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Situation Analysis of Rural Road Maintenance in Madhya Pradesh



Volume II: Policy,
Institutional and Financial
Aspects

2

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Chapter 1

Madhya Pradesh - An Introduction



1.1 Background

The State of Madhya Pradesh was formed on November 1, 1956 comprising of 43 districts. Subsequently, two large districts were bifurcated and 16 more districts were constituted in the year 1998. The Chhattisgarh region, comprising of 16 districts, was separated to form a new State of Chhattisgarh. The reorganized State of Madhya Pradesh came into existence on 1st November 2000 with 45 districts. The total geographical area of the State is now 308,000 sq km. It is situated in the very heart of India and is surrounded by five States viz. Rajasthan, Maharashtra, Gujarat, Chhattisgarh and Uttar Pradesh.

1.2 Administrative setup

The State has at present 9 Commissioner Divisions, 45 Districts, 264 Tehsils (Sub-districts) and 313 Community Development Blocks (including 129 tribal blocks).

1.3 Population characteristics:

About 5.9 per cent of the country's total population resides in Madhya Pradesh. According to Population Census 2001, the State has a population of 60,385,000 persons, spread in about 52,000 villages and 394 towns and cities. The urban population is 16,102,000 and the rural population is 44,283,000 (or

about 73 per cent). About 52 per cent of the population is male giving a sex ratio (females per thousand males) of 920, compared with the all India average of 933.

The density of population in Madhya Pradesh is 196 persons per sq km, compared to the all India average of 324. The main features are summarized below:

Area	-	3.08 million sq km
Population	-	60.3 million
Male	-	31.4 million
Female	-	28.9 million
Rural	-	44.2 million
Urban	-	16.1 million
Scheduled Caste	-	9.2 million
Scheduled Tribes	-	12.0 million

1.4 Development indicators

Some socio-economic development indicators are summarized below:

Indicator	Madhya Pradesh	All India
Total Literacy Rate (Age 7 and above)	64.1%	65.4%
Male Literacy Rate	76.8%	75.9%
Female Literacy Rate	50.3%	54.2%
Life Expectancy - Male	56.8 years	62.5 years
Life Expectancy - Female	57.2 years	63.4 years
Decadal Growth Rate of Population (1991-2000)	24.4%	21.3%
Crude Birth Rate	31.1	26.1
Crude Death Rate	10.4	11.1
Infant Mortality Rate	90 per 1000	70 per 1000

1.5 Land use

The land use pattern in the State is as follows:

Total area	307.50 lakh Ha
Wet sown area (1999-2000)	150.70 lakh Ha
Pastures and miscellaneous tree crops area (1999-2000)	16.58 lakh Ha
Fallow and waste land (1999-2000)	21.94 lakh Ha
Forest land	86.13 lakh Ha
Not available for cultivation	32.00 lakh Ha

1.6 Soils, geography and climate

The State is situated in the north-central part of the Indian Plateau. The central part of the State is high and contains the Satpura and Vindhya mountain ranges. The rest of the State largely consists of rolling terrain and plains. The Tropic of Cancer passes through the central part of the State and therefore it has well defined winter, rains and summer seasons. Temperatures are moderate in the southern part of the State and high in the north. The rainfall is moderate to high in eastern and northern districts and lower in the western part of the State. About half the Districts situated in the Plateau of Malwa and Bundelkhand have black cotton soils. Road construction materials are available within reasonable distances in most parts of the State. Exceptions are some forested areas in the State.

1.7 Water resources

Eight major perennial rivers (Narmada, Tapi, Betwa, Mahi, Son, Wainganga, Pench, Ken) originate in MP and flow through the State into bordering states. It is possible to irrigate about 61 lakh ha from surface water while 52 lakh ha can be irrigated from ground water. Thus the State has an irrigation potential of about 113 lakh ha. When utilized fully, the irrigation capacity is sufficient for 75 per cent of the total cultivated area of 150 lakh ha. By the end of the Ninth Five Year Plan (2002), development of irrigation from all sources is estimated to be 39.6 per cent of the cultivated area. This is below the national average of 65.2 per cent in 1997-98.

1.8 State economy

The economy of MP has grown at a rate of 4.2 per cent per year during the eight years 1993-94 to 2000-01 (growth estimate for post-2000 MP State). The net domestic product of MP increased from Rs 33,937 crore (US\$ 7,800 million) in 1993-94 to Rs 64,063 crore (US\$ 14,700 million) at current prices and to Rs 41,530 crore (US\$ 9,540 million) at constant (1993-94) prices in 2000-01, showing an increase of about 22.4 per cent.

The per capita income and its growth in MP remain low. At current prices, per capita income increased from Rs 6,577 (US\$151) in 1993-94 to Rs 10,803 (US\$250) in 2000-01. At constant (1993-94) prices per capita income growth is from Rs 6,577 (US\$151) to Rs 7,003 (US\$161) during the same period. Thus, in real terms the per capita income increased at a rate of only 2.2 per cent between 1993-94 and 2000-01.

About 77 per cent of the population depends on agriculture, which contributes about 35 per cent of the State Domestic Product. Agriculture is mainly

traditional. There is a practice of keeping fields in Kharif fallow (summer) crop and only one Rabi (winter) crop is taken. The cultivation is mainly rain fed. Because of traditional and rain fed cultivation, the low value crops are taken which give low productivity. Land holdings are fragmented. About 61 per cent of land holdings are small and provide low incomes for the farming households.

1.9 Electricity

The state is concerned with the power shortage. The total installed power capacity with the present Madhya Pradesh Electricity Board is 2900 MW, the ratio of thermal to hydro capacity being 74:26. During 1999-2000, a total of about 14,000 million WH of electricity was generated in the State. In the last five years, share of power consumption in the industrial sector declined from 42.0 per cent in 1995-96 to 30.0 percent in 1999-2000. The share of commercial and public utilities (lighting and works) sectors slightly increased from 5.3 to 5.8 per cent during the same period. Power consumption in irrigation for agriculture increased over this period to about 14 per cent in 1999-2000. The share of domestic sector consumption remained at about 14 per cent between 1995-96 and 1999-2000. The per capita power consumption decreased from 358 kwh in 1998-99 to 310 kwh in 1999-2000.

The percentage of villages electrified to total inhabited villages went up to 97.0 percent in 1999-2000, against 93.8 percent in 1995-96. With consumption out-stripping generation, there are severe shortages during the agricultural season.

Chapter 2

Road Infrastructure in Madhya Pradesh



2.1 Road network

Roads are a critical infrastructure component for economic growth and social development of the state and the surrounding region. In 2002, the road network in MP consisted of the following:

National Highways (NHs)	-	4,722 km
State Highways (SHs)	-	8,036 km
Major District Roads (MDRs)	-	11,115 km
Other District Roads (ODRs) and Village Roads (VRs)	-	44,233 km
Total Road length	-	68,106 km

(Source: Road Statistics of MP)

Out of the total network, 57,667 km are surfaced, of which 24,736 km (43 per cent) is WBM. The State has not seen a marked increase in road length in the last 10 years. Table 2.1 and Figure 2.1 show changes in road length, including reclassification of roads between categories, during the period 1997 to 2002.

Table 2.1 Road length in MP by road categories, 1997 - 2002

Road Category	Surface Type	Length in km										
		1997	1998	Percentage change from previous year	1999	Percentage change from previous year	2000	Percentage change from previous year	2001	Percentage change from previous year	2002	Percentage change from previous year
NH	BT	2,975.50	3,402.90	14.36%	4,881.90	43.46%	3,591.30	-26.44%	4,722.30	31.49%	4,722.30	0.00%
	WBM	0.00	0.00		0.00		0.00		0.00		0.00	
	Total surfaced	2,975.50	3,402.90	14.36%	4,881.90	43.46%	3,591.30	-26.44%	4,722.30	31.49%	4,722.30	0.00%
SH	Total	2,975.50	3,402.90	14.36%	4,881.90	43.46%	3,591.30	-26.44%	4,722.30	31.49%	4,722.30	0.00%
	BT	10,532.10	10,104.90	-4.06%	8,701.90	-13.88%	6,803.00	-21.82%	5,861.00	-13.85%	7,407.40	26.38%
	WBM	1,118.70	1,118.70	0.00%	1,042.70	-6.79%	574.60	-44.89%	557.00	-3.06%	579.10	3.97%
MDR	Total surfaced	11,650.80	11,223.60	-3.67%	9,744.60	-13.18%	7,377.60	-24.29%	6,418.00	-13.01%	7,986.50	24.44%
	Unsurfaced	137.80	137.80	0.00%	137.80	0.00%	81.30	-41.00%	81.30	0.00%	49.00	-39.73%
	Total	11,788.60	11,361.40	-3.62%	9,882.40	-13.02%	7,458.90	-24.52%	6,499.30	-12.87%	8,035.50	23.64%
ODR & VR	BT	12,113.60	12,113.60	0.00%	12,347.60	1.93%	16,402.70	32.84%	16,566.80	1.00%	9,273.20	-44.03%
	WBM	3,533.00	3,533.00	0.00%	3,299.00	-6.62%	12,961.80	292.90%	12,892.70	-0.53%	1,719.90	-86.66%
	Total surfaced	15,646.60	15,646.60	0.00%	15,646.60	0.00%	29,364.50	87.67%	29,459.50	0.32%	10,993.10	-62.68%
Grand Total	Unsurfaced	408.90	408.90	0.00%	408.90	0.00%	2,295.50	461.38%	2,056.30	-10.42%	121.40	-94.10%
	Total	16,055.50	16,055.50	0.00%	16,055.50	0.00%	31,660.00	97.19%	31,515.80	-0.46%	11,114.50	-64.73%
	BT	11,979.00	12,142.10	1.36%	12,596.10	3.74%	3,254.40	-74.16%	3,560.20	9.40%	11,528.50	223.82%
Total	WBM	35,541.80	36,378.70	2.35%	36,324.70	-0.15%	13,617.30	-62.51%	13,486.20	-0.96%	22,437.00	66.37%
	Total surfaced	47,520.80	48,520.80	2.10%	48,920.80	0.82%	16,871.70	-65.51%	17,046.40	1.04%	33,965.50	99.25%
	Unsurfaced	20,717.10	20,815.70	0.48%	20,815.70	0.00%	8161.70	-60.79%	8,321.80	1.96%	10,267.80	74.37%
Grand Total	Total	68,237.90	69,336.50	1.61%	69,736.50	0.58%	25,033.40	-64.10%	25,368.20	1.34%	44,233.30	74.37%
	BT	37,600.20	37,763.50	0.43%	38,527.50	2.02%	30,051.40	-22.00%	30,710.30	2.19%	32,931.40	7.23%
	WBM	40,193.50	41,030.40	2.08%	40,666.40	-0.89%	27,153.70	-33.23%	26,935.90	-0.80%	24,736.00	-8.17%
Total	Total surfaced	77,793.70	78,793.90	1.29%	79,193.90	0.51%	57,205.10	-27.77%	57,646.20	0.77%	57,667.40	0.04%
	Unsurfaced	21,263.80	21,362.40	0.46%	21,362.40	0.00%	10,538.50	-50.67%	10,459.40	-0.75%	10,438.20	-0.20%
	Grand total	99,057.50	100,156.30	1.11%	100,556.30	0.40%	67,743.60	-32.63%	68,105.60	0.53%	68,105.60	0.00%

Note: Negative increase in the year 2000 is because of the transfer of some roads to the new State of Chhattisgarh. Negative increase in the lower category and lower surface type is because of the upgrading in surface type and category of some roads. The large fall in MDR length and the large increase in ODRs and VRs in 2002 is because of the reclassification of some MDRs as ODRs. This was largely a reversal of the change in classification between 1999 and 2000. (Source Road Statistics of MP)

2.2 Past growth

Table 2.2 shows the growth in road network since 1956. Growth has been low in the last 12 years. Up to the end of the 7th Plan period (i.e. 1990) annual growth was more than 4 per cent but the rate declined to 1.8 per cent in 1992 and 1.5 per cent during the 8th Plan period (1992-97). In the 9th Plan period (1997-2002), the rate of growth declined further to below 1 per cent.

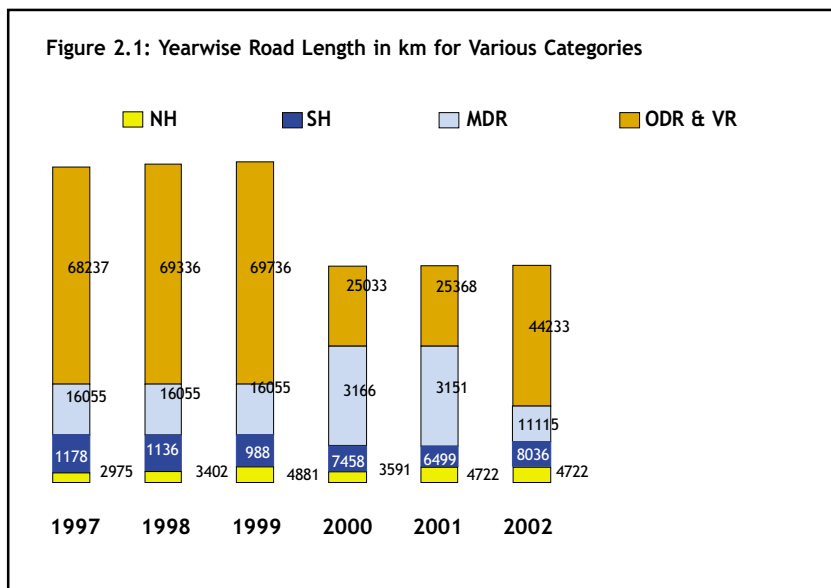
Before the division of the State between MP and Chhattisgarh, total road length was 100,555 km. After the division, 67,744 km of roads have remained in MP in the year 2000.

Table 2.2 Growth of Roads in Madhya Pradesh since 1956

S. No.	Plan Period	Year	BT/CC roads	Surfaced Roads			Total	Un-surfaced roads			Grand Total	Percent yearly increase
				Percent yearly increase	WBM roads	Percent yearly increase		Percent yearly increase	Gravel and earth	Percent yearly increase		
				5	6	7		9	10	11		
1	2	3	4	5	6	7	8	9	10	11	12	13
1	Creation of State	1956	2,661		16,595		19,256		8,917		28,173	
2	2nd Plan	1956-61	7,802	38.64%	15,178	-1.71%	22,980	3.87%	9,257	0.76%	32,237	2.89%
3	3rd Plan	1961-66	13,208	13.86%	12,174	-3.96%	25,382	2.09%	10,539	2.77%	35,921	2.29%
4	3 Yearly Plan	1966-69	16,085	7.26%	12,369	0.53%	28,454	4.03%	9,917	-1.97%	38,371	2.27%
5	4th Plan	1969-74	20,381	5.34%	14,502	3.45%	34,883	4.52%	12,178	4.56%	47,061	4.53%
6	5th Plan	1974-79	25,643	5.16%	18,810	5.94%	44,453	5.49%	13,262	1.78%	57,715	4.53%
7	1 Year Plan	1979-80	26,912	4.95%	19,786	5.19%	46,698	5.05%	14,949	12.72%	61,647	6.81%
8	6th Plan	1980-85	29,944	2.25%	28,270	8.58%	58,214	4.93%	18,792	5.14%	77,006	4.98%
9	7th Plan	1985-90	32,584	1.76%	37,454	6.50%	70,038	4.06%	18,616	-0.19%	88,654	3.03%
10	2 Yearly Plan	1990-92	33,358	1.19%	39,152	2.27%	72,510	1.76%	20,103	3.99%	92,613	2.23%
11	8th Plan	1992-97	37,600	2.54%	40,194	0.53%	77,794	1.46%	21,264	1.16%	99,058	1.39%
12	9th Plan (First Year)	1997-98	37,764	0.44%	41,030	2.08%	78,794	1.29%	21,362	0.46%	100,156	1.11%
13	9th Plan (Second Year)	1998-99	38,528	2.02%	40,665	-0.89%	79,193	0.51%	21,362	0.00%	100,555	0.40%
14	9th Plan (Third Year)	1999-00	30,051	-	27,154	-	57,205	-	10,539	-	67,744	-
15	9th Plan (Fourth Year)	2000-01	30,710	2.19%	26,935	-0.81%	57,645	0.77%	10,459	-0.76%	68,104	0.53%
16	9th Plan (Fifth Year)	2001-02	32,931	7.23%	24,736	-8.16%	57,667	0.04%	10,439	-0.20%	68,106	0.00%
Note - Decreases in the 7th and 11th columns are because of upgrading of WBM and unsurfaced roads.												
Average growth rate up to 1990 (%)			9.90		3.06		4.26		3.20		3.92	
Average growth rate, 1990 to 1998 (%)			1.48		2.84		2.14		1.36		1.94	
Yearly growth of roads in km up to 1990			880.09		613.50		1,493.59		285.26		1,778.85	
Yearly growth of roads in km, 1990 to 1999			660.44		356.78		1,017.22		305.11		1,322.33	

(Source: Road Statistics of MP)

* Decrease in network due to creation of new state of Chhattisgarh.



2.3 Asset base

The National Highways (4,722 km) have an asset value of Rs.4,700 crore. The State Highways (8,036 km) have an asset value of Rs. 4,000 crore. The asset value of the Major District Roads (11,115 km) is Rs. 2,630 crore and that of Rural Roads is Rs. 5,600 crore. Thus the road network in the state has a total asset base of Rs.16,930 crore (US\$ 3.9 billion). These are huge assets and need to be preserved.

2.4 Status of rural connectivity and development of rural roads

MP has 51,806 villages of which 10,489 villages are inhabited by 1,000 or more persons, 15,225 villages have population between 500 and 1,000 persons and 26,092 villages have a population below 500 persons. Before the launch of PMGSY in 2000, only 8,022 villages were connected by black-topped roads and 8,782 villages were connected by WBM roads. Thus, 16,804 villages were connected by surfaced roads. Another 16,677 villages were connected by unsurfaced roads. There were still 18,325 villages which were not connected by any type of road. The status of connectivity of villages in the year 2000 is summarized in Table 2.3.

Table 2.3 Status of connectivity of villages in MP in 2000

Villages	Sub grouping	Total number of villages	Villages connected by BT roads	Villages connected by WBM roads	Villages connected by gravel roads	Villages connected by earth roads	Villages not connected
Villages with population more than 1,000	VP HQ Villages	10,197	3,762	2,632	1,540	1,063	1,200
	Villages other than VPHQ	259	92	36	26	24	81
	Forest Villages	33	1	8	9	4	11
	Total	10,489	3,855	2,676	1,575	1,091	1,292
Villages with population 500 to 1,000	VP HQ Villages	9,118	1,590	2,003	1,879	1,583	2,063
	Villages other than VPHQ	5,946	686	1,072	1,113	1,056	2,019
	Forest Villages	161	8	37	18	13	85
	Total	15,225	2,284	3,112	3,010	2,652	4,167
Villages with population less than 500	VP HQ Villages	2,714	393	491	506	592	732
	Villages other than VPHQ	22,663	1,471	2,425	3,440	3,676	11,651
	Forest Villages	715	19	78	51	84	483
	Total	26,092	1,883	2,994	3,997	4,352	12,866
Grand Total		51,806	8,022	8,782	8,582	8,095	18,325

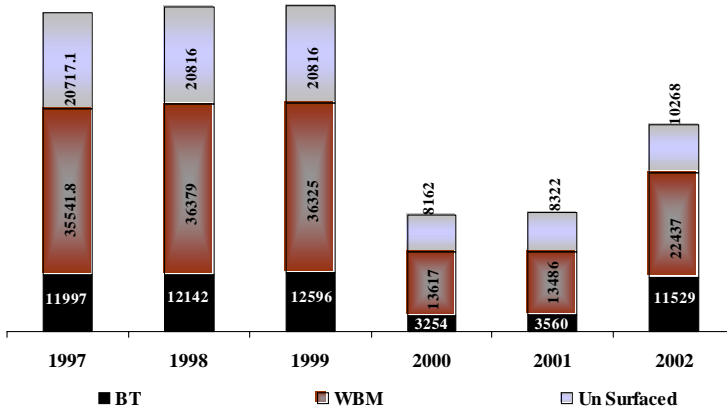
The changes in MDR, ODR and VR lengths in the years 1999 to 2002 (Table 2.1 and Figure 2.1) are explained by substantial lengths of ODRs being classified as MDRs in 2000 and then reclassified as ODRs in 2001. The total length of ODRs and VRs in the undivided State (pre-2000) was 69,737 km of which 20,816 km were unsurfaced. The length of ODRs and VRs in MP post-division is 44,233 km of which 10,268 km are unsurfaced. Breakdown of ODRs and VRs by surface type is shown in Figure 2.2.

Between 1997 and 2000 only 92 villages with population more than 1000 persons, 94 villages with population 500 to 1000 persons and 71 villages with population less than 500 persons respectively, were connected by all weather roads (Table 2.4).

Table 2.4 Connectivity of villages before PMGSY (undivided MP)

Year	Above 1,000 population			500-1,000 population			Below 500 population		
	Total villages	Connected during the year	Cumulative total connected	Total villages	Connected during the year	Cumulative total connected	Total villages	Connected during the year	Cumulative total connected
1997	7,437	21	5,550	16,516	25	8,283	47,030	20	5,773
1998	7,437	8	5,558	16,516	17	8,300	47,030	11	5,784
1999	7,437	21	5,579	16,516	25	8,325	47,030	22	5,809
2000	7,437	42	5,621	16,516	27	8,352	47,030	18	5,827
Total		92			94			71	

Figure 2.2: Surface-wise Position of ODRs & VRs in km (1997-2002)



2.5 State initiatives for development of road infrastructure

Development of the road infrastructure has not kept pace with the increase in traffic in the last decade. The number of vehicles registered in the state is currently around 3.2 million compared to 2.3 million in 1995. Resources for upgrading roads to cope with increased traffic and maintenance have been limited. The existing roads have deteriorated because of lack of maintenance. A number of recent initiatives have been taken by GOMP to correct the situation and improve the road infrastructure. These are described here.

2.5.1 Bond-BOT (Build, Operate and Transfer) Project

GOMP decided to attract private investment for development and management of economically viable roads under this project and identified 15 SHs of importance for tourism and industrial development, totaling about 2000 km in length. These roads are about 3 per cent of total road length in MP but carry about 30 per cent of all road traffic in the State. The upgrading of roads under this project includes widening of pavement, widening of bridges and culverts and building of hard shoulders. The total estimated cost of the project is Rs 987 crore (US\$ 227 million) with GOMP subsidy being upto 50 per cent. Competitive bidding based on the minimum subsidy required is a distinctive feature of this project. Private investors' return on investment during the concession period is through tolls on distance based rates set by GOMP. The asset will finally be transferred to the state at the end of the concession period of 5440 days (including the initial construction period). Private investors are responsible for performance based maintenance during the concession period.

2.5.2 MP State Roads Sector Development Project (ADB loan)

With loan assistance from the Asian Development Bank (ADB Loans 1958-IND and 1959-IND, December 2002), a project for upgrading 1,750 km of SHs is being implemented. The total project cost is Rs 1,707 crore (about US\$ 392 million) of which 60 percent is ADB loan component. Work on the project has already started and is likely to be completed in 5 years.

In addition to construction/upgrading of SHs, the project includes institutional reforms, capacity building and improved maintenance management. Specific aspects being addressed include:

- ❖ rationalisation of Public Works Department (PWD) staff structure and reduction of staff through a voluntary retirement scheme;
- ❖ phasing out of permanent gang labour force;
- ❖ creation of a State Highway Authority to manage State Highways and MDRs;
- ❖ management of road assets through a dedicated Road Maintenance Fund, and
- ❖ better control of overloading and more rigorous implementation of road safety measures.

2.5.3 Development of SHs and MDRs with Central Road Fund (CRF) support

GOI is allocating funds to GOMP for development and upgrading of SHs and MDRs out of the proceeds of fuel cess revenue. An amount of Rs 258 crore (US\$ 59 million) is available to the State under this fund. The State has taken up works on 1,233 km of SHs and MDRs. Improvement of about 1,000 km of roads has been completed with expenditure of Rs 150 crore (US\$ 34.5 million).

2.5.4 Fast Track Scheme

Some minor repairs and improvement of road surface on SHs which could not be improved under the programmes described above are being carried out under the Fast Track Scheme to maintain passability on these roads. GOMP has sanctioned an amount of Rs 306 crore (US\$ 70 million) for 376 roads (total length 7,343 km). Work on about 5,100 km has been started and an amount of Rs 120 crore (US\$ 28 million) has been spent. However, further progress has not been possible because of shortage of funds.

2.5.5 Kisan Road Fund (KRF)

KRF is an earmarked fund for improving and maintaining MDRs, ODRs and VRs. The source of funds is the Mandi (market) Cess on sales of agricultural produce. The bulk of this cess (85 per cent) is being put in KRF. The annual

revenue from Mandi Cess is estimated at between Rs 100 to 120 crore (US\$ 23 to 28 million). An amount of Rs 647 crore (US\$150 million) on construction and upgrading of 5,841 km of roads has been approved and work is in progress. An expenditure of Rs 362 crore has been incurred and works completed in a length of about 2,627 km of roads.

2.5.6 National Bank for Agricultural and Rural Development (NABARD) assistance through Rural Infrastructure Development Fund (RIDF)

The State has borrowed funds from NABARD under RIDF for construction and upgrading of MDRs and rural roads. The scheme was started in 1997-98 for works on 6,945 km road length with sanctioned cost of Rs 552 crore (US\$ 127 million). The scheme is in progress and works in a length of 4,100 km have been completed with an expenditure of Rs 418 crore (US\$ 96 million).

2.6 Overview of the initiative

The status of GOMP initiatives in the roads sector is summarised in Table 2.5. GOMP has clearly addressed the need to improve roads by a combination of private sector involvement, loans and allocation from the GOMP budget. The schemes are intended to improve some 25,000 km of roads though the actual length of roads improved may be lower mainly because of lack of resources (especially for the Fast Track scheme). Further, the Fast Track Scheme only addresses the immediate need of making 7,343 km of roads just passable. These roads will need rehabilitation to keep them serviceable even in the short run.

Table 2.5 GOMP initiatives in the roads sector: Summary

S. No.	Scheme	Category of roads	Sanctioned cost (Rs crore)	Length (km)	Expenditure up to Nov 2003 (Rs crore)	Length completed (km)
1	Kisan Road Fund	MDRs and rural roads	647.00	5,841	361.42	2627
2	RIDF- NABARD	MDRs and rural roads	551.64	6,945	417.65	4100
3	Fast Track	SHs and MDRs	306.60	7,343	120.00	1216
4	CRF	SHs and MDRs	189.15	1,233	144.70	927
5	Bond-BOT	SHs	958.00	1,753	-	-
6	ADB	SHs	1,707.00	2,000	-	-
Grand Total			4,359.39	25,115	1,043.77	8,870

Two of the schemes (Bond-BOT and ADB supported State Highways Project) address the issue of maintenance. For the rest of the network, institutional arrangements, capacity and funding for maintenance are inadequate and these issues need attention.

Chapter 3

Pradhan Mantri Gram Sadak Yojana (PMGSY)



3.1 Introduction

About 72 per cent of the population of India lives in about 590,000 villages. About 40 per cent of villages are still not connected by all weather roads. PMGSY was launched in 2000 with the objective of providing all weather connectivity to poorly connected villages/habitations and thereby contribute to provision of better services and poverty alleviation through improved access. The objective of PMGSY is to connect all habitations with population of 500 persons and above (250+ in case of hills, desert and tribal areas) through good all weather roads within a specified period. There are more than 825,000 habitations in the country. Around 330,000 habitations are yet to be connected by all weather roads. The PMGSY would cover around 170,000 of these habitations. Tables 3.1 and 3.2 give an idea of the magnitude of task involved in providing new connectivity and upgrading of existing roads in the country under this programme.

There have been a number of national and State level initiatives to construct rural roads since 1974, when a comprehensive package of Minimum Needs Programme (MNP) was launched. A large amount of funds has been spent and sizable length of roads has been created under these initiatives. However, these efforts still left a substantial proportion of the rural population poorly connected. Evidence from past programmes shows that rural roads suffered from:

- ❖ inadequate funding;
- ❖ poor planning;
- ❖ insufficient attention to surveys, design and project preparation,
- ❖ inadequate attention to quality of construction,
- ❖ spreading of available resources thinly, and
- ❖ lack of maintenance

The constructed roads have deteriorated because of the absence of maintenance. The National Rural Roads Development Committee (NRRDC) was constituted by GOI to examine the problem of improving the rural road network. The Committee Report in 2000 highlighted the urgent need to improve the rural road network and recommended that a "fast track" rural road construction programme should be developed to deal with the situation. This led to the launching of the PMGSY.

3.2 Special features of PMGSY

The design of PMGSY incorporates the following features built into the programme.

Funding

The Programme is 100 percent centrally funded. GOI undertakes to provide funds to State Governments before the road works start. This helps in reducing delays and maintaining the pace of the Programme. The states are expected to provide funds for maintenance.

Table 3.1: Length and Cost required for New Connectivity under PMGSY

#	Name the State	No. of Unconnected Habitations	Eligible Unconnected Habitations						Cost for Connectivity under PMGSY in Crores
			1000+		500-999		250+		
			No	Length	No	Length	No	Length	
1	Andhra Pradesh	2,679	167	668	417	1,668	396	990	452
2	Arunachal Pradesh	3,235	103	375	228	2,130	287	2,349	1,365
3	Assam	15,786	6,149	7,900	4,196	6,671	2,799	4,416	5,195
4	Bihar	24,321	11,717	26,687	6,203	6,664	0	0	6,647
5	Chattisgarh	24,202	2,604	12,213	6,313	14,709	3,644	10,634	7,670
6	Goa	55	0	0	20	40	35	50	10
7	Gujarat	8,127	472	1,038	2,288	4,027	1,493	2,387	1,021
8	Haryana	23	0	0	2	26	0	0	6
9	Himachal Pradesh	11,340	262	1734	853	3,389	2,379	7,709	3,490
10	Jammu & Kashmir	3,946	785	3454	942	2,722	1,065	2,236	2,772
11	Jarkhand	21,036	2,622	5298	4,178	8,943	3,896	7,204	3,642
12	Karnataka	4,608	156	103	118	397	602	1,367	225
13	Kerala	395	97	116	269	323	14	21	95
14	Madhya Pradesh	34,771	5,804	25,131	10,645	31,403	2,043	3,730	12,199
15	Maharashtra	6,892	203	633	794	1961	754	1,774	768
16	Manipur	1,250	71	355	187	633	340	1,143	517
17	Meghalaya	943	47	239	141	477	284	954	464
18	Mizoram	392	47	236	114	948	124	837	591
19	Nagaland	127	21	280	32	478	41	231	249
20	Orissa	28,299	3850	10,896	6,738	14,487	2,365	6,910	7,757
21	Punjab	920	103	205	433	774	0	0	161
22	Rajasthan	20,729	2,906	7,063	6,073	19,468	2,036	5,417	4,063
23	Sikkim	410	16	78	138	541	164	488	328
24	Tamil Nadu	5,318	577	1,426	1,825	3,552	238	281	787
25	Tripura	3,803	203	260	706	1,205	1,182	1,516	961
26	Uttar Pradesh	61,554	8,839	16,300	15,358	22,300	87	125	8,756
27	Uttaranchal	8,654	171	1,299	667	4,251	1,767	4,880	2,299
28	West Bengal	35,667	11,941	13,192	11,668	9,803	1,679	657	7,020
	Total	329,482	59,933	137,180	81,546	163,988	29,714	68,305	79,510

Table 3.2: Length and cost required for Upgrading under PMGSY

S. no	State	Total Road Length in the State in Km	Road Length in Core Network in Km	Length of Rural Roads in Km			# Length required for Upgrading	Ave Cost per km for Upgrading Rs. lakh	Total Cost in Rs. crore
				Through Route	Link Route	Total			
1	Andhra Pradesh	166,885	117,844	8,576	57,495	66,071	17,201	15.01	2,582
2	Arunachal Pradesh	NA	NA	2,750	9,154	11,904	4,123	17.6	726
3	Assam	41,328	33,069	10,551	16,632	27,183	13,046	25.54	3,332
4	Bihar	81,656	66,516	12,746	38,898	51,645	18,581	14.95	2,778
5	Chattisgarh	64,210	47,484	12,536	29,040	41,965	16,892	9.56	1,615
6	Goa	1,651	1,309	71.30	788	1,309	190	7.74	15
7	Gujarat	102,905	76,292	2,982	40,668	49,635	9,082	10.7	972
8	Haryana	28,402	18,508	6,567	6,387	12,954	7,525	17.48	1,315
9	Himachal Pradesh	33,926	32,453	5,894	23,577	29,472	9,431	17.6	1,660
10	Jammu & Kashmir	24,889	23,699	3,585	15,238	18,822	5,870	21.86	1,283
11	Jarkhand	60,349	47,992	7,978	29,677	39,736	12,429	13.91	1,729
12	Karnataka	160,517	100,901	8,141	58,539	66,679	16,921	10.8	1,828
13	Kerala	43,219	23,030	2,370	13,431	15,802	4,385	11.38	499
14	Madhya Pradesh	151,621	132,520	25,330	79,380	104,710	37,237	15.42	5,742
15	Maharashtra	234,707	149,944	8,905	72,130	81,035	19,724	8.58	1,692
16	Manipur	NA	NA	NA	NA	NA	NA	15.4	NA
17	Meghalaya	11,834	11,834	2,621	7,058	9,679	3,680	17.8	655
18	Mizoram	6935	6,019	1,117	2,396	3,513	1,476	17.95	265
19	Nagaland	12,226	9,307	805	6,003	6,807	1,705	10.9	186
20	Orissa	125,357	89,594	19,138	61,257	80,395	28,327	15.35	4,348
21	Punjab	46,640	30,517	7,484	17,751	25,235	10,147	12.65	1,284
22	Rajasthan	225,824	106,033	14,821	75,304	90,125	26,117	7.28	1,901
23	Sikkim	3,644	3,375	485	2,408	2,893	846	11.31	96
24	Tamil Nadu	133,810	83,739	14,317	52,561	66,878	22,201	13.6	3,019
25	Tripura	NA	6,985	1,637	4,704	6,341	2,343	20.31	476
26	Uttaranchal	27,295	25,506	4,321	17,124	21,446	6,890	17.56	1,210
27	Uttar Pradesh	201,133	170,996	40,363	111,404	151,767	57,074	17.56	10,022
28	West Bengal	83,580	56,499	13,410	36,991	50,400	18,958	16.73	3,172
	Total	2,074,543	1,471,963	239,430	885,993	1,134,401	372,401		54,400

Length Required for upgrading is computed as the total length of Through Roads + 15% of the Link Roads in the Rural Roads Category with State Average Cost per Km.

Design Standards

The design of roads under the PMGSY must conform to the standards laid down by the IRC in their Rural Roads Manual (IRC SP20: 2002)

Quality

To ensure that the work is done to a high standard, a three tier quality control mechanism is put in place. As the first tier of this mechanism, the contractor is required to carry out all mandatory quality control tests under strict supervision of the Engineer in charge of the work. A State level supervisory mechanism, independent of the executing agency, in the form of the State

Quality Monitoring System is envisaged as the second tier. At the national level, the Quality Audit System is envisaged as the third tier. This is in effect a third party auditing of quality management.

Execution

To ensure effective implementation and timely completion of projects with high quality, competent contractors with appropriate plant and machinery are required. PMGSY has therefore laid down clear criteria for qualification of contractors and devised a transparent tendering process with time bound completion schedules for the execution of works. A Standard Bidding Document has been prepared and is followed uniformly throughout the country.

Maintenance

The need for maintenance of roads constructed under PMGSY is fully recognized and the programme design incorporates provision for maintenance. During the defect liability period of five years after the completion of a road, the contractor is responsible for routine maintenance. The cost of routine maintenance for five years is to be borne by the state governments. The GOI is making all efforts to ensure that adequate funds are made available by the States for maintenance. Capacity of the institutions undertaking maintenance will need to be developed.

3.3 Implementation of PMGSY in MP

3.3.1 Background

MP is one of the largest recipients of PMGSY funds because it has a large number of unconnected habitations and the fifth largest road length required to connect them (Table 3.1). The yearly allocation of PMGSY funds to the State is as high as Rs 213 crore (US\$47 million) out of the total allocation of Rs 2500 crore (US\$556 million) for the entire country.

The existing methods of planning and implementation in MP were deficient in a number of ways and therefore it was felt necessary to develop a new approach for the PMGSY programme. Construction of roads involves surveys, investigations, preparation of Detailed Project Reports (DPRs) and execution of work. Conventionally, departmental officers carry out surveys and investigations and prepare DPRs. The execution of works is normally through contractors under the supervision of departmental staff. Responsibility for surveys and investigations normally rests with Sub Engineers and Assistant Engineers in the field. In the absence of adequate funds for surveys and investigations, these have tended to be unsound. Limited or delayed provision of funds for construction also leads to lowering in engineering standards.

A contracting process lacking in methodical identification of technically competent contractors, burdened with time consuming processes of tendering, evaluation and award of contracts resulted in time overruns and poor product delivery. Supervision of works was done by departmental officers in a routine manner with inadequate commitment and without effective management systems. Local pressures further reduced the effectiveness of implementation leading to:

- ❖ construction activity spread over indeterminate period;
- ❖ unsound structures on roads, and
- ❖ poor quality of construction.

3.3.2 Measures to improve planning and implementation

When PMGSY was launched, GOMP identified the deficiencies in the existing capacity to manage the programme and took the following steps to overcome the problem:

- ❖ creation of a dedicated agency, Madhya Pradesh Rural Roads Development Authority (MPRRDA) at State level and dedicated project implementation units (PIUs) at District level with lean administrative structures;
- ❖ deployment of staff from PWD and RES to MPRRDA;
- ❖ outsourcing of supervision and project preparation work;
- ❖ constitution of dedicated Project Implementation Units (PIUs). The PIU was envisaged as a unit of function as "Engineer" on the contract and exercise to supervise and control consultants and contractors rather than a unit for departmental execution of works;
- ❖ development of an effective contract management process with a transparent and decentralized procurement system;
- ❖ operationalisation of strict quality management systems, and
- ❖ a continuing programme of training and human resource development (HRD).

3.3.3 State Level Autonomous Agency, MPRRDA

In view of the need for rapid implementation of PMGSY, GOMP set up the MP Rural Roads Development Authority, a dedicated agency with a level of autonomy to implement PMGSY. Organisationally, MPRRDA comes under the Panchayat and Rural Development Department (PRDD). It is a separate legal entity governed by the General Body headed by the Chief Minister with stakeholder Departments represented by Ministers and Principal Secretary level officers. MPRRDA is managed by the Executive Committee headed by the Minister for Panchayat and Rural Development. The Chief Executive Officer is the head of the agency supported by two Chief Engineers and a Finance Officer. PIUs headed by General Managers (Superintending Engineer level officers) have been constituted to supervise planning and implementation of works.

3.3.4 Progress Achieved

In the first year of PMGSY, the State was allocated Rs 218 crore to construct 2,111 km to provide connectivity to 718 villages. During the second and third years of implementation, the State was allocated Rs 1,090 crore for construction of 6,630 km of roads to provide connectivity to 670 villages. The measures taken to develop effective planning and implementation have led to notable success. The work of construction of about 3,000 km of roads providing connectivity to more than 600 villages had been completed by early 2004. The State is on track to provide the connectivity to all villages with population above 1000 persons. As noted above, the completed roads will be maintained by construction contractors for the first 5 years and after this period, the roads are scheduled to be handed over to the Panchayati Raj Institutions (PRIs) for maintenance.

3.4 Limitations under PMGSY

The impact of PMGSY in respect of standards and practices has been very positive and the GOI contribution to improving rural connectivity has been valuable for many States including MP. However, there are a few issues that are still a matter of concern and need attention. These are summarised below.

New Connectivity

PMGSY being a programme aimed at new connectivity essentially addresses the connectivity of the 'last mile' but upgrading of existing rural roads beyond which the PMGSY roads start also need attention. The returns on PMGSY investments are critically dependent upon the condition of the whole rural road network. Therefore, a reorientation of PMGSY will be required to include also rehabilitation and upgrading of the existing rural roads with the objective of improving overall accessibility to villages and social and economic services.

Maintenance

Rural roads being the constitutional responsibility of the States, the PMGSY is a one time intervention and maintenance of core network will continue to be with the State. If adequate resources, institutional arrangements and capacity for maintenance are not made available by the State, the assets created under PMGSY will start deteriorating and their useful lives will be curtailed. GOI insistence that States must maintain roads constructed under PMGSY to qualify for continuing support programme funding may be counterproductive if it leads to cutback of maintenance on more important roads.

Quality

The quality management systems for PMGSY have had a positive impact on rural roads design and construction but there are gaps between precept and practice. This gap needs to be addressed through building total quality management features into the executing agency's operations and procurement procedures. The quality management systems developed for PMGSY should also be adopted for all other rural road construction in the State, so that in the long term, dichotomy between PMGSY and non-PMGSY rural roads is eliminated. This is a critical policy issue requiring deliberations by the state authorities.

Chapter 4

Institutional Arrangements for Administration of Roads



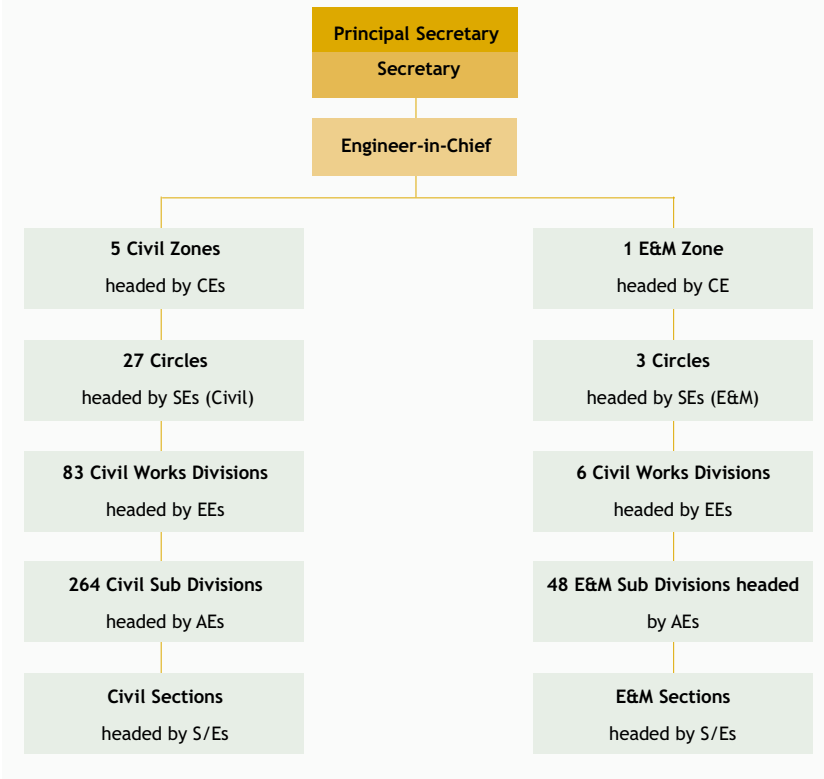
4.1 Introduction

The responsibility for construction and maintenance of roads in MP rests with the Public Works Department (PWD) which also has other responsibilities. Rural Engineering Service (RES) is another agency involved in the construction of rural roads and other civil engineering works in rural areas. The Madhya Pradesh Rural Roads Development Authority was created recently for the specific purpose of implementing PMGSY project. The organisational structure and capacities of these agencies have been reviewed in this Section followed by observations on the role of PRIs in the implementation of rural civil works.

4.2 Public Works Department (PWD)

4.2.1 Status and working of PWD

Figure 4.1: Organisational Structure of PWD



PWD is responsible for the construction and maintenance of public buildings, roads and other works on behalf of GOMP. Figure 4.1 shows the organisation structure of PWD, which is effectively a GOMP ministry. The Engineer-in-Chief is the technical head of the department and professional advisor to GOMP on policy and implementation related to public works. The Engineer-in-Chief reports to the PWD Principal Secretary and Secretary. PWD is organised into 6 Zones of which 5 Zones are responsible for construction and maintenance of roads including ODRs and VRs. The Zones are headed by Chief Engineers (CEs) located at Gwalior, Jabalpur, Rewa, Indore and Bhopal. CEs are responsible for implementation of policy and overall supervision of PWD administration at the Zone level and construction and maintenance of works within the Zone.

Before 2000, there were 25 Circle Offices headed by Superintending Engineers (SEs) under the Zone level. They were responsible for supervision of the District level Divisional offices and were important links between the District and State levels. These offices were abolished in 2000. Subsequently, a gap of supervision and coordination was felt. The Circle Offices have started functioning again.

Under every Circle, there are 4 to 5 Works Divisions. Each District has about 2 Divisions and at present for 45 Districts there are 83 Divisions. These Divisions are headed by Executive Engineers (EEs). They are the basic operational units and EEs are responsible for management of works including management of contracts and payment for works. A Division can handle annual workload of about Rs 10 crore (US\$ 2.2 million).

In every Division, there are 3 to 4 Sub Divisions headed by Assistant Engineers (AEs). There are 264 Sub Divisions in the State. AEs manage and supervise works within their Sub Division. This involves design and contract management including quality control and testing. AEs are required to check the quality and quantity (measurement) of works. They are also authorised to make staged payments to contractors and labour. Under every Sub Division there are 4 to 6 Sections headed by Sub Engineers (S/Es) who are the basic field functionaries. S/Es are responsible for managing actual construction activity in the field, taking measurements, giving day to day guidance and reporting to the AE.

PWD also has an Electrical and Mechanical (E & M) Wing which is responsible for installing and maintaining electricity supply in public buildings and maintenance of PWD equipment including machinery for roads. The E & M Wing has 3 Circles, 6 Divisions and 48 Sub Divisions.

4.2.2 PWD strengths and weaknesses

This section summarises the strengths and weaknesses of PWD as an agency for managing the road network.

Strengths

- ❖ PWD is a well organised department with clearly defined duties and responsibilities for professional staff at all levels.
- ❖ The department has competent and qualified engineers and other supporting staff for managing the road network and buildings in urban areas.
- ❖ The organisation has tools and plant and adequate staff to operationalise and maintain them in working condition.
- ❖ The accounting and auditing system of the organisation is well defined and managed.

Weaknesses

- ❖ **Quality Control**
Quality control of works is the responsibility of contractors under supervision of PWD staff. Contractors are responsible for establishment of field laboratories and carrying out mandatory tests for materials and workmanship. PWD does not have enough laboratories or a well defined system for testing and quality control at the Division level to

enable rigorous testing. There is one State level laboratory for testing and quality control for road works and every Zone has a regional laboratory. However, given the large area of the State and the extensive road network, adequate arrangements for quality control and testing of road material are needed.

- ❖ **Works Management**
The works management system is in need of overhaul. Adherence to the old codes and procedures are sometimes the cause of delays in implementing projects. Decision making is not sufficiently decentral-ized. Operational decisions are delayed because of too many levels of interventions. There is a tendency to adhere to established management and construction practices since staff are not motivated to accept new challenges.
- ❖ **Human Resource Development (HRD)**
There seems to be no regular arrangement for providing training and reorientation to the officers of the Department. The State does not have a single research or training institute dedicated to the roads sector.
- ❖ **Cadre Management**
Cadre management has not received due attention in PWD. Promotion prospects are poor and a large number of professional staff remain at lower levels for long periods. Discussions with PWD officers indicate that many junior engineers remain at the same level for up to 20 years. Assistant Engineers also remain at that level for about 20 years. Because of financial stringency and overstaffing in the GOMP administration , recruitment of new staff into government employment has been restricted to certain reserved categories only. In the last 10 years, there has been virtually no recruitment at the AE level in PWD. There is dire need to improve the capability of engineering staff and to reform the human resource management policy. The Engineers in the PWD are competent but they are demoralised and it is not possible to expect good results without increased training, capacity building and more effective cadre management and putting in place career development strategies. Avenues for promotion of staff have to be ensured, particularly for lower level functionaries.

4.3 Rural Engineering Service (RES)

4.3.1 Status and working of RES and its relationship with PRIs

Responsibility for execution and maintenance of local development works is with the PRIs which have been executing these works with technical support provided by RES engineers. Following the 73rd amendment to the Constitu-

tion, the GOMP transferred additional responsibilities to the PRIs and made services of dedicated RES engineering staff available to them.

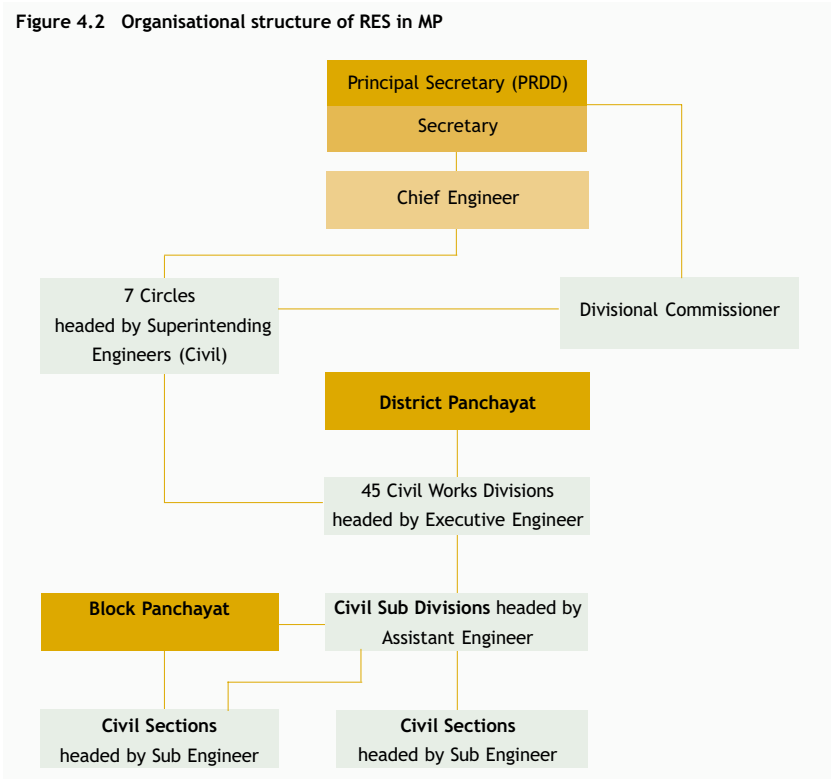
RES is an organisation under PRDD. Its organisational structure is given in Figure 4.2. RES operates at two different levels. On one hand, it provides technical support and guidance to the PRIs for construction works of smaller size at all the three levels, village (Gram) level, intermediate (Janpad or Block) level and the District (Jila) level. On the other hand, it is also responsible for the execution of works as the construction wing of PRDD and carries out construction of works related to the development of rural infrastructure in the State.

The Chief Engineer (CE) is the technical head of RES and works under the direct control of the Development Commissioner who is also ex-officio PRDD Principal Secretary. All the levels in RES work under dual control. The CE is responsible for providing technical support to the Development Commissioner on policy formulation and guidelines related to civil works undertaken by PRIs. The CE is also responsible for administration and control of construction projects allotted as "deposit" works to the organization.

The CE is supported by the Circle Offices headed by Superintending Engineers (SEs). Prior to 2000, there were Circle Offices at each Revenue Division Headquarter. The offices were responsible for supervision of district level Divisional offices and were important links between the district and state levels. The Circle offices were abolished in 2000. A gap in supervision and coordination was felt. The Circle offices have now been revived. SEs provide support to Divisional Commissioners in respect of the construction activities of PRIs within the Revenue Division. He is also responsible for supervision of construction projects within the Revenue Division area allotted as deposit works to RES.

There is one Works Division in every district, which is headed by an Executive Engineer (EE). The Division operates in the same way as PWD Divisions for implementation of deposit works. In addition, the EE is also responsible to the District Panchayat for technical support on construction activities performed by the PRIs. The EE works under the administrative control of the District Panchayat but also reports to the SE in respect of technical aspects of works.

Figure 4.2 Organisational structure of RES in MP



District level Divisions are supported by Sub Divisions headed by Assistant Engineers (AEs) in the same manner as in the PWD structure. The AE is also responsible to the District Panchayat and Intermediate Panchayat for technical support on construction activities performed by PRIs. The AE works under the direct administrative control of the EE but also reports to the Block Panchayat on day to day matters. The AE is supported by a Sub Engineer (S/E) for the area of each Block and the S/E heads the Section in the same way as in PWD. Services of two Sub Engineers are available under the administrative control of each Block Panchayat for the control and supervision of construction activities carried out by Village Panchayat and the Block Panchayat.

4.3.2 Works carried out by RES

Over the years, RES has carried out civil works, including rural roads, on behalf of PRIs under a number of GOI Ministry of Rural Development (MORD) sponsored programmes including local development works up to the year 1980, National Rural Employment Programme from the year 1980 to 1985, Rural Landless Employment Guarantee Programme from 1985 to

1990, Employment Assurance Scheme from 1990 to 2000 and Jawahar Gram Samrudhi Yojana (JGSY), Sampoorna Grameen Rozgar Yojana (SGRY) and other schemes from 1995 to date. It has also provided technical guidance on civil works implemented by Gram Panchayats under the JGSY and SGRY. RES also acts as an implementing agency for works (including rural roads) under the Members of Parliament (MP) Local Area Development Funds and Members of (State) Legislative Assembly (MLA) Local Area Development Funds. Rural roads have also been constructed by RES as deposit works. In some tribal districts, funds specifically for road construction were made available to RES. So far RES has implemented construction or provided technical guidance for construction. There is no arrangement for the maintenance of roads constructed by RES. Currently, RES is not involved in maintenance of roads.

4.3.3 RES strengths and weaknesses

The strengths and weaknesses of RES as an agency for managing the road network are summarised.

Strengths

- ❖ The organisation started functioning effectively in 1980 with the recruitment of officers at AE level. Since the establishment of RES, its professional staff have had good multidisciplinary exposure and opportunities for promotion within reasonable periods of time, Therefore, staff are enthusiastic and willing to accept challenges.
- ❖ The organisation has competent and qualified staff and there is provision for training of engineers at all levels.
- ❖ Engineering staff working under effective control of engineering officers are capable of managing even large works. Several staff members of the RES have been borrowed by MPRRDA.

Weaknesses

- ❖ **Organisational structure**
The functions and roles of RES are not clearly defined. The dual control over the organisation and its staff leads to possible division of responsibility.
- ❖ **Cadre management**
Many posts at EE, AE and S/E levels were vacant for a long time. As a response to this shortage, Water Resources Department staff were brought into the RES. This deployment of staff seems to have created some problems, possibly affecting the promotion prospects and morale in the organisation. Some of the staff brought in from the Water Resources Department also did not seem to have the same level of commitment to the RES as established RES staff. Professional develop-

ment of junior staff has been lacking. Lack of regular and timely recruitment has also caused problems.

4.4 PRIs, RES and rural civil works

MP has full-fledged three tier PRIs. The first tier is the village Panchayat, the second tier is the Block or Janpad Panchayat and the third tier is District or Jila Panchayat. All the three levels of institutions are headed by elected representatives.

Local development works in rural areas are carried out by these institutions through elected representatives, officials and committees. The District and Block Panchayats are administratively headed by the Chief Executive Officers whereas Village Panchayats are in effect headed by Sarpanches who are elected representatives. As noted earlier, the services of RES Division headed by an EE are available to the District Panchayat and services of an AE are available to about two Block Panchayats for the supervision of works carried out by them. The services of about two S/Es are also available to each Block for the supervision of works carried out by Village Panchayats in the Block.

All the technical officers of RES at the Division level and below are responsible for providing technical support to the PRIs in respect of preparation of estimates, supervision of works and measurement of work. The role of engineering staff is rendering technical advice. Responsibility for administration, procurement and payment rests with the PRIs and their administrative officers. Intervention of RES engineering staff in these matters is normally not welcomed by the PRIs.

Under various federally sponsored employment generation programmes, a sizable length of rural roads has been constructed by District, Block and even Village Panchayats. The primary objective of most of these programmes has tended to be employment generation and the quality of works has not received full attention. In most cases only earth work or some gravel application has been attempted. These roads are neither well designed nor executed on sound engineering principles. Most of them could be categorized as upgraded tracks. They are not maintainable and it is not clear whether they can be considered adequate for the purpose of connectivity.

Since PRIs are expected to be responsible for the maintenance of rural roads, the lack of road maintenance planning and implementation capabilities of the PRIs and RES is an issue of concern requiring attention of the state authorities. There is urgent need for finding ways and means of capacity building of both the PRIs and the RES.

Chapter 5

Road Maintenance Norms and Practices in Madhya Pradesh



5.1 Maintenance objectives

The basic objective of maintenance is to maintain and operate the road system in such a manner that:

- ❖ comfort, convenience and safety are assured for road users;
- ❖ the investment in roads, bridges and appurtenances is preserved;
- ❖ the aesthetics and compatibility of the highway system with the environment are achieved, and
- ❖ the necessary expenditure of resources is accomplished with continuing emphasis on economy.

5.2 Types of maintenance

In line with national practice, maintenance operations in the state are classified under the following sub-heads:

- ❖ Routine maintenance
- ❖ Periodic maintenance
- ❖ Special repairs
- ❖ Flood damage repairs / emergent repairs

5.2.1 Routine maintenance

Routine maintenance includes the following types of works:

- ❖ upkeep of road pavements and side shoulders;
- ❖ upkeep of the roadside drainage system;
- ❖ upkeep of culverts and bridges, and earth retaining structures and parapets;
- ❖ keeping signboards, km stones and other traffic aids and furniture in good condition;
- ❖ maintenance of roadside arboriculture, and
- ❖ upkeep and maintenance of inspection bungalows and gang huts.

Ordinary repairs thus include maintenance of culverts, patch repairs, sealing cracks, roadside drainage, repairing of shoulders, painting of road signs and km stones, arboriculture, road markings, maintenance of gang huts and store sheds, removal of litter, debris and dead animals and replacement of damaged retro-reflective signs. Routine maintenance of bridges requires attendance to bearings, joints, wearing coat, railings, minor repairs to sub-structure and super-structure as well as clearance of weeds in river channels.

5.2.2 Periodic maintenance

This involves periodic renewals to the road carriageway, whether graveled, metaled or blacktopped, to ensure that adequate level of service for users is maintained.

A. Need and importance of periodic renewals

Periodic renewals consist of the provision of a surfacing layer over the pavement at regular intervals, so as to preserve the required characteristics of the pavement and offset the wear and tear caused by traffic and weathering. In effect, periodic renewals represent maintenance, which is needed to prevent deterioration of the pavement characteristics and to ensure that initial surface quality is kept up for future requirements of traffic during the design life of the pavement. Early detection and repair of noticeable defects can prevent a major breakdown of the surface. For example, if symptoms like hungry surface and ravelling are noticed at an early stage and suitable preventive action by way of renewal of surface is taken, the life of the pavement can be prolonged.

B. Planning and programming of renewals

The general practice in the country is to prepare proposed annual renewal programmes and submit demand for funds within the budgetary processes. While the term "periodic renewal" suggests that renewal should be at fixed and pre-determined frequency, it would neither be practicable nor desirable to follow any specified frequency without giving consideration to the condition of roads. Renewal priorities and programme should be based on an assess-

ment of road condition through regular inspections and surveys. Special inspections are also necessary before and after the rains to assess the need for patching and other remedial measures required either in advance of or together with the renewal treatment.

C. Identification of sections to be renewed

Stretches of road showing signs of distress such as hungry surface, hairline cracking, ravelling and other damage should have the highest priority for inclusion in the renewal programme. Stretches of roads due for renewal according to the prescribed periodicity are inspected. Decisions on whether to include them in the renewal programme or to postpone the renewal for a specified period are taken depending on the condition of the road surface. Where the nature of distress failure is severe and the cause may be deep-seated and not capable of being rectified by renewal treatment alone, detailed investigations are carried out and special corrective measures are determined.

D. Types of renewal

Types of bituminous surfaces prevalent in India are surface dressing, thin premix chipping carpet, thin mix seal carpet and hot mix semi-dense carpet. These surfaces have different life spans depending on traffic and environmental conditions. Periodic renewals would generally provide the application of a surfacing layer up to 20 mm thickness so that superficial wear and weathering of the surface is covered up and pavement lasts for the full-intended life span. The specifications adopted for the renewal layer on a particular road would depend upon the type of the original surface and its condition at the time of renewal. The specifications generally adopted for periodic renewals are as follows.

- ❖ Single coat of surface dressing (SD) as per IRC: 17-1965.
- ❖ 20-mm thick premix chipping carpet (PC) as per IRC: 14-1977.
- ❖ Mix seal surfacing (MS) as per Ministry of Shipping, Road Transport and Highways.
- ❖ (Roads Wing) Specifications for road and bridge works.
- ❖ The specifications and thickness of the renewal course should be such that the road surface is restored close to the original condition as far as possible. For example, over an original premix chipping carpet surface, the renewal layer could either be single coat surface dressing or 20 mm thick premix carpet depending on the condition of the worn-out surface.

E. Periodicity of renewal and annual budgeting

Based on experience in India, broad norms have been recommended for the type and periodicity of renewals (Table 5.1). The norms are used as a guide for estimating requirement of funds for the annual renewal programme.

Table 5.1 Norms for frequency of periodic renewal

Type of road	Lane width	Traffic (commercial vehicles per day, CVD)	Type of renewal and periodicity of renewal treatment for:		
			Low rainfall upto 150 cm per year	Medium rainfall 150-300 cm per year	High rainfall above 300 cm per year
National Highways and State Highways	Single lane	1) Less than 450	SD/4	SD/4	SD/4
		2) 450 - 1500	SD/4	SD/3	SD/3
		3) More than 1500	PC/6 or MS/8	PC/5 or MS/7	PC/4 or MS/6
	Double lane	1) Less than 450	SD/4	SD/4	SD/4
		2) 450 - 1500	SD/5	SD/4	SD/4
		3) More than 1500	PC/6 or MS/8	PC/5 or MS/7	PC/4 or MS/6
Major District Roads, Other District Roads and Village Roads	Single lane	1) Less than 150	SD/6	SD/6	SD/6
		2) 150 - 450	SD/6	SD/5	SD/5
		3) More than 450	SD/5	SD/4	SD/3

Notes on Table 5.1:

- The treatment symbols SD, PC and MS signify surface dressing, premix carpet and mixed seal surface respectively.
- The denominator refers to the periodicity of renewal in years.
- For areas subject to snowfall and hilly areas with steep side slopes and heavy rainfall, renewal may be required at shorter interval.
- The periodicity of the renewal indicated in the Table should be taken as a general guideline for the purpose of budgeting and determining the extent of the renewal programme needed. Exact stretches should be identified based on condition survey.

F. Rectification of the profile at the time of renewal

The camber and super elevation provided initially on a road tend to be flattened out due to traffic. Before surface renewal, the cross profile should be corrected by means of a suitable leveling course.

5.2.3 Special repairs and flood damage repairs / emergent repairs

Special repairs are urgent works required to prevent further deterioration of roads and structures and to ensure safety. Examples include minor improvement of culverts, improvement of visibility for traffic, repairs to bridges, filling of large potholes and pavement rectification. Flood damage repairs / emergent repairs involve works to restore traffic on roads affected by severe weather and other natural events, e.g. heavy rains, floods, cyclones, landslides and sand dunes.

5.3 Planning of maintenance operations

5.3.1 Inventory of roads

The first step in planning maintenance operations is the evaluation of the existing physical condition of roads, structural capacity and surface profile (roughness). For this purpose, a basic road inventory containing details of

location, magnitude of stress and types of defects of the existing road should be undertaken. Formats for road inventories are available and PWD has "road registers" with inventory data on paper (but limited road condition data) for SHs and MDRs. The District Master Plans include inventories of ODRs, VRs and some other rural roads. They include data on road surface type and an indication of overall assessment of condition (i.e. good, fair and poor) but more detailed data are needed for maintenance planning and implementation.

5.3.2 Identifying defects, programming and planning

During inspections, engineers are required to identify and locate defects of surface, shoulders, side drains and cross drainage. IRC: 82 "Code of practice for maintenance of bituminous surfaces for highways" and "Manual for maintenance of roads" provide guidance for identifying surface defects such as bleeding, streaking, cracking, raveling, edge subsidence, edge fretting, rutting, shoving, potholes and common defects and deficiencies of shoulder draining and cross drainage works.

Defects in bituminous surfacing are grouped under four categories:

- ❖ surface defects - fatty surface, smooth surface, streaking and hungry surface;
- ❖ cracks - hair-line cracks, alligator cracks, longitudinal cracks, edge cracks, shrinkage cracks, and reflection cracks;
- ❖ deformation - slippage, rutting, corrugations, shoving, shallow depressions and settlements and upheavals, and
- ❖ disintegration - covering stripping, loss of aggregate, raveling, potholes and edge breaking.

For each type of pavement distress, the causes of the distress should first be determined. Maintenance measures should not only correct the damage but also prevent or delay its recurrence. In many situations, lack of proper drainage is the principal cause for stripping, loss of material from the pavement and shoulder, weakening of pavement layers and sub grade, resulting in the failure of the pavement. In such situations, the underlying cause should be eliminated before undertaking maintenance.

Based on the condition evaluation, the causes for the various defects observed should be examined in detail and a decision taken on whether to initiate a particular maintenance activity, or to go in for more detailed investigations to determine the maintenance/ rehabilitation needs precisely. Whenever distress on the pavement has reached a stage which affects the smooth operation of traffic, it should be rectified straightaway. For other defects like cracking and raveling, the optimal strategy should be determined having regard to the specifics of the situation. The main options are seal/renewal coat or to strengthen/ reconstruct the pavement. If the latter appears necessary, further investigations on structural deficiencies are needed. Technical planning of

maintenance operations should be looked upon as a total system rather than each activity being considered in isolation.

The suggested minimum frequency of road condition inspections by engineers at different levels are given in Table 5.2. As the description of the duties of engineers at different levels (para 5.3.3) shows, Sub Engineers (i.e. S/Es) have responsibility for assessing maintenance needs in the field. They are supervised and guided by senior engineers. Inspections should not only check existing road conditions and works in progress but should also be used for planning future strategies. On inspections, senior officers should communicate clear instructions to junior colleagues after going through their notes and provide necessary guidance.

Table 5.2: Frequency of inspections required

S. No.	Executive Engineer (EE)		Assistant Engineer (AE)		Sub Engineer (S/E)	
	Routine	Special	Routine	Special	Routine	Special
1.	Twice in a year (April & October)	Before and after Monsoon (rains)	Once every two months Jan, March, May, July, Sep., Nov.	Before and after Monsoon; Twice during rains	Once a month	Every week

In setting priorities and planning maintenance activities, account should be taken of (a) road classification, (b) location of works, streams, CD works and other physical features, (c) road surface type, and (d) road width and number of lanes. Apart from visual inspection, evaluation of pavement may be made on the basis of deflection and roughness to determine the appropriate rehabilitation treatment for roads with high volumes of traffic.

Once the overall maintenance plan has been drawn up, attention is required to the proper organization and management of the whole program including deployment of various resources i.e. skilled staff, materials and equipment. For each maintenance activity, the work at site should be carefully controlled so that optimum output and quality are achieved.

While the principles of maintenance planning are well known and the organizational structure for planning and implementation is in place, there are serious deficiencies in implementation of maintenance, especially of ODRs and VRs, related to (a) lack of funds, (b) insufficient priority given to maintenance, (c) too much responsibility left with junior staff, and (d) poor working of the gang labour system.

5.3.3 Duties of S/Es, AEs and EEs in respect of maintenance

- (i) Duties of Sub Engineers (S/Es)
 - ❖ Inspection of roads and supervision of works according to prescribed norms.
 - ❖ Reporting to higher authorities on road condition and maintenance requirements.
 - ❖ Preparing estimates for maintenance and repairs after conducting condition surveys on roads.
 - ❖ Reporting closure of roads or obstructions due to accidents, landslides or any other reasons.
 - ❖ Arranging for removal of obstructions, dead animals and other debris.
 - ❖ Identifying safety measures and restoration work in case of flood damage and breaches, reporting on completion of restoration and opening of road to traffic.

- (ii) Duties of Assistant Engineers (AEs)
 - ❖ Inspection of roads and supervision of works according to prescribed norms.
 - ❖ Reporting to higher authorities on road condition and maintenance requirements.
 - ❖ Getting estimates prepared and checked after conducting survey and site investigations.
 - ❖ Reporting on heavy rainfalls in the area and consequent rain damage.
 - ❖ Identifying safety measures and restoration works (both temporary and permanent) required after flood and other damage and breaches.

- (iii) Duties of Executive Engineers (EEs)
 - ❖ Inspection of roads and supervision of works according to prescribed norms.
 - ❖ Identifying and planning maintenance activities.
 - ❖ Arranging manpower, materials and machinery required for maintenance works.
 - ❖ Taking action on reports from AEs on safety measures and diversions in case of breaches and flood damage.
 - ❖ Coordination with agencies such as traffic police, local administration and media when emergency repairs and other works interrupt traffic.
 - ❖ Initiate steps for restoration work.

5.4 GOI maintenance norms and inflation adjustment

Table 5.3 Norms for maintenance of roads agreed by the GOI 10th Finance Commission

Traffic Classification	Single lane road	
	BT surface	WBM surface
[a] State Highway	Rs / km	Rs / km
Up to 500 C.V./day	54,259	48,755
500-1500 C.V./day	61,985	56,030
More than 1500 C.V./day	72,734	68,157
[b] MDR/ODR/VR [Single Lane]	Rs / km	Rs / km
Up to 500 C.V./day	42,272	41,717
500-1500 C.V./day	48,446	43,392
More than 1500 C.V./day	51,482	51,555

GOI Finance Commissions establish and revise maintenance cost norms to be used as guides for estimating maintenance funds required. The relevant GOI ministry is asked to propose norms to be approved or modified by the Finance Commission. Table 5.3 shows the norms agreed by the 10th Finance Commission up to 2001-02. The 11th Finance Commission has agreed revised norms based on inflation adjustment after 2001-02. Tables 5.4 and 5.5 set out the more detailed breakdown of maintenance activities and input on which Table 5.3 estimates are based.

Table 5.4: Norms for inputs for road maintenance for State Highways

(Rupees per km)

Activities and inputs (1)	Up to 500 CVD		500 to 1500 CVD		More than 1500 CVD	
	BT (2)	WBM (3)	BT (4)	WBM (5)	BT (6)	WBM (7)
1. Ordinary repairs / Routine maintenance						
i) General maintenance/repairs						
Labour	5,760 [0.3]	5,760 [0.3]	5,760 [0.3]	5,760 [0.3]	5,760 [0.3]	5,760 [0.3]
Mason	1,200 [0.04]	1,200 [0.04]	1,200 [0.04]	1,200 [0.04]	12,000 [0.04]	1,200 [0.04]
ii) Patch Repair						
BT Surface	4,015 [0.73T]	-	4,345 [0.79T]	-	5,060 [0.92T]	-
WBM	1,650 [5.016 Cum]	-	1,789	-	2,099	-
WBM	-	4,200 [5.62 Cum]	-	4,450 [6.5 Cum]	-	5400
Murram	-	472 [21 Cum]	-	500 [22.25 Cum]	-	608 [27.00 Cum]
		472 [5.25 Cum]		500 [5.56 Cum]		608 [6.75 Cum]
iii) Plantation	250	250	250	250	250	250
iv) Shoulder Filling	2,500	2,500	2,500	2,500	2,500	2,500
v) Store Room	500	500	500	500	500	500
vi) Bridges and culvert	2,000	2,000	2,000	2,000	2,000	2,000
vii) Sign Board and km stones	1,500	1,500	1,500	1,500	1,500	1,500
viii) Traffic Census	200	200	200	200	200	200
Total (ordinary repairs)	19,575	18,582	20,053	18,860	21,069	19,918
2. Periodical renewal						
i) SD/PC/MS	25,100	-	30,600	-	38,150	-
ii) Metal renewal	-	21,200	-	26,500	-	35,333
3. Special repairs	4,000	4,000	4,000	4,000	4,000	4,000
4. Flood damage repairs	5,584	4,973	6,332	5,670	7,415	6,906
Total Maintenance	54,259	48,755	61,985	56,030	72,734	68,157

Table 5.5 Norms for inputs for maintenance of MDRs, ODRs and VRs

Activities and inputs (1)	(Rupees per km)					
	Up to 500 CVD		500 to 1500 CVD		More than 1500 CVD	
	BT (2)	WBM (3)	BT (4)	WBM (5)	BT (6)	WBM (7)
1. Ordinary repairs / Routine maintenance						
i) General maintenance/ repairs						
Labour	5,760 [0.3]	5,760 [0.3]	5,760 [0.3]	5,760 [0.3]	5,760 [0.3]	5,760 [0.3]
Mason	1,200 [0.04]	1,200 [0.04]	1,200 [0.04]	1,200 [0.04]	12,000 [0.04]	1,200 [0.04]
ii) Patch Repair						
BT Surface	2,915 [0.53T]	-	3,325 [0.55T]	-	3,685 [0.67T]	-
WBM	1,200 [3.75 cum]	-	1,350 [4.22 cum]	-	1,500 [4.69 cum]	-
WBM	-	3,000 [15 cum]	-	3,400 [17 cum]	-	4,000 [20 cum]
Muram	-	338 [3.75 cum]	-	383 [4.25 cum]	-	450 [5.00 cum]
iii) Plantation	250	250	250	250	250	250
iv) Shoulder Filling	1,500	1,500	1,500	1,500	1,500	1,500
v) Store Room	400	400	400	400	400	400
vi) Bridges and culvert	1,500	1,500	1,500	1,500	1,500	1,500
vii) Sign Board and km stones	500	500	500	500	500	500
viii) Traffic Census	100	100	100	100	100	100
Total (ordinary repairs)	15,325	14,548	16,185	15,593	17,493	16,690
2. Periodical renewal						
i) SD/PC/MS	20,917	-	251,000	-	25,600	-
ii) Metal renewal	-	21,200	-	26,500	-	35,333
3. Special repairs	1,500	1,500	1,500	1,500	1,500	1,500
4. Flood damage repairs	4,530	44,694	5,161	5,387	5,395	6,906
Total Maintenance	42,272	41,717	48,446	43,392	51,482	51,555

Notes on Tables 5.4 and 5.5

- CVD (commercial vehicles per day) are trucks, buses and tractor trolleys.
- Numbers in cells represent costs in Rs per km.
- Numbers in square brackets in cells are physical inputs (T - Tonnes, Cum - cubic metres).

A procedure for updating norms to allow for inflation has now been agreed by MOSRTH. Earlier there was no set procedure for such adjustments. As there is an interval of a number of years between revisions of norms undertaken by MOSRTH, planners and field engineers had to work with out-of-date cost norms. To overcome this problem, a model for annual updating of norms by linking the labour cost component with the Consumer Price Index (CPI), material costs with the Wholesale Price Index (WPI) and machinery operation component with average price of fuel has been provided in the Report of the Committee on Norms for Maintenance of Roads in India, published by the Indian Roads Congress in 2001.

5.5 Latest norms for maintenance of roads recommended by the Committee on Norms for Maintenance of Roads in India

5.5.1 Introduction

This section summarises the norms published by the IRC in 2001 in "Report of the committee on norms for maintenance of roads in India" set up by the Ministry of Road Transport and Highways. The norms were last revised in 1993. Since then the road sector in the country has come under increased pressure from the high growth in traffic and expectations of road users have increased with the introduction of higher speed modern vehicles. The combined effect of these factors has led to demand for better maintained roads. The committee has taken account of this in revising the norms.

The Committee decided to keep the same classification of maintenance types (i.e. Ordinary Repairs, Periodic Renewal, Special Repairs and Emergency Repairs). The Committee also considered that the organizational structure of maintenance activities related to ordinary repairs has worked well in the past and recommended that it should be continued with some revisions to include a few new activities until a scientific maintenance management system is put in place.

5.5.2 Price zones

Table 5.6 shows the estimates of average shares of labour, material and equipment costs in maintenance activities. In ordinary repairs of BT surface roads, the cost of materials is about 62 to 67 per cent of total cost. In periodic renewal, the cost of material is 67 to 72 per cent of the total. The cost of material item which shows the largest variation between various parts of the country is the cost of stone chips/metal. Other items such as bitumen, labour and equipment do not show much variation in the country. In view of this, the cost of stone chips has been identified as the basis for dividing the country into six price zones, so that a cost estimate for a locality can be produced if the price of the stone metal is known. It needs to be clarified that these price zones have no linkages with any particular geographic location and more than one price zones may be applicable for any State or region depending upon the availability of stone metal and transport distances involved. It should also be noted that because of environmental restrictions on quarrying, prices of stone metal have increased substantially in many areas which were in lower price zones earlier.

Table 5.6 Percentages of labour, material and machinery costs in maintenance

Road types	Ordinary repairs			Periodic renewal		
	Labour	Material	Machinery	Labour	Material	Machinery
NH / SH	28	66	6	5	70	25
MDR/ODR/VR	30	67	3	10	72	18

In hilly areas, the cost of material and labour is more than in other regions due to climatic conditions and longer haulage distances. Therefore, one more price zone, VI A has been added for hilly areas. Table 5.7 shows the price zones. Most areas of Madhya Pradesh fall in price zone III.

Table 5.7: Price zones for stone chips

Zones	I	II	III	IV	V	VI	VI A **
* Range of cost of stone chips in Rs/Cum	280- 350	350-400	400-500	500-580	580-660	660- 740	740- 860

* Indicates the cost of stone metal in different zones.

** Indicates the high cost range for hilly areas.

5.5.3 Different norms for different category roads

MDRs, ODRs and VRs generally carry local traffic and as they are exposed to less intense road traffic, the maintenance requirements are lower than those for NHs and SHs. Therefore, the Committee recommended separate norms for NHs and SHs and for MDRs, ODRs and VRs. Table 5.8 shows the recommended renewal cycles for MDRs, ODRs and VRs.

Table 5.8: Renewal life cycle and surface treatment for MDRs, ODRs and VRs

Type of treatment/ Road category	Traffic intensity in CVD	MR-I	SD-I/ SD-II	PC+SC	20 mm MSS	25 mm SDBC	25mm BC
MDR/ODR/VR (Normal)	150-450	-	-	-	5/4	5/4	-
	< 150	5/4	5/4	5/4	-	-	-
MDR/ODR/VR (Urban)	150-450	-	3	4/3	4/3	-	-
	< 150	3	4/3	5/4	5/4	-	-
MDR/ODR/VR (Hilly)	150-450	-	3	5/4+	5/4+	-	-
	< 150	4/3	4/3	5/4	-	-	-

Note on Tables 5.8

- MR = Metal Renewal, SDI= One Coat Surface Dressing, SDII=2 Coat Surface Dressing, PC=Premix Carpet, SC=Seal Coat, SDBC=Semi Dense Bituminous Carpet, MSS=Mix Seal Surfacing
- More frequent renewal required in high rainfall (>3000mm) areas.
- More frequent renewal required in higher altitude (>2000m) areas indicated by +.
- SD-I treatment should be used only if resources are severely limited.

5.5.4 Flood damage repairs (FDR) and Special repairs (SR)

Every year in some parts of the country, the road network is damaged by floods, cyclones, etc. and provision has to be made for repairs to restore the roads to at least pre flood condition. Andhra Pradesh and Orissa, which are prone to be hit by cyclonic storms, have reported that expenditure of up to 65 per cent of the normal maintenance budget is required for flood damage repairs. Director General (Border Roads) has reported that up to 25 per cent of the maintenance budget is used for flood damage repairs. Provision will

have to be made for flood damage repairs on case-by-case basis. The IRC Subcommittee for urban roads recommended that 12.5 per cent of (OR+ PR) may be kept for FDR. The IRC Committee recommended an amount equivalent to 15 per cent of (OR+ PR) for FDR in normal and urban areas and 20 per cent for hilly areas for all categories of roads.

The same proportions were recommended for Special Repairs (i.e. 15 per cent of OR and PR expenditure in non-urban and urban areas and 20 per cent in hilly areas).

5.5.5 Cost norms for price zone III

Since most areas of MP fall in price zone III, Table 5.9 provides maintenance cost norms for MDR, ODR, VR categories of roads in price zone III. Figures for single-lane roads have been worked out based on costs for two-lane given in the report and conversion factors recommended for converting the prices into single-lane.

Table 5.9: All maintenance and repair costs for a single-lane MDR/ODR/VR in price zone III

Type of maintenance	Type of surface and traffic range (in CVDs)			Remarks
	<150 CVDs		150-450 CVDs	
	BT	WBM	BT	
Ordinary repairs	23,350	21,550	23,800	
Periodic renewal	46,550	44,600	51,300	
Flood damage repairs	10,500	9,900	11,300	
Special repairs	10,500	9,900	11,300	
Total	90,900	85,950	97,700	

Adequate maintenance is required if road assets are to be preserved. For rural roads, these norms appear to be high when compared with the figures agreed by the 10th Finance Commission and the provision made for PMGSY roads. A more detailed study is needed to arrive at a realistic assessment of maintenance costs for rural roads.

5.6 Maintenance practice in MP PWD

5.6.1 Planning and activities

The annual estimation of maintenance requirements is initially done between January and March. This is based on assessments of S/Es but there are site inspections by the EE and other senior engineers before the estimates are prepared. The selection of types of repairs required, including any special repairs or renewal of structures, is made after field investigations. The estimates for expenditure on special repairs are prepared and submitted to GOMP.

Estimates for periodic renewals as necessary and ordinary repairs for all roads are prepared on the basis of the GOI norms. The EE of each Division technically sanctions the estimate. The request for allocation of funds from the GOMP annual budget for maintenance of all roads under PWD responsibility is compiled and submitted by the Engineer-in-Chief. Based on the allocation of funds by GOMP, every Division is allocated funds on pro rata basis. Priorities have to be established to select the most urgent maintenance activities within the available funds. The work of renewals is done by contractors. For ordinary repairs, materials are procured from contractors but maintenance activities are undertaken by permanently employed gang labour. If permanently employed gang labour cannot cope with the quantity of work, additional casual labour is employed. Table 5.10 sets out the ideal frequencies of routine maintenance activities.

Table 5.10: Frequency of routine maintenance activities

No	Activity	Annual frequency of operation
1.	Clearing of road side gutters	Twice
2.	Pothole filling (WBM and BT)	Once
3.	Filling up edges of asphalt surface	i) Single Lane a) T.I. 0-1000 Twice b) T.I. 1000-5000 Four times ii) Intermediate Lane T.I. 0-1000: Once T.I. 1000-5000: Twice T.I. Over 5000: Four times iii) Two Lane T.I. 1000-5000: Once T.I. Over 5000: Twice
4.	Dressing of berms	Once
5.	White washing guard stones	Twice
6.	Fixing disturbed caution board / Village name board / Speed limit board, etc.	Once
7.	Refixing displaced guard stones	Once
8.	White washing and geroo rending of trunks of trees	Once
9.	Cutting of branches of trees, etc.	Once
10.	Topping of WBM bindage operation including picking of loose metal	18 times
11.	Maintenance of catch water drains	Once
12.	Clearance of CD works.	Twice
13.	Clearing of wild seasonal growth on berms	Once
14.	White washing parapets of CD works	Once
15.	Earthwork in berms, desilting of drains, etc.	As required

Note: T.I. stands for Traffic Intensity in tonnes per day.

5.6.2 Routine maintenance and permanent gang labour

The total labour strength in PWD in 2004, including work charge employees in the department, is about 26,000. According to GOI norms, there should be 30 workers per 100 km. At present, the labour strength is about 41 workers per 100 km. Because of the larger than required permanent labour force and low allocations of funds for maintenance in recent years, a large share of

maintenance funds has been spent on wages leaving insufficient resources for materials and tools and equipment for ordinary repairs and renewal of surface.

The manual methods are appropriate for a number of routine maintenance activities though better equipment is needed for some activities (e.g. paver and small roller for bitumen patching) for quicker completion on high traffic volume roads. The procedure for patch repair by manual labour is as follows:

- ❖ Clean the area for patch repair.
- ❖ Apply tack coat.
- ❖ Mix the material with bitumen / caloric emulsion on roadside.
- ❖ Fill the potholes with the mix material.
- ❖ Use the hand compactor (Durmuth) to stabilize the mix material in position.
- ❖ After the repair process is over, open for traffic.

Advantages of the manual process using permanently employed gang labour are:

- ❖ labour is directly employed and readily available;
- ❖ no advanced and expensive equipment is required;
- ❖ labour is cheaper for most routine maintenance activities;
- ❖ where traffic volumes are low and the amount of patching required is low, it is faster and more responsive;
- ❖ during harvesting and festivals, casual labour is scarce but permanently employed labour ensures availability;
- ❖ permanently employed labour is available to deal with emergencies, and
- ❖ through experience over time, permanently employed labour and supervisors have gained expertise in performing routine maintenance tasks.

The low efficiency of labour is due to a number of reasons including non-availability of adequate tools and plant, non-delivery of materials on time, lack of incentives and supervision to operate more efficiently and use of gang labour for purposes other than road maintenance. Improvement of efficiency and effectiveness would require major reforms in the manner in which the labour is deployed, reduction in the labour force and improved resources and organisation.

5.6.3 Periodic maintenance

Periodic maintenance is usually implemented through contractors though some roads are being maintained as part of BOT (build, operate and transfer) schemes. Periodic maintenance (surface renewal) of gravel, WBM and BT surfaces are clearly different.

Renewal of gravel roads

Renewal is required when the surface is damaged and there are deep ruts and

corrugations. The surface to be renewed is scrapped and new gravelling material is mixed with old material in required quantities, watered, graded and rolled to restore the shape.

Renewal of WBM Roads

Defects develop on WBM roads because of constant movement of traffic. The WBM surface is mainly damaged by bullock cart iron tyres and pneumatic tractor tyres. The main defects are potholes, corrugations and undulations. Loose metal, if not removed promptly, causes more damage to the surface.

The renewal of WBM surface requires following operations:

- ❖ metal and murrum collection in the required quality and quantity;
- ❖ picking of old surface and filling of potholes and depressions;
- ❖ spreading of metal on the full width;
- ❖ watering and rolling in proper grade and camber, and
- ❖ periodic blinding with sand or murrum essential for longer life of WBM surface.

Renewal of BT Surface

Common types of defects in bituminous surface are potholes, cracks, edge deformations and ravelling and bleeding. Table 5.11 shows the type of defects, their causes and remedial measures for proper maintenance.

Table 5.11: Causes, defects and required maintenance on BT roads

Defect	Possible causes	Maintenance measure
Bleeding surface	Excess / unsuitable binder	Spreading of aggregate chips
Surface and pavement structure cracks	Poor quality of material / workmanship, insufficient pavement crust, excessive loads	Local sealing or filling in of cracks and strengthening
Ruts and depressions	Poor quality of material, inadequate pavement or sub grade strength	Slight rutting: Filling Deep rutting: Local restoration of pavement
Edge subsidence	Inadequate or badly maintained shoulders	Slight subsidence: Filling of ruts and depressions and restoration of shoulders Deep subsidence: Local restoration of pavement, improvement of drainage
Rutting	Loss of strength due to water penetration	Slight rutting: Filling Deep rutting: Local restoration of pavement
Edge damage	Poor drainage, narrow road, shoulder damage due to action of water	Local restoration of pavement, repairs of shoulder
Potholes	Degradation of pavement structure, poor quality of material, infiltration of water, traffic.	Cutting and removal of material up to full depth of affected area and refilling with appropriate materials in layers and compacting

The defects shown in Table 5.11 are rectified first and the road surface is brought to the required camber and grade. If there is too much undulation, a profile corrective course is laid before laying the final surface. The tack coat is applied on the surface in the specified quantity. There are three types of surface treatment:

- ❖ surface dressing- single coat/two coats;
- ❖ open graded premix carpet, and
- ❖ mix seal surfacing (MSS).

The treatment to be applied depends on the type of existing surface, rainfall in the area and traffic on the road. It also depends on the practice generally followed in the area. In MP, premix carpet is provided on SHs, MDRs and ODRs and MSS/SDBC is provided on NHs and SHs, depending on resources.

5.7 Quality control in PWD

Quality control of construction and maintenance for roads and bridges generally follows the "Specifications for road and bridge works" published by the Indian Roads Congress. There is no separate quality control unit within PWD. Departmental officers perform quality control tasks and tests in various laboratories and maintain the record of testing. There is a Superintending Engineer (Quality Control and Vigilance) under the Engineer-in-Chief but he deals with complaints only.

Some changes which could improve quality control in construction and maintenance of roads are given below:

- ❖ There should be a continuing training programme for staff at all levels to enable them to achieve high standards. Accountability and monitoring should also be quality oriented.
- ❖ Appropriate technologies, equipment and designs should be adopted to achieve high quality outcomes.
- ❖ There should be sufficient number of easily accessible and well equipped testing laboratories.
- ❖ The schedule of rates should be frequently revised to incorporate the latest specifications and market rates.
- ❖ Contractors should be sensitised on quality control and actions should be taken against those who fail to achieve the required quality.
- ❖ Detailed Project Reports should be based on thorough investigations on the ground and if necessary, assistance of consultants could be procured on a competitive basis.

5.8 Monitoring

In order to ensure the desired progress in physical and financial terms, it is essential to keep a close watch by monitoring. At present, monitoring is undertaken by senior officers as a part of normal supervision of contractor operations and junior officers. There is no formal monitoring system in place and lack of computerised recording of works implementation makes monitoring difficult. Some of the important measures needed for improving monitoring are given below:

- ❖ Suitable training for staff in routine and periodical maintenance planning and implementation.
- ❖ A system for collection of data needed to monitor performance (financial flows and physical performance) is also equally important.
- ❖ Planning and scheduling of operations with timely allocation of funds.
- ❖ Senior management should give high priority to monitoring and undertake both regular and unscheduled inspections.
- ❖ Monitoring should be used to examine progress, anticipate possible problems and improve performance.
- ❖ EEs should ensure that AEs and S/Es regularly submit returns of physical and financial achievement every month. They should convene regular meetings to review progress and problems.
- ❖ There should be regular meetings at higher levels (i.e. EEs reporting to the CE) to review progress and problems.
- ❖ At present, there is neither a systematic database of the road network nor a maintenance management system in PWD. A road network database and an appropriate Road Maintenance Management System (RMMS) are needed for monitoring the maintenance programme and for planning, programming and estimating maintenance requirements and costs. The RMMS should be a simplified system. It should also be readily usable by officers who are directly involved in the planning and supervision of maintenance.
- ❖ Establishment of Contract Management and Project Management Systems in the Department.
- ❖ Quality audits twice a year by independent quality monitors and appropriate corrective measures where necessary.
- ❖ There should be a performance monitoring system with incentives related to performance, support for staff development and a Human Resource Development unit.

An important aspect to be monitored at the PWD headquarter level is the proper utilization of funds. A reporting and auditing system is required to (a) ensure that funds allocated for specific purposes are being used for these purposes, and (b) monitoring of progress in specific activities. The focus in sections 5.7 and 5.8 has been on quality control and monitoring issues in road maintenance by MP PWD. The assessment highlights the need to develop effective quality control and monitoring arrangements for the maintenance of rural roads under the PRIs.

Chapter 6

Road Maintenance: Funding and Operational Practices



6.1 Maintenance funding and expenditure

Assessment of the overall maintenance situation is based on available data, field visits and discussions with field and senior officers in PWD, RES and other Departments. Table 6.1 shows maintenance requirements, allocation and expenditure in MP. Columns 2, 3, 4, 5 and 6 reveal that the percent shortfall of expenditure compared with requirement was about 50 per cent on average up to the year 1997-98. Because of the steep decline in allocation of funds coupled with lower expenditure from 1998-99 to 2002-03, this shortfall increased to 79 per cent.

Column 8 in Table 6.1 shows that since 1999 about 50 per cent of maintenance funds have been spent on wages for permanent gang labour. Such a proportion of expenditure on wages is not unreasonable for some labour intensive maintenance activities. However, discussions with PWD staff at the State and District levels indicate that the efficiency of permanent gang labour is low and it is falling. This has further worsened the maintenance output. The decline in efficiency of gang labour is due to a number of reasons which include non-availability of adequate tools and plant, non-delivery of materials on time, lack of incentives and supervision to operate more efficiently and use of gang labour for purposes other than road maintenance.

Table 6.1 Road maintenance requirements, allocation of funds and expenditure in Madhya Pradesh

Year	Requirement as per norms (Rs crore)	Allocation (Rs crore)	Expenditure on repair and maint'ce (Rs crore)	Expenditure on permanent gang (Rs crore)	Total expenditure (Rs crore)	Shortfall as percentage of requirement	Percentage of expenditure on gang labour
1	2	3	4	5	6	7	8
1993-1994	-	170.05	132.15	72	204.15	-	35.27%
1994-1995	495.03	211.78	171.04	75	246.04	50.30%	30.48%
1995-1996	504.96	225.07	178.22	79	257.22	49.06%	30.71%
1996-1997	555.45	248.48	210.52	83	293.52	47.16%	28.28%
1997-1998	610.99	282.29	222.39	87	309.39	49.36%	28.12%
1998-1999	672.08	272.96	221.02	91	312.02	53.57%	29.16%
1999-2000	700.00	193.69	99.27	99	198.27	71.68%	49.93%
2000-2001	600.00	224.99	84.99	109	193.99	67.67%	56.19%
2001-2002	660.00	170.10	74.21	78.82	153.03	76.81%	51.51%
2002-2003	720.00	136.10	75.25	74.92	150.17	79.14%	49.89%

Source: Road Statistics of MP

As mentioned earlier, funds for maintenance of MDRs, ODRs and VRs are allocated under a single account head. Data on the allocation of expenditure between the different categories of roads are not available. However, discussions with State and District officials indicate that most of the expenditure has been on MDRs with about 10 to 15 per cent spent on ODRs and VRs, probably for emergency repairs where road sections have completely broken down. It appears that very little money has been spent on systematic routine and periodic maintenance of ODRs and VRs for many years. After the decision to transfer responsibility for ODRs and VRs to PRIs in 1999, maintenance expenditure on ODRs and VRs is likely to have been negligible since the PWD position is that maintenance responsibility for rural roads now rests with PRIs.

These general conclusions are broadly confirmed by evidence at the district level in Dhar and Jabalpur (see Annex 1). The assessment at the district level shows that:

- ❖ allocation of funds for maintenance of MDRs, ODRs and VRs provided to the PWD under a single account head is far below the requirement;
- ❖ the expenditure is below allocation because expenditure is blocked from time to time owing to the GOMP financial situation;
- ❖ funds for maintenance of rural roads are also diverted to non maintenance activities at times;
- ❖ the available funds are mainly used on MDRs partly because these roads are considered to be more important and partly because of the continuing ambiguity on ownership whether the PWD or the PRIs are responsible for ODRs and VRs;
- ❖ conventional systems of maintenance are not result oriented and

- therefore ineffective, and
- ❖ because of continuing inadequacy of maintenance funds, a large maintenance backlog has been created and substantial length of the road network has deteriorated to such an extent that funding on a large scale will be required to rehabilitate these roads to serviceable levels.

While firm evidence is lacking, discussions with PWD, RES and other officials suggest that because of poor maintenance, about 60 per cent of MDRs and about 80 per cent of ODRs and VRs have deteriorated to such an extent that they are impassable and will require huge investments of the order of 75 to 80 per cent of the cost of new pavement to render them usable. Evidence from the situation analysis in the two sample blocks shows that about 20 and 37 per cent of ODRs and VRs in Sihora and Dhar Blocks respectively provided full access with quite a large proportion of the remaining rural roads providing some level of access. While the two sample blocks may not be representative of the overall situation in MP, the evidence from the two Blocks shows that there is need for a more detailed assessment of the current situation for making a realistic estimate of rehabilitation costs.

Based on the asset management principle, the focus of this report is on developing a strategy for maintaining rural roads (ODRs and VRs) which are in maintainable condition. These include roads which are being constructed under PMGSY and other rural roads which are maintainable. A broader strategy for rural roads in MP would also require a plan for rehabilitating the more important ODRs and VRs which are currently in bad condition and unmaintainable. A concern also remains about the poor condition of many MDRs for which a preservation strategy to be developed by the PWD is required.

Table 6.2 shows tentative estimates of the cost of rehabilitating deteriorated MDRs, ODRs and VRs. The estimates assume that about 50 per cent of MDRs and about 80 per cent ODRs and VRs are badly deteriorated and therefore likely to require rehabilitation. For these estimates, the cost of rehabilitation is assumed to be Rs 600,000 per km for BT roads and Rs 300,000 per km for WBM roads. The total cost is estimated to be Rs 1,365 crore (US\$ 314 million) of which Rs 1,065 crore (US\$ 245 million) or about 78 per cent is for ODRs and VRs. More precise assessment of the situation is needed before making firm estimates and developing an approach to funding and implementation of a rehabilitation programme. It is likely that the estimates of rural road lengths requiring rehabilitation in Table 6.2 are overestimates since a significant proportion of PMGSY roads are ODRs and VRs.

Table 6.2: Estimated requirement of funds for rehabilitation of MDRs, ODRs and VRs

Road category	Surface type	Length (km)	Length requiring rehabilitation (km)	Tentative cost of rehabilitation (Rs crore)
MDRs	BT	9,273	4,600	276
	WBM	1,720	800	24
ODRs and VRs	BT	11,528	9,000	540
	WBM	22,437	17,500	525
Total		44,958	31,900	1,365

It will be necessary for the state to devise a strategy for mobilising additional funds for maintenance.

6.2 Arrangements for maintaining PMGSY roads in MP

6.2.1 Introduction

PMGSY as a large programme for improving rural access and its implementation in MP has been discussed in a number of places in this report. This section provides some additional details on implementation and maintenance of roads constructed under the programme. Table 6.3 summarises physical and financial progress between 2001 and 2005. During this period, projects for an amount of Rs.2190 crore have been cleared to cover connectivity to 3350 habitations. The rest of this section focuses on the details of the maintenance arrangements.

Table 6.3: Sanction of PMGSY works and physical and financial progress (2001 to 2005)

Phase	No. of roads sanctioned	Road length (km)	Sanctioned amount (in Rs crore)	No. of roads completed	Length completed (km)	Expenditure (Rs crore)
1	2	3	4	5	6	7
I	387	2,111	186.27	375	1,673	199.75
II	801	3,742	583.86	745	3,676	552.49
III	555	2,821	583.00	397	1,808	386.65
IV	743	3,508	736.59	182	728	338.09
ADB	97	515	99.40	-	-	-
Total	2,583	12,697	2,189.12	1,699	7,885	1,476.98

Source: NRRDA, MORD, Government of India

6.2.2 Maintenance of PMGSY roads by the construction contractors

There is a condition in the construction contractors' TOR that routine maintenance of the roads for 5 years after completion is to be done by the contractor. Under contracts during the early phases, 10 per cent of the

payment was withheld as security deposit. If the contractor failed to maintain the completed road as required, MPRRDA had the right to use the withheld amount for maintaining the road.

In the new tender document in use from Phase IV onwards, payment for routine maintenance is separated from payment for construction. The contractor is paid separately as follows for routine maintenance operations if maintenance performance is satisfactory:

- 1st year after construction - Rs 8,000 per km;
- 2nd year after construction - Rs 9,000 per km;
- 3rd year after construction - Rs 10,000 per km;
- 4th year after construction - Rs 11,000 per km, and
- 5th year after construction - Rs 12,000 per km.

The five-year period after construction is treated as the defect liability period. The contractor is responsible for rectifying any defects which develop during the five year period because of poor implementation and bad workmanship or inferior materials. The contractor is also responsible for maintaining the road in a good traffic worthy condition.

Procedures for identifying defects and lack of maintenance, notifying contractors of the defects and to rectify them are in place. Contractors are required to implement routine maintenance of roads (including pavement, roadsides, cross drains and surface drainage) to the required standard and keep the entire road surface and structures in defects free condition during the entire maintenance period which begins at completion of construction and ends after five years. Routine maintenance should meet the following minimum requirements:

- ❖ Potholes on the road surface to be repaired soon after they appear or are brought to the contractor's notice either during his monthly inspection or by the engineer.
- ❖ Road shoulders to be maintained in proper condition to make them free from excessive edge drops, roughness, scouring or potholes.
- ❖ Cleaning of surface drains including reshaping to maintain free flow of water.
- ❖ Cleaning of culverts and pits to maintain free flow of water.
- ❖ Any other maintenance operations required to keep the road traffic worthy at all times.

The contractor should carry out monthly inspections of the road and report to the MPRRDA any problems observed and corrective measures taken. The contractor should pay particular attention to road sections which are likely to be damaged or inundated during rainy season.

6.2.3 Maintenance of PMGSY roads by the Panchayat Raj Institutions (PRIs)

Maintenance of PMGSY roads after five years of their completion will be the responsibility of the PRIs. GOMP has made a commitment to support the PRIs in developing their maintenance capability and to provide sufficient funds for maintenance. Table 6.4 shows the rapid growth in the requirement of funds for maintenance of PMGSY roads.

Rural Engineering Service (RES) will support the PRIs in planning and implementing maintenance.

Table 6.4: Funds required for maintenance of PMGSY roads

Financial year	Estimated Amount (Rs crore)		
	Routine	Periodic renewal	Total
2005-2006	4.00	-	4.0
2006-2007	8.00	-	8.0
2007-2008	12.00	-	12.0
2008-2009	16.00	71.60	87.60
2009-2010	20.00	74.40	94.40
2010-2011	24.00	78.12	102.12

6.3 Institutional arrangements and PRI/RES capacity for maintaining rural roads

As mentioned above, the GOMP has decided to make PRIs (more specifically Jila Panchayats) responsible for the maintenance of PMGSY roads after the first five years of their completion. While there is some ambiguity on the responsibility for the remaining rural roads, the policy decision to make the PRIs responsible for these roads has already been made and making this policy effective is under active consideration.

The proposed institutional arrangements raise a number of serious concerns. The assumption is that maintenance will be executed by Jila, Block or Village Panchayat with RES technical support. A well managed maintenance programme involves a number of activities including inspection, assessment of road and traffic conditions, maintenance planning, procurement and management of contractors and financial control. At present, neither the PRIs nor the RES have been undertaking these activities.

It will, therefore, be necessary to develop a model for cooperation and division of responsibilities for managing maintenance between the PRIs and RES Units and develop the requisite planning and implementation capacities within them. The division of responsibilities and cooperation between the PRIs and RES and their capacity development will have to take account of

the need for professional expertise in planning, implementation and supervision of road maintenance.

One works Division of RES is placed under the administrative control of each Jila Panchayat, as engineering staff of the PRIs, to provide technical support for works executed by Jila, Janpad and Village Panchayats. In this mode, the engineering staff of PRIs work under the dual control of PRIs and RES Executive Engineer. The same Divisional RES staff are also responsible for a range of other rural infrastructure works, for example on behalf of the PRDD and MP's and MLA's funds. These works are small and widely scattered. The Divisional RES staff are therefore heavily overloaded. It is difficult to expect good output in respect of maintenance of rural roads in these circumstances.

As noted above, the role of professional staff in maintenance is not confined to supervision of works in the field. There are other essential functions such as road condition surveys, maintaining the roads database and operating a maintenance management system. Major restructuring and strengthening of RES Divisions, including a dedicated rural roads maintenance unit, will be required to ensure effective maintenance management. The planning capacity may be included in the strengthened RES or within the Jila Panchayat administration.

District Panchayats, being elected bodies, are normally prone to pressure groups. A transparent planning process based on a clear statement of criteria for prioritising and selecting roads for inclusion in the maintenance programme and which includes wide consultation would help in optimal utilisation of available funds.

Rural roads have different functions. Some may provide a link to the road network for the local population while others serve a much larger population and may also be through roads for some traffic. The maintenance planning function should be at the Jila level. Maintenance responsibility for the more important roads should be retained at the Jila level with delegation of responsibility to Block and Gram levels for the less important roads, say non-core roads.

6.4 Operational issues

Some operational issues which need attention are highlighted here. The observations are based on PWD practice since most road maintenance at present is carried out by PWD.

Planning and budgeting

PWD prepares an annual estimate of maintenance needs and funds required.

Sub Engineers (S/Es) are responsible for making the assessment of maintenance requirements in their sections. These are collated at the Division level. For maintenance activities, each S/E is supported by a permanent maintenance gang managed by a "timekeeper". Effectively the "timekeeper" manages maintenance operations. In the absence of (a) a specified method for road condition assessment, (b) a road inventory and (c) a maintenance management system, S/Es often rely on "timekeepers" to assess maintenance requirements. Subjective appraisals by S/Es and "timekeepers" are unlikely to produce realistic assessments of maintenance requirements. The motivation to make more systematic and realistic assessments of maintenance requirements and costs is probably lacking at all levels in the PWD because the actual funds available for maintenance are much less than the requirements. The concept of Pavement Management System is virtually absent.

Norms for maintenance

MOSRTH norms are used for estimating maintenance costs. These norms have been adopted without adequate assessment of realistic requirements based on regular condition surveys and prioritising and phasing of operations. The norms also relate maintenance requirements and costs to traffic levels. In the absence of a systematic programme of traffic surveys, the norms cannot be applied properly.

Initial road design

Maintenance requirements also depend on the quality of the original construction. As noted earlier, past construction of rural roads in MP suffered from ad hoc design and poor quality control. Designs were not based on subgrade conditions and traffic volume. The geometrics of roads also did not follow standard norms and drainage aspects did not receive full attention. As a result, many of the roads have deteriorated rapidly and may not be maintainable without substantial rehabilitation.

Monitoring arrangements

GOMP issues instructions for monitoring maintenance works from time to time but the monitoring mechanism for routine maintenance has not been found to be satisfactory. Senior officers in PWD seldom find time to monitor maintenance activities.

Implementation efficiency

Routine maintenance under PWD is generally carried out by permanently employed labour gangs. It was observed earlier that the efficiency of gang labour has gone down in recent years. Implementation efficiency is one of the important challenges facing the State PWD in improving the maintenance culture. This is an area of concern requiring serious consideration by GOMP.

Chapter 7

Primary Surveys and Analysis



7.1 Road inventory, road condition and maintenance needs assessment surveys

7.1.1 Objectives and approach

Database for rural roads is inadequate. Practically, no data are available on road condition, maintainability and traffic levels. Attention is also needed to better classification of rural roads including the newly constructed PMGSY roads based on their functions. Without proper data, it is not possible to develop a road maintenance strategy for rural roads. In order to assist in the development of the necessary database, a situation analysis has been carried out in two sample blocks in two sample districts as a pilot project. The two blocks selected are Sihora block in Jabalpur district in East-Central part of MP and Dhar block in Dhar district in the West of MP. In summary, the situation analysis in the two pilot blocks:

- (a) shows what data are needed and how they can be collected;
- (b) tests the feasibility of the necessary data collection;
- (c) is used as a basis for making recommendations on the type of database required, and
- (d) demonstrates, to some extent, how the database can be used.

The objective of the exercise was to provide a basis for developing appropriate district level databases which could be linked to a maintenance management system (MMS) appropriate for rural roads. The data requirements and the MMS should be appropriate for the specific conditions, i.e. rural road networks to be managed at the district level within the constraints of the available management and technical capacity. In particular, the information requirements and the MMS should not be over-elaborate and technically complex. It should also be possible to obtain most of the information by visual inspection so that the information can be initially collected and regularly updated with speed and relatively low cost.

7.1.2 Methodology

The starting point was examination of available data and maps on roads of all classes in the block. The district masterplans prepared for PMGSY were useful in this respect. However, the masterplans were based on their own numbering system which was not matched with the road numbers previously given to VRs and ODRs. They also did not include information on road conditions and traffic and some rural roads and tracks not of interest to PMGSY were excluded. The Block level summary databases and related maps have attempted to match these as far as possible and assigned numbers to the remaining tracks surveyed.

Road inventory, road condition and maintainability data were collected by traveling along all the roads and tracks identified in the block. The surveys were conducted by 2 teams of 2 persons working together. Each team used a motorcycle with a functioning trip-meter with 100 metre readings, essential for the survey. The need to identify the local road and track network also meant that it was highly desirable for at least one of the surveyors to have local knowledge. The PMGSY district master plans indicated that there are about 325 and 450 km of roads and tracks to be surveyed in Sihora and Dhar blocks respectively.

The surveyors found that on an average 10 km of roads can be surveyed per day. Therefore, 80 days (160 person-days) were required for the surveys in the two blocks. The initial survey provides a baseline for assessing maintenance requirements. Visual inspection based on clear guidelines is an appropriate method for rapid condition assessment of rural roads. Nevertheless, the approach is susceptible to inconsistencies because of the subjective element in the assessment. A training period of one week before the surveys, when the teams worked together in applying the guidelines, was intended to reduce these inconsistencies. The resulting data problems were overcome by some recalibration of the evidence and repeat surveys where necessary.

For ease of data collection and recording, any road longer than 5 km was divided into sections of 5 km length (or less for the last section). On each

road, inventory and condition data collection sheet, there was a diagrammatic representing of a 5 km road as a strip with space to put in the data. The data collected were compiled into a pre-designed computer database and strip maps for all roads were prepared. For the summary data sheets for the two blocks, see Annexes II and III.

7.2 Data on traffic counts and population served

7.2.1 Traffic counts

The intensity of traffic flow on any given section of the road forms the basis for determining its design and maintenance requirements. The traffic volume on a road is also an indication of its utilization and contribution to the provision of access, especially for rural roads. In order to assess the Average Daily Traffic (ADT) on a road, classified traffic volume counts were conducted for a continuous period of 7 days (7 a.m. to 7 p.m.) on almost all the roads (excluding NHs and tracks) in each Block. Daily (24 hour) traffic was estimated by multiplying 12 hour traffic by a factor of 1.33 following the convention in India and MP. The Average Daily Traffic (ADT) was calculated by taking a simple average of seven day traffic.

During preliminary reconnaissance surveys, the traffic count locations were identified on the selected roads to ensure that the count would be reasonably representative of traffic volume on the road. Classified traffic counts were conducted at the selected locations. The enumerators were recruited locally and trained. The fieldwork was supervised and a group of count stations was overseen by an officer-in-charge under the overall supervision and guidance of the consultants.

The standard form currently in use in MP was used for traffic counts. Data on the number of vehicles of different categories moving along the road in both directions were recorded. In line with IRC guidelines and formats used in MP, vehicles were broadly classified into motorized and non-motorized vehicles, which are further subdivided into specific vehicle types. Commercial vehicle traffic (trucks, buses and tractor trolleys) is also identified separately.

Traffic data have been recorded and traffic volume measures have been calculated. They include total traffic, total fast and slow traffic, standardised passenger car unit (PCU) equivalent traffic and commercial vehicle traffic (CVD). Table 7.1 shows the PCU factors used. Summary traffic data for each road are provided in Annexes II and III.

Table 7.1 PCU factors used

S.No.	Vehicle Type	PCU Factor
1	Car/jeep	1
2	Auto rickshaw	1
3	Two wheelers	0.75
4	Mini Bus	1.5
5	Bus	3
6	Trucks	3
7	Tractors	3
8	Pedal cycles	0.5
9	Cycle rickshaw	2
10	Animal drawn carts	6

Source: IRC: 64-1990

7.2.2 Population served

Data from population census records were also collected on the population served by each road or track directly and indirectly. The population of a village was assumed to be served directly by a road or track if the village was on it. A village was assumed to be served indirectly by a road if it was not on the road but was provided access for it to centres providing economic, social and administrative amenities and the rest of the road network. This could be for a village (a) which has no existing road or track at present but is the closest to the road in question, or (b) which is on a road or track which links with the rest of the network or amenities through the road in question. The summary data are shown in Annexes II and III.

Chapter 8

Private Sector Contractors and Consultants



8.1 Introduction

Private sector participation in planning and supervision of maintenance may also be necessary. Therefore, it was agreed to carry out an assessment of the availability and ability of the private sector to implement maintenance. This section sets out information on the classification of contractors and consultants and their availability. The classification system for contractors has been established by the MP PWD and set out in PWD manuals. The PWD classification guidelines are generally accepted by all public sector agencies. MPRRDA relies heavily on the private sector in implementing PMGSY and therefore its experience is also reviewed briefly.

8.2 Guidelines for registration and upgrading of contractors in A-I to A-V classes

The main technical criteria for registration and upgrading are related to the amount of previous civil works experience and are set out in Table 8.1.

Table 8.1 Requirements for upgrading and registration of contractors with MP PWD

For upgrading			For registration				Upper limit on value of works (Rs lakh)
Class	Average value of works executed during last 3 years (Rs lakh)	Value of work in hand (Rs lakh)	Class	Average value of works executed during last 3 years (Rs lakh)	Value of work in hand (Rs lakh)	Minimum contract size completed (Rs lakh)	
1	2	3	4	5	6	7	8
A-I	10.00	2.00	A-I	10.00	2.00	4.00	10.00
A-I to A II	25.00	10.00	A -II	50.00	10.00	10.00	50.00
A-II to A III	80.00	25.00	A -III	100.00	25.00	20.00	100.00
A-III to A IV	200.00	80.00	A- IV	400.00	80.00	40.00	400.00
A-IV to A V	800.00	100.00	A-V	1500.00	100.00	150.00	Unlimited

The application for upgrading to a higher class is accepted only after the expiry of a period of two years from the date of initial registration. There is some flexibility with respect to the criteria set out in Table 8.1 to accommodate qualification of lower class contractors, those from outside MP and technically qualified engineers who have public sector experience (see below).

In presenting evidence on the value of works for registration or upgrading, for works done for government or semi-government agencies, certificates issued by an officer of at least Executive Engineer (or equivalent level in other organisations) are required. Only 50 per cent of the value of works for the private sector can be taken into account. Income Tax Clearance Certificates must also be provided. Certification from private firms for work done as sub-contractors is not valid.

Partnerships must be registered with the Registrar of Firms and Societies. An additional condition for all contractors is a certificate of solvency from a recognised bank. Minimum solvency levels (indicated by bank balances) are shown in Table 8.2. Recent solvency certificates are also needed when applying for tender documents.

Table 8.2 Minimum bank solvency (balance) levels for A-I to A-V contractors

Class	Minimum Bank Solvency (Rs)
A-I	25,000/-
A-II	300,000/-
A-III	500,000/-
A-IV	1,200,000/-
A-V	2,500,000/-

All applications for upgrading of contractors for A-III, A-IV and A-V classes must be routed through the Chief Engineer (CE) of the Zone in which the contractor has done bulk of the work. The CE is responsible for checking the track record on the quality of works and financial capability before recommending the application. Registration in A-IV and A-V categories to undertake road works requires ownership of 30 to 40 tonne capacity hot mix plant and certain other equipment specified by MOSRTH though the CE can exercise some discretion in this respect when making the recommendation.

Contractors registered in other States, with GOI or with other authorities, may be considered for direct registration in the appropriate A class, if they have successfully executed works of required sizes and have carried out specified volumes of works during the last three years.

In addition to the A-I to A-V classifications, there are also smaller class B and C contractors. Class C contractors require site experience only for registration and can undertake small local works (upper limit Rs 2 lakh or about US\$4,600). Class B contractors can carry out works up to an upper limit of Rs 4 lakh (about US\$9,200). Normally contractors registered in class B and having successfully completed works of a total value of Rs 5.00 lakh (US\$11,500) or more during the last two years may be considered for registration in A-I class.

Qualified engineers with supervision experience can register as A class contractors. Direct registration of civil engineering graduates or diploma holders in A-I class may be considered even if they have not executed any works in their own name but have at least one year's experience of independently supervising and managing construction work of the value of Rs4.00 lakh or more. Civil engineering graduates with more substantial supervision experience can be registered directly in A-II class.

Retired PWD officers or partnerships in which their share of profits is at least 25 per cent can be registered as contractors under a class according to the seniority attained within PWD, including field and supervision experience. The classes under which retired officers or their partnerships can register are shown below.

❖ Retired E-in-C or CE PWD	A-V
❖ Retired SE PWD	A-IV
❖ Retired EE PWD	A-III
❖ Retired AE or S/E PWD	A-II

Registered contractors are reviewed on a random basis (3 per cent of the registered contractors each month) to check if they satisfy the registration requirements.

8.3 Number of contractors registered in MP

In 2004, the number of contractors registered under classes A-III, A-IV and A-V were 257, 251 and 157 respectively with MP PWD headquarters in Bhopal. Contractors in these classes can undertake contracts throughout the state. Many more contractors under classes B, A-I and A-II are registered with Chief Engineers' offices at the Zone level and can undertake contracts within the Zone in which they are registered. In addition there are a large number of class C contractors registered at the district levels and with other agencies (e.g. RES and municipalities). The maximum size of contracts which can be undertaken by class C contractors is Rs 2.00 lakh. Within this limit, class C contractors are capable of executing small works, such as maintenance works.

There are no active contractors' associations in Madhya Pradesh at present. There have been some associations in the past. One such association, Indore Civil Works Contractors' Association, was registered with the Assistant Registrar under the Registrar of Society Act, 1973. Contractors' associations were not officially recognised and had limited functions; and so they lapsed.

8.4 Contractors for PMGSY works

No separate registration is required for PMGSY works on behalf of the MPRRDA. Contractors registered by any State government or Central government organisations and semi-government agencies are entitled to take up PMGSY works within their financial capacities. About 150 contractors of various categories registered in MP and outside the state are currently working on PMGSY roads in MP. However, since the contract packets on PMGSY are in the Rs 5 to 10 crore range (US\$1.15 to 2.3 million), large contractors only (in PWD Class A-V or equivalent) are likely to have the experience and financial capacity to undertake these contracts. There is some scope for smaller contractors since MPRRDA permits sub-contracting of up to 25 per cent of contracts for constructing PMGSY roads as long as prior permission is obtained.

Earlier there was a condition that contractors must have executed road works worth at least 50 per cent of the PMGSY tender value within the last 3 years. To increase competitive bidding, this condition has been diluted.

8.5 Market for the contractors in MP and implementation capacity

PWD and MPRRDA are the two public sector agencies which receive funding on a large scale from GOMP and GOI for road sector works. The

state PWD and MPRRDA get funds under the following heads:

- ❖ Plan work.
- ❖ Non-plan recurrent allocation for road maintenance.
- ❖ Loan from NABARD for construction / rehabilitation of rural roads.
- ❖ Grant from GOI MOSRTH for the construction, upgrading and maintenance of NHs.
- ❖ Allocation from the Central Road Fund (CRF) for the upgrading of State roads.
- ❖ Grants to MP for roads of national economic importance and links between NHs.
- ❖ Allocation from Mandi Cess for expenditure on construction / rehabilitation of MDRs.
- ❖ From 2000-01 to 2003-04, the GOI has accorded sanction of Rs 2,052.25 crore (US\$471 million) for PMGSY.
- ❖ ADB loan (Rs 870 crore or US\$200 million) for upgrading SHs.
- ❖ ADB loan (Rs 1,450 crore or US\$335 million) for constructing rural roads under PMGSY.

Table 8.3 provides an approximate estimate of road works in progress in MP.

Table 8.3 Estimated size of road works market in MP

Scheme	No. of works	Length (km)	Sanctioned expenditure (Rs crore)	Approximate % completed
National Highway (Plan)	18	350	125.00 yearly	40%
Central Road Fund	52	1,233	189.14	75%
NABARD	402 roads 163 bridges	6944 -	401.24 160.02	73%
Kisan Sadak Nidhi (Farmer Road Fund)	322	5836	642.97	50%
Fast Track	380	7,415	310.00	16%
A.D.B.	25	1,837	958.00	-
B.O.T & Bond cum B.OT.	13	1,872	900.00	20%
Pradhan Mantri Gram Sadak Yojana (PMGSY)	2,491	12,159	2,052.25	50%
Total	1,331	34,160	5,738.62	
PWD Plan works			550.00	
Grand total			6,288.62	

The total value of continuing works is about Rs 6,239 crore (about US\$1,434 million). Annual expenditure is about Rs 2,000 crore (about US\$460 million). With the high priority given to the development and maintenance of the transport infrastructure, the market for contractors is expected to grow. However, contractors based in MP face competition from outside the state. By the same token, contractors registered in the state can bid for projects outside Madhya Pradesh.

8.6 Regulations on subcontracting

There are restrictions on sub-contracting. If "sub-letting" without prior approval of the employer is found to have taken place, the contract may be rescinded and the security deposit forfeited. If the contractor gets some work executed on a task rate basis with or without materials, this is not deemed as sub-letting of the contract.

However, for PMGSY works, subcontracting is allowed under the following conditions.

- i) The contractor may subcontract part of the construction work (up to 25 percent of the contract price) with the approval of the employer in writing. Subcontracting will not alter the contractor's obligations.
- ii) The contractor is not required to obtain any consent from the employer for:
 - a) the sub-contracting of any part of the works for which the sub-contractor is named in the contract;
 - b) contracts for the provision for labour, or labour component, and
 - c) contracts for the purchase of materials, which are in accordance with the standards specified in the contract.
- iii) Beyond the conditions in clauses i) and ii), if the contractor proposes sub-contracting any part of the work during execution of the works because of some unforeseen circumstances to enable him to complete the works, the employer will consider the following before according approval:
 - a) the contractor will not sub-contract the whole of the works, and
 - b) the contractor will not sub-contract any part of the liability or obligation under the contract and he will be responsible for the acts, defaults and neglects of any sub-contractors, agents or workmen as fully as if they were the acts, defaults or neglects of the contractor.
- iv) The supervising engineer should satisfy himself before recommending to the employer whether:
 - a) the circumstances warrant such sub-contracting, and
 - b) the sub contractor proposed for the work possesses the experience, qualifications and equipment necessary for the proposed job.

8.7 Registration of consultants

MP PWD does not have its own classification of consultants. The GOI MOSRTH classification shown below is used in the state.

- ❖ Category I A - All types of highway projects.
- ❖ Category I B - Small (up to 20 km) highway projects.
- ❖ Category II A - All types of bridge projects.

Category II B - Bridge inspection and rehabilitation

- ❖ Category III - Traffic and transportation study projects.
- ❖ Category IV - Geo-technical investigations.

For PMGSY, MPRRDA has the following two types of consultants:

- ❖ Category I - Preparation of detailed project reports (DPRs)
- ❖ Category II - Supervision and quality control of works and also preparation of DPRs.

8.8 Market for consultants

Forty consultants in MOSRTH category I A, 26 in MOSRTH category I B and 24 consultants empanelled by MPRRDA under its categories I and II are entitled to take up supervision and quality control and preparation of DPRs in MP. About 40 consultants have worked for the PWD and MPRRDA. Until recently, consultants have been working for large projects sponsored by ADB and World Bank in the state. In order to improve effectiveness, MPRRDA introduced engaging consultants to prepare DPRs for PMGSY roads and for supervision and quality control of works.

Contract packages for supervision and quality control consultancy on PMGSY range between Rs 20 and 40 crore (about US\$ 4.6 and 9.2 million). The highest rate of consultancy fee approved is 3.5 per cent of the cost of project put to tender, while the lowest is 1.2 per cent. The initial teething problems, related to the acceptance of consultants by PIU staff and willingness of consultants to work in rural areas, have been overcome and the participation of consultants is reported to be working well. The advantages of using consultants include (a) lower staffing requirements in the public sector and possibly lower overall costs, (b) timely and good quality DPRs, and (c) effective supervision and quality control. This is not to say that in some cases, poor quality of project preparation by the consultants has also been reported. The road agencies need to monitor their work.

Following the positive experience on PMGSY, the market for consultancy services is expected to grow. The PWD has followed the example and introduced a similar system for quality control of some road construction projects. There is now potential for the increased use of consultants on PMGSY and loan assisted project for upgrading SHs.

Most of the consultants are large national or international firms. However, PMGSY has helped in the emergence of some consultants from the State. There is no consultants' association within the State.

8.9 Private sector participation in road maintenance - Bhopal - Dewas section of SH-18 case study

As noted earlier, maintenance of roads is the responsibility of the PWD which undertakes routine maintenance through permanently employed gang labour and periodic renewal through contractors when resources permit. An innovative idea for carrying out major maintenance works through private entrepreneurs was experimented in 1997. It was the first project of its kind in India.

Objective

The objective was to introduce private participation in highway maintenance. The state selected an important state highway for this initiative.

Criteria for Project Award: The bidder who offers the maximum amount of money to the government in lieu of getting the right to collect toll on the project for three years after initial rehabilitation of road and subsequent maintenance during the concession period will be selected through bidding process.

Project features

- ❖ Name of project - Maintenance of Bhopal-Dewas Road SH 18 from km 10/6 to km 153/10 (143 km). Contractor to finance the cost of maintenance including construction of toll plazas.
- ❖ Contract Period - Three years and seven months from the date of issue of written order to commence the work. This included the first six months for the execution of remedial works and one month thereafter for issue of notification authorizing toll collection on the road.
- ❖ The contractor on completing all the works, as per the tender document with his own capital and resources, to the satisfaction of the client (GOMP) was authorized by GOMP to collect and retain tolls for three years at specified rates and conditions.
- ❖ The collection of tolls to commence one month after completion of works.
- ❖ The contractor was responsible for the maintenance of the road during the contract period as specified in the contract document.

Special Conditions

The contractor employed the following technical staff during the execution of work.

- ❖ One graduate engineer
- ❖ Three engineers qualified to diploma level
- ❖ Technical staff available at site for taking instructions during the working hours and during the inspection of departmental officers.

Scope of works

Following are the details of the works to be completed by the contractor during the first 6 months before he was authorized to collect the toll.

- (i) Rebuilding of road crust on widened portions
Widen sections of the road and rebuild the crust on the widened sections as specified in the tender document (minor work).
- (ii) Construction / reconstruction of cross drainage structures
Reconstruct and rehabilitate cross drainage structures according to the specified details provided (standard drawings of Hume Pipe Culverts from IRC Special Publication No.13 "Guidelines for the design of small bridges and culverts").
- (iii) Improvement of speed breakers
There were 55 speed breakers on the road. Locations of speed breakers were provided and all existing speed-breakers were to be modified according to standards in the publication IRC 99-1988 "Recommended specification for hump type speed breakers for heavy trucks and bus traffic".
- (iv) Repair of cross sectional deficiency
Cross sectional deficiencies of earth embankment in places to achieve formation width of 12m with side slope of 2H:1V.
- (v) Construction of longitudinal drains
Construction of longitudinal drains of specified sizes and at specified places to connect with natural streams to ensure proper drainage.

Execution of works

It was the sole responsibility of the contractor to properly maintain the road at his own cost throughout the period of the contract. PWD also outlined the periodic maintenance activities to be performed by the contractor during the contract period. These included:

- ❖ renewal of the riding surface and 12m formation width with specified soils over a length equal to one-fifth of the total road length during each year of toll collection (50 mm thick BM along with profile corrective course were specified), and
- ❖ submission of annual calendar of road maintenance activities at the start of each year to be approved by PWD and carrying out of the activities effectively and with due diligence.

Project achievements

The contractor was able to achieve the first milestone of carrying out the initial maintenance works well in time and to the satisfaction of the client. This was followed by the erection of two toll plazas, one near Sehore and the other near Dewas.

Along with routine maintenance of the entire road to provide a better service to users, about 60 per cent (86 km) of the total road length was renewed during the 3 year period. The benefits of good maintenance and renewal continued after the contract period. The road was reclassified as a National Highway (NH-86) after the completion of the contract.

The Contractor/Entrepreneur offered an amount of Rs. 44.6 million during the three year period starting from the date of toll collection on the state highway.

Annex 1

Data and observations on Dhar and Jabalpur Districts

In order to understand the current condition of the rural road infrastructure and its maintenance at the district level, a quick assessment of institutional and financial aspects and effects of policies relating to maintenance of roads in two typical districts (Dhar and Jabalpur) has been carried out. The Blocks selected for the Block level situation analysis are in these two districts. Dhar is in the west and Jabalpur is in the central part. Dhar also includes some Tribal Areas.

Dhar District

◆ Basic Statistics

Total population: 1,367,412; Female:Male ratio 95.2%; Decadal growth of population: 29.31%. Area: 8153 km²; Literacy: 34.54%; Scheduled Tribe population: 53.48%.

◆ Soil and geography

The eastern part of Dhar is predominantly part of the Deccan Plateau with heavy black cotton soil whereas the western part has rolling terrain with murram soils with high content of coarse particles. The average annual rainfall is 600 mm.

◆ Rural roads

The total length of rural roads and break-up by surface types are shown below.

(Length in km)				
Surfaced Roads			Un-surfaced Roads	Total
BT	WBM	Total		
432.90	611.00	1043.90	133.40	1177.30

◆ Allocation of funds for maintenance and expenditure (Table 1)

Table 1 Allocation of funds for maintenance and expenditure: State Roads in Dhar

(Figures in Rs lakh)

Year	Allocation	Expenditure						Total for State Roads
		SHs			MDRs, ODRs & VRs			
		Labour	Material	Total	Labour	Material	Total	
1997-98	588.00	22.40	348.34	370.74	121.40	237.15	358.55	729.29
1998-99	545.00	23.60	173.80	197.40	126.15	189.44	315.59	512.99
1999-00	334.30	25.40	78.39	103.79	129.60	171.49	301.09	404.88
2000-01	465.57	27.50	53.27	80.77	161.40	91.52	252.92	333.69
2001-02	393.90	27.94	40.13	68.07	163.73	107.86	271.59	339.66
2002-03	309.58	24.73	27.20	51.93	147.67	76.91	224.58	276.51

Source: PWD, Dhar Division.

Table 1 shows that the allocation for maintenance of roads in Dhar has been falling since 1997-98. This fall is in line with falls in the allocation for the whole State. In the last three years, expenditure is much less than the allocation and increasing proportions of expenditure are on wages for permanent gang labour (rising from about 20 per cent in 1997-98 to about 62 per cent in 2002-03). Data on the breakdown between expenditure on MDRs and ODRs and VRs were not available.

Jabalpur District

◆ Basic Statistics

Total population: 1,768,037; Female:Male ratio 91.5%; Decadal growth of population: 25.68 %; Area: 4479.13 km²; Literacy: 53.25 %.

◆ Soil and geography

The district is predominantly in rolling terrain. About half of the district has black cotton soil with the rest covered by murrum and sandy soils. Road construction materials are in plentiful supply. The average annual rainfall is 950 mm.

◆ Rural Roads

The total length of rural roads and break up by surface types are shown below:

Surfaced Roads			Un-surfaced Roads	(Length in km)
BT	WBM	Total		Total
247.80	826.50	1074.30	122.80	1197.10

◆ Backlog of road renewals

Information on allocation and expenditure of funds for maintenance was not available. The lack of data itself is indicative of management and implementation problems. Information on the backlog of periodical renewal in the relevant PWD Division area was available and is summarised in Table 2. The evidence shows very large gaps between renewal requirements and renewal carried out, especially for ODRs.

Observations on the rural roads maintenance situation in the two districts

Maintenance of all categories of roads in the districts formally remains the responsibility of PWD pending satisfactory arrangements for the proposed transfer of rural road maintenance to PRIs. Both the districts have adequate

PWD staff for the purpose. However, resources are severely limited and PWD officers in both the districts were under the impression that responsibility for maintenance of rural roads had already been transferred to the PRIs. Since PRIs and RES have no funding for maintenance, there has been no maintenance of rural roads in the two districts and probably in most of the rest of MP since the decision to transfer maintenance responsibility to PRIs was made.

Table 2: Backlog of renewal in PWD Division No 2

Year	Category	Required renewal (km)	Renewal carried out (km)	Shortfall (km)
1998-1999	SH	2.24	2.00	0.24
	MDR	16.40	3.00	13.40
	ODR	89.00	11.00	78.00
1999-2000	SH	2.24	0.00	2.24
	MDR	16.40	4.00	12.40
	ODR	89.00	8.00	81.00
2000-2001	SH	2.24	1.00	1.24
	MDR	16.40	0.00	16.40
	ODR	89.00	3.00	86.00
2001-2002	SH	2.24	2.00	0.24
	MDR	16.40	2.00	14.40
	ODR	89.00	5.00	84.00
2002-2003	SH	2.24	0.00	2.24
	MDR	16.40	0.00	16.40
	ODR	89.00	0.00	89.00

Source: PWD Division No. 2 Jabalpur

Sufficient data regarding allocation of funds for maintenance and expenditure in Jabalpur and other relevant data for the two districts were not available for a more detailed assessment. However, the following conclusions have been drawn from the available information, visits to a few road works and the discussions with officials in the two districts:

- ❖ Conventional systems of maintenance are not result oriented and are therefore ineffective.
- ❖ The allocation of funds for maintenance of MDRs, ODRs and VRs is far below the requirement.
- ❖ The allocation of funds for maintenance is decreasing year after year, in spite of the increasing demand as a result of continuing neglect.
- ❖ Funds for maintenance of MDRs, ODRs and VRs are being provided to PWD through one account head. The limited funds available, therefore, are diverted to MDRs because they are considered to be more important than rural roads and the PWD position is that maintenance responsibility for rural roads now rests with PRIs.

- ❖ It is not always possible to use all the funds approved by Finance Department because expenditure is blocked from time to time owing to the GOMP financial situation.
- ❖ Funds for maintenance of rural roads are also diverted to non maintenance activities at times.
- ❖ Because of continuing inadequacy of maintenance funds, a large maintenance backlog has been created and substantial length of the road network has deteriorated to such an extent that large amount of funds will be required to rehabilitate these roads to serviceable levels.

Annex 2

Surveys in Dhar Block: Summary Datasheet

DISTRICT	Dhar Road Status	Dhar Road Class + Number	Road Name (from- to)	Road Length (Km)	Direct Pop. Served	Indirect Pop. Served	ADT	PCU fast	PCU slow	CVD	Surface Type	Overall Accessibility Level	Overall Maintenance Level	Side Drains fully silted (L+R)/KM	Carriagew. Potholes, KM	DATE: January 2004	Culverts silted, Km	Camber Defective
PC	L-033	(VR)	NH-59 to Sejawa	1.1	2059	1190	621	314	144	27	BT	Full	Maintainable	2.2	0.00	2	0.00	0.00
L-036	0218(VR)		Kalsada khurd to NH-59	1.2	990	0	692	352	186	25	WBM	Full	Maintainable	2.4	0.80	2	1.20	0.00
	0212(VR)		Gunawad to Papioda	2.8	2948	898	723	354	269	29	WBM	Basic	Partial	5.6	1.50	4	2.80	0.00
	0229(VR)		Sirsoda to Gunawad	3.2	2649	2649	883	43	285	36	WBM /	Basic	maintainable	2.30	1	3.20	0.00	0.00
	0230(VR)		Utawad to Sirsoda	3.1	1047	194	869	654	543	125	Earth	Basic	Maintainable	6.2	1.30	2	3.10	0.00
PC	L-064	0208(VR)	Labrawad to Dhar	7.0	1186	1703	1112	1038	289	236	BT/WBM	Full	Maintainable	14.0	0.00	5	0.00	0.00
	0238(VR)		Kalukheri to Tormod	4.4	675	800	432	282	116	39	WBM	Full	Maintainable	8.8	2.40	0	1.80	0.00
L-056	0217(VR)		Lasuriya to SH-31	4.6	1166	1166	878	465	331	47	WBM	Full	Maintainable	9.2	0.00	2	0.90	0.00
L-057	0209(VR)		SH-31(Anarad) to Pacholalana	6.2	2083	800	422	220	167	37	WBM	Basic	Maintainable	12.4	0.00	4	0.00	0.00
PC	L-065	0205(VR)	Gardabad to Ahu	2.8	1703	694	1507	939	435	128	WBM	Basic	Maintainable	5.6	0.00	2	Under constm.	0.00
	0225(VR)		Karadia to Biloda	7.8	309	3155	1119	949	421	176	WBM	Basic	Maintainable	15.6	0.00	6	0.00	0.00
	0219(VR)		NH-79 to Chappar	2.6	855	466	1118	596	334	56	WBM	Basic	Maintainable	5.2	2.30	2	0.00	0.00
	0223(VR)		Tisgoan to Pinjaraya	1.3	1890	0	1152	578	427	68	WBM	Basic	Maintainable	2.6	1.20	1	0.00	0.00
	0235(VR)		Tiwadi to SH-31	11.4	2470	519	725	465	234	50	WBM	Basic	Maintainable	22.8	0.00	3	0.00	0.00
L-055	0216(VR)		Umariyabada to SH-31 (Approach Rd.)	1.3	806	935	668	319	223	18	WBM	Full	Maintainable	2.6	0.30	1	0.00	0.00
	0221(VR)		SH-31 (Anarad) to Saktali	2.1	1741	1406	693	392	190	42	WBM	Full	Maintainable	4.2	0.00	1	0.00	0.00
L-022	0214(VR)		NH-79 to Antarai	1.6	883	0	914	471	288	39	WBM	Full	Maintainable	3.2	1.50	0	1.60	0.00
L-021	0206(VR)		NH-79 to Khairrod	0.8	1450	0	696	400	201	42	WBM	Full	Maintainable	1.6	0.80	0	0.80	0.00
L-063	0215(VR)		SH-31 to Pipliya	1.0	879	0	668	319	223	18	WBM	Full	Maintainable	2.0	0.90	0	1.00	0.00
	0201(VR)		Sadgalpur to Kalsur	3.0	618	6100	1014	835	288	147	BT	Full	Maintainable	6.0	0.00	1	3.00	0.00
L-024	0241(VR)		Kaisur to Baaditai	3.7	777	441	736	395	271	46	WBM	Partial	Maintainable	7.4	2.10	1	3.70	0.00
	0211(VR)		Ekalduna to Sadalpur	4.2	2830	737	691	385	218	44	WBM	Partial	Maintainable	8.4	2.70	0	4.20	0.00
PC	L-027	(VR)	Kesur to Bijur	4.7	1721	308	806	435	213	41	BT	Full	Maintainable	9.4	0.00	0	0.00	0.00
	0246(VR)		Kilol to Ekalduna	2.8	1240	664	737	362	260	30	WBM	Partial	Maintainable	5.6	0.00	0	2.80	0.00
L-032	(VR)		NH-59 to Nekpur	13.8	1985	1024	1026	539	268	50	WBM	Full	Maintainable	27.6	0.00	6	Under constm.	0.00
L-031	0220(VR)		NH-79 to Sukera	2.0	726	972	930	474	315	38	WBM	Full	Maintainable	4.0	2.00	0	2.00	0.00
	0248(VR)		Sejwaya to Ahirkhedhi	1.4	2249	0	964	525	382	91	Earth	Partial	Partial	2.8	0.00	0	1.40	0.00

DISTRICT	Road Status	PMGSY Nr.	Dhar Road Class + Number	Road Name (from- to)	Road Length (Km)	Direct Pop. Served	BLOCK :				CVD	Surface Type	Overall Accessibility Level	Overall Maintenance Level	Side Drains fully silted (L+R)/KM	DATE: Carriagew. Potholes, KM	January 2004 Culverts silted, Nr Km	Camber Defective,
							Indirect Pop. Served	ADT	PCU fast	PCU slow								
L-029	0227(VR)		Lebarchowk to Nekpur	3.4	1896	0	721	392	201	42	WBM	Partial	Maintainable	6.8	3.30	2	3.40	
	0249(VR)		Baggad to Lohari Bujura	4.4	1087	598	734	357	273	27	WBM	Partial	Maintainable	8.8	0.00	0	4.20	
	0239(VR)		NH-79 to Machakada	2.4	520	987	901	453	265	34	WBM	Full	Maintainable	4.8	0.00	0	2.40	
	0240(VR)		Jamanda to Jamanda Fata (NH-79)	2.8	491	629	692	352	186	25	WBM	Full	Maintainable	5.6	2.50	0	2.50	
	0245(VR)		Kadola Bujurg to Jamanda	5.6	781	630	717	432	205	50	WBM	Partial	Maintainable	11.2	3.60	0	5.60	
	0213(VR)		Baggar to Kot Bhitoda	3.8	1533	314	974	471	335	50	WBM	Partial	Partial	Partial	7.6	0.00	1	3.80
L-042	0237(VR)		Baikheda to Utawad	4.2	2486	0	1154	934	441	145	WBM	Basic	Maintainable	8.4	1.30	1	4.20	
	0234(VR)		Kalamkhedi to Utawad	2.4	2501	434	856	464	208	45	WBM	Basic	Maintainable	4.8	0.60	0	2.40	
	0233(VR)		Kalamkhedi Uttarashi	1.0	982	207	1393	1168	937	257	WBM	Basic	Maintainable	2.0	0.40	0	1.00	
	0228(VR)		Gunawad to Bagriya	4.9	3587	0	844	420	313	34	WBM	Basic	Maintainable	9.8	2.30	4	4.90	
	0210(VR)		Bagri turk to SH-31	2.8	1028	207	781	513	223	72	WBM	Basic	Maintainable	5.6	1.60	0	2.80	
	0224(VR)		Ranipura to Dedla	3.4	3361	3361	897	508	255	51	WBM	Basic	Maintainable	6.8	0.90	0	3.40	
L-045	0202(VR)		Dedla to SH-31	1.7	3200	161	781	513	223	72	BT	Full	Maintainable	3.4	0.30	0	1.70	
	0247(VR)		Bagriturk to Jamukheri	1.7	1235	548	791	411	272	38	WBM	Basic	Maintainable	3.4	1.10	2	1.70	
	0226(VR)		Dharawara to SH-31 (Approach Rd.)	1.2	671	207	878	465	331	47	WBM	Full	Maintainable	2.4	0.70	0	1.20	
	MDR		Kesur to Badnagar	5.7	5399	0	868	568	292	79	WBM	Basic	Maintainable	11.4	5.70	0	5.70	
	TPW		Indore to Ahmadsabad	30.7		0	4568	4520	551	1254	BT	Full	Maintainable	4.60		0	0.20	
	TPW		Mahu to Neemuch	21.7	11115	12400	2796	3733	511	906	BT	Full	Maintainable	19.80		0	0.00	
L-052	SH-31		Gujjri to Ratlam	31.7	5845	14647	5685	5158	691	1157	BT	Full	Maintainable	13.90		0	0.00	
	0244(VR)		Sadalpur to Tiwadi	7.1	1216	1434	716	319	231	13	Earth	Partial	Partial	-		0	-	
	01 (ODR)		Kesur to Depalpur	2.0	4283		429	218	416	40	WBM	Full	Maintainable	2		0	2.00	
	02 (ODR)		Nh-79 to Junawada	0.5	337	587	1017	825	359	148	WBM	Basic	Maintainable	0.1		1	0.50	
	03 (ODR)		Nh-79 to Lebarchowki	0.8	1232	0	733	309	414	34	WBM	Basic	Maintainable	0.8		0	0.80	
	TRD		Tajpur to SH-31 Approach Rd.	4.2	732							Partial	Unmaintainable					
TRD		Tisgoan to Antori	6.2	1506							Earth	No	Unmaintainable					
TRD		Bhioda to Antari	2.0	1124							Earth	No	Unmaintainable					
TRD		Tomod to Holapur Dhar Road.	3.6	1862							Earth	No	Unmaintainable					
TRD		Tisgoan to Kharod	6.0	2191							Earth	No	Unmaintainable					
TRD		Sukhera to NH-79	1.9	924		912	462	310	39		Earth	Partial	Unmaintainable					

DISTRICT	Dhar	Dhar	BLOCK :				Dhar				DATE:							
			Road Class + Number	Road Name (from- to)	Road Length (km)	Direct Pop. Served	Indirect Pop. Served	ADT	PCU fast	PCU slow	CVD	Surface Type	Overall Accessibility Level	Overall Maintenance Level	Side Drains fully silted (L-R),KM	Carriagew. Potholes, KM	Culverts silted, Nr Km	January 2004
TRD	TRD007	Sukhera to Ekalduna	2.1	924	1186	691	385	218	44	Earth	No	Unmaintainable	Unmaintainable					
TRD	TRD008	Saldalpur to Bijur	4.4	2416	2191					Earth	No	Unmaintainable	Unmaintainable					
TRD	TRD009	Sukhera to Nekpur	1.5	1924	841					Earth	No	Unmaintainable	Unmaintainable					
TRD	TRD010	Sukhera to Kilioti	2.3	1924	392					Earth	No	Unmaintainable	Unmaintainable					
TRD	TRD011	Samar to Bhirota	1.9	888						Earth	No	Unmaintainable	Unmaintainable					
TRD	TRD012	Bagdad to Govindpur	3.7	1143	4073					Earth	Partial	Unmaintainable	Unmaintainable					
TRD	TRD013	Sunderkheri to Jamanda	2.7	694	625					Earth	Partial	Unmaintainable	Unmaintainable					
TRD	TRD014	Sirsoda to Kanjbhota	3.1	780	990					Earth	No	Unmaintainable	Unmaintainable					
TRD	L-040	Sirsoda to NH-59	3.4	780	2222					Earth	No	Unmaintainable	Unmaintainable					
TRD	TRD016	Tajpur to Kandola Khurd	2.6	732	905					Earth	Partial	Unmaintainable	Unmaintainable					
TRD	TRD017	Sunderkheri to NH-59 (Tejpur)	4.9	694	999					Earth	Partial	Partial maintainable	Unmaintainable					
TRD	TRD018	Umariya to Samar	1.7	1,026	888					Earth	Partial	Unmaintainable	Unmaintainable					
TRD	TRD019	Tornod to Umariya	3.5	1,862	1026					Earth	Partial	Unmaintainable	Unmaintainable					
TRD	TRD020	Tajpur to Jamanda	3.0	732	625					Earth	Partial	Unmaintainable	Unmaintainable					
TRD	TRD021	Umariya to Skaati	1.6	1,026	924					Earth	Partial	Unmaintainable	Unmaintainable					
TRD	TRD022	Sadalpur to Machakada	3.0	2,416	662					Earth	Partial	Unmaintainable	Unmaintainable					
TRD	TRD023	Gardawad to Bakurt	5.2	2,168	472					Earth	Partial	Unmaintainable	Unmaintainable					
TRD	TRD024	Pachhana to Biloda	3.1	1,359	1,781					Earth	Partial	Unmaintainable	Unmaintainable					
TRD	TRD25	Bhoroa to Khairod Tiswawon Rd.	5.6	1846						Earth	Partial	Unmaintainable	Unmaintainable					
TRD	TRD26	Bagritaj to Kusawad (end of the Rd.)	1.5	605	454					Earth	Partial	Unmaintainable	Unmaintainable					
TRD	TRD27	Govindpur to Gola	0.9	454	284					Earth	Partial	Unmaintainable	Unmaintainable					
TRD	TRD28	Bagritaj (Siloda) end of the Rd.	1.8	605						Earth	Partial	Unmaintainable	Unmaintainable					
TRD	TRD29	Kanjbhota to Lohari Khurd	1.1	808	4073					Earth	Partial	Unmaintainable	Unmaintainable					
TRD	TRD30	Govindpura to Akolia	3.3	452	420					Earth	Partial	Unmaintainable	Unmaintainable					
TRD	L-030	NH-79 (Baggat) to Ekalduna	3.4	1143	1186					Earth	Partial	Unmaintainable	Unmaintainable					
TRD	TRD32	Biloda to Pinjarota	3.5	1781						Earth	Partial	Unmaintainable	Unmaintainable					
TRD	TRD33	Dharawara to Dedla	2.2	854	4073					Earth	Partial	Unmaintainable	Unmaintainable					
TRD	TRD34	NH-79 to Ekalduna Sadalpur Rd.	2.7	1186						Earth	Partial	Unmaintainable	Unmaintainable					
TRD	TRD35	Labrawad to End of the Block	2.6	1510						Earth	Partial	Unmaintainable	Unmaintainable					
TRD	TRD36	Labrabad to Lasuriya	2.9	1510	1018					Earth	Partial	Unmaintainable	Unmaintainable					
TRD	TRD37	Gurariya to End of the Block	2.7							Earth	Partial	Unmaintainable	Unmaintainable					
TRD	TRD38	Holapura to End of the Block	1.5							Earth	Partial	Unmaintainable	Unmaintainable					
TRD	TRD39	Lasuriya to Gurariya	3.2	1018						Earth	Partial	Unmaintainable	Unmaintainable					
TRD	TRD40	Jamukheri to Dedla	3.4	263	4073					Earth	Partial	Unmaintainable	Unmaintainable					

DISTRICT		Dhar	BLOCK :			Dhar		DATE:		January 2004							
Road Status	PMGSY Nr.	Road Class + Number	Road Name (from- to)	Road Length (Km)	Direct Pop. Served	Indirect Pop. Served	ADT	PCU fast	PCU slow	CVD	Surface Type	Overall Accessibility Level	Overall Maintenance Level	Side Drains fully silted (L+R)/KM	Carriagew. Potholes, KM	Cutverts silted, Nr Km	Camber Defective,
TRD	TRD41	Etalduna(Sadalpur- Bijur G Rd.)	Dhar to Kalukheri	2.7	1186	2416					Earth	Partial	Partial	Unmaintainable			
TRD	TRD42		Dhar to Kalukheri	7.2	675						Earth	Partial	Partial	Unmaintainable			
TRD	TRD43		NH-79 to Kasar Khurd	1.7	990						Earth	Partial	Partial	Unmaintainable			
TRD	TRD44		Baggar to Sukherra	2.6	143	924					Earth	Partial	Partial	Unmaintainable			
TRD	TRD45		Piploda to Kanjbhota	2.4	808						Earth	Partial	Partial	Unmaintainable			
TRD	TRD46		Gardabad to Labrawad	3.4	2168	1510					Earth	Partial	Partial	Unmaintainable			
TRD	TRD47		Khot Bhiridota to Kadola Bujurg	1.7	808						Earth	Partial	Partial	Unmaintainable			
TRD	TRD48		Gardabad to Biloda	3.9	2168	1510					Earth	Partial	Partial	Unmaintainable			
TRD	TRD49		Pachlana to Labrawad	3.6	808	370					Earth	Partial	Partial	Unmaintainable			
TRD	TRD50		Chappat to End of the Block	4.2	2,168	1,781					Earth	Partial	Partial	Unmaintainable			
TRD	TRD51		Pachlana to Khari	3.6	1,359	1,510					Earth	Partial	Partial	Unmaintainable			
TRD	TRD52		Biloda to Tisgwaon	3.0	1,359	705					Earth	Partial	Partial	Unmaintainable			
TRD	TRD53		Dharawara to Delmi	3.6	1,781	1,506					Earth	Partial	Partial	Unmaintainable			
TRD	TRD54		Lasuniya to Kalukheri	2.5	854	948					Earth	Partial	Partial	Unmaintainable			
TRD	TRD55		Jamukheri to Kalamkheri	2.6	1,018	675					Earth	Partial	Partial	Unmaintainable			
TRD	TRD56		Tajpur to NH-79	8.4	263	698					Earth	Partial	Partial	Unmaintainable			
TRD	TRD57		Pipliya to Kharod	5.0	732						Earth	Partial	Partial	Unmaintainable			
TRD	TRD58		Nekpur to Gyaspur	2.4	1,119	1,846					Earth	Partial	Partial	Unmaintainable			
TRD	L-025	TRD59	Kaisur to Maulani (Manpura)	1.9	841	376					Earth	Partial	Partial	Unmaintainable			
TRD	TRD60		Kaisur to End of the Block	2.1	5,452						Earth	Partial	Partial	Unmaintainable			
TRD	TRD61		Bagritaj to Maulani (Manpura)	1.1	602	384					Earth	Partial	Partial	Unmaintainable			
TRD	TRD62		Bijur to(End of the Block) Pamaipur	1.6	2,191						Earth	Partial	Partial	Unmaintainable			
TRD	TRD63		Bijur to(End of the Block) Shivr Nagar	2.2	2,191						Earth	Partial	Partial	Unmaintainable			
TRD	TRD64		Bijur to Kiloti	3.1	2,191	392					Earth	Partial	Partial	Unmaintainable			

Legend:

- PC PMGSY road, phases I to IV, Completed
- PP-1 PMGSY road, remaining of Priority 1
- PL PMGSY road, of remaining Link roads
- PT PMGSY road, Through road
- VR Ordinary or Village Roads (not included in PMGSY)
- TPW NHs, SHs plus MDRs, Through Roads Puplic Works Department
- TRD/TRS Track Roads Dhar / Sihora
- BT Bitumen
- WBM Water Bound Macadam
- GRAV Gravel

Annex 3

Surveys in Sihora Block: Summary Datasheet

DISTRICT	PMGSY Road Status	Dhar Class + Number	Road Name (from- to)	Road Length (Km)	Direct Pop. Served	Indirect Pop. Served	ADT	Dhar fast	PCU slow	PCU	CVD	Surface Type	Overall Accessibility Level	Overall Maintenance Level	Side Drains fully silted (L+R),KM	DATE: Carriage w. holes, KM
VR	VR(04)		GADA TO MAHAGWAN	2.80	208	0	1,556	690	651	103		WBM	FULL	Partially Maint.	5.60	0.00
PL	L046		MAJHAGWAN ROAD TO CHANAGWAON	3.00	815	0	1,571	656	719	99		WBM/GRAY	FULL	Partially Maint.	6.00	0.00
VR	VR(18)		MAJHAGWAN ROAD TO KANHAI DEORI	1.85	397	0	667	135	364	18		WBM	FULL	Partially Maint.	3.60	0.00
TPW	MDR(02)		SIHORA TO MAJOHLI	3.00	0	0	1,933	1,172	567	190		BT	FULL	Maintainable	0.00	0.00
PT	T02		SIHORA TO MAJHAGWAN -SILONDILI	30.20	19,585	20,797	2,891	1,623	713	287		BT	FULL	Maintainable	39.60	2.00
PT	T04		KHITOLA TO UMARIYAPAN	10.20	752	3,454	969	470	359	77		BT	FULL	Partially Maint.	9.10	3.60
TPW	T03	NH-7	JABALPUR TO MIRAJPUR (NH-7)	25.20	17,491	37,581	Not Required					BT	FULL	Maintainable	0.40	7.00
PT	T01	ODR(05)	KUMHI TO PHANWANI	13.28	11,485	3,628	1,119	494	468	83		BT	FULL	Partially Maint.	7.60	0.40
VR	L-024	ODR(07)	UMARIYAPAN TO KUMHI SATDHARA	3.60	676	0	608	343	259	73		WBM	FULL	Maintainable	7.20	0.00
VR	ODR(04)		KUMHI PHANWANI ROAD TO SINNGULI TO MAJHAGWAN ROAD	6.90	2,464	1,187	580	235	281	46		BT	FULL	Partially Maint..	0.00	3.40
PL	L034	ODR(03)	MAJHAGWAN TO BHAGRAJI	11.55	1,954	1,818	1,611	970	736	219		WBM	FULL	Partially Maint.	22.00	0.00
VR	L045	ODR(02)	KIRHANI TO PARSEL	5.00	380	0	1,251	481	570	43		WBM	FULL	Partially Maint.	10.00	0.00
VR	ODR(08)		KIRHANI TO ANTERVED	4.50	580	0	489	13	264	0		WBM	PARTIAL	Maintainable	9.00	0.00
PL	L062	ODR(01)	GOSALPUR TO KHINI ROAD	5.00	1,500	552	1,497	1898	491	527		WBM	FULL	Partially Maint.	10.00	0.00
VR	ODR(07)		SIHORA SIMARIYA TO KHARDA	2.65	145	0	967	292	361	18		BT/WBM	FULL	Maintainable	0.50	0.40
VR	ODR(06)		PRATAPPUR TO AGARIA	7.00	3,823	1,576	1,304	521	572	56		WBM	FULL	Partially Maint.	14.00	0.00
PL	L-067	ODR(09)	GHAT SIMARIYA TO RAMKHIRIYA	5.75	3,757	0	1,119	413	462	49		WBM	FULL	Maintainable	8.20	0.00
PC	L-053	ODR(10)	AGARIA TO BARNI TIRAHA	15.70	10,771	0	2,319	712	809	39		BT	FULL	Maintainable	0.00	0.10
VR	VR(03)		DEONAGAR TO UMARIYA	2.20	250	0	634	102	345	15		WBM	FULL	under constr.	0.00	0.00
PL	L051	VR(06)	GANDHIGRAM TO BELA	4.50	1,306	418	785	264	303	32		GRAVEL	FULL	Partially Maint.	9.00	0.00
PL	L061	VR(11)	GOSALPUR TO AGARIA	10.800	5,075	21	970	245	429	54		WBM/GRAY	FULL	Partially Maint.	21.60	0.00
VR	VR-026		PWD ROAD KHINI TO GHORAKONI	1.40	677	0	601	387	509	83		GRAVEL	FULL	Maintainable	2.80	0.00
PL	L066	VR(01)	NH-7 TO NEGAI	5.00	391	0	690	157	289	13		GRAVEL	FULL	Partially Maint.	10.00	0.00
PL	L063	VR(09)	GHUGRI TO SHAHGARH	1.50	577	0	853	280	300	34		WBM/EARTH	FULL	Partially Maint.	3.00	0.00
PL	L064	VR(13)	JUJHARI TO RAMKHIRIYA	6.00	4,300	300	1,264	387	566	61		GRAVEL	FULL	Partially Maint.	12.00	0.00
PL	L068	VR(07)	GHAT SIMARIYA TO GHAR CHAPPA	2.00	582	0	925	400	524	80		WBM	FULL	Partially Maint.	4.00	0.00
VR	L-054+	VR-27	PWD ROAD TIKARIYA TO RANITAL	2.50	2,274	0	653	163	243	19		WBM	FULL	Maintainable	5.00	0.00
PL	L055															
PL	L056	VR-28	AGARIA ROAD PONDIKHURD TO GHUTNA	4.20	952	0	541	123	197	13		WBM	FULL	Maintainable	8.00	0.00
VR	VR(14)		KATRA KHAMARIA TO GHUTNA	3.250	330	0	1,105	749	492	131		WBM/GRAY	FULL	Partially Maint.	0.65	0.00
VR	VR-29		RAMKHIRIYA TO DEORI	6.41	641	0	588	285	242	49		GRAVEL	FULL	Maintainable	4.00	0.00
PL	L027/28	VR(19)	SEHORA MAJHAGWAN ROAD TO MANDOBAR	7.00	3,327	641	842	210	346	19		WBM/GRAY	FULL	Partially Maint.	14.00	0.00
VR	VR(24)		RAMKHIRIYA TO NUNUJI	8.00	4015	0	606	108	286	12		WBM/GRAY	FULL	Partially Maint.	16.00	0.00
PL	L038	VR(23)	SINGHANPURI TO RAJAGWAN	4.65	629	592	616	67	473	0		WBM/GRAY	FULL	Partially Maint.	8.60	0.00
PL	L033	VR(25)	TIKARIYA NAVEEN TO JHINTI	2.00	423	0	614	60	399	2		GRAVEL	FULL	Partially Maint.	4.00	0.00
PL	L069	VR(21)	NH-7 TO BARAGWAN	4.60	1,608	0	940	350	460	53		WBM	FULL	Partially Maint.	9.20	0.00
VR	VR(02)		SIHORA NH-7 TO BILHA	1.60	126	0	2,412	855	980	95		WBM/GRAY	FULL	Partially Maint.	3.20	0.00
PL	L073	VR(12)	SARDA TO HARGARH	1.50	848	0	715	91	632	12		GRAVEL	FULL	Partially Maint.	3.00	0.00

DISTRICT	Dhar Road Status	Dhar Class + Number	Road Name (from- to)	Road Length (Km)	Direct Pop. Served	Indirect Pop. Served	ADT	Dhar PCU fast	PCU slow	CVD	Surface Type	Overall Accessibility Level	Overall Maintenance Level	Side Drains fully silted (L-R), KM	DATE: Carriage w. Potholes, KM
VR	VR(08)		GUGHRA TO PIPARIYA	6.70	510	1,180	1,463	534	583	51	WBM	FULL	Partially Maint.	13.00	0.00
VR	VR(17)		SARDA TO KURRO	2.70	907	0	1166	164	606	24	BT/ EARTH	FULL	Partially Maint.	5.40	0.00
PL	L025	VR(10)	GUGHRA TO HARDI	7.00	1,500	0	856	207	433	24	GRAVEL	FULL	Partially Maint.	14.00	0.00
PL	L-074	VR-30	GUGHRA TO DAROULLI	1.30	270	0	603	164	292	2	GRAVEL	BASIC	Maintainable	2.60	0.00
PL	L026	VR(20)	MARHA TO KEOLARI	8.70	3,127	220	666	207	255	27	WBM/EARTH	FULL	Partially Maint.	17.40	0.00
PL	L023	VR-31	PHANWANI KUMHI ROAD TO JUNWANI	1.00	913	0	593	109	167	3	GRAVEL	BASIC	No Engineering Standard	2.00	0.00
PL	L-044	VR-32	DEORI TO KIRHANI KALAN	5.00	1019	0	588	285	242	49	WBM	BASIC	Maintainable	10.00	0.00
PL	L-029	VR-33	SEHORA SILONDI TO DABU	0.800	315	0	419	133	57	2	GRAVEL	FULL	Maintainable	1.60	0.00
VR	VR-34		SEHORA SILONDI TO RIWANHJI	0.650	49	0	409	128	46	2	WBM	FULL	Maintainable	1.30	0.00
PL	L021	VR(15)	SEHORA SILONDI KHAMAIA TO BHANPURA	3.50	332	0	714	143	337	12	GRAV/Earth	BASIC	unmaintainable	7.00	0.00
VR	VR(22)		PRATAPUR TO GIDURHA	2.50	817	0	727	231	355	38	WBM/GRV	FULL	Partially Maint.	5.00	0.00
PL	L-039	VR-35	MAJHAGWAN ROAD TO JAVELLY	1.70	691	0	822	526	338	99	WBM	FULL	Maintainable	3.40	0.00
VR	VR(05)		MAJHAGWAN TO GADA	7.80	1,076	208	1,678	721	721	111	WBM/GRV	PARTIAL	Partially Maint.	15.60	0.00
PL	L072	TRS(02)	NH-7 TO GUNHARU	1.20	688	0	1,647	610	1,136	129	WBM/GRV	FULL	Maintainable	2.40	0.00
PL	L-049	TRS-04	DEONAGAR TO MIDHASAN	2.00	862	0	682	387	113	78	GRAVEL	BASIC	Maintainable	4.80	0.00
TRS	TRS(01)		BELA TO TIKARIYA	1.00	779	0	851	238	341	20	GRAVEL	FULL	Partially Maint.	2.00	0.00
PC	L059	TRS(03)	NH-7 TO HIRDENAGAR	3.50	1,676	0	723	294	406	43	WBM	FULL	under constr.	0.00	0.00
PL	L-042	TRS-05	BHADRA TO MAJHAGWAN RD.	3.90	2,192	0	569	189	153	9	WBM	FULL	Maintainable	7.80	0.00
PL	L-070	TRS-06	NH-7 TO KURRO	3.40	907	0	1,659	719	669	53	WBM	FULL	Maintainable	2.90	0.00
TRS	TRS-07		NUNJHA TO MAJHAGWAN RD.	0.40	778	0	388	132	57	2	WBM	FULL	Maintainable	8.00	0.00
TRS	TRS-08		MOHATARA TO NH-7	0.30	813	0	not required				WBM	FULL	Maintainable	0.60	0.00
TRS	TRS-09		RAMKHIRIYA TO KHAMARIYA	2.00	901	0	542	198	142	6	GRAVEL	FULL	Maintainable	4.00	0.00
PC	L-048	TRS-10	NH-7 TO DEONAGAR	2.20	1,246	0	1,406	335	621	38	WBM	FULL	Maintainable	0.00	0.00
PL	L/060	TRS-11	NH-7 TO DHARAMPURA	2.00	2063	0	743	214	182	19	WBM	FULL	Maintainable	4.00	0.00
TRS	TRS04														
TRS	TRS05														
TRS	TRS06														
TRS	TRS07														
TRS	TRS08														
TRS	TRS09														
TRS	TRS10														
TRS	TRS11														
TRS	TRS12														
			Total	303.1	129,545	74,173								425.65	16.90

Legend:
 PC PMGSY road, phases I to IV, Completed
 PP1 PMGSY road, remaining of Priority 1
 PL PMGSY road, of remaining Link roads
 PT PMGSY road, Through road
 VR Ordinary or Village Roads (not included in PMGSY)

TPW Nhs. SHs plus MDRs, Through Roads Public Works Department
TRD/TRS Track, Roads Dhar / Sihora
BT Bitumen
WBM Water Bound Macadam
GRAV Grav

ASIST AP is a regional programme of the Employment Intensive Investment Programme (EIIP) of the ILO, concerned with developing and mainstreaming poverty alleviation strategies through sustainable infrastructure development. The programme is implemented through four major fields of operation, viz : accessibility planning, labour-based works technology, small-scale contracting and infrastructure maintenance, thus providing a comprehensive approach to infrastructure development covering all stages from planning and construction to maintenance and operation.

Based in Bangkok, ASIST AP provides a full range of expert support to all stages of the project cycle from formulation, implementation, monitoring to final review and evaluation. These services include activities such as:

- planning, policy development and design of infrastructure programmes,
- influencing public investments in infrastructure towards the greater use of local resources,
- technical and managerial support to project implementation,
- information services,
- preparation of planning and implementation guidelines,
- developing appropriate methods for increased involvement of the domestic construction industry in infrastructure works,
- design and conduct of tailor-made training programmes, and
- design of appropriate maintenance management systems.

This document forms part of a range of publications from ASIST AP, in its efforts to develop and disseminate general and country specific guidelines, best practices and lessons learned in the context of planning and implementing infrastructure works programmes.

More information about ASIST AP can be found at www.iloasist.org or by contacting us at

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