7.3.5 Rail Freight Transport in the United States

(1) Rail Freight Transport Industry De-Regulation

In the United States, the Staggers' Rail Act of 1980 promoted de-regulation of the old-fashioned freight railway industry. Before the de-regulation, the railway industry had long been controlled by the Interstate Commerce Committee (ICC). Freight rates needed to be filed to the ICC after the discussion among the relevant railway companies, which didn't allow each railway company to set its own tariff at its discretion. Besides, the ICC's approval was necessary to dispose of/sell off any inefficient lines or to merge with/acquire other railway companies. What is worse, the approval process needed a lot of time and costs, thereby further deteriorating the railway company's financial conditions. However, after the act was executed, railway companies have been allowed to compete rather freely with other railway companies and other mode of transport by setting their own freight rates at their discretion and developing their own ways of marketing. They have been also given more freedom in disposal of their assets or M&A with other railway companies, thought still needed to be approved by the ICC. As a result, a lot of innovations occurred not only within the industry but also involving other mode of transport, M&A was repeated among big railway companies thus bringing in the more efficient operations and management, and then the freight railway industry was totally modernized. A good example of the innovation is the invention of Double-Stack Train (DST) and initiative in combined transport involving shipping companies and trucking companies by taking advantage of the innovation. Its details are stated separately later.

As for M&A, there are many examples. Since 1980 major railway companies' M&A gave berth to 7 majors ones: Burlington-Northern (BN), Santa-Fe (SF), Union Pacific (UP), Southern Pacific (SP), Conrail (CR), CSX, Norfolk-Southern (NS). This movement seems to climax nowadays. BN and SF merged to be Burlington-Northern-Santa-Fe (BNSF) in 1995. UP and SP merged to be Union Pacific (new UP) in 1996. At present, a merger between CR and CSX is negotiated. In fact, railway industry has become more and more concentrated and now consists of fewer larger scale companies in order to keep its competitiveness in the freight transport. As a result of these M&A, their operations and management have been further rationalized and improved.

What are the major changes? (i) restructuring in marketing function such as abolishment of conventional sales and pricing functions, product-wise integration between marketing and operation functions, selective customer relations and pricing, contract sales and establishment of new Intermodal Market Company (IMC) or outsourcing to the third party IMC, (ii) restructuring in operation such as centralized control of train operations by computerized

systems, reduction of staff involved in train operation, construction of new terminals and re-modernization and extension of existing terminals in order to be fitted to intermodal operations involving shipping companies and trucking companies, (iii) rationalization and re-training in human resources (iv) pricing, costing, investment decision making based on the highly computerized accounting systems. Consequently, many American rail companies have become more profitable than before. However, the ICC was abolished in December 1995, and further de-regulation and freer competition will be promoted, thereby making railway companies' competition within the industry and with other transport mode much severer.

(2) Combined Transport in the United States

As mentioned above, such an innovation as DST occurred in the American railway industry in a manner to involve other mode of transport. Before that, Trailer on Flatcar (TOFC) and Container on Flatcar (COFC), or Piggy Back, were major combined transport forms, which could not compete successfully with trucks. In fact, combined transport has been accelerated by the Staggers' Rail Act of 1980. The combined transport in the United States nowadays has three elements from the railway point of view: (i) combination with shipping companies, (ii) use of IMC, and (iii) direct combination with trucking companies.

With the start of DST, major shipping companies servicing Asia-Pacific/North America lines made long-term contracts with the American railway companies to run DST shuttle trains from the Pacific coast to the inland customers exclusively for transporting the shipping companies' container cargoes. The shipping companies needed to tie-up with the railway companies in order to provide a "door to door," "day and time fixed weekly service" for their customers such as car manufacturers committed to "Just-In-Time" production. CSX's acquisition of Sealand, one of the world biggest shipping companies, is a good example of a reflection of how much efficient rail-sea connection is required in combined transport.

In the next stage, the railway companies and shipping companies began to establish IMCs, or forwarding companies to connect their own services with one or more other transport modes thus providing more flexible and fine-tuned services required by the customers. Apart from that, many independent IMCs appeared to make businesses by buying, connecting, and selling customers a variety of newly formed intermodal transportation services.

The recent trend in combined transport in the United States is the direct strategic alliance between large railway companies and large trucking companies. It started with a decision of J.B. Hunt, the second largest trucking company in the US, to ally with SF. One year after that, Schneider, the No.1 trucking company in the US, tied-up with SP.

7.3.6 Rail Freight Transport in Japan

(1) JR Freight

JR Freight (JRF) was born as the only freight transport railway company derived from the former Japan National Railways (JNR) when JNR was privatized in April 1987. In JNR, revenue from freight transport was very low. In 1987, just after the privatization, the JRF's revenue is 4.76% of the total combined revenue of all ex-JNR companies. This is because most of the inland freight transport in Japan (about 98%) is performed by trucks, and the rest (only about 2%) by railways, while a considerable portion of inland passenger traffic (about 30%) is performed by railways.

Since JRF is not a major user of rails, or rather marginal existence in that sense, rails as assets belong to each regional passenger JR companies. In other words, JRF pays rent of rails to other JR companies. The rent is calculated based on the avoidable costs as follows: Rent = (i) Rail usage charge + (ii) Electric facilities usage charge + (iii) Incentive, where Rail usage charge = Variable rail maintenance costs attributable to JRF, and Electric facilities usage charge = Variable electric facilities maintenance costs attributable to JRF, and Incentive = 1% of the total of the two. Shortly, rail and electric facilities' capital costs are not included. The rent accounts for about 10% of the JRF's annual revenue.

JRF's freight is divided into two categories: (i) container-load cargoes (carried in the JRF's special containers much smaller than the ocean containers) and (ii) wagon-load cargoes. The customers of the container-load cargoes are offered the "door to door" transport of their cargoes. In other words, JRF's contracted trucking companies or forwarders perform cargo collection and delivery and JRF performs rail transport from the origin terminals/depots to the destination terminals/depots respectively. The contracted trucking companies or forwarders collect "door to door" freight charge from the customers and pay JRF the rail transport portion based on the freight tariff mutually agreed. On the other hand, the wagon-load cargoes, mainly bulk cargoes such as petroleum, cement, and limestone (these three commodities combined occupy 65% of wagon-load cargoes), are only transported by rail, or shippers and consignees are responsible for carrying their cargoes to/from the JRF's freight terminals/depots. Container-load cargoes have been moderately increasing after the birth of JRF, while wagon-load cargoes have been decreasing. The volume of the container-load cargoes in 1995 was 20.6 million tons, while that of the wagon-load cargoes was 31.5 million tons. The revenue from the container-load cargoes in 1995 was 120.2 billion Yen (about US$ 1 billion), while that from the wagon-load cargoes was 50.9 billion Yen (about US$ 424 million). Therefore, the revenue/tons of the container-load cargoes, US$ 48.5, is more than three times that of the wagon-load

cargoes, US$ 13.5.

The major problem of JRF is that container-load cargoes' growth is declining because of their inability to flexibly cope with the a variety of customers needs depending on the cargoes' volume, value, transport distance, maximum transit time allowed, purpose of usage, etc., which is mainly caused by their inflexible pricing (tariff structure) and marketing policy. This has caused the JRF's operational losses these days.

(2) Combined Transport in Japan

Combined transport in Japan is focused on the door to door JRF specific container (much smaller than ocean container) transport by featuring the contracted trucking companies' cargo pick-up/delivery service. Besides, JRF specific piggy back is also operated. However, rail-sea combined transport has not been fully developed, because most Japanese leading industries are concentrated in the coastal regions and the import of raw material and the export of their products have been made directly through ports by ocean shipping companies. Therefore, strategic area of transport on which JFR should concentrate from now on is the combined transport connecting the JRF's direct shuttle train between the hubs with other mode of transport such as middle-long distance trucks and coastal shipping.

7.3.7 BDZ's Future Freight Marketing and Combined Transport Strategy

(1) BDZ's Future Freight Market Analysis

BDZ's freight types can be roughly divided into four categories from the marketing point of view: (i) purely domestic cargo, (ii) domestic cargo, but the one transported from/to the inland origin to/from the ports, and mostly ex/imported by sea (it can be called "domestic port cargo"), (iii) international cargo (the one ex/imported mainly by rail), and (iv) combined transport cargo. So far, (iv) is a sub-category of (iii) as combined transport, mostly international, is not yet in full bloom in Bulgaria. Table 4.6.2 in Chapter 4.6 of the Progress Report shows the volume/revenue distribution of freight. According to the table, purely domestic cargo occupies 61.7% in volume, but only 32.6% in revenue (thus the yield 1.89 Leva per ton/km is low). Domestic port cargo occupies 29.4% in volume, and 48.5% in revenue, and the yield 3.34 Leva per ton/km is relatively high. International cargo occupies only 8.9% in volume, but 18.9% in revenue, giving the highest yield of 5.31 Leva per ton/km. In case of combined transported, as it is not officially separated from international cargo, there is no information on that. We can imagine that the yields of both international container cargo and international piggy back cargo are high enough, though the margin of international piggy back after subtracting unit cost will be rather low at this moment due to the huge amount of initial costs and other constraints.

Purely domestic cargo excluding bulk cargo is faced with a competition with trucks, and thus the freight rate cannot be easily raised. Its freight rates are in Leva, and thus the revenue is vulnerable to the influence from the inflation in Bulgaria. Besides, the growth potential is low. Rail has an advantage in domestic port cargo since it is transported in a rather long distance. Particularly the container cargo ex/imported from/to the ports has a growth potential in the future, if assembly type industry is fully developed in Bulgaria. Since its freight rates are in Swiss Franc, its revenue is inflation-protected. International cargo including combined transport cargo either shows the highest yield or has a growth potential. Its freight rates are also in Swiss Franc, and the revenue is inflation-protected.

Based on the above marketing analysis, BDZ's freight market cycle and structure is summarized as in Figure 7.3.7. Therefore, BDZ's possible future marketing strategy will be as follows. BDZ should leave the purely domestic cargo as it is with only a maintenance investment, obtain a stable and large amount of revenue from domestic port cargo, dramatically expand the operation of international cargo with an aggressive investment, and take an R&D focused strategy for combined transport with a selective investment.

In order to implement the above strategy, organizational changes are needed in the BDZ's

present sale and marketing functions, as well as the operational functions. Key word here is "customer-oriented." Divisions and organizations must be re-organized in a cross-functional, cross-regional, and international way so that quicker, safer, more flexible, and reasonably-priced transportation services can be provided for the customers.

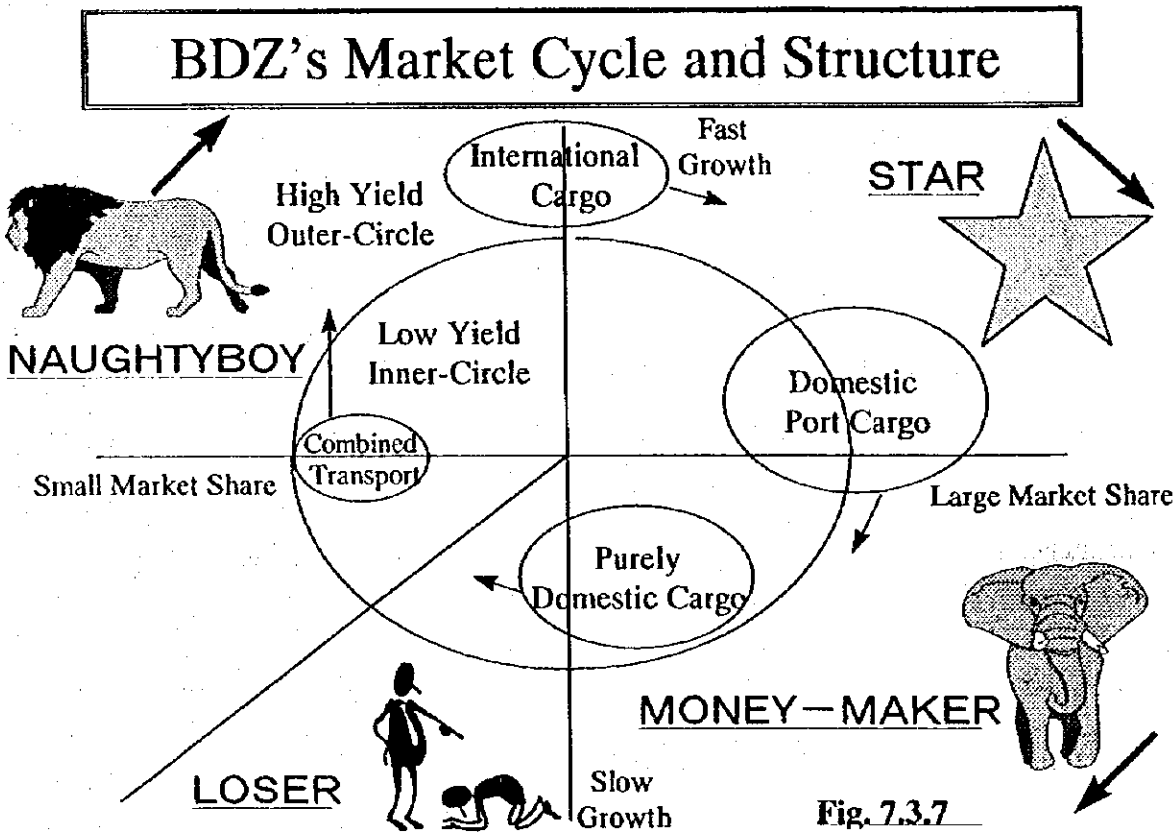


Fig. 7.3.7

(2) BDZ's Future Combined Transport Strategy

1) Strategic Direction from the Marketing Point of View

Based on the discussion in the above market analysis section, BDZ's possible future strategic alternatives relating to the combined transport can be summarized as follows (See Figure 7.3.8).

- International cooperation with other European railway companies and forwarding companies and establishment of international sales and marketing network.
- Strategic intermodal alliance with trucking companies, shipping companies, and warehousing companies, either Bulgarian or foreign, to provide customers with value-added services (In particular, alliance with shipping companies is important.).

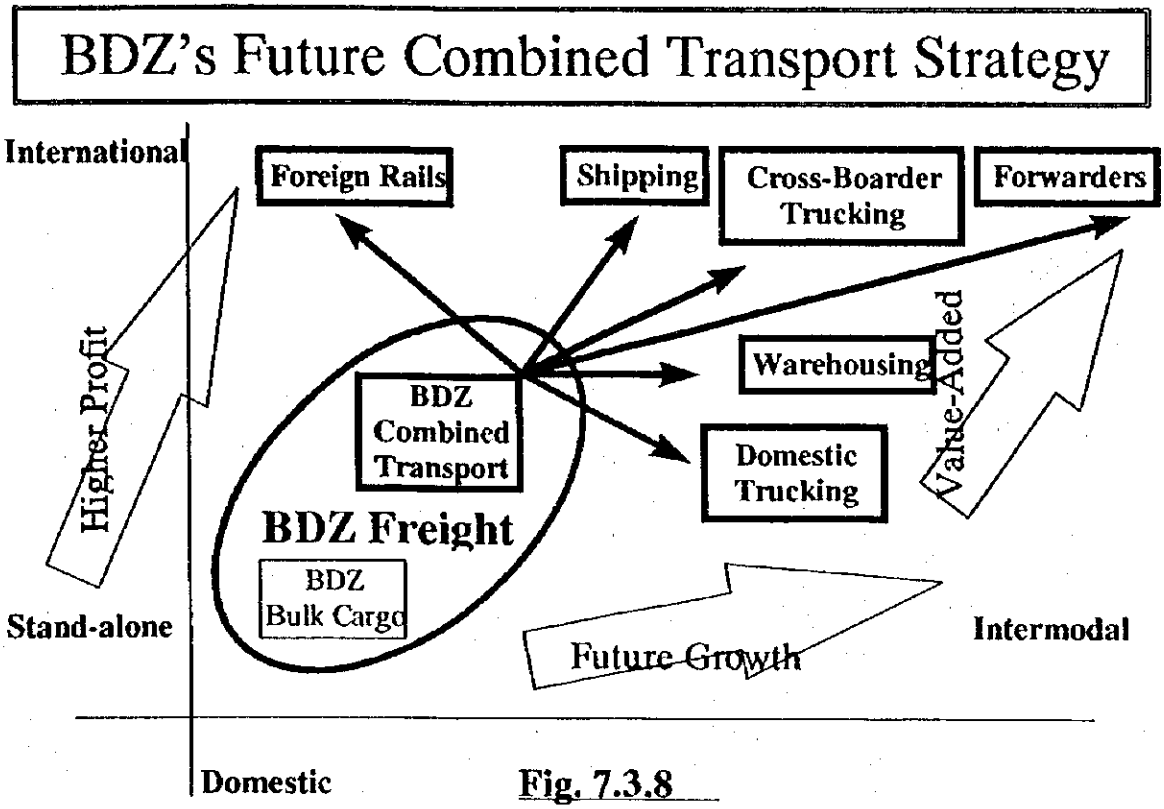


Fig. 7.3.8

2) Conditions to Affect Combined Transport in Bulgaria

Apart from the purely marketing strategy, the present EU traffic and environment policies and the future Bulgarian national road transport and environment policies will be of significant importance as conditions to affect combined transport strategy in Bulgaria.

The following items of regulations relating to road traffic and environment will be elements of the above-mentioned policies: maximum weight for vehicles, exemption for 44 tons for vehicles used in terminal pick-up and delivery, vehicle tax in Ecus per year for a 44 tons road vehicle, total or partial tax exemption for vehicles used in combined transport, diesel fuel taxation in road transport in Ecus per liter, restriction of road transport operation on Sunday, holidays, weekends and vacation periods, exemption for intermodal operations from these road restrictions, subsidies for investments for combined transport, etc.

3) Future Formation of Combined Transport Services in Bulgaria

From the above discussions, we can summarize that the following will be the conditions to regulate future combined transport in Bulgaria.

(i) The national road transport policies or regulations in line with the environment protection and in favor of the environment-friendly railway transport

(ii) Strategic cooperation with foreign railways and combined transport-related companies

(iii) Establishment of a new Bulgarian combined transport company or re-organization of the existing one, either of which is to be reinforced by market/customers-oriented management expertise and organizational structure in line with the overall re-organization of BDZ's freight marketing-related divisions

(iv) New investment into combined transport-related infrastructure and equipment or rehabilitation of the existing ones based on the financing from international financial institutions and investors or transport enterprises concerned.

Assuming that these conditions are satisfied, we can conclude that Figure 7.3.9 will be the direction of the BDZ's future freight services including combined transport. We will discuss the contents of each freight service more in detail in the next sub-chapter.

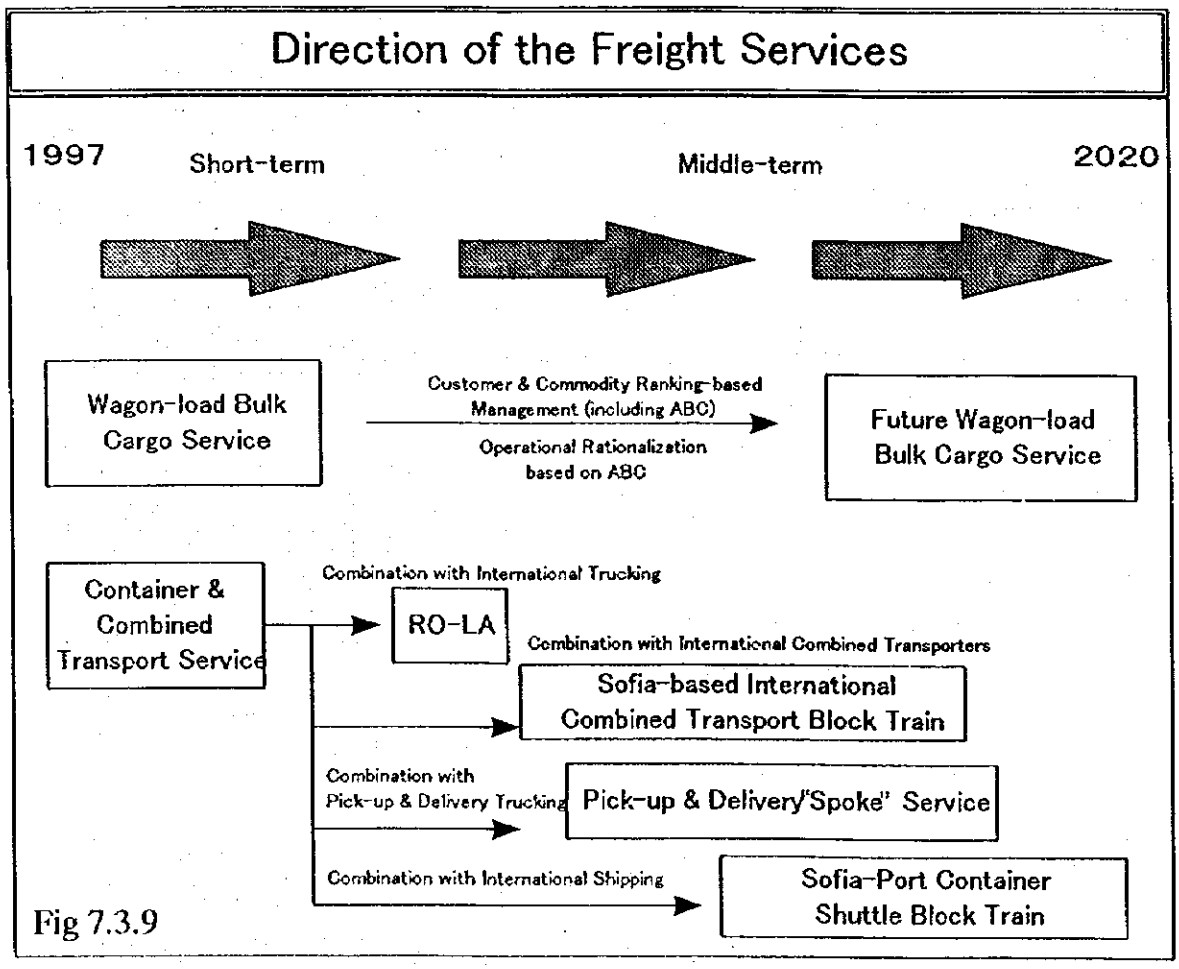


Fig 7.3.9

7.3.8 BDZ's Future Freight Services

(1) Wagon-load Bulk Cargo Service

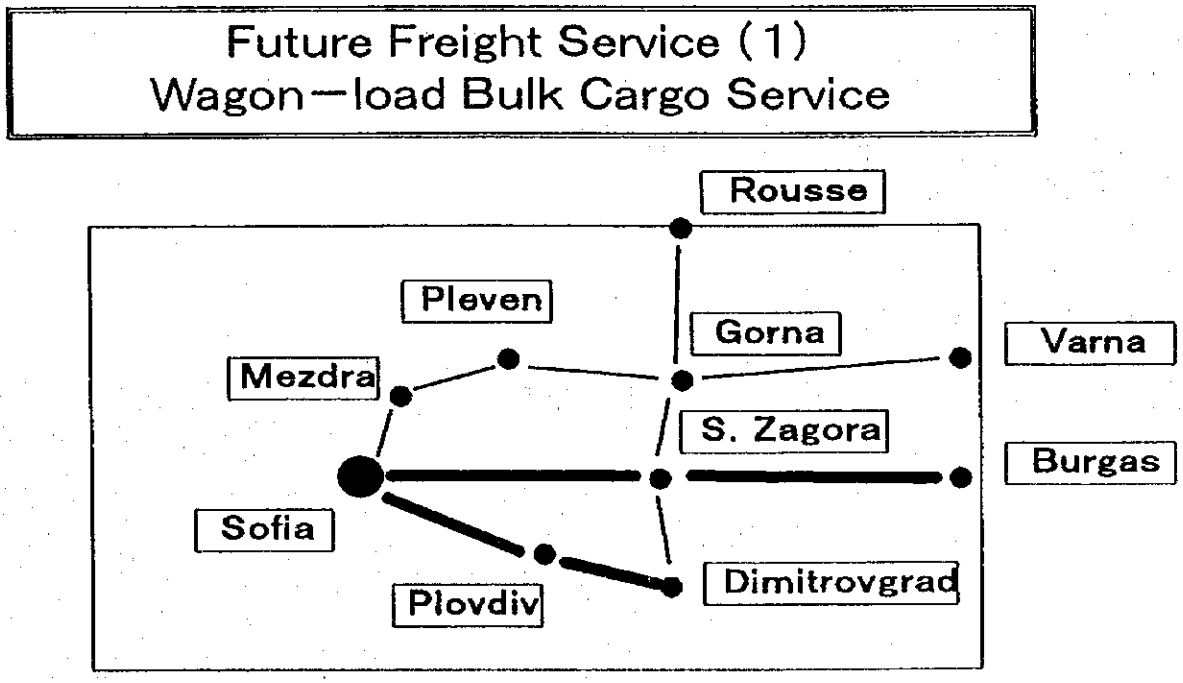


Fig.7.3.10

Such bulk cargoes as Petroleum Products, Coal, Ore, Cement, etc. have long been BDZ's major cargoes in terms of both volume and revenue. Before the democratization in the early 90's, the movement of most of these cargoes had been backed by the Bulgaria's national policy to promote heavy industries by a centrally-intensified manner. After the democratization, Bulgaria's economy was abruptly liberated from the dependence on the Soviet Union, and the movement of these cargoes, which had been closely related to the Soviet Union's economic system, were badly affected. The shift to the market-oriented economy thereafter accelerated the decrease of demand of the raw materials, thus decreasing their volume transported by BDZ. After the economic disorder some of these raw materials or bulk cargoes are coming back, but a dramatic increase of these cargoes in the future is difficult to expect since the economic system has totally changed.

How future wagon-load bulk cargo service must be constructed, taking into account the above-mentioned situation? What will be the future marketing policy for the cargoes ? There are some factors to consider such as that (i) bulk cargoes are not expected to grow dramatically in the future but still remain important cargoes especially in terms of volume, (ii) bulk cargoes cannot be transported by trucks, thus there is hardly any competition with trucks, (iii) BDZ's relationship with bulk cargo customers is very strong.

From an analysis of the above factors we can gain an implication in the future bulk cargo marketing strategy. We think that the following measures are important: pursuit of operational efficiency and cost saving, price setting at the highest level possible, avoidance of excessive related investment, provision of customer service according to the customer-wise and commodity-wise profit contribution ranking, etc. Therefore, the best marketing strategy we can think of will be first to make an Activity-Based Costing analysis to clarify the customer-wise profit contribution and commodity-wise profit contribution, and then to rationalize the cost-running operations made exclusively for the specific non-contributing customers and commodities without much deteriorating the service quality. An increase of efficient direct train services for the customers with a large volume cargoes should be simultaneously considered. There is little possibility that additional investment induces a new demand for bulk cargo. To avoid an inefficient and ineffective use of capital, additional investment in the bulk cargo service should be limited at the lowest level possible.

(2) RO-LA Block Train from Border to Border

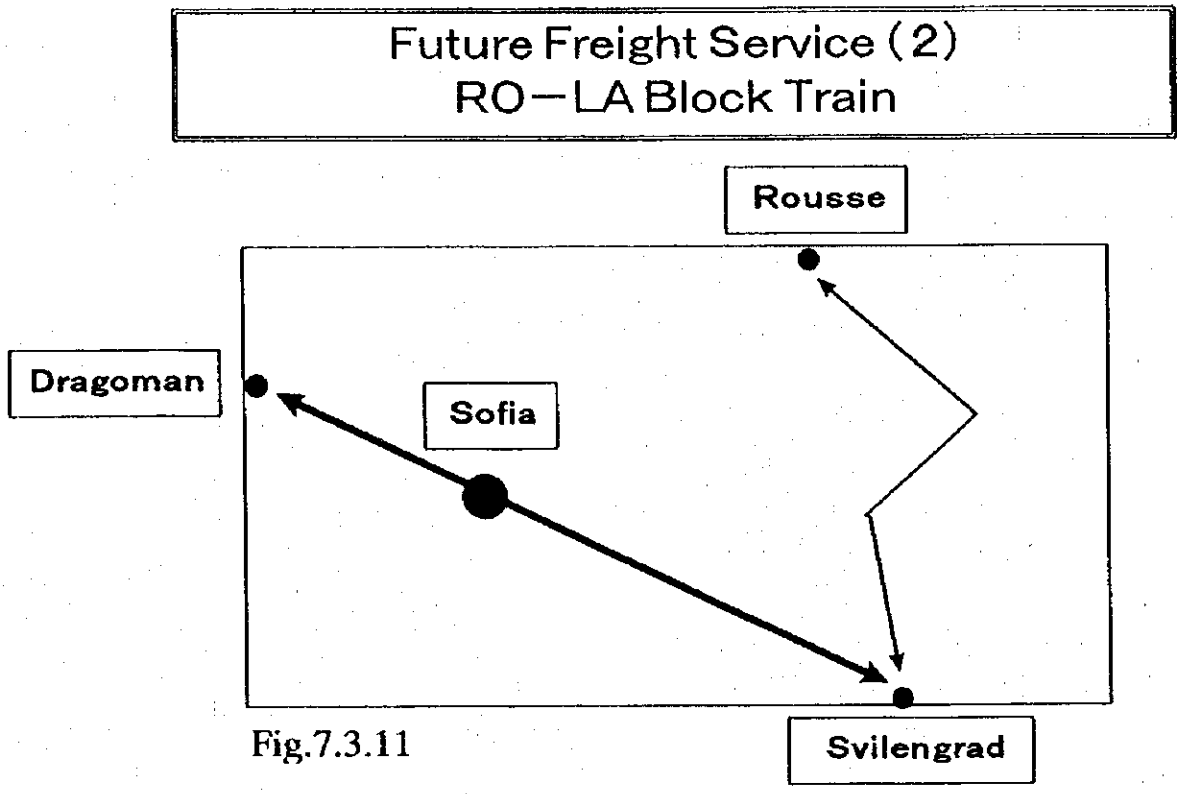


Fig.7.3.11

The Railway Research and Technology Institute (RRTI) of BDZ recommends in their research paper "The Program for Further Development of the Combined Transport in Bulgaria" (Sofia, February 1996) that BDZ take RO-LA for the most appropriate and feasible form of combined transport in Bulgaria.

RRTI says in their paper that there is a large volume of international freight carried by trucks entering the territory of Bulgaria thought such border points as Dragoman and Rousse and moving out from Bulgaria to Turkey by crossing such border points as Svilengrad. Their opinion is that in order to increase the volume of the freight carried by BDZ, RO-LA should be operated from border to border to recapture the cargoes carried by trucks.

RO-LA, on one hand, can load any kinds of road vehicles with a short loading/unloading and shunting/marshaling time without any special loading/unloading equipment and facilities. On the other hand, it needs special railway wagons, not connectable to ordinary freight wagons, with specially designed bogies of small wheel diameter, requiring special braking equipment and restricting axle load to under 7.5 tons and wagon loading capacity to under 40 tons.

The volume of cargo actually loaded by RO-LA is, therefore, less than the one loaded by container or other Piggy Back such as swap body and semi-trailer. This means less revenue is

carned by RO-LA than others. This is one disadvantage.

Another disadvantage is that since the wagon is the special one not connectable to ordinary freight wagon, it cannot be easily used in other forms of transport even if demand for RO-LA decreases.

The third disadvantage is that such Piggy Back as swap body and semi-trailer, not RO-LA, is the major form of combined transport commonly used in the trans-European rail network. RO-LA might be very effective only within the Bulgarian territory in capturing the trucks bypassing Bulgaria. However, it is not targeting at the rather distant future when Bulgaria joins EU and trans-European rail network is extended to Bulgaria. Combined Transport involving Bulgaria must be operated in a trans-European manner in order to be dramatically promoted, and for that purpose introduction of such equipment as swap body and semi-trailer commonly used throughout Europe is indispensable if BDZ targets the period after the Bulgaria's participation in EU. In that sense, RO-LA should be limited in domestic operation, and for international and trans-European operation of Combined Transport, swap body and semi-trailer should be considered as is described in the next section.

The forth disadvantage is that a lot of conditions should be satisfied in order for RO-LA to be implemented, namely, some incentives or restrictions for trucking companies to be forced to use RO-LA only in the Bulgarian territory. These incentives include truck operation cost and wage saving, transit time saving, security improvement, etc. These restrictions include night-time truck operation restriction, environment tax, the national policy to favor railway transport etc. Unless these conditions are satisfied, there will be little demand from trucking companies for RO-LA. Please remember that Wily Bets-Somat answered in the interview with us that their present priority for combined transport is (1) swap body, (2) semi-trailer, (3) RO-LA in this order. It is clear that they don't think the conditions are satisfied now.

We need to carefully analyze the above-mentioned advantage and disadvantage and measure the chances and risks involved in the investment in RO-LA. Otherwise the investment might end up a failure.

The paper says that in 1997 first two routes, Svilengrad-rousse and Svilengrad-Dragoman should be served, and in 1998 Svilengrad-Vidin, Kulata-Vidin, Kulata-Rousse, in 1999 Sofia-Targovishte, Sofia-Iambol, and in 2000 Vratza-Targovishte (in total 8 routes). RRTI has judged these routes are justifiable in terms of demand based on the present truck cargo movement statistics. However, as is described later, investment will be enormous if BDZ wants to service each of these 8 routes. Based on our opinion mentioned above, we recommend that

BDZ concentrate on the first two routes Svilengrad-Rousse and Svilengrad-Dragoman, and if and only if the additional services and investments are justifiable in terms of demand and profitability taking into account the experience of the first two routes, the additional investment should be made.

(3) International Combined Transport Block Train

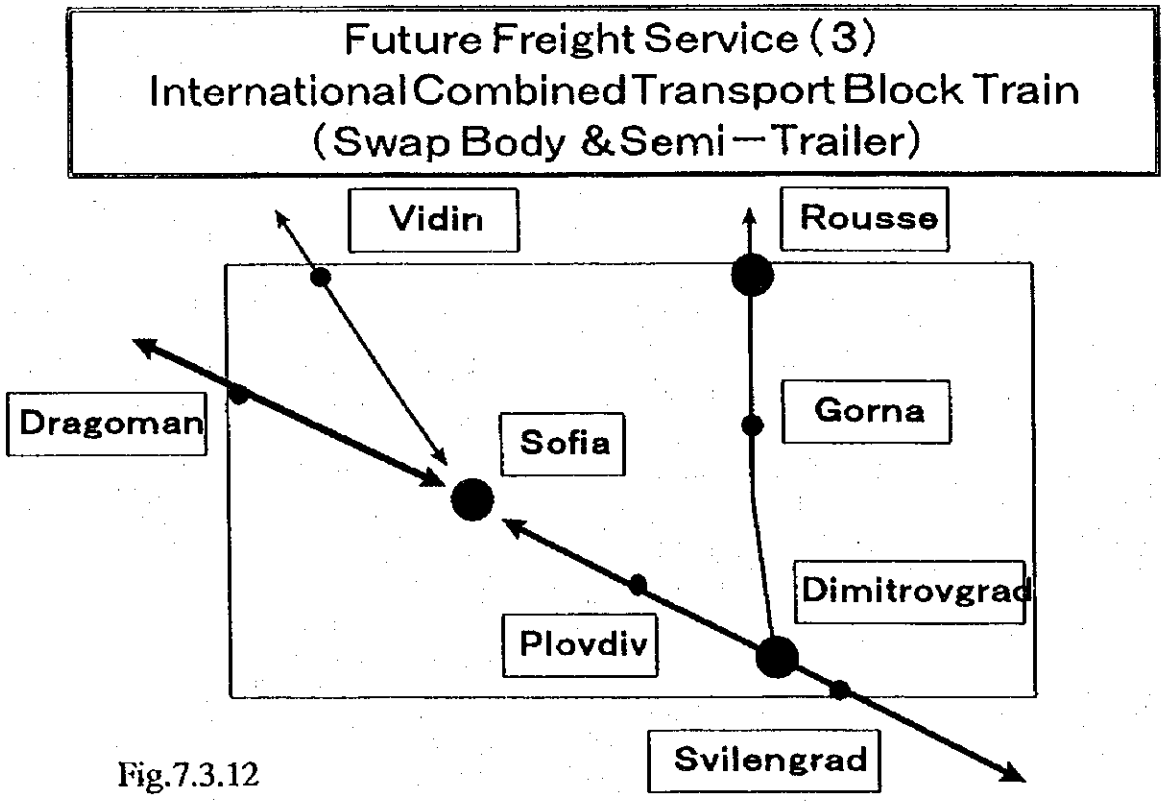


Fig.7.3.12

As was mentioned in the previous section, after Bulgaria's participation in EU and extension of the trans-European railway network to Bulgaria, swap body and semi-trailer commonly used in Europe will be the dominant form of trans-European combined transport linking Bulgaria to the rest of Europe. In that sense, international combined transport block train is able to be one of the most important forms of future combined transport involving Bulgaria.

BDZ is now operating international combined transport block trains bypassing Bulgaria. However, they are only consigned the operation within the Bulgarian territory by such European combined transport operators or forwarders as Intercontainer and Oe-Kombi. That means overall producers are Intercontainer and Oe-Kombi, not BDZ. It is impossible for BDZ to act as an overall producer (from A to Z) of such international combined transport block trains and make a retail sales of the train space for their customers by themselves, because of (1) their operational incapacity in terms of rolling stocks, terminal functions, loading/unloading equipment and human resources, and (2) their retail sales and marketing incapacity, i.e. difficulty to secure enough customers and their cargoes to fill out regularly the train space to be provided.

In order to overcome the first point, construction of at least one container/combined transport hub terminal equipped with loading/unloading machinery of sufficient capacity in such a central

city as Sofia in terms of production and consumption is imperative. It is more desirable to have one or two more hub terminals in such border cities as Rousse and Dimitrovgrad (Gorna can be another alternative), if financing allows BDZ to do so. Besides, enough number of rolling stock for the operation of international combined transport block trains must be procured, depending also on the financial conditions. However, the second point is difficult to overcome because to increase sales personnel capacity takes time and costs much, and above all is absolutely contrary to the basic policy to decrease human resources. A solution for the second point is that BDZ asks for cooperation of outside companies in retail sales.

For the above reasons, the relation between BDZ's marketing of combined transport block train and the so-called Intermodal Marketing Companies (IMCs) or combined transport-oriented freight forwarders should be discussed. In the U.S., IMCs have been acted as retailers of combined transport services, while railway companies have been acted as wholesalers. Such combined transporters as INTERCONTAINER and Oe-combi can be classified as IMCs. In addition, such leading European forwarders as Schenker, Danzas, Kuhne & Nagel, Panalpina and Nedlloyd are also capable of acting as IMCs.

Sometime from now and through the year 2020, we expect that there will be sufficient combined transport-fitted cargoes to be imported/exported from/to Bulgaria supported by the potential development of such export-oriented processing industries as auto parts, electric appliances, etc. in such industrial cities as Sofia and Plovdiv. In order to transport the cargoes BDZ needs to operate international combined transport block trains coming in/going out of Bulgaria in addition to the international transit trains currently operated. When BDZ is equipped with a combined transport terminal in such a central city as Sofia and gains cooperation of any internationally operating IMC, BDZ can take the initiative in operating the block trains to transport Bulgaria-based combined transport cargoes. That is the final objective of the block train plan.

(4) Sofia-Port Container Shuttle Block Train

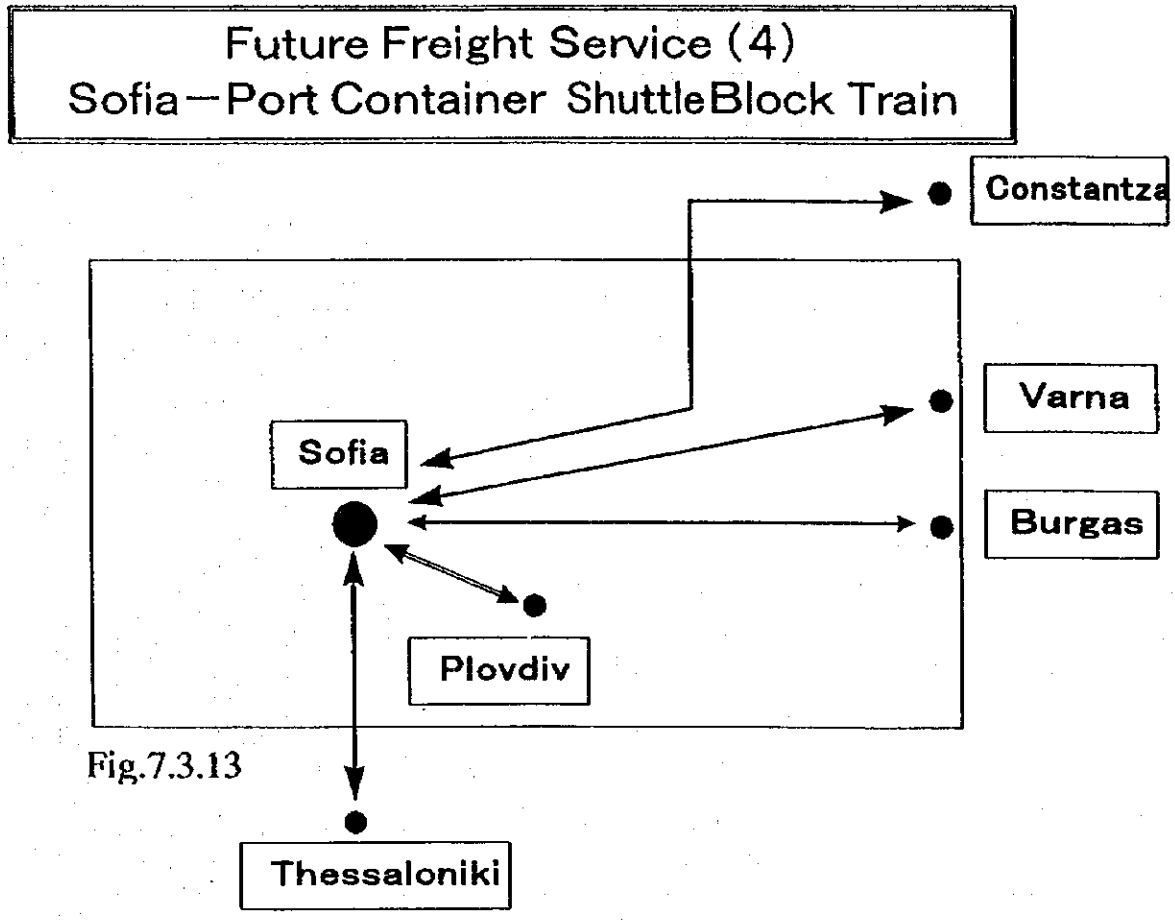


Fig.7.3.13

Sealand is now making a feasibility study to construct a container & combined transport terminal in Sofia. Their purpose is not to operate the container terminal and thereby make a profit but to secure a common-use terminal in Sofia which they can use to transport their potential container cargoes heading for Sofia and other Bulgarian cities.

They are not so interested in combined transport, or RO-LA, swap body, and semi-trailer. They are mainly interested in transporting quickly and in large volume their import container cargoes unloaded from their container vessels at such ports as Varna, Burgas, Thessaloniki, and Constantza and heading for Sofia, or their export container cargoes loaded at Sofia and heading for the ports to be exported in the vessels. In order to actualize this kind of inland container transport, container shuttle block trains must be operated regularly on a large scale.

Some readers knowing the present disastrous situation of container cargo volume decrease in Bulgaria may think it unrealistic to assume that so many container cargoes are to be transported inside Bulgaria. However, we are talking about the year 2020 as our target when we can expect a considerable GDP growth from the present time supported by the potential development of

the same export-oriented processing industries we discussed in the previous section, and besides the growth of container cargoes will probably overshoot the GDP growth as in the case of most developed nations including those in Europe. We can easily realize that Sealand is making a feasibility study because they believe in the possible rapid growth of container cargoes to occur in the future Bulgaria. In addition, the current poor volume of container cargoes are partly because BDZ is not at the moment conducting a time-sensitive and efficient container service closely linked to the shipping and customs operations.

Therefore, BDZ needs to make a technical and financial feasibility study of operating container shuttle block trains between Sofia and such ports as Varna, Burgas, Thessaloniki, and Constantza based on the future demand forecast. BDZ should also check the possibility to form an alliance with, or to reach a long-term agreement to exclusively wholesale the train space for, such a shipping company as Sealand or BULCON. This is the same idea as was described in the last section. A shipping company or its affiliated forwarder can act as an IMC. Such forwarding companies as DESPRED and RCL which have close relationship with many shipping companies can also be candidates for IMCs. This will save BDZ's sales personnel cost and decrease the risk of not filling out the train space, while profitability might be lessened a little bit.

(5) Combination with Pick-up & Delivery Service - Alliance with Short-Distance Trucking Companies

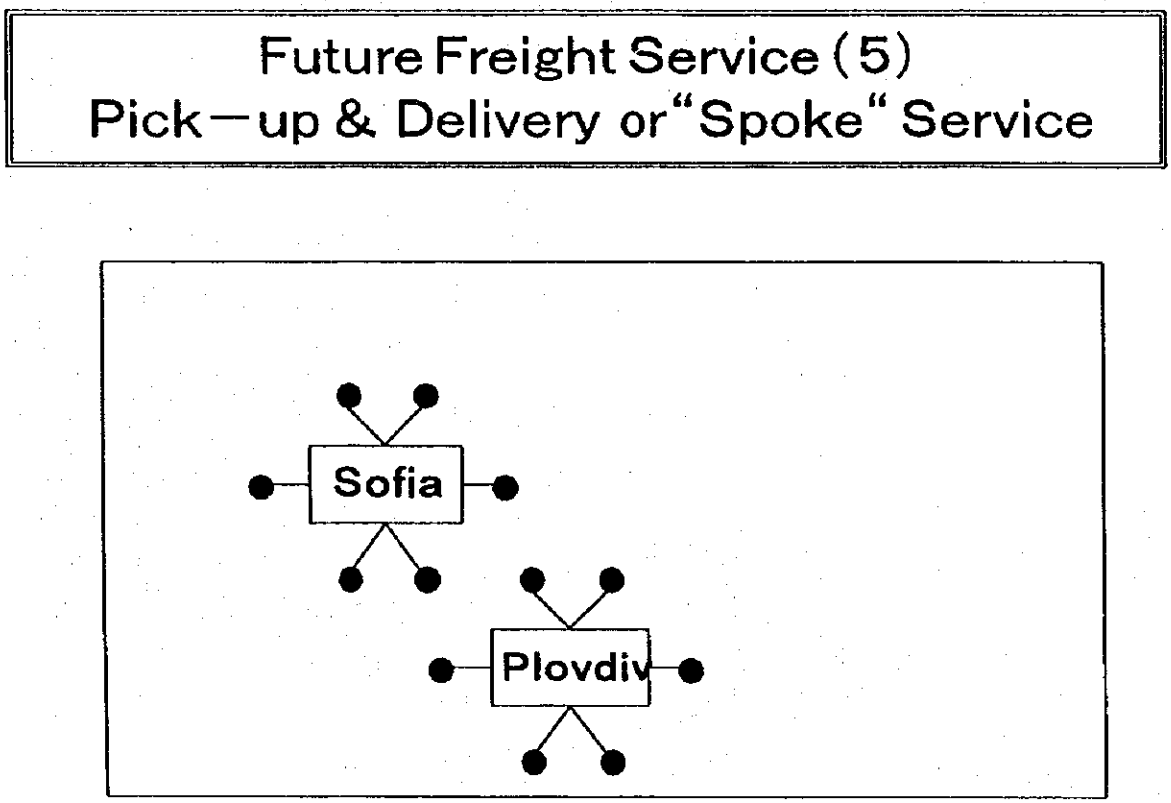


Fig.7.3.14

In order to implement the above-mentioned block train services operated between the two hub terminals, "spoke" transport, or transport of cargoes before and after the hubs (pick-up and delivery) will be very important. If this service is not organized well, block train service cannot be a flexible and time-sensitive value-added service.

Such cities as Plovdiv that are full of export/import container & combined transport cargoes should be served by feeder trains from/to the Sofia terminal. However, customers located within Sofia or at the neighboring cities in rather short-distance from Sofia must be served by trucks. It is not clear whether or not BDZ has actively serviced pick-up & delivery trucking by themselves, but our opinion is that short-distance trucking companies can make this kind of service more efficiently than BDZ does and moreover they have already established broader and closer business relationship with a lot of small and medium-sized customers (both shippers and consignees) than BDZ. Therefore, BDZ needs to have a strategic alliance with such short-distance-specialized trucking companies in order to service the door-to-door freight transport for the shippers and consignees located in the short-distance areas. In this sense, the Japan's example is suggesting.

Before 1984, Japan National Railways (JNR) had been responsible for the whole part of the door-to-door container transport. They directly reached contracts with the customers, and then consigned the pick-up and delivery part to the freight forwarders. The prices for the pick-up and delivery were decided by JNR. With the development of the door-to-door container transport, the freight forwarders, who had had more chances to make a day-to-day direct contact with the customers than JNR, gradually gained sales capability to threaten the JNR's sales system, and the customers themselves had become unsatisfied with the JNR's inflexible pick-up & delivery pricing policy. That is why in 1984 JNR's monopoly of the whole door-to-door container transport was terminated and the transport operation and responsibility was divided into (i) the pick-up & delivery part to be conducted by the freight forwarders and (ii) the rail transport part (including loading and unloading of the cargo) to be conducted by JNR. Finally in 1990, the freight forwarder were allowed to directly make contracts with the customers by themselves and to take the full responsibility of the whole part of the door-to-door container transport, and the responsibility of Japan Freight Railways (JRF: the name of the new freight railway company created by the separation and privatization of JNR in 1987) was limited to the rail transport part.

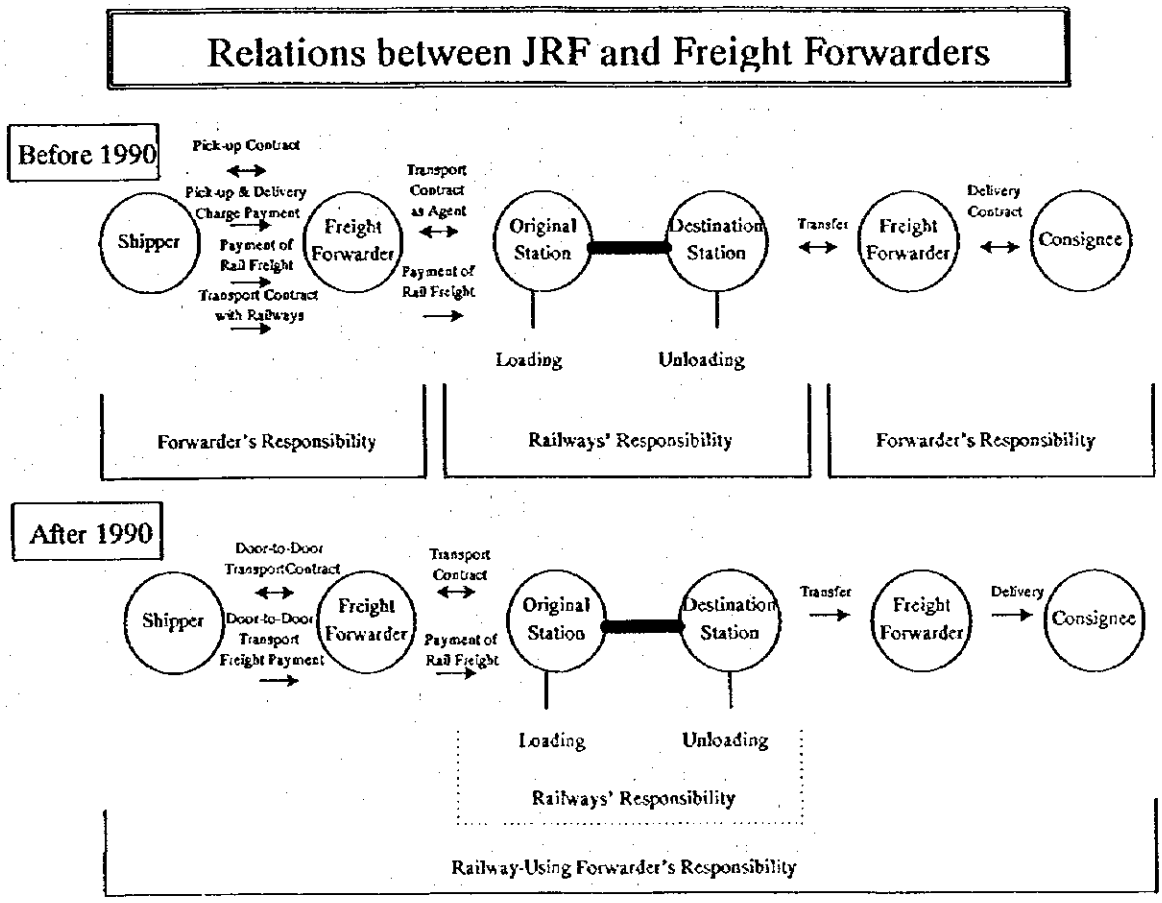


Fig.7.3.15 Source: The Future of Railway Freight Transport 3, *Container Age*, November 1994

(6) Summary of Formation of the Future Combined Transport Services

From the above discussions, we can summarize the future combined transport freight services as is stated in Figure 7.3.16.

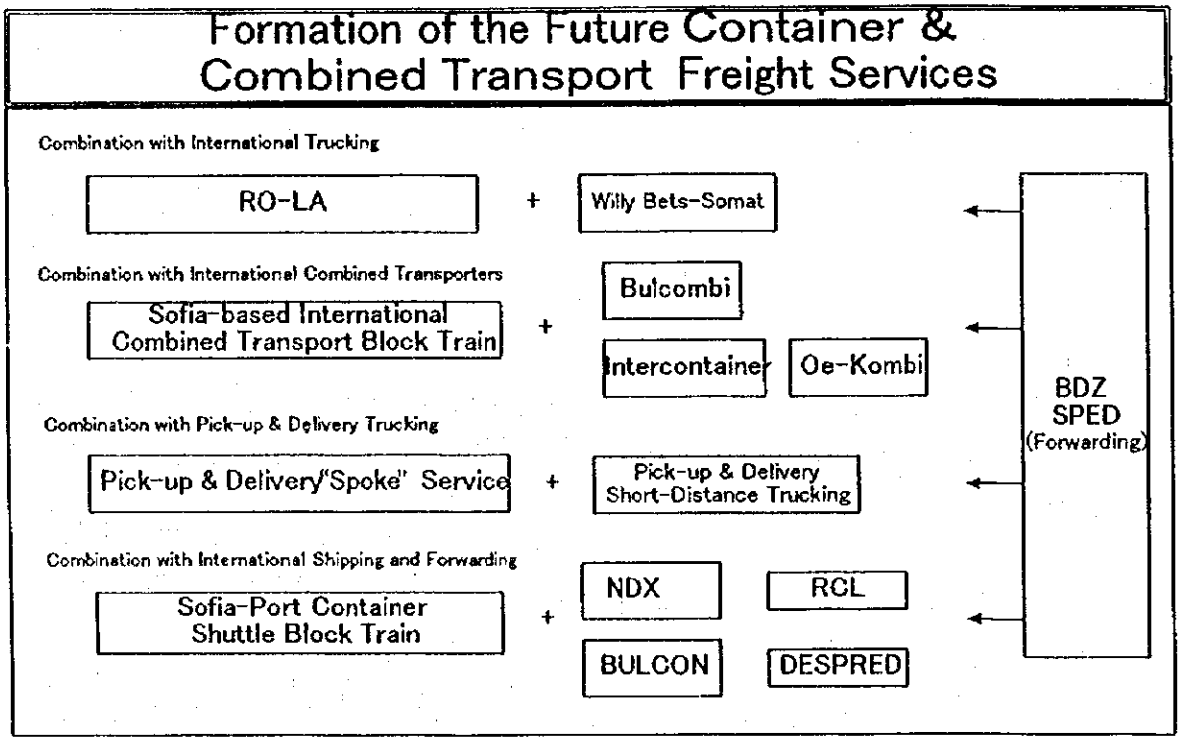


Fig. 7.3.16

7.3.9 Analysis for the Future Freight Marketing System

(1) Freight Marketing System of the Headquarters

BDZ needs to restructure their organizations based on the types of services to be provided in order to have more efficient market/service-oriented organizations. Firstly, passenger and freight service organizations should be separated. Then, the freight service division is divided into wagon-load bulk cargo service dept. and container & combined transport service dept. Each division or department include not only sales & marketing functions but also related operational functions such as traffic and rolling stock (Infrastructure is not included.). This is for the purpose of clarifying service-wise revenue, cost, and profit, thereby define each service-wise separated division's accountability.

Inside of either wagon-load bulk cargo service dept. and container & combined transport service dept., marketing sector and operations sector are placed. Marketing sector consists of profit management sub-sector, marketing planning sub-sector, and customer service sector. Operations sector consists of traffic sub-sector and rolling stock sub-sector.

Profit management sector's duties include tariff administration, pricing (discount policy-making), costing, yield/profit management. Marketing planning sector's duties include total marketing strategy management, product (service) management, customer (account) management, and sector (origin/destination, specific lines and routes) management. Customer service sector's main duty is such customer services as claim settlement, intermediary between customers and operations sector, control of customer service managers in freight railway stations, customers' needs survey, etc.

Each operations sector continues to perform more or less the same duties as are presently done. However, traffic system and rolling stock must be basically separated, shared and administered by each related operations sector (wagon-load bulk cargo operations sector or container & combined transport operations sector). Therefore, with this treatment BDZ will be able to clarify the costs attributable to each of wagon-load bulk cargo service and container & combined transport service. The related data on the costs is fully utilized by each profit management sector and analyzed in order to grasp the service-wise yield and profit.

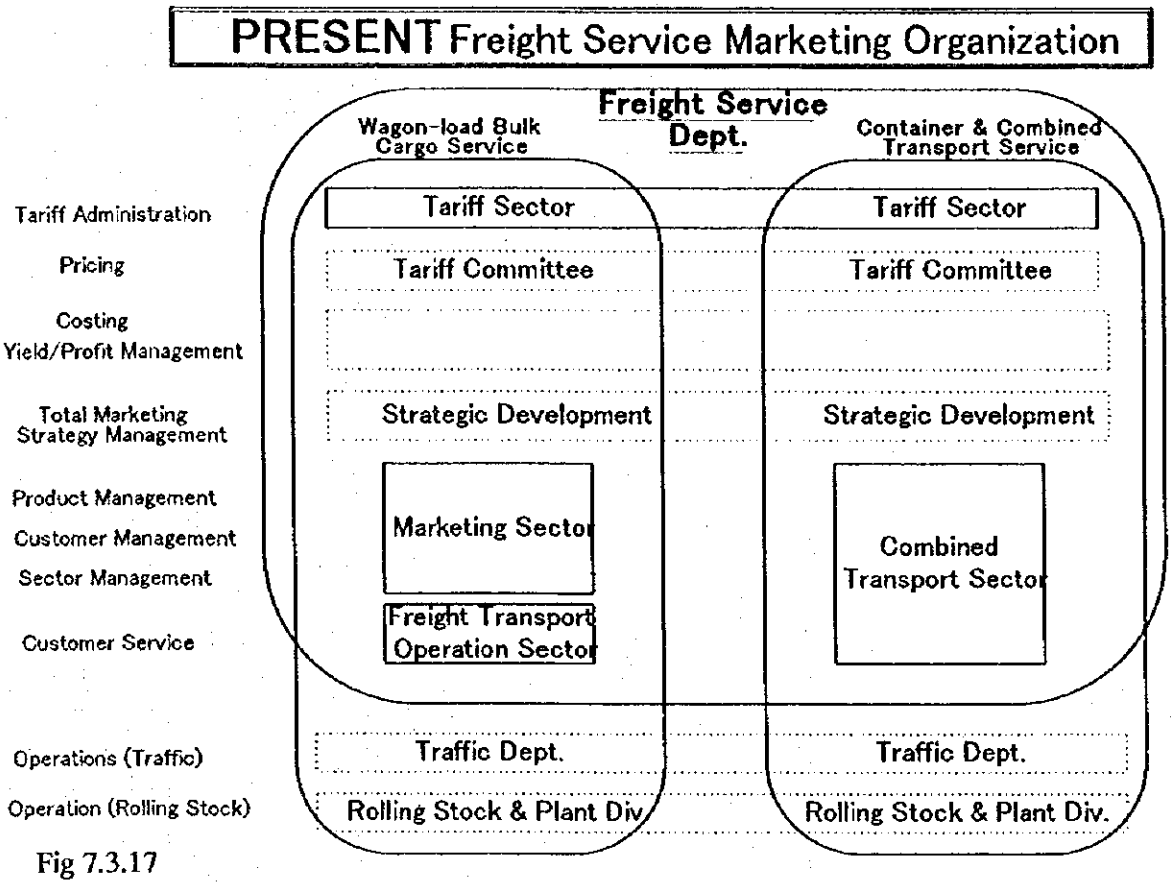


Fig 7.3.17

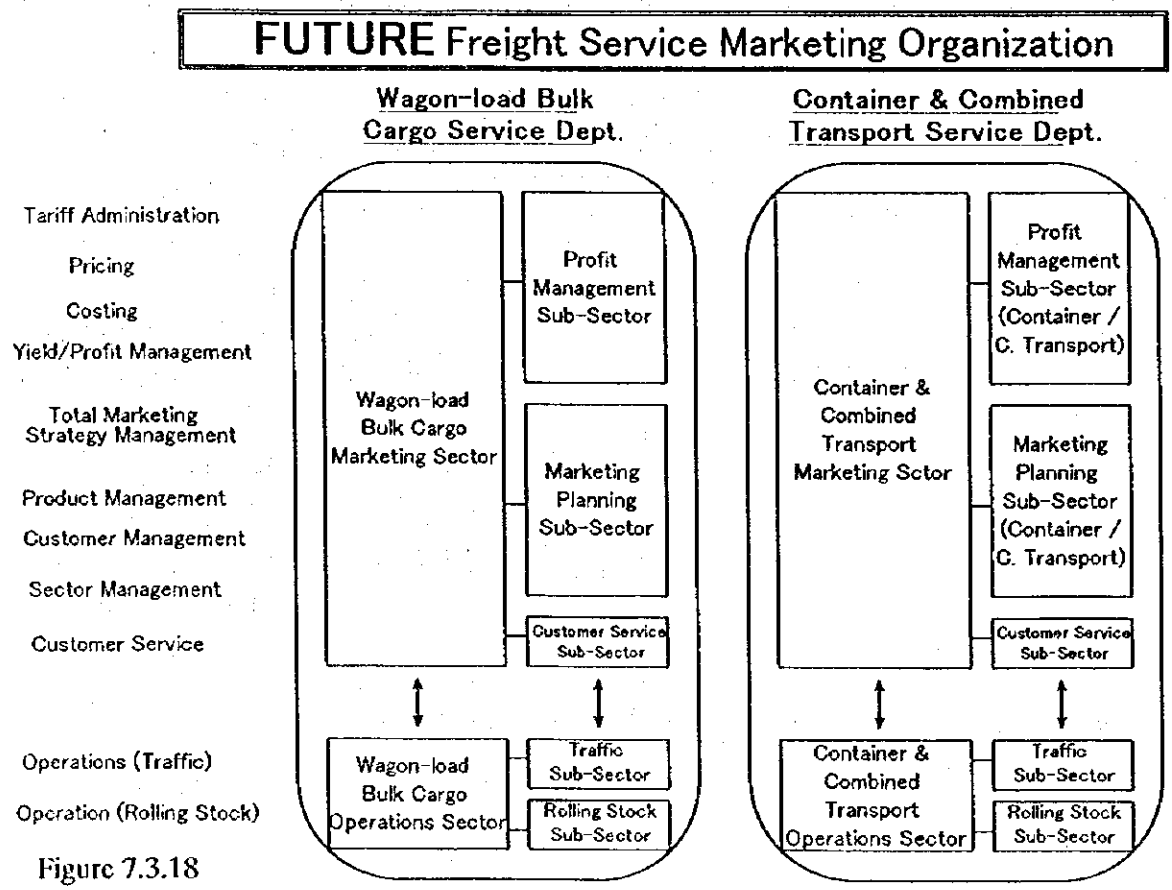


Figure 7.3.18

(2) The Roles of the Regional Offices and Freight Railway Stations

RRTI proposes in their research paper "Commodity-wise Marketing Survey" to establish a freight marketing structure consisting of the three hierarchical functions: freight railway stations, regional offices, and headquarters. They recommend each of the three having the following duties cooperate each other in order to realize the customer-focused marketing, thereby recapturing the cargoes having escaped from BDZ to road transport.

The main duties of freight railway stations include: (i) to receive the orders for transportation of goods from customers, (ii) to carry out the consultation regarding the type of wagons and the type of the consignment (wagon, container, wagon-load or small consignment), etc., (iii) to fix the loading scheme of certain type of freight from a viewpoint of maximum carrying capacity and usage of wagons, (iv) to set transport conditions with customers and immediately register their requirements.

The main duties of the regional offices include: (i) to conclude the agreements for transportation of goods between BDZ and the customers (shippers and consignees) and control the implementation of the transportation, (ii) to set a reasonable price for transportation of goods based on the flexible tariff policy, (iii) to organize a delivery of the goods in wagons at a fixed date and a further delivery of the goods by chartered trucks, (iv) to control non-scheduled freight.

The main duties of the headquarters include: (i) to control the subordinate's activities and implement the METHODOLOGICAL INSTRUCTION for concluding the agreements on the transportation of goods between BDZ and the customers (shippers and consignees) according to the legal system in Bulgaria. They have to be categorized based on the types of customers (depending on the volume and the frequency of the freight), i.e. a) shippers (consignees) who regular large scale freight by the railway transport, b) shippers (consignees) who used to have contracts with BDZ but at present use the road transport, c) new shippers (consignees) who mostly use the road or other mode of transport, (ii) to approve the METHODOLOGICAL INSTRUCTIONS to decide on the flexible tariff policy and control its application, (iii) to stimulate the development of new transport technologies and to approve them, (iv) to attempt continuous improvement in the quality of the personnel involved in the marketing of the freight services.

The above-mentioned duties of the headquarters, regional offices, and freight railways stations can be summarized as follows: (i) the headquarters acts as the only legislator of sales & marketing-related rules, regulations, and policy guidelines (including PRICING or

DISCOUNTING policies), (ii) the regional offices acts as negotiators to talk with the customers and reach transport contracts with them based on the policies decided by the headquarters, (iii) freight railway stations act as operations and customer service representative to control operational procedure, documentation, claim settlement, etc. We basically agree with this idea for the future freight marketing structure consisting of the three hierarchical functions.

(3) Use of BDZ SPED as an intermediary between BDZ and IMCs and forwarders - Wholesale Marketing Strategy and Alliance with Outside Companies

According to the RRTI's research papers "Commodity-wise Marketing Survey" and "The Program for Further Development of the Combined Transport in Bulgaria," the present position of BDZ SPED in terms of sales and marketing is summarized as follows:

"After establishing BDZ SPED, the accountability in the field of freight services has not been clear, or even confusing. The revenue from the customers are not always collected through the freight railway stations (Does it mean that sometimes BDZ SPED can reach direct transport contracts with the customers?). Besides, managers of freight railway stations and those of BDZ SPED do not have an equal opportunity. The former needs to offer the services and prices already approved by the headquarters' operational and tariff policies, while the later has the rights to offer some discounts under certain conditions. This structure does not satisfy the potential customers' requirement in rail transport, and sometimes some of them prefer to use other competitive transport companies and organizations. To eliminate this abnormality there are two ways: (i) the freight railway stations work as small forwarding companies within their region with all power of attorney and respective responsibilities, or (ii) the railway stations are entitled to act as agents or representatives of BDZ SPED and to contact customers under the brand name of BDZ SPED."

Taking into account the above negative aspects of the present existence of BDZ SPED, we have to consider its future roles. In order to implement the container and combined transport services mentioned in the previous section, the most important strategy for BDZ is to focus on wholesale marketing and use other combined transport-related companies as retailers. This strategy applies to sales & marketing of each container & combined transport service, i.e. either RO-LA, international combined transport block train, short-distance trucking, Sofia-port container shuttle block train, or pick-up & delivery trucking service. BDZ SPED can act as an intermediary between BDZ and IMCs/forwarders in order to implement the wholesale marketing strategy. Deploying presently non-performing sales and marketing managers in the regional offices and freight railway stations as BDZ SPED's agents or representatives might be one of the alternatives necessary to be considered when using BDZ SPED as a container &

combined transport wholesale intermediary.

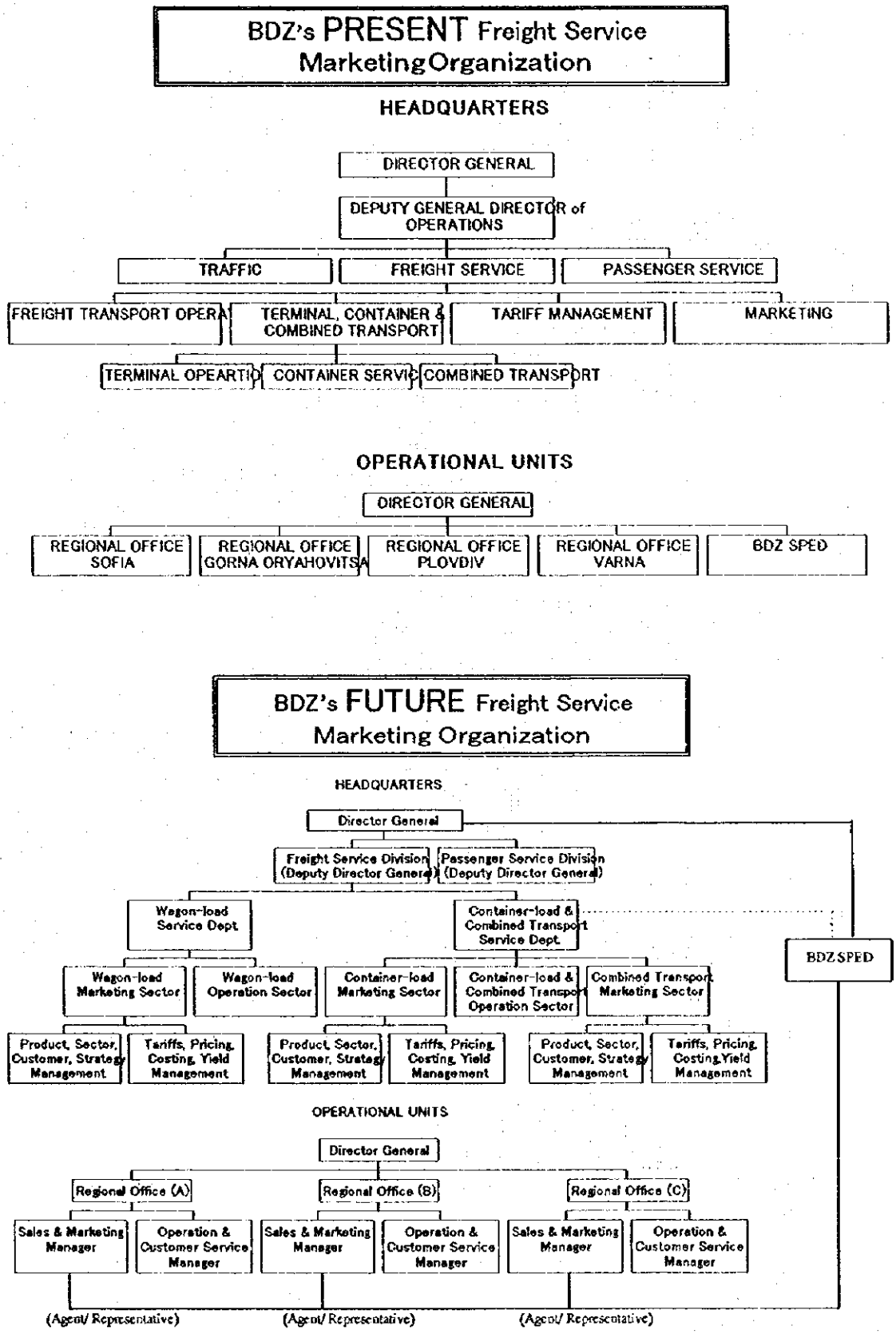


Fig. 7.3.19

7.3.10 Combined Transport Investment

(1) Ro-La

The point that Ro-La doesn't require expensive loading/unloading equipment and facilities will be the biggest advantage. It requires less investment than other forms of combined transport do.

According to the RRTI's idea, there are 6 options (or stages) of investment plans depending on the scope of work needed for the modification of the existing railway stations for the operation of the combine transport. These options with costs are as follows. The costs were originally calculated in Leva, but here are converted into US$ using the exchange rate in February 1996 when the report was published, because the leva value has been devalued since. (1 US$ = 74.15 Bulgarian Leva on February 1, 1996)

Option No.1: An existing railway station is to be used and equipped with two mobile metal platforms.

- mobile metal platform	- 2 pcs.	US$ 4,046 each = US$ 8,092

Option No.2: An existing railway station is to be equipped with two mobile metal platforms and a parking area.

- mobile metal platform	- 2 pcs.	US$ 4,046 each = US$ 8,092
- parking area (25,000 sq. meter)	- 1 pc.	US$168,577
		T O T A L : US$ 176,669

Option No.3: An existing railway station is to be reconstructed and connected to railway tracks.

- mobile metal platform	- 2 pcs.	US$ 4,046 each = US$ 8,092
- parking area (25,000 sq. meter)	- 1 pc.	US$ 168,577
- brittle	- 2 pcs.	US$ 4,046 each = US$ 8,092
- shunt, type R-49, 1 : 9	- 2 pcs.	US$ 6,743 each = US$ 13,486
		T O T A L : US$ 198,247

Option No.4: An existing railway station is to be reconstructed and equipped with two 580 meter track platforms and a parking area.

- mobile metal platform	- 2 pcs.	US$ 4,046 each = US$ 8,092
- parking area (25,000 sq. meter)	- 1 pc.	US$ 168,577
- track platforms (580 meter)	- 2 pcs.	US$ 47,202 each = US$ 94,404

- hauling track platform	- 1 pc.	US$ 40,459
- parking track platform	- 1 pc.	US$ 24,275
- shunt, type R-49, 1 : 9	- 2 pcs.	US$ 6,743 each = US$ 13,486
- shunt England	- 1 pc.	US$ 36,413

T O T A L : US$ 385,706

Option No.5: An existing railway station is to be reconstructed and equipped with 580 meter track platforms, two 480 meter track platforms and a parking area.

- mobile metal platform	- 2 pcs.	US$ 4,046 each = US$ 8,092
- parking area (25,000 sq. meter)	- 1 pc.	US$ 168,577
- track platforms (580 meter)	- 2 pcs.	US$ 47,202 each = US$ 94,404
- track platforms (480 meter)	- 2 pcs.	US$ 40,459 each = US$ 80,918
- hauling track platform	- 1 pc.	US$ 40,459
- parking track platform	- 1 pc.	US$ 24,275
- shunt, type R-49, 1 : 9	- 3 pcs.	US$ 6,743 each = US$ 20,229
- shunt England	- 1 pc.	US$ 36,413

T O T A L : US$ 473,367

Option No.6: An existing railway station is to be considerable reconstructed and equipped with two 580 meter track platforms, two 480 meter track platforms, a parking area and up-graded static platforms.

- static platform	- 1 pc.	US$ 43,156
- parking area (30,000 sq. meter)	- 1 pc.	US$ 202,293
- track platforms (580 meter)	- 2 pcs.	US$ 47,202 each = US$ 94,404
- track platforms (480 meter)	- 2 pcs.	US$ 40,459 each = US$ 80,918
- hauling track platform	- 1 pc.	US$ 40,459
- parking track platform	- 1 pc.	US$ 24,275
- shunt, type R-49, 1 : 9	- 3 pcs.	US$ 6,743 each = US$ 20,229
- shunt England	- 1 pc.	US$ 36,413

T O T A L : US$ 542,147

A special type of rolling stocks (Ro-La wagons) should be added to the above-mentioned investments. One Ro-La wagon costs about DM 270,000 (equivalent to US$ 156,069 or 263,445,087 Leva based on the exchange rates on June 23, 1997). Since at least 16 wagons are necessary in order to set up one block train, an additional cost of US$ 2,497,104 is required per

block train.

Although RRTI recommend that BDZ serve 8 routes, we recommended in Chapter 7.3.3 that BDZ serve the two routes only, Svilengrad-Rousse and Svilengrad-Dragoman. In this case at least three stations, Svilengrad, Rousse and Dragoman should be modified so as to be fitted to Ro-La. A pair of block trains (inbound and outbound) are to be operated every day on each of the two routes. We assume the Option No.6 (the most expensive option) for modification of the three stations and 64 wagons (2 routes x in/outbound x 16 wagons) for the operation. On that basis, the following investments are needed:

1. For modification of the three stations and installation of equipment:	US$ 1,626,441
2. For purchase of four sets of the 16 Ro-La wagons:	US$ 9,988,416
GRAND TOTAL:	US$ 11,614,857

(2) Container/Combined Transport Terminal

In order to implement the Sofia-Ports Container Shuttle Trains and the International Container and Combined Transport Block Trains, at least one hub terminal equipped with loading/unloading facilities fitting to both container and combined transport is indispensable. (Sofia will be the first priority, but such border cities as Rousse and Dimitrovgrad will be canndidates, too.) In terms of container handling capacity (crane capacity), at least around 100,000 - 300,000 TEU per year is required, as was mentioned in the section of Sealand. The terminal should include all the equipment necessary to handle either container, swap body, semi-trailer, Ro-La, etc., or all forms of container and combined transport. We can show the rough estimate on how much capital is required for each necessary piece of investment as follows.

1 US$ = 1,688 Leva as of 23-Jun-97 Table 7.3.1
1 US$ = 1.730 DM as of 23-Jun-97

	Volume	Unit Cost BGL	Unit Cost DM	Unit Cost US$	Total Costs US$
TERMINAL					
Infrastructure					
Feasibility Study/Designing	50,000 M2	10,128	10	6	300,000
Land	50,000 M2	8,440	9	5	250,000
Land Development	50,000 M2	245	0	0.145	7,250
Yard Pavement	25,000 M2	33,760	35	20	500,000
Warehouse	450 M3	168,800	173	100	45,000
Freight Station	300 M3	253,200	260	150	45,000
Building	250 M2	286,960	294	170	42,500
Railway Track	2,500 M	2,532,000	2,595	1,500	3,750,000
Shunting & Marshaling Facility	M2	0	0		
Power Supply, Signaling	Units	0	0		
& Telecommunication		0	0		
Repair & Maintenance Facility	M2	0	0		
Machinery					
Crane	1 Units		2,254,674	1,303,280	1,303,280
Spreader with Legs	1 Units		307,456	177,720	177,720
Reach Stacker	1 Units		1,229,822	710,880	710,880
Front Loader	1 Units		1,537,278	888,600	888,600
Fork Lift	2 Units		3,460	2,000	4,000
Battery for Fork Lift	4 Units		865	500	2,000
Computer System	1 Units		4,325	2,500	2,500
Office Equipment	41 PC		4,325	2,500	102,500
TOTAL					8,131,230
EQUIPMENT					
20' Container	1 Units		3,460	2,000	2,000
40' Container	1 Units		5,536	3,200	3,200
Swap Body	1 Units		8,650	5,000	5,000
Chassie	1 Units		87,106	50,350	50,350
Semi-Trailer	1 Units		102,485	59,240	59,240
Tractor-Head	1 Units		153,728	88,860	88,860
Flat Wagon for Swap Body	1 Units		292,024	168,800	168,800
RO-LA Wagon	1 Units		270,000	156,069	156,069
Pocket Wagon	1 Units		224,900	130,000	130,000
Wagon with Lowering Platform	1 Units		307,248	177,600	177,600
Road Railer	1 Units		484,400	280,000	280,000

7.3.11 Summary

In the process of the studies in this chapter, we have had some important implications which BDZ should reflect in its future strategy.

Implication from the first part of this chapter is that structural change in freight transport market is occurring in Bulgaria countries after democratization of former Soviet Union and Eastern Europe and BDZ can not have successfully coped with the change without having an appropriate market-oriented strategy.

Implication from the second part of this chapter is that railway companies of especially Western European countries have taken a strategy to promote market-oriented and environment-friendly combined transport throughout the EU boundary along with sector/function-wise organizational separation in the process of privatization.

Implication from the third part of this chapter is that in order to solve the problem clarified in the first part BDZ should follow the same strategy as the one taken by the railway companies of Western European countries, which is stated in the second part.

Finally, we would like to conclude this chapter by reiterating that what BDZ should recognize is the significance of marketing in freight transport and combined transport strategy, and recommending BDZ take the following next steps after the review of this study in order to reborn as a new market-oriented and environment-friendly railway company in accordance with the EU standard of railway transport.

(i) BDZ should continuously renovate its overall freight marketing organizations so that the organizations may become efficient, market-oriented and value-producing. First of all, information system renovation and marketing expertise build-up should be immediately implemented. This will enable pricing based on line-wise and train-wise costing and then lead to production of value-chain in its organizations.

(ii) BDZ should make a detailed business plan in relation to the establishment of a new combined transport company or re-organization of the existing one. For that purpose, strategic alliance in combined transport should be further studied together with other leading European combined transport-related companies. At least BDZ should contact Kombiverkehr, the largest combined transport operator in Europe, and have some advice from them on the strategic alliance and marketing organization restructuring.

(iii) When any investment relating to the construction/rehabilitation of container/combined transport terminals and the procurement of combined transport-related equipment and rolling stocks is studied, BDZ should have a detailed and large scale feasibility study based on accurate demand forecast focusing on combined transport freight movement.

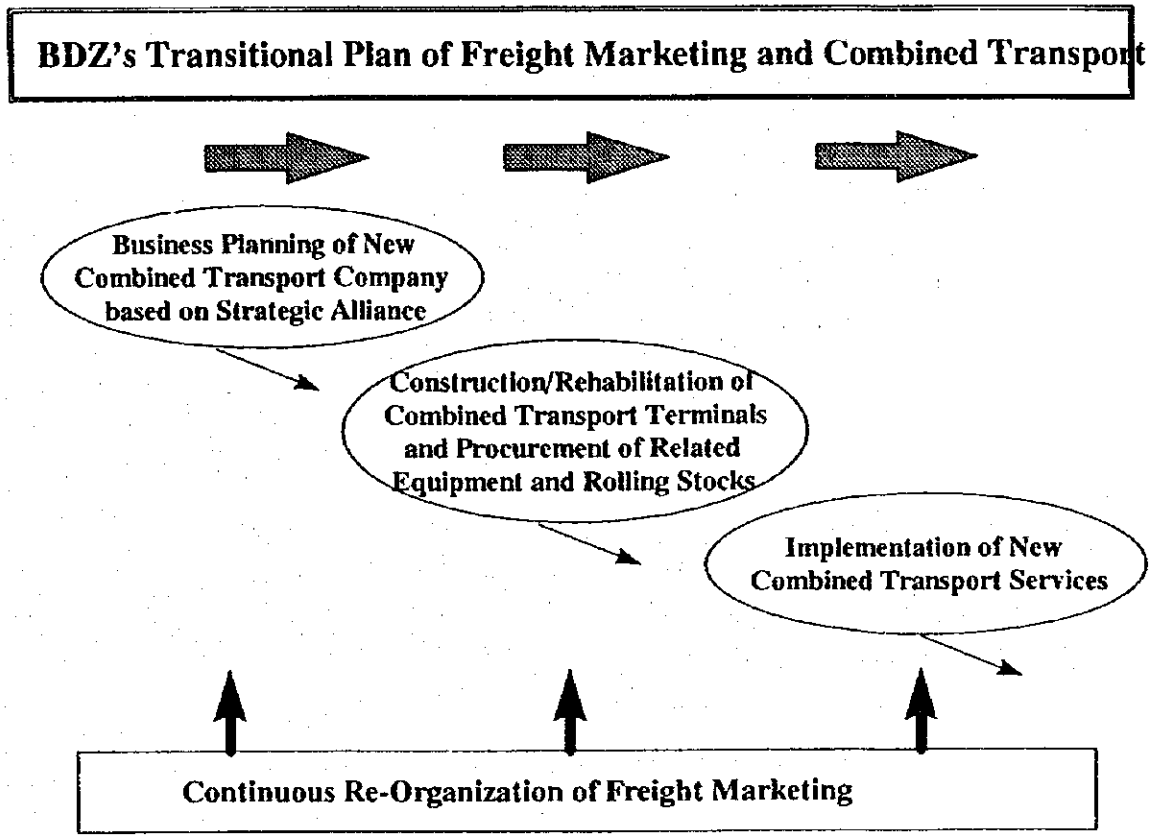


Fig. 7.3.20

7.4 IMPROVEMENT OF PASSENGER TRAIN SPEED AND ITS EFFECT

- Viewed from Train Operation Planning -

What will sell in the next decade? This is the initial question the Train Operation Planners pose. Since, in railway industry, production and sales are identical processes, the train operation planners cover, or should be covering, extensively the sales and marketing activities (See the work flow chart Fig.8.3-1). The answer to the question posed was, in the freight service, the seamless combined transport, which was dealt with in the preceding section 7.3. In the passenger service, the Team believes, it should be the intercity higher speed service.

Despite pessimistic demographic projections, the customers for the intercity service of all modes will not decrease much, as the urbanization will proceed. What matters more for the rail mode is how much more share it could gain from the targeted traffic. A 5% decrease, for example, in the population each of a city pair may bring about, theoretically say 9.75 % decrease in all mode intercity passengers of the city pair. But if the rail mode could see 10 % share increase by some service improvements (getting transfer from road mode), the railway service still stands a fair business chance. And the chance lies in speeding up the trains.

Many questions will follow: What city pairs will merit the higher speed service (priority for improvement)? How faster should it be than now (speed design)? What facilities should be provided for the speed improvement (investment), etc.

This section 7.4 deals with the possible increase of railway share by increase of train speed and clarifies the relation among the share, travel time and fare.

The questions of speed design and of required facilities will be described in the next Chapter 8 "Train Operation Planning (Technical Aspect of BDZ)", since they are highly technical issues. But they will be summarized later in this section.

7.4.1 Intercity Service

(1) BDZ Share in intercity passenger market:

The road mode's share in the intercity traffic is peculiar in Bulgaria. Generally speaking, the railway share of intercity transport should be increased by longer distance. In case of Bulgaria, as observed world – wide, when the distance of city pair gets longer, the rail share of the intercity service gets higher. But in this country, contrary to the said general rule, the road grows higher as the distance gets longer and reached to 85 - 90 % for 400 Km zones. (Fig. 7.4-1, next page)

The intercity rail services should be improved to change the transportation situation in Bulgaria.

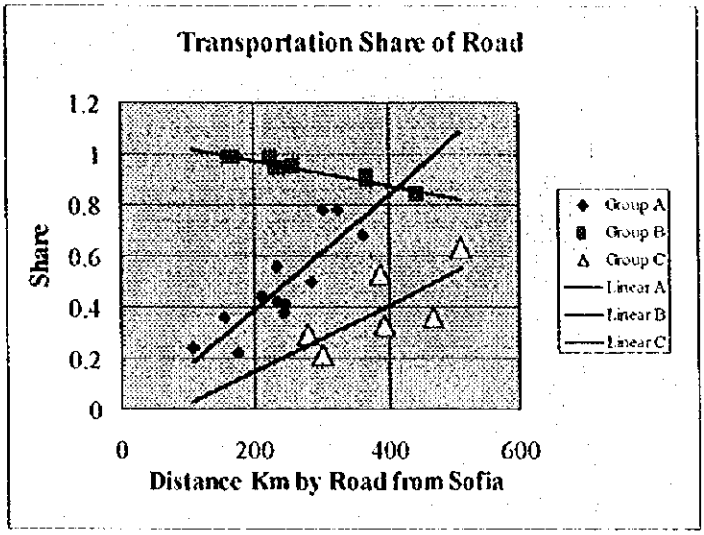


Fig.7.4- 1 Traffic Shares of Road by convenience groups of Railway

Note: Group A cities (marked with diamonds ♦) are equipped with normal railway service

Group B cities (marked with squares □) are equipped with inconvenient railway service

Group C cities (marked with triangle Δ) are equipped with relatively convenient railway service

Table 7.4- 1 Share of Road by the Railway Access Convenience Group

From	To Group A	To Group B	To Group C	Km	Group A	Group B	Group C
Sofia	Montana			109	0.24		
Sofia	Plovdiv			156	0.35		
Sofia		Trojan		167		0.98	
Sofia	Pleven			176	0.22		
Sofia	Vidin			211	0.44		
Sofia		Gabrovo		226		0.98	
Sofia		Haskovo		234		0.94	
Sofia	Stara Zagora			234	0.56		
Sofia	G. Oryahovitza			235	0.42		
Sofia	Dimitrograd			244	0.38		
Sofia	Velko Tarnovo			247	0.41		
Sofia		Kardzali		259		0.95	
Sofia			Sliven	279			0.29
Sofia	Dopovo			286	0.5		
Sofia			Jambol	300			0.21
Sofia	Svilengrad			303	0.78		
Sofia	Rousse			324	0.78		
Sofia	Aitos			361	0.68		
Sofia		Razgrad		370		0.91	
Sofia			Shumen	386			0.53
Sofia			Burgas	392			0.33
Sofia		Silistra		446		0.84	
Sofia			Varna.	470			0.36
Sofia			Dobrich	512			0.63

Railway accessibility to each city from Sofia is estimated from the difference of city pair distance between road and rail and from the share.

(2) Issue at stake – speed:

Reasons are many for this unusual share tendency: the bus' frequent service, the road distance etc. (Fig. 7.4-2 and Fig.7.4-3)

One may say that buses stop and pick him up at street corners in his city, while the trains stop at the sole station in the same city. Another one may add that the bus travel comfort, business images are better than the railway's.

The important fact here is that all these factors are precluding the rail's apparently cheaper fare to recover its share (Fig.7.4-4). BDZ can no longer attract customers by cheaper fare.

Travel time, or the train speed is the stake at issue.

1) Travel distance:

Fig.7.4-2 compares the distance kilometer of various city pairs by road and rail. Average distance ratio: Road / Rail is 0.84 in favor of road.

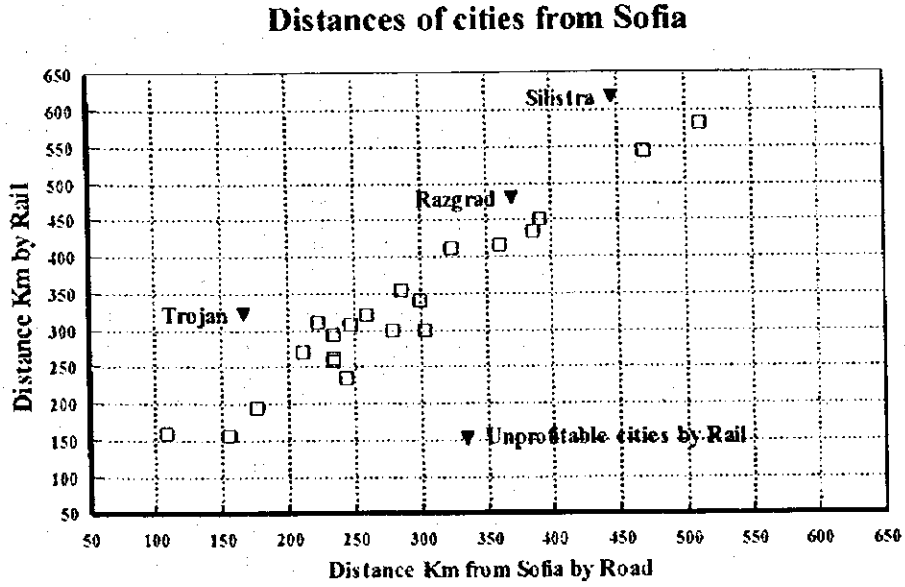


Fig.7.4-2 Difference of distances between City Pairs by Road and by Rail

As the figure suggests, the cities of Trojan, Gavrovo, Hascovo and Kardzali are unsuitable for intercity railway service from Sofia. The traffic might be better transferred to road transport. The figure also suggests that the lines' No 225, 442 and 991 should be used only for local passenger transport.

2) Travel time:

Fig.7.4-3 compares the travel time of the two modes The relationship between the share and travel time observed in the figures widely applicable through out the country, due to the situation of railway network and to the convenience of transfer, etc.

Generally speaking, the intercity train speed is not sufficient and the shortening of the travel time of intercity trains is of prime importance for BDZ. The average travel time raito: Road / Rail is 0.81, in favor of road.

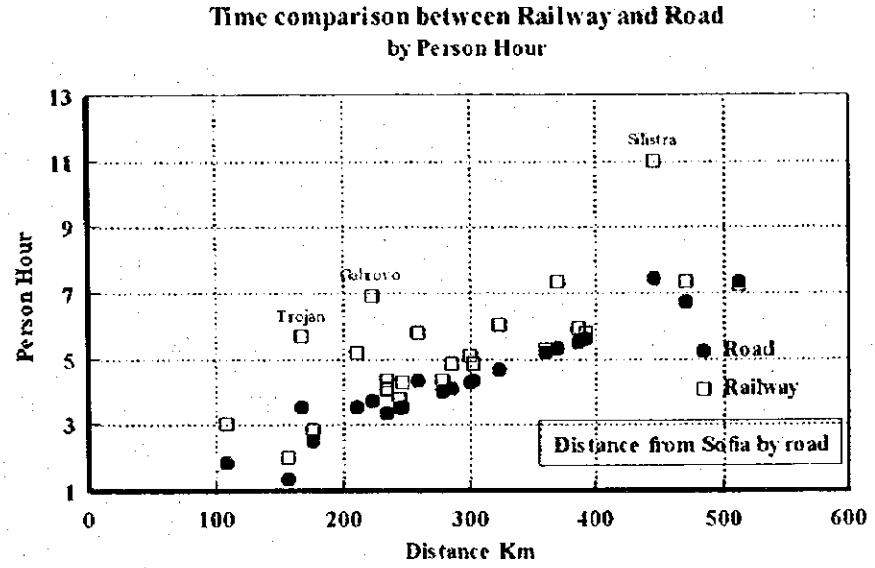


Fig.7.4-3 The travel time compared between railway and road in domestic service

3) Fare:

Fig.7.4-4 compares the fares of the two modes. The general impression people have for the passenger service of BDZ is " cheap but slow". The passenger fares of road and railway show a clear difference. The fare ratio: Road / Rail is 1.41, in favor of rail.

In Bulgaria, buses provide superior service in travel time to railway, although the bus fare is higher than the railway's.

BDZ already recognizes that the speed increase is a main business target.

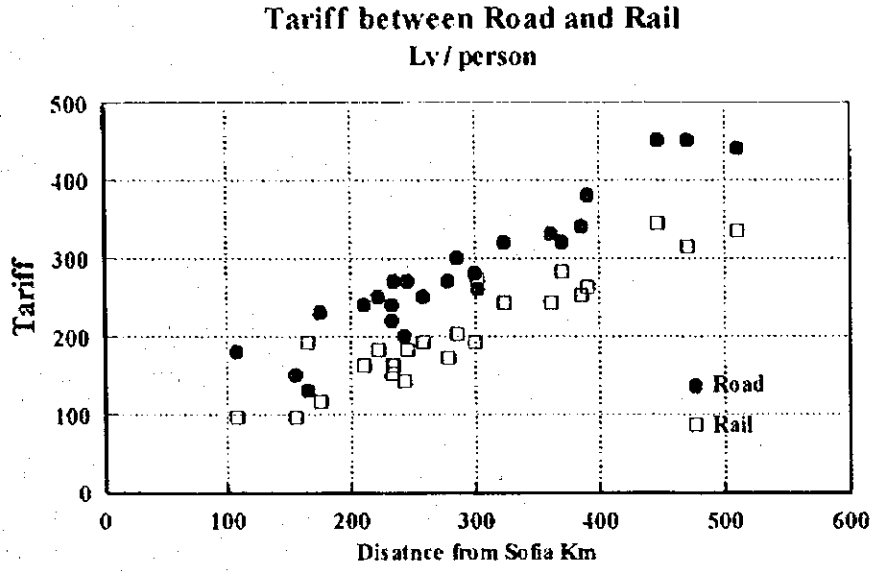


Fig.7.4-4 Domestic fares of rail and road in terms of Leva / person hour

Suppose that, distructing the notorious image at large " BDZ, cheap but slow ", an express train connects a city pair with the travel time short enough to overcome the distance which is longer than the corresponding bus routes.

7.4.2 International passenger service

Intercity service is important but international service should not be neglected. The recent trend for the internationalization will support this market.

As to the travel time of road and rail, railway is competing well in international market, but the travel cost of railways is unfavorable in the long distance zones of more than 1000 Km.

Essentially, however, the land transport service of such long distance is not the field vied between buses and conventional railways.

It should be left to the competition between airplanes and super high speed trains. But the cities within 800 Km in adjacent countries might be good targets for railway speed improvement projects under planning.

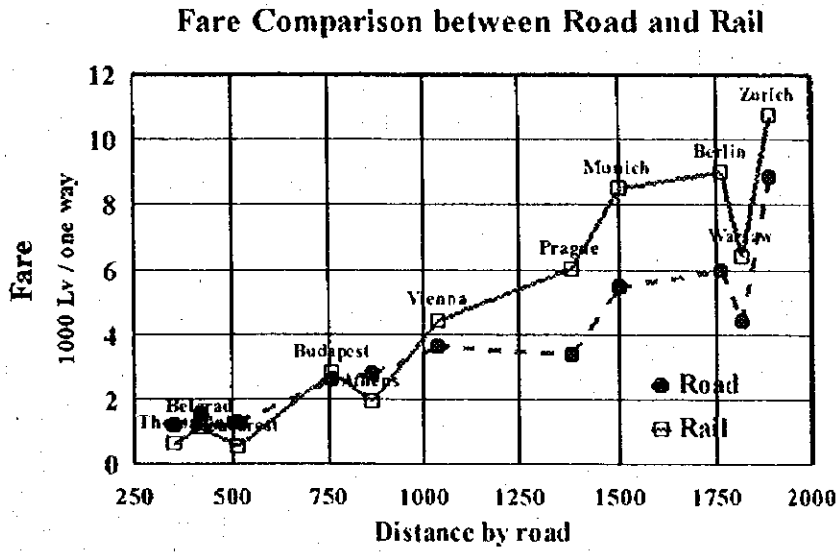


Fig.7.4- 5 International land transport to Sofia city

7.4.3 The Multiple Regression Analysis of the Influence of Tariff and Speed

If the road-rail share ratio is in a definite quantifiable relationship with the road- rail travel time, the effect of the speed improvement on the share ratio will be known. Conversely, it will become possible to design the required speed-up which would hopefully result in the desired share increase.
The estimation of the relation among the tariff, speed up and the traffic volume is important work for deciding actual investment plan for improving train operation plan.

(1) Results of multiple regression analysis:

The train speed improvement efforts have resulted in the recovery intercity passengers in various countries. Actual experience tell that, if the speed increases by 5 %, for example, the passenger volume will increase also approximately 5 %.
Although there are many factors to influence passenger volume and share, tariff and speed are two main independent factors to use transport modes by passengers.
- The multiple regression analysis is applied to the data of distance, speed and tariff of BDZ and road.

The acquired formulas by regression analysis are shown in the following formula.. The more detail information on the multiple regression analysis is introduced at the item 8.3.4 in the following Chapter;

Sroad = - 0.61130966 X Proad/rail - 0.88016712 X Troad/rail + 1.989338369

Srail = + 0.61130966 X Proad/rail + 0.88016712 X Troad/rail - 0.989338369

(Sroad + Srail = 1)

Sroad: Share of road vehicle passengers

Srail: Share of railway passengers

Proad/rail: Price rate of Road by Rail = Proad/Prail

Troad/rail: Travel time rate of Road by Rail = Troad/Trail

(2) Application of the formula:

- **A verification:**

Table 7.4-2 shows the results of the calculation of applying the formula for the three cases of increase of travel speed of intercity trains by +5 %, +10%, +15% and +20%.

The travel time and the price of road and the price of railway are assumed to be kept same in this calculation. This calculation result coincides with that of mathematics model.

The results of multiple regression by the data of Sofia –Plovdiv, where BDZ is competing well with road, show a similar inclination of the actual experience. The results of Sofia-Plovdiv are shown in the Table 7.4-3 and in the Table 7.4-4.

In general, when railway will aim to increase train speed, competitors will also shorten the travel time or decrease the price rate. The data in the transportation market is showing approximately 1 % increase of passengers in case of 1 % train speed up.

Table 7.4- 2 The relation between speed-up and traffic share increase

	Decrease of travel time	Increase of Share %	Increase of Passenger %
In Case of Total	95%	3.74%	6.55%
	90%	7.90%	13.83%
	85%	12.55%	21.96%
	80 %	17.78%	31.11%

- The above figures imply, at the same time, if the intercity train speed stay at the current level, and the highway road vehicles's speed is improved due to the on-going development of road network, the railway share will be aggravated manacingly.

7.4.4 Application of the Formula to Sofia – Plovdiv:

BDZ is competing well with bus in the section between Sofia and Plovdiv. The current rail share is 0.65. If the express trains of this section are improved in speed, how would be the share change ? Conversely, in order to get a meaningful share improvement, how far should the speed be improved ? A trial calculation was made as follows:

Table 7.4- 3 The relation between speed-up and traffic share increase

	Decrease of travel time	Increase of Share %	Increase of Passenger %
In Case of Sofia - Plovdiv	95%	3.01%	4.63%
	90%	6.36%	9.78%
	85%	10.10%	15.53%
	80 %	14.30%	22.00%

(1) Contents of speed increase:

To prepare for the application of the formula, 8 cases of improvement of rail travel - time of Sofia – Plovdiv were assumed as shown below. Also refer to the item 8.3.4.
Base Case is the speed of actual express train by train time table 1996/1997 of BDZ. Namely, the express train whose maximum speed is 120 to 130 km/h with switch limiting speed of 100 km/h. The eight cases are:

- Case A : The express train on partially improved track with maximum speed 130 km/h and switch limiting speed 100km/h at stations.
- Case B : The express train on improved track with maximum speed 130 km/hand with switch limiting speed 130 km/h at stations.
- Case C : The pendulum type express train on partially improved track with maximum speed 130 km/h and switch limiting speed 130 km/h at stations.
- Case D : The pendulum type express train on partially improved track with maximum speed 160 km/h and switch limiting speed 130 km/h at stations .
- Case E : The pendulum type express train on improved track with maximum speed 160 km/h but switch limiting speed is improved to160 km/h.
- Case F : The super high speed express train with maximum speed 300 km/h on actualtrack.
- Case G : The super high speed express train on new tunnel track with maximum speed 300 km/h and on partially improved track between Septemvri and Plovdiv.
- Case H : The super high speed express train on new track with maximum speed 300 km between Sofia and Plovdiv.

(2) Results of the speed up simulation

Refer to the items of 8.3.1, 8.3.3 and 8.3.4 in the Chapter 8 for details of the contents of the train speed simulation .

Table 7.4- 4 Assumed Travel Time of New Express on Sofia-Plovdiv Section

	Improvement measure		Speed km/h		Non stop		1 stop	2 stop
Case	Coach	Track	Maximum speed	Switch limiting speed	Calculated travel time	*Travel time on train diagram	*Reduction rate of time	*Reduction rate of time
Actual	Conventional		130-120	100	-	-	1(1hr57min.)	1(2 hr 0 min)
Case A	Conventional	Improved	130	100	1 hour 39 min	1 hour 44 min	0.91	0.92
Case B	Conventional	*Partial	130	130	1 hour 28 min	1 hour 32 min	0.81	0.82
Case C	Pendulum	*Partial	130	130	1 hour 24 min	1 hour 28 min	0.78	0.78
Case D	Pendulum	*Partial	160	130	1 hour 16 min	1 hour 20 min	0.72	0.73
Case E	Pendulum	*Partial	160	160	1 hour 13 min	1 hour 16 min	0.68	0.70
Case F	Bullet - light weight coach	*Partial	300	300	1 hour 6 min	1 hour 10 min	0.63	0.66
Case G	Bullet - light weight coach	Sofia-Septemvri	300	300	0 hour 39 min	0 hour 41 min	0.40	0.44
Case H	t - light weight c	Renovated	300	300	0 hour 36 min	0 hour 37 min	0.37	0.41

7.4.5 Calculated Share Increase :

Table 7.4- 5 Share Increase in Sofia – Plovdiv by New Express

	Improvement	Improvement	Improvement	Speed	Speed	1 stop	1 stop	1 stop
Project name	Coach	Track	Signal	Maximum	At switch	Railway speed up rate %	*Railway share	*Railway share up rate
Actual	Conventional		Conventional	130-120	100.00	1.00	0.65	100.00%
Case A	Conventional	Improved	Conventional	130	100.00	1.08	0.70	108.23%
Case B	Conventional	*Partial	Conventional	130	130.00	1.22	0.78	120.38%
Case C	Pendulum	*Partial	ATC	130	130.00	1.27	0.81	125.15%
Case D	Pendulum	*Partial	ATC	160	130.00	1.39	0.87	134.58%
Case E	Pendulum	*Partial	ATC	160	160.00	1.46	0.91	140.71%
Case F	Bullet - light weight coach	*Partial	ATC	300	300.00	1.52	0.98	151.14%
Case G	Bullet - light weight coach	Sofia-Septemvri	ATC	300	300.00	2.39	1.00	153.85%
Case H	Bullet - light weight coach	Renovated	ATC	300	300.00	2.60	1.00	153.85%

The two right hand columns of Table 7.4-5 shows the results of the calculated share increase corresponding to the afore-mentioned speed improvement. The calculation was made applying to the 8 cases. Some examples of simulation of running performance are introduced in the items of 8.3.1 and 8.3.3 of Chapter 8. (More detail treatment of calculation might be referred to the related items of Chapter 8.)

The Case B is meaningful. There, with the partial improvement the track and switches for 130 km/h

operation, 22 % speed increase will be achieved and this might possibly bring about 20.4 % share increase.

It will be appropriate to apply the formula for the judgement of the effect when the scale of the improvement stays at the level of minor change. But it will not be wholly appropriate when the scale is larger. According to the experience of advanced railways, including Japanese Shinkansen, the introduction of the Super High Speed Trains made the traffic volume of the Line more than twice. In such cases, Gravity model should be applied to know the benefit.

7.4.6 Priority City Pairs:

(1) Line priority:

The impact of the speed increase on railway share was thus estimated. Next issue is to identify the city pairs for which these speed increase measures might possibly attain the targeted share increase. By knowing the exact shortening travel time, the passenger increase can be estimated by using the afore-mentioned share model formula. Considering the exactitude required for a master plan making, the city pairs are not proposed. As a city pair for which the train running curves are simulated, the section Sofia – Plovdiv alone was selected.

The Tea believes that the lines No. 1,2 and 3, on one part, and on the other, line No. 5 connecting Sofia to Greek and line No.8 connecting Sofia, Plovdiv with Burgas and Varna will merit the speed improvement.

(2) Verification of traffic capacity

Each of the above mentioned lines / sections (to quote the next chapter) was put under close study of the actual train diagram, in order to learn whether or not it has the room in traffic capacity which the speeding up of passenger trains will demand.

The study reveals that , as a whole, the BDZ traffic capacity is, and will be, redundant for considerably long future, if the single track sections of No.8 line are double-tracked.

(3) Line / section - wise study

Track capacity having been thus verified, the influences by line configuration including curves, gradients and, amongst all, the switch limiting speed are closely studied, section by section, site by site, of the above mentioned lines. The description is given for line No.1 in Paragraph 8.2.1 for No. 2 in 8.2.2 and for No.3 in 8.2.3 of the next chapter. No. 5 and No. 8 lines were also studied in the same method.

(4) Speed design

Incidentally, Team's Study reveals that the traffic demand for railway will increase until 2015, but it will fall after this year onward. This is because the national highway network is supposed to be completed at a time in this year. More functionally, it will be advanced or delayed depending on parts of the road network to induce the 2015 abyss at that period or not. But no one can foresee it at present.

In line with this demand forecast, the total freight / passenger train km on major lines which was 37.4 million km in 1995. It was estimated to increase up until 2010. (37.5 million in 2005 and 40.5 in 2010) But after that, that will decline to 26.6 in 2020 (Table 8.3.2-3). In this train km calculation, the effect by system change of train operation, from yard shunting to direct block train, was considered.

The passenger train speed was designed in this context. Fairly wide option is possible and the Team chose the way of step by step improvement of using actual rolling stock and track. The 130 km/h operation between Sofia and Plovdiv with switch improve as for near future plan.

The rain running curve of express train of the section was simulated in 8.3.1. Such will be, Team considers, the most feasible target in near future of speed improvement.

For further future, a higher speed will have to be designed for this section introducing pendulum train coaches, etc.

Their running curves were simulated for two assumed cases: For one, with switch limiting speed of 130 km, and for the other, with switch limiting speed of 160 km/h. To know the effect of these two steps will become important to check precisely the passage of future improvement, in parallel with the advance of technology and research to realize the better measure without ineffective investment.

7.5 MANAGEMENT INFORMATION SYSTEM(MIS)

7.5.1 Current Computer System

At this moment some computer system is working in the company. The Main Information and Computer Centre in Sofia serves as the central information unit and supporting the headquarters and the Sofia Region, the latter having the computer section. All the other regions, Gorna Oryahovitsa, Plovdiv and Varna have their own computer centres. Of the 4 regional headquarters, only Gorna Oryahovitsa and Plovdiv have obtained regional servers connected directly with the Main Information and Computer Centre, while Sofia and Varna computer terminals are connected with the servers in the headquarters and Gorna Oryahovitsa respectively.

Currently the computer system serves limited purposes as the system suffers from constraints in the capacity and a lack of comprehensive networking, although upgraded micro-computers have been installed a couple of years ago.

The first purpose of the computer system is to provide information on the operation both for freight and passenger businesses. For the freight operation, one of each bill of lading is sent to the Revenue Control Centre every month and processed by the Main Information and Computer Centre. Information on the ticket sales is also reported to the Revenue Control Centre each month, and processed by the main Information and Computer Centre. Each side of the business information is stored by volume, and value with various type of clients (types of freight, types of tickets, etc.). Currently a system is working for automated ticket sales which was developed by the Main Information and Computer Centre. This automated ticketing has been installed in about 160 stations, and sells roughly 80% of the total ticket sales.

Second purpose of the system is for the international settlement both for revenue and payments which again requires the close contact with the Revenue Control Centre. This function is served both for freight and passenger businesses.

The third, and supposedly the most important function of the computer system currently in use is the freight operation management. While the other reports are essentially made in a hand written form and frequency is rather low because of the lack of communication capacity, freight information is processed and provided on a daily basis by utilizing, though partially, the regional network. Everyday at 6pm, each freight station and stop is obliged to report the daily information on the activities including loading, unloading and locomotive arrival,

departure in the 24 hours (6pm till 6pm) is reported to the 4 regional headquarters by telephone. The regional headquarters then processes it in the computer system, and the summary information is transmitted through the computer network to the Main Information and Computer Centre. Finally the overall freight activities for the day are reported to the Dispatching Section of the Train Operation Department around 11pm each day for the purpose of decision making.

Another system has been introduced and is still under development, which provides information on the wagons in the railway network. Currently about 23 border stations (which are located on the border of 2 railway regions) provides real time information on the wagon movement. The system is linked by the X-25 data network, and an expansion program of installing the computers in the other 4 stations is under consideration.

7.5.2Management Information System Project

Although some development has been achieved in the computer system, the stage of computerization is still under development. The importance of introduction of the comprehensive Management Information System has been repeatedly pointed out by various researches on BDZ. This is why the World Bank approved a loan extension of 20 million US Dollars to introduce and establish the system.

The planned system composes of 3 parts; Freight Operation System (FOS), Passenger Information System (PIS) and Financial Management System (FMS). The system architecture aims at inter-connected information system among the 3 parts. The architecture consists of 2 systems; FOS-FMS and PIS. After several months of tender period, final decision is planned to be reached in September 1997, and the delivery is expected to start thereafter. Initial production runs and acceptance of the system are planned to take place in the year 2000.

(1) Freight Operation System

Hardware requirements consist of 1 central sever, 1 disaster server, 230 work stations 6 regional servers (large) and 93 regional terminals and so forth. Software requirements include freight operation system, 217 database systems for workstations and so forth. The system is linked by the X-25.

The development of the FOS is planned to consist of 3 phases. The first stage will include controlling the location and status of wagons, containers and goods, railway stations and container terminals. Second phase is to include statistics and accounts. The third phase is to

develop technical status of empty wagons.

The system will definitely serve to improve the freight business quality by obtaining real time information on availability, rate, schedule and so forth. Higher efficiency and productivity are attainable. The system also will enable the company to easily create various management and accounting reports. In the end, the system is planned to be inter-connected with the other internal and external systems, to obtain wider range of information, both domestic and international, which will enable the company to manage the freight operation more easily and more efficiently.

(2) Passenger Information System (PIS)

Hardware requirements of PIS consist of 1 central server, 1 disaster server, 340 ticketing workstations and printers. Software should include the Passenger Information system, 331 data management system for workstations and so forth.

The system is planned to provide information and services to the customers and the management, including highly computerized ticketing which is not provided through stand alone system, place reservation system which does not exist now, passenger and train availability information and statistics and accounting information to the management for strategic decisions.

2 staged development is planned for the system. The first stage is to strengthen customer services by establishing a ticketing network with the newly introduced place reservation system. Approximately, 70 million passenger tickets are sold annually, and more than 10 million are reservation sales. The second stage of the development is to more easily create statistics and reports for marketing and management.

In the long run, inter-connections with other systems, both internal and external will have to be sought for in order to provide the customers with still better services and the management with more precise and up-to date information so as to improve the management assessment on the various kind of the businesses.

(3) Financial Management System (FMS)

Most of the key hardware is planned to be shared with the FOS such as the central server and the parallel server. One of a few hardware solely allocated to the FMS is 336 workstations though the other 50 workstations will be commonly used with the FOS.

At this moment the accounting and reporting procedure is mostly aiming at conforming to the official requirement which, though complying with the international standards, does not necessarily serves well to the management decisions. A computerized system for accounting, financing and budgeting purposes is at this moment virtually non-existent in BDZ. Furthermore, the accounting procedure is characterized by a highly manual based.

The introduction of FMS and the planned inter-connectibility with the other systems, FOS and PIS in particular, will first help the accounting procedure become more efficiently and with more credibly conducted. Second and most importantly, the system will serve to substantially improve the management accounting system which requires much more detailed revenue and cost information throughout the company. Without a full assistance from the computerized system, this important task of management support from the financial and accounting activities are hardly become possible. The newly introduced system and data transmission for both direction with the other systems, the segment information will become more precisely analyzed and management decision making on sensitive subjects.

7.6 LOW TRAFFIC DENSITY LINES

7.6.1 Current status

Table 7.6-1 shows the 1995 status of low traffic density lines/sections *.
Table 7.6-1 positions the secondary lines and low density lines in the whole network in terms of the financial results and of the route length *.
* The original data were obtained form the Railway Research Technology Institute (RRTI)

As shown in the Figure, the secondary lines/sections account for about 35% in route length, below 5% in revenue and 15% in cost of the total network **.
** As the secondary lines here include a part of the Main Lines, the numerics slightly differ from those given in paragraph 5.1.

While, of the total secondary lines/sections, the low traffic density lines occupy 80% of the route length and roughly half of the revenue and half of the cost.
This implies that the low traffic density lines are hardly distinguishable from other secondary lines at least from financial points of view. In fact, some secondary lines are divided each into two portions; low traffic density section and non-low traffic density section.
For example, the northern section of Line 82 (Filipovo - Karlovo) is classified as a low density line but the southern part of Line 82 (Plovdiv - Filipovo) is classified as an ordinary secondary line ***.
*** Attention should be paid to the possible use of the section for emergency shortcut route.

Incidentally, the lines enumerated in columns No.6 through 9 are presumably intended to be transferred to the related companies as their industrial lines.
Additionally, some lines/sections are not substantially operational as shown in blank columns.

7.6.2 Problem whereabouts

How to deal with the low traffic density lines has been repeatedly discussed between the Government and BDZ but no decision has been reached. The situation has not been altered even after the promulgation of the New Railway Law in 1995, where it was clearly stipulated that the State should compensate the PSO for the railway's activities that BDZ would not perform as a commercial entity.

This situation is more or less the same in all the national railways of the world with legislations to the similar effects.

The reason is : both the Government and the Railway are not really motivated to close any of the existing railway lines. The Government does not wish to be exposed to the public commotion protesting the closure. If the Railway deals with it, it is all right.
But the Government does not wish to shoulder the financial obligation to compensate the PSO. While the railway, it does not wish to reduce its scope of work and its attendant influence in the society. But it neither wishes to shoulder the enormous deficit deriving from keeping the low traffic density lines. It wishes to keep them open at the cost of the State even if apparently it proposes that it should be closed. The Government knows it.
It surmises : the Railway would not close the line even if they are not compensated for keeping it open.

To repeat, neither of the Government nor the Railway is really motivated to face the problem. The Government says it is the matter of the railway, whatever ambiguous responsibility a national company could carry. The Railway says that it is the matter of the Government. We did all that could be done according to the laws.

No final solution can be expected under such circumstances, except that the railway is completely privatised and steps out of the Government control. There, the responsibility of a railway will be questioned in real terms by the stockholders, according to the financial balance of the company, where no excuse is accepted for whatever reasons.
There, the responsibility the Government will be questioned in real terms directly by the people (not through an ambiguous entity called national company), according to what it will do or it will not do, in order to maintain or to sacrifice the people's mobility at its own risk.

7.6.2 Measures to be taken

The real whereabouts of the problem are as stated above, however, do-nothing attitude is not allowed. The privatisation of BDZ is not on agenda and the deficit deriving from keeping the lines in question surpasses 8% of the operational revenue of all lines of BDZ.

First, a comprehensive rationalisation of the low traffic density lines and other secondary lines should be continued with focus on cost reduction measures.

Second, in the long term perspective of the national economic growth, promote the transfer of these lines;
- to the related companies as their industrial lines;
- to the local governments;
- to " Third Sectors"

Third, maximum efforts should be made to promote the line closure as the motorization of the area progresses, through strenuous negotiation with the local public and the authorities concerned ****, while at the same time through trying to substitute the rail service by buses etc.

Fourth, governmental actions should be taken, as to the low traffic density lines which will remain after the above-mentioned measures will have been applied:
- either to completely subsidise the expenses to keep them open according to the current scheme;
-or to make legislative procedures including those for closing them, which are equivalent in value to the legislative procedures by which the lines were opened to service.

**** The result of the enquete survey (see 7.7 ENVIRONMENTAL ANALYSIS) is suggestive. 33% of the enqueted people gave yes reply to the question " If the railway services are not financially sustainable, do you agree that the train fares are increased ?".
To another question, (if train fare increase is not acceptable) " What would you do then instead ?", 54% of the people chose a prepared answer: " Use alternative bus service".
It is worthwhile investigating into the possibility of setting up a Third Sector which will operate substitute bus service. All the conceivable measures will have to be taken to make it viable, including: a considerable fare raise (bus), extensive cost reduction, due subsidies/detaxations by the national government to the Sector and /or to local governments.
Non monetary contribution to the Sector by BDZ such as free technical assistance is also conceivable.

Table 7.6-1 Current status of low density lines/sections of BDZ

Source: RRTI-BDZ

No	Line	Section	Kilometer	No. of Stations	Revenue (M. Levs)	Cost (Mil. Levs)	Loss (Mil. Levs)	Cost recovery ratio	Others
1	73	Vidin - Koshava	19.0	1					
2	26	Han Krum - Preslav	6.9	2	1.4	48.6	-47.2	2.9	Elecrified line
3	41	Zlataritsa - Elena	15.0	3					Line 41(G.Orayahovitsa-Elena, 43.499km)
4	17	Pazardjik - Varvara	16.3	2	5.9	20.0	-14.1	29.5	Narrow gauge
5	86	Parlov - Pomorie	25.0	1					
6	11	Kalotina - Stanyantsi	15.7	2	5.0	30.3	-25.3	16.5	
7	12	Bolshevik - Aldomirobtsi	13.6	2	2.9	33.6	-30.7	8.6	
8	15	Vakarel - Chukurovo	13.0	2	7.8	21.1	-13.3	37.0	
9	22	Cherven Bryag - Zl.Panega	33.3	3	4.4	48.6	-44.2	9.1	
10	21	Cherven Bryag - Oryahovo	102.6	7	9.0	48.4	-39.4	18.6	Narrow gauge
11	6	Radomir - Gyueshevo	88.6	8	60.2	215.6	-155.4	27.9	Line 6 (Voluyak-Gyueshevo,151.06km)
12	71	Boychinovtsi - Berkovitsa	39.0	4	9.9	62.4	-52.5	15.9	Electrified line
13	23	Yasen - Cherkvitsa	43.4	5	13.5	52.3	-38.8	25.8	
14	24	Levski - Svishtov	47.7	4	55.1	91.6	-36.5	60.2	
15	24	Oresh - Belene	13.6	2	2.1	28.7	-26.6	7.3	
16	25	Levski - Troyan	82.6	7	52.5	86.8	-34.3	60.5	
17	28	Kaspichan - Novi Pazar	4.9	2	1.2	35.6	-34.4	3.4	Electrified line
18	42	Gabrovo - Tsareva Livada	17.2	2		17.0			Electrified line
19	91	Samuil - Silistra	112.4	5	30.2	94.1	-63.9	32.1	
20	16	Septemvri - Dobrinishte	124.7	14	11.0	73.6	-62.6	14.9	Narrow gauge
21	18	Stamboliyski - Peshtera	28.3	5	6.3	50.2	-43.9	12.5	
22	81	Filipovo - Panagyurishte	71.3	4	9.8	47.0	-37.2	20.9	
23	82	Filipovo - Karlovo	60.5	7	25.7	114.7	-89.0	22.4	Electrified line
24	82	Dolna Mahala - Hisar	16.0	2					Electrified line
25	84	Yambol - Elhovo	43.1	2	6.2	53.9	-47.7	11.5	
26	29	Dobriych - Kardam	43.0	6					Line 29 (Razdelna-Kardam ,104.5 km)
27	32	Yunak - Stara Oryahovo	24.6	3	3.6	32.6	-29.0	11.0	
		Total	1,121.3	107	323.7	1,306.7	-966.0	24.8	

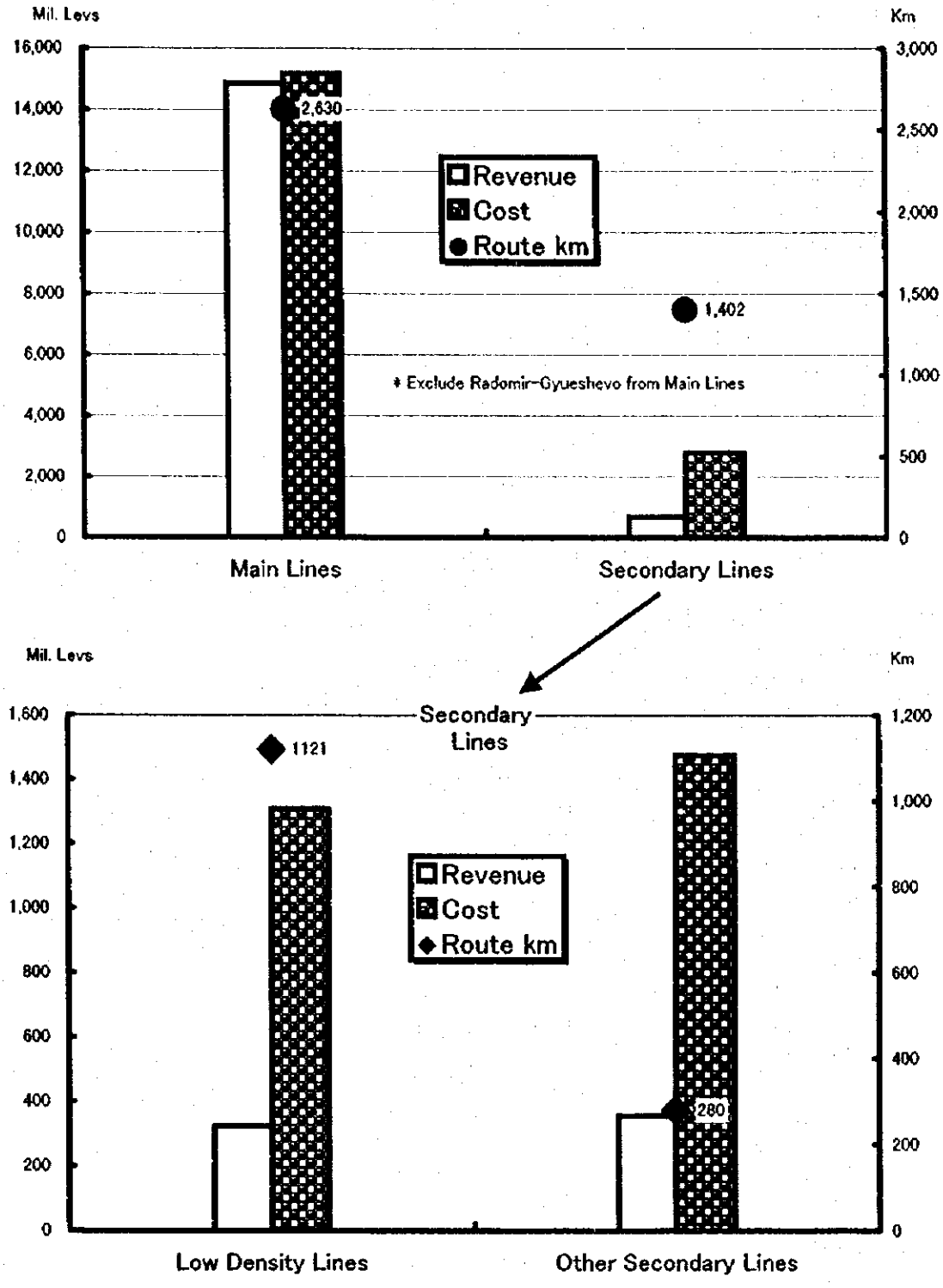


Fig. 7.6-1 Positioning of secondary and low density lines

7.7 ENVIRONMENTAL ANALYSIS

7.7.1 Overview of Current Environmental Policy for Railways

(1) EU Environmental Policy in Transport

The various forms of transport have been central to economic growth in the world and to the quality of life of its citizens, transport is well known as a major source of pollution in the world today and various modes of transport are the main source of nitrogen (NOx) and carbon monoxide (CO) which are major pollutants of the urban environment. While other sector have been able to reduce their environmental impacts, the environmental damage caused by the transport sector continues to increase.

In conjunction with its Member States, the Community has tried to develop a global strategy aimed at maintaining mobility while preserving the environment. Obviously, It is up to regional and local governments to introduce measures that are effective and command popular support.

Foremost among these will be the introduction of vehicle producing little or zero emission and the development of rapid, convenient public transport.

In order to achieve a balance in the development of the various transport modes, and cater to the imperative of environmental protection, it is vital that the environmental external cost of transport be taken into account and passed on to the user as part of the price. Adjusting the cost in this way provides for environmental protection on a fair market basis, as laid down in Article 130r (2) of the Treaty of European Union:

"The Community policy shall be based on the precautionary principle and on the principles that preventive action should be taken, that environmental damage should as a priority be rectified at source and that the polluter should pay. Environmental protection requirements must be integrated into the definition and implementation of other Community policies".

Regarding railway transport in the Community, the long term challenge for European transport policy is to ensure continued development of mobility while at the same time protecting the environment which will mean reducing air pollution, noise levels and the consequences of accidents.

(2) National Environmental Policy and Transport

Basic legislation on environmental protection in Bulgaria was established in the 1960s and amended in the 1970s and 1980s. However this environmental legislation was formulated in the period of central government planning and was so strict as to be unenforceable. Because of this the legislation did not meet the required objectives at that time. After a market-based economy was introduced, realistic requirements for environmental legislation have been formulated.

The environmental challenge for Bulgaria in the economic transition period is to ensure maximum environmental benefits not only from economic growth but also from economic reform and structural changes, by integrating environmental concerns into economic decisions. The following instruments were introduced to enhance implementation of the environmental policy.

1) Regulatory Instruments

a. Standards

The environmental standards created by the former central planning based economic system were so strict that they were unenforceable, they were, in many cases, more stringent than WHO guidelines. More realistic requirements for environmental protection were therefore introduced.

b. Enforcement

Charging fines when environmental standards are exceeded is major instrument of environmental protection. The fines levied go to an Environmental Protection Fund for investment in environmental protection projects.

2) Assessing Environmental Impact

The Environmental Protection Law introduced procedures for Environmental Impact Assessment. The EIAs are mandatory for the development or refurbishment of major projects and bodies such as Environmental Experts Council and Regional Environmental Inspectorates are charged with ordering and approving the EIAs.

3) Economic Instruments

The laws impose user charges on usage of natural resources as well as waste discharge in order to enhance environmental protection, economic instruments for user charge policy are introduced

- Solid waste charges (households and enterprises)
- Water use charges (water supply and waste water treatment)
- Waste water discharge charges (discharge to sewerage system)
- Administrative charges (environmental administrative actions)
- Charges on quarrying (quarried materials)
- Timber taxes and charges (domestic timber sales and export)
- Pollution fines (excess of permissible level)
- Car import duties (additional tax on cars older than 10 years)
- Tariff reduction on imports (environmental equipment)
- Excise tax differentiation (tax on leaded gasoline 10% higher)

4) Environment and Transport

There are only a few items related to the transport sector in the Environmental Protection Law and the most of these concern vehicle emissions form lead containing gasoline. The 1994 Environmental Strategy Update emphasizes to increase use of lead free gasoline. This will require incentives for use of lead free gasoline.

In addition, more stringent emission levels for vehicles, especially diesel engines for buses, are suggested. The Ministry of Environment has conducted a pilot project to rebuild bus engines in collaboration with the Sofia City Municipality.

Moreover, growth in the number of vehicles and in traffic in major cities, particularly Sofia will mandate the limitation of emission levels by motorcars. In cooperation with the Ministry

of Environment, Ministry of Transport and Sofia Municipality, strong measures for limitting motor vehicle emission levels in the city centers will be taken. Other steps, such as improvement of parking control, promotion of public transport to reduce commuter traffic by car, will be considered.

(3) Environmental Aspects of the Existing Railway System

Four major environmental issues related to railways were identified in the study: Railway Reconstruction Project (RRP) by EBRD, 1) waste water discharge and treatment; 2) waste disposal; 3) chemical application; 4)veterinarian control and coach hygiene.

Railway rehabilitation would improve its competitiveness over its main competitor, automobile transport, and would bring overall environmental benefits.

a. Waste water discharge and treatment

Waste water discharge is the most significant cause of systematic violation of Bulgaria's environmental standards by railways. BDZ has nine major depots and each of them had to pay fines in accordance with water sampling data which showed allowed levels had been exceeded. BDZ paid 1,238,485 Leva (equivalent to US$44,000) in 1993 as fines. The Sofia depot accounted for 77% of these fines and Durujba Depot paid 15%. It is reported that proactive countermeasures, housekeeping and low cost solutions, were carried out in depot and workshop. As a result of these activities to protect the environment utilizing sediment depositors and treatment facilities for waste water, the pollution issues was significantly improved.

b. Solid waste in depot and workshop

Solid waste is generated in both in operation and maintenance at depot and workshop. Characteristics of solid waste are caused by passenger waste in depot and maintenance stations and freight waste leftover in wagon from freight cargoes. This left over waste such as chemical freights is easily lead to soil and ground water contamination and create health risks for the staffs. In addition nickel batteries stored on the ground also occurs the contamination.

c. Chemical application for track maintenance

Chemicals have been used for track maintenance with a new to track safety. However, chemicals should be used carefully because they may spread to surrounding areas such as agricultural lands.

d. Veterinarian control and coach hygiene

This is quite an important aspect of the environment. There are thirteen (13) specialized quarantine stations able to operate in accordance with the hygiene regulation incorporated in the Veterinarian Activity Act. However, two items would need to be improved; regulations for proper treatment of freight cars after use and instructions for dealing with the consequences of accidents involving hazardous cargoes. Only one fine was reported for the improper handling of railway cars in connection with transportation of hazardous car.

(4) Environmental Affects of Existing Plans Formulated for the Railways

Two railway plans have been formulated 1) Bulgaria: Railway Rehabilitation Project by EBRD (RRP), 2) Management Plan of BDZ for the Period up to 2005 by BDZ (BDZ2005 Plan) and one on-going plan, Railways' Environmental Performance Improvement Project (REPIP). These three plans aim to upgrade the service level in the short term. A comparison of the two plans formulated is given in following table:

Table 7.7.1 Environmental Issues and Countermeasures in Existing Railways Rehabilitation Plan

Policy Plans	Issues	Countermeasure
EBRD Railway Rehabilitation Project	1) Waste water discharge and treatment 2) Solid waste 3) Chemical application 4) Veterinarian control and car hygiene	Recommendation: 1) Environmental management capacity 2) Setting environmental priorities 3) Incorporating environmental concern in the BDZ restructuring EBRD Loan: 1) Rehabilitation of locomotive workshop (water treatment plant and sediment treatment plant for waste drainage water from the washing of the locomotives and wagons) 2) Ballast management wagons for ballast pollution outputs
BDZ 2005 Plan	1) Breach of environmental standards 2) Uncontrolled disposal of waste 3) discharge water from passenger cars 4) Improper application of chemicals 5)Improper veterinarian control 6) insufficient hygiene norms and procedures	1) Improvement of environmental condition in depot and workshop and its vicinity 2) Adoption of certain standards for registered environmentally hazardous material used or transported by train 3) development of environmental technology coordinated with European railways

Source: JICA Study

The Railways' Environmental Performance Improvement Project (REPIP) has commenced and is financed by the European Union. The objectives of the project are :

- to develop a comprehensive phased strategy for strengthening the organizational and management arrangements, and updating the existing facilities of BDZ for veterinary and hygiene control at border crossings, and

- prepare detailed organizational management proposals, engineering designs and technical specifications, and program for implementation of the first phase of the approved plan.

7.7.2 Social Environmental Impact Examination

The most considerable aspects of social impact of the plan, reducing staff, raising tariffs, ceasing service in lines, are discussed in this clause with qualitative analysis. The results of the social environmental condition survey on railway service carried out in feeder lines were taken into account in this examination.

(1) Overview

1) Reducing Staff

The plan proposed reducing staff number gradually utilizing the difference between staff recruitment and staff wastage which is an acceptable method and not controversial for the people concerned. It is therefore considered that the social impact from this activity is not significant.

2) Tariff Increases

A passenger tariff increase of 3-5% annually is proposed for the years 1998-2002, of 10-15% annually year 2003-2005 and after year 2005, 2% annually, however, fares have already increased by over 700% during February to April 1997. The tariff is fixed based on market pricing principles and further increases in line with the growth rate of GDP would be acceptable, so that the social impact of tariff increases is considered not significant.

3) Ceasing Service on Lines

It would seem that discontinuing service on feeder lines would be logical given that frequency of current railway operations in feeder lines has greatly decreased and passenger and freight demand are also much less. The management plan intends to have no improvement on this matter. In addition, alternative transport such as buses and trucks are available at similar cost. Consequently the social impact is deemed not to be significant when the plan is implemented.

(2) Reducing Staff

1) Present Situation of Projected of Staff Reducing

Further staff reductions were projected in the PFR (Program for Financial Rehabilitation) and the Management Plan for BDZ up to the Year 2005. This has been overtaken by the policy of a new Management Team which had already reduced the staffing levels and has set new targets up to the end of 1998. The current staffing position and specific forecasts are as follows:

Table 7.7.2 Current Staffing Position

Actual Number of staff at June 1997	56,573
Planned number of staff July 1997	52,121 (Manpower Plan)
Actual number of staff July 1997	54,599
Estimated staff at the end of 1997	51,200 *
Planned number of staff at end of 1998	44,200 (Operations only)*
Planned number of staff at end of 1998	47,300 (Whole of BDZ) *

* These are the figures that were included in the Rehabilitation Plan in April 1997 and are also included in the 1997 -1998 contract between the State and BDZ.

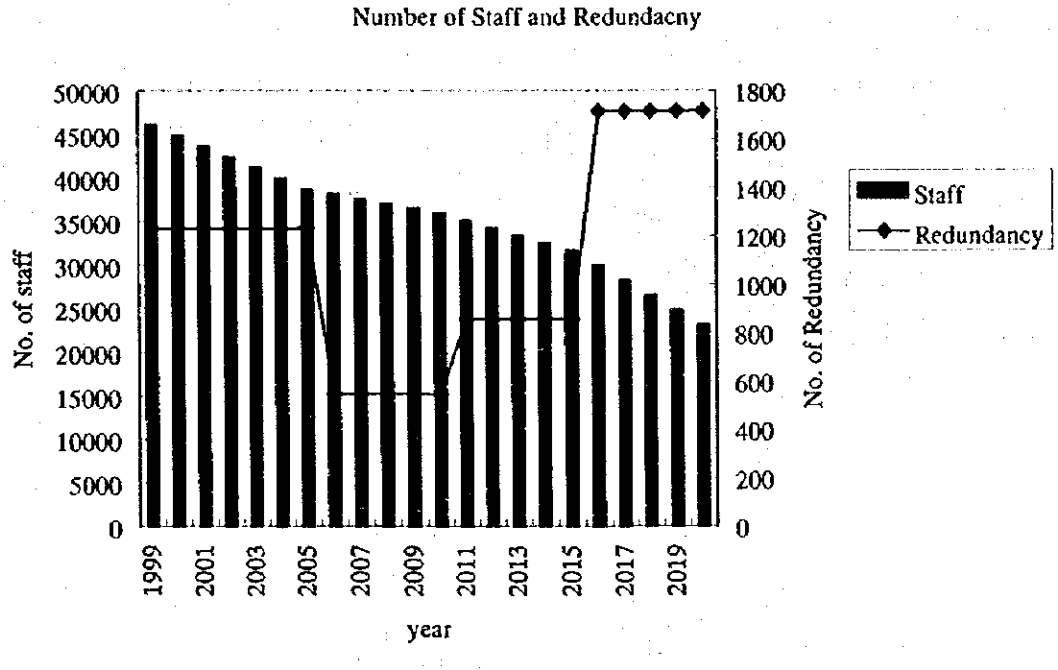
Source: JICA Study

The target staffing figures for 1997 and 1998 assume the implementation of a considerable number of staff reduction schemes included in the original 3 Year Plan. This plan is largely focused on the establishment of Joint Venture Companies or Joint Stock Companies for construction, maintenance and consultancy activities.

2) Reducing Staff and Social Impact

A Strategy for reducing the numbers of staff in the plan is based on the manipulation staff recruitment and staff wastage so that the social impact on this activity is minimal.

It is considered that the two key ingredients in producing an acceptable, non-controversial approach to reducing staff numbers will be Staff Recruitment and Staff Wastage. Providing recruitment can be regulated to provide a significantly lower annual figure than natural staff wastage, then it should be possible to make acceptable staffing and establishment reductions without causing undue problems. It is therefore considered that the social impact caused by staff reductions under the plan will be minimal.



Source: JICA Study

Figure 7.7.1 Proposed Number of Staff and Redundancy 1999-2020

(3) Tariff Increases

1) Summary of Policy on Tariff Increases

In the Management Plan, tariff increases both for passenger and freight tariff are proposed summarized below. The most important effect of tariff increases on social impacts is from passenger tariffs. For the first five years from 1998 to 2002, the rate of increasing is 3 to 5% a year with a market related tariff and for the next three years from 2003 to 2005, the rate of increasing is 10 to 15% a year with the tariff structure set by individual origin/destination station pairs. Beyond year 2005, rate of increasing is 2% a year as the new tariff structure is adjusted and fine tuned. Before the above plan proposal, the tariff was dramatically increased by 700% early 1997.

Table 7.7.3 Summary of Proposed Tariff Increases

Category	Subject Year	Tariff Increases
1. Passenger	1998-2002	3-5% a year with a market related tariff
	2003-2005	10-15% a year with a change in the tariff structure set by individual origin/destination station pairs
	over 2005	2% per year as the new tariff structure is adjusted and fine tuned
2. Freight		
1) International		Fixed by international tariff agreements
2) Ports Tariff	early 1998	20-30%
	after that-2015	small increase e.g. 2% a year
	Beyond 2015	a sharp overall decrease in tariff e.g. 20-25%
3) Domestic	early 1998	10-20% increase
	1998-	a small increase

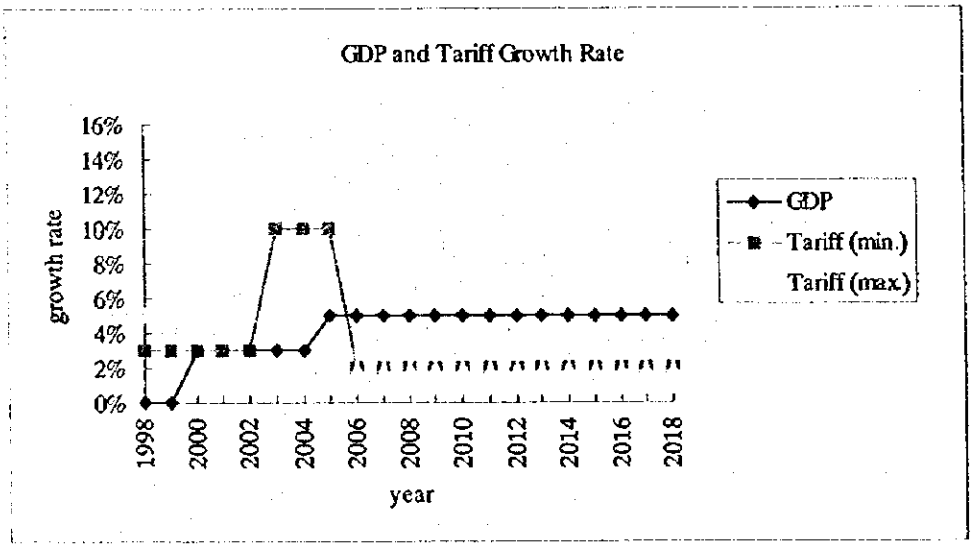
Source: JICA Study

2) Tariff Increase and Social Impact

In response to the economic growth (GDP) forecast, there are three phase; 0% growth per year up to year 2000, 3% growth per year 2000-2005 and 5% growth per year beyond year 2005.

It should be mentioned that tariffs have already been increased by 700% from February to April 1997 based on market pricing principles.

In terms of duration of the plan, average growth rate of GDP is at 4.13% while average tariff increase rates are at 3.26% to 4.35%. It is considered that this is an acceptable increase rate if when compared to GDP growth.



Source: JICA Study

Figure 7.7.2 GDP Growth and Tariff Increase Rate Projection

In addition, the results of interview survey on railway services show that around 75% of the people would not accept an increase of more than 30%. In other words, it might be said that an increase of less than 30% would be acceptable. Approximately 30% of the respondents agreed on the principle of self financed fares and one third of respondents agreed on fare increases, if the railway service would not be financially sustainable at present .

It is therefore proposed that the maximum tariff increase rate is at 15% for three years from year 2003-2005 that the GDP starts to grow at 3%. The tariff increase rate in other periods is from 3% to 5% which is nearly equal to the GDP growth rate. It is believed that the tariff increase rate will be acceptable to the people so that the social impact of tariff increases will not be significant.

Table 7.7.4 Results of Interview Survey on Tariff for Feeder Lines

4.1 Do you agree that railway services should be self financed from fares?	a. Agree (27.9%) b. Not Agree (72.1%)	No specified reasons (27.3%) There are specified reasons (72.7%):
4.2 If the railway services are not financially sustainable, do you agree that the train fares should increase?	a. YES (33.4%) b. NO (66.6%)	No specified reasons (24.6%) There are specified reasons (75.4%)
4.3 What level of fares increase would cause you to stop using the train services?	a.10% (24.2%) b.30% (24.4%) c. 50% (23.1%) d. 75% (4.4%) e. 100% (8.7%)	f. 200% (1.1%) g. over 200 % (1.1%) h. I will travel by train, does not mater the fare (13.1%)

Source: Household Interview Survey (JICA)

(4) Ceasing Service on Certain Lines

Referring to the train operation schedule of feeder lines, some examples are shown in the following table, showing low frequency of train operation including passenger, freight and combined trains. Some lines are operated daily, however one of the lines is operated only on Saturday and Sunday.

Table 7.7.5 Schedule of Feeder Lines

No.	Subject Lines	Current Operation Schedule (Sep.1997)
1.	No.16 Septiemvri - Dobrinishte (119 km)	two times (P) and one time (f) a day
2.	No.21 Cherven Briag - Oriahovo (104 km)	two times (P) and one time (f) a day
3.	No.25 Levski - Troyan (83 km)	two times (P) and one time (f) a day
4.	No.41 Gorna Oriahovitsa - Elena (44 km)	Once a day on Sat. and Sun.
5.	No.91 Samuil - Silistra (113 km)	2 times a day (combined)

Source: JICA Study

In this manner, frequency of train operation is much less and future demand estimated is also less due to the decline of major industry along the lines while alternative transports such as buses and tracks are introduced with more frequency service.

The results of the interview survey shown in the table below. Nearly half of respondents say that alternative transport such as buses is required either if tariff increases or lines cease. In other word, if there is alternative transport such as bus service, it is less impact on ceasing lines.

This is the fact that 10% of respondent agree while 90% of respondents disagree on ceasing lines, however, viewpoints from car ownership (44%) and frequent use of railway (36%), those number shows positive aspect of alternative transport existents.

So small number of people affected will use alternatives more frequent mean of transport, so the social impact of ceasing service on these lines will not be significant.

Table 7.7.6 Interview Survey Result on Ceasing Service in Feeder Lines

2.1 Do you have own car or Does your family have own car? If "YES", how many cars do you have?	a. YES (44.2%) b. NO (55.8%) If YES, please specify how many:	One 93.6% Two 5.2 % Three 1.0% Five 0.2%
2.2 Which transport mode do you most frequently use? (Select one item)	a. Railway Train (36.3%) b. Tram (0.4%) c. Bus (36.5%) d. Trolley Bus (0.4%)	e. Private Car (17.7%) f. Bicycle (3.0%) g. Other (Specify) (5.7%)
4.4 What would you then do instead? (If railway tariff increased)	a. Use alternative bus service (53.8%) b. Take a taxi (-) c. Hitch-hike (2.6%)	d. Travel elsewhere (-) e. Not travel at all (24.8%) f. Other (18.9%)
4.5. If there is alternative transport available, do you use the railway?	a. Yes (51.7%) b. No (48.3%)	No specified reasons (27.9%) There are specified reasons (72.1%)
4.6. If the railway services in your local area ceased operations would you agree?	a. Yes (9.7%) b. No (90.3%)	No specified reasons (21.5%) There are specified reasons (78.5%)
4.7 If the railway services in your local area ceased operations, what would you require?	a. I would need alternative transport (41.4%)	b. I don't require any thing (46.2%) c. Other (Specify) (12.4%)

Source: Household Interview Survey (JICA)

7.7.3 Natural Environmental Impact Examination

(1) Initial Environmental Examination (IEE)

An Initial Environmental Examination (IEE) of the plan was carried out using existing data, information and supplementary natural environmental condition surveys on related sites. The plan has been formulated in Chapter 8 and summarized in the following tables.

The Initial Environmental Examination (IEE) is to identify negative impacts in a preliminary way through the Screening and Scoping activities as explained below. Then environmental considerations are assessed, if required. These environmental issues will be considered for further detailed examination in a Environmental Impact Assessment.

- Screening

The purpose of screening of environmental aspects is to identify environmental impacts and social issues which would examined in more detail if a full scale assessment (Environmental Impact Assessment: EIA) is necessary in future.

- Scoping

The purpose of scoping is to clarify the significant environmental impacts which may be caused by the project .

1) Overview

In consideration of the nature of the plan which includes various kinds of institutional programs, and of the improvements of railway, an integrated IEE on this plan was carried out. As a result of Screening and Scoping, two major impacts, 1) waste and 2) noise and vibration during operation stage were identified. However no other major negative impacts were identified.

It was therefore concluded that an Environmental Impact Assessment (EIA) is not required.

Table 7.7.7 Summary of Long Term Management Plan of Bulgarian Railway

Proposed Plan	Components
1. Reorganization of Freight Department of BDZ	
2. Marketing and Sales	1) Freight 2) Passenger
3. Tariff Improvement	1) Freight tariff 2) Passenger tariff
4. Train Operation Plan	1) Competitive train 2) Future high speed train 3) Computerized adaptation of train diagram to forecast demand 4) Train Speed Improvement 5) Plans improving train operation of main issues 6) Planned train for financial projection
5. Facilities and Rolling Stocks	1) Reinstatement of deferred maintenance 2) Investment to combined transport 3) Maintenance and improvement
6. Human Resources	1) Planed manpower /pay level for financial projection 2) Pay system, incentive and management change 3) Personnel and training organization
7. Less traffic density lines	1) Continued rationalization and cost reduction 2) Transfer to related company 3) PSO subsidizing

Source : JICA Study

2) Screenig

As a result of screening, no major impact were identified except noise and vibration and waste. It is concluded that Environmental Impact Assessment is not required at all as follows:

Table 7.7.8 Screening of Long Term Management Plan of Bulgarian Railway

No.	Environmental Items	Description	Evaluation	Remarks (reason)
Social Environment				
1.	Resettlement	Resettlement by occupancy of proposed land	No	Existing ROW is used
2.	Economic Activities	Loss of productive opportunity such as land	No	Less change of economic activities
3.	Traffic and Public Facilities	Influence of existing traffic such as congestion	No	Public facilities exist in the project area
4.	Split of Communities	Split of Communities by obstruction of railway line	No	Non access control cause no obstruction
5.	Cultural Property	Loss of cultural property and falling of values	No	Cultural heritage do not exist
6.	Water Rights and Rights of Common	Obstruction of fishing rights, water rights, and common rights of forest	No	treatment facility exists
7.	Public Health Condition	Deterioration of a hygienic environment by production of refuse and noxious insect	No	Lots of refuse will not produced
8.	Waste	Occurrence of waste dumps and solid waste	Yes	wastes will be produced
9.	Hazards (Risk)	Increase of possibility of danger of landslide and accident	No	Less possibilities to occur
Natural Environment				
10.	Topography and Geology	Change of valuable topography and geology by excavation or filling works	No	Large scale of earth work is not included
11.	Soil Erosion	surface soil erosion by rainwater after land development (vegetation removal)	No	Subjected area is developed already
12.	Ground Water	Change of distribution of ground water by large scale excavation	No	No large scale excavation
13.	Hydrological Situation	Change of river discharge and riverbed condition due to landfill and drainage inflow	No	Subject area is developed
14.	Coastal Zone	Coastal erosion and sedimentation due to landfill or change in marine condition	No	No plan along the coast
15.	Flora and Fauna	Obstruction of breeding and extinction of spices due to change of habitat condition	No	developed land
16.	Meteorology	Change of temperature, precipitation, wind ,etc., due to large scale development	No	There are no large scale development
17.	Landscape	Change of topography and vegetation by land development and harmonious obstruction by structural objects	No	no new construction
Pollution				
18.	Air Pollution	Pollution caused by exhaust gas or toxic gas from vehicles and factories	No	less exhaust gas
19.	Water Pollution	Pollution by inflow of silt, and effluent into rivers and ground water	No	there is treatment facilities
20.	Soil Contamination	Contamination of soil by dust and chemicals	No	No activities with chemicals
21.	Noise and Vibration	Noise and vibration generated by railway	Yes	During operation
22.	Land Subsidence	Deformation of land and land subsidence due to the lowering of ground water	No	already developed area
23.	Offensive Odor	Generation of exhaust gas and offensive odor by facility construction and operation	No	No factor
Overall evaluation		Environmental Impact Assessment (EIA) is required or not	From the results of the evaluation, **EIA is not required.**	

3) Scoping

Noise and vibration due to improvement in operation speed including high-speed trains and waste generation in operational stage shall be examined in more detail when the plan carried out.

Table 7.7.9 Scoping (Long Term Management Plan of Bulgarian Railways

No.	Environmental Items	Evaluation	Remarks (reason)
	Social Environment		
1.	Resettlement	D	Resettlement will not occur due to improvement of existing railway
2.	Economic Activities	D	Important changes in economic activities will not occur
3.	Traffic and Public Facilities	D	Developed lands are used. There is no impact on schools, medical, religious facilities in urbanized areas
4.	Split of Communities	D	Access is already controlled and there is no new split the community
5.	Cultural Property	D	There is no impacts in cultural properties in urbanized areas
6.	Water Rights and Rights of Common	D	Treatment facility exists.
7.	Public Health Condition	D	Large amounts of refuse will not occur
8.	Waste	B	Small amount of waste will be produced in the operation stage
9.	Hazards (Risk)	D	There is little possibility of natural disaster
	Natural Environment		
10.	Topography and Geology	D	Large scale land development is not included
11.	Soil Erosion	D	Large scale soil erosion has not been identified
12.	Ground Water	D	There is no large scale structure affecting the under ground condition
13.	Hydrological Situation	D	No structures will be built on the rivers
14.	Coastal Zone	D	There is no alignment in the coastal area
15.	Flora and Fauna	D	Existing lines are used. There is no valuable flora and fauna.
16.	Meteorology	D	Large scale fills and construction of high buildings are not planned
17.	Landscape	D	No new alignment plan.
	Pollution		
18.	Air Pollution	D	There is no impact on air quality by increasing traffic volume during operation stage
19.	Water Pollution	D	Influence on rivers by discharge water from railway facilities is unknown
20.	Soil Contamination	D	There are no activities causing soil contamination
21.	Noise and Vibration	B	There will be some impact on noise and vibration by increasing the operation speed during the operation stage
22.	Land Subsidence	D	Developed land is used
23.	Offensive Odor	D	There are no factors causing offensive odors

Note1: Evaluation categories:
A: Serious impact is predicted
B: Some Impact is predicted
C: Extent of impact is unknown (Examination is needed. Impact may become clear as study progresses)
D: No impact is predicted. EIA is not necessary
Note 2: The evaluation should be made with reference to the Explanation of Item.

Table 7.7.10 Matrix for Scoping Classified by Project Phase

Environmental Factors \ Major facilities, activities / Activities which may cause impacts			Railway Facilities/ Construction of Railway					
			Overall Evaluation	Before Operation		After Operation		
				Reclamation and spatial occupancy	Operation of construction equipment	Occupancy of land	Operation of railway	Accumulation of people and goods
Social Environment	1.	Resettlement						
	2.	Economic Activities						
	3.	Traffic and Public Facilities						
	4.	Split of Communities						
	5.	Cultural Property						
	6.	Water Rights and Rights of Common						
	7.	Public Health Condition						
	8.	Waste	X				X	
	9.	Hazards (Risk)						
Natural Environment	10.	Topography and Geology						
	11.	Soil Erosion						
	12.	Ground Water						
	13.	Hydrological Situation						
	14.	Coastal Zone						
	15.	Flora and Fauna						
	16.	Meteorology						
	17.	Landscape						
Pollution	18.	Air Pollution						
	19.	Water Pollution						
	20.	Soil Contamination						
	21.	Noise and Vibration	X				X	
	22.	Land Subsidence						
	23.	Offensive Odor						

Note: XX: The environmental items to which special attention has to be paid. They might be serious impacts that may affect the project formulation depending on the magnitude of the impacts and the possibility of the measures.

X: The environmental items that may have a significant impact depending on the scale of the project and site condition

No mark: The environmental items requiring no impact assessment since the anticipated impacts are, in general, not significant.

(2) Overall Evaluation of Initial Environmental Examination

The management plan comprises various kinds of institutional programs, improvement plans and a few new developments such as combined transport. In the course of IEE, only a few impacts were identified due to the development a few new facilities. Most of the impacts arising from the plan affect on positive side. It is concluded that EIA is not required for this plan although a few direct impacts, noise and vibration, caused by improvement of railway service such as high speed train operation will be taken into consideration for further detailed examination.

1) Noise and Vibration

a. Noise

Most of the adverse impacts of railways on people could be described as nuisance. Train noise is the most measurable nuisance caused by railways. IEE procedures identified some impacts on noise by the plan, which comprise improvement of operating speed and high speed trains. However as the plans involved existing lines, the impact on noise will be minimal. However some examination of noise and vibration is given as follows:

In comparison with the other transport noise level shown in the following table, railways, e.g. BR electric train, shows that rail's noise level (93-99 dB(A)) remains between aircraft and cars, 110 dB(a) and 80 dB(a) in peak noise level respectively.

Table 7.7.11 Typical Transport Noise Level

	Peak Noise dB(A)	Maintained Noise Level	Position of observer
Aircraft B747	110		250 m below
Passenger Car	80		25 m from train or vehicle
Articulated Lorry	85-90		ditto
Highway Traffic		75-85	ditto
BR Electric (160 km/h)	93		ditto
TGV SE (270 km/h)	99		ditto
Busy road intersection		60 - 70	on side walk
Underground Station	100 - 105		on platform
Train Horn	100 - 110		at 30 m

Source: The environmental impact of railways

The BDZ noise level measured in Sofia residential areas shows rather a higher level of noise compared to reference data shown in Table 7.7.12. In general, train noise can be generated in the following:

- motive power unit: noise from engine and ancillary equipment escaping through exhausts or openings in the ceasing
- wheels running on rails
- aerodynamic effects
- vibrating structure

In another comparison between measured data of BDZ noise level and other country's railways, even high speed trains and different operating speeds, there seems to be little difference among them. For example BDZ express train shows 98 dB(A) of SEL at 90 km/h white TGV SE shows 93 dB(A) at 200 km/h.

Table 7.7.12 Noise Sampling Level and International Comparison

	Type	Speed (km/h)	SEL	L_{max}	Remark
BDZ	Express Train	90 km/h	92.7 - 98.3	84 - 96.5	
	Fast Train	90 km/h	90.1 - 96.1	84 - 89	
	Electric Train	90 km/h	83.6 - 90	70 - 78	
	Freight	60 km/h	87.8 - 97.9	76 - 84	
BR Coach	Passenger	144 km/h	88/90	82/85	Electric
ICE	Passenger	200 km/h	-	86/82	Electric
High Speed Train (HST125)	Passenger	200 km/h	97	94	Diesel
TGV SE	Passenger	200 km/h	93	84	600 m long
BR Intermodal freight	Freight	80 km/h	-	89	
French freight	Freight	80 km/h	-	86	450 m long/ Laeq 64

Note: data shows in dB(A) 25 m from track center. Data of BDZ shows in residential area in Sofia. BG level: daytime; 55.7 dB(A), night; 44.5 dB(A)
Source: JICA Study and The environmental impact of railway

In BDZ's case, the noise generation source can be the motive power unit and wheels running on rails. These stem from issues of railway maintenance that are proposed in the plan. Further improvement will reduce noise level. Consequently impact on noise level will be minimal.

Noise generation on the rails can be reduced by:
- better design of wheels, suspension and brakes to reduce wear,
- regular grinding of rail to remove corrugations
- avoidance of rail discontinuities in sensitive area
- resilient track mountings or fastenings, especially on elevated structure or in tunnels

b. Vibration

Diesel engines generate mainly low frequency sound. This can be radiated to surroundings where it reaches buildings. The main vibrations transmitted to the ground arise from forces between the wheels and the rails. The suspension and bogies of passenger trains, particularly electric multiple units, reduce the viblations. Heavy freight wagons are more likely cause of vibration.

The impact of vibration is potentially serious for structures (3mm/s; historical building, 10 mm/s; residential, 20 mm/s; commercial buildings) and human comfort (above 3mm/s). Typical acceptability criteria of vibration is 0.3 - 2.0 mm/s (The environmental impact of railway).

Table 7.7.13 Vibration level in Sofia Residential Areas

Type	Speed (km/h)	Peak particle velocity (mm/s)
Express Train	90 km/h	0.280 - 0.460
Fast Train	90 km/h	0.280 - 0.420
Passenger Train	90 km/h	0.500
Electric Train	90 km/h	0.230 - 0.400
Freight	60 km/h	0.210 - 0.580

Source: JICA Study Note: data measured 25 m from track center.

In this regard, measurement results of vibration in Sofia residential areas show peak particle velocity that ranges from 0.21 to 0.58 mm/s shown in Table 7.7.1. Also for noise level results,

there seems to be little differences among train category. If can be seen major results vibrations caused by BDZ train in Sofia residential area is well below the acceptability categorized of 0.3-2.0 mm/sec. given above.

In addition, vibration can be reduced at source by the following:
- improved design of suspension and bogies of rolling stock
- vibration-absorbing resilient track

2) Waste

Solid waste is generated in the operation and maintenance phases. The nature of this waste is mainly divided into two categories waste caused by passenger waste which is removed in major depots and maintenance station and, freight waste leftover in wagon from freight cargoes. Source of this impact is predicted in the operation and maintenance of railways.

7.7.4 Environmental Consideration

The considerations will be made in order to enhance positive impacts and minimize negative impacts figured out by results of environmental analysis based on this management plan and for further programs.

(1) Long Term Environmental Policy for the Railways

In response to the management plan, a concrete longer-term environmental policy should be formulated in order to better maintain a sustainable railway environmental condition.

Short term target plans in consideration of environmental aspects was formulated and is being implemented while the long term environmental plan is needed to confirm with the EU treaty 130r (2) which states "environmental damage should as a priority be rectified at source and that polluter should pay". In this regard, the proposed plans should have the environmental management plan based on BDZ's long-term environmental policy so that purpose of this management plan will be environmentally sustainable.

(2) Railways as an Environmentally Advantaged Transport

It is an attempt to present comparative information about transport energy use and emissions from road and railway transport, the Table 7.7.14 shows an order-of-magnitude that railway contributions are significant apparently.

One of the article of EU transport policy recommends the sue of combined transport to its members mainly because of its environmentally friendly aspects and the BDZ management plan include combined transport in compliance with this EU policy.

Table 7.7.14 Typical Transport Energy Use and Emissions

Transport type	Energy Use (KJ/Passenger-km)	CO_2	Nox	SO_2	CO	HC	VOC
				g/passenger-km			
Road Passenger							
Cars	2,000	150	2	0.05	10	1.5	2
Buses	800	40	1.0	0.1	0.5	0.1	0.5
Rail Passenger							
All train	800	80	0.6	0.3	0.2	0.2	0.3
Diesel train	800	80	1.5	0.2	0.2	0.1	0.5
Electric train	800	80	0.5	1.0	0.02	0.001	0.001
Road freight	(KJ/ton-km)			(g/ton-km)			
All road	2,000	250	4	0.3	2	0.5	1.0
Large lorries	1,000	100	3	0.2	0.2	0.3	-
All Rail freight	700	40	0.3	0.3	0.2	0.05	0.1
Diesel	-	40	0.7	0.1	0.15	0.1	0.1
Electric	-	40	0.2	1.0	0.01		0.01

Source: The environmental impact of railways, Note: KJ; kilo-joules ($1J=10^7$erg=0.239 Cal.)

(3) Facilities Development and High Speed Trains

It is recommended that further detail environmental analysis of each comportment plan, particularly high speed train and related facilities development shall be conducted when the feasibility study is implemented.

(4) Planning Standard

Standards should be set for either noise generation or noise reception levels in order to conserve human health and a comfortable living environment. There is no standard related to the noise and vibration emitted by railways in Bulgaria. Maximum train noise (L_{max}) generated at source is subject to upper limits. Examples of source standards are illustrated as follows:

- 90 dB(A) for US diesel Locomotive built after 1979
- 85dB(A) for Danish rolling stock wheel noise
- 96 dB(A) in the specification for Eurostar at 300 km/h

Noise reception standards shall be formulated to define the level of acceptability. Typical standards for 24 hours L_{aeq} at house facade are as follows:

- 70 dB(A)for new railway in Japan
- 69 dB(A) for SNCF TGV, reduced to 64 dB(A) in the latest guideline for application in residential areas
- 65 dB(A) for London Docklands Light Railway's Becton extension (bill)

7.8 ORGANISATIONAL REFORM

7.8.1 Necessities of Organizational Change

As Bulgaria has adopted and aims at a full implementation of introducing the market economy system, the economic and business system and entities have to change. This is the system which basically functions through price mechanism. There are roughly speaking two requirements in order to maximize the effects of the market economy system. (1)All the market participants have to be allowed to make decisions independently at their own discretion. (2)There should be a number of competitors in the marketplace. Allowing independent decisions are necessary in order to make the economic system functional, while the existence of competitors is also necessary to make the system more efficient.

These are the principles even applicable to the railway business which used to be regarded as social service run mostly by the government or public corporations. However, the above consideration has been extended increasingly to the railway business, and many countries have adopted measures to maximize market functions. Thus the ultimate goal of the railway market in Bulgaria should be the privatization of BDZ with a competitive environment.

However, it is not quite feasible to implement privatization at the early stage. The long term goal should be achieved in the long run and gradualism is a better alternative in transforming the company into more modernized railway unit.

However, even in the short run every possible effort should be employed in order to transform the railway entity into the desired direction. The basic notion of the privatization of the company is to create an entity which is more efficient and is able to provide better services at cheaper prices. In order to achieve this target, the company should be reorganized to conduct each business line in a more professional manner. Thus the company should consist of several units which are highly autonomous and market orientated. Each business unit has to become formed by specialized staff from the top to worker levels who are motivated by some schemes, like incentive pay scheme.

The forthcoming keener competition will require the company to make quicker and more flexible decisions. To this end, each unit, which is reorganized so as to cope with specialized demands from the customers, has to receive higher level of autonomy. Here lies the necessity that the company should consist of several market units which have higher level of autonomy.

The necessity of autonomous business units arises also from expanding international aspect

of the company. As the economy grows and internationalization proceeds, each business unit will face more opportunities to cooperate with the domestic and international enterprises in their specific areas. In order not to lose the business opportunities, each unit needs to obtain professional information to enable quick business decisions.

The planned introduction of Management Information System (MIS) will support the autonomy of each market unit. MIS will not only serve the more efficient train operation, but also make the company possible to obtain more precise and detailed segment/line financial information. With this information, the management and each unit will be able to make strategic decisions. The system also is supposed to serve the company to employ more flexible pricing policy which is necessary to enhance marketing activities.

However, the idea of one company with autonomous units should only be applied to the transition period, and not be regarded as the ultimate goal. The ultimate shape of the railway organization might consist of several entirely independent business units. The organization should be separated to grant and guarantee full autonomy of the management. In order to maximize the market oriented type of organization, such reorganization is considered necessary. However, before reaching this sensitive conclusion, a number of factors have to be carefully analyzed. Particularly the relationship with the government has to be more clearly defined.

In the short to medium term, the passenger business and infrastructure economy will still have to rely on subsidies from the government. This requires the Contract Plan, which will expire in1998, to be renewed and extended beyond 1998 so long as the company has to receive subsidies. Under this institutional framework, the organization may not be able to change substantially.

Intensive studies on the best and possible shape of the organization in the long term future will be conducted in the later stage of our study. The advantages and disadvantages of possible alternatives are carefully studied. The alternatives may include (1)one company with autonomous business units based on market segments, (2)separation between infrastructure and operation (passenger and freight), (3)separation between passenger and freight (infrastructure belongs either to passenger or freight), and (4) separation into infrastructure, passenger and freight.

Consideration has to be paid to the profitability of each unit including tariff and subsidy policies. The tariff policy should include attributed cost (revenue) to the infrastructure economy. The institutional framework with the government and among the units also has to

be studied. The strategy on the administrative services also will have to be constructed.

7.8.2 Phased Reform Plan

The team believes that the best alternative in organizational aspect is the separation into 3 entities, namely the infra structure entity, the passenger company and the freight company. The infra structure entity will specialize in maintaining and developing the infra structure of railway network, while the latter two companies will posses the rolling stock and run the train operation business. With this ultimate measure, the railway operation will be run by most efficiently as each business unit is secured the independence from the government, and increased financial commitment is expected from the government.

However, there are several obstacles to the immediate implementation of the measure. First, the internal organization is not developed in this market oriented direction, and immediate reorganization into these three business activities may create unnecessary disturbance in the management. Second, the separation requires allocation of functions, assets and staff, which is not easily agreed among various parties. Third, legal revisions have to be made toward this direction, which is expected to take some time. Forth, Accounting system to reveal profitability of each business activity has not been established yet. Thus before implementing the ultimate measure, several steps will have to be taken.

(1) Immediate Measure

As the financial situation of the company is expected to stay stagnant, any costly measure should not be implemented within this century. However, as the final goal of institutional separation is definitely vital to railway transport in the future, the company and the government should start possible measures as early as possible.

The team believes that the most important measure in the first stage is to develop the management accounting system in order to reveal the financial viability of each business activity. The importance of management accounting does not only arise from the business separation, but also from the planned introduction of open access in the future. The management accounting system will reveal accurately the cost structure of infra structure, and will form a basis of access charge to be collected from the operators. The management accounting system will also reveal the necessary amount of cost to be compensated and subsidized from the government.

The team understands that the company well recognizes the importance of the management

accounting, and has organized a working team to establish the system. The plan is to build a segment accounting system first, and then a segment/line accounting system. The whole process is expected to be completed in a year or so. The planned introduction of FMS will serve the accounting system to work more efficiently. The team proposes that the company should concentrate on the completion of the whole process as early as possible.

(2) Medium Term Measure

The next step to be taken is the organizational separation. In this stage, the company is sill a unified railway company owned wholly by the government, but the divisions are organized in the more market oriented manner. The existing functionally divisions will be replaced by the more market oriented divisions, namely the infra structure, passenger operation and the freight operation. Each division will be allocated the necessary production factors, such as human resource and assets.

Each division has to be granted higher level of autonomy in management, while also has the responsibility to restore financial viability of the division. The aforementioned management accounting system will help each division build the financial target and development plan. The management team will have to rake every possible measure to reach the annual target.

The division itself is better advised to reorganize the division's internal organization itself in order to create more market oriented structure. As was proposed in the future freight marketing organization, the existing cross section system (ex. Marketing for every kind of freight) is advised to be replaced by the vertical system. (ex. Specialized marketing sections for bulk, container, etc.)

(3) Long Term Measure

1) Institutional Separation

In the long run, the company will be separated and the aforementioned divisions will become fully independent entities. In this system, management independence is secured, while the management owes the whole responsibility in restoring financial viability through providing the customers with better service at attractive prices.

The team proposes the earliest possible timing of the implementation of the institutional separation will fall around 2007. This is the timing that several factors are expected to be satisfied, including the assumed year of the nation becoming a full member of EU, economic

development led by the new industrialization and the growing threat from the competitors from road transport and within the railway transport.

The team advises the infra structure manager maintains the status of government owned corporation, as the infra structure has to be maintained and developed by the government budget. Under the new transport system, railway and road transports will have to be given the equal competing ground for the healthy development of national transport system. As the road network is maintained and developed by the state government, the same maintenance and development system has to be built for railway network. Thus, the infra structure manager may be an independent, but directly held by the state government. The company and the government should enter such an agreement that maintenance and investment cost will be born by the state government.

The passenger and the freight units will be separated from the company in order to independently run the operation business. To this end, the most desirable way is the full separation of shareholdership among the three entities. However, the capital market will still be immature to deal with such huge companies around this timing, and it is better advised the two companies will be held by the infra structure manager in the transition period.

The financial analysis suggests that the freight company will be able to become financially independent, but the passenger company will have to depend on compensation by the government. Here it is vital for the passenger company and the government to agree upon the precise criteria and accurate calculation method for passenger compensation. The team believes that the existing financial target of 1 to2 in revenue/cost ratio is supposed to be a rough idea to used until a more accurate management accounting system is developed. The new compensation determination system should be built upon modernized accounting system.

The team believes that although the organization will be separated, the three entities will have to cooperate in order to develop the competitiveness of railway services. Also in the area of development project, the three entities and the transport authorities will have to closely coordinate for the future railway development.

2) Privatization

Privatization is the ultimate goal of the new economic regime for the company, as every thing is determined by the market force or the invisible hand. Under the new shareholdership, there is no threatening factor on the company's independence, while the company has to survive by

taking every possible measure.

The team suggests that the two operational companies are eligible for privatization, while the infra structure entity is better left in the hand of the government. Among the two operation companies, the freight company is much more easily privatized as the capital market always prefers to deal with the profitable companies. On the other hand, the passenger company is rather remote in terms of the timing for privatization.