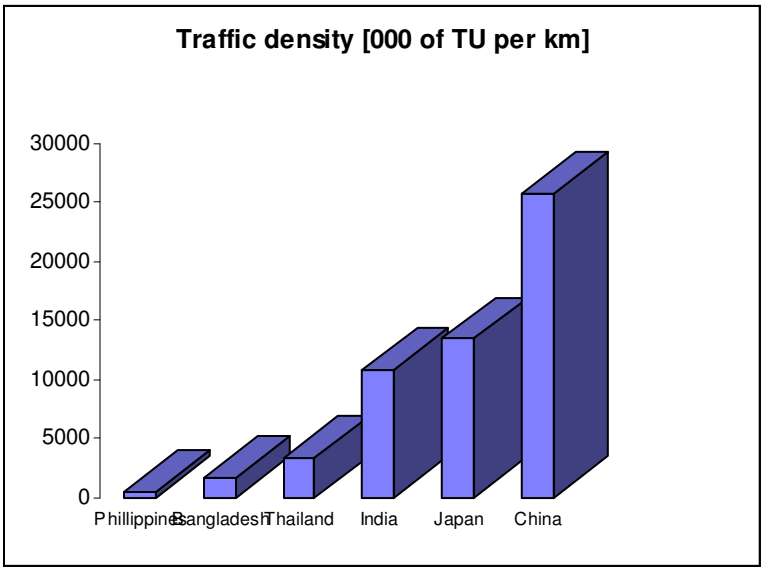
3 ANALYSIS OF PROBLEMS

3.1 Track Conditions

Track maintenance at adequate standard is a fundamental requirement of permanent way (P-way) to avoid derailments and provide acceptable riding quality for traffic being carried. In general, derailment occurs because of twist faults, cyclic top faults, buckles and of course broken rail, along with switch and crossing layouts. However, priority must be given to elimination of defects on the open line where train speed is more. Regular departmental staff of Bangladesh Railway undertakes maintenance of track mostly manually. Mechanical maintenance is done only on Dhaka-Chittagong line with a single machine, which is pretty old. Presently, more and more railway tracks are being laid on pre-stressed concrete sleepers, especially the Bangabandhu Rail Link with 3-rail DG structure, which cannot be manually maintained. Therefore, Bangladesh Railway needs to make adequate arrangement for mechanical maintenance to ensure safety and adequate riding quality. Maintenance of track mainly suffers due to inadequate allocation of resources. As a result, very often speed restriction is imposed to ensure safety.

The performance of P-way is generally measured by traffic density. The bar chart shows that utilisation of track in Bangladesh is less than most of the selected countries. The track therefore has enough unused capacity to carry additional traffic. Dhaka-Chittagong railway route is the only exception, where trains are running closer to its capacity on some sections. However, initiatives are underway to remove the present constraint along Dhaka-Chittagong corridor, where 119.45 km railway line is already double track, and 124.80 km is in the process of doubling and remaining portion is being planned for doubling.



Source: World Bank's Railway Database

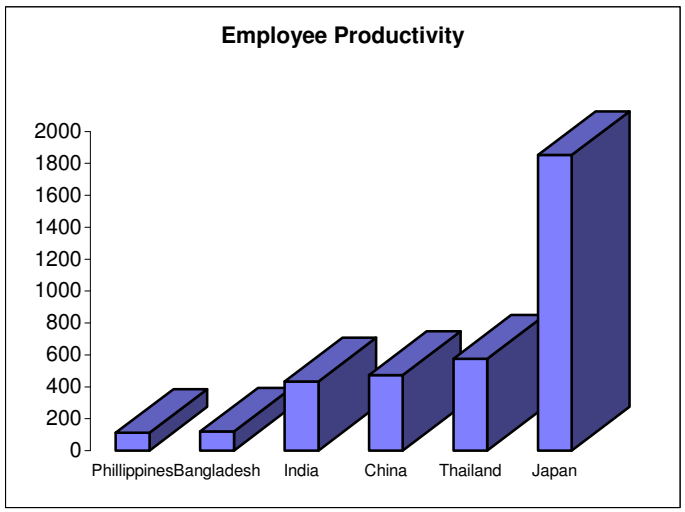
In the Bangladesh Railway system, there are big gaps between used capacity and available capacity of track. Generally, practical capacity is about 75% of theoretical capacity. For estimation of railway capacity, consideration of Practical Capacity is a more significant measure of track capacity since it relates to the ability of a specific combination of infrastructure, traffic, and operational aspects to move most of the traffic within an expected service level. It may be noted that only 8% of the route under Bangladesh Railway has double track or part of this route length has double track. Double track has a major impact on capacity. Two tracks usually have around four times more capacity than a single track; however, a four-track line rarely increases capacity by more than 50% over a double track.

Furthermore, adding a second track may not eliminate the problem because the station is the real bottleneck.

In order to improve, the track condition, a Feasibility Study for Improvement and Rehabilitation of Branch Lines of Bangladesh Railway was undertaken in 2007. The study team surveyed about 1009 km rail route out of total 2,885 km (since 228.74 km route was closed down) route length of Bangladesh Railway. The study indicated that 1009 km of tracks need urgent rehabilitation and 1,647 km of tracks are in good condition, which need only proper routine maintenance.

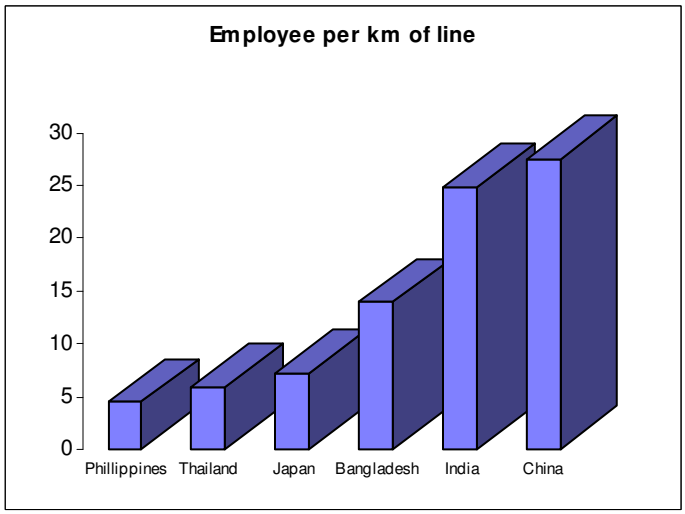
Employee Productivity in Maintenance

Employee productivity, related to track maintenance is one of the crucial issues which need to be maintained for ensuring proper utilisation of public fund. The bar chart related to employee productivity shows that it is very low in most of the Asian countries, which calls for improvement. It is partly because the regular departmental staffs maintain the track manually. However, close supervision may increase to some extent the productivity of maintenance labour, which could be and cheaper than mechanised track maintenance.



Source: World Bank's Railway Database

The mechanised maintenance system is also required, particularly in the main line, where traffic density and speed are of paramount importance. Presently, Bangladesh Railway has been laying concrete sleeper in place of steel sleeper, which are more heavier. This type of replacement needs more manual labour than before. In the context of employee per km of line, the bar-chart shows that Bangladesh is having an average position among the Asian countries. Employee per km of line is 14 in Bangladesh as compared to 25 in India. However, there are growing tendency for privatisation of maintenance labour worldwide to reduce the overall railway costs and to ensure better performance in railway track maintenance.



Source: World Bank's Railway Database

The maintenance of main lines, however, shall have to be mechanically maintained.

3.2 Bridge Conditions

Most of the railway bridges were built more than 100 years ago and they are still continuing. The permitted speed on most of the bridges is limited to 30-50 km/hour. According to railways requirements, the bridges need to be replaced or rehabilitated because of damage of abutment, pier, and girder, and crack and or corrosion of steel structures. In addition, some of the bridges need to be replaced because of double tracking programme, for instance, Dhaka-Chittagong route. Along this route, the bridges across the rivers Titas, Meghna and Lakhya are all single track only. Since double tracking works is in progress, it would be highly desirable that a second bridge is built for the new track being laid. Until the second bridge is build, the existing bridge, with appropriate signalling system could continue service the traffic of both the tracks. The various types of bridges under Bangladesh Railway are presented in the Table 3-1.

Table 3-1: Type of Bridges and percentages

Kind of Bridges	Percentage
Arch	11.2
Arch Concrete	3.6
Girder	29.7
Rail Cluster	2.5
RCC Slab	6.8
Deck Girder	18.5
Through Girder	7.4
Simi-through Girder	0.8
Hume Pipe	16.8
Open Rail Top	2.7
Total	

There are about 546 numbers of major bridges, having lengths more than 40 metres. The numbers of minor bridges are 3,104 which are mainly arch, rail cluster, RCC slab, Hume pipe etc. The following Table 3-2 sets out broader categories of bridges and their number.

Table 3-2: Category of Bridges by Number

Category of Bridges	Number
Major bridges	546
Minor bridges	3,104
Total	3,650

Table 3-3: Condition of Selected Major Bridges

Name of Major Bridges	Existing condition and actions to be taken
Jamuna Multipurpose Bridge	This bridge is 4.8 km long. Needs strengthening for higher axle load or construction of a new parallel railway bridge needed.
King George-VI (Bhairab Bridge) Bridge	The bridge length is 914 m. It was opened to traffic in 1937 and a second bridge needs to be built because doubling of the track is underway.
Hardinge Bridge	The bridge length is 1.8 km and opened to traffic in 1915. The bridge needs to be rehabilitated.
Tista Bridge	The bridge was opened to traffic in 1929. It will need rehabilitation.

Kalurghat Bridge	The bridge length is 239 m and it was constructed in 1930. It needs major rehabilitation.
Kanchan Bridge	The bridge is located at Dinajpur-Birol/Panchagarh railway line. It was damaged in 1971 war and needs to be rehabilitated.
Titas Bridge	The bridge length is 207m and was constructed in 1896. A second bridge needs to be built soon to provide for doubled track.
Lakhya Bridge	The bridge was constructed during the period 1910-1914, and its length is 335 m. The bridge needs to be doubled tracked as soon as possible.

3.3 Signals and Telecommunications

The basic purpose of railway signals is to enhance safety and to give train drivers enough scope to slow down, stops or accelerate. The big advantage of rail over other forms of surface transport is the low friction of steel wheel on steel rail which contributes to large scale fuel efficiency. But this in turn makes it hard for the train to stop; a modern express train may require more than 2km to stop on the level and 3km to stop on a downhill slope. Although, railway signalling originated from the basic needs of safety, but its further development has permitted the exploitation of wider facilities, in the form of considerable economies and increased efficiency, coupled with the attainment of higher speeds and improved control. It is closely supported by telecommunications facilities, both in ancillary functions and in establishing efficient railway communication services, using both land and radio transmission media.

Semaphore signals are the old style signals seen widely throughout the railway network; where each signal has an assembly with an arm mounted on a mast, where the arm can move through two or three different positions at different angles, each position providing a distinct signalling message. Very early in India's railway history, two-position lower-quadrant semaphore signals were the most prevalent. Colour-light signals are assemblies of lamps that indicate different messages by means of different colours of lamps that are lighted. Colour-light signals were introduced in 1928 but were slow to take off. In recent years many older semaphore signals have been replaced by colour-light signals. However, both the Semaphore signals and Colour-light signals exist in the Bangladesh Railway system, but the share of Colour-light signals has been increasing.

There are two types of systems: fixed and moving block signalling. In a fixed block signalling system, the position of each train is known only by the block section(s) that it occupies. The separation between trains is maintained by imposing the restriction that each block section be occupied by at most one train at a time. Block section lengths, train speeds, and train lengths are, therefore, important parameters of fixed block signalling. In a moving block signalling system, which is a modern technology, the position of each train is known continuously, thus permitting better regulation of the relative distances. This requires an efficient communication system between line signals, cabs, and control centres.

Bangladesh Railway has been introducing modernised signalling system on priority basis, considering the importance of lines. It is worth mentioning here that the line between Dhaka and Chittagong connects the capital city and the principal port of the country. The corridor carries about 40 percent of passengers and large share of freight traffic of East Zone. To meet the needs of train speeds and density of the traffic, signalling on the section were modernised in phases starting from the early sixties. At present, the entire section between

Dhaka-Chittagong is provided with colour light signalling & relay interlocking with token less block working. The double wire upper quadrant mechanical signalling is provided in sections of Tongi-Mymensingh, Santahar-Bonarpara and Khulna-Darsana. Relay interlocking system exists at two major stations in West Zone viz. Parbatipur and Ishurdi and at six stations in Mymensingh-Jamalpur section in East Zone. The most important and busy level crossing gates are also provided with interlocking system including approach warning and road signal. Replacement and modernisation works of stations from Muladuli to Joydevpur have been completed with computerised interlocking signalling system. Bangladesh Railway also modernised the stations at Akhauara - Sylhat section with computerized signalling and interlocking system. Modernisation of signalling system from Dhaka-Dhirassram is being carried out at present.

Table 3-4: Existing Standards of Interlocking

Standard of Interlocking	Number	% of Total
Double wire interlocked with standard 'I' (train speed up to 48 km/hour	36	10.81
Double wire interlocked with standard 'II' (train speed up to 72 km/hour	7	2.10
Mechanical Interlocking standard 'I' (train speed up to 48 km/hour)	31	9.31
Mechanical Interlocking standard 'II' (train speed up to 72 km/hour)	12	3.60
Mechanical Interlocking standard 'III' (above 72 km/hour)	16	4.80
Non-Interlocked (speed limit up to 16 km/hour)	115	34.53
Rely interlocked standard 'I' (train speed up to 48 km/hour)	8	2.40
Rely interlocked standard 'II' (train speed up to 72 km/hour)	2	0.60
Rely interlocked standard 'III' (maximum permitted train speed)	65	19.51
Computer based Signalling and Interlocking System (CBI)	41	12.31
Total	333	

Source: Working Time Table No. 43, Bangladesh Railway, 2005

Bangladesh Railway used telecommunication facilities from Bangladesh Telegraph and Telephone Board (BTTB) up to late eighties. These facilities were landline based, prone to interference and were unreliable. In 1984, Bangladesh Railway went for modernisation of the telecommunication systems and subsequently laid optical fibre-based digital telecommunication network as major share of line. The telecommunication network spans approximately over 1800 km and connects about 250 railway stations. Bangladesh Railway now earns about Tk. 1000 million from this network of 2000 km of optical fibre. The telecommunication system provides about 250 train control telephones and the same number of station-to-station telephones. Copper conductors are used for block instruments and the block telephones. Computerised Seat Reservation and Ticketing System (CSRTS) and Computerised Wagon Control System (CWCS) have also been installed using this network.

About 70% of railway networks is under optical fibre-based communications system and surplus capacity of optical fibre has been leased out to Grameen Phone. The optical fibre has had great impact on information technology and expansion of information network. There is a commercial as well as dissemination approach to achieve social goals of optical fibre technology. The optical fibre cables Fibre to-the Home/Premises (FTTH) has emerged as the fastest growing broadband access technology in many countries today. As such, positive policy action may be necessary for developing and expanding FTTH/P throughout Bangladesh. This approach will also eliminate the regional differences, in Zila, Upazila and

Cities of densely populated country like Bangladesh in respect of information system gaps of human resource development and skills.

Bangladesh Railway has advantages in excavation and lying of optical fibre cables in ground along railway tracks as far as land acquisition and right of way (ROW) is concern. Therefore, the organisation has potentials for expansion of door-to-door information technology in the country as well as enhancement of commercial uses. It is satisfying to note that the optical fibre has had great impact on commercial uses, human resource development and poverty reduction in the country.

3.4 Weight Restrictions

Bangabandhu Multipurpose Bridge (BMB) was originally designed to accommodate an MG railway track. When it was decided to build a DG track, BG train operation was allowed with severe load restrictions. The restrictions apply to BG freight trains only. Although most of BR's BG wagons can cross the bridge, Indian wagons cannot as they are heavier. Goods imported from India in Indian Railway (IR) wagons dominate freight traffic in the west zone. Unless the problem of weight restriction on BMB is addressed, Dhaka bound Indian cargo will have to be transhipped to BR wagons, or containerising. Containerised cargo can, however, move over BMB on suitable BG flat wagons.

The problem is further complicated by the fact that the Bangabandhu Multipurpose Bridge Authority (BMBA)-recently reorganised as that Bangladesh Bridge Authority owns the bridge and controls its use by road transport as well as by BR. This is something new and cumbersome for BR. BR is entrusted with the responsibility of operating train services as well as maintenance and safety of its infrastructure, which includes many important bridges. BR has its own institutional arrangement to prevent overloading of wagons and over-speeding of trains to ensure safety of its structures and operations. In case of BMB, BR is required to convince Bangladesh Bridge Authority that its operations are not endangering the safety of the bridge. BMBA has put a very severe speed restriction for train operation over BMB. The speed is now restricted to 20 km/h as opposed to the design speed of 40 km/h. This has drastically reduced the line capacity. The present estimated line capacity is 20 trains per day, which can at best be enhanced to 32 trains/day by splitting long block sections.

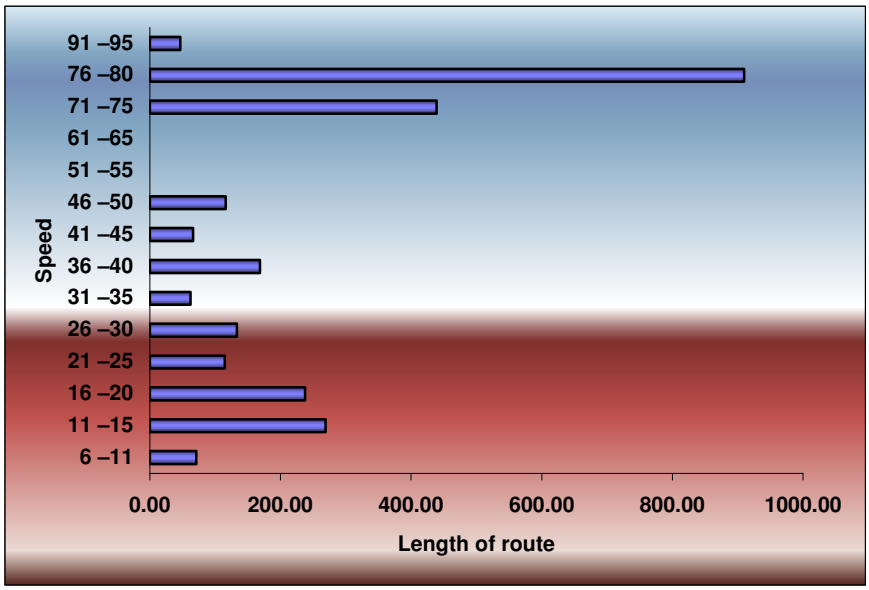
3.5 Speed Restrictions

Differential speed restrictions, indicated by signs on track side, are not new to Bangladesh and are currently permitted for permanent and temporary speed restriction. Due to gradients, slow orders, passenger stations, track configuration and maintenance level, it is quite usual to indicate speed restrictions. The lack of rehabilitation and regular maintenance causes derailments, mostly in the case of goods trains, and imposes speed restrictions based on shortage of ballast cushion, density and unserviceable sleeper, lack of P-way fittings, and bridge conditions, which indicates overall track condition. In Bangladesh Railway, there are two broader groups of speed restriction, which are 11-50 and 51>. It is seen from the data that the existing *sectional speed* is 11-50 for only 30% of the railway network, which 70% of the network has a speed limit of 50 above. Please see the bar chart for further details.

The following bar chart and the table describes the speed limit with *imposed restrictions*. A staggering 47% of the network has speed restrictions of less than 50kph. Compared to this, the speed restriction on China's railways are in the range of 94 kph (Beijing-Guangzhou), 112 kph (Shanghai-Nanjing), and 98 kph (Beijing-Qinhuangdao), and the World Bank's

recommended desirable speed is in the range of 60 to 100 kph. Hence the rail infrastructure in Bangladesh is severely hindering desirable operational performance.

Sectional speed with restrictions	Length (km)
Train not runs	381.28
6 –11	70.84
11 - 15	269.13
16 –20	237.76
21 –25	114.62
26 –30	133.26
31 –35	62.35
36 –40	168.56
41 –45	66.00
46 –50	116.05
51 –55	0.0
61 –65	0.0
71 –75	438.85
76 –80	909.68
91 –95	46.65
Total	2853.81



Source: BR Working Time Table No. 39 and GIS Database, TSMR, TSC Wing, Planning Commission

3.6 Rail Weight and Engine Horsepower

Rail weight is decided keeping in view the expected traffic and axle load. However, train performance depends on engine horsepower, gradient, curvature and especially on car loading. Most of the MG engines under BR are 1500 HP (with 1650 GHP) and the maximum speed for the recent classes is 100km/hour. The BG locomotive's average horsepower is within 2150HP-2600HP. However, 75lbs rail has been adopted on most of the MG lines and 60lbs on less busy MG routes, namely, Sholoshahar-Dohazari, Lalmonirhat-Burimari, and Jamalpur-Jagannathganj. In BG line, 90lbs rail has been laid. In the regional context, for example, in Malaysia in all MG (1000mm) lines 40kg (88lbs) rails are used on main lines and 30kg (66lbs) on less used branch lines. In the recent years, BR has been replacing 75lbs rail by 90lbs rail, particularly on the main lines.

The actual cost of the rail is an important element in the capital cost of the track – heavier rail is more durable and reduces maintenance but will only be justified where the loadings are high. However, this is an area, in which there is some scope for upgrading as demand increases.

3.7 Operational capacities

Bangladesh Railway is responsible both for railways infrastructure and train operation. The infrastructures include development and maintenance of track, bridge, ferry service, signalling, telecommunication system, and other civil engineering assets. The operation includes procurement and maintenance of rolling stock, operating performance and line capacity requirements. As such for efficient operation of the railway, coordinated management decisions in respect of all BR's assets, fixed as well as rolling stocks, would be

essential. Availability of well-maintained fixed assets are pre-requisite for punctual operation of rolling stocks. On the other hand, the quality, quantity and standard of maintenance of rolling stocks, namely, locomotives, wagons and coaches are equally important to maintain punctuality. However, the attractiveness of a train service depends on a number of factors, which include timing the train at origin and destination points, speed, frequency of services, cleanness of coaches, and ticketing system.

It is seen from the Information Book (2005) of Bangladesh Railway (2005) that on average about 19% of the coaches is either under repair or awaiting repairs daily out of the total number of coaches on line. Similarly, on average about 29% BG wagons and 16% MG wagons is either under repair or awaiting repairs daily out of the total number of wagons on line. With regards to locomotives, on average about 25% of BG locomotives and 15% of MG locomotives are under repair or awaiting repairs daily of the total number of locomotives on line. The available information shows that the repairable number of coaches, wagons and locomotives are increasing every year. The causes of low availability of rolling stocks compared to total stock are mostly inadequate maintenance and aging of the stock. Low availability of assets compared to total stock indicates that quantity is sufficient but actual availability are very low or lower than normal. Adequate maintenance of rolling stock and sufficient maintenance facilities for assets are the two key factors, which affect business operations of Bangladesh Railway an enterprise.

3.8 Safety

Rail is safer mode in comparison to road in Bangladesh. Presently, derailments of train are increasing but still the fatal accidents are less in number compared to other modes of transport. Railway is undoubtedly the most reliable traffic mode. The data on train accidents are available in the Information Books of Bangladesh Railway. The categories of train accidents are divided into collision, derailment, fire in the train and train running into obstruction. Please see Table 3-5 for further details.

The historical data shows that the derailments have been the major category of train accident in Bangladesh Railway. It was observed the accidents have been increasing over the years at around 16% per year and derailments dominated the scene. In this context, lack of proper maintenance was identified as one of the major causes of derailment.

Table 3-5: Train Accidents by Category

Year	Collisions	Derailments	Fire in trains	Train running into obstructions	Total
1997-98	8	233	0	16	257
1998-99	5	304	0	49	358
1999-00	6	405	1	44	456
2000-01	5	510	0	37	552
2001-02	14	624	3	67	708
2002-03	13	482	2	27	524
2003-04	8	723	0	23	754
2004-05	7	592	30	78	707
2005-06	3	790	0	37	853

Source: Information Book of Bangladesh railway, 2006

3.9 Ferries

Presently, Bangladesh Railway does not handle ferry services regularly. The last ferry at Balashi Ghat operates as conditional, which depends on river draught. The importance of ferry crossing reduced many folds after opening of Bangabandhu Multipurpose Bridge.

3.10 Locomotives

3.10.1 Metre Gauge Locomotives

The MG locomotives of Bangladesh Railway are a mix of diesel electric and diesel hydraulics. Most of the locomotives are actually diesel electric having North American origin. These were obtained from distinct sources, such as, Alco and General Motors. A smaller number (a total of 23 number MHZ 5 and MHZ 8 class) of diesel hydraulics locomotives were obtained from Hungary. A total number of 51 MEG 11 and MEG 9 class locomotives were procured in fifties and early sixties. The recent deliveries include 21 class MEL 15 locomotives from Germany during the period 1995-97 and 10 Indian MED 14 class in 1996. The most recent locomotives received were a total of 19 MEI 15 locomotives from Korea, of which eight were delivered in 1999 and a further 11 in 2005. Most of the MG locomotives are relatively low powered, i.e. 1500 HP (with 1650 GHP). The maximum speed for the most recent classes are 100km/hour with some of the earlier classes geared to a maximum 96km/hour.

Bangladesh Railway considers that the locomotives in excess of 30 years old are beyond their accountancy and due for replacement. According to this time limit, about 91 locomotives have already crossed that limits and another 23 are approaching this stage. However, the utilisation of locomotives is greater concern than their age. The aging fleet does account for the problems of low availability and the lack of reliability. It is also more difficult, and often very expensive, to obtain spare parts for such old designs, which can increase lead time of locomotive maintenance. All these uses contribute to shortage of locomotives on line. The details of MG locomotive number, types and age profile are presented in the Table 3-6.

Table 3-6: MG Locomotive Types and Age Profiles

Type	Year	Age Profiles										Total
		0-5	6-10	11-15	16-20	21-25	26-30	31-35	36-40	41-45	>45	
MEG11	1953-56										15	15
MEG9	1961-63										36	36
MEM14	1969-70								21			21
MEE5	1973-74							19				19
MEM14	1978						11					11
MHZ5	1980						12					12
MEH14	1981					17						17
MHZ8	1983					11						11
MEG15	1988				16							16
MEL15	1995-97		11	10								21
MED14	1996		10									10
MEI15	1999, 2005	11	8									19
Total		11	29	10	16	28	23	19	21	0	51	208

Source: Bangladesh Railway Sector Improvement Project (2007)

3.10.2 Broad gauge Locomotives

A total of 77 BG locomotives are available on line in West Zone of Bangladesh Railway. Of which, nine BHZ 9 class with 500 GHP from Hungary are not used for passenger and freight trains but used for shunting purposes. Most of the locomotives are relatively of higher power with 2150HP-2600HP compared to MG locos, which are on average around 1500HP. Only 37, out of total 77 BG locomotives are less than 30 years old. The detail of BG locomotive number, types and age profile are presented in the Table 3-7.

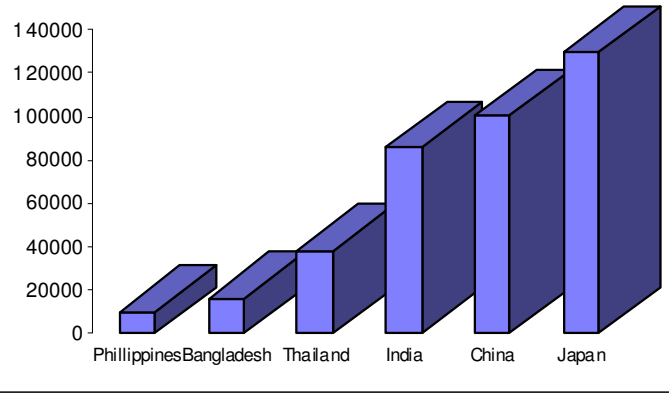
Table 3-7: BG Locomotive Types and Age Profiles

Type	Year	Age Profiles										Total
		0-5	6-10	11-15	16-20	21-25	26-30	31-35	36-40	41-45	>45	
BEA 20	1966									17		17
BEM20	1970								14			14
BHZ5	1980						9					9
BEB12	1980						12					12
BEH20	1981					12						12
BED24	2001&2004	13										13
Total		13	0	0	0	12	21	0	14	17	0	77

Source: Bangladesh Railway Sector Improvement Project (2007)

Locomotives are expensive items; as such it is only through increased productivity that the unit cost of a loco could be reduced. It is argued that a well-managed railway should have above 90 percent of its diesel locomotive fleet available for use on any given day. The availability for uses of MG locos is about 85 percent and for BG locos, it is 75 percent in Bangladesh. In addition, the speed is another factor for locos productivity, which depends on track condition. However, a-mix of factors contributes to reduce utilisation of locos in Bangladesh.

Diagram - 1: Loco productivity [000 of TU per loco+MU/MU Factor]



Source: World Bank's Railway Database

3.11 Rolling Stock (Coaches)

3.11.1 Metre Gauge and BG Coaches

The carriage fleet (passenger coaches) is the second area of critical importance in the context of providing railway services. The useful life of railway carriages can be extend up to forty years and this is a significant factor when addressing the issue of providing railway services. Some of the carriages are still being operated, which are over thirty years old and

most of the carriages have been in service since the early 1980s. The older carriages of Bangladesh Railway are, however, being phased out and replaced by modern units. The age profiles of MG and BG coaches are presented in Tables 3-8 and 3-9 respectively.

Table 3-8: MG Coaches and Age Profiles

Age Profile	Number	Percentage
0-5	0	0.0
6-10	67	7.4
11-15	17	1.9
16-20	164	18.1
21-25	208	22.9
26-30	219	24.1
31-35	153	16.9
35>	80	8.8
Total	908	100.0

Source: Bangladesh Railway Sector Improvement Project (2007)

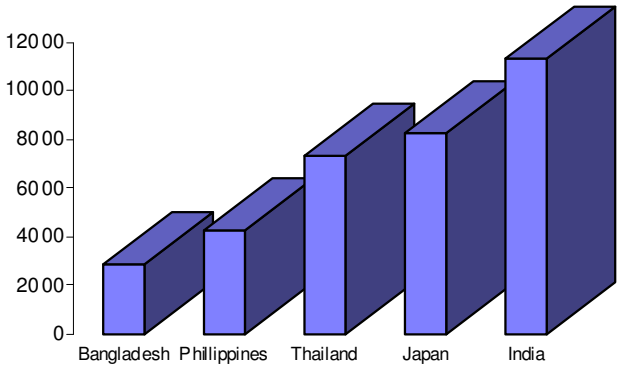
Table 3-9: BG Coaches and Age Profiles

Age Profile	Number	Percentage
0-5	50	15.4
6-10	0	0.0
11-15	3	0.9
16-20	13	4.0
21-25	7	2.2
26-30	175	54.0
31-35	31	9.6
35>	45	13.9
Total	324	100.0

Source: Bangladesh Railway Sector Improvement Project (2007)

An attempt was made to compare the productivity of Bangladesh Railway coaches with selected Asian countries. It is found from the Diagram – 2 that the productivity of coaches is less in Bangladesh compared to selected Asian countries. The coaches appear to be underutilised in Bangladesh. About 26 percent coaches of MG lines are over 30 years old and another 24 percent coaches are approaching that age. For BG line, 24 percent coaches are already over 30 years old and another 54 percent coaches are within the age range of 26-30 years. Moreover, maintenance of coaches is another important factor which contributes to productivity. The availability of MG coaches is about 81 percent, while it is 80 percent for BG coaches.

Diagram - 2: Coach productivity [000 of Pkm per Coach+MU]



Source: World Bank's Railway Database

3.11.2 Metre gauge and Broad gauge Wagons

The details of age profiles are shown in the following Table 3-10 and Table 3-11. It is found that most of the wagons are above 20 years old and after 1990, no BG wagons were procured. In addition, it is tried to segregate the 4-wheel and 8-wheel wagons of BG and MG system. Based on the age profile, the wagons are segregated further as broader age profile (0-45 years), because after 45 years BR declares the wagons beyond their economic age.

Table 3-10: Age Profiles of Wagons

Number of Wagons	Age Profiles (Years)										Total
	0-5	6-10	11-15	16-20	21-25	26-30	31-35	36-40	41-45	46+	
Metre Gauge	100	100	80	61	1468	210	1097	2784	687	700	7270
Broad Gauge	0	0	0	0	33	987	0	97	554	259	1930

Source: Reform of Bangladesh Railway (2008)

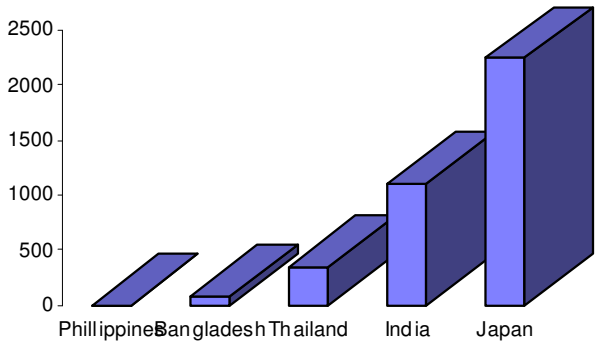
Table 3-11: Broader Age Profiles of Wagons

Age Profile (Years)	Number of MG Carriages	Number of BG Carriages
0-40	4900	1117
0-45	6587	1671
All age	7270	**1930**

Note: BR estimates the economic life of wagons up to 45 years old

It appears from Diagram – 3 that wagon productivity is very low in Bangladesh. The availability of MG wagon for use is 84 percent and in case of BG wagon, it is only 71 percent. It was found from the available data that there are significant numbers of extremely old wagons in the freight fleet of Bangladesh Railway. The old age of wagons is a matter of great concern to Bangladesh Railway, with regards to productivity, which is very low in Bangladesh compared to other countries in the region.

Diagram - 3: Wagon productivity [000 of Tkm per wagon]



Source: World Bank's Railway Database

3.12 Workshops and Loco Shed

Bangladesh railway has own workshops for maintenance of its rolling stocks. The workshops are based in Dhaka, Pahartali, Parbatipur and Saidpur. The different types of works relating to rolling stock are furnished in the various workshops. Saidpur Railway Workshops is the largest workshop of BR, which is well equipped for undertaking heavy repairs of carriages and wagons of both the gauges. Heavy repairs and major overhauling works for MG and BG locomotives are carried out at Parbatipur Central Locomotive and Diesel Workshops.

Repairs of locomotives are also carried out in the Dhaka Diesel Workshop. Pahartali Workshops are BR's main establishments for overhaul of Metre Gauge locomotives, carriages and wagons on the Eastern Zone. The details of main and damaged workshops under BR are described below:

Pahartali Workshops

Pahartali Workshops are BR's one of the main establishments for the overhaul of locomotives, carriages and wagons in the East Zone (EZ). The workshops undertake the major overhauls of majority of the metre gauge fleets. The workshops facilities comprise a diesel locomotive shop and a main carriage and wagon repair shop. There are another 14 shops; however, all the buildings and facilities of the workshop are aging fast. As a result, working conditions in the shops are getting worse, and this is impacting work efficiency. The renovation work of these buildings/sheds, facilities/utilities need to be undertaken on an urgent basis.

Saidpur Workshops

This workshop started working as a small MG steam locomotive running repair shed in the year 1870, just seven years after the rail transport started operating in the area. The repair of BG locomotives, carriages and wagons started in 1953 and a carriage construction shop was established in 1966. Presently, there are 28 shops in the workshop and the shops are broadly divided into three categories, namely:

- Under Work Manager (WM) – carriage shop, wagon shop, paint shop, general overhauling shop, CHR shop, welding shop, C&W M/C shop, yard shop, inspection shop, training school, schedule office, and drawing office;
- Under Production Engineer (PE) – loco M/C shop, boiler shop, millwright shop, tool room, saw mill, production M/C shop, crane shop, and laboratory; and
- Under Divisional Electrical Engineer (DEE) – power house, GER shop, LC&W shop, TL shop & diesel shop.

It is worth mentioning here that the only locomotive repairs and overhauling works have been shifted from Saidpur workshop to Parbatipur Loco shed in the recent past. However, most of the roofs and sidewalls of the shops have deteriorated and got damaged. In this regards, the working environment is not efficient and production friendly.

Civil Engineering Shops & Plants

There are Bridge Workshops situated at Kadamtali, Chittagong and Saidpur, Nilphamari which need modernization. The Bridge Engineering shop & concrete yard at Kdamtali, Chittagong may be converted to a modern Track Machine Shop where mechanized track maintenance machineries could be maintained & operated. Other production works related maintenance to Track & Bridge may also perform in the shop. Modernization of Saidpur Bridge Workshop is essential. Modernization and Capacity enhancement of Chatak Bazar Concrete Sleeper Plant need to pay attention. Rehabilitation & modernization of Kanchan Nagar Wooden Sleeper Treatment Plant is also essential for proper track maintenance. Moreover, Bangladesh Railway has a training academy at Halishahar, Chittagong which needs to be rehabilitated and training facilities and modules have to be improved.

3.13 Financial Position

Financial positions of Bangladesh Railway are dependent on a mix of overall financial performance, fare and tariff structures. Partly, due to its declining market share, increasing costs and regulated tariffs, Bangladesh Railway has been running at a deficit. The following sections discuss the financial and tariff structure of Bangladesh Railway in the recent years.

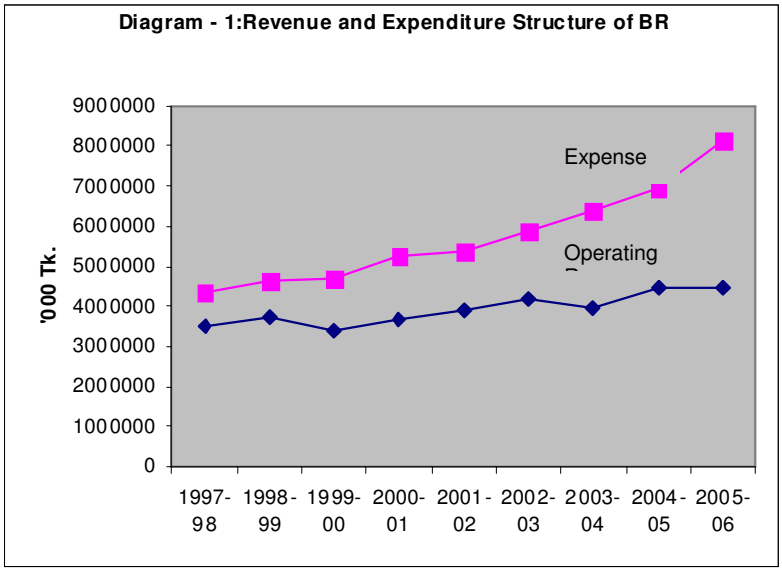
3.13.1 *Financial Performance and Vulnerability*

Bangladesh Railway has been losing concern for many years. In FY2005, the working ratio i.e. operating expenses divided by total revenues was 1.36 and the operating ratio i.e. operating expenses divided by operating revenues was 1.46 excluding provision of depreciation and Public Service Obligation (PSO) payments and welfare grants. Both these ratios show that operating revenues were not sufficient to cover operating expenses. The government has been subsidising the BR through deficit financing to make up the losses.

It was further noticed that expenditure had increased at 6.7% per year, while tariff revenue showed an increase of 3.8% only annually. Cement, fertiliser and raw jute which were carried by rail decreased in many folds. As a result, the earning-expenditure gap increased. The cultivation of jute and production of jute products has been decreasing in the country over the last decades. Also import of cement had been replaced with domestic production since late nineties. By and large, the stagnating trend of revenue earning had not caught up with the expenditures necessary for train operations. The following graph shows the earning-expenditures scenarios of Bangladesh Railway for almost a decade.

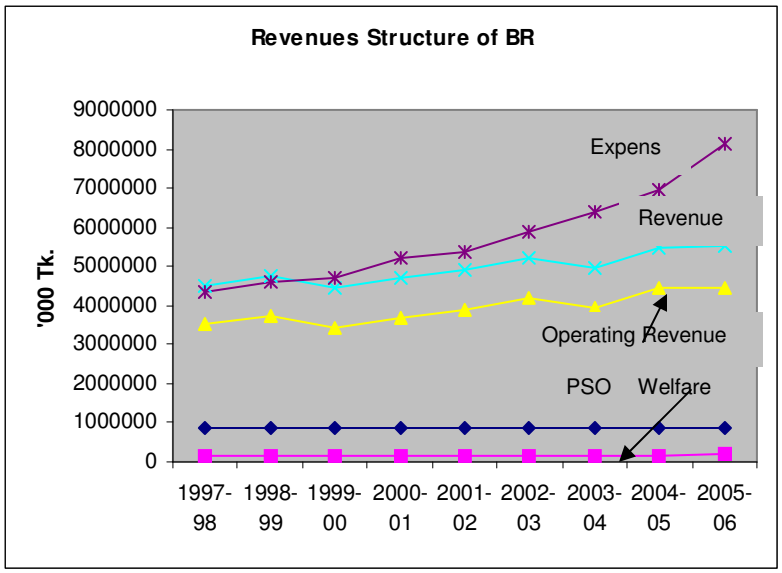
Bangladesh Railway, however, shall have to increase its operational efficiency to over-come the existing gap between earning – expenditure. However, the following graph shows that the earning-expenditure gap, before FY1998-99 was cancelled by the Public Service Obligation (PSO) expenditure by the government. The aims of the PSO is to compensate unprofitable rail services that were judged socially necessary and are operated

Diagram - 1:Revenue and Expenditure Structure of BR



Source: Information Book (2006), Bangladesh Railway

at the request of the government that are mainly local passenger trains operating on the branch lines. However, it is very difficult to collect information on detail and specific PSO expenditure by branch lines. Since FY1997-98, its amount had been fixed at Taka 860 million and it has continued up to FY2005-06 and it may be because of budgetary constraints of the government. It is told that the government under the name of PSO has been enforcing railway operation without appropriate compensation since last decades. The tariff of Bangladesh had been kept without revision since 1991, which may be contributed the existing financial situations and at the same time operational performance is also stipulated the earning-expenditure gap. It is seen from available information, in 1970's and 1980's, the tariff had been revised many times. After that, it has been kept unchanged for more than 15 years. However, all above phenomenon, which is operational efficiency, PSO expenditure and tariff structure led to loss-making rail service in Bangladesh.



Source: Information Book (2006), Bangladesh Railway

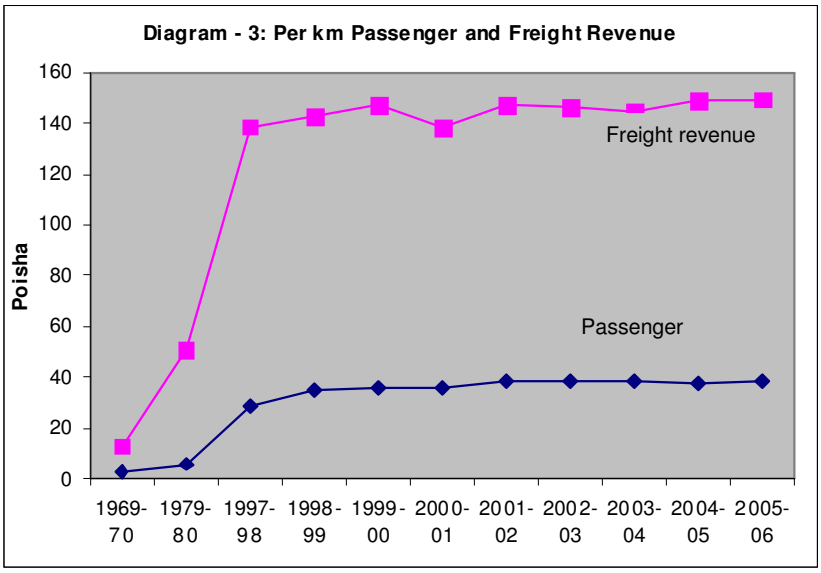
3.13.2 Passenger and Freight Tariffs

It is understood that the second class mail and express train fares are the basis for deciding unit price of passenger tariff. This unit price will be multiplied by a coefficient to decide tariff of other classes. Distance is also taken into consideration to give rebate on actual fare. In addition, the economic activities and GDP growth in different localities in different routes are also taken into consideration to calculate the rebate. This system has been introduced on Bangladesh railway since 1988. In 1988 this base fare was Tk. 0.16 and was increased to Tk. 0.24 in 1992. For details of passenger and freight revenues over a eight years period may be seen at Diagram – 3.

Per km Revenues (Poisa)

Year	Pass.	Freight
1970	3	13
1980	6	51
1998	29	139
1999	35	142
2000	36	147
2001	36	138
2002	39	148
2003	39	146
2004	38	145
2005	38	149
2006	38	150

Source: Information Book (1981 and 2006), Bangladesh Railway.



Tariff for passengers are mainly categorised into following classes:

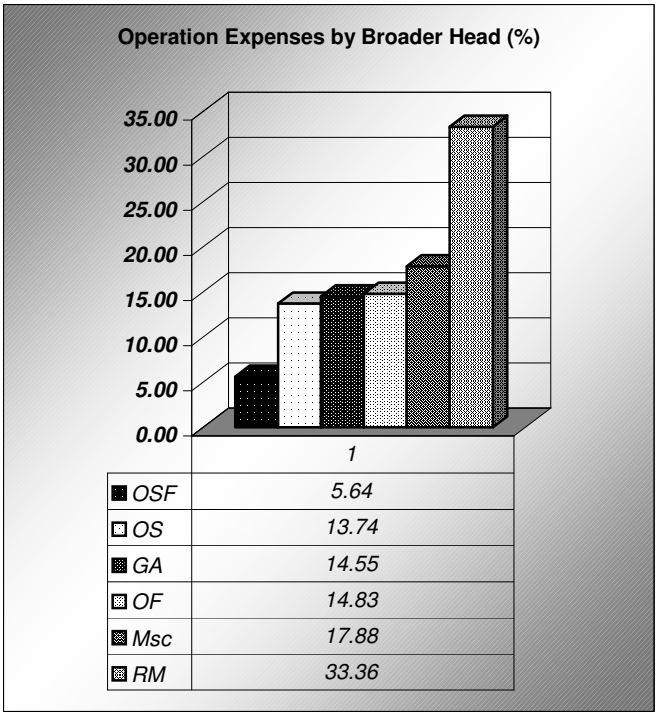
- Air Condition
- First Class
- First Class Chair
- Shovan Chair
- Shovan
- Shulov
- Second Class

The freight tariff structure revised in 1989 had been maintained for 10 years up to 1999. In 1999, freight tariff for luggage, parcel and a few other commodities were revised. As passenger, freight tariff depends on distances, over longer haulages, freight rate becomes down. Bangladesh Railway divides all types of commodity into 14 classes and fix tariff accordingly. The tariff rate is fixed by Ministry of Communications. For military consignment, there is a separate tariff rate. Railway started carrying container traffic from 1987 and container has been kept outside defined classes of commodities in railway.

As business promotion incentive to increase freight traffic on railway, Director General (DG) can give rebate up to 10% on different freight according to the nature of traffic and volume of traffic. There is also special discount rate for handling bulk traffic of particular nature from particular station to another particular station for a certain period. The special discounted rate from station to station is usually below the tariff rate but above the operating cost. However, the productivity and operational performance of Bangladesh Railway has not been up to the mark in the recent years. It was observed that if the traffic were at the levels of 1970s and 1980s, then the productivity and operational performance scenario would have looked better.

Based on the available information of 2006, an attempt was made to show the breakdown of Bangladesh Railway's operating expenses under different heads. It was found that the

expense of 'Operation other than staff and fuel' is 5.64%, which is about same as that of other developed or developing countries' fuel expenses for train operation. Operation Staff incurs about 13.74% expenditure of total Bangladesh railway operation, which is less than India and about only 40% of USA railways operation. Therefore, it is assumed that there is every scope for rationally increasing the operation staffs. The share of General Administration expenditure is about 14.55% and it compares reasonably well with other countries. But this percentage may go up if budget and finance officials are included as part of administration. The fuel cost of Bangladesh train operation is about 14.83%, which is quite high compared to India and USA. The fuel consumption of India and USA train operation is 6% and 6.25% respectively. The cost difference is mainly electric traction dominates the USA train operation, and a somewhat similar situation exists in India, where large sections have electric traction together diesel locos which also have a major share. The Miscellaneous expenses of Bangladesh Railway are about 17.88%, which is only 0.83% in USA. Repairs and maintenance expenses of Bangladesh Railway 33.36%, these dominate the train operation. This figure compares well with USA, where the share of maintenance expense 29.38%, which include many high-speed trains.



Source: Information book (2006), Bangladesh Railway

Note: OSF= Operation other than staff and fuel, OS= Operation Staff, GA=General Administration, OF=Operation fuel, Msc.=Miscellaneous expenses, RM=Repairs and Maintenance.

3.14 Synopsis of Problems and its Consequences

Most of the existing problems faced by BR currently are as a result of the lack of full and proper maintenance of BR's permanent ways, bridges, signals and other ancillary facilities over a number of decades. Bangladesh Railway has its own workshops for maintenance of its rolling stocks. Though the different types of works relating to rolling stocks are undertaken in the various workshops, these workshops themselves had not been maintained or overhauled over the past years to get the maximum productivity. Aging of rolling stocks, such as locomotives, coaches and wagons together with lack of maintenance on a timely manner, decreases the availability of rolling stock on line on any given day. As a consequence, weight restrictions, speed limit, safety issues have become matter of great concern for train operations. In addition, employee productivity, relating to infrastructure maintenance and train operation in Bangladesh Railway is low compared to other Asian countries, although it is a crucial issue for proper utilisation of public fund and to get optimal output from human resources. The net result is that BR has been a losing concern for many years. The identified problems and consequences are set out in Table 3-12.