	RS	54 km	37.8			O
R-23	Heavily Loaded Road Improvements (D. Vakuf-Jajce)	Improvement	FBiH	34 km	23.8			O
R-24	Heavily Loaded Road Improvements (Grude-Stolac)	Improvement	FBiH	69 km	48.3		O	
R-25	Stolac-Neum Road Improvement	Improvement	FBiH	51 km	20.4			O
Corridor Vc Development Projects								
R-26	Corridor Vc (Doboj Bypass)	New Bypass	RS	15 km	106.5			O
R-27(1)	Corridor Vc (South Zenica-Josanica)	Motorway	FBiH	56 km	448.0	O		
R-27(2)	Corridor Vc (Vlakovo-Tarcin)	New Bypass	FBiH	16 km	243.5	O		
R-28	Corridor Vc (Mostar Bypass)	New Bypass	FBiH	20 km	142.0			O
Bypass/Widening Projects								
R-29	Klasnica-Gradiska Road Improvement	New Bypass	RS	32 km	163.2		O	
R-30	Zivinice-Celik Road Improvement	Widening	FBiH	51 km	168.3			O
R-31	Lasva-Travnik Road Improvement	New Bypass	FBiH	26 km	184.6			O
R-32	Mostar-Gorica Road Improvement	New Bypass/Widening	FBiH	51 km	264.7	O		
Secondary Road Improvements								
R-33	B. Krupa-S. Most Road Improvement	Pavement	FBiH	52 km	41.6			O
R-34	K. Varos-S. Vakuf Road Improvement	Pavement	RS	16 km	12.8			O
R-35	Jagare-Turbe Road Improvement (RS)	Pavement	RS	80 km	64.0			O
R-36	Jagare-Turbe Road Improvement (FBiH)	Pavement	FBiH	18 km	14.4			O
R-37	Crna Rijeka-M. Grad Road Improvement	Pavement	RS	14 km	11.2		O	
R-38	Novi Travnik-Bugojno Road Improvement	Pavement	FBiH	32 km	12.8		O	
R-39	Blazuj-Kaonik Road Improvement	Pavement	FBiH	50 km	40.0	O		
R-40	Mokronoge-Prozor Road Improvement	Pavement	FBiH	43 km	17.2			O
R-41	Posusje-Jablanica Road Improvement	Pavement	FBiH	65 km	26.0			O
R-42	Ostrozac-Fojnica Road Improvement	Pavement	FBiH	65 km	26.0			O
R-43	Mostar-Ljubuski Road Improvement	Pavement	FBiH	33 km	13.2			O
R-44	Siroki Brijeg-Capljina Road Improvement	Pavement	FBiH	47 km	18.8			O
R-45	Citluk-Zitomislici Road Improvement	Pavement	FBiH	10 km	4.0			O
R-46	Gradacac-Ormanica Road Improvement	Pavement	FBiH	14 km	11.2		O	
R-47	Cerik-Brcko Road Improvement	Pavement	BR	24 km	19.2			O
R-48	Gracanica-Srnice Road Improvement	Pavement	FBiH	24 km	19.2		O	
R-49	Zepce-Zivinice Road Improvement	Pavement	FBiH	80 km	32.0		O	
R-50	Olovo-Ribnica Road Improvement	Pavement	FBiH	40 km	32.0			O
R-51	D. Polje-Pluzine Road Improvement	Pavement	RS	67 km	53.6			O
R-52	Nevesinje-Ljubinje Road Improvement	Pavement	RS	55 km	22.0			O
R-53	Trebinje-Grab Road Improvement	Pavement	RS	15 km	6.0		O	
Urban Transport Studies/Major Urban Projects								
R-54	Banja Luka Urban Transport Study	Study	RS	---	1.0	O		
R-55	Tuzla and Vicinity Urban Transport Study	Study	FBiH	---	1.0	O		
R-56	Mostar Urban Transport Study	Study	FBiH	---	1.0	O		
R-57	Sarajevo City Motorway	New Bypass	FBiH	10 km	** 99.5	O		
	Total for BiHTMAP Project Proposals ***		Entity	Length	Cost	2001-2005	2006-2010	2011-2020
	Total (Fedaration of BiH)		FBiH	---	**2,288.0**	807.0	687.8	793.2
	Total (Republika Srpska)		RS	---	**1,160.1**	204.7	364.5	590.9
	Total (Brcko District)		BR	---	**39.5**			39.5
	Total (Bosnia and Herzegovina)		---	---	**3,487.6**	1,011.7	1,052.3	1,423.6

Source: JICA Study Team   ** Year 2000 Constant Prices*   *** Cost obtained by Local Authorities*   *** Not including Committed Projects*

(3) Sufficiency Scenario Testing Result

The BiHTMAP Project Proposals recommended for the sufficiency scenario was tested in the model. The results are shown in Figure 2.2.19 and Figure 2.2.20.

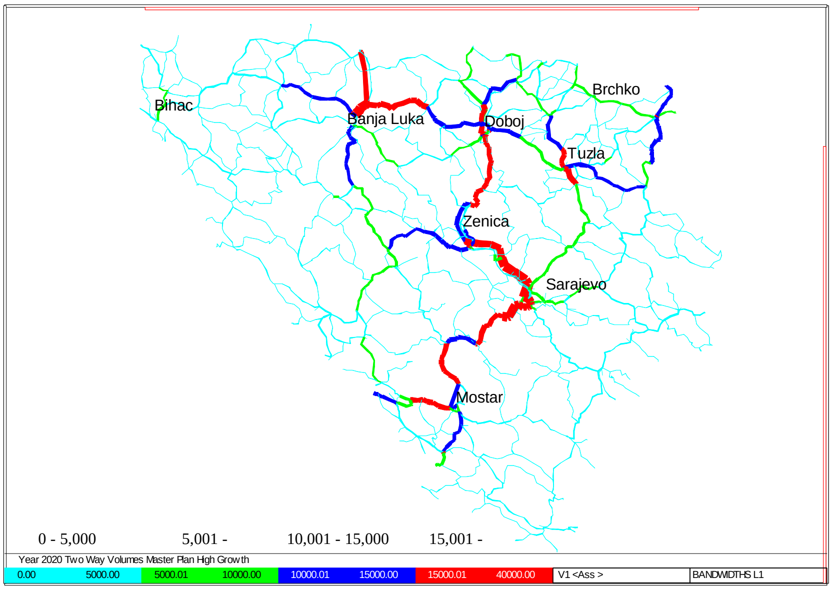


Figure 2.2.19 Year 2020 Total Daily Vehicle Trips (Sufficiency Scenario) (High Economic Growth)

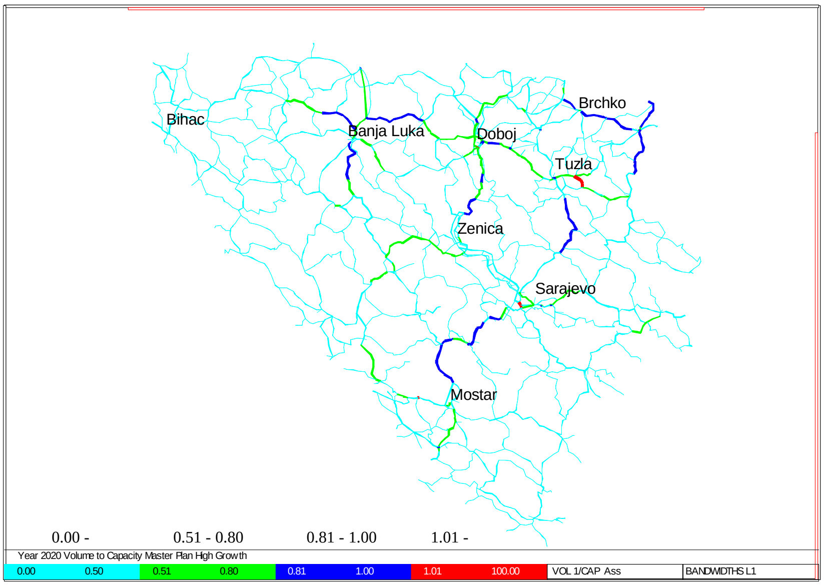


Figure 2.2.20 Year 2020 Volume to Capacity Ratio (Sufficiency Scenario) (High Economic Growth)

Figure 2.2.19 shows that major traffic flow would be guided to Primary I corridors. The higher traffic volume sections would be:

- E-661 Corridor (Gradiska - Jajce),

- E-73 Corridor (Corridor Vc),
- P-2 Corridor (B. Novi - Zvornik),
- E-761 Corridor (D. Vakuf - Zenica (Lasva)),
- P-6 Corridor (Gorica - Mostar), P-10 Corridor (north and south of Tuzla), and
- P-12 Corridor (Raca - Zvornik).

Figure 2.2.20 shows there would be no major capacity problems to occur in the network, except some urban areas. These urban issues, as discussed in the proposal of urban transport studies, should be analyzed by area-specific studies.

2.2.9 Improvement Plan

(1) Road Infrastructure Investment: Summary

As a result of analysis on road maintenance, rehabilitation, and new project proposals, the overall investment required in the road infrastructure improvement is summarized in Table 2.2.18.

Table 2.2.18 Road Infrastructure Investment for Year 2001 - 2020: Summary

(Unit: KM million)

Item	FBiH	RS	BR	Total	%
Maintenance	1,036.0	940.0	15.4	1,991.4	30.7 %
Rehabilitation	828.5	750.3	1.7	1,580.5	24.6 %
Committed Projects	161.7	9.1	---	170.8	2.5 %
BiHTMAP Projects	2,288.0	1,160.1	39.5	3,487.6	42.2 %
Total	4,314.2	2,859.5	56.6	7,230.3	100.0 %
% by Entity	59.7 %	39.5 %	0.8 %	100.0 %	---

Source: JICA Study Team

The total expected road infrastructure investment would be about KM6,500 million. This means on average total BiH would require KM325 million investment per year in the road sector.

There is a figure to compare regarding the assessment of this investment size. At the end of former Yugoslavian era, the Republic of Bosnia and Herzegovina was spending $200 million per year for the road sector investment, which can be converted to KM432 million in today's exchange rate. From this figure, the estimated investment cost for the road sector is considered as a level of "minimum necessity" to maintain proper function of the road network.

The modal share of road for both person and cargo trips keep increasing in most of industrialized countries all over the world. That is a fact of market-oriented economy. An appropriate mechanism for realizing the required level of investment for the road sector is needed if the movement of persons and goods is to be achieved at acceptable level of service.

(2) Long-term Design Goals

Development of a roadway network is, in its most basic sense, driven by a need to accommodate vehicle trip demand. Since the expected function of primary arterial system is to achieve higher mobility, a long-term desire would be to achieve a higher travel speed on the primary arterial network.

The Former-Yugoslavian Road Design Standard (FYDS) regulates the design classification of roads with design speed by category of traffic volume. It is shown in Table 2.2.19 and Table 2.2.20.

Table 2.2.19 Road Design Classification by Traffic Volume

Design Class of Roads	Daily Traffic Volume
Class 1	Over 12,000 vehicles/day
Class 2	7,000 - 12,000 vehicles/day
Class 2	3,000 - 7,000 vehicles/day
Class 4	1,000 - 3,000 vehicles/day
Class 5	Less than 1,000 vehicles/day

Source: Former-Yugoslavian Road Design Standard

Table 2.2.20 Road Design Classification and Design Speed

Design Class	Terrain Classification			
	I	II	III	IV
	Flat	Rolling	Hilly	Mountainous
Motorway	120 km/h	120-100 km/h	100-80 km/h	80 km/h
Class 1	120 km/h*	100 km/h	80 km/h	70 (60) km/h**
Class 2	100 km/h	80 km/h	70 km/h	60 (50) km/h**
Class 3	80 km/h	70 km/h	60 km/h	50 (40) km/h**
Class 4	70 km/h	60 km/h	50 km/h	40 (30) km/h**
Class 5	60 km/h	50 km/h	40 km/h	40 (30) km/h**

Source: Former-Yugoslavian Road Design Standard
* For 2-lane undivided roads, the maximum design speed shall be 100 km/h
** The values in ( ) are for special cases

As a long-term design goal, which means it can be a target beyond the current study's planning horizon, it is considered appropriate that the highest levels of primary arterial highway (i.e. Primary I) should target for achieving first and second class design standards all through the corridors. The following long-term design goals are recommended beyond the achievement of the recommended improvement summarized in Table 2.2.18.

BiHTMAP Primary Arterial I : L = 2,948 km

- FYDS Class 1 (Typical Design Speed: 100 - 80 km/h)
  or Class 2 (Typical Design Speed: 80 - 70 km/h)
- Reconstruction and widening to satisfy the design standard,
- Bypass all urban areas,
- Four lanes depending on the traffic volume,
- Climbing lanes and passing lanes where it is necessary

For indicative purposes, Figure 2.2.21 shows the road sections which is expected to carry more than 12,000 vehicles/day (brown) and more than 7,000 vehicles/day (blue).

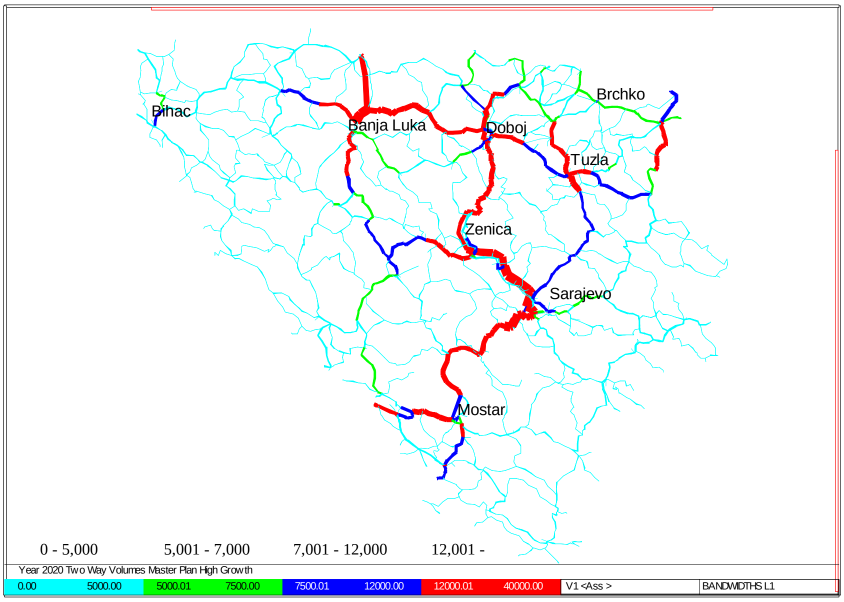


Figure 2.2.21 Traffic Volume on Master Plan Network in Year 2020 (High Economic Growth) (Scaled by 7,000 vpd & 12,000 vpd)

2.2.10 Selection of Priority Projects

The Study Team has defined a series of road improvements termed BiHTMAP project proposals. These are intended to provide a wide range of services, and fulfill road transport needs throughout the planning horizon of the current study. The temporal implementation strategy for these projects was previously presented in Table 2.2.17.

It is a stated goal of the BiHTMAP that, across all sectors (road, rail, air, inland waterway), a series of priority projects be identified whose realization is seen as being most important in terms of enhancing the movement of persons as well as goods, and whose implementation should be achieved in the shortest possible time. This “short-list” of sectorial projects will, over approximately a one month period, be the subject of additional, more detailed, pre-feasibility studies during which topics such as cost, social impacts, environmental impacts and economic feasibility, among others, will be explored. For the road sector, four issues are of importance in this regard:

- The project(s) should be drawn from the highest priority road systems, that is, international and primary road categories.

- Pre-feasibility reviews for road projects entail considerable effort since preliminary design, route alignment and refined costing will be addressed. Thus, the number of projects must be reasonable given time and staffing constraints associated with the current study. A preliminary culling process of BiHTMAP project proposals is therefore necessary.

- It is likely that, following completion of pre-feasibility studies and the Master Plan Study, follow-on works such as final design and construction could commence in very short order. Thus, consensus with local experts on priority project designation is of vital importance.

- In line with these issues, it is judged reasonable and prudent that the road sector nominate two priority projects, one from each Entity, to be subjected to further pre-feasibility investigations.

As an initial step, the capabilities of the transport model were utilized to provide quantitative assessment of all international and primary networks projects. These include 18 projects (refer Table 2.2.17, part 1, excluding “Committed Projects”). Two significant indicators of project need are relative demand (vehicle kilometer per road kilometer of project) in the long term (to year 2020) and, as a pre-cursor of follow-on economic feasibility reviews, savings in near-term (to year 2010) vehicle hours catalyzed by the project. In terms of relative demand, two projects clearly emerge within each Entity (Table 2.2.21):

- Republika Srpska: Project R-29, Klasnica – Gradiska road improvement and Project R-09, Banja Luka – Doboj road improvement.

- Federation of BiH: Project R-27, Corridor Vc (South Zenica – Josanica, Vlakovo – Tarcin) and Project R-16, Tarcin – Mostar road improvement.

The analysis also confirms that, in terms of relative demand, each of the top two Entity projects exceed the Brcko Administrative District project.

Table 2.2.21 Year 2020 Demand Ranking: Potential Priority Projects

Project Name	Project Number	Daily Vehicle Kilometers per Road Km
Federation of BiH		
Corridor Vc (South Zenica-Josanica, Vlakovo-Tarcin)	R-27	19,460
Tarcin-Mostar Road Improvement	R-16	17,057
Heavily Loaded Road Improvements (Zenica-Maglaj)	R-11	16,011
Zivinice-Celik Road Improvement	R-30	15,116
Lasva-Travnik Road Improvement	R-31	14,519
Mostar-Gorica Road Improvement	R-32	14,503
Corridor Vc (Mostar Bypass)	R-28	10,279
Ljubogosta-Mesici Road Development (FBiH)	R-14	3,957
Republika Srpska		
Klasnica-Gradiska Road Improvement	R-29	17,695
Banja Luka-Doboj Road Development	R-09	16,878
Heavily Loaded Road Improvements (Bijeljina-Raca)	R-21	11,312
Corridor Vc (Doboj Bypass)	R-26	6,896
Heavily Loaded Road Improvements (Vrsani-Bijeljina)	R-20	6,622
Heavily Loaded Road Improvements (B.Brod-Seslija)	R-10	6,401
Ljubogosta-Mesici Road Development (RS)	R-13	4,103
Heavily Loaded Road Improvements (Samac-Loncari)	R-18	1,859
Foca/Srbinje-Hum Road Improvement	R-15	1,650
Brcko Administrative District		
Heavily Loaded Road Improvements (Loncari-Vrsani)	R-19	7,073

Source: JICA Study Team

Analysis of the top two projects in each Entity in terms of saved vehicle hours of travel, that is, reductions in travel time catalyzed by the projects, suggests that, in Republika Srpska, Project R-29, Klasnica–Gradiska road improvement and Project R-09, Banja Luka-Doboj road improvement are virtually identical while in the Federation the Corridor Vc improvement (South Zenica-Josanica, Vlakovo-Tarcin) (Project R-27) emerges as being clearly superior (Table 2.2.22).

Table 2.2.22 Year 2010 Time Savings Ranking: Select Priority Projects

Project Name	Project Number	Annual Vehicle Hours (Million)
Federation of BiH		
Corridor Vc (South Zenica-Josanica, Vlakovo-Tarcin)	R-27	3.23
Tarcin-Mostar Road Improvement	R-16	0.02
Republika Srpska		
Klasnica-Gradiska Road Improvement	R-29	1.54
Banja Luka-Doboj Road Development	R-09	1.21

Source: JICA Study Team

To assist in the quantitative analysis, a series of qualitative indicators were defined within which each of the top two projects in each Entity were compared. The indicators ascertain, for each project, which is more:

- European networks: compatible with existing linkages to/from Europe, in particular western Europe.
- Regional service: is likely to be of more benefit to regional demands, or for major cities located in the region.
- Trans-BiH service: is likely to be of more benefit to longer-distance demands, either intra-Entity or inter-Entity in nature.
- Planning compatibility: exhibits correlation with other on-going road improvement plans or strategies, either on a corridor or location-specific basis.
- Right-of-way: likely to have the least impacts in terms of requiring additional right-of-way acquisition.
- Technical constraints: poses unique technical constraints in engineering design.
- Sustainability: likely to pose unique challenges in terms of day-to-day operation or maintenance requirements.
- Safety: expected to offer greater road safety benefits based on operating experiences of similar road facilities in other countries.

Table 2.2.23 Quantitative and Qualitative Comparative Criteria Potential Priority Projects in Federation of BiH and Republika Srpska

Criteria	Republika Srpska		Federation BiH	
	R-09	R-29	R-27	R-16
Quantitative				
Long-term Relative Demand		+	+	
Medium-term Time Savings		+	+	
Qualitative				
European Networks		+	o	o
Regional Service		+	+	
Trans-BiH Service	+		o	o
Planning Compatibility	o	o	+	
Right-of-Way	+			+
Technical Constraints	o	o	o	o
Sustainability	o	o		+
Safety		+	+	

Source: JICA Study Team
Note: + implies project preference. o implies no major difference.

In conclusion, therefore, two projects are adopted as priority projects, and will be subjected to further pre-feasibility analysis:

- Republika Srpska: Initial inspection suggests that the Klasnica-Gradiska Road Improvement Project is superior. However, discussion with local experts confirms that this road segment is currently under negotiation for implementation as a BOT project involving a private investor. Further, general design has been completed as part of this process. Therefore, Project R-09, Banja Luka–Doboj road improvement, was selected as the Republika Srpska priority project.

- Federation of BiH: Project R-27, Corridor Vc (South Zenica–Josanica, Vlakovo-Tarcin). However, discussion with local experts confirms that a part of this road segment (South Zenica–Josanica) is currently under negotiation for implementation as a BOT project involving a private investor. Therefore, the other part of Project R-27 (Vlakovo–Tarcin) together with Project R-16, Tarcin–Mostar road improvement was selected as the Federation of BiH priority project.

2.2.11 Financing and Implementation

Large capital investments are required to revitalize the new BiH economy not only in the transport sector but also other economic sectors. At the same time, however, a prudent fiscal policy must be pursued which ensures that public spending is maintained at a level consistent with macro-economic objectives such as controlling inflation and maintaining external credit-worthiness. Under these circumstances, capital investment should be determined based on a profound understanding of how limited public resources can be spent most efficiently and effectively.

In the transport sector, capital infusion is needed to mitigate the lingering effects of the war, to modernize and expand infrastructure as well as facilities, to achieve capacity increase in line with growing demand, for restructuring transport industries as well as improving environmental protection and traffic safety. However, during the on-going BiH economic transformation process, fiscal resources are limited, resulting in intensifying "competition" for sufficient allocations among the various (including transport) sectors. Key considerations embedded in the transport sector financing plan are therefore realism and affordability. In other words, even in difficult economic times, reasonable and prudent investment in transport infrastructure and facilities must continue to prevent further degradation. Should the investment stream be compromised, the danger emerges that the transport sector will evolve as a bottleneck to BiH's economic re-vitalization and internationalization.

The approach to financing requisite transport improvements rests on the assumption that the governments will continue to allocate reasonable and prudent funds to the transport sector, and that various internal efficiencies are achieved. At the same time, various measures should be solicited in the transport sector for raising funds, including review and revision of present policies and practices, introduction of "user pay" principles, and encouragement of private sector investment. In addition to internal financing, there also exist possibilities for soliciting loans from international and bilateral sources. However, care should be exercised when considering such actions: (1) external financing usually covers the external portion of project costs but excludes the local currency portion; (2) capital investments are typically followed by recurrent costs (such as maintenance) which are the responsibility of the borrower; and, (3) repayment of capital and interest sometimes over decades following loan issue.

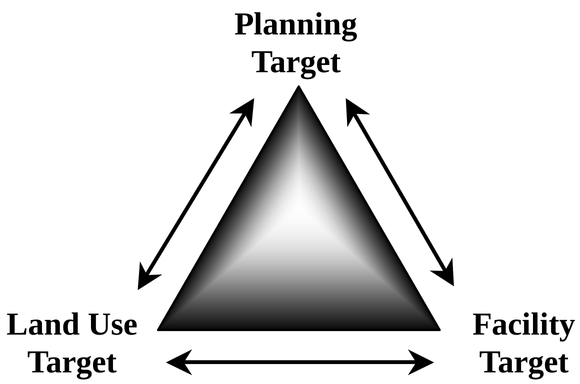
Financing Strategy

Judging from the current situation of BiH, it is recommended that, instead of promptly resorting to external financing, a prudent restructuring process needs to be furthered, particularly in terms of cost reduction through efficiency improvements, privatization of the bus and truck industries, raising additional funds through introduction of user pay principles, inviting direct investment and careful screening of capital investments.

2.2.12 Supporting Strategies

Realization of the proposed improvements represents a new chapter in BiH's road history. These projects and programs will present new challenges and opportunities; care is required to ensure their successful implementation and operation. Foregoing analyses have confirmed that, from a capacity point of view, upgrading of select road links within BiH is in order. However, it should not be inferred that any set of improvements can be conceived in isolation. Instead, the road infrastructure development concept must be viewed as consisting of an inter-related system whose principal components are facility targets, planning targets and land use targets (Figure 2.2.22).

Figure 2.2.22 Integrated Road Infrastructure Development Concept



(1) Planning Targets

The Road Transport Model A computerized simulation process was developed utilizing the capabilities of TRANPLAN/NIS and other software[30]. The approach was comprehensive and incorporated a number of data sources, details of which are described in the main body of this report. While the transport model proved invaluable in developing demand forecasts for purposes of the current project, it is equally obvious that potential applications extend to a much larger scale. It is hoped that relevant authorities will adopt the framework of the current model, and progressively expand its capabilities as additional projects are undertaken. This will catalyze many benefits for the BiH transport planning profession, and will encourage a more expansive use of clinical and analytical tools in the evaluation of project feasibility. The presence of a model will also permit a rapid evaluation of impacts should socio-economic conditions change, or if alternative road improvement strategies are formulated. Furthermore, the progressive use of a single model will foster a uniform and cohesive approach to economic and road demand forecasting, whose consistent findings can be applied across a wide spectrum of endeavors.

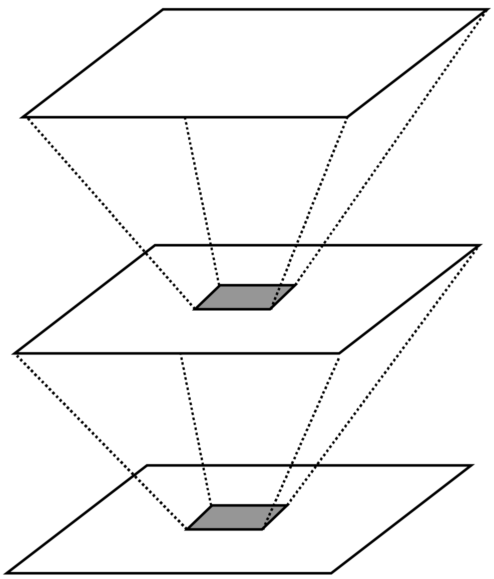
Three key steps are, in particular, recommended:

[30] TRANPLAN (Transportation Planning) and NIS (Network Information System) is an integrated package of computer programs offering comprehensive planning and forecasting capabilities. TRANPLAN/NIS is proprietary software licensed for use by Pacific Consultants International.

- The model be adopted by government, ideally under the auspices of a single organization. In this manner, the model may gradually be refined, expanded, or modified in a uniform, consistent manner.

- Application of the model be consistently conducted as part of on-going planning efforts, and should form the cornerstone for periodic updates of the Master Plan, say at five year intervals.

- Given the countrywide focus of the existing model, it is unavoidable, and highly desirable, that more refined regional or urban transport studies be performed. These would address in more detail needs of these areas. The BiH model may readily serve as the "base platform" from which a series of such cascading and increasingly refined sub-models are developed (Figure 2.2.23).



Level 3: Metropolitan Region
Focus on multi-modal trips within the urban agglomeration, and socio-economic factors which underlie these patterns. Principal output: urban area or metropolitan region transport programs and studies.

Level 2: Regional Focus
Refines focus of Level 1 by addressing more localized or micro-scale regional transport systems and economic development. Principal output: regional or (say) Kantonal transport programs and strategies.

Level 1: BiH Transport Master Plan
Country-wide transport planning (the current study) which focuses on trips within BiH and trips which cross international borders. Principal output: BiH and Entities-specific transport programs and strategies.

Figure 2.2.23 Nested Approach to Road Transport Planning

Longer-term Improvement Focus A series of recommendations, projects and programs have been developed as part of the current study. These are derived based on an identification of established need (based on economic development scenarios seen currently as being realistic) as well as reasonableness in terms of fiscal obligations as well as implementation capability. This is not meant to imply that other projects, in addition to those recommended by the current study, could arise both within the planning horizon of the current study or beyond. These could be justified based on a change in established planning patterns, refinement of governmental policies or unexpected availability of external funding. Also, more expansive programs could be implemented for example, a road maintenance management system, or a more rigorous approach to defining need for spot improvements.

We would urge that government retain a sense of mission in this regard, that is, focus what will surely be increasingly scarce monetary supply into read corridors identified by the current studies. That is, priority of investment should roughly parallel the road classification scheme described earlier. Sufficient flexibility has been programmed into this approach, including strategies for Corridor Vc.

Data Base The lack of a consistent, computerized BiH-wide road data base has been noted at various junctures of this report. Two types of data are seen as being particularly critical:

- Road inventory information, where available, largely dates from pre-war years, with select updating catalyzed by project-specific needs. But even available data focus on road engineering aspects; up-to-data information on surface condition, traffic control devices, or roadside development is lacking (these are particularly important for purposes of calculating system capacity). We would urge this shortcoming be remedied. It is understood that, at time of writing, efforts are underway under the sponsorship of IMG to develop such a computerized data source.

- Traffic count data is not collected on an on-going basis. Volume data collected at 86 locations throughout BiH as part of the current study proved to be the first post-war effort to collect such information on a uniform and structured basis. Yet, traffic data, stratified by time, vehicle type, and direction, is a basic requirement of most road-related demand investigations. The Study Team would urge the Entity Ministries of Transport to immediately take steps to remedy this shortcoming, using approaches and methodologies similar to those adopted by the current study, and initiate an annual traffic counting program. On the order of fifty state-of-the-art traffic counting machines would be sufficient for this task. While the majority of counts are likely to be about one week in duration, conducted annually on a rotating basis, a portion of counters should be employed to take continuous counts on a long-term basis, thus yielding data for quantification of weekly, monthly and seasonal traffic variation. It is noted that traffic count machines can, depending on type and design, be used to collect other data such as speed and vehicle configuration.

Manuals A further impediment to ensuring consistent approaches in the road sector, to include conformance to EU criteria, is an absence of BiH-specific manuals. Instead, a variety of pre-war (largely Yugoslav) publications are used, or, on an ad-hoc basis, criteria and/or manuals from overseas countries. The creation of such manuals is not an easy task, yet in BiH there is a dedicated cadre of professionals which can provide considerable input to such an effort, ideally in concert with assistance from knowledgeable overseas sources. Three manuals are seen as being particularly relevant:

- Road and Bridge Design: geometric design standards of highways, pavement design standards, bridge design code.

- Manual on Uniform Traffic Control Devices (MUTCD): set standards, design content, meaning, legal intent and application guidelines for, in particular, signage, pavement marking sand traffic signals.

- Highway Capacity Manual (HCM): quantifies the local inter-relationship between speed, volume, and capacity for a series of road types (such as motorway, expressway, multi-lane arterial, dual lane arterial), operating conditions (such as uninterrupted, semi-interrupted, interrupted) and type of control.

(2) Facility Targets

Transportation Systems Management The importance of Transportation Systems Management (TSM) has significantly increased as it has been recognized that many transport problems can be resolved without large-scale investment in transport infrastructure. The approach to planning transport improvements is management intensive rather than capital intensive with a view to reducing inefficiencies in the existing transport system. TSM achieves this through the planning, design, implementation maintenance, and monitoring of physical and policy measures which promote the efficient and safe flow of passengers, vehicles, and pedestrians. The schemes are low cost, being principally concerned with minor road works, traffic control equipment, and the introduction of regulations. In many cases, the success of the scheme depends on good inter-agency coordination and strong enforcement by the police of accompanying traffic regulations.

This switch in emphasis from “capital” solutions to “management” solutions is gaining momentum as the harsh realities of the current economic climate are being felt. The major obstacle in the development of this approach is a lack of trained and experienced professionals in BiH. These is, of course, also a need to develop an institutional environment that fosters the use, development and growth of transport management and planning skills.

The objectives of a TSM program can be summarized as follows:

- Reduce capital investment in roads by promoting low cost solutions to traffic and transport problems;

- Increase the capacity of the road network in terms of the movement of people and goods;

- Improve the enforcement of traffic regulations;

- Improve road safety; and

- Improve transport efficiency and the standard of services of public transport.

These objectives can be achieved through the implementation of a series on inter-related sub-components covering:

- Development of institutional capacity;
- Implementation of policy measures;
- Improvement of physical facilities; and,
- Procurement of equipment.

An "immediate-action" program centered on low-cost, but highly effective, TSM actions could include optimized utilization of existing road infrastructure via installation of traffic signals, road safety devices, truck weighing stations, improved signage and markings, public education, driver training as well as honest and on-going enforcement.

(3) Land Use Targets

Roadside Development The strategic nature of transport modeling reflects inter-zonal trip demand catalyzed by the anticipated economic evolution of BiH. However, it is likely (possibly unavoidable) that unexpected land use patterns will emerge, particularly in vicinity of high-order roads or within, for example, BiHTMAP Primary I corridors. The government is urged to pursue, as practical and possible, supporting strategies which forestall, to the highest possible degree, resulting potential transport disbenefits and/or degradation of the high capacity and operating standards embodied in technical implementation standards adopted by the current study.

Most elements of the identified road classification scheme consist of arterials without any form of access control. They are used by pedestrians and all conceivable forms of vehicles ranging from animal-drawn carts and bicycles to the fastest cars and largest commercial vehicles. Inter-city must accommodate all forms of trips ranging from the very short to extremely long. Considerable elements of the road network are, not surprisingly, unable to cope with this mix of functions and uses; operations and safety have been seriously degraded in recent years, and will continue to worsen in future as traffic increases and ribbon development intensifies.

Mitigating measures which government could pursue include:

- The purchase of property within major corridors (in particular BiHTMAP Primary I) and/or promulgation of zoning regulations which foster an orderly land use pattern near intersections and along roads systems.
- Ensuring that roads are designed to the highest standard including channelization, turning bays and demand responsive signalization, regardless if the latter is provided new or in future.
- Confirming that road traffic regulations and weight restrictions are enforced in a consistent, on-going and honest manner.

Traffic Impact Studies Major land development projects, to include those conceived within planning frameworks as well as others catalyzed by the presence of new road systems such as the Sarajevo-Zenica subsection of Corridor Vc, are likely to be proposed near interchanges or along roads linking interchanges with the arterial network. Some developments may be of such a scale as to jeopardize the effectiveness of proposed road improvements. It is therefore urged that land developments proposed within a pre-defined distance, which exceed pre-defined intensity thresholds, be required to submit, as part of the development approval process, a traffic impact study. Such studies should forecast development traffic demand, clarify impact upon roads vis-à-vis a "no development" scenario, and define needed resultant road improvements both adjacent to and within reasonable distance of the proposed development. Cooperation between developer and the government for financing needed road improvements must be addressed, as must monitoring processes which ensure that the proposed development and requisite road improvements do indeed materialize in accordance with approved plans.

Corridor Vc Various preliminary plans have been developed by other organizations for a motorway shown as extending partially or fully throughout Corridor Vc. While the Study Team understands the long-range concept and intent of such a project, it nevertheless continues to recommend that high-order, access-controlled facilities (with or without tolls) should only be considered if clearly warranted on demand grounds and supported by robust socio-economic (or financial feasibility) evaluations.

It is highly unlikely that a multi-lane motorway-class facility will be required in the study area within the current study's planning horizon, with exception of the previously-explained Sarajevo-Zenica sub-section. Nevertheless, should government choose to pursue a motorway solution for Corridor Vc - particularly under a post-2020 timeframe, key preliminary actions, particularly right-of-way acquisition, should proceed at the earliest opportunity.

- The initial concept promulgated by the current study calls for the provision of a four-lane cross section between roughly Sarajevo and Zenica, as well as high-order two-way, two-lane bypasses west of Doboj and Mostar. However, within the entire corridor, to include the Doboj and Mostar bypass sub-sections, it is strongly urged that about 30 meters of right-of-way be acquired.

- Strict zoning control must be instituted (and rigorously enforced) which prohibit any form of access from abutting properties into the right-of-way. If necessary, fencing should be installed to prevent access. The importance of this action cannot be overemphasized, as it is the only effective measure to prevent the chaos which now exists along considerable components of the BiH road network.

- Instead, a frontage road (or existing highway) will provide direct access to properties abutting the motorway right-of-way. Only at suitable distances (say every 10-20 kilometers) should high-order intersections or interchanges be provided.

- In the long-term future, as the motorway concept reaches maturity, adequate right-of-way would therefore be available for continuation of a staged facility implementation.

Requisite actions will be technically difficult and politically unpopular, however, must be achieved if the long-term movement of goods as well as persons in this corridor is to be achieved in an efficient and cost-effective manner.

2.2.13 Sensitivity Analysis

Previous sections of this report have detailed a series of logical and cascading investigative procedures which, in parallel with extensive consultations with local experts, were utilized do develop a road classification scheme and to define project-specific and phased improvement recommendations.

At this juncture it is desirable to address two questions; namely:

- Are forecast demands consistent with findings of other studies; that is, do they conform with what might be termed realistic East European norms; and,

- What testing procedures are necessary to ensure that the socio-economic foundation which underlies the generation of road traffic demand is consistent with local expectations.

European Expectations A recent study examined in detail existing, and forecast, levels of cargo activity in eastern Europe[31]. Forecasts considered economic growth (low, moderate, high); infrastructure development; and, speed of harmonization of transport markets. Five core scenarios were considered in deriving forecasts on the pan-European corridors:

- Scenario A: low economic growth, existing transport infrastructure, low degree of transport market integration.

- Scenario B: moderate economic growth, existing transport infrastructure, low degree of transport market integration.

- Scenario C: moderate economic growth, partially completed network, moderate degree of transport market integration.

- Scenario D: moderate economic growth, full TINA network, high degree of transport market integration.

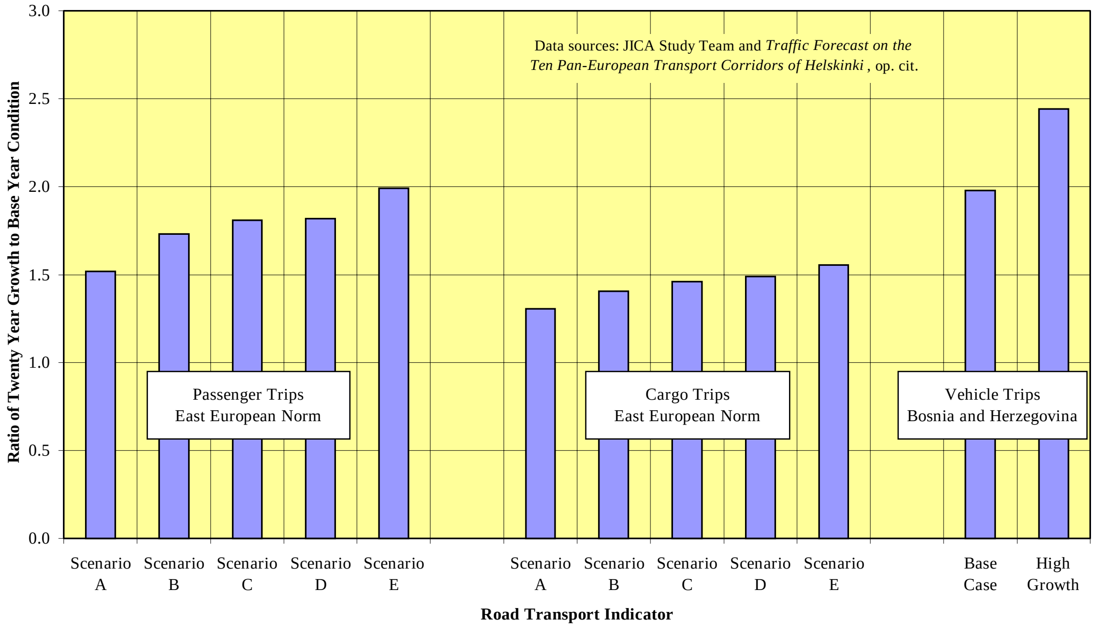
[31] *Traffic Forecast on the Ten Pan-European Transport Corridors of Helsinki*, for European Commission, by NEA Transport Research and Training, et. al., August 1999

- Scenario E: high economic growth, full TINA network, high degree of transport market integration.

In terms of existing activities, study data confirm that, in case of cargo shipments of moderate and long distance in western European countries, the majority is domestically oriented, with a large proportion of external trade linked with nearby countries. Similar findings are noted for eastern European countries; that is, domestic cargo activity greatly exceeds import/export shipments in terms of volume. The road (truck) mode is dominant in terms of domestic shipments. In case of passenger transport, conclusions are clear: increasing passenger activity will result as economic growth intensifies, transport infrastructure is upgraded and transport markets are integrated. Similar conclusions have been reached during the course of BiHTMAP investigations.

The Pan-European corridors study, as did BiHTMAP, forecast over a 20-year horizon although the periods were offset by five years (1995 to 2015, versus 2000 to 2020). Thus, some absolute differences in demand are likely to arise. However, in a relative perspective, results of both studies are consistent. The Pan-European corridors study trip growth ratio (vis-à-vis the base year) ranged up to 2.0 for passenger trips, and 1.6 for cargo trips depending on scenario. In case of BiHTMAP, total vehicle trips roughly doubled under the base case economic growth scenario, and grew by a factor of 2.4 under the high economic growth scenario. One might conclude that BiHTMAP forecasts support that growth in BiH road transport demand is in line with, but somewhat above, European expectations (Figure 2.2.24).

Figure 2.2.24 Comparison of Forecast 20 Year Relative Demand
BiH and Eastern European Expectations



Demographic Issues Considerable discussion with local experts has focused on socio-economic and demographic patterns with underlie the generation of road transport demand. In particular, the *Spatial Plan of Republika Srpska* is quoted in this regard[32]. The JICA Study Team therefore undertook a sensitivity analysis to ascertain what differences exist between the studies socio-economic framework and the Spatial Plan, and if such socio-economic differences influence the validity of road network recommendations detailed in earlier parts of this Section 2.2. The Study Team is most indebted in this regard to the Urbanism Institute of Republika Srpska in Banja Luka which kindly quantified Spatial Plan content to a zonal level of detail consistent with the planning horizon of BiHTMAP[33].

The Spatial Plan suggests that the population of Republika Srpska will grow from some 1.48 million in year 2000 to 1.76 million in year 2020. Concurrently GDP will, over the same time period, grow from 2,617 million year 2000 KM to 9,248 million KM, resulting in an increase in GDP per capita from 1,766 KM to 5,242 KM (Table 2.2.24). It should be noted that that portion of the Republic which is now located in the Brcko Administrative District is included in these totals; for consistency purposes, Brcko has been removed in direct comparisons between the BiHTMAP socio-economic framework and Spatial Plan content.

Table 2.2.24 Overview of Socio-Economic Growth:
Spatial Plan of Republika Srpska

Item	Year				
	2000	2005	2010	2015	2020
GDP in Year 2000 KM (000)	2,616,655	3,924,983	5,691,225	7,398,592	9,248,240
Population	1,481,570	1,599,280	1,676,042	1,752,804	1,764,403
GDP per Capita, KM	1,766	2,454	3,396	4,221	5,242

Source: Urbanism Institute of Republika Srpska in Banja Luka

In terms of population, the year 2000 totals are quite consistent, 1.44 million and 1.43 million (excluding Brcko) in case of the Spatial Plan and BiHTMAP socio-economic frame, respectively (refer Chapter 4 of *Volume I, Interim Report* for further detail regarding the socio-economic framework). Distribution among traffic zones is also highly consistent; in the zone with highest population (Banja Luka, zone 7) differences are some 11,000 persons, or 5.5 percent of population (Figure 2.2.25).

Differences to, however, exist in terms of population projections. The Spatial Plan foresees a year 2020 population of some 1.72 million persons, and the socio-economic framework some 1.47 million persons. However, both plans are consistent in that population growth is modest (never exceeding 1.54 percent during any five year period), and that this growth will, over time, decrease. Both plans suggest that during the

[32] *Prostorni Plan Republike Srpske; Etapni Plan 1996-2015*; op. cit.
[33] Completed on 3 November, 2000.

five-year period from years 2015 to 2020 average annual growth in population will be some 0.11 – 0.13 percent (Figure 2.2.26).

Figure 2.2.25 Comparison of Year 2000 Population by Analysis Zone

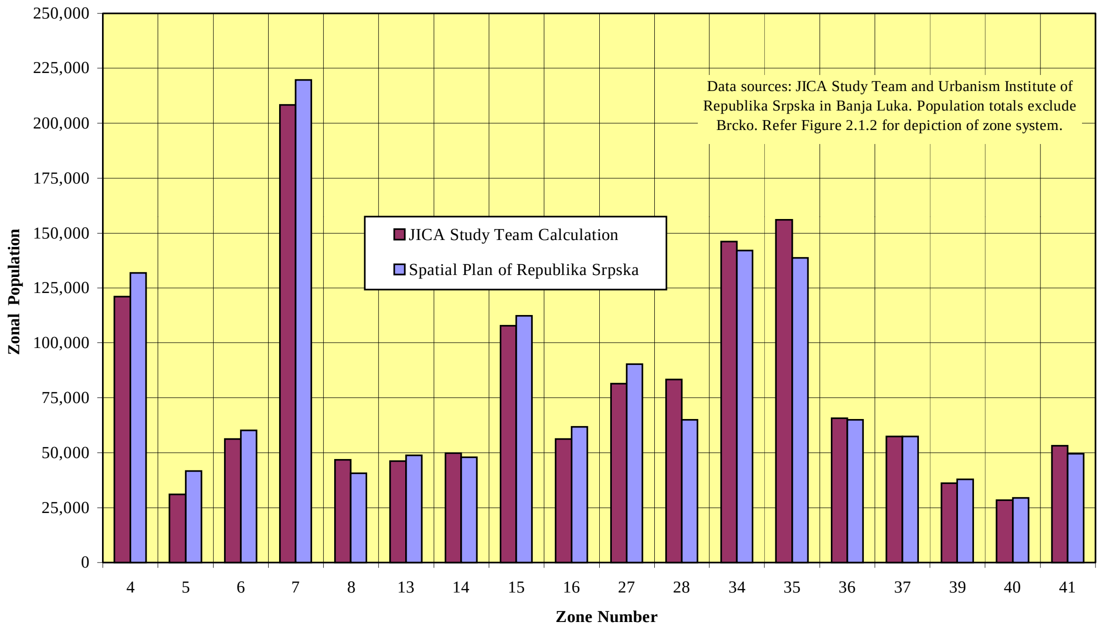
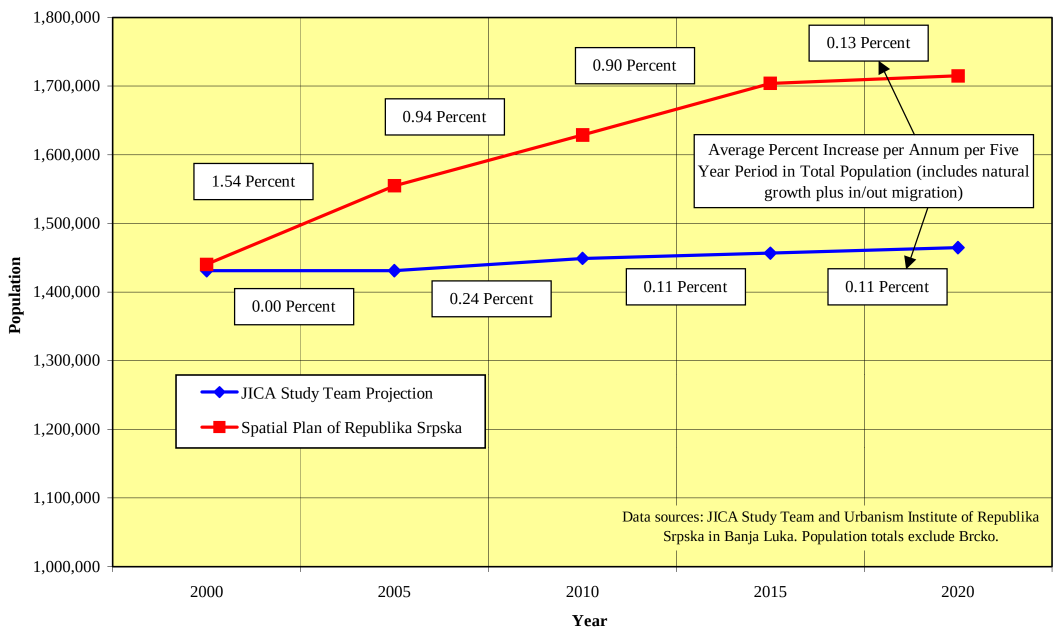
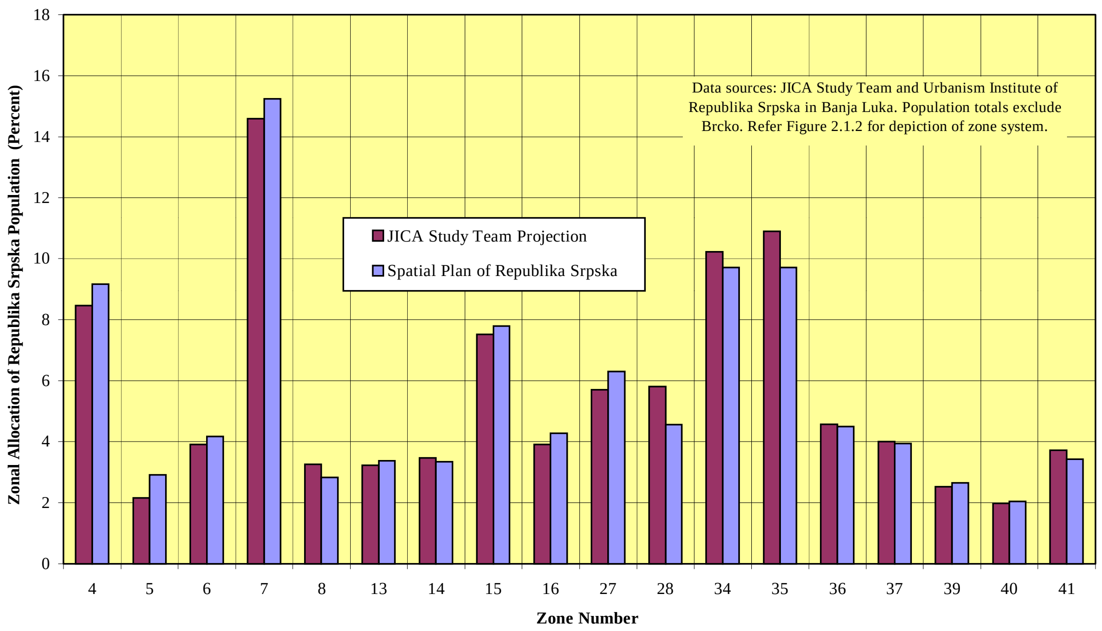


Figure 2.2.26 Comparison of Year 2020 Population Forecasts for Republika Srpska



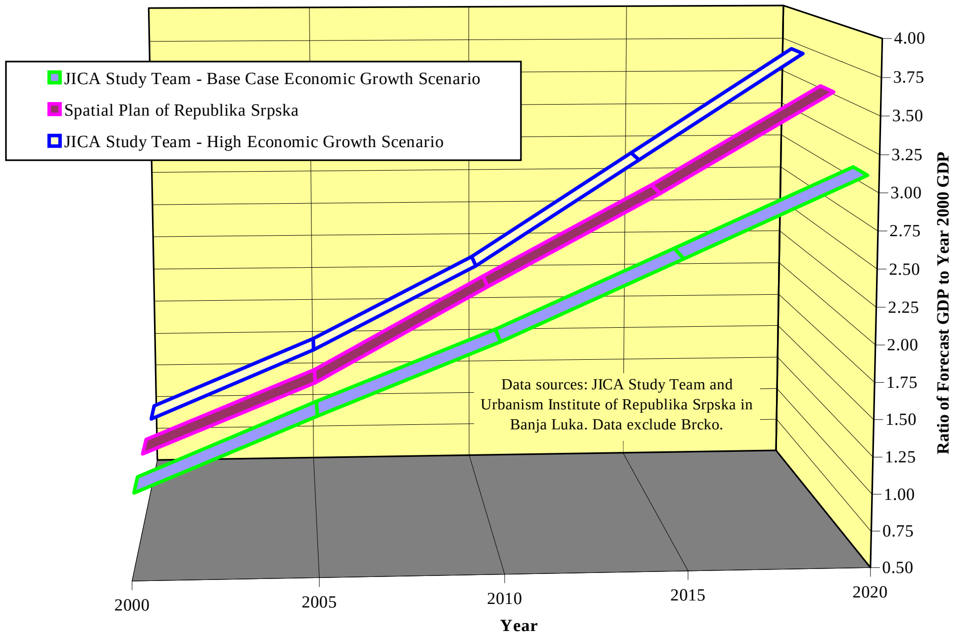
Both studies are also consistent in terms of relative year 2020 population distribution even though absolute control totals will differ. Thus, under both plans, highest population concentrations are shown as being in Banja Luka (zone 7), followed by zone 35 (containing Zvornik), zone 34 (containing Bijeljina) and zone 4 (containing Prijedor) (Figure 2.2.27). Of course, it should be noted that population densities will not necessarily result in a similar ranking in terms of persons per square meter given differences in zonal size.

Figure 2.2.27 Comparison of Forecast Year 2020 Population Distribution by Analysis Zone



The socio-economic framework contains two sets of forecasts for growth in GDP, termed the base case growth scenario and high economic growth scenario. In case of road network planning, it is again emphasized at this juncture that the high economic growth scenario underlies all investigative efforts. Relative to year 2000, the base case growth scenario is expected to more than triple (ratio of 3.1) to year 2020, while under the high economic growth scenario GDP is slated to almost quadruple (factor of 3.7). In comparison, the Spatial Plan suggests expansion of GDP equal to a factor of 3.5. Thus, both plans are again consistent. The high economic growth scenario of the socio-economic framework contains the most optimistic forecast for Republika Srpska, while the Spatial Plan forecast is between the high economic growth and base case economic growth scenarios (Figure 2.2.28).

Figure 2.2.28 Comparison of Forecast GDP for Republika Srpska



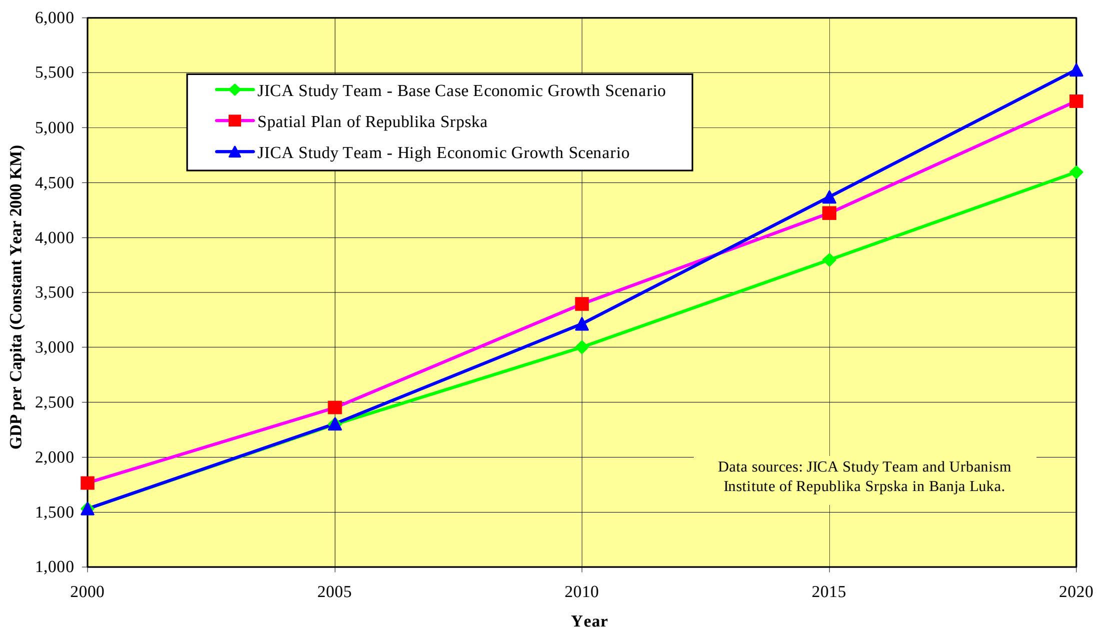
In terms of absolute transport demand, the single most important variable for estimating future growth is GDP per capita. Population is, of course relevant in the sense of relative distribution among zones, but economic growth is the key upon which vehicle ownership and trip making rest. The "bottom up" and "top down" approaches to trip demand forecasting, and the role of population, GDP and GDP per capita in this regard, are described in Section 2.1.7 of this chapter. The final conclusion is that again both studies contain comparable forecasts with the high growth scenario of the socio-economic framework achieving a year 2020 GDP per capita of some 5,526 KM, followed by the Spatial Plan (5,242 KM) and the base case economic growth scenario (4,593 KM) (Figure 2.2.29).

Thus, in terms of modeling road transport demand, three issues are important:

- The high economic growth scenario prepared under the socio-economic framework contains the most optimistic forecast in terms of future GDP per capita for Republika Srpska, thus will yield highest unit ownership of vehicles.

- The Spatial Plan economic forecast is below that of the high economic growth scenario, and thus will yield a lower unit vehicle ownership but applied to a larger number of persons. Applying parameters of the Spatial Plan results in a revised total of 314,000 trips.

Figure 2.2.29 Comparison of Forecast GDP per Capita for Republika Srpska



- The relative distribution of demand between zones is expected to slightly change given minor differences in population distribution inherent to the year 2020 population distribution forecasts.

The road transport model was therefore re-run to test two levels of sensitivity:

- The trip totals would stay the same as under the high economic growth scenario, but relative zonal distribution changes in accordance with Spatial Plan content; and,

- Both trip totals and relative zonal distribution changes in accordance with Spatial Plan content.

In case of the former test, minimal impact upon established volume to capacity relationships were noted. No additional improvements are therefore implied (Figure 2.2.30).

The impact of both additional trips and distribution is, however, shown as exerting some pressures on the Master Plan network. While the network has sufficient reserve capacity to cope with this demand, it is however now necessary to enhance the road linking Bijeljina and Zvornik. In this section, volume has reached capacity (Figure 2.2.31). While further route reconnaissance would be needed to ascertain details, it is likely that an enhanced two-lane section will be sufficient, but including spot-specific alignment improvements plus the provision of climbing lanes where appropriate.

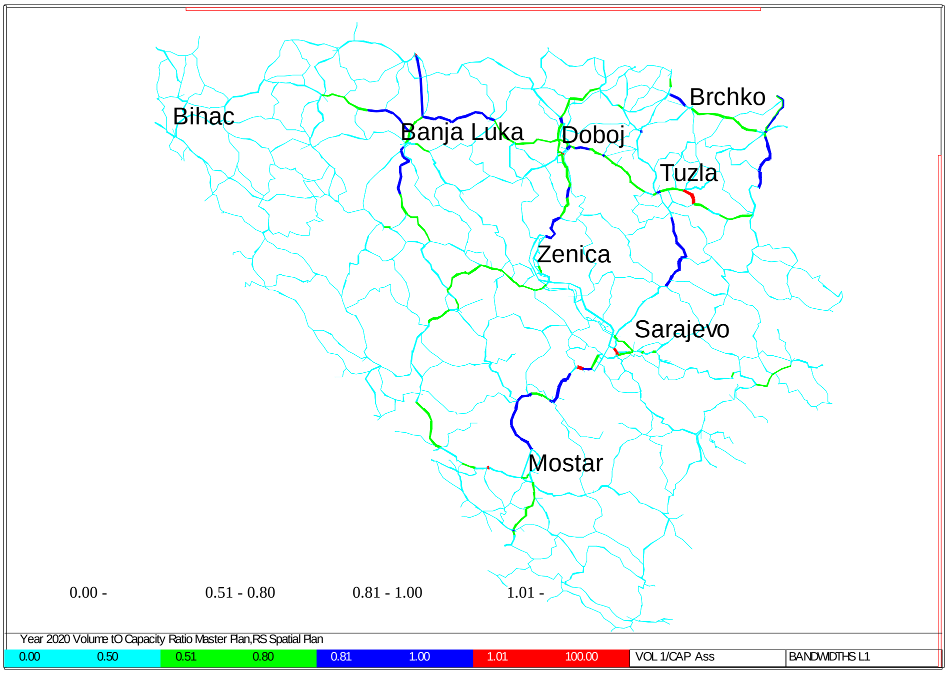


Figure 2.2.30 Volume to Capacity Ratio in Year 2020
Adjusted Spatial Plan Distribution On Master Plan Network

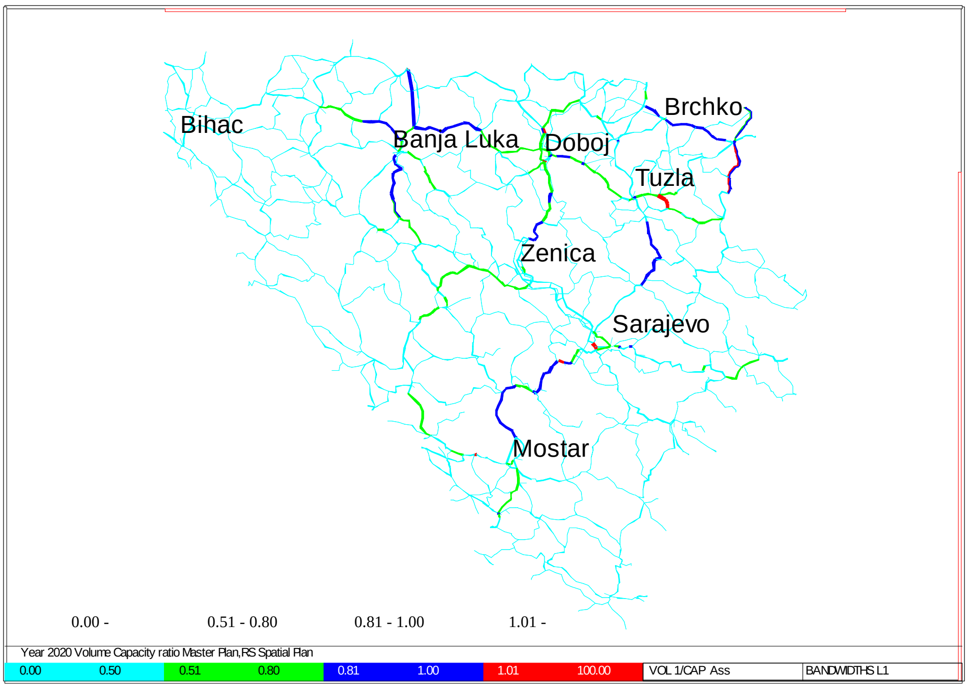


Figure 2.2.31 Volume to Capacity Ratio in Year 2020
Adjusted Spatial Plan Distribution and Trips On Master Plan Network

2.3 ROAD TRANSPORT OPERATORS

This section presents a discussion of road transport operators, that is, inter-city and long distance bus as well as truck activities. Section 2.3.1 contains information pertaining to trucking and cargo movement, Section 2.3.2 discusses bus services, and while Section 2.3.3 present a series of recommended strategic improvements for the sector.

2.3.1 Trucking Activities

(1) Organizational and Operational Overview

Cargo transport in BiH[32] falls into two general categories: international and within BiH. Unlike passenger transport, further stratification such as inter-Entity truck transport does not exist since freedom of cargo movement throughout BiH is guaranteed. Unfortunately, for intra-BiH truck transport, virtually no structured data exist regarding type of services, cargo carried, and operator performance. In case of international operations, more robust information is available since, in most cases, permits must be obtained for BiH trucks to journey abroad.

The Ministry of Civil Affairs and Communications is responsible for the issuance of permits authorizing foreign shipments of cargo by truck. After negotiating the number of available permits, the Ministry subsequently distributes[33] these to the Entity Ministries of Transport, some one-third to Republika Srpska and two-thirds to the Federation[34]. The Federation Ministry of Transport and Communications, in turn, assigns the permits to individual Kantons based on several criteria among them export/import activity, industrial development, population, number of registered transport companies as well as number of vehicles. Kanton Ministries of Transport and Communications, in turn, assign the permits to registered trucking companies within the Kanton. Similar procedures are followed in Republika Srpska, in that the Ministry of Transport and Communications allocates permits to individual operators based on several technical criteria, among them number of employees, export/import activity and number of vehicles.

Two types of permits exist: bilateral and CEMT. In case of bilateral permits, negotiated agreements are reached with various countries regarding the number of permits issued in any given year. These permits are negotiated on a reciprocal basis, that is, a number

[32] Considerable inputs to this discussion were obtained from interviews with persons knowledgeable of the truck industry within the BiH Ministry of Civil Affairs and Communications as well as Entity Ministries of Transport and Communications. Visits to all ten Kantons were also completed, to include discussions with Kantonal Ministries of Transport and Communications. All interviews were conducted during June and July 2000.
[33] Roughly 10 percent of permits are reported by the Ministry as being retained for emergency use, or to facilitate timely transport of high-priority shipments.
[34] At time of writing, no decisions had been reached regarding the role of the Brcko Administrative District in this procedure. However, it was implied that a review of the ratio allocation procedure might be forthcoming. The current ratio appears to be based on judgmental factors, and apparently does not take into account actual need, established trading patterns or type of truck fleet among the Entities.

equal to those issued to BiH truckers is also issued to truckers in the destination country. Trip permits are valid for one year, for a single trip, and, once issued, lapse if not used. The permits are cancelled upon entering the destination country, however, it is understood that lax border formalities at the BiH border frequently result in permits owned by foreign truckers not being cancelled at the point of BiH entry, thus permitting more than one trip on what was issued as a single trip permit. The permit allows two-way carriage of cargo, but does not permit cargo interchange with third countries. Bilateral agreements have been reached with 14 countries and encompass a total of 19,375 permits for calendar year 2000 (Table 2.3.1).

Table 2.3.1
Bilateral Permits for International Transport of Cargo by Truck
Bosnia and Herzegovina – Year 2000

Country	Number of Permits (1)
Austria	5,875
Belgium	500
Czech Republic	1,000
Denmark	600
France	1,050
Netherlands	500
Italy	4,850
FYR Macedonia (2)	300
Germany	2,000
Poland	500
Romania	500
Slovak Republic	1,000
Spain	500
Slovenia (2)	200
Total	19,375

(1) For calendar year 2000, including transit permits.
(2) Permit system to be abolished during year 2000.
Source: Ministry of Transport and Communications

No permits are required for truck trade with Albania, Croatia, Hungary, Sweden, Switzerland, Turkey and, recently, Slovenia as well as FYR Macedonia. Formal agreements with Yugoslavia do not exist. However, trucks of both nations may cross national boundaries for cargo shipment purposes, subject to payment of tax and other road user charges.

CEMT permits are much more liberal in nature; permits issued within BiH are valid for an unlimited number of annual journeys within the CEMT signatory group (although the license may be revoked if less than 50 uses per year are noted), with limitations on vehicle types used for journeys to Italy and Austria. The number of permits issued is strictly controlled by the signatory group, but is not subject to bilateral agreements. The "baseline" total for BiH is 120 annual permits, plus a temporary three-year[35] annual allotment of 25 permits due to unique local post-war conditions. Additional CEMT permits are issued based on "bonuses" for Euro1 and Euro2 vehicle content in the

[35] Year 1999, 2000, and 2001.

trucking fleet. For calendar year 2000, the all-inclusive number of BiH CEMT permits was fixed at 251.

The Ministry of Civil Affairs and Communications indicates that, at June 2000, 1,012 BiH operators are active in international trucking, with a total fleet of 3,065 vehicles. This is subdivided into 487 Euro1 units, 389 Euro2 units, and 2,189 other (traditional) units. These totals exclude operators active in the Slovenian, Croatian, and Yugoslav markets. While exact ownership data are not recorded, it was estimated that some 25 percent of the truck fleet is privately owned.

A concern voiced to the Study Team was that the most significant shortfall in bilateral permits is in totals negotiated with Italy and Austria; it was suggested that some 20 to 30 percent more permits are desirable, but as yet not achievable via the bilateral negotiation process. Another apparent concern is the high cost of shipping incurred by BiH truckers; this is due to several factors, among them inspection delays at border crossings. BiH, for example, is not a signatory to TIR agreements (but has observer status). Further, BiH drivers require visas for all countries and this catalyzes considerable cost both in the form of visa issuance, as well as delays incurred at border crossings.

A recent study examined the status of international licensed cargo movements in the Federation[36]. Findings reveal that, at 30 September 1999, 643 trucking companies held licenses for export-import activities. These operators controlled 1,981 trucks, 1,582 thereof being standard units, with a further 243 and 156 holding Euro1 and Euro2 ratings, respectively. Of the 1,981 trucks, 154 indicated having a capacity of less than six tons, 650 a capacity of between 6 and 20 tons, with a further 1,177 being tractive (cab) units. The trailer fleet encompassed 1,515 units, 407 thereof being full trailers and 1,108 semi-trailers. In terms of truck age, some two percent were, at that time, more than 21 years old, 45 percent 11-20 years old, 36 percent 6-10 years old, and 17 percent less than six years old. A similar distribution is noted for trailers.

The report gives insight to the Kantonal allocation within the Federation. Thus, during 1999, Zenicko-Dobojski was allocated 19.5 percent of annual CEMT licenses (which, for the Federation, totaled 164) and Tuzlanski Kanton received 19.2 percent of bilateral permits (Table 2.3.2).

[36] *Analiza Prijevoza Tereta U Medjunarodnom Prometu I Iskoristenja Jednokratnih Inostranih Dozvola Za Prijevoz Tereta U Federaciji Bosne I Hercegovine*, by Federacija Bosne I Hercegovine, Federalno Ministarstvo Prometa I Komunikacija, Sektor Prometa, Mostar, Novembar 1999.

Table 2.3.2
Kantonal Allocation
Permits for International Transport of Cargo by Truck
Federation of Bosnia and Herzegovina – Year 1999

Kanton	Percentage Permit Allocation	
	CEMT	Bilateral
Unsko-Sanski	7.9	8.5
Posavski	1.2	1.9
Tuzlanski	14.0	19.2
Zenicko-Dobojski	19.5	16.9
Bosansko-Podrinjski	0.6	1.1
Srednjobosanski	8.5	10.2
Hercegovacko-Neretvanski	15.9	12.8
Zapadno-Hercegovacki	18.3	10.4
Sarajevski	11.6	15.6
Herceg-Bosanski	2.4	3.3
Total	100.0	100.0

Source: *Analiza Prijevoza Tereta U Medunarodnom Prometu I Iskoristenja Jednokratnih Inostranih Dozvola Za Prijevoz Tereta U Federaciji Bosne I Hercegovine*, op. cit.

The use of permits issued as of 10 September 1999 was heavily dominated by Slovenia (some 61 percent of total) followed by Italy (18 percent) and Austria (15 percent). As indicated previously, permits are not required for trucks crossing between BiH and Croatia, while official permits are not issued for truck-based trade with Yugoslavia. In terms of ton activity for a 10.5-month period ending September, 1999, Slovenia dominated accounting for more than half of tons carried by the licensed operators. Cargo to/from Italy aggregated to a further 29 percent. Tuzlanski and Zenicko-Dobojski Kantons accounted for roughly one-quarter each of international cargo shipments during this period. The weighted average load per truck, all operators, all origins/destinations, was 18 tons (Table 2.3.3).

Within Republika Srpska, discussions reveal that, at present, 265 trucking companies hold licenses for export-import activities. These operators controlled 887 trucks and 712 trailers. The average vehicle age is 10-15 years. As is the case with Federation activity, international shipments are primarily oriented to Italy and Austria. It is understood that the majority of the fleet is privately owned.

Table 2.3.3 Overview of Export and Import Activity: Trucking Operators from Federation of BiH Holding Bilateral Cargo Permits

Trading Partner	Performance Indicator			Toffren Kanton										Total Federation of BiH	
	Item	Units	Description	Unsko-Sanski	Posavski	Tuzlanski	Zenicko-Dobojski	Gorajedrinski	Srednjobosanski	Hercegovacko-Neretvanski	Zapadnohercegovacki	Sarajevski	Herceg-bosanski (1)	Number	Percent
Italy	Cargo (2)	Tons	Export	921.3	195.6	7,078.0	5,882.8	90.0	3,355.0	1,013.0	1,187.7	4,998.0	*	24,641.4	39.0
			Import	422.2	128.6	7,265.3	6,624.2	25.0	2,818.0	2,374.0	2,795.8	4,645.0	*	27,098.1	23.4
			Total	1,343.5	324.2	14,343.3	12,507.0	115.0	6,173.0	3,387.0	3,983.5	9,643.0	*	51,739.5	28.9
	Trips (3)	Number	Total	80	14	467	373	5	207	141	163	334	*	1,784	23.7
		Percent	Two-way											57.8	*
	Load (4)	Tons/vehicle	Average											19.3	*
Slovenia	Cargo (2)	Tons	Export	1,407.0	413.0	9,785.0	6,755.8	139.6	5,504.0	257.0	533.5	581.0	*	25,295.9	40.1
			Import	2,650.0	445.0	18,233.6	14,564.2	174.5	7,008.0	8,707.0	7,036.6	7,889.3	*	66,708.2	57.6
			Total	4,057.0	858.0	27,938.6	21,320.0	314.1	12,512.0	8,964.0	7,570.1	8,470.3	*	92,004.1	51.4
	Trips (3)	Number	Total	220	66	1,167	863	10	492	449	432	545	*	4,244	56.5
		Percent	Two-way											23.9	*
	Load (4)	Tons/vehicle	Average											17.6	*
Austria	Cargo (2)	Tons	Export	0.0	42.5	1,070.3	1,026.3	15.4	1,438.0	164.0	666.8	1,424.2	*	5,847.5	9.3
			Import	0.0	201.3	1,663.1	1,698.4	92.0	1,899.0	788.5	1,033.9	1,616.1	*	8,992.3	7.8
			Total	0.0	243.8	2,733.4	2,724.7	107.4	3,337.0	952.5	1,700.7	3,040.3	*	14,839.8	8.3
	Trips (3)	Number	Total	0	12	98	96	5	101	45	68	109	*	534	7.1
		Percent	Two-way											42.1	*
	Load (4)	Tons/vehicle	Average											19.7	*
Austria (Transit Permit)	Cargo (2)	Tons	Export	128.0	23.6	1,241.3	724.0	0.0	248.0	84.0	48.4	332.7	*	3,030.0	4.8
			Import	172.0	112.8	1,906.3	985.6	24.0	287.0	225.0	413.7	708.7	*	4,835.1	4.2
			Total	300.0	136.4	3,147.6	1,709.6	24.0	535.0	309.0	462.1	1,241.4	*	7,865.1	4.4
	Trips (3)	Number	Total	16	6	136	66	1	16	18	33	48	*	340	4.5
		Percent	Two-way											35.6	*
	Load (4)	Tons/vehicle	Average											17.4	*
Germany	Cargo (2)	Tons	Export	198.0	102.8	160.1	1,874.6	0.0	772.0	236.0	505.5	355.6	*	4,204.6	6.7
			Import	22.0	120.3	526.6	1,542.2	0.0	592.0	617.4	1,543.0	425.6	*	5,389.1	4.7
			Total	220.0	223.1	686.7	3,416.8	0.0	1,364.0	853.4	2,048.5	781.2	*	9,593.7	5.4
	Trips (3)	Number	Total	12	21	35	119	0	61	41	115	26	*	430	5.7
		Percent	Two-way											49.2	*
	Load (4)	Tons/vehicle	Average											15.2	*
Romania	Cargo (2)	Tons	Export	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	*	0.0	0.0
			Import	0.0	0.0	0.0	173.0	0.0	110.0	34.0	366.4	255.7	*	939.1	0.8
			Total	0.0	0.0	0.0	173.0	0.0	110.0	34.0	366.4	255.7	*	939.1	0.5
	Trips (3)	Number	Total	0	0	0	8	0	8	3	28	20	*	67	0.9
		Percent	Two-way											0.0	*
	Load (4)	Tons/vehicle	Average											14.0	*
Slovakia	Cargo (2)	Tons	Export	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	*	0.0	0.0
			Import	0.0	0.0	0.0	68.0	0.0	26.8	75.0	25.7	363.8	*	558.5	0.5
			Total	0.0	0.0	0.0	68.0	0.0	26.8	75.0	25.7	363.8	*	558.5	0.3
	Trips (3)	Number	Total	0	0	0	3	0	3	6	2	19	*	33	0.4
		Percent	Two-way											0.0	*
	Load (4)	Tons/vehicle	Average											16.9	*
Czech Republic	Cargo (2)	Tons	Export	0.0	0.0	0.0	20.0	0.0	22.0	0.0	0.0	23.0	*	65.0	0.1
			Import	0.0	0.0	0.0	422.8	0.0	196.0	24.0	47.3	234.7	*	924.8	0.8
			Total	0.0	0.0	0.0	442.8	0.0	218.0	24.0	47.3	257.7	*	989.8	0.6
	Trips (3)	Number	Total	0	0	0	21	0	10	1	3	28	*	63	0.8
		Percent	Two-way											4.8	*
	Load (4)	Tons/vehicle	Average											18.2	*
Belgium	Cargo (2)	Tons	Export	0.0	0.0	0.0	50.7	0.0	0.0	0.0	2.7	7.1	*	60.5	0.1
			Import	0.0	0.0	0.0	48.0	0.0	20.0	168.0	44.4	111.5	*	391.9	0.3
			Total	0.0	0.0	0.0	98.7	0.0	20.0	168.0	47.1	118.6	*	452.4	0.3
	Trips (3)	Number	Total	0	0	0	3	0	1	7	3	9	*	23	0.3
		Percent	Two-way											17.4	*
	Load (4)	Tons/vehicle	Average											15.0	*
Total	Cargo (2)	Tons	Export	2,654.3	777.5	19,254.7	16,334.2	245.0	11,339.0	1,754.0	2,864.6	7,921.6	*	63,144.9	100.0
			Import	3,266.2	1,008.0	29,594.9	26,126.4	315.5	12,956.0	13,012.9	13,306.0	16,250.4	*	115,837.1	100.0
			Total	5,920.5	1,785.5	48,849.6	42,460.6	560.5	24,295.0	14,766.9	16,171.4	24,172.0	*	178,982.0	100.0
		Percent	Of BiH	3.3	1.0	27.3	23.7	0.3	13.6	8.3	9.0	13.5		100.0	*
	Trips (3)	Number	Total	328.0	119.0	1,903.0	1,552.0	21.0	899.0	711.0	847.0	1,138.0	*	7,518	100.0
		Percent	Of BiH	4.4	1.6	25.3	20.6	0.3	12.0	9.5	11.3	15.1	*	100.0	*
	Load (5)	Tons/vehicle	Average											18.0	*

Source: *Analiza Prijevoza Tereta U Međunarodnom Prometu I Iskorištenja Jednokratnih Inostranih Dozvola Za Prijevoz Tereta U Federaciji Bosne I Hercegovine*, op. cit.
(1) No data indicated.
(2) Shipments for 10.5 month period ending September, 1999. Exports from BiH, imports to BiH.
(3) Number of round trips. Two-way percentage indicates percent of total trips involving bi-directional cargo loadings.
(4) Average load is mathematical average of indicated export and import average loads per vehicle (tons). Average load reflects one-direction and two-direction loadings.
(5) Weighted average using number of trips of average loads per trading partner.

(2) Operator Interviews

Interviews were conducted with trucking companies throughout BiH in order to obtain more insight into fleet composition[37]. While considerable difficulties were encountered in completing these interviews, frequently due to the on-going privatization program, several interesting oversights nevertheless emerged. The ten interviewed operators have a fleet of some 480 commercial vehicles, including about 120 trailers. Capacities of load-bearing vehicles were noted to be very similar; on average 17.7 tons in the Federation, 18.5 tons in RS and 18.1 tons on a composite BiH basis. The fleet tends to be old, on average, almost 14 years per vehicle in the Federation, and 11 years in RS. The load characteristics vary depending on operator specialization. For example, some 90 percent of Autosaobracaj Tuzla haulage is within Tuzla Kanton, while a considerable component of ODP Tehnotrans activity is linked with Yugoslavia. Haulage rates vary depending on operator; in some cases, price for each load is negotiated. Flat rates can apply; for example, Kompanija Dusanic indicates a reasonable price for a load of fuel oil from Kopar, Slovenia to Prnjavor is KM 1,300 per truck, while a load of bricks between Kikinda, Yugoslavia and Prnjavor might be about KM 800. Standard rates, when used, tend to vary with distance and amount of load. That is, unit rates drop as amount and distance of haulage increases. Zenica Transport, for example, quotes rates of 3.5 KM per ton for a 75-kilometer trip, and 1.8 KM per ton for a 1,000-kilometer trip.

(3) Trade Tendencies

Accurate measurement of trade flows (considerable portions of which move by truck) has been one of the most difficult areas of BiH statistics. Various Ministries and Statistics Offices use different approaches to recording trade transactions, as do external sources CAFAO and the IMF *Direction of Trade Statistics (DOTS).*

Official Federation Office for Statistics data is based on reports from customs houses in the case of imports and from enterprises in the case of exports. CAFAO estimates the value of trade flows using data on receipts of the customs evidencing charge. Both sources are incomplete but the CAFAO data are generally viewed as being more accurate. The IMF uses trade reports from BiH's trading partners to estimate imports and exports. These suggest that, for 1998, BiH generated some US$ 491 million in exports, and US$ 2,508 million in imports (Table 2.3.4). The advantage of the IMF data is that a complete picture is drawn about total BiH imports and exports; however, the weakness is that trade with Yugoslavia is not included at all, which is a serious gap since Republika Srpska, at least until the Kosovo crisis, had significant trading relations with Yugoslavia. Consequently, for 1998 the DOTS probably underestimated imports

[37] Interviews were completed during early year 2000 on behalf of the Study Team by IPSA in the Federation of BiH, and Institute for Urbanism in Republika Srpska. Four operator interviews were completed in the Federation (Autoprevoz Mostar, Autosaobracaj Tuzla, ATP Bugojno, Zenica Transport) and six in RS (ODSRP Rotas, ODP Romanijaprevoz, Kompanija Dusanic, ODP Tehnotrans, DOO Butreks, DD Boksit). All data refer to the 1998/1999 period.

by US$ 475 million and exports by US$ 217 million[38]. In other words, using DOTS as the starting point and adjusting for the estimated BiH-Yugoslavia trade, total imports would have been worth US$ 2,983 million and exports could have US$ 716 million.

Table 2.3.4 Foreign Trade 1997 and 1998: Bosnia and Herzegovina (Million US$)

Period	Total Exports	Imports			
		Total	EU	Croatia	Slovenia
1997	372	2,377	943	713.57	317.3
1998	491	2,508	1025	740	350
Q1-97	68	609	215	177	73
Q2-97	89	563	238	157	83
Q3-97	107	582	232	192	77
Q4-97	108	624	258	187	85
Q1-98	106	530	219	154	69
Q2-98	110	589	250	171	78
Q3-98	143	669	255	222	95
Q4-98	132	720	302	194	108

Source: Direction of Trade Statistics (IMF)

Federation trade activity has consistently increased over recent years. In the short-term, exports seem to have increased dramatically in the second quarter of 1999 (both compared to the first quarter and the same period in 1998). Based on CAFAO data, second quarter imports increased eight percent compared to the same period in 1998 (Table 2.3.5).

Table 2.3.5 Foreign Trade 1994 – 1999: Federation of Bosnia and Herzegovina

Period	Exports(1) ('000 US$)	Imports (Thousand US$) (1)				Imports(2) ('000 KM)
		Total	EU	Croatia	Slovenia	
1994	4,628	489,717	92,790	379,152	8,986	-
1995	23,735	523,615	161,084	133,265	104,433	-
1996	57,993	1,203,967	387,788	322,167	207,446	-
1997	108,683	1,544,970	685,717	295,935	211,664	2,922,680
1998	185,264	1,193,172	403,986	301,025	168177	3,515,052
Q1-97	17,600	183,948	64,579	34,233	29,295	596,905
Q2-97	25,503	594,788	299,072	104,034	73,357	717,851
Q3-97	27,206	377,596	160,514	82,390	51,996	788,051
Q4-97	38,374	398,638	161,552	75,278	57,016	819,873
Q1-98	47,588	315,588	84,849	102,905	43,501	682,616
Q2-98	11,143	135,790	76,489	15,094	16,972	819,391
Q3-98	27,198	335,199	113,883	84,148	47,833	920,395
Q4-98	99,335	406,595	128,765	98,878	59,871	1,092,651
Q1-99	68,851	324,941	95,755	92,070	50,523	728,874
Q2-99	119,448	452,431	154,274	139,717	73,954	884,899
Jul-99	39,793	140,388	55,907	30,889	26,862	280,986
Aug-99						339,972

(1) Source: Federation Office of Statistics (2) Source: CAFAO

By contrast, the impact of severed trading relations with Yugoslavia has meant a dramatic drop in both exports and imports of the Republika Srpska. However, trade figures seem to be increasing since June (Table 2.3.6)

[38] Based on data contained in *BiH Economic Update, 1999 Third Quarter*, and United States Agency for International Development.

Table 2.3.6 Foreign Trade 1999: Republika Srpska

Period	Exports (Thousand KM)	Imports (Thousand KM)
January	57,229	149,428
February	19,304	83,974
March	13,650	81,515
April	14,132	63,547
May	18,812	73,053
June	36,193	195,224
July	46,780	215,485

Source: Customs Administration as presented in *BiH Economic Update, 1999 Third Quarter*, op. cit.

Statistics for Republika Srpska confirm that, for 1999, the Raca border crossing north of Bijeljina accounted for the highest total of imported goods (Table 2.3.7).

Table 2.3.7 Quantity of Imported Goods
Major Border Crossings - Republika Srpska

Border Crossing	Import Tons by Year			
	1997	1998	1999	2000 (1st Quarter)
Gradiska	16,700	250,300	194,200	44,300
Novi Grad	8,700	6,900	101,700	225,500
Raca	306,000	-	471,200	146,600
Pavlovica Most	165,500	298,200	253,200	59,700
Nudo	18,200	-	-	1,500

Notes: Gradiska crossing not operable 3.5.99-1.5.00 due to bridge reconstruction. Some entries are incomplete due to lack of information.
Source: Republika Srpska Ministry of Finance

Data[39] suggest that, for the final four months of 1999, trade between the Entities aggregated to 59.9 million KM. The majority of trade items are identified as being food products, metal products, technical products, and other industrial/craft products. Some 90 percent of trade payments are made via transfer orders. A comparison to trade statistics over the same period of the previous year confirms that trade activity increased by almost two-thirds from 36.5 million KM to 59.9 million KM. In absolute and relative terms, the growth in Sarajevo Kanton trade activity was impressive roughly tripling from 10.6 million KM to 32.8 million KM. Thus, between 1998 and 1999, the Kanton Sarajevo contribution to inter-Entity trade increased from 29.1 to 54.7 percent of the Federation total. Furthermore, during the last trimester (September, October, November, December) of 1999, two Kantons (Sarajevski and Tuzlanski) apparently accounted for more than three-fourths of total inter-Entity trade (Table 2.3.8).

[39] Source: Ministry of Trade, Federation of Bosnia and Herzegovina

Table 2.3.8 Third Trimester Trade Between Entities: Years 1998 and 1999

Origin/Destination Point Within Federation (Kanton)	Amount of Two-Way Trade (Mill KM)		Percentage Allocation		Trade Ratio
	1998	1999	1998	1999	1998-1999
Sarajevski	10.64	32.79	29.1	54.7	3.08
Tuzlanski	10.16	13.50	27.7	22.5	1.33
Zenicko-Dobojski	7.35	3.94	20.1	6.6	0.54
Srednjobosanski	4.73	3.77	13.0	6.3	0.80
Unsko-Sanski	2.04	3.34	5.6	5.6	1.64
Zapadno-Hercegovacki	0.55	0.04	1.5	0.1	0.07
Posavski	0.40	1.15	1.3	1.9	2.89
Hercegovacko-Neretvanski	0.32	0.72	0.9	1.2	2.25
Bosansko-Podrinjski	0.17	0.12	0.5	0.2	0.71
Herceg-Bosanski	0.11	0.52	0.3	0.9	4.73
Total	36.54	59.89	100.0	100.0	1.64

Source: Ministry of Trade, Federation of Bosnia and Herzegovina

For the third trimester of 1999, trade from Republika Srpska to the Federation totaled 22.05 million KM (an increase of 2.23 million KM over the same 1998 period), while trade from the Federation to Republika Srpska totaled 37.85 million KM (an increase of 21.14 million KM over the same 1998 period). On a Kantonal level, Kanton Sarajevo generates highest trade to/from Republika Srpska (Figure 2.3.1).

Figure 2.3.1 Year 1999 (Third Trimester) Trade Between Entities

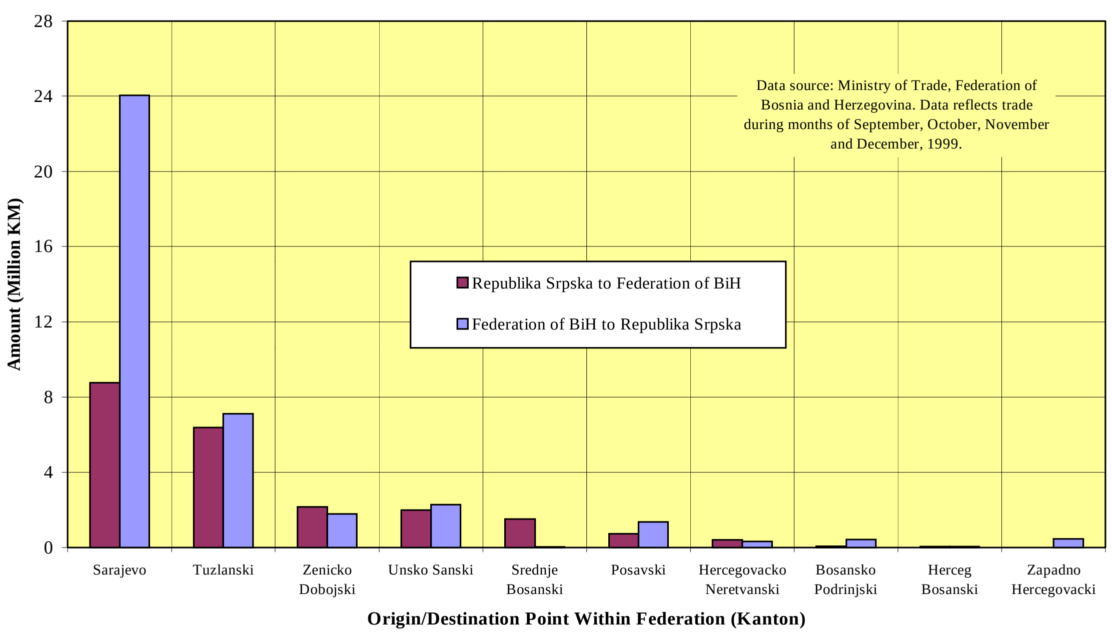


Table 2.3.9 Composite Distribution of Year 2000 Vehicle Trips

Total Vehicle Trips

From / To	Number of Daily Inter-zonalVehicle Trips				
	FBiH	RS	BAD	Foreign	Total
Federation of BiH	40,440	10,143	1,398	9,642	61,621
Republika Srpska	10,174	22,601	1,275	7,747	41,797
Brcko Admin. District	1,401	1,271	0	551	3,223
Croatia	7,146	786	120	321	8,373
Yugoslavia	736	6,333	357	187	7,613
Other Foreign	1,757	632	74	121	2,584
Total	61,654	41,766	3,222	18,569	125,211

From / To	Percent of Daily Inter-zonal Vehicle Trips				
	FBiH	RS	BAD	Foreign	Total
Federation of BiH	65.6	24.3	43.3	51.9	49.2
Republika Srpska	16.5	54.1	39.6	41.7	33.4
Brcko Admin. District	2.3	3.0	0.0	3.0	2.6
Croatia	11.6	1.9	3.7	1.7	6.7
Yugoslavia	1.2	15.2	11.1	1.0	6.1
Other Foreign	2.8	1.5	2.3	0.7	2.1
Total	100.0	100.0	100.0	100.0	100.0

Passenger Car Vehicle Trips

From / To	Number of Daily Inter-zonalVehicle Trips				
	FBiH	RS	BAD	Foreign	Total
Federation of BiH	35,589	8,671	1,269	8,799	54,328
Republika Srpska	8,691	19,835	1,138	6,870	36,534
Brcko Admin. District	1,272	1,132	0	493	2,897
Croatia	6,552	715	118	288	7,665
Yugoslavia	658	5,712	332	130	6,832
Other Foreign	1,583	448	52	78	2,161
Total	54,345	36,513	2,901	16,658	110,417

From / To	Percent of Daily Inter-zonal Vehicle Trips				
	FBiH	RS	BAD	Foreign	Total
Federation of BiH	65.5	23.7	43.7	52.8	49.2
Republika Srpska	16.0	54.3	39.2	41.2	33.1
Brcko Admin. District	2.3	3.1	0.0	3.0	2.6
Croatia	12.1	2.0	3.8	1.7	6.9
Yugoslavia	1.2	15.6	11.4	0.8	6.2
Other Foreign	2.9	1.2	1.8	0.5	2.0
Total	100.0	100.0	100.0	100.0	100.0

Bus Vehicle Trips

From / To	Number of Daily Inter-zonalVehicle Trips				
	FBiH	RS	BAD	Foreign	Total
Federation of BiH	925	189	15	194	1,323
Republika Srpska	194	531	18	181	924
Brcko Admin. District	17	18	0	9	44
Croatia	143	13	2	3	161
Yugoslavia	29	151	8	1	189
Other Foreign	22	16	1	2	41
Total	1,330	918	44	390	2,682

From / To	Percent of Daily Inter-zonal Vehicle Trips				
	FBiH	RS	BAD	Foreign	Total
Federation of BiH	69.5	20.6	34.1	49.7	49.3
Republika Srpska	14.6	57.8	40.9	46.4	34.5
Brcko Admin. District	1.3	2.0	0.0	2.3	1.6
Croatia	10.8	1.4	4.5	0.8	6.0
Yugoslavia	2.2	16.4	18.2	0.3	7.0
Other Foreign	1.7	1.7	2.3	0.5	1.5
Total	100.0	100.0	100.0	100.0	100.0

All Truck Vehicle Trips

From / To	Number of Daily Inter-zonalVehicle Trips				
	FBiH	RS	BAD	Foreign	Total
Federation of BiH	3,926	1,283	112	649	5,970
Republika Srpska	1,289	2,235	119	696	4,339
Brcko Admin. District	112	121	0	49	282
Croatia	451	58	8	30	547
Yugoslavia	49	470	17	56	592
Other Foreign	152	168	21	41	382
Total	5,979	4,335	277	1,521	12,112

From / To	Percent of Daily Inter-zonal Vehicle Trips				
	FBiH	RS	BAD	Foreign	Total
Federation of BiH	65.7	29.6	40.4	42.7	49.3
Republika Srpska	21.6	51.6	43.0	45.8	35.8
Brcko Admin. District	1.9	2.8	0.0	3.2	2.3
Croatia	7.5	1.3	2.9	2.0	4.5
Yugoslavia	0.8	10.8	6.1	3.7	4.9
Other Foreign	2.5	3.9	7.6	2.7	3.2
Total	100.0	100.0	100.0	100.0	100.0

Rigid Truck Vehicle Trips

From / To	Number of Daily Inter-zonalVehicle Trips				
	FBiH	RS	BAD	Foreign	Total
Federation of BiH	3,127	931	92	282	4,432
Republika Srpska	941	1,723	99	192	2,955
Brcko Admin. District	91	100	0	9	200
Croatia	202	14	0	9	225
Yugoslavia	21	169	6	5	201
Other Foreign	59	11	1	4	75
Total	4,441	2,948	198	501	8,088

From / To	Percent of Daily Inter-zonal Vehicle Trips				
	FBiH	RS	BAD	Foreign	Total
Federation of BiH	70.4	31.6	46.5	56.3	54.8
Republika Srpska	21.2	58.4	50.0	38.3	36.5
Brcko Admin. District	2.0	3.4	0.0	1.8	2.5
Croatia	4.5	0.5	0.0	1.8	2.8
Yugoslavia	0.5	5.7	3.0	1.0	2.5
Other Foreign	1.3	0.4	0.5	0.8	0.9
Total	100.0	100.0	100.0	100.0	100.0

Articulated Truck Vehicle Trips

From / To	Number of Daily Inter-zonalVehicle Trips				
	FBiH	RS	BAD	Foreign	Total
Federation of BiH	799	352	20	367	1,538
Republika Srpska	348	512	20	504	1,384
Brcko Admin. District	21	21	0	40	82
Croatia	249	44	8	21	322
Yugoslavia	28	301	11	51	391
Other Foreign	93	157	20	37	307
Total	1,538	1,387	79	1,020	4,024

From / To	Percent of Daily Inter-zonal Vehicle Trips				
	FBiH	RS	BAD	Foreign	Total
Federation of BiH	52.0	25.4	25.3	36.0	38.2
Republika Srpska	22.6	36.9	25.3	49.4	34.4
Brcko Admin. District	1.4	1.5	0.0	3.9	2.0
Croatia	16.2	3.2	10.1	2.1	8.0
Yugoslavia	1.8	21.7	13.9	5.0	9.7
Other Foreign	6.0	11.3	25.3	3.6	7.6
Total	100.0	100.0	100.0	100.0	100.0

(4) Traffic Simulation

The trip matrixes developed as part of the road transport model, and described in Section 2.1 of this chapter, provides excellent insight into cargo and truck trip patterns. Several observations may be made for year 2000 inter-zonal[40] vehicle trip demand (Table 2.3.9):

- A total of 125,211 vehicle trips are recorded as occurring on a typical day during year 2000. Some 88 percent of them are by passenger cars (110,417 trips), two percent by buses (2,682 trips), and ten percent by trucks (12,112 trips). This relationship is compatible with official vehicle registration data, which for BiH, suggests that some 90 percent of registered vehicles are passenger cars, nine percent trucks and one percent buses.

- Truck trips are split roughly two thirds – one third between rigid trucks (up to three axles) and articulated trucks (trucks with more than three axles).

- Simulation results confirm that the average internal (having both trip ends within BiH) inter-zonal trip length differs among the modes. Within BiH, passenger cars travel, on average, some 92 kilometers per trip, buses 97 kilometers, rigid trucks 109 kilometers and articulated trucks 125 kilometers.

- In case of passenger cars, 66 percent of trips that begin in the Federation, and 54 percent of trips that begin in Republika Srpska, end in the Federation and Republika, respectively. These statistics are slightly higher in case of buses, totaling 70, and 58 percent respectively.

- The pattern of trips is very different between rigid and articulated trucks. In the former type, 70 percent of trips that begin in the Federation, and 58 percent of trips that begin in Republika Srpska, end in the Federation and Republic, respectively. Conversely, 21 percent of trips that begin in the Federation, and 32 percent of trips that begin in Republika Srpska, end in the Republic and Federation, respectively. However, in case of articulated trucks, only 52 percent of trips that begin in the Federation, and 37 percent of trips that begin in Republika Srpska, end in the Federation and Republic, respectively. A further 23 percent of trips that begin in the Federation, and 25 percent of trips that begin in Republika Srpska, end in the Republic and Federation, respectively.

In the case of rigid and articulated trucks, surveys verified that a high proportion of vehicles were not fully loaded (Table 2.3.10). In fact 40 percent of articulated trucks were noted as being empty.

[40] It is noted again at this juncture that simulated trip matrixes contain inter-zonal demand. Short trips, that is trips occurring entirely within a single zone (such as Banja Luka or Sarajevo) are not included in trip matrixes.

Table 2.3.10
Distribution of Commercial Vehicle Loading Pattern

Load Category	Truck Type	
	Rigid	Articulated
Full	31.3	48.3
¾ Full	5.4	4.1
½ Full	10.4	5.2
¼ Full	5.1	1.7
Empty	47.8	40.7
Total	100.0	100.0

Source: Year 2000 JICA Study Team surveys.

Of all other vehicles (i.e. cars and buses), only one percent was noted to be carrying any goods. Of the fully loaded rigid and articulated trucks only 31 percent had BiH license plates. In the case of articulated trucks with an origin or destination outside BiH only 17 percent had BiH plates. The distribution by type of goods being carried by fully loaded trucks is shown in Table 2.3.11. The highest proportion of all categories is around 30 percent and this category includes building materials.

Table 2.3.11 Distribution of Goods Carried by Fully Loaded Trucks

Goods Category	Percent by Truck Type	
	Rigid	Articulated
1. Agricultural	9.9	4.6
2. Food stuffs	19.6	15.9
3. Solid Mineral Fuels	2.0	2.9
4. Petroleum Products	2.4	9.3
5. Ore Sand Metal Waste	9.5	7.5
6. Metal Products	5.2	5.3
7. Crude, Manufactured Minerals, Building Materials	26.0	31.6
8. Fertilizers	0.7	0.5
9. Chemical Products	2.1	2.6
10. Machinery Transport Equipment, Manufactured Products, Others	22.6	17.8
Total	100.0	100.0

Source: Year 2000 JICA Study Team surveys

The composite year 2000 truck vehicle trip matrixes, internal plus external trips, encompass 12,112 trips, of which 8,088 are by rigid trucks (66.7 percent). To provide and overview of trip patterns, the 54 zone matrixes were aggregated to superzones consisting of Kanton's in the Federation, Functional Regions in Republika Srpska, the Brcko Administrative District and principal foreign destinations (the complete 54 zone matrixes, by vehicle type, are contained in Volume III of the *Interim Report*)[41]. As expected, Sarajevo Kanton and Banja Luka Functional Region are the precincts with highest absolute number of rigid truck trips. However, most are utilized only for short trips between zones located in these two precincts (Table 2.3.12). In case of articulated trucks, Sarajevo Kanton and Banja Luka Functional Region continue to play prominent

[41] It should be noted that aggregating to superzones will invariable imply that larger regions have a large number of trips, and vice versa. Nevertheless, superzone summaries provide a useful overview of trip patterns.

roles in trip making. However, the strong position of foreign locations (Croatia, Yugoslavia) is noted (Table 2.3.13).

Assignment of total truck trips onto the committed highway network is a useful tool for identifying those corridors with highest absolute numbers of trucks. Volumes of up to 2,000 trucks (total both directions) per day are noted on network links near Banja Luka, near Zenica and near Sarajevo (Figure 2.3.2).

The combination of current patterns established via the roadside origin-destination filed surveys, and forecast demand projections, permits an estimation of daily tonnage moved by trucks[42]. At present, an estimated 88,700 tons are transported daily including 33,800 tons by rigid trucks and 54,900 tons by articulated trucks[43]. This is expected to grow to about 159,000 tons per day by year 2010, and 288,000 tons by year 2020 (Table 2.3.14).

Table 2.3.14 Estimated Daily Cargo Transport by Truck
Years 2000, 2010, and 2020

Truck Type And Year	Ton Kilometers (000)	Average Load (tons) Per Truck	Total Tons Carried
Rigid			
2000	3,683.1	4.2	33,803
2010	6,438.2	5.3	65,996
2020	11,142.6	6.5	115,213
Articulated			
2000	6,563.3	13.6	54,944
2010	10,121.5	14.8	92,992
2020	17,224.5	16.1	172,543
Combined			
2000	10,246.4	7.3	88,747
2010	16,559.6	8.5	158,988
2020	28,367.0	9.7	287,756

[42] It is assumed that, over time, the current inefficient backload pattern will gradually moderate, reducing ultimately to 20 percent for rigid and 30 percent for articulated vehicles. As truck efficiency increases, there is also likelihood that the number of truck trips will be impacted.
[43] In modeling terms, base calculations reflect inter-zonal trips traveling on internal network links.

Table 2.3.12 Simulated Year 2000 Daily Inter-zonal Rigid Truck Vehicle Trips

From Superzone		Superzone Designation	To Superzone A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Total
A	FBiH	Bosansko Podrinjski	0	1	2	9	1	2	1	0	2	1	3	2	0	1	0	0	15	8	2	1	0	0	0	0	1	52
B	FBiH	Herceg-Bosanski	2	46	22	14	30	4	7	1	51	7	25	5	1	3	4	4	2	0	6	2	1	2	1	1	0	241
C	FBiH	Hercegovacko-Neretvanski	1	23	140	74	16	8	4	1	211	10	17	7	2	3	2	3	6	3	38	2	2	51	3	1	1	629
D	FBiH	Sarajevo	10	14	74	552	64	38	6	4	21	129	33	20	4	11	2	4	42	7	10	11	6	23	7	17	1	1.110
E	FBiH	Srednjebosanski	1	30	16	64	61	12	6	2	15	69	46	7	4	7	7	5	4	2	4	4	2	37	4	2	0	411
F	FBiH	Tuzlanski	1	4	7	38	12	347	4	22	4	30	42	51	27	54	1	4	5	2	3	26	32	25	3	17	2	763
G	FBiH	Unsko-Sanski	0	6	4	5	7	3	75	0	4	4	40	5	1	1	3	30	2	1	2	1	3	50	0	16	0	263
H	FBiH	Velezupa Posavska	1	1	1	4	2	22	1	0	1	3	10	18	18	4	0	1	0	0	0	2	41	0	1	0	0	131
I	FBiH	Zapadno-Hercegovacki	1	52	211	22	15	5	4	1	0	5	15	5	1	3	2	2	3	1	18	2	1	10	1	0	0	380
J	FBiH	Zenicko-Dobojski	2	7	9	129	68	30	3	2	6	63	44	10	9	45	2	3	4	1	3	3	4	4	1	0	0	452
K	RS	Banja Luka	4	26	18	32	45	43	40	10	16	42	669	29	26	95	31	126	5	1	8	9	11	5	49	2	0	1.342
L	RS	Bijeljina	2	4	7	20	8	51	5	18	5	9	28	0	11	9	1	4	6	1	3	67	64	1	87	2	2	415
M	RS	Gradacac (Brcko)	1	1	1	5	4	28	1	18	1	9	26	10	0	23	0	2	0	0	1	3	11	0	1	0	0	146
N	RS	Doboj	0	2	3	9	8	54	2	4	2	48	96	7	24	25	1	5	2	0	3	3	5	3	11	0	1	318
O	RS	Mrkonjic Grad	0	4	1	3	8	1	3	1	2	2	30	1	0	1	0	3	1	0	1	0	0	1	0	0	0	63
P	RS	Prijedor	0	4	3	5	6	4	30	1	2	3	124	4	2	4	3	35	2	1	1	1	1	0	1	1	0	238
Q	RS	Srpska Sarajevo	15	3	4	42	4	6	2	0	3	3	7	5	1	1	0	1	1	2	4	2	1	0	6	2	0	115
R	RS	Srbinje	8	0	2	7	2	1	0	0	1	1	1	1	1	0	0	1	3	0	2	0	0	1	1	0	0	33
S	RS	Trebinje	3	7	39	11	4	3	3	0	18	3	8	4	2	1	1	1	3	2	4	1	1	1	10	0	0	130
T	RS	Zvornik	1	2	3	11	4	27	1	2	2	4	9	67	2	4	0	2	3	1	1	0	5	0	4	0	0	155
U	BAD	Brcko Administrative District	0	1	2	5	3	32	2	41	1	4	12	64	11	5	0	1	1	0	1	5	0	1	6	2	0	200
V	Foreign	Croatia	0	3	51	23	36	25	50	0	10	4	5	0	0	3	1	0	0	2	2	1	0	4	2	0	3	225
W	Foreign	Yugoslavia	0	0	3	8	5	3	0	1	0	1	49	86	1	12	0	0	6	1	9	5	6	3	0	2	0	201
X	Foreign	Western Europe	0	1	1	18	1	18	16	0	0	0	1	2	0	0	0	1	1	0	0	0	1	0	2	0	0	63
Y	Foreign	Eastern Europe	0	0	2	0	0	2	0	0	0	0	1	3	0	2	0	0	0	0	0	0	0	2	0	0	0	12
Total Matrix			53	242	626	1.110	414	769	266	129	378	454	1.341	413	148	317	61	238	117	36	126	151	198	224	201	65	11	8.088

(1) Functional regions in Republika Srpska conform to those designated in *Prostorni Plan Republike Srpske; Etapni Plan 1996-2001* ; op. cit. Kanton and Functional Regions have been adjusted to account for the Brcko Administrative District.

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Table 2.3.13 Simulated Year 2000 Daily Inter-zonal Articulated Truck Vehicle Trips

From Superzone		Superzone Designation	To Superzone A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Total
A	FBiH	Bosansko Podrinjski	0	0	1	5	1	0	0	0	1	1	1	1	0	0	0	1	5	2	1	1	1	0	0	1	0	23
B	FBiH	Herceg-Bosanski	1	8	4	7	4	0	3	0	11	2	7	2	2	0	2	3	1	0	0	1	1	14	3	0	0	76
C	FBiH	Hercegovacko-Neretvanski	1	3	12	15	2	2	1	0	28	2	4	1	2	2	1	2	3	0	4	0	0	40	2	8	1	136
D	FBiH	Sarajevo	5	7	16	215	12	17	5	3	11	52	16	5	5	8	3	5	25	3	4	7	3	19	3	7	2	458
E	FBiH	Srednjebosanski	0	5	3	13	6	2	2	0	3	9	6	1	2	3	2	3	2	1	0	1	0	44	3	12	9	132
F	FBiH	Tuzlanski	2	3	1	17	3	46	2	6	2	10	11	8	16	20	0	4	2	0	1	9	8	6	7	7	2	193
G	FBiH	Unsko-Sanski	1	3	1	5	2	3	12	0	3	2	14	1	3	3	2	16	1	0	1	2	1	73	2	17	1	169
H	FBiH	Velezupa Posavska	0	0	0	2	0	7	1	0	1	2	3	2	9	1	1	1	1	0	0	1	6	1	0	0	1	40
I	FBiH	Zapadno-Hercegovacki	1	11	29	11	3	2	2	0	0	2	5	1	1	2	1	2	2	0	4	1	0	14	0	4	1	99
J	FBiH	Zenicko-Dobojski	0	2	3	52	10	11	3	1	1	17	11	2	7	17	2	2	3	1	1	3	0	38	3	15	7	212
K	RS	Banja Luka	0	5	3	15	8	12	14	4	5	13	91	5	14	38	11	43	4	2	1	4	3	20	55	37	30	437
L	RS	Bijeljina	0	1	1	6	1	7	2	3	1	2	5	0	3	3	0	1	2	0	1	11	7	5	101	5	41	209
M	RS	Gradacac (Brcko)	1	1	1	5	2	16	2	9	1	6	14	4	0	20	0	3	1	0	0	2	5	1	0	1	1	96
N	RS	Doboj	2	2	1	8	2	21	3	1	1	16	38	2	20	13	2	5	0	0	1	3	2	1	27	5	20	196
O	RS	Mrkonjic Grad	0	2	1	3	3	1	3	1	1	1	10	0	0	1	0	2	1	0	0	0	0	3	16	2	0	51
P	RS	Prijedor	1	2	2	5	2	2	17	0	2	2	41	2	3	5	3	20	1	1	0	1	2	2	11	0	0	127
Q	RS	Srpska Sarajevo	5	2	2	25	1	2	1	1	1	2	3	2	2	1	1	1	1	2	2	1	0	1	13	0	1	73
R	RS	Srbinje	2	0	1	3	0	0	0	0	0	1	2	1	0	0	0	0	1	0	1	0	0	0	1	0	0	13
S	RS	Trebinje	2	0	5	3	1	1	1	0	3	1	4	0	2	0	1	0	0	0	0	1	0	1	2	0	0	28
T	RS	Zvornik	1	1	1	8	1	10	1	1	1	2	5	10	3	2	0	2	2	0	1	0	1	12	78	8	3	154
U	BAD	Brcko Administrative District	0	0	0	3	1	8	1	6	0	2	3	6	6	2	0	1	1	0	0	2	0	8	12	10	10	82
V	Foreign	Croatia	0	14	42	18	45	6	72	1	12	39	21	6	0	1	2	1	1	0	1	11	8	3	15	1	2	322
W	Foreign	Yugoslavia	1	2	1	4	4	8	4	0	0	4	54	99	0	28	17	10	12	1	1	79	11	16	3	23	9	391
X	Foreign	Western Europe	1	0	10	5	12	7	17	0	3	16	37	6	1	7	1	1	1	0	0	7	9	0	24	0	2	167
Y	Foreign	Eastern Europe	0	0	1	2	9	3	0	0	1	6	28	40	1	21	1	1	1	0	0	3	11	2	8	1	0	140
Total Matrix			27	74	142	455	135	194	169	37	93	212	434	207	102	198	53	130	74	13	25	151	79	324	389	164	143	4.024

(1) Functional regions in Republika Srpska conform to those designated in *Prostorni Plan Republike Srpske; Etapni Plan 1996-2001*; op. cit. Kanton and Functional Regions have been adjusted to account for the Brcko Administrative District.

2 - 143

2 - 144

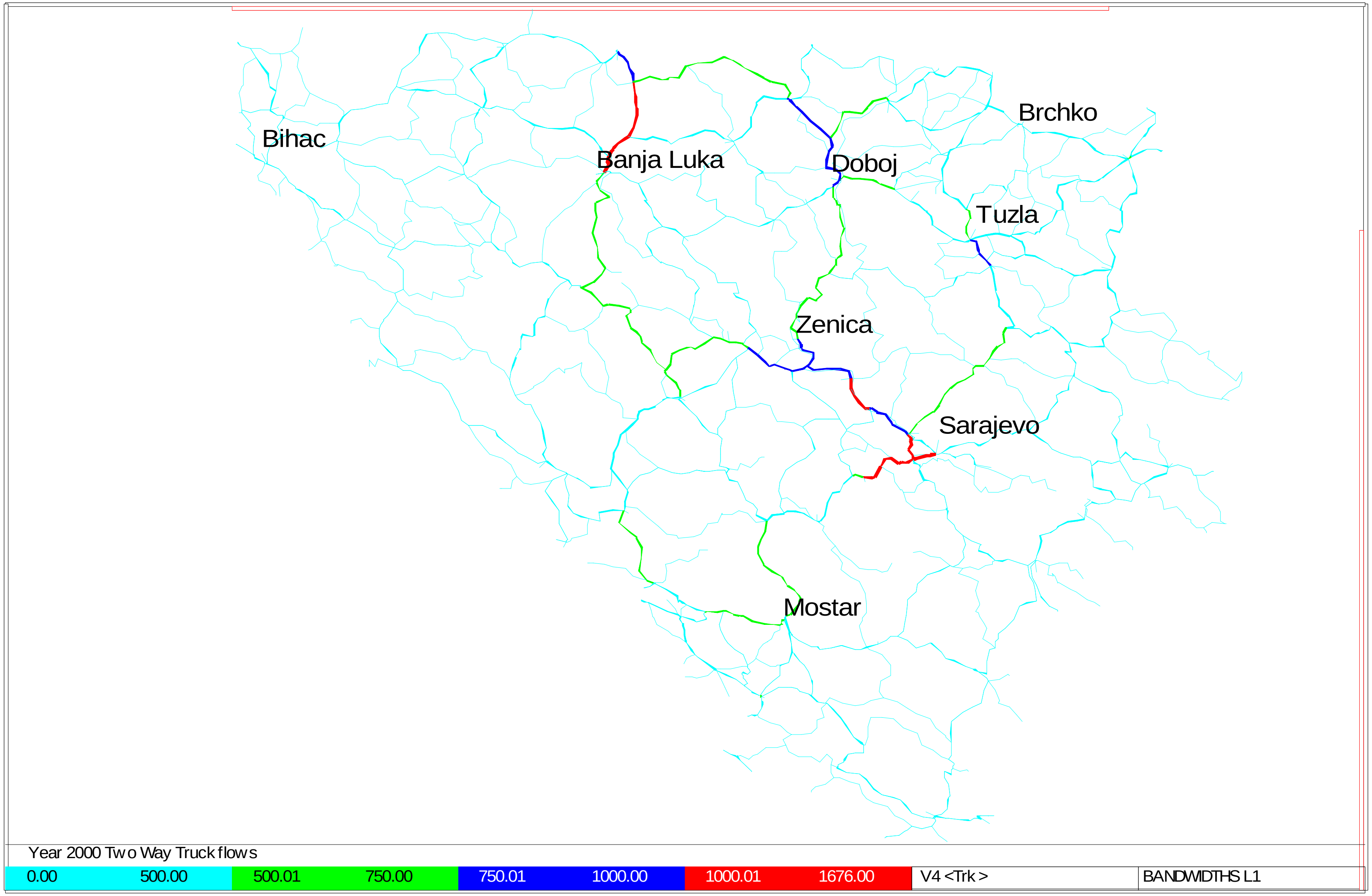


Figure 2.3.2 Assignment of Year 2000 Daily Truck Trips onto Committed Network

(5) A European Perspective

Analyses presented in previous sections has confirmed that trade activities, particularly via truck, serve an important function within the BiH economic pattern. It is of interest to examine the European experience at this juncture with a view toward clarifying the role of road transport. Over the longer-term horizon, it is anticipated that BiH will gradually transition toward similar norms.

Unit shipments, that is, absolute annual tons per capita shipped nationally via rail, road and inland waterway modes[44] increase with increasing unit national income (Figure 2.3.3). Likewise, in comparing rail vs. road shipments, a clear preference for the road mode emerges at higher unit national incomes (Figure 2.3.4). However, a degree of caution is advised as these data likely mask patterns, which are only revealed via more detailed and cargo-specific examinations. It is undeniable that, as economies grow and diversify, the appeal of transporting value-added cargo via the road mode (trucks) increases due to the speed, convenience, door-to-door and "just in time" service offered by shippers, who often operate within a very competitive environment. However, this attraction is not necessarily diminished in countries of more modest unit national incomes (assuming that a viable and competitive trucking industry exists). Instead, simpler economies are often more reliant upon basic bulk goods, such as mining products. Thus, economies of scale, and existing infrastructure, will often dictate that shipment by rail and inland waterway is more practical.

The experiences of East European nations and former Soviet Republics also support that external unit trade, that is, the value of annual imports plus exports per person, increases with increasing unit national income. The total value is shown as reaching some US$ 10,000 (in current terms) per person at a GNP per capita of 10,000 constant

1995 US dollars (Figure 2.3.5). As trade value is expressed in current terms, some inflationary and currency conversion factors are invariably included; nevertheless, it is logical to state that increasing national economic activity catalyzes an increase in external trade. One might argue that future border traffic could increase in line with the overall value of trade. However, this is unlikely since increased value of trade does not necessarily imply increased volume of trade (example: computer chips).

[44] Shipments by air are, in comparison, minor while maritime shipping is excluded from the current analysis.

Figure 2.3.3 Overview of European Cargo Shipment Pattern

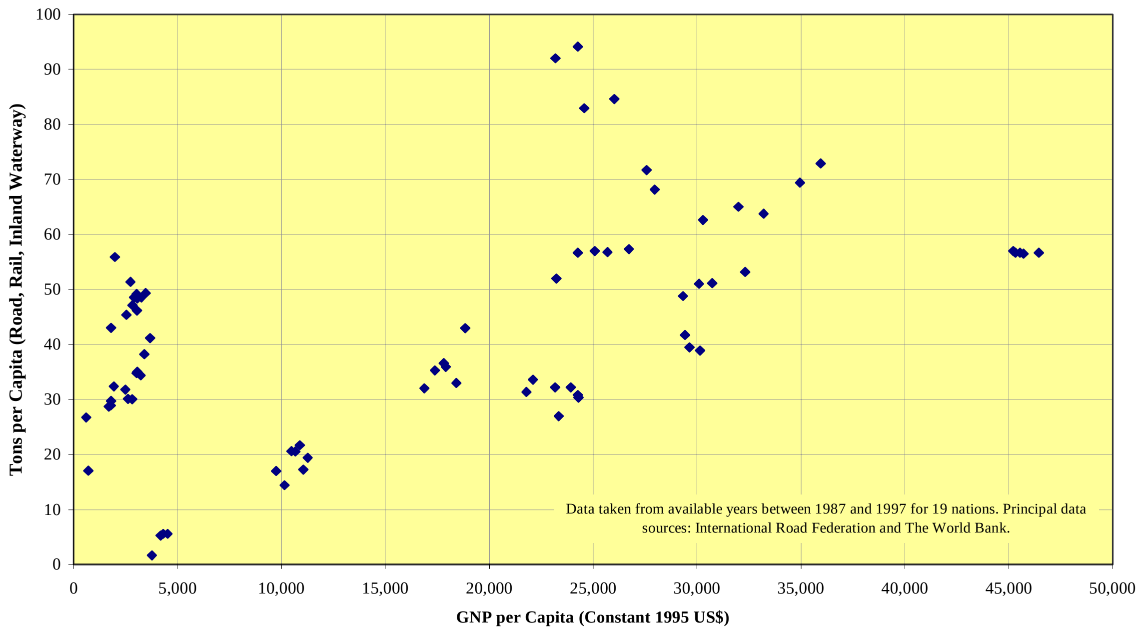


Figure 2.3.4 Overview of European Cargo Shipment Modal Preferences

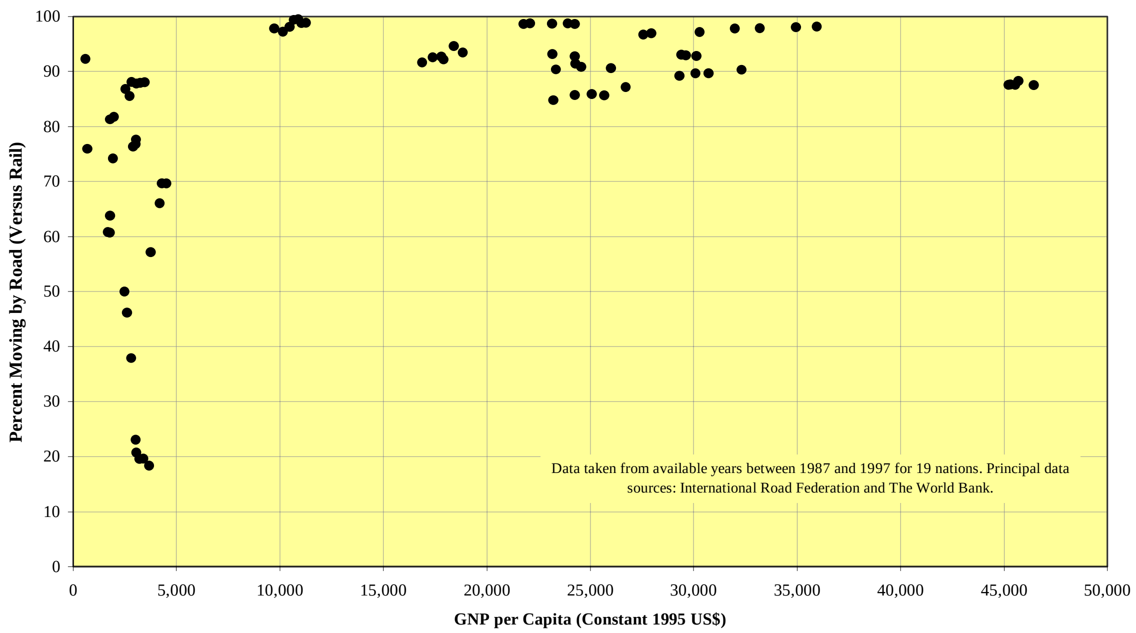
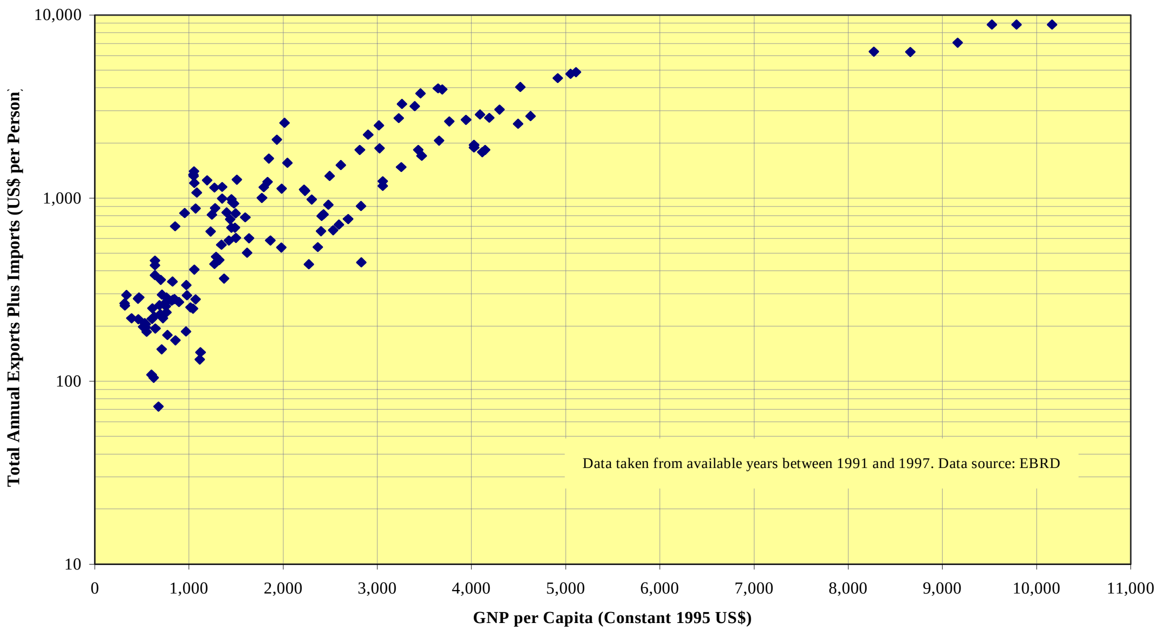
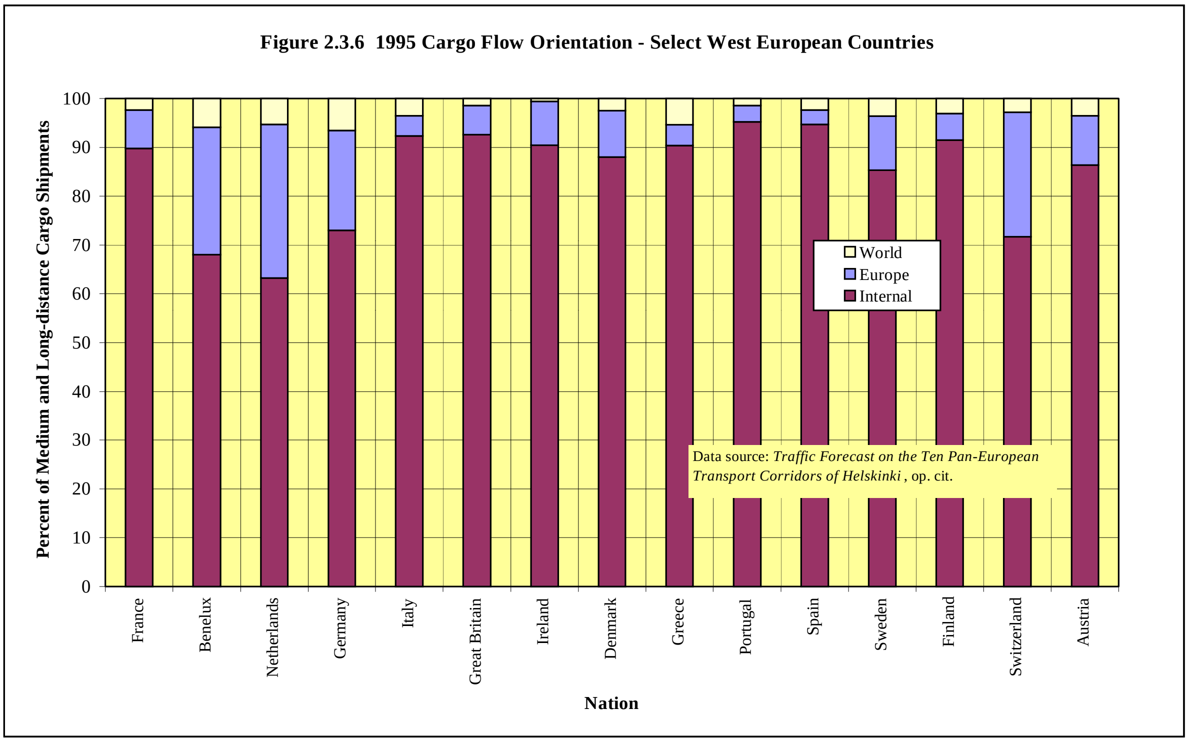


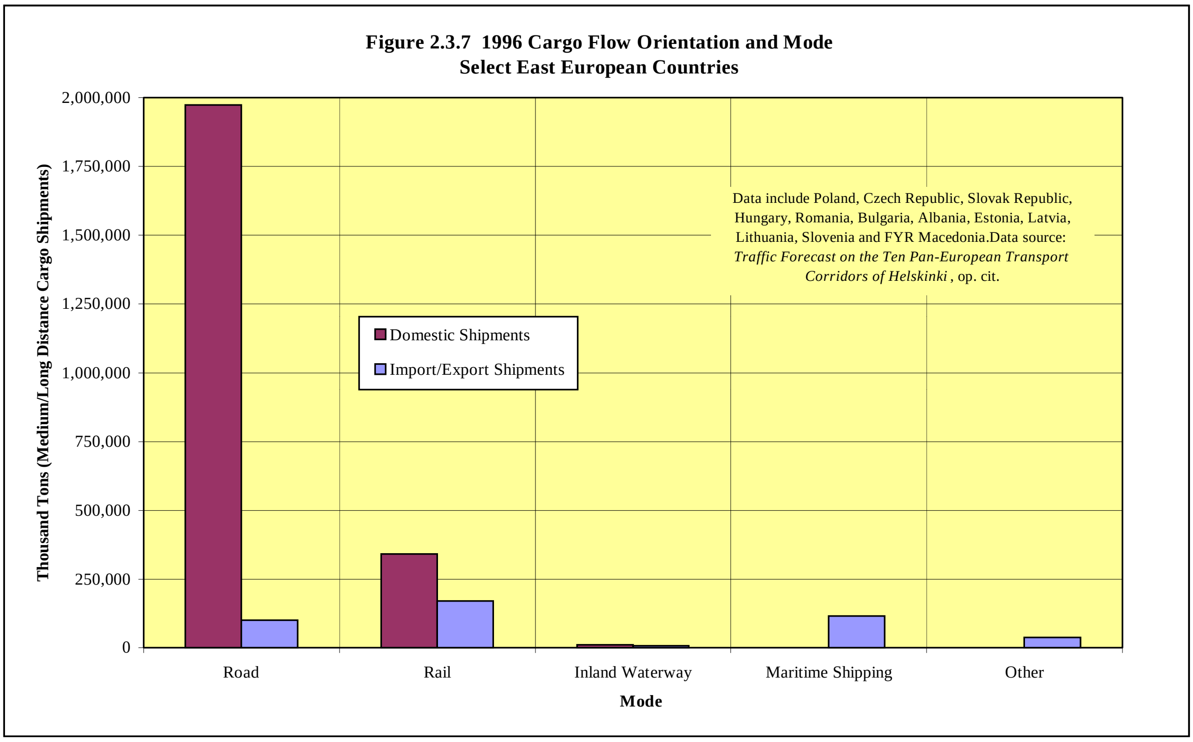
Figure 2.3.5 Recent Trade Activity - Eastern European States and Former Soviet Republics



A recent study examined in detail existing, and forecast, levels of cargo activity in Eastern Europe[45]. Forecasts considered: economic growth (low, moderate, high); infrastructure development; and, speed of harmonization of transport markets. In terms of existing activities, data confirm that, in case of cargo shipments of moderate and long distance in western European countries, the majority is domestically oriented, with a large proportion of external trade linked with nearby countries (Figure 2.3.6). Similar findings are noted for eastern European countries; that is, domestic cargo activity greatly exceeds import/export shipments in terms of volume. The road (truck) mode is dominant in terms of domestic shipments; however, more balance is achieved in external trade among road, rail, and maritime shipping modes (Figure 2.3.7).

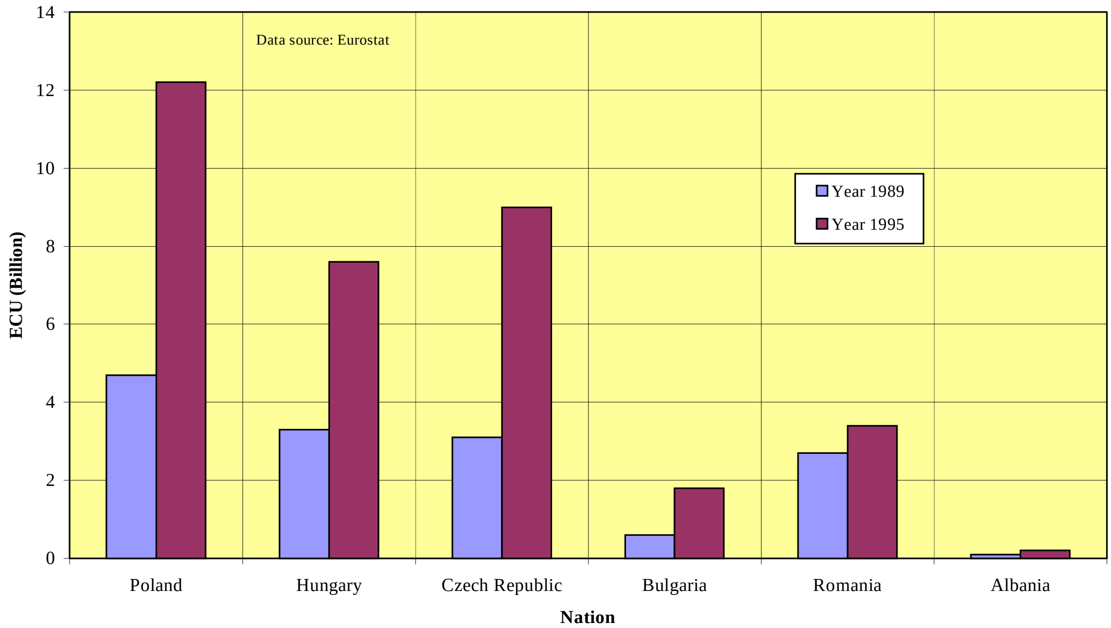
[45] *Traffic Forecast on the Ten Pan-European Transport Corridors of Helsinki*, for European Commission, by NEA Transport Research and Training, et. al., August 1999





The role of the European Union vis-à-vis east European trade has also dramatically increased in importance since the break-up of the former Soviet Union (Figure 2.3.8).

Figure 2.3.8 Export of Goods to European Union
Select East European Countries - 1989 and 1995



Five core scenarios were considered in deriving forecasts on the pan-European corridors:

- Scenario A: low economic growth, existing transport infrastructure, and low degree of transport market integration.
- Scenario B: moderate economic growth, existing transport infrastructure, and low degree of transport market integration.
- Scenario C: moderate economic growth, partially completed network, and moderate degree of transport market integration.
- Scenario D: moderate economic growth, full TINA network, and high degree of transport market integration.
- Scenario E: high economic growth, full TINA network, and high degree of transport market integration.

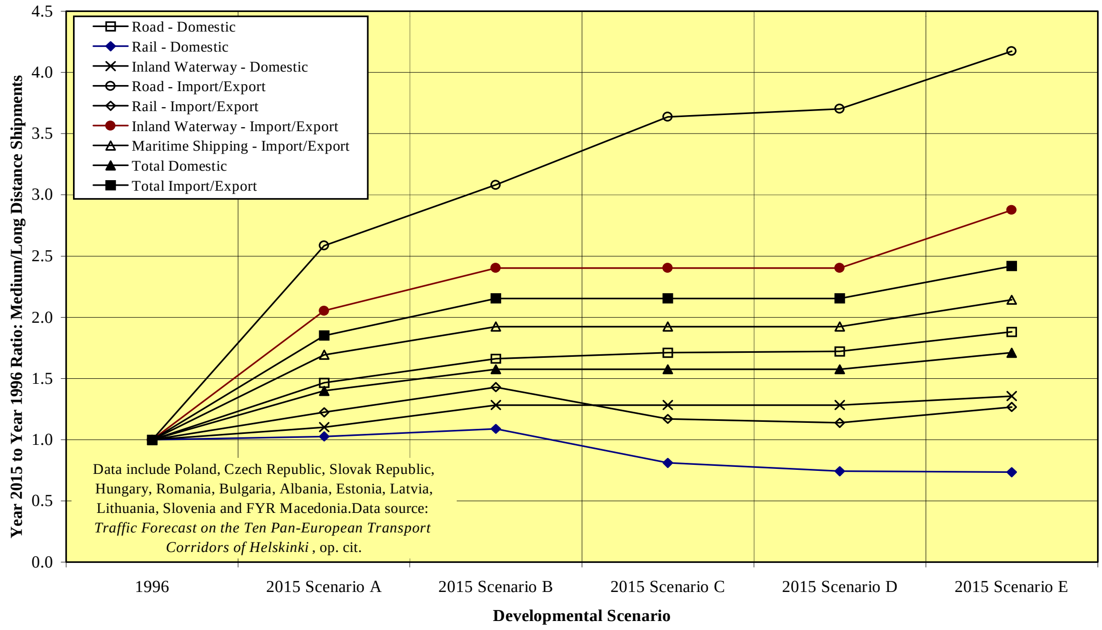
Findings suggest that (Figure 2.3.9):

- External trade increases as economic activity becomes more robust, traffic infrastructure is improved, and transport markets integrated.
- Both external and domestic cargo activity is forecast to grow at robust rates, with external shipments increasing faster than domestic shipments.

- Import/export ton shipments via the road mode are shown as being the fastest growing mode, increasing more than a factor of four (Scenario E) by year 2015 compared to year 1996 conditions.

- Domestic ton shipments via the road mode are shown as growing faster than rail or inland waterway modes under all scenarios.

Figure 2.3.9 Forecast and Modal Orientation of Year 2015 Cargo Shipments
Select East European Countries



2.3.2 Bus Services

Bus passenger transport[46] is accomplished at multiple functional levels, among them international, inter-Entity, inter-Kantonal, inter-municipal, and intra-municipal. International and inter-Entity transport is controlled at the State level (Ministry of Civil Affairs and Communications), and provided via the Entity Ministries of Transport and Communications. The Federation Ministry of Transport and Communications provides inter-Kanton services, while inter-municipal bus services in Republika Srpska fall under the responsibility of the Chamber of Commerce. In the Federation, Kanton Ministries of Transport and Communications are responsible for Kantonal bus services, while intra-municipal services are the purview of individual municipalities. Given that the current study is countrywide in scope, international, inter-Entity, inter-Kantonal and inter-municipal services are, due to their route structures, of particular interest.

[46] Considerable inputs to this discussion were obtained from interviews with persons knowledgeable of the bus industry within the BiH Ministry of Civil Affairs and Communications, Entity Ministries of Transport and Communications as well as Republika Srpska Chamber of Commerce. Visits to all ten Kantons were also completed, to include discussions with Kantonal Ministries of Transport and Communications. All interviews were conducted during June and July 2000.

(1) International Lines

International bus services are not, as in the case of trucks, accomplished on a bilateral license basis. Instead, after an agreement between cooperating partners (operators) in both countries is reached, official arrangements are procured from relevant Ministries in both countries. In case of BiH, this is the Ministry of Civil Affairs and Communications. This approach applies to both scheduled and non-scheduled services. Within BiH, the Ministry follows several guidelines in the allocation of bus permits, including compatibility of the proposed operating timetable with existing services. Also, operators must fulfill certain requirements as to fleet size (minimum of two buses) and station/stop locations. However, it is understood that there is no law within BiH, hence no formal requirements, to prove that vehicles used in international travel meet minimum technical standards.

Scheduled services are provided to nine foreign countries (Austria, Belgium, Denmark, Netherlands, Croatia, Germany, Slovenia, Switzerland and Sweden), and non-scheduled service agreements exist with five countries (Austria, Czech Republic, Croatia, Italy and Slovenia). Due to the absence of diplomatic relations between BiH and Yugoslavia, official scheduled service does not exist. However, BiH operators particularly in Republika Srpska have coordinated scheduling with Yugoslav operators to ensure that cross-border travel by bus is possible.

During year 2000, 65 operators provide almost 74,000 officially scheduled annual departures from BiH (Table 2.3.15). Data regarding rider-ship are not available. Some 80 percent of scheduled international bus services are provided via lines operated by Federation-based operators. However, the Study Team was informed that the share of Republika Srpska operators appears to be steadily increasing, both as a result of more operators becoming active in Srpska, as well as reductions in the number of Federation-based operators.

Table 2.3.15 International Scheduled Bus Services
Federation of Bosnia and Herzegovina – Year 1999

Country	Number of Lines			Annual Departures
	Federation BiH	Republika Srpska	Total	
Austria	24	9	33	5,752
Belgium	1	0	1	52
Denmark	1	1	2	156
Netherlands	1	0	1	104
Croatia	121	19	140	42,972
Germany	61	14	75	15,652
Slovenia	11	9	20	6,188
Switzerland	11	5	16	3,068
Sweden	1	0	1	52
Total	232	57	289	73,996

Source: Ministry of Civil Affairs and Communications

(2) Inter-Entity Lines

Fixed route, scheduled bus service between Republika Srpska and the Federation was initiated in 1998 via 23 registered lines offering some 50 daily departures. However, due to demand reasons, Entities issued approvals for about 50 lines, offering some 150 departures from each Entity. Following a stabilization and “shake out” period, 48 registered lines exist at present offering about 120 daily departures from each Entity. It is understood that some 30 additional lines have been approved by the Entities, but not yet registered by the Ministry of Civil Affairs and Communications.

The registered lines link major long-distance destinations, but are also responsive to short-distance corridors of demand (Figure 2.3.10). Thus, for example, the most intense inter-Entity services are provided between the Sarajevo metropolitan precinct (Grbavica, Ilidza, Vijecnica, Sarajevo) and nearby areas of Srpska (Lukavica, Hresa, Renovica). No rider-ship data are available.

To establish an inter-Entity line requires an agreement between counterpart operators. Following approvals by relevant Ministries in each Entity, the Ministry of Civil Affairs and Communications issues a one-year operating permit. In principle, some form of equal sharing of equipment and rolling stock is intended, but in practice the stronger partner may indeed provide a larger (or dominant) proportion of rolling stock used on the line. All buses, regardless if Federation or Srpska based, travel from route origin to destination.

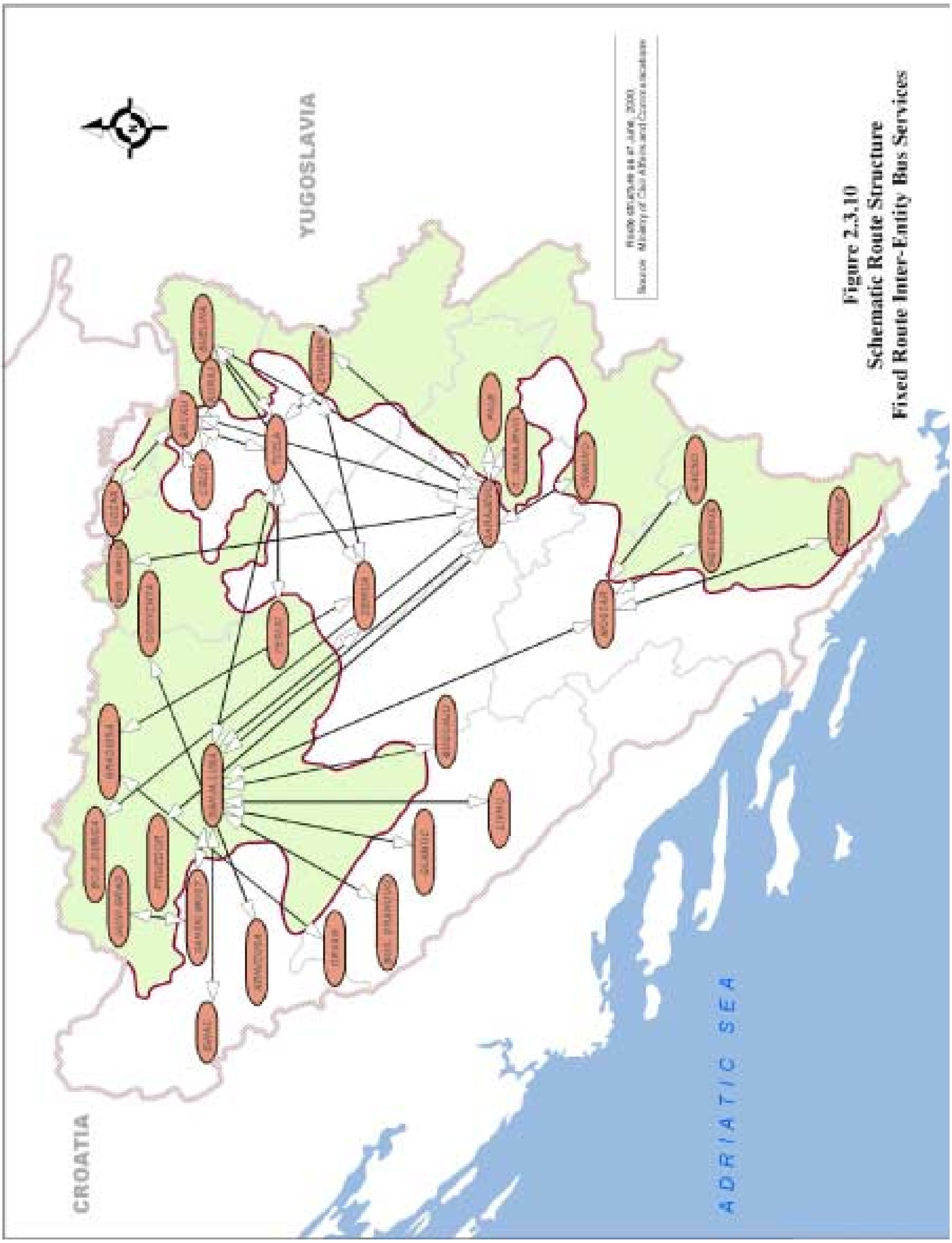


Figure 2.3.10
Schematic Route Structure
Fixed Route Inter-Entity Bus Services

(3) Federation Inter-Kantonal Lines

A clear segregation among the various service hierarchies is virtually impossible as different operators tend to service different types of routes with their available fleets. Thus, operating statistics are intermingled; passenger data is largely not available, or where quoted, is understood to be unreliable. Likewise, performance measures considered standard in the overseas bus industry (route kilometers, seat kilometers, passenger kilometers, revenue kilometers) appear not to be routinely calculated.

The Federation Ministry of Transport indicates that some 140 companies operate within the Federation, roughly 40 providing non-scheduled services, the remainder scheduled services. Of the 100 operators providing scheduled services, the Ministry maintains a database for 62 operators; the remainder are not registered for Federation services and understood to provide other services, including at the Kanton and municipality levels. Of the 62 operators maintained in the database, 44 are indicated as providing inter-Kantonal service, and a further 18 Kantonal services. The registered operators own some 800 buses, with roughly 60 percent under public ownership, and 40 percent under private ownership.

The catchments area for Federation services is extensive, linking both longer-distance population centers as well as nearby centers of activity. Lowest headways are noted around major cities, particularly Sarajevo. But considerably differences apparently exist between scheduled operation and actual operation. For schedules valid through early year 2000, the route structure suggests that almost 90,000 route kilometers are expended each day (Table 2.3.16). However, it is understood that only some 50 to 60 percent of the indicated schedule is actually operated on a daily basis. The reasons for this are varied; some technical, some not.

New schedules were issued during early 2000 with the intention of rationalizing route/operator services, and eliminating problems identified with the earlier schedule[47]. It is understood that non-performance continues to also plague the new schedules, but that direct rectification is difficult due to a lack of enforcement mechanisms and a shortage of personnel. Nevertheless, the optimized schedules suggest that, for Federation bus lines, 615 daily departures are scheduled over some 185 lines extending over 61,200 kilometers, thus yielding an average trip length per departure of slightly less than 100 kilometers. In terms of trip length distribution, 63 departures are shown for route lengths of less than 30 kilometers, 360 departures for route lengths of 30-100 kilometers, 187 departures for route lengths of 100-250 kilometers, and 59 departures for route lengths of more than 250 kilometers. Average fares on Federation lines appear to somewhat vary by distance; for shorter distances, say, 30 kilometers, typical fares are on the order of 0.10 KM per kilometer, dropping to near 0.07 KM per kilometer for longest distances. However, differences in fare structure exist between the various lines. The average age of buses, as per early 2000, is 14.1 years, encompassing 16 types of buses, with average age by type ranging from 8.2 to 18.7 years. In terms of activity

[47] *Commission for the Harmonization of Time Table for the Federal Bus Lines*, Federation of Bosnia and Herzegovina Ministry of Transport and Communications, Mostar, February 2000 (translated version).

at major bus centers, that is, Kantonal intersection points of Federation lines, 143 departures are noted at Sarajevo station, with highest number of transfers scheduled at Travnik station (Table 2.3.16).

Table 2.3.16 Overview of Scheduled Inter-Kanton Federation Bus Services

Operational Schedule [1]				
Trips Between		Daily Trips [2]	Route Length (km) [3]	Daily Route Kilometers
Banovici	Olovo	6	56	336
Banovici	Orasje	2	117	234
Banovici	Vozuca	18	13	234
Banovici	Zavidovici	12	49	588
Bugojno	Scipe	2	56	112
Busovaca	Capljina	6	269	1,614
Busovaca	Zenica	8	25	200
Busici	Sarajevo	2	44	88
Capljina	Zenica	1	273	273
Capljina	Drvar	2	286	572
Gorazde	Velika Kladusa	2	478	956
Gracanica	Orasje	2	69	138
Gracanica	Tesanj	8	43	344
Gradacac	Orasje	2	47	94
Ilijas	Bukovik	2	16	32
Ilijas	Breza	6	9	54
Ilijas	Gornja	1	19	19
Ilijas	Kakanj (Sarajevo)	4	40	160
Ilijas	Trtorici	1	16	16
Ilijas	Zenica	4	63	252
Jajce	Mostar	2	162	324
Jajce	Zenica	2	120	240
Kakanj	Fojnica	6	51	306
Kakanj	Kresevo	2	46	92
Livno	Siroki Brijeg	2	174	348
Livno	Bihac	2	190	380
Livno	Sarajevo	2	208	416
Livno	Mostar	2	127	254
Livno	Kiseljak	4	173	692
Livno	Jajce	2	114	228
Livno	Prozor	2	107	214
Livno	Sarajevo	4	205	820
Medjugorje	Jajce	2	219	438
Mostar	Bihac	6	322	1,932
Mostar	Bugojno	2	122	244
Mostar	Zavidovici	2	261	522
Orasje	Celic	4	78	312
Orasje	Klokotnica	2	79	158
Orasje	Maglaj	2	130	260
Orasje	Maoca	2	58	116
Orasje	Zovik	2	61	122
Sanski Most	Jajce	2	96	192
Sanski Most	Novi Travnik	2	210	420
Sanski Most	Preocica	1	222	222
Sarajevo	Bukici	2	48	96
Sarajevo	Banovici	2	127	254
Sarajevo	Bihac	6	314	1,884
Sarajevo	Bjelimici	2	100	200
Sarajevo	Blagaj	2	149	298
Sarajevo	Bosansko Grahovo	4	297	1,188
Sarajevo	Breza	18	32	576
Sarajevo	Bugojno	12	144	1,728
Sarajevo	Busovaca	12	61	732
Sarajevo	Cazin	2	346	692
Sarajevo	Celic	2	216	432
Sarajevo	Dubravine	2	38	76
Sarajevo	Doboj Jug	4	158	632
Sarajevo	Donji Vakuf	4	127	508
Sarajevo	Fojnica	32	55	1,760
Sarajevo	Gorazde	14	117	1,638
Sarajevo	Gornji Vakuf	2	154	308
Sarajevo	Gradacac	8	191	1,528
Sarajevo	Kakanj	48	53	2,438
Sarajevo	Kalesija	4	156	624
Sarajevo	Kiseljak	14	36	504
Sarajevo	Klokotnica	2	148	296
Sarajevo	Kraljeva Sutjeska	6	69	414
Sarajevo	Kresevo	8	49	392
	Total	362	8,708	34,766

Operational Schedule [1]				
Trips Between		Daily Trips [2]	Route Length (km) [3]	Daily Route Kilometers
Sarajevo	Lukavac	3	129	387
Sarajevo	Maoca	2	229	458
Sarajevo	Mostar	14	129	1,806
Sarajevo	Novi Travnik	6	105	630
Sarajevo	Olovo	6	56	336
Sarajevo	Orasje	6	241	1,446
Sarajevo	Sanski Most	6	256	1,536
Sarajevo	Srebrenik	2	207	414
Sarajevo	Stolac	2	174	348
Sarajevo	Tesanj	9	175	1,575
Sarajevo	Travnik	2	93	186
Sarajevo	Tuzla	25	131	3,275
Sarajevo	Velika Kladusa	4	377	1,508
Sarajevo	Vares	43	54	2,322
Sarajevo	Visoko	10	32	320
Sarajevo	Zabrdje	6	38	228
Sarajevo	Zavidovici	7	132	924
Sarajevo	Zenica	32	79	2,528
Tesanj	Bihac	2	362	724
Tesanj	Bugojno	2	184	368
Tesanj	Fojnica	2	163	326
Tesanj	Kalesija	4	118	472
Tesanj	Mostar	2	328	656
Tesanj	Neum	2	389	778
Tesanj	Orasje	6	133	798
Tesanj	Sanski Most	2	298	596
Tesanj	Travnik	2	147	294
Tuzla	Bihac	4	413	1,652
Tuzla	Bugojno	2	228	456
Tuzla	Capljina	4	295	1,180
Tuzla	Kakanj	2	184	368
Tuzla	Maglaj	6	94	564
Tuzla	Mostar	2	261	522
Tuzla	Orasje	16	83	1,328
Tuzla	Velika Kladusa	2	475	950
Tuzla	Vozuca	12	56	672
Tuzla	Tesanj	18	97	1,746
Tuzla	Travnik	4	190	760
Tuzla	Zavidovici	2	87	174
Visoko	Fojnica	9	34	306
Visoko	Kiseljak	16	15	240
Zavidovici	Travnik	2	97	194
Zenica	Bihac	4	265	1,060
Zenica	Bugojno	7	87	609
Zenica	Cazin	2	301	602
Zenica	Donji Vakuf	2	78	156
Zenica	Gorazde	4	183	732
Zenica	Fojnica	18	72	1,296
Zenica	Gornji Vakuf	8	110	880
Zenica	Jajce	2	113	226
Zenica	Kiseljak	1	49	49
Zenica	Konjic	2	114	228
Zenica	Kruscica	8	20	160
Zenica	Lugovi	8	33	264
Zenica	Mehurici	16	25	400
Zenica	Mostar	4	207	828
Zenica	Neum	4	312	1,248
Zenica	Novi Travnik	9	58	522
Zenica	Orasje	2	245	490
Zenica	Preocica	14	14	196
Zenica	[illegible]	11	29	319
Zenica	Sanski Most	10	207	2,070
Zenica	Tomislavgrad	2	222	444
Zenica	Travnik	37	38	1,406
Zenica	Tuzla	10	142	1,420
Zenica	Vrhovine	6	14	84
Zivinice	Fojnica	2	157	314
Zivinice	Mostar	2	239	478
	Total	505	18,702	52,832

[1] Scheduled route structure valid 1998 through 2000. Source: *Autobusni Red Vožnje Federalnih Linija Bosna i Hercegovina* and Federation Ministry of Transport and Communications

[2] Total both directions of travel.

[3] Average route kilometers weighted by frequency in case of varying intermediate stops

Table 2.3.17 Overview of Year 2000 Scheduled Daily Bus Station Activity Federation Lines at Kantonal Intersection Points (Bus Terminals)

Station	Number of Movements			
	Departures	Arrivals	Transfers	Total
Sarajevo	143	143	22	308
Zenica	84	84	40	208
Tuzla	43	43	20	106
Mostar	33	33	30	96
Travnik	21	20	74	105
Bihac	7	7	6	20
Gorazde	10	10	0	20
Orasje	11	11	0	22
Livno	5	8	1	14

Source: Commission for the Harmonization of Time Table for the Federal Bus Lines, op. cit.

Buses are inspected regularly, but the system can be complex and contradictory. Annual inspections are required under the Ministry of Internal Affairs, and three-month inspections under the Ministry of Transport and Communications. It is understood the latter inspection is more technical in nature and focuses on operational reliability of the vehicle (however, attempts to stem the introduction of old, second-hand buses acquired from other European countries have so far not been successful). Thus, two sets of inspection certificates are required, and it is not uncommon to have a pass – fail situation. It is unclear at present as to which inspection result takes priority. The Federation Ministry of Transport and Communications is attempting to expand its network of inspection stations, and refine the process via a continuing introduction of computerized and automated testing processes. To date, nine inspection centers exist, with a further ten to eleven slated to come “on line.” In response to Ministry-issued tenders, some 75 facilities have applied to be incorporated into the inspection network with 25 having been accepted based on Ministry criteria involving type of facility, type of equipment, and quality of staff. It remains a goal of the Ministry to ultimately provide a wide network of conveniently located vehicle inspection centers, each of which performs identical and automated state-of-the-art testing procedures, with results stored in a single, system-wide data base.

Privatization is, in line with governmental regulations, on-going. While some successes are noted (indeed about 40 percent of buses owned by operators providing Federation services are privately owned), difficulties persist. These relate to not only finding willing buyers (in some cases employees are becoming owners), but also legal questions, answers to which remain nebulous under existing statutes. While ownership of rolling stock is, for example, a direct issue, ownership of other assets (such as depots, ticket sales offices, stations) is not. Other complexities arise in sharing arrangements between the various BiH ethnic communities.

(4) Republika Srpska Inter-Municipal Lines

As indicated previously, inter-Entity and international bus services are managed by the Ministry of Transport and Communications. Inter-municipal services whose lines are more than 50 kilometers in length are managed by the Republika Srpska Chamber of Commerce, while lines of less than 50 kilometers in length are managed by regional Chambers of Commerce located in Banja Luka, Doboj, Bijeljina, Trebinje, and S. Sarajevo.

Some 125 operators provide inter-municipal services using a fleet of near 500 buses. Typical capacity is 51 seats; the fleet is aged, with typical vehicle age being 10-20 years. Year 2000 schedules indicate that inter-municipal services (of longer than 50 kilometers) are scheduled for some 2,000 daily two-way trips (Table 2.3.18). However, it is understood that not all routes operate at all times due to a variety of reasons, some technical, some not. Additional services are provided by the regional Chambers of Commerce via routes of less than 50 kilometers in length. For example, a daily total of 272 two-way trips by the Banja Luka Chamber of Commerce (Table 2.3.19). In case of Bijeljina, 238 daily trips over some 7,100 daily route kilometers are scheduled, yielding an average trip length of near 30 kilometers.

Table 2.3.19 Overview of Scheduled Inter-Municipal Republika Srpska Bus Services (Route Length Less Than 50 Kilometers)

Regional Chamber of Commerce	Daily Two-way Trips	Number of Lines
Banja Luka	272	47
Doboj	138	20
Bijeljina	238	42
Trebinje	*	*
S. Sarajevo	*	*

Source: Republika Srpska Chamber of Commerce
* Data not made available, although it is understood that short-route service is minimal in these regions.

Inter-municipal services (route length greater than 50 kilometers) include both lines entirely within Republika Srpska, as well as between Republika Srpska and Yugoslavia. The intra-RS schedule, which accounts for about 35 percent of daily scheduled trips, features routes with an average length of 93 kilometers. The Republika Srpska-Yugoslavia routes are understandably longer, with an average route length of some 240 kilometers. The latter are arranged on a cooperative basis between Republika Srpska, and Yugoslav operators, with service provided on a reciprocity basis. It is understood that routes to/from Yugoslavia may carry both international as well as domestic BiH passengers between scheduled bus stops/stations.

An operator desiring to provide inter-municipal services must first be assessed by the Ministry of Transport and Communications. This procedure includes items such as minimum available drivers per bus, number of employees and fleet size (minimum of two), as well as guarantees that the focus of licensing is only transport (drivers may not, for example, moonlight on alternative employment). Following completion of the registration process, operators may apply to the Chamber of Commerce for rights to operate a route for one year. This is discussed within the Chamber, and with representatives of the Association of Operators, to ensure basic principles of fairness, service, and competition on routes. If approved, the right to operate is granted. The operator is free to set ticket prices but within specified minimum and maximum ranges. All procedures must, of course, conform to the existing legal structure of the Republika.

Table 2.3.18 Overview of Scheduled Inter-Municipal Republika Srpska Bus Services (Route Length Greater Than 50 Kilometers)

Operational Schedule [1]				
Trips Between		Daily Trips [2]	Route Length (km)	Daily Route Kilometers
Banja Luka	Banja Vrućica	34	93	3212
Banja Luka	[illegible]	18	99	1620
Banja Luka	Bijeljina	2	239	478
Banja Luka	[illegible]	2	125	250
Banja Luka	Brčko	2	205	410
Banja Luka	Derventa	8	91	728
Banja Luka	Doboj	11	115	1265
Banja Luka	[illegible]	6	70	420
Banja Luka	[illegible]	2	79	158
Banja Luka	[illegible]	2	76	152
Banja Luka	Kozarska Dubica	16	99	3060
Banja Luka	[illegible]	12	56	665
Banja Luka	[illegible]	4	107	428
Banja Luka	Modriča	2	128	256
Banja Luka	Mrkonjić Grad	6	63	378
Banja Luka	Novi Grad	16	88	1408
Banja Luka	Oštra Luka	14	74	1036
Banja Luka	Prijedor	19	56	1064
Banja Luka	Prijedor	32	56	1792
Banja Luka	Prnjavor	7	52	364
Banja Luka	Ribnik	2	79	158
Banja Luka	S.Kostajnica	8	114	912
Banja Luka	S.Sarajevo	10	529	5290
Banja Luka	S.Sarajevo	18	229	4122
Banja Luka	Šipovo	15	98	1470
Banja Luka	Srbac	6	57	342
Banja Luka	Srebrenica	4	348	1392
Banja Luka	Srpski Brod	14	112	1568
Banja Luka	Teslić	8	89	712
Banja Luka	Trebinje	6	355	2130
Banja Luka	Višegrad	4	434	1736
Banja Vrućica	Bijeljina	4	172	688
Banja Vrućica	Brčko	2	179	358
Banja Vrućica	Doboj	2	74	148
Berkovići	Trebinje	4	75	300
Bijeljina	Kalinovik	4	301	1204
Bijeljina	Šekovići	8	108	864
Bijeljina	Srbinje	4	320	1280
Bijeljina	Mackovac	6	53	318
Bijeljina	Pale	2	187	374
Bijeljina	Srebrenica	6	108	648
Bijeljina	Višegrad	2	226	452
Bijeljina	Zvornik	29	55	1595
Bratunac	Bijeljina	2	117	234
Bratunac	Pale	2	131	262
Brčko	Doboj	4	118	472
Brčko	Modriča	2	62	124
Brčko	Pale	2	229	458
Brčko	S.Sarajevo	4	264	1056
Brčko	Srebrenica	4	170	680
Brčko	Srpski Brod	2	132	264
Brčko	Višegrad	2	267	534
Brčko	Vlasenica	2	190	380
Čajniče	Pale	128	2	256
Čajniče	Srbinje	2	44	88
Derventa	[illegible]	4	257	1028
Doboj	Blatnica	4	83	332
Doboj	Pale	4	179	716
Doboj	Pojezna	2	71	142
Doboj	Pribinić	3	71	213
Doboj	Pribinić	2	71	142
Doboj	Prnjavor	8	60	480
Doboj	Šamac	10	78	780
Doboj	Srpski Brod	10	68	680
Doboj	Teslić	2	57	114
Doboj	Zvornik	4	123	492
Gacko	Trebinje	16	74	1184
Gacko	[illegible]	9	62	558
Gradiška	Oštra Luka	2	123	246
Prijedor	[illegible]	5	108	540
Prijedor	Gradiška	2	104	208
Prnjavor	Srpski Brod	2	60	120
S.Brod	Modriča	4	67	268
S.Sarajevo	Kalinovik	2	58	116
S.Sarajevo	Rogatica	6	98	588
S.Sarajevo	Sokolac	2	90	180
S.Sarajevo	Srebrenica	4	195	780
S.Sarajevo	Trebinje	12	217	[illegible]
S.Sarajevo	Višegrad	2	140	280
S.Sarajevo	Zvornik	4	183	732
Srbinje	Kalinovik	2	60	120
Srbinje	Višegrad	18	79	1422
Srebrenica	Šekovići	2	75	150
Srebrenica	Zvornik	6	53	318
Trebinje	Ljubinje	2	63	126
Trebinje	Pale	4	252	1008
Višegrad	Rudo	2	58	116
Zvornik	Rogatica	2	127	254
	Subtotal	768	11,459	68,123

Operational Schedule [1]				
Trips Between		Daily Trips [2]	Route Length (km)	Daily Route Kilometers
Bajina Bašta	Beograd	4	288	1848
Banja Luka	Beograd	28	369	10332
Banja Luka	Crvenka	4	441	1764
Banja Luka	Herceg Novi	4	523	2092
Banja Luka	Herceg Novi	8	566	4528
Banja Luka	Kragujevac	4	599	2836
Banja Luka	Novi Pazar	4	582	2328
Banja Luka	Novi Sad	2	363	726
Banja Luka	Sombor	4	536	2144
Banja Luka	Subotica	8	459	3672
Banja Luka	Valjevo	4	374	1496
Banja Luka	Zrenjanin	4	433	1732
Banja Vrućica	Herceg Novi	4	329	1316
Banja Vrućica	Novi Sad	8	334	2672
Berkovići	Podgorica	9	161	1449
Bijeljina	B. Palanka	2	117	234
Bijeljina	Bačka Palanka	2	79	158
Bijeljina	Beograd	28	121	3388
Bijeljina	Loznica	78	36	2808
Bijeljina	Novi Sad	14	132	1848
Bijeljina	Šabac	16	53	848
Bijeljina	Subotica	2	217	434
Bijeljina	Užice	4	204	816
Birač	Loznica	12	27	324
Bratunac	Beograd	8	212	1696
Bratunac	Lazarevac	8	164	1312
Bratunac	Ljubovija	12	6	72
Bratunac	Ljubovija	28	4	112
Bratunac	Valjevo	4	153	612
[illegible]	Beograd	2	451	902
[illegible]	Kikinda	2	624	1248
[illegible]	Novi Sad	4	497	1988
Brčko	Beograd	8	181	1448
Brčko	Novi Sad	8	176	1408
[illegible]	Mioče	7	44	308
Čajniče	Novi Sad	4	346	1384
Čajniče	Pljevlja	2	52	104
Derventa	Kikinda	4	445	1780
Doboj	Beograd	8	231	1848
Doboj	Herceg Novi	4	524	2096
Doboj	Herceg Novi	8	193	1118
Doboj	Niš	4	526	2104
Doboj	Sombor	8	311	2488
Doboj	Vrnjačka Banja	4	469	1876
Gacko	Beograd	4	486	1944
Gacko	Nikšić	4	82	328
Gacko	Podgorica	8	165	1320
[illegible]	V.Reka	8	27	216
Donji Šepak	Loznica	18	9	162
Gradiška	Beograd	6	441	2646
Gradiška	Lazarevac	8	473	3784
Gradiška	Novi Sad	10	438	4380
Kozluk	Loznica	32	24	768
Kneževo	Novi Sad	4	413	1652
Kotor Varoš	Beograd	4	402	1608
Kotor Varoš	Herceg Novi	4	678	2712
Kozarska Dubica	Beograd	6	468	2808
Kozarska Dubica	Igalo	4	702	2808
Kozarska Dubica	Novi Sad	4	453	1812
Krajčinovci	Priboj	12	32	384
Kremna	Laptoško polje	2	48	96
Lukavac	Subotica	2	482	964
Laptoško polje	Kremna	18	24	432
Laptoško polje	[illegible]	30	30	900
Laptoško polje	Mioče	18	34	612
Ljubinje	Podgorica	2	189	378
Lokanj	Loznica	14	24	336
Lopare	Beograd	8	177	1416
Majevac	Beograd	2	174	348
[illegible] polje	Bistrica	6	27	162
[illegible] polje	Kratovo	13	24	312
[illegible] polje	Priboj	2	14	28
Modriča	Beograd	8	227	1816
Nevesinje	Beograd	4	710	2840
Nevesinje	Beograd	10	405	4050
Nevesinje	Podgorica	16	240	3840
Novi Grad	Beograd	4	459	1836
Novi Grad	Kikinda	6	554	3324
Novi Grad	Sombor	4	562	2248
Novi Grad	Subotica	4	523	2092
Oštra Luka	Beograd	4	476	1904
Oštra Luka	Novi Sad	4	434	1736
Oštra Luka	Subotica	2	494	988
Oštra Luka	Zrenjanin	4	532	2128
Pale	Beograd	4	317	1268
Pale	Čačak	4	256	1024
Pale	Herceg Novi	6	421	2526
	Subtotal	713	28,550	147,449

Operational Schedule [1]				
Trips Between		Daily Trips [2]	Route Length (km)	Daily Route Kilometers
Pale	Priština	4	395	1580
Pale	Stara Pazova	4	441	1764
Pale	Užice	2	181	362
Pelagićevo	Beograd	4	197	788
Pelagićevo	Novi Sad	2	194	388
Petrovo	Stara Pazova	2	329	658
Prijedor	Beograd	10	441	4410
Prijedor	Kikinda	8	515	4120
Prijedor	Kragujevac	4	597	2388
Prijedor	Trstenik	4	446	1784
Prijedor	Vršac	4	536	2144
Prnjavor	Beograd	4	417	1668
Prnjavor	Novi Sad	6	417	2502
Rogatica	Beograd	2	298	596
Rudo	Beograd	2	338	676
Rudo	Priština	2	341	682
S. Orašje	Beograd	8	180	1440
S.Brod	Beograd	4	295	1180
S.Kostajnica	B. Palanka	4	525	2100
S.Kostajnica	Beograd	12	478	5736
S.Kostajnica	Lazarevac	4	538	2152
S.Kostajnica	Novi Sad	6	478	2868
S.Kostajnica	Zrenjanin	4	594	2376
S.Sarajevo	Aranđelovac	4	397	1588
S.Sarajevo	Beograd	29	345	10005
S.Sarajevo	Bijelo Polje	4	287	1148
S.Sarajevo	Bijelo Polje	4	270	1080
S.Sarajevo	Ostrog	6	362	2172
S.Sarajevo	Herceg Novi	6	386	2316
S.Sarajevo	Lazarevac	6	386	2316
S.Sarajevo	Niš	8	477	3816
S.Sarajevo	Novi Pazar	8	377	3016
S.Sarajevo	Novi Sad	14	327	4578
S.Sarajevo	Peć	4	463	1852
S.Sarajevo	Pljevlja	4	256	1024
S.Sarajevo	Požega	4	262	1048
S.Sarajevo	Rožaje	4	276	1104
S.Sarajevo	Rudo	2	180	360
S.Sarajevo	Sjenica	8	252	2016
S.Sarajevo	Soko Banja	4	478	1912
S.Sarajevo	Užice	4	395	1580
Šamac	Beograd	2	226	452
Šekovići	Beograd	8	214	1712
Šipovo	Beograd	4	460	1840
Šipovo	Lazarevac	2	530	1060
Šipovo	Novi Sad	6	465	2790
Šipovo	Sombor	4	507	2028
Šipovo	Stara Pazova	4	488	1952
Šipovo	Zrenjanin	4	546	2184
Skelani	Beograd	4	170	680
Srbac	Novi Sad	6	375	2250
Srbinje	Beograd	8	373	2984
Srbinje	Budva	4	371	1484
Srbinje	Herceg Novi	8	236	1888
Srbinje	Nikšić	6	122	732
Srbinje	Pljevlja	4	100	400
Srbinje	Podgorica	2	177	354
Srbinje	Stara Pazova	4	396	1584
Srebrenica	Bajina Bašta	8	61	488
Srebrenica	Beograd	2	229	458
Srebrenica	Ljubovija	12	17	204
Srebrenica	Ljubovija	60	17	1020
Srebrenica	Novi Sad	14	214	2996
Srebrenica	Užice	8	124	992
Stanari	Beograd	2	494	988
Stanari	Novi Sad	2	474	948
Teslić	Beograd	4	216	864
Teslić	Igalo	8	600	4800
Teslić	Lazarevac	4	415	1660
Teslić	Novi Sad	8	348	2784
Teslić	Sombor	4	445	1780
Teslić	Subotica	8	463	3704
Trebinje	Beograd	24	506	12144
Trebinje	Herceg Novi	12	95	1140
Trebinje	Nikšić	6	71	426
Trebinje	Novi Sad	4	550	2200
Trebinje	Podgorica	2	125	250
Ugljevik	Beograd	10	153	1530
Višegrad	Beograd	4	281	1124
Višegrad	Novi Sad	10	368	3680
Višegrad	Užice	24	74	1776
Vlasenica	Beograd	4	217	868
Vlasenica	Lukavica	4	277	1108
Zvornik	Beograd	4	173	692
Zvornik	Herceg Novi	4	548	2192
Zvornik	Loznica	12	30	360
Zvornik	Niš	2	409	818
Zvornik	Valjevo	8	118	944
	Subtotal	589	29,128	165,275

[1] Schedule route structure valid 1999 through 2000. Source: [illegible] Red Vožnje Republike Srpske / Međunarodnih linija 1999/2000 in RS, Chamber of Commerce and Industry of the Republika Srpska [2] Total both directions of travel

An operator desiring to provide inter-municipal services must first be assessed by the Ministry of Transport and Communications. This procedure includes items such as minimum available drivers per bus, number of employees and fleet size (minimum of two), as well as guarantees that the focus of licensing is only transport (drivers may not, for example, moonlight on alternative employment). Following completion of the registration process, operators may apply to the Chamber of Commerce for rights to operate a route for one year. This is discussed within the Chamber, and with representatives of the Association of Operators, to ensure basic principles of fairness, service, and competition on routes. If approved, the right to operate is granted. The operator is free to set ticket prices but within specified minimum and maximum ranges. All procedures must, of course, conform to the existing legal structure of the Republika.

Buses are inspected regularly. Three-month inspections were required under the Ministry of Internal Affairs, and a new law passed February 2000 makes monthly inspections mandatory. Inspectors from the Ministry of Transport and Communications also have the right to send buses of questionable technical condition to an inspection. Three private bus companies have their own workshops for maintenance; remaining companies use outside maintenance centers, with larger facilities operated by Rotas, Mercedes, or Renault.

Privatization is, in line with governmental regulations, on-going. While some successes are noted (indeed about 90 percent of operators, but not on-the road buses, are privately owned), difficulties persist. A particularly problematic issue relates to the age of the fleet. Most are 10-20 years old, and frequently originate as second (or third) hand vehicles from Western Europe (where sale of a vehicle to BiH is more profitable than outlay for in-country disposal charges). Apparently, the fare structure within Republika Srpska is not adequate to cover both operations and fleet renewal.

(5) Federation Kantonal Services

Federation services and Kantonal services are schedule-coordinated in five Kantons; that is, arrival and departure schedules ensure reasonable opportunity for trip continuity at transfer points. Two Kantons do not explicitly coordinate schedules due to the small size of the Kantons and limited bus fleets (Unsko-Sanski and Bosansko Podrinjski Kantons). As mentioned earlier, a clear segregation among the various service hierarchies is virtually impossible as different operators tend to service different types of routes with their available fleets.

The most comprehensive public statistics are available from GRAS, which provides the bulk of public transport services in the Sarajevo area. These data indicate that, on average, some 211 vehicles, most being buses, were operated over 80 lines during 1999. Annual rider-ship is shown as having totaled some 175 million persons. Trams, while representing 20 percent of the operational fleet, provided 38 percent of daily seats, and carried 47 percent of annual passengers (Table 2.3.20).

Table 2.3.20 Overview of Scheduled GRAS 1999 Public Transport Services

Number of	Mode				
	Tram	Bus	Trolley Bus	Minibus	Total
Operational Vehicles	42	98	35	36	211
Lines	7	42	3	28	80
Daily Seats	17,220	20,109	5,652	2,610	45,591
Annual Passengers (*1,000)	82,750	52,604	27,385	12,700	175,449

Source: GRAS

The war exerting an immediate devastating impact upon public transport operations, effects which continue to linger until the present. Considerable parts of the fleet were totally destroyed; the pre-war fleet total of 474 vehicles was reduced to 318 immediately after the war (1996) and had, by year 1999, stabilized at 381 vehicles. However, considerable problems remain in keeping units in operational service due to a lack of proper maintenance equipment, an aging fleet and a shortage of trained personnel. Prior to the war, some 80 percent of the fleet available for service was placed into operation on an average day. By 1997, that ratio had reduced to 67 percent, and by 1999 had recovered to 73 percent. However, in 1999, considerable elements of the fleet are still unusable; thus, operational vehicles (211) represent only 55 percent of the total fleet. In terms of rider-ship, recovery has been strong and, by 1999, had reached almost 70 percent of pre-war levels (Table 2.3.21).

Table 2.3.21 GRAS Pre and Post-War Vehicle Fleet and Ridership

Number of	Year			
	1991	1997	1998	1999
Annual Passengers (* 1,000)	255,607	123,458	154,245	175,449
Total Vehicles	474	359	403	381
Vehicles Available for Service	392	235	272	289
Operational Vehicles	314	159	194	211

Source: GRAS

Hercegovacko-Neretvanski Kanton provides Kantonal (inter-municipal) services over 11 routes offering a total of almost 100 daily departures. The network strategically links Mostar with its service hinterland (Capljina, Stolac, Neum, Prozor, Citluk, Konjic, Jablanica and G. Dreznica) while concurrently providing services between Stolac and Neum, Capljina and Neum as well as Capljina and Stolac. Highest daily departures are found on the Capljina-Stolac route (24) and the Mostar-Stolac route (21). The latter route also offers transfer opportunities to Citluk and Capljina.

Unsko-Sanski Kanton links 26 municipality-pairs with 40 Kantonal lines offering near 80 daily departures. Route length ranges from 19 to 194 kilometers. The fleet totals 82 units, with an average capacity of 46 seats, and average age of near 16 years. Roughly two-thirds of the fleet is public sector owned, and one-third private sector owned. Additional services are provided via municipal routes: in Bihac, eight lines offering 58 departures with route length varying from 12 to 40 kilometers; in Cazin, 19 lines offering 77 departures with route length varying from seven to 31 kilometers; in Bos. Krupa, 10 lines offering 39 departures with route length varying from 13 to 25 kilometers; in Kljuc, seven lines offering 18 departures with route length varying from five to 19 kilometers; and, in Velika Kladusa, 32 lines offering 91 departures with route length varying from four to 42 kilometers. The fleet based in Cazina totals 30 buses, with an average capacity of 50 seats and an average age of 16 years.

(6) Traffic Simulation

The trip matrixes developed as part of the road transport model, and described in Section 2.1 of this chapter, provides excellent insight into vehicle and, based on average occupancy factors, passenger trip patterns. Several observations may be made for year 2000 inter-zonal vehicle trip demand. A total of 125,211 vehicle trips are recorded as occurring on a typical day during year 2000. Some 88 percent of that is by passenger cars (110,417 trips), two percent by buses (2,682 trips), and ten percent by trucks (12,112 trips). This relationship is compatible with official vehicle registration data, which, for BiH, suggests that some 90 percent of registered vehicles are passenger cars, nine percent trucks, and one percent buses.

The combination of current patterns established via the roadside origin-destination filed surveys, and forecast demand projections, permits an estimation of daily passengers carried by cars and buses[48]. At present, an estimated 267,100 passengers are transported daily including 221,300 by cars (83 percent) and 45,900 by buses[49]. These totals are expected to grow to about 418,800 passengers per day by year 2010, and 618,000 passengers per day by year 2020 (Table 2.3.22). Over time, therefore, the relative share of passengers traveling by bus vis-à-vis by car is expected to decrease.

[48] Based on year 2000 occupancies of 2.0 persons per car and 17.1 persons per bus. As bus service efficiency increases, there is also likelihood that the number of bus trips will be impacted.
[49] In modeling terms, base calculations reflect inter-zonal trips traveling on internal network links.

Table 2.3.22
Estimated Daily Passenger Transport by Car and Bus
Years 2000, 2010 and 2020

Vehicle Type And Year	Passenger Kilometers (000)	Total Passengers Carried
Car		
2000	19,637.0	221,258
2010	29,158.4	362,154
2020	44,472.5	546,358
Bus		
2000	4,806.7	45,879
2010	5,755.2	56,687
2020	7,241.8	71,632
Combined		
2000	24,443.7	267,137
2010	34,913.6	418,841
2020	51,714.3	617,990

Source: JICA Study Team

(7) Operator Interviews

Interviews were conducted with bus operators throughout BiH in order to obtain more insight into fleet composition[50]. While considerable difficulties were encountered in completing these interviews, frequently due to the on-going privatization program, several interesting oversights nevertheless emerged. The 12 interviewed operators have a fleet of some 320 buses, with typical capacity being 44 seats in Republika Srpska. The fleet tends to be old; on average, almost 14 years per vehicle in the Federation, and 10 years in RS. In the latter case, average age is heavily influenced by ODPPS Autoprevoz of whose fleet a significant component is less than one year old. Rider-ship is influenced by the type of service structure. In the case of PJ Fosnica Centrotrans, for example, roughly half of all passengers travel on lines within a municipality, a further one-third on lines between Kantons, with the remainder being on lines within Kantons. In case of PJ Ilijas Centrotrans, however, about 55 percent of patrons are shown as riding on lines between Kantons, thus apparently reflecting the spatial makeup of the Sarajevo metropolitan area. ODP Romanijaprevoz indicates that 39 percent of its patrons have a local orientation, 28 percent travel between 21 and 50 kilometers, some 10 percent travel between 51 and 100 kilometers, about eight percent between 101 and 300 kilometers and the remainder more than 300 kilometers. The Centrotrans services offer the same fare structure; a 10-kilometer trip is charged at KM 2.00, a 50-kilometer trip at KM 6.00, and a 100-kilometer trip at KM 9.00. Differing fare structures were noted in RS; for example, ODP Drinatrans quotes a price of KM 1.00 for a 10-kilometer trip, KM 2.50 for a 50-kilometer trip and KM 5.00 for a 100-kilometer trip (plus KM

[50] Interviews were completed during early year 2000 on behalf of the Study Team by IPSA in the Federation of BiH, and Institute for Urbanism in Republika Srpska. Six operator interviews were completed in the Federation (PJ Fosnica Centrotrans, PJ Ilijas Centrotrans, PJ Kiseljak Centrotrans, PJ Olovo Centrotrans, PJ Sarajevo Centrotrans, PJ Visoko Centrotrans) and six in RS (ODP Romanijaprevoz, ODP Tehnotrans, DO Boksit, ODP Drinatrans, DOO Zis, ODPPS Autoprevoz). All data refer to the 1998/1999 period.

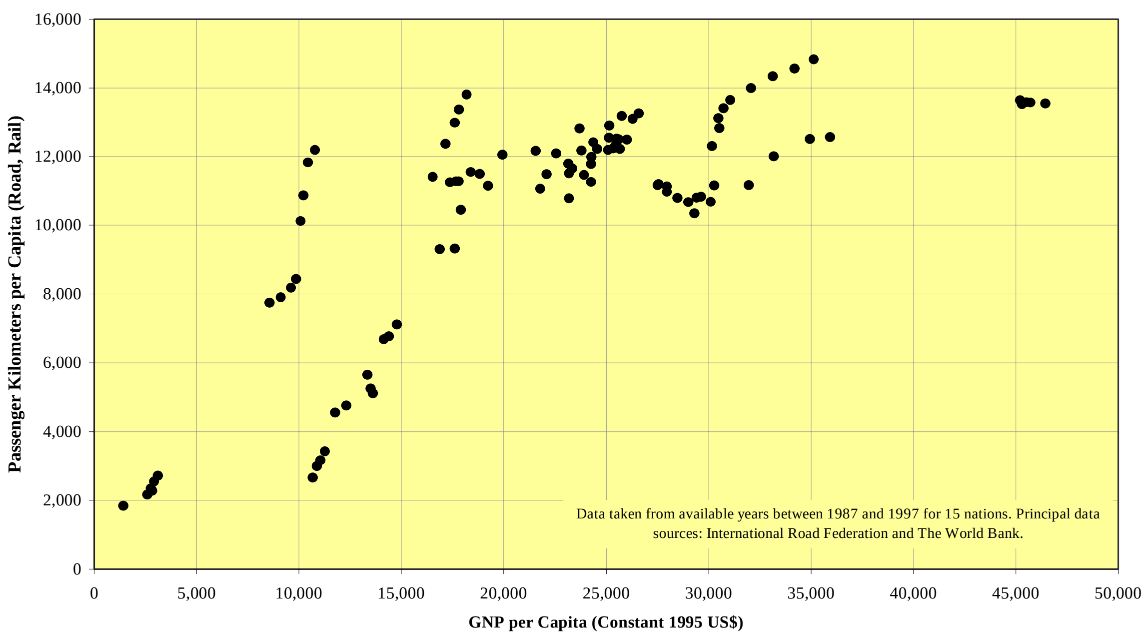
0.50 per piece of luggage). ODP Romanijaprevoz quotes a price of KM 2.00 for a 10-kilometer trip, KM 3.50 for a 50-kilometer trip and KM 5.50 for a 100-kilometer trip (plus KM 1.00 per piece of luggage).

(8) A European Perspective

Analyses presented in previous sections have confirmed that bus passenger travel fulfills an important role for the residents of BiH. It is of interest to examine the European experience at this juncture with a view toward clarifying the role of public road transport. Over the longer-term horizon, it is anticipated that BiH will gradually transition toward similar norms.

Unit passenger travel, that is, annual passenger kilometers of travel per capita expended throughout the nation as a whole, increases noticeably with increasing unit national income. Above GNP per capita of about $15,000 (in constant year 1995 terms), passenger travel by road and rail modes[51] appears to stabilize at some 10,000 – 14,000 kilometers per year per person (Figure 2.3.11). Of that total, roughly 90 to 95 percent is accomplished using road (versus rail) modes of travel (Figure 2.3.12). For passenger trips using the road mode, a clear preference for private means (car) versus public means (bus) emerges in that private means absorb, again at higher levels of unit national income, 80 or more percent of road passenger trips (Figure 2.3.13).

Figure 2.3.11 Overview of European Passenger Travel Pattern



[51] Passenger travel via air and inland waterway modes is minor relative to road and rail modes.

Figure 2.3.12 Overview of Modal Preferences for European Passenger Travel

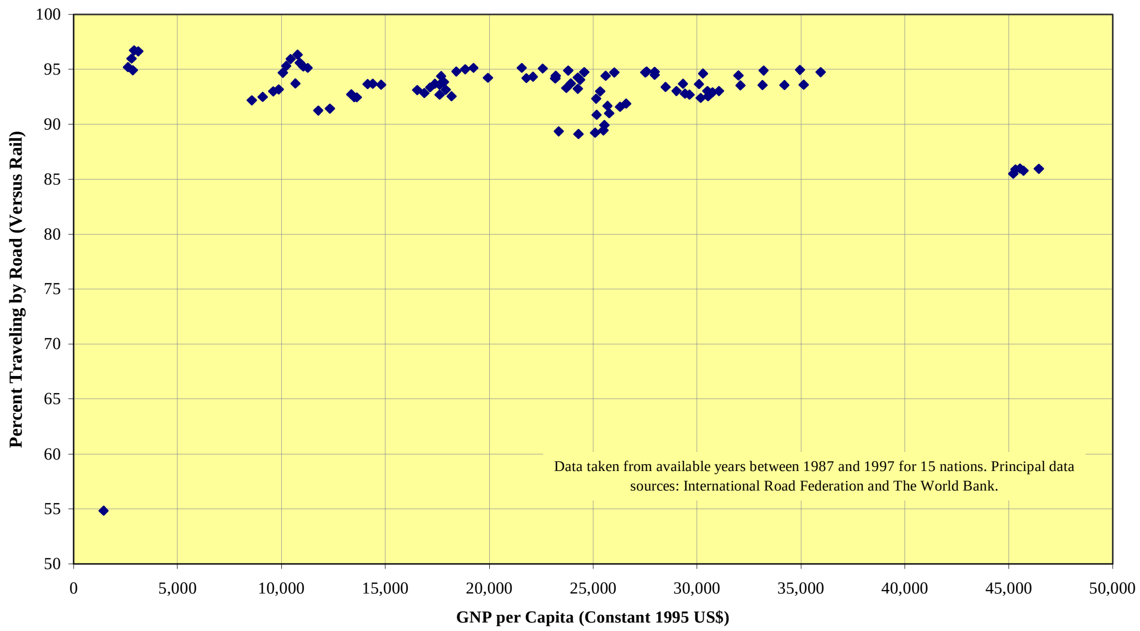
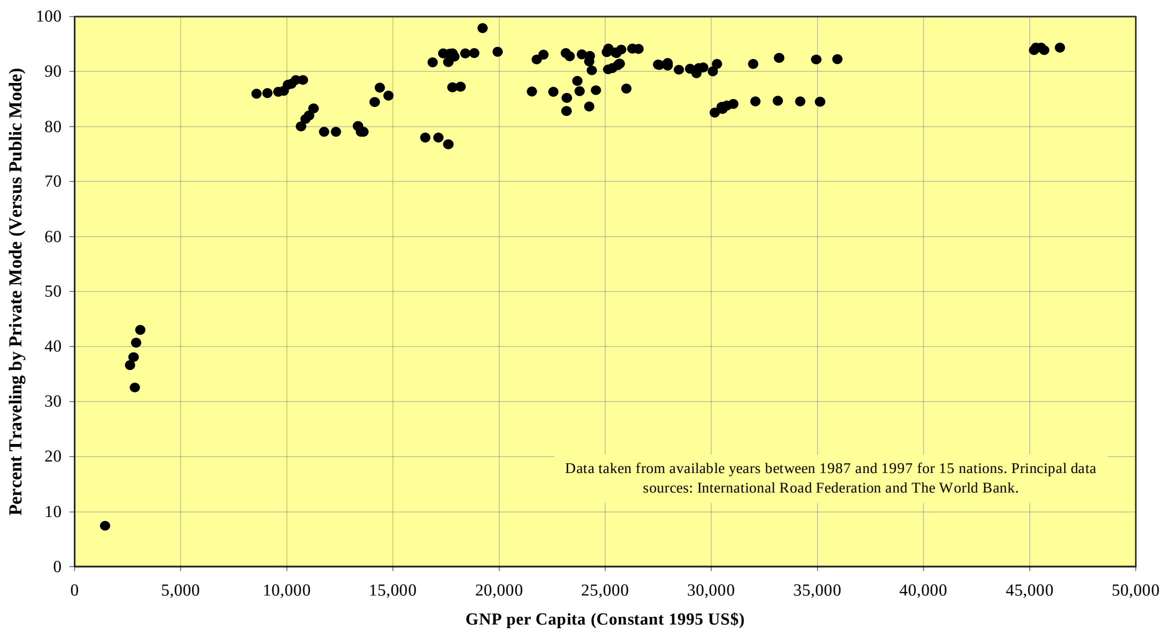
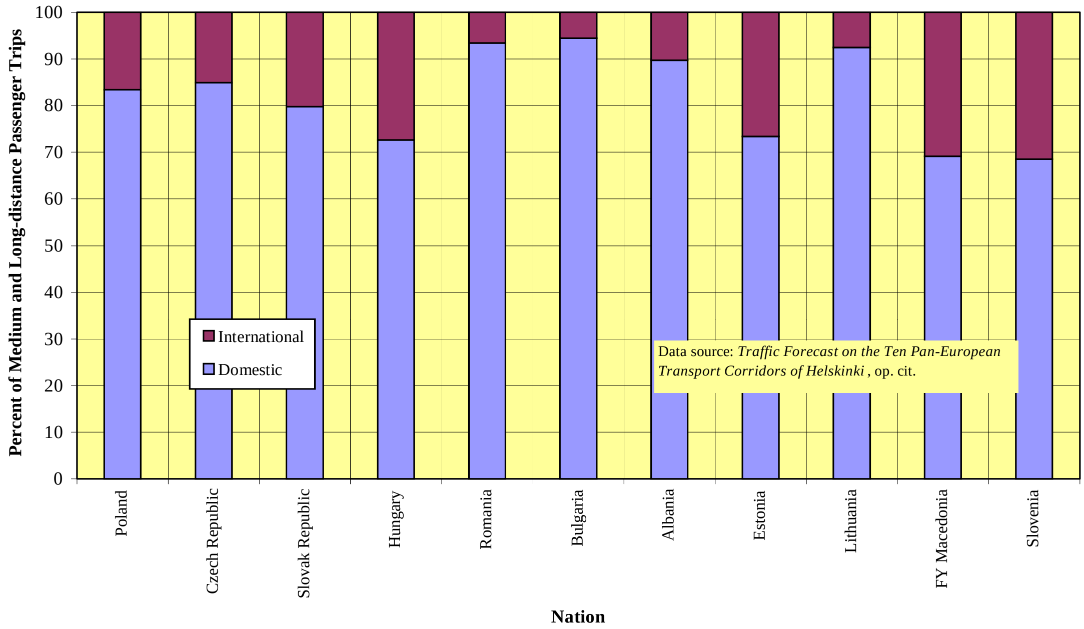


Figure 2.3.13 Overview of Mode Preference: European Road Passenger Travel



In terms of existing east European activities, data confirm that, for passenger trips of moderate and long distance, and considering the zoning system adopted, most are domestically oriented, with most international trips destined for nearby countries (Figure 2.3.14).

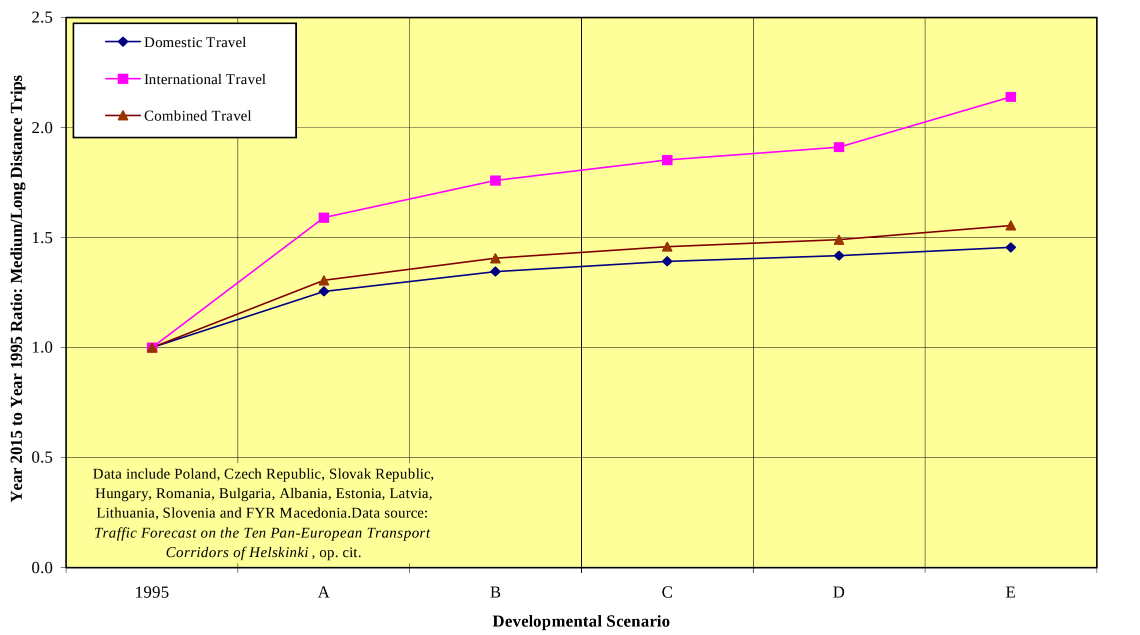
Figure 2.3.14 1995 Passenger Travel Orientation - Select East European Countries



The Pan-European corridors study also examined existing, and forecast, passenger activity in Eastern Europe to include modal preferences[52]. Conclusions are clear: increasing passenger activity will result as economic growth intensifies, transport infrastructure is upgraded, and transport markets are integrated. This is particularly so in case of international trips (Figure 2.3.15).

[52] *Traffic Forecast on the Ten Pan-European Transport Corridors of Helsinki*, op. cit.

Figure 2.3.15 Forecast Year 2015 Passenger Flows - Select East European Countries



The study also reaches several important conclusions regarding modal preferences under year 2015 scenarios:

- Highest growth factors among all modes vis-à-vis year 1995 will be achieved by the international air sector, although the absolute number of air trips is modest when compared to the road and rail modes. Typical ratios of year 2015 to year 1995 trips is on the order of three to five, although several higher instances are noted, particularly in the case of Romania and Albania. Differences are, as in other modes, observed for the five core scenarios (refer previous section for description of scenarios A through E). In the case of Poland, for example, the Scenario A ratio is near 3.1, Scenarios B and C near 3.5, Scenario D near 3.9 and Scenario E near 4.6.

- The absolute and relative road sector growth ratios are pronounced, particularly so under the more progressive scenarios. In the case of Slovakia, for example, the Scenario A ratio is near 1.9, Scenario B near 2.1, Scenario C near 2.3, Scenario D near 2.4 and Scenario E near 2.5. For all countries, demand is particularly influenced by more pronounced economic evolution and provision of infrastructure.

- In contrast, growth in the bus sector is more modest and relatively stable across all scenarios. A typical ratio range is 1.1 to 1.2, with exception of Albania where the growth ratio is shown as reaching near 1.6. Under some core scenarios, and for some countries (Hungary, Poland, Lithuania), the bus ratio is shown as falling slightly below unity.

- As with the bus sector, growth in the rail sector is more modest and relatively stable across all scenarios. A typical ratio range is 1.1 to 1.2, with exception of Albania, Bulgaria, and Romania where growth ratios are shown as reaching near 1.6, 1.4, and 1.3, respectively.

- In general, all modes show higher rates of growth for international passenger trips than for domestic passenger trips. This is correlated with an expanding market for international trips for leisure and holidays, on which some bus operators can achieve a strong position due to modest costs, door-to-door service, and flexible sightseeing itineraries. However, car traffic is the main impetus of this development.

2.3.3 The Way Forward

The conversion of the current BiH road transport sector, to include bus and truck operations, to one that is responsive to market mechanisms and, ipso facto, under largely privatized control, is both desirable and needed. Concurrently, a transition toward EU norms and practices must begin even though, realistically speaking, this transition is likely to require consistent and focused effort over longer time frames until full compliance is achieved. These efforts must proceed concurrently, and in parallel with, BiH's efforts to ultimately become a member state of the European Union.

This section presents an overview of existing issues for the bus and truck industries, on-going regional transport initiatives of interest to the industry, strategies for integration with the European Union and potential industry-specific courses of action.

(1) Issues and Opportunities

1) Buses

The objective of the current assessment is to provide a broad framework within which the inter-city bus transport system may be optimized, which, in turn, can help to provide effective alternatives to traffic congestion and pollution. It is important to recognize that there are many agencies, groups, and individuals with an interest in the BiH inter-city bus system; as such, they are the "stakeholders," each of which has their own objectives related to public transport systems or to specific elements of these systems. In considering new plans, it is necessary how these plans will affect the stakeholders and their objectives, some of which are contradictory or seek to achieve differing ends. The review of BiH inter-city bus systems has identified a number of issues which are central to any potential improvement strategy, and which must be addressed if stakeholders' objectives are to be realized and/or taken into account.

- The administrative system is complex and cumbersome. Various jurisdictional hierarchies ranging from municipal to Kantonal, Chambers of Commerce, Entity, and State are involved. This can be very intimidating, confusing, and contradictory for even knowledgeable operators, not to mention possible new external private sector participants.

- A clear segregation among the various service hierarchies is virtually impossible to define as different operators tend to service different types of routes with their available fleets. Thus, operating statistics are intermingled; passenger data is largely not available, or where quoted, is understood to be unreliable. Likewise, performance measures considered standard in the international bus industry (route kilometers, seat kilometers, passenger kilometers, revenue kilometers) appear neither to be routinely calculated nor available. Even the most basic of information, such as which inter-city domestic route is operational at what level of service, is not known with certainty. While a comprehensive service schedule exists, there is a consistent lack of knowledge as to which routes are actually servicing their licensed schedule and route on a consistent basis, and which are not. Numerous contradictions also surfaced during the Study Teams interviews with various governmental agencies regarding route operations.

- Buses are inspected regularly, but the system can be contradictory. Monthly inspections are needed in Republika Srpska, while in the Federation annual inspections are required under the Ministry of Internal Affairs, and three-month inspections under the Ministry of Transport and Communications. It is understood the latter inspection is more technical in nature and focuses on operational reliability of the vehicle (however, attempts to stem the introduction of old, second-hand buses acquired from other European countries have so far not been successful)[53]. Thus, two sets of inspection certificates are required in the Federation, and it is not uncommon to have a pass – fail situation. It is unclear at present as to which inspection result takes priority.

- Privatization is, in line with governmental regulations, on-going. While some successes are noted difficulties persist. These relate to not only finding willing buyers (in some cases employees are becoming owners), but also legal questions, answers to which remain nebulous under existing statutes. While ownership of rolling stock is, for example, a direct issue, ownership of other assets (such as depots, ticket sales offices, stations) is not. Other complexities arise in sharing arrangements between the various BiH ethnic communities.

- The current (controlled) fare structure is understood to be adequate to cover operating costs, but not fleet replacement. Thus, the typical BiH bus is 10-20 years old, and is likely to be, in essence, a discard from Western Europe. This presents a classical dilemma for BiH, particularly so in light of privatization desires. Fares should be determined by market factors, not direct governmental edict. In that manner, the operator stakeholder is ensured of an adequate cash flow, which supports operating costs, fleet modernization, and reasonable profit. Yet concurrently, from the country's perspective, lower volume routes fill a social need, particularly in lower-income areas of the country, yet the imposition of market-driven prices will present a hardship to that population sub-group.

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[53] It is understood that regulations are being considered at present, which would limit the import of vehicles more than seven years old.

- European data would suggest that viable inter-city, and international, bus services will continue to fill an important role in the movement of persons. While growth in bus passenger demand can, on a relative basis, be expected to be less than that of private transport, the modest unit national income levels suggest that a sizable market, in absolute terms, will remain for some time.

2) Trucks

The review of BiH trucking operations has identified a number of issues which are central to any potential improvement strategy.

- The administrative system is complex and cumbersome. Various jurisdictional hierarchies ranging from Kantonal to Entity and State are involved. This can be very intimidating, confusing, and contradictory for even knowledgeable operators, not to mention possible new external private sector participants.

- Licensing for international operations is accomplished largely on the State level. There is little technical evidence to support the current practice of bilateral permit distribution with one-third going to Republika Srpska, and two-thirds going to the Federation. It is understood that population is the basis of this allocation; however, from a trade perspective, this ratio is totally insensitive to market mechanisms, trade patterns of local operators and fleet composition.

- Various procedures exist leading to the allocation of international licenses to local operators. However, in general, the process is not very transparent, nor do robust technical (fleet, operator) and trade considerations appear to play a central role in this practice.

- Cargo transport in BiH falls into two general categories: international and within BiH. Unfortunately, for intra-BiH truck transport, virtually no structured data exist regarding type of services, cargo carried, and operator performance. In case of international operations, more robust information is available since, in most cases, permits must be obtained for BiH trucks to journey abroad.

- Cargo transport is heavily influenced by the “negative” economics of BiH; that is, varying taxation structures, high local costs, visa requirements and extensive border delays (BiH is not a member of the TIR group of nations).

- Privatization is, in line with governmental regulations, on-going. While some successes are noted difficulties persist. These relate to not only finding willing buyers but also legal questions, answers to which remain nebulous under existing statutes. A further deterrent to foreign investors is the status of the BiH truck fleet, which, with few exceptions, is dominated by aged “traditional” vehicles.

- European precedence and statistical evidence has clearly confirmed that the role of trucks will become increasingly important in future. It may readily be accepted that inevitable changes in the size and nature of demand as reforms take hold in BiH's economy will be increasingly shouldered by the road transport system. Over time, these changes will cause a significant shift in market share to road transport. Reliability, speed and predictable service will become more important to customers than movement of large volumes at low cost in response to pre-determined plans – as was the case in the Yugoslav pre-war economy. Further, expanding privatization will offer extensive opportunities for small-scale ("mom and pop operators") to quickly enter the new economy by purchasing (or leasing) a commercial vehicle and providing cargo transport services.

(2) Regional Transport Initiatives

BiH is not an island. Thus, a knowledge of, sensitivity to, and participation in regional transport initiatives will be an important stepping stone toward closer trade and passenger activity with national neighbors and other parts of Europe. In a broader sense, as indicated previously in this report, regional integration, in both strategic and tactical terms, is identified as an important element in the path to EU membership.

South Eastern Europe is on the crossroad between Europe and Asia and is also the natural transit route between Greece and the other EU Member States. Six out of ten multi-modal transport corridors included in the Helsinki and TINA Networks[54] go through South East European (SEE) countries. The collapse of the Soviet Union and the break-up of the Yugoslav Federation have led to radical changes in the direction of traffic flows, disruptions along the transport corridors, and the creation of new states. Performance of the border control agencies have been unsatisfactory: traffic has been subject to long waiting times, raising the cost of transport services and making them unpredictable; customs revenue collection has fallen short; and smuggling and corruption have become widespread. These deficiencies amount to bottlenecks to trade, with macroeconomic effects similar to those of protectionist trade polices; they undermine incentives to improve competitiveness; and deter foreign direct investment. To address these problems, the EU has been advising Romania and Bulgaria on customs reform and computerization, as part of its pre-accession assistance, and Albania and FYR Macedonia, as part of the approximation process. In BiH it has provided substantial direct operational support to build up the customs administrations after the war and likewise in Albania after the civil unrest of 1995-97. The Southeast European Cooperative Initiative (SECI) has, in parallel, set up national "PRO" committees to mobilize public and private sectors to simplify procedures and otherwise facilitate trade. In this connection, the governments of Albania, BiH, Bulgaria, Croatia, FYR

[54] The TINA (*Transport Infrastructure Needs Assessment*) process was launched in September 1995. Its mandate was to identify the transport investment projects in the accession countries along the pan-European Transport corridors as defined by the 2nd Pan-European Transport Conference (Crete, 1994) and update at the third Pan-European Transport Conference (Helsinki, 1997). At the Helsinki Conference the concept of Pan-European Investment Partnership was endorsed to promote the connection of the Trans-European Transport Network (TEN) on the EU territory with the TINA Network of the accession countries, the Pan-European corridors on the territory of the NIS and the four Pan-European Transport Areas of the maritime sea basins and the Euro-Asian links, i.e., the TRACECA corridors.

Macedonia and Romania have each asked the World Bank to finance improvements to border crossing points.

The border crossing problems, by its nature, requires coordinated and mutually reinforcing action in many areas. The resultant program, therefore, aims to integrate the efforts of the EU, SECI and the World Bank Group for: (a) physical improvements to border crossings; (b) technical assistance to strengthen the customs administrations; (c) computerization of procedures at the border crossings and electronic filing of customs declarations; and (d) improved exchange of information between the border control agencies and the business community, through seminars, training and the development of Internet web sites ("trade facilitation"). At the regional (i.e., international) level a steering committee is to provide a forum for exchange of experience among the countries, the collective aligning of procedures on EU standards. Aims are to reduce costs to trade and transport, at the same time reducing smuggling and corruption at border crossings, and strengthening regional partnerships and trade.

Recent wars are not the only cause for the generally poor availability and quality of transport infrastructure and services in the SEE region. Though the countries in the region are significantly different, institutions and polices in the transport sector are generally weak. These weaknesses have led to decades of inadequate maintenance; continuing over-regulation of the sector; dependence of transport enterprises on subsidies; and insufficient progress towards commercialization and privatization of transport services (except trucking). As a result, low quality of transport infrastructure and services, and relatively high transport tariffs limit international competitiveness of SEE countries.

Trucking throughout the region has begun to be privatized (including in BiH) with licensing practices in Romania, Bulgaria, and Croatia being close to those in the EU. Small entrepreneurs mostly operate the trucking sector in those countries with limited financial viability. There are only a few international operators with long traditions in international markets, such as the recently privatized Bulgarian freight operator SOMAT. Further growth in the trucking sector will depend on access to international markets. The still protectionist bilateral quota system and the difficulties in acquiring multiple entry visas for commercial drivers further constrain competitiveness. Romania, Bulgaria, and FYR Macedonia have negotiated agreements with the EU on relatively liberalized transit arrangements[55], but these do not provide for easier access to

[55] As a follow-up to the Europe Agreements three Transit Agreements have been negotiated between the European Community and Bulgaria, Romania and Hungary. These agreements ensure progressive and mutual liberalization of transit by the introduction of transit quotas in addition to the bilaterally existing quotas. Reciprocity is based on the recognition of transit through any Community Member States. The Transit Agreements also accelerate the adoption of EU standards, particularly the higher weight limits of vehicles. While this is part of the integration process, the consequent deterioration of the road networks in these countries will impose increased spending on road maintenance without the users' contribution (vehicle with over-weight are obligated to pay a fee; by the increase of the limits the amount of the collected fee will decrease). The Agreement between the EU and FYR Macedonia in the field of transport was concluded in 1998. It offers more limited transit opportunities for FYR Macedonia operators, as transit is restricted to journeys through the whole Community territory and destined for or originating from a third country.

bilateral cargo permits. In case of Romania and Bulgaria liberalization of all trucking services (both international and cabotage[56]) is expected when they join the EU. All SEE countries have also signed a SECI Memorandum of Understanding on the Facilitation of International Road Transport of Goods with the intention to gradually liberalize intra-regional road freight transport.

In order to facilitate international passenger transport by road a pan-European agreement, called INTERBUS, is under preparation. The agreement would liberalize certain occasional transport services and at the same time would provide for harmonization of rules on admission to the occupation, as well as technical (safety and emission), social, and fiscal matters. This technical harmonization, however, will be difficult for many SEE operators, who cannot afford to replace their fleet with vehicles meeting the EU standards. In this way not all SEE countries will be able to have the benefits of liberalization.

(3) Integration with the European Union

In a synoptic sense, in order to become a Member State of the European Union, acceding countries must align their national laws, rules and procedures to the entire body of Community legislation ('acquis communautaire') in such a way that the relevant EU law is fully incorporated in the legal system. This obligation continues after accession. The transport acquis[57] includes all the Directives, Regulations, and Decisions adopted on the basis of relevant provisions in treaties. It furthermore includes all the principles of law and interpretations of the European Court of Justice, all international transport agreements to which the European Community is a party, as well as the relevant declarations and Resolutions of the Council of Ministers.

While the transport acquis do indeed provide sector-specific information, it becomes immediately obvious that broader perspectives other than transport will likely play a leading role in the gradual transition of BiH and being selected for accession to the EU. In that sense, liberalization and harmonization policies, while by nature being country-specific, remain as the foundation for guiding policies of the EU. There are five areas that appear to be of a high priority:

- Private sector development, especially through liberalization of trade, improvement of the business regulatory environment, and strengthening of the financial sector, particularly banking regulation and supervision;
- Poverty reduction and social development, especially through policies to foster social cohesion and inclusion;
- Institutional development and governance, especially strengthening public administration, improving financial control mechanisms and improving legal and judicial systems;

[56] Cabotage: when a foreign operators are involved in domestic transport.
[57] *Guide to the Transport Acquis*, Directorate General of Transport, The European Commission, October 1999.

- Infrastructure and transport policies, especially streamlining and commercialization, thus fostering a wider role for the private sector; and,

- Environmental policies, especially protection of valuable natural resources and remedying the consequences of recent conflicts.

BiH has adopted liberalization and privatization as a basic policy for its economic transformation; these tenets must also flow to the transport sector. However, there currently exist a variety of constraints (as identified in Section 2.3.3.1) that hinder the immediate implementation of these policies and related measures; for example, existence of traditional systems and a shortage of funds. It is indispensable to develop a staged implementation program by taking priorities and constraints into account. Short-term priorities should be given to removing non-capital intensive bottlenecks, for example, elimination, or improvement of legislative and jurisdictional barriers. Medium and longer-term priorities should be given to improvement or development of strategic measures to encourage harmonization. During this period, a tactical focus should be rationalization strategies and industry modernization in terms of accelerated replacement of the aged transport fleet and supporting facilities so as to enhance the competitiveness of the BiH transport industry. Related measures include:

- Improvement of border crossing facilities in terms of procedures and facilities (refer *Volume 1, Interim Report*, intermodality section, for further detail in this area).

- Derivation of uniform, consistent and transparent fiscal, taxation and banking structures, considerations of vital importance to providers of both domestic and international cargo and passenger services.

- Transition of government's role from that of being a provider of services to one being a supervisor of services; that is, sort of a "watch dog" and facilitator.

- Development of an efficient and integrated multi-modal transport system, in line with recommendations promulgated by the current study.

- Accelerated upgrading of principal road segments and corridors.

- Replacement of aged fleets of trucks and buses, with an emphasis on energy efficiency and environmental protection as part of the EU standards for these vehicles.

- Introduction of user pay principles, to include "fair share" contribution for road maintenance, in accordance with the practices of EU countries.

A recent analysis[58] points out some necessary tasks, which face BiH on the road to European integration in terms of removing legislative, physical, technical, and fiscal barriers. Key needs include:

- New legislation at the state level regarding conduct of, and access to, international road transport.
- Development of appropriate institutional structures whose function is supervision of the transport industry, and the transparent application of new legislation.
- Harmonization of Entity regulations in a manner, which incorporates EU requirements.
- Certification (via recognized training institutes) of all transport operators regarding professional qualification and competence, regardless whether the operator provides domestic or international services, both for passenger and freight transport.
- Establishment of BiH institutions capable of testing and certifying professional qualifications.
- Appropriate guidelines and training for the handling of unique items such as hazardous cargo.

Trade practices remain an economic cornerstone of international relationships and, as indicated previously, an important element in European integration. Trade practices between BiH and other European States are based on a variety of special arrangements and agreements. The enhancement of those relations, in terms of both practices and volumes, depends not only on bilateral relationships, but also, in a larger sense, on the status of the Balkan region as a whole. Study Team representatives discussed in Brussels the perceived status of BiH transport with various organizations active in international transport. In addition to political and legislative constraints, an over-riding comment received was that BiH, in isolation, is likely to generate only modest cargo and passenger demands when compared to other east and central European states whose size is both larger, and geographically closer to, western Europe. This, in turn, is likely to dampen the desire of major European players in the transport industry of intensifying/extending services to/from BiH. It was frequently suggested to the Study Team that “critical mass” in transport demand must be enhanced via regional consolidation, thus catalyzing larger, more concentrated, shipments to/from Western Europe.

Similar issues are central to formation of the Stability Pact, and its impact of enhanced economic as well as trade activities among, and with, the SEE members – Albania,

[58] *Harmonization with EU Regulations for the Road Transport Sector* (translation); by Z. Heco, Federation Ministry of Transport and Communications, Sarajevo, June 2000.

BiH, Bulgaria, Croatia, FYR Macedonia, Romania and Yugoslavia. Action plans[59] focus on four key elements:

- Moving rapidly towards trade integration with the EU and within the region itself, and creating a stable, transparent and non-discriminatory environment for private sector development;

- Fostering social inclusion and social change within the region to reduce tensions and create the conditions for peace and stability;

- Improving institutional capacity and governance structures, and strengthening anti-corruption efforts in the region; and,

- Investing in regional infrastructure to integrate the region physically with rest of Europe and within itself, which must include initiatives that safeguard the environment.

The review goes on to state that the current state of trade relations – discriminatory, variable, and sometimes highly protectionist – is a long way from the ultimate goal of regional countries, that is, integration with the EU. Yet there is no simple or single way of moving towards that objective. The review postulates a possible approach of meeting the objective of overall trade integration, an important prerequisite. This is presented in two phases with an intermediate review that would permit the analysis of progress achieved and would also permit the tailoring for further EU integration to individual countries.

- During the initial phase – say over two or three years, a gradual but general liberalization of all trade must be achieved, with support by the World Bank and IMF, and elimination of administrative barriers to trade must be achieved, as must the beginning of multilateralization of existing bilateral trade practices.

- Following the initial phase, the EU may wish to decide among various options with regional countries, but might include decisions as to which countries would simply continue building free trade relationships; which, if any, are invited to negotiate for EU accession; and which, if any, are invited to join a customs union on the way to fuller integration with the EU.

- During the second phase, the regional countries would need to establish a full-fledged Free Trade Area with the EU and among each other. In some cases, this may lead directly to full association with the EU; in others, a customs union may be an intermediate step. In both cases, countries will need to implement a convergence of their external tariff to that of the EU; in addition, they would have to make progress in aligning economic policies and institutions in other areas needed to make a customs union and/or full integration effective. Concurrently, the EU will

[59] _The Road to Stability and Prosperity in South Eastern Europe – A Regional Strategy Paper_, The World Bank, Europe and Central Asia Region, March 2000.

need to progressively eliminate remaining restrictions on imports from these countries according to timetables to be negotiated.

Considerable additional detail regarding European integration is presented in the *Interim Report, Volume 1*. Supporting sector-specific strategies are presented in the following section.

(4) Sector Modernization Strategies

1) Objective and Program Framework

For a government to bring coherence into the actions of its many agents and to be able to communicate with the community it governs, it is necessary that there be a statement of the political, social and economic principles which guide its policies and actions. The road operations aspect of the Transport Master Plan is intended to fulfill this role for inter-city and long-distance truck and bus operations. It is, of necessity, a framework approach, rather than an overly detailed statement of operations. The Study Team considers this approach necessary as first there must be established a new industry framework that is responsive not only to transport management and operating issues, but is compatible with other on-going efforts in areas of trade, taxation, privatization and financial restructuring. Only once the “ground rules” are established is there a coherent basis for more detailed reviews regarding the formulation of route structures, operating standards, etc.

The transition from pre-war to post-war conditions has been extraordinarily difficult; even today; many challenges remain due to both the war and the ongoing economic reforms within BiH. Thus, a continuing test in the transport sector may be to define a path, which is adaptable to today’s circumstances and tomorrow’s market challenges.

- **In its most basic sense, the structure of the inter-city and long distance truck/bus operations strategy strives to put as much of the sector’s assets and functions as possible in a deregulated, competitively structured private sector, in which determination of prices and investment is left to the marketplace. The government’s role would then be limited to one of setting policies to ensure that the (transport) market place works effectively, that transport operations are undertaken safely, that environmental norms are observed, and that services are available to all users on an equal basis.**

The suggested strategy strives to be innovative, yet practical, while concurrently meeting the needs of various participants active in the BiH transport industry. Following principles guide the process and form the basis upon which the framework is founded, and within which recommendations are derived:

- Regulation tends to protect firms from competition, whereas government monopolies are neither disciplined by the market nor by a regulator. Privatization and deregulation are alternative ways to restore competitive private markets to industries that government has traditionally controlled and/or operated. In deregulating or privatizing road transport services, one of the most essential services that government can perform is creation of an environment that fosters effective competition, and that prevents the formation of predatory monopolies or cartels.

- The focus of the current study is a countrywide transport master plan; thus, any series of recommendations will be geared toward that objective. However, it must concurrently be understood that any change in the transport sector, such as that contemplated for road transport, cannot be achieved in isolation. Instead, efforts must proceed parallel to, and be compatible with, on-going reforms in other sectors at both the State and Entity levels to include, among others, revisions of customs duties and procedures, restructuring of banking/financial markets, review of taxation policies, industrial privatization policies/practices and integration with the European Union. It should concurrently be understood that privatization of the inter-city and long distance road transport industry is not simply a matter of "selling the buses and trucks." If the privatization and deregulation of road transport operators is to succeed in BiH, and indeed it must, legal and administrative changes must concurrently occur.

- Privatization/deregulation comes in many forms; frequent references in literature are made to experiences in the United Kingdom, Russia, United States, Mexico, and Chile. The Study Team agrees that privatization and deregulation of the inter-city and long distance bus/truck operators is needed in BiH, but not necessarily in an unfettered free-market format driven entirely by market demand and performance. The BiH market is still imperfect, and likely to remain so for the near-term future; thus, initial actions regarding the road transport sector should embrace free market principles guided by a reasonable policy framework. But, in the medium to longer term, gradual transition to a more unfettered mechanism is desirable.

- The plan is based on the realities of the existing condition. It is apparent that throughout BiH there are a number of individuals who are highly knowledgeable of, and experienced in, the operation of buses and trucks, but are often frustrated and constrained by the existing "system". Many essential elements for improvements are already in place, thus the current plan attempts to build upon existing opportunities, rather than suggesting that a whole new approach be implemented.

- Compliance with EU transport policies remains desirable, but it must concurrently be realistically accepted that full EU membership for BiH will take some time. Thus, in the bus and truck industry, one must "walk before running"; that is, initial efforts should focus on transforming the industry so as to provide efficient and effective services, then gradually conforming to EU standards and practices. This should not be mutually exclusive paths, but on-going (although not necessarily deterministic) exercises; indeed, considerable conformance has already been achieved by those operators providing services to Western Europe.

- Any strategy that includes policy measures must be monitored and enforced. The safety characteristics of vehicles and the control of overloading are some of the most difficult technical regulations to be enforced. Associated inefficiencies, such as payment of unofficial payments to monitoring officials, must concurrently be addressed via both "stick" (prosecution under existing laws) and the "carrot" (improved training and morale enhancing measures) approaches.

- Existing regulations, controls, and procedures in the inter-city transport sector tend to be complex and intimidating. It must be accepted universally within BiH that, under a post-privatization scenario, bus and truck operators cannot continue to be smothered under a blanket of restraints. To do so will impede the growth and success of this vital sector, and if private sector growth is impeded due to stifling governmental control, then all of BiH will suffer, included the government itself. The path to a prosperous future will be blazed by private enterprise and market-driven economic mechanisms.

2) General Recommendations

In following sections, recommendations are arrayed as applying equally to both inter-city bus and truck operators, and those with a specific focus toward either mode.

Operator Database At present, data regarding inter-city and long distance bus and truck operations is, with partial exception of international services, lacking. In case of buses, operating statistics are intermingled; passenger data is largely not available, or where quoted, is understood to be unreliable. Likewise, performance measures considered standard in the international bus industry (route kilometers, seat kilometers, passenger kilometers, revenue kilometers) appear neither to be routinely calculated nor available. Even the most basic of information, such as which inter-city domestic route is operational at what level of service, is not known with certainty. While a comprehensive service schedule exists, there is a consistent lack of knowledge as to which routes are actually servicing their licensed schedule and route on a consistent basis, and which are not. Likewise, in case of trucks, virtually no structured data exist regarding type of services, cargo carried, and operator performance.

Data on cargo and passenger transport are very important for a number of reasons:

- Bus and truck operators have available a reliable source of information via which market-oriented decisions can be facilitated regarding potential demand and opportunities for expanded services (i.e. new routes).

- The Entity Ministries have at their disposal a tool through which administrative and policy decisions may readily be reached. It will be vitally important to guide the transition to a market economy using orderly and efficient procedures. This would include early detection of undesirable developments such as predatory monopolistic practices. A database will also quantify supply and demand indicators, operational parameters of the industry and broad performance indexes.

- The involvement of domestic and international investors in the bus and truck industries in BiH is a highly desirable goal and seen as a key element in the overall privatization program. The Privatization Task Force has indeed provided guidelines for financial information, which each company in BiH involved in privatization must provide. However, these data focus, understandably so, on accepted international accounting practices and do not necessarily provide a measure of operational efficiency of a bus or truck operator. The Study Team sees the absence of such information as a considerable deterrent to soliciting interest from private investors, particularly foreign private investors.

- Bilateral negotiations regarding international permits should, as recommended in other sections of this chapter, be based on precise data rather than notional indicators. The existence of an operator database will provide invaluable assistance in this regard.

- Transport data could, at discretion of the relevant Ministries, be shared with Entity/BiH statistical organizations. A further option is that some elements of the database could be collected with assistance of statistical organizations.

Market indicators considered typical EU norms would be a good reference point for inclusion into the BiH database. These would include:

- For trucks: type of carriage, goods, fleet profile, trip length, origin and destinations as well as capacities of trucks and their utilization. A commodity transport price index would also be highly desirable.

- For buses: route structure, trip length, average fare levels, fleet profile, origins and destinations as well as capacities of buses and their utilization (route kilometers, seat kilometers, passenger kilometers, revenue kilometers).

It is noted that the present study, using results from the roadside origin-destination survey, can be used to make a considerable contribution toward the establishment of such a database. Furthermore, the road transport model can also be invaluable to the Ministries in terms of testing alternative demand scenarios and bus/truck service options.

New Role for Ministries of Transport and Communications The cornerstone of this essential recommendation is, as stated previously, that

- **Inter-city and long distance truck/bus assets and functions remaining under government ownership should, as quickly as possible, be converted to private ownership. Subsequent operation would be in a deregulated, competitively structured environment, where determination of prices and investment is left to the marketplace. The government's role would then be limited to one of setting policies to ensure that the (transport) market place works effectively, that transport operations are undertaken safely, that environmental norms are observed, and that services are available to all users on an equal basis.**

The devolution of assets could be in the form of direct means (for example, auctioning of vehicles) or indirect means (for example, establishing a leasing company and making (previously) public-owned assets available to entrepreneurs with insufficient resources for vehicle purchase).

The implications are that:

- Freight rates and passenger fares will be freely determined by the market;

- The Ministries will ensure that cartels and regional monopolies are not created, that safe operating conditions are complied with, and that there is free access by new operators; and,

- There will be no special subsidies for the purchase of equipment, but all efforts will be made to eliminate existing obstacles and limitations on their purchase. At the same time, there will be no restrictions on the type of vehicles or their capacity, and they may be freely imported assuming minimum technical standards are met. Their operation, on the other hand, will continue to be subject to general regulations, in particular for trucks those related to axle weights.

Several changes in procedures applicable to domestic services are consequently suggested:

- To obtain a concession, potential bus operators should be required to present applications indicating the route to be served, the characteristics of the service as well as evidence that technical (vehicle) and driver standards are being complied with. It presented correctly, the application should be approved. That is, the government (and, in case of Republika Srpska, the Chamber of Commerce) does not decide whether or not the service is necessary. There is, of course, an on-going obligation for operators to maintain vehicle and driver standards, and to provide information for the operator database.

- In case of truck operators, evidence of technical (vehicle) and driver standards remain paramount. No restrictions on cargo, routing or fee should be imposed, except in unique cases such as carriage of hazardous materials[60]. Truck operations would be subject to a continuation of usual periodic procedures associated with vehicle inspections, adherence to regulations and vehicle weight.

- It is a goal that all operators currently under government ownership be privatized. However, given that unique conditions exist within BiH, there may exist justification under which public ownership is, on an interim basis, retained. However, such operators must be transformed into “arm’s length” companies and set up with standard accounts so that operations and financial transactions would be visible and explicit. Also, the “arm’s length” companies must compete, along with

[60] As specified in EU Directive 92/579/EEC; *Commission Recommendations of 27 November, 1992 calling upon Member States to set up the infrastructures needed to identify dangerous products at the external frontiers.*

private operators, under identical conditions in the market place without preferential treatments. The eventual transformation to private ownership should be retained as a priority goal.

- There may also exist justification, given the unique conditions, which exist within BiH in terms of low income pockets, refugees and other socially disadvantaged groups, for providing concessionaire rates for bus transport. In case of such non-profitable routes, government may choose to award operations based on evaluation of tenders, with supplemental payments (market shortfall) justified in terms of social considerations (and, of course, savings over an equivalent provision of service via public services). However, all operators would have to be given access to such compensation on an equal basis, and any form of compensation must strictly and rigorously be based on accurate financial records and transparent tendering procedures.

- This recommendation carries two important caveats. Firstly, at present, a considerable portion of the traveling public qualifies for free bus transport. Such policies are not unexpected, and indeed, for certain sectors of the population, most deserved. However, the Study Team urges that a fare review and rationalization be undertaken with a view to accurately determining, in financial terms, the impacts social polices exert upon operator and government coffers. Secondly, at present, bus operators carrying qualified free passengers are due compensation from the government. However, it has been brought to the attention of the Study Team that such compensation is frequently late, if indeed paid at all. This places an unfair burden upon operators, particularly those currently under public ownership. The government must clearly understand the linkage between social programs (free fares) and financial impact (affordability) and must surely be prepared to fairly and honestly meet its resultant obligations.

- It is again noted that privatization does not imply that any provisions regarding safety or environment are changed. Operator’s licenses would be required and vehicles would still be subject to regular and random inspections. Likewise, local authorities would still have limited powers to impose conditions upon route locations and stopping places; however, such reasons must be based on sound traffic engineering or social considerations.

- Route associations are organizations of very small private operators (usually with one or two vehicles each) that band together to provide common facilities (such as maintenance depots) and, in case of buses, coordinate their schedules on a route. It should be possible for a route association to be given the charter to service a specific route, as long as members compete with one another and entry into the association is open.

The successful and efficient operation by inter-city and long distance bus and truck operators hinges upon the availability of road infrastructure whose supply is adequate and condition acceptable. Therefore, there exists a mutual obligation discussed in and earlier section of this chapter; that is, operators must accept that vehicle fees reflect the potential damage they inflict upon roads (and resultant maintenance requirements) and that the Ministries must ensure that reasonable programs of infrastructure construction, rehabilitation, and maintenance are in effect.

International bus operations are managed by the Ministry of Civil Affairs and Communications. After an agreement between cooperating partners (operators) in both countries is reached, official arrangements are procured from relevant Ministries in both countries. In case of BiH, this is the Ministry of Civil Affairs and Communications. It is anticipated that such arrangements and formalities will continue for the foreseeable future. The Study Team also sees no reason to recommend any changes in terms of authorizing agencies as it is considered common European practice that agreements are reached between central authorities (in the BiH context, a State ministry). The Study Team also sees no major difficulties in the modus operandi for international bus permits. Indeed, the private sector has already taken a leading role in that initial agreements are reached by operators, with official approvals following assuming that operators satisfy technical criteria specified by the Entity Ministries of Transport and Communications.

International truck operations are managed by the Ministry of Civil Affairs and Communications. The Ministry is responsible for the issuance of permits (both bilateral and CEMT) authorizing foreign shipments of goods. In case of bilateral permits, the absolute number is dependent upon inter-governmental negotiations and agreements. Responsibilities for the fleet rest with Entity Ministries of Transport and Communications. It is anticipated that such arrangements and formalities will continue for the foreseeable future. The Study Team sees no reason to recommend any changes in terms of authorizing agencies as it is considered common European practice that inter-governmental agreements are reached between central authorities (in the BiH context, a State ministry). Subsidiary distribution within BiH should continue to be achieved via the Entities (and, presumably, the Brcko Administrative District at some point). However, the Study Team does feel a more cooperative relationship between State and Entity Ministries is desirable in this arena, as noted in following paragraphs.

At present, *bilateral permits* are distributed on a one-thirds two-thirds ratio between Republika Srpska and Federation, respectively. This ratio carries uniformly across all countries. It is also understood from the Ministry of Civil Affairs and Communications that the ministry retains some 10 percent of permits for emergency use or to facilitate timely transport of high-priority shipments.

It is recognized that historical precedence plays a considerable role in the determination of this allocation; however, the Study Team sees an inherent flaw:

- **In recognition of the importance of international trade to BiH and the Entities, the allocation of bilateral cargo permits should be market driven so that the needs of the economy are indeed met.**

Concurrently, it is also recognized that any change in the status quo will imply redistribution; thus, some gains and some losses in permits when compared to previous practices are inevitable. Nevertheless, all parties must vigorously and with an open mind debate such a solution. A wide variety of options exist, with the following forming broad generic categories:

1. No change is made to existing practices; that is, market (Entity) share continues to be determined only by externally derived constraints. This is discouraged by the Study Team.

2. The overall one-thirds two-thirds ratio is maintained, but allocation flexibility by countries permitted. For example, inter-operator “trading” of shipment permits.

3. Permits are allocated based on need and trade potential, regardless of operator base.

4. A complete free-market auction of all permits, with permissions going to operators with highest competitive bids.

The Study Team considers option 3 to be a realistic goal. That is, the allocation of permits should reflect economic need and potential. The exact allocation mechanism should be determined among participating factions, that is, the Ministry of Civil Affairs and Communications and Entity Ministries of Transport and Communication. Input from external organizations, for example, the truckers association (which the Study Team recommends be located under the umbrella of Chambers of Commerce) or the (coming) BiH Transport Corporation, should be considered. Such relationships must be decided locally. It is suggested at this early juncture that, in terms of technical allocation criteria, shipment contracts (operators or operator organizations), international (export/import) trade statistics (for BiH, Entities and sub-regions thereof), modal shipment preferences (growing role to the truck fleet in various commodity groupings), fleet composition (compliance with EU standards) and effective use of previous-period issued permits all play a role. The value of broader databases, such as vehicle fleet origin-destination patterns ascertained by the current study, and most certainly the recommended *operator database* could also provide a valuable contribution to this process.

The development, processing, and utilization of such data unavoidably implies additional work and effort on part of all participants. Further, in areas such as trade statistics, considerable improvements over existing capabilities must be implemented. However, in the interests of fairness, this is seen as being justified. There is a further considerable advantage that such a database can play. Bilateral permits are negotiated on an annual basis; however, while the current allocation procedure is the source of much displeasure at the moment, both Entities are apparently in agreement that the absolute number of permits is too small. Thus, the existence of a comprehensive data base could very easily form a valuable information tool to be applied during the annual negotiation process with a view to providing technical justification for issuance of more permits.

Inter-Entity Transport At present, inter-Entity bus routes are treated separately from intra-Entity routes in terms of licensing requirements. That is, the Ministry of Civil Affairs and Communications ultimately issues route permits after technical approval processes by the Entity Ministries of Transport are completed. It is understood that historical reasons are the basis for this procedure, however, from a public convenience point of view, we would urge the relevant Ministries to jointly discuss (and hopefully agree) that procedures for inter-Entity fixed-route bus transport should follow the example of inter-Entity cargo transport and indeed inter-Entity charter bus transport; that is, free movement, without restrictions and, ultimately, governed by the private sector and operated based on market considerations.

Operator Associations Following privatization, it is expected that operators, many of which will be “mom and pop” companies owning perhaps one or two vehicles, will invariably group together and pool knowledge as well as resources via operator organizations. These could evolve along the lines of existing jurisdictions (say a Kantonal Association of Professional Road Transport Operators), within the umbrella of an existing regional jurisdiction (such as Chambers of Commerce), operator characteristics (domestic, international) or commodity type. In any case, such organizations should be free of governmental interference and control with main objectives being to serve as the collective voice of the industry, ensure the welfare as well interests of its members, and to provide the public with reliable, cost effective, as well as safe transport of cargo/passengers. Some areas of mutual benefit would include cooperation in terms of:

- Market information exchange;
- Return load optimization in case of trucks;
- Procurement of vehicles, fuels and spare parts through mutual financing;
- Education and training;
- Managerial rationalization; and,
- Development of terminals and depots.

The Study Team suggests that the Chambers of Commerce would form an ideal umbrella agency within which inter-city and long distance bus/truck operators, or operator associations, could flourish. There are several reasons for this:

- The Chamber of Commerce has a historically strong link with the transport industry and transport operators.
- The existing Chamber structure is well diversified and established on both a regional (ten in Federation, five in Republika Srpska) and Entity basis. In addition, at time of writing, negotiations were being finalized for the formalization of a BiH Chamber of Commerce.

- Linkage is provided with international chambers, which by definition, represent international business.

- Chamber membership is conversant with, and inherently sensitive to, private sector activities. For example, the largest regional chamber in Republika Srpska (Banja Luka) indicates that private sector membership has grown from nothing in 1990 to 10 percent in 1996 and 40 percent in year 2000. Membership is expected to be 100 percent private within two years.

- The existing membership structure of the Chamber permits operators, transport companies, or operator associations to join.

- In a broader sense, the Chamber provides a venue for “one stop” shopping, that is, opportunities for direct interaction with a wide variety of businesses (including coordinated partnerships and financing conglomerates).

While the transport industry should perform free from government control, close working relationships with Entity Ministries of Transport and Communication are nevertheless required in several areas:

- The distribution of relevant operator permits (in case of international activity) in a fair and transparent manner;

- Operational requirements (vehicle safety, vehicle inspection procedures, emission standards, driver licensing, vehicle licensing).

- Jurisdictional matters (truck weight enforcement, vehicle inspection procedures, border formalities)

The transport industry, particularly if sponsored by the Chamber, should raise its collective voice in other areas. For example:

- Arranging credit lines with banking and financial institutions for expansion of the vehicle fleet;

- Coordinating ancillary methods of revenue generation, such as, in case of buses, advertising and, perhaps, transporting express parcels;

- Coordinating SME assistance programs, NGO participation, and other foreign assistance programs for its members for direct financial support or training/incentive programs in diverse areas such as accounting, formulation of business plans, fleet maintenance and operations, public information dissemination, etc.

- Lobbying on behalf of the industry in areas such as human resources training, taxation policies, driver visa requirements, and vehicle importation regulations. Within the umbrella of a more comprehensive private sector organization, such as the Chamber of Commerce, more far-reaching goals could be pursued with foreign industrial concerns, such as the location of a regional vehicle assembly plant in BiH.

- Develop or adapt training manuals (and possibly computer software) into local language in such areas as maintenance, operations planning, book keeping, and marketing.

Bus Terminals Inter-city bus terminals already exist in BiH and serve important functions in that longer-distance bus passengers may interchange with other modes of transport, including local buses and passenger cars. These facilities are under government control.

For deregulation/privatization to be sustainable, the competitiveness of transport markets must be a constant concern of government. Of particular importance is the policy regarding passenger terminals. Experience in other countries has confirmed that users of bus services, as well as existing and potential providers of services, must have access to timely information about the market; that is, what routes are available, what schedules exist, what classes of service are being offered, and at what price. The private sector market place will be fluid in content, with frequent changes in services either due to operator capability, or passenger desires. The most direct opportunity for obtaining such timely information, and doing comparative shopping between operators, is within inter-city bus terminals.

It is therefore recommended that bus companies should not be permitted to also own bus terminals. Instead, separate companies should be selected to take ownership of bus terminals. The reasons for this are four-fold: to prevent a proliferation of competing bus terminals and/or the dominance of large companies over small operators; to ensure that only a limited number of bus terminals evolve as needed to support actual operations, being compatible with local modal-interchange opportunities as well as land use plans; that bus services by all operators are focused at these terminals; and, that existing and potential bus passengers have ready and centralized access to information pertaining to bus services. The latter is particularly important in inter-urban bus transport in that passengers can best compare vehicles, schedules, and fares if buses are concentrated in a single terminal.

Bus terminal operation could mirror terminal operating procedures at airports; that is, income is generated through modest fees assessed to transit operators for “docking rights,” lease of space for ticket offices; operation of supporting amenities such as vehicle parking and restaurants; and, leasing fees for ancillary services such as shops and advertising.

Truck Terminals It is very likely that international and domestic general cargo transport will substantially increase in the future. It is a general tendency that truckers pursue the efficiency of truck operations through separating trunk line transport from distribution services, thus fostering “stop and go” services on trunk lines, as well as “just in time deliveries” for distribution services. Over time, differing vehicle types will also likely evolve to achieve economic efficiencies, with larger trucks likely on trunk routes, and smaller, more nimble, vehicles on distribution routes.

Truck terminals need to be developed in the vicinity (periphery) of urban centers with due consideration to good connectivity between inter-city and distribution (intra-urban) cargo transport as well as possible impacts on urban environment including traffic congestion, accidents, air and noise pollution. Development of truck terminals would catalyze significant benefits to urban traffic particularly in larger cities as new loading and unloading facilities would be created in more accessible areas. Major truck terminals should ideally be equipped with not only trans-shipment facilities but also container depots, warehouses, sorting and packaging facilities, and some kinds of processing facilities.

Currently, in BiH, the volume of container transport is not great when compared to other types of cargoes. Further, international feeder points such as Port Ploce in Croatia have at present minimal container turnover, and no dedicated container facilities. Nevertheless, it is expected that in BiH the movement of containers by truck will gradually increase. Thus, will need to be reflected in the planning and design of truck terminals. Further discussions regarding multi-modal container activity are presented in *Volume I, Interim Report* in the Intermodality chapter.

Vehicle Inspections Buses are inspected regularly, but the system can be contradictory. Monthly inspections are needed in Republika Srpska, while in the Federation annual inspections are required under the Ministry of Internal Affairs, and three-month inspections under the Ministry of Transport and Communications. Thus, two sets of inspection certificates are required in the Federation, and it is not uncommon to have a pass – fail situation. It is unclear at present as to which inspection result takes priority.

It is urged that inspections procedures be clarified in the Federation so that only one inspection certificate is required. It is further urged that the Entity Ministries discuss the coordination of vehicle inspection procedures, both in terms of time span and content. A vehicle operating on the roads of BiH should, regardless of place of ownership, conform to identical measures of road safety and environmental standards, thus assuring the public of uniform compliance.

Neighborly Relations Croatia, BiH’s southern, western, and northern neighbor, enjoys a special relationship with BiH in that bus and truck movements between these two countries are market driven and not subject to permit procedures. This is a commendable development. At present, diplomatic relations does not exist with BiH’s eastern neighbor, Yugoslavia. Nevertheless, considerable informal cross-border passenger and cargo flow takes place. It is anticipated that in the foreseeable future diplomatic relationships will once again be established. The Study Team urges that, from an economic activity point of view, bus and truck activity should follow similar procedures as those established with Croatia, that is, be market driven and not subject to permit procedures.

CHAPTER 3: RAILWAYS

3.1 INTRODUCTION

The railway system in BiH has not been functionally recovered yet from the critical war damages in terms of its infrastructures, facilities/equipment, and operational systems. Since the Dayton agreement in December 1995, the peace has been maintained and the reconstruction and rehabilitation works in the transport sector started over the entire country, however, the railway system has been left unable to meet the demands for passenger and freight transportation. As an essential transport mode incorporated into the entire intermodal transport system, the railway transport should be first rehabilitated and re-functionalized, then innovated in such a manner that the railway can be sustainably operated at a commercial basis, as a part of the European railway network. Tremendous efforts need to be made to this end.

The railway development plan should be prepared to assure more efficient and effective transport services for each Entity, between Entities and among the countries and her European neighbors. The transport strategies embedded in the master plan must concurrently contribute to the recovery of economy of BiH, strengthen trade relations with neighbors and other areas of Europe, and provide a base for market-oriented transport activity. Based on the above recognition, the key objectives are addressed as follows:

- To identify an urgent recovery plan of the railways in BiH; and
- To formulate a railway development plan in a phased manner towards the target year 2020 in Bosnia and Herzegovina.

The database of the railways in BiH also needs to be built to facilitate rational planning discussions. The railway transport plan was formulated with the following basic planning views:

- The railway plan should contribute to recover an efficient economic structure of BiH, thereby strengthening economic relations with customers in and around BiH.

- Development and strengthening of transport network linkages with EU countries will be fundamental, because BiH will be, in the long run, integrated with the international as well as the European economy

- The railway operation system shall be restructured in the medium-term to be competitive in the market-oriented economy.

- Viewing the longer-term beyond the target year 2020, the railway activities and its traffic demands are influenced more greatly by the European economy. At the same time, the operational system of the railways shall be further technically modernized so as to meet the European standards and norms.

Meanwhile, the international donor organizations are now contributing to reconstruction efforts in BiH. Currently, a number of projects are being implemented under the Emergency Transport Reconstruction Program. Continuity, consistency, and coherence with these committed and/or on-going projects should be kept in the railway plan.

Moreover, the existing plans proposed by both Entities and by Railway Public Corporation (BHZJK) shall be taken into account by the Study Team to establish the railway plan for BiH through facilitating constructive discussions with the concerned organizations.

3.2 CURRENT SITUATION OF THE RAILWAYS IN BIH

3.2.1 Historical Background

The railways in BiH have a long history of operation, and had functioned as the most significant transportation mode to support the country's industrial activities, by providing stable and economical transport services for both freight and passenger transport.

The first railway line in Bosnia and Herzegovina was developed in the Dobrljin - Banja Luka section and started operation on December 1, 1872. This is the birthday of Bosnia and Herzegovina Railways (ZBH). Seven years later, on February 12, 1897, the lines Bos. Brod - Zenica was set into operation with the first narrow gauge railway line under the Austro - Hungarian rule.

During the period of 1879-1918, narrow gauge lines were intensively constructed to be a total of 1,611 km long. After 1946, the narrow gauge lines were gradually replaced by the standard gauge rails, and during the period of 1946-1978, intensive construction of standard gauge lines were undertaken with termination of narrow gauge lines. A total of 855 km standard gauge lines, including 87 km double truck line, were developed, while all narrow gauge lines were closed down. In 1985, the railway transport record presented that the railway carried 19.1 million passengers and 32.1 million tons of goods.

Until April 1992, the Railways in BiH operated under the Yugoslav Railways Association as the Railway Transportation Enterprise Sarajevo. After June 1992 , leaving the Yugoslav Railways Association, ZBH, the Bosnia and Herzegovina Railways, became to be an independent railway administration, accepted in International Union of Railways (UIC) membership, Paris code 89, on June 6, 1992. Austrian Railways (OBB) were authorized to act on behalf of ZBH in all UIC bodies during the war.

In 1995, the Law on financing railway infrastructures and sub-financing of passenger railway transport was promulgated. The State took responsibility for railway infrastructure expenses, in accordance with EU Council instruction, 91/440 EWG. The year 1995 was the 123rd anniversary of ZBH

The epoch-making change took place in April 1998. Based on the DAYTON agreement and the endorsed agreement between Federation of Bosnia and Herzegovina and Republic of Srpska, the Bosnia and Herzegovina Public Railway Corporation (PRC) was established as a part of the BiH Public Corporation. Then, the PRC confirmed a promise of greater engagement of the international community in the revitalization process.

The history of the railway construction is tabulated as shown in Table 3.1. It can be said that the major parts of the railways in BiH were developed in relatively recent years and the facilities are to some extent modernized.

Table 3.1 History of Line Construction of the Railways in BiH

History of line construction

Number	Line No.	Section	Section km	Line section	Line section km	Year of construction
1	11	Sarajevo Caplina	170.390	-		1966
2	12	Sarajevo - Bos. Samac	236.154	Sarajevo - Podlugovi	23.154	1968-1969
				Podlugovi - Zenica	54.200	1986-1989
				Zenica - Doboj	95.200	1963-1966
				Jelina - Doboj ii koj.	87.200	1978
				Doboj - Grapska	5.800	1967
				Grapska - B. Samac(Gr. RBiH)	57.800	1970-1971
3	12.1	Sarajevo - Rajlovac T.	5.579	-	-	1966
4	12.2	Rajlovac T. - Rasp. Ljesevo	3.162	-	-	1966
5	12.3	Podlgovi - Droskovac	23.524	-	-	1980
6	12.4	Rasp. Polje - Rasp. Ljesevo	2.441	-	-	1957
7	12.5	Zenica P. - Zenica Zelj. - Jelina	6.770	-	-	1954
8	12.6	Modrica - Gradacac	14.630	-	-	1951
9	13	Doboj - Tuzla	57.369	Doboj - Lukavac	43.369	1982-1985
				Lukavac - Tuzla	14.000	1989
10	13.1	Rasp. Spreca - Doboj Pred.	0.760	-		
11	14	Banovici - Brcko (Gr. RBiH)	90.226	Banovici - km 136+700	4.300	1975
				Izmjestanje pruge	3.700	1987
				Km 133+000 - Bos. Poljana	14.700	1967, 1975
				Bos. Poljana - Srebrenik	28.300	1978-1985
				Srebrenik - Brcko (Gr. RBiH)	39.226	1963-1965
12	14.1	Sicki Brod odv. - Blok 3 ogr,	0.531	-	-	1981
13	15	Zvinice - Zvornik (Gr. RBiH)	45.676	-	-	1992
14	16	Doboj - Bosnski Novi	179.631	Doboj - Josavka	70.100	1975-1976
				Josavka - Banja Luka	24.100	1972-1974
				Banja Luka - Bosanski Novi	85.100	1977-1982
15	16.1	Omarska - Tomasica	10.532			1987
16	16.2	Brezicani - Ljbija Rudnik	15.063			1948
17	16.3	Krcevine odv. - Zajednica odv.	0.564			1956
18	16.4	Bos. Novi - Most na Sani	1.695			1960
19	17	Sunja - (Gr. RBiH) - Bos. Novi - (Gr. RBiH) Knin	137.178	Dobljin - Bos. Novi	19.600	1988
				Bos. Novi - Most na Uni	29.900	1966-1968
				Most na Uni - Cazin Srbljani	25.200	1985-1986
				Cazin Srbljani - Ripac	18.300	1962
				Ripac - L D. Polje	42.506	1987
				L. D. Polje - Golubic(174.412)	1.674	1986-1987
20	18	Bos. Brod (Gr. RBiH) - SL. Brod	1.536	-	-	-
21	19	Bileljina - (Gr. RBiH) S. Raca	18.099	-	-	-
22	20	Beograd - Bar Jablanica (Gr. RBiH) - Strbci - (Gr. RBiH) Priboj	10.288	-	-	-
		Total	1,031.798			

3.2.2 Organization and Infrastructures

(1) Organizational Structure

In April 1998, based on the Dayton Agreement, Annex 9, both Entities of Federation of Bosnia and Herzegovina and Republic of Srpska were agreed to establish the Railway Public Corporation (BHZJK) as a part of the Transport Corporation. BHZJK's headquarters is located in Sarajevo. The Board of Management and the Board of Directors have been formed, and for the time being, undertaking for registration on the Corporation and making conditions for the beginning of the Corporation performance.

The Railways in BiH comprise the Bosnia and Herzegovina Railways (ZSH) and the Republika Srpska Railways (ZRS). Both ZBH and ZRS jointly operate the passengers and freight trains. The Board of Management of BHZJK consists of representatives from ZBH and ZRS. The decisions of the Board are made unanimously. BHZJK shall take responsibility for coordination of railway operation, planning, and etc.

(2) Railway Facility Outlines

Immediately before the war, in April 1992, the Railways in BiH ran the transport services with the following facilities according to the BHZJK:

1) Railway Network:

- A total of 1,031 km railway lines, out of which:
  - 87 km double track lines;
  - 776 km electrified railway lines; and
  - 383 km of track with modern controlled system (tele-command).
- Direct connection with the Port of Ploce at the Adriatic Sea and the Sava River ports of Samac and Brcko, as well as Metkovic in the Neretva River
- 174 tunnels; 399 bridges; and 231 official places (stations, stops, freight forwarding stations)

2) Depots and Workshops:

- Workshops for railway cars, locomotives, rail mechanization and vehicle repair;
  - 4 modern marshaling yards
  - 8 depots for locomotives
  - 6 workshops for maintenance of passenger and freight cars
  - 1 workshop for maintenance of construction and electric engineering mechanization

- Specialized departments for maintenance, track renewal and electric traction facilities with railway machinery, including:

- Motor trolleys	80
- Track and switch tamping machines	11
- Ballast clearing machines	4
- The ballast regulator machine	5
- Track and OCL measuring car	1
- The rail-way crane (EDK 750, EDK 500)	4
- The rail welder	1

3) Related Maintenance Works and Services:

- Road Machinery, including:

- Snow clearing machine	3
- Civil engineering machine	42
- Containers and cars (for residence, workshop)	120

- Material production capacities such as ballast, track accessories, etc;
- Educational institutions, health and recreational facilities of the workers;
- Service and Passenger Cars such as:

- Trucks	52
- Buses	54
- Service cars	194

The BiH railway network with a total of 1,031 km long is connected with the strategically important seaport of Ploce and the river ports of Samac and Brcko along Sava River, thereby providing the north-south trunk railway corridor linked with the Mediterranean Europe and the Southeast Europe along the Danube River. This corridor is recognized as “Corridor Vc.” Another East-West railway trunk corridor parallel to Corridor X provides transport linkages with the Croatia and Yugoslavia.

Thus, the most important trunk lines, as shown in Figure 3.1, 3.2 and Table 3.2, are:

- Corridor Vc: Samac – Doboj – Sarajevo – Mostar – Capljina - Ploce (the Port Ploce at the Adriatic Sea in the Republic of Croatia);

- The line parallel to Corridor X; the transversal railway line Zvornik – Tuzla – Doboj – Banja Luka – Novi Grad Bos. Novi – the Republic of Croatia;

- Banovici – Tuzla – Brcko; and

- Dobrljin – Novi Grad, Bos. Novi – Bihac – Martin Brod – Knin, the Republic of Croatia North South direction.

The route of the lines is predominantly hilly, with 174 tunnels (the total length of 50.5 km), 399 bridges (the total length of 15.3 km), and many sharp curves and steep gradients.

The railway line Samac-Sarajevo-Mostar-Ploce was equipped with the up to date signaling and telecommunication devices. The traffic and electric traction facilities have been operated from the remote control centers in Sarajevo and Doboj. The electric traction facilities on Doboj-Banja Luka- Novi and Novi-Bihac-Martin Brod have, also, been operated by the remote control system.

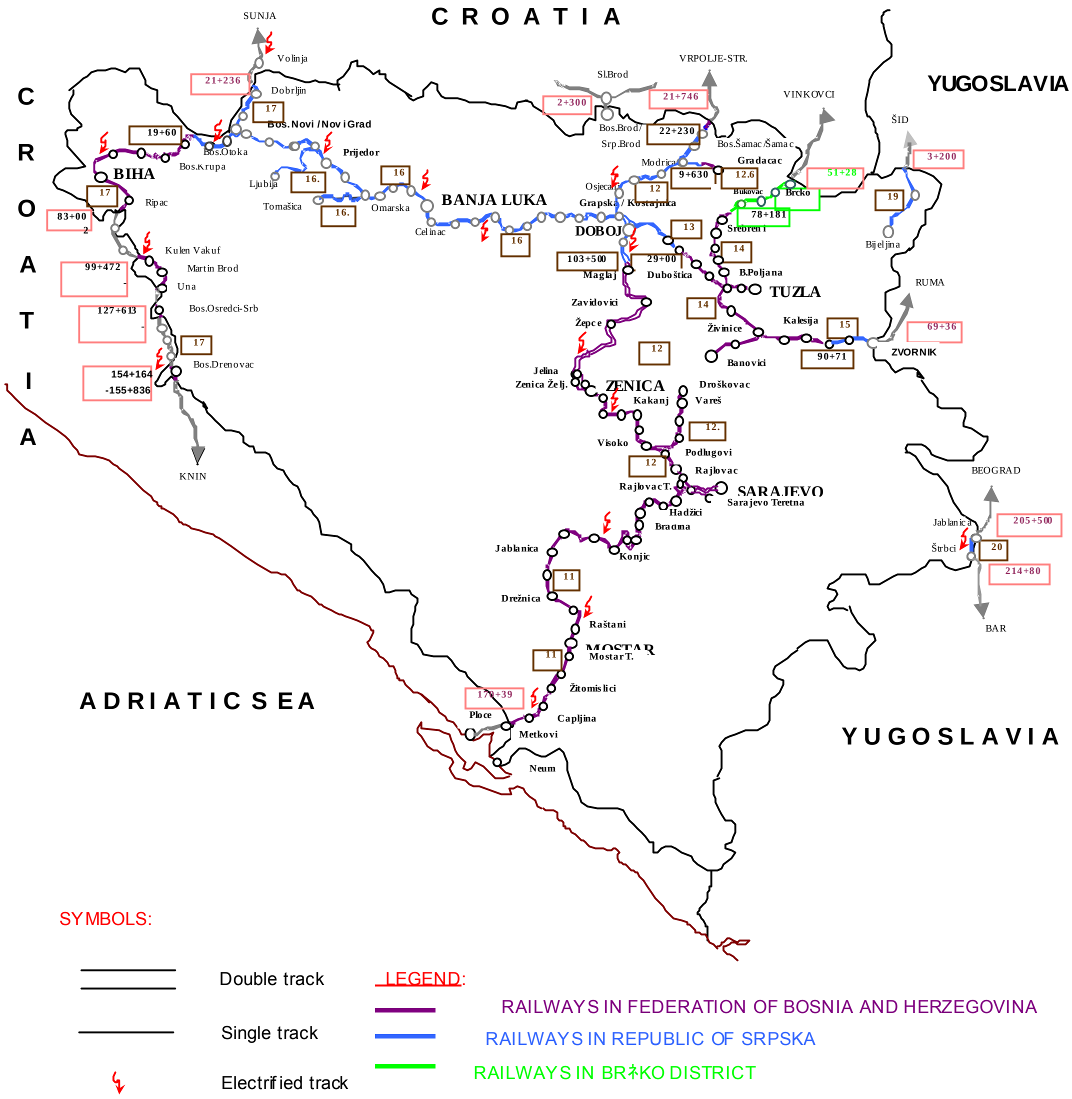


Figure 3.1 Railway Lines of BiH

Table 3.2 Bosnia and Herzegovina Railway Network (1.01.1999)

No.	No. of line	Title of a line	km
1	11	Sarajevo Capljina (Granica R BiH / B&H border)	170.390
2	12	Sarajevo Bosanski Samac (Granica R BiH / B&H border)	236.154
3	12.1	Sarajevo Teretna - Rajlovac Teretna	5.579
4	12.2	Rajlovac Putna-Rasp. Miljacka	3.162
5	12.3	Podlugovi-Droskovac	23.524
6	12.4	Rasp Polje - Rasp. Ljesevo	2.441
7	12.5	Zenica Putna-Zenica Zeljezara-Jelina	6.770
8	12.6	Modrica-Gradacac	14.630
9	13	Doboj-Tuzla	57.369
10	13.1	Rasp.Spreca-Doboj Predg.	0.760
11	14	Banovici-Brcko (Granica R BiH / B&H border)	90.226
12	14.1	Sicki Brod Odv.-Blok 3 Ogr.	0.531
13	15	Zivinice-Zvornik (Granica R BiH / B&H border)	45.676
14	16	Doboj-Bos Novi	179.631
15	16.1	Omarska-Tomasica	10.532
16	16.2	Brezicani-Ljubija Rudnik	15.063
17	16.3	Krcevine Odv-Zajednica Odv.	0.564
18	16.4	Bos, Novi Ter - Most Na Sani	1.695
19	17	Sunja (Gr. BiH border)	137.178
20	18	Bos. Brod (Granica R BiH / B&H border) - Slavonski Bro	1.536
21	19	Bijeljna - (Granica R BiH / B&H border) S. Raca	18.099
22	20	Beograd - Bar Jablanica (Gr. R BiH / B&H border) Strbci Gr. R BiH/ B&H border Priboj	10.288
		Total Length	**1,031.798**

Note: Marked by [green box] / Electrified line

Figure 3.2 Railways in BiH in the Pan-European Railway Network

(3) Economic Activities along Railway Corridors

Under the planned economy, the railway had historically been functioning as a predominant transport mode to support the heavy industries as well as the mining and quarry industry. These activities are mostly located along the railway corridors, as illustrated on Figures 3.3 and 3.4. These industrial activities, eventually, encouraged urbanization process in major urban centers along the railway corridors. It is estimated that more than 70% of the total human settlements are located along the railway corridors. Thus, the BiH railway network structures the backbone of the BiH economy.

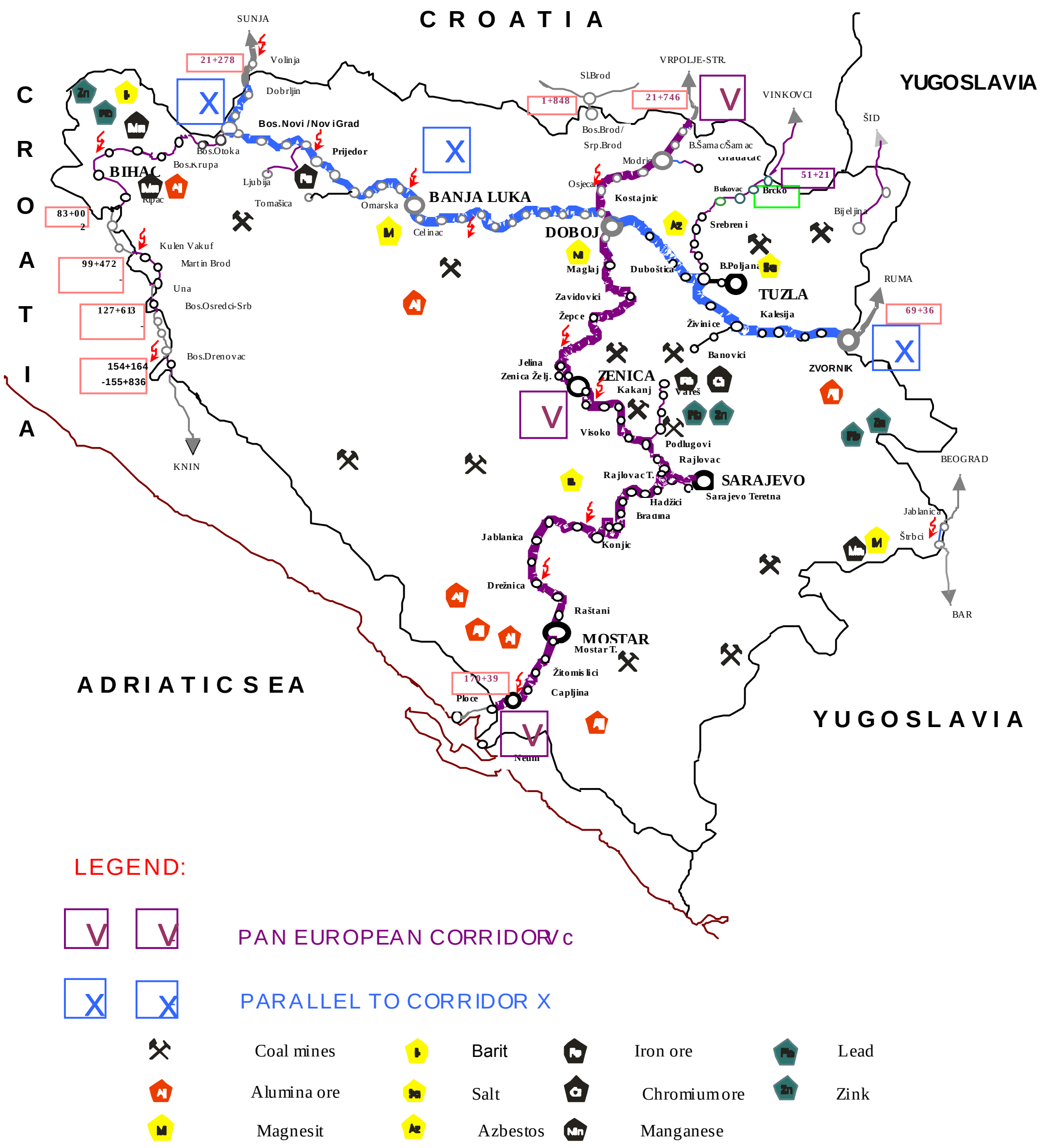


Figure 3.3 Natural Resources along Railway Lines

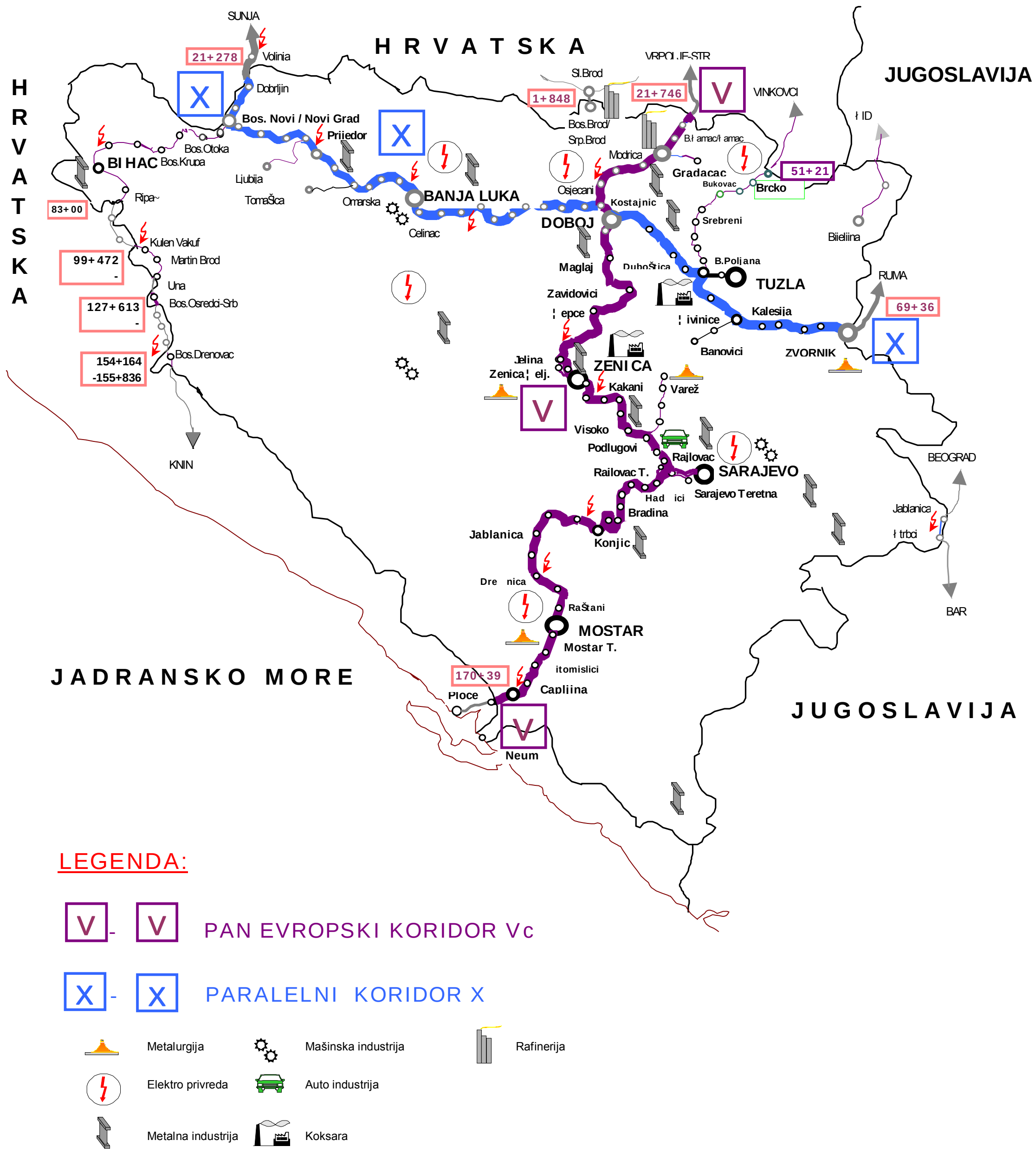


Figure 3.4 Railways and Industries in BiH

3.2.3 War Damages on the Railway System

(1) General Overview

Since the end of the former Yugoslavia era, the railway system had been deteriorated due to lacks of investment for the procurement, renewal, and maintenance. During the war period of 1992 – 1995, most of the important bridges were destroyed, the railways tracks were mined, railway building were demolished, and the greater part of rolling stocks were either destroyed or severely damaged. Essential facilities and equipment such as workshops, tools and machines, electric traction facilities, signaling devices and telecommunication system, traffic remote control, permanent way and overhead contact line and other specific equipment were heavily damaged. Transport links leading to or near confrontation lines suffered from the most extensive damage. Most railway lines were rendered inoperable, public transport facilities and vehicles were damaged or run down. Transport institutions lost premises, records, staff, and funds and, in many instances, were disjointed.

A total of 14 bridges have been destroyed, of which the most important are those over the Sava River near Brcko, Bosanski Samac, and Bosanski Brod. This caused the cut-off of connection with BiH and Croatian Railways and the "exit" of the BiH to the Western Europe. Likewise, the bridges over Neretva River near Mostar were disabled the connection with the Port Ploce at the Adriatic Sea and the exit to the South.

Besides the bridges, another greatest damages were on business buildings such as railway station buildings, storehouses, management buildings, workshops, and the other building. A total of 311 facilities have been completely destroyed or damaged.

According to the information from BHZJK, the aggregated value of direct damages by the war is estimated at US$1,000 million with the following breakdown.

- On civil engineering related:	US$41.94 Mill.
- On electric engineering related:	US$45.07 Mill.
- On mobile facilities related:	US$767.37 Mil.
- Others including workshop and equipment, spare parts materials, specific equipment, etc.:	US$145.62 Mill.
Total:	US$ 1,000 Mill.

Out of the damages of mobile facilities, those of wagons (US$395 Mill.) and locomotives (US$98 Mill) are included. These seem to be particularly large.

Since the end of hostilities, transport improvement programs have focused on the immediate alleviation of physical war damages and the reactivation of basic transport services and facilities. To this end, significant improvements to transport infrastructure have been achieved, mainly within the framework of the Emergency Transport Reconstruction Program[1] with supports provided by the EBRD, the World Bank, the European Union, and other bilateral donor institutions.

[1] Refer Bosnia and Herzegovina Emergency Transport Reconstruction Program, authored by the World Bank, March 1996; Bosnia and Herzegovina Second Emergency Transport Reconstruction Program, authored by the World Bank, August, 1997,
Priority rehabilitation projects of the railways in Bosnia and Herzegovina on Pan European Corridor Vth and Xth, published by BiH Railway Public Corporation, January 1999 and Bosnia and Herzegovina Emergency Transport Reconstruction Program – Roads, Bridges, Railways and Civil Aviation, by International Management Group, October 1999.

(2) Operation Performance before and after the War

Looking into the train operation diagrams of “Corridor Vc” and ”the line paralell to Coridor X” before and after the war, as shown in Figures 3.5 and 3.6, it is identified that the train operation peroformance befor the war had been at the maxium level in both corridors, and that the track capacity had come up to its limit with less flexibility for aditional train operation. The train diagrams shows that the track utilization was perfectly well and the operation management was well conducted with good traffic. Compared to such past busy performance, the current one is generally poor.

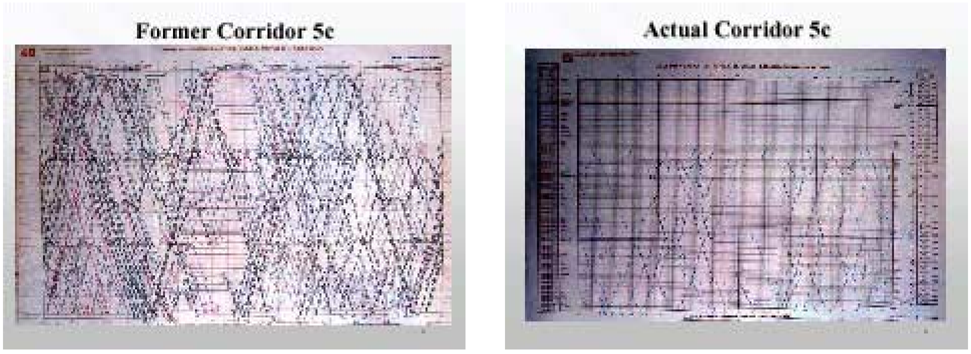


Figure 3.5 Train Diagram of Corridor Vc before and after the War

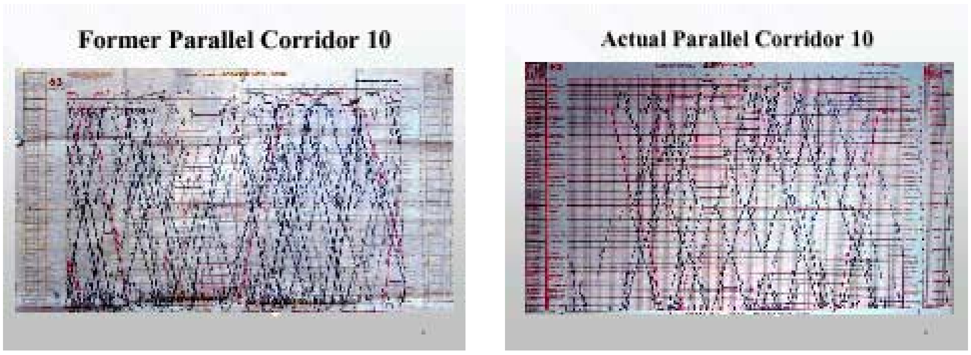


Figure 3.6 Train Diagram of the Line Parallel to Corridor X before and after the War

(3) Damages on Physical Facilities

1) Discontinuity of the Railway Track

As described in the preceding section, the railway continuity was broken by 14 destroyed bridges. Out of them, the most important are those over the Sava River near Brcko, Bosanski Samac, and Bosanski Brod. Due to this, the railways in BiH have lost an international railway connection with the other markets in Europe.

2) Catenary System

By the war activities, about 190 km of the overhead contact line has been completely destroyed or severely damaged, as well as external signaling and telecommunication devices, centers for traffic remote control and electric traction facilities, the electric sectioning posts, and the traction substations.

Urgent recovery is required strongly for the section between Doboj and Maglaj stations. The catenary system of some sections near Samac Bridge is also destroyed. In 2 years future, this section shall be repaired prior to the reconstruction of Samac Bridge.

3) Workshops

As mentioned before, the mobile facilities of the railway, wagons, locomotives, reloading mechanization, as well as the permanent way and overhead contact line maintenance machines were deployed along the railways lines. The damages on these facilities are also extremely large. Almost entire permanent way and overhead contact line maintenance and renewal machines have been destroyed, including 16 specialized machines for the permanent way maintenance, 40 motor dollies for the track and overhead contact line maintenance work, electronic measuring car for the track and overhead contact line geometry control etc. Over 100 trucks and special vehicles for container manipulation have been destroyed or deprived.

4) Infrastructure

Infrastructure of the railway lines before the war complied with the highest UIC category D-4 on 87% of railway lines. 75% of the lines were electrified and equipped with Sub-station facilities and Overhead Catenary system to feed traction power under AC 25kV /50Hz. The permanent way consists of S 49 (49Kg/m) rails, mostly with wooden and concrete sleepers with "K", SKL-2/D/I PANDROUE/fastenings.

Except for the part of side railway lines, the rails and the switches have been continuously welded (CWR). The railway lines were maintained with modern permanent way machines and the geometry of the tracks and overhead contact line was controlled by the own electronic measuring car.

(4) Rolling Stocks

Rolling stocks received heavy damages during the war. Most of locomotive fleets and wagon fleets have been disabled in use, although some are operable. Substantial parts of the wagon fleet have not been fixed up to date.

Numbers of rolling stocks by type and other vehicles owned by RBiH in 1991 are shown in Table 3.3, and the current situation, as of December 1998, is shown in Table 3.4, which represents an overview of operationable locomotive and wagon fleets.

Percentages of actual operable car numbers as of 1998 against the 1991 level are demonstrated in Figure 3.7. As seen in this figure, the lowest percentage appears in Electric train-sets and freight wagons. It should be noted that the number of recovered cars does not necessarily represent the corresponding recovery level of the actual situation, because in order to make the cars safely and practically operable, the wheel tread figure condition and the catenary connection need to be improved at the same time.

Table 3.3 Total Number of Rolling Stock of RBiH (State on December 31st 1991)

Type	Unit	Subtotal	Total
Passenger fleet			407
Railway vehicle		406	
Electric train-sets	24		
Rail buses	8		
Four-axle cars	175		
Two-axle cars	155		
Sleeping cars	14		
Other cars restaurant, "couchette"	30		
Road vehicles		1	
Buses	1		
Freight fleet			9,730
Railway vehicles		9,406	
Wagons	9,406		
Road vehicles		324	
Trucks	115		
Connected vehicles	34		
Container terminal tractors	87		
Trailers	88		
Motive fieet			174
Locomotives		138	
Electric locomotives	87		
Diesel-electric locomotives (serial 661)	40		
Diesel-electric locomotives (serial 642)	11		
Shunting locomotives		36	
Diesel-electric locomotives (serial 643)	4		
Diesel-h draulic locomotives (serial 733)	32		

Source: BHZJK

Table 3.4 Total Number of Rolling Stocks of RBiH (State in December 1998)

No .	Type	Railways		
		RBiH	ZBH	ZRS
1	Electric locomotive serial 441	49	24	25
2	Diesel-locomotive	24	4	20
3	Electric train-sets	3	3	
4	Passenger two-axle cars	53	43	10
5	Passenger four-axle cars	144	94	50
6	Freight wagons	764	364	400

Source: BHZJK

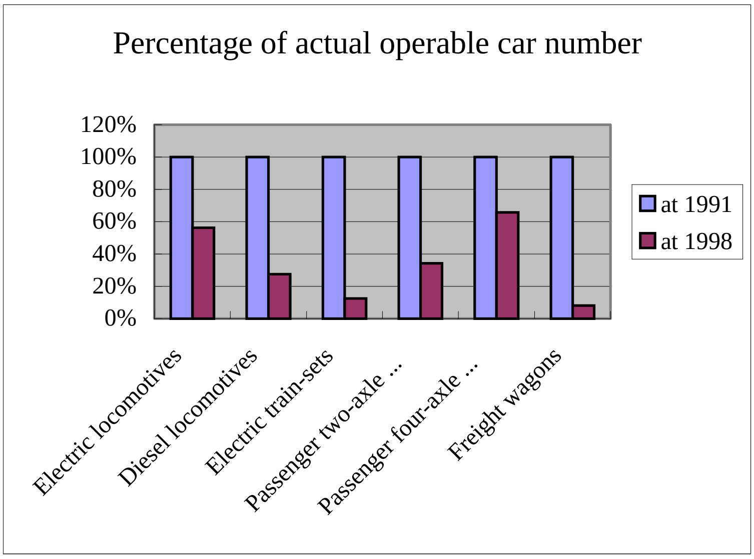


Figure 3.7 Percentage of Actual Operable Cars against the Former Level

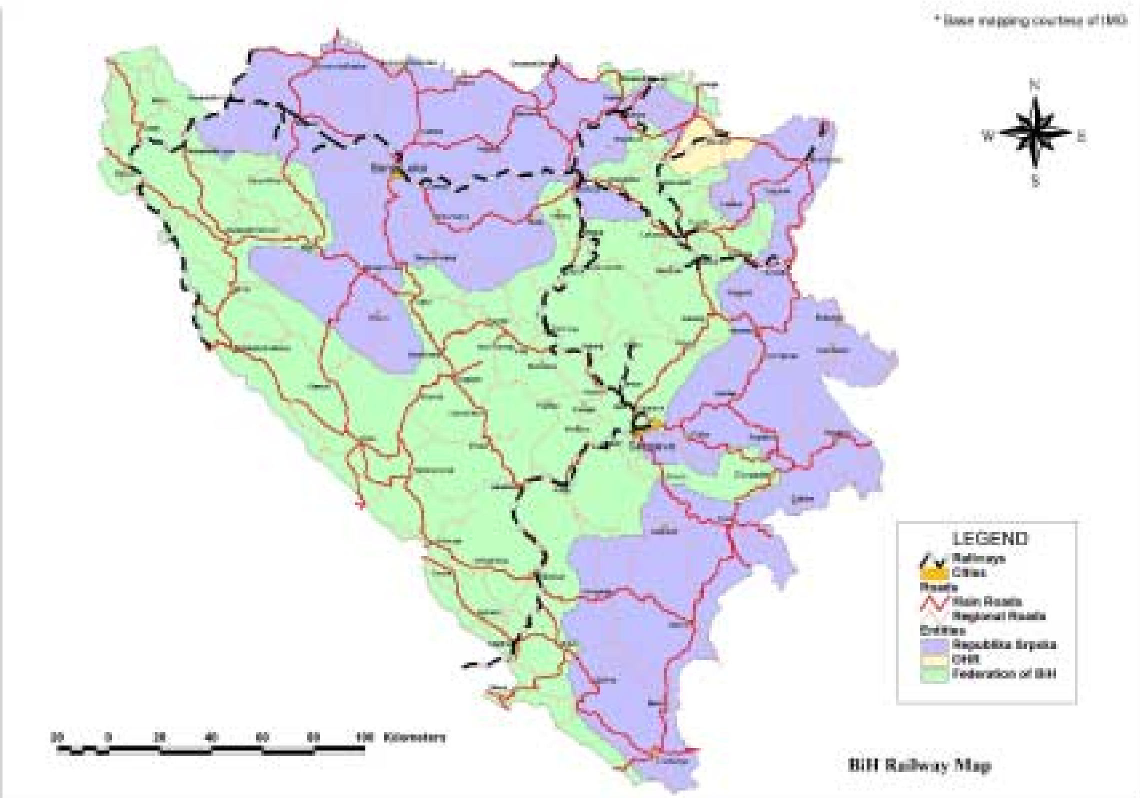


Figure 3.8 Railways and Major Road Network in BiH

3.3 OPERATION PERFORMANCE OF THE RAILWAYS IN BIH

3.3.1 Transport Volumes

Usage of railway transportation before the war was remarkably predominant, compared to other countries, because mining resources, material resource-based heavy industries, population are concentrated along the railway lines. However, due to the heavily damaged system by the war and the stagnant economy, railway transportation of both passengers and freights in 1998 had sharply fallen down, compared to those before the war in 1990, as shown in Figure 3.9 and Table 3.5.

Figure 3.9 Transition of traffic volume in BiH

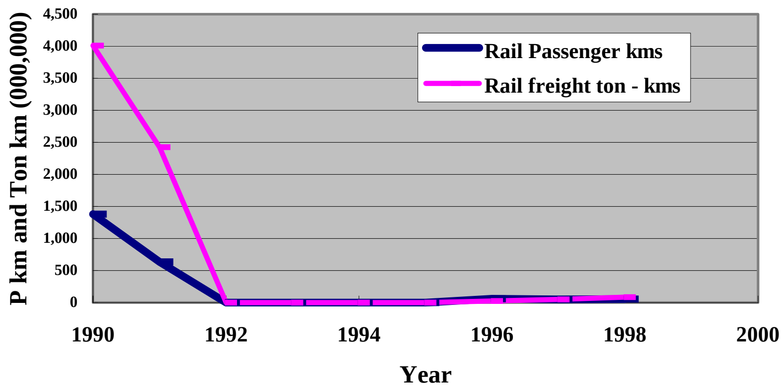


Table 3.5 Railway Operation in Past and Actual

Transportation volume of Railways in BiH in (000)

	1990	1991	1992	1993	1994	1995	1996	1997	1998
Rail Passenger kms	1,382,000	637,000	0	0	0	0	61,189	49,529	55,894
Rail ton - kms	4,009,000	2,424,000	0	0	0	0	24,827	49,871	86,781

Note: Statistical yearbook 1993-1998
RPC
During 1992-1995, traffic data are not existing and are admitted negligible small.

Source: Statistical Yearbook of Bosnia and Herzegovina 1992

As seen in the above figure, the transport volumes of the railway drastically decreased in 1991 and reached negligible small in 1992. In terms of passenger-km, as seen in the table, the railways transported about 1,382 million in 1990, while the amount in 1998 accounted for about 55.9 million, which is equivalent to 4% of that in 1990. On the other hand, in terms of freight ton-km, the railways transported about 4,009 million ton-km, compared to about 86.8 million ton-km in 1998. The 1998 transport level was only 2%of that before the war.

3.3.2 Characteristics of the BiH Railway Transport

It is generally seen in the railway transport in other countries that given a railway traffic density is high, the railway can demonstrate efficiency advantages in terms of transport cost. However the railways in BiH are 1,031 km long. This means that in order to operate the railways in BiH with more efficient cost-benefit performance, an integrated operation with the network of neighboring and European railways will be needed, thereby contributing to the improvement of the railway management.

Looking into the average transport length of the railways in BiH, as shown in Figure 3.10, even before the war, the average travel distance of freight was more or less 150 km, while that of passenger, more or less 100 km. These figures seem so low that the railway can compete with the road transport modes such as truck and bus, in terms of cost, frequency, accessibility, etc.

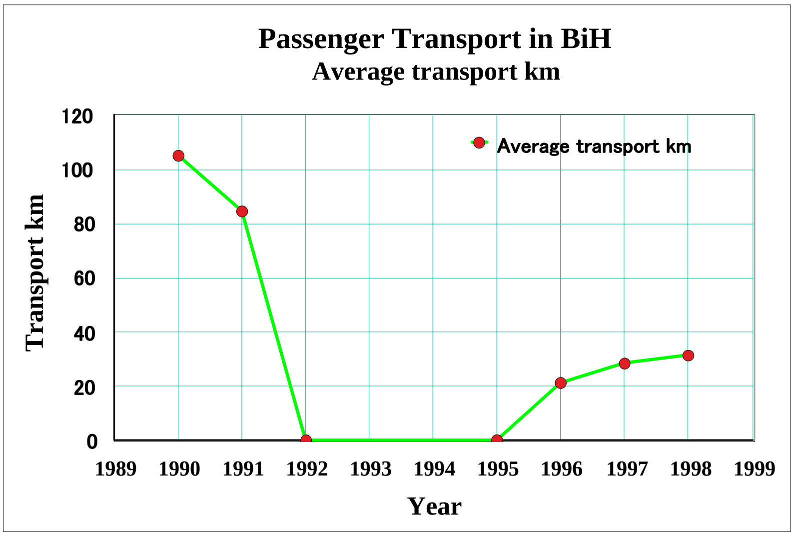


Figure 3.10: Average Transport Travel Length (km) of the Railways in BiH

3.3.3 A Comparison of the Railway in BiH with European Railways

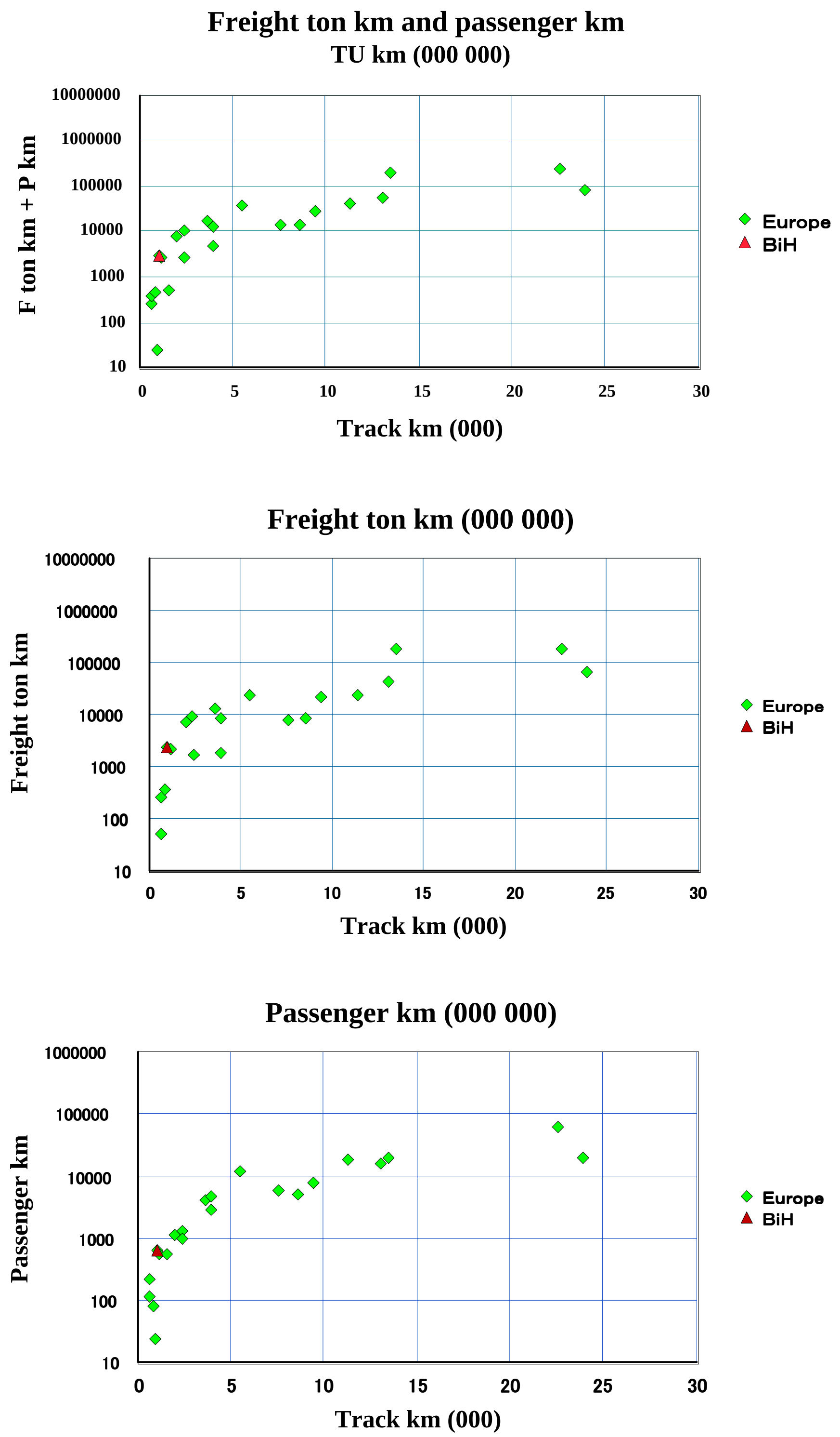
A comarative analysis was made to identify ralative characteristics of the railways in BiH, as of the 1991 before the war, among the other European railways. Since the current operation is not significant, the date of the railways in BiH is quated from the 1991 data.

1) Interrelation between Passenger and Freigh Traffic:

It is generally identified in European railway transport that a relation between freight ton-km and passenger-km is very significant with R^2 of 0.982 under 22 data samples. This means that passenger transport will be increased when freight transport increases. The railways in BiH is characterized as a freight-based transport mode rather than a passenger service-oriented transportation. It is noted that form the railway management point of view, freight transport will be a leading roll of the BiH railway transport, but still passenger transport will possibly increase after the railway recovery.

2) Transport Amount vs. Route Track Length

An unique curve can be depicted in the ralation between the railaway tansport amouns in terms of freight-km and passenger-km, and the route tack length (km). Naturally, the longer the route distnace is, the more the tranport amounts become. However, this relation is not straightforword, as shown in Figure 3.11. In a range up to 2,000~3,000 km of the route distance, the transport amounts of both freights and passengers are very elastic, or a steep curve. While, over the 3,000 km, the transport amounts are not sensitively changed or a flat curve. This implies an important note that the railway transport should be operated with a reasonably longer distance operation in an integrated manner to explore a stable transport demand. This isthe reason why the Study Team recommends an integrated operation which includes not only ZBH and ZRS, but also neighboring countries.



Data source: Railway gazette international based on the WB record.

Figure 3.11 Railway Transportation and Route Km in Europe and in BiH

3.4 RAILWAY TRANSPORT DEMAND FORECAST

3.4.1 Overview of Railway Transport

(1) Railway Transport

Table 3.6 and Figure 3.12 show railway transport volume changes since 1990. Data during the war is missing.

As shown in the figure, the war gave a deathblow to the railway traffic volume. However, it should be noted that the volume dropped drastically in 1991, when Slovenia, Croatia, and Macedonia declared independence from the former Yugoslavia.

In 1990, railway freight transport volume in terms of ton-km was 4,009 million. It means that the average daily railway freight transport density per kilometer was more than 10,000 ton. This transport density was extraordinary high, because more than ten freight trains with 1,000-ton capacity were operated every day in the network on average to cope with the density. With regard to passenger transport, the average daily number of passengers per km was 3,700. This figure was considered relatively small.

Average transport length was 152 km for freight and 104 km for passenger. It can be said that the railway was used for long distance transport means both for passenger and freight transport.

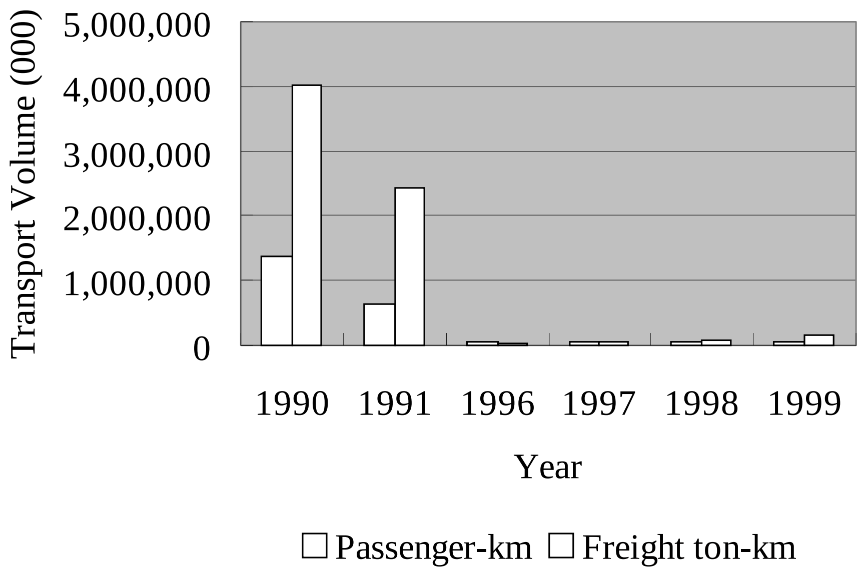


Figure 3.12 Railway Transport Volume Changes

In 1991, transport volume dropped to a half against the previous year both in passenger and freight. Average transport lengths were dropped as well to 140 km and 84 km in freight and passenger transport, respectively.

Table 3.6 Railway Transport Volumes

	1990	1991	1996	1997	1998	1999
Passenger Transport						
Number, 1000	13,171	7,527	2,878	1,476	1,751	1,481
Pax-km, 1000	1,382,000	637,000	61,189	41,873	56,616	51,104
Freight Transport						
Tons, 1000	26,253	17,307	2,521	1,905	2,870	3,247
Ton-km, 1000	4,009,000	2,424,000	24,827	48,539	85,291	146,054

Source: Federal Institute of Statistics, Institute of Statistic of Republika Srpska

After the war, the railway freight transport volume in terms of ton-km dropped to 24.8 million, which was less than 1 % of the pre-war (1990) level. Freight tons transported in 1996 was dropped to less than 10 % compared to the volume in 1990. Average transport length was also decreased to 9.8 km, which was unbelievably short for railway freight transport.

As to the passenger transport, number of passengers was decreased to 2.9 million in 1996, which was less than one fifth compared to the 1990 level. The passenger-km was decreased to less than 5 %. The average travel length of the passengers was also decreased to 21 km.

According to the latest railway transport statistics in 1999, railway passenger transport was reduced to 1.5 million in number and 51.1 million in passenger-km, which are almost a half and 15 % decrease compared to even the 1996 level, respectively.

The freight transport has been increasing since 1996 in both tons and ton-km. In 1999, freight tons and ton-km transported by the railway was 3.2 million and 146 million, which were about 30 % and about 6 times bigger compared to the 1996 level. However, the freight transport volumes were 13 % and 3 % compared to the 1990 level in terms of tons and ton-km, respectively. The average transport length was 45 km in 1999, which is considered very short as railway transport.

With regard to commodity types of railway transport, Table 3.7 shows a summary. The table was obtained by aggregating detailed statistics of Sarajevo Railway Transport Organization in 1989 by former Yugoslavia Railway. The study team could not obtain this kind of information on after the war from railway companies in BiH. The commodity groups are adjusted as same as the road freight transport survey category, which were adopted by the roadside interview survey on trucks, so as to be able to compare difference between them.

According to the table, “Solid Mineral Fuels” was the biggest category of railway freight transport, followed by “Ore, Sand, Metal Waste” and “Metal Products”, which shared around 40%, 26.2% and 10.5% of total railway freight transport in terms of ton-km, respectively.

Table 3.7 Railway Freight Transport by Goods Category in 1989

Goods Category	Volume Tons	Volume Ton-km	Share by Category(%) Tons	Share by Category(%) Ton-km	Average Length(km)
1 Agricultural	499,058	92,748,983	1.7	2.0	185.8
2 Food stuffs	388,299	82,748,018	1.3	1.8	213.1
3 Solid Mineral Fuels	11,672,512	1,650,596,825	40.0	35.4	141.4
4 Petroleum Products	832,811	124,771,191	2.9	2.7	149.8
5 Ore Sand Metal Waste	6,993,491	1,218,856,809	24.0	26.2	174.3
6 Metal Products	2,608,955	488,923,384	8.9	10.5	187.4
7 Crude, Manufactured Minerals, Building Materials	562,818	76,852,249	1.9	1.6	136.5
8 Fertilizers	1,536,721	310,653,018	5.3	6.7	202.2
9 Cheminal Products	876,776	180,530,532	3.0	3.9	205.9
10 Machinery Transport Equipment, Manufactured Products, Others	3,221,326	432,139,160	11.0	9.3	134.1
Total	29,192,767	4,658,820,169	100.0	100.0	159.6

Note: The study team made the table based on a 1989 statistics of former Yugoslavia Railway.

Average transport distance was about 160km. This is certainly longer than the length in recent years. However, the average transport length of the railway was not long compared to other railways even before the war.

Regarding average transport distance by goods category, “Solid Mineral Fuels” were carried only 141.4 km. The average distance of “Ore, Sand, Metal Waste was 174.3 km, which was a bit longer than the average, though it is considered short as railway freight transport distance.

As a conclusion, the followings can be pointed out.

- The railway passenger transport was dropped extraordinary by the war and it has been decreasing even after the war. The average travel length of railway passenger was also very short.

- The railway freight transport was decreased drastically by the war, however, the transport volume has been increasing after the war. The average transport length has been increasing after the war, although the length is still very short as railway.

- Major cargoes by the railway before the war (1989) were “Solid Mineral Fuels,” “Ore, Sand, Metal Waste” and “Metal Products.”

(2) Comparison with Road Transport

Tables 3.8 and 3.9 show past passenger and freight transport by railway and by road. However, transport statistics have been made based on monthly reports of transport enterprises. Therefore, transport volume by private cars and private companies are not included in the statistics in the road transport sector statistics. Furthermore, when a company transported own goods or passengers by its own cars/trucks, it is not recorded.

Table 3.8 Railway and Road Passenger Transport

	1990	1991	1996	1997	1998	1999
Railway Transport						
Number, 1000	13,171	7,527	2,878	1,476	1,751	1,481
Pax-km, 1000	1,382,000	637,000	61,189	41,873	56,616	51,104
Road Transport						
Number, 1000			22,075	35,540	39,290	37,039
Pax-km, 1000			952,727	1,042,466	1,306,181	1,190,270
Railway Market Share						
Number (%)			11.5	4.0	4.3	3.8
Pax-km (%)			6.0	3.9	4.2	4.1
Road Market Share						
Number (%)			88.5	96.0	95.7	96.2
Pax-km (%)			94.0	96.1	95.8	95.9

Source: Federal Institute of Statistics, Institute of Statistic of Republika Srpska

Table 3.9 Railway and Road Freight Transport

	1990	1991	1996	1997	1998	1999
Railway Transport						
Number, 1000	26,253	17,307	2,521	1,905	2,870	3,247
ton-km, 1000	4,009,000	2,424,000	24,827	48,539	85,291	146,054
Road Transport						
Number, 1000			1,656	1,740	1,895	1,838
ton-km, 1000			216,741	323,151	392,744	363,788
Railway Market Share						
Number (%)			60.4	52.3	60.2	63.9
ton-km (%)			10.3	13.1	17.8	28.6
Road Market Share						
Number (%)			39.6	47.7	39.8	36.1
ton-km (%)			89.7	86.9	82.2	71.4

Source: Federal Institute of Statistics, Institute of Statistic of Republika Srpska

As shown in the above tables, railway shares against road become very big as a result.

According to the estimation by the study team based on the roadside interview and traffic count survey, passenger-km and ton-km by road were 8,922 million and 3,740 million in 2000. These estimates are 7.5 times and 10.3 times, in freight transport and passenger transport, compared to the official statistics. Analysis of modal shares in the past by mode would not give us any fruitful results.

Regarding goods category by road transport, it was mentioned already in Chapter 2: ROADS AND ROAD TRANSPORT. Major goods transported by trucks in 2000 were “Crude, manufactured Materials, Building Materials”, “Machinery, Transport Equipment, Manufactured Products and Others” and “Food Stuffs”. Transport shares in terms of total ton-km were 26.0%, 22.6% and 19.6% by rigid trucks and 31.6%, 17.8% and 15.9% by articulated trucks.

As road transport deals with almost freight transport in BiH currently, it is clear from this that mining and heavy industries has not been recovered yet in BiH, if one compares the composition of goods category of road transport with the railway before the war.

3.4.2 Railway Freight Transport Demand Forecast

(1) Basic Methodology

The railway transport facilities and rolling stocks were heavily damaged by the war. Only limited railway operation has been realized after the war. The transport volume by the railway is very small at present, because no normal railway transport service has been supplied.

Therefore, it was considered inappropriate to forecast future railway transport demand directly under this condition. Only a potential demand can be forecasted by assuming possible railway service recovery in future.

Accordingly, future freight transport demand for the railway was conducted in the following manner.

- Analysis on a relation between the past railway freight transport volume and the GDP of the industry and mining sector.
- By assuming an elasticity of railway freight transport demand against the sector GDP is 1.0 in terms of ton-km, future potential demand was forecasted.
- The railway service will be recovered to transport 40 % of potential transport demand in 2005, 70 % in 2010 and 100 % in 2020.
- The estimated future demand was verified referring to the past European experience in terms of railway modal share in the transport market.

(2) Railway Transport Demand Forecast

Table 3.10 and Figure 3.13 show the future railway freight transport demand forecast results.

In 2010, the railway freight transport demand will be 2,049 million ton-km, which is as about a half of the transport volume as in 1990. The demand will be 4,437 million ton-km in 2020, which is about 10 % bigger than the 1990 level.

Table 3.10 Railway Freight Transport Demand Forecast

	1990	2000	2005	2010	2020
GDP of Industry and Mining Sector (Million KM, 2000 price)	5,100	1,922	2,795	3,723	5,644
Railway Freight Transport Demand (Million ton-km)					
Potential Demand	4,009	1,511	2,197	2,927	4,437
Realization Ratio	-	-	40%	70%	100%
Possible Transport Demand	-	-	879	2,049	4,437

Note: GDP growth of the industry and mining sector was assumed as as same as the countries GDP until 2005. After 2005, growth rates of 5.9%, 4.4% and 4.1% was assumed to 2010, 2015 and 2020 respectively.

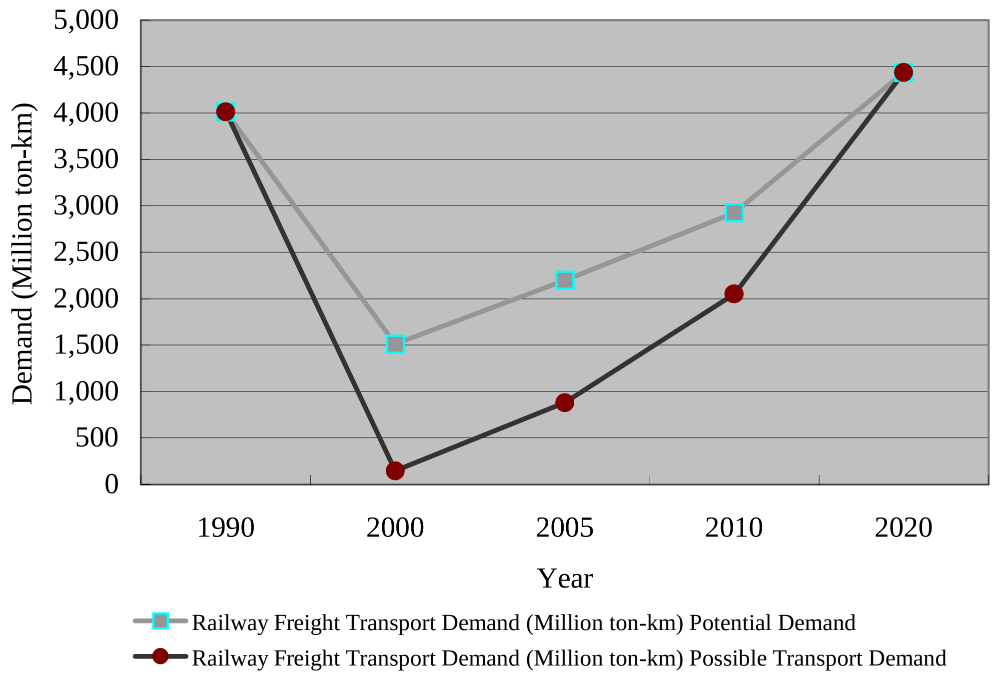


Figure 3.13 Future Railway Freight Transport Demand

Regarding future cargo types of railway freight transport, it is clear that future direction of economic development of BiH determines it. In this study, the future economic development direction is forecast that the development would not be a complete recovery of the before the war economy which was heavily dependent on mining and heavy industrial sectors. However, the study team believes that products of mining and heavy industries would recover in some extent, because BiH has assets for the production of them and demand to the products would exist for power plants, construction and so on in future as well.

Railway freight transport system has advantages for long-distance and bulky cargoes with relatively high transport speed against the other modes such as road and inland water transport. Air transport is not a direct competitor to railway, because the air transport market is so much different from railway.

According to the roadside interview results on cargoes by trucks conducted by this study, which was mentioned earlier, railway has a potential to transport more than a half of total cargoes transported by trucks. That is cargo types of “Crude, Manufactured Minerals, Building Materials”, “Solid Mineral Fuels”, “Ore, Sand, Metal Waste” and “Machinery, Transport Equipment, manufactured Products, Others”. A sum of shares of the above cargoes to the total amounts to 60.1% and 59.8% by rigid and articulated trucks, respectively.

In BiH, major cities and industrial areas are located along the north-south and east-west railway corridors. This is a great advantage for the railway in the transport market. The railway has a lot of potential customers currently and in future as well.

Even if the railway has such advantages in specific transport market, however, the railway of BiH should become to a modern railway to do its duty in future transport market in BiH. This modernization will include such fields as management, technology, sales promotion, and higher service for the customers. In addition to those, cooperation with the other modes would be critical to supply efficient and low-cost transport services to the customers, such as integrated transport services and intermodality. For example, cooperation with inland water transport along Sava River and cooperation with road transport between stations and origin/destination of cargoes, where no railway service is, would be the first step. Preparation for containerization would be one of the issues. The BiH railway would not be able to survive in future transport market without above modernization, because the market will become competitive more and more as the economy develops.

Summarizing the above discussion, future major railway cargoes will be:

- Solid Mineral Fuels;

  Solid mineral fuels will be used for thermal plants and some factories in future as well. The railway has advantages to transport this kind of bulky and low value cargo.

- Crude, Manufactured Minerals Building materials; and,

  In any country, demand to this kind of products exists. These products are also bulky and low value and the railway has advantages.

- Machinery, Transport Equipment, manufactured Products, Others.

  Containers would transport a considerable part of cargoes in future, when modal integration and intermodality would be realized. The railway will be able to cope with competition with the other modes by promoting the containerization together with promotion of integrated transport and intermodality.

(3) Verification of the Forecast Results

The study team conducted a countrywide traffic survey including roadside Origin-Destination interview survey. Based on the survey, the study team developed future transport demand forecast models and forecast future demand. Table 3.11 shows the resulting forecast in terms of ton-kilometers.

Table 3.11 Comparison of Road and Railway Freight Transport Demand

MN ton-km

Transport Mode	2000	2010	2020
Road	3,740	6,044	10,354
Railway	146	879	4,437
Railway Share (%)	3.8	12.7	30.0

Note: Railway demand 1n 2000 represents a result in 1999.

Railway share in the major transport market is 3.8 % in 2000. The share will be 12.7 % and 30.0 % in 2010 and 2020. The railway share in 2020 might seem a little bit high if one considers comparison with other countries.

Table 3.12 shows market share of railway in Europe in terms of ton-kilometers has been decreasing year by year. The market share of railway was 32.6 % in 1970. It decreased to 14.5 % in 1997. The transport volume by railway has been also decreasing in European countries since 1980.

Table 3.12 Freight Transport by Mode in Europe

Billions of Metric Ton Kilometers	Road	Rail	Inland Waterway	Pipeline	Total
1970	416	283	103	66	868
1980	628	287	107	91	1,113
1990	932	255	108	75	1,370
1997	1,205	238	118	85	1,646
Market Share(%)					
1970	47.9	32.6	11.9	7.6	100.0
1980	56.4	25.8	9.6	8.2	100.0
1990	68.0	18.6	7.9	5.5	100.0
1997	73.2	14.5	7.2	5.2	100.0

Source: European Union

However, the railway shares in the road and railway transport market were 40.5 %, 31.4 %, 21.5 % and 16.5 % in 1970, 80,90 and 97 respectively. The railway share in the European countries was more than 40 % in 1970. Even in 1980, the share was more than 30 %.

Considering the future economic development level together with the past freight transport volume by railway and industrial concentration along the railway network in BiH, the future railway would be able to transport 4,437 million ton-km volume in 2020, if the railway service is improved considerably.

3.4.3 Railway Passenger Transport Demand Forecast

(1) Basic Methodology

With regard to passenger transport, transport volume of the railway was not big in BiH compared to the freight transport as described before. The basic methodology for the railway passenger transport demand forecast is not similar to the freight transport, because the passenger transport demand is not depend on GDP growth only.

Therefore, the study team made assumption for the railway passenger transport demand forecast as follows.

- Railway passenger demand would recover to the 1990 level in 2020, if appropriate improvement of the railway service were made.
- In 2005 and 2010, recovery ratio would be 40 % and 70 % respectively.

(2) Future Railway Transport Demand Forecast

Table 3.13 and Figure 3.14 show the forecast results of future railway passenger transport.

Table 3.13 Future Railway Passenger Transport Demand

	1990	2000	2005	2010	2020
Railway Passenger Transport Demand (Million pax-km)					
Potential Demand	1,382	51	1,382	1,382	1,382
Realization Ratio	-	-	40%	70%	100%
Possible Transport Demand	1,382	51	553	967	1,382

Note: Railway passenger-km in 2000 represents the number in 1999.

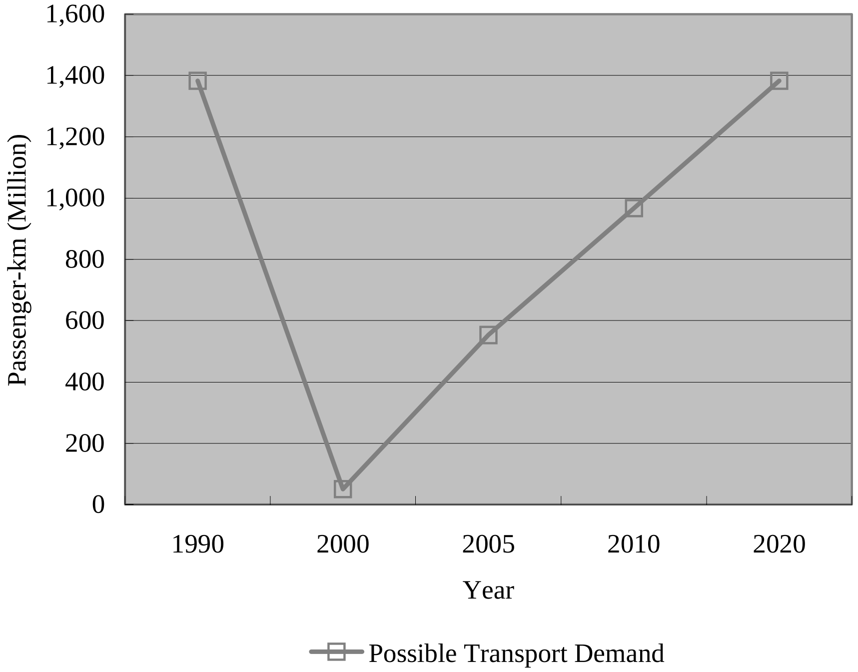


Figure 3.14 Future Railway Passenger Transport Demand

(3) Verification of the Forecast Results

To verify the demand forecast results, the study team used railway shares in the road and railway transport market as same as the railway freight transport.

Table 3.14 shows the forecast results and road passenger transport demand in the target years. Railway shares are forecasted 7.1 % and 6.8 % in 2010 and 2020 in terms of passenger-km.

Table 3.14 Comparison of Road and Railway Passenger Transport Demand

Transport Mode		2000	2010	2020
Road	(Million pax-km)	8,922	12,744	18,876
Railway	(Million pax-km)	51	967	1,382
	Railway Share (%)	0.6	7.1	6.8

Note: Railway passenger-km in 2000 represents the number in 1999.

Table 3.15 Railway Passenger Transport Share in Europe

(passenger-km)

	1991	1992	1993	1994	1995	1996
Average (%)	6.6	6.5	6.2	6.0	5.8	5.8

Source: The study team based on ECMT information (refer to Appendix).

Note: The railway share represents a proportion to railway and road transport volume.

Average railway share in Europe is shown in Table 3.15. The railway share has been gradually decreasing from 6.6 % in 1991 to 5.8 % in 1996. The forecasted railway shares in BiH were 7.1 % and 6.8 % in 2010 and 2020. The difference of the shares between BiH railway and European railway is considered small. The study team adopted the forecast for the BiHTMAP study.

3.5 RAILWAY DEVELOPMENT SCENARIO

3.5.1 On-going Rehabilitation Programs

(1) The Emergency Transport Reconstruction Program

Destruction and devastation of all components of the railway system have brought a collapse of the railway traffic. Furthermore, lack of proper maintenance, during the war years, results in significant increase in costs for the rehabilitation. Since the railway is an indispensable transport mode for the industrial recovery, the international community has made great efforts and invested a large amount of money for the rehabilitation of the railways in order to restore it in normal condition.

The first phase of the Emergency Transport Reconstruction Program (ETRP) focused on the repairs of the infrastructures such as railway bridges, permanent way, overhead contact line, maintenance machines, etc. With the completion of the ETRP Projects, most of the railway network will become operable. This means that, from a technical viewpoint, there will be no obstacles for the normal transport operation, even with reduced speed, on the two main tracks: the Ploce (Croatia) - Sarajevo Zenica - Doboj line and the Croatia - Novi Grad - Doboj - Tuzla – Brcko – Croatia line.

The EU member countries donated approximately US$10 million for the rehabilitation of the line Sarajevo - Mostar - Metkovic. The European Community Council also envisaged approximately ECU9.65 million (Budget 97) for partial rehabilitation and reconstruction of the following railway lines:

- Sarajevo – Zenica;
- Zenica – Doboj;
- Doboj - Banja Luka; and
- Banja Luka - Novi Grad (Bosanski Novi).

The IFOR/SFOR participated in the Reconstruction Program with rehabilitation of the Volinja bridge (border of BiH and Croatia), rehabilitation of the line between Bosanski Novi (Novi Grad) and Doboj as well as the line Doboj - Zvornik.[2]

After the railway lines are physically re-linked with the rest of the railway network, more emphasis should be placed on assuring the minimum safety standards, followed by fixing other works (e.g. telecom links, signal safety devices etc) in order to make the railway

[2] Main Source: IMG report

system safely operable. To this end, a number of works/projects still remains to be undertaken.

In addition, track and wheel tread figures should be normalized to recover the normal operation. For this purpose, the track maintenance machines such as multiple tie tamper, rail replacing machines, etc. and wheel tire lathing machines and supporting facilities should be installed or replaced. Most serious cases were observed at Railovac central rolling stock workshop and at Blazuj facility workshop.

(2) Rail Rehabilitation Project by EBRD

As of November 2000, the EBRD is pursuing the feasibility of a loan for railway rehabilitation to Bosnia and Herzegovina, based on the proposed support agreements between the Federation of Bosnia & Herzegovina and Republika Srpska. The beneficiaries of the loan would be Bosnia and Herzegovina (BiH), Railway Public Corporation (BHZJK), the joint railway institution serving for both Entities. The proposed project consists of priority rehabilitation works on part of BiH's main railway network, along:

- The Pan-European Transport Corridor V passing north-south, connecting the Croatian border-Doboj-Sarajevo-Mostar-Capljina-Croatian border, linking to Ploce port on the Adriatic Sea in the Republic of Croatia (1ength of 426 km); and
- A transversal east-west line Parallel to Corridor X from the Serbian border-Zvornik-Tuzla-Doboj-Banja Luka-Croatian border over a total length of 285 km.

Followed by the renewal of operational links within Bosnia and Herzegovina as well as with Croatia and Yugoslavia, and a gradual resumption of economic activity, the demand for rail services is expected to increase. All railway border crossing points are now open for transport and agreements have been signed recently with the railways companies of Croatia and Yugoslavia enabling greater volumes of freight traffic.

Based on these observations, EBRD is seeking a loan which will be necessary for periodic renewal of many capital assets, in consideration of reasonable assumptions of likely sources of finance and any debt service obligations, which might thereby accrue.[3]

3.5.2 Basic Concepts for Railway Transport Development

(1) Necessity of Integrated Approach

1) Three Essential Factors for the Railway Improvement

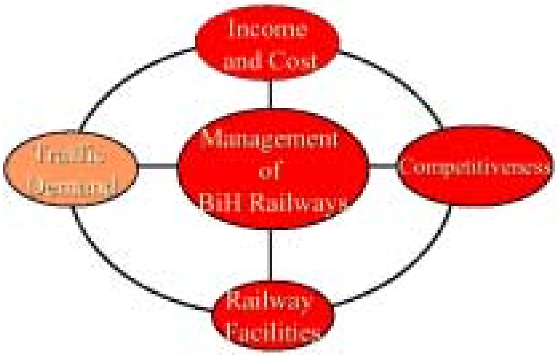
The railway transportation is an integrated system with three essential elements: 1) the network connection; 2) the safety system; and 3) the proper operation. Without either one out of the three elements, the railway system could not healthily function. The

[3] Resource: EBRD plan

current condition of the BiH railways is assessed to be far from the healthy condition. They lack their continuity, communication systems, signal systems, level-crossing security systems, and necessary maintenance backup. Although tracks are physically operable, they have extremely low capacity of traffic operations and a low commercial speed of trains from 30 to 70 km/h.

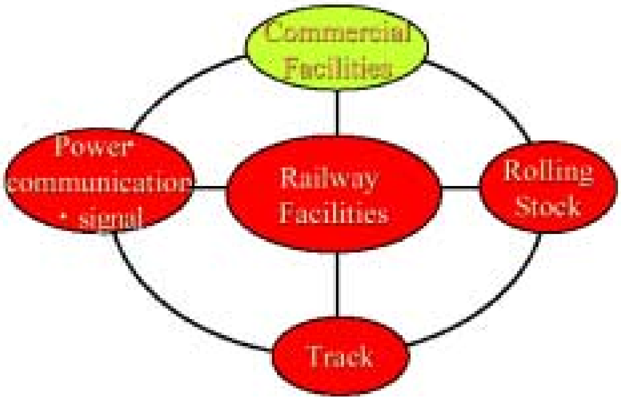
2) Essential Factors for Railway Management

In order to recover such situation, the healthy railway management system should be established, taking into account following four significant factors: 1) income and cost; 2) traffic demand; 3) railway facilities; and 4) competitiveness. These four factors are mutually related to each other, and it is considered indispensable to seek a well-balanced railway management system.



3) Functionally Integrated Railway Facilities

The railway system is operable only under a condition that all the elements of railway facilities are well functioning and integrated as a total system. These elements are: 1) tracks: 2) rolling stocks; 3) power, communication and signal; and 4) other supporting facilities. Overemphasized efforts on only selected facilities, therefore, are not meaningful for the improvement of the entire railway system. Balanced investment must be a key. All the facilities should also hold the **maintenance function** on a technically and financially sustainable basis.



(2) Better Operation for Railway Connection with the Neighboring Countries

The BiH Railways are physically connected with the neighboring countries, the Croatian and Yugoslav railways. With the Croatian railway, there exist three gateway points such as: 1) Capljina border crossing to Ploce Port; 2) Bosanski Novi (Novi Grad) to Sunja; and Brcko to Vinkovci. For the connection with the Yugoslav railway, Zvornik is important to Romania

For better operation of the railway network, the following technical considerations need to be taken:

- Rehabilitate railway bridges over Sava River nearby Bosanski Samac as the most significant connection between the BiH and Croatian Railways;
- Put into operation line Bihac-Knin-Split (over Bosanski Novi (Novi Grad));
- Increase the level of track maintenance that requires procurement of necessary machinery;
- Facilitate relevant activities to the gauge renewal in critical sections;
- Carry out rehabilitation of the signaling-safety and communication systems;
- Operate and manage border stations for Croatia and Yugoslavia individual operations.

(3) Phased Development Scenarios

There still remain a tremendous number of works to fully recover from the current damaged railway system and to functionalize it as one of essential transport alternative modes to meet the economic development in BiH. To this end, enhanced efforts should be made in a phased manner with three stages as follows:

- Phase 1 (up to 2005) is recognized as "*the normalization period*," when all efforts should be made to recover from the current deficient situation and normalize its entire system.

- Phase 2 (2006 ~ 2010) is regarded as "*the transportation recovery period*," when the credibility of the railway transport is resumed, thereby exploiting more passengers as well as freight traffic demands.

- Phase 3 (2011 ~ 2020) is conceptualized as *"the functionally strengthening period"*, when the BiH railway system is further strengthened in its technical, operational and managerial facets in such a way that the railways in BiH can play a significant role as part of the Pan European Network System, sharing the European norms, regulations and standards for the commercial operations.

(4) Relevance to Railway Traffic Demand

The railway traffic demands in BiH were examined in the preceding section. As discussed there, the future railway transport cannot be expected as performed before the war, because the industrial activities will be greatly different in the future from those before the war. Mining resources and mineral resource-based manufacturing industries have lost their competitiveness in the world market, and therefore, strong emphasis of the industrial development should be focused on value-added manufacturing industries. Along with such an industrial restructuring process, major components of the railway transport demands will be undoubtedly shifted from the mineral resources-dominant goods.

Nevertheless, the railways still hold competitive advantages as alternative transport modes for bulk and long-haul freight movements, should the intermodal facilities be functionally developed.

Relevant to the phased development scenarios as elaborated in the above section, the railway transport demand curves, in terms of ton-km, are delineated in the 20 years time horizon, as shown in Figure 3.15. Two scenarios are envisaged in this figure: an ambitious growth (Scenario 1) and a more likely growth scenario (Scenario 2).

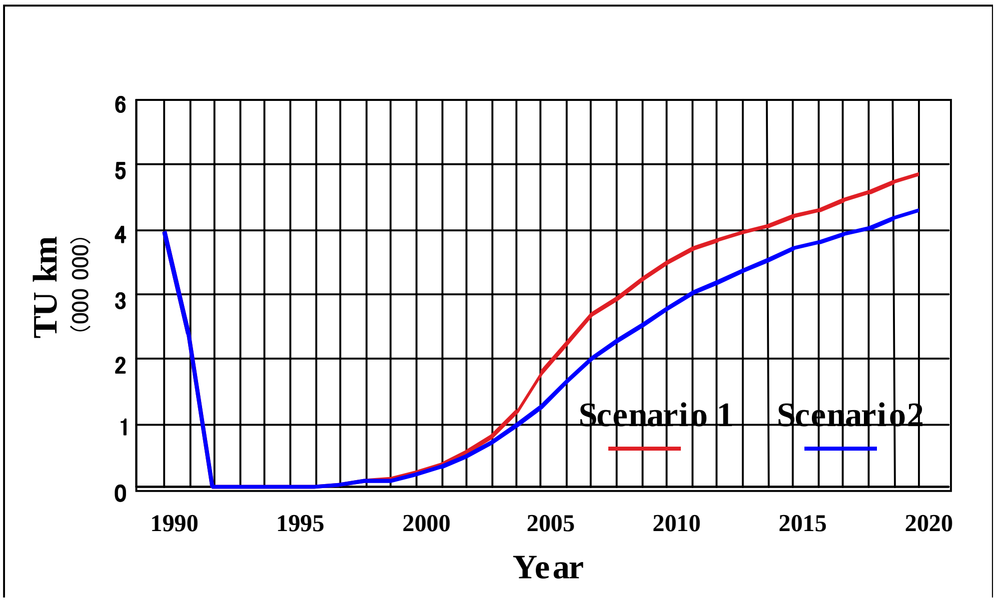


Figure 3.15 Traffic Recovery Scenario of Railways in BiH

Scenario 1 represents an ambitious case which recovers at a 50 % level of the former situation, or, the 1990 transport volume, in 2005, and reaches almost the same level of the former state in 2015. Holding this high growth momentum, the transport demands in 2020 will reach to about 120% level of the 1990 performance.

While, Scenario 2 is slightly adjusted downward, taking into account the implications from the transport demand analysis and a difficulty in recovering process in practice. This scenario aims to reach to the 50% level in 1990, 2 years after 2005, and eventually the traffic demand in 2020 will be slightly higher level compared to the 1990 performance. Compared to Scenario 1, this scenario needs longer time until the recovery projects put in place and its practical effect comes out. This assumption would be rational, looking into experiences in CIS and CEE countries where the railway transport demands had suddenly fallen down by approximately 50% in 1990 to 1991, and they could not recover from such a situation even at present. It can be said that for programming the facility improvement, Scenario 2 provides a more rational basis.

3.5.3 Physical Improvement Plans for the Railways in BiH

(1) General

A general task flowchart of the railway infrastructures, facilities, and equipment is proposed based on the phase scenarios discussed in the preceding section, as shown in Figure 3.16. The flowchart shows necessary task items, timing of the implementation and functional relationships between items. Since the railway system is a total technical system, each element of the tasks can be neither separable nor independent. Therefore, those works for the improvement should be implemented with keeping the mutual linkages.

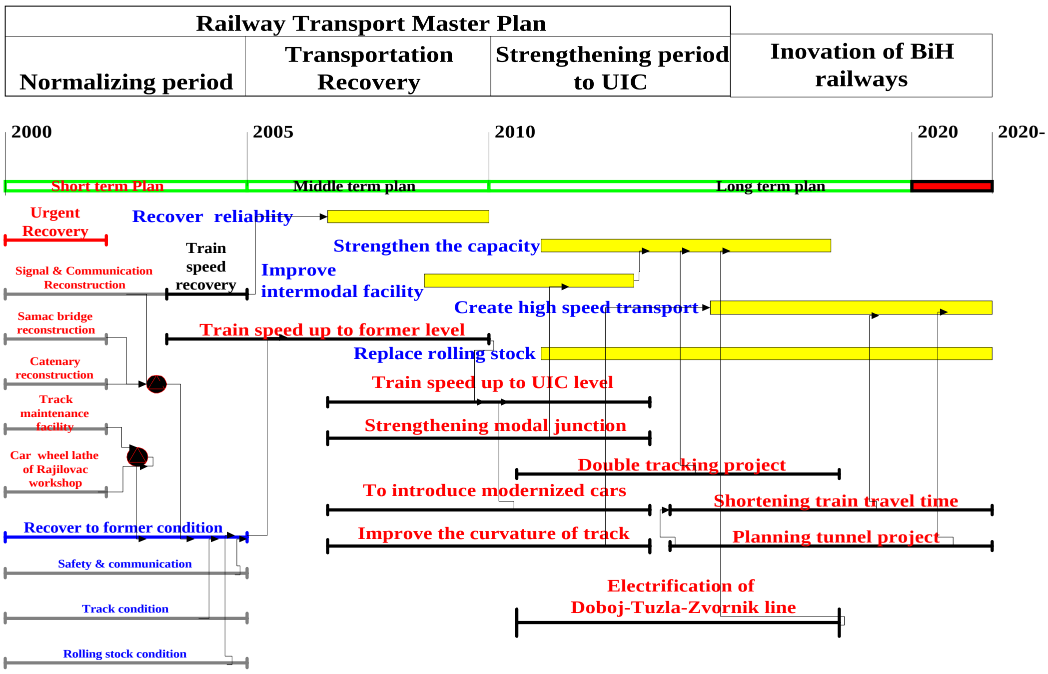


Figure 3.16 Task Items of Reconstruction and Improvement

(2) Short-term Plan for Phase 1 (2001-2005)

The short-term plan, that is to recover the facility conditions to the former state, is targeted to be completed in the Phase 1 period until 2005,which consides with the target year of the economic recovery of BiH. It is deemed that after 2005, the intesive assistance programs for rehabilitation by the international community will retreat from this country.

A strategic focus of this short-term plan should be placed on: 1) perfect connection of the railway lines; 2) improvement of maintenance conditions for track facilities, rolling stocks, electrical systems of power supply, signal and communication systems and train control systems. All these facilties and equipment are expected to be recovered at the normal level before the war. The detailed components to be undertaken in this period are discussed in the following Section 3.6 in this chapter as an urgent program.

(3) Medium-term Plan for Phase 2 (2006-2010)

The medium-term plan needs to include a considerable number of improvement components to functionalize the total raiway system as a reliable transport mode. Safe and efficient operation is a focal issue for the improvement during this period to attract and call back railway custmers. In this regard, the railway system will be required to be incorporated into the enire intermodal system with the other transport modes such as roads, airports and ports, developing intermodal transfer facilities. Based on the above requirements to the railways, the following improvements need to be undertaken:

- Facilitate electrification of Doboj-Tuzla-Zvornik and introduction of pendulum train, referring to the requirement of UIC regulations;
- Improve the curvatures on some sections for speed up to meet the UIC standard;
- Introduce a private freight car system;
- Develop/improve loading and unloading facilities at freight terminals;
- Establish a passenger information service system;
- Improve the intermodal connection at major stations;
- Construct container inland terminals;
- Develop a freight information service system; and
- Begin the introduction of pendulum passenger train of light weight construction.

(4) Long-term Plan for Phase 3 (2011-2020)

The long-term plan is to strengthen the technically, operational and managerial functions of the railways in BiH, thereby promoting its competitiveness with other transportation modes. Emphasis of the improvement should be placed on preparing the integration with the Pan European railway network, taking into account the following aspects:

- Explore a double tracking project to increase the capacity of “Corridor Vc”, depending upon the demand;
- Facilitate electrification of the section Doboj-Tuzla-Zvornik Novi;
- Study a tunnel construction project between Blazuj and Konjic including double tracking;

- Seek measures to raise up train operation speed to meet the UIC regulations for operation in the international corridors; and,

- Improve the curvatures fundamentally on selected sections for speed-up.

For shortening the travel time, introduction of pendulum trains and a tunnel project between Blazuj and Konjic should be studied from the engineering and economic feasibility points of view, for the strengthening the railway corridor lines.

(5) Longer-term Considerations beyond 2020

- Along with the economic development in the longer-term, the railways are expected to function as a more economically efficient mass transportation mode that can supplement or reinforce the intermodality linked with the European market. It may require further strengthening of the transport capacity as well as the transport service quality of the international corridors such as "Corridor Vc" and "the line parallel to Corridor X."

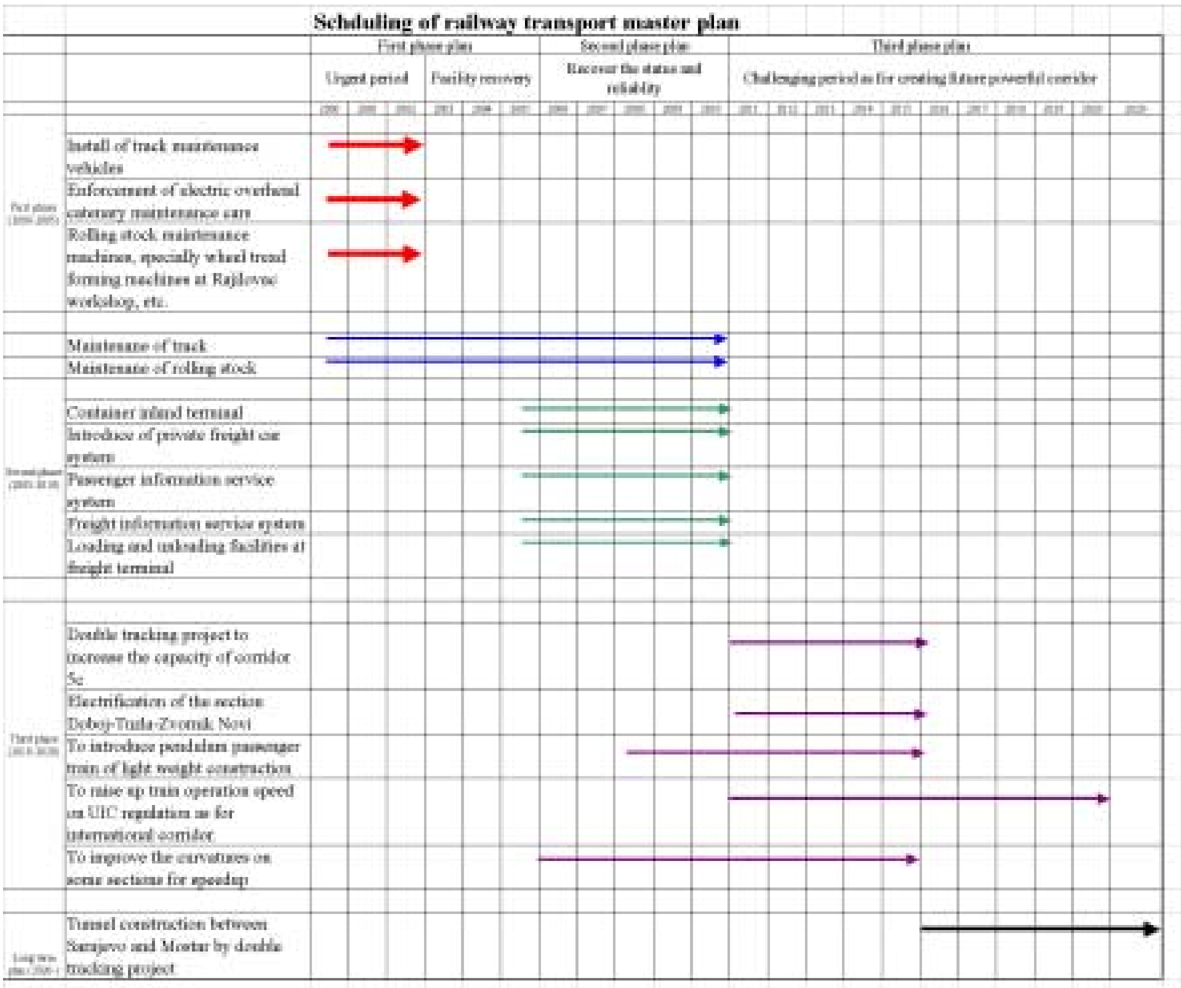


Figure 3.17 Schedule of Railway Improvement in BiH

3.6 URGENT IMPROVEMENT PROGRAM

The railway transportation is currently at the stage of starting the recovery. Considering the actual situation of the railways in BiH, the urgent program is the most important step affecting the progress in all the phases. Figure 3.18 presents an overall picture with crucial work components to be undertaken in the urgent program and their mutual relations.

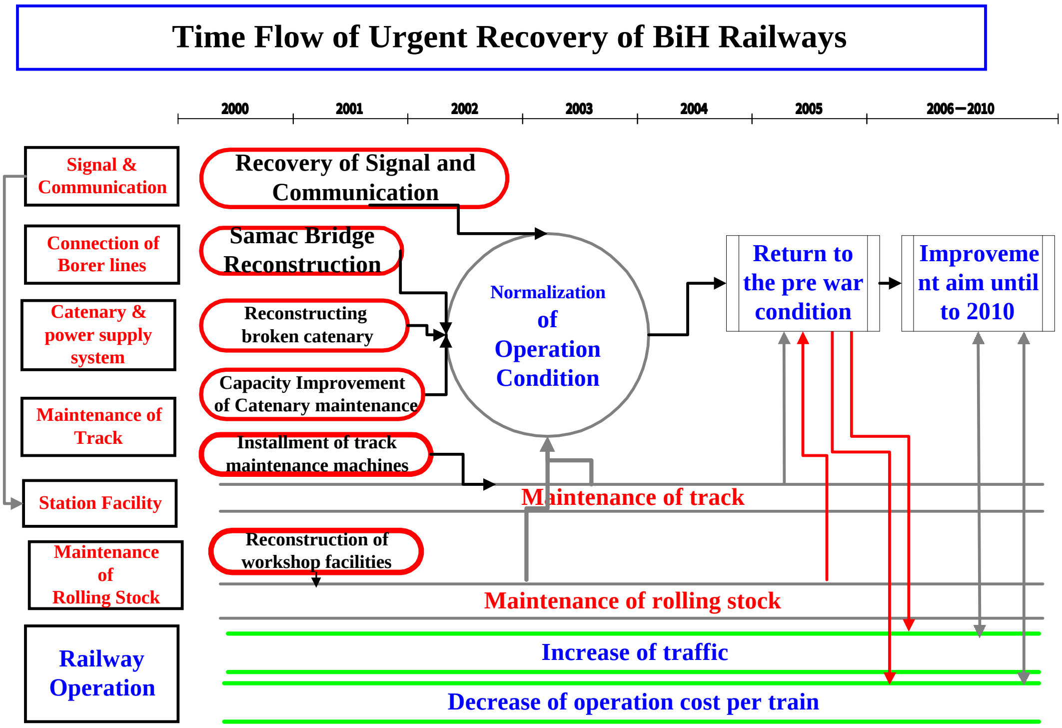


Figure 3.18 Urgent Recovery Flowchart of Railways in BiH

3.6.1 Immediate Actions

Immediate actions for the rehabilitation need to be taken, focusing on the accomplishment of the railway connection, safety recovery, and the improvemant of the running conditions between rail and wheel. These urgent works should be completed till 2002-2003. Major work components are as follows:

(1) Reconstruction of Signal and Communication Systems

For the necessity of keeping safety in BiH, SFOR has made much effort for the recovery of communication and signal systems in the important junction system, houwever, the signal and communication systems should be fundamentally constructed for safety operation, taking into account the increase of demand. It is also considered that the innovative improvement of the signal and communication systems may initiate the IT revolution over BiH in the near future, should the railway track corridors provide with a trunk sytem of the telecommunication network.

(2) Samac Bridge Reconstruction

The Samac Bridge is the most important issue for recovering the transport spine of Corridor Vc of BiH. This bridge was used for road and railway to connect Croatia and the other European countries. This bridge is scheduled to be reconstructed in 2 years.

Near this bridge, a fluvial port and a number of industries of agricultural products, car parts, storage of grains, etc. locate in the surrounding area. They have waited for railway transport services connecting the markets.

(3) Recovery of Disconnected Catenary System

About 190 km overhead contact line has been completely destroyed or severely damaged, and external signaling and telecommunication devices, centers for traffic remote control and electric traction facilities, the electric sectioning posts, and the traction substations have not been recovered. The total recovery of the catenary system is an urgent need to normalize the railway operation.

3.6.2 Urgent Program for Short-term Plan (Phase 1)

(1) General Concept

Although the physical condition of ZRS is a little better than that of ZBH, the inter-Entity operation passing trough both Entities is not necessarily smooth due to a difficulty in train operation, thereby leading to each Entity's defects. Thus, the improvement needs to keep the same progress in both railways to functionalize the entire railway system.

Enhanced issue for the completion of the short term plan should be focused on the improvement of the maintenance conditions, including facilities of track, rolling stock, electrical systems of power supply, signal, communication system and train control system.

Urgent recovery is required for the section between Doboj and Maglaj stations. The catenary system of some sections near Samac Bridge is also destroyed. In near future, this section shall be repaired before the reconstruction of Samac Bridge.

(2) Procurement of Maintenance Machines

It is important for recovery of railways in BiH to enforce the production capacity of the maintenance facilities and maintenance machines of rolling stocks, including:

- Installation of track maintenance vehicles
- Enforcement of electric overhead catenary maintenance cars;
- Installation of rolling stock maintenance machines, specially wheel tread forming machines at Rajilovac workshop.

(3) Improvement of Rail and Wheel Tread

Extraordinarily inadequate conditions of rail and wheel figures should be improved to facilitate the normal speed operation in safe operation against derailment. Low train speed requires much more rolling stock and operation personnel. It is observed that a plenty of wheels out of the gauge control are waiting for cutting outside of all car workshops. The work for fixing the wheel tread requires a considerable long time even with an intensive work program.

(4) Track Maintenance Machines

The existing inoperable and poor capacity for track maintenance work cannot keep up with the improvement requirement of deteriorated track facilities. Some maintenance cars for catenary and for track maintenance work were donated to BiH, but fundamental tie tamper machine and measuring equipment have not been installed yet, because the railways in BiH are confronting with a serious fund deficit and they cannot start improving work by themselves.

(5) Safety System Improvement

Continuous efforts should be made to promote the safety system with modernizing the signal system and communication system. The current signal system, communication system and level crossing guard system have been completely damaged along the whole lines, and some remaining facilities are old-fashioned, thereby facing a difficulty in procurement of parts. A modern system is far cheap and its faculty is far higher than that of old system.

(6) Improvement of Train Operations

The actual train operation is being executed by operator’s attention in a condition with low speed, low frequency, and inadequate safety system. An increase of number of trains seems dangerous, because one additional train will create a possibility of fatal accidents. The operation system shall be guaranteed not to meet collision and derailment even under increasing the density of train operation.

(7) Engineering Improvement of Tunnel Structures

There are urgent needs to solve the engineering problems on several tunnels. The tunnel of “Jedrinje” is facing serious water leakage. The water appearance suddenly takes place, and hinders the normal train operation. An adequate engineering solution should be taken to prevent the water appearance in association with a provisory countermeasure against detecting water on the surface of the rail in side tunnel.

The tunnel “Ljeskove Vode” located 20km from Doboj on the “the line parallel to Corridor X” corridor is also in a dangerous condition, and need a detailed engineering study to seek the solution.

3.6.3 Indicative Investment Requirement for the Urgent Program

The amount of up-to-date investments, including development of the current projects, is estimated by the IMG Report prepared in October 1998, as shown in Table 3.16. This project comprises of the most priority components on two strategic railway lines in BiH such as:

- Line Croatia border-Doboj-Sarajevo-Mostar-Croatia border (single line, 311 km electrified, double track 95 km electrified); and

- Line Croatia border-Banja Luka-Tuzla-Serbia border (single line electrified 285 km).

Components considered in these two projects, however, include neither those of the previous projects nor some other plans for the rehabilitation and modernization of the railways. Levels of existing technical documentation for particular project components vary. Some of them are limited to a preliminary level of observations (for instance, border crossing stations), while some are based on technical and technological studies including basic designing (for instance, communication and information systems). Further detailed investigations and surveys are needed to make a reliable estimate for the investment requirement for the urgent program in a feasibility study.

Nevertheless, it has been estimated, as seen in Table 3.15, that the improvement for the two strategic lines costs a total of EUR 56.58 million (equivalent to US$ 47.55 million or KM 110.31 million), out of which the investment cost for ZBH accounts for about EUR 32.31 million (equivalent to US$27.15 million , or KM 63.0 million), or 57% of the total, while that for ZRS, EUR 24.27 million (equivalent to US$ 20.39 million, or KM 47.32 million), sharing 43% of the total.

As mentioned above, this rehabilitation project package does not include components to satisfy substantial needs for normalization of the entire BiH railway system, as proposed in the preceding section. Should these costs be added, the total cost will significantly increase. The cost estimate is forthcoming.

Table 3.16 Lists of Priority Rehabilitation Projects

No .	Pro j ect	Line Croatia Border-Doboj -Sarajevo-Mostar-Croatia Border		
		ZBH (10^3 EUR)	RS (10^3 EUR)	Total (10^3 EUR)
1	Border railwa station Samac			1.650
2	Border railway station Capljina	1.000		1.000
3	Reconstruction of tunnel of Jedrinje	1.500		1.500
4	Station signalling system on the line Samac-Capljina	10.700	5.000	15.700
5	Power traction remote control on the line Samac-Capljina	1.800	200	2.000
6	Traffic remote control on the line Samac-Capljina	1.250	250	1.500
7	Communication system on the line Samac-Capljina	7.190	1.410	8.600
8	Information system on the line Samac-Capljina	1.437	363	1.800
9	Equipment for infrastructure maintenance on the line Samac-Capljina	5.500		5.500
	Total :	**30.377**	**8.873**	**39.250**

No .	Project	Line Croatia Border-Banja Luka-Doboj-Tuzla-Serbia Border		
		ZBH (10^3 EUR)	RS (10^3 EUR)	Total (10^3 EUR)
1	Border railway station Dobrljin		1.000	1.000
2	Border railway station Zvornik		1.000	1.000
3	Power traction remote control on the line Doboj-Novi Grad		600	600
4	Communication system on the line Dobrljin-Zvornik	1.580	6.520	8.100
5	Information system on the line Dobrljin-Zvornik	351	1.449	1.800
6	Equipment for infrastructure maintenance on the line Dobrljin-Zvornik		4.830	4.830
	Total:	**1.931**	**15.399**	**17.330**
	Grand Total:	**32.308**	**24.272**	**56.580**

Data resource: IMG Report

3.7 INSTITUTIONAL AND ORGNZATIONAL ASPECTS

3.7.1 Organizational Issues of the Railway Public Corporation

(1) Roles of the BHZJK

Agreement was signed between the Federation of Bosnia and Herzegovina and the Republika Srpska on the establishment of a joint railway public corporation as part of transportation corporation on April 1, 1998, based on Annex 9 of the General Framework Agreement for Peace in Bosnia and Herzegovina signed in Paris on 14 December 1995, which provides for the establishment of Bosnia and Herzegovina public corporations for their mutual benefit by the Federation of Bosnia and Herzegovina and the Republika Srpska.

The parties (or both Entities) wish to adopt solutions which are fully in line with European Union guidelines and especially the European Directive 9l/440 of 29 July 1991 and subsequent texts relating to rail transportation, and the parties attach great importance to the development of international rail traffic and are therefore prepared to take whatever measures are needed to act in conformity with the rules adopted by the "Union Internationale de Chemins du Fer" (UIC) OCTI, CIT or other similar organizations.

This comes from a fact that the third pan-European transport conference held in Helsinki in June 1997 declared the line Ploce-Mostar-Sarajevo-Doboj-Slavonski Samac-Budapest to be a branch of "Corridor V". There appears to be a strong commercial interest to develop freight railway traffic on the line Zagreb-Banja Luka – Doboj – Tuzla – Zvornik – Belgrade in order to double Corridor X. Thus, it has been recognized that international assistance is necessary to restore conditions which permit the development of transport by rail in Bosnia and Herzegovina.

A joint railway public corporation, named “Bosnia and Herzegovina Railways Public Corporation (BHZJK)” created by the Entities as part of Transportation Corporation to fulfill a number of responsibilities in the common interests. In essence, the purpose of BHZJK is to establish an institutionalized cooperation among the Entities and to provide whatever decisions are necessary to ensure smooth, safe, and regular inter-Entity and international railway traffic. The definition of terminology is as stipulated below:

- "the Corporation” shall mean the joint corporation created by this agreement.
- "infrastructure manager" shall mean any public body or undertaking responsible in particular for establishing and maintaining railway infrastructure as well as for operating the control and safety systems.
- “railway infrastructure" shall mean all the items listed in Annex 1 to this agreement, it being specified that this Annex will be automatically modified to be all times identical to the definition of railway infrastructure by the European Commission (currently Article 3 of the Council Directive 91/440 of 29 July 1991).

- "railway undertaking" shall mean any private or public undertaking whose main business is to provide rail transport services for goods and/or passengers with a requirement that the undertaking shall provide traction.

The BHZJK assums a responsibility for harmonization of signaling, safety, telecommunications and other systems and of the rules and criteria used in the railway network of the two Entities, and the harmonization and determination of infrastructure fees. BHZJK is assigned the specific mission to examine, in coordination with the railway companies, the international requirements for efficient traffic (including inter-operability) on two lines that are viewed as a part of the Pan-European railway network. The two lines, as mentioned earlier, are: 1) Ploce - Mostar Sarajevo - Doboj - Slavonski - Samac –Budapest; and 2) Zagreb - Banja Luka - Doboj - Tuzla - Zvornik – Belgrade.

BHZJK's main functions are summarized below:

- Allocation of train paths for inter-Entity and international traffic.
- Harmonization of signaling, safety, and other systems.
- Harmonization and determination of infrastructure fees.
- Settling of accounts between the railway companies.
- Overall supervision of compliance with regulations on inter-Entity and international traffic.

By specific mandate of the Entities or of the railway companies, BHZJK could act as a common agent or in its own right for the acquisition of railway equipment, construction of facilities and/or the management of items of infrastructure or rolling stock.

BHZJK's budget resources shall include part of infrastructure fees and subsidies from the Entities.

The Board of Directors of BHZJK shall adopt a basic fee and a matrix of multipliers to be applied in the computation of infrastructure fees. The multipliers for the computation of fees shall take into consideration among other matters.

The Board of Directors shall be composed of 12 members as follows:[4]

a. Six ex-officio members of the Board

- The Minister of Transport and Communications of the Federation of Bosnia and Herzegovina
- The Deputy Minister of Transport of the Federation of Bosnia and Herzegovina
- The Minister of Transport and Communications of Republika Srpska
- The two top officials (one Bosnia, one Croatia) of the Federation railways

[4] Resource: Office of High Representative

- The General Manager of the Railways of Republika Srpska

Each of the above ex-officio members shall have two votes.

b. Three representatives (one Bosnia, one Croatia, one Serb)

Elected for two years by the main railway trade union in the Federation of Bosnia and Herzegovina and in Republika Srpska. Each such representative shall have one vote.

c. Three members (one Bosnia, one Croatia, one Serb)

Designated for 2 years to represent the customers of the railway undertakings for the inter-Entity and international traffic in Bosnia and Herzegovina. The Chamber of Commerce of Republika Srpska will designate one member and the Chamber of Commerce of Federation of Bosnia and Herzegovina two members. Each such representative shall have one vote.

(2) Relationship between the Corporations and the Entities

It is envisaged that almost all transport implementation (infrastructure and operations) would remain with the Entity institutions and companies. The exceptions would be common functions such as heavy maintenance equipment used over the whole of BiH territory and common safety systems such as remote control centers. This is already starting in the railway with BHZJK owning and operating commonly used maintenance equipment. The modal corporations would also focus on harmonization of standards (design, construction, safety etc). The Transportation Corporation would consolidate the work of the modal corporations to realize a multi-modal dimension and database.

3.7.2 Management Aspect

(1) Employees of Railway Sector

The number of employees within railway traffic operations in railway sector in the pre-war period accounted for approximately 14,000 personnel. At present, as of 1998, the number of staff in ZBH is 3,861 in total, while that in ZRS, 3, 453. Summing up both, it totals 7,314, which is almost a half of the pre-war level. Table 3.17 shows the employees' distribution of ZBH by regional directorates and by activity type, and Table 3.18, the employments of ZRS by activity type.

Although such a drastic reduction and restructuring of personnel was undertaken for both railway organizations of ZBH and ZRS, the financial burden for the personnel cost is still serious, because of too few transport operations of the railways in BiH.

Looking into the relation between numbers of personnel and amount of railway operation among the European railways, there is a clear co-relationship, as shown in Figure 3.19. It is assessed that even the decreased number of stuff in the railways in BiH as of 1998 exceeds an appropriate level, with respect to the current transport demand, however, the number of personnel needs to be pertained for the modernized railway operation, once after the railway systems will recover and normal operation begins. This co-relationship implies that the demand for freight and passenger traffic reaches the level of 1,000 million TU (ton-km plus passenger-km), the number of staff will reach a reasonable level, compared to European railways.

Endeavor for modernization of its operation system is needed to realize good performance in the near future. It is expected that this will be realized through the rehabilitation program in the first period (2000-2005).

Table 3.17 Number of Employees in ZBH (as of December, 1998)

	Workers				
Location / Service	STD	VV	ZOI	Others	Total
General Directorate				569	569
Sarajevo Directorate	467	114	212	71	864
Tuzla Directorate	552	121	239	85	997
Zenica Directorate	206	84	190	75	555
Mostar Directorate	177	47	241	37	502
Bihac Directorate	112	65	126	59	362
Doboj Directorate	0	0	0	12	12
Overall	1,514	431	1,008	908	3,861

Source: ZBH
Notes: STD stands for Department for Traffic and Transport; VV: Department for Traction of Trains; and ZOI: Department for Infrastructure Maintenance.

Table 3.18 Number of Employees in ZRS (as of November, 1998)

Department	No. of Staffs
Directorate	393
Traffic operations	1,240
Infrastructure maintenance	863
Railway vehicle maintenance	462
Traction of trains	359
Complementary activities	136
Total	3,453

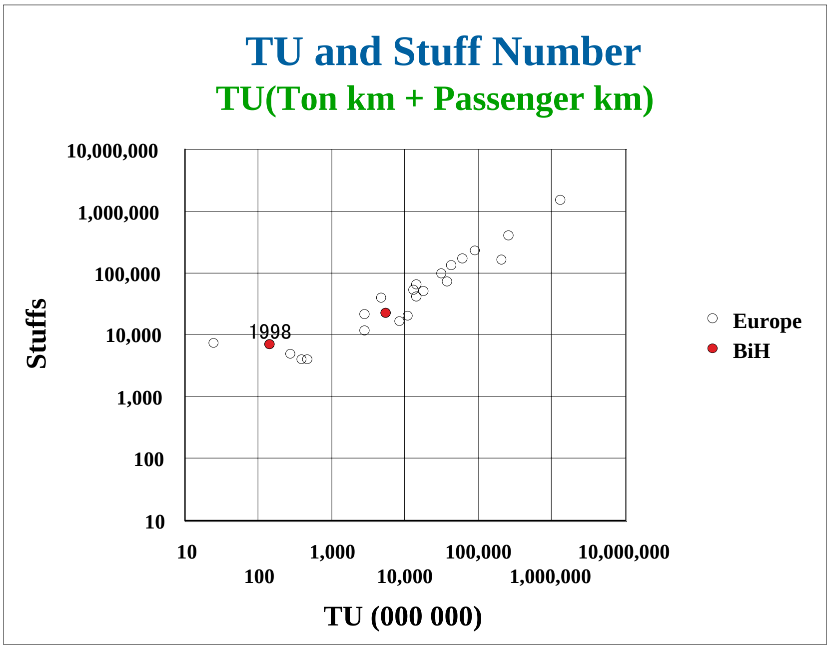


Figure 3.19 Relation between Numbers of Railway Staff and Railway Transport in European Railways

(2) Tariff Structure

The present tariff structures for freight and passenger are as shown in Figures 3.20 and 3.21 respectively. As a basic policy, the tariff structure should be developed, considering two factors: 1) the international competitiveness in freigh and passenger transport; and 2) commercially operationality and sustainability of the railways in BiH including energy consumption, supporting costs of rolling stocks, personnel, commercial activities. The tariff structure is also prepapred in such a way that the railway freight may be more economical for long distance transport than road transport.

For the passenger tariff, various discount systems are existing for return ticket, student ticket, season ticket, etc. These incentives need to be further explored to meet the deamand and effectively attract railway passengers. In general, the tariff should be cheaper or approximately equal to the bus transport. If travel time and frequency be return to normal state, the number of passengers is expected to increase. At present, however, the actual commercial service level is far from the normal service level.

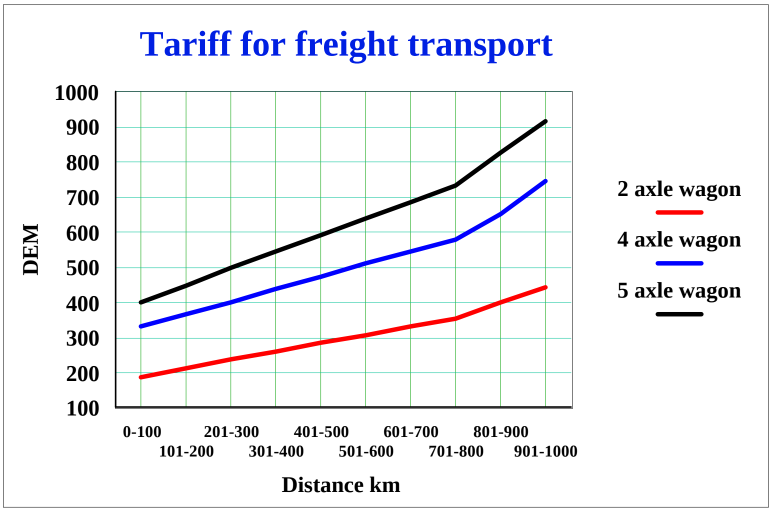


Figure 3.20 Tariff Structure of Freight Transport (example)

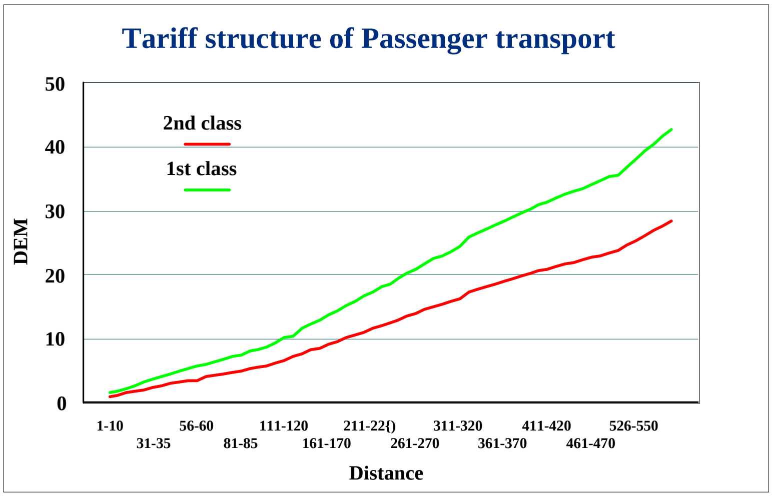


Figure 3.21 Tariff Structure of Passenger Transport (example)

3.7.3 Institutional Issues

Several institutional aspects still remain in order to restore the railways in BiH. The following issues are particularly important to be addressed.

(1) Strengthening of Absorptive Capacity

Massive investments will be required to rehabilitate and further improve the entire railway systems, including not only the infrastructures but also maintenance facilities and equipment. For this, concessional loans and/or grant funds need to be accepted from international donor organizations. It must be a focal issue whether or not the BiH railway organizations will be able to implement the projects/programs smoothly and properly as planned and expected. Therefore, important is to strengthen the BiH railway organizations' absorptive capacity to make use of those funds. In this regard, there are two areas to be addressed: technical and financial:

As for the technical aspect, the managerial capability for the implementation of projects/programs is a focal issue. Rational decision-making and management for the international competitive bidding (ICB) process should be undertaken for fair procurement of goods and services necessary for the implementation of the project. The project management should be done with internationally common rationales.

While, as for the financial capacity, it must be a central concern particularly for loan projects as shown below.

- In usual cases, the recipient should prepare some counterpart budget equivalent to a certain percentage of the total project cost. The counterpart budget should be prepared by Bosnia and Herzegovina side, if necessary.

- The loan projects should be financially feasible or inherently of cost-recovery based on the commercial operation. The repayment needs to be covered from the revenues to be yielded from the sales of services even in the long-term. A reasonable, reliable, and stable revenue system should be established including other revenue sources such measure as renting a state-of-the-art communication system.

- Recurrent expenditures to properly and sustainably operate, manage and maintain the project/program should be provisionally considered. A new project/program bears additional expenditures as par of the recurrent costs, which sometimes brings a new financial burden which otherwise would not take place. The additional expenditures should be spent for increasing revenues by seeking careful financial studies.

The above absorptive capacities need to be further strengthened through a comprehensive capacity building programs to be assisted by the international community.

(2) Structuring of a Commercial Based Operation System

The railways need to be operated on a commercial basis, as a reliable and economically advantageous transport mode both for freight and passenger movements in the market oriented transport sector in BiH. Because, the entire transport system should be geared with the economic reforms towards the market-driven economy. The centrally controlled transport assignment system do/will no longer function to support the economic activities, but a competitive market mechanism works for transport modal choice. All transport modes, therefore, should be competitive in provision of transport service in terms of pricing and quality. The railway is not the exceptional case.

Currently, the BiH freight transport cost is relatively high, thereby loosing its international competitiveness in neighboring countries as well as the European Region. This provides with significantly negative impacts on the industrial sector that needs to be recovered and restructured. As for the railway freight, because the railway system has not fully functioned in the network, the freight transport rate is ranging from **6.8** to **8.5** US cents per ton-km, depending upon shipment goods (bulk or not). This rate is extremely high, compared with 3 to 5 US cents per ton-km in Poland; 3.8 to 8.2 US cent in Croatia; and 4.3 US cents in Belgium. Meanwhile, the World Railway Industry considers 3.0 US cents per ton-km as a standard target rate.

Thus, the freight rates in BiH are high in spite of lower labor costs and lower petrol prices than those in the Western Europe. The transport rates are, of course, determined with a variety of efficiency factors such as vehicles, drivers, management aspects, amount of demands and conditions of infrastructures of railways. Innovative changes and reforms are necessary in all the factors to make the railways in BiH more operationally rational and internationally price-competitive.

(3) Integrated Operation for Borderless and Seamless Transportation

In order to strengthen the competitiveness of the railways, it should be operated in such an efficient manner the railway's strength can be activated, namely the longer haulage, the more cost-advantageous. European experiences suggest that the railway is most competitive with the car for business trip at distances of over about 400 km. It is also observed that the railway transport demand is considerably stable for the service with more than 1,000 route-km operation. However, it should be noted that high-speed train service is indispensable to be competitive in longer distance travel market as experienced in developed countries.

Based on these implications, and taking into account the importance of international transport relations with neighboring countries, the railways of ZBH and ZRS should not be separately operated, but are collectively operated in an integrated manner to provide borderless and seamless transport services. This must be a basic premise to make the railways sustainably functional.

(4) Integration of Developing Railway Technology

In line with the above discussion, technological development should be further pursued at the same level for both ZBH and ZRS. Since the railway is an integrated technology, one side development of the technology cannot work effectively, rather be problematic than do-nothing. The both railways need to gradually apply the European technical standards for infrastructures, facilities and equipment for the safety system with the same timing. In this regard, it is also expected that maintenance facilities and equipment owned by each Entity be mutually utilized for not only financial benefits but also technical benefits.

(5) Privatization Policy

To improve the enabling environment for private sector participation in the economy, OHR is assisting State and Entity authorities to prepare a BiH wide cross-sectorial model for Concession Legislation. A working group between the State and Entity authorities has been established to tackle this task. The eventual legislation will be enacted at both State and Entity level, but with both levels being consistent with each other. This initiative will be of particular interest for the transport sector.

As a measure for more efficiently commercialized operation of the railway based on market mechanism, some models of privatization schemes should be further explored for services such as cargo handling services, station building management and other rail-related and off-rail business. Several alternatives can be conceivable for the model schemes such as a BOT type and a concessionaire system.

(6) Education and Training

An enhanced education and training function should be restored and/or re-strengthened for the railway staffs. Without a well-organized continuing education and skill refreshment training system, the railways could not be operated and managed as a reliable transport mode. This important task would be achieved by the Transport Training Institute, which was described in Volume I.

CHAPTER 4: AIR TRANSPORT

4.1 INTRODUCTION

The main purpose of this section is to forecast air passenger and cargo flows for the 2020 and, following this, to determine the priority investment requirements for the period 2000-2005. In order to put the aviation sector in context within the European aviation sector, past trends both in Europe and the BiH are outlined in Section 4.1.1. Based on the past volumes of traffic in the BiH, Section 4.1.2, and an analysis of air traffic in other European countries, forecasts for the country as a whole and broken down by individual airport are presented in Section 4.2.

On the basis of these forecasts and the present airport capacities, an infrastructure plan has been developed and this is contained in Section 4.3. Operational aspects (air navigation services) are contained in Section 4.4 and financial aspects are given in Section 4.5. Finally, the priority projects for the sector, with costs, are discussed in Section 4.6.

4.1.1 European and Regional Context

The last decade has seen an increasing trend of privatization and deregulation taking place within the European aviation sector. This has led to increasing competition between airports as they seek to attract airlines to use their facilities. Because of the privatization process, there has been a need for individual airlines to make profit through a careful selection of routes, by increasing their aircraft loading factors and making optimum use of their aircraft fleet. Over the same period, the hub and spoke system has developed, enabling airlines to provide more cost-effective decisions regarding routing. No longer can airlines rely on subsidy to remain in operation and airports cannot rely on government intervention to force airlines to use routes. Furthermore, competition has increased over shorter distances as transport links have been improved for other modes. At the same time there has been an increasing demand for passenger air travel as countries get more affluent and the price of airfares has reduced, in real terms.

The main regional airport hubs that are relevant to the BiH are shown in Figure 4.1. Around each airport are shown concentric rings of 600-kilometer radius. The map is shown mainly to reinforce the picture of the intensity of airport competition in the region. A developing airport hub will concentrate services and be attractive to airlines. Vienna, for example, has already developed into a main hub for services to the BiH.

Figure 4.1 International Context of Regional Hubs

Bosnia and Herzegovina has four main airports, all of which, to a greater or lesser extent, have international air traffic. In addition there is competition from neighbor countries i.e. the airports of Zagreb, Belgrade, Split and Dubrovnik.

Accessibility to airports is also important. Figure 4.2 shows a series of concentric rings, between 100 and 300 kilometers in radius, around the four airports of the BiH. This illustrates the competition for air traffic within the country. The proximity of the main airports to each other, and the relatively small size of the country, will mean that there are unlikely to be significant levels of domestic air traffic.

Figure 4.2 Main Airports in Bosnia and Herzegovina

4.1.2 Past Developments in Air Traffic, BiH

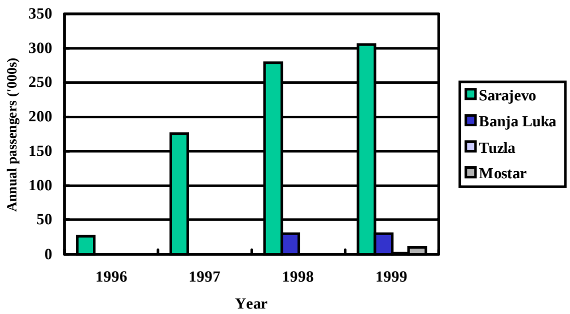
The recent situation regarding volumes of air passengers in Bosnia and Herzegovina is shown overleaf in Figure 4.3.

In 1999 Sarajevo catered for 304,000 passengers, and it's average over the last four years was 280,000. The Sarajevo Airport was the only one airport in BiH that all civil aviation has been performed with the infrastructures and technical facilities available.

The situation in the remaining airports is a little more complex. Historically, these airports have served a lesser role. Banja Luka and Tuzla are former military airfields and, thus, are new entrants into the international air market. Evidence from Mostar shows something different with volumes of almost 100,000 passengers recorded, mainly religious pilgrims in the early 1990's. It must be said, however, that all flows at the three smaller airports have been partly constrained due to air navigation equipment and other limitations.

Total passenger volumes for BiH as a whole, in 1999, were approximately 340,000.

(1) Annual passengers ('000s), by airport (1996-99)



(2) Annual cargo (tons), by airport (1996-99)

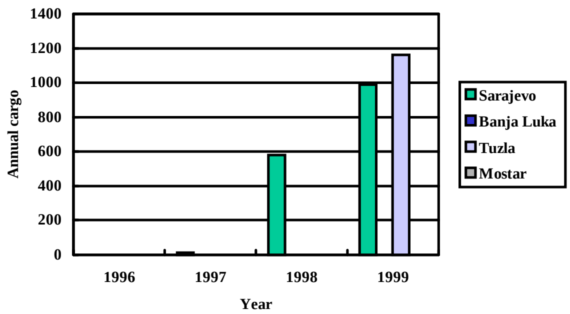


Figure 4.3 Annual Passengers/Cargo, 1996-99

4.2 AIR TRAFFIC DEMAND FORECASTS FOR BIH

4.2.1 Methodology

(1) Introduction

Forecasting future air traffic growth is difficult because of the transition process that has taken place and because some of the airports are only now beginning to commence civilian operations.

Possible growth trends for BiH will depend, in particular, on its greater integration within Europe as a whole. Current and past trends within BiH make forecasting difficult for several reasons:

- The effects of the war have distorted traffic patterns and there is hardly any recent historical data to allow for the determination of traffic development trends on which short and medium term forecasts are usually based;
- The status of certain airports has changed dramatically: especially Sarajevo was used primarily for domestic traffic as a regional point of the Yugoslavian airport system, whilst now it is the political and economic capital of a sovereign state.

Other airports such as Banja Luka and Tuzla were purely military airports but now operate as civilian airports. The post war conditions will affect to a great extent the type and volume of traffic which will develop at the various airports; and

- The BiH economy is currently in a transitional phase; it is likely that during this transitional reconstruction phase the GDP will be substantially different from the long term GDP; also quite a high proportion of passenger and cargo traffic is linked to the transport of personnel working in international agencies in BiH at the present time to assist in the reconstruction phase; this traffic may diminish over the next few years.

- Investments have, since end of the war, predominately focused on Sarajevo Airport with relatively modest allocations to other airports. Further, the international community is overwhelmingly represented at Sarajevo Airport. These considerations partially explain the present activity balances between BiH airports.

It is to be recognized that future traffic scenarios may be completely different from past scenarios.

(2) Forecasting Methodology for Passengers and Cargo

The methodology applied for passengers was as follows:

- Based on air traffic flows for other Eastern Europe countries, the total passenger volume for the BiH as a whole, in 2020, was forecasted. GDP per capita forecasts for BiH, made by BiHTMAP, were utilized and price elasticities were also taken into account.

- Based on the known traffic volume at Sarajevo Airport, and after deducting traffic relating to current military and humanitarian agency personnel, reasonable traffic growth rates and income elasticities were applied to produce a passenger forecast for the year 2020, for Sarajevo Airport.

- The remaining traffic for the country as a whole was split by other airport on the basis of approximate population catchment areas, taken into account accessibility to Sarajevo Airport as well as their own unique functions to be expected.

- The forecasts are assessed, reviewing the existing forecasts made by available previous studies.

The methodology applied for cargo was as follows:

- For Tuzla, Banja Luka and Sarajevo airports, growth rates based on worldwide indicators were applied to base 2000 cargo flows to produce forecast flows for the year 2020. Some account was taken of current levels of military and humanitarian agency cargo flows. A similar figure was used for Mostar.

- These forecasts are assessed, reviewing the forecast figures for the airport's own master plan such as Sarajevo and Banja Luka.

(3) Base Factors for Forecasting

1) Air Passenger Traffic Growth in Relation with GDP

GDP growth is considered to be the main driver of air travel growth (the Boeing 1997 *Current Market Outlook* states that two thirds of air travel demand is explained by GDP growth) and the most widely used method to forecast demand for air travel is to relate travel demand to economic development of a country.

The link between economic development and growth is clear. Business travel will increase as the economy of a country develops. At the same time, as people's personal income level rises, air transport becomes an option to travel longer distances to holiday destinations. The relationship between air travel and income (GDP) changes can be measured by an income elasticity. Income elasticities vary between market segments. For example, business travel shows in most studies lower income elasticities than leisure travel. Also the stage of economic development of a country influences the responsiveness of the demand for air travel in relation to economic growth.

2) Passenger Growth Rates

Most existing long-term world forecasts are either made by international aviation organizations, such as IATA and ICAO, or by aircraft manufacturers (Boeing, Airbus) for which market forecasts are essential. A number of existing traffic forecasts for Central Europe are shown in Table 4.1.

Table 4.1 Some Existing Air Transport Forecasts for Central Europe

Source	Traffic	Routes	Period	Average Annual Growth Rate in %
IATA, 1994	Pax	CE Eur. – W. Eur.	1995-2010	6.6%
Boeing, 1997	Pax (rkm)	CE Eur. – internat.	1996-2006	7.5%
	Pax (rkm)	CE Eur. – internat.	1996-2016	6.6%
Airbus, 1997	Pax (rkm)	CE Eur. – internat	1998-2008	6.1%
	Pax (rkm)	CE Eur. – internat	1996-2016	5.4%

Sources: *IATA, European Traffic Forecasts, 1991-2010*; Boeing, 1997, *Current Market Outlook*; Airbus, *Global Market Forecast 1997-2016*

In general, the forecasts foresee a passenger growth in the first ten years, followed by a relative slowdown in the subsequent years. For international passenger travel, growth rates have been assumed for this JICA study which are in line with existing international forecasts.

Traffic growth curves have also been reviewed for the Ljubljana and Zagreb airports. Both airports were also dedicated domestic airports in the former Yugoslavian airport system whilst now the cities of Zagreb and Ljubljana have become the political and economic capitals of the sovereign states of Croatia and Slovenia respectively.

In both cases there was an initial adjustment period which lasted 5 years with varying traffic growth rates per year. Subsequently a period of consolidation followed with average traffic growth rates of 7% per annum (2% for Zagreb and 12% for Ljubljana).

3) Income and Price Elasticities

Most demand studies in recent years have produced results indicating income elasticities for various categories of passengers that are usually between 1.5 and 2.5. However, business and necessary traffic takes a large share of present traffic. Since these markets segments will show lower elasticities, the income will most likely be in the range of 1.0 to 1.5. For calculation purposes, an income elasticity of 1.25 will be taken. This means that the air passenger demand will increase by 1.25%, as the per capita income level of the sate uplifts at a 1.0% growth.

The effect of changes in the price of airfares must also be taken into account. Studies have shown that price elasticities for air passengers, for international leisure trips, are in the range -1.5 to -2.2, i.e. as the fare price decreases by 1% then demand increases by between 1.5% - 2.2%. Price elasticities for business travel are much lower, of the order of -1. For this study, a price elasticity of 1.7 has been taken.

(4) Passenger Growth Rates

The future economic development of Bosnia and Herzegovina has been outlined in two economic scenarios by the JICA study team. Both scenarios consider the period to year 2005 as a “reconstruction period” and the period after 2005 as a “potential development period”. Up to 2005, a growth rate of 7.8% is expected in both scenarios. According to the pessimistic growth scenario, average growth rates of 4% are expected for the period 2006-2020, while the optimistic scenario predicts an average growth rate of 5%.

On the basis of above considerations, the passenger growth rates for international traffic have been calculated as follows:

- Up to 2005 (reconstruction period) the growth scenario would be 7.8% times 1.25 (i.e. 9.75%);

- For the period 2006-2020, the pessimistic growth scenario would be 4% times 1.25 (i.e. 5%); and

- For the period 2006-2020, the optimistic growth scenario would be 5% times 1.25 is (i.e. 6.25%).

The forecast demand for air travel will then be an average of 6.2% (overall weighted) for the pessimistic scenario and 7.1% (overall weighed) for the optimistic scenario. This forecast is in line with forecasts made by other international agencies shown above.

4.2.2 Air Passenger Forecast for the Whole BiH, 2020

For this study, air traffic for Eastern Europe in 1999 was analyzed and the relationship was confirmed between GDP per capita and volumes of passenger traffic. Some countries were omitted because of either the absence of data or because of other factors i.e. the Russian Federation which, because of the distances involved, has a significant proportion of domestic traffic. The results, as seen in Figure 4.4, show a fairly significant correlation between the two variables.

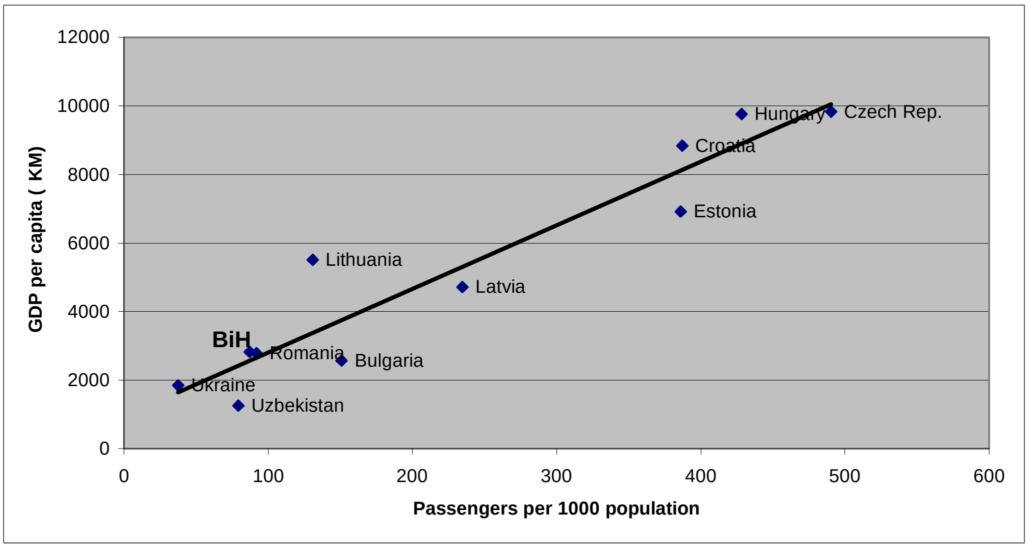


Figure 4.4 GDP per Capita – Passengers per 1000 Population, Eastern Europe, 1999

The trend line can be represented by a regression equation:

PCG = 18.55 PXP + 944.73 ($R^2 = 0.95$)

Where,

PCG: GDP per capita (KM); and

PXP: Air passengers per 1,000 population.

On the basis of the high growth economic forecasts made by the JICA team, the approximate volumes of passengers **<u>for the whole of the BiH</u>** can be calculated for the year 2020. Assuming that the relationship, as shown above, holds the estimated BiH volumes would be approximately 1,258 thousand passengers.

One further factor was taken in to account. Airfares, in real terms, have decreased by 1% per year over the last 10 years. It has been assumed that this trend will continue for a similar period for the future but after this period prices will remain stable. Based on a price elasticity of -1.7, this will increase passenger demand by a further 18%.

Based on this methodology, it is then estimated that the total volume of air passenger traffic, in the year 2020, will be approximately 1,484 thousand passengers. This is four times higher than existing flows.

On the other hand, given assumptions of the growth rates, the income and price elasticities and the base year passengers of 340,000 as determined earlier, it can simply be computed that the passenger traffic accounts for 1,590,000 in 2020. The results derived from both methodologies are not significantly different, hence, it can be concluded that the air passenger traffic for the whole BiH will fall in a range between 1,500 to 1,600 thousand in the year 2020. For a convenience, the average volume of 1,550 thousand is applied as a BiHTMAP estimate.

Meanwhile, applying the same methodology and using the case of lower economic growth forecasts, the total passenger volumes forecast for this economic scenario, for the year 2020, is approximately 1,200 thousand. Although this pessimistic case is one of the likely scenarios, for the sake of discussing facility requirements to meet the demand, the figure based on the higher growth scenario is adopted.

Table 4.2 Air Passenger Traffic Volume Estimate for the Whole BiH

	2000	2005	2010	2015	2020
Air Passenger Volumes of the Whole BiH	340,000	570,000	850,000	1,150,000	1,550,000

Source: BiHTMAP

Figure 4.5 shows the future position of BiH in 2020 in comparison of the current state of other Eastern Europe countries in the coordinates of GDP per capita and air passengers per 1,000 population. As seen in this figure, the BiH position will be shifting along with the trend line, but be a bit predominant in the air passenger demand, compared to the economic level.

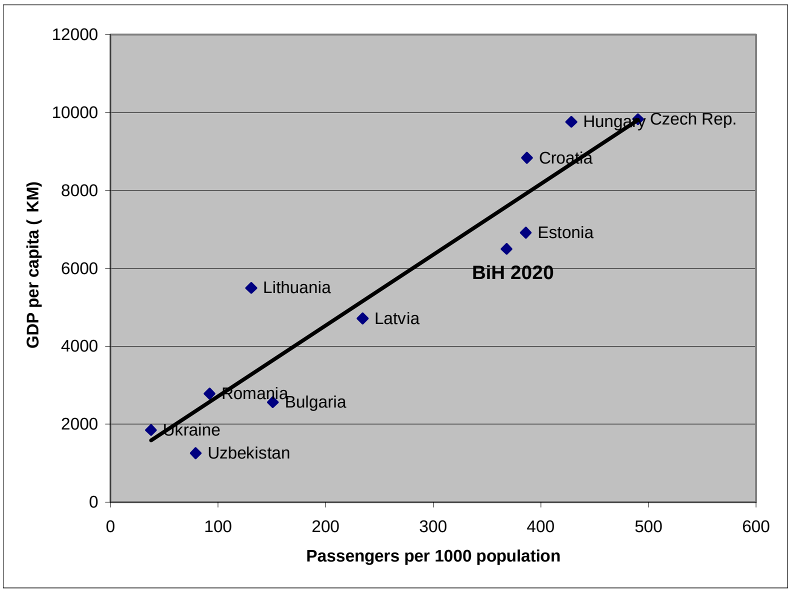


Figure 4.5 Future Position of BiH 2020 in the Current State of Eastern Europe

4.2.3 Passenger Demand Forecast for Individual Airports

(1) Sarajevo Airport

In order to establish the future air passenger and cargo flows, some assumptions will need to be made on the level of "normal" traffic for the start year 2000, before applying above percentage growth forecasts. Based on the 1998 and 1999 figures, adjustments have been made to the base 2000 volumes.

Passenger and cargo flows in 2000 have been decreased by a margin of 25% from the flows measured in 1999; this is to discount the proportion of passenger and cargo traffic linked to the aid and military presence working in BiH at the present time (part of the military personnel is also flown in through civil air transport means). From local sources it is understood that the aid community has already decreased in numbers from 18,000 in 1998 to 10,000 in 2000; the same applies to the SFOR presence: from 30,000 in the beginning to approximately half in 2000. Therefore the base figure, for the year 2000, for passenger volumes is of the order of 250,000.

Based on above starting flows in the year 2000, and based on the growth rate percentages determined in the previous paragraphs, the future passenger flows for Sarajevo Airport is shown as follows.

Table 4.3 Forecast Passenger Flows, Sarajevo Airport, 2000 – 2020

	2000	2005	2010	2015	2020
High growth	250,000	350,000	500,000	700,000	1,000,000
Low growth	250,000	320,000	400,000	520,000	660,000

Source: BiHTMAP

The Final Master Plan document, as of January 1999, produced by Italian Consultant S.E.A. Aeroporti di Milano, has been reviewed by the JICA team and found very comprehensive. The following comments are made in the context of the traffic forecast. The projected passengers in the year 2020 account for 2,360 thousand under an optimistic hypothesis and 960 thousand under a pessimistic one, thus there exists a great difference between both cases. As a result, it shows that in the reference scenario, i.e. this is the average scenario, amount to 1,550 thousand passengers in the year 2020. This is approximately 100% higher than the average growth forecast (830,000 passengers) made by the JICA team. It is assessed that this projected figure seems to be remarkably or unrealistically high, because it is just the same number of the passenger volume for the whole BiH projected by the JICA team. Therefore, the projection is considered to be one of the would-be-possible scenarios.

Nevertheless, it can be said that for the purpose of assessing airport capacities and, hence, future investment needs, the JICA volumes are within the capacity limits.

(2) Distribution of Remaining Passenger Volumes by Airport

The volumes calculated for the year 2020 indicate that, after taking account of traffic served by Sarajevo, a volume of 550 thousand passengers must be split between the three remaining airports. The rationale for making such a split is that it is highly likely that the majority of traffic will center on Sarajevo because it is already established and that the airport will attract airlines because of the facilities already established there. The criteria to make a rational decision for future distribution of air passenger traffic are: 1) air transport service catchment areas; and 2) expected airport functions.

The approximate air passenger catchment areas for the three remaining airports are Banja Luka: 800,000, Tuzla 1,125,000 and Mostar: 330,000. Potential catchment areas for each of the three airports are shown below in Figure 4.6. However, because of their proximity to Sarajevo (approximately 2 hours by road), it is considered likely that Tuzla and Mostar will continue to lose some traffic to Sarajevo airport and the catchment areas were reduced by 50% for calculation purposes. Finally, some account was taken of the particular flows i.e. pilgrims that may be attracted to Mostar airport.

It must be stated that the difficulties in forecasting at the current time indicate that only approximate ranges can be given. Actual volumes will be dependent on individual airports to attract additional traffic, particularly away from Sarajevo airport. In this respect, Banja Luka is the best suited because of the travel distances involved. However, for other reasons i.e. Tuzla serves an industrial area with high population, and Mostar can cater for tourist traffic, there are possibilities for increasing passenger traffic at these airports.

The unique role of Banja Luka airport should also be noted. Even though the current passenger volumes are modest, its potential could differ from that of other airports in that it serves as the gateway to Republika Srpska. Banja Luka and its environs also represent a focal point for the Republic in terms of governmental, social and commercial activities. It is expected in the near future that should Banja Luka Airport be fully equipped with necessary infrastructures and technical facilities for safe operation, more international air links with other European cities could be opened.

The exiting study titled “Development Plan for Banja Luka Aerodrome (1999)” indicates a projection that the future air passenger demand will account for 580,000 in the year 2020. This is based on the accumulation being increased at expected annual growth rates. Thus, forecasts for Banja Luka airport could exceed expectations, and this exaggerated figure might be theoretically achievable possible, however, it would be determined by market forces and economic evolution.

On this basis and after distributing the 550 thousand passenger volume, the possible 2020 passenger flows are shown in Table 4.4.

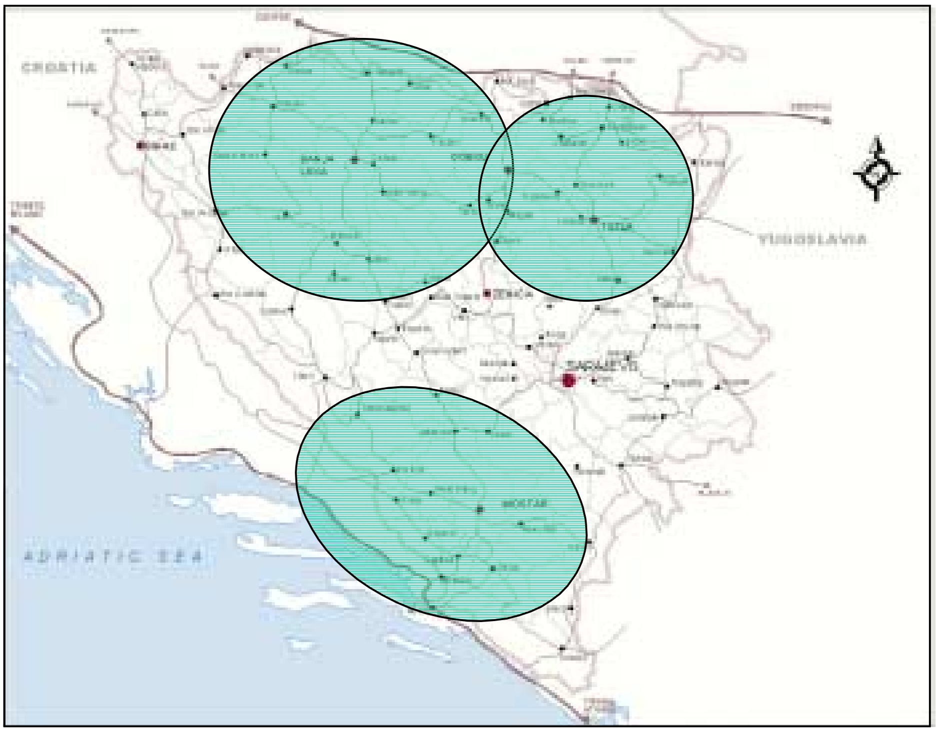


Figure 4.6 Potential Airport Catchment Areas, Banja Luka, Mostar, and Tuzla

Table 4.4 Passenger Volumes, Banja Luka, Mostar, and Tuzla Airports, 2020

	Annual Air Passengers	Reference: Lower Estimate Case
Banja Luka	**250,000**	150,000
Mostar	**150,000**	100,000
Tuzla	**150,000**	100,000

Source: BiHTMAP

4.2.4 Cargo Forecasts

Based on the JICA team's experience, air cargo traffic is much more difficult to predict: the number of variables is much greater (type of cargo, value of cargo, development of local export oriented industries, availability of other modes of transport, significant increases in annual income per capita, significant increases in purchasing power, etc).

(1) Existing Forecasts for Air Cargo Transport Demands

Some previous studies predict air cargo traffic volumes in the future. As previously stated, the master plan carried out by the Italian consultants S.E.A. Aeroporti di Milano estimated an annual volume of 60,000 tons for Sarajevo Airport as a reference scenario.

Taking into account Tuzla's Canton industrial potential and high population, Tuzla Airport could have a potential as an air cargo center for the Tuzla Kanton in conjunction with the proposed development of a free enterprise zone and in conjunction with the rehabilitation of the single line railway close to the airport and connected to the main railway network. Studies carried out by Louis Berger, on this basis, indicate very high cargo flows (28,000 tons in 2004 and 67,000 tons in 2009) based on extremely high forecasts of GDP growth (37% in 1997up to 2000 and 18% there after up to 2009.

The Development Plan for Banja Luka airport, prepared in 1999 for Banja Luka for the airport authorities, forecasted 2,500 tons of cargo in the year 2020.

(2) Forecasting Future Flows

A similar methodology to that used for forecasting passenger flows i.e. analyzing flows in other Eastern European countries, was used initially to assess future cargo flows, but the results achieved were inconclusive because it was considered that the spread of cargo to country GDP was too extensive to be of use, or no significant correlation between the GDP and air cargo flow volumes.

On the other hand, based on world-wide trends and experiences (ref. Global Market Forecast, Airbus Industries), it has been observed that cargo traffic growth rates in other countries range between 0.5 times and 4.0 times the average passenger traffic growth rates. This range is also very wide and, for practical purposes and to indicate the range of possibilities, factors of 1 to 3 (assumed to be the high and low growth scenarios respectively) have been considered. For calculation purposes, this would lead to annual growth rates of between 20% and 10% per annum.

For Tuzla airport, the 1999 cargo flow has been retained as the cargo flow for the year 2000, for estimation purposes. After adjusting military and humanitarian agency traffic, a base flow of 750 tons is taken for Sarajevo airport.

In the absence of better information, the 2020 forecast cargo flow of 2,500 tons has been taken for Banja Luka and it is assumed that a similar flow is potentially possible at Mostar. This is assumed to be an average flow and some adjustments have been made for a high and low growth scenario i.e. 1.5% above and below the average growth rate.

The provisional resulting cargo flows, forecast, for the year 2020, are shown below in Table 4.5.

Table 4.5 Provisional Estimate of Air Cargo Flows, 2020

Airport	**High growth (tons), 2020**	Low growth (tons), 2020	Average growth (tons), 2020
Sarajevo	**28,750**	5,000	17,000
Banja Luka	**3,250**	1,800	2,500
Mostar	**3,250**	1,800	2,500
Tuzla	**43,000**	7,500	25,000

Source: BiHTMAP

These forecast flows are indicative only but potentially realizable and are compared with existing facilities to identify future investment requirements. In the case of Tuzla, the proposed establishment of a free enterprise zone, with associated facilities, will be needed to ensure the higher levels of cargo forecast.

4.3 AIRPORT INFRASTRUCTURE DEVELEMENT

4.3.1 General

The major observation from site investigations is that the main infrastructural elements are now in place. However, moderate investments would increase the operational capacity of airports and improve safety, which is of utmost importance. These limited improvements concern, primarily, navigational aids and, for example, the provision of an aircraft apron at Tuzla and Banja Luka to increase its operational capacity.

It is assessed that most of the airports will have sufficient capacity, after some moderate improvements, to cater for these volumes, although considerable additional investments may well be required in the medium- and long-term, particularly at Sarajevo and Banja Luke airports.

The overall infrastructure development in the air transport sector needs to be liked with substantial improvements in other transport sectors. This will improve airport accessibility. At the same time, it ensures that there will be less demand for domestic air services.

Infrastructure plans have been drawn up for the four main airports separately (Sarajevo, Mostar, Tuzla and Banja Luka) as each airport is primarily operating independently. An indicative implementation timeframe has been given for each component to ensure timely compliance with: 1) safety and security issues to international standards; 2) conformity with international service standards; and 3) traffic demand growth. The subject of smaller airports and training requirements are also addressed. Investment components are summarized at the end of this sub-section.

4.3.2 Individual Airport Development Plans

(1) Sarajevo Airport

The master plan, produced by Italian Consultant S.E.A. Aeroporti di Milano, related to the ultimate runway capacity up to year 2020, has been found extremely relevant. As the runway capacity is the most limiting factor in the development of Sarajevo Airport due to meteorological and geographic conditions at this particular site, the study indicates clearly and convincingly that with adequate operational measures and minor technical improvements to the taxiway configuration, the runway capacity can accommodate the projected passenger and cargo flows.

It is expected that there will be imminent completion of a number of on-going projects at the airport. Those include rehabilitation of new terminal building plus airside car park, rehabilitation of cargo building, completion of control tower and equipment supply, completion of airfield lighting installation, completion of supporting technical facilities such as a boiler house. These on-going components, as of 2000, are not included in this infrastructure plan.

The infrastructure plan has taken account of the Master plan Report of S.A.E. Aeroporti di Milano of January 1999 with full details on facility sizings.

(2) Banja Luka Airport

Banja Luka's present airport terminal building should be renovated as a gateway of the Entity, being able to cope with 250,000 passengers at least in the medium-term. Since the basic infrastructure is in place, in principle, short-term passenger traffic flows should be accommodated without major constraints. However, given the range of passengers forecast, the development of new facilities will be necessary in the medium- and long-term.

The cargo volumes are much more volatile; as soon as new traffic trends become visible new traffic forecasts should be made. The cargo building area (excluding airside paved area but including external land side paved area for parking, maneuvering, loading/unloading) will, however, have to be developed.

As the airside infrastructures such runway, taxiway and apron has an adequate area-wise capacity to deal with even long-term traffic flows, the special facilities such as cargo, extension of terminal building, commercial space, parking areas, etc. would need to be further developed. This could be done in a very modular approach to cope with increased traffic flows as and when they take place.

The extent and nature of above named facilities (i.e. cargo building, extension of terminal building, commercial and parking areas) are prime targets for private investment as they are fully driven by commercial demand and should therefore be implemented through public-private partnership. This will ensure timely accommodation of the increased cargo traffic flows.

Some genuine requirements would still need to be satisfied at the beginning of the development process described above: minimal initial cargo building, improvement of airport safety and security.

The infrastructure plan has taken account of the Master plan prepared for the airport in 1999.

(3) Mostar Airport

Mostar Airport should presently be able to cope with approximately 150,000 passengers. The basic infrastructure has been in place, so in principle the short-term traffic flows should be accommodated without major constraints.

As soon as new traffic trends become visible (preferably through hard facts i.e. number of passengers, aircraft movements, eventually cargo etc. counted during at least three consecutive years), actual traffic forecasts should be made. Charter flights movements for a tourism purpose will be further accommodated.

Although the airside infrastructure (runway, taxiway, navigational and lighting aids) has adequate capacity to deal with even the long-term traffic flows, the terminal building would need to be further developed while cope with increased traffic flows

Same as the other airports such as Banja Luka, the extent and nature of above named facilities (i.e. terminal building, cargo building, commercial and parking areas) are prime targets for private investment and should therefore be implemented through public-private partnership. This will ensure timely accommodation of the increased traffic flows.

Some genuine requirements would still need to be satisfied during the development process described above: airport safety and security.

(4) Tuzla Airport

The existing basic airport infrastructures, including civil and building infrastructure, with the exception of a proper apron and minimum cargo building at Tuzla Airport, is generally adequate for passenger flows up to 150,000 per annum, referring to the size of the new terminal building of 900m^2, and the peak hour design capacity of 120 passengers/hr; also, up to 50,000 aircraft movements.

Implementation of missing elements in the basic infrastructure set up, such as an apron area, a minimum cargo building, an access road, and improvement of safety and security standards to international standards, is considered as a pre-requisite to stimulate further air traffic growth (passenger and cargo).

Facility capacities have been taken from the preliminary Master plan studies carried out by IPSA in April 1999 and from the Sarajevo Master plan for the cargo building sizing.

(5) Smaller Aerodromes

At the master plan level, the issue of developing smaller airports is of lesser relevance. The Study did not make an extensive survey of the requirements of all small airports within the country. There exist a number of aerodromes over the country for uses of not only business transport but also sport and flight training. A further study is required to confirm actual investment requirements for all smaller airports, thus, a feasibility study is recommended to be carried out to identify the airports needing investment, taking into account a number of selected aerodromes such as Bihac (Zeljava) and Visoko in FBiH and Prijedor, Zaluzani, Sokolac, Trebinje and Bijeljina in RS.

Geographical setting of the air aviation system for the entire country should also be delineated, taking into consideration some strategically and functionally important aerodromes. The following technical components for these small aerodromes should be clarified:

1) Improvement of proper and safe general aviation operations, including repair of damages on existing runway infrastructures; and installation of basic equipment (e.g. direction finder, wind cone, etc);

2) Development of minimum aerodrome infrastructure to stimulate further growth, providing minimum building and other operational requirements.

(6) Other Matters: Alternative for Sarajevo Airport

In order to consolidate its position, Sarajevo Airport needs to organize and develop an alternative airport within Bosnia and Herzegovina.

This would definitely increase the level of reliability and service to incoming and outgoing passengers (and cargo) the whole year round, albeit the additional inconveniences to and from the alternative airport should be minimized.

At specific times, in winter especially, when meteorological conditions are poor, Sarajevo Airport is no longer operational: outgoing flights are cancelled and incoming flights are cancelled or return to their home base outside BiH. It is the poor visibility, in relation to the geographical surroundings of Sarajevo Airport and demanding consequently very critical "missed approach procedures" which account for the lower usability of Sarajevo Airport at those specific times.

The alternate airport to Sarajevo Airport should therefore fulfill the following requirements:

- Usability factor of (close to) 100% under prevailing meteorological, geographical and operational conditions;
- Compatibility of airport facilities: runway length, strength, landing aids, minimum terminal building facilities for international traffic, etc;
- Location in close proximity to Sarajevo; in the international context, "close" could be defined as within approximately two hours from Sarajevo by land transport (road/rail-private/taxi/public); and
- Minimum investment requirements.

The most logical choice as an alternative airport to Sarajevo Airport would be Mostar Airport, although the airport holds a topographical constraint hindering safe aviation in the surroundings. As a matter of fact, Mostar Airport was built for the Winter Olympics of 1984 as an alternative to Sarajevo Airport.

The possibility of promoting Visoko Airport as an alternative has been historically discussed. Visoko has the advantage of being much closer to Sarajevo. This might be feasible in the very long-term if economic conditions improve considerably. However, any investment at Visoko should be subject to further cost-benefit analysis as well as technical issues.

4.3.3 Other Projects: Training / Licensing / Certification

With respect to the procurement of any airport equipment, adequate on-the-job and factory training should be included in any procurement contract. Said training will primarily focus on operational and maintenance aspects.

(1) Training and Certification

With respect to CFR services additional "formal" training is required to ensure CFR staff is certified to international standards. This type of formal training to be carried out through established international training centers outside BiH (such as ICAO Civil Aviation Training Schools, FAA training centers, Singapore Aviation School, etc).

(2) Training and Licensing

With respect to ANS services, reference is made to the next Section 4.4.

All these training/certification/licensing projects need to be addressed in the short term to meet international safety and security standards as soon as practicable.

Table 4.6 Project Components for the Infrastructure Plan – Sarajevo Airport

1. Improvement of safety and security standards to meet international ICAO standards:
• Improvement of site conditions (runway strip, perimeter fence, access control, operational roads) • Improvement of runway shoulders, taxiway system • Relocation of CFR facilities and re-equipment • Relocation of fuel farm • Preparation of areas for solid waste disposal and water treatment plants (environmental impact and air safety i.e. bird strike impact) • Installation of radar for terminal [SSR: secondary surveillance radar] (subject to further study on operational aspects and feasibility study on required investments) *These project components need to be addressed in the short-term (2000-2005) to meet the international standards as soon as practicable and to ensure future international demand and growth of traffic; a specific list of these projects with cost estimates is presented in the priority project paragraph.*
2. Development of Sarajevo Airport:
• Acquisition of lands in accordance with master plan development • Designation of Mostar as full alternative airport to Sarajevo; resolve all operational, technical, organizational constraints *These project components need to be addressed in the short- to medium-term (2000-2010) to ensure continued future international demand and growth of traffic.*
3. Increase connectivity to airport
• Improve/extend road connections to existing and new road infrastructure (e.g. E762, E761) • Improve/create public transport services *These project components need to be addressed in the short- to medium-term (2000-2010) to avoid landside congestion of airport facilities and to avoid negative impacts on the surrounding road infrastructure of the urban development of Sarajevo during said period and in the long term.*
4. Increase operational capacity
a) Increase airside operational capacity • Lengthening and strengthening of runway • Further improvement of taxiway system including holding positions • Extension/new aprons b) Increase operational capacity special facilities • Further extension terminal building • Further extension cargo buildings • Other facilities: technical/administrative buildings, maintenance facilities, fuel farm, etc. c) Increase operational capacity landside • Internal road network between facilities (incl. infrastructure for public transport) • Car park areas

• Others: supporting facilities *These project components are fully demand driven. Capacity of facilities to be developed with increased traffic flows as and when they occur. Based on the available present civil infrastructure (runway, taxiway, apron) and rehabilitated terminal building and cargo facilities, it is anticipated that, in general, short to medium term requirements are being met.*

Table 4.7 Project Components for the Infrastructure Plan – Banja Luka Airport

1.	**Improvement of safety and security standards to meet international ICAO standards**
	• Installation of new ILS system (present ILS is plus 20 years old) • Installation of new ATC equipment(present is plus 20 years old) • Installation of new airfield lighting systems (present is plus 20 years old) • Installation of new VOR system • CFR equipment(one additional Fire Tender) *These project components need to be addressed in the short-term (2000-2005) to meet the international standards as soon as practicable and to ensure future international demand and growth of traffic.*
2.	**Development of Banja Luka airport**
	• Construction of cargo building of 250m^2 with associated external works on landside.
3.	**Increase operational capacity**
	a) Increase airside operational capacity: • Improvement of runway and taxiway system • Extension/new aprons b) Increase operational capacity special facilities: • Further extension terminal building • Development of cargo buildings • Other facilities: technical/administrative buildings, maintenance facilities, fuel farm, etc c) Increase operational capacity landside: • Car park areas • Others: supporting facilities *These project components are fully demand driven. Capacity of facilities to be developed with increased traffic flows as and when they occur. Based on the available present civil infrastructure (runway, taxiway, apron) and rehabilitated terminal building and cargo facilities, it is anticipated that, in general, short to medium term requirements are being met*

Table 4.8 Project Components for the Infrastructure Plan – Mostar Airport

1.	**Improvement of safety and security standards to meet international ICAO standards:**
	• Installation of MLS system or GPS System in lieu of ILS (there is no ILS system in place; there never has been due to the terrain configuration) • Construction of CFR building and re-equipment (only if SFOR is pulling out and present SFOR equipment is not transferred); • Maintenance facilities and equipment (only if SFOR is pulling out and present SFOR equipment is not transferred); _These project components need to be addressed in the short-term (2000-2005) to meet the international standards as soon as practicable and to ensure future international demand and growth of traffic._
2.	**Increase operational capacity**
	a) Increase airside operational capacity • Improvement of runway and taxiway system • Extension/new aprons b) Increase operational capacity special facilities • Further extension terminal building • Development of cargo buildings • Other facilities: technical/administrative buildings, maintenance facilities, fuel farm, etc. c) Increase operational capacity landside • Car park areas • Improvement of access road • Others: supporting facilities _These project components are fully demand driven. Capacity of facilities to be developed with increased traffic flows as and when they occur. Based on the available present civil infrastructure (runway, taxiway, apron) and rehabilitated terminal building and cargo facilities, it is anticipated that, in general, short to medium term requirements are being met._

Table 4.9 Project Components for the Infrastructure Plan – Tuzla Airport

1. Improvement of safety and security standards to meet international ICAO standards:
• Installation of ILS system • Construction of CFR building and re-equipment • Maintenance facilities and equipment • Construction of new ATC tower and installation of equipment *Only if SFOR is pulling out and the present SFOR equipment is not transferred and/or acceptable for civilian air traffic requirements, these project components need to be addressed in the short term (2000-2005) to meet the international standards as soon as practicable and to ensure future international demand and growth of traffic.*
2. Development of Tuzla airport
• Construction of concrete apron area of 11,000 m^2; • Construction of cargo building of 250m^2 with associated external works on landside; (capacity is based on an initial volume of cargo of 1500t per year and a ratio of 6t/m^2 to calculate capacity requirements; the rational behind this low ratio is i) limited cargo volume, ii) basic handling operations not involving technologically sophisticated methods and high investment • Improvement of road and rail links to existing infrastructure (and, in the medium-term, to the future free enterprise zone) *These project components need to be addressed in the short term (2000-2005) to ensure continued future international demand and growth of traffic.*
3. Increase operational capacity
a) Increase airside operational capacity: • Improvement of runway and taxiway system • Extension/new aprons b) Increase operational capacity special facilities: • Further extension terminal building • Development of cargo buildings • Other facilities: technical/administrative buildings, maintenance facilities, fuel farm, etc c) Increase operational capacity landside: • Car park areas • Others: supporting facilities *These project components are fully demand driven. Capacity of facilities to be developed with increased traffic flows as and when they occur. Based on the available present civil infrastructure (runway, taxiway, apron) and rehabilitated terminal building and cargo facilities, it is anticipated that, in general, short to medium term requirements are being met .*

4.4 OPERATIONAL ASPECTS

All air navigation services issues have been solved in principle with the long-term perspectives, supported and intervened by relevant international organizations such as ICAO and EUROCONTROL.

Implementation constraints (of the agreed airspace / ATC services) with respect to civil/building, equipment, training, licensing, etc, requirements to be left in the capable hands of specialized international organizations such ICAO as subject matters are highly specialized. Funding of projects to implement above is considered as a priority project in the air sector plan.

4.4.1 Air Navigation Services

With respect to the air navigation services for Bosnia Herzegovina, reference is made to the summary of discussions of the Second ICAO Meeting on Air Navigation Services for Bosnia and Herzegovina of 13 and 14 September 2000. The meeting was attended by all parties concerned i.e. the BiHDCA, the Croatian Civil Aviation, the Federal Republic of Yugoslavia Civil Aviation, EUROCONTROL, IATA, ICAO, OHR, SFOR. A summary of the consensus reached by the meeting on the recommendations is given as follows:

(1) Upper Airspace

For the short- and medium-term phases, the existing arrangements (i.e. provision of air traffic services by CCL of Croatia and FATCA of Federal Republic of Yugoslavia) be retained in the upper airspace until CEATS is established to take over the air traffic services provision in that airspace.

(2) Intermediate Airspace

For the short-medium term phases (2000-2005), the provision of air traffic services to be delegated to a "third party" to be identified by Bosnia and Herzegovina as soon as possible. For the long-term phase (2000-2015), one single ATS unit be established within BiH.

It is also concluded that the geographical location of the single ATS unit shall be decided internally by Bosnia and Herzegovina as soon as possible.

(3) Immediate Action on Transfer of Air Traffic Services Responsibility from SFOR to BiH

SFOR be encouraged to make known as soon as possible its decision and time frame for the return of the responsibility of ATS provision in the remaining portions of airspace of Sarajevo FIR to the civilian authorities of BiH.

ICAO, in order to enable the transfer, shall take the initiative, as a matter of urgency, to convene meetings amongst the relevant authorities of BiH, Croatia and SFOR to determine the best course of action to provide air traffic services at short notice in the intermediate airspace within Sarajevo FIR on a temporary basis until implementation of a suitable air traffic services arrangement by BiH itself, preferably by transferring the functions of NATO Zagreb for General Air Traffic to Zagreb ACC under the responsibility of Croatia Control Ltd.

ICAO facilitates, as a matter of urgency, discussions amongst the civil aviation authorities of Bosnia and Herzegovina and SFOR to make suitable arrangements for the air traffic services for departures/arrivals at the four international airports.

4.4.2 Aviation Management and Licensing Issues

Through the Second ICAO Meeting on Air Navigation Services for Bosnia and Herzegovina of 13 and 14 September 2000, the management issues were also elaborated and reached the following agreement.

(1) Licensing Process in BiH

Bosnia and Herzegovina consider as an interim measure the establishment of licensing procedures and arrangements that would enable suitable qualified and experienced personnel to be awarded a BH license.

It has been agreed that ICAO will assist the civil aviation authorities of BiH, as far as possible, with the resolution of the important and outstanding problem of establishing a licensing and certification authority and of the development methods of issuing such licenses and certificates to individuals and to aeronautical operators.

(2) Management of the Transition Plan for the Airspace of BiH

It has been agreed that Bosnia and Herzegovina shall appoint suitable qualified and experienced persons to manage and co-ordinate the transition plan; and that ICAO shall obtain information on the costs and funding required for such a post and explore funding methods for presentation to donors as part of a wider support program or as an individual project

4.4.3 Restructuring of Air Operators

Two government-own airline companies currently provide air transport service, namely Air Bosnia and Air Srpska. As described in the beginning of this chapter, it is the fact that the air transport business has been internationally competitive under the open air policy in Europe. This will be the case in BiH, being involved in such a competitive market, hence, a more economically efficient operation model should be explored to restructure the exiting airline companies, facilitating a privatization scheme in the short-term.

Domestic air services between major cities such as Sarajevo, Banja Luka, Tuzla, and Mostar as well as short-haul international flight services to connect major cities in neighboring countries will be further demanded along with the economic recovery. The air operators need to be sensitive to such business and market environment.

4.5 FINANCING ASPECTS

The infrastructure development plans, as outlined in the previous sections, are hinged on the following three components:

- Improving of safety and security to meet international standards (ICAO/FAA/IATA etc);
- Setting up of the basic airport infrastructures to create an environment which will stimulate further demand and growth;
- Increasing of operational capacity; this is fully based on demand and commercially driven; development to take place in a modular approach to cope with increased traffic flows as and when these take place.

For the first component, which is of urgently importance, external funding through donation, soft loan, etc. is definitely required, as no funds are available within BiHDCA and the State Ministry for the time being. In the medium- to long-term, it is expected that the maintaining safety and security standards should be covered by the increasing aeronautical revenues.

For the second component, external funding is also required to cover the massive financial needs. Since these investments are basically a cost-recovery type of projects, some concessional soft loans from external aid organizations should be provided, based on feasibility studies.

For the third component, an increase of operational capacity, after the minimum basic set-up is in place, should become the responsibility of each airport, assuming that public and private partnerships are created to manage and operate commercially driven and independent airport businesses. Private funding will then be required, in association with the public funding. International technical and financial assistance programs are also required to facilitate such an innovative initiative.

Needless to say, aid coordination among relevant international donors is significantly important for the sake of bearing integrated and efficient benefits.

4.6 PRIORITY PROJECTS

4.6.1 Airport and Aviation Development

The project components which need to be addressed in the short-term (2000-2005) to meet the ICAO standards with respect to **safety and security** as soon as practicable and to ensure future international demand and growth of traffic have been labeled as priority projects.

With respect to the general aviation, all project components have been labeled as priority projects to meet **adequate general aviation operations** and to stimulate further general aviation growth. However, the precise number of smaller airports to de developed has not yet been verified. A feasibility study for such purpose has been included in the list of priority projects.

With respect to **ANS services and training requirements**, all project components have been noted as priority projects as they affect directly the safety and security standards at the airports. A specific list of these projects with cost estimates is presented herewith by airport. Indications for the ANS Services and training projects are given thereafter.

For the preparation of the **intermediate airspace traffic control system**, it has been committed that after the delegation to the third party (by the year 2005), one ATS unit is to be established in BiH. In order to make the devolution technically smooth, the project of the station with one single ATS unit is also taken into account as the priority project.

The summary of priority projects with indicative cost estimates is tabulated as shown in Tables 4.10 through 4.15. Individual priority project sheets have been prepared and can be found in Volume I. These sheets summarize each priority project: identification of project, description, objective, cost, implementation time, dependency from other activities, etc.

Table 4.10 Establishment of One ATS Unit for Intermediate Space Control

Project Components	Indicative Cost (Mill. KM, at 2000 prices)
Purchase of Secondary Radar, range app. 200 NM (SSR) with necessary equipment	43.0
Construction of physical facilities with necessary equipment	5.1
Provision of Technical Training of the Staff	4.2
Total	**52.3**

Source: BiHTMAP

Table 4.11 Priority Investment Projects, Sarajevo Airport

Project Components	Indicative Cost (Mill. KM, at 2000 prices)
Acquisition of land in accordance with master plan development	not costed
Construction of runway strip	0.6
Construction of new perimeter fence with emergency exits and intruder detection system	3.5
Construction of new perimeter and operational access roads	1.7
Widening/reconstruction of connecting taxiways "C" and "B" including fillets to suit class 4D aircraft	1.2
Construction of by pass exit at runway end 30	1.7
Relocation of fuel farm (preparation of new area)	1.7
Relocation and reconstruction of fire fighting building, re-equipment of CFR (minimal fire tender building: 2.9 m. KM; one fire tender: 1.4 m. KM)	4.3
Preparation for solid waste disposal and water treatment plants	1.2
Installation of radar for terminal (SSR)	5.8
Total	**22.0**

Source: BiHTMAP

Note: Cost estimates, for Sarajevo Airport, have been derived from the Master Plan Report based on US$1=KM2.32 (full details to be found in the Final Master Plan Report of S.E.A. Aeroporti di Milano)

Table 4.12 Priority Investment Projects, Banja Luka Airport

Project Components	Indicative Cost (Mill. KM, at 2000 prices)
Improvement of Safety and Security to meet the ICAO Standard	**37.7**
Development of the complete CFR system with equipment and facilities	17.0
Reconstruction and enlargement of the control tower	2.5
Installation of new ILS system	5.0
Installation of new ATC equipment	4.2
Installation of radar system	5.0
Installation of new airfield lighting systems	4.0
Airport Facility Development	**10.2**
Acquisition of land and removals of houses/buildings for widening the runway	Not costed *
Civil works for improvement of drainage system, water supply pipes, stabilization of the base layer of the runway, and construction of new perimeter fence	1.7
Construction of cargo building of 250m^2 with associated external works on landside:	4.0
Relocation of fuel warehouses	4.0
Installation of telecommunication connections and electric power line (20KV)	0.5
Total	**47.9**

Source: BiHTMAP

Note: *The costs for land acquisition for expanding the runway and compensation for removal of existing houses and buildings are not included as the project cost items.

Table 4.13 Priority Investment Projects, Mostar Airport

Project Components	Indicative Cost (Mill. KM, at 2000 prices)
Improvement of Safety and Security to meet the ICAO Standard	
Installation of MLS system or GPS System in lieu of ILS. Estimate based on equivalent ILS systems at other airports.	6.0
Construction of CFR building and re-equipment (only if SFOR equipment is not transferred)	3.5
Maintenance facilities and equipment (only if SFOR equipment is not transferred)	2.5
Total	**12.0**

Source: BiHTMAP

Table 4.14 Priority Investment Projects, Tuzla Airport

Project Components	Indicative Cost (Mill. KM, at 2000 prices)
Improvement of Safety and Security to meet the ICAO Standard	**15.5**
Installation of ILS system (only if SFOR equipment is not transferred)	5.0
Construction of CFR building and re-equipment (only if SFOR equipment is not transferred)	3.5
Maintenance facilities and equipment (only if SFOR equipment is not transferred)	2.5
Construction of new ATC tower and installation of equipment (only if SFOR equipment is not transferred)	4.5
Airport Facility Development	**3.5**
Construction of concrete apron area of 11,000 m^2	3.0
Construction of cargo building of 250m^2	0.5
Total	**19.0**

Source: BiHTMAP

Note: Facility capacities and cost estimates have for the proposed concrete apron area and the cargo building at Tuzla airport have been taken from the preliminary Master plan studies carried out by IPSA in April 1999 and unit costs available from Sarajevo Airport Master plan.

Table 4.15 Priority Investment Projects, Small Aerodromes

Project Components	Indicative Cost (Mill. KM, at 2000 prices)
Urgent minimum needs for improvement of "Safety and Security" for Selected Strategic Aerodromes	5.0
Feasibility Study *	0.5
Total	**5.5**

Source: BiHTMAP

Notes: A number of selected aerodromes need to be studied in terms of functions to be enhanced and improvement needs in the entire aviation network system for BiH, taking into account Bihac (Zeljave) and Visoko in FBiH and Prijedor, Zaluzani, Sokolac, Trebinje and Bijeljina in RS.

4.6.2 Other Projects

Implementation of ANS recommendations should be facilitated. Costs being prepared by ICAO at present time have no details available yet. However, a sum of 7.5m KM is allocated to cover training for air navigation services staff, meteorological staff and for management.

CFR training needs to be conducted. An indicative cost of 1.5 million KM (assuming 40 trainees over 5 year, 3 months training per trainee) is estimated for the urgent project.

CHAPTER 5: WATERWAY TRANSPORT

5.1 INTRODUCTION

Before 1990, the rivers in Bosnia Herzegovina had an important commercial, social, and recreational function. In particular the river Sava, via the Danube River, constituted an efficient link to the international industrial and economic network. For the last decade, the rivers have no longer been used for commercial traffic. Maintenance and quality improvement were absent and the entire waterway network declined and lost its commercial functionality. The objective of the Master Plan for Bosnia and Herzegovina is to revitalize the declined transport systems, including the waterway network taking into account its commercial and social functionality.

5.2 FUNCTIONALITY OF WATERWAY TRANSPORT BEFORE 1990

Several rivers were navigable in Bosnia and Herzegovina before 1990:

- Sava river at a length of 333 rkm (from 175 rkm to 507 rkm),
- Neretva river at a length of 4 km from Metkovic to Gabela,
- The mouths of the rivers Una, Bosna and Drina for the transportation of building materials form the riverbeds,
- the length of 24 km along the BiH seacoast.

In addition to transport of freight and passengers, the rivers and lakes in Bosnia and Herzegovina also had / have other functions. Leisure activities (sport manifestations, tourism and recreation) were performed on the lakes Modrac, Jablanica, Salakovac, Grabovica, Hutovo Blato, Husko and Pliva and the (regional) provision of energy was guaranteed by several power plants (see overview in Table 5.1).

Table 5.1 Overview of Power Plants on BiH Waterways

Waterway	PP	Q_{sr} m^3/s	Q_i m^3/s	N.R.N m a.s.	M.R.N M a.s.	D.V. m.a.s	Hbr M	Ni MW	E GWh	Q_i/Q_{sr}
Drina	Drina III	436.0	800.0	87.9	85.4	77.2	14.1	91.9	319.8	1.8
	Drina II	427.0	800.0	102.0	99.5	90.0	14.1	81.9	337.5	1.9
	Drina I	413.5	800.0	116.1	113.5	103.6	14.1	81.9	339.1	1.9
	Kozluk	410.0	800.0	135.0	132.5	121.3	13.7	67.2	354.0	1.5
Bosna	Cijevna VI	157.8	170.0	102.4		95.5	7.0	8.6	52.0	1.1
	Cijevna V	156.8	170.0	109.5		102.5	7.0	8.6	52.0	1.1
	Cijevna IV	155.8	170.0	116.5		109.5	7.0	8.6	52.0	1.1
	Cijevna III	153.8	170.0	123.5		116.5	7.0	8.6	52.0	1.1
	Cijevna II	150.8	170.0	130.5		123.5	7.0	8.6	52.0	1.1
	Cijevna I	149.8	170.0	137.5		130.5	7.0	8.6	52.0	1.1
Vrbas	Razboj	126.7	160.0	101.0	100.0	88.0	13.0	16.9	102.9	1.3
	Kosjerovo	125.3	160.0	114.0	113.0	101.0	13.0	17.0	102.9	1.3
	Laktasi	121.6	160.0	127.0	126.0	114.0	13.0	16.2	96.2	1.3
	Trn	116.3	160.0	145.0	142.0	127.0	18.0	24.0	138.5	1.4
Una	Kostajnica	221.8	300.0	116.0		108.0	8.0	20.0	112.7	1.4
Sava	Samac	1170.8	1600.0	85.0		78.0	7.0	70.6	361.6	1.4
	Jasenovac	807.0	560.0	95.5	93.5	85.0	8.5	40.5	204.5	0.3
	Strelecko		500.0	99.5			4.9	21.8	96.8	

The data in Table 5.1 are taken from the available documentation on the power plants. Some of the plants have a low power, which could be solved by a smaller number of plants with bigger drop-down.

N.R.N. – normal water level
M.R.N. – minimal working level
D.V. – level of bottom water
E – average annual power production

Q_{sr} – Average flow
Q_i – installed water flow
N_i – installed power

5.3 WATERWAY TRANSPORT BEFORE 1990

(1) River Traffic

The most important waterway for commercial transport was Sava River, part of the Danube waterways network. Before the war, navigation on the Sava River was possible from the river mouth to the Danube up to the Galdov and Rugvica for a length of 683 rkm. Also navigation on the river Kupa was possible from the river mouth into the river Sava at a length of 5 rkm. Transport on the rivers was according to following European river standards:

Class IV:

From the mouth of river Sava to the Danube river – Belgrade rkm 00 until Brcko rkm 221/225. For the ships that are carrying 2,000 t and with a displacement of 2.5 meters;

Class III:

From Brcko rkm 221/225 until Slavonski Brod rkm 365. For ships carrying 1,000 t and having a displacement of 1.8 meters. When the hydro conditions are favorable, ships can navigate up-to Jasenovac rkm 507.

Class II:

From Slavonski Brod rkm 365 until Galdov rkm 588 and Rugvica rkm 653 and until the mouth of the river Kupa in the river Sava rkm 00 up to Sisak rkm 5. This class allows traffic for ships carrying 650t. When conditions are favorable, vessels with a capacity of 1,000 t can navigate up-to Galdov rkm 588 and Sisak rkm 5.

In times of the lowest river flows (insufficient water displacement) limits were introduced for navigation on Sava River. Limits for navigation speed were introduced when there was fog, except if vessels were equipped with radar. Navigation limits were in force, sometimes for a 100-day period in some areas. Ice and wind on the river Sava would in severe cases also reduce navigation conditions.

Along Sava River on Republic of Croatia and Bosnia and Herzegovina territory there are a wide variety of ports and piers: Brcko, Samac, Slavonski Brod, Bosanski Brod (terminal for petroleum), Sisak (3km on Kupa) and Zagreb (Rugvica). Beside above mentioned ports and piers, there are places where loading of sand and gravel, unloading of river-dredging sand and some agriculture products was done.

In addition to the Sava river, sections of the other rivers and lakes provided local passenger and freight transport. Several rivers were partly navigable for larger commercial traffic, more in particular:

- Neretva river over a length of 4 km from Metkovic to Gabela;
- The mouths of the rivers Una, Bosna and Drina, mainly for the transportation of building materials from the riverbeds
- 24 km of seacoast.

In spite of the availability of several navigational rivers, the share of river transport in 1990 was relatively moderate as demonstrated in Table 5.2.

Table 5.2 Modal Split in 1990

Mode	%
City transport	22.30 %
Road transport	47.20 %
Air transport	0.80 %
Railway transport	26.60 %
Other (river)	3.10 %

Source: Steering Committee

The economic recession that started in the second half of 1980 in the ex-Yugoslavia brought a decline in the sector of transport and communications. In the period of 1984 to 1990, the decrease was constant at 26 %. In the same period industrial gross production decreased with 6% in total.

(2) Sea Traffic

1) Port of Ploce

Bosnia and Herzegovina is internationally approved as a sea navigational country. It has the possibility to register sea-going vessels in its ship's register. Its responsibilities include:

- Adriatic Main Road (M17) of 739+065 km towards Neum up to 748+200 km towards Dubrovnik, including the entire peninsula Klek;
- Sea and coastal waters of the Adriatic Sea within the boundaries of BiH, based upon following navigation points:
    - The middle of the entrance in the gulf Klek-Neum;
    - Between cape Klek and cape Medjed;
    - The middle of the channel Mali Zaton, including Mali and Veliki Skolj, up to 900 meters from the cape Nedelja;

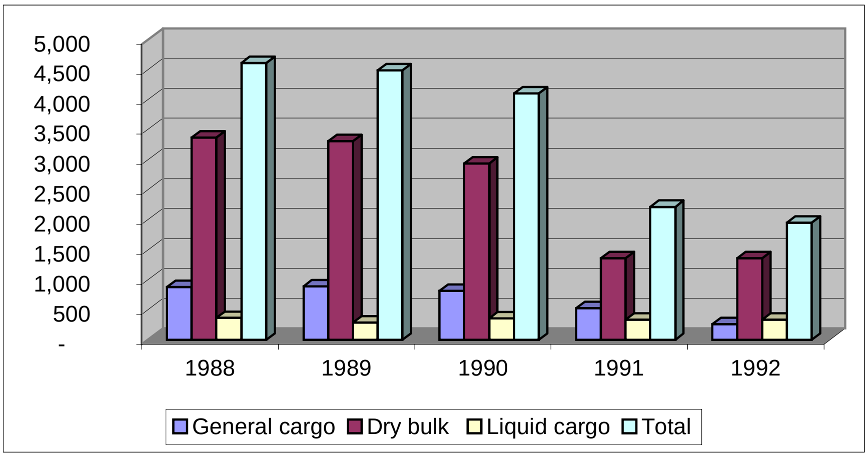
After its independence, BiH overtook the membership of the Federal Republic of Yugoslavia in international organizations such as ILO and IMO and ratified numerous international conventions, resolutions, directives, and contracts related to sea-going traffic. Freight traffic by sea-going vessel continued to concentrate in the port of Ploce because of its well-developed hinterland connections by road and rail and its accessibility by sea.

Before the war, the seaport of Ploce already serviced the industry of BiH, the eastern region of Hungary and Romania (mostly agriculture products and live stock) and in a lesser amount Slovenia. Its total traffic volume reached 4.5 million tons in 1988 – 1989 (see Table 5.3 and Figure 5.1).

Table 5.3 Port of Ploce Pre-war Productivity

	1988	1989	1990	1991	1992
General cargo	881	890	814	521	255
Dry bulk	3.366	3.307	2.934	1.356	1.356
Liquid cargo	360	289	352	336	336
Total	4.607	4.486	4.100	2.213	1.947

Source: Port of Ploce



Source: Port of Ploce

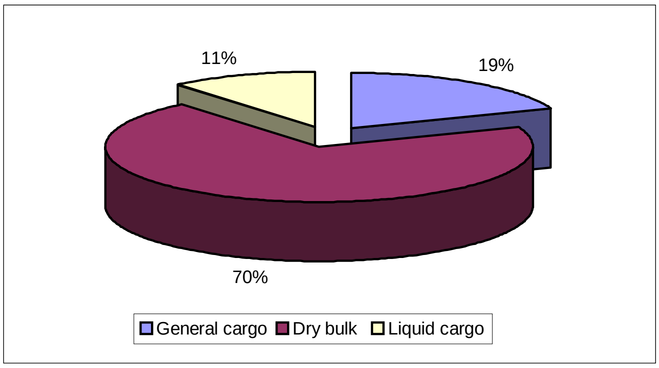
Figure 5.1 Port of Ploce Prewar Productivity

The distribution in cargo type concentrated on dry bulk with an average percentage of 70% of total annual turnover (see Table 5.4 and Figure 5.2), given the importance of servicing the BiH steel industry in Zenica, the aluminum plants in Mostar and the industries in Tuzla and Bihac. Also Energoinvest in Sarajevo was a major customer for the port of Ploce. This BiH directed traffic constituted approximately 90% of total traffic for the port of Ploce.

Table 5.4 Cargo Distribution

	1988	1989	1990	1991	1992	sum
General cargo	19%	20%	20%	24%	13%	19%
Dry bulk	73%	74%	72%	61%	70%	70%
Liquid cargo	8%	6%	9%	15%	17%	11%
Total	100%	100%	100%	100%	100%	100%

Source: Port of Ploce



Source: Port of Ploce

Figure 5.2 Cargo Distribution

The port has:

- A general cargo terminal (705 m length, 9.2 m depth), also capable to handle limited number of containers;

- A bulk freight terminal (length of 510m, depth of 10.55m) that was able to more ships up to 40.000 DWT;

- A liquid bulk terminal with a dept of 12 m and capacity to storage mazut (40.000 m^3), NaOH of 55% (17.000 m^3), Petrol D2 ortohelene (20.000 m^3), and petrochemical products (15.000 m^3); and

- A loose load terminal with a length of 180m and a depth of 10m, a wood transit terminal with a quay length of 110m, a sea depth of 9.20m, and a petrol-coke terminal of 80m length and a sea depth of 9.2m.

Since 1982, the port of Metkovic is part of the port of Ploce. This port specialized in slag, bulk, bagged cement, roundwood, and other general products, mainly for transit. The port is located 20km up the river Neretva.

2) Region of Neum

The early strategic thinking behind sea transport development focused on following priorities:

- Construction of port facilities in Neum (however under the precondition that a railway connection was constructed linking Dubrovnik, Neum and Capljina);

- Construction of facilities to dock seagoing yachts and pleasure ships;

- Development of passenger sea traffic, commercial fishing and passenger ferry services, sea sports (diving, sailing) and sea tourism;

- Development of commercial and sport fishing.

During the period 1964 – 1978, Bosnia and Herzegovina authorized the Republic of Croatia – Ministry of Sea Navigation Traffic and Communication, Port Master's Office Ploce to perform all administrative, managerial, and operational expert tasks related to sea traffic on the part of the Adriatic Sea that belonged to BiH. The Republic Ministry of Traffic and Communications of Bosnia and Herzegovina took a number of important decisions on the basis of the Constitution of the Republic of BiH among which

- The Law on internal and sea navigation (Official Gazette SRBiH nr 11/78 and 10/84);

- Decision to establish a sea Port Master's Office in Neum

- Definition of the work area for the Port Master's Office (Official Gazette SRBiH nr 26/80)

- Appointment of a Captain for the Port Master's Office in Neum and of an Inspector for sea navigation as well as an expert for sea navigation traffic

- Installment of an expert organization (Plovoput Split) for establishing, market and maintain all relevant activities that guarantee safe navigation in the territorial waters of BiH;
- Construction of an operational shore for docking sea going vessels in Neum;
- Construction of a road on the peninsula of Klek.

Sea traffic included at that time mainly commercial fishing, passenger traffic, and minor commercial sea transport.

5.4 WATERWAY TRANSPORT INFRASTRUCTURE: STATUS REPORT

(1) Navigability of Rivers

During the period of bridge reconstruction, ferry services were the only means to cross the rivers, both for passengers and for vehicles. The total volume of ferry traffic on the rivers gradually declined as bridge crossings were reconstructed (see Table 5.5).

Table 5.5 Ferry Services on the BiH Rivers

	Passengers		Vehicles	
	1998	1999	1998	1999
Orasje-Zupanja	2,305,674	2,073,300	770,470	740,553
Odzak-Svilaj	791,474	372,466	364,546	172,554
Domaljevac-Dubocac	568,634	173,775	185,631	64,605
Total	3,665,782	2,619,541	1,320,647	977,712

Source: Steering Committee

Ferry traffic (and some economic activities such as fish farms) has been the only important economic activity on rivers and lakes, because since the war, navigation conditions substantially deteriorated. Rivers were no longer navigable due to the total absence of maintenance. For example, the Sava river was no longer navigable because the majority of the tributaries, in particular the rivers Una, Vrbas, Ukrina, Bosna and Drina are carrying large amounts of silt material. This material is collected at the river-mouths and further transported downstream. Consequently, the morphological characteristics of the Sava riverbed are unstable, having a negative impact on navigation conditions (decrease on the depth of the navigation channel, discontinued levels of incline, unequalled speeds, etc). Although efforts have been made to improve this situation (works on stabilizing the bottom flows of the river Sava tributaries), very sharp meanders have developed downstream of the mouths of the bigger tributaries. These meanders continue to deteriorate navigation conditions of the waterway (smaller diameters of the curves, shallows, significant extension of the waterways, etc.). At present, the Sava River and tributaries as well as the other rivers are not used for commercial freight transport.

(2) River Ports

Three “important” inland ports were operational on the river Sava before the war. The first one is Brcko port (located rkm 221/225). The second port is Samac port (rkm 306), and thirdly, there is the port in Bosanski Brod (rkm 368) a dedicated port for liquid cargo. Some preparations to build a port in Gradiska (rkm 465) have been made but the construction was never started.

The geographical position of the ports of Brcko and Samac and their links to an international road and railway system made these ports important connections between the Sava river and the surrounding region (including the parts of BiH, Republic of Croatia and Yugoslavia). This unique position enabled the transfer of goods at a low cost between the Sava basin and different locations between the Black and the North Sea.

1) Brcko Port (rkm 221/225 on the Sava River)

Brcko was an important inland port in Bosnia and Herzegovina. The port was constructed in the period of 1952 – 1962 and became an independent port in 1973. Its main goal was the loading and unloading of bulk goods and other non-unitized cargoes.

The capacity of the port was approximately 670,000 – 750,000 ton per year in an operational period of 260 days per year. Its main problem was the low water levels in particular during the period of July – August (water level oscillation up to 9m).

The port is constructed on an area of 14 ha. The loading/unloading equipment includes a 150m long and 15m wide slope quay of reinforced concrete and reinforced concrete pillars, suitable for different types of cargo. This quay is equipped with two portal cranes (Ganz -Budapest) on rail-tracks, with a capacity of 5/6 ton over a 30m range. A vertical quay of 76m is located next to the slope quay. The port also possesses 6 forklifts and 3 loaders. Warehouse facilities of around 12,000 m² are available. The existing tarmac is 3,000 m² large but unpaved.

The port had direct connections to the rail and road networks. Capacity of these connections was sufficient but its quality and operational efficiency was low. In particular the rail network lacks the logic of good logistics. Also the quality of the port’s road network is reduced due to the operational impact of the Customs Clearing Terminal in the center of the port. International road traffic passes frequently through Brcko region to enter BiH and all trucks must pas customs in the port. This generates a volume of daily traffic that is not port-related. Once the port is again operational and volumes reach pre-war levels or higher, this traffic will hinder the fluent logistics of the port. Plans therefore exist to re-locate the customs center outside the port area to eliminate non port-related traffic over the road in the port area.

The railway terminal is located on the eastside of the port, connected to the internal railway system with a length of 1,911m. The internal railway can serve both cranes on the slope quay. The present layout of the internal network and the external connection requires substantial re-organization because the internal network needs to pass via the railway station located inside the city center before it connects to the main network. Also the internal logic of the rail-tracks needs adjustments. To position the tracks under the cranes, the railcars need to travel the length of the quay and then return under the cranes. After loading/unloading, the cars need to travel the same way. The construction of the vertical quay at the end of the sloped quay interrupted the track and therewith all possibilities to create a closed loop for efficient railcar throughput.

The pre-war capacity of the port was over 500,000 tons. In 1973/74, the turnover of the port was over 1 million tons, mainly due to a spectacular increase of general cargo. In the 1980's, volume prognoses indicated that the port could achieve 2 million tons annual turnover by the year 2000. The port therefore started developing plans for the further expansion and technical / technological improvement of the port with a terminal to handle containers and pallet-size goods. However, since that period, the turnover constantly decreased. While the port still had a turnover of 744,000 tons in 1984, it decreased to 77,000 tons in 1990 and 16,000 tons in 1991. At present, the port is no longer operational.

The dominant prewar cargo types were:

- Construction materials (Iron, gravel, cement, lime etc),
- Coal / Coke,
- Iron / Ore,
- Steel,
- Agricultural products (Posavina region),
- Wood, and
- Fertilizer.

The Tuzla region (Federation of BiH) was its most important hinterland (50% Coal / Coke; 40% Steel; 11% consumer coal and 3% of other goods). Other regions of importance for the port were the Posavina region (Croatia) and Brcko town.

2) Samac Port (rkm. 304 on the Sava River)

Total operational port area is 85 m^2. The port was originally designed for 1 million tons per year. In a second and third phase, port capacity would be increased to 3 million tons (second phase) and 5 million tons (third phase). This plan includes the development of a customs free zone of 20 ha. Some works were started (office buildings and entrance gate) but the zone was not yet in operations when the war started.

The infrastructure consists of a vertical quay placed on reinforced concrete Franki pillars, constructed in the late 1980's. This platform is 304 m long and 40 m wide. The carrying capacity of the quay is 80 tons per m^2. Behind the quay, a large open area is available for storage activities. The area is finished but not yet paved. The huge flat surface further behind to the platform could be used as storage area. Two warehouses (3,600 m^2 in total) are available and located near the platform. Two movable portal cranes with a capacity of 5/6 ton over a 34m span are mounted on rail tracks. The arms consist of two sections, making it capable of serving vessels moored next to each other. Two 2x630 KW transformers in the port area provide the electric power of the cranes.

The oldest part of Samac port is the “gat” (floodgate). This area is foreseen for the construction of a dock and the development was started with the construction of a quay of 200m. Given that the dock was not yet constructed, this quay has no economic function at this time.

A direct connection to the railway and road system was available. The port was usable approximately 220 days per year. Due to the oscillation of the river, the port is on average 90 days per year inoperable.

The port has a strategic location on the Baltic and Adriatic corridor and is connected to rail, road, and sea. The railway connection of the port needed some re-organization because there was a road – rail crossing at equal levels, creating a bottleneck for both modes, in particular during shunting operations in the port area. The port was initially designed for bulk cargo, in particular steel and semi-finished products. During the pre-war situation, the maximum capacity of one million tons was never achieved. The average throughput of the port was 500,000 tons per year (average turnover during the period 1985 – 1990).

The major clients were Energoinvest and the steel plant of Zenica. But due to its good hinterland connections, industrial clients in both the Federation and the Republic were served (e.g., companies in Prijedor and Modrica). Also equipment for mining was imported from Germany.

At present, port activities have not yet recovered due to several reasons, which are:

- No clarity on the status of Sava river (regulatory impact),
- No guarantees on the safety or navigability of Sava river (operational impact), and
- No operational port-infrastructure (infrastructure impact).

The pictures hereafter demonstrate the state in which the ports are at present.

Cranes and Quay at Samac Port

Waterside of Samac Quay

General Overview of Brcko Port

Crane at Brcko Port

The future development of commercial transport on Sava River and the need for additional ports (such as Gradiska) and quays will be dependant of the economic development of Bosnia and Herzegovina. Future volumes of commercial traffic on the waterways will be determined by industrial demand (for freight transport) and social need (for passenger transport). This means concretely that after the realization of the priority projects to guarantee a minimum of river transport operations, future investments / developments will be conditioned and guided by socio-economic demand.

(3) Sea Transport

1) The Region of Neum

Port of Ploce now has its infrastructure on Croatian national territory. On 11 May 1995, a formal Agreement was signed and ratified between the Federation of Bosnia and Herzegovina and the Republic of Croatia that regulates the access of BiH to the Adriatic Sea via Ploce port through Croatian territory.

On November 22nd 1998, an Agreement was signed between both States that regarding the free transit over the territory of the Republic of Croatia of goods moving between

BiH and the port of Ploce as well as in Neum over BiH territory. The Agreement is awaiting ratification.

In this context, the planned construction of a commercial port in Neum was abandoned and the focus of the attention in this area went towards tourism and leisure. At present, most of this potential is, however, not validated in spite the fact that the necessary public investments to stimulate private sector initiatives are relatively low.

Several high quality hotels are located in the city of Neum. The condition of the road system in the region is very good and there is a quay that would enable river transport of tourists coming, e.g., from Dubrovnik on a day-trip. This quay is also interesting for the commercialism sight seeing trips along the islands and coastline near Neum.

Public authorities in BiH (in particular in Neum) could cooperate with Croatian authorities (in particular the Dubrovnic city council) to formulate a joint strategy for tourism development in the region.

This joint initiative should efficiently promote the region and facilitate private investments in tourism-related activities. In particular, the development of a marina for sea going ships could be considered an interesting option.

The depth of 9m along the peninsula could in time make commercial traffic possible. Although the construction of a full commercial seaport has been abandoned, the construction of a commercial loading and unloading facility at the opposite side of the peninsula could be investigated in the future.

2) Port of Ploce

As it was before the war, traffic in Ploce port remained oriented towards BiH and has seen a constant improvement (see table 5.6). Total volume increased from 317.000 tons in 1993 to 934.000 tons in 1999, roughly 20% of pre-war volumes. Expectations for the year 2000 are that the increase would continue with the same level and would reach 1 million tons.

Table 5.6 Port of Ploce Traffic Volumes 1992 - 1999

(x 1000 ton)	1993	1994	1995	1996	1997	1998	1999
General cargo	180	206	251	361	301	282	414
Dry bulk	93	39	78	116	275	329	341
Liquid cargo	44	23	85	153	137	108	179
Total	317	268	414	630	713	719	934

Source: Port of Ploce

The distribution of cargo between the different types is visualized in Table 5.7.

Table 5.7 Cargo Distribution per Type (% Distribution per Year)

	1993	1994	1995	1996	1997	1998	1999
General cargo	57%	77%	61%	57%	42%	39%	44%
Dry bulk	29%	15%	19%	18%	39%	46%	37%
Liquid cargo	14%	9%	21%	24%	19%	15%	19%
Total	100%	100%	100%	100%	100%	100%	100%

Source : Port of Ploce

An important conclusion from the percentile distribution per cargo type is that dry bulk is gradually decreasing in favor of general cargo, reflecting the post-war shift in economic activity in BiH. At present, the aluminum production in Mostar accounts for approximately 300.000 tons per year. Zenica steel plant is also expected to increase its volumes in a near future to approximately 200.000 tons per year, reaching 80% of pre-war levels within 3 years. Energopetrol, before the war an important customer with approximately 450.000 tons, remains until now far below pre-war productivity with 200.000 tons transported in 1999. Port of Ploce could also expand its activities if the railway system on Corridor Vc would be improved, providing the port a competitive link to the Hungarian market, which was lost since the war.

Another potential future development is container traffic. At present, no dedicated terminal is foreseen and containers are handled at the general cargo terminal on quay nr 3. Only a limited number of containers are handled but initiatives are taken to increase that number, such as the feeder service with the Mediterranean container hubs of Giao Tauro and Malta. The present number of containers is approximately 2.000 TEU but studies indicated that container traffic in the port could reach 16.000 TEU in 2005 and could double to 32.000 TEU in 2010.

Important efforts are done to improve the port. Reconstruction works at quay nr 5 are completed, enabling fully loaded Panamax vessels to berth at the quay (13m depth). Also quay nr 3, intended for general cargo and the handling of containers and pallets using the floating multi-purpose crane has been rehabilitated and improved. At present, no specialized container crane is foreseen, given the low volumes of container throughput. Quay nr 2 is not yet re-constructed but is operational, mainly to handle weed products and aluminum. In May 2000, the new berthing facility for ro/ro and passenger traffic was completed.

Future port development is phased, according to productivity needs. In the first phase, the use of existing equipment will be increased and other developments are decided upon demand. Terminal development (within the context of the zoning plan) will be established via co-operation with the private sector. Port authorities will issue concessions according to BOT type agreements and are willing to participate via public private partnerships.

5.5 FRAMEWORK CONDITIONS FOR THE DEVELOPMENT OF RIVER TRAFFIC

When estimating future river traffic potential, several elements have to be taken into consideration. These conditions are:

- Geographical scale,
- Infrastructure scope,
- Volume of transport,
- Economic activity and transport needs, and
- Institutional and regulatory problems.

Future river transport development will require substantial investments, in particular in upgrading to EU standards the rivers, lakes, ports (including Neum passenger and leisure facilities), and other transfer facilities. However, the geographical scale of river transport in BiH is limited as compared to the European Trans European Transport Network for waterways. Sava River accounts for approximately 1/100th of the total river network in Europe, as demonstrated in Figure 5.3. At this time, even in the European Union, planned investments are behind schedule and the budgets are lacking to complete the agreed upon development plans for river transport. For that reason, it can be expected that future financial resources for upgrading waterborne activities will be scarce and the available resources will have to be allocated according to socio-economic rationales using established feasibility assessment methodologies.

Figure 5.3 European River Network (Trans European Relevance Only)

From that perspective, the potential to transport cargo by river from BiH over the Danube and adjunct water infrastructure to the European Union will remain limited, due to existing efficiency obstacles and insecurities regarding the navigability and the costs related to improve the situation. Therefore, priority investments in river transport will have to focus towards target markets in the east (Black Sea) and north (Russian market) and towards the neighboring countries (Croatia, Hungary, Romania, Yugoslavia) as demonstrated in Figure 5.4.

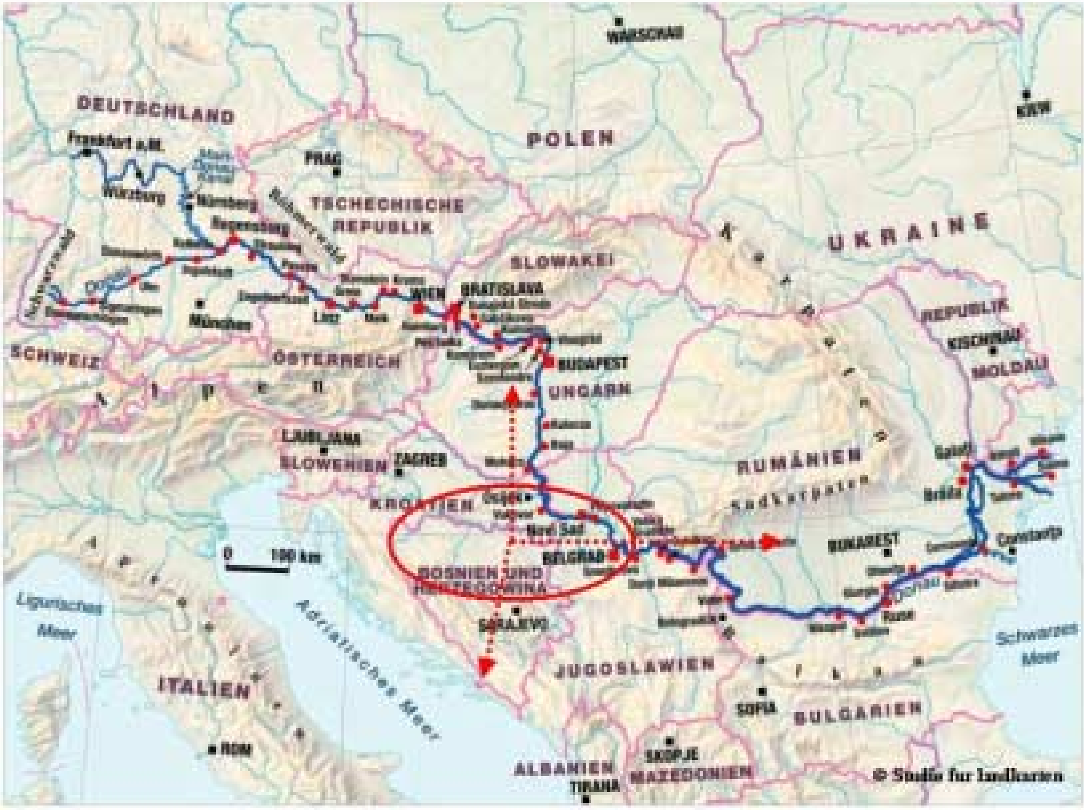


Figure 5.4 Target Markets for River Transport

An important element in the waterway transport development is the link to the relevant pan-European corridors. For example, efficient road and rail connections on Corridor Vc will increase the potential to connect sea and river transport in an integrated and intermodal transport system. Cargo from the European Union with destination north and east of BiH could be loaded and unloaded in Ploce, travel over Corridor Vc by rail or road and continue its route over the Sava river and the Danube. In that context, BiH could play a future role as transit country towards the Balkan area, in particular Hungary and Romania and as far as the Black Sea regions.

But it is necessary to stress that the importance of the river network in BiH is not only determined by the potential to generate river traffic as demonstrated in next Figure 5.5.

Figure 5.5 Relevance of BiH River Network

In addition to the transport freight over the Sava river, the rivers and lakes and the stretch along the Adriatic coast (the region of Neum) offer a genuine potential to develop local and regional commercial initiatives such as regional freight and passenger transport, water sports, tourism and recreation.

Local studies on the hydrological and morphological characteristics of the waterways in BiH indicate that the technical conditions exist to expand the waterway network along the existing rivers in BiH. Navigation could be further extended to the middle and higher river flows in using existing and planned water accumulation lakes with other purposes than transport (hydro energy, water provision, industry, irrigation, flood protection, etc.). All studies identify as necessary pre-conditions:

- The construction of the channel Sava - Danube (Samac – Vukovar) over a length of 61 rkm. This investment would shorten by 415 rkm the navigable way from Bosanski Samac to the other ports in the Central and Western Europe while to the other ports in the down flow from Belgrade by 85 rkm;

- Extending the river Sava in the direction of Zagreb and Ljubljana as towards Krupno in the direction of Karlovac;

- Connecting the Danube to the BiH network via

- Kupa from Sisak to Karlovac (137 km), increase category from today's Class I,

- Drina from the mouth of river to Zvornik (90 km),

- Bosna from the mouth of river to Doboj (72 km) and from junction of Spreca – Bosna to Lukavica (47 km),
- Vrbas from the mouth of river to Banja Luka (60 km), and
- Una from the mouth of river to Bosanski Novi (73 km) and from junction of Sana – Una to Prijedor (38 km).

From a purely technical perspective, the construction of above-mentioned river network could be feasible. Some studies argue that its development is also feasible form an economic point of view if:

- The construction is implemented in the scope of multipurpose water management activities (protection of floods, water-energy, drainage, irrigation, etc);
- The approach is market orientated, technically designed and planned on the basis of a commercial exploitation of sand and gravel from dredging activities; and
- The systematic serial construction / exploitation of power plants in lower flows of Una, Vrbas, Bosna and Drina is accompanying the river constructions. Encouraging fact is that many mentioned power plants have relatively good economic indicators - they are potentially economically favorable and even without any commercial valorization, they still have a positive impact on the water management.

Important (financial) efforts will be necessary to develop widespread commercial river transport in Bosnia and Herzegovina. If improved economic and industrial conditions ever require such level of upgrading, it will be the responsibility of the public authorities to provide the initial investments (dredging, river banks, maintenance, etc...), but the private sector will have to provide for all transport facilities on the rivers. Given the present status of the economy in BiH, the timeframe for its development remains uncertain.

This does not mean that the rivers and lakes have no short-term economic potential. On the contrary, some of the lakes and several stretches of the rivers are already used for local transport of goods and passengers. Most of these are private initiatives and via limited public investments could be further stimulated. However, its concrete potential should be assessed on a project-by-project basis by feasibility studies, based upon socio-economic parameters.

Also other economic activities can be developed along the rivers and in the lakes. The use of the rivers and lakes for power plants is already widely applied, the exploitation of fish farms is another interesting option that is presently ongoing at a modest scale and could be further increased. These issues need further investigation but are not relevant in the context of the Transport Master Plan.

Recreation and tourism

BiH has several lakes of which the most important ones are: Modrac, Jablanicko, Salakovac, Grabovacko, Busko blato, Hotovo Blato, and others. Before 1990, these lakes had an important recreational and sportive function. These lakes still offer interesting possibilities to initiate again the development of sport, recreation, and tourism.

Several lakes are already used for sailing, sport fishing, sportive activities and mainly regional tourism and recreation along the shores (restaurants and hotels, beaches and sunbathing facilities, etc.

Further initiatives should come from the private sector, while public authorities need to act as "facilitator" in providing the necessary infrastructure to guarantee an efficient access to these facilities. Access roads to several of these lakes are in a poor condition or go through industrial zones and there is insufficient signalization towards the lakesides and tourist centers. The relevant public authorities should therefore take action to improve access conditions and to upgrade lakeside facilities, therewith making the lakes more attractive for tourists and stimulating private investors to invest in tourism and recreation development. Although of high economic potential, the concrete realization is mainly of regional interest.

5.6 DEMAND FORECAST FOR WATERWAY TRANSPORT

(1) Modal Split and Modal Competition

In terms of river transport, Sava River is the most important facility available and the largest share of freight will be transported over this river. For that reason, the analysis will concentrate on the potential of this river. In time, it will be possible to expand waterway transport to other rivers and on the available lakes, but this development will be determined by economic needs and it is under present conditions impossible to estimate its potential volume.

Also estimating future demand for waterway transport on the Sava River is difficult to do for several reasons:

- Pre-war traffic numbers cannot be used because the economic environment of BiH underwent drastic changes,
- There is at present no relevant commercial traffic on the river, and
- There is only limited interest by the international community for the development of waterway transport.

In spite of these difficulties, the potential for future transport on the Sava river will be estimated using available economic and transport data, adjusted with the results of the socio-economic analysis conducted in the context of BiHTMAP.

Several basic assumptions have therefore been made. The assumptions are:

- The status of the river Sava is clarified,
- Sava river becomes an international river,
- The ports of Brcko and Samac are operational (minimum start-up investments are realized),
- The minimum navigation channel for Sava river is dredged, and
- There will be economic recovery of the industries that used waterway transport before 1990 and that these industries use this transport mode as soon as the basic infrastructure becomes available.

An important element to estimate future transport on the river Sava is the average modal split for Bosnia and Herzegovina. This factor is determined based upon the information provided in Volume 1 of the Final Report.

The share of inland waterways in total transport is strongly influenced by the quality of the available infrastructure. An overview of the inland waterways infrastructure in Europe is provided in Table 5.8 hereafter.

Table 5.8 Available Waterway Infrastructures

Inland Waterways **2.9**

Length in use (Navigable canals, rivers and lakes regularly used for transport) km

	B	DK	D	EL	E	F	IRL	I	L	NL	A	P	FIN	S	UK	EU15	1970=100
1970	1 553	-	6 808	6	*70*	7 433	-	2 337	37	5 599	350	124	*6 000*	390	1 631	**32 338**	100
1980	1 510	-	6 697	6	*70*	6 568	-	2 337	37	4 843	350	124	6 057	390	1 631	**30 620**	95
1990	1 513	-	6 669	6	*70*	6 197	-	1 366	37	5 046	351	124	6 237	390	1 631	**29 637**	92
1995	1 531	-	7 343	6	*70*	5 962	-	1 466	37	5 046	351	124	6 245	390	1 153	**29 724**	92
1996	1 531	-	7 339	6	*70*	5 678	-	1 466	37	5 046	351	124	6 245	390	1 153	**29 436**	91
1997	1 540	-	7 339	6	*70*	6 051	-	1 466	37	5 046	351	124	6 245	390	1 153	**29 818**	92

Source : EUROSTAT , UN, national statistics   D : includes D-E : 1970=2300, 1980=2302, 1990=2319

Navigable inland waterways not regularly used for transport

	B	DK	D	EL	E	F	IRL	I	L	NL	A	P	FIN	S	UK
1997						2 450	*750*				7			775	1 200

Notes : the inland waterways of Greece (Korinthos Canal), Spain (Guadalquivir), Portugal (Douro, Guadiana, Tejo) and Sweden are used by seagoing ships only

Sweden: data relate to Göta canal system; only 91 km (Göta river) are regularly used for goods transport

Germany: includes 978 km non-classified waterways, some of them not regularly used for transport

Italy: figure includes 428 km rivers (of which Po: 389 km), 201 km canals, 225 km coastal and Venice lagoon waterways (= 854 km) and in addition 612 km passenger transport lines on the lakes in Northern Italy and in Venice

Austria : Danube canal in Vienna not regularly used. Ireland: inland waterway freight transport ceased in the late 50s

New infrastructure: the last part of the Main-Danube Canal/Germany opened in 1992, the Niffer canal link in France opened 1995

Germany has the longest waterway network in Europe with a total of 7,343 km in length. France and the Netherlands follow with 6,051 km and 5,463 km respectively. Belgium and the UK each have the same length of waterways, approximately 1,500 km of waterway. The Netherlands, closely followed by Belgium, has the best-developed network. The German network with the Rhine is a main aorta for long haul transport over the German territory. The quality of the network and its impact on the modal split per country is clearly reflected in the modal split as demonstrated in Table 5.5. Transport over inland waters in the Netherlands accounts for approximately 45% of total transport. In Belgium and Germany, the share of inland waterway transport is approximately 13%. For France with its large waterway network and the UK with a network similar in length with the network in Belgium, the share of inland waterway transport is only 0.1% for the UK and 1.9% for France. The reason is that only a small share of the network is accessible for 1,000 tons vessels or more.

The waterway network in the CEECs is represented in Table 5.9 (total ton-km transport over navigable channels and rivers in the Central and East European countries). Total volume is low compared to EU volumes and has been decreasing since 1990.

Table 5.9 Inland Waterway Network in CEEC

Goods Transport **8.5**

Inland Waterways

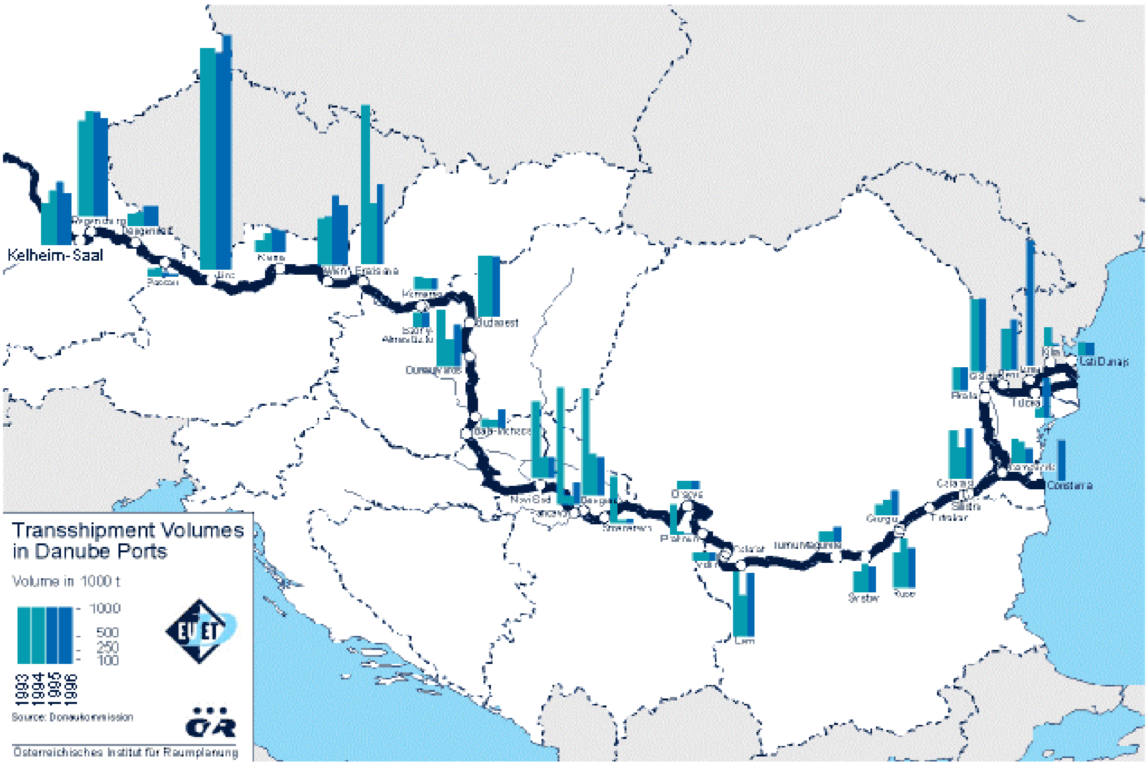
1000 mio tkm

	BG	CS	CZ	SK	EST	H	LT	LV	PL	RO	SLO	CEC	Index 1989 =100	% of all tkm
1970	1.83	2.43			0.01	1.76	0.12	0.05	2.30	1.35		**9.9**	68	2.8
1980	2.61	3.59			0.01	2.15	0.15	0.09	2.33	2.35		**13.3**	91	2.5
1989	1.95	5.10			0.01	2.11	0.17	0.30	1.19	3.70		**14.5**	100	2.7
1990	1.61	4.42			0.00	2.04	0.16	0.29	1.03	2.09		**11.6**	80	2.5
1991	1.02	3.89			0.00	1.72	0.14	0.34	0.74	2.03		**9.9**	68	2.7
1992	0.84	2.98			0.00	1.60	0.05	0.40	0.75	1.89		**8.5**	59	2.8
1993	0.46		1.26	0.84	0.00	1.62	0.05	0.00	0.66	1.59		**6.5**	45	2.1
1994	0.36		1.19	0.85	0.00	1.35	0.03	0.00	0.79	1.90		**6.5**	45	2.0
1995	0.73		1.32	1.23	0.00	1.26	0.02	0.00	0.88	3.11		**8.5**	59	2.5
1996	0.63		1.10	1.60	0.00	1.34	0.01	0.00	0.85	3.77		**9.3**	64	2.6
1997	0.68		0.78	1.52	0.00	1.64	0.01	0.00	0.93	4.33		**9.9**	68	2.6
1998	0.71		0.91	1.53	0.00	1.56	0.01	0.00	1.10	4.20		**10.0**	69	2.8

Source : ECMT, national statistics

The analysis of the modal split in the CEECs (see Volume 1) demonstrates an average annual change for the waterways' share in the total transport share of +1.3%. This increase is based upon the evolution since 1970. Although the average share remains positive, waterway transport has experienced a substantial decline in the last decennium. On overall, the total decline of the volume of cargo transported on the CEEC waterways was approximately 14%.

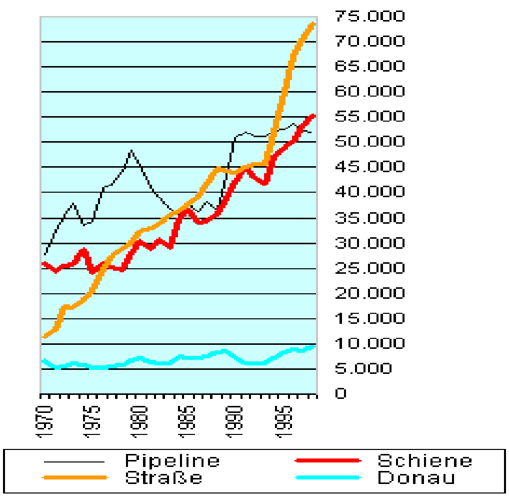
The decline in traffic in the CEECs is also noticeable in the results of freight transport on the Danube River. Compared to the other CEEC Rivers, the cargo turnover on the Danube is important, as the port statistics for the Danube River in Figure 5.6 demonstrate.



Source OIR

Figure 5.6 Danube Ports Annual Transport Volumes

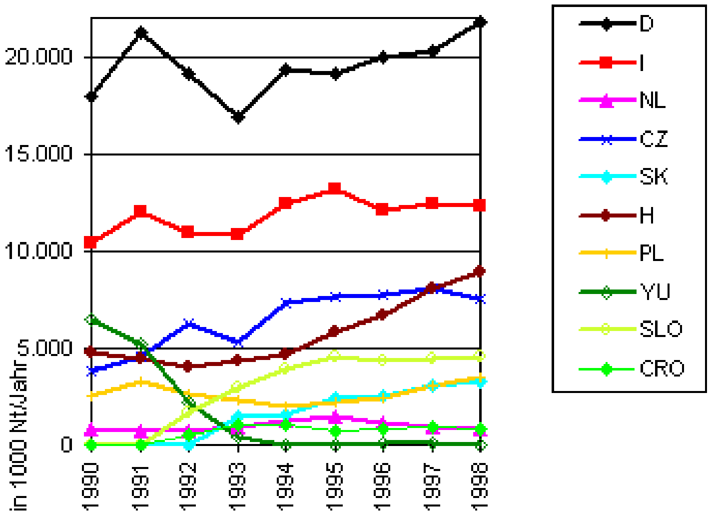
Freight transport on the Danube has known a positive evolution since the 1970's and has reached the double of its volume over that period (see Figure 5.7 hereafter). However, the pace of increase was slower then the one of road, rail and pipeline.



Source OSTAT

Figure 5.7 Traffic History on Danube River

The data in the figure hereafter show a clear difference in the relational development of freight transport on the Danube. While freight transport with the EU, and in particular with Germany show a strong increase, transport with Eastern countries generally decreased or remained stable.



Source: OSTAT

Figure 5.8 Transport Over the Danube With Other Countries

Note in particular the full stop of traffic with Yugoslavia since 1994. The disappearance of transport relations (over water) with Yugoslavia is a direct consequence of the damages on the Danube bridges. A total of 8 Danube bridges in Yugoslavia were damaged during the fighting in April 1999; three of them, located in Novi Sad (Sloboda Bridge, at km 1,257,600; Petrovaradin Bridge, at km 1,255,000, and Zezeljev Bridge, at km 1,254,170) were destroyed to the extent that parts blocked the shipping channel.

In November 1999 the European Council recognized the need of re-establishing navigation on the Danube. A proposal on the reconstruction of the bridges it was adopted unanimously by the Danube Commission on January 25, 2000 and sent to the European Union along with a request for co-financing. The European Union promised support amounting to 85% of the project costs (24.1 million EURO). The Member States of the Danube Commission and third countries should fund the rest.

Freedom Bridge over the Danube Matija Kokovic (Vecernje Novosti) Novi Sad, April 1999; *Picture Via-Danube*

The main conclusions in terms of potential share of total transport are:

a. Modal share for river transport in countries with well-developed infrastructure (Belgium, Germany, the Netherlands, Danube river) could be over 30% of total traffic;

b. Modal share for river transport in countries with low developed infrastructure (France, UK, CEECs) is between 0.1% and 2% average;

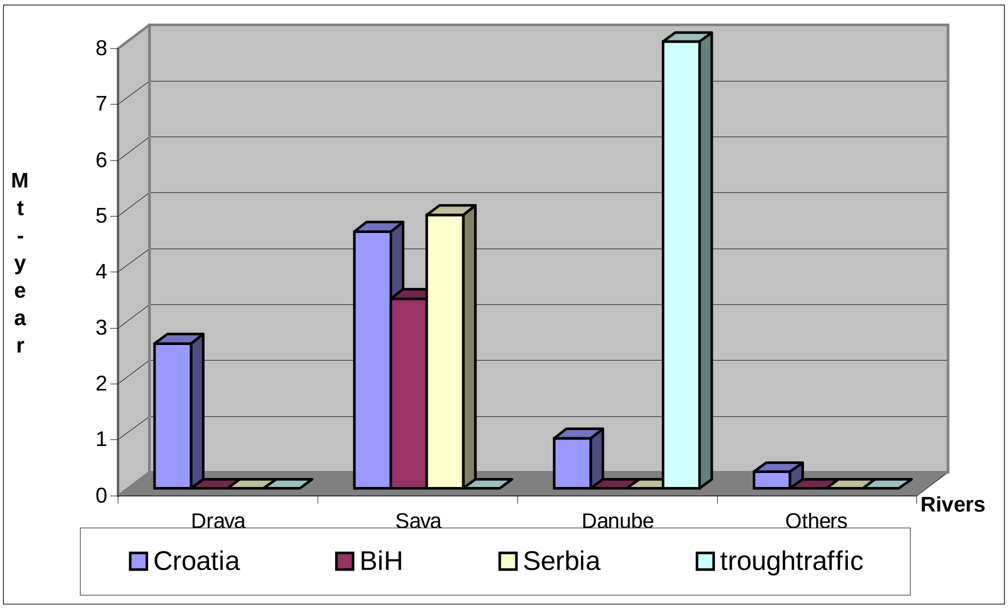
c. The share of river transport in the CEECs is below or equal to the modal share of the EU countries with a less developed waterway network;

d. Waterway transport in the CEECs and on the Danube direction CEECs has known a constant decline;

e. At present, waterway transport to Yugoslavia and related countries has ceased completely and will require some time to recover.

(2) Transport by River in Bosnia and Herzegovina

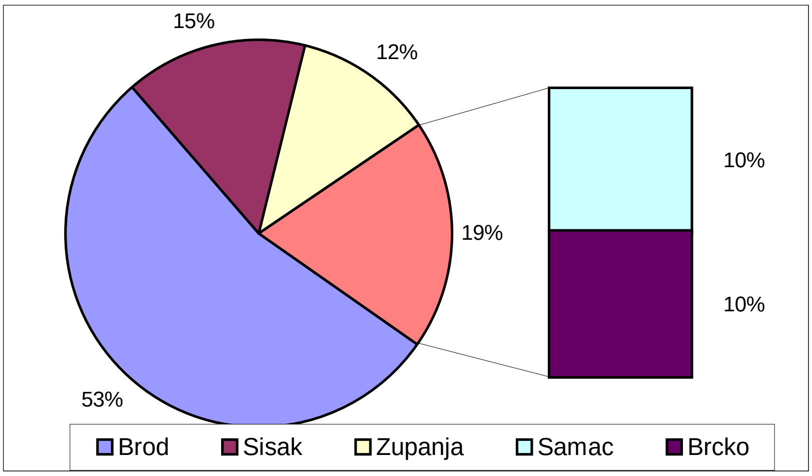
Before the war, the role of Sava River in the total transport in FYR was important. Almost 76% of total cargo transported by river (except throughput on the Danube) was transported over the Sava River, see Figure 5.9.



Source: BiHTMAP, based upon information from Steering Committee

Figure 5.9 Distribution of Traffic in FYR

Transport on the river Sava was predominantly handled in three ports, namely Brcko, Samac and Brod, the latter handling oil and oil derivates for the refinery in Brod. The distribution of cargo between the major facilities along Sava River is visualized in Figure 5.10.



Source: BiHTMAP, based upon information from Steering Committee

Figure 5.10 Port Shares for Throughput on Sava River (1990 in Mt)

Brod was undoubtedly the most important facility on Sava River in 1990 in terms of handled volumes (see Table 5.10). Its share in total traffic on Sava River is therefore over 50% of total cargo that was transported in 1990.

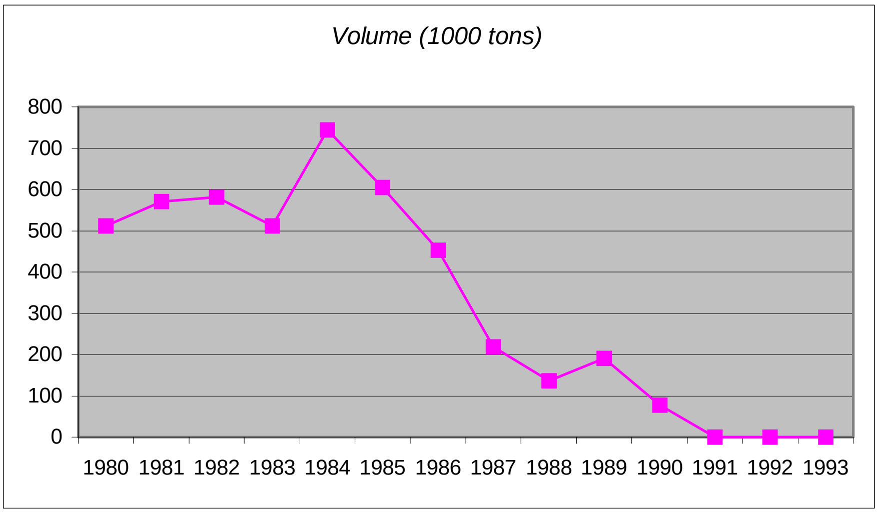
Table 5.10 Throughput Volume Per Port

Throughput Sava ports 1990 (Mt)	
Brod	2.8
Sisak	0.8
Zupanja	0.6
Samac	0.5
Brcko	0.5
TOTAL	5.2

Source: Steering Committee

Sisak and Zupanja are now Croatian ports. Traffic on the river Sava was equally distributed over the 2 BiH ports Brcko and Samac. Tuzla and the surrounding area (including some traffic from Doboj and Zenica) could be considered as the natural hinterland for the port of Brcko. Port of Samac was linked via road and rail (electrified) to the main industrial locations of Zenica, Doboj, Tuzla, and Sarajevo and was also connected to the Zagreb – Belgrade axis.

Although the war caused activities in the ports to cease completely, a continued decline in port activities could already be detected before that moment. For example, the port of Brcko had in its peak years between 500 and 750 thousand tons per year, since 1985, however, the turnover declined constantly, resulting in an annual cargo volume of 77,000 tons in 1990, as demonstrated in Figure 5.11 hereafter.



Source: Steering Committee

Figure 5.11 Cargo Evolution in Port of Brcko

At present, there is limited commercial traffic on Sava River. The Water Resource Management Company “Sava Gradiska” is excavating / dredging approximately 200,000 m^3 of gravel per year from Sava riverbed and transport by river along the bank, from Raca to Brcko. This volume is 15% of the total fleet capacity of 1.2 million tons.

(3) Product Portfolio Analysis

Before the war, the port of Brcko handled cargo for two predominant customers, Zenica Iron & Steel Works in Zenica and the Koksno-Hemijski Kombinat (KHK) coke factory in Lukavac. Steel products, coke, coal, and sand/gravel accounted for over 90% of their total volume.

The pre-war activity of Samac port was oriented towards the industrial production (production of furniture, refinery and mining), the food-processing industry, and local sand/gravel. The dominant products handled in the port were coke, coal, iron, ore, raw materials, foodstuff, and heavy industrial materials for the mining and energy sectors.

The industrial analysis, conducted by the BiHTMAP research team has identified following for river transport important industrial centers:

Table 5.11 Relevant Industries in Bosnia and Herzegovina

CENTER	Main industrial activities
Banja Luka	Metal manufacturing, wood, paper industry, graphite industry, agriculture…
Zenica	Metallurgy, metal industry, coal production…
Tuzla	Coal mines, electro energy, salt production, industrial outfits, chemicals…
Mostar	Outfits, aluminum, metal industry, wood industry
Doboj	Production of compressors…
Bijeljina	Agriculture
Bihac	Outfits, metal manufacturing…
Travnik	Textile, wood, agriculture…
Gorazde	Chemical industry, metal production…
Trebinje	Metal manufacturing, wood….
Orasje	Chemical industry, metal manufacturing, agriculture…
Pale	Wood industry…
Prijedor	Iron, ore and mining activities
Brcko	Production and manufacturing of foods stuff, metal manufacturing, textile,…

Source: BiHTMAP Study Team

Additional market analyses and direct industrial contacts indicated that several industries are interested to utilize river transport to transport a share of their (half)-finished products and for improving their raw materials. Given the above industrial data, following cargo types are relevant to estimate future traffic on the Sava River:

- Steel and metal production, mainly in Banja Luka, Zenica, Trebinje and Gorazde,
- Cokes and coal in Zenica and Lukavac and Thermal coal in central Bosnia mines,
- Sand and gravel in Gradiska and regional construction,
- Forrest and wood from Pale, Travnik, Mostar, Banja Luka,
- Fertilizers and agriculture products from Banja Luka, Travnik and Orasje,
- Oil and oil derivates in Brod,

- Iron, ore, and mining in Prijedor.

The location of the relevant industrial centers in Bosnia and Herzegovina and their relation to the ports of Brcko and Samac is visualized hereafter in Figure 5.12.

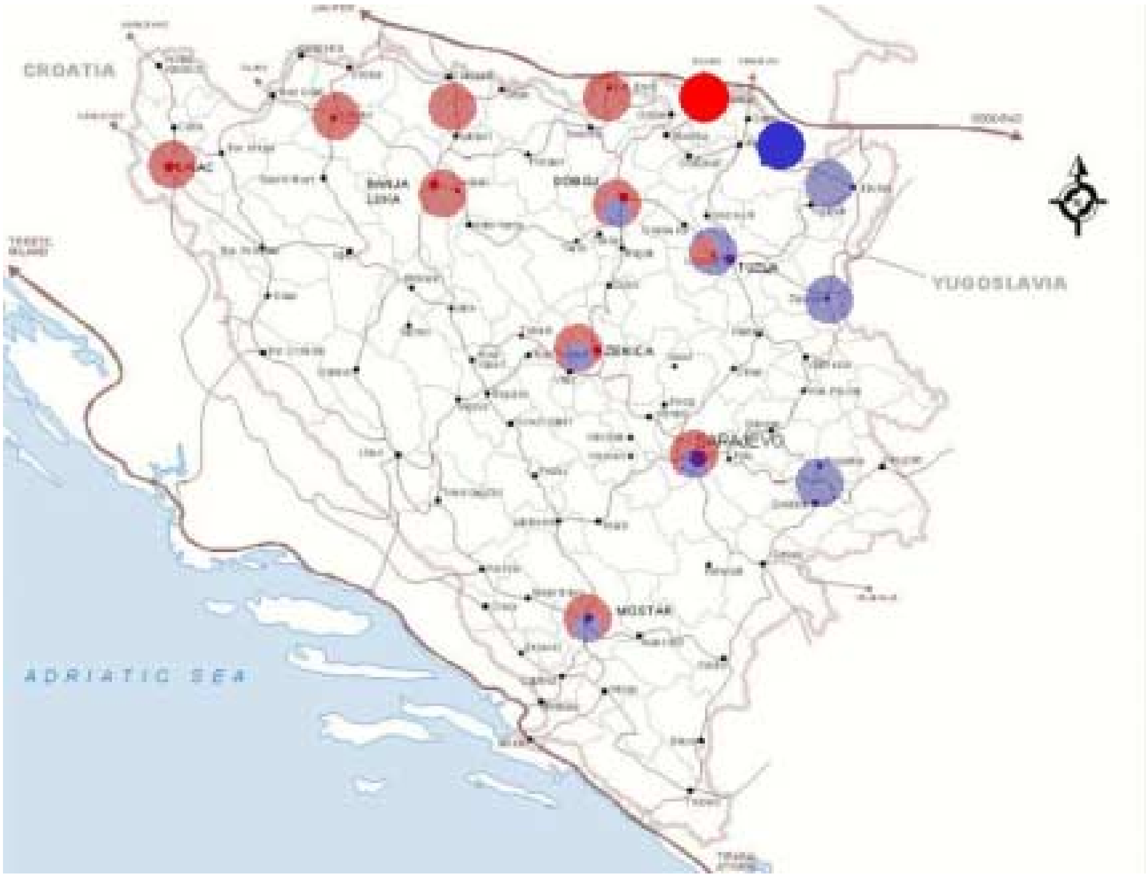


Figure 5.12 Industrial Production Centers, Relevant for Transport Over Sava River

The functional role of Brcko is in the first place to serve its natural hinterland in the larger Tuzla region. Samac will have its natural hinterland oriented towards the Republika Srpska and in addition benefit from its location on Corridor Vc.

(4) Traffic Forecasts for Bosnia and Herzegovina: Final Framework

1) Kick-off Transport Volume

Following conditions are assumed to estimate the volume of kick-off traffic:

- Transport activities will resume in 2002,
- Modal split equals 1.3% of total road traffic (average modal split for river transport share),

- Road transport in BiH will evolve from a total of 32.392 million tons transported per year in 2000 (88.7 thousand tons / day) to 93.434 million tons (255.984 thousand tons per day) in 2020, which is an average annual growth rate of 5.5%.

- Distribution between two ports is equal during kick-off period in terms of volumes,

Supposing that waterway traffic will take a 1.3% share of total road traffic, the total volume in 2002 is equal to **421,096 tons per year transported by river. This initial volume is distributed as follows:**

- Share of Samac 48%,
- Share of Brcko 48%,
- Other loading/unloading facilities 4%.

The refinery in Brod will start using waterway transport again as soon as there are sufficient guarantees that navigation on the river is safe. The availability of the river as transport mode will double their annual production and bring it to 750,000 tons per year. The situation of the refinery in Brod will be considered separately. The kick-off volume for river transport of oil and oil derivates is estimated at 25% of total annual production, **equal to 187,500 tons.** The situation of the Brod refinery is considered separately according to each development scenario.

All detailed calculations per scenario are provided in Annex 5A.

2) Development Scenarios

The *base scenario* assumes waterway transport to increase with a similar rate as road transport. This means that:

- Growth per annum for waterway transport is 5.5% per year (equal to road transport growth);

- Growth remains constant until 2020;

- Samac and Brcko evolution remains equal 48% each of (river transport).

The base scenario is however too vague for accurately estimating future river traffic and in particular, to determine cargo volumes in the ports of Brcko and Samac. Industrial growth differences, modal split effects and the geographical location of industrial centers will determine the future shape of river transport. It can also be expected that the distribution of cargo between the ports of Brcko and Samac will change over time and that the location of Samac on Corridor Vc will increase its opportunities to grow stronger after 2010 as compared to Brcko port that will focus on its natural hinterland of the greater Tuzla area.

The volume of industrial growth for river cargo is demonstrated in next Figure 5.13. It assumes growth rates as identified in the socio-economic analysis.

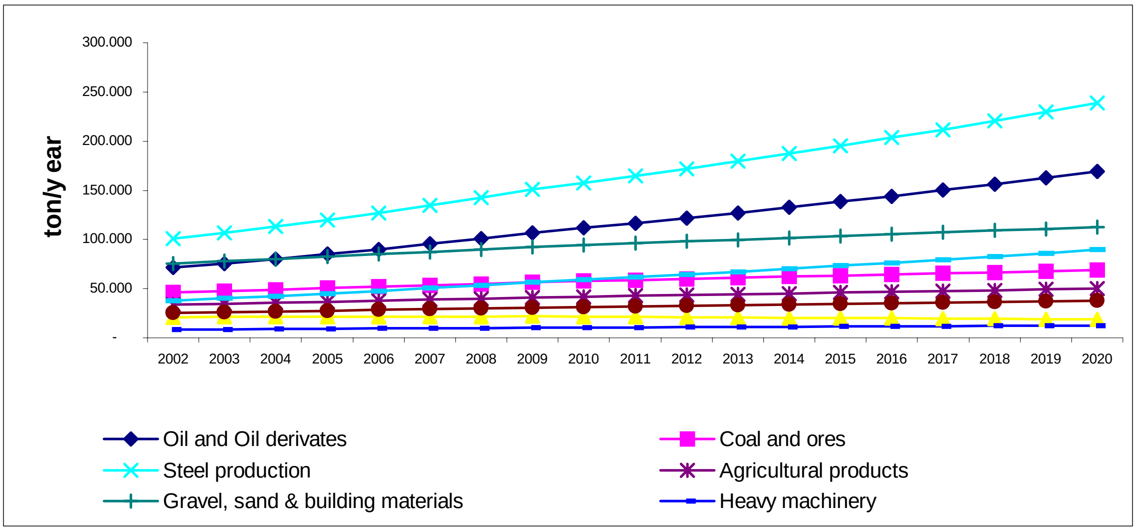


Figure 5.13 Growth of Industrial Sectors, Relevant for River Transport Development

In case the modal share of inland transport would not increase and no additional / new cargo attracted to the river, cargo would grow parallel with industrial growth.

The assumed future impact of Corridor Vc on Samac and the geographical distribution of the major industrial centers is demonstrated in next Table 5.12.

Table 5.12 Percentage Capture Traffic for the Ports of Brcko and Samac

Growth rate distribution	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Brcko	48	48	48	48	44	44	44	44	44	41	41	41	41	41	38	38	38	38	38
Samac	48	48	48	48	49	49	49	49	49	52	52	52	52	52	53	53	53	53	53
Other	4	4	4	4	7	7	7	7	7	7	7	7	7	7	9	9	9	9	9
TOTAL	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100

Source: BiHTMAP

It can be expected that in the beginning of river transport, the importance of Brcko and Samac is equal. Both could capture approximately 96% of initial traffic, set at 421,096 tons. It is assumed that some minor traffic flows (in particular dredging /excavation materials) will be handled at individual piers along the river. It should be noted that this volume does not include oil traffic for the refinery in Brod. A separate forecast for oil traffic in Brod has been made according to the different development scenarios.

From 2005 on, the Corridor Vc location of Samac and the road and rail improvements to access both ports will influence the orientation of traffic to the ports. While Samac will know a constant increase of capture traffic, the market share of Brcko will gradually reduce, also because other terminals and loading/unloading facilities will become operational along Sava river. Brcko will focus on its natural hinterland that predominantly includes Tuzla, Bijeljina, as well as a part of the production at Zenica, Doboj, and Sarajevo. From a logistics perspective, the majority of industrial facilities in the Republic of Srpska will concentrate on Samac port.

This evolution requires that Samac will become accessible for class IV vessels in the future. In case this important condition is not realized in time, the difference between the two ports will remain negligible and future growth could even be in favor of Brcko port.

Future industrial growth and the increase of modal share in transport according to the different development scenarios are described hereafter. The forecasting formulae is the following:

$\mathbf{V_n = ((V_C * G_i) + V_{n-1}) * G_s}$ where:

V_n = total traffic in year "n" with n = 1,2…20
($V_C * G_i$) = the increase in capture traffic as a consequence of industrial growth
V_C = basic capture traffic for river transport
G_i = industrial growth index
V_{n-1} = total traffic in year "n-1"
G_s = the growth index of the modal share of river transport.

The *minimum growth scenario* assumes the same starting point as the base scenario but considers a differentiated growth rate for inland waterways, similar to European traffic forecasts. In this scenario, it is assumed that:

- Transport on Sava river will increase with 1.3% until 2005 (average growth rate CEECs);
- Transport on Sava river will increase with 5.5% until 2010 (growth share of road transport);
- Transport on Sava River will stabilize at 3% (increase of river transport in CEECs in 1970-1980).

The *maximum growth scenario* assumes cargo growth according to the best growth scenarios in Europe and the CEECs and the pre-war volumes in Bosnia and Herzegovina. In this scenario, it is assumed that:

- Transport on Sava river will increase with 5.5% until 2005 (road transport growth rate);
- Transport on Sava river will increase with 15% until 2010 (share of river transport in CEECs in 1989);
- Transport on Sava river will reduce at 13% annual growth until 2015 (share of river transport in CEECs in 1980); and
- Transport on Sava River will stabilize at 5.5% (road transport growth rate).

Finally, in the *moderate growth scenario,* average growth rates are applied over the entire period, taking into account a more than average increase until 2010 because of the availability / attractiveness of this mode to / for several industries in BiH. In this scenario, it is assumed that:

- Transport on Sava river will increase with 5.5 % until 2005 (road transport growth rate);
- Transport on Sava river will increase with 13% until 2010 (share of river transport in CEECs in 1989);
- Transport on Sava river will increase with 5.5 % until 2015 (road transport growth rate);
- Transport on Sava River will stabilize at 3 % (share of river transport in CEECs in 1980).

(5) River Transport Potential: Résumé of the Results

In the base scenario, traffic on the river will increase with the same rate as road transport and the distribution between the ports remains stable. In 20 years time, transport on the rivers will almost triple from 421,096 tons to **1,103,261** tons. The ports of Brcko and Samac would each capture 48% of this traffic (530,000 tons) the remaining 4% would be distributed over several loading/unloading facilities along the river.

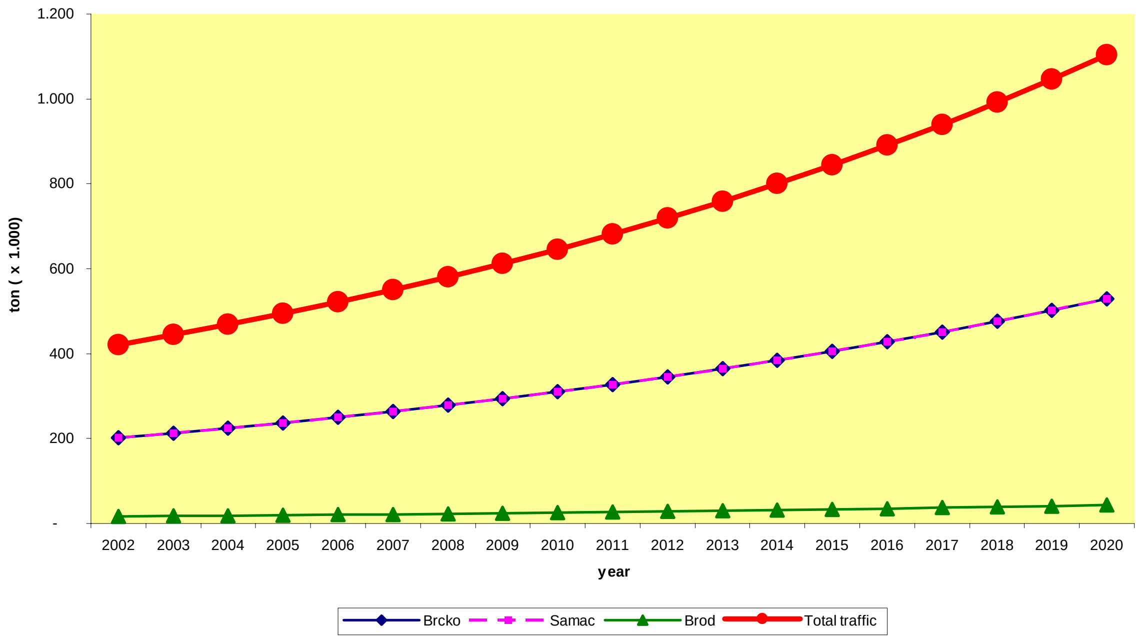


Figure 5.14 Traffic Forecast: Base Scenario

According to the base scenario, industrial growth guarantees there is sufficient traffic volume to validate the development of river transport. However, the volumes for the individual ports are relatively moderate and the opportunity of fully developing both the ports of Samac and Brcko on an equal basis could be questioned.

The minimum scenario takes into account the industrial development as well as the possibilities for river transport to increase their share in total transport. If low growth is assumed, river transport will increase from its initial volume to **1,262,179** tons in 2020.

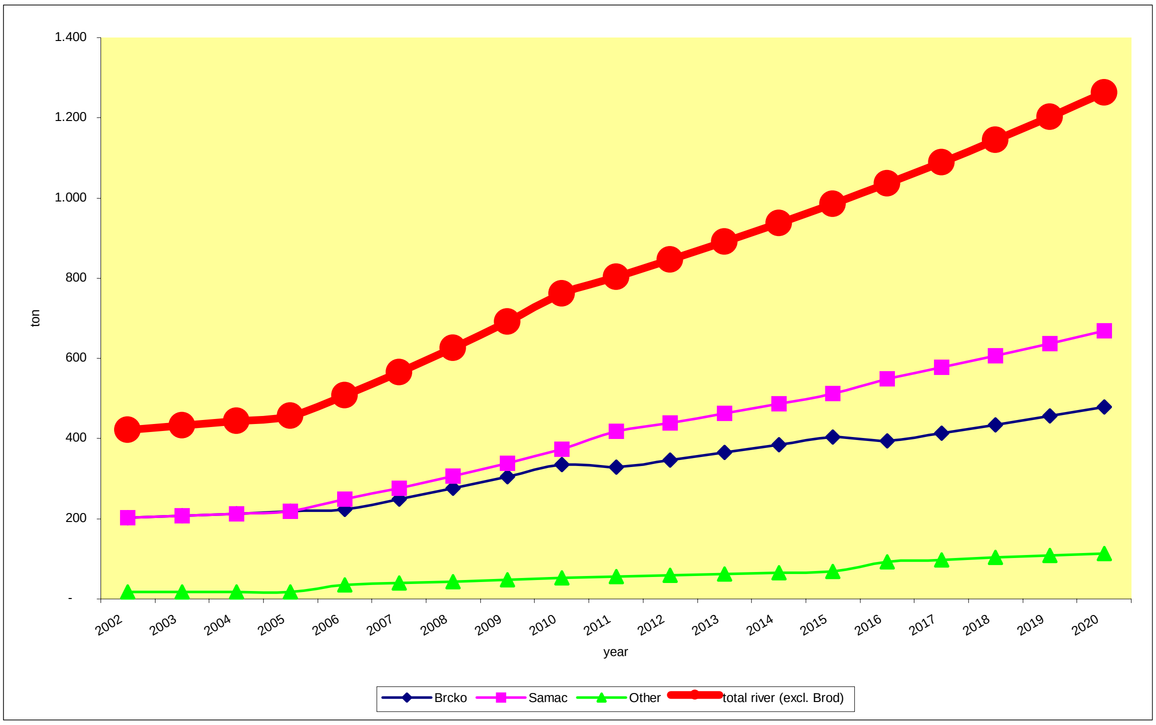


Figure 5.15 Traffic Forecast: Minimum Growth Scenario

This scenario is similar to the base scenario, but the shares of the ports of Samac and Brcko are divergent. Samac would from 2005 on gradually capture more traffic, reaching a total traffic volume of **669,000 tons**, while Brcko would have a total annual turnover of **480,000 tons.** Industrial development along the riverbanks will generate a moderate growth in traffic outside the two main ports, reaching **114,000 tons** in the year 2020. It should be noted that these prognoses do not include traffic to and from the refinery of Brod (see further).

In the high growth scenario, traffic is assumed to increase according to the best growth numbers in Europe and the CEECs. In particular the period between 2005 and 2015 knows a constant and substantial increase of transport volume per year. In this optimistic scenario, traffic on river Sava will reach **5,023,673 tons** in the year 2020, demonstrated in the next Figure 5.16.

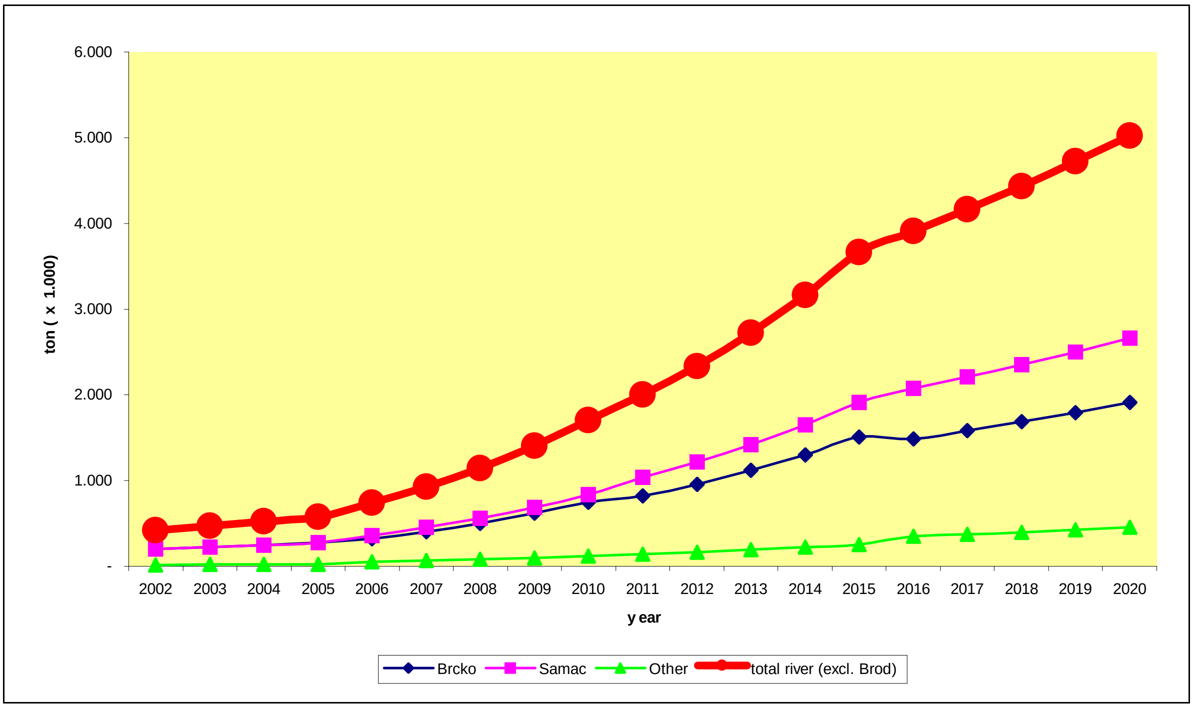


Figure 5.16 Traffic Forecast: High Growth Scenario

The port of Samac would, according to the high growth scenario, handle a total cargo volume of **2,662.55 tons**, compared to the port of Brcko that would handle **1,909.00 tons.** In this optimistic scenario, the capacity of both ports would reach pre-war levels in 2007-2008 and would from then on increase gradually to reach the levels that were forecasted in the eighties and on which all port development plans.

Finally, in the moderate scenario, a more realistic growth of river transport is applied by using growth rates that are similar to the EU and CEECs. In the moderate scenario, which is the most probable development scenario, river transport would increase from 421,096 tons to **2,379,702** tons per year. This amount is similar to total pre-war river traffic in BiH.

For each of these scenarios, traffic of oil and oil derivates to and from the refinery in Brod have been excluded from the analysis. It is estimated for each scenario that the refinery, as soon as river transport becomes available, will ship between 250,000 ton and 1.3 million tons per year in 2020, see next figure. Compared to the total production capacity of 5 million tons per year, this would constitute a share of approximately just 25% of total transport. It is realistic to assume that inland waterways could at least capture this volume. Given the cost effectiveness and logistics benefits of transporting oil and oil derivates in barges over the river, the real volume transported by river could be higher.

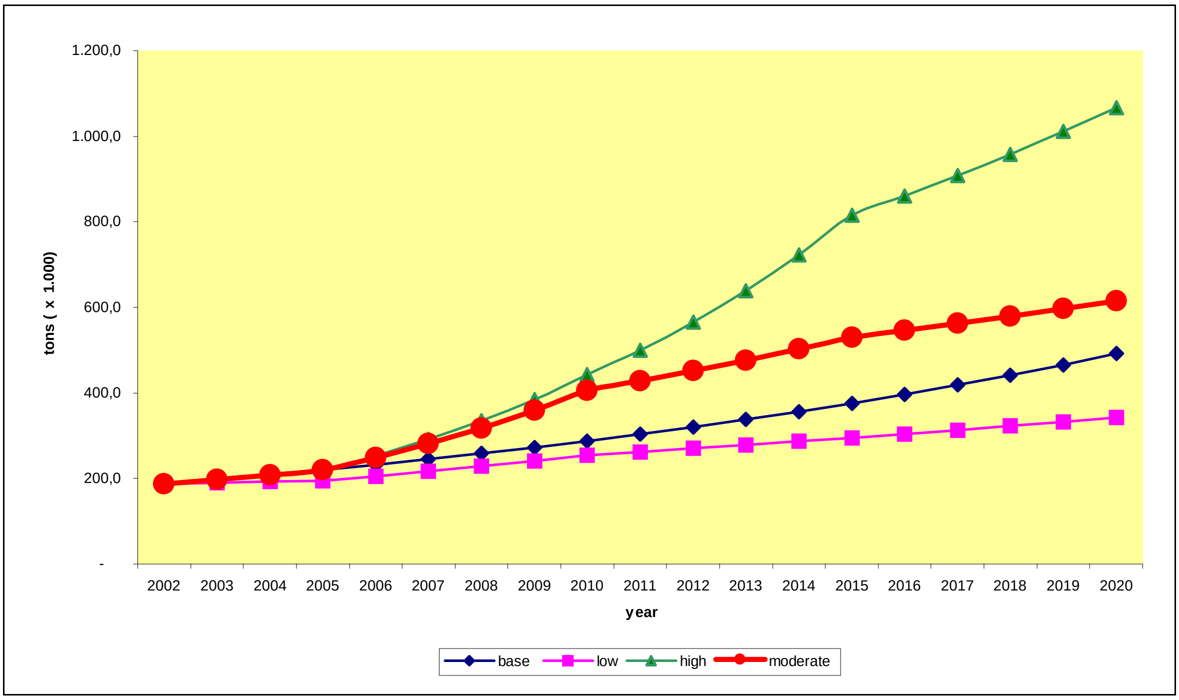


Figure 5.17 Traffic Forecast: Oil and Oil Derivates Refinery Brod

In the final figure hereafter, the traffic evolution on Sava River for the BiH is summarized according to the different development scenarios. Traffic to and from Brod is included in these numbers.

According to the results visualized in the figure below, the high growth scenario would generate over 6 million tons of traffic on river Sava. Although this number is feasible, it requires full industrial growth, in particular in the sectors that will use river transport for an important share of their transport needs. The low growth scenario and the base scenario follow the opposite approach. According to both scenarios, industrial development will be slow and the share of river transport will remain very moderate in total transport. This is a very pessimistic view and contrary to the European development where the share of this mode increases with higher than minimum growth rates. In Europe, river transport is capturing new markets such as container transport, ro/ro traffic, and high end products. Furthermore, recent research has demonstrated that efficient intermodal applications can reduce the cost effective length of transport modes such as rail and road.

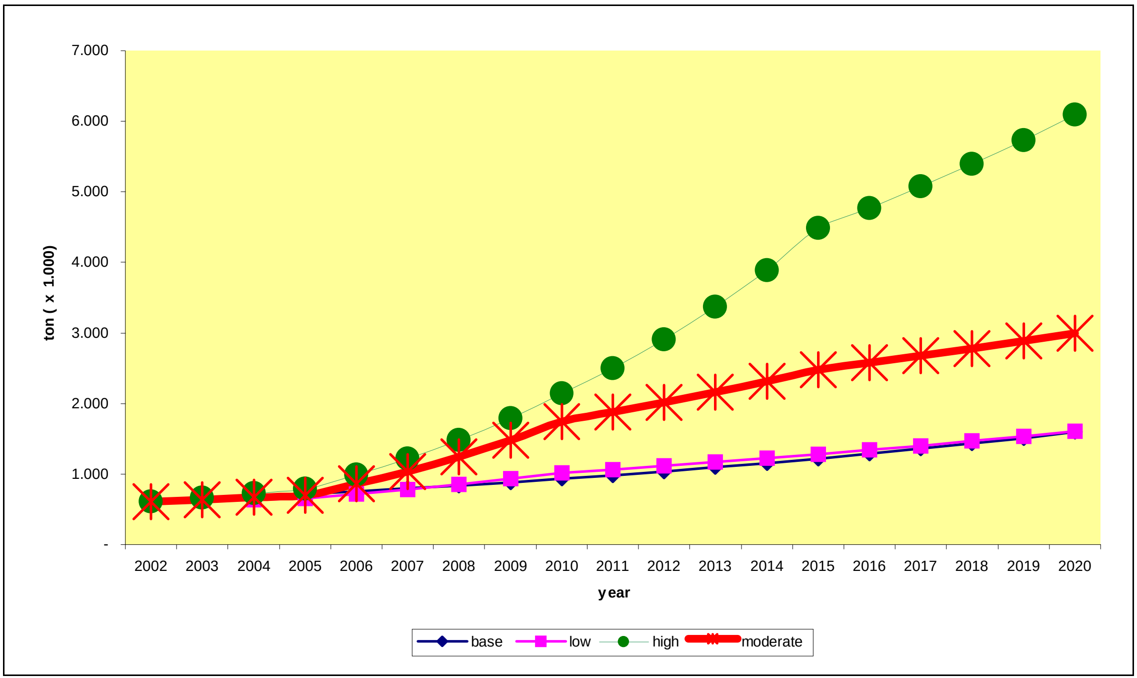


Figure 5.18 Traffic Forecast: Total Traffic on Sava River: All Scenarios

The moderate scenario is a probable scenario according to which river traffic will be at pre-war levels again around 1010 at latest, to further grow the next 10 years. The share of river transport will grow because of its logistics benefits for the industry. It will also grow because there is a further increase in industrial development and the expansion of cross border transport. It will be up to the river transport operators and port managers to maximize the potential benefits generated by these evolutions. Modal integration and the development of new markets will be a core success-factor to reach the highest possible transport growth.

5.7 INFRASTRUCTURE PLAN

(1) Introduction

No (relevant) investments have been made in the rivers of BiH until present day. Two IMG studies have been made to estimate the total costs for urgent rehabilitation and at present, OHR has commissioned a study to Parsons Brinckerhoff International (USA) to assess the potential of the port of Brcko and to determine the infrastructure rehabilitation needs. Several development plans also exist at the entity and municipality levels that foresee future developments for the existing infrastructure and the construction of new river transport facilities.

All this information has been reviewed and taken into consideration to assess the urgent reconstruction projects, and the phased development projects. The *urgent reconstruction projects* are projects that need to be implemented in the short-term future in order to have as soon as possible an operational river transport sector in BiH.

The *phased development projects* are necessary in the medium- and long-term to guarantee the sustainability of river transport and to upgrade the transport system to EU levels.

(2) The Urgent Reconstruction Projects

1) Minimum Navigation Channel on the River Sava

Establishing the minimum navigation channel on Sava River is a two-step process. The first step includes recording the present condition of the prior navigation channel and signalization systems. Navigation signs on Sava river, right bank of the navigation waterway according to division of the coastal authorities, and according to the marking Plan of river Sava from the side of Institution for marking and maintenance of inland waterways from 1998.

I. Federation of Bosnia and Herzegovina

right bank of rkm 231 up to rkm 304 = 73 rkm
right bank of rkm 306 up to rkm 338 = 32 rkm
Total = 105 rkm

rkm 248,0	- bar………………………………………………………….	2 pieces,
254,0-255,0	- bar………………………………………………………….	1 -“-
254,0	- travel sign. Sign for crossing for upstream and downstream………………………………………………..	1 -“-
257,0	- travel sign: dangerous place besides a bank with a radar reflector…………………………………………….	1 -“-
264,0	- bar…………………………………………………………..	1 -“-
268,0	- bar…………………………………………………………..	5 -“-
279,0	- bar…………………………………………………………..	1 -“-
279,5	- bank’s lighting sign………………………………..……	1 -“-
285,0	- bar…………………………………………………….……	7 -“-
285,0	- bank’s lighting sign………………………………………	1 -“-
293,0	- bar…………………………………………………………..	2 -“-
295,0	- bar…………………………………………………………..	2 -“-
297,0	- bar…………………………………………………………..	2 -“-
299,0	- bank’s lighting sign…………………………………...	1 -“-
304,0	- bar…………………………………………………………..	1 -“-
rkm 307,0	- bar………………………………………………………….	2 -“-
308,0	- bar………………………………………………………….	1 -“-
309,0	- bar………………………………………………………….	1 -“-
314,0	- bar…………………………………………………………..	1 -“-
315,0	- bar…………………………………………………………..	1 -“-
317,0	- bar…………………………………………………………..	3 -“-
317,0	- float……………………………………………………..….	3 -“-
319,0	- float……………………………………………………...	1 -“-
319,0	- bar………………………………………………………....	5 -“-
320,0	- travel sign: sign for crossing…………………………….	1 -“-
320,0	- bank’s lighting sign……………………………………….	1 -“-
321,0	- float………………………………………………………...	3 -“-
321,0	- bar…………………………………………………….……..	6 -“-

328,0 - bar……………………………………………………….…….1 -“-
328,0 - float………………………………………………….…..1 -“-
335,0 - bar…………………………………………………………2 -“-
335,0 - bank’s lighting sign……………………………………….1 -“-

Recapitulation:

- **bars………………………………………………………………..50 pieces,**
- **floats……………………………………………………………...6 -“-**
- **bank’s lighting signs……………………………………………..5 -“-**

travel signs:

- **sign for crossing for upstream and downstream…………….2 -“-**
- **sign for crossing…………………………………………………1 -“-**
- **dangerous place beside bank with radar reflector…………2 -“-**

TOTAL: 66 pieces.

II. Republic of Srpska of BiH

right bank from rkm 175 up to 207 rkm = 33 rkm
right bank from rkm 304 up to 306 rkm = 2 rkm
right bank from rkm 338 up to 508 rkm = 170 rkm
TOTAL = 205 rkm

175+50 - bank’s lighting sign…………………………………….1 piece
rkm 181,0 - bar……………………………………………………2 pieces
186,0-188,0 - bar…………………………………………………..3 -“-
198,5 - travel sign: sign for crossing…………………………1 -“-
203,5 - bank’s lighting sign…………………………………..1 -“-
rkm 304,0-306 - no navigation and bank signs………………………….. -
rkm 350,1 - bank’s lighting sign…………………………………….1 piece
351,6 - travel sign: dangerous place beside a bank with a radar reflector……………………………………………………1 -“-
359,0 - bars…………………………………………………………2 -“-
359,0 - bank’s lighting sign………………………………………1 -“-
366,0 - bar……………………………………………………………..1 -“-
368,5 - bank’s lighting sign………………………………………1 -“-
369,0 - bars..……………………………………………………….5 -“-
373,0 - bars..1 -“-
375,5 - bank’s lighting sign..1 -“-
376,0 - bars...3 -“-
380,8 - bank’s lighting sign......................................…1 -“-
381,0 - bars..3 -“-
381,0 - float...…..1 -“-
387,0 - bars...…2 -“-
389,0-390,0 - bars...1 -“-
389,0 - float...1 -“-
390,0 - nonlighting float with a radar reflector....................1 -“-
390,1 - bank’s lighting sign..…1 -“-
393,0 - bank’s lighting sign...1 -“-
408,0 - bar...…1 -“-
410,0 - bar...…1 -“-
416,0 - bank’s radar reflector..1 -“-
417,0 - bank’s lighting sign..…1 -“-
418,0 - bar...1 -“-
423,0 - bars...4 -“-

441,0-445,0 - bars..6 -“-
445,2 - bank’s lighting sign..1 -“-
447,8 - bank’s lighting sign..1 -“-
453,5 - travel sign: necessary to give a sound signal..............1 -“-
456,3 - bank’s lighting sign..1 -“-
458,0 - bar..1 -“-
476,0 - bar...1 -“-
479,0 - travel sign: dangerous place beside a bank with its radar reflector..1 -“-
480,0 - travel sign: dangerous place beside a bank with its radar reflector..1 -“-
481,0 - bar..1 -“-
496,0 - travel sign: for crossing upstream...........................1 -“-
495,0-496,0 - bars..3 -“-
504,0 - bar...1 -“-
507,7 - travel sign: for crossing upstream...........................1-“-
508,0 - bars...2 -“-

Recapitulation:

- **bars...44 pieces**
- **bank’s lighting sign...14 -“-**
- **floats..2 -“-**
- **bank’s radar reflector..1 -“-**
- **non-lighting float with a radar reflector..........................1 -“-**
- **travel sign: sign for crossing...1 -“-**
- **travel sign: dangerous place beside a bank with a radar reflector..3 -“-**
- **travel sign: necessary to give a sound signal.......................1 -“-**
- **travel sign: sign for crossing upstream.............................2 -“-**
- **travel sign: necessary to pay special attention...................1 -“-**

TOTAL: 69 pieces.

III. Brcko District Bosnia and Herzegovina
right bank from rkm 207 up to 231 rkm = 24 rkm.

rkm 208,0 - bar...1 piece
208,0 - travel sign: sign for crossing upstream and downstream..........1 -“-
211,0 - bars..2 -“-
215,0 - bars..3 -“-
216,0 - bank’s lighting sign...1 -“-
223,0 - bank’s lighting sign...1 -“-

Recapitulation:

- **bars...6 pieces**
- **bank’s lighting sign...2 -“-**
- **travel sign: sign for crossing upstream and downstream..1 - ‘-**

TOTAL: 9 pieces.

A detailed survey of present navigation conditions can only be realized after installation of an international body that solves all pending questions between BiH and the Republic of Croatia in the sector from rkm 207 till rkm 507 and between BiH and the SR

Yugoslavia in sector rkm 176 (mouth of river Drina) till rmk 207. The need to establish an international body to govern the river Sava is discussed further in this chapter.

Once having solved the responsibility issues, the rehabilitation of the navigation channel is the most important priority. Without a navigable channel, all investments in the ports of Samac and Brcko and in other terminals (such as Brod) and transshipment facilities are futile because they will remain inaccessible for river traffic.

The rehabilitation of a minimum navigation channel is the second step and includes four elements:

- De-mining of navigation channel, port and terminal access and river banks where necessary;
- Debris removal in navigation channel, port and terminal access and river banks where necessary;
- Dredging of minimum navigation channel;
- Installing signaling system adapted to meet the conditions of the new navigation channel.

The de-mining of river Sava needs coordination and cooperation with MAC, SFOR and the entity and regional public authorities. A detailed survey is necessary to estimate the total number of mines on the riverbanks and in the river.

Although no real surveys have been performed yet to estimate the total number of mines along the river, some indications on the costs can be found in the IMG studies for the ports of Samac and Brcko. An estimate of the costs for de-mining the river Sava and the port areas is provided in the next Table 5.13. The estimated cost for removing one mine is 5 KM (source: IMG report on rehabilitation of port of Samac).

Table 5.13 Estimated Cost for De-mining

Location	# mines	Costs (KM)	Estimate made by
Samac	20,000	100,000	IMG
Brcko	8,000	40,000	IMG
Brod Refinery	10,000	50,000	Various / Industry
River + banks	50,000	250,000	Estimate BiHTMAP
Total	88,000	550,000	(Including survey costs)

Given the number of mined zones in the Brod-region and between Samac and Brcko, this estimate is moderate. A detailed cost assessment for de-mining can only be given after an in-depth survey of the river channel and banks.

Along the river, remaining debris needs to be removed and cleaning is required before dredging can begin. IMG estimates the costs for cleaning the river (banks) at 30 KM per meter. This would mean that the total cost for debris removal and riverbank cleaning would be approximately **990,000 KM** (30 KM x 330 rkm).

Finally dredging of a minimum navigable channel is urgently required. The minimum navigation conditions for river Sava should be:

- Width: 60 meters;
- Depth: 1 meter; and
- Length: 333 km (total length guaranteed for minimum navigation to access facilities from both sides).

Several sources indicated that approximately 95% of the river is at that standard and that 5% of the river length (16,500 m) needs to be dredged. According to this information, a total volume of 990,000 m^3 needs to be dredged. The cost estimates vary according to the source contacted. An overview of the different estimates per m^3 is provided in Table 5.14.

Table 5.14 Estimated Dredging Costs

Source of cost estimate	*Cost per m^3*	*Total cost for dredging*
European Dredging Association	4 KM	3,960,000 KM
IMG	6 KM	5,940,000 KM
Captaincy / Industry	10 KM	9,900,000 KM

2) Urgent Rehabilitation Port of Brcko

Loading and unloading facilities are a necessity for utilizing the benefits of river transport. Port of Brcko is one of two important facilities along Sava River that offers the industry access to the benefits of river transport. Urgent repairs are necessary to ensure minimum operations in the port area.

IMG has made a first estimate of the costs related to the rehabilitation of the port area. The rehabilitation program of IMG includes urgent repairs and elimination of war damages. The total costs estimated by IMG were around 1 million KM for the first phase of the repairs (4.8 million KM if phase 2 of the urgent rehabilitation project is included). The first phase included:

- Mine clearance in port area (not estimated),
- Cranes and tracks,
- Bank and apron rehabilitation,

- Port railway and roads rehabilitation,
- Building rehabilitation, and
- Research and engineering studies.

According to the on-sight investigation and the expected traffic volumes, following investments are needed to guarantee an efficient operational port in the near future:

- Mine clearance,
- New crane and transformer station repairs,
- Bank and apron rehabilitation,
- Surface works on quay area, and
- Quay road and crane rail track.

Next Table 5.15 provides an estimate of total costs for the urgent rehabilitation works for port of Brcko. The estimates are based upon the IMG estimates.

Table 5.15 Urgent Rehabilitation Costs Port of Brcko

Item	Quantity	Total cost (KM)
Mine clearance (port area)	10,000	50,000
Cranes (new, min 5 ton)	1	3,000,000
Crane rail track and supply (repairs)	1	25,000
Transformer station rehabilitation	1	200,000
Rehabilitation (sloped quay)	1	150,000
Rehabilitation (vertical quay)	1	1,000,000
Port railway track repair	1	150,000
Port road repairs (+ new stretch)	1	65,000
Engineering study costs	1	450,000
TOTAL COSTS		**5,090,000**

The purchase of a new crane generates over 60% of total investment costs. However, this option has been selected to avoid investments that will not generate sufficient payback. Rehabilitating the two existing cranes would be less interesting. Given the expected increase in traffic in the port, one efficient crane is sufficient to coop with the traffic in the port in the next five years. If the existing cranes should be repaired, both will have to be replaced in the next five years of operations, and the total investment of 1.5 million KM would not be recuperated while the investment for a new crane becomes imminent at that time.

Even if a privatization scenario is supposed in which private investors are given concessions for the exploitation of a terminal / quayside facility, the benefits of installing a new crane are clear. Private investors would not be willing to use the old rehabilitated crane (renting or leasing from port authorities) and the crane would have to be removed. If however, a new crane needs installed by the port authorities from the beginning, revenues can be generated for the port by leasing the crane to the private operator(s).

A second important cost factor is the rehabilitation of the new vertical quay. This investment is considered urgent because the sloped quay is not convenient to guarantee direct loading and unloading activities (taking into account span of crane). The availability of a vertical quay is a minimum condition for efficient port operations and the crane should be made operational at that quay. The sloped quay can be used for vessel related activities such as maintenance, provision supply, fuelling and waste disposal, etc…

No warehousing rehabilitation or the reconstruction of the administrative building is proposed. On site investigation demonstrated that sufficient warehouses of reasonable quality are available to accommodate for cargo storage (e.g., warehouse nr. 4). Also the administrative and other staff buildings are in sufficiently good condition.

The proposed rehabilitation would provide an efficient port system that offers a quay and crane to load and unload vessels, storage facilities in warehouse nr 4, and additional yards for open storage of bulk.

3) Urgent Rehabilitation of Port of Samac

Loading and unloading facilities are a necessity for utilizing river transport. Port of Samac is the second important facility along Sava River. Urgent repairs are necessary to ensure minimum operations in the port area.

IMG has made a first estimate of the costs for urgent repairs and elimination of war damages. The total costs estimated by IMG were around 8.5 million KM for the first phase of the repairs. This first phase includes:

- Mine clearance in port area,
- Cranes and transformer station,
- Bank and apron rehabilitation,
- Railway and roads in port and access to port, and
- Warehousing and buildings.

In a second phase, additional improvements were identified for a total additional budget of 10.3 million KM. This second phase consists of following works:

- Construction of warehouses and extension of administrative building,

- Surface works,
- Road construction and parking facilities,
- Water supply rebuilding and extension of network,
- Construction of hydrant network, and
- Fences and portals.

The necessary works are much more important than for the urgent rehabilitation phase in the port of Brcko. Following investments are needed to guarantee an operational port in the near future:

- Mine clearance,
- New crane (5 ton),
- Bank and quay rehabilitation,
- Surface works on quay area,
- Reconstruction of road and rail tracks, and of warehouse.

Next Table 5.16 provides an estimate of total costs for the urgent rehabilitation works for port of Samac. The estimate is based upon the IMG estimates.

Table 5.16 Urgent Rehabilitation Costs Port of Samac

Item	Quantity	Total cost (KM)
Mine clearance (port area)	20,000	100,000
Cranes (new, min 5 ton)	1	3,000,000
Transformer station	1	1,000,000
New warehouse	1	1,500,000
Rehabilitation quay	1	1,000,000
Port railway and road repairs	1	150,000
Administrative building	1	450,000
Engineering study costs, miscellaneous & contingencies	1	650,000
TOTAL COSTS		**7,850,000**

Similar to Brcko port, a new crane is selected over the possible rehabilitation of the existing cranes. But contrary to the situation in Brcko, several new constructions have to be built. This increases the emergency investment costs with 2.5 million KM as compared to the urgent reconstruction needs for Brcko port. On site investigation demonstrated that also the existing quay requires serious rehabilitation.

The proposed investments will provide an efficient port system that offers a quay and crane to load and unload vessels, storage facilities, and an efficient access to the port area by road and rail.

The proposed investments are mainly for new building. They are important but not mandatory to starting port operations. To start operations, the crane and quay investment (totaling 4 million KM) is mandatory. The other investments can follow once the port has started up its activities.

(3) Phased Development Plan: Transport Integration and Intermodality

Urgent reconstruction of the ports of Samac and Brcko and the rehabilitation of the river are urgent reconstruction projects to enable the future development of river transport in BiH. The traffic forecasts are based upon the immediate start of these projects so that river traffic becomes possible in 2002. The emergency projects should be fully completed in 2005.

At that time, a minimum navigation channel of class III should be available from the border over Brcko to Samac and both ports should be fully operational. The rest of the river should be accessible for class II vessels and, depending upon private initiatives, additional quays and terminals could operate along the river (e.g., terminal in Brod for oil refinery).

The further development of river transport is related to the economic and industrial development that will determine the future need for river transport as a part of the total transport offer.

Phase 2 and phase 3 are focusing on the intermodal integration of the river transport system.

Phase 2 includes:

- **Stabilization of Sava river accessibility**
  - Further dredging of the Sava river (class IV from border to Samac)
  - Hydraulic engineering to avoid further silting of the river
  - River bank improvements

- **Further development of the river ports**
  - Improvement of road and rail access to the ports of Brcko and Samac
  - Preparation of development plan for Gradiska port

- **Development of the region of Neum**
  - Promote tourism development in the region
  - Establishment of ferry services, tourism on the sea, commercial fishing and other initiatives

Phase 3 includes:

- **Stabilization of Sava river accessibility**
  - ➢ Maintenance dredging of the Sava river
  - ➢ Hydraulic maintenance
  - ➢ River bank maintenance

- **Integration of river transport**
  - ➢ Intermodal platform Samac
  - ➢ Intermodal platform Brcko
  - ➢ Intermodal platform Gradiska

The objective of the two phases is to gradually integrate waterway transport in the entire transport system of BiH; the concept is demonstrated in next figure. The integration is necessary to achieve sustainability of waterway transport. At the same time, transport integration will benefit the other transport modes and improve the entire transport system of BiH. It is clear that the integration of waterway transport is not limited to the Sava river but also includes the other navigable rivers and sea transport.

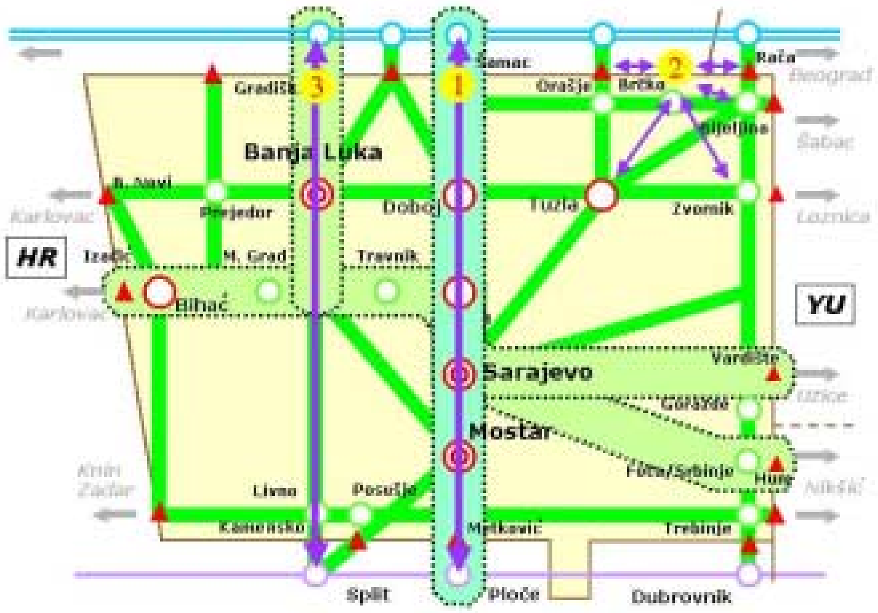
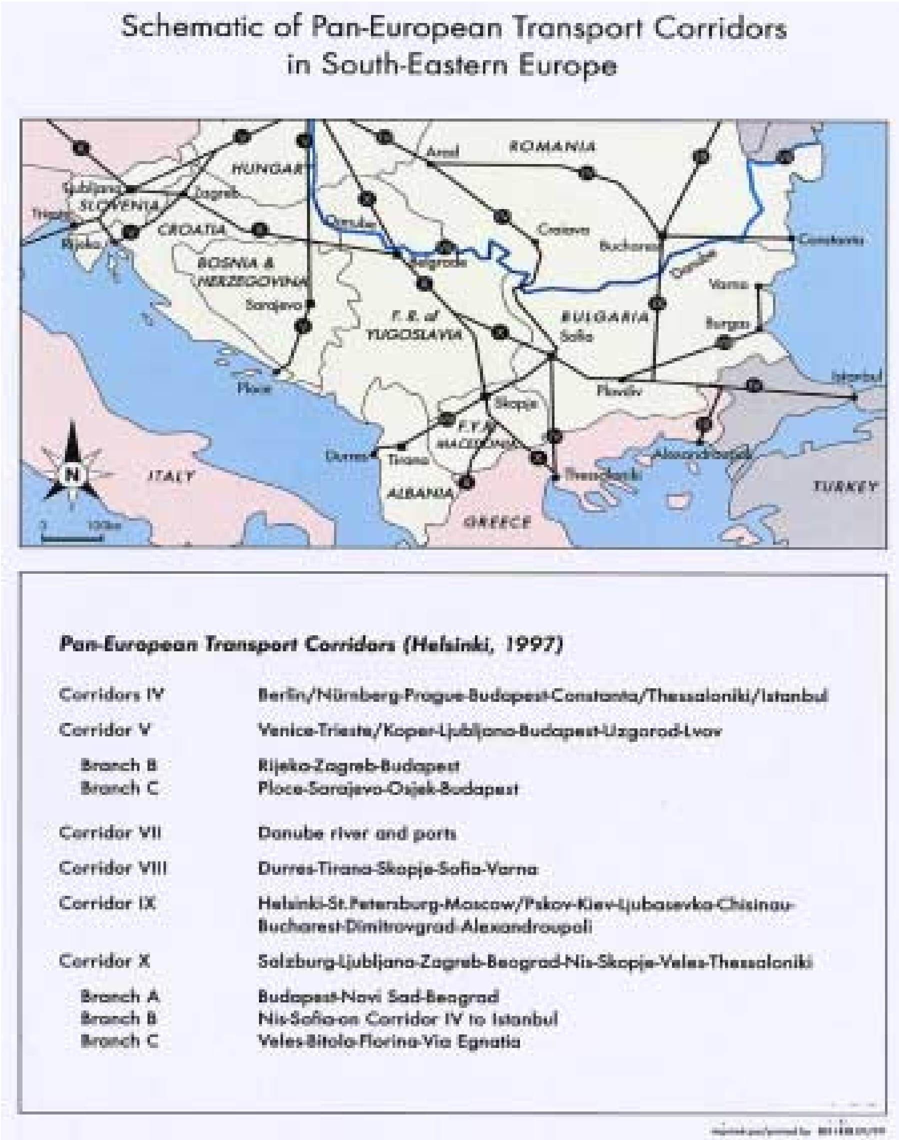


Figure 5.19 River Transport Integration: Conceptual Approach

Above map demonstrates the concept of an integrated transport system for road, rail, and river transport. The river port of Samac is directly related to the development of Corridor Vc. The port of Brcko will focus on regional cargo while the development of the third intermodal platform, river port Gradiska will depend upon the needs of the industrial centers in RS.

- The final objective of transport system integration should be to efficiently and effectively link all transport modes to the relevant international transport corridors.

The Pan European transport corridors, as defined by the European Commission during their Helsinki Meeting in 1997, are visualized in the figure hereafter.



Source: EIB

Figure 5.20 Schematic of Pan-European Transport Corridors in Southeastern Europe

For Bosnia and Herzegovina, three corridors are particularly important, namely:

- Corridor VII: Danube river,
- Corridor Vc: Ploce – Budapest,
- Corridor X: Salzburg – Thessalonica.

River transport and transport over sea via Ploce in BiH thus constitutes an important element of the future transport offer that connects the industrial and economic environment of BiH to Europe. However, river transport has to be considered with the necessary realism. Even in the optimistic scenario, total river transport volumes remain moderate (compared to volumes of river transport in Europe). Therefore, river transport integration into the intermodal transport system should be considered, taking into account the difficulties related with interoperability and interconnectivity of transport systems. The issue is discussed in more detail in the chapter on intermodal transport.

5.8 OPERATIONAL ASPECTS

5.8.1 Introduction

Given the traffic forecasts for river transport and the volume distribution between the ports of Brcko and Samac, the infrastructure development and the improvement of navigability on the river has to be realized in three phases, as demonstrated in next Figure 5.21.

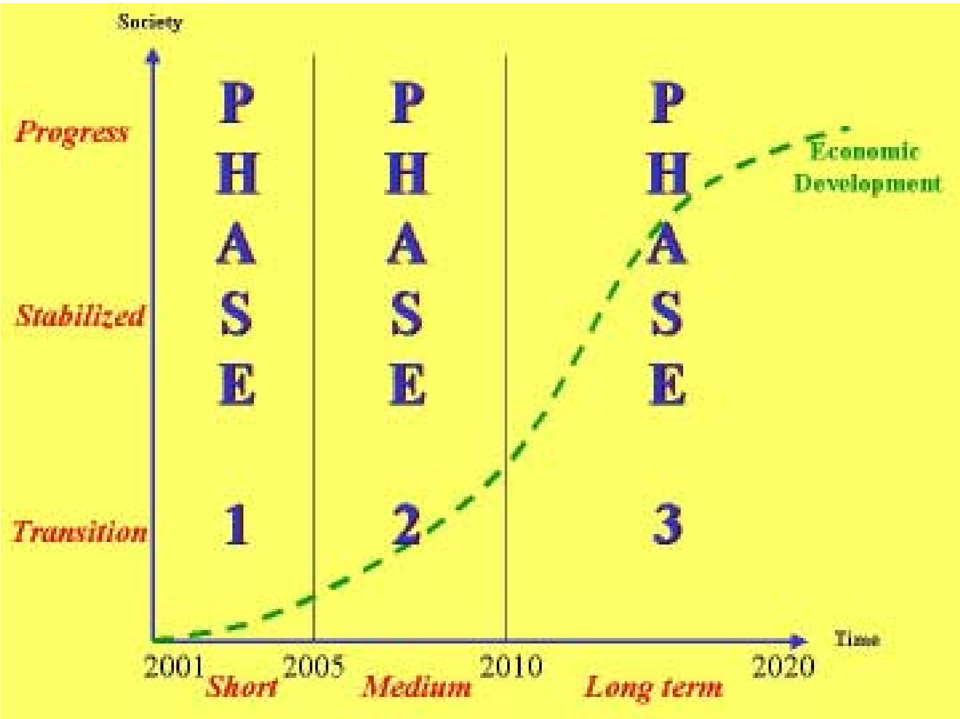


Figure 5.21 River Transport Development Plan

At present, there is no real commercial traffic on the Sava River and the ports of Brcko and Samac are completely in operational. Furthermore, no maintenance has been done on the navigation channel, creating uncertainty regarding the navigability of the river Sava. In addition to the physical situation, the regulatory situation is also unclear. Until present there is no agreement regarding the responsibilities and ownership over Sava

River. Only a Protocol was signed between BiH and Croatia. But this protocol is insufficient to organize, monitor and control commercial traffic on the river.

5.8.2 Integrated Approach to Projects and Initiatives

The proposals are divided into three for the sector extremely relevant sections, namely:

- The regulatory framework,
- The infrastructure framework, and
- The operational framework.

Certainly during the priority rehabilitation period, all three sections have to be addressed simultaneously to avoid future investments that cannot generate results. For example, if the regulatory framework for the river Sava is not established, infrastructure investments cannot be realized to secure a navigational channel on the river. Any potential investment in the ports of Brcko or Samac or in the terminal facility of Brod would than be futile because navigation would remain impossible.

Therefore and although the regulatory framework does not include important financial resources, it is of critical importance that decisions are taken in this field as soon as possible to avoid any further delays in the development of the inland waterway sector.

(1) The Regulatory Framework

a. High Priority Initiatives

➢ Ratification of the Protocol on Sava River and inclusion of Yugoslavia in the process,

➢ Establishment of the Waterways and Ports Public Corporation to co-ordinate initiatives from both entities, and

➢ Preparation of the international status of Sava River.

b. Priority Initiatives

➢ Realization of international status of Sava River,

➢ Organization of a Sava River Management Board to co-ordinate future development initiatives.

c. Sustainability Initiatives

➢ Standardization of regulations on Sava river transport and management,

- EU integration by meeting international standards on river transport, and
- Establish formal relations between the Sava River Management Board and the Danube Commission.

It is clear that coherent regulations for navigation on the Sava River are a priority condition for the near future. This will need co-operation at different levels (inter- and intra-entity level, tri-country level and international level). A possible approach is demonstrated in next figure.

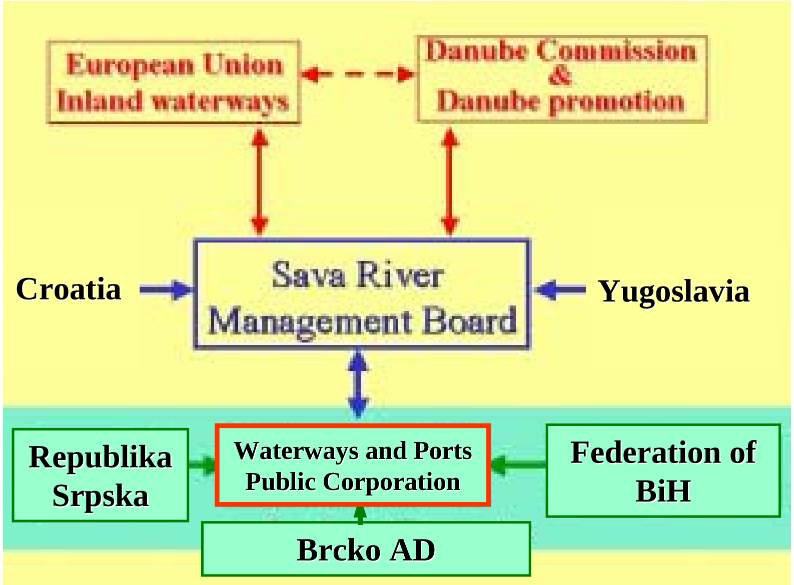


Figure 5.22 Regulatory Framework for the Rivers and Ports

The General Framework Agreement for Peace in Bosnia and Herzegovina (Dayton, 1995) has particular relevance for transport on the river Sava. Annex 4 – Constitution provides a certain level of authority to the country of BiH, and Annex 9 – Agreement regulates the establishment of Bosnia and Herzegovina (BiH) Public Corporations.

The need for the Waterways and Ports Public Corporation (to cooperate between the entities on relevant issues of river transport) and for the Sava River Management Board (to cooperate with Croatia and Yugoslavia) is necessary because Sava River is running through all 3 countries. River Sava is within the boundaries of Republic of Croatia and Republic of Srpska from rkm.304+750 by Samac up to rkm.306+000 by the mouth of a river Bosna, from rkm.338+750 by Mala Brusnica up to rkm.507+360 by Donja Gradina. Republic of Srpska also has the boundary of a river Sava with Yugoslavia from rkm.175, the mouth of a river Drina up to rkm.207 by the mouth of a brook Lukavac, and from rkm.207+000 up to rkm.231+000 by Vucilovac is currently situated in the area of Brcko District and borders with Rep. of Croatia, and the remaining part of a right bank of Sava river is situated on the area of Federation of BiH.

(2) The Infrastructure Framework

Once the emergency reconstruction program for the river Sava and the ports of Brcko and Samac are completed, future developments will be determined by industrial development and commercial transport needs. Privatization of port activities is the logical future path and is similar to the European evolution. However, creating sustainability in the river transport sector cannot fully be transferred to the private sector. The public sector will continue to play an important role. Public authorities will guarantee sustainability in the sector via:

- Further dredging of Sava river to EU standards,
- Maintenance of the river banks and signaling systems, and
- Controlling and rationalizing transport infrastructure investments.

While the two first tasks are straight forwards, controlling and rationalizing transport infrastructure investments are a more complicated public responsibility.

(3) The Operational Framework

Transport infrastructure is needed for the benefit of the industry and of the population. However, the interests of both groups are not always converging. Therefore, the only possible way for public authorities to respond to the problem is by approaching the transport problem from an *integrated network approach*, in which the river transport must not be regarded as a competing alternative to road transport, but as a separate component in its own right of an integrated (intermodal) transport network, as demonstrated in next figure.

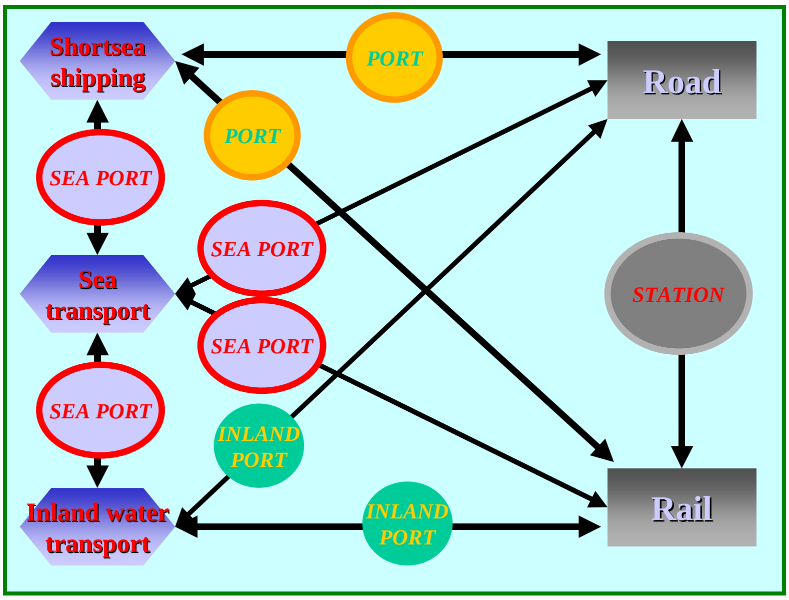


Figure 5.23 Ports, Terminals, and Intermodality

Transport systems should be affordable, safe and provide satisfactory services to the industry. It is therefore imperative for public authorities to embrace the *network concept* when planning future transport investments in waterway transport. In that context, investments require to be taken upon socio-economic decision factors that maximize from a network perspective the future return.

5.9 FINANCING ASPECTS

(1) Decision Parameters

An important consideration for transport investments are related to the distribution of benefits and the uncertainty of future social and economic developments, particularly for infrastructure investments related to international traffic. To consider the overall uncertainty about the future level of impacts, sensitivity analyses and scenario building is used. Scenarios generally include high and low traffic forecasts to test the robustness of results. Other sensitivity analyses refer to different levels of investment and transportation costs.

An overview for several European countries of decision parameters when assessing the value of infrastructure investments in river transport (including terminals) is provided in Table 5.17 hereafter.

Table 5.17 Decision Factors for Waterway Infrastructure Investments

Core Criteria / Country	Belgium	Finland	France	Germany	Netherlands
Investment costs	M	M	M	M	M
Operation and Maintenance	M	M	M	M	M
Transportation Costs:					
- Inland navigation	M	M	M	M	M
- Modal Shifts		M	M	M	M
Traffic safety		M	M	(M)	P
Environmental Impacts	P	D	M	M/D	P
Spatial and Regional Effects	D	D	P	M	P
Non – Traffic related Impacts		M/D	M/D	M	P

M = money values; P = physical measures or ordinal valuation, D = description
V = not relevant in the specific project study analyzed
(M) = money values only if the project is specifically directed to traffic safety

Source: EURET (European Research on Transport, 1991-93)

All European methods rely on money values to measure the effects of the projects on the performance of inland navigation (as is the case for the other transport modes).

In relation to future investment financing of transport infrastructure for river transport in BiH, two elements are of critical importance. These elements are the cost of maintenance and the return on investments when the private sector benefits from the transport infrastructure investment. Both aspects are relevant for investments in phase 2 and phase 3 but are less important in phase 1, where urgent rehabilitation can be considered as a necessity for the re-establishment of river transport in Bosnia and Herzegovina.

As regards maintenance and operation costs, traffic routes (e.g., Sava river transport) are evaluated similar to construction costs. They are calculated as financial inputs in constant prices. The maintenance costs are divided into periodical phases and should be surveyed on a yearly basis. Comparing the situation with and without project implementation generally identifies future maintenance and operating costs. The same approach should be applied when investments in river transport are considered in phase 2 and 3 of the sector plan.

The return of investment on river transport infrastructure is a more complicated issue and will be discussed in more detail in the final report. However, the principle should be upheld that any public investment in river transport infrastructure that is not related to the public duty of transport infrastructure maintenance, monetary values should be applied to assess the relevance of the investment and a system should be foreseen to guarantee a positive return on investment. A possible approach is discussed hereafter and is based upon the public policy for river transport infrastructure investments in Belgium (Flemish region).

Since 1994, the Department of Infrastructure and the Environment, Section Waterways and Sea affairs (AWZ) apply a methodology to evaluate new waterway infrastructure, in particular terminals and loading and unloading facilities along waterways. Projects for the development of waterborne transport infrastructure are since then probably the most scrutinized investments in Flanders. The preparation of projects and eventual follow up is the responsibility of the Dienst voor de Scheepvaart (DvS), responsible for the Albertkanaal and the Kempische kanalen, and the NV Zeekanaal en Watergebonden Grondbeheer Vlaanderen (NVZ) responsible for all other Flemish Waterways. The information provided hereafter is based upon research conducted by the Centre for Intermodal Research – CIR for the Flemish Government.

The procedures related to the construction of loading and unloading facilities for inland waterways is very rigid and includes 4 major phases, as demonstrated in the overview Table 5.18 hereafter.

Table 5.18 Evaluation Phases in Waterborne Transport Infrastructure Investments

Phase	*Activities*
Preparation Phase	- Identification and project description - calculation of costs and traffic volumes - approval by the private investor of his share of the development costs and minimum volumes required (see further)
Evaluation phase	- assessment of project by the Evaluation Committee (see further) - calculation of return on investment (see further) - ranking of project in the list of projects eligible for participation - advise by the Financial Committee
Implementation phase (if approved by the Minister)	- formal signature of conditions for co-operation - public tender for infrastructure works - infrastructure development - Concession agreement
Follow up phase	- Permanent control of the agreed upon volumes - Control of the maintenance by private partner - Collection of concession fees - Collection of punitive damages if volumes are not met by private partner

The participation by the government is important in all phases of the project lifecycle. The conditions imposed by government and the engagements required from the private partner are clearly defined and constitute a full part of the project. This agreement also includes punitive damages in case the private partner does not meet the agreed upon conditions.

The approach of the government is straightforward. If a project is interesting, the AWZ (Administration Waterways and See transport of the Department of Infrastructure and the Environment) develops the infrastructure and invites the private partner to exploit this infrastructure under strict conditions during a fixed period of time.

The general conditions for the private partner are:

- Participate 20 % in the development of the infrastructure without becoming owner of the infrastructure;
- Develop the site in purchasing equipment and construct the superstructure;
- Maintain the site during the concession period;
- To pay an annual concession fee; and
- To guarantee a minimum level of performance / volume or to pay punitive damages if these volumes are not met.

(2) Description of the Procedures

The dossier to be submitted for evaluation must contain following information:

- Details of the private partner,
- Description of the project and preliminary designs,
- Proof of financial and economies solvability,
- The date when the investor plans to start operations,
- Description of present in – and outbound traffic flows,
- Prognoses of expected traffic flows over a period of 10 years, generated by the new investment. Proof should be delivered that these volumes are new volumes,
- Types of commodities that will be treated on the new site, and
- Detailed indications regarding the modal split at the site.

The request will be considered in so far:

- The budgets are available at the government level;
- The pre-design is approved by the government / AWZ;
- The financial analysis is acceptable in socio – economic terms;
- Sufficient financial and economic guaranties are given by the candidate investor;
- The waterborne transport benefits are clearly demonstrated;
- Inland navigation is stimulated; and
- Regional benefits in terms of mobility improvement are guaranteed.

(3) Return on Investment

The Evaluation Committee evaluates and ranks all received projects, based upon the Return on Investment (ROI). The ROI is calculated as follows:

$$R = K/S$$

with

- R = Return on Investment
- K = the 10 year cargo turnover value of the site (see further)
- S = the amount of the government’s participation

Projects are included in the list of projects drawn up by the Evaluation Committee and this according to a descending ROI. Projects with the highest ROI (figuring top of the list) are considered with highest priority. After a preliminary approval by the Minister of Transport, the final dossier is developed in collaboration with the private partner.

In that phase, if the financial calculations and the technical plans, a formal co-operation agreement is signed with the private investor, stipulating:

- The tentative investments by both the public and the private partner (excluding VAT);
- The approval and inclusion in the agreement of the tender conditions, the financial calculations and the technical development plans;
- The modalities of the works to be executed are described in detail, and the responsibilities of each party are determined;
- The targeted annual cargo turnover volume is determined (see further); and
- The clauses regarding concession fees and punitive damages are fixed.

After signing this agreement, the Minister of Transport fixes the maximum participation of the Flemish government, based upon the financial criteria of the contractor who won the tender for the construction of the infrastructure.

(4) The Cargo Turnover Volume

The annual cargo turnover volume for the loading and unloading facility is determined by following formula:

$$\mathbf{K = A \times G \times J}$$

where

- K = number of m^3 or / and ton which the private partner guarantees on annual basis over a period of 10 years (new volumes are calculated only)
- G = Cargo Coefficient with following values
- 1 for al commodities except
- 1.2. for waste products, containers and heavy loads not transported by road
- J = annual coefficient with following values
- 1.4. for the first full year after following values (starting January 1st)
- 1.3. for he second full year
- 1.2. for the third full year
- 1.1. for the fourth full year
- 1.0. for the fifth until the 10th year after starting operations

The *ten*-year cargo turnover volume is calculated as

$$\mathbf{K = k^1 + k^2 + \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ k^{10}}$$

where

- K = the targeted 10 year turnover volume
- K^n = the turnover value for year n with n ={1,10}

(5) Punitive Damages

If the above cargo turnover volumes are not met, the private investor must pay punitive damages, calculated as follows:

$$\frac{(Kj - K^*) \times S^* \times 0.8}{K}$$

where

- Kj = the targeted annual turnover value for year j with j ={1,10}
- K = the targeted 10 year turnover value
- K* = the actual annual turnover value
- S* = the final amount of government participation

5.10 GENERAL CONCLUSION

Waterway transport played an important role in Bosnia and Herzegovina before the war. In time, it will be possible to rehabilitate and improve waterborne facilities to efficiently integrate waterway transport (both sea going and river traffic) into the transport system of BiH.

In the short-term, sea going commercial traffic will focus on the Ploce gateway, while river traffic will be developed mainly along the Sava River. This river and its future development are not only important for BiH, but also for the Republic of Croatia and the Republic of Yugoslavia. Therefore, it is particularly important to urgently solve the problems regarding the (international) status of this river.

Closely related to the Sava River is the provision of guaranteed open access on river crossings. Before the war, the crossing of the river at dedicated bridges was guaranteed in such a way that when it was impossible to use the bridge, ferry services or other means would guarantee the possibility to cross the river at that point. In time, it will be necessary to reinstall this guarantee.

In the later development phases of waterway transport, tourism, water sports, and other leisure activities could be developed along the lakes and in the region of Neum. Furthermore, commercial traffic on the Sava River and via Ploce could be further expanded while more local initiatives could be developed on the other rivers. These local initiatives include commercial transport of freight and passengers as well as the exploitation of fish farms.

It is clear that waterway transport will have to be developed in accordance with specific needs. This means concretely that after completion of the emergency reconstruction of waterway transport (phase 1), further development will depend upon economic and societal progress. This also implies that any investment will require detailed feasibility studies and the participation of private investors will be essential.

But independent of the future initiatives, it is a critical success-factor that the development of commercial freight traffic on the water is considered and designed according to intermodal principles, therewith expanding the potential of this mode in relation to the availability of cargo.

CHAPTER 6: PRE-FEASIBILITY STUDY ON ROAD IMPROVEMENT PROJECT (SARAJEVO - MOSTAR)

6.1 PROJECT DESCRIPTION

6.1.1 Development Alternatives

The existing road link between Sarajevo and Mostar is the hilliest section on E-73, which is the existing route for Corridor Vc. As the development of a full motorway-class facility for Corridor Vc all through BiH was suggested too early in terms of traffic demand in BiHTMAP, an improvement of this section should be analyzed to satisfy one of the most important links between the major cities in the south of BiH.

On Corridor Vc development, two projects are currently under planning. One is the Sarajevo Bypass project from Josanica to Vlakovo, coded as R-01 (Committed Projects) in BiHTMAP. This is now under preparation for implementation with a finance from the European Development Bank and other sources. The other is Sarajevo - Zenica Motorway Project, coded as R-27 (Corridor Vc Development Projects) in BiHTMAP. This project is to widen the existing high-order two-lane highway between Sarajevo and Zenica to a motorway-class facility utilizing the high level of applied design for the existing highway. An extension of the Sarajevo Bypass from Vlakovo to Tarcin was one of the proposals in BiHTMAP since this section is expected to have relatively high traffic demand affected by the Sarajevo Bypass and Sarajevo-Zenica Motorway when these are realized.

The purpose of this pre-feasibility study is to conduct a cost-benefit analysis for:

a) the preliminary plan of new Corridor Vc bypass between Vlakovo and Tarcin as an extension of the Sarajevo Bypass (L = 16.2 km), and

b) the existing road improvement for Tarcin - Mostar section of E-73 (L = 93.0 km).

Figure 6.1.1 shows the improvement plan for Sarajevo - Mostar. It consists of the above two parts. The proposed improvement plan is as follows:

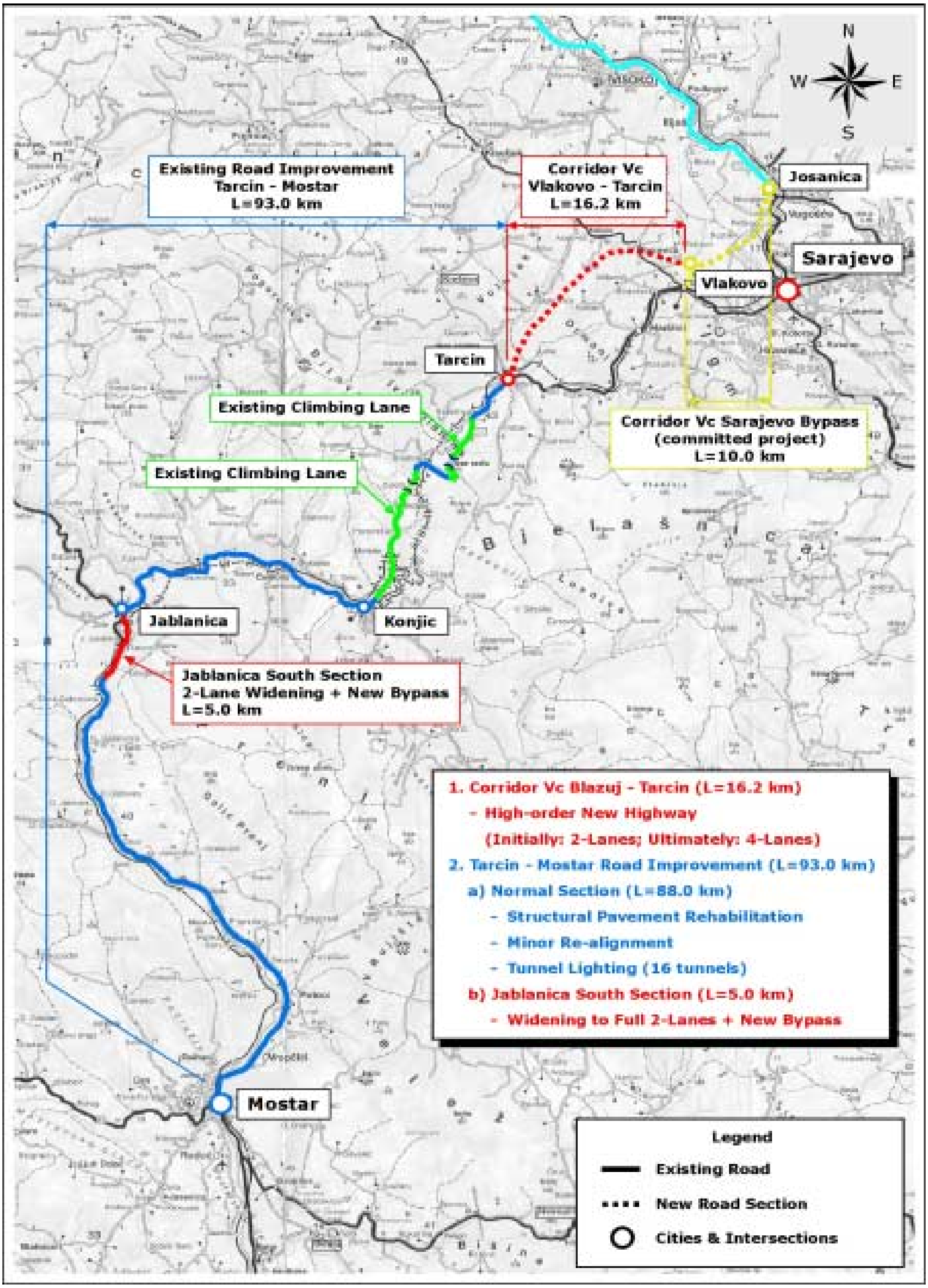


Figure 6.1.1 Sarajevo - Mostar Road Improvement Plan

1) Corridor Vc Vlakovo - Tarcin Section (L = 16.2 km)

   - High-order New Highway: Initially 2-Lanes; Ultimately 4-Lanes

2) Tarcin - Mostar Road Improvement (L = 93.0 km)

   a) Normal Section (L = 88.0 km)

      - Structural Pavement Rehabilitation
      - Minor Re-alignment
      - Tunnel Lighting (16 tunnels)

   b) Jablanica South Section (L = 5.0 km)

      - Widening to Full 2-Lanes + New Bypass

To evaluate the alternatives for these projects, two cases of development scenarios are designated as shown in Table 6.1.1.

Table 6.1.1 Project Case Designation

Project No.	R-27 (1)	R-01	R-27 (2)	---	R-16
Sections	Zenica - Josanica	Josanica - Vlakovo	Vlakovo - Tarcin	Vlakovo - Tarcin	Tarcin - Mostar
Description	Sarajevo-Zenica Motorway	Corridor Vc Sarajevo Bypass	Corridor Vc New Bypass	Existing Road Improvement	Existing Road Improvement
Length	69.0 km	10.0 km	16.2 km	17.8 km	93.0 km
Base (WITHOUT)	YES	YES	NO	NO	NO
Case 1 (WITH)	YES	YES	NO	YES*	YES
Case 2 (WITH)	YES	YES	YES	NO	YES

Source: JICA Study Team
* Improvement within 2-lane designation.

This means that the Sarajevo - Zenica Motorway and the Sarajevo Bypass are considered as a given condition, and try to evaluate WITH and WITHOUT the new bypass of Vlakovo - Tarcin, together with the existing road improvement of Tarcin - Mostar section.

Corridor Vc: Vlakovo - Tarcin is a new bypass, and a proposed preliminary design is shown in Figure 6.1.2, and a proposed typical cross section is shown in Figure 6.1.3. This preliminary design was given by the local authorities.

The alignment begins at the connection point of the Sarajevo Bypass, runs through the mountainous area through Bukovica, and intersects with E-73 at Tarcin. The design parameters will be higher than the minimum requirement to satisfy 100 km/hr design speed.

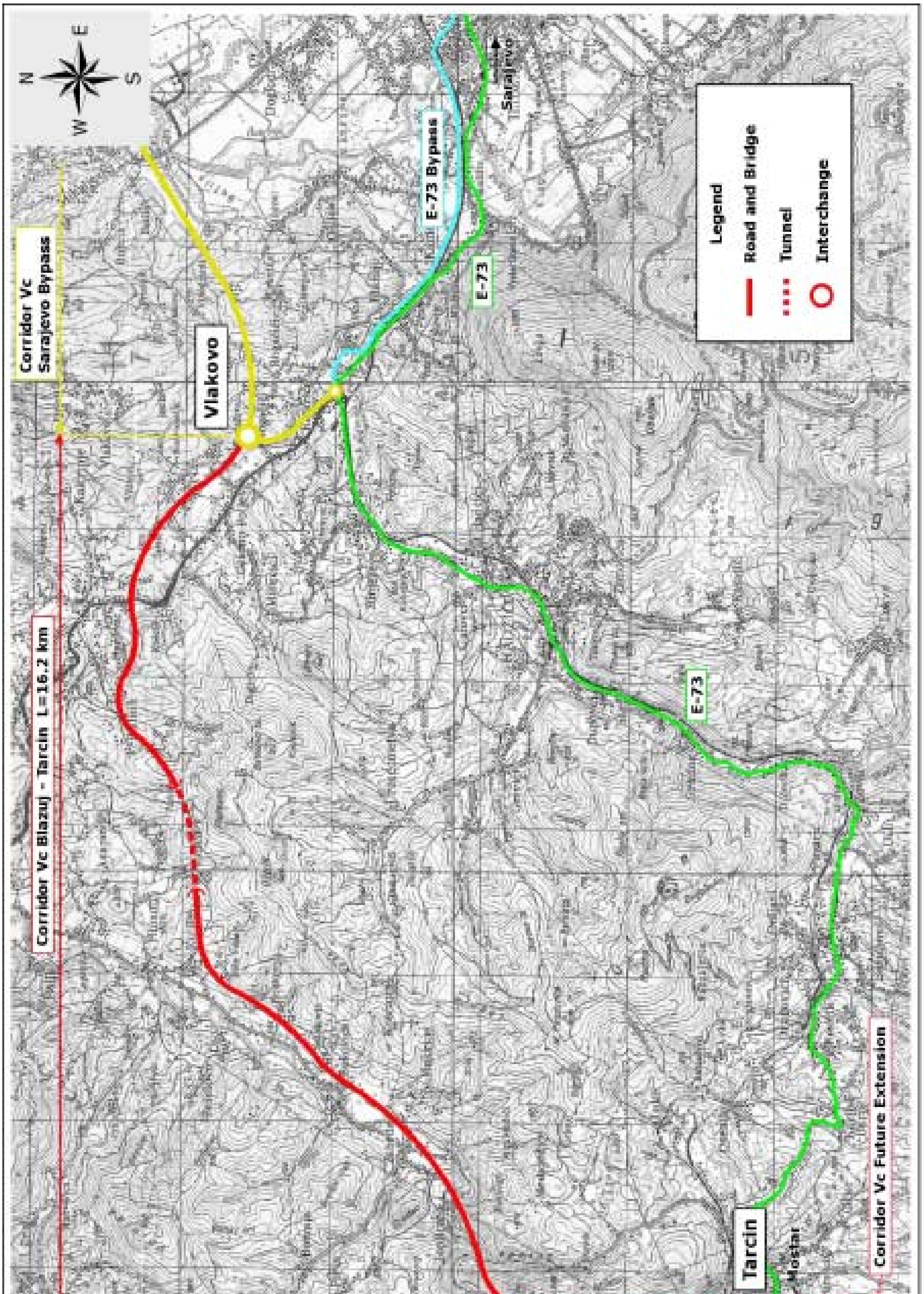


Figure 6.1.2 Proposed Preliminary Alignment for Corridor Vc Vlakovo - Tarcin Project

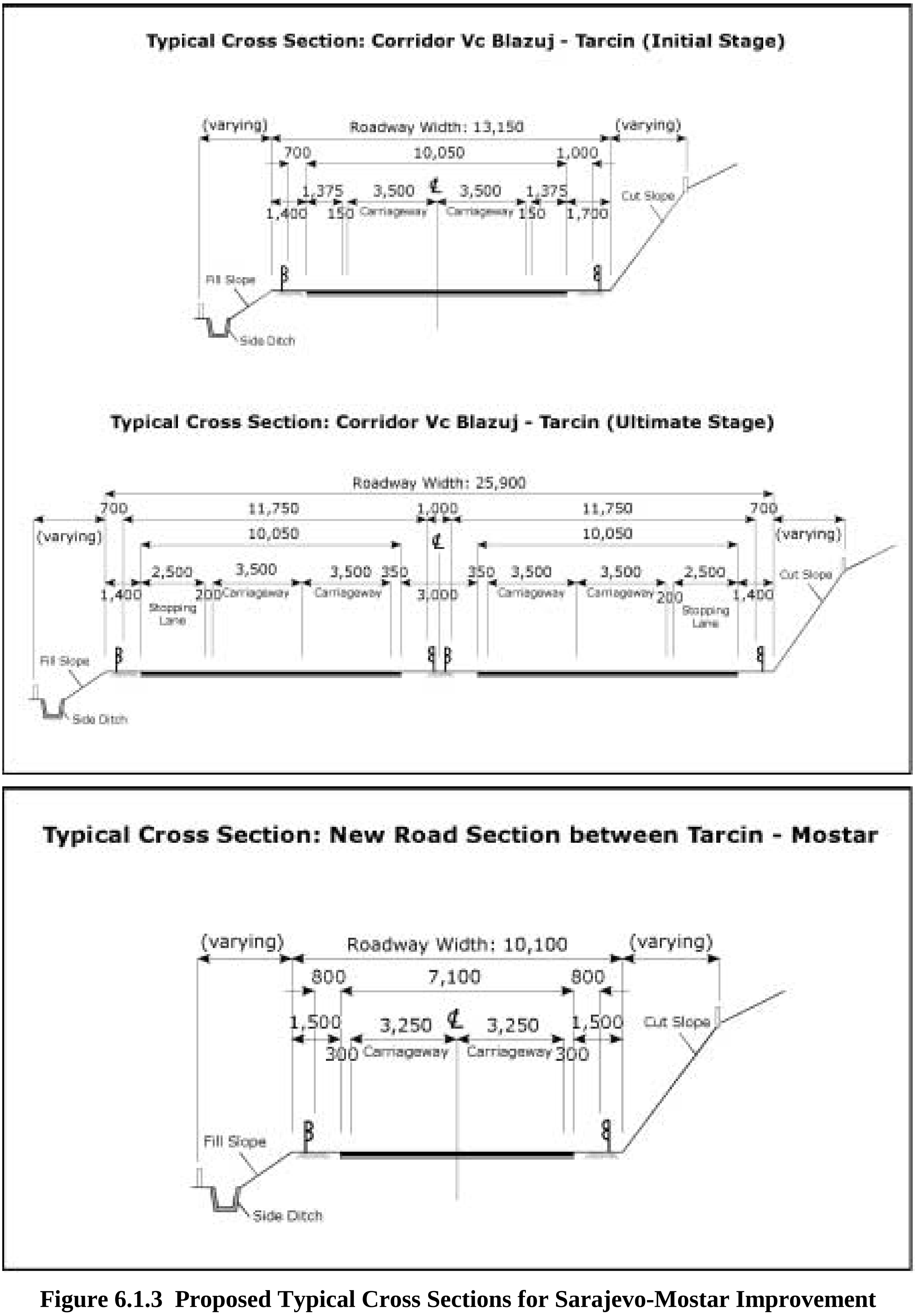


Figure 6.1.3 Proposed Typical Cross Sections for Sarajevo-Mostar Improvement

6.1.2 Definitions and Assumptions of the Project

Due to the limitation of the available inputs for this pre-feasibility study and to clarify the setting of the analysis, the following definitions and assumptions are made.

(1) The pavement for the "normal section" for Tarcin - Mostar (L = 88.0 km), which means the remaining section other than the "South Jablanica Section" (L = 5.0 km), is assumed to be fully improved for about 50 % in length. This is a very rough assessment for the necessity of the pavement improvement by observations of the site.

(2) The bridge reconstruction is not included in the improvement proposal for the "normal section." This is because the most of the bridges on this route are already rehabilitated and reconstructed in the ETRP programs, and their conditions are considered to be able to support the future traffic without major structural problems.

(3) The South Jablanica Section (L = 5.0 km) will be fully improved as explained in Section 6.1.1.

(4) The flee flow speed after improvement will be 100 km/hr for Corridor Vc Vlakovo - Tarcin, 64 km/hr for Tarcin - Mostar road (WITH condition) against the assumed existing flee flow speed of 52 km/hr (WITHOUT condition).

(5) The implementation schedule of the project is assumed to be from Year 2002 to 2004, and the start of the service will be at the beginning of Year 2005.

(6) The project life is assumed to be 30 years.

(7) The economic project cost is assumed to be 87 % of the financial cost. A more detail discussion will be made in Section 6.4.4: Economic Project Cost.

6.2 TRAFFIC DEMAND FORECAST

This analysis is to estimate future traffic demand for the project and savings for Sarajevo - Mostar Road Improvement Project. As an input to that economic evaluation, travel time savings and vehicle cost savings are estimated.

The road transport savings are estimated from the road transport model. The model is first run WITHOUT the project and then again WITH the project. The difference in the two model runs is the net savings or net loss as a result of the inclusion of the new project in the road network. The transport model is run for three time horizons namely:

- Year 2005 (Assumed Year of Opening);
- Year 2010; and
- Year 2020(Planning Data is not available beyond this year).[1]

[1] In the year 2020, the analysis is made for the High Economic Growth Scenario. This growth scenario was used in the formulation of the Road Sector Master Plan.

The savings or benefits associated with each project are estimated over an area of influence rather than the complete road network of BiH. In this analysis the area of influence is chosen as an agglomeration of traffic zones. In general it is likely that the introduction of a higher standard road into a regional road network will attract additional trips from alternative routes. This can result in trips traveling over shorter routes in time but longer in distance. It is therefore feasible that on a regional network; a new route will increase the total amount of vehicle kilometers of travel(VKT) whilst resulting in a decrease in vehicle hours of travel(VHT). This theoretically could produce a negative benefit. To ensure consistency within the area of influence, the VKT is normalized to the base case.

The increase in VKT does not necessarily mean an increase in vehicle travel costs. Some portions of these trips will likely occur at a higher speed and thus more likely at a cheaper unit vehicle operating cost. For this reason in the detailed estimate for vehicle distance related travel cost, the VKT has been prepared over 19 speed ranges. These ranges are defined in Table 6.2.1. The results (VKT) from the transport model are estimated for each speed range and for the four vehicle types namely car, bus ,truck, and articulated truck.

Table 6.2.1 Speed Group Classifications

Speed Group	Speed Range (KPH)		
1	0.0	–	12.5
2	12.6	–	17.5
3	17.6	–	22.5
4	22.6	–	27.5
5	27.6	–	32.5
6	32.6	–	37.5
7	37.6	–	42.5
8	42.6	–	47.5
9	47.6	–	52.5
10	52.6	–	57.5
11	57.6	–	62.5
12	62.6	–	67.5
13	67.6	–	72.5
14	72.6	–	77.5
15	77.6	–	82.5
16	82.6	–	87.5
17	87.6	–	92.5
18	92.6	–	97.5
19	> 97.6		

Source: JICA Study Team

6.2.1 The Priority Project

The priority project in FBiH is the upgrade of the existing road link between Sarajevo and Mostar. The analysis is undertaken for two cases namely:

- Case 1- Upgrade of Vlakovo to Mostar; and
- Case 2 – Upgrade of Tarcin to Mostar plus Vlakovo to Tarcin Bypass.

The engineering upgrade (Vlakovo - Mostar) is to improve the quality of the road with the inclusion of passing lanes and with some horizontal realignment for the South Jablanica Section. These road improvements are reflected in modeling terms with an increase in daily capacity of 20 % and an increase in free flow speed of 10 % in the mountainous and rolling sections of the road.

The motorway between Sarajevo and Zenica including the Sarajevo Bypass is treated as a given condition in both cases.

For the estimation of benefits the area of influence of this project was defined to include traffic zones11, 12, 18 and zones 20 through to 25.

6.2.2 Traffic Demand Forecast

The result of the future traffic demand forecast is shown by cases in Table 6.2.2.

Table 6.2.2 Traffic Demand Forecast Results

Case	Project No.	Section	FF Speed	Daily Traffic Volume		
			(km/hr)	2005	2010	2020
Base (WITHOUT)	R-27 (1)	Sarajevo-Zenica Motorway	100	16,200	20,100	29,100
	R-1	Sarajevo Bypass	100	16,200	20,100	29,100
	R-27 (2)	Vlakovo-Tarcin New Bypass	---	---	---	---
	---	Vlakovo-Tarcin (E-73)	52	15,200	17,700	23,500
	R-16	Tarcin-Mostar	52	5,600	6,200	9,800
Case 1 (WITH)	R-27 (1)	Sarajevo-Zenica Motorway	100	16,700	20,300	29,000
	R-1	Sarajevo Bypass	100	16,700	20,300	29,000
	R-27 (2)	Vlakovo-Tarcin New Bypass	---	---	---	---
	---	Vlakovo-Tarcin (E-73)	64	15,200	17,900	23,800
	R-16	Tarcin-Mostar	64	6,900	8,300	13,200
Case 2 (WITH)	R-27 (1)	Sarajevo-Zenica Motorway	100	16,600	20,300	29,800
	R-1	Sarajevo Bypass	100	16,600	20,300	29,800
	R-27 (2)	Vlakovo-Tarcin New Bypass	100	6,600	9,900	18,000
	---	Vlakovo-Tarcin (E-73)	52	10,700	10,700	10,900
	R-16	Tarcin-Mostar	64	6,800	8,300	13,300

Source: JICA Study Team

The volume for existing Vlakovo - Tarcin section (E-73) shows a very high volume for a 2-lane road in Base Case and Case 1. This indicates an overflowing condition.

6.2.3 The Estimation of Savings

The estimation of savings for the three time horizons is presented in Tables 6.2.3 through to Table 6.2.5. The time savings associated with Case 2 vary between 6 % and 10 % whereas for Case 1 the savings are of the order of 1%. The inclusion of the Bypass project in Case 2 has a significant impact on the project. The Sarajevo-Mostar project without the bypass is not a significant project and does not generate high benefits.

Table 6.2.3 (a) Overall Performance Characteristics in 2005

Case	Daily VKT	Daily VKT
Base (WITHOUT)	3,901,383	71,613
Case 1	3,916,816	71,172
Case 2	4,045,339	64,901

Source: JICA Study Team

Table 6.2.3 (b) Summary of VKT by Grouped Speed Category - Percentage Distribution in 2005

Speed Range	Base (WITHOUT)	Case 1	Case 2
<20	2.3	2.3	0.5
20 - 50	21.9	21.8	21.3
50- 65	32.0	31.9	30.7
>65	43.7	43.9	47.6
Total	100.0	100.0	100.0

Source: JICA Study Team

Table 6.2.4 (a) Overall Performance Characteristics in 2010

Case	Daily VKT	Daily VKT
Base (WITHOUT)	4,769,026	88,941
Case 1	4,783,181	88,216
Case 2	4,971,244	80,892

Source: JICA Study Team

Table 6.2.4 (b) Summary of VKT by Grouped Speed Category - Percentage Distribution in 2010

Speed Range	Base (WITHOUT)	Case 1	Case 2
<20	2.3	2.3	0.5
20 - 50	27.9	29.0	28.4
50- 65	26.0	24.8	23.2
>65	43.8	43.9	47.9
Total	100.0	100.0	100.0

Source: JICA Study Team

Table 6.2.5 (a) Overall Performance Characteristics in 2020

Case	Daily VKT	Daily VHT
Base (WITHOUT)	7,458,336	155,474
Case 1	7,503,361	155,090
Case 2	7,812,073	146,768

Source: JICA Study Team

Table 6.2.5 (b) Summary of VKT by Grouped Speed Category - Percentage Distribution in 2020

Speed Range	Base (WITHOUT)	Case 1	Case 2
<20	3.5	3.6	2.9
20 - 50	44.3	37.7	33.6
50- 65	11.9	20.5	20.7
>65	40.3	38.3	42.9
Total	100.0	100.0	100.0

Source: JICA Study Team

In tables 6.2.3 (b), 6.2.4 (b) and 6.2.5 (b) the normalized change in distribution of VKT by summary speed category are shown for years 2005, 2010 and 2020 respectively. These table present only minor changes for Case 1 but significant changes for Case 2. The fact that the Bypass is an extension of the Motorway is also significant.

In fact by 2020 the time savings show a decrease for Case1 indicating that Case 2 is needed to generate significant benefits rather than just Case 1.

6.3 COST ESTIMATION

The financial project cost was estimated based on the unit cost information collected through discussions with the local authorities, engineers and specialists. The basic premises in estimating the project cost are as follows:

1) All the construction works will be executed by contractors to be employed.

2) The unit price of each cost component was determined based on the economic conditions prevailing in November 2000.

3) The construction cost was estimated for the items of earthwork, pavement, bridge and tunnel structures as the representing items, and other cost items are estimated by assumed percentage of these basic costs.

4) Indirect cost including contingency, contractor’s profit, administration and others are estimated as 30 % in total of the direct construction cost.

5) Land acquisition cost was estimated for new road sections and additional right of way for widening.

6) Engineering cost, consisting of final engineering design and construction supervision, is assumed to be 10 % of the sum of direct and indirect construction cost.

The estimated cost for each route is summarized in Table 6.3.1.

Table 6.3.1 Project Cost Estimate for Sarajevo - Mostar Road Improvement

No.	Item	Unit	Unit Cost (KM)	Case 1					
						Case 2			
				(a) Vlakovo - Tarcin L= 17.8 km		(b) Tarcin - Mostar L= 93.0 km		(c) Vlakovo - Tarcin 2-Lane L= 16.2 km	
				Q'ty	Cost (x000)	Q'ty	Cost (x000)	Q'ty	Cost (x000)
1	Earthwork								
	Cut and Fill	m^3	4.0			126,000	504	294,000	1,176
	Embankment/Subgrade	m^3	7.0			172,000	1,204	183,750	1,286
2	Pavement								
	Structural Overlay (t=15cm)	m^2	72.0	124,600	8,971	298,900	21,521		
	Surface+Binder Course (t=15cm)	m^2	72.0			51,100	3,679	105,000	7,560
	Base Cource (t=30cm)	m^2	24.0			51,100	1,226	105,000	2,520
	Subbase (t=30cm)	m^2	15.0			51,100	767	105,000	1,575
3	Bridges & Viaducts								
	L=30 - 100m; H<20m (W=9.0m)	m	17,000			300	5,100		
	L<100m; H<20m (W=9.0m)	m	15,000					4,200	63,000
	L=30 - 100m; H<20m (W=18.0m)	m	25,000						
	L<100m; H<20m (W=18.0m)	m	22,000						
4	Tunnels								
	500<L<2,000m; Fav. Geology (2L)	m	20,000					1,700	34,000
	500<L<2,000m; Fav. Geology (4L)	m	36,000						
5	Interchanges	LS						1	4,550
	Sub-Total (1)				8,971		34,001		115,667
6	Ditches & Culverts	LS	5.0%		449		1,700		5,783
7	Miscellaneous Items	LS	30.0%		2,826		10,710		36,435
	Sub-total (2)				12,246		46,411		157,886
8	Indirect Cost		30.0%		3,674		13,923		47,366
	Total Construction Cost				15,919		60,335		205,252
9	Engineering Cost	LS	10.0%		1,592		6,033		20,525
10	Land Acquisition & Compensation	m^2	30.0			42,000	1,260	588,000	17,640
	Total Section Cost				**17,511**		**67,628**		**243,417**
	Total Project Cost					**Case 1 Total:**	**85,139**		
								Case 2 Total:	**311,045**

Source: JICA Study Team

6.4 PROJECT EVALUATION

In this section, economic analysis is made as a process of project evaluation regarding road improvement project for Sarajevo - Mostar.

6.4.1 Methodology for Economic Analysis

(1) General

The main purpose of the economic analysis is to show the effects of the implementation of the project of the road improvement for Sarajevo - Mostar" (hereinafter called as

"Project"), from the point of view of the country's economic well-being and to estimate a return on the resources invested. The economic analysis is an assessment of the economic viability of the Project. For the purposes of evaluation, the economic internal rate of return (EIRR), net present value (NPV) and benefit-cost ratio (BC ratio) are demonstrated.

Economic analysis follows a conventional cost benefit analysis of discounted cash flow methodology. The cost benefit analysis is made by comparison between project benefits and project costs.

- The formula of EIRR is shown below:

$$\sum_{t=1}^{n} \frac{\text{Benefits}_t}{(1+R)^t} = \sum_{t=1}^{n} \frac{\text{Inv. cost}_t + \text{O/M cost}_t}{(1+R)^t}$$

where:

Benefits_t	:	Benefits in year t
Inv. cost_t	:	Investment cost in year t
O/M cost_t	:	Operation and Maintenance costs in year t
n	:	Calculation period
t	:	Year t (from 1 to n)
R	:	Value of EIRR

EIRR is the value which will satisfy the above formula.

- The formula of NPV is shown below:

$$\sum_{t=1}^{n} \frac{\text{Benefits}_t}{(1+D)^t} - \sum_{t=1}^{n} \frac{\text{Inv. cost}_t + \text{O/M cost}_t}{(1+D)^t}$$

- The formula of BC Ratio is shown below:

$$\sum_{t=1}^{n} \frac{\text{Benefits}_t}{(1+D)^t} \Big/ \sum_{t=1}^{n} \frac{\text{Inv. cost}_t + \text{O/M cost}_t}{(1+D)^t}$$

where:

Benefits_t	:	Benefits in year t
Inv. cost_t	:	Investment cost in year t
O/M cost_t	:	Operation and Maintenance costs in year t
n	:	Calculation period
t	:	Year t (from 1 to n)
D	:	Discounted rate

(2) Basic assumptions

The following basic assumptions are made:

1) The benefits are calculated for the planning year of 2005, 2010 and 2020, and by the four categories of vehicle; passenger car, bus, truck and large truck in accordance with the traffic demand forecast.

2) The construction work of the project road is scheduled to be from 2002 to 2004, and the start of service is from 2005.

3) The base year is 2000. The project life is assumed to be 30 years after the start of service. The calculation period of cost benefit analysis is 35 years of from 2000 to 2034.

6.4.2 Project Benefits

(1) Expected benefits

Benefits which can be expected by implementation of the Project are as follows:

As a direct benefit,

- Saving in vehicle operating cost
- Saving in vehicle time cost, and
- Reduction of vehicle accident cost, and

As an indirect benefits,

- Contribution to regional industrial and tourism development

(2) Quantitative benefits

In this economic analysis in the pre feasibility study stage, out of the above, two benefits of the saving in vehicle operating cost and the saving in vehicle time cost are treated as quantitative benefits.

(3) Estimation of benefits

Saving in Vehicle Time Cost

The saving in vehicle time cost is calculated as a difference between the vehicle time cost in the case of "WITH" project condition and that in "WITHOUT" project condition. While "WITH" project condition means the case in which an investment for road improvement is implemented, "WITHOUT" project condition means the case in which no such an investment is made except a daily basis maintenance. Higher speed is, in general, expected in the case of "WITH" project than "WITHOUT" project.

The vehicle operating time costs are calculated by multiplying the vehicle-hours by the unit vehicle time cost. The vehicle-hours are obtained as a result of traffic assignment process in the traffic demand forecast. The unit time cost is set up by vehicle type.

Saving in Vehicle Operating Cost

The saving in vehicle operating cost is calculated as a difference between the vehicle operating cost in the case of "WITH" project condition and that in "WITHOUT" project condition.

The vehicle operating time costs are calculated by multiplying the vehicle-kilometer by the unit vehicle operating cost. The vehicle-kilometers are obtained as a result of traffic assignment process in the traffic demand forecast. The unit vehicle operating cost is set up by vehicle type and speed range.

(4) Unit cost of vehicle time cost and vehicle operating cost

While the estimation of time costs of passenger car and bus are made on the basis of per capita GDP, those of truck and large truck are based on the study results in the report of " Development of Branches on Corridor V, Bosnia and Herzegovina Road, Phare, June 2000". For both estimations, the results of traffic survey which has been conducted by the Study Team are utilized.

The estimation results are shown in the following tables: The details of estimation process are referred to Appendix.

Table 6.4.1 shows the estimated vehicle time value of bus and passenger car per hour.

Table 6.4.1 Estimated Vehicle Time Value of Bus and Passenger Car per Hour (KM in constant year 2000 price)

	2000	2005	2010	2020
Bus	15.53	22.58	27.49	37.12
Passenger Car	2.25	3.28	3.99	5.38

Source: JICA Study Team

Table 6.4.2 shows the estimated vehicle time value of truck and large truck.

Table 6.4.2 Unit Vehicle Time value of Truck and Large Truck

Type	Unit Time Value per Ton-hour (KM)	Year	Freight Load	Unit Time Value per Vehicle-hour (KM)
Truck	0.6	2005	4.8	2.85
		2010	5.3	3.19
		2020	6.5	3.89
Large Truck	0.6	2005	14.2	8.50
		2010	14.8	8.87
		2020	16.1	9.60

Source: JICA Study Team

Table 6.4.3 show the estimated unit vehicle operating cost.

Table 6.4.3 Unit Vehicle Operating Cost

(KM per vehicle-kilometer)

Speed (Km/hr)	Pass. Car	Bus	Truck	Large Truck
10.000	1.204	4.345	1.973	3.747
15.000	0.885	3.276	1.508	2.863
20.000	0.726	2.747	1.278	2.427
25.000	0.631	2.437	1.144	2.172
30.000	0.568	2.237	1.058	2.009
35.000	0.524	2.099	1.000	1.900
40.000	0.491	2.003	0.960	1.824
45.000	0.465	1.935	0.933	1.771
50.000	0.445	1.886	0.913	1.734
55.000	0.430	1.852	0.899	1.707
60.000	0.418	1.827	0.890	1.690
65.000	0.409	1.811	0.884	1.678
70.000	0.401	1.800	0.879	1.670
75.000	0.395	1.793	0.877	1.665
80.000	0.390	1.789	0.876	1.663
85.000	0.386	1.786	0.875	1.661
90.000	0.383	1.786	0.875	1.661
95.000	0.379	1.786	0.875	1.661
100.000	0.378	1.786	0.876	1.663

Source: JICA Study Team

6.4.3 Estimation of Benefits

As the results of traffic assignment in traffic demand forecast process, daily vehicle kilometers and daily vehicle hours are obtained for the cases of "WITHOUT" project and "WITH" project, in which four cases of "Case 1" and "Case 2".

Multiplying the above obtained vehicle kilometers by the unit vehicle operating cost, vehicle operating costs are calculated. Similarly, multiplying the above obtained vehicle hours by the unit vehicle time cost, vehicle time costs are calculated. Then, as a difference of values between "WITHOUT" and "WITH," benefits are calculated.

The above daily basis benefits are converted to the annual basis benefits by using a conversion factor of 300. The summary of annual benefits is shown in Table 6.4.4. The details of calculation results of daily benefits in 2005, 2010 and 2020 are shown in Tables A.6.4.15 to A.6.4.17 in Appendix, respectively.

Table 6.4.4 Summary of Estimated Annual Benefits (Sarajevo - Mostar Road Section)

(KM 1,000/year)

	Case 1			Case 2		
	VOC Saving	Time Saving	Total	VOC Saving	Time Saving	Total
2005	5,569	2,146	7,714	25,041	9,208	34,249
2010	6,533	2,557	9,090	30,093	11,976	42,069
2020	20,605	4,787	25,392	56,353	15,901	72,254

Source: JICA Study Team

6.4.4 Economic Project Costs

(1) Estimation of Economic Costs

The project costs in terms of financial costs are referred to Section 6.3 in this Chapter. Economic analysis treats an economic cost, which is estimated by eliminating the portion of transfer item such as taxes from financial costs.

In this economic analysis, the related taxes to the estimated costs are assumed as the custom duty and the tax on trade on goods and services.

Regarding the tax system (tax ratio), while that of the custom duty are common to Federation of Bosnia and Herzegovina (FBiH) and Republika Srpska (RS), that of the tax on trade on goods and services are different by FBiH and RS.

The tax ratios regarding tax on trade of goods and services in FBiH are 24% in tariff No. 1, 12% in tariff No.2 for goods, and 12% for services. Tariff No. 1 is applied in general. Tariff No. 2 includes commodities related to, for example, energy, basic agricultural / fishery products, products serving for food of people, construction material such as timber, etc. Tariff No. 1 stands for the other commodities than stipulated in tariff No. 2.

Regarding the tax on trade on goods and services in RS, there are two categories of tax rate of 18% and 8%. The tax rate of 18% is applied in general, and that of 8% is, for example, for food products, agricultural / fishery products, electricity, coal, materials for construction such as timber, etc.

Regarding fuel, there are several special taxes both for FBiH and RS.

According to the law on the custom duty, the custom tariff which is considered to be related to project ranges, roughly speaking, 0%, 5%, 10% and 15%, for example; construction equipment such as crane (0% / 5%), forklift (5%), bulldozer (5% / 10%), machinery for work of road construction (5%), truck (10%), bus (15%), passenger car (15%), rail locomotive (0%), passenger coach (5%), freight wagon (5%), equipment for signal (5%), etc. It should be noted that the above tax ratios are still only shown as a general sample. The actual tax ratio is determined based on the detailed specification of equipment.

For the elimination about tax portion, the following are to be taken into consideration:

In the cost estimates of projects in this pre-feasibility study stage, specification and procurement source of equipment are not fixed. And the breakdown of cost component for local / foreign currency portion and also that for labor / material / depreciation for equipment portion in the total cost is not certain (just rough estimates) in the pre-feasibility study stage. Therefore, it is difficult to estimate a tax portion.

Regarding the estimation of economic cost, the following are assumed:

According to the engineering study, the percentage of equipment cost in foreign currency portion is roughly estimated to be about 5% to the total cost. Regarding the custom duty, 5% of custom tariff is assumed to this portion. And regarding the portion of the other tax than custom duty, i.e. the tax portion including the tax on trade of goods and services, ratio of 15% is assumed to be as a tax portion, considering the share of material cost in total cost.

As a result, a conversion factor of 0.87 is obtained, and using this factor economic cost is obtained.

(2) Economic Project Costs

As a result, the economic project costs are estimated as shown in Table 6.4.5. The annual distribution is based on the assumption of portion of 30%, 40%, and 30% for 2002, 2003 and 2004.

Table 6.4.5 Economic Project Cost (Sarajevo - Mostar Road Section)

(KM 1,000)

Case	Total	2002	2003	2004
Case 1	74,071	22,221	29,628	22,221
Case 2	270,609	81,183	108,244	81,183

Source: JICA Study Team

The annual operation and maintenance costs are estimated based on the unit cost per kilometer of KM 15.5 thousand. The economic price of annual operation and maintenance costs is obtained by using an above-mentioned conversion factor of 0.87, which is about KM 13.5 thousand per kilometer. The total lengths of road in WITHOUT case and Case 1 are both 110.8 km, whereas that in Case 2 is 109.2 km. Thus, the operation and maintenance costs in terms of economic price are obtained to be KM 1,494 thousand per annum for WITHOUT case and Case 1, and KM 1, 473 thousand for Case 2 per annum.

The operation and maintenance costs in WITHOUT case are considered in the cash flow of cost benefit analysis. The rehabilitation cost for WITHOUT case is also considered.

6.4.5 Cost Benefit Analysis

Based on the above estimated benefits and the related costs, cost benefit analysis was made. In this economic analysis, benefits after 2021 are assumed to be fixed as the 2020 values. The calculation results are summarized in Table 6.4.6. These results show that either case is economically feasible.

Table 6.4.6 Summary of Cost Benefit Analysis for Sarajevo - Mostar Road Section

	Case 1	Case 2
EIRR	15.5%	15.0%
NPV (KM 1,000)	22,388	62,377
B/C	1.48	1.33

Source: JICA Study Team
Note: NPV and B/C are computed at a discount rate of 12 %

The details of cash flow of cost benefit analysis are shown in Tables A.6.4.19 and A.6.4.20 in Appendix for Case 1 and Case 2 of Sarajevo - Mostar Road Section, respectively.

6.5 IMPLEMENTATION PLAN AND RECOMMENDATIONS

6.5.1 Evaluation of the Cases

The results of the project analysis shows that the two cases, Case 1 and Case 2 are at the same level of feasibility. These numbers should be considered almost the same if the level of detail of this study is taken into account. The EIRR of 15.0 % - 15.5 % is considered that the project is at a feasible level.

As mentioned in Section 6.1.2: Definitions and Assumptions, these results are under many simplified assumptions. However, it is a result to figure out an “investment limit”, which means how much investment is allowed to make this project feasible. In the designated cases, the message is that the level of improvement proposed in the description is considered feasible.

However, this does not mean the satisfaction to the accommodation of future traffic demand is the same between the two cases. Table 6.2.2: Traffic Demand Forecast Results suggests that a serious overflowing condition is observed in E-73 Vlakovo - Tarcin section in Case 1, as well as in the same section in WITHOUT case. This means the implementation of Case 1 will still leave a lot of traffic problem in this section.

It is theoretically possible to designate a case of four-lane improvement for the existing E-73 Vlakovo - Tarcin against Corridor Vc development. However, it was not considered because of the following reasons:

- E-73 Vlakovo - Tarcin has urbanized areas, and the further urbanization will prevent this section from achieving a rural 4-lane capacity by the widening.

- The busy four-lane arterial would create more serious traffic accidents and other negative social influence to the local communities along the road.

- A development of separate Corridor Vc highway will take long-distance traffic away from the existing E-73, whether E-73 stays in two lanes or is widened to four lanes. Case 2 forecast demand in Table 2.2.2 suggests that existing two lanes will be sufficient for the next twenty years if Corridor Vc bypass is provided. This means the investment for four laning of E-73 would not be an effective investment unless the realization of Corridor Vc is far future.

It is therefore recommended that Case 2: Corridor Vc new bypass for Vlakovo - Tarcin be developed at the soonest possibility. However, it is recommended to be 2 lanes at the initial stage with 4-lane right of way, which can be further widened to 4 lane full motorway when time comes.

In reality, however, Corridor Vc Vlakovo - Tarcin Project is feasible only if Sarajevo - Zenica Motorway and Sarajevo Bypass projects are realized. The Vlakovo - Tarcin section should be considered as the next step following these two prior projects.

6.5.2 Implementation Schedule

A recommended overall implementation schedule is shown in Figure 6.5.1. This is considered at the earliest possible schedule if the full feasibility study and detailed design are implemented without delay. Particularly it is recommended that Tarcin - Mostar road improvement be implemented at the earliest possibility in accordance with this schedule. The case of Corridor Vc Vlakovo - Tarcin development, however, should be carefully planned in accordance with the progress of the related Corridor Vc development projects, namely Sarajevo - Zenica Motorway and Sarajevo Bypass because the feasibility of Corridor Vc Vlakovo - Tarcin will strongly depend on the realization of these two prior projects.

Figure 6.5.1 Recommended Implementation Schedule

Item	2002	2003	2004
Feasibility Study and Detailed Design			
Construction			

For the further analysis in the later stage of the project, a more detailed analysis is recommended to assess the existing pavement conditions of Tarcin - Mostar section to examine more detailed pavement improvement design, and to assure the durability of individual bridges.

6.5.3 Project Finance and Implementation

The finance of the project is recommended to be by a low-interest foreign loan from international project finance organizations. The availability of domestic funds is limited, and for those domestic funds a higher priority should be given to achievement of better road maintenance system and more urgent rehabilitation needs. It is considered that the result of economic analysis supports the realization of the project by an international finance mechanism.

It is strongly recommended that Corridor Vc Vlakovo - Tarcin be implemented by a toll road system. This is because of the following reasons:

1) This highway is an expensive investment for much higher level of service than ordinary arterial highway, and it is reasonable to charge the project cost to the beneficiary users.

2) This highway is a completely new road separated from the existing arterial highway, and it is easy to implement a toll collection system.

Private finance initiative is recommended to promote the realization of this project because of the adaptability and reasonableness of applying a toll road system. If a larger view of future Corridor Vc development is taken into account, it is highly recommended that the future string of Corridor Vc highway be consolidated in a single tollway mechanism. If each segment of the new highway is developed with independent toll charge system, it is highly likely that toll gates have to be furnished at each boundary of the project segment, which forces the users to stop at each boundary of the designated project section. It would be a silly system because the advantage of an access-controlled high-order tollway is to minimize the travel time of the users.

Unfortunately, such a silly example is what is actually happening in many other countries particularly when separate segments of a highway are constructed by independent private investors. It is important that the responsible government organizations will carefully analyze the future tollway system at the planning stage.

CHAPTER 7: PRE-FEASIBILITY STUDY ON ROAD IMPROVEMENT PROJECT (BANJA LUKA - DOBOJ)

7.1 PROJECT DESCRIPTION

7.1.1 Development Alternatives

The existing road link between Banja Luka and Doboj is one of the weak links among the major cities in BiH in terms of distance versus travel time. As a part of the designated Primary I corridor from Bosanska Novi to Zvornik, this connection should be improved for more balanced network.

The purpose of this pre-feasibility study is to conduct an alternative route study to evaluate the best future alternative for the main road link between Banja Luka and Doboj, and to perform a preliminary cost-benefit analysis for the project.

The alternative routes for future Primary I corridor between Banja Luka and Doboj are shown in Figure 7.1.1. Current condition is that most of the traffic is using the route of Banja Luka - Klasnica - Prnjavor - Derventa - Seslije - Doboj, which is shown as Route 1 in Figure 7.1.1. The existing competitor is the route of Banja Luka - Kotor Varos - Moslovare - Teslic - Doboj, which is shown as Route 3 in Figure 7.1.1.

The current popular route of Route 1 is a long detour for the OD pair between Banja Luka and Doboj. It has about 127 km in total between the two cities, and the travel time is about 1 hour and 40 - 50 minutes on average by a normal passenger car. The Banja Luka - Prnjavor - Derventa section is shared with other major OD pairs such as Banja Luka - Brod and Banja Luka - Brcko / Bijeljina directions. To accommodate the future traffic demand, this route needs a several improvement. A separate bypass is recommended both for Prnjavor and Derventa. A grade separation (interchange) facility is recommended for the intersection at Klasnica to accommodate the busy traffic with Banja Luka - Gradiska road. Minor re-alignment is also recommended for a few locations on the route.

Route 3 is an existing competitor with Route 1 for Banja Luka - Doboj connection. It generally has a good alignment particularly between Doboj and Pribinic. It however has a hilly section between Maslovare and Pribinic (L = about 16 km) to pass over a

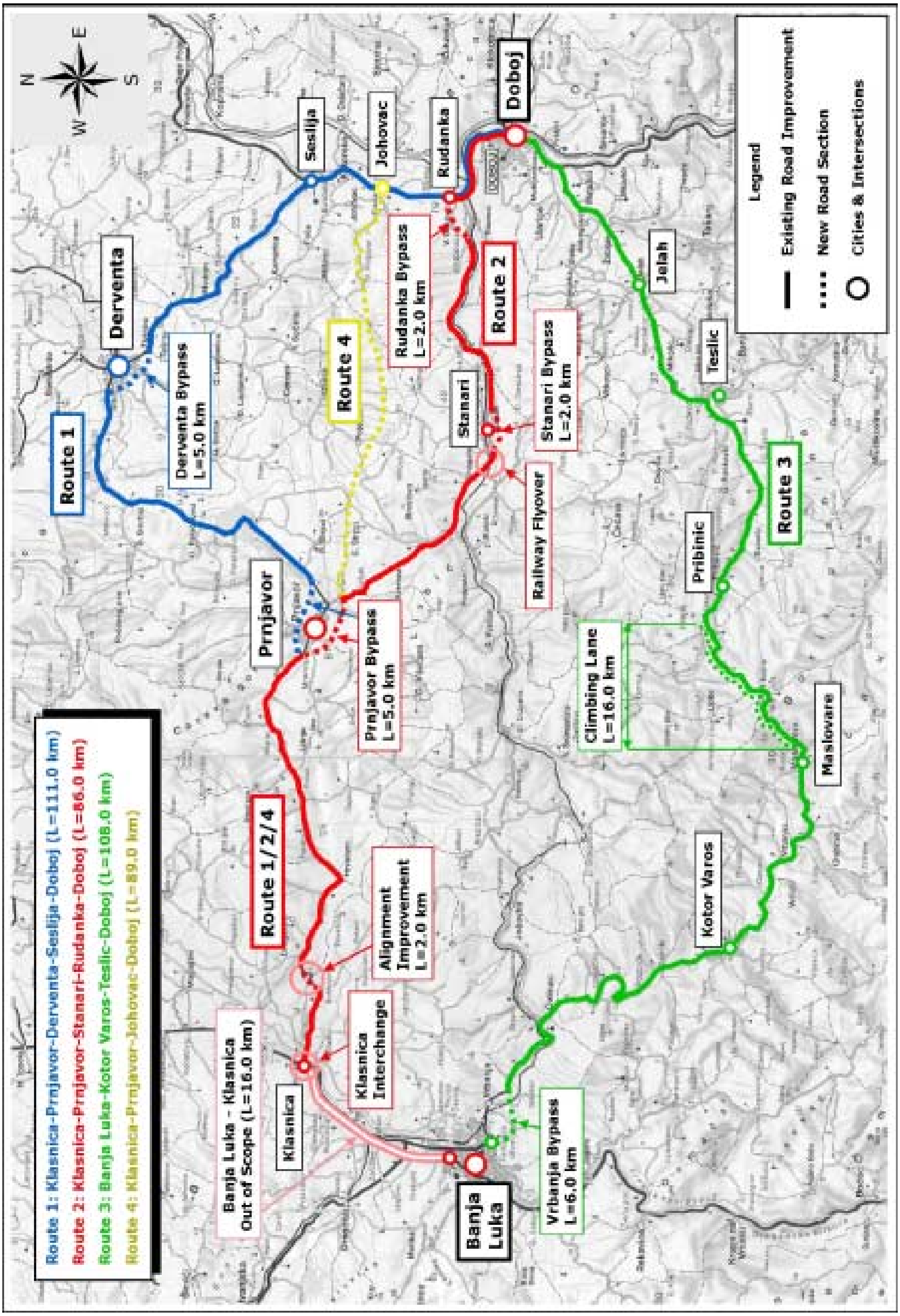


Figure 7.1.1 Alternative Routes for Banja Luka - Doboj Road Improvement

mountain area. A part of this section (L = about 10 km) is currently closed caused by a land slide, and this route is only passable through an unpaved temporary detour. The rehabilitation project for this landslide section is under implementation by the Ministry of Transport and Communications of Republika Srpska with an EBRD finance. After the rehabilitation the travel time through this route will be largely improved. This route however, has a few problems to work as a major corridor for Banja Luka - Doboj. One is the hilly section of 16 km as mentioned above. To accommodate increasing future traffic and heavy vehicle traffic, a climbing lane should be provided for this section. The other is the accessibility to Banja Luka. If Route 3 works as the main route for Banja Luka - Doboj, all of the traffic from Prijedor and further west must pass through the urban area of Banja Luka, which will create an unavoidable problem when the traffic volume grows on this corridor.

A development of another route is proposed since the existing two routes (Route 1 and Route 3) have weaknesses to serve as the main route for Primary I corridor between Banja Luka and Doboj. Route 2 is an alignment to utilize the existing Banja Luka - Klasnica - Prnjavor, and to develop an existing regional road of Prnjavor - Stanari - Rudanka, which forms a shorter connection for Banja Luka - Doboj. In addition to the same improvement recommended for Route 1 regarding Klasnica - Prnjavor section, several other improvement is recommended to develop this route. This route will cross the railway near Stanari, and a grade separation to flyover the railway will be necessary. Short bypasses (L = about 2 km each) are also recommended for the towns of Stanari and Rudanka to avoid the local town areas.

Another alternative route is Route 4, which is to develop a new road to connect Prnjavor and Johovac. This can achieve a better alignment for the new road section for which a desirable design standard can be applied. It however needs a larger investment than other routes since other routes are mostly utilizing existing roads.

Another possibility is to shortcut the Banja Luka - Stanari section by following the existing railway alignment or its nearby areas. This area, however, is very hilly, and a new development of primary arterial road class facility is expected to be very costly compared with other existing road improvement alternatives. At the same time the benefit is expected to be basically the same as other routes. It was therefore not included in the comparison of the alternatives.

The project road will have 2 lanes in all of the alternatives except the 4-lane highway of Banja Luka - Klanica, which is treated as a given condition, and the 16 km hilly section in Route 3, which will need an additional climbing lane for achieving the same traffic condition as other sections.

A proposed typical cross section is shown in Figure 7.1.2. This typical cross section is mostly the same design standard as in the existing Route 1 and Route 3 sections. In the Former Yugoslavian Road Design Standard, this designation (Total Roadway Width = 10.10 m) falls into the category of Class 1: hilly/mountainous terrain or Class 2: rolling terrain, which is considered appropriate and balanced with other sections. For a new road section it is highly recommended that additional 5.25 m will be provided for right of way at the outside of the roadway. This space will work as the controlled zone by the road authority to prevent unorganized urbanization and to maintain a better access control to keep the mobility of the primary road. It can also utilized for future widening when the traffic demand increases in the long-term future.

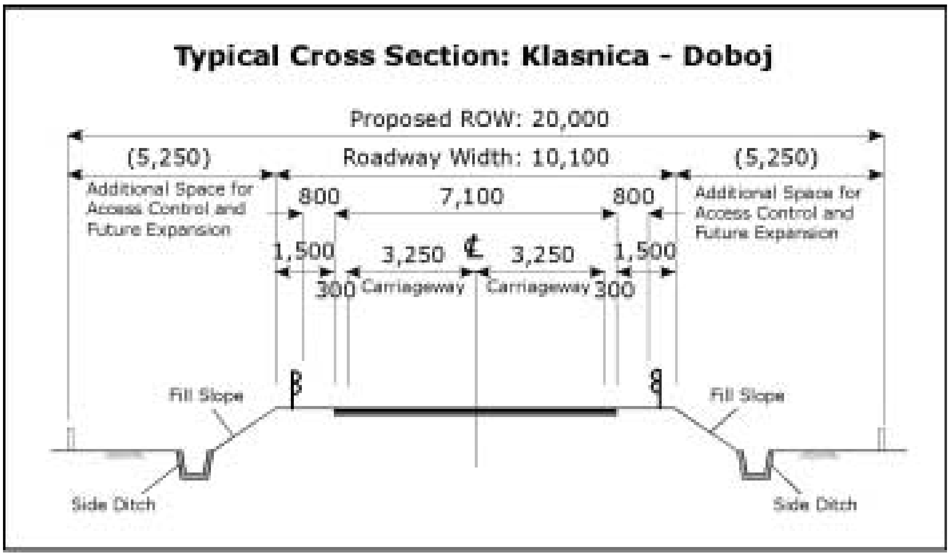


Figure 7.1.2 Typical Cross Section for Klasnica - Doboj Improvement

7.1.2 Definitions and Assumptions of the Project

Due to the limitation of the available inputs for this pre-feasibility study and to clarify the setting of the analysis, the following definitions and assumptions are made.

(1) Major pavement improvement will be provided for all of the routes. The actual pavement condition varies depending on the routes and sections, but it is difficult to evaluate detail conditions of the pavement section by section in this Study. Some of the sections have already been rehabilitated, some of the sections are not, and some of the sections are in fine condition without rehabilitation. To accommodate the increasing future heavy traffic, however, a fundamental pavement improvement will be necessary for most of the sections. It was therefore assumed that uniform structural overlay of 15 cm thickness be provided to accommodate the future traffic. The pavement for new road section was assumed to have the structure shown in Figure 7.1.2.

(2) All of the existing bridges will be reconstructed. The actual bridge durability and remaining life varies depending on the individual conditions. However, the reconstruction during the project life will be necessary for most of the bridges. It is therefore assumed that all of the bridge reconstruction will be done at the time of improvement.

(3) The existing 4-lane highway section between Banja Luka and Klasnica will be excluded from the project. This highway has a much higher capacity and ability compared with any other part of alternative sections, so it is treated as a given condition for the project.

(4) The free flow speed after improvement will be 80 km/hr.

(5) The implementation schedule of the project is assumed to be from Year 2002 to 2004, and the start of the service will be at the beginning of Year 2005.

(6) The project life is assumed to be 30 years.

(7) The economic project cost is assumed to be 87 % of the financial cost. A more detail discussion will be made in Section 7.4.4: Economic Project Cost.

7.2 TRAFFIC DEMAND FORECAST

This analysis is to estimate future traffic demand for the project and savings for Banja Luka - Doboj Road Improvement Project. As an input to the economic evaluation, travel time savings and vehicle cost savings are estimated.

The road transport savings are estimated from the road transport model. The model is first run WITHOUT the project and then again WITH the project. The difference in the two model runs is the net savings or net loss as a result of the inclusion of the new project in the road network. The transport model is run for three time horizons namely:

- Year 2005 (Assumed Year of Opening);
- Year 2010; and
- Year 2020(Planning Data is not available beyond this year).[1]

The savings or benefits associated with each project are estimated over an area of influence rather than the complete road network of BiH. In this analysis the area of influence is chosen as an agglomeration of traffic zones. In general it is likely that the introduction of a higher standard road into a regional road network will attract additional trips from alternative routes. This can result in trips traveling over shorter routes in time but longer in distance. It is therefore feasible that on a regional network; a new route will increase the total amount of vehicle kilometers of travel(VKT) whilst resulting in a decrease in vehicle hours of travel(VHT). This theoretically could produce a negative benefit. To ensure consistency within the area of influence, the VKT is normalized to the base case.

The increase in VKT does not necessarily mean an increase in vehicle travel costs. Some portions of these trips will likely occur at a higher speed and thus more likely at a cheaper unit vehicle operating cost. For this reason in the detailed estimate for vehicle distance related travel cost, the VKT has been prepared over 19 speed ranges. These ranges are defined in Table 7.2.1. The results (VKT) from the transport model are estimated for each speed range and for the four vehicle types namely car, bus ,truck, and articulated truck.

[1] In the year 2020, the analysis is made for the High Economic Growth Scenario. This growth scenario was used in the formulation of the Road Sector Master Plan.

Table 7.2.1 Speed Group Classifications

Speed Group	Speed Range (KPH)		
1	0.0	–	12.5
2	12.6	–	17.5
3	17.6	–	22.5
4	22.6	–	27.5
5	27.6	–	32.5
6	32.6	–	37.5
7	37.6	–	42.5
8	42.6	–	47.5
9	47.6	–	52.5
10	52.6	–	57.5
11	57.6	–	62.5
12	62.6	–	67.5
13	67.6	–	72.5
14	72.6	–	77.5
15	77.6	–	82.5
16	82.6	–	87.5
17	87.6	–	92.5
18	92.6	–	97.5
19	> 97.6		

Source: JICA Study Team

7.2.1 The Priority Project

The priority project in RS is the road link between Banja Luka and Doboj (refer to Figure 7.1.1). There are four possible routes namely:

- Route 1 – Northern Alignment on existing Road;
- Route 2 – Central Alignment on existing Road;
- Route 3 – Southern Alignment on Existing Road: and
- Route 4 – Central Alignment with the eastern connection to Doboj on a new alignment.

The proposal for improvement of the alternative routes is essentially to upgrade or construct new road surface where possible to meet the following transport modeling standard namely a road capacity of 11,900 vehicle per day per direction with a free flow speed of 80 km/hr. Along some portions of the alternative alignments it was not always possible to meet these conditions in particular in the mountainous regions of the alignments.

For the estimation of benefits the area of influence of this project was defined to include traffic zones 7, 11 through to 16 and zones 25, 26 and 27.

7.2.2 Traffic Demand Forecast

The result of the future traffic demand forecast is summarized by cases in Table 7.2.2.

Table 7.2.2 A Summary of Traffic Demand Forecast Results

Case	Route	Section	FF Speed	Daily Traffic Volume		
			(km/hr)	2005	2010	2020
Base (WITHOUT)	1,2,4	Klasnica-Prnjavor	64	5,100	6,000	8,300
	1	Prnjavor-Doboj	75	2,600	2,800	4,200
	2	Prnjavor-Stanari	30	1,400	1,900	2,400
	2	Stanari-Doboj	45	1,200	1,600	1,900
	3	BL-Kotor Varos	52	3,200	3,700	6,300
	3	KV-Teslic	64	2,100	2,500	4,800
	3	Teslic-Doboj	50	5,300	6,100	9,300
Case 1 (WITH)	1	Klasnica-Prnjavor	80	10,100	11,800	18,800
	1	Prnjavor-Doboj	80	7,900	9,200	14,200
Case 2 (WITH)	2	Klasnica-Prnjavor	80	10,900	13,000	21,000
	2	Prnjavor-Stanari	80	8,700	10,100	14,500
	2	Stanari-Doboj	80	7,900	9,100	13,100
Case 3 (WITH)	3	BL-Kotor Varos	80	5,800	6,900	10,100
	3	KV-Teslic	80	4,000	4,700	7,100
	3	Teslic-Doboj	80	7,100	8,200	11,400
Case 4 (WITH)	4	Klasnica-Prnjavor	80	10,400	12,400	20,100
	4	Prnjavor-Doboj	80	8,400	9,700	13,300

Source: JICA Study Team

The section-by-section traffic volumes in the WITHOUT case are much lower than each route in WITH cases. It is because in the WITHOUT case the traffic is spread among the alternatives, particularly between Route 1 and 3. The summation of traffic volume of each route at corresponding sections of the WITHOUT case will be a comparable level of volume against each of the WITH cases.

7.2.3 The Estimation of Savings

The estimation of savings for the three time horizons is presented in Tables 7.2.3 through to Table 7.2.5. In 2005 Alignment 2 and 4 show the highest saving in VHT of 4.3%. By 2020 the best time savings are achieved with Route 2, namely 6%.

In tables 7.2.3(b), 7.2.4(b) and 7.2.5(b) the normalized change in distribution of VKT by summary speed category are shown for years 2005, 2010 and 2020 respectively. In 2005, the percentage of VKT in the highest speed range has the greatest increase for Route 1 increasing from the base of 30% to 41%. There is a similar pattern in 2010. However by

2020 Route 2 performs best with an increase in distribution from the base of 12% to 19% within the highest speed range.

Route 1 and 2 produce the best results in terms of savings. The relationship between vehicle operating cost and travel time saving costs together with the project cost will determine which of the two alignment produce the higher economic benefits.

Table 7.2.3 (a) Overall Performance Characteristics in 2005

Route	Daily VKT	Daily VHT
Base (WITHOUT)	3,634,205	69,005
Route 1	3,857,288	67,313
Route 2	3,728,430	66,020
Route 3	3,680,517	66,121
Route 4	3,714,100	66,027

Source: JICA Study Team

Table 7.2.3(b) Summary of VKT by Grouped Speed Category - Percentage Distribution in 2005

Speed Range	Base (WITHOUT)	Route 1	Route 2	Route 3	Route 4
<20	0.3	0.0	0.0	0.1	0.0
20 - 50	37.1	29.5	33.9	33.4	34.0
50- 65	32.4	28.9	29.6	31.7	31.0
>65	30.2	41.5	36.5	34.8	34.9
Total	100.0	100.0	100.0	100.0	100.0

Source: JICA Study Team

Table 7.2.4(a) Overall Performance Characteristics in 2010

Route	Daily VKT	Daily VHT
Base (WITHOUT)	4,373,124	86,324
Route 1	4,647,458	82,884
Route 2	4,467,281	80,815
Route 3	4,422,244	81,495
Route 4	4,466,559	81,123

Source: JICA Study Team

Table 7.2.4(b) Summary of VKT by Grouped Speed Category - Percentage Distribution in 2010

Speed Range	Base (WITHOUT)	Route 1	Route 2	Route 3	Route 4
<20	1.5	0.0	0.0	0.1	0.0
20 - 50	36.0	34.0	35.6	33.5	35.6
50- 65	37.8	29.5	32.5	34.2	33.1
>65	24.7	36.5	31.9	32.2	31.3
Total	100.0	100.0	100.0	100.0	100.0

Source: JICA Study Team

Table 7.2.5(a) Overall Performance Characteristics in 2020

Alignment	Daily VKT	Daily VHT
Base (WITHOUT)	6,699,848	156,594
Route 1	7,415,104	148,332
Route 2	7,270,838	146,336
Route 3	6,964,182	148,789
Route 4	7,271,167	146,962

Source: JICA Study Team

Table 7.2.5(b) Summary of VKT by Grouped Speed Category - Percentage Distribution in 2020

Speed Range	Base (WITHOUT)	Route 1	Route 2	Route 3	Route 4
<20	4.9	2.3	1.8	1.8	1.7
20 - 50	48.7	47.0	49.4	47.0	51.8
50- 65	34.3	37.2	30.0	36.1	28.3
>65	12.1	13.5	18.9	15.0	18.2
Total	100.0	100.0	100.0	100.0	100.0

Source: JICA Study Team

7.3 COST ESTIMATION

The financial project cost was estimated based on the unit cost information colleted through discussions with the local authorities, engineers, and specialists. The basic premises in estimating the project cost are as follows:

1) All the construction works will be executed by contractors to be employed.

2) The unit price of each cost component was determined based on the economic conditions prevailing in November 2000.

3) The construction cost was estimated for the items of earthwork, pavement, bridge and tunnel structures as the representing items, and other cost items are estimated by assumed percentage of these basic costs.

4) Indirect cost including contingency, contractor's profit, administration, and others are estimated as 30 % in total of the direct construction cost.

5) Land acquisition cost was estimated for new road sections and additional right of way for widening.

6) Engineering cost, consisting of final engineering design and construction supervision, is assumed to be 10 % of the sum of direct and indirect construction cost.

The estimated cost for each route is summarized in Table 7.3.1.

Table 7.3.1 Project Cost Estimate for Banja Luka - Doboj Road Improvement

No.	Item	Unit	Unit Cost	(1) Prnjavor/Derventa L= 111.0 km		(2) Prnjavor/Stanari L= 86.0 km		(3) Kotor Varos/Teslic L= 108.0 km		(4) Prnjavor/Johovac L= 89.0 km	
			(KM)	Q'ty	Cost (x000)	Q'ty	Cost (x000)	Q'ty	Cost (x000)	Q'ty	Cost (x000)
1	Earthwork										
	Cut and Fill	m^3	4.0					320,000	1,280		
	Embankment/Subgrade	m^3	7.0	672,000	4,704	619,200	4,334	108,000	756	392,000	2,744
2	Pavement										
	Structural Overlay (t=15cm)	m^2	72.0	686,770	49,447	227,080	16,350	710,710	51,171	227,080	16,350
	Surface+Binder Course (t=15cm)	m^2	72.0	84,000	6,048	364,280	26,228	98,000	7,056	49,000	3,528
	Base Cource (t=30cm)	m^2	24.0	84,000	2,016	364,280	8,743	98,000	2,352	49,000	1,176
	Subbase (t=30cm)	m^2	15.0	84,000	1,260	364,280	5,464	98,000	1,470	49,000	735
3	Bridges & Viaducts										
	L=30 - 100m; H<20m (W=9.0m)	m	17,000	340	5,780	360	6,120	470	7,990	160	2,720
	L<100m; H<20m (W=9.0m)	m	15,000	550	8,250	400	6,000			400	
4	Interchanges	LS		1	4,000	1	4,000			1	4,000
	Sub-Total (1)				81,505		77,239		72,075		31,253
5	Ditches & Culverts	LS	5.0%		4,075		3,862		3,604		1,563
6	Miscellaneous Items	LS	30.0%		25,674		24,330		22,704		9,845
	Sub-total (2)				111,255		105,432		98,383		42,660
7	Indirect Cost		30.0%		33,376		31,629		29,515		12,798
	Total Construction Cost				144,631		137,061		127,897		55,458
8	Engineering Cost	LS	10.0%		14,463		13,706		12,790		5,546
9	Land Acquisition & Compensation	m^2	30.0	204,000	6,120	595,700	17,871	476,000	14,280	119,000	3,570
10	*(NEW ROAD: Separate Cost)*	*km*								*35.0*	*201,000*
	Total Project Cost				**165,215**		**168,638**		**154,967**		**265,574**

Source: JICA Study Team

Note: Land acquisition cost for Route 4 is for short bypasses only. Land acuisition cost for the 35 km new road section is included in Item 10.

7.4 PROJECT EVALUATION

In this section, economic analysis is made as a process of project evaluation regarding road improvement project in Banja Luka – Doboj section.

7.4.1 Methodology for Economic Analysis

(1) General

The main purpose of the economic analysis is to show the effects of the implementation of the project of "Pre feasibility study of road improvement project in Banja Luka – Doboj section" (hereinafter called as "Project"), from the point of view of the country's economic well-being and to estimate a return on the resources invested. The economic analysis is an assessment of the economic viability of the Project. For the purposes of evaluation, the economic internal rate of return (EIRR), net present value (NPV) and benefit-cost ratio (BC ratio) are demonstrated.

Economic analysis follows a conventional cost benefit analysis of discounted cash flow methodology. The cost benefit analysis is made by comparison between project benefits and project costs.

- The formula of EIRR is shown as follows:

$$\sum_{t=1}^{n} \frac{\text{Benefits}_t}{(1+R)^t} = \sum_{t=1}^{n} \frac{\text{Inv. cost}_t + \text{O/M cost}_t}{(1+R)^t}$$

where:

Benefits_t	:	Benefits in year t
Inv. cost_t	:	Investment cost in year t
O/M cost_t	:	Operation and Maintenance costs in year t
n	:	Calculation period
t	:	Year t (from 1 to n)
R	:	Value of EIRR

EIRR is the value which will satisfy the above formula.

- The formula of NPV is shown as follows:

$$\sum_{t=1}^{n} \frac{\text{Benefits}_t}{(1+D)^t} - \sum_{t=1}^{n} \frac{\text{Inv. cost}_t + \text{O/M cost}_t}{(1+D)^t}$$

- The formula of BC Ratio is shown as follows:

$$\sum_{t=1}^{n} \frac{\text{Benefits}_t}{(1+D)^t} \Big/ \sum_{t=1}^{n} \frac{\text{Inv. cost}_t + \text{O/M cost}_t}{(1+D)^t}$$

where:

$Benefits_t$	:	Benefits in year t
$Inv.\ cost_t$	:	Investment cost in year t
$O/M\ cost_t$	:	Operation and Maintenance costs in year t
n	:	Calculation period
t	:	Year t (from 1 to n)
D	:	Discounted rate

(2) Basic assumptions

The following basic assumptions are made:

1) The benefits are calculated for the planning year of 2005, 2010 and 2020, and by the four categories of vehicle; passenger car, bus, truck and large truck in accordance with the traffic demand forecast.

2) The construction work of the project road is scheduled to be from 2002 to 2004, and the start of service is from 2005.

3) The base year is 2000. The project life is assumed to be 30 years after the start of service. The calculation period of cost benefit analysis is 35 years of from 2000 to 2034.

7.4.2 Project Benefits

(1) Expected benefits

Benefits which can be expected by implementation of the Project are as follows:

As a direct benefit,

- Saving in vehicle operating cost
- Saving in vehicle time cost, and
- Reduction of vehicle accident cost, and

As an indirect benefits,

- Contribution to regional industrial and tourism development

(2) Quantified benefits

In this economic analysis in the pre feasibility study stage, out of the above, two benefits of the saving in vehicle operating cost and the saving in vehicle time cost are treated as quantified benefits.

(3) Estimation of benefits

Saving in Vehicle Time Cost

The saving in vehicle time cost is calculated as a difference between the vehicle time cost in the case of “WITH” project condition and that in “WITHOUT” project condition. While “WITH” project condition means the case in which an investment for road improvement is implemented, “WITHOUT” project condition means the case in which no such an investment is made except a daily basis maintenance. Higher speed is, in general, expected in the case of “WITH” project than “WITHOUT” project.

The vehicle operating time costs are calculated by multiplying the vehicle-hours by the unit vehicle time cost. The vehicle-hours are obtained as a result of traffic assignment process in the traffic demand forecast. The unit time cost is set up by vehicle type.

Saving in Vehicle Operating Cost

The saving in vehicle operating cost is calculated as a difference between the vehicle operating cost in the case of “WITH” project condition and that in “WITHOUT” project condition.

The vehicle operating time costs are calculated by multiplying the vehicle-kilometer by the unit vehicle operating cost. The vehicle-kilometers are obtained as a result of traffic assignment process in the traffic demand forecast. The unit vehicle operating cost is set up by vehicle type and speed range.

(4) Unit cost of vehicle time cost and vehicle operating cost

While the estimation of time costs of passenger car and bus are made on the basis of per capita GDP, those of truck and large truck are based on the study results in the report of “ Development of Branches on Corridor V, Bosnia and Herzegovina Road, Phare, June 2000.” For both estimations, the results of traffic survey which has been conducted by the Study Team are utilized.

The estimation results are shown in the following tables: The details of estimation process are referred to Appendix.

Table 7.4.1 shows the estimated vehicle time value of bus and passenger car per hour.

Table 7.4.1 Estimated Vehicle Time Value of Bus and Passenger Car per Hour (KM in constant year 2000 price)

	2000	2005	2010	2020
Bus	15.53	22.58	27.49	37.12
Passenger Car	2.25	3.28	3.99	5.38

Source: JICA Study Team

Table 7.4.2 shows the estimated vehicle time value of truck and large truck.

Table 7.4.2 Unit Vehicle Time value of Truck and Large Truck

Type	Unit Time Value per Ton-hour (KM)	Year	Freight Load	Unit Time Value per Vehicle-hour (KM)
Truck	0.6	2005	4.8	2.85
		2010	5.3	3.19
		2020	6.5	3.89
Large Truck	0.6	2005	14.2	8.50
		2010	14.8	8.87
		2020	16.1	9.60

Source: JICA Study Team

Table 7.4.3 show the estimated unit vehicle operating cost.

Table 7.4.3 Unit Vehicle Operating Cost

(KM per vehicle-kilometer)

Speed (Km/hr)	Pass. Car	Bus	Truck	Large Truck
10.000	1.204	4.345	1.973	3.747
15.000	0.885	3.276	1.508	2.863
20.000	0.726	2.747	1.278	2.427
25.000	0.631	2.437	1.144	2.172
30.000	0.568	2.237	1.058	2.009
35.000	0.524	2.099	1.000	1.900
40.000	0.491	2.003	0.960	1.824
45.000	0.465	1.935	0.933	1.771
50.000	0.445	1.886	0.913	1.734
55.000	0.430	1.852	0.899	1.707
60.000	0.418	1.827	0.890	1.690
65.000	0.409	1.811	0.884	1.678
70.000	0.401	1.800	0.879	1.670
75.000	0.395	1.793	0.877	1.665
80.000	0.390	1.789	0.876	1.663
85.000	0.386	1.786	0.875	1.661
90.000	0.383	1.786	0.875	1.661
95.000	0.379	1.786	0.875	1.661
100.000	0.378	1.786	0.876	1.663

Source: JICA Study Team

7.4.3 Estimation of Benefits

As the results of traffic assignment in traffic demand forecast process, daily vehicle kilometers and daily vehicle hours are obtained for the cases of "WITHOUT" project and "WITH" project, in which four cases of "Route 1," "Route 2", "Route 3" and "Route 4".

Multiplying the above obtained vehicle kilometers by the unit vehicle operating cost, vehicle operating costs are calculated. Similarly, multiplying the above obtained vehicle hours by the unit vehicle time cost, vehicle time costs are calculated. Then, as a difference of values between “WITHOUT” and “WITH,” benefits are calculated.

The above daily basis benefits are converted to the annual basis benefits by using a conversion factor of 300. The summary of annual benefits is shown in Table 7.4.4. The details of calculation results of daily benefits in 2005, 2010, and 2020 are shown in Tables A.7.4.15 to A.7.4.17 in Appendix, respectively.

Table 7.4.4 Summary of Estimated Annual Benefits (Banja Luka - Doboj Road Section)

(KM 1,000/year)

	Route 1			Route 2			Route 3			Route 4		
	VOC Saving	Time Saving	Total	VOC Saving	Time Saving	Total	VOC Saving	Time Saving	Total	VOC Saving	Time Saving	Total
2005	15,779	1,474	17,254	15,431	3,731	19,162	9,592	3,152	12,744	12,836	3,191	16,027
2010	21,060	4,002	25,062	20,934	7,029	27,963	12,956	6,324	19,281	17,985	6,678	24,664
2020	53,409	11,608	65,017	55,759	16,447	72,205	33,131	10,324	43,455	50,175	13,005	63,181

Source: JICA Study Team

7.4.4 Economic Project Costs

(1) Estimation of Economic Costs

The project costs in terms of financial costs are referred to Section 7.3 in this Chapter. Economic analysis treats an economic cost, which is estimated by eliminating the portion of transfer item such as taxes from financial costs.

In this economic analysis, the related taxes to the estimated costs are assumed as the custom duty and the tax on trade on goods and services.

Regarding the tax system (tax ratio), while that of the custom duty are common to Federation of Bosnia and Herzegovina (FD) and Republika Srpska (RS), that of the tax on trade on goods and services are different by FD and RS.

The tax ratios regarding tax on trade of goods and services in FD are 24% in tariff No. 1, 12% in tariff No.2 for goods, and 12% for services. Tariff No. 1 is applied in general. Tariff No. 2 includes commodities related to, for example, energy, basic agricultural / fishery products, products serving for food of people, construction material such as timber, etc. Tariff No. 1 stands for the other commodities than stipulated in tariff No. 2.

Regarding the tax on trade on goods and services in RS, there are two categories of tax rate of 18% and 8%. The tax rate of 18% is applied in general, and that of 8% is, for example, for food products, agricultural / fishery products, electricity, coal, materials for construction such as timber, etc.

Regarding fuel, there are several special taxes both for FD and RS.

According to the law on the custom duty, the custom tariff which is considered to be related to project ranges, roughly speaking, 0%, 5%, 10% and 15%, for example; construction equipment such as crane (0% / 5%), forklift (5%), bulldozer (5% / 10%), machinery for work of road construction (5%), truck (10%), bus (15%), passenger car (15%), rail locomotive (0%), passenger coach (5%), freight wagon (5%), equipment for signal (5%), etc. It should be noted that the above tax ratios are still only shown as a general sample. The actual tax ratio is determined based on the detailed specification of equipment.

For the elimination about tax portion, the following are to be taken into consideration:

In the cost estimates of projects in this pre-feasibility study stage, specification and procurement source of equipment are not fixed. And the breakdown of cost component for local / foreign currency portion and also that for labor / material / depreciation for equipment portion in the total cost is not certain (just rough estimates) in the pre-feasibility study stage. Therefore, it is difficult to estimate a tax portion.

Regarding the estimation of economic cost, the following are assumed:

According to the engineering study, the percentage of equipment cost in foreign currency portion is roughly estimated to be about 5% to the total cost. Regarding the custom duty, 5% of custom tariff is assumed to this portion. And regarding the portion of the other tax than custom duty, i.e. the tax portion including the tax on trade of goods and services, ratio of 15% is assumed to be as a tax portion, considering the share of material cost in total cost.

As a result, a conversion factor of 0.87 is obtained, and using this factor economic cost is obtained.

(2) Economic Project Costs

As a result, the economic project costs are estimated as shown in Table 7.4.5. The annual distribution is based on the assumption of portion of 30%, 40%, and 30% for 2002, 2003, and 2004.

Table 7.4.5 Economic Project Cost (Banja Luka - Doboj Road Section)

(KM 1,000)

Case	Total	2002	2003	2004
Route 1	143,737	43,121	57,495	43,121
Route 2	146,715	44,015	58,686	44,015
Route 3	134,821	40,446	53,929	40,446
Route 4	231,049	69,315	92,420	69,315

Source: JICA Study Team

The annual operation and maintenance costs are estimated based on the unit cost per kilometer of KM 15.5 thousand. The economic price of annual operation and maintenance costs is obtained by using an above-mentioned conversion factor of 0.87, which is about KM 13.5 thousand per kilometer. The total lengths of road in WITHOUT case, Route 1, Route 2, Route 3 and Route 4 are 111.0 km., 111.0 km, 86.0 km, 108.0 km and 91.0 km, respectively. Thus, the operation and maintenance costs in terms of economic price are obtained to be KM 1, 497 thousand, KM 1,497 thousand, KM 1,160 thousand, KM 1,456 thousand, KM 1,227 thousand, per annum, respectively.

The operation and maintenance costs in WITHOUT case are considered in the cash flow of cost benefit analysis. The rehabilitation cost for WITHOUT case is also considered.

7.4.5 Cost Benefit Analysis

Based on the above estimated benefits and the related costs, cost benefit analysis was made. In this economic analysis, benefits after 2021 are assumed to be fixed as the 2020 values. The calculation results are summarized in Table 7.4.6.

Table 7.4.6 Summary of Cost Benefit Analysis for Banja Luka - Doboj Road Section

	Route 1	Route 2	Route 3	Route 4
EIRR	18.0%	19.1%	15.2%	12.8%
NPV (KM 1,000)	80,946	100,451	35,802	14,490
B/C	1.84	2.04	1.40	1.09

Source: JICA Study Team
Note: NPV and B/C are computed at a discount rate of 12 %

The result of the economic analysis suggests that Route 1 and Route 2 has higher EIRR compared with Route 3 and 4.

The details of cash flow of cost benefit analysis are shown in Tables A.7.4.19, A.7.4.20, A.7.4.21, and A.7.4.22 in Appendix for Route 1, Route 2, Route 3, and Route 4 of Banja Luka - Doboj Road Section, respectively.

7.5 IMPLEMENTATION PLAN AND RECOMMENDATIONS

7.5.1 Route Selection

The results of the project analysis show that Route 1 and Route 2 are the optimum alternatives. The EIRR of 18 % to 19 % is considered that the project is at the feasible level. The difference in EIRR between these two alternatives, however, is not large. These numbers should be considered almost the same if the level of detail of this study is taken into account.

As mentioned in Section 7.1.2: Definitions and Assumptions, these results are under many simplified assumptions. However, it is a result to figure out an “investment limit,” which means how much investment is allowed to make this project feasible. In the optimum alternatives of Route 1 and Route 2, the message is that the level of improvement proposed in the description is considered feasible.

The selection between Route 1 and Route 2, however, needs more discussion on development policy. It is recommended that Route 2 be implemented for the future main route of Banja Luka - Doboj connection by the following reasons:

1) Route 2 has a shorter distance and travel time particularly for Banja Luka - Doboj connection. The overall economic analysis result reflects the benefits for all of the traffic passing through the designated road sections, but for Banja Luka - Doboj connection Route 2 is a more attractive alternative.

2) Route 1 traffic consists of a few different major OD pairs. The advantage of Route 1 is more for Banja Luka - Brod and Banja Luka - Brcko/Bijeljina directions rather than Banja Luka - Doboj or further. For increasing future traffic, it is recommended that the function of Banja Luka - Doboj connection and Banja Luka - Brod/Brcko/Bijeljina connection be separated.

3) The improvement of travel time for Banja Luka - Doboj connection will contribute to the change of travel pattern between Sarajevo and Banja Luka. Since the possibility of improvement for Banja Luka - Donji Vakuf road is limited due to the very severe topographic condition, the improvement of Banja Luka - Doboj connection will give a preference of this route to Sarajevo - Banja Luka OD pair traffic. This will eventually eliminate a future burden on Banja Luka - Donji Vakuf road.

4) A shorter travel time between Banja Luka and Doboj will contribute to an improvement of Banja Luka - Sarajevo connection itself. The better connection between the entity capital of RS and the state capital will be of more importance in the future. Route 2 will contribute to a better transport condition between Banja Luka and Sarajevo.

7.5.2 Implementation Schedule

A recommended implementation schedule is shown in Figure 7.5.1. This is considered as the earliest possible schedule if the full feasibility study and detailed design are implemented without delay.

Figure 7.5.1 Recommended Implementation Schedule

Item	2002	2003	2004
Feasibility Study and Detailed Design			
Construction			

For the further analysis in the later stage of the project, a more detailed analysis is recommended to assess the existing pavement conditions of each alternative to examine more detailed pavement improvement design, and to examine the necessity of bridge reconstruction for individual bridges.

7.5.3 Project Finance and Implementation

The finance of the project is recommended to be by a low-interest foreign loan from international project finance organizations. The availability of domestic funds is limited, and for those domestic funds a higher priority should be given to achievement of better road maintenance system and more urgent rehabilitation needs. The result of the economic analysis is considered to support the realization of the project by an international finance mechanism.

An introduction of private finance for this project is not recommended. Most of private finance projects in the road sector are based on the idea that the cost will be directly recovered by collection of tolls. In this particular project, however, toll road scheme is difficult to be applied since the alternative routes will be competitive if a toll is charged on the optimum route, which result in the very low usage of the toll road.

CHAPTER 8: PRE-FEASIBILITY STUDY ON RAILWAY IMPROVEMENT PROJECT

8.1 PROJECT DESCRIPTION

Since the Dayton agreement in December 1995, several railway reconstruction programs have been focused on the immediate alleviation of physical war damages and the re-activation of basic transport service and facilities. For this end, significant improvement of transport infrastructure have been achieved, mainly within the framework of Emergency Transport Reconstruction Project with support provided by the EBRD, the World Bank, the European Union, and other bilateral donor institutions.

At present, several projects such as the reconstruction of signal and telecommunication, the reconstruction of Samac Bridge, and the reconstruction of catenary system are on-going. These projects have been treated as a "committed project."

Railway plan recommended by JICA Study Team has the concept that railway system in BiH will be rehabilitated / reconstructed and sustainably operated at a commercial basis, aiming at a part of European railway network.

Railway plan is established based on the phased implementation schedule with the step-wise target of recovery of railway operation to the condition before the war, then strengthening to UIC standard, and innovation of railway system.

Railway recovery schedule comprises three phases:

- Phase 1 (up to 2005) is recognized as the "normalization period" aiming at facility recovery to the condition before the war,
- Phase 2 (2006 to 2010) is regarded as the "transportation recovery period" aiming at transportation recovery to the condition before the war, and
- Phase 3 (2011 to 2020) is conceptualized as the "functionally strengthening period" including railway system innovation aiming at the commercial operation as a part of European railway network.

Out of the above phasing, Phase 1 is treated as an objective of the pre-feasibility study.

8.2 FUTURE DEMAND FORECAST

Future railway transport demand was forecasted in Part 1: Sector Plans in Vol.2 for passengers and cargoes. However, the forecast was made based on the railway improvement plan consisting of three phases. For the pre-feasibility study of the railway, two forecasts are necessary, namely for with project and without project cases to supply basic information on effects by the railway improvement.

Regarding the forecast for the with case, future railway transport demand was forecasted based on relation to economic activity level of the country, as mentioned in Part 1. The realization ratios against the potential demand were assumed to forecast the demand according to the improvement progresses. Therefore, possible demand for the Phase 1 improvement is the forecast in 2005, when all the project components of the phase were completed. Future railway demand is assumed to be stable, because no more improvements would be realized in the phase.

In the without case, only committed railway improvement projects were considered. The study team assumed for the without case forecast that the demand would be double compared to transport volume in 1999 both for passenger and freight transport. The railway transport demand for the without case would not increase, if the Phase 1 improvement projects were not implemented. Therefore, future railway transport demand will be stable.

The future railway transport demand forecast is shown in Table 8.1. Railway passenger demand will be 102 million passenger-km and 553 million passenger-km after 2005 for the without and with cases respectively. Freight transport of the railway will be 292 million ton-km and 879 million ton-km for the without and with cases respectively.

Table 8.1 Future Railway Transport Demand for Passengers and Freight

	1999	2005	2010	2020
Passenger-km (million)				
without case	51.1	102.2	102.2	102.2
with case	-	553.0	553.0	553.0
Freight ton-km (million)				
without case	146.1	292.1	292.1	292.1
with case	-	879.0	879.0	879.0

8.3 DEVELOPMENT PLAN

8.3.1 Railway Improvement Policy

Since the railway system of BiH was destroyed severely, only limited transport service is supplied currently, although efforts have been made by international society and the railway companies, as mentioned in Part 1.

The target of the railway improvement plan is the “normalization” of railway transport service to the level of pre-war condition.

Figure 8.1 shows the idea of the improvement plan.

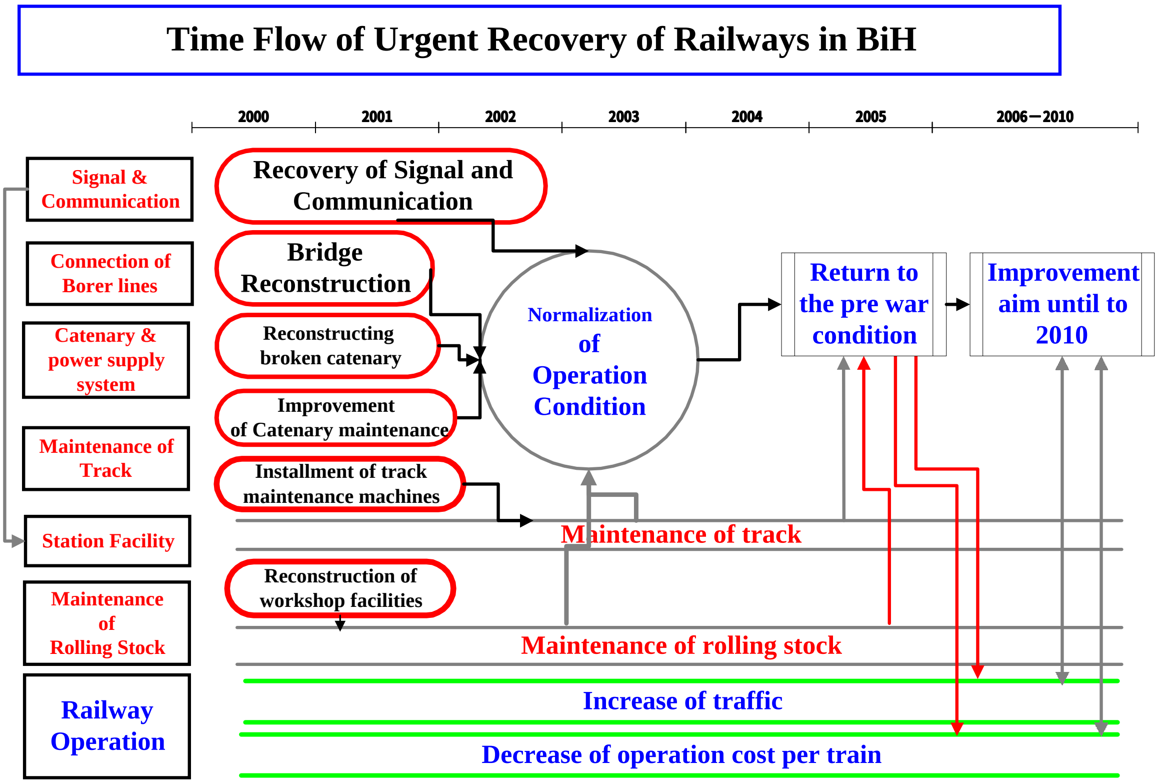


Figure 8.1 Railway Improvement Plan

For the “normalization” purpose, the Phase 1 includes following improvement projects:

- Urgent Recovery;
- Signal & Telecommunication system reconstruction;
- Catenary Reconstruction;
- Procurement of Rolling Stocks

- Reconstruction of track maintenance facilities;
- Maintenance of track;
- Reconstruction of power maintenance facilities;
- Reconstruction of workshop machines;
- Maintenance parts supply; and,
- Reconstruction of border stations.

8.3.2 Major Improvement Projects in Phase 1

(1) Urgent Recovery

Until 2005, facilities will be restored as pre-war situation, but condition of track and rolling stock is too serious in whole area.

For realizing the Phase 1 target, the urgent program should be executed as soon as possible. Without urgent project, Phase 1 improvements cannot be achieved especially on the recovery of track and rolling stock which will determine the train operation speed.

By considering the actual situation of railways in BiH, the urgent program is the base and the most important step controlling all endeavors of 3 phases.

Railway transportation is at the stage of starting of recovery. For that sake, the contents of railway recovery should be explained in detail upon the fundamental matters.

Urgent recovery plans are to be completed until 2002-2003. They are mainly consisted of connection, safety recovery and running condition between rail and wheel.

(2) Catenary Reconstruction

By war activities, about 190 km of overhead contact line has been completely destroyed or severely damaged, as well as external signaling and telecommunication devices, centers for traffic remote control and electric traction facilities, the electric sectioning posts, and the traction substations.

The catenary system of some sections near Samac Bridge and of Una line is also destroyed. In near future, this section shall be repaired before the reconstruction of Samac Bridge.

(3) Signal & Telecommunication System Reconstruction

The signal and communication innovation, completely damaged by war, will lead to the inovation of IT revolution in adverse. The construction work by using railway track facility will bring the merit of low cost investment of most modernized system..

(4) Maintenance Machines

By accumulated deteriorated track facility, the inoperable and poor capacity cannot support the required track maintenance work.

Some maintenance cars for catenary and for track maintenance work are donated to BiH, but fundamental tie tamper machine and measuring equipment are not yet.

Railways in BiH are confronting with serious financial deficit and they cannot start improving work by themselves.

The following maintenance machines are necessary:

- One tamping machine for switches;
- One ballast clearing machine; and,
- Eight motor trolleys for track and OCL maintenance.

Other equipment (tools, instruments, light track machines), service road vehicles for infrastructure maintenance are necessary.

(5) Reconstruction of Workshop Machines

Extraordinary condition of rail and wheel figures is preventing normal speed operation for fear of derailment. Low train speed requires much more rolling stock and operation personnel.

Plenty of wheels out of gauge control are waiting at outside of all car workshops.

(6) Procurement of Rolling Stocks

To cope with the increased transport demand by the Phase 1 improvement, procurement of rolling stocks is necessary for passengers and freight. Table 8.2 shows the necessary number of rolling stocks.

Table 8.2 Necessary Number of Rolling Stocks

Necessary car number

Necessary number of cars				1990	2000	2,005	2010	2015	2020
Locomotives		Total	1	174	73	97	122	131	174
	Diesel locomotives	Main line use	2						
		Shunting use	3						
		Sub total	4	87	24	44	61	60	60
	Electric locomotive		5	87	49	53	61	71	114
Freight cars			6	9,406	764	2,613	4,703	7,055	9,406
Passenger coaches			7						
	2 axle coach		8	155	23	86	109	136	155
	4 axle coach		9	219	33	122	153	192	219
		Subtotal		374	56	208	262	328	374
	EC		10	24	4	13	17	19	24

Possesed car number

Necessary number of cars				1990	2000	2,005	2010	2015	2020
Locomotives		Total	1	174	73	123	104	70	34
	Diesel locomotives	Main line use	2						
		Shunting use	3						
		Sub total	4	87	24	49	52	35	17
	Electric locomotive		5	87	49	74	52	35	17
Freight cars			6	9,406	764	1,764	2,764	3,762	1,881
Passenger coaches			7						
	2 axle coach		8	155	53	78	93	62	31
	4 axle coach		9	219	144	169	131	88	44
		Subtotal		374	197	247	224	150	75
	EC		10	24	4	13	14	10	5

Necessary new car number

Necessary number of cars				1990	2000	2,005	2010	2015	2020
Locomotives		Total	1	174		0	18	61	140
	Diesel locomotives	Main line use	2						
		Shunting use	3						
		Sub total	4	87	0	0	9	25	43
	Electric locomotive		5	87		0	9	36	97
Freight cars			6	9,406	0	849	1,939	3,293	7,525
Passenger coaches			7						
	2 axle coach		8	155		8	16	74	124
	4 axle coach		9	219		0	22	104	175
		Subtotal		374		0	38	178	299
	EC		10	24		0	3	9	19

Accumulated cost of acquiring new car

US mill. $

Total value of cars			unit price	1990	2000	2,005	2010	2015	2020
Locomotives		Total							
	Diesel locomotives	Main line use	2.5						
		Shunting use	1.5						
		Sub total	2		0	0	18	50	86
	Electric locomotive		5			0	45	180	485
Freight cars			0.08		0	68	155	263	602
Passenger coaches									
	2 axle coach		0.1			1	2	7	12
	4 axle coach		0.2			0	4	21	35
	EC		2			0	6	18	38
		Grand total			0	69	230	540	1,258

8.3.3 Train speed increase by Phase 1

In parallel with the improvement of terminal operation, the travel time and train operation speed will control the railway competitiveness and efficiency of using rolling stock and operation personnel.

Actual train maximum speed is limited to 40/50 km/h although the standard of track and rolling stock is designed to 100/120 km/h.

Although the train average speed should be calculated by train km and train hours, the attractiveness and efficiency of train operation service can be estimated by using typical train operation data.

The following data table, that will be used for the evaluation of improvement on railway management, shows the possible train operation speed increase in each stage by selecting typical trains from the former train diagrams and actual train diagrams.

Table 8.3 Typical Train Speed by Phase

Transition of typical passenger express train speed km/h

Line number	Where	Km	Actual max speed	1990	Actual	By committed	Phase 1	Phase 2	Phase 3	after 2020
No 11	Sarajevo-Ploce	193.5		70.0	39.4	39.4	63.0	77.0	86.7	93.6
No 12-1	Samac-Doboj	60.6	50	71.0	37.1	40.0	63.9	78.1	80.0	85.0
No 12-2	Doboj-Sarajevo	172.4	50,70	70.4	45.0	48.1	63.3	77.4	80.0	85.0
No 12	Samac-Sarajevo	233.0	50,70	73.8	41.1	45.1	74.0	75.0	80.0	85.0
No 13-1	Doboj-Tuzla	57.6	50		34.6	34.6	57.6	70.4	78.0	80.0
No 13-2	P. Novo-Tuzla	30.5	50		40.7	40.7	57.6	70.4	78.0	80.0
No 14	Brcko-Sicki Brod	63.4			39.6	39.6				
No 15	Petrovo Novo-Zvornik	81.0	50		30.0	30.0	83.7	102.3	100.0	112.0
No 16	Doboj-Novi Grad/Bos Novi	180.0	70	73.9	55.1	55.1	73.9	83.6	90.0	100.0
No 17	Novi Grad/Bos Novi-Bihac	65.8	50		37.6	37.6	59.3	65.9	82.8	86.5
Total					39.7	40.7	67.5	77.3	84.5	90.5

Note: Total travel speed is summed up by considering weight of each line.

Transition of typical freight train speed km/h

Line number	Where	Km	Actual max speed	1990	Actual	By committed	Phase 1	Phase 2	Phase 3	after 2020
No 11	Sarajevo-Ploce	193.5		48.9	23.5	23.5	44.0	48.9	48.9	48.9
No 12-1	Samac-Doboj	60.6	50							
No 12-2	Doboj-Sarajevo	172.4	50,70							
No 12	Samac-Sarajevo	233.0	50,70	45.7	35.0	38.7	41.1	45.7	45.7	45.7
No 13-1	Doboj-Tuzla	57.6	50							
No 13-2	P. Novo-Tuzla	30.5	50							
No 14	Brcko-Sicki Brod	63.4								
No 15	Petrovo Novo-Zvornik	81.0	50							
No 16	Doboj-Novi Grad/Bos Novi	180.0	70	58.0	43.5	43.5	52.2	58.0	58.0	58.0
No 17	Novi Grad/Bos Novi-Bihac	65.8	50							
Total										

The difference of train speed between freight and passengers is relatively few in actual stage because of the maximum speed is limited to low areas of 40/50 km/h for fear of derailment.

The rail condition and running gear of rolling stock are improved by the progress of maintenance condition and the train maximum speed will be raised up to former conditions.

Before the war, the track was still not sufficient for running to physical allowable speed by lack of enough maintenance work. By considering the importance of leveling up the train operation speed, such serious situation, that restrict competitiveness of railway, will be solved in the progress of improvement by improving the curvatures, rolling stock running gears, electrification, double tracking projects, tunnel projects, etc.

Firstly the effect will be released on the intercity passenger express trains and the difference of speed between freight and passenger trains will be enlarged. The average freight train speed will not appear clearly, although improvement of curvatures, track conditions, electrification, double tracking will reveal the effect on speed up and efficiency on the usage of rolling stock, etc.

The effects of freight trains are belonging to the future heavy investment as shown in the above, and the speed data given in the above table do not consider their effect because the speed difference will cause also the negative effect on the freight train average speed by waiting the higher speed trains at intermediate stations.

The study team expects that train operation speed will recover the pre-war level by 2005.

8.4 COST ESTIMATION

Necessary investment cost is shown in Table 8.4. The cost is the value in year 2000 constant KM.

Table 8.4 Phase 1 Investment Cost Estimates

(KM million)

		2002	**2003**	**2004**	Total
Rolling Stock	Rolling Stock	47.68	63.57	47.68	158.92
	Workshop	9.05	12.06	9.05	30.2
	Maintenance	6.96	9.28	6.96	23.2
	Subtotal	**63.7**	**84.9**	**63.7**	**212.3**
Infrastructu	Signal & Telecom.	29.23	38.98	29.23	97.4
	Track Maint. Faclty.	13.22	17.63	13.22	44.1
	Curcature Imprv.				0.0
	Track	34.80	46.40	34.80	116.0
	Power Maint. Faclty.	4.87	6.50	4.87	16.2
	Caternary	4.87	6.50	4.87	16.2
	Border Station	3.48	4.64	3.48	11.6
	Subtotal	**90.5**	**120.6**	**90.5**	**301.6**
Total		154.2	205.6	154.2	513.9

8.5 PROJECT EVALUATION

8.5.1 Economic Analysis

(1) General

1) Methodology

The main purpose of the economic analysis is to show the effects of the implementation of the project of “Pre feasibility study of railway improvement project in Phase 1 stage” (hereinafter called as “Project”), from the point of view of the nation’s economic well-being and to estimate a return on the resources invested. The economic analysis is an assessment of the economic viability of the Project. For the purposes of evaluation, the economic internal rate of return (EIRR), net present value (NPV) and benefit –cost ratio (BC ratio) are demonstrated.

Economic analysis follows a conventional cost benefit analysis of discounted cash flow methodology. The cost benefit analysis is made by comparison between project benefits and project costs.

The formula of EIRR is shown below:

$$\sum_{t=1}^{n} \frac{\text{Benefits}_t}{(1+R)^t} = \sum_{t=1}^{n} \frac{\text{Inv. cost}_t + \text{O/M cost}_t}{(1+R)^t}$$

where:

Benefits_t	:	Benefits in year t
Inv. cost_t	:	Investment cost in year t
O/M cost_t	:	Operation and Maintenance costs in year t
n	:	Calculation period
t	:	Year t (from 1 to n)
R	:	Value of EIRR

EIRR means the value, which will satisfy the above formula.

The formula of NPV is shown below:

$$\sum_{t=1}^{n} \frac{\text{Benefits}_t}{(1+D)^t} - \sum_{t=1}^{n} \frac{\text{Inv. cost}_t + \text{O/M cost}_t}{(1+D)^t}$$

The formula of BC Ratio is shown below:

$$\sum_{t=1}^{n} \frac{\text{Benefits}_t}{(1+D)^t} \Big/ \sum_{t=1}^{n} \frac{\text{Inv. cost}_t + \text{O/M cost}_t}{(1+D)^t}$$

where:

Benefits_t	:	Benefits in year t
Inv. cost_t	:	Investment cost in year t
O/M cost_t	:	Operation and Maintenance costs in year t
n	:	Calculation period
t	:	Year t (from 1 to n)
D	:	Discounted rate

2) Basic Assumption

The following basic assumptions are made:

i) Cost benefit analysis

Cost benefit analysis is made in comparison between the incremental costs and the incremental benefits, in which “incremental” means the difference between “With project” condition and “Without project” condition.

ii) Precondition on benefit estimation

The benefits are calculated for the planning year of 2005, 2010 and 2020.

For other years than the planning years, estimation by interpolation is made.

iii) Implementation schedule

The construction work of the project is scheduled to be from 2002 to 2004, and the start of service is from 2005.

iv) Calculation period of cost benefit analysis

The base year is 2000. The project life is assumed to be 30 years after the start of service. The calculation period of cost benefit analysis is 35 years from 2000 to 2034.

v) With project and without project

In this economic analysis, while “With project” means the condition in which investment related to “Phase 1” project is implemented, “Without project” stands for the condition in which investment only related to “Committed project” is implemented.

vi) Railway transport demand

The transport demand in “With project” and “Without project” follows the previous section in this chapter (refer to Table 8.5)

Table 8.5 Railway Transport Demand

		2005	2010	2020
With Project	Passenger-km (1,000)	553,000	553,000	553,000
	Ton-km (1,000)	879,000	879,000	879,000
Without Project	Passenger-km (1,000)	102,208	102,208	102,208
	Ton-km (1,000)	292,108	292,108	292,108
Incremental	Passenger-km (1,000)	450,792	450,792	450,792
	Ton-km (1,000)	586,892	586,892	586,892

Source: JICA Study Team

(2) Project Benefits

1) Expected Benefits

Benefits which can be expected by implementation of the Project are as follows:

As a direct benefit,

Saving in time cost regarding railway passengers and freight in transport demand of “Without” condition

Saving in time cost regarding railway passengers and freight in incremental transport demand, and

Saving in operating cost regarding railway passengers and freight in incremental transport demand, and

As an indirect benefits,

Contribution to regional industrial and tourism development

2) Quantitative Benefits

In this economic analysis in the pre feasibility study stage, out of the above, three benefits of i) saving in time cost regarding railway passengers and freight in demand of “Without” condition, ii) saving in time cost regarding railway passengers and freight in incremental demand, and ii) saving in operating cost regarding railway passengers and freight in incremental demand are treated as quantitative benefits.

3) Estimation of Benefits

i) Saving in time cost regarding railway passengers and freight in transport demand of “Without” condition

The saving in time cost regarding railway passengers and freight in transport demand of “Without” condition is calculated based on the difference of passenger-hour and ton-hour between in the case of “With” project and that in “Without” project condition. The difference of passenger-hour and ton-hour are derived from the difference of travel speed between in "With" project and "Without" project condition. By the train operation service with higher running speed, passengers, and freight in "Without project" condition can enjoy a saving in time cost.

ii) Saving in time cost regarding railway passengers and freight in incremental transport demand

The saving in time cost regarding railway passengers and freight in incremental transport demand is calculated based on the difference of passenger-hour and ton-hour between in the case of "With" project condition (use of railway mode) and that in "Without" project condition (use of road mode). The difference of passenger-hour and ton-hour are derived from the difference of travel speed between in railway mode of "With" project and that in road mode of "Without" project. By the railway operation service with higher running speed than road mode, incremental passengers and freight can enjoy a saving in time cost.

iii) Saving in operating cost regarding railway passengers and freight in incremental transport demand

The saving in operating cost regarding railway passengers and freight in incremental transport demand is calculated based on the difference of operating cost between in the case of "With" project condition (operating cost of railway mode) and that in "Without" project condition (operating cost of road mode).

4) Unit Time Cost

i) General

While the estimation of time cost of passenger is made on the basis of per capita GDP, that of freight is based on the study results in the report of " Development of Branches on Corridor V, Bosnia and Herzegovina Road, Phare, June 2000" (hereinafter called as "Phare Report").

ii) Estimation of unit time cost of passenger

The socioeconomic framework of per capita GDP in BiH (base case) is shown in Table 8.6.

Table 8.6 Per Capita GDP in BiH

(KM in constant year 2000 price)

	2000	2005	2010	2020
BiH	2,261	3,288	4,002	5,404

Source: JICA Study Team

The total annual working hour is assumed as follows:

- Total number of weeks is approximately 52.
- Total working hour per week is assumed to 40 hours. (8.0 hours x 5)
- Gross annual working hour is 2,080 (40 x 52).
- Assumed total number of non working days and hours except Saturday and Sunday is 25 days and 200 hours (25 x 8.0), respectively.
- Total average annual working hours is 1,880 (2,080 – 200)
- Assumed total average annual working hours is 1,800 (approximately).

As a result, per capita GDP per working hour is obtained as shown in Table 8.7.

Table 8.7 Estimated Per Capita GDP per Working Hour

(KM in constant year 2000 price)

	2000	2005	2010	2020
BiH	1.26	1.83	2.22	3.00

Source: JICA Study Team

Using the distribution of trip purpose based on the traffic survey conducted by the Study Team on June 2000, and the assuming the facto (refer to Table 8.8), time value after consideration of trip purpose are obtained. Here, while for the trip purpose of "work / business", 1.0 is given as a factor, for "personal" and "others," 0.5 is given. The results are shown in Table 8.9.

Table 8.8 Distribution of Trip Purpose

(KM in constant year 2000 price)

Trip Purpose	Percentage	Assumed Factor	After factor
Work/business	44.6%	1.0	0.446
Personal	53.0%	0.5	0.265
Others	2.4%	0.5	0.012
Total	100.0%		0.723

Source: JICA Study Team

Table 8.9 Estimated Unit Time Cost of Passenger

(KM in constant year 2000 price)

	2000	2005	2010	2020
BiH	0.91	1.32	1.61	2.17

Source: JICA Study Team

iii) Estimation of unit time cost of freight

Regarding the unit time cost of freight, the data in the above Phare Report are utilized, due to the limitation of data availability. According to the Phare Report, the 1999 time of value for railway freight is EUR 0.28 per ton-hour. Assuming that this value is equivalent to the 2000 value, and using the exchange rate of KM 1.96 per

EUR as of October 31 2000, the year 2000 time value of road freight is obtained as approximately KM 0.55 per ton-hour.

5) Unit Cost of Vehicle Operating Cost (VOC)

Regarding the unit vehicle operating cost, the data in the above Phare Report are utilized, due to the limitation of data availability. According to the Phare Report, the 1999 vehicle operating costs (for existing trunk road) in EUR per km are shown in Table 8.10. Assuming that these values are equivalent to the 2000 value, and using the exchange rate of KM 1.96 per EUR as of October 31 2000, the year 2000 unit vehicle operating costs are obtained as shown in Table 8.10.

Table 8.10 Unit Vehicle Operating Cost (VOC)

Vehicle Type	Unit VOC in EUR per kilometer	Estimated Unit VOC in KM per kilometer
Passenger Car	0.199	0.390
Bus	0.919	1.801
Truck	0.453	0.888
Large Truck	0.863	1.691

Source: Phare Report, and JICA Study Team

These values are not in accordance with the speed range. Regarding the VOC with speed range pattern, the study result of HDM-VOC (version 4) has been incorporated. According to this study result, index by speed range of unit VOC are shown in Table 8.11.

Table 8.11 Unit VOC Index by Speed Range

SPEED (km/hr)	Car Category	Bus Category	Truck Category
10.000	3.086	2.414	2.217
15.000	2.270	1.820	1.694
20.000	1.862	1.526	1.436
25.000	1.619	1.354	1.285
30.000	1.457	1.243	1.189
35.000	1.343	1.166	1.124
40.000	1.258	1.113	1.079
45.000	1.193	1.075	1.048
50.000	1.142	1.048	1.026
55.000	1.102	1.029	1.010
60.000	1.071	1.015	1.000
65.000	1.048	1.006	0.993
70.000	1.029	1.000	0.988
75.000	1.013	0.996	0.985
80.000	1.000	0.994	0.984
85.000	0.990	0.992	0.983
90.000	0.981	0.992	0.983
95.000	0.973	0.992	0.983
100.000	0.968	0.992	0.984

Source: HDM-VOC (version 4)

As a result, unit vehicle operating costs are shown in Table 8.12.

Table 8.12 Unit Vehicle Operating Cost

(KM per vehicle-kilometer)

SPEED (km/hr)	Passenger Car	Bus	Truck	Large Truck
10.000	1.204	4.345	1.973	3.747
15.000	0.885	3.276	1.508	2.863
20.000	0.726	2.747	1.278	2.427
25.000	0.631	2.437	1.144	2.172
30.000	0.568	2.237	1.058	2.009
35.000	0.524	2.099	1.000	1.900
40.000	0.491	2.003	0.960	1.824
45.000	0.465	1.935	0.933	1.771
50.000	0.445	1.886	0.913	1.734
55.000	0.430	1.852	0.899	1.707
60.000	0.418	1.827	0.890	1.690
65.000	0.409	1.811	0.884	1.678
70.000	0.401	1.800	0.879	1.670
75.000	0.395	1.793	0.877	1.665
80.000	0.390	1.789	0.876	1.663
85.000	0.386	1.786	0.875	1.661
90.000	0.383	1.786	0.875	1.661
95.000	0.379	1.786	0.875	1.661
100.000	0.378	1.786	0.876	1.663

Source: JICA Study Team

(3) Estimation of Benefits

1) Saving in Time Cost Regarding Railway Passengers and Freight in Transport Demand of "Without" Condition

According to the engineering study result, the train speed condition is as shown in Table 8.13.

Table 8.13 Train Speed Condition

	Without	With	Difference
Passenger Train	35 km/hour	63 km/hour	28 km/hour
Freight Train	25 km/hour	44 km/hour	19 km/hour

Source: JICA Study Team

The saving in time cost is represented as a difference of passenger-hour / ton-hour between "Without" condition and "With" condition. Passenger-hour is estimated by dividing passenger-kilometer by speed of passenger train, and similarly ton-hour is estimated by dividing ton-kilometer by speed of freight train. The estimation results of difference of passenger-hour and ton-hour between "Without" condition and "With" condition are shown in Tables 8.14 and 8.15, respectively.

Table 8.14 Estimation of Passenger-hour (for Without Transport Demand)

		2005		2010		2020	
	Train Speed (km/ hour)	Pax.-km (1,000) for Without	Pax.-hour (1,000)	Pax.-km (1,000) for Without	Pax.-hour (1,000)	Pax.-km (1,000) for Without	Pax.-hour (1,000)
Without	35	102,208	2,920	102,208	2,920	102,208	2,920
With	63	102,208	1,622	102,208	1,622	102,208	1,622
Difference			1,298		1,298		1,298

Source: JICA Study Team

Table 8.15 Estimation of Ton-hour (for Without Transport Demand)

		2005		2010		2020	
	Train Speed (km/ hour)	Ton-km (1,000) for Without	Ton-hour (1,000)	Ton-km (1,000) for Without	Ton-hour (1,000)	Ton-km (1,000) for Without	Ton-hour (1,000)
Without	25	292,108	11,684	292,108	11,684	292,108	11,684
With	44	292,108	6,639	292,108	6,639	292,108	6,639
Difference			5,045		5,045		5,045

Source: JICA Study Team

The benefits of saving in time cost are calculated as shown in Table 8.16. The unit time values are referred to the previous section of “4) Unit time cost.”

Table 8.16 Estimation of Time Saving Benefits for Railway Passengers and Freight in Transport Demand of Without Condition

	Passengers			Freight			Total
	Pax.-hour Saved (1,000)	Unit Time Value (KM/ hour)	Time Saving Benefits (KM 1,000)	Ton-hour Saved (1,000)	Unit Time Value (KM/ hour)	Time Saving Benefits (KM 1,000)	Time Saving Benefits (KM 1,000)
2005	1,298	1.32	1,714	5.045	0.55	2.769	4,483
2010	1,298	1.61	2,086	5.045	0.55	2.769	4,855
2020	1,298	2.17	2.817	5.045	0.55	2.769	5,586

Source: JICA Study Team

2) Saving in Time Cost Regarding Railway Passengers and Freight in Incremental Transport Demand

Railway passengers and freight in incremental transport demand means the diverted demand from road mode, and they can enjoy a saving in time cost due to the difference of travel speed between rail mode and road mode.

The train speed condition in “With condition” is already shown in Table 8.13. The speed condition of road is obtained based on the traffic assignment result in the process of road transport demand forecast.

Here, as a corresponding vehicle type for passenger and freight transport, bus and large truck are assumed, considering the process of road transport demand forecast. The obtained speeds of passenger car are 53 km/hour, 52 km/hour and 45 km/hour for 2005, 2010 and 2020, respectively. The running speed of bus and large truck are assumed to be 80% of that of passenger car, which is equivalent to 42 km/hour, 42 km/hour and 36 km/hour for 2005, 2010 and 2020, respectively. The running speed in road mode shows a decreased trend in accordance with the traffic congestion in road. The comparison of the above speeds between railway mode and road mode is shown in Table 8.17.

Table 8.17 Comparison of Speed Condition between Railway and Road Mode

(km/hour)

		2005	2010	2020
Rail Mode	Passengers	63	63	63
	Freight	44	44	44
Road Mode	Passengers (Bus)	42	42	36
	Freight (Large Truck)	42	42	36
Difference	Passengers	21	21	27
	Freight	2	2	8

Source: JICA Study Team

The saving in time cost is represented as a difference of passenger-hour / ton-hour between rail mode and road mode. Passenger-hour in rail mode is estimated by dividing passenger-kilometer by speed of passenger train, and passenger-hour in road mode is estimated by dividing passenger-kilometer by speed of bus. Similarly, ton-hour in rail mode is estimated by dividing ton-kilometer by speed of freight train, and ton-hour in road mode is estimated by dividing ton-kilometer by speed of large truck. The estimation results of difference of passenger-hour and ton-hour between rail mode and road mode are shown in Tables 8.18 and 8.19, respectively.

Table 8.18 Estimation of Passenger-hour (for Incremental Transport Demand)

	2005			2010			2020		
	Pax.-km (1,000) Incre-mental	Speed	Pax.-hour (1,000)	Pax.-km (1,000) Incre-mental	Speed	Pax.-hour (1,000)	Pax.-km (1,000) Incre-mental	Speed	Pax.-hour (1,000)
Road	450,792	42	10,733	450,792	42	10,733	450,792	36	12,522
Rail	450,792	63	7,155	450,792	63	7,155	450,792	63	7,155
Difference			3,578			3,578			5,367

Source: JICA Study Team

Table 8.19 Estimation of Ton-hour (for Incremental Transport Demand)

	2005			2010			2020		
	Ton-km (1,000) Incre-mental	Speed	Ton-hour (1,000)	Ton-km (1,000) Incre-mental	Speed	Ton-hour (1,000)	Ton-km (1,000) Incre-mental	Speed	Ton-hour (1,000)
Road	586,892	42	13,974	586,892	42	13,974	586,892	36	16,303
Rail	586,892	44	13,338	586,892	44	13,338	586,892	44	13,338
Difference			636			636			2,965

Source: JICA Study Team

The benefits of saving in time cost are calculated as shown in Table 8.20. The unit time values are referred to the previous section of "4) Unit time cost."

Table 8.20 Estimation of Time Saving Benefits for Railway Passengers and Freight in Incremental Transport Demand

	Passengers			Freight			Total
	Pax.-hour Saved (1,000)	Unit Time Value (KM/ hour)	Time Saving Benefits (KM 1,000)	Ton-hour Saved (1,000)	Unit Time Value (KM/ hour)	Time Saving Benefits (KM 1,000)	Time Saving Benefits (KM 1,000)
2005	3,578	1.32	4,725	636	0.55	349	5,074
2010	3,578	1.61	5,752	636	0.55	349	6,101
2020	5,367	2.17	11,650	2,965	0.55	1,627	13,277

Source: JICA Study Team

3) Saving in Operating Cost Regarding Railway Passengers and Freight in Incremental Transport Demand

Railway passengers and freight in incremental transport demand means the diverted demand from road mode, and they can enjoy a saving in operating cost due to the difference of operating cost between rail mode and road mode. Here, incremental operating cost is treated in accordance with the incremental transport demand.

i) Operating cost of rail mode

In this economic analysis, the operating cost of rail mode is assumed to comprise the personnel cost including overhead and the energy cost.

a. Personnel cost

Based on the information obtained interview from Railway Public Corporation, the average personnel cost is obtained to be US$ 2,000 per person / annum. Using the exchange rate of KM 2.32 per US$, this value is equivalent to KM 4,640 per annum (financial price). The portion of tax is obtained to be 35% based on the information obtained interview at Railway Public Corporation. Assuming this ratio, the average unit personnel cost in terms of economic price is obtained as KM 3,440 per annum.

According to the statistical information, the actual number of staff related to railway is 23,856 and 7,314 in 1990 and 2000, respectively. The number of staff in 2005 in "With condition" is estimated as follows:

(1990 actual number) x (transport volume ratio of 2005 to 1990) x (assumed efficiency factor)

The transport volume ratio of 2005 to 1990 is obtained as shown in Table 8.21.

Table 8.21 Estimation of Transport Volume Ratio of 2005 to 1990

	Pax.-km	Ton-km	Total		Ratio
Transport Volume (1990)	1,520,200	4,409,900	5,930,100	(a)	(b)/(a)=
Transport Volume (estimated 2005)	553,000	879,000	1,432,000	(b)	0.25

Source: Transport volume (1990): Community of the Yugoslavia Railways, Statistics, for 1990.
Transport volume (estimated 2005): JICA Study Team

The efficiency factor is assumed to be 1.25 considering the current management condition. As a result, the number of staff in 2005 is estimated to be 7,455 persons (23,856 x 0.25 x 1.25).

The number of staff in 2005 in "Without condition" is assumed to be the same as the actual number in 2000, which is equivalent to 7,314 persons. Thus, the incremental number of staff between "With condition" and "Without condition" is estimated to be 141 persons (7,455 minus 7,314).

Consequently, the incremental personnel cost is estimated to be KM 654 thousand in terms of financial price (KM 4,640 x 141 persons). The incremental personnel cost is estimated to be KM 485 thousand in terms of economic price (KM 3,440 x 141 persons).

Assuming the portion of overhead to personnel cost to be 100%, the incremental personnel cost including overhead portion is estimated to be KM 1,308 thousand and KM 970 thousand, in terms of financial and economic price, respectively.

b. Energy cost

According to the statistical information regarding transport volume and energy cost (Community of the Yugoslavia Railways, Statistics, for 1989 and 1990), the unit energy cost is estimated to be KM 0.01939 per TU-kilometer in terms of financial price. (TU-kilometer means the total value of passenger-kilometer and ton-kilometer.) Assuming the conversion factor to economic price to be 0.87, the unit energy cost is estimated to be KM 0.01687 per TU-kilometer in terms of economic price. (Regarding the conversion factor to economic price is mentioned later in the Section (4).)

The energy cost for the incremental transport demand is estimated as shown in Table 8.22.

Table 8.22 Estimation of Incremental Energy Cost

		2005	2010	2020
Incremental Transport Volume	Pax.-km (1,000)	450,792	450,792	450,792
	Ton-km (1,000)	586,892	586,892	586,892
	TU-km (1,000)	1,037,684	1,037,684	1,037,684
Unit Cost (KM per TU-km)	Financial Price	0.01939	0.01939	0.01939
	Economic Price	0.01687	0.01687	0.01687
Estimated Energy Cost (KM 1,000)	Financial Price	20,120	20,120	20,120
	Economic Price	17,505	17,505	17,505

Source: JICA Study Team

ii) Operating cost of road mode

The operating costs of road mode are estimated as follows:

The incremental transport demand in terms of passenger-kilometer and ton-kilometer are converted into vehicle-kilometer basis using the load factor in road vehicle. Then applying the unit vehicle operating cost to the above calculated vehicle-kilometer, the incremental vehicle operating costs are obtained. The estimation process is shown in Table 8.23.

Here, the load factors of bus and large truck are set-up based on the results of traffic survey conducted by the Study Team. Regarding large truck, the future load factor is assumed to be increased according to the improvement of occupancy rate. The running speeds of bus and large truck are referred to Table 8.17. The unit vehicle operating costs in accordance with running speed are assumed based on those in the similar speed range as shown in Table 8.12.

Table 8.23 Estimation of Incremental Vehicle Operating Costs

			Passengers	Freight	Total
Incremental Demand in Rail Mode			Pax-km (1,000)	Ton-km (1,000)	
	2005		450,792	586,892	
	2010		450,792	586,892	
	2020		450,792	586,892	
Load Factor in Road Vehicle			Bus (persons)	Large Truck (tons)	
	2005		17.1	14.2	
	2010		17.1	14.8	
	2020		17.1	16.1	
Conversion to Vehicle-kilometer (1,000)			Bus	Large Truck	
	2005		26,362	41,330	
	2010		26,362	39,655	
	2020		26,362	36,453	
Unit Vehicle Operating Cost (KM per Vehicle-km)			Bus	Large Truck	
	2005	Speed	42 km/hour	42 km/hour	
		Unit VOC	KM 2.003	KM 1.824	
	2010	Speed	42 km/hour	42 km/hour	
		Unit VOC	KM 2.003	KM 1.824	
	2020	Speed	36 km/hour	36 km/hour	
		Unit VOC	KM 2.099	KM 1.900	
Estimated Incremental			Bus	Large Truck	Total
	2005		52,803	75,387	128,190
	2010		52,803	75,387	125,134
	2020		52,803	69,261	124,595

Source: JICA Study Team

iii) Estimated benefits of saving in operating cost

The incremental operating costs on rail mode and road mode are estimated as shown in the above sections. Table 8.24 shows the summary of the incremental operating costs on rail mode and road mode, and the difference is represents benefits of saving in operating cost.

Table 8.24 Estimation of Benefits of Saving in Operating Cost

(KM 1,000)

	2005	2010	2020
Incremental Operating Cost in Road Mode	128,190	125,134	124,595
Incremental Operating Cost in Rail Mode			
Personnel Cost	970	970	970
Energy Cost	17,505	17,505	17,505
(Rail Total)	18,475	18,475	18,475
Difference	109,715	106,659	106,120

Source: JICA Study Team

4) Summary of Estimated Benefits

The estimation results of benefits are summarized in Table 8.25.

Table 8.25 Summary of Estimated Annual Benefits

(KM 1,000/year)

	Time Saving for Without Demand	Time Saving for Incremental Demand	Operating Cost Saving for Incremental Demand	Total
2005	4,483	5,074	109,715	119,273
2010	4,855	6,101	106,659	117,615
2010	5,586	13,277	106,120	124,983

Source: JICA Study Team

(4) Project Costs

1) Project Costs

The project costs in terms of financial costs are shown in Table 8.26. (Referred to Section 8.4 in this Chapter.) Economic analysis treats an economic cost, which is estimated by eliminating the portion of transfer item such as taxes from financial costs.

Table 8.26 Project Costs (in terms of Financial Price)

(KM million)

		Total
Rolling Stock	*Rolling Stock*	158.92
	Workshop	30.2
	Maintenance Parts	23.2
	(Subtotal)	212.3
Infrastructure	Signal & Telecommunication	97.4
	Track Maintenance Facility	44.1
	Track	116.0
	Power Maintenance Facility	16.2
	Catenary	16.2
	Border Station	11.6
	(Subtotal)	301.6
	Total	513.9

Source: JICA Study Team

2) Estimation of Economic Costs

In this economic analysis, the related taxes to the estimated costs are assumed as the custom duty and the tax on trade on goods and services.

Regarding the tax system (tax ratio), while that of the custom duty are common to Federation of Bosnia and Herzegovina (FBiH) and Republika Srpska (RS), that of the tax on trade on goods and services are different by FBiH and RS.

The tax ratios regarding tax on trade of goods and services in FBiH are 24% in tariff No. 1, 12% in tariff No.2 for goods, and 12% for services. Tariff No. 1 is applied in general. Tariff No. 2 includes commodities related to, for example, energy, basic agricultural / fishery products, products serving for food of people, construction material such as timber, etc. Tariff No. 1 stands for the other commodities than stipulated in tariff No. 2.

Regarding the tax on trade on goods and services in RS, there are two categories of tax rate of 18% and 8%. The tax rate of 18% is applied in general, and that of 8% is, for example, for food products, agricultural / fishery products, electricity, coal, materials for construction such as timber, etc.

Regarding fuel, there are several special taxes both for FBiH and RS.

According to the law on the custom duty, the custom tariff which is considered to be related to project, ranges, roughly speaking, 0%, 5%, 10% and 15%; for example, construction equipment such as crane (0% / 5%), forklift (5%), bulldozer (5% / 10%), machinery for work of road construction (5%), truck (10%), bus (15%), passenger car (15%), rail locomotive (0%), passenger coach (5%), freight wagon (5%), equipment for signal (5%), etc. It should be noted that the above tax ratios are still only shown as a general sample. The actual tax ratio is determined based on the detailed specification of equipment.

For the elimination about tax portion, the following are to be taken into consideration:

In the cost estimates of projects in this pre-feasibility study stage, specification and procurement source of equipment are not fixed. And the breakdown of cost component for local / foreign currency portion and also that for labor / material / depreciation for equipment portion in the total cost is not certain in the pre-feasibility study stage. Therefore, it is difficult to estimate a tax portion.

Regarding the estimation of economic cost, the following are assumed:

In the case of railway project, regarding the custom duty, the following assumption are made:

Although the specification and procurement source of equipment are not fixed, out of the cost items, rolling stock (actually, passenger coach and freight wagon), maintenance parts for rolling stock, signal telecommunication facilities, track maintenance facilities and power maintenance facilities are assumed to be imported in this economic analysis. And the custom duty ratio of 5% is assumed for the above cost item. And regarding the portion of the other tax than custom duty, i.e. the tax portion including the tax on trade of goods and services, ratio of 15% is assumed to be as a tax portion, considering the share of material cost in total cost.

For the cost item which is conceived to be not related to import, a conversion factor of 0.87 (100 / 115 = 0.87) is assumed.

3) Economic Project Costs

As a result, the economic project costs are estimated as shown in Table 8.27. The annual distribution is based on the assumption of portion of 30%, 40%, and 30% for 2002, 2003 and 2004.

Table 8.27 Project Costs (in terms of Economic Price)

(KM million)

		Total	2002	2003	2004
Rolling Stock	Rolling Stock	131.60	39.48	52.64	39.48
	Workshop	26.20	7.87	10.49	7.87
	Maintenance Parts	19.20	5.76	7.69	5.76
	(Subtotal)	177.04	53.11	70.82	53.11
Infrastructure	Signal & Telecommunication	80.7	24.21	32.28	24.21
	Track Maintenance Facility	36.50	10.95	14.60	10.95
	Track	100.90	30.26	40.35	30.26
	Power Maintenance Facility	13.40	4.03	5.38	4.03
	Caternary	14.10	4.24	5.65	4.24
	Border Station	10.10	3.03	4.03	3.03
	(Subtotal)	255.73	76.72	102.29	76.72
	Total	432.77	129.83	173.11	129.83

Source: JICA Study Team

4) Reinvestment

In this economic analysis, the following life expectancy is assumed as shown in Table 8.28. Assets except signal & telecommunication and catenary, the life expectancy of 30 years is assumed in accordance with the period of project life.

Table 8.28 Assumption on Life Expectancy

(Year)

		Life Expectancy
Rolling Stock	*Rolling Stock*	30
	Workshop	30
	Maintenance Parts	-
Infrastructure	Signal & Telecommunication	15
	Track Maintenance Facility	30
	Track	30
	Power Maintenance Facility	30
	Catenary	10
	Border Station	30

Source: JICA Study Team

Consequently, reinvestments regarding signal & telecommunication and catenary are set-up in accordance with the above life expectancy.

5) Annual maintenance repair cost

The annual maintenance repair cost is estimated base on the assumption of ratio of 2% to the initial investment cost. The economic price of annual maintenance repair cost is obtained by using an above-mentioned conversion factor of 0.87.

(5) Cost Benefit Analysis

Based on the above estimated benefits and the related costs, cost benefit analysis was made. The calculation results are summarized in Table 8.29. This result shows that the Railway Phase 1 Project is economically feasible.

Table 8.29 Summary of Cost Benefit Analysis for Railway Phase 1 Project

EIRR	17.6%
NPV (KM 1,000 at discounted rate of 12%)	154,550
B/C (at discounted rate of 12%)	1.34

Source: JICA Study Team

The detail of cash flow of cost benefit analysis is shown in Table 8.30.

Table 8.30 Cash Flow of Cost Benefit Analysis (Railway Phase 1 Project)

EIRR :	17.6%		
NPV :	154,550	(KM 1,000 at Discounted Rate:	12.0%)
B/C :	1.34	(at Discounted Rate :	12.0%)

(KM 1,000)

		Benefits				Costs					Net
		Time Saving for Without Demand	Time Saving for Increm. Demand	Operating Cost Saving for Increm. Demand	Total	Invest.	Maint. Repair	Personnel Cost (including Overhead)	Energy Cost	Total	Cash Flow
1	2000				0					0	0
2	2001				0					0	0
3	2002				0	129,830				129,830	-129,830
4	2003				0	173,110				173,110	-173,110
5	2004				0	129,830				129,830	-129,830
6	2005	4,483	5,074	109,715	119,273	0	8,655	970	17,505	27,130	92,142
7	2006	4,557	5,280	109,104	118,941	0	8,655	970	17,505	27,130	91,811
8	2007	4,632	5,485	108,493	118,609	0	8,655	970	17,505	27,130	91,479
9	2008	4,706	5,690	107,881	118,278	0	8,655	970	17,505	27,130	91,148
10	2009	4,781	5,895	107,270	117,946	0	8,655	970	17,505	27,130	90,816
11	2010	4,855	6,101	106,659	117,615	0	8,655	970	17,505	27,130	90,484
12	2011	4,928	6,818	106,605	118,352	0	8,655	970	17,505	27,130	91,221
13	2012	5,001	7,536	106,551	119,088	0	8,655	970	17,505	27,130	91,958
14	2013	5,074	8,253	106,497	119,825	0	8,655	970	17,505	27,130	92,695
15	2014	5,148	8,971	106,443	120,562	14,130	8,655	970	17,505	41,260	79,302
16	2015	5,221	9,689	106,389	121,299	0	8,655	970	17,505	27,130	94,169
17	2016	5,294	10,406	106,335	122,036	0	8,655	970	17,505	27,130	94,905
18	2017	5,367	11,124	106,282	122,772	0	8,655	970	17,505	27,130	95,642
19	2018	5,440	11,842	106,228	123,509	0	8,655	970	17,505	27,130	96,379
20	2019	5,513	12,559	106,174	124,246	80,700	8,655	970	17,505	107,830	16,416
21	2020	5,586	13,277	106,120	124,983	0	8,655	970	17,505	27,130	97,853
22	2021	5,586	13,277	106,120	124,983	0	8,655	970	17,505	27,130	97,853
23	2022	5,586	13,277	106,120	124,983	0	8,655	970	17,505	27,130	97,853
24	2023	5,586	13,277	106,120	124,983	0	8,655	970	17,505	27,130	97,853
25	2024	5,586	13,277	106,120	124,983	0	8,655	970	17,505	27,130	97,853
26	2025	5,586	13,277	106,120	124,983	14,130	8,655	970	17,505	41,260	83,723
27	2026	5,586	13,277	106,120	124,983	0	8,655	970	17,505	27,130	97,853
28	2027	5,586	13,277	106,120	124,983	0	8,655	970	17,505	27,130	97,853
29	2028	5,586	13,277	106,120	124,983	0	8,655	970	17,505	27,130	97,853
30	2029	5,586	13,277	106,120	124,983	0	8,655	970	17,505	27,130	97,853
31	2030	5,586	13,277	106,120	124,983	0	8,655	970	17,505	27,130	97,853
32	2031	5,586	13,277	106,120	124,983	0	8,655	970	17,505	27,130	97,853
33	2032	5,586	13,277	106,120	124,983	0	8,655	970	17,505	27,130	97,853
34	2033	5,586	13,277	106,120	124,983	0	8,655	970	17,505	27,130	97,853
35	2034	5,586	13,277	106,120	124,983	0	8,655	970	17,505	27,130	97,853

Source: JICA Study Team

8.5.2 Financial Analysis

(1) General

1) Methodology

The main purpose of the financial analysis is to show the financial viability of the project of "Pre feasibility study of railway improvement project in Phase 1 stage" (hereinafter called as "Project"), from the point of view of the project implementation body. For the purposes of evaluation, the financial internal rate of return (FIRR) is demonstrated.

Financial analysis follows a conventional cost benefit analysis of discounted cash flow methodology. The cost benefit analysis is made by comparison between project benefits (revenues) and project costs. In the case of financial analysis, benefits represent financial revenues.

The formula of FIRR is shown below:

$$\sum_{t=1}^{n} \frac{\text{Revenues}_t}{(1+R)^t} = \sum_{t=1}^{n} \frac{\text{Inv. cost}_t + \text{O/M cost}_t}{(1+R)^t}$$

where:

Revenues_t	:	Revenues in year t
Inv. cost_t	:	Investment cost in year t
O/M cost_t	:	Operation and Maintenance costs in year t
n	:	Calculation period
t	:	Year t (from 1 to n)
R	:	Value of FIRR

FIRR means the value, which will satisfy the above formula.

2) Basic Assumption

The following basic assumptions are made:

i) Incremental revenues and incremental costs

Cost benefit analysis is made in comparison between the incremental costs and the incremental revenues, in which "incremental" means the difference between "With project" condition and "Without project" condition.

ii) Precondition on revenues estimation

The revenues are calculated for the planning year of 2005, 2010, and 2020. For other years than the planning years, estimation by interpolation is made.

iii) Implementation schedule

The construction work of the project is scheduled to be from 2002 to 2004, and the start of service is from 2005.

iv) Calculation period of cost benefit analysis

The base year is 2000. The project life is assumed to be 30 years after the start of service. The calculation period of cost benefit analysis is 35 years from 2000 to 2034.

v) With project and without project

In this economic analysis, while "With project" means the condition in which investment related to "Phase 1" project is implemented, "Without project" stands for the condition in which investment only related to "Committed project" is implemented.

vi) Railway transport demand

The transport demand in "With project" and "Without project" follows the previous section in this chapter (refer to Table 8.5 in Section 8.5.1.)

(2) Project Revenues

1) Fare Level

i) Information of Railway Public Corporation

Based on the information obtained from Railway Public Corporation, the fares of passenger and freight are estimated to be KM 0.0413 per passenger-kilometer and KM 0.14 per ton-kilometer, respectively. The estimation process is as follows:

- According to the recent transport data in Railway Public Corporation, the average passenger trip length is 105 kilometer, and the corresponding fare is KM 6.2. As a result, the fare is estimated to be KM 0.059048 per passenger-kilometer. Assuming the average discount rate to be 30%, the passenger fare after discount is estimated to be KM 0.0413 per passenger-kilometer.

- According to the recent transport data in Railway Public Corporation, the average freight trip length is 150 kilometer, and the corresponding fare is KM 6.2 per ton-kilometer. As a result, the fare is estimated to be KM 0.2 per ton-kilometer. Assuming the average discount rate to be 30%, the freight fare after discount is estimated to be KM 0.14 per ton-kilometer.

ii) Assumption on fare level

According to the information of USAID regarding other countries' railway fare, the world railroad industry considers US$ 3 cents per ton-kilometer as a standard cost target rate. This is equivalent to KM 0.0696 per ton-kilometer, using the exchange rate of KM 2.32 per US$. Thus, although the data is only mention about freight, the fare level of Railway Public Corporation can be said to be, roughly speaking, approximately twice that of world railroad industries.

In the revenue estimation in financial analysis, consequently, regarding the fare level, several alternative cases are assumed, setting-up the fare level of Railway Public Corporation to be a base case, as shown in Table 8.31.

Table 8.31 Assumption on Fare Level

	Passenger	Freight
Base Case of Fare	KM 0.0413 per pax.-kilometer	KM 0.14 per ton-kilometer
Case 1	75% of Base Case	75% of Base Case
Case 2	50% of Base Case	50% of Base Case

Source: JICA Study Team

2) Incremental Transport Demand

The incremental transport demand is shown below (Refer to Table 8.5):

		2005	2010	2020
Incremental Transport Demand	Passenger-km (1,000)	450,792	450,792	450,792
	Ton-km (1,000)	586,892	586,892	586,892

3) Estimation of Revenues (railway operation revenue)

By using the above assumed fare and the incremental transport demand, railway operation revenues are estimated as shown in Table 8.32.

Table 8.32 Estimation of Revenues

(KM 1,000)

		2005	2010	2020
Base Case of Fare	Passengers	18,618	18,618	18,618
	Freight	82,165	82,165	82,165
	Total	100,783	100,783	100,783
Case 1	Passengers	13,963	13,963	13,963
	Freight	61,624	61,624	61,624
	Total	75,587	75,587	75,587
Case 2	Passengers	9,309	9,309	9,309
	Freight	41,082	41,082	41,082
	Total	50,391	50,391	50,391

Source: JICA Study Team

4) Estimation of Other Revenues (compensation)

The compensation for the amount of discount of fare is assumed. Although as mentioned previously the discount rate for fare is 30%, the portion of compensation is assumed to be 5% of revenues in this financial analysis.

5) Estimation of Other Revenues (revenue from rental of optical fiber cable)

The investment plan of Phase 1 includes a facility of optical fiber cable along railway line. Railway Public Corporation has a plan to rent an optical fiber cable for the portion of capacity over its own usage to a private telecommunication company. The expected rental revenue is assumed to be KM 10,000.

Regarding this revenue item, the alternative of two cases; “with rental revenue” or “without rental revenue” is assumed in the revenue estimation.

(3) Project Costs

1) Project Costs

The project costs in terms of financial costs are shown in Table 8.26 in Section 8.5.1.

2) Reinvestment

As similar to “Economic Analysis” (refer to the Section (4), 8.5.1), reinvestments are set-up.

3) Annual Maintenance Repair Cost

As similar “Economic Analysis” (refer to the Section (4), 8.5.1), annual maintenance repair cost is set-up.

(4) Estimation of FIRR

Based on the above estimation of revenues and the costs, FIRR for the Phase 1 railway project is calculated as shown in Table 8.33. The detail of cash flow for FIRR calculation for the case of “base case” regarding fare level and “without rental revenue” is shown in Table 8.34. In the case of “without rental revenue”, FIRR values in “base case”, “75% of base case” and “50% of base case” regarding fare level show 11.9%, 6.9% and –0.1%, respectively. In the case of “with rental revenue”, FIRR values in “base case”, “75% of base case” and “50% of base case” regarding fare level show 13.6%, 8.9% and 3.0%, respectively. These results suggest that fare level equivalent to a world railroad industry is difficult to support a sound financial condition.

Generally speaking, FIRR in the "base case" of fare level show rather high value as a FIRR value for a railway project. This can be explained by an existence of "sunk cost". The phase 1 railway project is not a "new" project but a rather "improvement" project. Consequently, investment amount is rather small compared to "new" project. The existing facilities (in the condition after implementation of "Committed project") can be utilized as a base, which can be considered as a "sunk cost."

Table 8.33 FIRR for Phase 1 Railway Project

Fare Level	Rental	
	Without Rental Revenue	With Rental Revenue
Base Case	11.9%	13.6%
75% of Base Case	6.9%	8.9%
50% of Base Case	-0.1%	3.0%

Source: JICA Study Team

Table 8.34 Cash Flow of FIRR (Railway Phase 1 Project)

FIRR : 11.9%

(KM 1,000)

		Revenues							Costs					
		Railway Operation Revenues			Other Revenues			Grand Total	Invest.	Maint. Repair	Personnel Cost (including Overhead)	Energy Cost	Total	Net Cash Flow
		Passengers	Freight	Total	Compensation	Rental Revenue	Total							
1	2000												0	0
2	2001												0	0
3	2002								154,164				154,164	-154,164
4	2003								205,552				205,552	-205,552
5	2004								154,164				154,164	-154,164
6	2005	18,618	82,165	100,783	5,039	0	5,039	105,822	0	10,278	1,308	20,120	31,706	74,115
7	2006	18,618	82,165	100,783	5,039	0	5,039	105,822	0	10,278	1,308	20,120	31,706	74,115
8	2007	18,618	82,165	100,783	5,039	0	5,039	105,822	0	10,278	1,308	20,120	31,706	74,115
9	2008	18,618	82,165	100,783	5,039	0	5,039	105,822	0	10,278	1,308	20,120	31,706	74,115
10	2009	18,618	82,165	100,783	5,039	0	5,039	105,822	0	10,278	1,308	20,120	31,706	74,115
11	2010	18,618	82,165	100,783	5,039	0	5,039	105,822	0	10,278	1,308	20,120	31,706	74,115
12	2011	18,618	82,165	100,783	5,039	0	5,039	105,822	0	10,278	1,308	20,120	31,706	74,115
13	2012	18,618	82,165	100,783	5,039	0	5,039	105,822	0	10,278	1,308	20,120	31,706	74,115
14	2013	18,618	82,165	100,783	5,039	0	5,039	105,822	0	10,278	1,308	20,120	31,706	74,115
15	2014	18,618	82,165	100,783	5,039	0	5,039	105,822	16,240	10,278	1,308	20,120	47,946	57,875
16	2015	18,618	82,165	100,783	5,039	0	5,039	105,822	0	10,278	1,308	20,120	31,706	74,115
17	2016	18,618	82,165	100,783	5,039	0	5,039	105,822	0	10,278	1,308	20,120	31,706	74,115
18	2017	18,618	82,165	100,783	5,039	0	5,039	105,822	0	10,278	1,308	20,120	31,706	74,115
19	2018	18,618	82,165	100,783	5,039	0	5,039	105,822	0	10,278	1,308	20,120	31,706	74,115
20	2019	18,618	82,165	100,783	5,039	0	5,039	105,822	97,440	10,278	1,308	20,120	129,146	-23,325
21	2020	18,618	82,165	100,783	5,039	0	5,039	105,822	0	10,278	1,308	20,120	31,706	74,115
22	2021	18,618	82,165	100,783	5,039	0	5,039	105,822	0	10,278	1,308	20,120	31,706	74,115
23	2022	18,618	82,165	100,783	5,039	0	5,039	105,822	0	10,278	1,308	20,120	31,706	74,115
24	2023	18,618	82,165	100,783	5,039	0	5,039	105,822	0	10,278	1,308	20,120	31,706	74,115
25	2024	18,618	82,165	100,783	5,039	0	5,039	105,822	0	10,278	1,308	20,120	31,706	74,115
26	2025	18,618	82,165	100,783	5,039	0	5,039	105,822	16,240	10,278	1,308	20,120	47,946	57,875
27	2026	18,618	82,165	100,783	5,039	0	5,039	105,822	0	10,278	1,308	20,120	31,706	74,115
28	2027	18,618	82,165	100,783	5,039	0	5,039	105,822	0	10,278	1,308	20,120	31,706	74,115
29	2028	18,618	82,165	100,783	5,039	0	5,039	105,822	0	10,278	1,308	20,120	31,706	74,115
30	2029	18,618	82,165	100,783	5,039	0	5,039	105,822	0	10,278	1,308	20,120	31,706	74,115
31	2030	18,618	82,165	100,783	5,039	0	5,039	105,822	0	10,278	1,308	20,120	31,706	74,115
32	2031	18,618	82,165	100,783	5,039	0	5,039	105,822	0	10,278	1,308	20,120	31,706	74,115
33	2032	18,618	82,165	100,783	5,039	0	5,039	105,822	0	10,278	1,308	20,120	31,706	74,115
34	2033	18,618	82,165	100,783	5,039	0	5,039	105,822	0	10,278	1,308	20,120	31,706	74,115
35	2034	18,618	82,165	100,783	5,039	0	5,039	105,822	0	10,278	1,308	20,120	31,706	74,115

Source: JICA Study Team

8.6 IMPLEMENTATION SCHEDULE

Table 8.35 shows an implementation schedule of the railway Phase 1 improvement project.

Table 8.35 Implementation Schedule

Item \ Year	2001	2002	2003	2004
Feasibility Study and Detailed Design	■			
Construction		■	■	■

For further details of the implementation schedule, a full scale of feasibility study will be necessary to clarify technical issues as well as funding methodologies.

8.7 RECOMMENDATION

The Phase 1 railway improvement plan was justified by the economic and financial analyses. The EIRR was 17.6 %, which is exceptionally high value for a railway project. The FIRR was also high enough. These results are considered as a result of “sunk cost” effect, because the railway has enormous railway assets, even though the damages were so severe. Additional investment to the railway reconstruction will contribute to BiH industries and economy a lot.

However, the study team strongly recommends that a full scale of feasibility study should be conducted for the realization of the project to confirm the feasibility more precisely. The study team believes that the railway reconstruction is one of key factors to revitalize the overall economy of Bosnia and Herzegovina, since the railway lines locate at most densely populated area of the country and the railway should do roles in the transport sector which would contribute the total transport system of the country more effective and efficient.

CHAPTER 9: TRANSPORT TRAINING INSTITUTE DEVELOPMENT PLAN

9.1 NEED FOR EXPERTISE BUILDING

Transport in all its different dimensions has become very complex and different levels of expertise have emerged with the introduction of innovative techniques and technologies. The complexity of transport knowledge is no longer limited to the physical transport of goods and passengers, but has expanded towards a set of complex issues:

- Complexity of the regulatory environment;
- Complexity of the operational transport systems;
- Complexity of efficient transport management and the applied management systems;
- Complexity of applied technology and techniques (including automated systems);
- Complexity of international markets.

Consequently, humanware development in BiH cannot be limited to professional training and education of transport operators but has to be extended towards all public and private stakeholders, including corporate managers and public decision-makers. Given the complexity of transport, expertise building is a critical success-factor that has to be *urgently* attended to guarantee that the future transport system is used, maintained, and improved according to EU and international standards and practices. *The lack of modern and dedicated training and education constitutes at present a serious cross-modal problem.*

Three country-specific evolutions caused the present situation, namely:

- The emigration of high quality professionals immediately after the war;

- The lack of training and education for the remaining experts, which causes a substantial difference between their present knowledge base and the modern techniques and technologies applied in modern logistics;

- The present need to train local experts in European institutes enables BiH experts to find employment in Europe and do not return home.

All professional experts and public representatives recognize the lack of professional staff and consider this a critical problem that requires immediate attention. They argue that training and education in modern techniques and technologies and in integrated logistics is a basic requirement to develop transport in BiH in the future. Representatives from the profession emphasize the need for basic practical training to ensure a minimum quality level at all levels of the transport system.

A general overview of required expertise for both private and public stakeholders is provided in the figure hereafter.

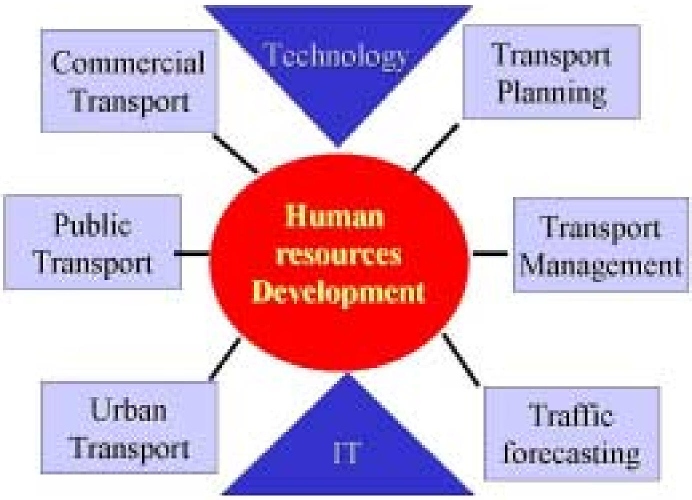


Figure 9.1 General Fields of Transport Expertise

To ensure that sustainable expertise is build in BiH, the creation of a **Transport Training Institute** should be a short-term objective. In support of the activities of the Transport Training Institute, a strategic planning instrument should be developed and later implemented. The staff of the Institute will also have to be familiarized with the instrument and stimulated to use this instrument to tackle the ongoing and coming required changes within and outside the Transport Training Institute in an efficient and effective way.

The long-term objective of the proposed development plan is to ensure the continuity of the Institute as an efficient and effective institution for the transport industry, which can be achieved by creating "stability" during the development processes and by ensuring that quality of training is at a high international level. This high international level means also recognition of the **certificates** to be issued by the Institute as being equal to those of the traditional Western nations.

Specific targets have therefore to be set for the Transport Training Institute in terms of organization, structure, and expertise level so that this institute can contribute to the sustainable development of human expertise in the transport sector.

9.2 IMPLEMENTATION CONTEXT

The organization of training and education in BiH should be organized in such a way that cooperation with the different stakeholders is direct and efficient. Concentration and rationalization of the training and education system is, therefore, a key issue in the development program. Because the final goal of the Transport Training Institute is to issue certificates, accepted by both entities and the international community, the organizational issue, including the relation with public authorities is a priority concern in the realization of the Transport Training Institute for Bosnia and Herzegovina. The training and education program needs to be developed to European quality standards and international practices and the related certificates homologated at the international level. It is essential that foreign expertise be incorporated into the development plan of the BiH training and education program.

(1) Structure

Controlling and monitoring the training and education programs is essential for international acceptance. A structure is therefore necessary to guarantee international quality standards in the training and education programs. Equal standards and certification methods in both Entities are essential to obtain international acceptance and support.

(2) Expertise

Expertise in the transport sector and at the level of public authorities responsible for transport issues is a critical issue. The available expertise in the public and private sectors is at present below the required standards. Both basic and advanced training for public and private transport professionals is essential to ensure the sustainability of future development of the transport sector in BiH. The proposed development plan for the Transport Training Institute incorporates all the above-described targets and considers not only the training and education aspects, but also the organizational, structural, and financial aspects to strengthen the training functions for the entire BiH transport system.

9.3 AVAILABLE TRAINING AND EDUCATION FACILITIES IN BIH

Three important initiatives / facilities are presently ongoing / available in BiH that have direct or indirect relevance to the conditions for establishing the Transport Training Institute in BiH.

(1) The Universities in Bosnia and Herzegovina

At present, transport related courses are provided in the University of Sarajevo and Banja Luka.

In Sarajevo, transport courses are scheduled under the Faculty of Civil Engineering. This Faculty has 4 sections, each including an Institute for “commercialization” of the available expertise. The Department for Traffic degree (traffic engineer) can be obtained after a 5-year program, consisting of 9 semesters and 1 semester for the Thesis. The focus is still on basic physical traffic engineering problems but plans exist to extend the courses and adapt these to European level. This would include courses such as traffic management, logistics, etc. The university of Sarajevo also offers post-graduate courses in transport in collaboration with foreign Universities via the Department of Transport. The impact of the war on the performance of the university has been devastating. Experts have left the country, infrastructure has been damaged and equipment has been destroyed or stolen.

The University in Banja Luka only offers a basic course on transport within the Faculty of Civil Engineering.

(2) PHARE Program on Institutional Reforms

At present, the European Commission under the PHARE program funds a large-scale project for institutional reforms. This project includes a segment related to the training of civil servants. Within that context, civil servants in BiH responsible for and working on transport related issues could be trained in basic aspects of transport. These training courses could be developed within the context of the Transport Training Institute in collaboration with the PHARE project. It is likely that several courses such as computer knowledge and basic management training for civil servants could be provided on a joint basis.

(3) PHARE Program on Transport Training

Since 1999, a multi-year transport training program is ongoing in Bosnia and Herzegovina. The project includes international experts to establish training courses in international road freight transport and ADR transport according to EU standards (see proposal COM(97) 25 final and COM(97) 501 final and Council Directive 98/76/EC amending Directive 96/26/EC on the admission to the occupation.

The program has established an Institute for Education within the framework of the Chamber of Industry of Bosnia and Herzegovina (Sarajevo). The Institute for Education has recently applied for membership of EUROTRA (European Transport Training Association).

The main objective of the Institute is to establish and operate a training facility for road transport in accordance with existing UN/ECE and EU standards. According to the terms of reference, the Institute should in future issue valid certificates for professional competence for road haulage and road passenger operators. The long-term objective for the Institute is to become self-sustainable.

9.4 WHY THE TRANSPORT TRAINING INSTITUTE?

- Passenger and freight transport, using different modes and intermodal constructions will become increasingly important when the BiH economy further develops. International and inter-entity transport will increase and cooperation with foreign industries and transport service providers will prevail.

- This evolution will force private transport operators and public authorities to improve the present transport offer to a level that meets international standards. To achieve this goal, operators in the transport sector and civil servants organizing, controlling and assisting the transport sector in its development need to have the necessary up-to-date expertise and knowledge about the legislation, regulations and organization of international passenger and freight transport, and this for all transport modes (air, road, rail, water, combined and intermodal).

- During and after the war, academic and professional experts have left the country and have therewith disrupted the knowledge base of Bosnia and Herzegovina. As a direct consequence, the training and education offer for transport related subjects is limited, endangering the further draining of expertise because the younger generations will lack sufficient training in stat-of-the-art transport and logistics.

- Although several initiatives are ongoing in the field of transport training and education, the offer remains too limited to meet future demands. Furthermore, the focus of these programs is on specific segments of transport (e.g., engineering or road transport) and do not integrate these aspects in the total transport problem. Undoubtedly, there is an urgent need to establish a Transport Training Institute at the level of the country (possibly the Balkan regions) that approach transport from an integrated multi-modal perspective, offering a wide variety of relevant courses at a high level of education that meets European standards, rules and regulations.

- The final objective of the Transport Training Institute is to train public and private experts in all fields of transport and logistics. Certificates that are recognized at the European level should validate their expertise. The integration of all courses into a single "official" Transport Training Institute will facilitate the processes related to the courses, exams, the evaluations, certification and recognition of it etc....

- The diversification of training initiatives is interesting in a well-developed market economy where several recognized institutes compete. Generally, this has a positive effect on the prices of the courses. However, in transition countries such as Bosnia and Herzegovina, the social, economic and political conditions are not suitable to introduce private and competitive activities in expertise building. This section of the development of the country needs careful monitoring and supervision to assure that the transition can continue under optimal conditions and according to international standards.

- The development of the Transport Training Institute should also be considered from an international dimension. What could be the role of that institute in the greater Balkan region and how should that institute be connected to / cooperating with European institutes and universities. These questions and others need to be answered in order to determine the future structure of the Transport Training Institute for Bosnia and Herzegovina.

Finally, there is also an economic dimension related to the project. An integrated approach to transport training and education, accepted and validated at the national, European and international level, could create value added to the Institute. They could attract foreign students and professionals to follow specialized training and education at the Institute. Their presence in Bosnia and Herzegovina would generate revenues to the country and the institute, improving therewith the possibility of becoming self-sustainable in the medium-term.

Provision of modern transport training thus requires a practical approach to training and education in all relevant segments of transport, including freight forwarding, intermodal transport chain management, document flows, technological and technical applications, dangerous goods etc. Furthermore, the establishment of the Institute should take into consideration all related operational, regulatory/institutional and structural/financial problems via the creation of a ***roll-out plan for the Transport Training Institute*** during the first phase of the project.

9.5 ROLL-OUT PLAN

(1) Activities

The development of a roll-out plan for the Transport Training Institute is the first and most critical phase in the concrete development of the Institute. The design of the plan includes following steps among others:

- Investigate the present situation in BiH:

- Investigate the existing training and education facilities and available expertise
- Benchmark existing facilities and expertise with European examples
- Identification of needs;

- Design the detailed need for foreign assistance in the concrete establishment of the Transport Training Institute in terms of equipment and human expertise and design a detailed timetable and allocation of human and financial resources for the implementation of the project.

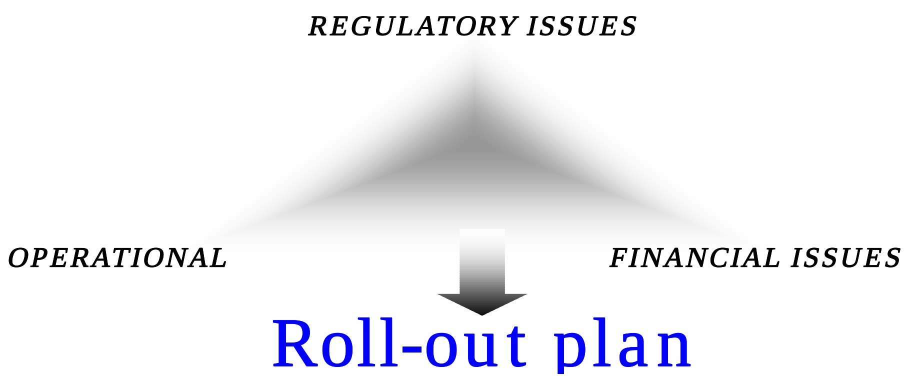
- Evaluate the practical conditions of integrating existing training and education initiatives and design the structure of the integrated Transport Training Institute for BiH;

- Evaluate the situation in the larger Balkan region and determine the international potential of the Institute;

- Assess the availability of infrastructure and identify one of more suitable locations for the establishment of the different training and education departments of the Institute;

- Assess the political and regulatory framework in which the Transport Training Institute should operate and identify the needs for national and international validation of the certificates issued by the Transport Training Institute

The first phase of the project (design of roll-out plan) thus concentrates on 3 critical issues that will determine the shape and structure of the Transport Training Institute. These 3 issues are visualized in next figure.



The regulatory / institutional issues consider a very important first element of attention in the roll-out plan. In this section, possibilities and structures have to be proposed on the ownership of the Institute, the involvement of public and private stakeholders, the relationships between the partners, etc.

The complexity of the institutional environment is visualized in Figure 9.2.

Figure 9.2 Regulatory Framework

On the one hand, decisions have to be taken regarding the relation between the Transport Training Institute and the different levels of government (Entities, Country, International authorities). Simultaneously, the future development of the Transport Public Corporation has to be taken into consideration and the relation between both organized. Secondly, structures have to be proposed regarding the relation between the TTI and the universities and training institutes both in BiH and in Europe (in particular with a well-established European Institute for the future agreement of a strategic alliance).

As regards the operational conditions, the framework has to be set for modern, flexible, and practical training courses. The available courses at BiH universities and institutes as well as other initiatives (e.g. PHARE) have to be evaluated and compared with European and international training and education standards. Specific provisions have to be incorporated in the operational roll-out plan to adapt training and education facilities to the specific conditions in BiH.

Finally, an important element in the roll-out plan is the financial analysis. In that context, it is essential that the future self-sustainability of the institute is taken into consideration and plans are proposed on how to secure future revenues (Figure 9.3).

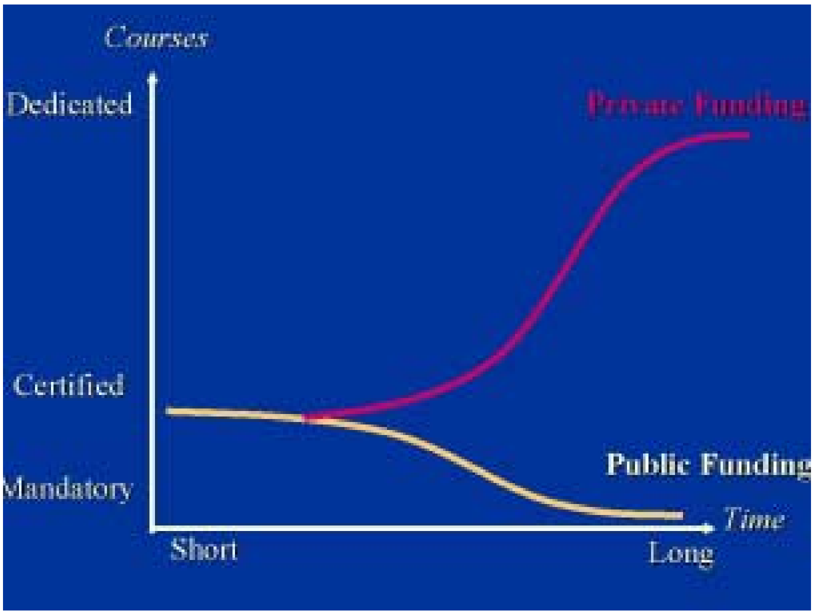


Figure 9.3 Financial Framework

As demonstrated in Figure 9.3, the financial framework has a long-term objective of self-sustainability through private funding. The level of private funding will have to be related to the different types of courses that will be offered at the institute. The mandatory and certified courses will in time remain partly public funded, while the dedicated courses (and in time the certified courses and parts of mandatory courses) will have to be privately funded through tuition fees.

The draft roll-out plan will be evaluated via:

- Discussions with local teachers/trainers. These discussions will aim to determine the need for upgrading expertise. Also the need for upgrading the know-how of supporting staff (administration, technical staff, etc.) should be determined in this procedure.

- Follow–up interviews with public authorities and technical experts, responsible for the development of transport and of education in BiH.

- Discussions with relevant experts (e.g., World Bank, EBRD, EIB, EU, OHR, etc) regarding the planned and ongoing training needs and programs for BiH.

The optimal concept of the future Transport Training Institute will thus be decided in close cooperation with university experts, the Institute for Education of the Chamber of Industry, the PHARE program for assistance to institutional reform and the relevant public authorities in BiH.

(2) Budget Information Related to Phase 1 of the Project

Item	Goal	Time (months)	Budget (KM)
Expertise	Identification of local and international experts to conduct the different analyses	1	30,000
Tenders	Issuing tenders for the selection of experts according to the regulations of the donor	2	60,000
Selection	Selection of experts	1	30,000
Analyses	Analysis of the political, operational and location conditions related to the establishment of the Transport Training Institute (*for details see above*)	10	320,000
Conclusions	Development and approval by client of roll-out plan (including budget for phase 2 of the project)	4	60,000
TOTAL		**18**	**500,000**

After approval of the roll-out plan and the therewith related need of human and financial resources, the second phase can be initiated on the basis of the agreed upon plan.

9.6 PHASE 2: ESTABLISHMENT OF TRANSPORT TRAINING INSTITUTE

(1) Activities: General Overview

In the second phase, all steps identified in the agreed upon roll-out plan will be implemented. Solutions have to be found for all operational, legal and location problems and this within the timeframe and budget as calculated in the roll-out plan. For that reason, the tender procedure in phase 1 is very important. The selection of the right experts will proof its value during the second phase in terms of time – and cost – efficiency during the execution of the project.

The establishment of the Transport Training Institute consists of several phases, which are:

- Ensure that the necessary expertise will be available once the institute becomes operational
- Organize the location(s) for the different departments of the Transport Training Institute
- Ensure that all vocational materials are state-of-the-art and meet European and international standards
- Negotiate agreements with local universities and the Chamber of Industry's Institute for Education on the terms of the cooperation
- Negotiate cooperation conditions with International institutes and universities
- Formalize the establishment with the relevant public authorities in Bosnia and Herzegovina, the two Entities and the International institutions
- Formalize the certification and examination procedures in terms of recognition and official validation

(2) Expertise Building

The development of an international recognized Transport Training Institute requires public and private decision makers, responsible for the control and management of the Institute, to have sufficient knowledge about the transport sector and the way training and education for transport is given. Also key persons that will be directly involved in the transport training activities (training and teaching staff) should be introduced with the state-of-the-art in transport training and education.

Expertise building will therefore include a combination of **practical training courses and study tours** to selected training institutes, education facilities, and public authorities. The study tours are beneficial because they will provide in-depth insight in the *organization and operations of high quality transport training institutes, education centers such as universities*.

For the future trainers and teachers, the expertise-building program foresees a **Train-the-Trainers Program** where the future training and education staff will be trained according to their individual expertise and needs. The training will include

1) Modern Logistics

In this module the background of modern logistics is explained. It deals with questions like how goods flows come about and what the term "logistics" stands for. A systems approach is presented to help defining traffic flows, borders, starting- and endpoints and transfer points. The field of logistics will also study logistics influence on other departments in a company and will include an introduction to transport economics, where logistic costs are analyzed. Finally, the roles of the different means of transport, distribution centers, terminals, and storage facilities are discussed.

2) Forwarding

Forwarders can be regarded as the "architects of the transport." They set up transport flows and keep them going. On the physical distribution side attention is paid to public warehousing, Distribution Requirements and Resources Planning, Material Requirements Planning and Manufacturing Resources Planning as well as Roles of the forwarder, integration with truckers, distribution centers and storage facilities.

3) Document Flows

The Bill of Lading and the Connossement and their different use, aspects and problems are discussed in detail in this module. For road transport the CMR, for rail transport the CIM, the Air Waybill for air transport and the DGC for sea/air transport are discussed separately and in combination. Furthermore, insurance certificates, packing, and type of goods are analyzed in detail. Seller's risks, Buyer's risks and claims are subjects of this module. The relations between transport documents, customs documents and payment documents are given in-depth attention. The use of INCO-terms and the different aspects of each of the terms are explained. A detailed description on the aspects of terms and critical points (costs, risks, documents) gives not only theoretical but also practical expertise.

The **Train-the-Trainers Program** also includes vocational and managerial training. The trainers will be introduced in the use of new technologies such as distant learning, Internet applications, interactive courses on computer and via Internet, etc. Training the trainers program will also include social / practical training modules such as:

- Flexible learning & multi-form learning;
- Distant learning;
- Study techniques;
- Modular training;
- Designing/adapting study and teaching material;
- Open/flexible curriculum design;
- Self-instructional study material;
- Teacher's role; student's role;
- Contemporary adult pedagogy.

(3) Establishment of the Transport Training Institute

The development of the Institute plan includes following concrete steps:

- Guidance and technical assistance during the process of establishing the training institute
  - Selection of location(s) for the institute
  - Conclude cooperation agreements with local institutes and universities
  - Conclude cooperation agreements with international institutes and universities
  - Formalization of the Transport Training Institute in relation to regulatory and political issues;
- Assistance in procurement of training staff;
- Assistance in obtaining training skills (a *train-the-trainers program*);
- Assistance in curriculum design; and
- Assistance to the institute in becoming self-supporting.

Foreign experts will provide the necessary technical assistance in the concrete establishment of the Transport Training Institute. This assistance includes among others

- Identification of necessary teaching equipment (computers, printers, projectors, etc);
- Installment and testing of the equipment; and
- Familiarization of staff with new teaching equipment.

Similar assistance will be provided in the selection of teaching staff for the Transport Training Institute. In collaboration with the responsible authorities, the best selection procedure will be determined to guarantee the necessary quality levels of the staff, responsible for future training activities.

(4) Transport Training Curricula

The development of transport training curricula is the next segment in this phase of the program. Some important principles are applied in the development of the training programs and courses:

- The program and courses are **modular-based**, meaning that the traditional curricula are split up in small(er) units, modules, which are elaborated in direct contact with the market / stakeholders and with consideration taken of future needs. This has several advantages in comparison with the more traditional approach. *First*, it allows a more flexible course management, which answers to specific needs. *Second*, it is more efficient, since it allows an individual approach. *Third*, it allows easily adjustments of the training to a changing transport environment.

- The curricula will consider **the existing situation.** Consideration must be given to existing training curricula and training material and they should be used / integrated as much as possible.

- The courses will offer **both theoretical and practical components**. The theoretical parts are substantiated through practical examples and hands–on exercises to introduce the students with concrete market practices.

- Training courses will be **interactive**, including group work, presentations and discussions and computer based applications.

Although the training courses for the Transport Training Institute have to be decided during the development program, a first overview of what might be necessary is discussed hereafter. The professional training courses include three different approaches:

- Courses with syllabi;
- Simulation courses (with CD-ROM and group sessions); and
- Interactive courses.

1) Courses with Syllabi

The courses with syllabi contain four main fields:

- General Transport Training: general requirements and conditions of (intermodal) transport and freight handling;

- Function – Specific Training: detailed training, directly related to specific duties and responsibilities in the transport environment;

- Training in Economics and Management: training courses in various fields of economics and management; and

- Training in Intermodal Logistics: specialized training in intermodal logistics and freight forwarding, including affiliated fields of interest such as automation.

Following types of courses can further be integrated in the total curriculum of the institute:

i) <u>General Courses on Transport</u>

- Transport economics

- Studies in traffic culture and traffic rules and regulations

- Transport mode standardization (European standards)

- Road and railroad transport and introduction to intermodal transport concepts
- Operations handling of goods in ports and terminals
- Acceptance of loads, loading/unloading
- Vehicle and container construction/inspection/reparation
- Environmental issues

ii) <u>Function Specific Training (to be determined by the beneficiary)</u>

- European Transport Policy
- Integrated chain logistics
- Hazardous and toxic waste transport
- Training with different equipment and vehicles (off-the-job training) such as straddle carriers, fork lift trucks, container stacking equipment and empty container handling
- Responsibilities of consignors, consignees, drivers, haulers, ship-owners, air carrier owners, etc.

iii) <u>Transport Specialization Courses</u>

- Air Transportation
- Maritime Technology
- Shipping (Management; Operations)
- Safety training & Environmental protection
- Terminal Management
- Techniques of International Trade and Transport
- Port Informatics
- Maritime Law
- Transport Law
- Hinterland Transportation
- Maritime and Transport Insurance

iv) Automation and Telematics Courses

- Windows and Windows NT
- WORD, WordPerfect, EXCEL (spreadsheets), CorelDraw and PowerPoint
- Internet use (management of the «homepage », Website creation)
- Intranet computer network management (NOVEL NETWORK 4.1)
- Specialized computer programs on freight handling, transport document handling dangerous goods, warehousing, stuffing and stripping, queuing systems, etc
- EDI / EDIFACT, GPS, GNSS technology etc;

v) Courses in Economics and Management

- Strategic Management
- Strategic Management Tools
- Operational Management
- Structural changes in the World Economics
- Maritime Economics
- Port Economics
- Transport Economics
- Environmental Economics

vi) Intermodal Transport Training Module

Attention must also be devoted to intermodal transport. An in-depth training program on all elements of intermodal transport should therefore be available. An example syllabus of this type of course is provided hereafter.

Module 1: Costs and benefits of intermodal transportation:

- cost calculations of the different modalities for a certain transport route
- cost build-up of intermodal transport

Module 2: Non-financial costs and benefits of intermodal transportation:

- qualitative advantages and disadvantages
- rules and regulations in the different European countries

Module 3: Essentials of intermodal transportation:

- possibilities for combinations
- mechanisms and systems for combinations

Module 4: The importance of co-operation, from both a national and an international point of view:

- reasons for strategic alliances are discussed in order to facilitate the decision process

Module 5: Company strategy development:

- internal and external analytical methods

Module 6: Advantages and disadvantages of production organization compared with traditional organization

- process and management systems
- modern socio-technology

Module 7: Information technology:

- types and applications
- advantages and disadvantages

Module 8: Implementation of strategic changes:

- concepts of intermodal transportation
- phases of the implementation process

Module 9: Case Studies:

- integration of the knowledge and skills obtained in the course
- development of a business plan for intermodal transport
- presentation of the business plan
- discussion on the practical application of the plan

2) Transport Simulation Tools

Given that the Transport Training Institute requires a long-term sustainable development plan, the training program should also include a *Transport Network Simulator*. The simulation of transport and logistics in door-to-door transport includes all typical transport needs, operational, administrative, and managerial. Transport is nearly always implemented by a variety of organizations working together to complete the transport, but each chasing their own objectives by contributing in this specific transport. The program will therefore offer a helicopter view that surpasses the objectives of single organizations in the intermodal transport chain. The logistical full mission simulator will answer to the questions and problems of all network participants. The objective of the Transport Network Simulator is to provide students insight in the realities of transport. To teach students the concept of logistics they have to be familiar with the tools of the trade. So any education starts with the basics of transport, described in the following paragraphs at operational, tactical, and strategic level.

Full mission simulators provide environments in which:

- a complete job can be exercised;
- the level of complexity can be managed by the succession of exercises;
- it is possible to go “to far”; students are allowed to make mistakes that would cause a disaster when done in reality;
- exercise can be varied in as many ways as required; and
- an exercise can be repeated indefinitely.

So a carefully composed set of exercises give students the opportunity to find out what logistics is all about, at each stage adapted to their knowledge and experience.

3) Interactive Training Courses

Computer aided courses on logistics can be used in the (computer) classroom and mad available for the students at home. These programs provide a very flexible type of study material, with which the student can set his or her own pace.

Most available courseware is divided into modules. Each module deals with a certain subject of transport and forwarding and consists of the following elements:

- a written text, explaining the subject
- Software: one or more diskettes or CD's, containing:
- an interactive software program, including questions
- a test, consisting of multiple choice questions. The software registers the results of this test
- exercises to be submitted to a lecturer.

The following interactive training modules exist and can be easily adapted to the needs of the training institute in BiH:

- Logistics in general
- Logistics in transport
- Ports as nodal points of logistic flows
- Transport of dangerous goods

- Logistic costs
- Electronic Data Interchange (EDI)
- Planning in Transport
- Transport and storage of pesticides
- Loading carriers with dangerous goods
- Documents in Transport
- INCO-terms

4) Distant Learning Courses

Special training courses will be applied in the Transport Training Institute that applies **i**nteractive distant learning in core topics. To bring persons from different background up to date with new developments or changing approaches to familiar problems requires a highly adaptable and flexible didactical method. Interactive training is the most flexible method to reach that goal. Even when these people are professionals and/or managers, interactive learning methods can give them new opportunities, even when they have no time to attend regular courses. The courseware can be studied in the classroom, at home or on the job. The equipment only includes a (Pentium II) PC with CD-ROM and an Internet connection (modem).

In general, each module in an interactive training course deals with a specific subject and includes following elements:

An Internet site, containing:

- **Pre-test** for students that are familiar with the subject to check how much they already know and to determine if it is useful to use that part of the course. If their answers are satisfactory they can proceed to the next item. The results of the Pre-test are recorded and can be checked by the tutor.

- **Theoretical introduction** into the subject, basically an interactive syllabus.

- **Exercises** to be made by the student to test his/her ability to understand the theory and to get some practice in the required actions.

- **Post-test** to test the knowledge and understanding of this subject. The results of the Post-test are recorded and can be checked by the tutor. After satisfactory completion of a module the student can continue with another module (subject).

A CD-ROM application, containing the video-clips required for the theoretical or exercise part. This is done to avoid long waiting times in case of slow connections to the Internet.

An Email address for the student and for the teacher to exchange assignments, guidance, advice, questions, answers, etc.

(5) Budget Information Related to Phase 2 of the Project

Item	Goal	Time (months)	Budget (KM)
Train trainers	Training of civil servants and selected specialists who will provide training in the institute	6	250,000
Organization	Organization of the Transport Training Institute in terms of regulatory, political, locational and other issues as well as cooperation with local and international institutes and universities	8	145,000
Institute	Physical establishment of Transport Training Institute (construction works)	15	1,150,000
Equipment	(*for details see calculations below*)	4	1,088,200
Courses	Development of courses and syllabi in local language	18	1,150,000
TOTAL		**18**	**3,783,200**

The following table provides an indicative budget for the establishment of a modern Transport Training Center.

Description	#	Unit price (EUR)	Total (EUR)
NT Server, incl UPS/ Tape	2	14.000	28.000
Workstations	30	5.000	150.000
Docent workplace	2	5.000	10.000
Network printer Laser Z/W	2	4.000	8.000
Network printer Laser color	2	6.500	13.000
Patch system	2	2.000	4.000
HUB	3	1.200	3.600

Software			
NT Server version 5.0	2	2.080	4.160
NT workstation 5.0	30	960	28.800
MS Office 97	30	1.922	57.660
Cables / CAT 5			1.500
Projection screen	2	590	1.180
Overhead projector / Beamer	2	13.000	26.000
Video Conferencing camera's	30	900	27.000
Electronic equipment & Cable protection system			6.000
UPS workstations	30	1.500	45.000
Office furniture			57.000
Floor 80 M2			7.200
Transport / Hardware + furniture			13.000
Installation - man hours	400	240	96.000
Travel	10	2.500	25.000
Hotel / expenses	80	400	32.000
TOTAL			**644.100**

The above provided information is intended as demonstration for the complexity of modern training facilities. The final framework will have to be determined and fixed during the roll-out phase via the benchmark of the available facilities in BiH and the requirements according to international and European standards.

9.7 PHASE 3: HELP THE TRANSPORT TRAINING INSTITUTE BECOME SELF-SUPPORTING

(1) Expert Assistance for Transition Period

The expert assistance in the final phase will include:

- A financial plan (expected costs and revenues) that satisfies the need to become self-sufficient. This financial plan should evaluate the possibility of alternative financing structures;

- Methods to find support by private companies;
- Potential partners for strategic alliances and co-operations agreements;
- Organizational and operational structures; and
- Development of a management information system on student progress, finance, equipment, personnel, curricula (yearly development /revision), buildings, energy, consumption, facilities (classrooms, workshops, copying and printing facilities, audio-visual equipment, hard- and software)

(2) Financial Business Plan

The financial plan will be based upon the evaluation of following elements:

- Identify number and location of facilities
- Commercial conditions, based on market prices
- Size of groups of students
- Possible combinations of study lines
- Co-operation between different departments
- Cooperation with the transport industry to assess job profiles

(3) Indicative Investment Requirements

The required budget for the third transition phase is estimated at **250.000 KM**. The majority of the works will consist of short-term assistance in specific fields of training and in the management of the Transport Training Institute including financial auditing and budgetary optimization.

9.8 OVERVIEW TOTAL BUDGET

Implementation phase	Estimated Costs (KM)
Research and facility assessment	500,000
Establishment of the Institute	3,783,200
Assistance during transition period	250,000
Total	**4,533,200**

Source: The JICA Study Team

9.9 IMPLEMENTATION TIME FRAME

A tentative implementation timeframe is provided in the table hereafter. A detailed time span for the implementation of the project will be established during phase 1 of the project and will be included in the roll-out plan for the Transport Training Institute.

In general terms, it is expected that the implementation time to establish the Transport Training Institute is 2.5 years and an additional 1.5 years for assistance during the transition period.

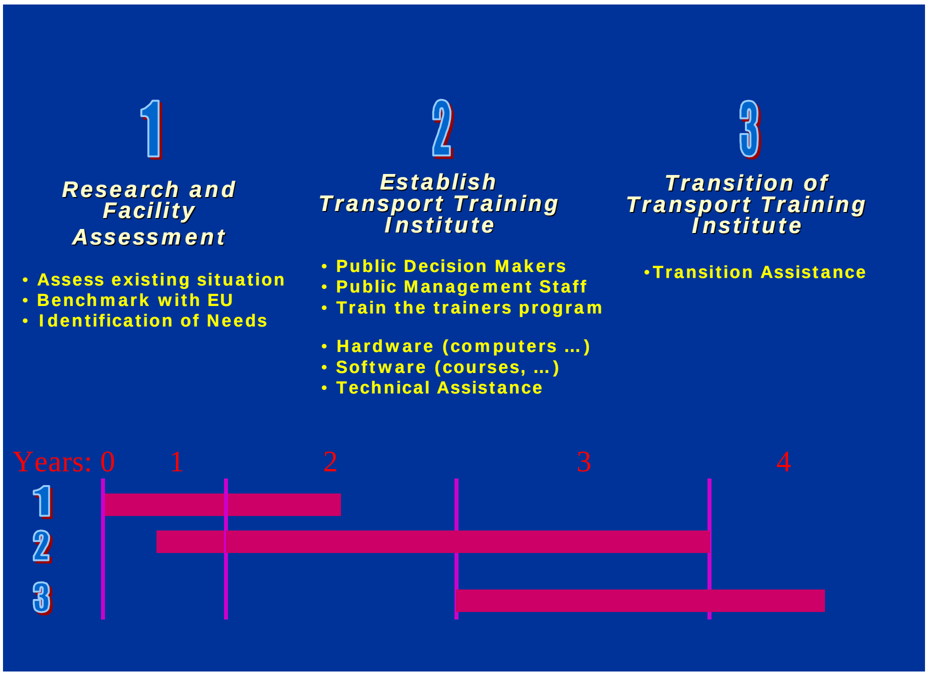


Figure 9.4 General Time Frame for the Establishment of the TTI

9.9.1 Institutional and Organizational Arrangements

The Transport Training Institute needs a flexible organization that is embedded in a consistent political structure. It should be noted that the final organization and structure of the Transport Training Institute is subject to the results of the organizational and structural assessment.

The Transport Training Institute could be organized as an integrated part of the Transport Public Corporation (see Chapter 7 for details on this issue). A structure and organizational context of the concept is provisionally proposed as shown in Figure 10.5.

Within the Transport Public Corporation, a special department for Training and Education will be responsible for:

- the content of the courses of the Transport Training Institute;

- the (quality) control of the institute;
- the certification of the institute and other (private) transport training centers; and
- the ratification of certificates and diplomas.

Given that a section of their activities is related to educational aspects, a direct relation with the Ministry of Education is advisable. Consultation between both parties will ensure that the courses in transport education at the graduate and post-graduate levels are consistent with market requirements and that specialized training programs in the Transport Training Institute can be integrated in the course packages at BiH universities.

During and after the transition phase, a preferred relation with a well-reputed European Transport Training Institute should be established. This strategic alliance will ensure that the Transport Training Institute in BiH will continue to operate according to European standards of transport training.

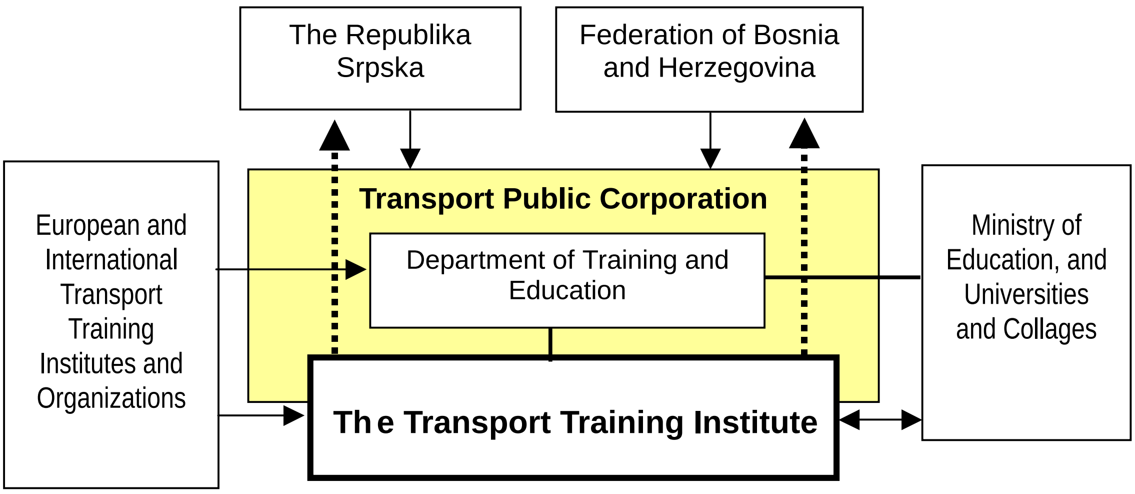


Figure 9.5 A Proposed Structure and Organizational Context

Final conclusions and proposal in relation to the integration of the Transport Training Institute in the political framework of Bosnia and Herzegovina can only be formally decided during the preparation phase of the project (phase 1).

9.10 EXPECTED BENEFITS

Every major public investment requires a feasibility study to estimate future benefits and to determine in time the viability of the planned allocation of public resources. However, estimating the benefits of the Transport Training Institute is difficult if not impossible to quantify.

The most important reason is that the Institute is a public service with the objective of improving the know-how of both public and private transport experts and professionals so that the activities of the transport sector will become more efficient and the negative consequences for / impact on the public and the environment reduced to acceptable levels.

In that perspective, the benefits of establishing the Transport Training Institute will be achieved on the qualitative level of the transport sector. The level of expected benefits of the development of the Transport Training Institute in BiH will be discussed hereafter. It should be noted that during the first phase of the proposed project, detailed quantitative and financial analyses will be conducted in addition to the total quality analysis to determine the viability of the project and to draw up the financial plan of the Institute in the short and medium term (e.g., for the first five years).

The establishment of the Transport Training Institute in BiH will generate qualitative benefits in three major fields, as demonstrated in next Figure 9.6.

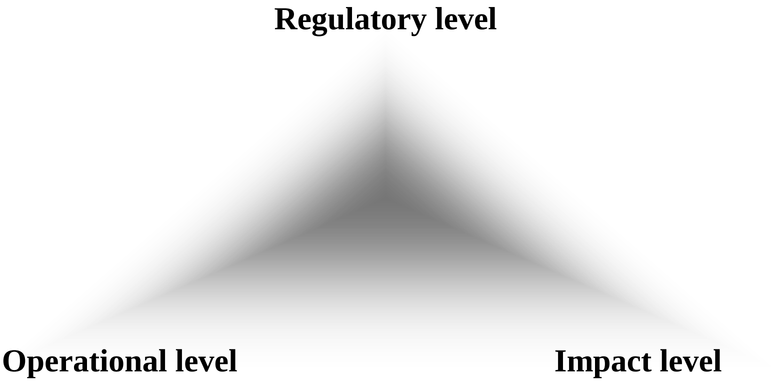


Figure 9.6 Qualitative Benefits of the TTI

The *first* level of qualitative benefits can be found at the regulatory level. This level is undoubtedly of major importance for the future integration of BiH in the international transport environment. If this integration will be successful, it is imperative that the public authorities, responsible for the transport sector, have the necessary expertise to install rules and regulations according to which the sector will operate in the near future.

The TTI will therefore offer transport training courses for public decision-makers and persons in the public administration. These persons will be trained in all forms of modern logistics and transport, including in-depth training in international transport law and standards.

Training of public decision makers and administrators, responsible for the transport sector, will be fundamental for BiH to obtain international acceptance and to ensure that transport in BiH will develop according to international standards and regulations governing in all transport modes.

In that context, the direct and indirect regulatory benefits of the Transport Training Institute are:

- Up-to-date expertise at the level of public decision makers and administrative staff, responsible for the management of transport in BiH;
- Introduction of new and / or improved legislation that is in accordance with international rules and regulations;
- Introduction of standards that are conform international standards governing national and international transport;
- Introduction of minimum quality requirements for companies and persons active in the transport sector that are equal to the requirements set forward in the European Union;
- Efficient control on national and international transport activities on the territory of Bosnia and Herzegovina.

The above described qualitative effects will indirectly generate quantitative effects, mainly in terms of:

- Cost savings at the level of public administration due to improved procedures in decision making and reduction of staff;
- Cost savings at the level of the public budget via improved and more efficient budget allocation in transport infrastructure development and maintenance;
- Cost savings at the level of the transport sector via improved government control and regulation of professional activities, and through the reduction of public participation and further efficient privatization of transport activities presently under public responsibility;
- Increased direct and indirect benefits (taxes, VAT, foreign investments, etc...) because increased professionalism of the transport sector and an efficient public administration is the minimum requirement to attract foreign investors;
- Benefits at the level of the country and the environment (see further).

The *second* level of qualitative effects can be found in the sector itself. The Transport Training Institute will be the most important means to increase professionalism in the transport sector. Professionals will be trained in all fields of transport and logistics, enabling transport companies in Bosnia and Herzegovina to expand their business and participate in international transport activities.

The qualitative effects of efficient and modern training can also be demonstrated at both the internal and external corporate level. Internally, increased expertise will assist companies to improve the efficiency of operations and reduce operational costs. Increased knowledge and use of computer technology will, for example, reduce operational costs at the level of staff allocation, inventory management, transport costs (fuel and transport time), etc... At the external level, individual companies will integrate in international and intermodal transport operations, therewith increasing activities while at the same time further reducing operational costs.

The qualitative benefits at the operational level can be summarized as follows

- Improved expertise of the transport sector in Bosnia and Herzegovina;
- Improved efficiency of transport activities;
- Increased commercial activities;
- Reductions in operational costs;
- Integration of local companies in international transport activities.

The possible benefits will not remain limited to the transport sector itself. Indirectly, the whole industrial community of Bosnia and Herzegovina will benefit from an increase in transport efficiency. Given that transport is and will always be a *service to the economy*, improvements in the transport sector will directly reflect on economic activities that need transport services. More concretely, industries will be able to reduce their overall transport costs and therewith increase benefits. Furthermore, the industry in Bosnia and Herzegovina will be able to increase productivity because companies will be able to

- Efficiently import high quality basic materials hence produce better products;
- Expand in new markets via more cost efficient export, therewith reducing their prices and increase their international competitive position;
- Develop new economic and industrial activities such as the production of semi-finished products or final assembly, activities that require high quality transport services.

The *third and last* important level of qualitative benefits is related to the impact of transport activities on the community and the environment. The present transport services in Bosnia and Herzegovina are characterized by

- Inefficiency of transport operations, generating in particular unnecessary travel and therewith creating congestion and pollution;
- Use of old and badly maintained equipment that is far below international safety and environmental standards;

- Uncoordinated implantation of transport activities having a negative impact on living conditions and urban / land planning.

Increased expertise by public decision makers and transport professionals will have a direct positive influence on safety and security on the one hand and on the environment on the other hand.

Improved expertise via dedicated and modern training will contribute to:

- Reduce accidents when handling transport equipment;
- Reduce road accidents through reductions in physical transport, better management of road traffic and the use of intermodal and combined transport alternatives;
- Reduce the negative impact on the community via a better and expertise driven selection of the locations for warehouses, terminals and other transport and logistics activities;
- Improve mobility on the roads via a better and technology driven selection of transport routes and modes, using optimal routing programs and other state-of-the-art technology to avoid urban areas and highly congested traffic spots;
- Reduce the impact of final distribution in urban areas via the introduction of modern applications that have already demonstrated their effectiveness in Western countries.

Increased public and private expertise will also improve the environmental conditions of Bosnia and Herzegovina, a problem that is critical in Europe and will increase in importance when Bosnia and Herzegovina will further integrate in the international community. Positive effects on the environment can be expected on:

- Pollution by CO_2 via the use of better transport equipment and reduced road transport;
- Land use via better planning in the location of transport facilities and in the development of new transport infrastructure;
- Noise pollution via better route planning and use of environment friendly transport modes;

9.11 CONCLUSIONS

The establishment of a Transport Training Institute for Bosnia and Herzegovina is undoubtedly an interesting and priority investment of which the benefits have been clearly demonstrated in this chapter and the costs for its establishment remain limited.

The estimated cost of 4.5 million KM for the establishment of the Institute are only a small fraction of the annual costs that transport in Bosnia and Herzegovina will generate.

Furthermore, it is anticipated that the Transport Training Institute will become self-sufficient after the transition period via the provision of dedicated training courses, entrance fees, and other commercially viable initiatives. As demonstrated in next figure, it is expected that the Institute will not only offer certified and mandatory courses but also dedicated and high quality courses that will be attended by professionals from Bosnia and Herzegovina as well as from the surrounding countries.

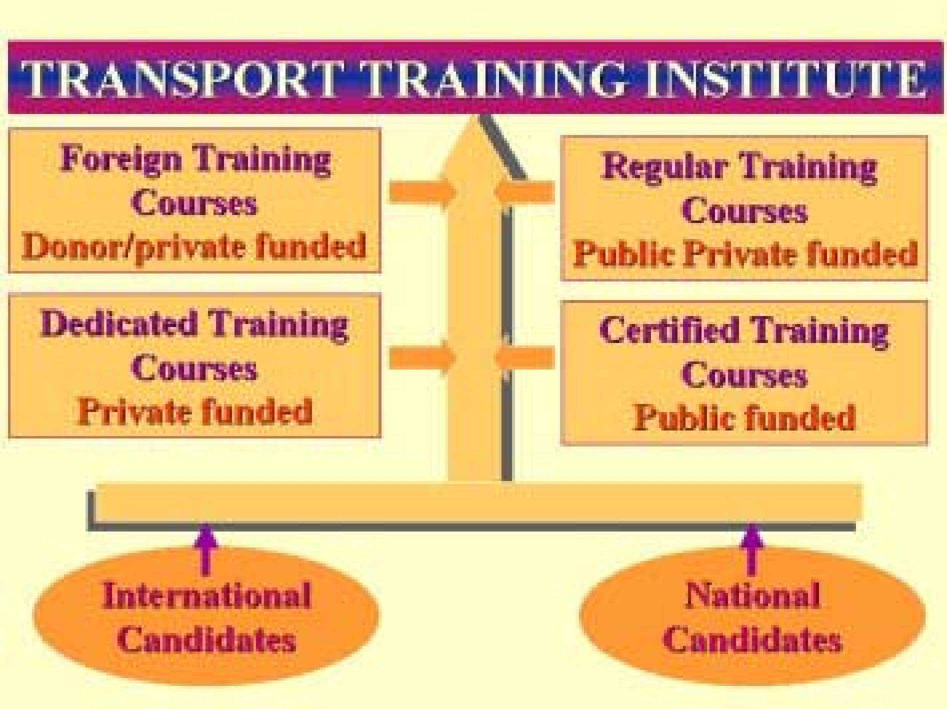


Figure 9.7 Dedicated Training Courses of the TTI

The establishment of the Transport Training Institute will have one general and highly important overall benefit. It will assist both public authorities and transport professionals in Bosnia and Herzegovina to set forward the necessary conditions for the integration of Bosnia and Herzegovina in the international community and in particular in the European Union.

Ensuring a level of expertise that meets international standards will have direct benefits at three major levels, the regulatory level, the professional level, and the level of the community and the environment.

Although the majority of benefits are at the qualitative level, the financial and economic benefits of modern expertise building cannot be underestimated. These benefits will be generated at the public level through a more efficient allocation of public financial resources and at the professional level via reductions of operational and managerial costs and increased commercial activities. Finally, increased safety and security and reduced external environmental effects will generate indirect financial benefits to the country because les financial resources will have to be invested in dealing with the consequences of traffic accidents, pollution, congestion and other consequences of inefficient transport.

Chapter 10: INITIAL ENVIRONMENTAL EXAMINATION

10.1 INTRODUCTION

Transport improvement projects are implemented to improve the mobility of goods and persons, which should result in improved economic development. Consequently, it will improve the social environment of the people involved. However, almost every project has also negative environmental impacts, being slight or severe.

Environmental Impact Assessment (EIA) is an integral part of the process of project selection, design, and implementation. It should be a tool for decision makers to consider the impacts of proposed activities on the (physical and social) environment, in order to seek for alternatives, to prepare steps to mitigate the negative impacts and to enhance the positive impacts, or if necessary, to reject a proposed activity.

To ensure sustainability for the proposed urgent transport improvement projects for Bosnia and Herzegovina, an Initial Environmental Examination (IEE) of these projects has been carried out as part of the pre-feasibility studies. The IEE indicates the potential negative environmental impacts (as well as the positive environmental impacts) to be expected from the planned priority transport development projects, in order to determine whether follow up detailed environmental studies are needed. Also an indication of mitigation measures, required to alleviate the identified adverse environmental impacts, are provided.

JICA environmental guidelines for IEE prescribe that for projects to be screened for their environmental implications, Site Surveys are to be carried out. From the proposed priority projects in Bosnia and Herzegovina, two major road projects have been selected for environmental Site Surveys.

Local consultants have been contracted to carry out the Site Surveys, which results helped to reveal the present environmental condition of the project areas and the potential environmental impacts expected from the proposed transport projects.

The screening and scoping process, whereby European Union (EU) guidelines, guidelines from the Japan International Co-operation Agency (JICA), as well as World Bank guidelines, have been applied, has resulted in identification of one of the following analysis requirements for each proposed priority transport project:

- A full Environmental Impact Assessment plus Environmental Management and Monitoring Plans are required, because ***significant*** adverse environmental impacts are to be expected;

- Only Environmental Management and Environmental Monitoring Plans are required; and

- No further environmental actions are required, as only ***minor*** (no significant) adverse environmental impacts are to be expected.

Besides possibly recommended environmental studies, it is assumed that for all projects proper Operation & Maintenance Plans will be prepared and executed.

The following definitions have been applied in current report:

- *Initial Environmental Examination (IEE)*: the examination/assessment to determine the environmental impacts that may be created by a proposed transport development project, based on: existing information and data, easily accessible information, and professional judgment.

- *Screening*: the evaluation/judgment on the necessity of an Environmental Impact Assessment.

- *Scoping:* the identification of important/significant environmental impacts, resulting from a proposed transport development project, and the formulation of the items to be studied in an EIA.

- S*ignificant environmental impact*: a fundamental change to the physical, biological, or social environment, resulting from a proposed transport development project.

- *Environmental Impact Assessment (EIA)*: a detailed and in-depth research study on significant environmental impacts to be expected from a proposed transport development project.

- *Environmental Management Plan*: a document presenting those efforts that will be made to manage adverse environmental impacts resulting from a proposed transport development project.

- *Environmental Monitoring Plan*: a document presenting those efforts that will be made to monitor the environmental components, which may be affected by a proposed transport development project.

- *Operation and Maintenance Plan*: a plan that describes in detail which measures are required for a proper operation/functioning and maintenance of a proposed transport development project.

10.2 PROPOSED PRIORITY TRANSPORT IMPROVEMENT PROJECTS

10.2.1 Introduction

A number of transport improvement projects have been identified for the Federation of Bosnia and Herzegovina and the Republika Srpska. Several of these projects have been selected as urgent (priority) projects. Only the priority transport improvement projects have been screened for their environmental impacts. The identified priority transport development projects in the Roads Sector, the Air Sector, the Waterway Transport Sector, and the Railways Sector, are presented in the following sections.

10.2.2 Road Sector

The priority road improvement projects, which have been identified for the Federation of Bosnia and Herzegovina and for the Republika Srpska, and which have been screened for their environmental impacts, are presented in Table 10.1.

Table 10.1 Proposed Priority Improvement Projects in the Road Sector

Federation of BiH
VLAKOVO – MOSTAR ROAD IMPROVEMENT PROJECT: R-16 (93 KM) AND PART OF R-27 (16 KM): R-16: Tarcin – Mostar Road Improvement (93 km): (1) Tarcin – Konjic (25 km): additional lanes; minor re-alignment. (2) Konjic – Jablanica (23 km): minor re-alignment; cross section improvements. (3) Jablanica – Mostar (45 km): additional lanes, climbing lanes; minor re-alignment. R-27(1), Corridor Vc: Vlakovo – Tarcin Road Improvement (16 km) {medium-term priority}: New motorway; initially two lanes, ultimately four lanes. Tuzla and Vicinity Urban Transport Study Mostar Urban Transport Study
Republic of Srpska
BANJA LUKA – DOBOJ ROAD IMPROVEMENT PROJECT: Improvement and partly new construction of high way; two or three bypasses (each 2 to 5 km length). Heavily loaded road improvements: Brod-Seslija; Zenica-Maglaj; Improvement of pavement structure Banja Luka Urban Transport Study

10.2.3 Air Sector

In the air sector several priority projects have been identified for the Federation of Bosnia and Herzegovina and the Republika Srpska. These priority improvement projects are presented in Table 10.2.

Table 10.2 Proposed Priority Improvement Projects in the Air Sector

Priority Improvement Projects, Sarajevo Airport
Construction of runway strip. Construction of new perimeter fence. Widening/reconstruction of taxiways. Relocation of fuel farm. Relocation and reconstruction of fire fighting building, re-equipment of CFR. Installation of radar for terminal.
Priority Improvement Projects, Mostar Airport
Installation of MLS system or GPS System. Construction of CFR building and re-equipment. Maintenance facilities and equipment.
Priority Improvement Projects, Tuzla Airport
Construction of concrete apron. Construction of cargo building. Installation of ILS system. Construction of CFR building and re-equipment. Maintenance facilities and equipment. Construction of new ATC tower and installation of equipment.
Priority Improvement Projects, Banja Luka Airport
Construction of cargo building. Installation of new ILS system. Installation of new ATC equipment. Installation of new airfield lighting systems. CFR equipment.
Development of smaller aerodromes and feasibility study
Identifying small airports for development. Identifying and implementing small airports needs.
Training requirements
Training of staff for air navigation, meteorology, and management. CFR training.

10.2.4 Waterway Transport Sector

Priority reconstruction projects in the waterway transport sector have been formulated as projects that need to be implemented in the short-term future, i.e., prior to 2005, in order to have as soon as possible an operational river transport sector in BiH. Phased development projects are necessary in the medium and long-term to guarantee the sustainability of river transport and to upgrade the transport system to EU levels. The priority reconstruction projects in the waterways sector, which have been evaluated for their environmental implications, are presented in Table 10.3.

Table 10.3 Proposed Priority Improvement Projects in the Waterways Sector

Rehabilitation of the Sava River navigation channel
De-mining of river and riverbanks. Cleaning of river and riverbanks of debris. Dredging of minimum navigation channel.
Rehabilitation of the port of Brcko
De-mining of port area. Dredging port access. Reconstruction of vertical quay. Warehouse rehabilitation. New crane (5 tons). Road and rail rehabilitation.
Rehabilitation of the Port of Samac
De-mining of port area. Dredging port access. Reconstruction of vertical quay. New crane (5 tons). New warehouse. Road and rail rehabilitation.

10.2.5 Railway Sector

In the railway sector an urgent rehabilitation program has been formulated on the two strategic railway lines in BiH namely:

- The line Croatia border-Doboj-Sarajevo-Mostar-Croatia border (single line, 311 km electrified, double track 95 km electrified), and
- The Line Croatia border-Banja Luka-Tuzla-Serbia border (single line electrified 285 km).

The following actions would need immediate attention (see Table 10.4):

Table 10.4 Proposed Priority Improvement Projects in the Railway Sector

Reconstruction of signal and communication systems. Recovery of disconnected catenary system Capacity improvement of catenary maintenance. Installation of track maintenance machines. Reconstruction of workshop facilities

10.3 ORGANIZATION OF ENVIRONMENTAL PROTECTION IN FBIH AND RS

10.3.1 Environmental Steering Committee

There is no Ministry of Environment at State level; both Entities in the State of Bosnia and Herzegovina have their own ministry dealing with the environment. However, there is an Environmental Steering Committee (with 8 members) for co-ordination between both entities. Each entity has four members in the Committee (see Table 10.5), which meets once per month.

Table 10.5 Members of the Environmental Steering Committee

Members from the Federation of Bosnia and Herzegovina	Members from the Republika Srpska
1 Secretary General of Federal Ministry 2 Deputy Minister, Department of Environmental Protection 3 Deputy Minister for Reconstruction 4 Expert of the Institute of Hydrotechnic Engineering	1 Director of the Institute for Water 2 Deputy Minister of the Ministry of Urbanism, Civil Engineering, Residential-Utility Activities and Ecology 3 Deputy Minister for Environmental Protection 4 Director of the Institute of Urbanism

10.3.2 Environmental Organization in Entities

In the Federation of Bosnia and Herzegovina, the Department of Environmental Protection falls under the responsibility of the Federal Ministry of Physical Planning and Environment. The structure of their present organization, and the planned organization in the near future, is presented in Table 10.6.

Table 10.6 Present and Planned Organization of Environmental Protection in FBiH, Federal Ministry of Physical Planning and Environment

DEPARTMENT FOR ENVIRONMENTAL PROTECTION	Present number of Personnel	Planned number of Personnel
Head of Sector/Deputy Minister. Staff working for the Department of Environmental Protection, and not particularly attached to a specific department: Expert coordinator Lawyer Technical secretary	1 1 1 1	1 - - 1
	4	2
Sub-Departments under the Department for Environmental Protection		
Sub-Department for General Ecology and Environmental Protection Chief of Department Expert for ecological planning and sustainable development Expert for co-ordination and co-operation	 1 - -	 1 1 1
Sub-total	1	3
Sub-Department for Ecology Protection Chief of Department Expert for climate change protection Expert for water protection Expert for soil protection and urban eco-systems Expert for protection and preservation of biological diversity and natural eco-systems Expert for waste and hazardous waste Expert for pesticides and other chemicals	 - - - 1 - 1 -	 1 1 1 1 1 1 1
Sub-total	2	7
Sub-Department for Natural and Cultural Heritage Chief of Department Expert for protection of natural heritage and ecological tourism Expert for cultural heritage	 - 1 1	 1 1 1
Sub-total	2	3
Total	9	15

The Department for Environmental Protection in the Republika Srpska is incorporated in the Ministry of Urbanism, Civil Engineering, Residential-Utility Activities and Ecology. The structure of the present organization for environmental protection in the Republika Srpska, and the planned number of personnel for the near future, is presented in Table 10.7.

Table 10.7 Organization for Environmental Protection in the RS, Ministry of Urbanism, Civil Engineering, Residential-Utility Activities and Ecology

DEPARTMENT FOR ENVIRONMENTAL PROTECTION	**Present number of Personnel**	**Personnel to be recruited shortly**
Head of Department/Deputy Minister	1	1
Sub-Departments under the Department for Environmental Protection		
1. Sub-Department for Protection in Planning and Building Environmental Expert	-	-
2. Sub-Department for Protection of Natural Resources and Biological Diversity Expert for protection and preservation of biological diversity and natural ecosystems	-	-
3. Sub-Department for Solid Waste Management Solid Waste Expert	-	1
4. Sub-Department for Protection of Waters and Nature Reserves Environmental Expert	-	1
5. Sub-Department for Air and Radiation Protection Environmental Expert	-	1
6. Sub-Department for Inspection of the Environment Environmental Expert	-	-
Total	1	4

Ideas have already been formulated for a future organization for environmental protection. Although no definite blueprint is available, a tentative proposal is presented below.

The future Agency for Environmental Protection in the Republika Srpska might have 5 Departments:

- Department for Communication, Co-operation and Strengthening of Social Awareness;
- Department for Air;
- Department for Water;
- Department for Land; and

- Department for Waste.

Furthermore, there will be established Local City/Municipality Departments for Environmental Protection and Inspection, with the following division of each Department in Environmental Units:

- Unit for Communication, Co-operation and Strengthening of Social Awareness;
- Unit for Land and Solid & Hazardous Waste;
- Unit for Water and Natural Resources;
- Unit for Air and Radiation Protection; and
- Unit for Environmental Inspection and Supervision.

The number of staff that would be required in the future environmental organization could not yet be specified.

10.3.3 Organizational Aspects

It is advisable that both entities will have a similar environmental organization in the future. This will facilitate in dealing with mutual environmental problems.

The environmental organizations should cover the basic environmental compartments: water, soil, and air. Further differentiation would present the following major fields with environmental implications:

- Municipal waste;
- Hazardous/chemical waste;
- Municipal waste water;
- Industrial waste water;
- Air pollution;
- Nature reserves/biological diversity/eco-systems;
- Water quality of surface waters;
- Water quality of groundwater;
- Soil quality; and
- Cultural heritage.

Proper managing of above fields would result in improvement of environmental conditions related to:

- Surface water pollution;
- Groundwater pollution;

- Soil pollution;
- Degradation of nature reserves and ecological systems;
- Air pollution; and
- Damage to cultural heritage.

Ultimately, improvement of above-mentioned environmental items would result in improvement of public health, general ecological conditions, and the socio-economic situation of the population.

10.4 ENVIRONMENTAL LEGISLATION RELATED TO TRANSPORT DEVELOPMENT

10.4.1 General

Environmental guidelines to be followed in the study are in principle the regulations of Bosnia and Herzegovina, as well as EU and JICA environmental guidelines. However, because both entities have not yet formulated their specific environmental laws and regulations (see Section 8.4.2), EU and JICA guidelines were followed for the Initial Environmental Examination (IEE). In general, it can be stated that EU and JICA environmental regulations, as well as other international guidelines (like World Bank guidelines), prescribe that transport development projects should be designed and constructed along environmentally sound principles to ensure sustainability.

10.4.2 Environmental Laws and Regulations in BiH

At present there are no specific environmental laws and regulations in the Federation of Bosnia and Herzegovina and the Republika Srpska (although the existing Law on Physical Planning has provisions related to environmental issues). However, in October 2000 a team started working on new environmental legislation in line with EU regulations and standards. Both entities will have their own environmental laws in the near future, but they will be practically identical.

The preparation of the new environmental laws and regulations in BiH is assisted by the EU, with Austria as main contributor. An Environmental Framework Law is being processed now and will probably be finalized by the end of the year. Other environmental laws being prepared are:

- Law on Water Protection;
- Law on Waste;
- Law on Nature Protection; and
- Law on Air Protection.

The laws will provide an integrated framework for environmental licensing, including references to supporting procedures (such as Environmental Impact Assessment) based upon the concept of integrated pollution prevention and control.

Under the support of the EC Environmental Programme for Bosnia and Herzegovina, the following projects are being carried out at present:

- Solid Waste Management Strategy Project (PHARE Program);
- Pilot Facility Studies (Japanese Grant); and
- Urgent Strengthening of Environmental Institutions in Bosnia and Herzegovina (METAP/PPU Technical Assistance).

10.4.3 JICA Environmental Guidelines for Infrastructure Projects

JICA Environmental Guidelines for Infrastructure Projects, especially for Transportation Development (Sector XII), were used for the IEE concerning the proposed transport improvement projects in Bosnia and Herzegovina. It was agreed in the JICA Study Team that also EU-regulations should be followed, since Bosnia and Herzegovina has the intention to apply for European Union Membership. The EU-Directives related to Initial Environmental Examination, and related JICA guidelines, correspond well on the basics of Environmental Impact Assessment. According to JICA-regulations, there should be carried out a Site Description (SD, for which guidelines are provided) related to proposed projects. The SD will facilitate the process of Initial Environmental Examination, which is mainly carried out in a qualitative way (a sample of the SD-checklist, prepared for the Transport Master Plan Studies is presented in Appendix 10-1).

"Scoping" is the identification of the important/significant environmental impacts, expected to result from proposed development projects. Based on the scoping-procedure, the items to be studied in an EIA can be defined, and these subjects can subsequently be used to define the TOR for the EIA.

10.4.4 Environmental Guidelines of the European Union

Both JICA and EU environmental regulations and guidelines have been used for the assessment of the impacts of proposed transport improvement projects on the environment. The JICA Environmental Guidelines and the EU directive 97/11/EC (amended version of 85/337/EEC) form the basis for the Initial Environmental Examination of the proposed priority transport development projects in Bosnia and Herzegovina.

Annex I of Council Directive 97/11/EC provides a list of activities and projects for which an Environmental Impact Assessment is required. The following projects, related to infrastructure, are listed as 'first category projects' and need an EIA:

- Construction of lines for long-distance railway traffic and of airports with a basic runway length of 2100 m or more.
- Construction of motorways and express roads.
- Construction of a new road of four or more lanes, or realignment and/or widening of an existing road of two lanes or less, so as to provide four or more lanes, where such new road, or realigned and/or widened section of road would be 10 km or more in a continuous length.
- Waterway transport and ports for waterway transport, which permit the passage of vessels of over 1 350 tons.

A case-by-case environmental examination (or the use of thresholds or environmental criteria) is to be used for projects not included in the first category. Specific criteria will indicate whether an EIA is required or not. These projects – related to infrastructure - of the so called 'second category', which will be of smaller magnitude than 'first category' projects - and not included in Annex I - are (Annex II, Council Directive 97/11/EC):

- Construction of railways and intermodal transshipment facilities, and of intermodal terminals.
- Construction of airfields.
- Construction of roads, harbors, and port installations, including fishing harbors.
- Waterway transport construction, canalization, and flood-relief works.
- Tramways, elevated and underground railways, suspended lines or similar lines of a particular type, used exclusively or mainly for passenger transport.

If a case-by-case examination is carried out, or thresholds or criteria are set for, the following relevant criteria (Annex III; 97/11/EC) shall be taken into account:

(1) Characteristics of Projects

- the size of the project,
- the cumulative effect with other projects,
- the use of natural resources,
- the production of waste,

- pollution and nuisances, and
- the risk of accidents.

(2) Characteristics of the Location of Projects/Environmental Sensitivity

- the existing land use,
- the relative abundance, quality and regenerative capacity of natural resources in the area, and
- the absorption capacity of the natural environment, paying particular attention to the following areas:

a. wetlands;
b. coastal zones;
c. mountain and forest areas;
d. nature reserves and parks;
e. areas classified or protected under Member States' legislation; special protection areas designated by Member States, pursuant to Directive 79/409/EEC and 92/43/EEC;
f. areas in which the environmental quality standards laid down in Community legislation have already been exceeded;
g. densely populated areas; and
h. landscapes of historical, cultural, or archaeological significance.

(3) Characteristics of the Potential Impacts

- the extent of the impact (geographical area and size of the affected population),
- the trans-frontier nature of the impact,
- the magnitude and complexity of the impact,
- the probability of the impact, and
- the duration, frequency, and reversibility of the impact.

In general, the directives state that pollution and nuisance should be prevented at the source, and at the earliest possible stage, in all the decision-making and technical planning processes (Pre-Construction, Construction and Post-Construction phases).

10.5 POTENTIAL ADVERSE AND POSITIVE ENVIRONMENTAL IMPACTS OF PROPOSED PRIORITY PROJECTS

10.5.1 Introduction

Potential adverse and positive environmental impacts have been identified, which might originate from the proposed projects in the Transport Master Plan 2000 for Bosnia and Herzegovina. Also, the existing situation (which requires improvement) has been evaluated for their environmental impacts.

10.5.2 The Social Environment

When discussing the impact on the environment, not only the physical and biological environment is meant, but also the social environment. Impact on the social environment, which is an important issue in any development project, implies adverse effects on social structures and persons.

Examples of impacts on the social environment, related to transport development projects, are:

- ***Necessity of resettlement*:**

  When persons have to leave their homes for the realization of a project, they should be compensated for the loss of their land, house and other properties. Also they should be assisted (socially and financially) to find other accommodation (and work, if applicable), to be able to live at least at the same standard as before.

- ***Health hazards*:**

  Health hazards have social implications. Health risks can result for example from air pollution, collisions, uncontrolled storage of spoils, leakage of hazardous spills, and noise.

- ***Impairment of historical/cultural sites, monuments, and aesthetics*:**

  Impacts on the social environment are: damage to areas worthwhile for their natural beauty and damage to specific historical areas, beloved monuments, or graveyards. If such areas/monuments have to be used for a project, careful weighing of interests should be executed, and alternative solutions should be investigated. If it is decided to sacrifice an area (or monument) totally or partly, one should try to offer compensation for what is lost, or take as many mitigation measures as possible.

- ***Nuisance*:**

Nuisance, for example caused by noise, air pollution, bad smells of spoils, dust, etc., also has an adverse impact on the social environment.

10.5.3 Criteria for Environmental Impact Assessment

Environmental impacts may be permanent or temporary; may occur during the Pre-Construction/Design Phase, the Construction Phase, and the Operation & Maintenance Phase of a project, and may be a direct result of construction activities, or an indirect result (like unplanned developments along roads).

Environmental criteria for the proposed transport improvement projects relate to processes and activities, which may affect the social and cultural environment and/or the physical/biological environment. The EC Council Directive 97/11/EC (Section 10.4.4.) and JICA guidelines (Section 10.4.3.) provide criteria to judge the significance of environmental impacts. Additionally, the following aspects should be taken into account in the process of Environmental Impact Assessment: number of other environmental components affected and the cumulative nature of the impact.

The overall environmental appropriateness of proposed projects could be indicated by answering the following questions:

- Will the project make unwarranted accelerated use of scarce resources in favor of short-term over long-term economic gains?
- Will the project create unwarranted losses in precious/irreplaceable natural or other sources?
- Will the project significantly affect people's health negatively?
- Will the project result in unwarranted hazards to endangered species?
- Will the project have an unreasonable impact on the livelihoods and subsistence of the people concerned?
- Will the project tend to intensify urban migration from rural areas to an undesirable degree?

10.5.4 Existing Situation and Potential Positive Impacts after Project Implementation

From the proposed transport improvement projects, positive effects are expected for the whole region. Generally, the following positive impacts - which are related to the socio-economic environment - result from transport development projects:

- improved access and safe traffic connections;
- reduced travel time and costs, related to improved access and mobility;

- improved conditions for economic development;
- reduced number of accidents, and thus increased safety.

Often the existing transport situation is unsatisfactory in several aspects; reason why transportation improvement projects are initiated and developed. Tables 10.8, 10.9, 10.10, and 10.11 present the *Adverse socio-economic environmental impacts in the existing situation* and the *Expected positive socio-economic environmental impacts after project implementation* for all proposed urgent transport improvement projects in the sectors: Roads, Air, Waterway Transport, and Railways.

For characterization of the existing situation the results have been used from the Site Surveys of selected (proposed) project areas (see Section 10.7).

Table 10.8 Road Sector: Adverse Environmental Impacts in Existing Situation and Expected Positive Impacts from Proposed Projects

Priority investment projects in the Road Sector	Adverse socio-economic environmental impacts in existing situation	Expected positive socio-economic environmental impacts after project implementation
R-16: Tarcin – Mostar Road Improvement (93 km): Tarcin – Konjic (25 km): additional lanes; minor re-alignment. Konjic – Jablanica (23 km): minor re-alignment; cross section improvements. Jablanica – Mostar (45 km): additional lanes, climbing lanes; minor re-alignment.	Bad condition of existing roads. Bottlenecks, causing unsafe traffic conditions, nuisance, and high vehicle operation costs. Traffic congestion, caused by through traffic. Poor accessibility.	Reduction of travel time and vehicle operation costs, increased economic development, securing good mobility on priority corridor, increased safety.
R-27(1), Corridor Vc: Vlakovo – Tarcin Road Improvement (16 km): New motorway; initially two lanes, ultimately four lanes.	Bad condition of existing roads, causing unsafe traffic conditions, nuisance, and high vehicle operation costs. Poor accessibility.	Reduction of travel time and vehicle operation costs, increased economic development, securing good mobility for major traffic direction, facilitating the urban function of the city by eliminating bypass function from existing road, increased safety.
Banja Luka – Doboj Road Improvement: Improvement and partly new construction of high way; two or three bypasses (each 2 to 5 km length).	Bad condition of existing road, causing unsafe traffic conditions, nuisance, and high vehicle operation costs. Poor accessibility of entity capital.	Reduction of travel time and vehicle operation costs, increased economic development, securing good accessibility to the entity capital, facilitating the urban function of the cities along the road, increased safety.
Heavily loaded road improvement: Brod-Seslija; Zenica-Maglaj Improvement of pavement structure	Bad condition of existing roads, causing unsafe traffic conditions, nuisance, and high vehicle operation costs. Poor mobility.	Reduction of travel time and vehicle operation costs, increased economic development, securing good mobility among primary centers/to industrial center, facilitating industrial functions, increased safety.
Road, railway, human resources development, inter-modality **Banja Luka Urban Transport Study** **Tuzla and Vicinity Urban Transport Study** **Mostar Urban Transport Study**	Poor infrastructure, causing unsafe traffic conditions, nuisance, and high vehicle operation costs. Poor mobility.	Securing good and safe urban transport. Facilitating urban functions. Stimulating economic activities.

Table 10.9 Air Sector: Adverse Environmental Impacts in Existing Situation and Expected Positive Impacts from Proposed Projects

Priority investment projects in the Air Sector	**Adverse socio-economic environmental impacts in existing situation**	**Expected positive socio-economic environmental impacts after project implementation**
Sarajevo Airport – improvement of safety and security		
Construction of runway strip. Construction of new perimeter fence. Widening/reconstruction of taxiways. Relocation of fuel farm. Relocation and reconstruction of fire fighting building, re-equipment of CFR. Installation of radar for terminal.	No optimal safety and security for passengers and aircraft.	Increased safety and security for air traffic Raising airline confidence.
Mostar Airport– improvement of safety and security		
Installation of MLS system or GPS. Construction of CFR building and re-equipment. Maintenance facilities and equipment.	Existing navigation equipment is not sufficient to meet safety standards. No optimal safety and security for passengers and aircraft.	Increased safety and security for air traffic. Raising airline confidence.
Tuzla Airport– improvement of safety and security		
Construction of concrete apron. Construction of cargo terminal. Installation of ILS system. Construction of CFR building and re-equipment. Maintenance facilities and equipment. Construction of new ATC tower and installation of equipment.	Too low operational capacity. Obstruction of international trade. Existing navigation equipment is not sufficient to meet safety standards. No optimal safety and security for passengers and aircraft.	Enhancing regional development. Attracting new airlines. Increased safety and security for air traffic. Raising airline confidence.
Banja Luka Airport– improvement of safety and security		
Construction of cargo building. Installation of new ILS system. Installation of new ATC equipment. Installation airfield lighting systems. CFR equipment.	Obstructed regional development. Not optimal safety and security for passengers and aircraft. Existing equipment is not sufficient to meet safety standards.	Enhancing regional development Increased safety and security for air traffic. Raising airline confidence.
Development of smaller aerodromes and feasibility study		
Identifying small airports for development. Identifying and implementing small airports needs	Obstruction of safe general aviation operations. Obstructed regional development	Ensuring safe general aviation operations. Stimulating regional development.
Training requirements		
Training of staff for air navigation, meteorology, & management of such. CFR training.	No optimal safety and security for passengers and aircraft. Skills not sufficient.	Increased safety and security for air traffic. Raising airline confidence

Table 10.10 Waterway Transport Sector: Adverse environmental Impacts in Existing Situation and Expected Positive Impacts from Proposed Projects

Priority investment projects in the Waterway Transport Sector	**Adverse socio-economic environmental impacts in existing situation**	**Expected positive socio-economic environmental impacts after project implementation**
Rehabilitation of the Sava River navigation channel		
De-mining river and riverbanks. Cleaning river and river banks of debris. Dredging of minimum navigation channel.	Unsafe situation for residents, workers, and navigation. Poor ecological condition. Public health risks.	Waterway transport become operational again. Increased safety for residents, workers, and navigation. Enhancing regional development. Enhancement of environmental condition of river and river banks.
Rehabilitation of the port of Brcko		
De-mining port area. Dredging port access. Reconstruction of vertical quay. Warehouse rehabilitation. New crane (5 tons). Road and rail rehabilitation.	Unsafe situation for residents, workers, and navigation. Lack of efficient port facilities.	Waterway transport become operational again. Increased safety for residents, workers, and navigation. Enhancing regional development.
Rehabilitation of the Port of Samac		
De-mining port area. Dredging port access. Reconstruction of quay. New crane (5 ton). New warehouse. Road and rail rehabilitation.	Unsafe situation for residents, workers, and navigation. Lack of efficient port facilities.	Waterway transport become operational again. Increased safety for residents, workers, and navigation. Enhancing regional development.

Table 10.11 Railways Sector: Adverse Environmental Impacts in Existing Situation and Expected Positive Impacts from Proposed Projects

Priority investment projects in the Railways Sector	**Adverse socio-economic environmental impacts in existing situation**	**Expected positive socio-economic environmental impacts after project implementation**
Reconstruction of signal and communication systems. Recovery of disconnected catenary system. Capacity improvement of catenary maintenance. Installation of track maintenance machines. Reconstruction of workshop facilities.	Safety risk for passengers. Bad condition of existing railways, causing slow and unsafe traffic conditions. Poor mobility.	Reduction of travel time and operation costs. Increased economic development. Increased safety. Raising confidence in the railway sector. Increasing mobility.

10.5.5 Screening of Potential Adverse Impacts

Activities and processes, related to transport development projects, may result in significant negative impacts to the environment. Major (significant) potential adverse environmental impacts are:

- adverse impacts on the social and cultural environment, including health risks from increased air pollution and noise.
- modifications of land forms and natural landscape; and
- adverse impacts on nature reserves or cultural reserves;

The potential significant environmental impacts from the proposed priority transport development projects are presented in Tables 10.12, 10.13, 10.14, and 10.15. In these tables the impacts have been differentiated in two main categories: impacts on the socio-economic environment and impacts on the physical-biological environment. Only potential realistic impacts are presented for the priority transport development projects.

For the proposed projects the tables do not suggest that all listed impacts will actually occur; merely they show which environmental impacts can be expected from the proposed activities.

The presented results are also based on visual inspection of the project areas (with potential environmental problems) by the environmental specialist of the JICA/PCI Study Team.

Table 10.12 Road Sector: Potential Significant Adverse Environmental Impacts from Proposed Projects

Priority investment projects in the Road Sector	Potential significant impacts on socio-economic environment	Potential significant impacts on physical/biological environment
R-16: Tarcin – Mostar Road Improvement (93 km): Tarcin – Konjic (25 km): additional lanes; minor re-alignment. Konjic – Jablanica (23 km): minor re-alignment; cross section improvements. Jablanica – Mostar (45 km): additional lanes, climbing lanes; minor re-alignment.	Loss of houses, property, public facilities, cultural sites. Impact on affected persons, households. Effects of increased air pollution and noise/ vibrations on health. Impact on health of workers.	Impact on ecologically fragile areas. Risks of contaminating drinking water sources and soil by spills of hazardous materials.
R-27(1), Corridor Vc: Vlakovo – Tarcin Road Improvement (16 km): New motorway; initially two lanes, ultimately four lanes.	Loss of land, houses, property, public facilities, historical and cultural sites. Fragmentation/split up of areas, especially split up of agricultural land. Impact on land use. Impact on affected persons, households. Effects of increased air pollution and noise/vibrations on the health of affected persons (public health). Risk of accidents (public health). Impact on aesthetics/modification of landscape. Encroachment (unplanned settlements and development of industries:), affecting land use and aesthetics.	Impact on ecologically fragile areas. Fragmentation/split up of areas, especially split up of agricultural land. Impact on land use. Increased air pollution Risks of contaminating drinking water sources and soil by spills of hazardous materials, caused by accidents.
Banja Luka - Doboj Road Improvement: Improvement and partly new construction of high way; two or three bypasses (each 2 to 5 km length).	**In case a new alignment is selected:** Loss of land, houses, property, public facilities, historical and cultural sites. Fragmentation/split up of areas, especially split up of agricultural land. Impact on land use. Impact on affected persons, households. Effects of increased air pollution and noise/vibrations on the health of affected persons (public health). Risk of accidents (public health). Impact on aesthetics/modification of landscape. Encroachment (unplanned settlements and development of industries:), affecting land use and aesthetics.	**In case a new alignment is selected:** Impact on ecologically fragile areas. Fragmentation/split up of areas, especially split up of agricultural land. Impact on land use. Increased air pollution Risks of contaminating drinking water sources and soil by spills of hazardous materials, caused by accidents.
Heavily loaded road improvement: Brod-Seslija; Zenica-Maglaj Improvement of pavement structure	Temporary impact on health of workers.	Risks of contaminating drinking water sources and soil by spills of hazardous materials.
Road, railway, human resources development, inter-modality **Banja Luka Urban Transport Study** **Tuzla and Vicinity Urban Transport Study** **Mostar Urban Transport Study**	No impact	No impact

Table 10.13 Air Sector: Potential Adverse Environmental Impacts from Proposed Projects

Priority investment projects in the Air Sector	Potential significant impacts on socio-economic environment	Potential significant impacts on physical/biological environment
Sarajevo Airport – improvement of safety and security		
Construction of runway strip. Construction of new perimeter fence. Widening/Reconstruction of taxiways. Relocation of fuel farm. Relocation and reconstruction of fire fighting building, re-equipment of CFR. Installation of radar for terminal.	Temporary impact on health of workers.	Impact on ecologically fragile areas. Risks of contaminating drinking water sources and soil by spills of hazardous materials, during construction phase.
Mostar Airport– improvement of safety and security		
Installation of MLS system or GPS. Construction of CFR building and re-equipment. Maintenance facilities and equipment.	Temporary impact on health of workers.	No impact.
Tuzla Airport– improvement of safety and security		
Construction of concrete apron· Construction of cargo building. Installation of ILS system. Construction of CFR building and re-equipment. Maintenance facilities and equipment. Construction of new ATC tower and installation of equipment.	Temporary impact on health of workers.	Risks of contaminating drinking water sources and soil by spills of hazardous materials, during construction phase.
Banja Luka Airport– improvement of safety and security		
Construction of cargo building. Installation of new ILS system. Installation of new ATC equipment. Installation of new airfield lighting systems. CFR equipment.	Temporary impact on health of workers.	Risks of contaminating drinking water sources and soil by spills of hazardous materials, during construction phase.
Development of smaller aerodromes and feasibility study		
Identifying small airports for development. Identifying and implementing small airports needs	No impact.	No impact.
Training requirements		
Training of staff for air navigation, meteorology, & management of such. CFR training.	No impact.	No impact.

Table 10.14 Waterway Transport Sector: Potential Adverse Environmental Impacts from Proposed Projects

Priority investment projects in the Waterway Transport Sector	Potential significant impacts on socio-economic environment	Potential significant impacts on physical/biological environment
Rehabilitation of the navigation channel on River Sava		
De-mining of river and riverbanks. Cleaning river and riverbanks of debris. Dredging of minimum navigation channel.	Health risk for workers.	Deposition of contaminated dredging spoils.
Brcko port improvements/ rehabilitation works		
De-mining port area. Dredging port access. Reconstruction of vertical quay. Warehouse rehabilitation. New crane (5 tons). Road and rail rehabilitation.	Health risk for workers.	Deposition of contaminated dredging spoils.
Rehabilitation of the Port of Samac		
De-mining port area. Dredging port access. Reconstruction of quay. New crane (5 ton). New warehouse. Road and rail rehabilitation.	Health risk for workers.	Deposition of contaminated dredging spoils.

Table 10.15 Railway Sector: Potential Adverse Environmental Impacts from Proposed Projects

Priority investment projects in the Railways Sector	Potential significant impacts on socio-economic environment	Potential significant impacts on physical/biological environment
Reconstruction of signal and communication systems. Recovery of disconnected catenary system. Capacity improvement of catenary maintenance. Installation of track maintenance machines. Reconstruction of workshop facilities.	Temporary impact on health of workers.	No impact.

10.6 RECOMMENDATIONS FOR FURTHER ENVIRONMENTAL STUDIES

All the proposed urgent (priority) projects in the road, air, waterway, and railway sectors, have been screened on the necessity for further environmental studies. Table 10.16 presents the outcome of the environmental screening of the priority transport improvement projects.

It has been indicated in Table 10.16 from which projects slight (mostly temporary) impacts are expected and from which projects significant (mostly long term) impacts are expected. A method of scoring has been used to weight the severity of the impacts.

Table 10.16 Environmental Screening of Proposed Priority Transport Improvement Projects, and Recommended Environmental Studies

PROPOSED TRANSPORT PRIORITY PROJECTS	Potential Negative Environmental Impact	Recommended Environmental Study/Action
ROAD IMPROVEMENT PROJECTS		
Tarcin – Mostar Road Improvement: R-16: Tarcin – Mostar Road Improvement: additional lanes; minor re-alignment, cross section improvements, climbing lanes.	XXX	**EIA** + Env.Man.Plan + Env.Mon.Plan
Vlakovo – Tarcin Road Improvement: R-27(1), Corridor Vc: Tarcin – Blazuj Road Improvement (16 km): new motorway.	XXX	**EIA** + Env.Man.Plan + Env.Mon.Plan
Banja Luka – Doboj Road Improvement: Improvement and partly new construction; two or three bypasses.	XXX	**EIA** + Env.Man.Plan + Env.Mon.Plan
Heavily loaded road improvement: Brod-Seslija; Zenica-Maglaj: Improvement of pavement structure	X	Env.Man.Plan+ Env.Mon.Plan *Limited*
Banja Luka Urban Transport Study Tuzla and Vicinity Urban Transport Study Mostar Urban Transport Study	Nil Nil Nil	None

(continues to the next page)

Table 10.16 Environmental Screening of Proposed Priority Transport Improvement Projects, and Recommended Environmental Studies (cont'd)

PROPOSED TRANSPORT PRIORITY PROJECTS	Potential Negative Environmental Impact	Recommended Environmental Study/Action
AIR SECTOR IMPROVEMENT PROJECTS		
Priority Investment Projects, Sarajevo Airport	X	Env.Man.Plan+Env.Mon.Plan *Limited*
Priority Investment Projects, Mostar Airport	X	Env.Man.Plan+Env.Mon.Plan *Limited*
Priority Investment Projects, Tuzla Airport	X	Env.Man.Plan+Env.Mon.Plan *Limited*
Priority Investment Projects, Banja Luka Airport	X	Env.Man.Plan+Env.Mon.Plan *Limited*
Development of smaller aerodromes and feasibility study	Nil	None
Training requirements	Nil	None
WATERWAY TRANSPORT IMPROVEMENT PROJECTS		
Rehabilitation of the Sava River navigation channel.	XX	Env.Man.Plan+Env.Mon.Plan *Safety risk; dredge spoils*
Rehabilitation of the port of Brcko.	XX	Env.Man.Plan+Env.Mon.Plan *Safety risk; dredge spoils*
Rehabilitation of the Port of Samac.	XX	Env.Man.Plan+Env.Mon.Plan *Safety risk; dredge spoils*
RAILWAY IMPROVEMENT PROJECTS		
Reconstruction of signal and communication systems.	Nil	None, normal safety precautions
Recovery of disconnected catenary system.	Nil	None, normal safety precautions
Capacity improvement of catenary maintenance.	Nil	None, normal safety precautions
Installation of track maintenance machineries.	Nil	None, normal safety precautions,
Reconstruction of workshop facilities.	Nil	None, normal safety precautions,

Notes:

- XXX: negative impacts expected to be significant (long term impact)
- XX: negative impacts expected to be moderate
- X: negative impacts expected to be slight (temporary impact)
- Nil: no significant impact expected
- EIA: Environmental Impact Assessment
- Env.Man.Plan: Environmental Management Plan*
- Env.Mon.Plan: Environmental Monitoring Plan

* Environmental Management Plans should include resettlement plans if people have to be moved from their homes.

Two proposed major road projects might have significant environmental impacts. Consequently, EIA's are required for these priority transport improvement projects.

i) The projects which require a full EIA are:

- Mostar-Blazuj Road Improvement Project:
  - Mostar-Tarcin Sub-Project;
  - Tarcin-Blazuj Sub-Project;
- Banja Luka-Doboj Road Improvement Project.

ii) The projects which require Environmental Management and Environmental Monitoring Plans are:

- Rehabilitation of the Sava River navigation channel;
- Rehabilitation of the port of Brcko;
- Rehabilitation of the Port of Samac.

iii) The projects which require *limited* Environmental Management and Environmental Monitoring Plans are:

- Priority Investment Projects, Sarajevo Airport;
- Priority Investment Projects, Mostar Airport;
- Priority Investment Projects, Tuzla Airport;
- Priority Investment Projects, Banja Luka Airport.

To present in more detail the potential impacts from major road projects, the project activities have been presented, together with the environmental impacts expected from these activities (Table 10.17).

In Table 10.17 a differentiation was made for the various implementation phases of road improvement projects:

- the Pre-Construction Phase/Design Phase;
- the Construction Phase;
- Post-Construction Phase /Operation and Maintenance Phase.

Not all recommended environmental activities need to have the same scope; an EIA for one type of project might need to be more extensive than for another type of project. The same applies for recommended Environmental Management and Monitoring Plans as well as for Operation and Maintenance Plans.

Table 10.17 Potential Adverse Impacts from Major Road Projects

PROJECT ACTIVITIES	POTENTIAL ADVERSE IMPACTS ***Socio-economic and physical/biological aspects***
Pre-construction Phase Survey and site investigations Land acquisition: area to be acquired for the "right of way", for borrow pits and quarries Resettlement Compensation Re-employment.	**Pre-construction Phase** Community anxieties Loss of land, houses, property, public facilities, historical and cultural sites Fragmentation/split up of areas Impact on: affected persons, households, land use, aesthetics
Construction Phase 1 Mobilization of workforce 2 Basecamp establishment and operation 3 Quarry establishment and operation 4 Land clearance 5 Earthworks/embankment fill: - excavation, borrow pit establishment & operation - haulage of embankment fill (and construction) material - embankment spreading, leveling - compaction of embankment - shaping, finishing of embankment 6 Grade separation: - interchange construction - construction of over and underpasses 7 Bridge/tunnel construction: - excavation works - foundation works - construction of piers - construction of beams - erection of beams and casting deck slabs 8 Drainage structures and related construction 9 Pavement 10 Miscellaneous works: sign posting, road lighting, road marking, km posting, traffic control, noise reduction barriers etc.	**Construction Phase** 1. Alien labor force: community anxieties, conflicts with local culture 2. Interference with local people/disturbance of local culture, disposal of waste, waste spills (oil) 3. Air pollution, spills of waste, vibrations, noise, traffic congestion, impairment of aesthetics, damage to existing roads, safety risks for workers 4. Impact on ecologically fragile areas, loss/disturbance of flora and fauna, disturbance on public utilities, effect on graveyards and cultural/ historical sites 5, 6, 7, 8. Interruption of water flows, erosion/sedimentation, change in groundwater level, air pollution, spills of waste, vibrations, noise, safety risks for workers, damage to existing roads, traffic congestion, disposal of earth material/spoils, impact on aesthetics 9. Impact of asphalt plants: air pollution, risk of spills 10. Minor impact
Operation & Maintenance Phase Maintenance and repairs of pavement Maintenance and repairs of rest areas Maintenance and repairs of signposts, road lights etc. Cleaning up of road debris Maintenance of planted trees, grass and berms	**Operation & Maintenance Phase** Long-term effects of increased air pollution and noise/vibrations on the health of affected persons (public health). Risk of accidents (public health). Long term effect on communities, split up by the roads, and disruption of traditional modes of transport and communication. Long term effect of split up of agricultural land. Long-term impact on aesthetics/modification of landscape. Encroachment (non-planned activities: unplanned settlements, unplanned development of industries:), affecting land use and aesthetics. Increase of land prices, pushing lower income residents out. Long-term impact on ecologically fragile areas. Long-term effect of increased air pollution on flora. Long term effect of increased air pollution and noise on fauna. Highway runoff pollution Risks of contaminating drinking water sources and soil by spills of hazardous materials, caused by accidents. Long term interruption of water flows and drainage.

10.7 SITE SURVEYS FOR PRIORITY ROAD IMPROVEMENT PROJECTS REQUIRING AN ENVIRONMENTAL IMPACT ASSESSMENT (EIA)

10.7.1 Introduction

It is expected that two major priority road projects (Section 10.6) would result in significant environmental impacts on the physical/biological as well as on the socio-economic environment. The project areas of these proposed transport improvement projects have been selected for environmental site surveys. The Site Surveys have been carried out for:

In the Republika Srpska:

- **Banja Luka – Doboj Road Improvement Project**

The survey was carried out from 20 November-8 December 2000, by the Institute of Urbanism in Banja Luka.

In the Federation of Bosnia and Herzegovina:

- **Vlakovo – Mostar Road Improvement Project**

Vlakovo – Tarcin Road Improvement (new motorway, 16 km) and Tarcin – Mostar Road Improvement (93 km). The survey was carried out from 29 November-15 December 2000, by CETEOR (Centre for Economy, Environmental and Technological Development, Sarajevo).

The Site Surveys have resulted in concise descriptions of the project sites, relating to the natural (physical/biological) and socio-economic environmental conditions. The characteristics of the areas have served as a basis for the formulation of expected impacts of the proposed projects. Also the site descriptions provide a picture of the existing situation, which can be regarded as the “zero” situation.

The results of the Site Surveys have been used for environmental screening and for scoping. In this way, the significant environmental items to be studied in the proposed Environmental Impact Assessments could be defined.

The following activities have been carried out for the Site Surveys:

- Traveling to the selected project areas.
- Visual inspection of the project areas.
- Taking photographs of the project areas.
- Description of the items mentioned on the “Checklist for Site Survey” (see Appendix 10.1).

- Relevant available data from town community offices will be used.
- Investigate the situation concerning possibly affected residents.
- Prepare a concise report on the basis of the "Checklist for Site Survey."

Concerning the identified "medium-urgent" Klasnica-Gradiska motorway project, it appeared that a full Environmental Impact Assessment had already been prepared by the Institute of Urbanism in Banja Luka.

The environmental condition of the concerning project areas was inspected by the environmentalist in the JICA/ PCI Project Team.

10.7.2 Site Surveys

(1) Site Survey for Banja Luka – Doboj Road Improvement Project

The Institute of Urbanism in Banja Luka has investigated in their study not one alignment, but three alignments, indicated with Corridors K1, K2, and K3. Corridor K1, the alignment Banja Luka (Klasnice)- Prnjavor-Kulasi-Dobj, was the official project area selected by the JICA Study Team to be investigated. The data related to the other corridors are very valuable, especially at further stages of the road projects. However, at this stage in the Transportation Master Plan, only the relevant data related to the selected Corridor K1 will be briefly discussed. For the complete set of data provided, and the related discussions on the found data, is referred to the Site Survey Report prepared by the Institute of Urbanism (reference 4).

The following **environmental impacts** have been brought forward by the Institute of Urbanism as potentially **significant**. Most of the impacts will have long-term effects; some of them will have a moderate to long-term impact (this information has been used for the environmental screening and scoping processes in current report):

- Impact from noise (at several places the allowable levels have already been exceeded);
- Air Pollution (present air pollution already reaches at several places allowable limits; at some sites there is a cumulative effect, caused by mining activities);
- Groundwater and surface water pollution (precaution measures; risk of spills);
- Soil degradation (related to erosion and stability; precaution measures);
- Degradation of flora and fauna (relation to borrow sites; increased accessibility of area/increase of human activities; protected and partially protected natural areas; forest park in wider zone; fire risk);
- Visual pollution/adverse impact on aesthetics (at some areas detailed surveys necessary);

- Socio-economic impacts (compensation; at some areas a fall of economic activities is expected; positive impact: increased economic potential); and
- Risk of accidents (inadequate protection measures; inadequate performance of work; spills of hazardous materials, related to pollution of groundwater, surface water, and soil).

The conclusion made in the Site Survey Report that the Corridor K-K' (Banja Luka-Klasnice-Prnjavor-Johavac) would be the optimal alignment between the cities Banja Luka and Doboj, is regarded by the JICA Study Team as too early. A full Environmental Impact Assessment of several alternative alignments would be required for such a definite statement.

(2) Site Survey for Vlakovo – Mostar Road Improvement Project

The Center for Economy, Environmental and Technological Development, Sarajevo, has investigated the road alignment Vlakovo-Tarcin. The focus of the Site Survey was on the section Vlakovo-Tarcin, because there a new motorway is proposed. The section Tarcin-Mostar was described more globally, since for this section mainly road improvement activities have been advised.

At the stage of Initial Environmental Examination in the Transportation Master Plan Study, only the major relevant data, related to the selected alignment, will be briefly discussed. For the complete set of data, which will be valuable in the next stage of the road project, is referred to the Site Survey Report prepared by CETEOR (reference 5).

The information provided by CETEOR has been used for the environmental screening and scoping processes in current report. The following **environmental impacts** from the proposed road have been identified by CETEOR as potentially **significant** (most of them with a probable long-term impact and some of them with a moderate to long-term impact)**:**

1) R-16: Tarcin – Mostar Road Improvement (additional lanes; minor re-alignment, cross section improvements, climbing lanes):

- Noise (in urban areas complains about noise and vibrations; cumulative effect expected);
- Air pollution (allowable limits reached; cumulative effect expected);
- Health/ car accidents (risk for pedestrians);
- Socio-economic impacts (demolishing of houses; removal of graveyards, mosque(s); resettlement; compensation; loss of arable land);
- Groundwater and surface water pollution (risk of spills; polluted run off water from road);

- Soil degradation (related to erosion and stability; depending on area);
- Impact on flora and fauna (two officially protected nature reserves in vicinity {areas of Vrtaljice and Prenj}; specific eco-systems; endangered species);
- Visual pollution/impact on aesthetics;
- Risk of accidents (spills of hazardous materials, related to pollution of groundwater, surface water, and soil).

The opinion about the project is divers and split into positive and negative attitudes. Part of the population is willing to sell their property and get compensated financially.

After visual inspection of the project area, the JICA Team environmental expert would propose additionally several bypasses around major towns.

2) **R-27(1): Vlakovo – Tarcin Road Improvement** (16 km), Corridor Vc (new motorway)

- Degradation of flora (part of the project area: large diversity of especially primary vegetation, endangered species; forest, complex and delicate eco-systems);
- Degradation of fauna (large variety of species, mammals {bears, boars}, birds, reptiles, amphibious; fragile complex associations; migration of animals);
- Adverse impact on landscape/aesthetics;
- Change of groundwater regime (blocking of water flow by road construction);
- Adverse impact on hydrological situation/rivers (abundant clean rivers and streams in the area);
- Erosion/ soil degradation/ instability/ land slides (22% of examined area severely exposed to erosion, 62% medium exposed, 17% slightly exposed);
- Fragmentation/split up of land;
- Groundwater and surface water pollution (risk of spills);
- Risk of accidents (spills of hazardous materials, related to pollution of groundwater, surface water, and soil).
- Socio-economic impacts (demolishing of houses and some cultural establishments; resettlement; compensation; loss of jobs; loss of arable land);
- Air Pollution;
- Noise.

The study team got the indication during the survey that the local population in the highlands supports the project, because they have the opinion to benefit economically from the proposed road (project). The population in the plains and valleys is split in their opinion. Part of the population has the opinion that they will not benefit from a new road.

10.8 SCOPING

Using the identified potential adverse environmental impacts (Sections 10.5 and 10.6) and the results from the Site Surveys, the significant environmental impacts **expected** to result from the proposed road projects (which require an EIA) could be formulated. The results of this scoping process are presented in Table 10.18. The expected adverse environmental impacts are the identified items to be studied in the Environmental Impact Assessments. Also in Table 10.18 a differentiation was made in the various implementation phases of road improvement projects.

Table 10.18 Expected Adverse Environmental Impacts from Road Improvement Projects in BiH

PROJECT ACTIVITIES	EXPECTED ADVERSE IMPACTS *Socio-economic and physical/biological aspects*
Pre-construction Phase Survey and site investigations Land acquisition: area to be acquired for the "right of way", for borrow pits and quarries Resettlement Compensation Re-employment.	**Pre-construction Phase** Loss of land, houses, property, public facilities, historical and cultural sites Fragmentation/split up of areas Impact on: affected persons, households, land use, aesthetics
Construction Phase 1. Base camp establishment and operation 2. Quarry establishment and operation 3. Land clearance 4. Earthworks/embankment fill: - excavation, borrow pit establishment & operation - haulage of embankment fill (and construction) material - embankment spreading, leveling - compaction of embankment - shaping, finishing of embankment 5. Grade separation: - interchange construction - construction of over and underpasses 6. Bridge/tunnel construction: - excavation works - foundation works - construction of piers - construction of beams - erection of beams and casting deck slabs 7. Drainage structures and related construction 8. Pavement 9. Sign posting, road lighting, road marking, km posting, traffic control, noise reduction barriers etc.	**Construction Phase** 1. Disposal of waste, waste spills (oil) 2. Air pollution, spills of waste, vibrations, noise, traffic congestion, impairment of aesthetics, damage to existing roads, safety risks for workers 3. Impact on ecologically fragile areas, loss/disturbance of flora and fauna, disturbance on public utilities, effect on graveyards and cultural/ historical sites 4, 5, 6, 7. Interruption of water flows, erosion/sedimentation, change in groundwater level, air pollution, spills of waste, vibrations, noise, safety risks for workers, damage to existing roads, traffic congestion, disposal of earth material/spoils, impact on aesthetics 8. Impact of asphalt plants: air pollution, risk of spills 9. Minor impact
Operation & Maintenance Phase Maintenance and repairs of pavement Maintenance and repairs of rest areas Maintenance and repairs of signposts, road lights etc. Cleaning up of road debris Maintenance of planted trees, grass and berms	**Operation & Maintenance Phase** Long-term effects of increased air pollution and noise/vibrations on the health of affected persons (public health). Risk of accidents (public health). Long term effect on communities, split up by the roads. Long term effect of split up of agricultural land. Long-term impact on aesthetics/modification of landscape. Encroachment (non-planned activities: unplanned settlements, unplanned development of industries:), affecting land use and aesthetics. Increase of land prices, pushing lower income residents out. Long-term impact on ecologically fragile areas. Long-term effect of increased air pollution on flora. Long-term effect of increased air pollution and noise on fauna. Obstruction of migrating animals. Highway runoff pollution Risks of contaminating drinking water sources and soil by spills of hazardous materials, caused by accidents. Long-term interruption of water flows and drainage.

10.9 MITIGATION MEASURES

The overall effect of the proposed Transport Improvement Projects on the region is expected to be positive and should result in progressing economic development.

Several negative impacts can be avoided or minimized when appropriate mitigation measures are incorporated in the Design, the Construction, and the Operation & Maintenance Phases of a project.

It is emphasized that especially during the Pre-Construction/Design Phase as many mitigation measures as possible should be incorporated to minimize adverse environmental impacts in the next project phases.

Table 10.19 presents the adverse environmental impacts (which are expected during the Pre-Construction, the Construction and the Operation & Maintenance Phases of the proposed road improvement projects) with an indication of possible mitigation measures to minimize the negative impacts.

Table 10.19 Indication of Mitigation Measures for Road Improvement Projects

EXPECTED ADVERSE IMPACTS ***Socio-economic and physical/biological aspects***	**MITIGATION MEASURES**
Pre-construction Phase Community anxieties Loss of land, houses, property, public facilities, historical and cultural sites Fragmentation/split up of areas Impact on: affected persons, households, land use, aesthetics	**Pre-construction Phase** Providing sufficient information. Proper selection of alignment and sites, including quarries and borrow pits. Proper design of roads, underpasses, bridges, animal migration bypasses, sound barriers; landscaping, planting trees and shrubs. Preparation and execution of Environmental Management and Monitoring Plans, Transport Management Plan. Resettlement, compensation for lost land, accommodation, public facilities, property, and jobs (re-employment).
Construction Phase 1. Interference with local people/disturbance of local culture, disposal of waste, waste spills (oil) 2. Air pollution, spills of waste, vibrations, noise, traffic congestion, impairment of aesthetics, damage to existing roads, safety risks for workers 3. Impact on ecologically fragile areas, loss/disturbance of flora and fauna, disturbance on public utilities, effect on graveyards and cultural/ historical sites 4, 5, 6, 7. Interruption of water flows, erosion/sedimentation, change in groundwater level, air pollution, spills of waste, vibrations, noise, safety risks for workers, damage to existing roads, traffic congestion, disposal of earth material/spoils, impact on aesthetics 8. Impact of asphalt plants: air pollution, risk of spills 9. Minor impact	**Construction Phase** Proper Environmental Management and Monitoring during all works/execution of Transport Management Plan Construction of bridges/ underpasses/ migration routes for animals, sound barriers Safety precautions Planting of trees, landscaping, re-establishing situation Enforcement of laws and planning
Operation & Maintenance Phase Long-term effects of increased air pollution and noise/vibrations on the health of affected persons (public health). Risk of accidents (public health). Long term effect on communities, split up by the roads, and disruption of traditional modes of transport and communication. Long term effect of split up of agricultural land. Long-term impact on aesthetics/modification of landscape. Encroachment (non-planned activities: unplanned settlements, unplanned development of industries:), affecting land use and aesthetics. Increase of land prices, pushing lower income residents out. Long-term impact on ecologically fragile areas. Long-term effect of increased air pollution on flora. Long term effect of increased air pollution and noise on fauna. Obstruction of migrating animals. Highway runoff pollution Risks of contaminating drinking water sources and soil by spills of hazardous materials, caused by accidents. Long term interruption of water flows and drainage.	**Operation & Maintenance Phase** Bridges and underpasses Sound barriers Settling ponds for runoff Landscaping, trees, plantations Routes for migrating animals Proper Operation & Maintenance and repairs Proper Environmental Management and Monitoring Safety precautions Zoning Use of unleaded fuel Noise and engine control Strict enforcement of laws and planning Development of social housing schemes

10.10 CONCLUSIONS AND RECOMMENDATIONS

In the Transport Master Plan for Bosnia and Herzegovina, road, airport, waterway transport, and railway improvement projects have been proposed. In the process of the Initial Environmental Examination the proposed priority projects have been screened for their potential adverse and positive environmental impacts, scoping has been carried out, and recommendations have been made for further environmental studies.

The result of the Initial Environmental Examination **(IEE)** is as follows:

Environmental Impact Assessments (EIA), Environmental Management Plans (including Resettlement Plans) and Environmental Monitoring Plans are required for:

- The Banja Luka – Doboj Road Improvement Project;
- The Vlakovo – Mostar Road Improvement Project, with Sub-Projects:
  - Tarcin-Mostar Road Improvement Sub-Project;
  - Vlakovo-Tarcin Road Improvement Sub-Project.

Environmental Management + Environmental Monitoring Plans are required for:

- Rehabilitation of the Sava River navigation channel;
- Rehabilitation of the Sava River navigation channel;
- Rehabilitation of the Port of Samac;

Limited Environmental Management + Environmental Monitoring Plans are required for:

- Priority Investment Projects, Sarajevo Airport;
- Priority Investment Projects, Mostar Airport;
- Priority Investment Projects, Tuzla Airport;
- Priority Investment Projects, Banja Luka Airport.

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