Role of Infrastructure in Poverty Reduction

Final Quantitative and Qualitative Report
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Executive summary

Poverty trends in India in the nineties have been a matter of intense controversy. The debate has often generated more heat than light, and confusion still remains about the extent to which poverty has declined during the period. In the absence of conclusive evidence, widely divergent claims have flourished. Some have argued that nineties have been a period of unprecedented improvement in living standards while others have claimed that it has been a time of widespread impoverishment. Against this background the study presents an assessment of the evidence of the role of infrastructure in poverty reduction in West Bengal.

Infrastructure projects, which are known to be associated with large costs and long gestation periods can impact on the poor in both direct and indirect terms. The Japan Bank for International Co-operation in the recent years has supported 8 large infrastructure projects in West Bengal namely Industrial Pollution Control Project, Metro Railways Phase II Construction Project, Haldia Port Modernization Project, Kolkata Infrastructure Development Project, Bakreswar Thermal Power Project, Teesta Canal Hydroelectric Project, Purulia Pumped Storage Project and West Bengal Transmission Project amounting to Rs. 82.5 billion. These infrastructure investments are spread over a number of years and some part of the investment is yet to be received by the Government of West Bengal.

The report has two broad components: quantitative analysis and qualitative analysis.

To assess the impacts of infrastructure investments quantitatively, an assessment has been undertaken at three levels-macro, meso and micro, using available information from various sources and through econometric and statistical techniques. Accordingly, we begin (Section 1) the analysis with a basic introduction to the poverty scenario and the infrastructure projects, which is followed by a brief analysis of the relation between infrastructure, growth and poverty reduction. Though infrastructure has got large sunk costs, it can also be viewed as a crucial component for increased growth and less poverty. A brief background to the projects in West Bengal has been provided along with a review of the West Bengal economy.

Section 2 outlines the analytical framework that we have used for the analysis based on the PAMS (Poverty Analysis Macroeconomic Simulator) of the World Bank. The framework of PAMS segregates the analysis into three levels namely macro, meso and micro. The framework also states the equations, using

which we have calculated the effects of infrastructure projects at various levels and assessed the combined effect on poverty.

Section 3 depicts the macro analysis in detail where we have gauged the effect of different infrastructure and relevant variables on the sectoral outputs and then collecting the coefficients of those relevant variables we simulated those with the project outputs i.e. electricity generation and the port distance. Here we have shown how the projects have helped the sectoral output to increase or decrease given a base year value i.e. 2000. Similarly, section 4 has detailed the meso analysis, where we have regressed the different households' share on the different output variables and a wage variable. In line with the previous section analysis we have simulated the coefficients of various relevant variables on the different categories of household shares to find how the household shares categorised by different occupations have changed over the base period.

Section 5 concerns the basic idea of poverty simulation. A change in poverty can be decomposed into two parts: a change in distribution of income and a growth in income. In previous sections, i.e. the macro and meso layers, we have examined the effect of infrastructure on growth and of growth on occupation changes. In this chapter, we examine how aggregate growth would change poverty in six groups of occupations: agriculture, services and industry, each divided into rural and urban.

Section 6 summarises the study findings, based on estimates of the power projects and Haldia Port. The maximum reduction in poverty ratio (head count ratio) is observed among rural industrial households (16.5% in 2000 to 5.9% with project). The increase in sectoral output for agricultural, industrial and services sector is estimated at 8%, 30% and 10% respectively.

The qualitative analysis is presented project-wise in separate chapters. Each project is evaluated using DAC criteria: relevance, efficiency, effectiveness, impact and sustainability. While the quantitative component investigates project impacts on poverty at a macro-scale, the qualitative component considers specific local impacts such as employment generation and (local) social development. Additionally, we report results of a survey among relevant categories of project beneficiaries (such as commuters of the metro railway or residents of villages adjoining power project sites. The key observations for each project are mentioned below:

- Metro: High reliability, high customer satisfaction, excess capacity
- Flyovers (Transport infrastructure): High customer satisfaction, enhancement of the city image
- Bakreshwar Thermal: Strong social development support and environmental performance

- Transmission: Contribution to rural electrification, enhanced reliability
- Industrial Pollution Control: Enhancement of facilitative functions and monitoring capacity
- Teesta Hydrolectric: High relevance
- Purulia Pumped Storage: High relevance, strong social development support, high efficiency in implementation
- Haldia Port Modernisation: High relevance

CHAPTER 1 Introduction

Poverty is often described as a pronounced state of deprivation of human well being, or the absence of opportunities and choices most fundamental to human life and development. The government of India recognizes this well, with poverty reduction, being an overriding objective for development planning.

It is increasingly being recognised that well-being should encompass outcomes that can support better opportunities for people. In this respect, infrastructure projects, which are known to be associated with large costs and long gestation periods can be seen to impact on the poor in both *direct* terms—through changes in distribution—and *indirect* terms through the wider growth effects and higher economic activity stimulated by them.

The Japan Bank for International Cooperation (JBIC) in the recent years has been supporting several infrastructure projects related to power, gas, transportation, and telecommunications sectors. To India, JBIC has funded approximately JPY 1,510 billion (US$ 14 billion, Rs 644 billion) mainly for infrastructure projects. Through this study, we attempt to assess the impact of 8 infrastructural projects supported by JBIC in the state of West Bengal.

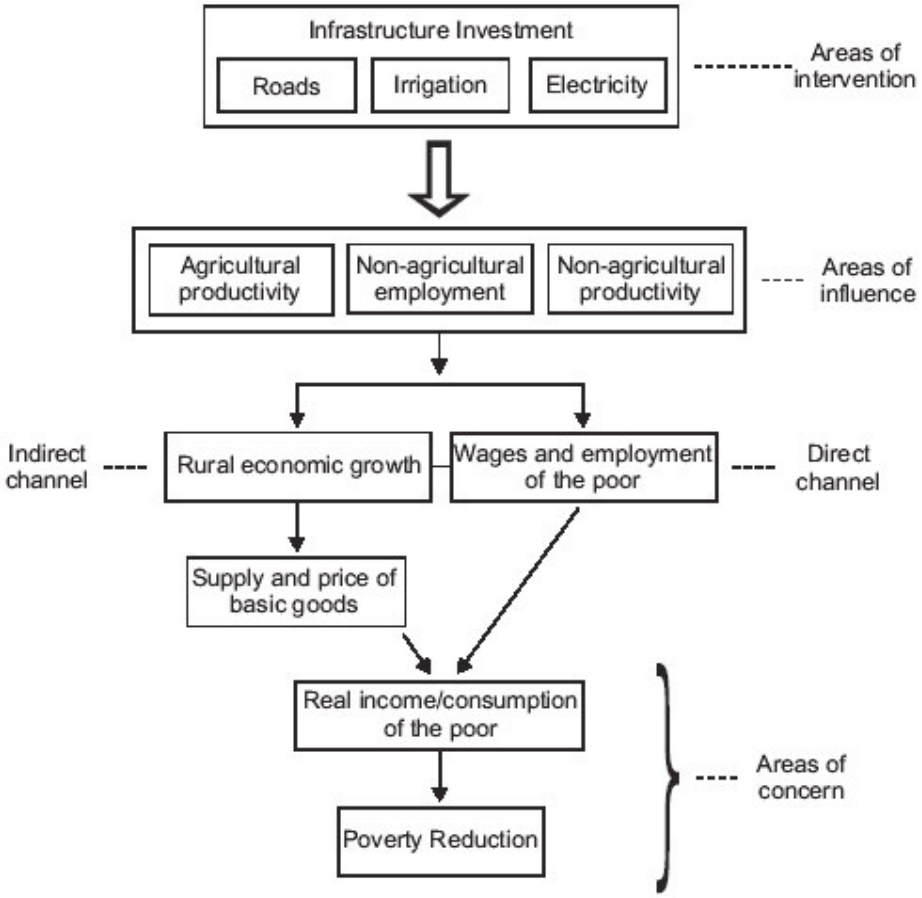
This study has been undertaken to determine the impacts of the JBIC supported infrastructure projects through both qualitative and quantitative assessment. For the qualitative assessment part, the DAC evaluation criteria (relevance, efficiency, effectiveness, impact and sustainability) along with analysis of the consumer and executing agency perceptions obtained through the questionnaires have been considered. To gauge the impacts quantitatively, an assessment has been undertaken at three levels-micro, meso and macro, using available information from various sources and through econometric and statistical techniques.

The results obtained from the two techniques are then analysed to determine the overall impact of the JBIC supported infrastructural projects on the poor residing in the state of West Bengal.

Infrastructure, growth and poverty reduction

Infrastructure investments are known to be associated with large sunk costs and long gestation periods. However, they are also known to be highly growth enhancing. Ex-ante, one could form a null hypothesis that a positive relationship exists

between infrastructure and growth, and of growth being associated with falling poverty. The following schematic is self-explanatory.



SOURCE Ali and Pernia (2003)

Some authors view infrastructure and its impact on the poor in both direct terms—through changes in distribution—and indirect terms through the wider growth effects and higher economic activity stimulated by infrastructure (Ali and Pernia 2003) .

In the 90's two schools of thought came about regarding infrastructure and poverty reduction. One of them attached importance to infrastructure in poverty reduction efforts of developing economies. In the other school, assistance for infrastructure was viewed with skepticism by many in the international development community. There were three reasons for this scepticism (Ali and Pernia 2003):

- Though important for economic growth, infrastructure investment had little relevance in reducing poverty.
- Actual benefits from infrastructure were less than anticipated.

- Weak governance and institutions gives way to corruption and distorted public investment choices. This lowers the contribution to economic growth and redistribution, which was the very aim of setting out on such projects in the first place.

However, now we have begun to realise that if governance and institutional frameworks are strengthened, the linkage between infrastructure and reduction of poverty shall get strengthened in the right direction.

Background of the infrastructure projects in West Bengal

Several infrastructure projects have been developed in West Bengal to address the issues related to poor public transport and road infrastructure, power shortages, and inadequate port facilities. Some of these projects, supported by JBIC are briefly discussed below (Table 1.1).

Table 1.1 JBIC projects in West Bengal

Sl. No	*Project*
1	Metro Railways Construction Project (Phase II)
2	Haldia Port Modernization Project
3	Industrial Pollution Control Project
4	Kolkata Infrastructure Development Project
5	Bakreswar Thermal Power Project
6	Teesta Canal Hydroelectric Project
7	Purulia Pumped Storage Project
8	West Bengal Transmission Project (I & II)

To address the issue of insufficient public transport infrastructure and to sustain economic growth in large cities, the Government of India established the Metropolitan Transport Project in Ministry of Railways in 1969. A project for the construction of a metro railway in Calcutta was recognized under the Master Plan (the Urban Railway Transport Development Plan) as the only viable option to address Calcutta's harsh traffic problems. There was however, a considerable time over-run in the project's civil works, which was scheduled for completion in August 1987, but got actually completed only in June 1996. Some of the reasons pointed out for this included delays in land acquisition, long processing time for importing construction machinery, ineffective and time-consuming technical transfer of construction skills, limited availability of working space due to congestion of the roads.

The Haldia Port Modernization project emerged to meet the goal of improving operational efficiency of the national ports. The effectiveness of the project was felt through increases in cargo traffic and improved operational efficiency, (total cargo volumes and container handling volumes increased dramatically in 2002/03). The major impact that the project brought was regional economic promotion with the added value of manufacturers in the Haldia area increasing by approximately 87% between 1997/98 - 2002/03.

The Teesta Canal Hydroelectric project coincided with the West Bengal State Development Plan and was initiated at the time when the state suffered from peak shortages. The 5 hydro power stations, totalling 1,600 MW, were being constructed in order to achieve the best mix of generation capacity. The project is expected to contribute overall to rural electrification in the northern part of the state. It chiefly adhered towards stabilizing power supply and promoting regional development in Darjeeling and West Dinapur Districts of West Bengal State through the construction of three hydroelectric power stations on the Mahananda Main Canal (MMC) of the Teesta Irrigation Project.

Purulia Pumped Storage Project was initiated to expand the capacity in the state to provide electricity at peak hours. Its outputs include Construction of Pumped Storage, Construction of two transmission lines and extension of two sub-stations.

Industrial Pollution Control Project was undertaken for strengthening the monitoring and enforcement abilities of the West Bengal Pollution Control Board primarily by upgrading facilities and equipments of WBPCB's offices (head office cum central laboratory and regional office cum regional laboratory) and training of staff and providing technical and financial assistance to the Board and industrial units for strengthening pollution abatement.

Another important infrastructural project that came up in May 2004 is the West Bengal Transmission System Project. Its objective is to enhance reliability of transmission system, and to make efficient inter-state power transmission, by constructing competent power transmission network and construct new substations and expand existing substations in response to growing power demand and increase of generation capacity in coming years in the state of West Bengal. As its overall goal the project aims to revitalize industry, and improve the livelihood of the rural community.

The Calcutta Transport Infrastructure Development project aimed at enhancing transport infrastructure in West Bengal, by building flyovers and improving road junctions to

enhance accessibility into central and other area of Calcutta was.

West Bengal economy

The average annual growth rate of the Net State Domestic Product (NSDP) of West Bengal in the last decade has been 8.55 per cent, the highest in India. Even in terms of growth of per capita income West Bengal has fared much better than all other states during the post-reforms era. It has registered an average growth of 6.21 per cent between 1993 and 2003 compared to the national performance of 4.25 per cent.

Table 1.2 Net State Domestic Product at factor cost (at constant prices) (1993-94) (**Rs crore**)

States	*1980-81*	*1990-91*	*Average growth (Per cent)*	*1993-94*	*2002-03*	*Average growth (Per cent)*
West Bengal	9594	14458	5.06	48398	89792	8.55
India	401128	692871	7.27	781345	1318321	6.87

Note * 2001-02 figures for the states of Punjab

Source CSO, Economic Survey 2004-05 and RBI

Agriculture

Table 1.3 Land availability, usage, production and yield of food grains in 2001-02

States	*Irrigated area as per cent of total agricultural area*	*Production (million tonnes) 2001-02*	*Yield (Kg/per Ha) 2001-02*	*Average annual growth in yield per cent 1991-2001*
West Bengal	28.10	16.50	2424	1.90
India	-	212.03	1739	2.58

West Bengal in the 1970s had one of the slowest growth rates of agricultural production- whereas in the 1980s it was the fastest growing state with growth rate of 6.5 percent for food grains production.[1] West Bengal's agricultural performance is remarkable because it ranks third from the bottom in terms of irrigated acreage.[2]

The relationship between irrigation and agricultural productivity and growth is a well-known one and needs no elaboration here. Despite the low intensity of irrigation West Bengal has the third-highest average yield in India, which at 2424 kg per ha is substantially higher than the national average. Not only does West Bengal have a high level of

[1] Banerjee et al., 2002
[2] Guruswamy et al., 2005

productivity, its volume of food grain production places it third after UP and Punjab. The true significance of West Bengal's performance in agriculture comes out vividly when we see the pattern of operational landholdings in that state. In 1991-92, the last time when such data was collected in the 48th round of the National Sample Survey, 80.69 per cent of all farmers in West Bengal were marginal farmers accounting for 39.98 per cent of the total acreage. [3]

Industry

In 1980-81 West Bengal produced 9.8 per cent of the industrial output produced in India. In 1997-98, which is the latest year for which we have the numbers the share was 5.1 per cent, up from a low of 4.7 per cent in 1995-96. Organised sector employment actually declined in West Bengal over the period 1980-97; in particular, employment in the organised private sector went down from 10.84 lakhs all the way to 7.99 lakhs.[4] This industrial decline in West Bengal has had a profound impact on the structure of the state's economy. The share of manufacturing sector declined in West Bengal from 16 per cent in 1993-94 to 14 per cent in 2002-03. This happened in a period when the industrial growth rate in the country as a whole accelerated.[5]The fall of the industry is contemporarily perpetuated by the fact that the service sector rose at a moderate rate during the same time-period.

Infrastructure

A recent study puts West Bengal 14th among Indian states in 1997-98 in terms of an index of infrastructure, as compared with 4th position in 1971-72.[6] The index comprises (a) roads, railways, ports, (b) irrigation, (c) electricity, (d) telephone, (e) loan-deposit ratios of banks and (f) tax collection of the state government. In each of these indicators West Bengal has fallen below the national level.

Poor roads delay shipments and raise shipping costs. A case study of a failed mini-steel plant in Purulia in a recent report on industrial sickness in eastern India by Sudip Chowdhury and Anindya Sen reports that each year the plant paid Rs 25-30lakh extra for transportation (compared to liquidation value of the plant, Rs 81.5 lakh).[7] In terms of road density per capita, West Bengal happens to be far below the all-India average.

Electricity is another key input to production. The Chowdhury-Sen report mentions many cases of firms that became non-viable simply because they got less than the

[3] NSSO Reports.
[4] Banerjee et. al.
[5] Banerjee et. al., 2002
[6] Buddhadeb Ghosh, 2001
[7] Anindya Sen, IIM Kolkata, 2001

promised amount of electricity from WBSEB. The Planning Commission data show that while India generated an additional 43.75 per cent of electricity in 2001-02 over 1993-94, West Bengal lagged behind with an increase of 38.64 per cent.[8] But in terms of per capita consumption of electricity, which is a better indicator of how a state is faring, West Bengal with an increase in consumption by 38.11 per cent remained pretty close to the national increase of 40.21 per cent. While West Bengal did fairly well in terms of consumption, it fell behind in terms of electrification of villages. At the end of 2002 only 78.17 per cent of its villages were electrified, while the coverage for India was 86.65 per cent. In 2002, eight states (AP, Harayana, HP, Karnataka, Kerala, Maharastra, Punjab and Tamil Nadu) have almost complete coverage (Planning Commission 2002a).

Poverty and backwardness

When the CPM (Communist Party of India Marxists) -led coalition came to power in West Bengal in 1977 the incidence of poverty in the state was 60.52 per cent, well above the national BPL (below poverty line) of 51.32 per cent. In 1999-00 these were 27.02[9] per cent and 26.10[10] per cent, respectively. This means that while those below the poverty line decreased by 55.35 percentage points in West Bengal, in all India the decline was 49.22 percentage points. West Bengal's BPL level is the lowest in the eastern region with the levels of Assam (36.09 per cent), Bihar (42.60 per cent) and Orissa (47.15 per cent) remaining well above the national level. The performance of West Bengal is comparable to that of Maharastra where the decline from 1977-78 to 1999-00 was 55.28 per cent to 25.02 per cent or a decline in incidence of 55.22 percentage points. When we relate the performance of West Bengal and Maharastra, the former having fared dismally in terms of industrial expansion while the latter is a star on this account, perhaps one will get a better idea of how much the regime in West Bengal has been designed in favour of the people of the state at large.[11] The real top performers in terms of reducing the incidence of poverty have been Kerala, Tamil Nadu, AP and Rajasthan. In Kerala BPL level declined from 52.22 per cent in 1977-78 to 12.725 in 1999-00.

[8] Planning Commission Report on SEBs, 2001
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CHAPTER 2 Analytical framework for quantitative analysis

Adapted PAMS (Poverty Analysis Macroeconomic Simulator) framework

We use an analytical framework that adapts the World Bank's PAMS (Poverty Analysis Macroeconomic Simulator). PAMS is best viewed as a framework, rather than a model (Essama-Nssah, personal communication). Also, at the World Bank, several different models that measure the incidence and distribution of poverty can be thought of as being nested within this framework, have been developed, such as SimSIP and PovStat (Essama-Nssah 2005). As da Silva et al. (2003) point out, the key feature of the PAMS framework is the linking of macro and meso with micro levels of the economy:

'The key feature of PAMS is the possibility to infer changes in levels of disposable income for specific categories of workers from expected changes in aggregate variables such as gross domestic product (GDP) by sector. The only requirement concerning the aggregate variables is that they be consistent, as in national accounts. Such a link allows one to project ex ante national accounts and to conduct poverty and distributional analysis in a way that makes income growth, transfers, employment, poverty, and inequality estimates consistent with the macroeconomic framework. The basic idea in linking the macroeconomic framework to the household sector is to multiply the incomes or expenditures of each household of a specific group by the relevant growth rate based on changes in disposable income of that specific group induced by changes in aggregate variables."

PAMS is a framework that has three layers: macro, meso and micro. The objective of the macro layer is to project GDP and other macro variables. The objective of the meso layer is to examine incomes of different groups via representative households. The micro layer examines the effect of the changes in representative households income on poverty.

An application of PAMS to Burkina Faso is a very detailed study of the Poverty Reduction Support Credit given by the World Bank to Burkina Faso (da Silva et al. 2003). The macro-consistency software RMSM-X was used to examine projections of macroeconomic variables, such as GDP, investment, debt burden etc. Given sectoral growth rates, projections of the labour market were carried out, at a very

detailed level, with such groups as rural formal skilled labour, urban skilled labour, and public sector.

A relatively simpler application of the PAMS framework to Paraguay used the SimSIP software (Datt et al. 2003). In this application, the effect of growth in different sectors (agriculture, services, and industry) on poverty indicators was studied.

The present study can be seen as being intermediate in detail between the PAMS applications to Burkina Faso and Paraguay. While it uses the sectoral breakup of the Paraguay study (agriculture, services, industry; rural, urban) it adds to that with macro and meso layers as in the Burkina Faso study. However, the macro and meso layers in the present study use econometric analysis.

The following factors have determined our adapted analytical framework:

- The issues need to be highlighted in the project
- The availability of data

Figure 2.1 shows the analytical framework that used in this study.

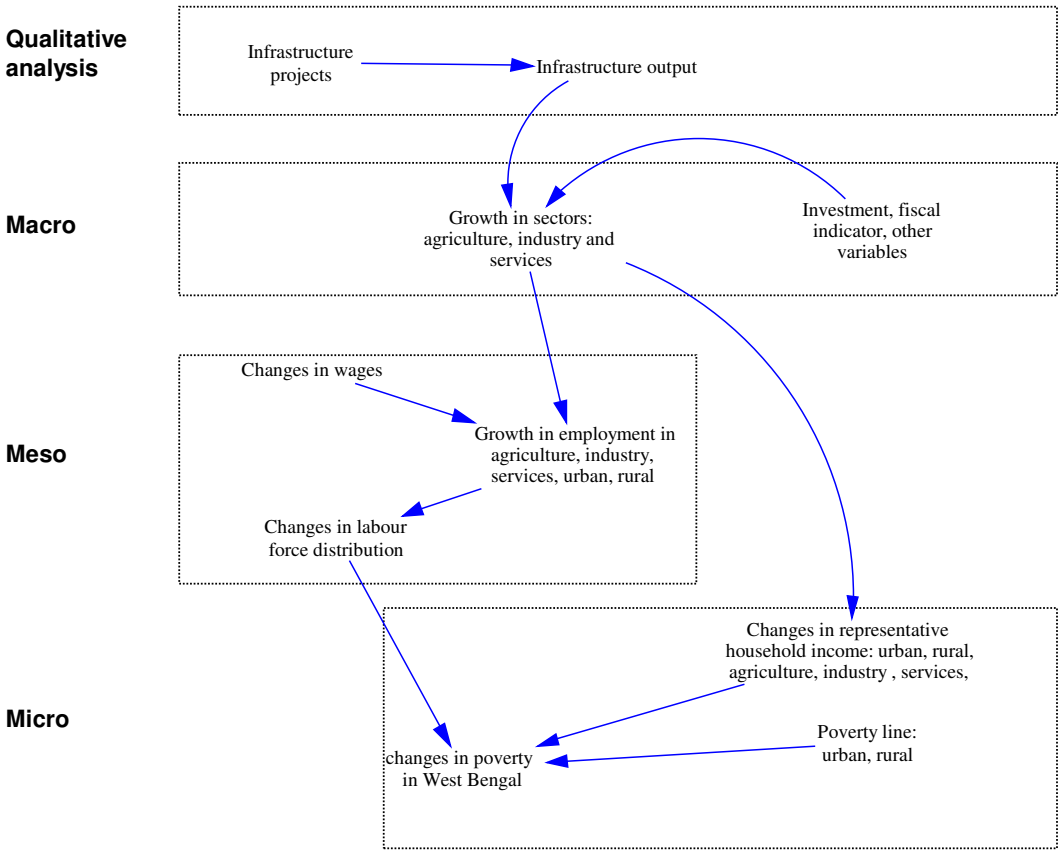

Figure **2.1** Analytical framework for quantitative analysis

The qualitative analysis assesses each of the infrastructure projects individually. One of the criteria assessed is how investment in a project translates into output from that project. Outputs from individual infrastructure projects translate into total infrastructure output at a district or state level.

In the quantitative part, the primary level of the analysis is the macro, where the relationship between infrastructure output and growth in the agricultural, industrial and services sectors is being studied. This analysis uses state level data for India.

The meso level of analysis examines relationships between the sectoral output and principal occupational status of urban and rural households. This analysis uses state level data for India. Annexure 1 presents the percentage of household population with principal occupation for 1993/94 and 1999/00 for rural and urban areas.

The micro level of analysis examines the effect of aggregate sectoral output growth on poverty in West Bengal. The National Sample Survey Organisation (NSSO) data at the household level for the state of West Bengal has been used for this level of analysis.

Equations

We need to compute aggregate and sub-group poverty with the JBIC projects and without.

$$AggPov = \sum_{i=1}^{6} P_i S_i \qquad (1)$$

where AggPov stands for aggregate poverty index, P stands for poverty index of sub-group and S is the share of the number of households in this sub-group to total households. i indexes the sub-groups, and there are six: rural agriculture, rural industry, rural services, urban agriculture, urban industry, and urban services. (The FGT class of poverty indices that we use have the property that the aggregate poverty index is the weighted sum of the group poverty indices).

In order to compute the Ps and Ss with and without the project we first examine the effect of electricity and port outcome indicators on sectoral output econometrically.

Using the fact that the coefficients from a regression represent ceteris paribus effects of the explanatory variables on the dependent variable,

$$\Delta outpc_j = \beta_E^j \Delta eltotpc + \beta_P^j \Delta portdis \quad (2)$$

where outpc is the output per capita, eltotpc is the electricity indicator ((energy availability + non-utility generation)/population) and portdis is the port indicator (sum over different ports of (major port cargo/distance to port from centre of state)). eltotpc and portdis are explained in the macro chapter. j is an index of economic sectors (agriculture, services and industry). The subscript E is for the eltotpc variable, and the subscript P is for the portdis variable.

Similarly,

$$\Delta S_i = \sum_k \gamma_k \Delta outsh_k + \gamma_{totoutpc} \Delta totoutpc \quad (3)$$

where γ represent corresponding regression coefficients in the meso layer. outsh is output share of industry and services, indexed by different values of k. totoutpc is the total output per capita.

We assume in the analysis that the households belonging to a sub-group (i) experience an increase in their monthly per capita expenditures (mpce) at a rate equal to the rate of increase of the output of the corresponding sector (j). Summary statistics for these 6 different groups has been provided in Annexure 1.

$$mpcegr_i = mpce_i (1 + \frac{\Delta outpc_j}{outpc_j}) \quad (4)$$

The poverty indicator for a sub-group is a function of the mpce of that sub-group and the relevant poverty line (rural or urban). Thus,

$$\Delta P_i = f(mpce_i, pline_{R/U}) - f(mpcegr_i, pline_{R/U}) \quad (5)$$

Equation (5) represents the estimation of change in poverty due to the JBIC projects.

We begin by estimating regressions underlying (2), which is the macro layer (see Figure 2.1) in Chapter 3. We then estimate regressions underlying equation (3), which is the meso layer, in chapter 4. These feed into the poverty simulations based on equations (1), (4) and (5) in chapter 5.

Throughout the analysis the year 1999/2000 has been taken as the base year. This has been done since detailed poverty estimation is undertaken by the National Sample

Survey Organization, Government of India on a quinquennial basis, the last estimates being available for the year 1999/2000. It is also assumed that the project benefits were not realized in 1999/2000, making possible the comparison of results with the projects (i.e. based on the simulation) and without (base value 1999/2000).

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Annexure 2.1

Table 2.1.1 Percentage of Household Population with principal occupation, 1993/94 and 1999/00, rural and urban

State	Agriculture				Industry				Services			
	Rural	Rural	Urban	Urban	Rural	Rural	Urban	Urban	Rural	Rural	Urban	Urban
	1993-94	1999-00	1993-94	1999-00	1993-94	1999-00	1993-94	1999-00	1993-94	1999-00	1993-94	1999-00
Andhra Pradesh	57	56	5	3	7	6	6	8	11	10	14	17
Arunachal Pradesh	64	69	3	1	6	10	3	1	16	13	8	7
Assam	68	54	3	1	3	5	1	1	17	28	8	10
Bihar	73	70	3	2	4	7	2	3	10	11	7	7
Goa	28	15	7	2	10	12	11	18	19	21	25	32
Gujarat	48	51	6	2	9	7	12	12	9	9	17	18
Haryana	44	43	3	2	8	11	9	12	17	15	18	18
Himachal Pradesh	58	51	3	0	16	23	2	2	14	17	7	7
Jammu & Kashmir	46	50	5	1	13	13	4	5	14	18	18	13
Karnataka	55	58	7	3	5	5	8	10	9	8	16	16
Kerala	44	38	8	5	12	15	6	7	19	21	11	13
Madhya Pradesh	67	67	5	3	4	5	6	6	5	6	13	12
Maharashtra	47	46	5	2	6	6	12	14	8	9	22	23
Manipur	47	58	8	5	5	4	2	2	21	15	17	16
Meghalaya	68	71	2	0	3	2	2	2	14	10	12	16
Mizoram	54	47	10	8	2	2	3	7	10	11	20	26
Nagaland	46	48	3	1	3	2	4	4	24	17	21	27
Orissa	69	67	3	3	7	7	3	4	10	9	8	10
Punjab	46	42	3	2	8	9	10	15	14	12	18	20
Rajasthan	54	52	4	2	13	15	7	8	9	10	14	13
Sikkim	51	56	2	0	8	8	1	2	32	25	6	10
Tamil Nadu	43	44	7	3	10	11	11	12	11	11	18	18
Tripura	44	44	2	1	5	11	1	2	37	31	10	12
Uttar Pradesh	62	58	4	2	7	10	5	7	11	11	11	13
West Bengal	47	51	4	1	11	10	9	8	15	15	14	15
Andaman & Nicober Islands	32	42	3	3	18	15	9	8	19	13	19	19
Chandigarh	1	3	8	3	5	7	25	21	6	7	55	59
Dadra & Nagar Haveli	44	39	1	0	17	29	3	7	31	19	4	5
Daman & Diu	22	21	8	8	17	27	10	8	20	13	23	23
Delhi	1	1	8	0	5	5	29	20	5	20	51	52
Lakshadweep	22	25	23	15	9	14	7	4	20	24	20	18
Pondicherry	26	24	14	4	7	10	19	26	6	8	28	29

CHAPTER 3 Macro analysis

In this chapter, we examine the effect of infrastructure on growth in agriculture, industry and services. It is closely related to several studies of this nature, notably Calderon and Serven (2004). While most studies use cross-country data sets, we used panel data for different states in India. We also used sectoral output rather than aggregate output measures.

Methodology

Our basic regression equation is of the form:

$$outpc_{j,it} = \beta_0 + \beta_E^j eltotpc_{it} + \beta_P^j portdis_{it} + \beta_{control} control_{it} + unobserved\ heterogeneity + \varepsilon_{it}$$

where outpc is the output per capita of different sectors. j denotes sectors (agriculture, industry and services). eltopc and portdis are indicators of electricity and port outcomes, that are discussed in greater detail in the section on data. Panel data regressions allow us to control for unobserved heterogeneity that stays constant across units (states) or over time. This regression equation provides the estimates for equation (2) mentioned in the chapter on analytical framework, Chapter 2.

Data

Sources

The National Accounts Statistics (NAS) brought out by the Central Statistical Organization (CSO) is the main source of data for various regional economic activities in India. The regional income data are however complied by the statistical departments of various regions (that is, the States) and the CSO accepts the data as they are. Since there are variations in the accounting of national income by different regions, it is therefore argued that the regional data series are not strictly comparable. However, the CSO has brought out comparable regional income series for the purpose of Finance Commission in India. The data series is available at 2 different base year prices: (1) at 1980-81 prices and the other (2) at 1993-94 prices. The data for the study has been obtained directly from CSO.

The CSO gives us both current as well as constant price data. There are two constant price series- one for 1980-81 prices and the other for 1993-94 prices. Since the constant price series for the entire period of the analysis at 1993-94

prices cannot be obtained the data for the entire period has been converted at 1993-94 prices and has been used for calculations and deriving results. In other words, all the variables in this study are measured at 1993-94 prices.

The variables, which have been used as explanatory in order to estimate the impact on various sectors outputs, have been sourced from various publications of Centre for Monitoring of the Indian Economy. Likewise, the variables, which are related to agricultural output have been taken from the various issues of Agriculture Statistics of CMIE. Similarly in case of infrastructure variables and fiscal related variables it has been sourced from various issues of Energy, Infrastructure and Public Finance of CMIE. The net terms of trade, which have been used as a proxy variable for exchange rate implies Unit Value of Exports, expressed as a percentage of Unit Value of Imports. The data on terms of trade have been taken from various issues of Economic Survey.

Basic statistics

The variables used in the analysis are given in Table 3.1 along with their units. The mean and standard deviation for each variable are also indicated in the table below.

Table 3.1 Descriptive statistics

Variables	*Units*	*Mean*	*Standard deviation*
Agri output	Rs lakhs	1324357.98	793753.02
Industry output	Rs lakhs	1077261.67	868281.66
Ser output	Rs lakhs	1976477.87	1593838.61
Actual rainfall	Millimetre	1575.91	1076.17
Fertilizer consumption	1000 tonnes	877.73	706.56
Expenditure on social services	Rs crore	3996.95	3115.49
Electricity	Million kwh	20741.86	14548.71
Port distance	Free of unit	254.91	191.53

Electricity and port indicators

The choice of electricity and port indicators is quite crucial in such an exercise. Although the electrification rate is less than 100%, an increase in this indicator may not give us the picture that all the households are electrified.

One electricity indicator that suggests itself is installed capacity in each state. However, several small states have negligible installed capacity, and this would not reflect the inter-state transfers of electricity. One indicator available for different states for different years is electricity sold to different sectors, but this is plagued by measurement errors (Ruet 2005), as is evident from careful examination of the

data. Also, the sales only reflect the sales by utilities, and several states have substantial captive generation.

We therefore, chose the indicator that we call total electricity, which is:

> Total electricity=energy availability (net of energy received from captive plants) + non-utility generation

where the non-utility generation refers to the captive generation, which is the generation used for self-consumption.

> Energy availability = net generation + energy received from joint and central plants+ energy received from other states and imports

We then get

> Eltotpc=total electricity/total population of state

Portdis captures the effect of both increases in port capacity of different ports and distance of a state from different ports, both of which would capture the effect of ports. For example, Tamil Nadu is close to several ports, while Punjab is far.

In the case of ports, there is data on cargo handled by each major port in India. Since the cargo handled in a port is not entirely that of the state in which each port lies, we need to account for this. We therefore devised the following indicator, port distance:

$$Portdis = \sum [Port / dis]$$

where port is the cargo handled in each major port, and dis is the distance from approximately the centre of each state to each major port. We got the distance from each state to each major port by selecting some town in each state that was centrally located, and taking the distance from this town to each major port. The distances are available at the maps of India website.

Descriptive statistics

We examine time plots of different variables of interest.

Figure 3.1 shows the time plots of the per capita agricultural output in each state (value of output of agricultural sector divided by total population in the state). This increased steadily for West Bengal from Rs 2030 in 1989/90 to Rs 2865 in 2002/03. Most states do not show much increase, and experienced fluctuating agricultural output per capita.

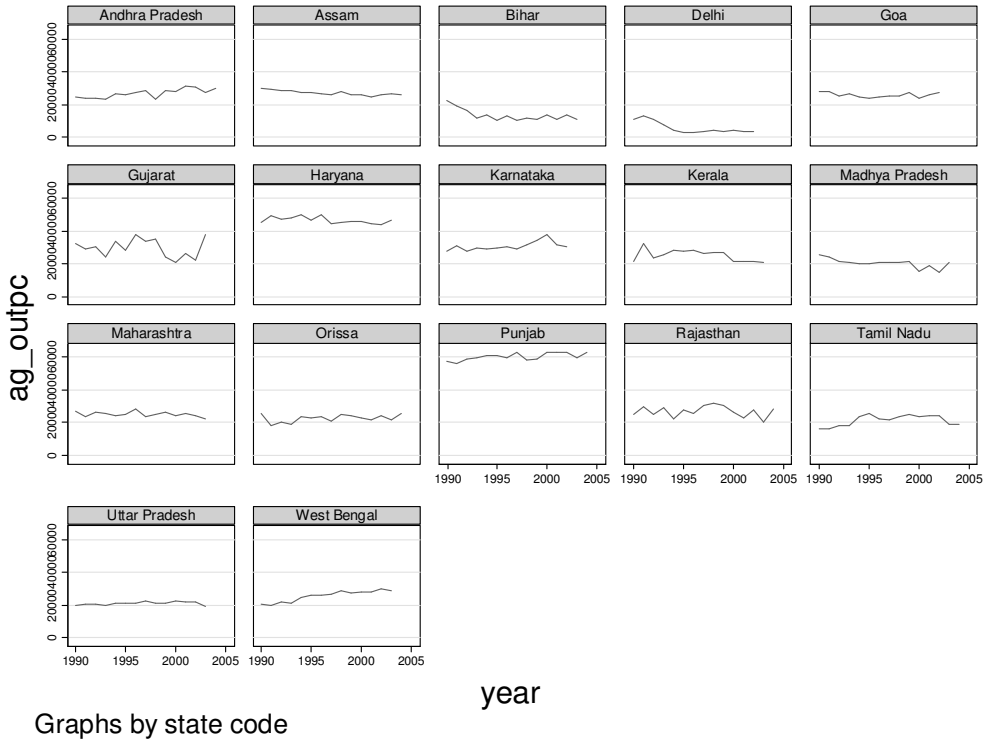

Figure **3.1** Line plots of agricultural output per capita

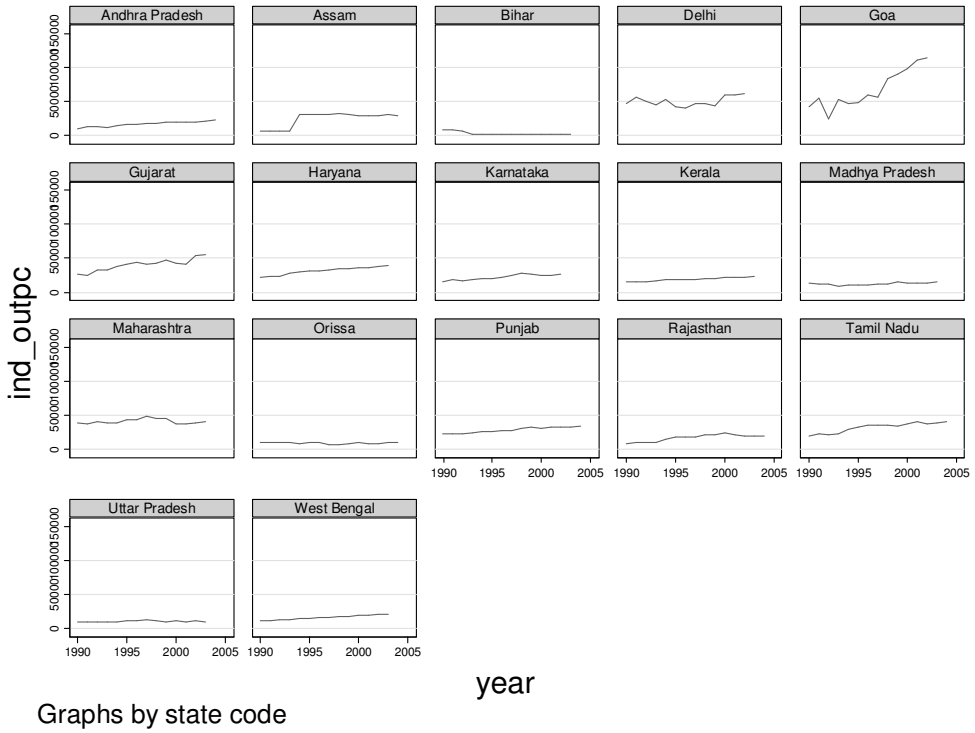

Figure **3.2** Line plots of industrial output per capita

Figure 3.2 shows the line plots industrial output per capita for different states in India. In terms of industrial output per capita, West Bengal witnessed steady growth between 1989/1990 and 2002/03, as did Tamil Nadu, Gujarat, Karnataka and Haryana.

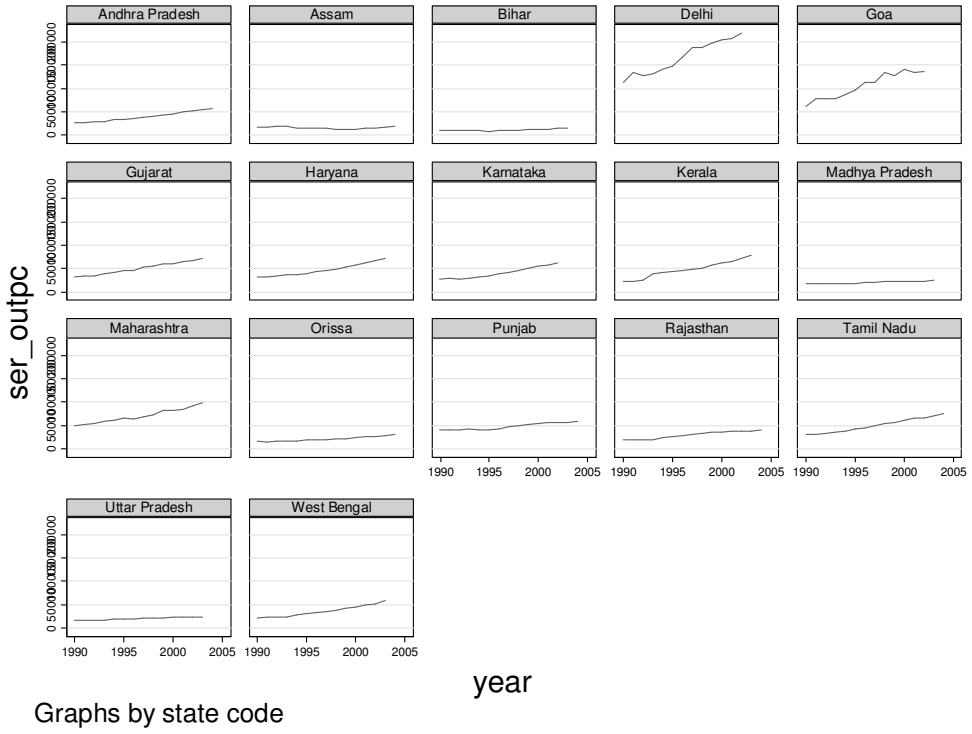

Figure **3.3** Line plots of services output per capita

Figure 3.3 shows the line plots of output per capita in the sector in which growth in most states has been fastest—services. This has gone up rapidly in West Bengal in this period.

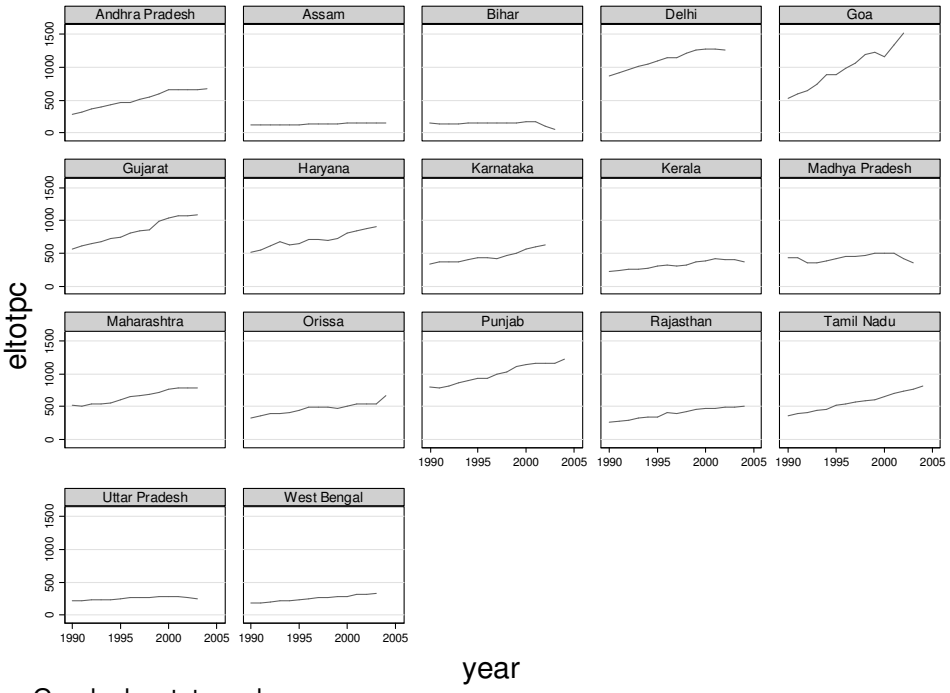

Figure **3.4** Line plots of total electricity per capita by state

Total electricity per capita also increased steadily in West Bengal (Figure 3.4) though not as much as in Tamil Nadu, Gujarat and Goa.

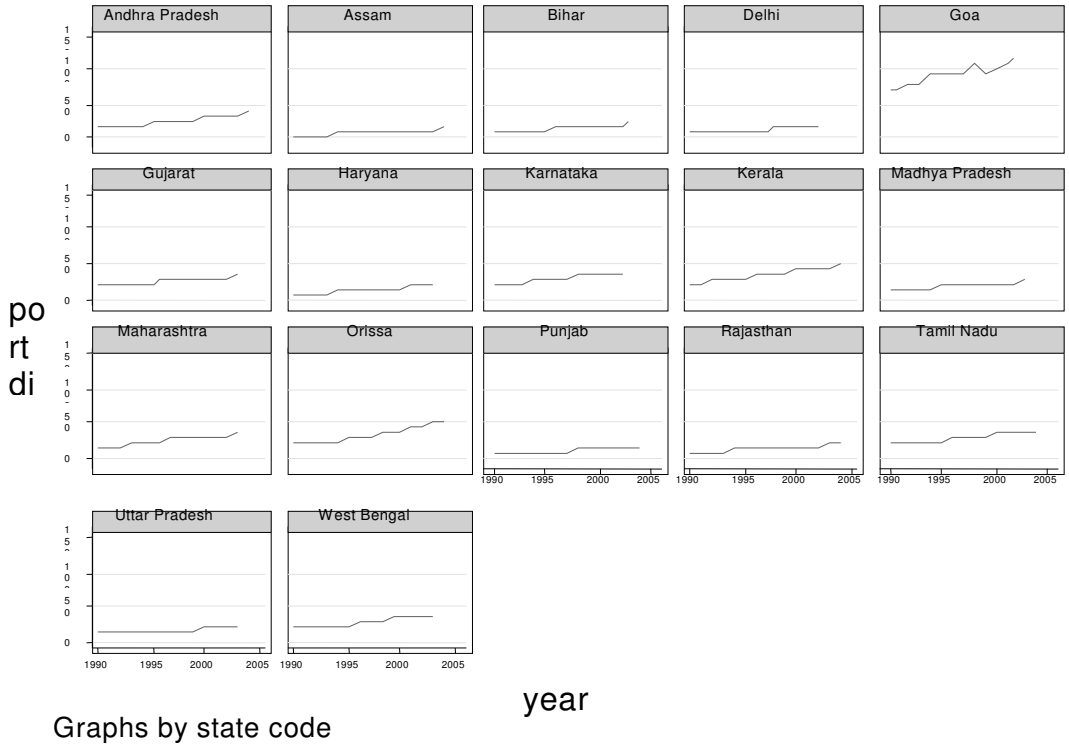

Figure **3.5** Line plots of port distance by state

West Bengal also witnessed a steady growth in the variable port distance (Figure 3.5).

Regression results

Panel data analysis has been used to calculate the impact of relevant variables on the sectoral output. For this, actual values have been considered rather than logarithmic values, as the analysis with the latter will give us the estimation of elasticities rather than the direct impacts. For the macro analysis, a total of 16 states have been considered for a time period of 15 years (1990-2004). The results of the analysis are provided in the tables below. The high value of the constant term in the regression results below can be attributed to the fact outlined above.

The first table gives the results of the effect on agricultural output per capita. The explanatory variables considered here are electricity availability per capita, port distance, per capita expenditure on social overheads, per capita fertiliser consumption and actual rainfall. The first two variables can be considered broadly as a proxy to the projects that JBIC has financed in West Bengal, while the social overheads being a

summation of the expenditure on education, public health, family welfare, water supply and sanitation, housing, welfare of scheduled casts and tribes, labour and employment, nutrition etc. makes a possible explanatory variable to account for agricultural growth. The other two i.e. fertilizer consumption and rainfall are taken into account because these are one of the two main inputs needed to account for agricultural growth.

Agriculture

Table 3.2 Regression results for dependent variable agricultural output per capita

Variable	*Coefficients*	*Robust Standard Error*	*t statistic*
eltotpc	7.50	4.16	1.80
portdis	11.35	5.97	1.90
expsopc	-37.97	9.50	-4.00
fertpc	253.82	104.54	2.43
actualrain~m	0.84	0.40	2.08
_cons	17687.60	2279.88	7.76

Fixed effects regression, number of observations = 240,
R-sq within = 0.1044, between =0.5779, overall = 0.5472

The large value of the constant relative to the coefficient of the explanatory variables reflects the units of measurement rather than anything intrinsic to the relationship.

Table 3.2 shows the regression results for agricultural output per capita. Both total electricity per capita and port distance are statistically significant at the 5% level. The control variables expenditure on social sector, fertilizer per capita and rainfall are statistically significant. The beneficiary survey from the qualitative analysis also shows strong social development support from the JBIC financed projects. For example, the Bakreswar project, like other power projects has created additional opportunities in the agricultural sector. The survey indicated construction of water tanks; ponds, wells and deep well hand pumps in the local agricultural lands in the project area, which has immensely benefited the local farmers.

Industry

Table 3.3 Regression results for dependent variable industrial output per capita

Variable	*Coefficients*	*Robust Standard Error*	*t statistic*
eltotpc	31.2	7.7	4.0
portdis	12.9	14.6	0.9
fiscaldefi~t	-0.8	0.3	-2.7
expsopc	54.4	31.2	1.8
_cons	1915.7	3874.1	0.5

Fixed-effects regression, 241 observations,
R sq within = 0.8917, between=0.6055, overall = 0.59

Table 3.3 shows the regression results for industrial output per capita. Total electricity per capita is highly statistically significant. Fiscal deficit is negatively related to industrial output per capita and statistically significant indicating that although there has been government investment, the number of productive investments needs to be questioned properly. Also because of the high interest burden, the infrastructural investment for industrial growth gets dampened.

Services

Table 3.4 Regression results for dependent variable services output per capita

Variable	*Coefficients*	*Robust Standard Error*	*t statistic*
eltotpc	29.55	10.84	2.73
portdis	-1.46	17.23	-0.08
expsopc	218.22	41.14	5.30
_cons	12954.12	4430.87	2.92

Table 3.4 shows the regression results for services output per capita. Total electricity per capita is statistically significant, as is the expenditure on social services. Education being a major component of expenditure on social services, justifies its high correlation with the services sector output.

We also carried out regressions (1) with three-year averages, (2) using the Arellano-Bond estimator. In both cases the size of the effects of infrastructure on output are similar to those reported in Tables 3.2, 3.3 and 3.4. Arellano-Bond estimator also included the lagged dependent variables.

Simulating the effect of projects on sectoral output

Equation (2) in Chapter 2 is the basis of the simulation of the effect of JBIC projects (power and port) on sectoral output. A project represents an incremental output in the infrastructure indicator, and using the regression coefficients reported in Tables 3.2, 3.3 and 3.4, we get the effects on sectoral output.

Table 3.5 Projects and infrastructure indicators

Project	*Outcome*	*Unit*
Bakreshwar	9780	Million kWh
Purulia	1500	Million kWh
TandD	225.6	Million kWh
Teesta	319.9	Million kWh
Total in Million kWh	11825.5	Million kWh
Population of West Bengal in 2000	82.6	Million
Eltotpc	143.16586	
Port Haldia	20000	thousand tonnes
Distance	202	km
Portdis	99	

Table 3.5 shows that the JBIC power projects combined would have an outcome equivalent to 11825 million kWh, which is very substantial. Dividing by the population of West Bengal in 1999/2000, we get incremental eltotpc due to project of 143. Similarly, Haldia port outcome could be taken as 20000 thousand tonnes (this is partly a matter of judgement since the output has been changing with the year). The distance from the central city of West Bengal (Bardhaman) to Haldia is 202 km, and dividing the outcome by distance gives portdis of 99. Plugging the values of outcome variables into our equations, we get effects on sectoral output (Table 3.6).

Table 3.6 Effects of projects on sectoral output

	Coefficients				
Sector	*Eltotpc*	*Portdis*	*Effect of projects (Rs lakh)*	*Base (2000) values (Rs .lakh)*	*% effect of projects*
ag_out	7.5	11.35	177475.2	2187353	8.11
ind_out	31.2	12.9	469864.3	1565636	30.01
ser_out	29.6	0	350034.8	3599792	9.72
Total output per capita			997374.3	7352781	13.56

Table 3.6 shows that the estimated effect of the projects is about 8% increase in agricultural output per capita over 1999/2000 levels, 26% increase for industrial output per capita, 7% for services per capita and 11% for total output per capita (the three sectors added up). It is worth pointing out that Haldia port will also affect output in states other than West Bengal.

References

Calderon C and Serven L. 2004
The Effects of Infrastructure Development on Growth and Income Distribution
Washington, DC: The World Bank [Policy research working paper, no. WPS 3400]

Ruet J. 2005
Privatising Power Cuts
New Delhi: Academic Foundation

Annexure 3.1

Table 3.1.1 Regression results for dependent variable agricultural output with time dummies

Variable	Coef.	Std. Err.	T	P>t	95% Conf.	Interval
Portdis	10.34	6.99	1.48	0.14	-3.44	24.12
Fertpc	264.41	118.02	2.24	0.03	31.71	497.11
Expsopc	-39.20	12.33	-3.18	0.00	-63.50	-14.89
Eltotpc	7.94	3.87	2.05	0.04	0.31	15.57
actualrain~m	0.91	0.49	1.87	0.06	-0.05	1.87
yeard1	-822.53	2073.52	-0.40	0.69	-4910.81	3265.75
yeard2	-1354.71	2016.04	-0.67	0.50	-5329.66	2620.24
yeard3	-1921.11	1998.96	-0.96	0.34	-5862.38	2020.16
yeard4	-2382.03	1981.09	-1.20	0.23	-6288.07	1524.02
yeard5	-1390.41	1916.92	-0.73	0.47	-5169.93	2389.10
yeard6	-2027.15	1812.22	-1.12	0.27	-5600.23	1545.93
yeard7	-885.36	1733.85	-0.51	0.61	-4303.93	2533.21
yeard8	-1374.33	1678.41	-0.82	0.41	-4683.59	1934.94
yeard9	-1539.48	1560.54	-0.99	0.33	-4616.33	1537.37
yeard10	-916.75	1524.92	-0.60	0.55	-3923.38	2089.89
yeard11	-2019.09	1466.79	-1.38	0.17	-4911.10	872.92
yeard12	-1423.48	1433.08	-0.99	0.32	-4249.04	1402.07
yeard13	-1472.51	1425.53	-1.03	0.30	-4283.16	1338.14
yeard14	-1613.86	1474.55	-1.09	0.28	-4521.16	1293.44
yeard15	(dropped)					
_cons	18983.15	3757.86	5.05	0.00	11573.92	26392.37

Number of obs= 240, R-sq: within = 0.13, between = 0.60, overall = 0.57

Table 3.1.2 Regression results for dependent variable industrial output with time dummies

Variable	Coef.	Std. Err.	t	P>t	95% Conf.	Interval
Eltotpc	27.00	7.25	3.72	0.00	12.70	41.30
Portdis	30.75	13.39	2.30	0.02	4.34	57.15
Expsopc	87.31	23.93	3.65	0.00	40.13	134.49
fiscaldefi~t	-0.67	0.26	-2.58	0.01	-1.18	-0.16
yeard1	12027.32	3940.27	3.05	0.00	4258.90	19795.75
yeard2	13099.50	3904.97	3.35	0.00	5400.68	20798.33
yeard3	10154.16	3849.74	2.64	0.01	2564.22	17744.10
yeard4	10275.84	3779.75	2.72	0.01	2823.88	17727.79
yeard5	11439.95	3630.79	3.15	0.00	4281.68	18598.21
yeard6	10005.98	3451.34	2.90	0.00	3201.49	16810.46
yeard7	9430.42	3324.02	2.84	0.01	2876.96	15983.87
yeard8	8869.35	3192.72	2.78	0.01	2574.76	15163.94
yeard9	8939.06	3004.81	2.97	0.00	3014.93	14863.18
yeard10	8491.25	2927.78	2.90	0.00	2719.00	14263.51
yeard11	7255.95	2823.43	2.57	0.01	1689.42	12822.48
yeard12	5782.86	2771.46	2.09	0.04	318.79	11246.92
yeard13	6736.98	2770.90	2.43	0.02	1274.02	12199.93
yeard14	5393.49	2823.32	1.91	0.06	-172.82	10959.81
yeard15	(dropped)					
_cons	-12294.90	5217.66	-2.36	0.02	-22581.80	-2008.01

Number of obs =241, R-sq: within = 0.59, between = 0.78,overall = 0.73

Table 3.1.3 Regression results for dependent variable industrial output with time dummies

ser_outpc	Coef.	Std. Err.	t	P>t	95% Conf.	Interval
Eltotpc	22.02	7.92	2.78	0.01	6.40	37.64
Portdis	19.78	14.61	1.35	0.18	-9.03	48.58
Expsopc	271.79	25.70	10.58	0.00	221.13	322.45
yeard1	13667.82	4211.49	3.25	0.00	5364.91	21970.73
yeard2	15499.59	4171.91	3.72	0.00	7274.72	23724.47
yeard3	13833.06	4112.63	3.36	0.00	5725.04	21941.08
yeard4	14101.77	4032.34	3.50	0.00	6152.04	22051.49
yeard5	13718.82	3881.34	3.53	0.00	6066.79	21370.85
yeard6	12337.41	3689.11	3.34	0.00	5064.38	19610.44
yeard7	12837.58	3566.34	3.60	0.00	5806.58	19868.59
yeard8	13165.53	3455.33	3.81	0.00	6353.38	19977.68
yeard9	12533.82	3257.41	3.85	0.00	6111.87	18955.77
yeard10	9963.08	3196.61	3.12	0.00	3660.99	16265.16
yeard11	8073.87	3066.44	2.63	0.01	2028.41	14119.33
yeard12	5943.17	3003.84	1.98	0.05	21.14	11865.20
yeard13	8688.11	2987.57	2.91	0.00	2798.14	14578.07
yeard14	7515.76	3031.20	2.48	0.01	1539.77	13491.75
yeard15	(dropped)					
_cons	-4310.25	5612.72	-0.77	0.44	-15375.70	6755.16

Number of obs.= 241, R-sq: within = 0.84, between = 0.50, overall = 0.54

CHAPTER 4 Meso analysis

In this chapter we examine the effect of changes in output per capita and shares of sectoral output on shares of different sectors in the principal occupation of households. With economic growth there is a shift in households, broadly, from agriculture and rural areas to industrial and service sectors in urban areas.

Methodology

Our basic regression equation is of the form:

$$S_i = \gamma_0 + \sum_k \gamma_k outsh_k + \gamma_{totoutppc} totoutpc + \gamma_w w + \eta_i$$

where S is the share of a group in total number of households. There are six groups, rural agriculture, rural industry, rural services, urban agriculture, urban industry and urban services, and these are indexed by i. The γs represents regression coefficients. outsh is output share of industry and services, indexed by different values of k (inclusion of agriculture also would lead to perfect multicollinearity). totoutpc is the total output per capita. w is real agricultural wage, and is used as a proxy for general wage adjustments in all sectors, since we do not have data on wages in other sectors for different states. Also, agricultural wages provide an important source of further information. In fact, there are two ways of thinking about the relevance of this information. First, real agricultural wages are highly correlated with standard poverty indexes such as headcount ratios: where poverty is higher, wages tend to be lower, and vice versa. Second, it is also possible to think about the real wage as a rough poverty indicator in its own right. The idea is that, if the labour market is competitive (at least on the supply side), then the real wage measures the 'reservation wage', i.e. the lowest wage at which labourers are prepared to work. This has direct evidential value as an indication of the deprived circumstances in which people live (the more desperate people are, the lower the reservation wage), independently of the indirect evidential value arising from the statistical association between real wages and standard poverty indexes such as the headcount ratio. The share of a group in total number of households is a function of the sectoral shares of output, the level of total per capita output and wage changes.

Data

The data for principal occupations of households in different states was extracted from the National Sample Survey, 50th and 55th rounds (for years 1993/94 and 1999/2000), conducted by the National Sample Survey Organization.

Basic statistics

The variables used in the analysis are given in Table 4.1 along with their units. The mean and standard deviation for each variable are also indicated in the table.

Table 4.1 Descriptive statistics

Variables	*Units*	*Mean*	*Standard deviation*
Agricultural output share	Free of unit	0.31	0.13
Industrial output share	Free of unit	0.25	0.08
Service output share	Free of unit	0.44	0.12
Total output per capita	Rupees	103139.59	57005.66
Agricultural wage	Rs Thousand	3.12	1.08

Regressions results

Panel data analysis has also been used in this chapter to see the impact of the relevant economic variables on the share of different households categorised by occupation. As far the observations are concerned, the same number of states has been retained while the time period consists of two years (1993-94 and 1999-2000). The results for each category of households are represented in the tables below. It is mentionable that coefficients for total output per capita are of very low order for each analysis. This is because of the fact the values of this particular variable are of very large order compared to other variables used in the analysis. This is evident from Table 4.1 column 3.

Rural

Table 4.2 Regression for dependent variable share of rural agricultural households

Variables	*Coefficients*	*Robust Standard Error*	*t statistic*
indoutsh	-0.23	0.18	-1.28
seroutsh	-0.36	0.16	-2.25
totoutPC	-1.95E-06	0.00	-8.24
agwage2	-0.03	0.01	-2.96
_cons	0.99	0.08	11.83

Pooled OLS regression, observations = 34, Rsq=0.884

Table 4.2 shows the regression for the share of rural agricultural households. Industrial output share and services output share are negatively related, though only services output share is statistically significant. Total output per capita and real agricultural wage rate are statistically very significant, and negatively related. Increase in total output per capita would led to a rise in per capita income resulting in a shift of the households from the agriculture to other occupation categories.

Table 4.3 Regression for dependent variable share of rural industrial households

Variable	*Coefficients*	*Robust Standard Error*	*t statistic*
indoutsh	0.03	0.08	0.33
seroutsh	0.02	0.06	0.36
totoutPC	-8.06E-08	0.00	-0.38
agwage2	0.01	0.01	2.38
_cons	0.03	0.03	0.98

Pooled OLS regression, observations = 34, Rsq=0.2

Table 4.3 shows the regression for the share of rural industrial households. Only the real agricultural wage is statistically significant, and is positively related. Industrial output share and services output share are positively related, and total output per capita is negatively related. Increase in total output per capita would led to a rise in per capita income resulting in a shift of the households from the industrial sector to the services because of the recent growth in the services sector.

Table 4.4 Regression for dependent variable share of rural services households

Variable	*Coefficients*	*Robust Standard Error*	*t statistic*
indoutsh	0.08	0.15	0.49
seroutsh	-0.20	0.12	-1.71
totoutPC	3.41E-07	0.00	1.23
agwage2	0.02	0.01	1.99
_cons	0.10	0.06	1.69

Pooled OLS regression, observations = 34, Rsq=0.34

Table 4.4 shows the regression for the share of rural services households. Only the real agricultural wage is statistically significant. Total output per capita is positively related with the share of rural services households as because with the increase in income people will intend to shift to the services sector, which has gained the most importance in the era of globalisation.

Urban

Table 4.5 Regression for dependent variable share of urban agricultural households

Variable	*Coefficients*	*Robust Standard Error*	*t statistic*
indoutsh	0.07	0.05	1.48
seroutsh	0.08	0.04	1.95
totoutPC	-1.64E-07	0.00	-2.03
agwage2	-7.87E-05	0.00	-0.03
_cons	0.00	0.02	-0.08

Pooled OLS regression, observations = 34, Rsq=0.1

Table 4.5 shows the regression for the share of urban agricultural households. Industrial output share and services output share are positively related, but not statistically significant. Total output per capita is negatively related, and statistically significant, the reason for which can be the same as in case of rural agricultural households. Agricultural wage is not statistically significant.

Table 4.6 Regression for dependent variable share of urban industrial households

Variable	*Coefficients*	*Robust Standard Error*	*t statistic*
indoutsh	0.02	0.08	0.33
seroutsh	0.16	0.10	1.61
totoutPC	6.36E-07	0.00	3.42
agwage2	-3.94E-04	0.01	-0.06
_cons	-0.05	0.05	-0.91

Pooled OLS regression, observations = 34, Rsq=0.77

Table 4.6 shows the regression for the share of urban industrial households. Total output per capita is positively related and is very statistically significant. Increase in total output will lead to an increase in industrial activity in the urban areas, which supports the fact that people will shift from other sectors to the industrial sector in the urban area.

Table 4.7 Regression for dependent variable share of urban services households

Variables	*Coefficients*	*Robust Standard Error*	*t statistic*
indoutsh	0.03	0.09	0.31
seroutsh	0.30	0.13	2.28
totoutPC	1.21E-06	0.00	3.95
agwage2	-4.11E-03	0.01	-0.37
_cons	-0.08	0.07	-1.08

Pooled OLS regression, observations = 34, Rsq=0.84

Table 4.7 shows the regression for the share of urban industrial households. Total output per capita is positively related and is very statistically significant which corroborates

the fact of the growth of services in the urban sector in the recent times. Share of output is also positively related and statistically significant.

Simulation

Table 4.8 Effects of projects on shares of households in different groups

	Coefficients					
Group	*indoutsh*	*seroutsh*	*totoutPC*	*Effect of projects*	*Base (2000) shares*	*New shares*
ru_aghhSH	-0.23	-0.36	-1.95E-06	-0.0257	0.511	0.485
ru_indhhSH	0.03	0.02	-8.06E-08	-0.0004	0.104	0.103
ru_serhhSH	0.08	-0.2	3.41E-07	0.0101	0.146	0.157
urb_aghhSH	0.07	0.08	-1.64E-07	-0.0012	0.010	0.009
urb_indSH	0.02	0.16	6.36E-07	0.0060	0.080	0.086
urb_serSH	0.03	0.3	1.21E-06	0.0112	0.148	0.160

Using the simulation of projects on sectoral output per capita and the results of the regressions reported in this chapter, we simulate the effect of the projects on shares of households in different groups (Table 4.8).

For rural agricultural households, the infrastructure projects led to a reduction of 2.3% in the share of rural agricultural households, i.e. there is a shift of 2.3% of households from rural agricultural sector to other sectors categorised by occupation. The other notable changes are an increase in rural services households (1%), in urban industrial households (0.5%) and urban services households (1%).

CHAPTER 5 Simulating the effect of sectoral output growth on poverty

The basic idea underlying the poverty simulation is that a change in poverty can be decomposed into two parts: a change in distribution of income and a growth in income. The effect of a policy that affects aggregate growth on poverty can then be studied by abstracting from distributional effects (Figure 5.1). In previous sections, i.e. the macro and meso layers, we have examined the effect of infrastructure on growth and of growth on occupation changes. We now examine how aggregate growth would change poverty in six groups of occupations: agriculture, services and industry, each divided into rural and urban.

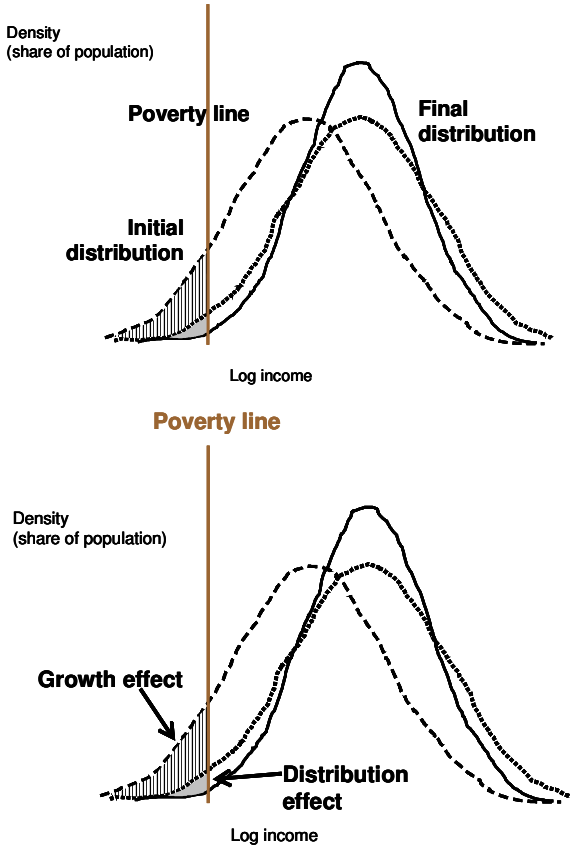

Figure **5.1** The distribution with dashed line shows the initial distribution of income (log of income). The solid line shows the final distribution. The dotted line shows the distribution of income with growth effect only. The area with vertical line shading shows the growth effect of reduction on poverty; the gray shaded area shows the distribution effect.

Poverty measures

The most commonly used measure of poverty is the headcount ratio. This is the fraction of the population below the poverty line.

$$P_0 = \frac{1}{N}\sum_{i=1}^{N} 1(x_i \le z)$$

P_0 is the headcount ratio, N is the total population and 1 is a indicator function that is 1 if its argument is true and 0 otherwise. One disadvantage of the headcount ratio is that it does not take into account the degree of poverty. In fact, it is possible for the headcount ratio to improve by a transfer of income from the very poor to the not so poor (Deaton 1997).

The poverty gap measure is an improvement on the headcount ratio. It is given by

$$P_1 = \frac{1}{N}\sum_{i=1}^{N} [1 - (x_i / z)]\, 1(x_i \le z)$$

P1 is the poverty gap measure. In the poverty gap measure, poorer individuals get a greater weight (Deaton 1997).

The poverty measures use poverty lines to distinguish poor households from non-poor households. Deaton (2003) reports on careful estimations of poverty lines for India. The poverty lines used officially have two serious problems (Deaton 2005):

- The urban to rural price differentials that the imply are too large to be credible.
- The lack of accuracy in the rate of inflation in the state level price indexes used.

The poverty lines reported by Deaton (2003) are used in this report. The poverty lines for West Bengal for 1999/2000 are:

Rs 306.84 for rural areas

Rs 343.51 for urban areas

Data

The 55th round of National Sample Survey is an integrated survey on household consumer expenditure, employment-unemployment and informal non-agricultural enterprises. The data from the household schedule 1 on consumer expenditure were extracted and analyzed. Given the very detailed nature of the survey considerable effort went into understanding how the data were stored, coded etc.

The key variables used were:

- Sector: rural or urban
- State region: this indicates the regions within states, with West Bengal code beginning with 26
- Principal occupation of household according to the NIC 1998 classification
- Monthly per capita expenditure

The data were analysed in Stata[12].

Income distribution of the six groups in West Bengal in 1999/2000

We examine the expenditure distribution of the six groups in West Bengal in 1999/2000. In order to do so, we examine the kernel density curves of the expenditure distributions. Kernel density curves can be thought of as smoothed histograms (for details see Deaton 1997). Examining the kernel density curves of the expenditure distribution gives us a visual sense of the measures of poverty and the improvement in poverty corresponding to growth in output of different sectors. Since the expenditure data is highly positively skewed we examine the log of monthly per capita expenditure.

[12] Although the excel based softwares SimSip and Povstat can be used, they tend to limit flexibility. Moreover, Stata has excellent survey related functions. The use of Stata for poverty analysis is explained very well in Deaton (1997).

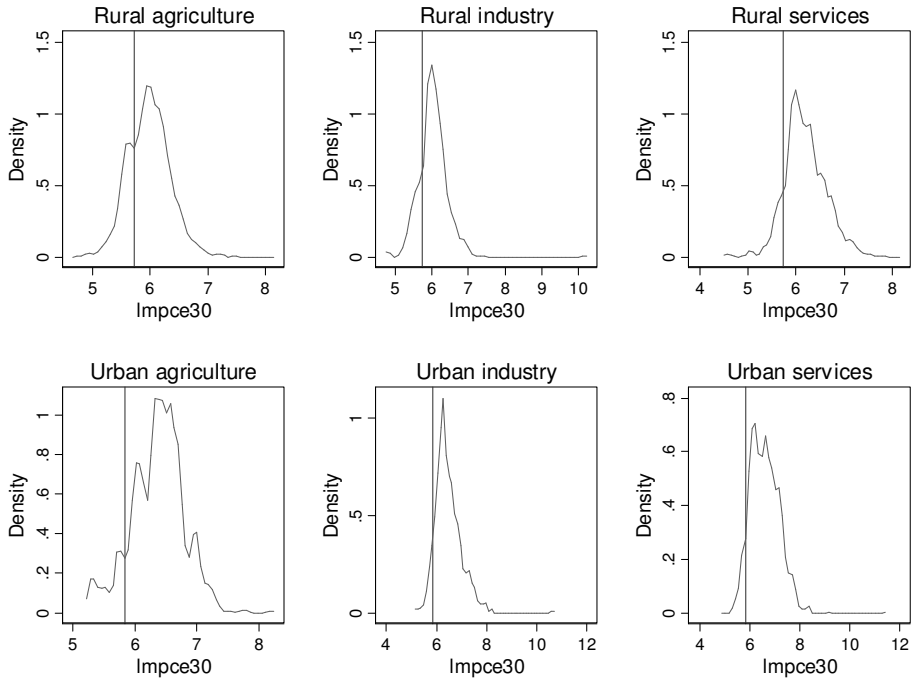

Figure **5.2** Kernel density curves of the log of monthly per capita expenditure (30 day reporting period) of different occupational groups in West Bengal. Vertical lines show the poverty line

Figure 5.2 shows the kernel density curves of the log of monthly per capita expenditure (30 day reporting period) of different occupational groups in West Bengal. The vertical lines show the poverty line. The proportion of area to the left of the poverty line gives us an indication of the extent of poverty among each occupational group. Clearly, there is greater poverty in rural areas than in urban areas. There is also greatest poverty among the occupational group rural agriculture. The figure also indicates that per capita growth of rural incomes could greatly reduce poverty. At the same time occupational shifts from rural agriculture to urban industry and services could also reduce poverty in West Bengal.

Estimation and simulation of poverty among different occupational groups

Table 5.1 shows the estimation and simulation of poverty among different occupational groups in West Bengal. The poverty measure used in the table are obtained from Deaton's revised estimates on the official calculation of Planning Commission on 1999-00 using price indexes. Deaton (2003) has recalculated the headcount ratios with adjustment for 55th Round expenditure overstatement.

Table 5.1 Estimation and simulation of poverty among households belonging to different occupational groups in West Bengal

		Household share		*Head count ratio*		*Poverty gap*	
Occupational group		*2000*	*With project*	*2000*	*With project*	*2000*	*with project*
Rural	Agriculture	51.09	48.79	21.01	15.95	3.48	2.30
Rural	Industry	10.36	10.31	16.52	5.91	2.83	0.71
Rural	Services	14.64	15.67	9.37	6.61	1.57	1.09
Urban	Agriculture	1.04	0.88	9.32	8.29	2.05	1.52
Urban	Industry	8.01	8.53	5.47	1.32	0.79	0.16
Urban	Services	14.85	15.81	4.60	3.21	0.69	0.46
Total				15.04	10.12	2.49	1.47

The simulation of poverty builds on the simulation of sectoral output and distribution of households in Chapters 3 and 4. The poverty simulations use equations (1), (4) and (5) of the chapter on the analytical framework, Chapter 2.

The poverty simulations are done with households as the unit of analysis, because the group distribution is on the basis of principal occupational status of households, not individuals. The projects have a large estimated effect on poverty. Rural headcount ratio, equal to 21% of households in 2000, falls to 16% with the projects. But the most significant effects are in households whose principal occupation is industry, because expansion of power and ports affects industry growth most. Rural industry household headcount ratio falls from 16.5% in 2000 to 6% with the project, while urban industry household headcount ratio falls from 5.5% to 1.3%. The fall in poverty with projects is least, and yet significant, in the services households. Urban services household headcount ratio falls from 4.6% to 3.2%. The overall fall in headcount ratio for households is from 15% to 10%. The poverty gap numbers tell a similar story. The overall poverty gap measure falls from 2.49% in 2000 to 1.47% with the projects.

References

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Prices and Poverty in India, 1987-2000
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CHAPTER 6 Conclusions

The effects of the four power projects and the Haldia port project on poverty was simulated. The simulation indicates a significant effect of the projects. Infrastructure expansion and improvement is a key component, we conclude, in the attempt to alleviate poverty.

The estimates of the four power projects and the Haldia port project are listed below.

Sectoral output:

- 8% increase in agricultural output per capita.
- 30% increase in industrial output per capita.
- 10% increase in services output per capita.

Shares of households in different occupational groups:

- 2.3% reduction in share of rural agricultural households.
- 0.06% reduction in share of rural industrial households.
- 1% increase in share of rural services households.
- 0.16% reduction in share of urban agricultural households.
- 0.5% increase in share of urban industrial households.
- 1% increase in share of urban services households.

Poverty experienced by different occupational groups:

- Reduction in headcount ratio from 21% in 2000 to 16% with project by rural agricultural households.
- Reduction in headcount ratio from 16.5% in 2000 to 5.9% with project by rural industrial households.
- Reduction in headcount ratio from 9.4% in 2000 to 6.6% with project by rural services households.
- Reduction in headcount ratio from 9.3% in 2000 to 8.3% with project by urban agricultural households.
- Reduction in headcount ratio from 5.5% in 2000 to 1.3% with project by urban industrial households.
- Reduction in headcount ratio from 4.6% in 2000 to 3.2% with project by urban services households.

Annexure

Introduction

The analytical framework that has been adopted for this study is World Bank's framework PAMS ((Poverty Analysis Macroeconomic Simulator). The key feature of PAMS is the possibility to infer changes in levels of disposable income for specific categories of workers from expected changes in aggregate variables such as gross domestic product (GDP) by sector. This helps to project planned national accounts and to conduct poverty and distributional analysis in a way that makes income growth, transfers, employment, poverty, and inequality estimates consistent with the macroeconomic framework. PAMS is a framework that has three layers: macro, meso and micro. Macro framework analyses the relationship between infrastructure output and growth in the agricultural, industrial and services sectors. Meso examines the relationships between the sectoral output and principal occupational status of urban and rural households. Micro level identifies the effect of aggregate sectoral output growth on poverty.

Equation used in the quantitative analysis

Macro

As already mentioned in introduction, the basic objective of the macro analysis is to identify the relationship between the output for different sectors and other significant explanatory variables. A similar relationship estimated from the panel regression model is as follows

$$outpc_{j,it} = \beta_0 + \beta_E^j eltotpc_{it} + \beta_P^j portdis_{it} + \beta_{control} control_{it} + unobserved\ heterogeneity + \varepsilon_{it}$$

where *outpc* is the output per capita of different sectors viz agriculture, industry and services, indexed by the subscript 'j'. *eltopc* and *portdis* are indicators of electricity and port outcomes. *eltopc* and *portdis* are defined as ((energy availability + non-utility generation)/population) and portdis is the port indicator (sum over different ports of (major port cargo/distance to port from centre of state)). Panel data regressions allow us to control for unobserved heterogeneity that stays constant across units (states) or over time.

Meso

In meso analysis a relationship has been developed between the principal occupation status for urban and rural household with their output share and the output per capita. This is represented as

$$S_i = \gamma_0 + \sum_k \gamma_k outsh_k + \gamma_{totoutppc} totoutpc + \gamma_w w + \eta_i$$

where Si is the share of the ith group in total number of households. For the project six such groups have been identified viz, rural agriculture, rural industry, rural services, urban agriculture, urban industry and urban services. Outsh is the output share of industry and services, indexed by of k (inclusion of agriculture also would lead to perfect multi collinearity). Totoutpc is the total output per capita. Finally w is real agricultural wage, and is used as a proxy for general wage adjustments in all sectors.

Micro

In micro analysis the sectoral growth on poverty is identified. For this a measure of poverty needs to be identified. One of the wisely used methods is the headcount ratio. It is defined as the fraction of the population those are below the poverty line. This is given by

$$P_0 = \frac{1}{N}\sum_{i=1}^{N} 1(x_i \le z)$$

where P_0 the headcount ratio, N the total population and 1 is a indicator function that is 1 if its argument is true and 0 otherwise. The poverty gap measure is an improvement on the headcount ratio. However Deaton (1997) has identified that it does not take into account the degree of poverty. In fact, it is possible for the headcount ratio to improve by a transfer of income from the extreme poor group to the relatively less poor one. It is given by

$$P_1 = \frac{1}{N}\sum_{i=1}^{N} [1 - (x_i / z)]\, 1(x_i \le z)$$

P1 is the poverty gap measure. In the poverty gap measure, poorer individuals get a greater weight compared to less ones (Deaton 1997). The poverty measures use poverty lines to distinguish poor households from non-poor households. Deaton (2003) reports on careful estimations of poverty lines for India. This poverty line has been used in the project.

Next the computation of aggregate and sub-group poverty is required both in the presence and absence of JBIC project.

$$AggPov = \sum_{i=1}^{6} P_i S_i \quad (1)$$

where *AggPov* is the aggregate poverty index, P_i indicates the poverty index for the ith sub-group and S_i is the share of the number of households in this sub-group to total households

In order to compute the P_iS and S_iS with and without the project, the effect of electricity and port outcome indicators on sectoral output needs to be examined econometrically. Using the fact that the coefficients from a regression represent ceteris paribus effects of the explanatory variables on the dependent variable, from the macro equation we get

$$\Delta outpc_j = \beta_E^j \Delta eltotpc + \beta_P^j \Delta portdis \quad (2)$$

where *outpc* is the output per capita, *eltotpc* is the electricity indicator. eltotpc and portdis are explained in the macro chapter.

Similarly,

$$\Delta S_i = \sum_k \gamma_k \Delta outsh_k + \gamma_{totoutpc} \Delta totoutpc \quad (3)$$

where *outsh* is output share of industry and services, indexed by different values of k. *totoutpc* is the total output per capita.

Assuming in the analysis that the households belonging to a sub-group (i) experience an increase in their monthly per capita expenditures (mpce) at a rate equal to the rate of increase of the output of the corresponding sector (j). This is represented functionally as

$$mpcegr_i = mpce_i(1 + \frac{\Delta outpc_j}{outpc_j}) \quad (4)$$

The poverty indicator for a sub-group is a function of the mpce of that sub-group and the relevant poverty line (rural or urban). Thus,

$$\Delta P_i = f(mpce_i, pline_{R/U}) - f(mpcegr_i, pline_{R/U}) \quad (5)$$

Equation (5) represents the estimation of change in poverty due to the JBIC projects.

CHAPTER 7 Kolkata Metro Railways (phase II) construction project

Project and loan profile

In an effort to address the issue of insufficient public transport infrastructure and to sustain economic growth in large cities, the Government of India established the Metropolitan Transport Project in Ministry of Railways in 1969. Subsequently, the Urban Railway Transport Development Plan, a master plan targeting the cities of Delhi, Kolkata, Mumbai and Chennai[2], was prepared in 1969. This project, which provides for the construction of a metro railway in Kolkata, was recognized under the Master Plan as the only viable option to address Kolkata's growing traffic problems.

Objectives

To construct a metro railway that will provide an efficient, rail-based mass transportation system for catering to the increasing transport demand.

Borrower / executing agency

The President of India / Ministry of Railways, Railway Board (Metro Railways Calcutta ("MRC").

Outline of loan agreement

Table 7.1 summarizes the terms and conditions of the loan arrangement.

Table 7.1 Terms and conditions of the loan arrangement

	Category	*Details*
1	Loan amount/ Loan amount disbursed	4800 million yen / 4671 million yen
2	Exchange of notes/ Loan agreement	August 1982/ February 1983
3	Terms and Conditions	
	Interest rate	2.75% per annum
	Repayment period (grace period)	30 years (10 years)
	Procurement	Partially untied
4	Final disbursement date	March 1992

SOURCE JBIC Evaluation Report, Calcutta Metro Railways Phase II) Construction Project, November 2002,page no-2

Project scope and salient features

The procurement of equipment and material, and mechanical and civil works required to construct a metro railway structure in Kolkata, with Yen loan making up a part of the foreign currency portion of the project.

Tables 7.2 and 7.3 summarize the salient features of the project.

Table 7.2 Salient features of the project

S No.	*Category*	*Details*
1	Total route length	16.45 km
2	Stations	17 (15 underground, 1 surface and 1 elevated)
3	Coaches per train	8
4	Maximum permissible limit	55 km/ h
5	Average speed	30 km/ h
6	Voltage	750 volts DC
7	Method of current collection	Third Rail
8	Travel time- Dum Dum to Tollygunge	33 minutes
9	Interval between trains	8 minutes in peak hours

SOURCE Metro Railways

Table 7.3 Present commuter service (as on 01.12.2004)

Category	*Details*
Daily period of service	
Monday to Saturday	7.00 am to 9.45 pm
Sunday	3.00 pm to 9.45 pm
Number of train services	
Monday to Friday	188
Saturday	132
Sunday	56
Holidays	120
Frequency of train services	
Peak hours	8 minutes
Non-peak hours	10-15 minutes
Travel Time (Dum Dum – Tollygunge)	
By Metro	33 minutes
By bus (road travel)	90 minutes (approx.)
Passenger fare structure (including safety surcharge)	
Up to 5 km	Rs 4.00
> 5 km – 10 km	Rs 6.00
> 10 km	Rs 8.00
Concession on passenger fares (as on 01.12.2004)	
Limited multi ride tickets (LMR)	25% on 40 rides
Extended multi ride tickets (EMR)	31.25% on 80 rides

SOURCE Metro Railways

Status

The project has been completed and ex post evaluation has been carried out.

Evaluation of the project

Relevance

With rapid urbanization, the government of India has increasingly recognized the need for efficient public transport systems. Further, competition for land from alternative sources together with difficulties in expanding existing roads in urban areas has led to growing emphasis on overhead or underground public transport systems. In order to address this issue, the Government of India established the Metropolitan Transport Project in the Ministry of Railways in 1969. As noted earlier, an Urban Railway Transport Development Plan was prepared for the major metropolitan areas of the countries, which recognized the need for a metro railway in Calcutta. The continued relevance of the metro and the need to integrate it with other modes of transportation to facilitate its better utilization has been recognized in the Transport Master Plans for the Calcutta Metropolitan District (CMD).

Evaluator comment: The project is highly relevant.

Efficiency

Project scope

Yen loan assistance covered part of the entire metro railway infrastructure covering 5.027 out of the total 16.45 km, including 6 out of the 17 stations. According to the Project Completion Report, the project was implemented in accordance with the original scope, with Japanese instruction and guidance where necessary.

Implementation schedule

The project witnessed considerable time overrun, being completed in June 1996 instead of August 1987 as per the original schedule. The reasons reported for this delay are manifold including delays in land acquisition and import of construction machinery; time consuming technical transfer of construction skills; construction difficulties due to limited availability of working space on account of congested roads, existence of old buildings in the vicinity of the site, complicated water supply and sewage network underneath the worksite, and interruptions due to rains; and strikes by the employees of the local contractor.

Project cost

As a result of the time overruns, the project was completed with a large cost overrun. In addition, the price index rose nearly 3 times from the 1981 base to 1994. Expenditure incurred to divert underground utilities and to prepare extra road- decking works to maintain a four-lane road during the construction stage also added to the cost overrun.

Evaluator comment: The project has suffered from significant time and cost overruns due to several operational constraints as outlined above.

Effectiveness

In order to examine the extent to which the project achieved its objective of "providing an efficient and non-polluting rail-based mass rapid system," this section will look at how well the metro railway infrastructure has been utilized and how effectively railway services have been provided since the system was commissioned.

Train operation

The following table provides information on operating hours and intervals for trains. It is seen that these indicators show a steady value over the last three years.

Table 7.4 Train Operation Indicators

	Total number of trains		*Interval between trains (minutes) peak/off-peak*	*Total hours of train operation during weekdays (mon-sat)*		*Operating time (from X: X to X: X)*
	Planned	*Actual*	*Actual*	*Planned*	*Actual*	*Actual*
1995-96	112	92	n.a	75	61	7:20-21:53
1996-97	120	119	15/20	80	79	7:20-21:53
1997-98	132	130	10/15	88	87	7:20-21:53
1998-99	142	136	10/15	95	91	7:20-21:53
1999-00	142	137	10/15	95	91	7:20-21:53
2000-01	153	153	10/15	102	102	7:00-22:18
2001-02	167	167	8/15	148	86.7	7:00-22:18
2002-03	280-300	186	8-10/15	187-240	86.7	7:00-21:45
2003-04	280-300	186	8-10/15	187-240	86.7	7:00-21:45
2004-05	280-300	188	8-10/15	187-240	86.7	7:00-21:45

SOURCE Metro Railways' Executing Agency Questionnaire, JBIC Evaluation Report, Calcutta Metro Railways (Phase II) Construction Project, November 2002, Page 4

Quick means of transport

The entire 16.45 km journey between Dum Dum and Tollygunj can be covered in a Metro train in just 33 minutes. By road, it takes about 60-90 minutes under average traffic conditions. Thus the metro offers a quicker and more reliable mode of transport.

Power supply

Kolkata Metro has been given priority next only to defence in regard to power supply and therefore, chances of power failure inside the tunnel are almost nil. In the unlikely event of a power failure, emergency lighting arrangements exist through standby batteries to provide the minimum illumination required in the tunnels and at the stations.

The Metro railways system draws its power from its own sub-stations that provide uninterrupted supply from different feed-lines. The power is provided by the Calcutta Electric Supply Corporation (CESC). The UPS back-up runs upto an hour.

Passenger traffic volume

The following table provides information on volume of passenger traffic on the metro.

Table 7.5 Passenger traffic

	Yearly passenger traffic (Million/year)		*Average daily passenger traffic (thousand/ day)*		*Yearly volume of transportation (Thousand persons x km)*
	Planned	*Actual*	*Planned*	*Actual*	*Actual*
1995-96	667	43.7	1880	146.5	362,440
1996-97	678	62.6	1910	221.1	561,350
1997-98	688	69.1	1940	233.4	631,150
1998-99	699	57.1	1970	192.7	523,330
1999-00	710	55.8	2000	188.7	526,560
2000-01	717	70.6	2020	238.9	657,300
2001-02	724	76.65		210.02	712,648
2002-03		77.35		211.92	727,801
2003-04		90.55		247.41	844,358

SOURCE Metro Railways' Executing Agency Questionnaire, JBIC Evaluation Report, Calcutta Metro Railways (Phase II) Construction Project, November 2002, page no-5

The table shows a continuously increasing trend in passenger volume with a relatively sharp increase between 2002-03 and 2003-04. However, the passenger volumes are low as compared with expected volumes. This is due the following reasons:

- There are competing bus-routes along the metro route. Buses plying in these routes siphon off many potential metro passengers. There was an initial plan to realign these bus routes, and more generally achieve inter-modal transport integration. This however has not happened.
- There are hardly any feeder services from metro stations to various destination points; so some commuters prefer buses over the metro.

Coach mobilization

The table below shows that coach mobilisation levels have remained steady over the last few years on an average.

Table 7.6 Coach mobilisation

	Number of coaches owned (average units)	*Number of coaches mobilized (average units)*	*Average time required for maintenance (day/train) **	*Maximum speed/ rated speed (km/h)*
1995-96	144	100	140	55/30
1996-97	144	100	144	55/30
1997-98	144	108	143	55/30
1998-99	144	116	172	55/30
1999-00	144	120	164	55/30
2000-01	144	124	94	55/30
2001-02	144	124		55/30
2002-03	144	128		55/30
2003-04	144	128		55/30

Source Metro Railways' Executing Agency Questionnaire, JBIC Evaluation Report, Calcutta Metro Railways (Phase II) Construction Project, November 2002, Page 6

Punctuality

The punctuality norms for the Metro are very stringent. A train reaching the destination 3 minutes behind schedule is deemed to have lost punctuality. During the most recent period 2004-05, the punctuality rate was 99.29% which is the highest achieved during the past five years. (Table 7.7)

Table 7.7 Punctuality and reliability of service

Item	*1999-2000*	*2000-01*	*2001-02*	*2002-03*	*2003-04*	*2004-05*
Punctuality*	97.47%	99.16%	98.81%	99.27%	99.18%	99.29%
Reliability**	83.19%	97.04%	97.95%	98.14%	98.05%	

* **Punctuality** is linked to the arrival of the train at destination. If a train reaches its destination within two minutes from the scheduled arrival time, it is treated as punctual. Arrivals later than two minutes of the scheduled time are treated as "loss of punctuality".

** **Reliability** is linked to starting of a train from originating station. The trains which fail to start from originating points within two minutes from the scheduled time are treated as rescheduled. Reliability is estimated as the total number of trains starting as 'scheduled' expressed as a percentage of total number of trains scheduled to work.

source General Manager's Annual Report, 2003-04(Page 16, Table 1.10)

Evaluator comment: The project is high on efficiency in terms of punctuality and reliability. However, the metro railway system is running below capacity due to lack inter-modal transport integration.

Impact

Table 7.8 Metro usage against other modes of transport

	1998-1999		*2000-2001*		*2003-2004*	
	Passenger	*(%)*	*Passenger*	*(%)*	*Passenger*	*(%)*
Buses	10,650	60.1	11,510	60.7	27,450	70
Tram/LRT	160	0.9	200	1.1	240	0.6
Taxi/other	3,280	18.5	3,500	18.5	670	1.7
Ferry	220	1.2	240	1.3	3,120	7.9
Railway	3,215	18.2	3,270	17.3	4,200	10.8
Metro	193	1.1	239	1.3	3,500	9.0
Total	17,718	100.0	18,959	100.0	39180	100.0

SOURCE Metro Railways' Executing Agency Questionnaire (Unit: '000 passengers)

It is seen from the above table there the percentage of passengers using the metro as against other modes of transport has increased sharply during the period 1998-99 to 2003-04. During the same period, percentage of taxi and surface rail users have decreased substantially. But interestingly, the percentage of bus users has increased by almost 10%. If metro has to capture the share of passengers using buses, which are arguably less comfortable, more time-consuming and much more polluting, competing bus and metro routes have to be rationalised.

Social impacts

These are captured in the section dealing with users' views obtained through a primary survey.

Social development support

The Dum-Dum – Tollygunge Metro line is laid underground. Therefore, no displacement of population has place in the project.

Evaluator comment: There is relatively little negative social impact on grounds of displacement. Overall social and economic impact is largely positive due to high commuter satisfaction, and increase in economic value of property around the metro route.

Sustainability

Financial status

The only source of information available to evaluate the financial performance of the project is a simplified income-loss statement of the executing agency.

The overall financial performance and details of revenue receipts and expenditure of the metro railway during the last five years are provided in the tables below.

Table 7.9 Key indicators of financial performance **(Rs '000)**

Description	*1999-2000*	*2000-2001*	*2001-2002*	*2002-2003*	*2003-2004*
Salary related cost	276230	289720	302190	321210	335743
Fuel traction	75120	83370	82020	93060	96996
Fuel other than traction	202510	214310	214900	230820	231731
Contractual payment	93490	130920	147600	141630	162060
Other expenses	135100	150600	165070	95900	79785
Total Net working expenses	782450	868920	911780	882620	906315
Revenue from passenger service	255010	319490	342470	346800	385380
Revenue from other activities	14280	24350	49240	38350	38771
Total earnings	269290	343840	391710	385150	424151
Safety surcharge	0	0	36090	72160	74717

SOURCE General Manager's Annual Report, 2003-2004(Page 8, Table 1)

Table 7.10 and Figure 7.1 show the trend in total earnings from and total expenditure on the metro rail since 1995/96, while Table 7.11 and Figure 7.2 provide the corresponding information for the period 1985/85 till 1994/95. (The through service for the entire metro line was initiated in 1995/96).

Table 7.10 Total earnings and expenditure (**Rs million**) 1995/96- 2003/04

Year	*Total earnings*	*Total expenditure*
95-96	117.0	222.5
96-97	174.2	330.4
97-98	196.4	482.4
98-99	241.6	622.1
99-00	269.3	782.5
00-01	343.8	868.9
01-02	391.7	911.8
02-03	385.1	882.6
03-04	424.2	906.3

SOURCE General Manager's Annual Report, 2003-2004(Page 9,Table 3)

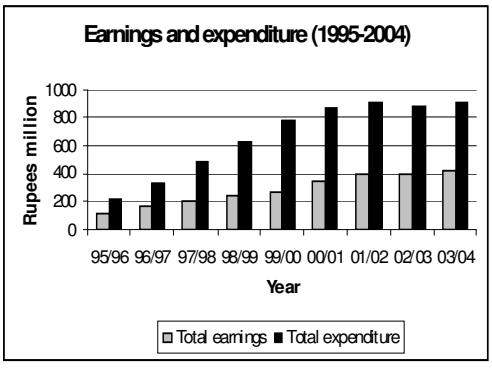


Figure **7.1**Total earnings and expenditure (**Rs million**) 1995/96- 2003/04

Table 7.11 Total earnings and expenditure 1984/85- 1994/95 (**Rs million**)

Year	*Total earnings*	*Total expenditure*
84-85	1.5	02.9
85-86	2.8	11.4
86-87	12.3	21.3
87-88	20.6	42.6
88-89	23.0	59.6
89-90	26.8	79.3
90-91	30.0	82.2
91-92	32.7	93.6
92-93	43.7	102.2
93-94	40.3	113.5
94-95	50.2	139.0

SOURCE General Manager's Annual Report, 2003-2004(Page 9, Table 3)

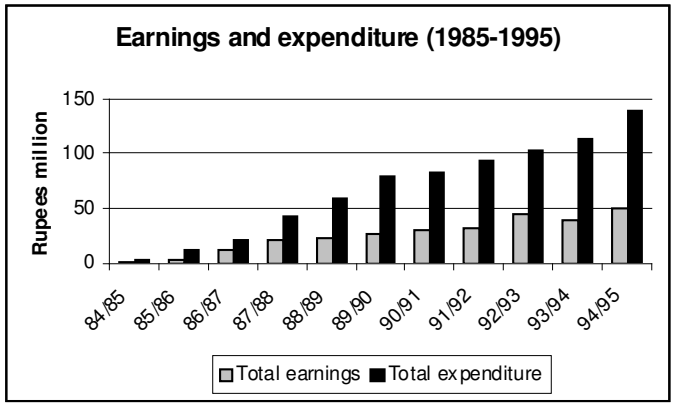


Figure **7.2** Total earnings and expenditure 1984/85- 1994/95 (**Rs million**)

Table 7.12 and Figure 7.3 show the break-up of the working expenses by head for the year 2003/04. As can be seen, the two largest running expenses are for power/energy and salaries.

Table 7.12 Break up of ordinary working expenses for 2003-2004

Category	*Amount (Rs million)*	*Percentage*
Staff cost	335.7	37
Energy (non-traction)	231.7	26
Energy (traction)	97	11
Contractual	162.1	18
Stores	64.6	7
Miscellaneous	15.2	2
Total	906.3	100

SOURCE General Manager's Annual Report, 2003-2004(Page 9, Table 3)

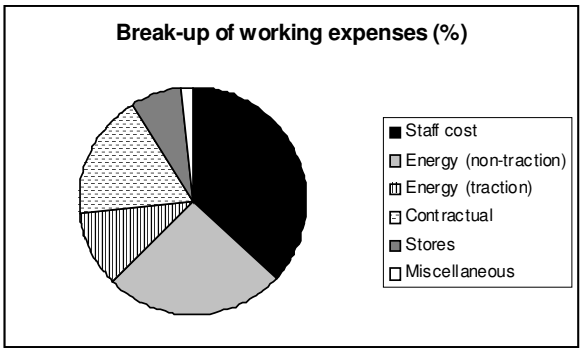


Figure **7.3** Break up of ordinary working expenses in percent for 2003-2004
SOURCE Metro Railway Executing Agency Questionnaire

As stated earlier, the metro carries far less passengers that it potentially could. This is due to competing bus routes and inadequate feeder services from metro stations.

This is the main reason for the poor financial performance of the metro. It is to be noted that the metro needs to maintain massive infrastructure in order to serve short distance commuters, paying low fares. The viability of the metro perhaps cannot be judged through its financial performance alone; it needs to be seen that the metro enhances the quality of life of thousands of commuters everyday.

Monitoring system

Day to day train operations are monitored continuously from morning to late evening.

Training programme

The training programmes for each category of work has been designed based on the nature of work and are considered quite adequate.

Compliance with maintenance manual

Very strict compliance with maintenance manual is ensured through constant monitoring. Adequate stocks of spare parts/consumables are available on the Metro Railway.

Evaluator comment: Financial performance is relatively poor due to under utilisation of capacity.

Beneficiary views

As part of this evaluation, a survey was carried out to study the profile of metro and non-metro users and their assessment of the metro service and its impacts. The questionnaire used for the survey is provided as Annexure 7.1. The total number of respondents interviewed was 403 out of which 68 percent were males and the rest females. Almost an equal number of users and

non users of the metro were interviewed (202 of the respondents were users, while the rest 201 were non-users).

Socio-economic profile of the sample

The basic profile of the respondents was as follows:

- About two fifth of them were in the age group of 15-25 years.
- Graduates comprised about 40 percent of the respondents.
- The monthly household income of 42 percent of the respondents varied from Rs 5000 – Rs 10,000, followed by 38 percent with a monthly income less than Rs 5000.
- About 73 percent of the respondents lived within 5 km and 23 percent within a range of 6 to 10 km from the nearest metro station.
- Most respondents (94 %) reported that the distance from their work place to the Metro station was within 1-5 km.
- As high as 78 percent of the respondents reported that they did not own a vehicle

The detailed profile of the respondents is given in Table 7.13.

Table 7. 13 Profile of the respondents

	Number of respondents	Percent
Age group		
< 15yrs	4	0.99
15-20yrs	87	21.59
21-25yrs	92	22.83
26-30yrs	63	15.63
31-35yrs	47	11.66
36-40yrs	32	7.94
41-45yrs	22	5.46
46-50yrs	14	3.47
>50yrs	42	10.42
Total	403	100.00
Education		
Primary	51	12.66
Secondary	75	18.61
Higher Secondary	79	19.60
Graduate	161	39.95
Post Graduate	34	8.44
Non Literate	3	0.74
Total	403	100.00
Household monthly income (Rs)		
5000	151	37.47
5000-10000	171	42.43
10000-15000	50	12.41
15000-20000	18	4.47
20000-25000	10	2.48
>25000	3	0.74
Total	403	100.00
Distance of home from nearest metro station (km)		
1-3km	227	56.33
4-5km	67	16.63
6-7km	53	13.15
8-9km	30	7.44
10-15km	16	3.97
16-20km	3	0.74
>20km	7	1.74
Total	403	100.00
Distance from workplace to nearest metro station (km)		
1-3km	337	83.62
4-5km	41	10.17
6-7km	8	1.99
8-9km	3	0.74
10-15km	12	2.98
16-20km	2	0.50
Total	403	100.00
Ownership of vehicle		
Yes	90	22.33
No	313	77.67
Total	403	100.00

Source Executing agency

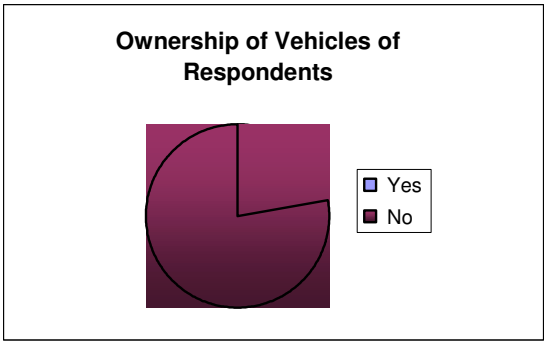


Figure **7.4** Ownership of vehicles of the respondents

Socio-economic profile of users and non-users of the metro

Table 7.14 shows the profile of metro users and non users by sex, monthly household income and ownership of vehicles. It was seen that more than 85% of the users of the metro were male while about 50% of the non-users were male.

With regard to income of metro users, it was seen that about 45% of the users belonged to the income category "Rs 5000-10000". Majority of the non-users belonged to the "<Rs 5000" income level. With the increase in the household income, the number of non-users in the sample went down.

Table 7.14 Socio-economic profile of users and non users of metro

	Users of metro		*Non users of metro*	
	Number of respondents	*Percent*	*Number of respondents*	*Percent*
Sex				
Male	176	87.13	99	49.25
Female	26	12.87	102	50.75
Total	202	100.00	201	100.00
Household monthly income (Rs)				
<5000	43	21.29	108	53.73
5000-10000	92	45.54	79	39.30
10000-15000	41	20.30	9	4.48
15000-20000	15	7.43	3	1.49
20000-25000	8	3.96	2	1.00
>25000	3	1.49	0	0.00
Total	202	100.00	201	100.00
Ownership of vehicles				
Yes	59	29.21	31	15.42
No	143	70.79	170	84.58
	202	100.00	201	100.00

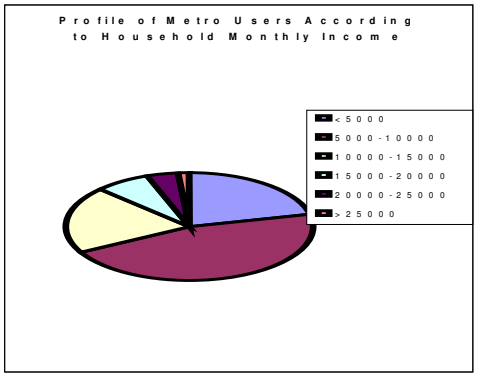


Figure **7.5** Profile of Metro users by income

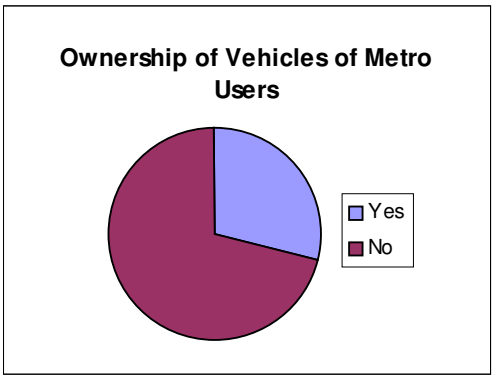


Figure **7.6** Ownership of vehicles of Metro users

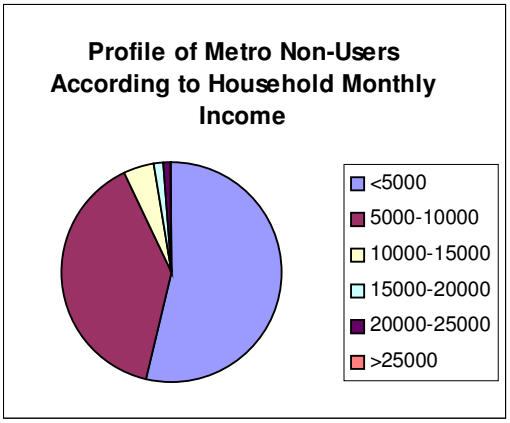


Figure **7.7** Profile of Metro Non-Users according to Household monthly income

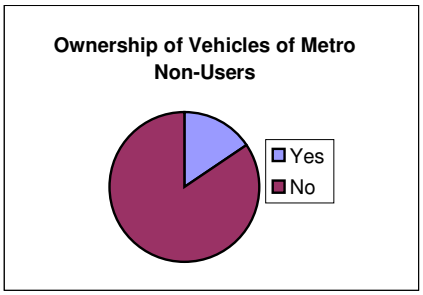


Figure **7.8** Ownership of Vehicles of Metro Non users

Use of other modes of transport

Users of metro

The 202 respondents who used the metro were asked whether they also used any other mode of transport. About 78 percent reported that they did and several of them used multiple modes of transport, along with the metro. The bus was the most widely used mode of transport together with the metro, followed by shared auto and taxi. The use of cycle/ hand pulled rickshaw, private vehicles and auto was also reported (Table 7.15).

Table 7.15 Use of other modes of transport along with the metro

	Number of responses	*Percent of total respondents*
Use of any other mode along with the metro		
Yes	158	78.2
Mode of transport along with metro*		
Bus	101	63.92
Taxi	25	15.82
Auto	6	3.80
Shared auto	75	47.47
Cycle/hand pulled rickshaw	7	4.43
Private vehicle	6	3.80
Others	2	1.27
Train	14	8.86

* Multiple responses

Non-users of Metro railways

The non-users of metro also used multiple modes of transport. More than 89 percent reported that they used the bus as the mode of transport. The use of shared auto was also high (Table 7.16).

Table 7.16 Modes of transport used by non-metro users

Mode of transport *	*Number of responses*	*Percent of total respondents*
Bus	179	89.05
Taxi	43	21.39
Auto	3	1.49
Shared auto	123	61.19
Cycle/hand pulled rickshaw	21	10.45
Private vehicle	9	4.48
Others	2	1.00

* Multiple responses

The following table provides comparative fares for different modes of transport.

Table 7.17 Comparative fares

		Routes	
	Tollygunge-Dumdum	*Tollygunge-Esplanade*	*Esplanade-Dumdum*
Distance by metro route (approx., in km)	16.5	8.2	8.3
Distance by road (approx., in km)	17.2	8.6	8.6
Transport		Fares (Rs)	
Metro	8	6	6
Private Bus	10	5	5
Mini Bus	14	7	7
Taxi (total)	190	90	90
Taxi (per person)*	47.5	22.5	22.5

* Assuming that a taxi will carry four passengers

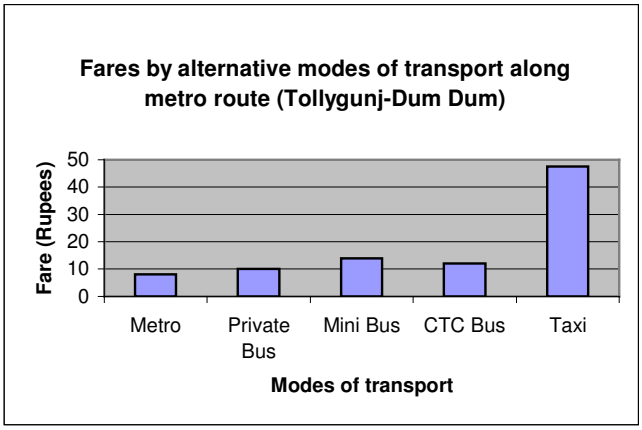


Figure **7.9** Fare comparison of different modes of transport along Metro route

We can see from Figure 7.9 that metro is quite affordable in comparison to other modes of transport. However, from Table 7.17, we can easily see that percentage of passengers using Metro

is still only 9% against 70% of passengers using buses in 2003-2004. The reason behind this would largely be the lack of inter-modal integration of different modes of transport. Besides this, buses provide door-to-door services to the passengers, which is preferred by many.

Frequency and purpose of metro use

The respondents were asked how often they used the metro. About three fifth reported that they used it daily (five days or more in a week). Most of the remaining used it on a weekly basis, and about 5 percent used it less than once a week (Table 7.18).

Respondents used the metro for multiple purposes- about 65 percent said that they travelled by the metro for commuting between home and office. Little less than one-third respondents reported that they used the metro for shopping trips. About 14 percent reported that they used it for commuting between school and home (Table 7.18).

Table 7.18 Frequency and purpose of metro use

	Number of responses	*Percent of total respondents*
Use of metro		
Daily (five days or more in a week)	122	60.40
Weekly (Less than five days in a week)	70	34.65
Monthly (Less than once a week)	10	4.95
Purpose of use of metro *		
Home-office	130	64.36
School-home	28	13.86
Shopping	64	31.68
Personal	9	4.46
College	11	5.45
Pvt. tuition	4	1.98
Occasion	3	1.49
Entertainment	16	7.92
Business	10	4.95

* Multiple responses

Preference for the metro

The respondents were asked about their preference for the metro over other private and public modes of travel. More than three fourth of the respondents preferred the metro very much while 20 percent preferred it to some extent. Only about 4 percent of the users of Metro did not prefer to use it over private and other modes of public transport (Table 7.19).

Table 7.19 Preference for metro over other modes of transport

Prefer the metro or other transport	*Number of respondents*	*Percent*
Yes very much	307	76.18
Yes to some extent	81	20.10
No, not so much	13	3.23
No, not at all	2	0.50
Total	403	100

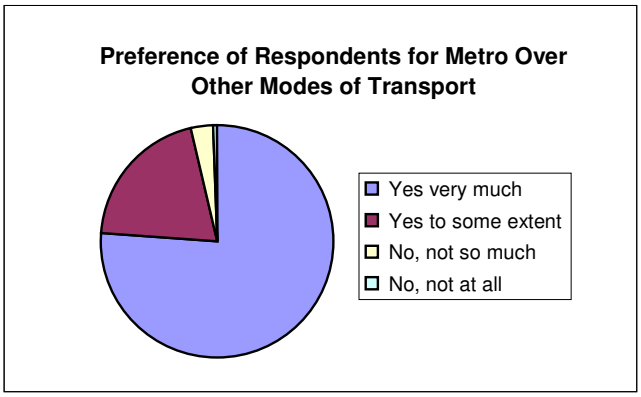


Figure **7.10** Preference of Respondents for Metro over other modes of transport

The 388 respondents who preferred the metro were asked the reasons for their preference. Majority of the respondents cited time saved in commuting as a factor. The time saved varied from 10 - 30 minutes.

About 14 percent also said that they saved money by travelling by the metro- among them, about 55 percent reported to be saving about Rs 5 and 30 percent up to Rs 10.

The other factors for the preference for the metro railways included convenience (98%) and comfort (96%). Little less than one third thought that the metro was user friendly (Table 7.20).

Table 7.20 Reasons for preferring metro over other transport *

Reason		*Number of responses*	*Percent of total respondents*
Saves Time		**382**	98.45
	Amount of time saved daily (in minutes)		
	<10	10	2.62
	10-20	159	41.62
	21-30	158	41.36
	31-40	20	5.24
	41-50	15	3.93
	51-60	18	4.71
	61+	2	0.52
	Total	382	100.00
Saves Money		**56**	14.43
	Amount of money saved daily (in Rs)		
	<5	31	55.36
	5- 10	17	30.36
	11 –15	2	3.57
	16-20	3	5.36
	21+	3	5.36
	Total	56	100.00
Convenience		**381**	98.20
Comfort		**374**	96.39
User friendly		**123**	31.70

* Multiple responses

Social and economic impact of metro

The survey attempted to find out what people felt about the social impacts of the metro railways. All the respondents were asked whether they felt that the construction of the metro had brought down the congestion on the roads. Almost four fifth of them reported negatively in this regard (Table 7.21).

Table 7.21 Has the metro brought down road congestion: responses

Congestion on the road	*Number of respondents*	*Percent*
Yes very much	26	6.45
Yes to some extent	53	13.15
Do not know	3	0.74
No, Not so much	71	17.62
No Not at all	250	62.03
Total	403	100.00

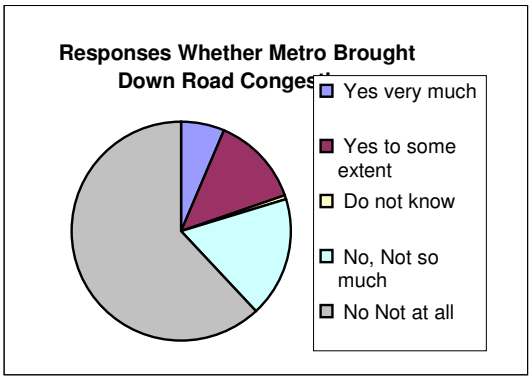


Figure **7.11** Responses whether Metro brought down road congestion

The respondents were also asked whether they thought the metro was affordable by all income groups. While majority of the respondents' felt that the metro was affordable for the lower middle class, upper middle class and rich income group users, only half of the respondents felt that people in the poor income group could afford the metro (Table 7.22).

Table 7.22 Is the metro affordable for different income groups: responses

Income class	*Number of respondents*	*Percent*
Poor class		
Yes	223	55.33
No	180	44.67
Lower middle class		
Yes	387	96.03
No	16	3.97
Upper middle class		
Yes	402	99.75
No	1	0.25
Rich class		
Yes	403	100.00
No	0	0.00

The survey also asked the respondents whether they observed any improvement in the economic / social environment along the metro route due to its existence. Most respondents responded affirmatively to this. About 43 percent reported there was much improvement while 56 percent reported that there was some improvement (Table 7.23).

Table 7.23 Improvement in economic environment along the metro route

Improvement in the environment	*Number of responses*	*Percent of total respondents*
Yes very much	173	42.93
Yes to some extent	227	56.33
Do not know	1	0.25
No, Not so much	2	0.50
Total	403	100.00
Reasons for improvement*		
Establishment of shops around the metro	352	88.00
Improvement in access to a school, hospital	319	79.75
Increase in labour productivity	246	61.50
Less congestion on roads	213	53.25
Provision of feeder services (auto etc)	132	33.00
Others	1	0.25
Total	400	100.00

* Multiple responses

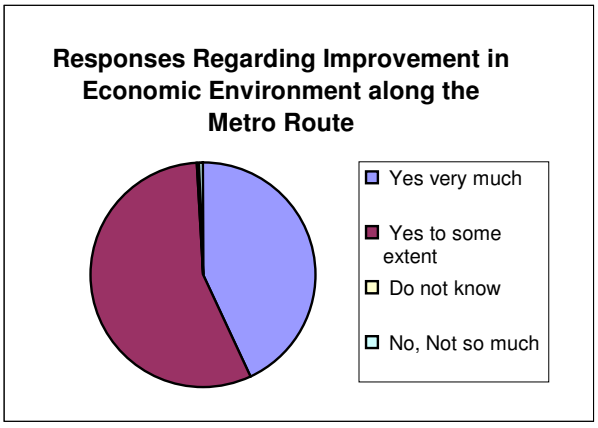


Figure **7.12** Responses regarding improvement in economic environment along the Metro route

The improvement in the economic and social environment was mainly attributed to the establishment of shops around the metro (88%), improvement in access to schools and hospitals (80%), increase in labour productivity (62%), less congestion on roads (53%) and provision of feeder services (33%) (Table 7.23).

On improvements in economic conditions of the residents, the majority of the respondents reported that there had been an improvement in the economic condition of the residents in the city due to the metro. The reasons suggested for this included more employment opportunities (93%), increased access to hospitals, schools, banks and markets (85%), increase in labour productivity (70%), increased opportunities for socialization (57%) (Table 7.24).

Table 7.24 Improvement in economic condition of residents due to the metro

Impact on economic condition of residents	*Number of responses*	*Percent of total respondents*
Yes very much	163	40.45
Yes to some extent	235	58.31
No, Not so much	4	0.99
No Not at all	1	0.25
Total	403	100.00
Reasons for improvement		
More employment opportunities	368	92.46
Increase in labour productivity	279	70.10
Increased access to hospital schools, banks, markets	338	84.92
Increased opportunities for socialization	227	57.04
Others	3	0.75
Total respondents	398	
Reasons for non-improvement		
No economic improvement	2	40.00
I haven't observed and kind of usefulness due to the metro	1	20.00
Has not increased employment opportunities	1	20.00
Not popular in the lower income class	1	20.00
Total	5	

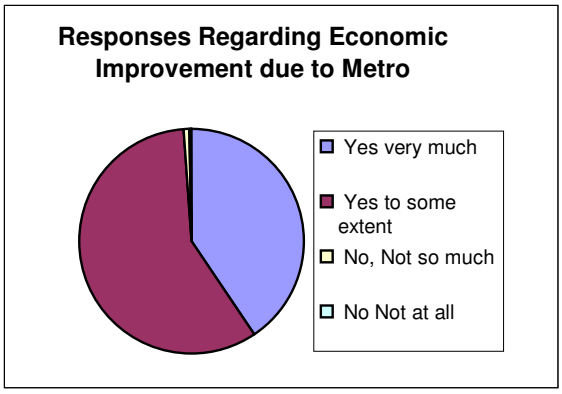


Figure **7.23** Responses regarding economic improvement due to Metro

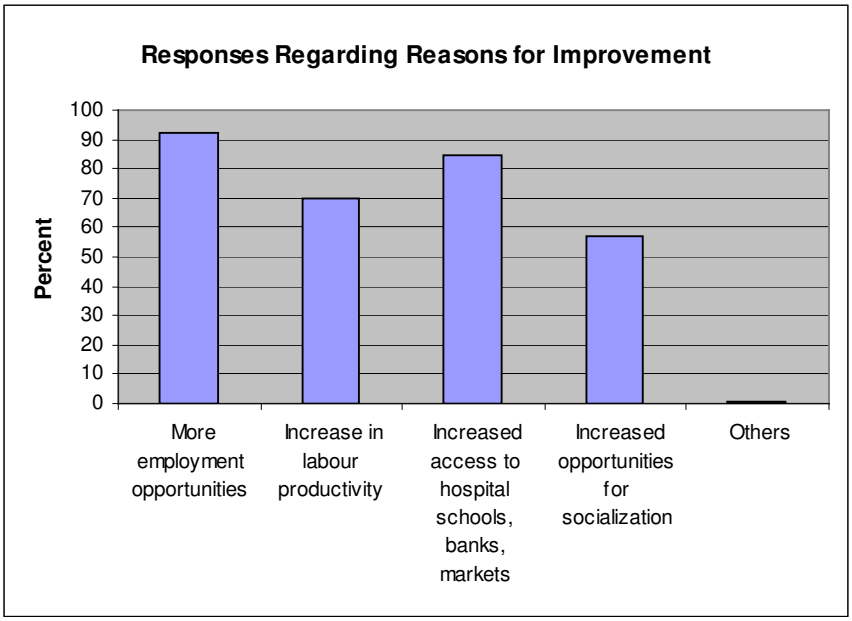


Figure **7.14**Reasons for improvement

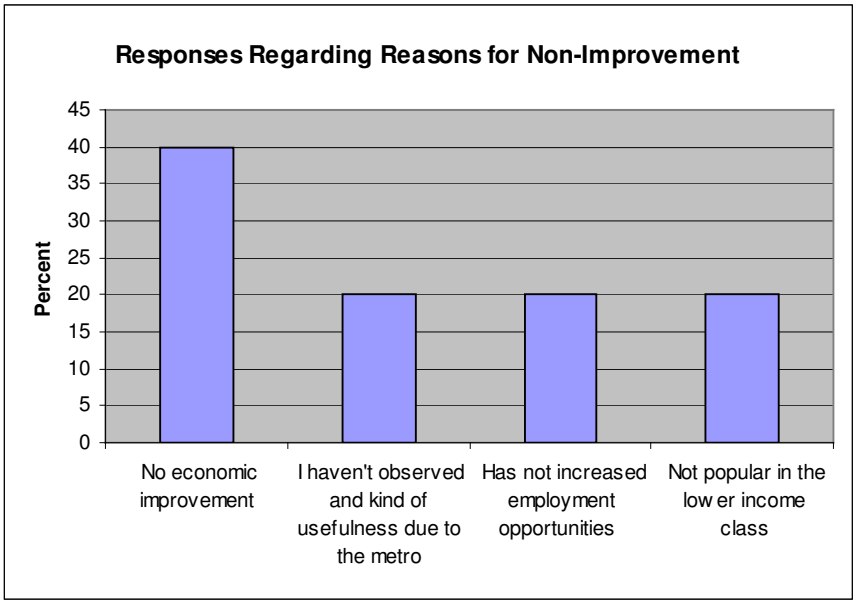


Figure **7.3** Reasons for non-improvement

A majority reported that the metro was a safe mode of travel. More than half the respondents felt that they considered the metro to be a very safe mode of travel, while about 40% felt that the metro was somewhat safe.

The majority of the respondents also reported that the m had enhanced the image of the city in general (Table 7.25).

Table 7.25 Impacts of metro on convenience and safety of travel and image of the city

Has metro made travel easier?	*Number of respondents*	*Percent*
Yes very much	149	37.0
Yes to some extent	177	43.9
Do not know	1	0.2
No, Not so much	47	11.7
No Not at all	29	7.2
Total	403	100
Is it a safe mode of travel?		
Yes very much	213	52.9
Yes to some extent	164	40.7
Do not know	3	0.7
No, Not so much	20	5.0
No Not at all	3	0.7
Total	403	100
Has it enhanced the image of the city?		
Yes very much	345	85.6
Yes to some extent	56	13.9
No, Not so much	2	0.5
Total	403	100

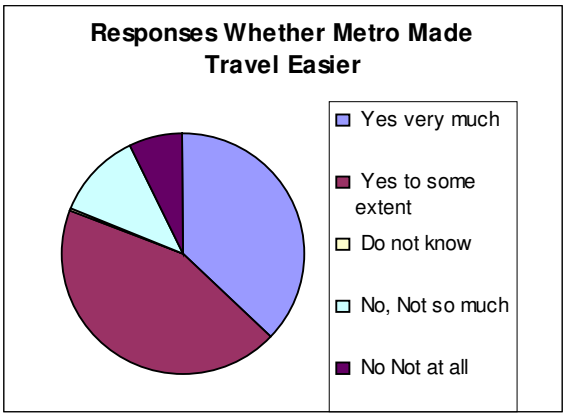


Figure **7.4** Responses whether Metro made travel easier

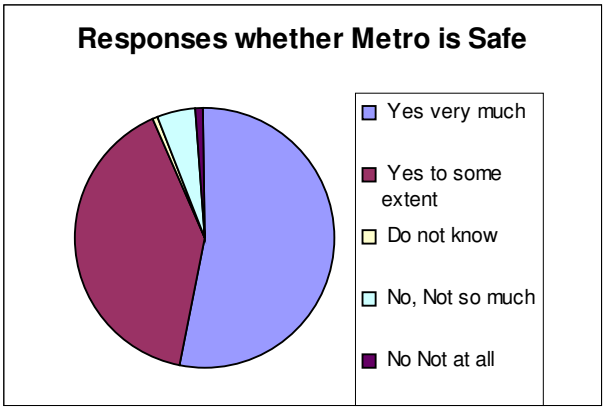


Figure **7.5** Responses whether Metro is safe

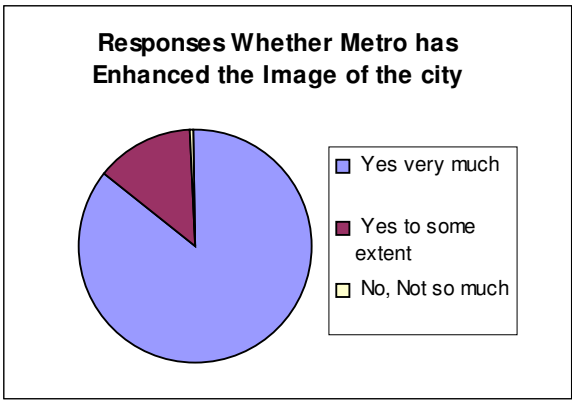


Figure **7.6** Responses whether Metro enhanced the image of the city

Overall Comments of evaluator

The project is highly relevant, and has received positive feedback from users.

However, as mentioned in the report, the metro railway system is running far below capacity. Frequency between trains could be increased so that more passengers could be carried. However, this is not possible since there are competing bus routes, and a large segment of people prefer the buses over the metro, though the metro is affordable and certainly more comfortable than buses. It is therefore important that transport planning is done more effectively so that bus routes along metro routes can be minimised. Further, there should be convenient feeder bus routes from key metro stations. Indeed, many people prefer buses because they can take a bus from a point near their home/office and reach the destination by the same mode of transport. Thus, for metro to be used to capacity, it is important to have well-planned inter-modal integration of transport systems.

ANNEXURE 7.1: TERI QUESTIONNAIRE FOR KOLKATA METRO RAILWAYS CONSTRUCTION PROJECT

Schedule No. ☐☐☐☐

IDENTIFICATION PARTICULARS:

Name of the PSU		☐☐
Name of site / location		☐☐
Date of visit (DD/MM)		☐☐ ☐☐
Result* of the visit		☐
*Result Codes 1 = Eligible and Completed 2 = Eligible but refused 3 = Eligible but incomplete 4=Not Eligible		

TO BE ADMINISTERED TO USERS AND NON USERS OF METRO AND ALTERNATIVE TRANSPORT

FOR OFFICIAL USE ONLY

	Name	*Signature*
INTERVIEWER:	_____	_____
SUPERVISOR:	_____	_____
SPOT CHECKED:	_____	_____

INFORMED CONSENT FORM

Introduction: Good morning/ afternoon/ evening. "My name is…… I'm from a research agency called TNS India. We are carrying out a study to understand peoples' perception about the different infrastructure in the city. Importantly, the results of this study will help us in designing appropriate strategies for the future.

We're interviewing different categories of people. Although it is useful to interview every individual, time and finances restrict our ability to do so. Hence, we select a sample of individuals. You were randomly selected to be interviewed – that means that you were picked by chance to talk with me as are others who are asked to talk with us. This place has also been selected by chance for the survey in order to find out the present scenario.

Confidentiality and consent: I'm going to ask some questions that some people may not feel comfortable answering. I want to assure you that your responses will be completely confidential – that is, no one will ever know what answers you gave because your name will not be linked to your answers. Your answers will be combined with answers from everyone else who is being interviewed so we can understand what is happening to this place as a whole – not just to you as an individual. Your name will never be divulged to anyone. You do not have to answer any questions that you do not want to answer, and you may end this interview at any time.

Your participation in the interview will help us to provide better infrastructure in the city. Kindly spare some time and respond to my questions. It will take approximately 15-20 minutes.

A.	**INFORMATION OF INTERVIEWEE**		
Q No.	**Questions and filters**	**Coding categories and codes**	**Skip to**
1.	What is your name? **PLEASE WRITE IN BLOCK LETTERS**		
2.	Contact details	Phone number: Address:	
3.	Sex of the respondent	Male Female	
4.	What is your age? MENTION IN COMPLETE YEARS	☐☐	
5.	How far have you studied?	Primary Secondary Higher Secondary Graduate Postgraduate Non Literate	
6.	Monthly Income (Rs):	5000 5000-10000 10000-15000 15000-20000 20000-25000 >25000	
7.	No. of Persons in the Household:	_____ __	

8.	Distance of home from nearest metro station (km)	☐☐	
9.	Distance from workplace to nearest metro station (km)	☐☐	
10.	Do you own Car/ motorcycle	Yes No	

B.	**PROFILE OF USERS/NON USERS**		
Q No.	**Questions and filters**	**Coding categories and codes**	**Skip to**
11.	Do you use the Metro?	Yes No	
12.	If 'Yes' (Coded 1 in Q 11) Do you use any other mode along with the Metro?	Yes No	
13.	If "Yes' (Coded 1 in Q 12) Which ones:	Bus Taxi Auto 	

			Cycle/hand pulled rickshaw		
			Private vehicle		
			Others (Specify) Add Tram (since there is tram track along a large part of the metro route)		
14.	How often do you use it?		Daily (five days or more in a week),		
			Weekly (less than five days in a week, but at least once a week		
			Monthly (Less than once a week, but at least once a month		
			Rarely (Less than once month		
15.	For what purpose do you use it?		Home-office		
			Home-school/ college		
			Shopping		
		Others (specify)			

16.	If 'No', (Coded 2 in Q 11) Which mode of transport do you use?	Bus		
		Taxi		
		Auto		
		Shared auto		
		Cycle/hand pulled rickshaw		
		Private vehicle		
		Others (Specify) (Change as in Q13)		
17.	Do you prefer the Metro over private or other modes of public transport?	Yes very much		
		Yes to some extent		
		Do not know		
		No, not so much		
		No, not at all		

Q No.	Questions and filters	Coding categories and codes		Skip to
18	If 'Yes', (Coded 1& 2 in Q 17) Then why?	Time (give an indication of amount saved daily)	1	
		Money (give an indication of money saved daily)	2	
		Convenience	3	
		Comfort	4	
		User friendly	5	
		Others (please specify)	6	
19	If you answer 'No', why? (Coded 4& 5 in Q 17)	Time (give an indication of time lost if traveling by)	1	
		Metro compared to others	2	
		More expensive (give an indication of money lost if traveling by Metro compared to others)	3	
		Convenience/	4	
		Comfort/	5	
		User friendly	6	
		Others (please specify	7	
C.	**SOCIAL IMPACT OF THE METRO**			
20	Do you think that construction of the Metro has brought down congestion on the roads?	Yes very much	1	
		Yes to some extent	2	
		Do not know □	3	
		No, not so much □	4	
		No, not at all	5	
21	Do you think the Metro is affordable by the follwoing income groups (READ OUT ONE BY ONE AND CODE ACCORDINGLY)	Poor	1	
		Lower middle class	2	
		Upper middle class	3	
		Rich	4	
22	Do you think there has been an improvement in the economic/social environment around the metro route due to the Metro?	Yes very much	1	
		Yes to some extent	2	
		Do not know	3	
		No, not so much	4	
		No, not at all	5	
23	If you answer Yes (coded 1& 2 in Q 22), what do you attribute this to?	Establishment of shops around the Metro	1	
		Improvement in access to a school, hospital	2	
		Increase in productivity of work among those who use the metro	3	
		Less congestion on roads	4	
		Provision of feeder services (auto etc)	5	
		□ Others (please specify	6	
24	If you answer No, what do you attribute this to?	_____		

Q No.	Questions and filters	Coding categories and codes		Skip to
25	Do you think the Metro has made any impact on economic conditions of residents in the city generally?	Yes very much	1	
		Yes to some extent	2	
		Do not know	3	
		No, not so much	4	
		No, not at all	5	
26	If you answer Yes (Coded 1&2 in Q 25), what do you attribute this to?	More employment opportunities	1	
		Increase in labour productivity	2	
		Increased access to hospital, schools, banks, markets	3	
		Increased opportunities for socialization	4	
		Others (please specify)	5	
27	If you answer No,(Coded 4& 5 in Q 25) what do you attribute this to ?			
28	Do you think that metro has made travel easier for elderly/ infirm people?	Yes very much	1	
		Yes to some extent	2	
		Do not know	3	
		No, not so much	4	
		No, not at all	5	
29	Do you think that the metro is a safe mode of travel?	Yes very much	1	
		Yes to some extent	2	
		Do not know	3	
		No, not so much	4	
		No, not at all	5	
30	Do you think that metro has enhanced the image of the city in general?	Yes very much	1	
		Yes to some extent	2	
		Do not know	3	
		No, not so much	4	
		No, not at all	5	

Interviewer's Remarks:

……
……

CHAPTER 8 Kolkata transport infrastructure development project

Project and loan profile

Kolkata (earlier Calcutta), the capital of West Bengal, is a unique city with co-existence of different modes of transport. The road space of the city however, is limited (about 6 percent of the total surface area), making it difficult to cope with the increased motorized vehicles, which are rapidly growing in number. To tackle this problem, a comprehensive project- Calcutta Transport Infrastructure Development Project (CTIDP) - was conceived to construct intra-city corridors in the form of flyovers on some of the busiest crossings of the city and to realign some other corridors[1]. The project is a comprehensive package aimed at improving traffic movement and improving the quality of life in the city.

Objectives

The primary objective of the project is to improve accessibility into central and other parts of Calcutta[2], by building flyovers and improvement several existing road junctions.

Project output

The project has delivered the following:

(a) Construction of Vehicular Flyovers at seven different locations. The intersection number where this has happened include[3]:

1. No.1: at Moulali Junction (dropped due to technical reasons)
2. No 3: at Gariahat Crossing
3. No. 5 & 6: between Rabindra Sadan and Beckbagan on A.J.C. Bose Road
4. No. 8: at the junction of Park Street and Chowringhee Road
5. No. 9: across Railway line on Lock Gate Road
6. No. 10: on Park Street across A.J.C. Bose Road at Mullickbazar (dropped due to technical reasons)

(b) Surface Level Improvement at 3 locations[4]:

There has been improvement in the road surface at

1. No.2: at Esplanade
2. No.4: at Shyambazar (dropped)
3. No. 7: at Maniktala crossing (dropped)

- Borrower/ Executing Agency

[1] Refer to CTIDP Booklet provided by Hooghly River Bridge Commissioner
[2] Refer to CTIDP Project Status Report,31st March,2005(Page 2)
[3] Refer to CTIDP Project Status Report,31st March,2005(Page 2-1)

The Borrower/ executing agency for the project is the Government of West Bengal, Transport Department /Roads.

- Outline of Loan Agreement
  The outline of the loan agreement is given in Table 8.1.

Table 8.1 Loan agreement

	ID-P122
Loan Amount	JPY 10,679 Mil
Loan Disbursed Amount	JPY 6,958,683,599
Date of Exchange of Notes	22 January, 1997
Date of Loan Agreement	25 February, 1997
Terms and Conditions	OECF (JBIC) " General Terms and Conditions" dated November 1987
Interest Rate	2.3% p.a
Repayment Period (Grace Period)	5 years
Procurement	OECF (JBIC) "Guidelines for Procurement under OECF loan" dated November 1987
Final Disbursement Date	29 December 2005

SOURCE Executing Agency Questionnaire, HRBC

Status: The project has been completed, but the ex post evaluation has not been implemented.

Evaluation of the project

Relevance

The road network of Calcutta city is highly centralized with most vehicles requiring to pass through the central area and through a few important road corridors. With different modes of transport including non-motorized vehicles like rickshaws severe traffic congestion on the major traffic corridors and intersections has become a regular practice. Also, the city having very limited road space which is about 6 percent of the total area, the project of construction of flyovers is expected to considerably reduce the traffic congestion by streamlining the traffic flow in an orderly manner.

The benefits envisaged from the project include[5]:

- Reducing the traffic congestion at the important intersections, which are mostly located in the central area.
- Increasing the traffic capacity by grade-separation of the through –traffic from the turning traffic at major intersections by constructing vehicular flyovers. Making the bus transport more efficient and attractive by reducing traffic congestion on roads.

[5] Implementation Program for CTIDP (Transport Planning & Traffic Engineering Directorate/Transport Department/Government of West Bengal),May, 1996

- Improve the accessibility to the central area of Kolkata through the newly built Second Hooghly Bridge (the Vidyasagar setu) since some of the proposed vehicular flyovers lie on a major road corridor connecting this bridge.
- Promoting the decentralization of residential and commercial activities by providing improved accessibility to the central area of Calcutta city and also due to more utilization of the Second Hooghly Bridge.

The links between creation of road infrastructure and improvement in socio-economic conditions in the city could be understood through a set of multiplier effects. Creation of fly-overs would reduce congestion in the heart of the city, which would increase traffic speed and reduce commuting time and discomfort. This will in turn increase work productivity while facilitating flow of goods and services to the heart of the city, which also hosts the central business district.

The project is consistent with the *Transport Action Plan (TAP)* for the city. [6]This plan emphasizes, among other things, integration of (transport) services and better use of available resources, strategic transport planning, and integration with land-use plans. This plan links with several other urban plans such as the Municipal Environmental Strengthening and Institutional Development plan. Essentially, a flyover project of this nature attempts to minimally disturb existing land-use and provide more efficient transport services. Moreover, smoother flow of traffic would be expected to reduce pollution levels, and enhance quality of life of both vehicle users and residents of areas adjoining the flyovers. Thus, the project is consistent with the broad thrust of the *Transport Action Plan*.

Evaluator comment: The project is relevant for easing traffic congestion in the heart of the city.

Efficiency

Project scope

The Project consists of four contract packages, consisting of the intersection improvement and existing road/junction improvement for the sake of wide-area traffic management. These are detailed out in Table 8.2.

[6] http://kolkata.wb.nic.in (accessed on 26-2-06)

Table 8.2 Project scope

Contract package	*Intersections*		*Type of work*	*Construction period*
	ID No.	*Name*		
I	8	Park Street	Flyover & At-Grade	24 months (now 40.5 mnth.)
	9	Lock Gate Road	Flyovers & At-Grade	
	2	Esplanade	At-Grade	
II	3	Gariahat	Flyover & At-Grade	29 months (now 65 mnth.)
	4	Shyambazar	At-Grade (dropped)	
	7	Maniktala	At-Grade (dropped)	
III	5&6	AJC Bose Road	Flyover & At-Grade	Taken-over on 12.04.2004
IV	Additional WATM Program		At-Grade	21 months

SOURCE YEC Monthly Progress Report, February, 2005 (Page 2-1)

Status of various Packages[7]

Package I

Intersection 8: Park Street flyover

The work under the above was commenced on 15th November 2001 and was scheduled to be completed by 14th November 2003. The flyover was however completed and opened to traffic only on 19th February 2005.

Intersection 9: Lock Gate Flyover

The lockgate road flyover proper and its 7 m and 4 m wide access roads on either side from B.T. road were completed and taken over on 29th August 2004. The Flyover was opened to traffic with effect from 31st August 2004.

Package II

Intersection 3: Gariahat Flyover

The work for the above flyover commenced on the 1st November 1999. The flyover was completed and opened to traffic on 14th April 2002. The reconstruction of the at grade road with concrete pavement on both sides of the fly over except the junction of Rashbehari Avenue and Gariahat road have also been completed.

Intersection 2: At-grade improvement of Esplanade

All works at Esplanade Intersection have been completed except the following, which are in progress:

- Landscaping and beautification work.
- Installation of traffic signalling system.
- Lying of Mastic Asphalt with profile corrective course is in progress and about 90 percent of the work has been completed.
- All remaining works will be completed by 30th June 2005.

[7] Source: CTIDP Project Status Report,31st March,2005

Package III

AJC Bose Road Flyover

The work commenced on the 15th March 2001 and completed and was opened to traffic on 19th August 2003.

Package-IV

Additional Wide Area Traffic Management Programme

This package comprises of widening of carriageway and de-reservation of the Tram Track thereby increasing the number of traffic lanes. The work commenced on 7th July, 2003 and was scheduled for completion within a period of 9 months. There were seven sub-projects under this package and at present all of them have been opened to traffic.

The Transport Department, Government of West Bengal proposed to include a few additional schemes of road improvement in the contract package IV, expenditure for which could be met from the savings of loan allocation. JBIC through their letter no 2004/NDL (IA)- 174 dated 17.03.2005 informed no objection to the amendment of the contract of package IV as proposed by the State Govt. Amendments of the contract package IV were hence carried out with concurrence of JBIC by which the following additional sub projects were included:

- Canal East Road (from B.T. Road to Manicktala Main Road)
- Manicktala Junction (APC Roy Road with Vivekananda Road)
- Park Street (between Park Circus Jn. and Mallikbazar)
- Rashbehari Avenue (from Triangular Park to Sarat Bose Road)

All the above sub-projects have been taken up for execution. The amended contract of package IV is scheduled to be completed by 30th September 2005.

Brief description of the flyovers

Gariahat Flyover

Gariahat flyover is on Gariahat Road over the intersection with Rashbehari Avenue. The flyover has Golpark at its south and Gariahat Tram Depot at its north. There are two surface lanes on either side of the flyover. The flyover has used an advanced design technology for centrally supported steel structure. Pre-fabricated steel units were brought to the site and were erected using very limited road space. It proved to be helpful in accelerating the pace of construction.

The complexity involved in the construction called for skill and expertise of several teams: engineering and highway design, traffic and geometric design, construction engineering, landscape planners and the likes. It was their collective effort that helped the timely delivery of the transport infrastructure.

The skilled labour came from surrounding towns, and the engineers were both Indian nationals and expatriates from Germany and Japan.

Features of the Gariahat Flyover

Total Length	571.06 m
Width of Carriage Way	2 x 7 m
Abutments	2
Piers	14
Contractor	Senbo Engineering Ltd., Kolkata
Consultant	Yachio Engineering Co. Ltd.
Implementing Agency	Hooghly River Bridge Commissioners
Date of Commencement	1 November, 1999
Opened to traffic	14 April, 2002

SOURCE Booklet on Gariahat Road Flyover provided by Hooghly River Bridge Commissioners

Park Street Flyover

The Park Street Flyover stands on Jawaharlal Nehru Road with Lindsay Street at its north and Middleton Street at south. The structure stands over the ever-busy intersections of Jawaharlal Road with Park Street, Outram Road, Mayo Road and Kyd Street.

Features of Park Street Flyover

Total Length	1350 m
Width of Carriage Way	2 x 7 m
Abutments	2
Piers	21
Contractor	Senbo-Skanska Joint Venture
Consultant	Yachio Engineering Co. Ltd.
Implementing Agency	Hooghly River Bridge Commissioners
Date of Commencement	15 November 2001
Opened to traffic	19 February 2005

SOURCE Booklet on Park Street Flyover provided by Hooghly River Bridge Commissioners

AJC Bose Road Flyover

The flyover extending from D.L. Khan Road – AJC Bose Road crossing to Park Circus Rotary over Circus Avenue ensures an intersection-free east-west corridor.

Features of AJC Bose Road Flyover

Total Length	2.448 km
Width of Carriage Way	East Bound 7.3 m wide (2 lane) , West Bound 7.3 m wide
Piers	21
Contractor	L & T ECC Division
Consultant	Yachio Engineering Co. Ltd.
Implementing Agency	Hooghly River Bridge Commissioners
Project Duration	29 Months
Date of Commencement	15 March 2001
Opened to Traffic	19 August 2005

SOURCE Booklet on AJC Bose Road Flyover provided by Hooghly River Bridge Commissioners

Lockgate Road Flyover

Lockgate Road Flyover is over Cossipore and Chitpur Railway yards connecting B.T. Road and Cossipore Road. It can be used for avoiding the busy Shyambazar five-point crossing.

Features of Lockgate Road Flyover

Total Length	1070 m
Width of Carriage Way	1 x 7 m
Contractor	Senbo-Skanska Joint Venture
Consultant	Yachio Engineering Co. Ltd.
Implementing Agency	Hooghly River Bridge Commissioners
Date of Commencement	15 March 2001
Opened to Traffic	29 August 2004

SOURCE Booklet on Lockgate Road Flyover provided by Hooghly River Bridge Commissioners

Relocation of Utilities[8]

A number of dry and wet utilities had to be relocated before construction of the main flyovers could commence. Dry utilities like gas lines, electric and telephone cables and tram tracks had to be shifted. Relocation of underground wet utilities like filtered and unfiltered water supply and the trunk sewer lines however was done with several problems.

To prevent inconvenience to the people, Tube Heading or Micro- Tunneling method was used for relocation of main sewer lines. The modern method affected minimum road surface, while providing absolutely new lines for underground utilities.

Further, necessary steps were taken to ensure that minimum inconvenience was caused to public during construction of the flyover. In consultation with Kolkata Traffic police, a plan for traffic diversion and its management was prepared. During the entire construction period, 2 lanes were made available on Gariahat Road for each direction of vehicular movement.

The disruption lasted for roughly the project period.

[8] Source: Booklet on Gariahat Road Flyover provided by Hooghly River Bridge Commissioners

Implementation Schedule

Time Frame

As per the loan agreement, the loan closure date was 29th May 2005. The date has however been extended to 29th December 2005. The present status of the project is given in Table 8.3.

Table 8.3 Present status

Package	*Date of Tender*	*Date of opening of Tender*	*Date of commencement of work*	*Schedule time for construction*	*Extension granted up to*
Package I	Done (31.3.2000)	(27.06.2000)	15/11/2001	24 months	30/06/05
Package II	Done	Done	1/11/99	29 months	30/06/05
Package III	Done (4.4.2000)	Done (12.07.2000)	15/3/2001	29 months	31/03/04* (completed)
Package IV			07.07.2003	27 months	30.09.2005

*Certain items of works are being carried out during the defect liability period

SOURCE CTIDP Project Status Report, 31st March, 2005, Page-4

Project Cost

The cost of the project is given in Table 8.4. The present situation of the civil construction costs are detailed in Table 8.5.

Table 8.4 Project cost **(billion rupees)**

(A)	Civil work	2.96
(B)	Consulting Services	0.41
(C)	Interest during Construction	0.20
(D)	Contingencies	0.30
(E)	General Administration, Taxes	0.13
(F)	Total	4
	OECF Contribution	3.4
	Government of West Bengal contribution	0.60(0.47 for civil work)

SOURCE CTIDP Project Status Report, 31st March 2005, page no-3

Table 8.5 Present situation: civil construction cost

Intersection No.	*Package Number*	*Name of intersection*	*Project Cost in Rs Crores after amendment where made*
8	I	Park Street	63.62
9	I	Lock Gate	28.87
10	I	Mullickbazar	Dropped
Sub Total			92.49
2	II	Esplanade	11.90
3	II	Gariahat	47.60
4	II	Shyambazar	Dropped
7	II	Maniktala	Dropped
			59.50
1	III	Moulali	Dropped
5 & 6	III	Rabindra Sadan / Beck Bagan	142.70
AWATM INCLUDING	IV	In different roads	52.03
PHASE 2			
Total			346.72

SOURCE CTIDP Project Status Report,31st March, 2005,page-4

Cost efficiency

The following table provides information on estimated and actual expenditures (both for the foreign and the local component). We also provide a graph showing year-wise comparison of estimated and actual expenditure. It is seen that the actuals are lower than the estimated values for all the years.

The basic reason for this is the delay in project execution right from the tendering stage. It is to be noted that the project was implemented at the heart of the city, which has a very high population density. The population density for Kolkata is 24718 per sq km as per the 2001 census; for areas covered by the project, the density is expected to be higher. Projection execution in such crowded areas poses a special challenge, specially since it involves temporary relocation of critical utilities.

Table 8.6 Estimated and actual expenditure

Year	*Estimated expenditure (yen)*			*Actual expenditure (yen)*		
	Foreign Total Cost	*Local Total Cost*	*Total Cost*	*Foreign Total Cost*	*Local Total Cost*	*Total Cost*
1997-98	654375960	165644040	820020000	344159646	133293	344292939
1998-99	109798416	27793584	137592000	81529915	53671483	135201398
1999-00	721711200	182688800	904400000	472523620	110641776	583165396
2000-01	1783051200	451348800	2234400000	1037866482	245134834	1283001316
2001-02	3320322390	840482610	4160805000	886141613	220025502	1106167115
2002-03	2513707980	636302020	3150010000	1401116196	431444689	1832560885
2003-04	2530685430	640599570	3171285000	2072701778	456666641	2529368419

Source Executing agency

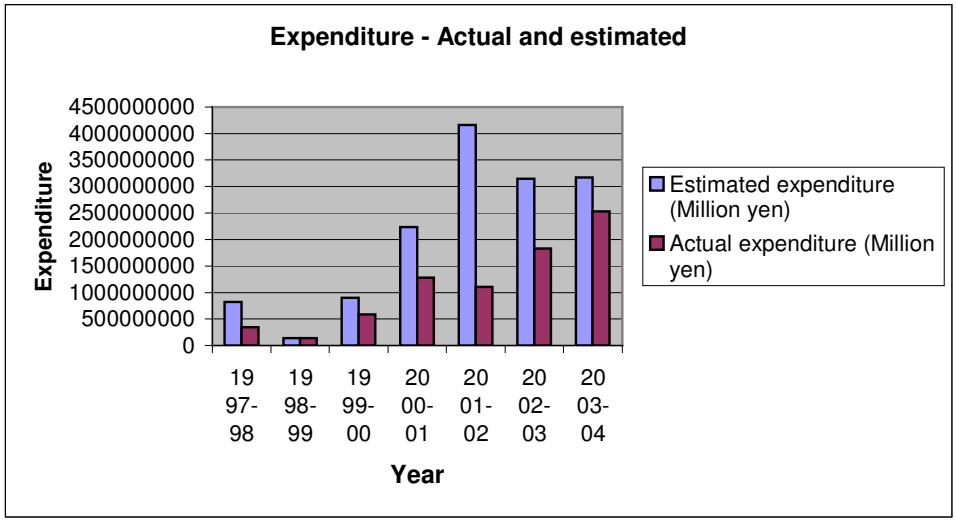


Figure **8.1** Estimated and actual expenditure

Evaluator comment: The project suffered from time overruns, largely due to operational constraints resulting from the congested nature of the project area.

Effectiveness

1) Annual Average Daily Traffic (AADT) (PCU/12 hours)	1998 (estimation)		
	Intersection no.		
	1, 24,021	4.18,040	7. 14,043
	2. 26,895	5. 19,172	8. 28,527
	3. 16,487	6. 18,847	10. 23,512
	Total from 2001 to 2021 (1,000 Rs.)		
2) Saving of driving expenses (Rs/hrs)	Route*	Route 2**	Route 3***
	1,320,950	910,808	462,746
3) Saving of transport time (Rs/hrs)	5,650,976	3,951,721	4,377,736
4) Decrease of traffic accidents (Rs.)	Not available		
5) EIRR	20.08%		
	* Route 1: intersection No.1, 5-6, 10		
	** Route 2: intersection No. 9,4,7		
	*** Route 3: intersection No. 3,8,2		

SOURCE Log frame, CTIDP

The table above shows projected figures for key effectiveness indicators based on the logframe. Actual figures were not available for comparison based on traffic data. Hence, effectiveness of the project has been captured in terms of beneficiary feedback through primary surveys, and the results have been discussed in a later section. For example, we have reported the percentage of users who say that flyovers have reduced travel time, and the percentage of users who consider the flyovers safe. These serve as

(qualitative) indicators of transport time saved and accident rate respectively.

Evaluator comment: There is generally a high level of user satisfaction; however traffic data to quantitatively assess effectiveness was not available.

Impact

Social impacts: land acquisition and relocation

There has been no land acquisition and relocation for the construction of flyovers in and around Kolkata.[9]

This was because all construction was done on empty government land.

Demography & Socio-economic

Detailed socioeconomic surveys conducted on a representative sample covering residential & commercial institutions around the site revealed that the people's perceptions on the project were by far positive. They felt that the project would lead to improvement of the traffic situation in the area and they would feel less disturbance than at present due to a lower degree of congestion.[10]

Environmental impacts[11]

Land use

The flyover construction would not result in changing the existing land use pattern as no additional acquisition of land is necessary. For the same reason, the construction and operation of the flyovers would also not result reduction of soil fertility or erosion.

Surface and ground water quality

The waste dumps generated from the project can impact the water quality (surface and ground water). As the project has not generated any such wastes which could result in contamination of water and hence the impacts due to project on the quality is negligible.

Impact on Air Quality

The Caline3 Dispersion Model[12] developed by California Department of Transportation was used for simulation of the

[9] (Refer to Environmental Impact Assessment Study, CTIDP (Transport Department/ Government of West Bengal,/HRBC/ YEC), March 1998)

[10] Source: Environmental Impact Assessment Study, CTIDP (Transport Department/ Government of West Bengal,/HRBC/ YEC), March 1998

[11] The section is based on Environmental Impact Assessment Study, CTIDP (Transport Department/ Government of West Bengal,/HRBC/ YEC), March 1998

[12] Caline3 is a third generation line source air quality model. It is based on the Gaussian Diffusion Equation and employs a mixing zone concept to characterize pollutant dispersion over the roadway. Given source strength, meteorology, site geometry and site characteristics, the model can reliably

major pollutants emanated from automobiles, viz. CO and NO_x . Three different scenarios were considered-

- The present day 1997-1998 scenario
- The year 2000-2001 scenario without the flyover project and
- The year 2000-2001 scenario with the flyover project

The model simulation exercise revealed that the air quality around the project site would improve with the setting up of the facility with the resultant post project 1- hour CO and 24-hour NO_x levels being 6.30 mg/m^3 respectively due to improvement in emission factors coupled with the increase in corridor speeds leading to a concomitant decrease in the emission levels.

Noise

Currently, the high noise levels recorded are a resultant of the vehicular noise being accentuated by the incessant use of horns. This phenomenon is expected to be alleviated with the smooth flow of traffic once the facility is operational and thus doing away with the present frequent stop-go traffic conditions.

Ecology

The construction of the flyover along its proposed alignment would affect about 200 trees. However, the project proponent would be ready to undertake compensatory plantation in this regard. Co-operation of concerned Civic Authorities would be sought to identify suitable lands for this purpose.

Evaluator comment: The flyovers has very limited negative social and environmental impact, and a high level of positive social impact due to easing of traffic congestion.

Sustainability

Financial Status

CTIDP 122 Financial Status Upto 31.03.2005

1.	Total Project Cost Estimate Rs 400 Crores		
	(i)	Loan from JBIC	Rs 340
	(ii)	Govt. of West Bengal	Rs 60
		Total	Rs 400

SOURCE CTIDP Project Status Report, 31st March, 2005 (Page no 8)

2.	Consultancy Service from 7th May 1997			
	Contract Price Yachiyo Engg. Co. Ltd.	Rs	Yen Portion	Rupee Value
		302,892,990	894,580,052	

SOURCE CTIDP Project Status Report, 31st March, 2005 (Page no 8)

predict pollutant concentrations for receptors located within 200 metres of roadway

3.	Name of Package	Contractor	Contract Value (RS)
	Package I 24 months/extended upto 30.06.05	Senbo-Skanska JV Commenced from 15/11/2001	689,193,286.56
	Package II Extended upto 30.06.2005	SENBO ENGG.Co.Ltd. Commenced from 01/11/1999	636,300,172.27
	Package III 29 months/completed on 31.03.05	M/SL&T Ltd Ecc Div Commenced from 15/03/2001.	1,777,273,650.00
	Package IV 26 months 3 weeks (up to 30.09.05	TANTIA CONSTRUCTION CO LTD Commenced from :-08/07/2003	520,270,888.00*

* The disbursement by JBIC upto 31st March 2005 was Rs 494639875 (or 95% of the contract value). *The previous figures were taken from the CTIDP project status report, in which there was an error.*

SOURCE CTIDP Project Status Report, 31st March 2005(Page no 8)

4.	Disbursement Upto 31 st March, 2005				
			JBIC	JBIC	Govt. of West Bengal
			Rs	Yen Portion	Rs
	[a]	Consultancy	347,122,619	928,085,640	-
	[b]	Contingency			294,719,318
	[C]	Senbo-Skanska JV (Civil)	585,161,053		114,659,250
	[d]	Senbo Engg.Co . Ltd.(Civil)	378,785,690		72,149,655
	[e]	L & T LTD. ECC.Divn.(Civil)	1,138,560,218		216,868,611
	(f)	Tantia Construction Co.Ltd.(Civil)	306,314,481	-	58,345,615
		Total Rupees	2,755,944,061	928,085,640	756,742,449

SOURCE CTIDP Project Status Report, 31st March 2005(Page no 8)

C T I D - P R 0 J E C T (I D P - 1 2 2)

Expenditure Statement From 1997-98 To
31st March, 2005

Major Break Up of Project Contingent Expenditure

1.	CONTINGENCIES	Rs	14,638,185
2.	PUBLIC AWARNESS PROGRAMME	Rs	4,763,964
3.	LEGAL EXPENSES	Rs	461,635
4.	BANK CHARGES	Rs	6,929,431
5.	COMPUTER & SOFTWARE ACCESSORIES	Rs	1,059,458
6.	FUND PLACED TO CMC, KMDA,CTC(Civil)	Rs	9,026,110
7.	PLANTATION PROGRAMME	Rs	4,249,900
8.	Charges of land use (Rail, Metro Rail)	Rs	29,535,358
9.	1% MARGIN MONEY TO D.E.A., GOVT. OF INDIA	Rs	395,111
	Total (Rs)	Rs	71,059,152
10.	Utilities relocation of PWD shifting of pillar box (Civil)	Rs	1,83,154
11	Utilities relocation of CESC reimbursable from JBIC (Civil)	Rs	61,231,383
12	Electricity charges of Package- I, II & III	Rs	8,881,772
13	Electricity charges of Package- I, II & III	Rs	153,363,856
Total		**Rs**	294,719,318

SOURCE CTIDP Project Status Report, 31st March, 2005 (Page no 9)

Since flyovers are not a revenue-earning infrastructure project, it is difficult to ascertain sustainability through financial statements. However, as the table above depicts, a large share of the project contingent expenditure is on heads like utility relocation, public awareness, plantations etc, which makes the project sustainable in the long run. These three heads account for about 24% of the total contingent expenditure of the project.

Organisational status

The implementing agency has the following staff profile:

Category	*2001-02*	*2002-03*	*2003-04*
Technical	61	77	69
Administrative*	37	33	42

* Finance, stores, general administration etc.

It is clear that the project implementing staff is maintained at a steady level over the years. Monitoring as done packagewise by one senior engineer for each package – under the supervision of the Chief Engineer of the project. There are targeted institutional training programmes for regular updating of technical knowledge.

Evaluator feedback: Financial sustainability is not much relevant in the context of this project. In other respects, specially organisational, the project is high on sustainability.

Beneficiary views

A survey was carried out to understand the perspective of the flyover users and their assessment of its impacts on the society. 312 respondents were interviewed for determining the impact of flyovers on the community.

Basic profile of the sample

The basic profile of the respondents was as follows.

- A major proportion of the respondents interviewed belonged to the service class (33 percent) and the business community (23 percent).
- Graduates comprised about 39 percent of the respondents.
- The monthly household income of 43 percent of the respondents was less than Rs 5000 followed by 39 percent with a monthly income between Rs 5000 – Rs 10000.
- About 21 percent of the respondents were using their own vehicles.

A detailed profile is given in Table 8.7.

Table 8.7 Profile of the respondents

Occupation	*Number of respondents*	*Percent*
School student	12	3.85
Collage student	34	10.90
Factory worker	2	0.64
Daily wage earner	6	1.92
Service holder	103	33.01
Business	73	23.40
Self-employed	27	8.65
Housewife	43	13.78
Others	12	3.85
Total	312	100.00
Education		
Illiterate	2	0.64
Literate without schooling	4	1.28
Upto 5th	5	1.60
6th to 9th	27	8.65
10th complete	45	14.42
12th complete	75	24.04
Graduation complete	123	39.42
Post graduate and above	31	9.94
Income		
<5000	133	42.63
5000-10000	121	38.78
10000-20000	40	12.82
20000+	16	5.13
Don't know/Can't say	2	0.64
Ownership of vehicles		
Drive own vehicle	67	21.47

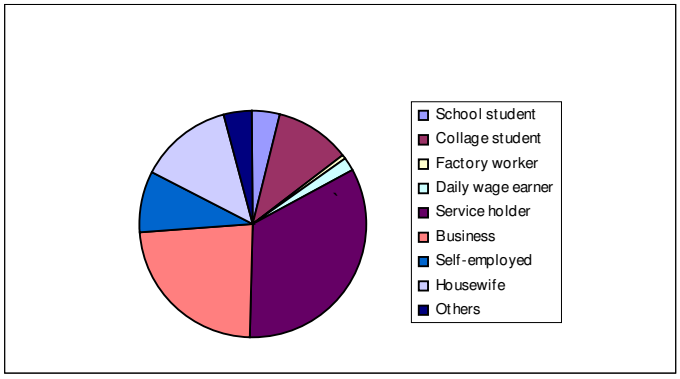


Figure **8.2**Profile of the Respondents

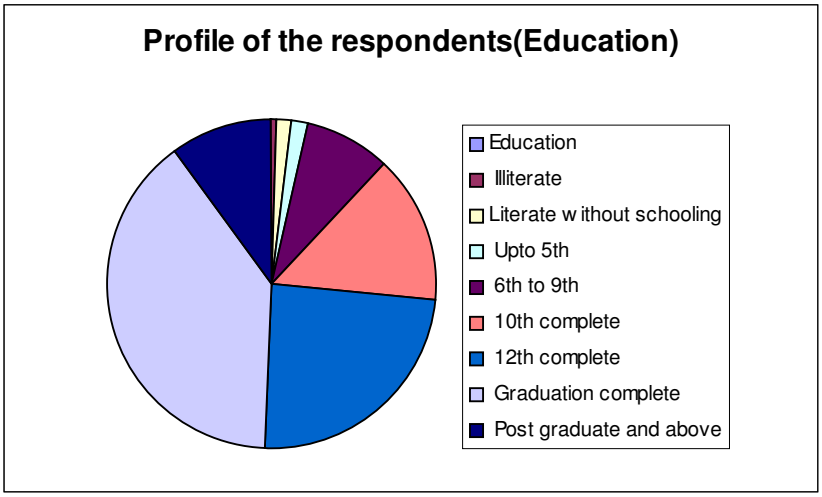


Figure **8.3** Profile of the Respondents (Education)

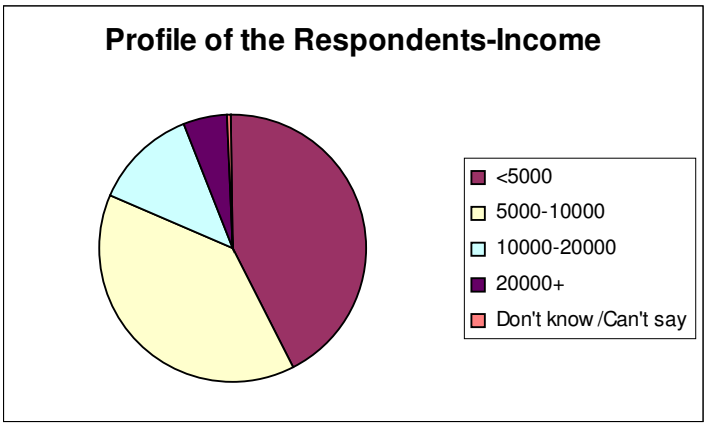


Figure **8.4** Profile of the Respondents (Income)

Use of flyover

More than half of the surveyed respondents (53 percent) reported usage of the flyovers everyday followed by 46 percent who were using it on an average 2-3 times a week (Table 8.8).

Table 8.8 Frequency of flyover usage

Frequency of use of flyover	*Number of respondents*	*Percent*
Use it every day	165	53.05
2-3 Times a week	143	45.98
Once a week	3	0.96
Total	311	100

Frequency of buses plying over the flyover

About 82 percent of the respondents when asked if enough buses were plying over the flyover, reported affirmatively (Table 8.9). Further, while nearly 84 percent were satisfied with the frequency of the buses, only 47 percent agreed that their frequency has increased after construction of flyovers (Table 8.9).

Table 8.9 Frequency of buses plying over the flyover

Enough buses ply over flyover	*Number of respondents*	*Percent*
Yes	255	81.73
No	53	16.99
Don't know/Can't say	4	1.28
Total	312	100
Frequency of the buses satisfactory		
Yes	261	83.65
No	51	16.35
Total	312	100
Frequency of buses increased from the time when flyover were not there		
Yes	147	47.12
No	165	52.88
Total	312	100

Driver's perceptions: flyover safety

As high as 89 percent of the respondents reported that flyovers were safe and low accident-prone. Those who were of the other opinion (flyovers as accident prone areas) attributed multiple reasons for low safety. A majority (about 71 percent) amongst them stated that the prime cause for accidents was violation of traffic rules, while 65 percent regarded flyovers to have instigated reckless driving (Table 8.10).

On being asked if they enjoyed driving over the flyover, as high as 97 percent of the respondents reported in affirmative. Those who did not enjoy using the flyover mentioned congestion as being the major reason (75 percent). A few (25 percent) also pointed out pollution as being the reason for non-usage (Table 8.10).

Table 8.10 Percent of respondent by safety of flyovers and enjoyment of drive on it

Safety of flyovers in terms of accident	*Number of respondents*	*Percent*
Yes	278	89.10
No	34	10.90
Total	312	100
Reasons for flyovers not being safe *		
Flyover have instigated for reckless driving	22	64.71
The condition of the roads are poor	19	55.88
There is violation of traffic rules	24	70.59
Total	65	
Enjoy while driving on flyovers		
Yes	304	97.44
No	8	2.56
Total	312	100
Reasons for not enjoying while driving over flyover		
There is too much of congestion	6	75.00
There is pollution	2	25.00
Total	8	100

* Multiple response

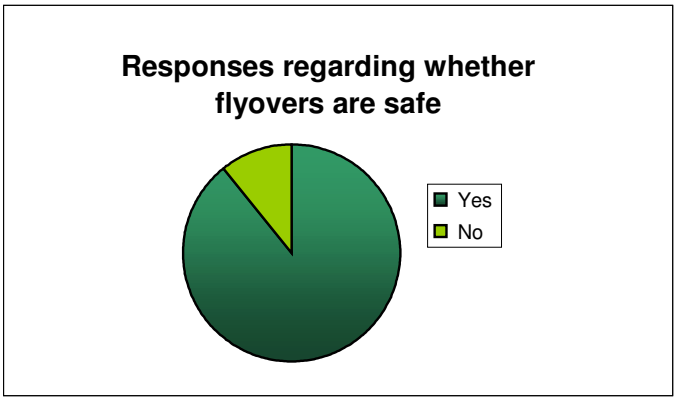


Figure **8.5** Responses for Flyover safety

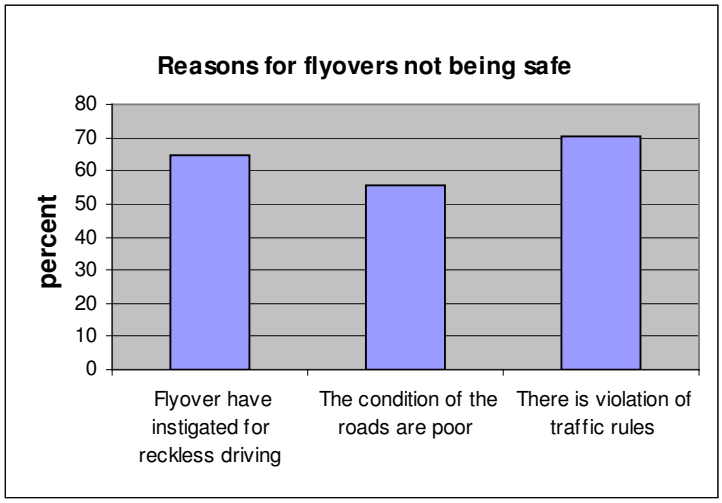


Figure **8.6** Reasons for flyovers not being safe

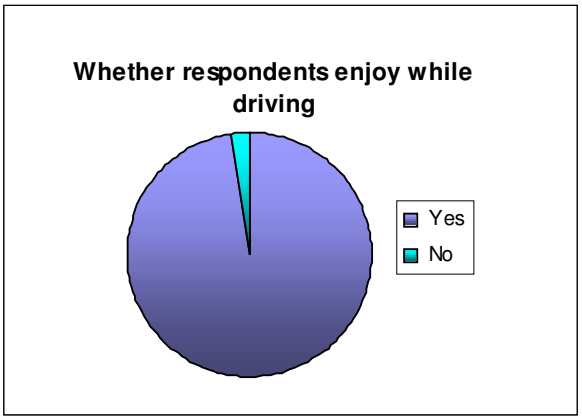


Figure **8.7** Whether respondents enjoy while driving

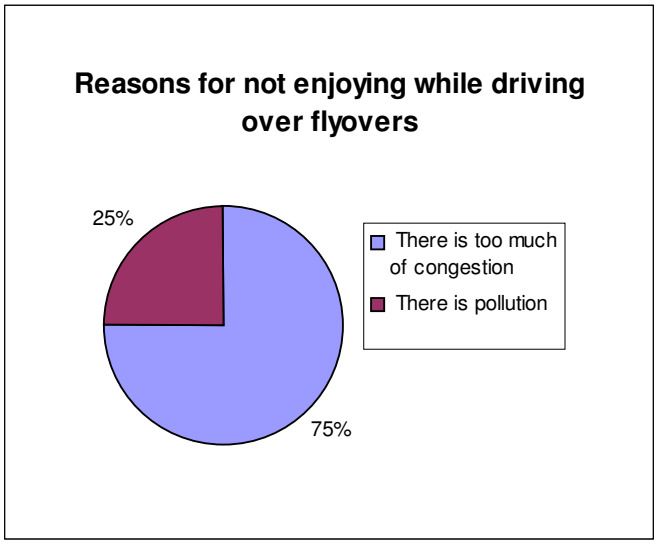


Figure **8.8** Reasons for not enjoying driving over flyovers

Impact of flyovers: social

Commuting time

Almost all respondents reported the commuting time to have reduced after they started using the newly constructed flyovers (Table 8.11).

Table 8.11 Reduction in commuting time by using flyovers

Flyover usage has reduced the commuting time	*Number of respondents*	*Percent*
Yes	311	99.67
No	1	0.33
Total	312	100

Road congestion and city outlook

All the respondents except two agreed that the flyover construction has enhanced the city's image (Table 8.12). Further, when asked whether the flyovers had brought down the congestion on the roads, about 31 percent of were of the view that it has to some extent, while about half of the respondents 55 percent reported that congestion of the city has not gone down despite the construction of flyovers (Table 8.12).

Table 8.12 Social impacts of flyovers

Flyovers have enhanced the image of the city	*Number of respondents*	*Percent*
Yes	310	99.36
No	2	0.64
Flyovers decreased the congestion on the road		
Yes very much	43	13.78
Yes to some extent	96	30.77
No, Not so much	69	22.12
No Not at all	104	33.33
Total	312	100

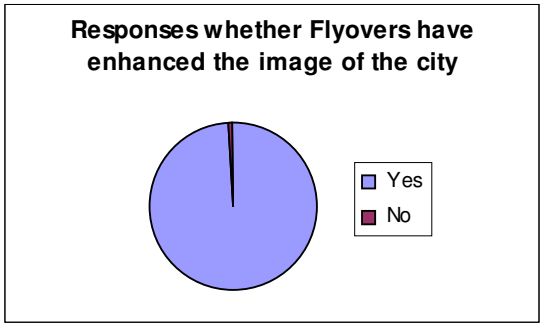


Figure **8.9** Whether Flyovers have enhanced the image of the city

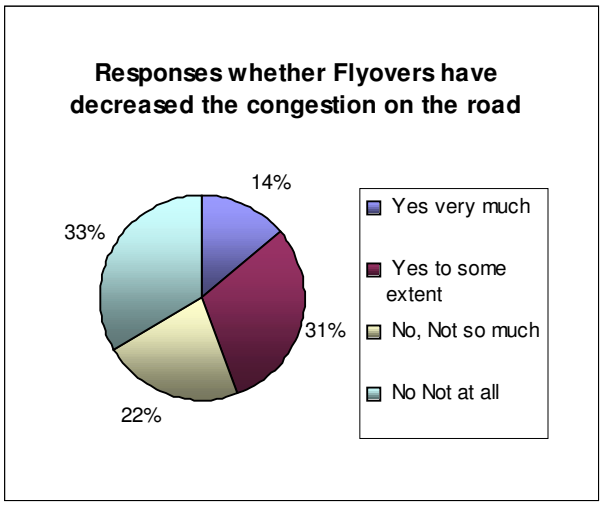


Figure **8.10** Whether flyovers have enhanced the image of the city

Impact of flyovers: environmental

More than 97 percent of the respondents agreed that flyovers have had a positive impact on the environment. Of these 34 percent stated that the impact was considerable. Increased access (77 percent) and establishment of shops around the flyover (19 percent) were considered as the main attributes to this improved environment (Table 8.13).

Table 8.13 Environmental impact of flyovers

Improvement in the environment	*Number of respondents*	*Percent*
Yes very much	105	33.65
Yes to some extent	198	63.46
No, Not so much	4	1.28
No Not at all	5	1.60
Total	312	100
Attributes for improvement		
Establishment of shops around the flyover	236	77.89
Improvement in access to a school, hospital	59	19.47
Increase in labour productivity	3	0.99
Less congestion on roads	5	1.65
Total	303	100

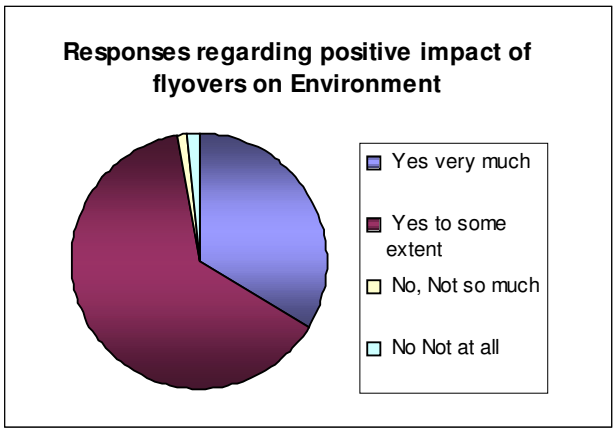


Figure **8.11** Responses regarding positive impact of flyovers

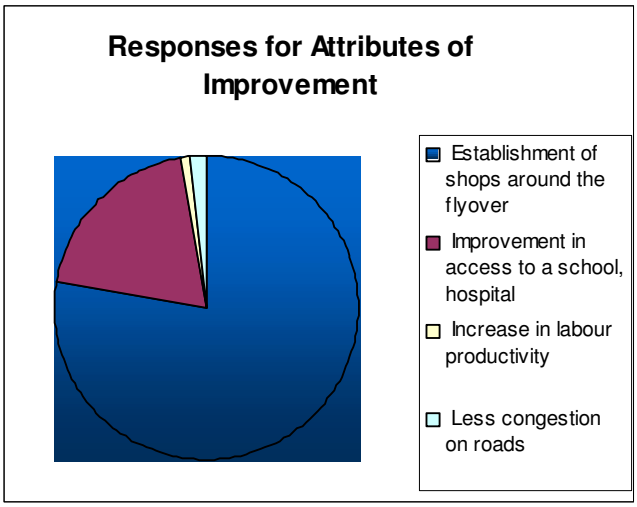


Figure **8.12** Responses for attributes of environment

Impact of flyovers: economic

Nearly 66 percent of the respondents agreed that construction of the flyovers had increased the employment opportunities. Further, about 23 percent reported an increase in labour productivity mainly due to reduction in the commuting time. Some respondents (11 percent) also stated increased access to the hospital, schools and markets as a result of flyovers (Table 8.14).

Table 8.14 Economic impacts of flyovers

Attribute	*Number of respondents*	*Percent*
More employment opportunities	200	66.01
Increase in labour productivity	69	22.77
Increased access to hospital, schools, banks, markets	32	10.56
Increased opportunities for socialization	1	0.33
No of shop increased	1	0.33
Total	303	100

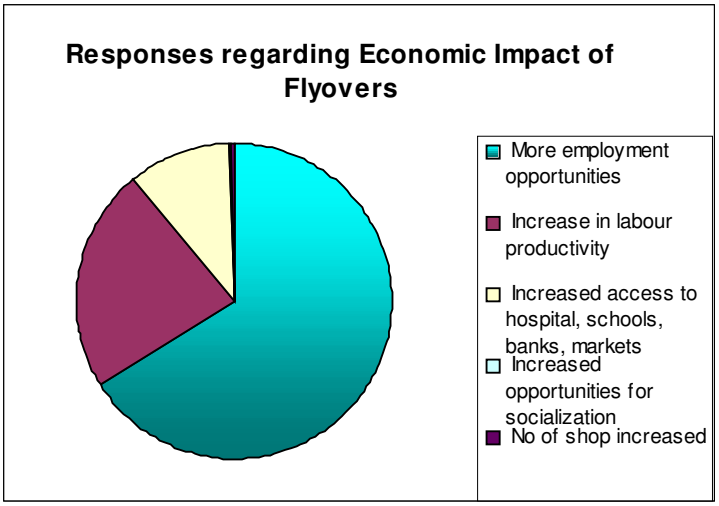


Figure **8.13** Responses regarding Economic Impact of flyovers

ANNEXURE 8.1: TERI QUESTIONNAIRE FOR FLY-OVER USERS

Schedule No. | | | | |

IDENTIFICATION PARTICULARS:

Name of the PSU		
Name of site / location		
Date of visit (DD/MM)		
Result* of the visit		

*Result Codes 1 = Eligible and Completed 2 = Eligible but refused 3 = Eligible but incomplete 4=Not Eligible

TO BE ADMINISTERED AT A SCHOOL/ COLLEGE/ OFFICE COMPLEX WHERE THERE IS A SIGNIFICANT NUMBER OF USERS

FOR OFFICIAL USE ONLY

	Name	*Signature*
INTERVIEWER:	_____	_____
SUPERVISOR:	_____	_____
SPOT CHECKED:	_____	_____

INFORMED CONSENT FORM

Introduction: Good morning/ afternoon/ evening. "My name is…… I'm from a research agency called TNS India. We are carrying out a study to understand peoples' perception about the different infrastructure in the city. Importantly, the results of this study will help us in designing appropriate strategies for the future.

We're interviewing different categories of people. Although it is useful to interview every individual, time and finances restrict our ability to do so. Hence, we select a sample of individuals. You were randomly selected to be interviewed – that means that you were picked by chance to talk with me as are others who are asked to talk with us. This place has also been selected by chance for the survey in order to find out the present scenario.

Confidentiality and consent: I'm going to ask some questions that some people may not feel comfortable answering. I want to assure you that your responses will be completely confidential – that is, no one will ever know what answers you gave because your name will not be linked to your answers. Your answers will be combined with answers from everyone else who is being interviewed so we can understand what is happening to this place as a whole – not just to you as an individual. Your name will never be divulged to anyone. You do not have to answer any questions that you do not want to answer, and you may end this interview at any time.

Your participation in the interview will help us to provide better infrastructure in the city. Kindly spare some time and respond to my questions. It will take approximately 15-20 minutes.

Q No.	Questions and filters	Coding categories and codes	Skip to
18.	What is your name? **PLEASE WRITE IN BLOCK LETTERS**		
19.	Contact details	Phone number: Address: Email	
20.	Sex of the respondent	Male ---------- ---------- Female	
21.	What is your age in completed years? **(WRITE THE AGE IN THE SQUARE BOXES)**	☐☐	
22.	What is your occupation?	School student 1 …… 2 …….. 3 Collage student 4 …… 5 …….. Factory worker…… …… … Daily wage earner …… …… Service holder …… …… Business Self-employed Housewife Other (specify)_____ _____	

23.	What is your highest level of education? **(SINGLE CODE)**	Illiterate ..... 1 Literate without schooling---------- 2 ----------Upto 5th 3 6th to 9th ---------- 4 ---------- 5 ---------- 6 10th complete---------- 7 ---------- 8 12th complete ---------- ---------- Graduation complete---- ---------- Post Graduate and above---------- ----------	
24.	Combining all your sources of income, how much do you earn on average in a month? **(WRITE THE INCOME IN NUMBERS IN THE SQUARE BOXES WITH LEADING ZEROES)**	Rs ☐☐☐☐☐ Don't know/Can't say 88888	
25.	What is the address of your work place / school / collage?		
26.	How far is it from your place of residence? **Mention distance in KM**	☐☐☐	
27.	What is the name of the flyover you use?	_____ _____ _____	
28.	Do you drive or use a public transport for commuting?	Drive own vehicle 1 Use public transport 2	

29.	Has your commuting time been reduced by using flyovers?	Yes 1 → No 2 →	
30.	How much time has been reduced? **Mention In Minutes (ONE WAY)**	☐☐☐	

Q No	Questions and filters	Coding categories and codes	Skip to	Q No.
31.	Why has the commuting time not reduced?	There is congestion over the flyover There is congestion at the intersection points Any other _____ (specify)	1 2	
32.	Do you think that the flyovers are safe in terms of accident etc?	Yes No	1 → 2	
33.	Why do you think that the flyovers are not safe?	Flyovers have instigated for reckless driving The condition of the roads are poor There is violation of traffic rules Any other_____ _____ (specify)	1 2 3	
34.	Do you enjoy a drive over the flyover?	Yes No Don't know / Cant say	1 → 2 3	
35.	Why don't you enjoy your ride over the flyover?	There is too much of congestion There is pollution Any Other_____ _____ (Specify)	1 2	

36.	Are there enough bus routes over the flyover to suit your needs?	Yes No Don't know / Cant say	1 2 3	
37.	Is the frequency of the buses satisfactory?	Yes No	1 2	
38.	Has the frequency increased from the time when flyover were not there?	Yes No	1 2	
39.	Do you think that the flyovers has enhanced the image of the city?	Yes No	1 2	

CHAPTER 9 Haldia port modernization project

Project and loan profile

Objectives

To increase the cargo handling capacity and improve operational efficiency at the Haldia Port so as to enable the port to handle increasing volumes of cargo.

Project scope and salient features

The project entailed the construction of the Oil Jetty 2. The incidental facilities created under the project are as follows:

- Fire fighting equipment.
- Waste oil disposal facilities.
- 2 tug boats (traction: 35 tons; also used as fire boats).
- Navigational and berthing aids.
- 1 trawler (200 HP)
- Loan agreement

Of total project cost of 8,525 million yen, the ODA loan covered the entire foreign currency portion (3,463 million yen) and a part of the local currency portion (328 million yen when converted) for a total of 3,791 million yen. The remaining local currency portion was covered by a loan from the central government and funds from the executing agency.

Status

The project is completed and ex post evaluation has been carried out.

Evaluation of the project

Relevance

There are 12 major ports in India including Calcutta and its outer port Haldia and about 140 minor ports along India's coastline. Haldia port is located on the right bank of the Hooghly river-a tributary of the river Ganges. Development of the Haldia port as an outer port for Calcutta started during the 1960s. However, growth in vessel size in recent years and the geographical constraints of the Calcutta Port Complex led to strengthening of its role as a substitute port, and cargo was increasing every year.

The development of Haldia port was important because the existing oil jetty became unstable due to riverbed erosion. A limitation on the weight became necessary because of this. Some of the facilities were damaged over time, and the port could not meet the demand for transport of crude oil, petrol and lubricants. Oil and container handling facilities and capacity suffered from insufficiencies. Thus sensing the need of the hour, the government of India and Calcutta Port Trust decided to construct a second oil jetty along with the reinforcement of the existing (Number 1) oil

jetty and procurement/installation of cargo handling equipment. However, it was also consistent with the seventh five-year development plan (1985-1989) goal to "improve the operational efficiency of national ports".

The planned cargo handling capacity of major ports was to be 344.4 million tons at the end of the plan, however, the actual volume was 289.1 million tons during the 9th five-year plan (1998-2002). However, in the following national development plan the government announced that as the cargo handling capacity are not a constraining factor any longer, it is necessary to improve the quality of services and shorten the number of waiting days, and in addition to that, the cargo handling capacity is to be increased to 415 million tons (annual growth of 6%) at the end of tenth five-year plan (2007).

The relevance of the project remains while the plan is being implemented as in terms of improving the services provided by existing port infrastructure and shortening the waiting time. There are strong policy based connections between Haldia Port Modernization Project and India's tenth five-year plan where the goal is to "improve port services, including reductions in demurrage time".

Evaluator comment: The project is highly relevant.

Efficiency

Output

The output was originally planned to include the following three components-

1. Reinforcement of No. 1 oil jetty
2. Construction of No. 2 oil jetty and incidental facilities
3. Improvement of cargo handling facilities

But among the three items, (1) and (3) were excluded. Component (1) was financed by the executing agency and excluded from the ODA loan portion of the project. However, the details of the problems with the jetty were identified by a comprehensive investigation of the executing agency, and each pile supporting the jetty was reinforced.

Component (3) was excluded from the output because of delays in gaining approval from the government in connection with the detailed design. Subsequently, demand for container transport had increased at Haldia Port and the executing agency procured two Rail Mounted Quay Cranes (RMQC) and four Rubber Tiered Gantry Cranes (RTG) with its own funds.

Component (2) was executed almost in tandem with the original plans. However, some minor adjustments were made based on geographical and physiographical conditions at the site. These adjustments were made in consideration of the environment

and in response to recommendations[13] made by the Oil Coordination Committee (OCC), a governmental organization.

According to the executing agency the reasons for changing the output can be outlined as the components that were excluded were not funded by the Japanese ODA loan.

Implementation schedule

According to the executing agency, the following delays occurred in the implementation schedule.

Planned and actual Schedule

Item	*Planned Schedule*	*Result*
L/A conclusion	October 1986	December 1986
Prequalification survey	April 1986-June 1986	September-December 1986
Bidding	July 1986-April 1987	January 1987-August 1988 (A) *
		January 1987-February 1989 (B) *
Construction	May 1987-October 1988	September 1988-April 1990 (A)
		March 1989-January 1991 (B)

A: International Bidding portion (platform, dolphin, loading arm, etc)

B: Local Bidding portion (approach, walkway, etc)

The delays were attributed to changes in the bidding system. Initial bidding was undertaken for both international (foreign currency) and domestic (local currency) portions. But as the price for the local currency portion was higher than expected, the foreign and local currency portions were separated and the bidding was undertaken again. Although construction work proceeded at a favorable pace, the domestic (local currency) portion was prolonged due to the effects of tidal currents. As a consequence, the entire project was delayed by 28 months.

However, because of the helping hand laid out by Indian Oil Corporation, the major user of the port, these delays had no significant adverse effects on initially targeted project benefits.

Project Cost

A comparison of planned and actual project costs is given below.

[13] Specifically, the OCC recommended reinforcements to walkway materials, changes to fire fighting equipment (pump tyres), etc.

Comparison of Planned and Actual project Costs

Output	*Foreign Currency total (million yen)*		*Local currency total (100 thousand rupees)*	
	Planned	*Actual*	*Planned*	*Actual*
(1) Reinforcement of No. 1 oil jetty	543		289	
(2) Construction of No. 2 oil jetty and incidental facilities	1580	1933	2189	4246
(3) Improvement of cargo handling facilities	1025		342	
(Reserve fund, price escalation)	315		555	
Total	3463	1933	3375	4246

Further, details of the costs involved in the construction of the No. 2 oil jetty are given below.

Comparison of Original and Actual Costs for No. 2 Oil Jetty

Item	*Foreign currency total (million yen)*		*Local currency total (100 thousand rupees)*		*Total* (million yen)*	
	Planned	*Actual*	*Planned*	*Actual*	*Planned*	*Actual*
Berthing/mooring facilities	920	540.19	198	516.85	1217.00	961.42
Service Platform	-	286.92	155	285.20	232.50	519.36
Approach/walkway/pump room	-	-	316	500.00	474.00	407.50
Fender/bollards etc	24	41.13	17	99.07	49.50	121.87
Capital dredging	-	-	33	-	49.50	0.00
Floating landing equipment	188	286.44	65	188.76	285.50	440.28
Fire fighting equipment	27	109.11	90	368.87	162.00	409.74
Electrical equipment Electrolyte protection equipment	53	54.49	50	146.78	128.00	174.12
Waste of oil disposal facilities	-	-	100	607.74	150.00	495.31
Navigation aids	368	614.50	1165	1532.50	2115.50	1863.49
Total	1580	1932.78	2189	4245.77	4863.50	5393.08

(Note: The exchange rate fluctuated from Rp 1=15 yen at appraisal to Rp 1=8.15 yen)

Both foreign currency and local currency portions exceeded the initial budget because of the following reasons:

1) Between 1986 and 1991, domestic prices rose above projections and local currency procurement costs also increased.

2) Excluding for the "dolphin" [14] and the "electrolyte protection equipment" [15], changes in the output mentioned above caused the price to increase.

3) Import duties were higher than expected on the procurement of some of the elements.

[14] This is a free-standing columnar structure that is built in the sea at a distance from the land and is used for berthing

[15] This system prevents the discharge of corrosion currents by artificially passing an electric current, in order to protect the pipelines from corrosion

Since revenues from port dues exceeded initial forecasts, this overrun has not had a significant impact on the profitability of the project.

Consultant and Construction Contractor Performance

The executing agency evaluated the consultant favourably, stating that it had the expertise, design and coordination skills, and bidding appraisal ability. The construction contractor met the delivery schedules of both foreign and local currency portions (except when delays occurred due to external causes).

Evaluator comment: There were some delays in project implementation due to logistic constraints.

Effectiveness

Cargo handled

The traffic projections of HDC made up to 2005 envisage a 50% increase in POL products and 100% increase in the number of containers (1,30,000 TEUs) handled. This implies that the total traffic by 2005 would be around 25 million tonnes per year. In tune with these projections plans are afoot for improving the navigation channel, increasing the draft and expanding the port railway system and creating additional:

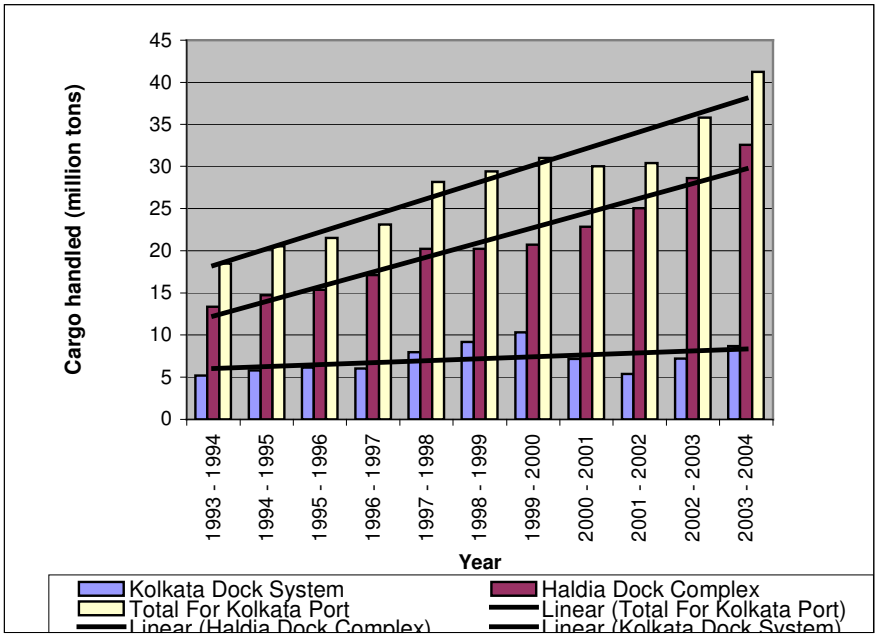
- Container handling equipment
- Cargo berths
- Third liquid cargo jetty
- Storage facilities

Kolkata Port is ranked third amongst major ports of India in terms of cargo traffic handled during 2003-04. The volume of cargo handled by the Port during the year 2003-2004 was 41.26 million tones compared to 35.804 million tones handled during the previous year, implying an increase of 15.24%. The import traffic of the Port increased by 3.776 million tones (14.27%) and the export traffic increased by 1.68 million tones (17.98%) during 2003-2004, in comparison to corresponding cargo handling figures of the previous year.

Statistics of cargo handled by Kolkata Dock System and Haldia Dock Complex are given in Table 9.1 below. During 2003-2004, the traffic handled at Kolkata Dock System (KDS) increased by 14.92 lakh tons (20.72%) and the traffic at Haldia Dock Complex (HDC) increased by 39.64 lakh tons (13.86%) as compared to the traffic handled during 2002-2003. Table 9.2 provides the volumes of export and imports handled by the two ports.

Table 9.1 Cargo handled In Last Twenty Years (**Million Tones**)

Year	*Kolkata Dock System*	*Haldia Dock Complex*	*Total For Kolkata Port*
1984 - 1985	3.988	6.536	10.524
1985 - 1986	4.163	7.964	12.127
1986 - 1987	4.047	8.025	12.072
1987 - 1988	4.393	8.678	13.071
1988 - 1989	4.338	9.885	14.223
1989 - 1990	4.339	10.350	14.689
1990 - 1991	4.126	11.114	15.240
1991 - 1992	4.157	11.843	16.000
1992 - 1993	5.157	13.180	18.337
1993 - 1994	5.169	13.327	18.496
1994 - 1995	5.804	14.731	20.535
1995 - 1996	6.124	15.391	21.515
1996 - 1997	6.023	17.101	23.124
1997 - 1998	7.952	20.205	28.157
1998 - 1999	9.163	20.224	29.387
1999 - 2000	10.313	20.713	31.026
2000 - 2001	7.158	22.842	30.000
2001 - 2002	5.374	25.029	30.403
2002 - 2003	7.201	28.603	35.804
2003 - 2004	8.693	32.567	41.260



The figures denote a steady increase over the last ten years. They also show the increasing importance of the Haldia Dock Complex. Thus, while the cargo handled by the Kolkata Port has remained almost static, the amount handled by Halida Dock has increased steadily, as the trendline in the above chart clearly shows.

Table 9.2 Volume of imports and exports handled at the Kolkata Dock System and the Haldia Dock system (**In lakh tonnes**)

Year	*Import*	*Export*	*Total*
A. KOLKATA DOCK SYSTEM (KDS):			
1999 – 2000	90.60	12.53	103.13
2000 – 2001	59.29	12.29	71.58
2001 – 2002	44.90	8.84	53.74
2002 – 2003	63.37	8.64	72.01
2003 – 2004	75.59	11.34	86.93
B. HALDIA DOCK COMPLEX (HDC):			
1999 – 2000	158.76	48.37	207.13
2000 – 2001	172.50	55.92	228.42
2001 – 2002	184.60	65.69	250.29
2002 – 2003	201.23	84.80	286.03
2003 – 2004	226.77	98.90	325.67

Table 9.3 provides the status of the cargo handled (Crude and POL) split by Jetty.

Table 9.3 Oil jetty wise cargo break up of crude & POL products [Haldia dock complex]

Year	*Oil jetty-I (in tones)*		*Oil jetty -II (in tones)*		*Oil jetty -III (in tones)*		*Barge jetty (in tones)*	*Total (in tones)*	
	Crude	*Pol*	*Crude*	*Pol*	*Crude*	*Pol*	*Pol*	*Crude*	*Pol*
2-2003	20080	1752309	2008045	1946682	5700977	254037	155964	7729102	4108992
3-2004	30892	1501883	3104317	2349610	7271202	171496	170445	10406411	4193434

SOURCE Questionnaire filled up by the Executing Agency

Table 9.4 Cargo handling status

	Parameter		*FY 2002 (2002-2003)*	*FY 2003 (2003-2004)*
1	Total cargo (Container, TEU)		117138	136657
2	Cargo (million tons)			
		Total	28.60	32.57
		Crude Oil	7.73	10.41
		POL	4.11	4.20
		Fuel Coke	3.37	3.20
		Coking Coal	4.30	4.47
		Iron ore	2.69	3.75
		Fertilizer	0.36	0.25
		Fertilizer Material	0.45	0.37
		Containers	1.85	2.28
		Other	3.74	3.64
3	Total tonnage of incoming vessels (GRT,million tons)		35.72	39.53
4	Berth occupancy rate *		71.59%	70.25%
		No.1 Oil jetty	67.48%	71.34%
		No.2 Oil jetty	55.35%	61.93%
		No.3 Oil jetty	45.70%	52.45%
5	Average waiting time (days/vessel)		0.87	0.97
6	Berth charge / day		Rs 529710*	Rs 508858*
7	Maximum DWT (No. 2 jetty)		105051.00	105051.00
8	Weekly working hours (average)		157.5	157.5

Note Calculation at 6 above = Total Berth Hire Charge Billed / 365 for all berths at HDC.
SOURCE Calcutta Port Trust (executing agency Haldia Port.)

Container traffic

Container traffic (ship face) increased considerably at Kolkata Port during 2003-2004. Total number of TEUs handled at Kolkata Port during 2003-2004 increased by 16.17% and the total containerized tonnage increased by 20.11% compared to the traffic handled during the previous year. At HDC, there was an increase of 16.66%

in respect of TEUs handled while at KDS the increase was of 15.62%. Containerized tonnage increased by 22.99% at HDC, while that at KDS increased by 16.55%. Intermodal handling at KDS and HDC during 2003-2004 was 1,06,509 TEUs and 1,27,186 TEUs, respectively, compared to 93,490 TEUs and 105,697 TEUs handled during the previous year.

Number of containers (TEUs) and containerized tonnage handled at KDS and HDC during the years 2003-2004 and 2002-2003 are shown below.

Table 9.5 Number of containers handled (**In tonnes**)

	2002-2003			*2003-2004*		
	KDS	*HDC*	*Total*	*KDS*	*HDC*	*Total*
Import	65524	44853	110377	77515	54054	131569
Export	40361	72285	112646	44904	82603	127507
Total	105885	117138	223023	122419	136657	259076

Table 9.6 Volume of containerized cargo (**In Tones**)

	2002-2003			*2003-2004*		
	KDS	*HDC*	*Total*	*KDS*	*HDC*	*Total*
Import	923375	650854	1574229	1110067	839115	1949182
Export	574406	1199103	1773509	635666	1436139	2071805
Total	1497781	1849957	3347738	1745733	2275254	4020987

Table 9.7 Ship calls at Kolkata port (**In Number**)

Year	*KDS*	*HDC*	*Total*
1999 - 2000	983	1279	2262
2000 - 2001	726	1447	2173
2001 - 2002	674	1570	2244
2002 - 2003	725	1676	2401
2003 - 2004	762	1835	2597

Table 9.8 Railway traffic (**In Thousand Tones**)

Year		*Inward*	*Outward*	*Total*
	KDS	624	85	709
1999 - 2000	HDC	4034	5431	9465
	TOTAL	4658	5516	10174
	KDS	428	9	437
2000 - 2001	HDC	4509	5867	10376
	TOTAL	4937	5876	10813
	KDS	507	4	511
2001 - 2002	HDC	5373	5709	11082
	TOTAL	5880	5713	11593
	KDS	609	5	614
2002 - 2003	HDC	6755	6645	13400
	TOTAL	7364	6650	14014
	KDS	998	80	1078
2003 - 2004	HDC	7682	6367	14049
	TOTAL	8680	6447	15127

SOURCE Official website of Calcutta Port Trust (www.portofcalcutta.com)

Evaluator comment: The project has been effective in general; however in some cases effectiveness has been limited by poor access roads.

Impact

Haldia is fast growing into a major industrial centre of eastern India. In the present phase of expansion an additional area of about 6 to 8 thousand hectares is being planned to be acquired and developed into a mega industrial township. Supported by the major port complex, Haldia with its existing and proposed manufacturing base and oil refineries is ideally suited for industries exporting bulky finished goods or importing voluminous raw material.

The upcoming major petrochemical complex of Haldia Petrochemicals adds a new dimension to these possibilities by acting as the mother unit for setting up both upstream and downstream industries. Rs 51, 700 million (US$ 1477 million) project, construction work has already started. The other mega project in Haldia, with downstream opportunities, is the Purified Terephthalic Acid (PTA) project being implemented by Mitsubishi Chemical Corporation of Japan at an estimated cost of Rs 14000 million (US$ 400 million). Land for the project has already been earmarked.

Apart from opportunities in various manufacturing ventures in petrochemicals, chemicals and heavy engineering, the projected need for support infrastructure also throws up diverse

opportunities in the area of infrastructure projects, both within the city and to connect Haldia to the rest of the World. The existing infrastructure in Haldia is as follows.

- National Highway (NH 41) connects Haldia with the Mumbai - Calcutta Highway (NH6). Connected with the railway network via Panskura on the Howrah Kharagpur section by electric traction.
- Calcutta can also be accessed through waterways by ferry service (Catamaran).
- Has surplus power, primarily from the 1200 MW Kolaghat Thermal Power Station, which is now operating below capacity.
- Self sufficient in water, supplied from the Rupnarayan river.
- Telecom and social infrastructure like housing complexes, educational institutions and recreation facilities exist to support present industries and population of half a million in the area.

Table 9.9 lists the major existing and upcoming industrial units.

Table 9.9 Existing major units in industrial units in Haldia

Industry	*Product*
Exide Industries Ltd.	Automotive Batteries
Consolidated Fibers & Chemicals Ltd.	Acrylic Staple Fiber
Him Containers Ltd.	Marine Containers
Hindustan Lever Ltd.	Industrial Phosphate
Indian Oil Corporation Limited	Oil Refinery Complex
Shaw Wallace & Co. Ltd.	Dimethanate Fenithrothion

In addition, Haldia has 118 registered small scale and cottage industries.

Upcoming industrial and infrastructural units in Haldia

Projects in construction

- Haldia Petrochemicals Limited (naphtha cracker)
- Indian Oil Corporation (LPG storage and bottling)
- Indian Oil Corporation (Haldia- Barauni Pipeline)
- IBP (Petroleum products)
- ITW Signode India Limited
- IBP- CALTEX Limited (LPG storage)
- Shamon ISPAT Limited (coal roll mill)
- Mitsubishi Chemical Corporation (PTA)
- Bhushan Industries Limited (cold roll mill)
- South Asian Petrochemicals Limited (pet resin)

Projects finalized

- TCG Refineries Limited
- Western Petro-Diamond Limited (POL storage)
- Allied Deals (India) Limited (copper wire rod)
- Poly park

Proposals in planning stage

- HPL downstream industries
- Paharpur Group (fertilizer plant)
- Indian Oil Corporation Power plant
- Export Promotion Industrial Park (EPIP)

Industries in pipeline

Industry Name	*Product*
TCG Refineries Ltd.	Oil Refinery
Marcus Oils Chemical Pvt. Ltd.	ylene Waxes
IOC Lube Blending Limited	Lube
Manaksia Limited	Aluminum and Steel
Triton Corp Limited.	Tin Smelter Project
Econ India.	Drinking Water& Soda Water
R. D. B. Rasayans Ltd.,	HDPE, PLB & HDPE Ducts.
Chitral Merchants Pvt. Ltd.,	Jute Weaving and Processing Unit
Five Star Shipping Agency (P) Ltd.	
Rakshit Chemicals	Aluminum Plant Unit.
M/S Rehab Lifting Co. (P) Ltd.,	Down stream business.
S. M. Plastic	Down stream business
Indian Tanning Industries Pvt. Ltd.	
Assent Waste Management Ltd.	
Haldia Paper Boards Ltd.	Duplex Board Manufacturing Plant
Rejoin Petro-Plast	Plastic Goods

SOURCES www.shilpabichitra.com, www.portofcalcutta.com

Evaluator comment: The project has made significant impact on industrial development in the region.

Sustainability

The project is functioning as expected in terms of its objectives viz, to improve cargo handling facilities and increase operational efficiency . The growing relative importance of the Haldia port is apparent from the Haldia Port Complex Profit and Loss Statement and balance sheet provided by the Calcutta Port Trust.

Table 9.10 Haldia Port Complex Profit and Loss Statement (**million rupees**)

	Fiscal Year	*1999 (1999-2000)*	*2000 (2000-01)*	*2001 (2001-02)*	*2002 (2002-03)*	*2003 (2003-04)*
Operating Income	Cargo handling/storage	1564.7	1835.6	2263.0	2609.29	2820.76
	Port/docking fees	3616.9	4697.4	6257.5	3183.97	3848.29
	Rail Tariffs	253.2	274.6	308.5	371.08	410.37
	Property rental	239.0	302.8	323.0	352.88	395.48
	Total	5673.8	7110.3	9152.0	6517.22	7474.91
Operating expenditure	Cargo handling/storage	343.4	415.2	427.7	441.42	437.01
	Port/dock facilities costs	2997.9	3198.3	3525.6	3327.33	3524.67
	Rail facility costs	153.4	144.5	160.8	158.58	187.29
	Land/Buildings for rent	143.8	169.8	154.7	140.06	141.65
	Administrative costs	446.8	499.1	474.6	467.85	474.80
	Total	4085.3	4426.9	4743.3	4535.24	4765.42
	Gross profit	1588.5	2683.4	4408.6	1981.98	2709.48
	Finance/ miscellaneous income	320.6	420.9	446.5	428.25	310.25
	Finance/ miscellaneous expenditure**	1089.7	2138.7	3170.3	1142.75	1128.21
	Net Profit***	819.4	965.7	1684.8	1267.48	1891.51

* Including the maintenance costs for this project.

** Mainly comprised of 'expenditure based on transactions in the preceding fiscal year: details unknown'(Rs 2,080 million) and "pension reserve funds"(Rs 803 million).

*** Based on consolidated accounting with Calcutta Port Complex, the net profits for Calcutta Port Trust as a whole for each fiscal year are 436.4,-75.3,1203.7(million rupees),respectively(because Calcutta Port is operating at a loss).

Table 9.11 Haldia Port Complex Balance Sheet (**In million rupees**)

	Fiscal Year	*1999 (1999-2000)*	*2000 (2000-01)*	*2001 (2001-02)*	*2002 (2002-03)*	*2003 (2003-04)*
	Fixed Assets	6566.8	7027.1	8545.2	8418.78	8426.51
Assets	Liquid assets	9060.9	10069.2	10421.0	11967.43	12742.78
	Investment	930.0	1080.0	1480.0	1600.00	2103.96
	Total	16557.8	18176.3	20446.3	21986.21	23873.25
Capital/ Liabilities	Reserves/surplus	11143.9	12100.6	14270.2	15822.12	17591.19
	Pension fund,etc	300.0	464.2	694.1	769.34	1260.95
	Deferred income	0.0	0.0	9.4	131.19	124.17
	Capital liabilities	2270.8	2090.2	2378.7	2135.98	1906.13
	Current liabilities	2843.2	3521.3	3093.7	3127.59	2990.81
	Total	16557.8	18176.3	20446.3	21986.22	23873.25

Fire-fighting

The 2nd Oil Jetty has adequate fire-fighting systems. These systems comprise of the following:

- Three main fire water pumps two of which are diesel-driven and one motor-driven each having a water discharge rate of 9000 l/ min at 12 kg/ cm2 pressure
- Two foam feeding pumps of discharge capacity 834 l/min

- Two foam compound tanks of capacity 25000 l each
- Two jockey pumps
- Two long range water-cum-foam monitors
- Fish tail nozzles assembly for water curtain system
- Four portable foam extinguishers (9 l capacity) and 5 DCP extinguishers (10 l capacity)
- One hand siren and one electrically operated siren alongwith a dedicated telephone

Training

About 90 short term training programmes have been conducted during the last financial year on a variety of subjects, including cost control, inventory management, environment management, handling of hazardous chemicals, quality assurance, maintenance of marine structures etc. It is to be noted that several courses conducted by Haldia Dock Complex cover 'soft' management skills (or behavioral issues) such as stress-free management, team work and conflict resolution, productivity improvement, leadership development etc.

The staff break-up at Haldia Dock Complex is provided below.

Table 9.12 Staff profile at HDC

Staff category/ Year*	*2002*	*2003*	*2004*
I and II (Managerial)	336	317	335
III and IV (Supervisory and others)	4178	4010	3828
Total	*4514*	*4327*	*4163*

* Staff strength as on 31st December of the respective year

It is seen that there is a decline in total staff strength over the last three years. However the decline is on the account of supervisory and other staff, rather than anagerial staff, which has remained almost constant over 2002-04. The loss in managerial staff seen in 2003 has been fully replenished in 2004, as seen in the table above.

Evaluator comment: The project operations are sustainable in financial and organisational terms.

Beneficiary views

The major users of the Haldia Oil Jetty 2 (HOJ2) are Indian Oil Corporation (IOL), Haldia Petrochemicals Limited (HPL) and Hindustan Petroleum Corporation Limited (HPCL). The Haldia Port plays an important role in the economy of eastern India as the transit route for petroleum products.

IOL

IOL is the largest user of HOJ2, accounting for 87% of the usage. Almost three-fourth of this is by the IOC Refinery. The products

loaded/unloaded at the jetty include Diesel, Super Kerosene Oil (SKO), Motor Spirit (MS), High Speed Diesel (HSD), Naphtha and Furnace Oil (FO) apart for crude oil. IOC is currently installing a pipeline to connect with Paradeep Port that will reduce its dependence of the jetty. The major raw materials of IOC are imported through the sea route, while the products are despatched by both land and sea routes.

IOC officials feel that though handling charges at HOJ2 are relatively high, its proximity reduces the total transportation cost. Moreover, the jetty has good security arrangements and there are rarely any safety issues. The pipelines are all dedicated lines (one product per line); hence the jetty is considered very safe.

However, the road infrastructure in Haldia is poor. IOC officials feel that in spite of the fact that they pay a significant amount as road tax, no initiative is taken by the government to improve road conditions.

HPL

HPL is another of the major users of HOJ2. Essentially, it imports naphtha as raw material through the sea route. Its products include Motor Spirit, Carbon Black Feed Stone, polymers etc. Notably, HPL was the first in India to produce Euro-III petroleum.

Unlike IOC officials, HPL officials do not rate HOJ2 very high in terms of safety. They also say that poor condition of the approach road to the jetty caused traffic hazards and loss of time.

HPCL

HPCL imports HSD, MS, SKO and FO through HOJ2, and supplies the products through land routes to various parts of West Bengal and adjoining states.

Officials of HPCL feel that infrastructure costs are high at Haldia as compared to other ports. HOJ2 is among the costliest jetties of the country though the facilities are not of international standard. The approach road is particularly bad; this affects product outflow specially at peak periods.

Annexure 9.1

Break-up of traffic in terms of principal commodities at Kolkata Dock System and the Haldia Dock Complex

KOLKATA DOCK SYSTEM (KDS) (**In Thousand Tonnes**)

Sl. No.	*Commodity*	*2002-2003*	*2003-2004*
IMPORT:			
1.	Fertilizer (Finished)	-	5
2.	Sugar	3	-
3.	Salt	12	-
4.	Newsprint/Paper	32	59
5.	Petroleum Coke	-	7
6.	Iron & Steel	103	105
7.	Machinery	32	51
8.	Metal & Metal Products	69	65
9.	Scrap	48	50
10.	Timber	365	424
11.	Pulses/Peas	260	187
12.	Rapeseed	3	-
13.	Vegetable Oil	473	631
14.	Other Liquid Cargo	37	37
15.	Other Cargo	4067	5074
16.	General Cargo	726	808
17.	IVW Traffic	107	56
TOTAL IMPORTS:		6337	7559
EXPORT: -			
1.	Jute & Jute Products	124	119
2.	Tea	19	22
3.	Iron Ore	-	71
4.	Iron & Steel	74	87
5.	Machinery	13	21
6.	CI Goods	44	55
7.	Mica	35	29
8.	Shellac	15	15
9.	Metal & Metal Products	67	68
10.	Rice	5	9
11.	Wheat	-	52
12.	Sugar	-	16
13.	Fly Ash	-	80
14.	Other Cargo	178	126
15.	General Cargo	250	300
16.	IVW Traffic	40	64
TOTAL EXPORTS:		864	1134
GRAND TOTAL OF IMPORT & EXPORT:		7201	8693

HALDIA DOCK COMPLEX (HDC) (**In Thousand Tones**)

Sl. No.	Commodity	*2002-2003*	*2003-2004*
IMPORT: -			
1.	Fertilizer (Finished)	360	245
2.	Fertilizer (Raw Materials)	446	370
3.	Wheat	-	8
4.	Salt	47	19
5.	Newsprint /Paper	117	125
6.	Coking Coal	4299	4473
7.	Petroleum Coke	50	32
8.	Metallurgical Coke	422	186
9.	Other Coal / Coke	173	205
10.	Lime Stone	353	281
11.	Iron & Steel	100	107
12.	Machinery	12	3
13.	Metal & Metal Products	17	22
14.	Scrap	62	43
15.	Timber	62	61
16.	Pulses / Peas	45	7
17.	Rapeseed	32	13
18.	Soda Ash	-	14
19.	Vegetable Oil	189	238
20.	Other Liquid Cargo	1194	1187
21.	LPG	385	429
22.	Other Cargo	11376	13982
23.	General Cargo	382	627
TOTAL IMPORTS:		20123	22677
EXPORT: -			
1.	Thermal Coal	3368	3195
2.	Metallurgical Coke	11	-
3.	Jute & Jute Products	116	126
4.	Tea	43	53
5.	Iron Ore	2694	3752
6.	Iron & Steel	889	996
7.	Machinery	20	11
8.	C.I. Goods	128	127
9.	Pig Iron	-	11

Sl. No.	Commodity	*2002-2003*	*2003-2004*
10.	Mica	15	15
11.	Metal & Metal Products	53	57
12.	Wheat	2	12
13.	Mill Scale	-	19
14.	Other Liquid Cargo	60	100
15.	Other Cargo	462	625
16.	General Cargo	619	791
TOTAL EXPORTS:		8480	9890
GRAND TOTAL OF IMPORT & EXPORT:		28603	32567

CHAPTER **10** West Bengal Industrial Pollution Control Project

Project and loan profile

We present an evaluation of the project 'Industrial Pollution Control Project', adding to previous evaluations: Log frame analysis (JBIC a) and Draft evaluation report (JBIC b).

At the outset, we note that a pollution control project affects poverty through a range of indirect pathways. In this case, the project, in the main, consists in upgrading the technical capacity of the West Bengal Pollution Control Board, which is the state-level pollution control agency.

On the one hand, such an upgradation is expected to enable the Board to carry out its regulatory functions in a more efficient way. This can be seen, for example, by the speed at which consents to establish/ operate are issued to industries that need such permission. It can also be seen by the degree of compliance (to environmental standards) on an ongoing basis through agreements or technical guidance.

On the other hand, the Board is also responsible for implementing the provisions of various waste management rules, such as the Hazardous Waste (Management and Handling) Rules, 1989 (as amended in 2000 and 2001). These rules have been notified under the Environmental (Protection) Act 1986, which is India's umbrella environmental law.

More generally, the Board could be thought of carrying out two distinct but complementary functions: a regulatory function and a promotional/ facilitating function. Indeed, the recent emphasis on research and development (R&D) roles of the Board signify the increasing importance that is being to its promotional role.

The enhancement of technical capacity of the Board implies an increased efficiency in carrying out both these functions. This would impact poverty variables through a range of indirect pathways. For example, a pollution-free environment would result in improved health conditions of citizens, which would enhance work productivity and lower health expenses. Similarly, industries could be induced to improve the efficiency of its waste management systems, which would result in cleaner production practices while enhancing their public image.

Objective

The overall goal of the project was to improve the environment in West Bengal (JBIC a).

The specific project purpose had three components (JBIC a):

- To strengthen the monitoring and enforcement abilities of the West Bengal Pollution Control Board
- To promote investment in pollution control/abatement facilities through ICICI, and
- To conduct technical assistance for promoting investment (point above) and for project formation in other states.

Borrowers

The borrowers were (JBIC b):

(1) Organizational strengthening component and technological cooperation component : President of the Republic of India

(2) Capital investment for pollution measures component : Industrial Credit and Investment Corporation of India (ICICI)[16]

Executing Agencies

There were three executing agencies (JBIC b):

(1) Organizational strengthening component and technological cooperation component: West Bengal Pollution Control Board (WBPCB) and the Central Pollution Control Board (CPCB)

(2) Capital investment for pollution measures component: Industrial Credit and Investment Corporation of India (ICICI)

(Supervisory Agency: Ministry of Environment and Forest)

Table 10.1 Outline of loan agreement

	Organizational Strengthening component and technical cooperation component	*Capital investments for pollution measures component*
Loan amount/ Disbursed amount	1,525 million yen/951 million yen	3,000 million yen/3,000 million yen
Exchange of notes/ Loan Agreement	December 1994	February 1995
Terms & Conditions	2.6%	
-Interest Rate		
-Repayment Period (Grace Period)	30 years (10 years)	
-Procurement	General Untied	
	(Consultant Portion partial Untied)	
Final Disbursement Date	April 2003	October 2002
Main Agreement	Advance Scientific Equipment (India),	
	Omega instruments (India), other local	
	companies	
Consultant Agreement	National Thermal Electric Power	
	Corporation (India), other local companies	

SOURCE JBIC b

[16] Due to reorganization, the name of ICICI changed on March 31, 2002, from The Industrial Credit and Investment Corporation of India : (ICICI Limited) to ICICI Bank Limited.

Status

The project has been completed and ex post evaluation has been carried out.

Evaluation of the project

Relevance

Prevention of environmental pollution is a major legislative and policy thrust of the Indian government. The Central Pollution Control Board and the various State-level Pollution Control Boards represent the administrative machinery to implement the provisions of various environmental laws. As mentioned earlier, the West Bengal Pollution Control Board (WBPCB) plays a facilitating (or promotional) role in addition to its basic regulatory role. This requires continuous upgradation of capacity – both in terms of equipment and human resources. The Industrial Pollution Control Project attempts to support this process through the construction of a new building of WBPCB, acquisition of new monitoring equipment and implementation/enhancement of environmental management programmes (EMPs). Major improvement in laboratory facilities of WBPCB under this project has been made possible by JBIC assistance. Besides, construction of a new building has expectedly contributed to more efficient utilization of human resources, and more effective outreach.

Evaluator comment: The project is very relevant.

Efficiency

Organizational strengthening

Construction of building

The construction of new headquarters of WBPCB in Salt Lake was carried out according to plan. The construction/ relocation of regional offices of WBPCB was also carried according to plan.

Purchase of environmental data measuring devices

Purchase of planned devices was done according to original plan, and implementation schedule. In addition to originally planned devices, some additional devices were purchased for the regional offices. The total number of devices purchased is as follows:
Air Quality Monitoring Devices: 54 (against 23 planned)
Water Quality Monitoring Devices: 64 (against 40 planned)

Implementation of EMPs

Reorganization and staff increase: Staff reorganization and establishment of new departments (accompanying procurement of new equipment) was done as per plan.

Expansion of computer hardware and software

Equipment needed for construction of a databank for pollution data was procured as per plan.

Training for WBPCB staff and company managers
Training was conducted for WBPCB managers and company managers to use newly purchased equipment, and also for promoting environmental awareness.

Compilation of environmental data
Basic data was collected at several locations in Kolkata on air pollution parameters, such as SPM, and on water quality parameters, such as Dissolved Oxygen and BOD.

Capital investment

The size of sub-loan borrower companies (in terms of assets) was 6120 million rupees on an average. The total amount loaned was 2996 million yen – with an average of 272 million yen per company. The actual repayment period (average) was 8 years, against a maximum repayment period of 15 years. The industries selected for sub-loans included paper mills, textiles, cement and pharmaceuticals. The sub-loans were used for purchase of environmental equipment, involving purchase of equipment for end-of-pipe treatment, recycling of discharged material, and pollution monitoring equipment. The interest rate charged was 12-13%, which is lower than ICICI's lending rate of 15-17%.

Evaluator comment: The project has been implemented efficiently.

Effectiveness

Organizational Strengthening Component

(1) Usage of Environmental Data Measuring Devices at the WBPCB

The usage rate was high for the main equipment provided by this project, including the atomic absorption spectrophotometer (AAS), which was used daily, and the total organic carbon (TOC) meter, which was used 3 times per week (JBIC b).

One factor that may be mentioned as promoting the usage of equipment provided by this project is the high proficiency of the staff in using the equipment. In this project, training on how to use the equipment provided by the project is conducted continually, and it may be said that the knowledge and techniques learned during are being well utilized (JBIC b).

(2) Improvement of the WBPCB's Monitoring Capacity

Table 10.2 displays the improvement in the WBPCB's monitoring capacity due to the implementation of this project. According to the table, a striking improvement was shown, including large increases in monitoring personnel from 40 persons (FY94) to 118

persons (FY02) to 245 persons in 2005. In addition the companies monitored by the WBPCB grew from 5,950 companies (FY97) to 19500 in 2002. The number of locations increased from 21 in 1997 to 912 locations (FY02). It may be said that, due to the provision of equipment by this project, monitoring of companies and environmental monitoring was promoted (JBIC b).

Table 10.2 Improvement of WBPCB's Monitoring Capacity

	1994	*1995*	*1996*	*1997*	*1998*	*1999*	*2000*	*2001*	*2002*	*2003*	*2004*	*2005*
Monitoring Personnel (Persons)	40	40	53	77	86	92	109	113	118	245#	245	245

SOURCE Up to FY2002 JBIC reference material and for FY2003 WBPCB Annual Report2003-2004, annexure1and for rest years Senior scientist of WBPCB

(3) Promotion of Environmental Education and Dissemination of Public Information concerning the environment by the WBPCB

The WBPCB is disseminating information concerning the environment and environmental education to the general public, in addition to carrying out the above-mentioned monitoring. Also, a complaint desk has been set up within the WBPCB for complaints about the environment from ordinary residents. Every month, the complaint desk receives between 150 to 200 complaints concerning air and noise pollution, and it takes swift measures in response. The number of complaints concerning the environment dropped from 2,330 (FY97) to 953 (FY04) (Figure 10.1). Moreover, public hearings are held regularly (every Saturday) to resolve complaints about the environment from ordinary citizens, and these hearings are proving useful as a counter measure for environmental problems.

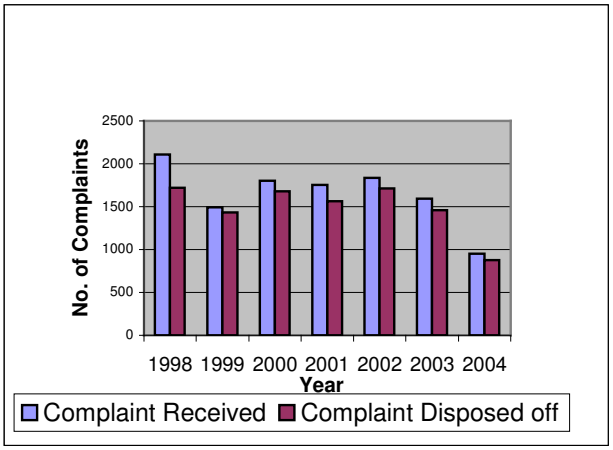


Figure **10.1** Status of complaints received & disposed during 1998-2004

SOURCE WBPCB, Annual Report2003-2004

(4) Improvement of the WBPCB's Law Enforcement Capacity

The provision of environmental data by this project is contributing to environmental policy planning by the government of West Bengal (air pollution and noise prevention policies, etc.).

Also, due to the above-mentioned promotion of pollution prevention measures and pollution regulation measures, cases of legal action declined from 222 cases (FY97) to 96 cases (FY02).

Figure 10.2 shows the distribution of complaints received during FY2003-04.

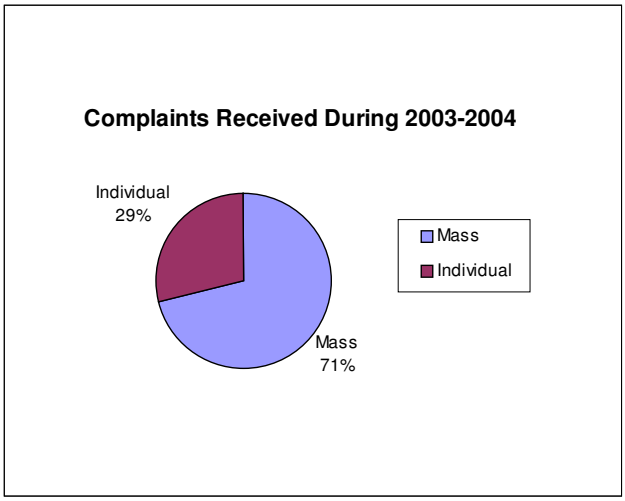


Figure **10.2** Complaints received during 2003-2004

SOURCE WBPCB Annual Report2003-2004.Page83

The nature wise distribution of complaints during 2003-2004 is illustrated in Figure 10.3.

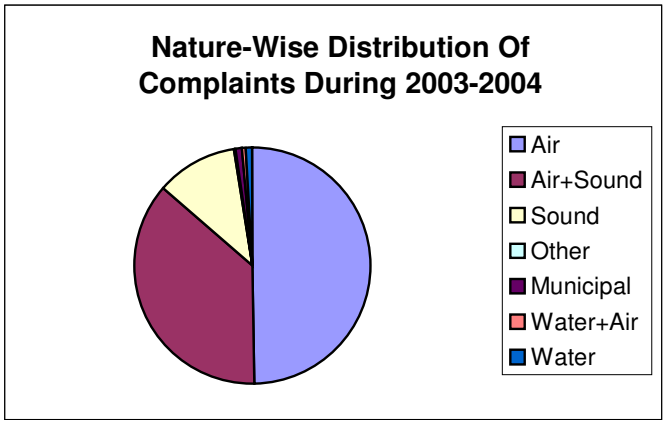


Figure **10.3** Nature-wise distribution of complaints during 2003-2004

SOURCE WBPCB Annual Report2003-2004

Furthermore, not only is the WBPCB implementing regulations, as stated above, it is also putting effort into training and dissemination of public information, making it a model for pollution control boards in other states. The WBPCB is accepting trainees from other states and is actively advancing efforts to alleviate environmental problems.

Capital Investment for Pollution Measures Component

Verification of the actual effects of pollution prevention, control, and reduction at individual companies was conducted through an impact evaluation[17] funded by the executing agency. Below are the results of the impact evaluation that relate to the effectiveness of the capital investment for pollution prevention component and the results of the beneficiary survey[18] of this study (JBIC b).

(1) Installation and Operation of Environmental Equipment at Borrower Companies

This study was unable to obtain sufficient information on the condition of the installation and operation of environmental equipment at borrower companies. However, according to the results of the impact evaluation, 2 out of the 11 borrower companies were behind schedule in installing their equipment, but it was surmised that the condition of installation and operation of environmental equipment at the remaining 9 companies was favourable.

(2) Environmental Effect of Environmental Equipment at Borrower Companies

In this project, 9 out of 11 companies installed environmental equipment related to end-of-pipe processing at the discharge stage. Among those, at companies that installed electrostatic precipitators (West Coast Paper Mill, Graphite India, Tata Chemicals, etc.), it was reported that the effluent load was reduced to less than 50μ g/m^3, whereas the discharge standard was 150 μg/m^3 for discharge of particle material.

Also, together with reducing the effluent burden by installing environmental equipment in the borrower companies and improving observance of environmental regulations, this project is contributing to improvements in the health of plant workers and surrounding resident.

(3) Cost Reduction at Borrower Companies

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[17] Impact Evaluation Report by Environmental Management Center Mumbai, August, 2004.

[18] A questionnaire was sent to all 11 companies. Because the borrower companies were spread all over India and because the time period of the field survey was limited, one company in western Bengal (Graphite India) was selected for inspection from among all the companies in the survey.

Installation of environmental equipment by this project is contributing to improved resource conservation and recycling of wastes; thus, reducing costs in long-term. Reported examples include a borrower company (Sirpur Industries) that reduced water consumption from 260m^3/ton to 200 m^3/ton by repairing bleaching equipment and coal washing equipment and another borrower company (Sagar Cement Limited) that saved 24 million rupees annually due to more energy-efficient equipment.

To summarize the above, in the organization strengthening component and the capital investment for pollution measures component, this project attained a fairly high level of achievement of its objectives in "improvement of supervisory capacity and the law enforcement capacity of the staff" and "promotion of capital investment by companies for environmental improvement."

Evaluator comment: The project has increased the effectiveness of the West Bengal Pollution Control Board in terms of its monitoring and facilitating roles.

Impact

The WBPCB started functioning in 1974 and with the continued emphasis of the state government in improving infrastructure for efficient environmental management. It has now become an independent body. The Board now has a central Laboratory at Kolkata and five other regional Laboratories at Kakinara, Durgapur, Hoogly, Haldia and Siliguri. The quantum improvement of the infrastructural facilities of the laboratories has been made possible through an external financial loan assistance programme from Japan Bank for International Cooperation (JBIC). The setting up of the laboratories during the last ten years under the JBIC assisted Industrial Pollution Control Project (IPCP) reflects the sincere efforts made by the state government and WBPCB to combat environmental damage.

Depending upon the pollution potential of different industrial process of the state, the industrial units are classified into three different categories:

i) **Red industries:** These types of industries have maximum pollution potential.
ii) **Orange industries:** These industries have moderate pollution potential
iii) **Green industries:** These types of industries have least pollution potential.

The Red units are again classified into Special Red and Ordinary Red categories depending upon the relative pollution potential. There are also some units under Green category with no pollution potential known as Ex-empted units.

In order to combat industrial pollution the Red category industries are not permitted in Kolkata Metropolitan Areas (KMA)

and Orange industries are not permitted in Kolkata Municipal Corporation (KMC) and Howrah Municipal Corporation (HMC) areas, except the industrial estates of KMC &HMC.A few water intensive and highly polluting industries having high water consumption are not permitted within 10-km radius of Calcutta Leather Complex at Bantala. A total of 294 grossly polluting industries were identified for regulatory compliance on an immediate basis.

Regarding the promotional role the WBPCB provides financial assistance for change of fuel in small boilers and ceramic kilns within the KMC area. The project works in close association with various NGOs. Academic institutions, chamber of commerce and industry associations. The WBPCB prioritised its surveillance over the grossly polluting units instead of monitoring all the units under its consent administration, these units are inspected and monitored in a fixed schedule either monthly or bimonthly or thrice a year or quarterly or half yearly or yearly. These grossly polluting industries are identified under National River Conservation Plan (NRCP). (WBPCB Annual Report2003/04)

The category wise number of "Consent to Establish" applications received and processed by the board during the years 2003/04 and 2004/05 is illustrated by Figures 10.4 and 10.5.

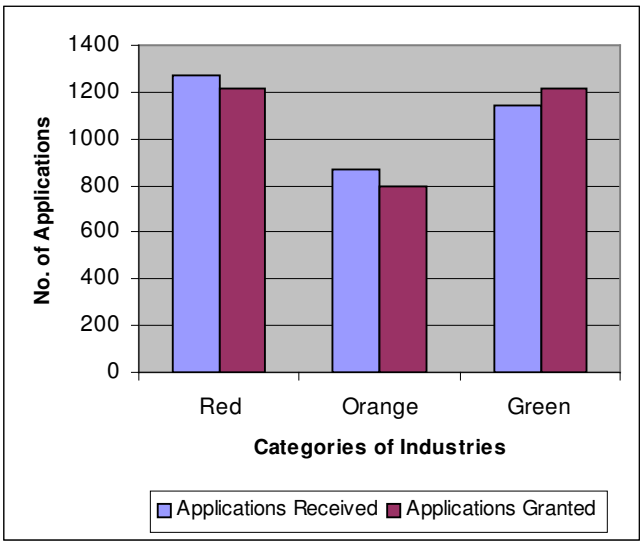


Figure **10.4** No. of 'consent to establish' application received and issued during 2003-2004

SOURCE WBPCB Annual Report 2003-2004. p. 23

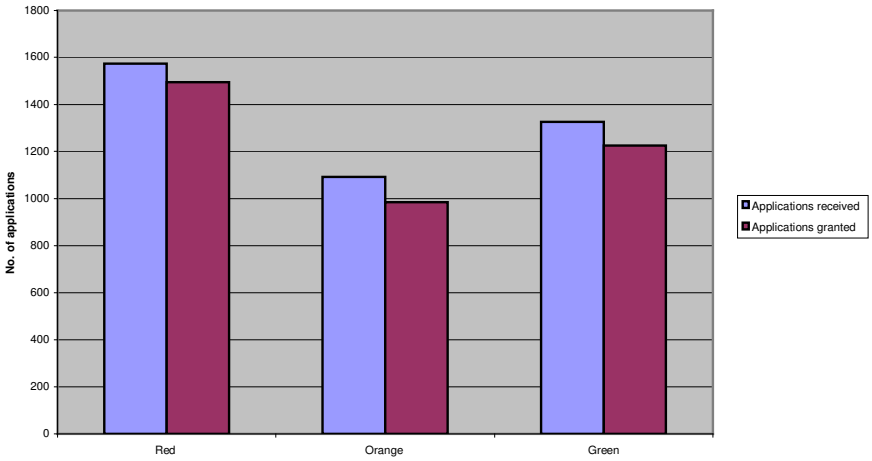


Figure **10.5** No. of 'consent to establish' application received and issued during 2004-2005

The category wise number of ''Consent to operate" received and processed by WBPCB during the years 2003/04 and 2004/05 can be illustrated with the help of Figures 10.6 and 10.7:

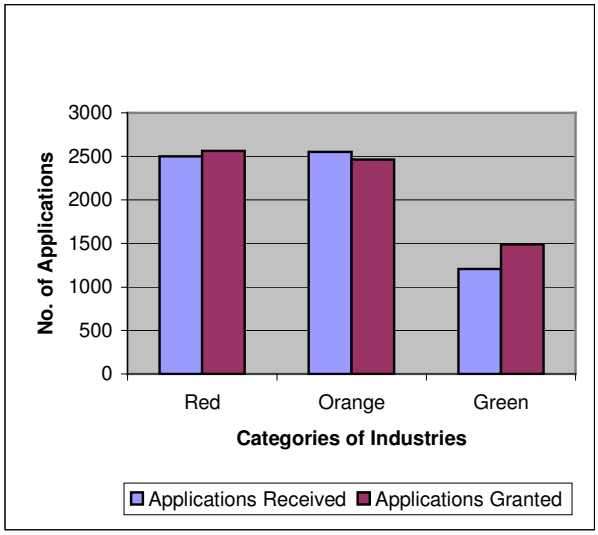


Figure **10.6** No. of 'consent to operate' applications received and granted during 2003-2004

SOURCE WBPCB Annual Report2003-2004.Page24

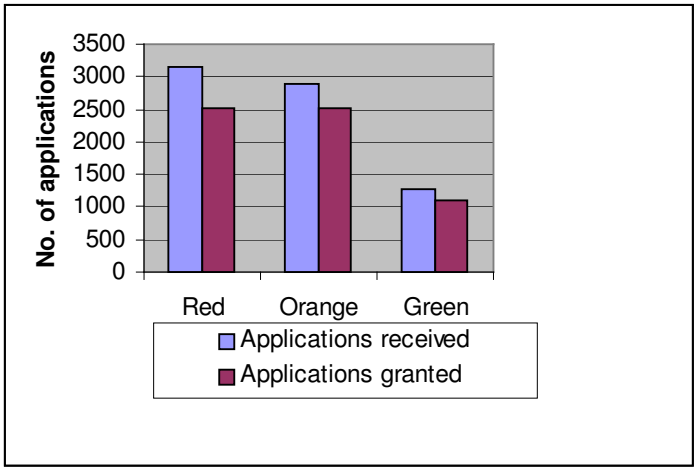


Figure **10.7** No. of 'consent to operate' applications received and granted during 2003-2004

Further, some specific categories of industries require an Environmental Impact Assessment (EIA), which involves a public hearing. In this public hearing, the members of the public who are likely to be affected by the proposed project are given a chance to comment on the proposed project. During 2004-05, the WBPCB conducted eight public hearings in different parts of the state.

The WBPCB has also instituted an Environment Excellence Award in collaboration with the Indian Chamber of Commerce. In 2004, the first prize for the industrial sector was awarded to MCC PTA India Corp. Pvt. Ltd. based in Haldia. The first prize for sustained environmental performance was bagged by the JBIC-assisted Bakreshwar Thermal Power Project. Awards were also given to the service sector, including NGOs and local bodies for environmental excellence and appreciation.

Organizational Strengthening Component

(1) Reduction of Air Pollution

In order to assess the overall environmental status of the state WBPCB monitors the air & water quality on a regular basis. Regular monitoring of air quality in Kolkata was started by WBPCB from 1992. The WBPCB has commissioned 5 continuous automatic ambient air quality-monitoring stations in the state.

Annual Average Concentration of Ambient Air Quality of Kolkata during 2003-2004 for SPM and RPM (Respirable Particulate Matter) are shown in Figure 10.8.

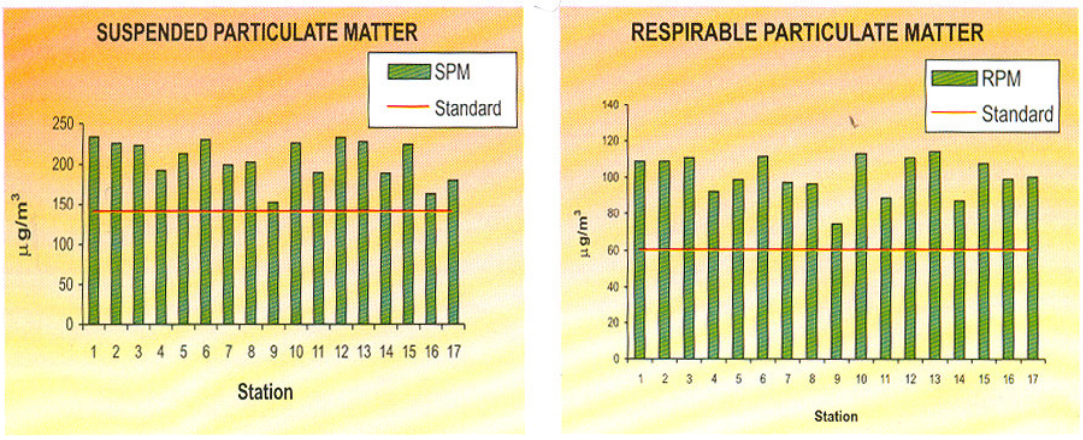


Figure **10.8** Annual average concentrations of ambient air quality of Koldata during 2003-2004

SPM standard: 140 mg/m^3

During the last decade automobile pollution has increased in Kolkata metropolitan area. Various factors like predominance of old outdated vehicles, lack of maintenance, limited available road area & rapid increase in the number of vehicles are the reasons for increasing automobile pollution. The WBPCB will technically examine the Auto Emission Testing Centers before grant or renewal of license.

Furthermore, as a part of its regulation of auto emissions, the WBPCB is implementing training for Traffic Department staff and for police officers involved in actual enforcement of the regulations. After receiving training from the WBPCB and recommendations from the study results concerning air pollution, the Traffic Department is implementing programs to alleviate air pollution and noise and is promoting a switch from coal to oil as boiler fuel, etc. Through endeavors such as these, air pollution in Calcutta appears to be headed toward improvement.

Studies performed by the WBPCB for the air pollutants in the sate over the years have established that amongst the criteria pollutants i.e. SO2, NO2& particulate matters, NO2 & particulates reach a peak during the winter months which is much higher than the national standard. Fine & inhalable particulates are by far the worst type of air pollutants for the city dwellers. The most vulnerable aspect of fine particulates is that more fine ones are the more dangerous ones. In West Bengal the Automatic Air Quality Monitoring (AAQM) stations have been installed through an externally assisted project, supported by JBIC for the first time.

(2) Reduction of Water Pollution

The WBPCB is monitoring water quality at eight measurement stations located along the Hooghly from its upper reaches to its lower reaches in western Bengal. Figure 10.9 shows the results of monitoring of BOD concentration in the Hooghly. According to the table, the average concentration at the measurement station was 2.2 mg/l in FY 1998 and 2.54 mg/l in FY2002. The BOD concentration has risen slightly.

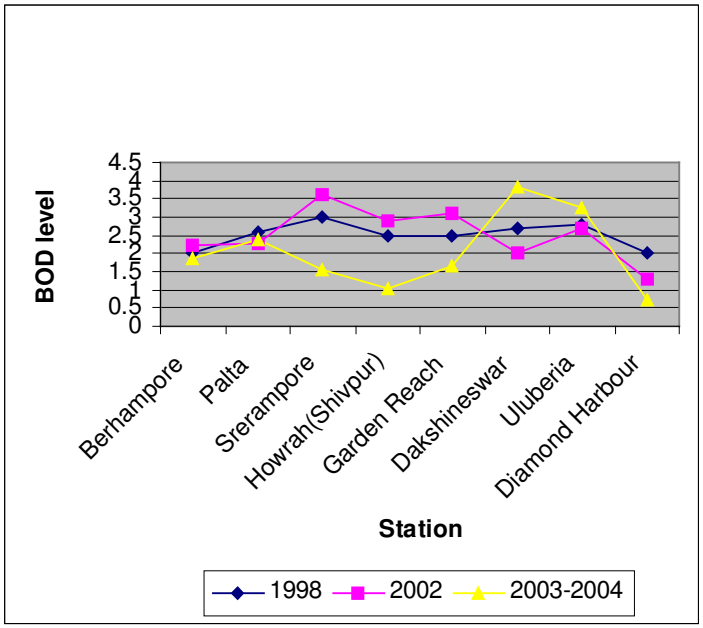


Figure **10.9** Fluctuations in BOD concentration in mg/l at different stations

SOURCE WBPCB Annual Report2003-2004.Page51 &JBIC reference report

(3) Reduction of Other Environmental Pollution

With the view that higher decibels of noise can not only damage human hearing but also frighten animals & birds literally to death. Various steps are taken to restrict sound levels over the years in West Bengal, especially during festive occasions. The standards prescribed in the noise pollution law for industrial areas (2000) sets the daytime level at 75 decibels and the night time level at 70 decibels[19].

The noise survey results in 2003 reveal a slight increase in ambient noise levels in various residential areas in Kolkata and Howrah on kali puja and Depavali day in comparison to any other day. The main cause of increase in ambient noise level on festival days is bursting of fire crackers whereas in normal days the main contributions to noise level of any residential area are from trade activities, the transport system and various domestic activities. The main observations are as follows.

[19] "Decibel" is a unit of noise and vibration level. The "bel" derives from the name of Alexander Graham Bell, the inventor of the telephone, and the "deci" means 1/10, thus "decibel" (dB).

i) The increase of noise level at selected locations on the kali puja day compared to a normal day in 2003 varies from 1 % to 7 %.This is much lower compared to the figure during 2001 & 2002.
ii) Compared to 2002 there is a reduction in the noise level at the selected locations, varying from 1% to 6%.
iii) The reduction of noise level at the selected places in 2003 varies from (-)3 to =23% compared to 2001 data.

(Source: WBPCB Annual Report2003-2004.Page 64)

To deal with the noise pollution which was serious in urban areas of western Bengal, the WBPCB has endeavored to reinforce noise countermeasures, including training and implementation of a public campaign against indiscriminate usage of loudspeakers and firecrackers during festivals (see Figure 10.10). Due to these efforts, the noise level has declined, with the road traffic noise at 27 intersections in Calcutta dropping from 83.3 decibels in the summer of 1993 (April through June) to 71.3 decibels during the same period in 1999.

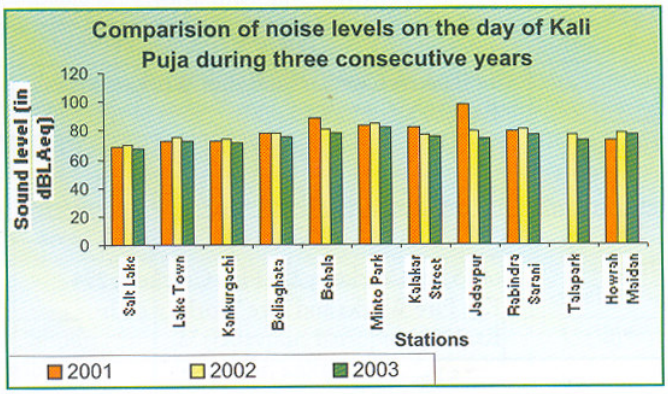


Figure **10.10** Comparison of noise levels on the day of Kali Puja during three consecutive years at different stations

(Note: Kali puja is a major festival in the state. It is marked by display of fireworks, including those that produce noise such as crackers. Over the last few years, noise levels on the festival day has significantly reduced due to a ban to bursting of crackers.)

SOURCE WBPCB Annual Report2003-2004.Page64

The estimated number of beneficiaries in this project is approximately 80 million persons 6 (i.e. 60% of Japan's population of approximately 130 million persons).

Plastic waste management

Plastic throwaway bags are a major environmental problem due to their non-biodegradable nature. The plastic carry bags exceeding the minimum thickness of 20micron are banned .It is made

mandatory that plastic carry bags made from recycled plastic would have to be colored, specially marked & should not be used foe carrying foodstuffs. The WBPCB has imposed a blanket ban on the use of plastic carry bags of all descriptions in the ecologically sensitive areas of the state, namely Sunder bans, Coastal, Forest & hill areas. WBPCB has issued a direction extending the blanket ban on the entry, use & sale of plastic carry bags in ten heritage/tourists spots of the state. Moreover use of plastic carry bags, cups, containers of less than four inches in height & forty microns in thickness have been banned in all Govt. buildings. Figure 10.11 shows the status of the units fined & closed with regard to plastic carry bags. During 2004-05, the ban has been extended to 13 tourist and heritage sites of the state.

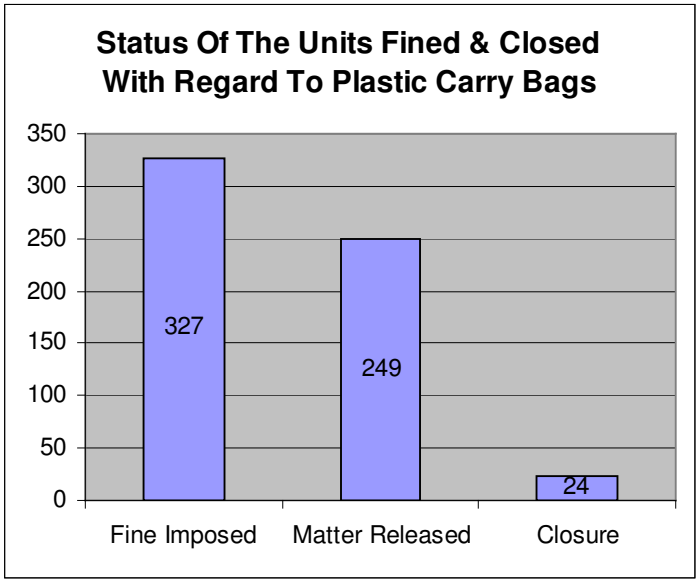


Figure **10.11** Status of the units fined and closed with regard to plastic carrybags

SOURCE WBPCB Annual Report2003-2004.Page83

Hazardous Waste Management

Hazardous wastes which are categorized based on their toxicity, corrosivity, reactivity & flammability, need special treatment, every year in West Bengal about 0.22 million metric tones of such wastes are generated from 465 units. The WBPCB has ensured that these units must apply requisite treatment to the same. So far 80 industries have built on-site engineered facilities having storage capacities varying from 3-10 years. Applying suitable eco-friendly technologies further recycles the waste. The WBPCB has identified a common storage treatment & disposal facility site at Haldia. Another common disposal facility is being developed for chrome mud, a highly toxic hazardous waste, in Chakundi, Dankuni in Hooghly district for the disposal of treated chrome mud.

(Source: WBPCB Annual Report 2003-2004.Page 32)

Capital Investment for Pollution Measures Component

(1) Contribution to Pollution Prevention by Companies in Western Bengal

After receiving the recommendations of JBIC's mid-term review study, the WBPCB and the western Bengal office of the Ministry of Environment and Forest acted cooperatively to implement publicity activities, including seminars for companies concerning the usage of loans for capital investment in environmental measures. The environmental investment that was financed by this project in western Bengal was smaller than initially planned. However, progress is being made in pollution prevention by companies in western Bengal as shown in the reduction of or pollution in Calcutta, the legal countermeasures for pollution, and the decline in the number of complaints. Thanks to these publicity activities, more effects from pollution prevention can be expected in the future.

(2) Contribution to Pollution Prevention by Companies Across India

Through seminars held by ICICI concerning this project, other companies are learning about the companies that have already implemented capital investment in pollution measures, and the other companies are beginning the same type of investment. So, pollution prevention measures are beginning to spread to other companies.

Impact Evaluation Result

Contribution to Pollution Prevention by Companies across India

Triggered by the example of a borrower company (Shree Cements) in this project that succeeded in using coke as a substitute for coal, cement companies in Gujarat, Rajasthan, Jammu Kashmir, and Tamil Nadu are promoting usage of coke as a substitute for coal.

Also, the example of a borrower company (Orchid Chemicals and Pharmaceuticals) in this project that recycled collected solvent was featured in many seminars and journals, etc., and as a result, recycling of collected solvent spread to pharmaceutical companies, etc., in Hyderabad (JBIC b).

Evaluator comment: The project has had a high impact in reducing environmental pollution, and control of environmentally damaging products such as plastic bags.

Sustainability

Organizational Strengthening Component

(1) Operation and Maintenance System and Technical Capacity

The WBPCB is an agency that was established in 1974 based on the water pollution regulation law, and it is in charge of promoting

improvements in water and air quality in western Bengal. Headquartered in Calcutta, the WBPCB has regional offices combined with research centers in Durgapur.

There were also no technical problems visible following the conclusion of this project in the operation and maintenance of the machinery, materials, and equipment because various forms of training for staff are continually implemented concerning air quality management, industrial waste management, and environmental data bases.

(2) Human Resource Development

The human resources of WBPCB consists of scientists, engineers, legal professionals and support. The total sanctioned staff strength is 328 and the total current staff strength is 242 or 74% of the sanctioned strength. During 2004-05, 22 technical staff members of the Board attended training programmes and workshops on topics such as application of Geographical Information System in aquatic pollution management, environmental auditing, development of CDM projects, air quality management etc. Many of these programmes were organised by the Central Pollution Control Board, while some were organised by industries (like Bharat Heavy Electricals Limited) and research institutes (like TERI).

(3) Financial Status

According to the financial statements of the WBPCB, there is income from inspection fees and sales of publications to the agencies concerned, but the amount is inconsequential. Consequently, the majority of the WBPCB's financial needs are met with state budget allocations. Henceforth, operation and maintenance costs are forecast to increase, but the stable apportionment of the operation and maintenance budget from the government is expected. During the financial year 2003-2004, the total receipts of the WBPCB (except cess reimbursement from GOI) was Rs 1,102.02 lakhs and the total expenditure of the board was Rs 680.98 lakhs. The distributions of receipts and expenditure during 2003-2004 is shown in Figures 10.12 and 10.13.

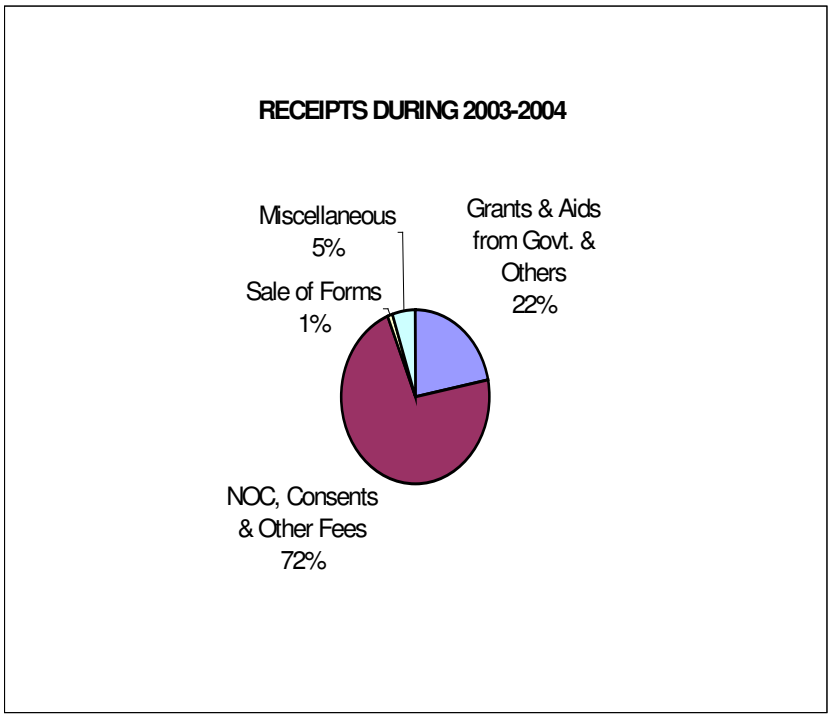


Figure **10.12** Receipts during 2003-2004

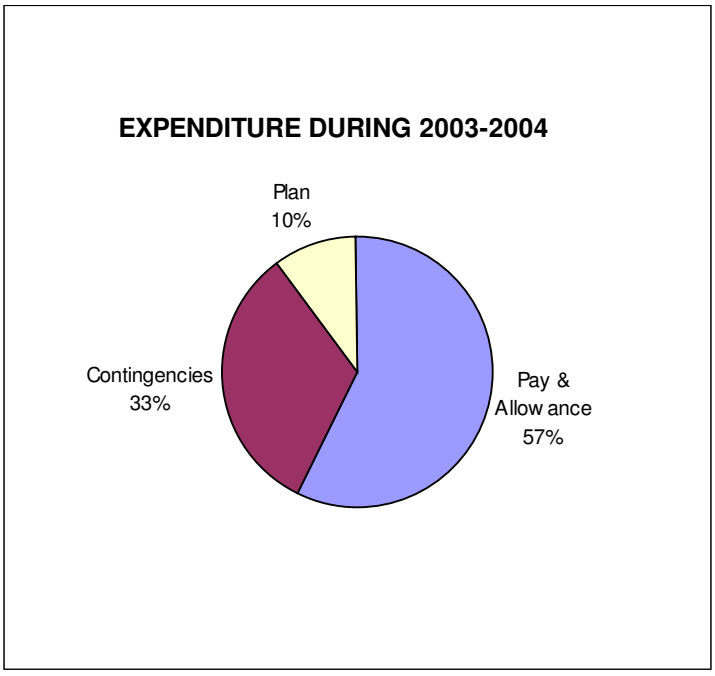


Figure **10.13** Expenditure during 2003-2004

SOURCE WBPCB Annual Report2003-2004.Page104)

Evaluator comment: The project activities are sustainable since they establish capacities on a long term basis.

Recommendations

As mentioned earlier, WBPCB is gradually enhancing its role as a promotional agency, as opposed to a purely regulatory body. For example, the Board has undertaken some R&D work in the area of characterisation of PM10 and PM2.5 at traffic intersection points of Kolkata. It is necessary to also make precise linkages between PM concentrations and human health impacts, if one has to assess the benefits of pollution control. Research studies in this direction could be a potential promotional activity of the Board.

Public hearings constitute an important component of the EIA process. As mentioned in this report, nine public hearings have been conducted during 2004-05. It may be useful to report the broad outcome of the hearings at some appropriate forum, including a discussion of the process of consultation.

CHAPTER 11 Bakreshwar Thermal Power Project

Project and loan profile

Executing Agency The West Bengal Power Development Corporation Limited (WBPDCL)

L/A Date : Jan.94/ Dec.97/Feb.95/Mar.99/Mar. 03

Final Disbursement Date: Mar.99/Feb.03/Mar.00/Apr.04

Location: Bakreswar is in Birbhum district of West Bengal, (Longitude 87° 27/ E and Latitude 23° 50/ N)

Access by Road: The site is about 12 km west from Suri Town and 9 km east from Dubrajpur town by the side of Dubrajpur- Suri State Highway.

Main Fuel: Coal

Land : About fifty-six hectares of land has been allocated for installing the unit 4 and 5. About ninety hectares of land has been earmarked for disposal of ash for unit 4 and 5

Project status

Units 1, 2 and 3 completed, Units 4 and 5 under construction *(Project is in operation, but a part is not completed)*

Evaluation of the project

Relevance

The Eastern region of India, particularly West Bengal has a peculiar position as far as availability of energy is concerned. Hydro resources are limited. Because of high population density and geographical features, feasibility of constructing Nuclear Power Station is low. Natural gas is yet to be struck in the Gangetic basin. Thus, this region has to depend basically on coal-fired thermal power generation to meet its energy needs

West Bengal is one of the prime sources of coal and other raw material needed for Indian industry. The state also leads in the electrification of its railway tracks. Shortage of power critically affects the exploitation of coal and other material, and their transportation. This in turn affects the power generation not only in Eastern region but also in the other regions.

All these factors have made the completion of two phases (Phase-1 of 3 x 210 MW units and Phase-II of 2 x 210 Mw units) of the Bakreshwar project a dire need.

It may be pertinent to note that the Bakreshwar project is no longer at the stage of feasibility, but is a package for which considerable amount of investment has already been made. It may be of interest to note that Purulia Pumped Storage Project (PPSP) scheme will be somewhat dependent upon power available from Bakreshwar during the off-peak period.

Completion of the Phase –II Bakreswar Extension Units 4 and 5 is of utmost importance for vital national production sectors, such as coal, and export-based industries such as tea, jute and leather.

(Source: DPR for unit 4 & 5, page: 17 and 18)

West Bengal initiated the process of *perspective planning* for power from 1977-78. The state, which had experienced chronic power shortage for long, is now in a position to export power to neighbouring states after fully meeting its internal demand. Enhancement of thermal power generation capacity is consistent with the long term perspective plans for power. The power projects under construction are projected to meet the power demand growth till the *Twelfth Five Year Plan* period.

Evaluator comment: The project is highly relevant.

Efficiency

Project Implementation

The project implementation process was actualised without any major deviation by the WBPDCL in accordance with the 'Guidelines for procurement under OECF Loans' (for Main Plant, Transmission & Substation System, Hydrogen Generation Plant, Training Simulator and through LCB for coal handling system, water intake, plant water system, water tippler and discharge wagon.)

The original & actual time schedule for the project implementation period is as follows:

Table 11.1 Project implementation period for Unit 1& 2

Item	*Original Schedule(at the time of OECF appraisal in April,1997*	*Actual period*
Civil Works	December 1996-May 1999	
Steam Generator	June1996-November1999,May 2000	April1999,May2000
Turbine Generator	June1996- November1999,May 2000	July1999,May2000
Coal handling Plant	August1996-May1999	July1999
Water Intake & Plant Water system	May1997-July1999	April1999
Associated transmission System	July1996 -October1999	
BOBR Wagon	April1998-july1999	July1999
Wagon Tippler	January1998-January2000	January2003
Hydrogen Generation Plant	April1998-October1999	Nov/Dec2001
Training simulator	April1998-April1999	
Consulting services	February1994-November2000	May2000

The completion date for Steam generator & Turbine generator was scheduled for November2000 at the time of OECF appraisal.

The reasons behind the early completion period were mobilisation of commissioning team at right time, proper programming of erection and commissioning activity, mobilisation of sufficient number of contractor manpower, quick transportation of material etc.

Table 11.2 Project implementation period for Unit 3

Item	*Original Schedule(at the time of OECF appraisal*	*Actual period*
Civil Works	June1997-July1999	
Steam Generator	April1997-May2000	August 2000
Turbine Generator	April1997-september 2000	March 2001
Consulting Services	January1995-September2000	June 2001

From the table above, it is clear there were some delays regarding the project implementation period of Unit 3. WBPDCL had taken several remedial actions to combat the delay. These actions were the mobilisation of sufficient number of contractor manpower, quick transportation of material and improved interaction with the main contractor etc.

(Source: PCR for Uit1,2 &3, Page ; 8-9)

We now present information on the project scope for the two units under construction. The two units have identical scope. In either case, there is no deviation so far from the actual scope. We mention below the original scope under various relevant items (which is the same as the actual scope):

Boiler with concerned auxiliaries: 670T/hr
Turbine and turbo-generator: 210 MW
Control and instrumentation: As required for a 210 MW unit

Switchyard equipment
Coal handling system: 1600 T/hr
Water system: For supplying 60 T/hr DM plant and potable
Ash handling system for wet bottom ash and dry fly ash
Other civil works and consulting services

The implementation schedule covers design and manufacturing, civil works, transportation, erection, testing/ commissioning, technical services for O&M, procurement of spares, and ash disposal mechanisms (three ash ponds). The contract for the main plant and the coal handling plant was made in end 2004 and these are under execution. Hence, information on project implementation status cannot be provided now.

Costs

Under the Bakreswar Thermal Power Project the total project cost for Unit 1 & 2 is JPY 89,351 Million of which the ODA loan portion is JPY 61,220 Million. The WBPDCL borne JPY 28,131 Million of the total cost. The break down of cost items is shown in following table.

Table 11.3 Originally estimated cost for unit 1 & 2

Breakdown of cost item	Foreign		Local		Total	
	Total cost (Mil. Yen)	JBIC(Previously OECF) (Mil. Yen)	Total cost (Mil. Rs.)	JBIC (Mil. Rs.)	Total cost (Mil. Yen)	JBIC (Mil. Yen)
Plant & equipment	13,562	13,562	10,650	10,650	49.879	49,879
Transmission & Substation	1,559	1,559	1,478	1,478	6,598	6,598
Spare parts & training of O/M	274	274	297	297	1,287	1,287
Other facilities(additional component)	591	591	627	627	2,728	2,728
Admission cost etc.	0	0	2,408	-	8,211	-
Land acquisition	0	0	170	-	580	-
Taxes & duties	0	0	2,163	-	7,375	-
Price escalation	16	16	257	83	892	299
Contingencies	1,600	1,600	1,807	1,314	7,762	6,081
Consulting services	510	510	-	-	510	510
SUB Total	18,113	18,113	19,856	14,449	85,824	67,384
Interest during construction period	3,529	3,529	-	-	3,529	3,529
TOTAL	21,641	21,641	19,856	14,449	89,351	70,912

(Exchange Rate Used: Rs1=JPY 3.41as on Apr.,1997)

For Unit 3 the total project cost is JPY 25,227 Mil. ODA Loan portion : JPY 20,196 Mil. (Phase 1: JPY 8,659 Mil. Phase 2: JPY 11,537 Mil.)

The details of the project cost is given in the following table.

Table 11.4 Originally estimated cost for Unit 3

	Foreign		Local		Total	
Break down of cost items	Total cost (Mil. Yen)	JBIC (Mil.Yen)	Total cost (Mil.Rs.)	JBIC (Mil.Rs.)	Total cost (Mil. Yen)	JBIC (Mil.Yen)
Main plant	6,221	6,221	3,564	3,564	17,840	17,840
Spare parts	188	188	107	107	537	537
Training of O&M	26	26	1	1	29	29
Consulting services	123	123	0	0	123	123
Administration cost,etc.	0	0	518	0	1,689	0
Taxes & duties	0	0	924	0	3,012	0
Price escalation	4	4	36	8	121	30
Contingencies	322	322	258	184	1,161	922
SUB TOTAL	6,884	6,884	5,408	3,864	24,512	19,480
Interest during construction period	715	715	-	-	715	715
TOTAL	7,599	7,599	5,408(JPY 17,630 Mil)	3,864 (JPY12,597 Mil.)	25,227	20,195

(Exchange Rate used : Rs1= JPY 3.26 as on Apr. 1998)

Source PCR for unit 1,2,3, ,page 10,11

The following table provides information on estimated cost and expenditure for units 4 and 5:

Table 11.5 Estimated cost and actual expenditure

	Estimated cost	Actual expenditure (under implementation)
Foreign currency	15903 MJY	13833 MJY
Local currency	11241 MINR	14207.2 MINR
Total	17602.3 MINR	19740.4 MINR
% of foreign currency component	36	28

MJY: Million Japanese Yen

MINR: Million Indian Rupee

Exchange rate: 1 INR = 2.5 JY

It is seen that there is an increase of 12% in the total project expenditure as compared to the estimated cost. It is also seen that the local currency component has gone up by 26%, while the foreign currency component has gone down by 13%. The reasons behind the rise in costs are the following:

- The cost estimate was prepared in 2002, while the JBC loan was sanctioned in mid-2003.
- The inflation rate was higher than what was expected, and there was a significant increase in steel prices worldwide
- The tender process could be completed and the order placed only in late 2004. (Due to procedural delays, the order for the

main plant package and the coal handling plant package could be placed in Nov-Dec 2004, and subsequently, an advance payment was released).

The total expenditure for 2004-05 was 2603 MJY – the same as the estimated expenditure. There was no expenditure from the local component in this period. As mentioned, the work started only in late 2004, and hence there was no expenditure in any of the previous years.

Evaluator comment: The project is being implemented efficiently.

Effectiveness

Utilisation indicators

The following tables provide information on utilisation indicators of the three units in operation:

Table 11.6 Utilization indicators - Unit 1

Year	*Generation (Million units)*	*PLF (%)*	*Availability factor (%)*	*Auxiliary Power Ratio (%)*
2001	1136.474	62	81	8
2002	1343.826	73	89	10
2003	1267.574	69	84	11
2004	1601.322	87	99	8

Table 11.7 Utilization indicators - Unit 2

Year	*Generation (Million units)*	*PLF (%)*	*Availability factor (%)*	*Auxiliary Power Ratio (%)*
2001	1007.177	67	82	10
2002	1265.095	69	82	10
2003	1458.128	79	87	9
2004	993.624	54	56	8

Table 11.8 Utilization indicators - Unit 3

Year	*Generation (Million units)*	*PLF (%)*	*Availability factor (%)*	*Accident rate*
2001	425.772	NA	51	19
2002	1260.790	69	87	2
2003	1501.905	82	100	0
2004	1602.624	87	99	1

PLF: Plant load factor

The target PLF is 70-90%. Unit 3 is seen to have the best performance in terms of the PLF, followed by Unit 1.

The target availability factor (operating hours per year/ total hours per year) is 83-90%. Units 1 and 3 have been meeting this target consistently over the last three years. Both these indicators reflect the adequacy of the original operating plan.

The target auxiliary power ratio for coal-based thermal power plants is 8%. The ratios for all units are above the target ratio.

The gross thermal efficiency (%) for the three units in 2004 was 36.34, 36.08 and 36.78 respectively. These values are all within the target range (35-40%).

The maximum output in 2004 was 229 MW, 222 MW and 224 MW respectively.

The following table provides information on outage hours per years broken up by reason for outage. Significantly, there has been no outage due to human error in any of the three units over the last four years (2001-04). This is the expected state, where no zero outage due to human error is targeted. Outage is either planned or due to machine trouble.

Table 11.9 Outage hours per years broken up by reason for outage

Year	*Outage due to machine trouble*			*Planned outage*		
	Unit 1	*Unit 2*	*Unit 3*	*Unit 1*	*Unit 2*	*Unit 3*
2001	12.75	31.47	1012.94	676.3	1527	0
2002	488.46	359	135.6	518.09	1273.13	1048.65
2003	102.12	186.63	13.13	1386.81	142.28	108.78
2004	73.4	1215.8	113.75	8.91	2559.75	0

All figures are in hours/year.

The SPM count (mg/Nm^3) for Units 1,2 and 3 is shown in the graph below:

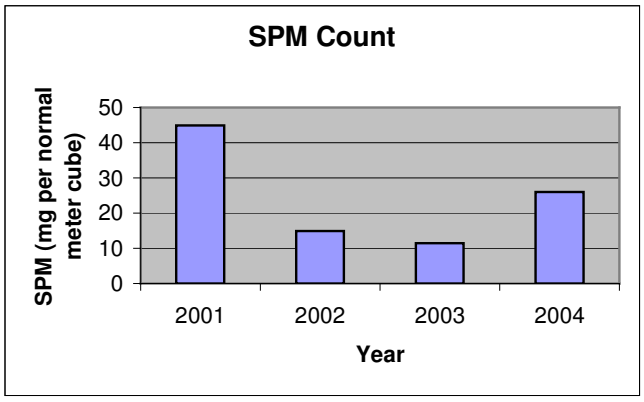


Figure **11.1** SPM Count

The SPM count (mg/Nm^3) is well below the emission limit in India, which is 150 mg/Nm^3 for thermal power plants of generation capacity 210 MW or more.

The Bakreshwar Thermal Power Plant has commissioned one ash pipeline in 1999 and four in 2002. The ash generated is used

for manufacturing cement by three companies: Ultratech Cement, Cement Asbestos Manufacturing and Asbestos Cement Products. Local manufacturers use the ash for brick blocks and local area filling. The fly ash evacuation rate is 135 MT/hr/unit. There are three silos with a capacity of 300 MT each and a discharge capacity of 120 MT/hr.

Evaluator comment: The project is highly effective in terms of various utilisation and environmental indicators.

Impact

Employment and local infrastructure (social)

The Bakreshwar Project, like other power projects, has created opportunities for additional employment – both directly and indirectly. With expansion of the project, manpower will be increased but the manpower per MW ratio will be kept same or slightly reduced. In Units 1,2 and 3, during the construction phase, about 4500 people were employed; of this 2430 or 54% were local. During operation, 1345 people are employed (including contractors' workers); of them a third are local. During construction phase of Unit 4, 1800 people have found employment; of them 20% are local.

The Project has provided strong social development support. Two plots have been developed for people who have lost homestead land, besides payment of compensation. In addition, water tanks, ponds, wells and deep well hand pumps have been constructed. The project has also established a primary school, a secondary school, and healthcare facilities.

The township for the power plant has generated demand for items of basic need and provision of basic services, including social and cultural facilities. Percolation effects of the project include urbanisation of the region, development of social infrastructure , and growth of trade and small-scale manufacturing. As Bakreshwar Thermal Power Station with an ultimate capacity of 1,050 MW becomes fully operational, several ancillary industries will be developed in and around the area to supply spare parts, and carry out maintenance work.

Environmental

A large thermal power station like BTPP, utilizing coal as its source of energy may pollute the environment in a number of ways. The major pollutants likely to affect the environment of the neighbourhood are:

- Suspended Particulate Matter (Stack emission) (Information on Suspended Particulate Matter Count is provided in the previous section)
- Toxic gases (Stack emission)
- Thermal Pollution (Stack, cooling tower etc.)

The BTPP is equipped with efficient devices for control of emission of pollutants to a level within the acceptable norms of the country. All the units have received the clearance of the Ministry of Environment & Forests (MoEF).

Air quality is monitored at a regular basis on a five kilometre radius area centring the BTTP. Monitoring of raw and drinking water is done by BTTP authority. Results of air pollution monitoring is provided in the tables below:

Table 11.10 Results of air pollution monitoring

Year/ standard	*SPM*	*SO_2*	*NO_x*
Environmental standard	500	120	120
2000	116.86	2.56	62.8
2001	118.90	3.53	40.96
2002	110.40	24.52	10.50
2003	111.06	10.21	19.61
2004	155.30	5.66	21.81
2005	119.44	6.10	12.75

All values are in ug/Nm^3. The values are well below the environmental standard.

The results for water pollution monitoring are presented below:

Table 11.11 Results for water pollution monitoring

Year	*pH*	*COD (mg/l)*
2001	7.98	23.64
2002	7.45	18.26
2003	7.73	16.50
2004	7.91	22.13
2005	8.13	19.65

The acceptable pH value for (pond) effluents) from thermal power plants is 6.5 – 8.5; thus the Bakreshwar Plant meets the environmental standard consistently.

The ash utilisation percentage (ash utilisation/ ash generation X 100) for the plant was 18, 22 and 24 for 2002-03, 2003-04 and 2004-05 respectively, showing a steady upward trend. A high ash utilisation percentage signifies better environmental performance, and reflects confidence in ash using technologies. The ash utilisation percentage for the Bakreshwar plant is higher than the national average (13%) though slightly lower than the average for the eastern region (29%).[20]

Evaluator comment: The project has done well in terms of social development support, and also in terms of environmental performance.

[20] www.tifac.org (accessed 10-12-05)

Sustainability

Social

The Bakreshwar project is known for integrating social development activities within its project scope. It has established one primary and one secondary school in the township. About 35% of students of these schools belong to local villages. The project authorities have also arranged transport for students staying far away from the schools. Several other local schools have received financial help from the project. In some cases, schools have been provided with blackboards, benches etc.

Besides, the project has provided job opportunities to almost 45% of people who have lost land. These people have been hired on a contractual basis; so there are issues of social and financial security to a certain extent.

Organisational

The three operational units have a total of 513 staff of which 226 or 44% belong to the managerial/supervisory category. Among the managerial/supervisory staff, 192, almost 85% are involved in O&M activities.

The monitoring methods for the three operating units are as follows on a monthly basis:

SO_2: Colorimetric (ambient air monitoring), absorption and titrametric (stack emission monitoring)

NO_X : Titrametric (ambient air monitoring and stack emission monitoring)

Instrumental/analytical methods are used for wastewater monitoring on a monthly basis at the guard pond outlet and ash pond recovery.

The following monitoring equipment is available at the plant: pH meter, conductivity meter, nephelometer, colorimetric meter, spectrophotometer, incubator/autoclave and separating funnel.

The operations at the plant are entirely departmental, and not contracted out. Maintenance has been distributed in packages of Boiler and Turbine, and CHP on an Annual Maintenance Contract (AMC).

There is regular training for both technical and non-technical staff at the State Productivity Council, Kolkata on various subjects. In addition, staff participate in safety training programmes organised by the National Safety Council in various cities of India. Safety training programmes have also been conducted at the plant by the Loss Prevention Association of India.

Besides, a workshop on contract labour issues was conducted at the plant in association with the Industrial Management Academy, New Delhi. Likewise, an in-house orientation programme on Quality Circle was organised in collaboration with the Quality Circle Forum of India.

Finally, teachers of the high school set up by the plant were nominated for a workshop on Mathematics at the Netaji Subhash Open University at Kolkata.

Financial

The Bakreshwar Thermal Power Plant is managed by the West Bengal Power Development Corporation Limited (WBPDCL), a Government of West Bengal undertaking. WBPDCL runs four power plants in total, and financial figures are not available for each plant separately. However, the following table provides information on generation cost (net sent out) per KWH in Indian Rupees for the Bakreshwar Plant:

Table 11.12 Generation cost of Bakreshwar Plant (Rs)

	2001-02	*2002-03*	*2003-04*
Fuel	1.02	0.96	0.94
Repair and maintenance	0.03	0.04	0.05
Employee cost	0.03	0.02	0.02
Admin. cost	0.03	0.06	0.04
Depreciation and interest	0.50	0.74	1.06

The WBPCDL has made a net profit of Rs 99.12 million in 2003-04 which is a big jump from the figure of Rs 14.47 achieved in the previous financial year. This is largely due to increase in sales revenue and non-operating income.(Source: WBPDCL Annual Report: 2003-04).

Evaluator comment: The project is sustainable from the environmental, social and organisational angles.

Beneficiary views

A survey was executed to elicit the perceptions of the beneficiary community with regard to this project. The total number of respondents interviewed was 203 of which 65.5 percent were males and the rest females. The survey was conducted in villages adjoining the plant to capture impressions of people living in the immediate vicinity of the plant, including people who have lost land due to construction of the plant.

Socio-economic profile of the sample

Data on the basic profile of the respondents is provided in Table 11.13. The main features are as follows.

- The age of the respondents was evenly distributed ranging from 18 years to 74 years with an average age of about 39 years.
- About 38 percent of the respondents reported that there were 2 male members in the households followed by 3 male members

in 20% of the households, and 1 in 15% households. On the other hand, about 37 percent households had 2 female members followed by 24% with 1 female member and 19 percent with three.

- About 20% of respondents reported their primary occupation was cultivation, daily wage labourer, and business each, followed by about 13% in service.
- About 44 percent of the respondents reported an average monthly income between Rs 2000-5000, followed by 43 percent with less than Rs 2000 per month.

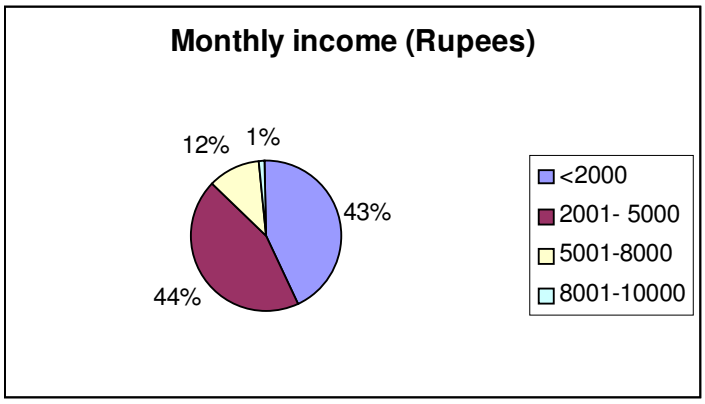


Figure **11.2** Monthly Income

Table 11.13 Profile of respondents

	Number of respondents	*Percent*
Age of respondents		
<15 years	0	0.00
15-20yrs	9	4.43
21-25yrs	16	7.88
26-30yrs	32	15.76
31-35yrs	31	15.27
36-40yrs	41	20.20
41-45yrs	20	9.85
46-50yrs	24	11.82
>50yrs	30	14.78
Total	203	100.00
Primary family occupation		
Factory worker		0.00
Business	40	19.70
Daily wage labourer	41	20.20
Cultivation	42	20.69
Clerk	17	8.37
Social worker	1	0.49
Teacher	14	6.90
Service	26	12.81
Pension holder	10	4.93
Bank interest	1	0.49
Carpenter	1	0.49
Computer operator	1	0.49
Agriculture	7	3.45
Self-employed	2	0.99
Driver		0.00
Total	203	100.00

Impact of the project on access to electricity in the survey area

Provision of electricity

Almost all individuals surveyed had access to electricity even before the project; however, about 97% reported that they consumed less electricity than they would normally require (Table 11.14).

Table 11.14 Provision of electricity before and after the project

		Number of respondents	*Percent*
Was there the provision of electricity in your locality in past	Yes	202	99.51
	No	1	0.49
Total		203	100.00
Has electricity been provided to your house post-project	Yes	2	0.99
	No	201	99.01
Total		203	100.00
Do you consume less power than what you would normally require	Yes	197	97.04
	No	6	2.96
Total		203	100.00

Hours of electricity use

85 percent of the respondents consumed between 12 and 20 hours of electricity per day before the project and about 85% were consuming between 12 and 21 hours post project. Thus there is no difference in the pattern of electricity consumption in the two situations. However, it is very difficult to estimate the impact of the project on units of electricity used by individual households based on this general survey.

Payments for electricity use

Before the project, about 62% of the respondents were paying less than Rs 100 per month for electricity, while 32 percent were paying between Rs 100 and 200. After the project, about 19 percent were paying less than Rs 100, 59% Rs 100-200 and 14 percent Rs 200 -300 (Table 11.15). Once again, it is difficult to assess the impact of the project on consumption units of electricity consumed and payments made by individual households.

Table 11.15 Monthly electricity bill before and after the project

	Number of respondents	*Percent*
Monthly bill before the project (Rs)		
<100	125	61.58
100-200	64	31.53
201-300	9	4.43
301-400	0	0.00
401-500	1	0.49
>500	4	1.97
Total	203	100.00
Monthly bill after the project (Rs)		
<100	38	18.72
100-200	120	59.11
201-300	29	14.29
301-400	9	4.43
401-500	3	1.48
>500	4	1.97
Total	203	100.00

Applications of electricity

Respondents stated the use of electricity for lighting and running fans, televisions, refrigerators etc. The overall use of electricity for various applications does not seem to have changed much before and after the project, except the noticeable rise in the reported use of electricity for running televisions and refrigerators after the project (Table 11.16). This could be due to general improvement in living standards, or increased penetration of household durables.

Table 11.16 Applications of electricity before and after use

	Number of respondents	*Percent*
Applications before the project		
1 Light	199	100.00
2 Fan	188	94.47
3 TV	89	44.72
4 Refrigerator	1	0.50
6 Any other	1	0.50
Total	199	100.00
Applications after the project		
1 Light	199	99.00
2 Fan	193	96.02
3 TV	160	79.60
4 Refrigerator	17	8.46
5 Heater	0	0.00
6 Any other	3	1.49
Total	201	100.00

Employment created by the project

The project provided employment to about 9% of the respondents at the stage of construction and about 18% during operations. The number of days of employment provided during construction varied from 1-800. During operations, however about 76% of the respondents employed by the project reported that they were given employment for 500-1500 days, while 16% were provided more than 2000 days.

Table 11.17 Employment provided by the project during construction and operation

		Number of respondents	*Percent*
Did the project provide employment to any member during construction	1 Yes	19	9.36
	2 No	184	90.64
Total		203	100.00
Did the project provide employment to any member during operational phase	1 Yes	37	18.23
	2 No	166	81.77
Total		203	100.00

Table 11.18 Number of days of employment provided by the project

	Number of respondents	*Percent*
Number of days of employment during construction phase		
1-100days	4	21.05
101 thru 200days	1	5.26
201 thru 300days	5	26.32
301 thru 400days	2	10.53
401 thru 500days	0	0.00
501 thru 600days	3	15.79
701 thru 800days	4	21.05
Total	19	100.00

Loss of land and property due to the project and compensation paid

More than half of the 203 respondents reported that they had lost land or property due to the project. Of these, about 97 percent said that they had received compensation in lieu of the loss (Table 11.19).

Table 11.19 Loss of property due to the project and compensation received

		Number of respondents	*Percent*
Did you lose any land/property due to the project	Yes	114	56.16
	No	89	43.84
Total		203	100.00
Were you compensated for the loss	Yes	111	97.37
	No	3	2.63
Total		114	100.00

Improvements in the social and economic environment due to the project

The respondents were asked to provide their perception on improvements in the social and economic infrastructure in their locality on account of the project. The results are presented in Table 11.20. It is seen that generally only a minority of people feels positive impacts on social infrastructure. The largest positive impacts are felt in the area of transport, schools and markets, but in none of these cases have more than a fifth of respondents felt a positive impact.

A majority (83%) felt that the project had no negative impacts. Only about 10% of the respondents felt that the project had caused environmental pollution in the area.

Table 11.20 Improvement in social and economic infrastructure due to the project: perceptions

		Number of respondents	Percent
Improvement in the transport infrastructure	Yes	39	19.21
	No	164	80.79
Total		203	100.00
Improvement in the medical facilities	Yes	4	1.97
	No	199	98.03
Total		203	100.00
Improvement in the schools	Yes	33	16.26
	No	170	83.74
Total		203	100.00
Improvement in the markets	Yes	35	17.24
	No	168	82.76
Total		203	100.00
Improvement in the local government institutions	Yes	5	2.46
	No	198	97.54
Total		203	100.00

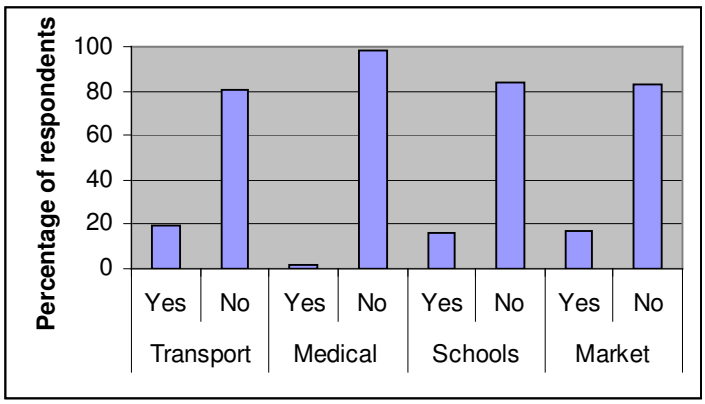


Figure 11.3 Perceptions on infrastructure improvement.

Table 11.21 Negative impacts due to the project: perceptions

Impact	*Number of respondents*	*Percent*
Environmental(air pollution etc)	22	10.84
Balance of the natural environment becoming destroyed	0	0.00
Crime or other safety issues	11	5.42
Alcohol addiction in young boys	1	0.49
Land loss	3	1.48
Water crisis	2	0.99
No negative impacts	168	82.76
Total	203	100.00

CHAPTER 12 Teesta Canal Hydroelectric Project (TCHP)

Project and loan profile

Project Area: West Dinajpur District, West Bengal.

Location: On Mahananda Main Canal of Teesta Barrage project. On Canal Drop at CH 5.503 km for P.S-I, at Ch 21.275 km for P.S[21] II, Ch 31.5 km for P.S III of Mahananda Main Canal.

Installed Capacity: 3 x 3 x 7.5M.W = 67.5 MW

Executing Agency: West Bengal State Electricity Board (WBSEB)

Total Project Cost: JPY 17,762 Mil.

ODA Loan Portion: JPY 14,247 Mil.

Cost borne by the borrower: JPY 3,515 Mil.

Status

The project has been completed and ex post evaluation has been carried out.

Evaluation of the project

Relevance

The West Bengal power sector is characterised by an adverse hydro-thermal ratio of 4:96 (including imported power) against the desirable ratio of 40:60. This could make the power supply system unstable specially in peak demand periods.

In comparison to the southern part of West Bengal, the northern part viz. the districts of Darjeeling, Jalpaiguri, Coochbehar, West Dinajpur and Malda have a lower rate of growth, particularly in the industrial sector. Beside inadequate road and rail connection, shortage of power is one of the most important factors contributing towards such retarded growth rate.

Being situated away from the coalfields or oil fields and due to inadequacy of transport facilities, power generation only with fossil fuel was never an attractive proposition for this area. On the other hand, the northern part of West Bengal gained strategic importance after independence serving as a vital link in the border area between the eastern states like Assam, Meghalaya, Arunachal,

[21] P.S: Power Station

Manipur,Tripura, Nagaland, Mizoram and the rest of the country. Tea cultivation is a key economic activity in this area, and a major foreign exchange earner. The tea industry, run mostly from their captive generating stations are eager to connect with the power grid of North Bengal because isolated captive diesel stations are often uneconomic. An interesting feature of the tea industry is that its working season and the demand for power synchronizes with that of the secondary power generation available from Hydro Power stations during monsoon months. A number of industrial schemes, specially paper pulp industries, were kept in abeyance due to non-availability of adequate power in this region[22]

All this points to the continued relevance of hydro power development in the state.

The West Bengal government planned to add 704.7MW of generating capacity in the 7th Plan Period (1985-90). Given the lack of peaking facilities, the Central Electricity Authority placed great importance to hydropower generation at that time. The Teesta project is therefore consistent with stated priorities of the government.

Evaluator comment: The project is very relevant.

Efficiency

Project Scope

The project consists in the installation of three Hydro-Electric Power Stations of 67.5 MW aggregate capacity by taking advantage of four canal falls on Mahananda Main Canal of the Teesta Multipurpose project.

The Teesta Canal Hydroelectric project began its commercial operation on 1st April, 2000.The three power stations takewater from Teesta River through Mahananda Barrage and the Teesta – Mahananda Link Canal.

Under the Teesta Canal Hydroelectric Project the following ex-ante scopes are actualised:

- Installation of nine generating units: The generating units are of valve type water-wheel generator with capacity of 7.5 MW each.
- Construction of Three power stations, PS-1, PS-2, and PS-3.
- Construction of approach canal, by-pass canal and tailrace canal. The approach canal and tailrace canal are respectively of length 705 meter and 5,040 meter.
- Construction of one set of switchyard.
- Installation of three main transformers with voltage 132/6.6 and capacity of 27.0 MVA per unit.

For the optimal functioning of the project some additional constructions were also done, which are as follows:

[22] Teesta Canal Fall Project Detailed Project Report, Section1: Page1and 5

Installation of a diesel power generator: The diesel power generator was installed to supply energy to the power station's starter.

Construction of an escape canal: In order to avoid the sudden surge in water levels caused by sudden tripping/closure of the power station an escape canal was constructed at PS-1 &PS-3.

Construction of remote control radial fall gate system: In order to avoid the flooding caused by the surge in water levels a remote control radial fall gate was constructed on Mahananda Main Canal (MMC).

Catering additional surge of water in case of sudden tripping/closure of the power station posed a technical problem. To improve the efficiency and reliability factor, construction of an escape channel at PS-I & III to take care of the additional surge by spilling the same directly to Mahananda Main Canal was considered essential[23].

Implementation Schedule

The project was completed in March 2000, seven years behind schedule. The reasons for the delay have been discussed in the 2002 JBIC evaluation, and are not being repeated here.

Evaluator comment: The project suffered from implementational delays.

Effectiveness

The original annual target for the three power stations was 109.9, 107.0 and 103.0 GWH respectively. The relevant performance indicators are presented below[24]:

[23] TCF Project Completion Report and JBIC Evaluation Summary.
[24] Figures for previous years are available in the 2002 JBIC evaluation report

Table 12.1 Performance indicators of the project (Utilisation indicators)

		2001-02	*2002-03*	*2003-04*
Gross Energy	PS-1	52.82	49.96	28.07
production (In	PS-2	54.18	57.68	32.441
million units)	PS-3	62.18	56.45	32.58
Peak load (MW)	PS-1	7.5	8.6	6.4
	PS-2	7.5	9.1	6.8
	PS-3	10.4	9.2	6.9
Plant load Factor	PS-1	32.16	48.06	45.46
(%)	PS-2	35.89	50.63	53.91
	PS-3	43.88	60.32	54.81
Water Flow in the	Average	110	110	100
MMC at PS-1	Max	170	120	110
(m^3/sec)	Min	90	80	70

SOURCE Questionnaire for Executing Agency

The following table compares total generation figures with targets.

Table 12.2 Generation of Power from TCHEP

Year	*Generation (in MU)*	*Target (in MU)*	*Remarks*
2000-01	118.90	60	Almost double generation
2001-02	169.10	122	Nearly 40% more generation
2002-03	164.09	172	Shortfall due to restriction in release of water and extension of canal shutdown by 15 days
2003-04	93.02	128	Shortfall due to shutdown of canal from 22.5.03 and from 05.08.03 and from 01.12.03 to 31.03.04,a total of six and half months

SOURCE WBSEB annual report 2003-04, page12

The following table provides information on outage causes.

Table 12.3 Outage causes

Year	*Outage due to human error (%)*	*Outage due to machine trouble (%)*	*Planning outage (%)*
2001	0	10	90
2002	0	11	89
2003	0	11	89
2004	0	10	90

Evaluator comment: The project has had a mixed performance in terms of effectiveness – with generation shortfall in recent years.

Impact

The project is not expected to affect the livelihood of the local people directly in a major way. The project did not generate any remarkable amount of employment for the local people even at the construction phase. As per results of the household survey, the project has made a somewhat positive impact on rural electrification in the project vicinity.

As per information provided by the Executing Agency, on an average, 250-500 local people were employed in each power station through agencies/ contractors during the construction phase. In the post-construction phase, around 50 local people are employed in each station.

A more detailed discussion on impact can be found in the section on beneficiary perceptions.

Evaluator feedback: The project did not result in large scale employment creation, but had some positive social impacts in the vicinity.

Sustainability

Organisational outlook

A Project Manager heads the project. At the O&M level, the project employs two Superintending Engineers – Electrical and Civil. The project has a total of 140 employees, that includes 87 technical and 53 non-technical employees.

The following tables show original expected and actual/currently expected expenditure on O&M.

Table 12.4 Original expected expenditure for O/M under ID-P40

Fiscal Year	*Total expenditure in million (Rs.)*
1989	0.5
1990	6.5
1991	11.5
1992	11.7
1993	11.7
1994	11.7
:	:
:	:
:	:
:	:
2023	11.7

SOURCE Project Completion Report, Page 25 and 26

Table 12.5 Actual & Current expected expenditure for O & M under ID-P40

Fiscal Year	*Total expenditure in million (Rs.)*
1999	29.90
2000	59.82
2001	59.82
:	:
:	:
:	:
:	:
2023	59.82

SOURCE Project Completion Report, Page 25 and 26

Table 12.6 Expected expenditure for O/M under ID-P72

Fiscal Year	*Total expenditure in million (Rs.)*
1994	n.a
1995	n.a
1996	15.3
1997	15.3
1998	15.3
1999	15.3
:	:
:	:
:	:
:	:
2028	15.3

SOURCE Project Completion Report, Page 25 and 26

Table 12.7 Original expenditure for O/M under ID-P72

Fiscal Year	*Total expenditure in million (Rs.)*
1999	24.62
2000	46.38
2001	46.38
:	:
:	:
:	:
:	:
2026	46.38

SOURCE Project Completion Report, Page 25 and 26

O&M works are usually carried out by agencies who are given Annual Maintenance Contracts (AMCs) at power stations. Capital spares for machineries are provided by suppliers, while other spares/ consumables are procured through a tendering process. In some cases, spares are procured directly from the original manufacturer as a proprietary item The Executing Agency reports that power generation is never seriously affected for want of spares/consumables or lack of maintenance and repair.

Constraints

In order to secure the sustainability of the project, several measures are being taken by the Executing Agency. We discuss some of these below:

Deterioration of MMC

Mahananda Main Canal (MMC), on which this project is situated, was built in 1998 as part of the Teesta Irrigation Project, but there were frequent collapses of the embankments. Taking this into account, water release to MMC was always less than what was estimated. In fact, though water release has been gradually increased as per the requirement of WBSEB, it has always been below the level needed for full utilisation of the hydro-electric plant. Thus rehabilitation of the canal is an urgent necessity. It is to be noted that the responsibility of canal maintenance lies with the Irrigation and Waterways Directorate (I&WD) off the Government of West Bengal.

The work of lining the side slopes of MMC upstream of the PS1 is now completed. But the condition of the canal between PS1 and PS2 remains vulnerable. Thorough repairing is to be taken up by the I&WD.

Insufficient discharged capacity in the lower reaches of MMC

The Dauk-Nagar Main Canal (DNMC) is situated at the lower extension of MMC, and was to serve as both an irrigation canal and a discharge canal. The DNMC was to be completed before the commissioning of the Teesta Project, but it is not yet complete. I&WD has chalked out a plan to complete the remaining part of the canal around 2008. However, construction of Escape Channel from DNMC to Doloncha River has been completed to cater 200 cumecs of water in the MMC lower reaches. However, the maximum discharge upto 220 cumecs could not be realised, since there was insufficient water in MMC.

Deposition of silt at MMC bed

The water in the MMC (originating in Teesta River) contains high amounts of sand and silt, which gets deposited in the canal bed, reducing the discharge capacity of the canal. Sand and silt deposited at the Head Race Channel and intake locations of each Power Station is cleared during the annual shutdown of the canal.

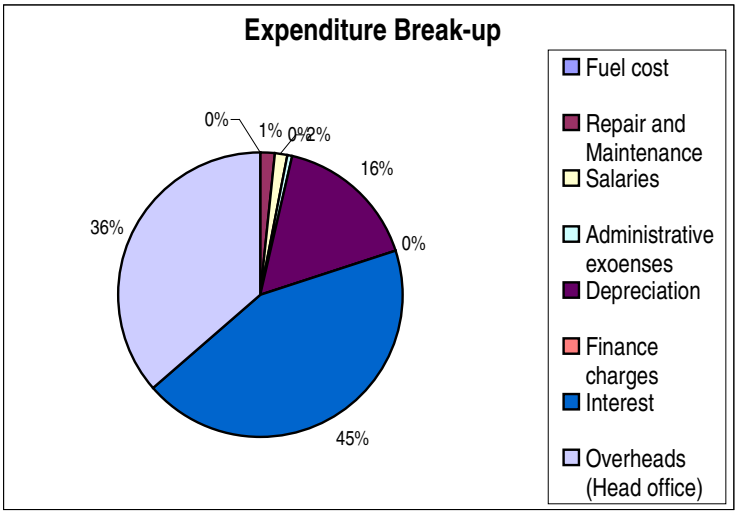
Floating and underwater trash

Floating and underwater trash at Head Race Channel and Trash Racks are cleared by engagement of divers and labours. Trash cleaning machines are being currently considered.

Financial statement

The following table provides information on income and expenditure of the Teesta Hydroelectric Project for the year 2003-04.

Income	*Amount (Rs million)*
Revenue from sale of power	167.5
Expenditure	
Fuel cost	0.5
Repair and Maintenance	23
Salaries	25.5
Administrative expenses	6.8
Depreciation	249.8
Finance charges	0.8
Interest	669.3
Overheads (Head office)	560.6
Total	1536.3
Profit	(-) 1368.8



As seen above, the bulk of the expenditure is on account of interest payment (41%) and overheads (36%). The project's income-expenditure statement shows an annual loss of Rs 1368.8 million owing to the large interest and overhead components. If however, the status of the individual project is to be considered, we can consider two further scenarios (a) When interest liability is not considered: The loss reduces to Rs 699.5 million (b) When both interest and overheads are not considered: The loss reduces to Rs 138.9 million.

Evaluator feedback: The project displays relatively poor financial performance largely due to the high interest burden. Measures are being taken to enhance technical sustainability of the project.

Beneficiary view

A survey was carried out to study the impact of the Teesta canal Hydroelectric Project. The survey attempted to investigate whether the project has impacted the lives of the people either by providing access to electricity and other infrastructure, or by generating employment opportunities in the neighbourhood. The total number of respondents interviewed was 206 out of which 65 percent were males and the rest females.

Socio-economic profile of the sample

The basic profile of the respondents was as follows.

- About 35 percent of them were in the age group of 25-35 and about 14 percent were above 50 years.
- About 75 percent of the respondents reported belonging to households with 3 or less than 3 male members and about 80 percent were those with 3 or less than 3 female members in the households.
- 35 percent of the respondents were daily wage labourers, 27 percent were businessmen and 21 percent reported cultivation as being their primary family occupation.
- About 59 percent of the respondents reported average monthly income below Rs 2000 while 31 percent reported it to be between Rs 2000-5000.

The detailed profile of the respondents is given in the tables below.

Table 12.8 Profile of the respondents

Sex		*Number of respondents*	*Percent*
	Male	134	65.05
	Female	72	34.95
Total		206	100
Age	<15 years	1	0.49
	15-20yrs	5	2.43
	21-25yrs	23	11.17
	26-30yrs	36	17.48
	31-35yrs	36	17.48
	36-40yrs	27	13.11
	41-45yrs	28	13.59
	46-50yrs	21	10.19
	>50yrs	29	14.08
Total		206	100

Table 12.9 Average monthly income of the respondents

Average monthly income	*Number of respondents*	*Percent*
1-2000	121	58.74
2001- 5000	64	31.07
5001-8000	12	5.83
8001-10000	3	1.46
10001 and above	3	1.46
Don't Know /Cannot Say	3	1.46

Occupational structure of the respondents

Table 12.10 shows the occupational structure of respondents. About 35 percent of the respondents were daily wage labourers, 27 percent were businessmen and 21 percent reported cultivation as being their primary family occupation.

Table 12.10 Profile of the primary family occupation

Occupation	*Number of respondents*	*Percent*
Factory worker	7	3.40
Business	56	27.18
Daily wage labourer	71	34.47
Cultivation	43	20.87
Clerk	4	1.94
Teacher	6	2.91
Service	7	3.40
Pension Holder	3	1.46
Agriculture	7	3.40
Self-Employed	1	0.49
Driver	1	0.49
Total	206	100

Impact of the project: electricity generation

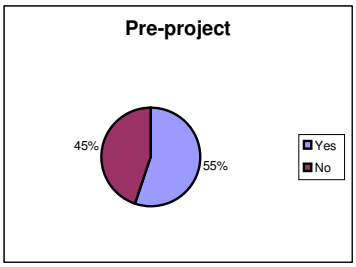
Electricity provision: before and after Teesta project

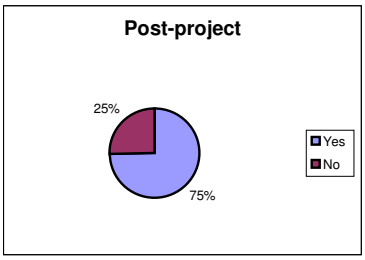
The Teesta survey revealed that the electricity was available to only 55 percent of the respondents before the Teesta project The number however, post Teesta went up to about 75 percent.

Table 12.11 Record of electricity provision- Pre and post project

Pre-project	*Number of respondents*	*Percent*
Yes	114	55.34
No	92	44.66
Post-project		
Yes	154	74.76
No	52	25.24

Further when enquired about the per day electricity availability pre and post Teesta, 48 percent respondents stated that availability for about 20 or more hours per day. After the project came into existence 93 percent claimed to get electricity for more 20 or more than 20 hours per day. On an average electricity was available for 16.5 hours pre Teesta and about 22.2 hours after the project came into existence.





Monthly electricity bill- pre and post project

The survey revealed that the average monthly electricity bill after the project came into existence is less than Rs 200 for almost 90 percent of the respondents. Further, on an average prior to the project people paid Rs 77 per month for electricity. After the project came into existence, this has risen to Rs 118 per month.

Table 12.12 Monthly bill pre and post-project

	Pre project		*Post project*	
Monthly bill (Rs.)	*Number of respondents*	*Percent*	*Number of respondents*	*Percent*
<100	41	19.90	94	45.63
100-200	9	4.37	92	44.66
201-300	2	0.97	11	5.34
301-400	0	0.00	5	2.43
401-500	1	0.49	2	0.97
>500	153	74.27	2	0.97
	206		206	

Social impact of the Teesta project

Employment generation

The project was not found to have generated considerable employment during the construction as well as the operational phase. Only about 3 percent of respondents stated that they received employment during the construction phase of the project.

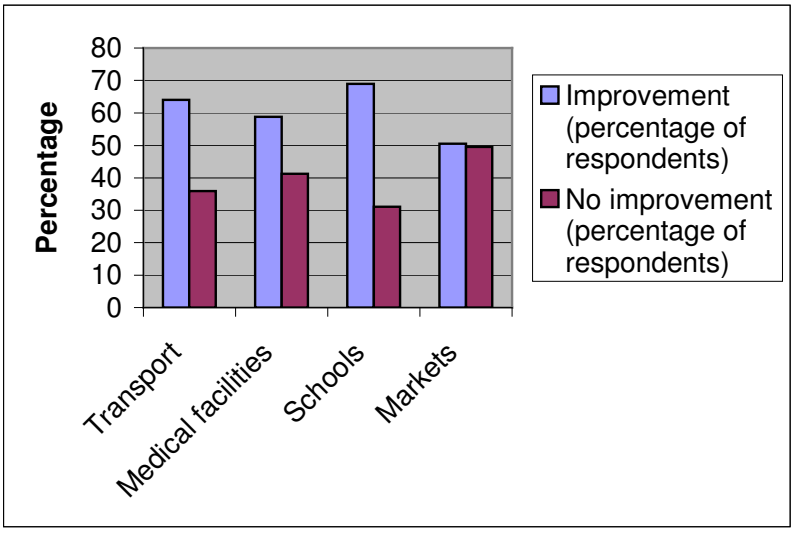
Infrastructural facilities

About 64 percent of the respondents stated an improvement in the transport infrastructure; 59 percent in medical facilities; 69 percent in schools; and 50 percent in local markets. When asked about other negative impacts that may have occurred as a result of the Teesta project about 94 percent of the respondents reported no negative impact on their lives.

Table 12.13 Improvement in the infrastructural facilities

Infrastructure	*Improvement (percentage of respondents)*	*No improvement (percentage of respondents)*
Transport	64.08	35.92
Medical facilities	58.74	41.26
Schools	68.93	31.07
Markets	50.49	49.51

Total respondents = 206



CHAPTER 13 Purulia Pumped Storage Project (PPSP)

Project and loan profile

The Purulia Pumped Storage Project (PPSP) with a total installed capacity of 900 MW is being set up in Ajodhya Hills of the Purulia district of West Bengal. The project is based on loan assistance from Japan Bank for International Cooperation (JBIC). The total estimated project cost is 107150 million yen.

While the primary purpose of the project is to serve as a peak power supply facility in India's eastern region, the project is also expected to contribute to general socio-economic development within its immediate vicinity and result in increase in revenues from eco-tourism. It is to be noted that the project site falls within a predominantly tribal area, that is backward both socially and economically. However, the area is also known for its rich cultural heritage, and Ajodhya Hills is a major tourist attraction of West Bengal, both due to its scenic beauty and its tribal culture.

Basic details of the projects are provided in the table below
Installed Capacity: 4 X 225 MW (900 MW).

Project Cost (Original): 107150 MY (31889 million Rupees)
JBIC Component (Original): 88025 MY (26197 million Rupees)
(1 Re = 3.36 Y)

Project Cost (Now Anticipated): 73521 MY
JBIC Component (Now Anticipated): 62061 MY (1 Re =2.59 Y)
State contribution: 11460 MY

Status: The project is currently under construction.

Evaluation of the project

Relevance

The eastern region of India depends to a very large extent on coal-based thermal power plants for meeting its power needs. West Bengal has a skewed hydro-thermal mix of 6:94 (including imported power) which makes it difficult to meet sudden and steep load fluctuations. A Pumped Storage Project is a response to this situation, since it can handle (accept/ reject) a sudden load efficiently and with minimum lag.

The need for accelerated development of hydropower, both in conventional as well as Pumped Storage schemes, is now an imperative to stabilize the West Bengal power system. The PPSP is an ideal solution to utilize the off-peak surplus of Thermal power stations for pumping the water from the Lower Reservoir to the Upper Reservoir and generate during peak load hours by

utilizing water from the Upper Reservoir. This will ensure high PLF and base load operation of thermal Plants with high efficiency.

With the available thermal power stations under WBSEB, WBPDCL, DPL and CESC the base load including pumping power can be managed efficiently and the entire peak power can be catered by the PPSP.

In the year 2000, the Central Electricity Authority (CEA) conducted an assessment study based on which several regional pumped storage schemes were identified. Under this assessment, 6 projects were identified in the eastern region with a total capacity of 9085 MW. Formulation of the Purulia Project is consistent with this national level planning exercise.

Evaluator comment: The project is highly relevant.

Efficiency

Cost efficiency

The project will use electricity generated by WBSEB and WBPDCL at a cheaper rate at the off peak period as input for this project, and will sell it at higher rate to the users. So it is expected to generate positive revenue at the implementation phase. After storing rainwater in the reservoirs during 2005 and 2006 it will start production around 2007. Cost comparison corresponding to the same annual peak supply hours between a coal-based Thermal Power Plant (using indigenously available coal) and the PPSP shows that PPSP is superior with a BCR of >2. Thus, the PPSP remains viable as a peak power supply facility. At the construction phase this project is using local stone of Ayodhya Hills as key manufacturing material, which has reduced the project cost substantially.

Efficiency in implementation

The following table provides lot-wise implementation status.

Table 13.1 Lot wise implementation status

Lot No.	*Description of Package*	*Completion of work*
1	Road	December, 2006
	Base camp	First phase of work completed consequent to which major work
	Construction power	commenced and remaining work will continue till gestation period of the
	Other preparatory & miscellaneous works	project.
2	400 kv double circuit transmission lines between Purulia – Arambagh.	October 2006.
3	400 kv extn.bays at Durgapur and Arambagh 400 kv sub station.	August 2006.
4	Main civil works.	February 2007. March 2007 – December 2007.in phases
5	Hydro-mechanical equipment.	February 2007. March 2007 – December 2007.in phases
6.1	Electro –mechanical equipment, pump/turbine,generator/motor & other power house auxiliaries.	February 2007. March 2007 – December 2007.in phases
6.2	GIS Sub station & generator.	February 2007. March 2007 – December 2007.in phases
6.3	400 kv XLPE power cable	February 2007. March 2007 – December 2007.in phases
	Commissioning: Unit: 1,2,3,4	Dec 2007, Sep 2007, June 2007, March 2007 (respectively)

Evaluator comment: The project is being implemented efficiently.

Effectiveness

Project is under construction; so this segment is not applicable. However, the expected values of indicators are:

Comprehensive Circulating Efficiency (%)[25] : 75.5
Operating hours: 6 hours/ day
Planned outage: 1 week/ year for annual inspection
Maximum Output: 900 MW
Net Electricity Production: 1700 GWh/year
Volume of sedimentation in reservoir: 950 cum/ha/year

Evaluator comment: Not applicable at this stage.

Impact

Beneficiaries at the construction phase

The most direct beneficiaries in the construction phase are people of the villages adjoining the project site, who receive wage employment from the project. The estimated requirement of daily wage labour is 6000 during the peak construction phase. As mentioned earlier, the project is located in a relatively backward area of West Bengal[26]. It is therefore expected that people belonging to backward communities would enjoy a higher standard of living due to wage employment benefits of the project.

Importantly, a project of such magnitude and nature is being implemented without any social displacement in the construction phase.

Establishment of a project of the magnitude of PPSP necessitates development of social infrastructure around the project area. Such social infrastructure - serve at least the following groups of people:

- Technical and non-technical people during construction and operational phases, and their families
- Other residents of locations in the project vicinity who could potentially access infrastructure created by the project
- Small and medium industry that develop as a consequence of the project, employees in these industries and their families

In the context of the PPSP, the area development plan includes creation of the following infrastructure:

- School
- Hospital
- Market complex
- Roads (upgradation)

[25] Comprehensive Circulating Efficiency (%) = (Net electricity / Electricity used for pumping) * 100. This indicator is applicable only to pumped storage power plants.
[26] The project area has about 40% tribal population. Almost 80% of people depend on agriculture, and 6% depend on livestock/ forestry.

It is expected that communication facilities developed by the project will benefit the general residents of the area apart from direct project employees.

It is to be noted that currently, most of the residents of the villages adjoining the project site belong to the low income group with limited access to electricity. Where electricity is available, the supply is erratic with large spells of power cuts. Improvement in power availability could be viewed as an indicator of social development at the operational phase of the project.

After completion of the PPSP, there would be possibilities of covering a larger chunk of the project zone by irrigation facilities. This would result in additional employment of local people in the agricultural sector.

The following are some of the qualitative impacts that can be observed at this stage:

- Additional demand for household goods due to construction of a market complex
- Improved communication and creation of new bus routes (Many existing village roads have been converted into bituminous roads)
- Increase in school attendance among local children due to improvement of local schools and increased awareness among parents

Besides, the area has a huge tourism potential, and several new hotels have already come up. The reservoirs also provide an opportunity to develop fisheries, which could provide additional income to local people.

Details about beneficiary perceptions is provided in a later section.

Environmental impact

The project has received environmental clearance from the Ministry of Environment and Forests (MoEF) in October 1993. At the initial assessment stage, 232.42 ha of forest land was required for the project; subsequently an additional 140.72 ha of forest land was to be acquired. Details are provided below.

Table 13.2 Forest land acquired by the project

Phase	*Date*	*Area (ha)*
1	December 1997	232.42
2	February 2002	131.67
3	March 2003	9.07
Total		373.16

As per provisions of Forest Conservation Act 1980, whenever forest land is diverted for non-forest purposes, compensatory afforestation needs to be done on equivalent amount of non-forest land, or twice the amount of degraded forest land.

The following table shows payments made by the West Bengal State Electricity Board to the Forest Department for compensatory afforestation.

Table 13.3 Payments made for compensatory afforestation

Purpose	*Payment in Rs (lakh)*
Compensatory afforestation (Phase I)	24.17
Compensatory afforestation (Phase II)	121.11
Afforestation works, Catchment Area Treatment (CAT), reclamation of quarried area etc	273.19
Total	418.47

WBSEB has also agreed to return an area of 113.95 ha of prime forest land to the Forest Department on demand after project completion and reclamation of this land.

Compensatory afforestation has been initiated by the Forest Department in 2000-01, and is expected to continue upto 2008-09. The broad steps in the compensatory afforestation programme are as under:

- Selection of species
- Advance soil works
- Creation works
- Maintenance works
- Soil and moisture conservation
- Formation of Forest Protection Committee (FPC)
- Vegetative fencing
- Raising seedlings
- Construction of a permanent nursery

In addition, landscaping, beautification and forestry-related works of the Administrative Building, Police Complex and 32 KV Substation/ Guest House Complex was taken up by the Forest Department in 2001 and has been completed. Similar work in the Barriya Township Area was taken up in 2003 and will be completed soon.

Evaluator comment: The project has a positive social impact, and limited negative environmental impact.

Sustainability

The project is not yet operational; so this segment is not applicable. We may however point out relevant issues in project sustainability:

- Since the project site is in a backward area, it is important that villagers residing in the vicinity of the project site continue to perceive benefits beyond the construction phase (when wage employment is received). This is possible when there is continued interest in social development work, and the benefits due to enhanced infrastructure continue to be felt.
- Eco-tourism activities can benefit from the project, and the infrastructure generated. It is important to ensure that gains from additional tourist traffic are shared with locals.
- Since the primary purpose of the project is to generate power, sustainability will also depend on how much additional power local people would get in the operational phase.
- The project is expected to have significant irrigation benefits leading to enhancement of agricultural productivity

Evaluator comment: Not applicable at this stage.

Beneficiary views

A survey was executed to elicit the perceptions of the beneficiary community (residents of villages in the vicinity of the project site) . The total number of respondents interviewed was 205 of which about 66.0 percent were males and the rest females.

Socio-economic profile of the sample

Data on the basic profile of the respondents is provided in the table below. The main features are as follows:

- The age of the respondents ranged from 15 years to 71 years with an average age of about 33.5 years and more than 70% of the respondents lying in the range 21-40 years.
- About 27 percent of the respondents reported that there were 2 male members in the households followed by 3 male members in 21% of the households, and 4 in 18% households. On the other hand, about 24 percent households had 2 and 3 female members each followed by 19% with 1 female member.
- About 40% of the respondents reported their primary occupation was cultivation, while about 18% each reported their primary occupation as daily wage labourer and business.
- About 55 percent of the respondents reported an average monthly income less than Rs 2000 while another 36$ reported it between Rs 2000-5000.

Table 13.4 Profile of respondents

	Number of respondents	*Percent*
Age of respondents		
<15 years	0	0.00
15-20yrs	20	9.76
21-25yrs	31	15.12
26-30yrs	44	21.46
31-35yrs	38	18.54
36-40yrs	31	15.12
41-45yrs	13	6.34
46-50yrs	13	6.34
>50yrs	15	7.32
Total	205	100.00
Primary family occupation		
Factory worker	0	0.00
Business	38	18.54
Daily wage labourer	36	17.56
Cultivation	81	39.51
Clerk	6	2.93
Teacher	9	4.39
Service	12	5.85
Pension holder	1	0.49
Bank interest	0	0.00
Carpenter	4	1.95
Computer operator	0	0.00
Agriculture	17	8.29
Self-employed	1	0.49
Driver	0	0.00
Total	205	100.00
Average monthly earning (Rupees)		
1-2000	112	54.63
2001- 5000	73	35.61
5001-8000	10	4.88
8001-10000	8	3.90
10001+	0	0.00
Don't know/cant say	2	0.98
Total	205	100.00

Impact of the project on access to electricity in the survey area

Provision of electricity

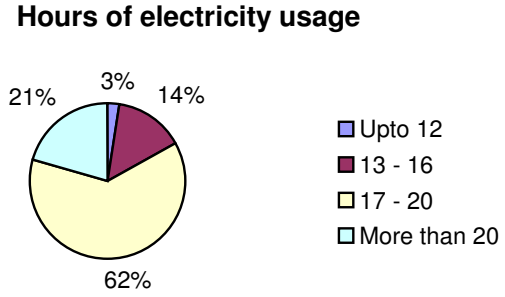
Almost all individuals surveyed had access to electricity even before the project; however, as high as 90% reported that they consumed less electricity than they would normally require.

Table 13.5 Provision of electricity before the project

		Number of respondents	*Percent*
Was there the provision of electricity in your	Yes	203	99.02
locality in past	No	2	0.98
Total		205	205
Do you consume less power than what you would	Yes	201	98.05
normally require	No	4	1.95
Total		205	100.00

Hours of electricity use

About 62 percent of the respondents consumed between 17 and 20 hours of electricity per day even before the project. The figures reveal that electricity is available for large parts of the day, and most people use it for some purpose or the other throughout the day. Expectedly, bulk of the respondents use power for 17-20 hours, and a fifth use it for more. In rural areas, daytime usage is usually relatively less, since electricity is rarely used for cooking or running household appliances.



Payments for electricity use

Before the project, about 62% of the respondents were paying Rs 100-200 per month for electricity, while about 22 percent were paying more than Rs 500. After the project, 98% were reported to be paying more than Rs 500 (Table 13.6). However, it is difficult to assess the impact of the project on units of electricity consumed and payments made by individual households on the basis of this survey.

Table 13.6 Monthly electricity bill before and after the project

	Number of respondents	*Percent*
Monthly bill before the project (Rs)		
<100	12	5.85
100-200	106	51.71
201-300	30	14.63
301-400	8	3.90
401-500	2	0.98
>500	47	22.93
Total	205	100.00
Monthly bill after the project (Rs)		
<100	0	0.00
100-200	3	1.46
201-300	0	0.00
301-400	0	0.00
401-500	0	0.00
>500	202	98.54
Total	205	100.00

Applications of electricity

Respondents stated the use of electricity for lighting and running fans, televisions, refrigerators etc, with all respondents using electricity for lighting before the project, and upto 94 percent using it for running fans and 67 percent for televisions.

Table 13.7 Applications of electricity before project

	Number of respondents	*Percent*
Applications before the project		
1 Light	156	100.00
2 Fan	147	94.23
3 TV	105	67.31
4 Refrigerator	7	4.49
6 Any other	4	2.56

Employment created by the project

The project provided employment to about 19% of the respondents at the stage of construction (Table 13.8). The number of days of employment provided during construction varied from 1-800. About 38 percent reported that they got 300-400 days of employment while about 31 percent reported that they got 700-800 days of employment during construction.

Table 13.8 Employment during construction

		Number of respondents	*Percent*
Did the project provide employment to any member during construction	Yes	39	19.02
	No	166	80.98
Total		205	100.00

Table 13.9 Number of days of employment provided by the project

	Number of respondents	*Percent*
Number of days of employment during construction phase		
1-100days	1	2.56
101 thru 200days	5	12.82
201 thru 300days	4	10.26
301 thru 400days	15	38.46
401 thru 500days	1	2.56
501 thru 600days	1	2.56
701 thru 800days	12	30.77
Total	39	100.00

Improvements in the social and economic environment due to the project

The respondents were asked to provide their perception on improvements in the social and economic infrastructure in their locality on account of the project.

The greatest positive impact felt was in the area of transport infrastructure, where 41% perceived an improvement. 16% of respondents felt that there is an improvement in market facilities. A majority of residents (72%) felt that the project had no negative impacts.

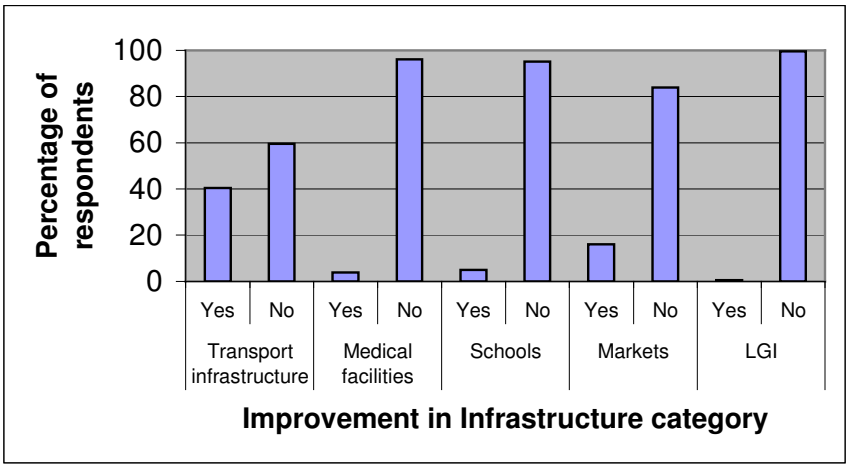
This is along expected lines. In the project construction stage, it is expected that there would be improvements in roads around the project site to facilitate transport of materials and project personnel. It is also likely that markets would improve since there would be greater demand for goods and services on account of increasing purchasing power and additional number of buyers (people who temporarily relocate to the project area for work. Relatively less impact is expected for facilities like schools and hospitals during the construction stage. These facilities get developed when the project is operational, and there is permanent relocation of people into the project area. Improvement in Local Government Institutions (LGIs) take a much longer time. As socio-economic conditions improve, people get more empowered and this is reflected in improved performance of LGIs. It is unlikely that much improvement in LGIs will be observed at the

construction stage, and expectedly almost all respondents have indicated that there has been no improvement.

Significantly, 72% of respondents have mentioned that they feel no negative impact. The project involves no relocation, since no family has lost any land or house. Historical/ cultural monuments have also not been affected. The loss is primarily of forest land, which is compensated by a "compensatory afforestation programme".

Table 13.10 Improvement in social and economic infrastructure due to the project: perceptions

		Number of respondents	*Percent*
Improvement in the transport infrastructure	Yes	83	40.49
	No	122	59.51
Total		205	100.00
Improvement in the medical facilities	Yes	8	3.90
	No	197	96.10
Total		205	100.00
Improvement in the schools	Yes	10	4.88
	No	195	95.12
Total		205	100.00
Improvement in the markets	Yes	33	16.10
	No	172	83.90
Total		205	100.00
Improvement in the local government institutions	Yes	1	0.49
	No	204	99.51
Total		205	100.00



Annexure 13.1: Staffing pattern (Construction stage)

	Engineering Officers	Non-engineering Officers	Technical staff	Non-technical staff
Sanctioned	140	14	31	140
Re-assessed	82	14	31	140

Annexure 13.2: Financial statement

(Rs. in Lakh)

Sl. No.	Name of Project	Nature / Location / Code No.	Name of External funding Agency	Date of Sanction / Date of Commencement of Work	Terminal Date of Disbursement of External aid	Estimated Cost
					Original Revised	Original Revised
1	2a	2b	2c	3	4	5
1.	Purulia Pumped Storage Project (900 MW)	Pumped Storage Hydro – Electric / P.S. Bagmundi Dist. Purulia West Bengal / ID-P.98 dated 28.02.95	Overseas Economic Co-operation Fund	12.04.95	12.04.2003 -	145656 318890 (107150 MY)

Pattern Of Funding State Share Central Assistance Others (OECF)	Cumulative Exp. Upto Annual Plan 1991 – 92 State Share Central Assistance OECF	IX Plan Provision (1997 – 2002) State Share Central Assistance OECF		Actual Expenditure 1992 - 1997 State Share Central Assistance OECF	 1997 - 1998 State Share Central Assistance OECF
		Approved	Anticipated		
6	7	8 (a)	8 (b)	9	10
56920 (19125 MY) c) 261970 (88025 MY)	Nil	40380.00 c) 201880.00	36440.00 c) 187830.00	344.03 c) 1604.48	122.03 c) 963.83

Annual Plan 1998 – 99		Proposed Outlay 1999 – 2000	Remarks
Approved	Anticipated		
State Share Central Assistance OECF	State Share Central Assistance OECF	State Share Central Assistance OECF	
11	12	13	14
264.00 c) 3216.00	730.00 c) 14710.00	850.00 c) 4880.00	OECF loan approved in 1st tranche upto 1998-1999 is 20520 MY.

N.B. Exchange Rate : Re. 1 = 3.36 Yen

Annexure 13.3: Lotwise expenditure as on 29 March 2005 (Provisional)

S. No.	Lot No.	Description	Estimated Cost (in crore)	Awarded Cost (in crore)	Expenditure up to 31-Mar-04 (in crore)	Expenditure from April 2004 to 29-Mar-05 (in crore)	To Expen (in cr
1	Lot-1	Infrastructure	139.00	100.47	103.97	22.72	
2	Lot-2.1	PPSP-Arambag 400 kV Tr. Line	254.30	164.60	27.66	42.57	
	Lot-2.2	PPSP-Durgapur 400 kV Tr. line		161.06			
3	Lot-3	400 kV Extension Bays at Durgapur and Arambag	40.10	10.617	Nil	Nil	
4	Lot-4	Main Civil Works	556.70	707.29	387.00	217.59	
5	Lot-5	Hydro-mechanical equipment	393.50	143.92	36.39	45.75	
6	Lot-6.1	Electro-mechanical equipment	972.90	361.26	51.80	5.67	
7	Lot-6.2	400 kV Switchyard and Power Transformer		101.50	12.52	1.31	
8	Lot-6.3	400 kV XLPE Cable		37.794	Nil	3.82	
9		Consulting Services	35.30	28.68	17.19	6.83	
10		IDC	227.90		19.47	10.11	
11	JBIC Component		2619.70		656.00	356.37	
12	Non-JBIC Component	Administrative Cost	114.00		18.94	15.77	
		Land Cost	0.40				
		Taxes & Duties	454.80				
		GRAND TOTAL	**3188.90**		**674.94**	**372.14**	

Annexure 13.4: Budget and disbursement figures

STATEMENT SHOWING QUARTER-WISE KEY MILESTONES ACHIEVED DURING THE YEAR 2003-04

(Amount in INR)

S. No.	Milestone Description		1 Quarter	II Quarter	III Quarter	IV Quarter	Annual
1	Anticipated Expenditure [according to Revised Estimate (RE)]	JBIC	4340 lakh	4120 lakh	8860 lakh	6470 lakh	23790 lakh
		Non-JBIC	280 lakh	470 lakh	500 lakh	1150 lakh	2400 lakh
						Total:	26190 lakh
2	Actual Expenditure	JBIC	5386.95 lakh	5764.95 lakh	9033.12 lakh	10167.91 lakh	30352.81 lakh
		Non-JBIC	269.80 lakh	82.38 lakh	66.57 lskh	246.88 lakh	665.83 lakh
						Total: 31018.64 lakh	
						(Achievement: Plan Budget + 18.4%)	

STATEMENT SHOWING QUARTER-WISE KEY MILESTONES TO BE ACHIEVED /ACHIEVED DURING THE YEAR 2004-05

(Amount in INR)

No.	Milestone Description		1 Quarter	II Quarter	III Quarter	IV Quarter	Annual
1	Anticipated Expenditure [according to Revised Estimate (RE)]	JBIC	6170 lakh	8750 lakh	8263 lakh	23307.7 lakh	46485.7 lakh
		Non-JBIC	575 lakh	570 lakh	600 lakh	579.3 lakh	2324.3 lakh
						Total:	48810 lakh
2	Actual Expenditure	JBIC	7806.96 lakh	6202.55 lakh	9211.92 lakh	12415.78 lakh*	35639.21 lakh*
		Non-JBIC	402.89 lakh	113.99 lakh	186.87 lskh	873.25 lakh*	1577.00 lakh*
						Total:	37214.21 lakh
							(Achievement: 76.24%)

*Up to 29 March 2005 (Provisional)

Annexure 13.5: Calculation of FIRR and EIRR

Computation of financial internal rate of return (FIRR) for PPSP

Sent out energy (MU)			1700	MU						
Energy required for pumping			2206	MU						
Selling rate			4.2	Rs./unit						
Off-peak rate of pumping			1.81	Rs./unit						
		CASH OUTFLOW (MILLION RS.)				CASH OUTFLOW (MILLION RS.)				
Year	Fiscal Year	CAPITAL COST INCL. IDC AND TAXES AND DUTIES	O&M COST INCL. EMPLOYEE'S COST AS PER CERC's REGULATION	COST OF ENERGY FOR PUMPING	TOTAL CASH OUT FLOW	ENERGY SALE (MU)	TARIFF (Rs./Unit)	REVENUE	TOTAL CASH IN FLOW	NET CASH IN FLOW
	Upto 2003	6562			6562				0	-6562
	2004	3901			3901				0	-3901
	2005	10002			10002				0	-10002
	2006	4573			4573				0	-4573
1	2007	3018	445	3993	7456	1700	4.2	7140	7140	-316
2	2008	999	463	3993	5455	1700	4.2	7140	7140	1685
3	2009	606	482	3993	5081	1700	4.2	7140	7140	2059
4	2010		501	3993	4494	1700	4.2	7140	7140	2646
5	2011		521	3993	4514	1700	4.2	7140	7140	2626
6	2012		542	3993	4535	1700	4.2	7140	7140	2605
7	2013		564	3993	4557	1700	4.2	7140	7140	2583
8	2014		587	3993	4580	1700	4.2	7140	7140	2560
9	2015		610	3993	4603	1700	4.2	7140	7140	2537
10	2016		634	3993	4627	1700	4.2	7140	7140	2513
11	2017		659	3993	4652	1700	4.2	7140	7140	2488
12	2018		685	3993	4678	1700	4.2	7140	7140	2462
13	2019		772	3993	4765	1700	4.2	7140	7140	2375
14	2020		740	3993	4733	1700	4.2	7140	7140	2407
15	2021		770	3993	4763	1700	4.2	7140	7140	2377
16	2022		801	3993	4794	1700	4.2	7140	7140	2346
17	2023		833	3993	4826	1700	4.2	7140	7140	2314
18	2024		866	3993	4859	1700	4.2	7140	7140	2281
19	2025		901	3993	4894	1700	4.2	7140	7140	2246
20	2026		937	3993	4930	1700	4.2	7140	7140	2210
21	2027		974	3993	4967	1700	4.2	7140	7140	2173
22	2028		1013	3993	5006	1700	4.2	7140	7140	2134
23	2029		1054	3993	5047	1700	4.2	7140	7140	2093
24	2030		1096	3993	5089	1700	4.2	7140	7140	2051
25	2031		1140	3993	5133	1700	4.2	7140	7140	2007
26	2032		1186	3993	5179	1700	4.2	7140	7140	1961
27	2033		1233	3993	5226	1700	4.2	7140	7140	1914
28	2034		1282	3993	5275	1700	4.2	7140	7140	1865
29	2035		1333	3993	5326	1700	4.2	7140	7140	1814
30	2036		1386	3993	5379	1700	4.2	7140	7140	1761

Computation of economic internal rate of return (EIRR) for PPSP

Sent out energy (MU)			1700	MU						
Energy required for pumping			2206	MU						
Average peak tariff			4.2	Rs./unit						
Max rate of _____			5.7	Rs./unit						
Off-peak rate of pumping			1.81	Rs./unit						
		CASH OUTFLOW (MILLION RS.)				CASH OUTFLOW (MILLION RS.)				
Year	Fiscal Year	CAPITAL COST INCL. IDC BUT EXCL. TAXES AND DUTIES	O&M COST INCL. EMPLOYEE'S COST AS PER CERC's REGULATION	COST OF ENERGY FOR PUMPING	TOTAL CASH OUT FLOW	ENERGY SALE (MU)	AVERAGE PEAK TARIFF (Rs./Unit)	REVENUE	EMPLOYMENT BENEFIT	TOTAL CASH FLOW
	Upto 2003	6172			6472				204	204
	2004	3791			3791				204	204
	2005	8133			8133				204	204
	2006	3680			3680				204	204
1	2007	2440	445	3993	6178	1700	4.2	7140	204	7344
2	2008	820	463	3993	5276	1700	4.2	7140	204	7344
3	2009	505	482	3993	4980	1700	4.2	7140	204	7344
4	2010		501	3993	4494	1700	4.2	7140	204	7344
5	2011		521	3993	4514	1700	4.2	7140	204	7344
6	2012		542	3993	4535	1700	4.2	7140	204	7344
7	2013		564	3993	4557	1700	4.2	7140	204	7344
8	2014		587	3993	4580	1700	4.2	7140	204	7344
9	2015		610	3993	4603	1700	4.2	7140	204	7344
10	2016		634	3993	4627	1700	4.2	7140	204	7344
11	2017		659	3993	4652	1700	4.2	7140	204	7344
12	2018		685	3993	4678	1700	4.2	7140	204	7344
13	2019		772	3993	4705	1700	4.2	7140	204	7344
14	2020		740	3993	4733	1700	4.2	7140	204	7344
15	2021		770	3993	4763	1700	4.2	7140	204	7344
16	2022		801	3993	4794	1700	4.2	7140	204	7344
17	2023		833	3993	4826	1700	4.2	7140	204	7344
18	2024		866	3993	4859	1700	4.2	7140	204	7344
19	2025		901	3993	4894	1700	4.2	7140	204	7344
20	2026		937	3993	4930	1700	4.2	7140	204	7344
21	2027		974	3993	4967	1700	4.2	7140	204	7344
22	2028		1013	3993	5006	1700	4.2	7140	204	7344
23	2029		1054	3993	5047	1700	4.2	7140	204	7344
24	2030		1096	3993	5089	1700	4.2	7140	204	7344
25	2031		1140	3993	5133	1700	4.2	7140	204	7344
26	2032		1186	3993	5174	1700	4.2	7140	204	7344
27	2033		1233	3993	5226	1700	4.2	7140	204	7344
28	2034		1282	3993	5275	1700	4.2	7140	204	7344
29	2035		1333	3993	5326	1700	4.2	7140	204	7344
30	2036		1386	3993	5379	1700	4.2	7140	204	7344

CHAPTER 14 West Bengal Transmission System Project

Project and loan profile

The broad objective of the project is "to enhance reliability of transmission system, and to make efficient inter-state power transmission, by constructing competent power transmission network and construct new substations and expand existing substations in response to growing power demand and increase of generation capacity in coming years in the state of West Bengal." In addition, reduction in transmission losses and voltage fluctuation is also intended.

There are as many as eight agencies dealing with power in West Bengal. These are WBSEB, WBPDCL, DPL (in the state sector), DVC in the concurrent sector, NTPC and PGCIL in the central sector, and CESC and DPSC in the private sector.

As per the Detailed Project Report of the Transmission System Project, the project puts emphasis on enhancing T&D facilities in the state to meet the increased demand load (4587 MW in 2001-02). Efforts are also made to establish better ties among the various power agencies, to keep transmission losses to a minimum, and to keep a tolerable voltage profile.

The following are the details of the JBIC loan for the project:

1st tranche: LA no. IDP 117 dt 25-2-97: 11087 million yen
Date of closure: 29-5-04

2nd tranche: LA no. IDP 143 dt 10-5-02: 3127 million yen
Date of closure: 2-8-09

(The total project cost is Rs 6.31 billion.)

Status

The project is completed in part.

Evaluation of the project

Relevance

The Government of West Bengal has targeted 100% rural electrification by the end of 2007. This is based on the Government of India Action Plan to speed up the process of rural electrification in the country. This Action Plan was endorsed by State Governments in conference of Chief Ministers/ Power Ministers on March 3, 2001. [27]The Transmission System Project is expected to contribute to rural

[27] http://pib.nic.in/feature/feyr2001/fjul2001/f130720011.html (Website of Press Information Bureau, Government of India; Accessed 27-2-06)

electrification through enhanced transmission reliability. The degree of rural electrification is usually measured by the Rural Electrification Ratio (RER). The RER is defined as the number of inhabited mouzas[28] electrified divided by the total number of inhabited mouzas (expressed as percentage). Increase in RER is ultimately the result of downstream transmission arrangements which is the responsibility of the Rural Electrification Department. In other words, this Department is responsible for making electricity available to the mouzas. The Transmission System Project can thus only indirectly contribute to an enhanced RER. The RER figures for 2001-2005 are provided in the figure below. The figures for 2006 and 2007 are projected figures – with 100% electrification targeted for 2007. District-wise figures have been provided in the Annexure to this chapter.

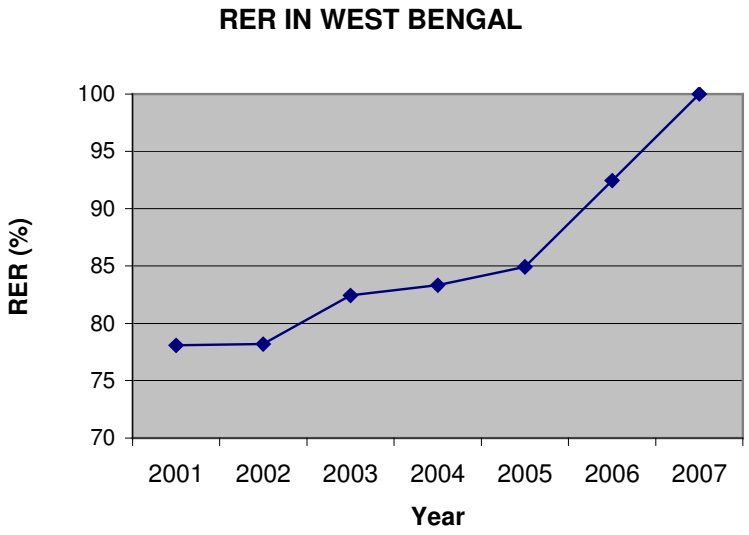


Figure **14.1** RER in West Bengal

Note: Figures pertaining to any year refer to status on 31st March of that year (The financial year used for reporting purposes in India is April-March). In certain districts, some electrification has been achieved through non-conventional means, such as through renewable energy sources. (Source: Rural Electrification Department, Government of West Bengal)

Evaluator comment: The project is highly relevant.

Efficiency

The original project covered the construction of 32 substations and 25 transmission lines. One substation and one transmission line was deleted from the original project scope; beyond this the original scope was adhered to.

[28] A mouza is the smallest revenue-cum-administrative unit in West Bengal, and may comprise of one, or a few villages.

The actual yearly project expenditure is provided below:

Table 14.1 Annual Project Expenditure

Fiscal Year	*Foreign Total Cost (Rs million)*	*Local Total Cost (Rs million)*
1997 – 98	25	4.6
1998 - 99	104	21.1
1999 - 00	381.7	2
2000 - 01	447.7	7.2
2001 - 02	1427.1	16.5
2002 - 03	1143.2	62
2003 - 04	484.3	49.1
2004 - 05	363.6	38.9

The estimated (original) expenditure is provided below (includes substations and transmission lines):

Table 14.2 Expenditure by Fiscal Year

Fiscal year	Expenditure (Rs million)
1996-97	788.73
1997-98	1806.71
1998-99	2546.94
1999-00	2500.25
2000-01	1633.26
2001-02	456.23

(Figures quoted from the Detailed Project Report)

The following table provides lot-wise scope of work for Lots 1 and 2 (transmission lines):

Table 14.3 Lot-wise scope of work (Lot 1& 2)

Transmission Lines:		
No.	*Line Section*	*Month of Commissioning (Original completion target)*
Lot-I		
400 KV		
1	Lilo of Kolaghat TPS – Durgapur 400 KV S/C at Arambag	September 2003 (June 2001)
200 KV		
1	Arambag – Rishra	November 2003 (Oct 2001)
2	Lilo of 1 CK of STPS – Howrah D/C line at Arambagh	February 2003 (Feb 2001)
3	Lilo of STPS – Howrah D/C line at Domjur	September 2003 (June 2001)
132 KV		
1	KTPS - Uluberia	May 2003 (Feb 2001)
2	Lilo of 1 CKT of Midnapur – Ballichak D/C line at Pingla	April 2003 (Oct 2001)
3	Extension of Adisaptagram – Belmuri D/C line to Arambag via Tarakeswar	June 2003 June 2001)
4	Lilo of BTPS – Rishra 132 KV line at Chanditala	July 2003 (Feb 2001)
5	Lilo of BTPS – Howrah 132 KV line at Lilooah	January 2004 (June 2001)
6	Arambagh – Birsingha	October 2001 (Oct 2001)
7	Domjur - Uluberia	February 2004 (June 2001)
8	Domjur - Jangipara	October 2003 (Oct 2001)
9	Laxmikantapur - Falta	April 2002 (June 2001)
10	Lilo of 1 CKT of BTPS – Bidhannagar 132 KV line at Khanyan	October 2003 (June 2001)
Lot-II		
132 KV		
1	NBU/NJP – Dalkhola S/C line with Lilo at TCF	June 2003 (June 2001)
2	Jeerut - Bongaon	March 2002 (Feb 2001)
3	Lilo of 1 CKT of Malda – Raigunj 132 KV D/C line at Samsi	January 2002 (Oct 2001)
4	Barasat - Basirhat	August 2002 (Oct 2001)
5	New Jalpaiguri – Moinaguri - Birpara	December 2002 (Oct 2001)
6	New Jalpaiguri - Siliguri	June 2003 (N.A.)
7	Krishnagar - Bongaon	April 2002 (Feb 2001)
8	Lilo of Raigunj – Balurghat 132 KV S/C line at Gangarampur	December 2001 (Oct 2001)
9	Lilo of 1 CKT of Sainthia – Gokarna 132 KV D/C line at Rampurhat	February 2002 (June 2001)
10	Lilo of BTPS – Bidhannagar 132 KV D/C line at Mankar	February 2002 (Oct 2001)

The following tables provides information on scope of work under Lots 3 and 4 (substations):

Table 14.4 Lotwise scope of work (Lot 3)

No.	*Name of Sub-station (Lot 3)*	*Month of Commissioning (Original planned)*
1	Midnapore 220/132 KV	Feb. 2003 (Oct 2002)
2	Domjur 220/132 KV	Jul. 2003 (Feb 2003)
3	New Haldia 220/132 KV	Dec. 2004 (N.A.)
4	Rishra 220/132 KV	Dec. 2003 (Feb 2003)
5	Uluberia 132/33 KV	May 2003 (Oct 2002)
6	Kolaghat 132 KV (Extn)	Dec. 2001 (Oct 2002)
7	Pingla 132/33 KV	Apr. 2003 (June 2003)
8	Tarakeswar 132/33 KV	Mar. 2003 (Oct 2002)
9	Chanditala 132/33 KV	Feb. 2004 (Oct 2002)
10	Lilooah 132/33 KV (Extn)	Jun. 2002 (Feb 2003)
11	Birsingha 132/33 KV	May 2005 (N.A.)
12	Raina 132/33	Dec. 2002 (June2003)
13	Haldia 132/33 KV (Extn)	Aug. 2001 (Feb 2003)
14	Jangipara 132/33 KV	Jan. 2005 (N.A.)
15	Mankar 132/33 KV	Oct. 2002 (June 2003)
16	Falta 132/33 KV (Extn)	Aug. 2001 (Feb 2003)
17	Khanyan 132/33 KV	Oct. 2003 (Feb 2003)

Table 14.5 Lotwise scope of work (Lot 4)

No.	*Name of Sub-station (Lot 4)*	*Month of Commissioning (Original planned)*
1	Arambagh 400/220 KV	May 2005 (N.A.)
2	Jeerat 132 KV (Extn)	Dec. 2001 (Oct 2002)
3	New Jalpaiguri 220/132 KV	Sept. 2003 (June 2003)
4	Laxmikantapur 132 KV (Extn)	Jun. 2002 (Feb 2003)
	Laxmikantapur 220/32 KV	Jan. 2005
5	Bongaon 132/33 KV	Mar. 2003 (Oct 2002)
6	Samsi 132/33 KV	Nov. 2003 (June 2003)
7	Basirhat 132/33 KV	Jan. 2003 (June 2003)
8	Barasat 132/33 KV (Extn)	Aug. 2001 (June 2003)
9	Siliguri 132/33 KV	Sept. 2003 (Feb 2003)
10	Moinaguri 132/33 KV (Extn)	Oct. 2001 (June 2003)
11	Birpara 132/33 (KV)	Dec. 2001 (June 2003)
12	Krishnagar 132/33 KV	Jan. 2003 (Oct 2002)
13	Gangarampur 132/33 KV	Oct. 2002
14	Rampurhat 132/33 KV	Oct. 2002 (Feb 2003)

The above tables broadly indicate that for several of the substations in lots 3 and 4 have been commissioned ahead of schedule. In fact, about 50% of substations in lot 3 and 75% of substations in lot 4 have a commissioning date earlier than the original commissioning schedule. On the other hand, there has been delays in commissioning of transmission lines, as the earlier table shows.

Evaluator comment: The project is implemented efficiently.

Effectiveness

The WBSEB has entrusted Power Grid Corporation of India with the task of establishing Operation and Effect Indicators (O&EI) to assess and evaluate the effectiveness of the project. This exercise is expected to be completed by April 2006. Besides, preparation of technical specifications and estimates for procurement/installation of equipment for monitoring the indicators at the substation level is under progress. Thus at this stage, indicators for effectiveness of the project (such as transmission loss %) are not available, but these would be available when the above exercises are completed.

Evaluator comment: Not applicable at this stage.

Impact

The project has little environmental impact as there is no question of emission of any gaseous pollutants or liquid effluents. The project does not involve any diversion of forest land, and thus clearance from the Forest Department was not necessary. The impacts are therefore largely social in nature.

Wherever land has been acquired for substations, the land costs have been paid by WBSEB at government rates before taking possession. There has not been any major displacement, since the land that has been taken is either government land or in a few cases agricultural land. During the construction phase, around 150 to 200 people found casual employment at each substation site during the peak season of about 6-8 months. About 30% of the labour hired (mostly unskilled) were from the local area; the rest came from adjoining regions. The substations are manned by WBSEB staff, and an estimated 12-15 people are involved in the operation of each of the substations.

Evaluator comment: The project has limited negative social impact, and resulted in generation of some local employment.

Sustainability

The project was monitored through three transmission field zones located at Siliguri, Midnapur, Chandannagar and Kalyani. Overall monitoring was done from the office of the Chief Engineer (Transmission Project) located at the corporate office of WBSEB at Kolkata. Two monthly review meetings were held at the project headquarters by the Member (Transmission) of WBSEB to monitor the progress of work and settle any pending issues in the presence of representatives of the executing vendors and respective site engineers.

The WBSEB has an in-house training centre under its Human Resource Development Wing for its O&M staff. It also deputes its officers to various training programmes conducted inside and outside the state.

The financial statements available refer to all operations of the West Bengal State Electricity Board, and do not refer to any specific project such as the one under review.

Evaluator comment: The project is backed by strong organisational support.

Beneficiary views

A survey was executed to elicit the perceptions of the beneficiary community with regard to this project. The total number of respondents interviewed was 313 out of which 63 percent were males and rest females. The sample was restricted to areas around substations for logistic convenience. It was felt that people living nearer to substations would find it relatively easy to relate to the project, though they would perhaps receive the same benefits as those living farther away. It has been mentioned in the 'Relevance' section that the project only indirectly affects supply of electricity to households; this

ultimately depends on downstream connectivity which falls within the purview of the Rural Electrification Department.

Socio-economic profile of the sample

Data on the basic profile of the respondents is provided in Table 14.6. The main features are as follows.

- It was observed that the sample was more or less evenly distributed across all age groups with highest number of respondents in the age group above 50 years (20%)
- Two-fifth of the respondents were educated up to primary level and another one fifth up to secondary level. Graduates and above constituted another one fifth of the respondents
- More than three-fourths of the respondents interviewed had a monthly income less than Rs 5000 followed by 20 percent with income level Rs 5 000-10000 per month
- In terms of household size, it was observed that 69 percent of the respondents had 1-5 household members followed by one-forth of respondents with a household size of 6-10 members

Table 14.6 Profile of respondents

Age group	*Number of respondents*	*Percent*
15-20yrs	11	3.5
21-25yrs	39	12.5
26-30yrs	50	16.0
31-35yrs	42	13.4
36-40yrs	53	16.9
41-45yrs	32	10.2
46-50yrs	25	8.0
>50yrs	61	19.5
Total	313	100.0
Education		
Primary	126	40.3
Secondary	63	20.1
Higher Secondary	42	13.4
Graduate	56	17.9
Post Graduate	11	3.5
Non Literate	15	4.8
Total	313	100.0
Household monthly income (Rs)		
5000	237	75.7
5000-10000	59	18.8
10000-15000	15	4.8
20000-25000	2	0.6
Total	313	100.0
Members in each household (Nos.)		
1-5	216	69.0
6-10	80	25.6
11-15	15	4.8
>15	2	0.6
Total 313	100	

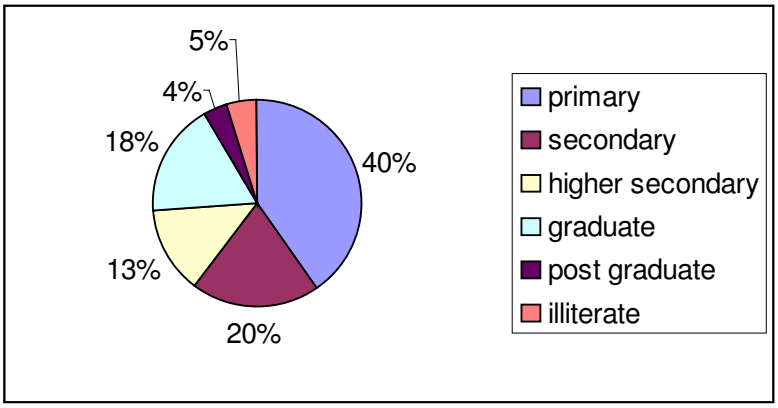


Figure **14.2** Education Profile of the respondents

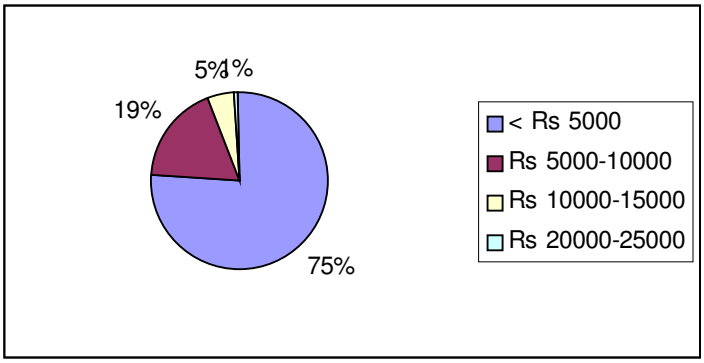


Figure **14.3** Education Profile of the Respondents

Awareness about the project

While assessing the level of awareness about the West Bengal Transmission System project, it was observed that more than four-fifths of the respondents are not aware of the project. About seventy percent of those who knew of the project were mainly informed by other people while some (19.3%) came of know of it through newspapers (Table 14.7).

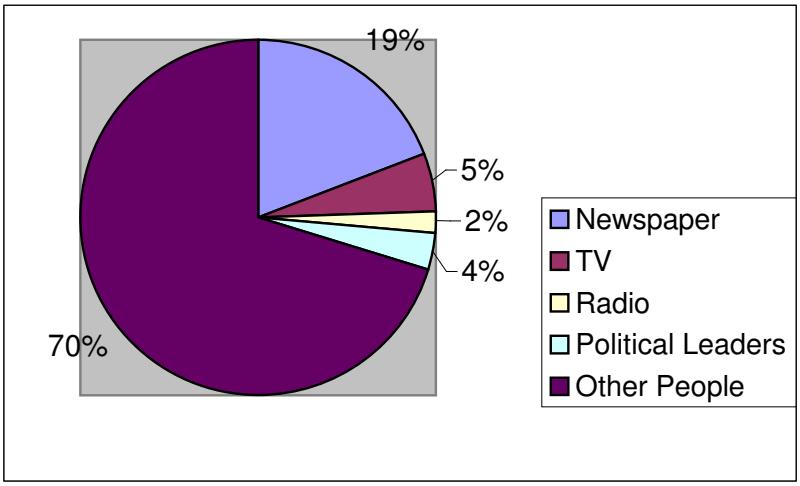


Figure **14.4** Distribution of the total people aware of the project

Table 14.7 Awareness about the project

Awareness	*Number of respondents*	*Percent*
Yes	57	18.2
No	265	81.8
Total	**313**	**100**
Source of awareness		
Newspaper	11	19.3
TV	3	5.3
Radio	1	1.8
Political Leaders	2	3.5
Other People	40	70.2
Total	**57**	**100**

Use of electricity

Domestic use of electricity

Among the 313 respondents interviewed, 96 percent had electricity connections in their houses. Among the rest, the main reason (83.3%) reported for the lack of a connection was financial constraints. For the majority of the respondents (80.1%), the daily hours of load shedding of electricity varied from 1- 4 hours.

The main purpose of electricity use was reported to be general lighting- as reported by all the respondents using electricity. This was followed by other applications (98%) such as running fans, television, pumps etc. About 68 percent of the respondents used electricity for studying (Table 14.8).

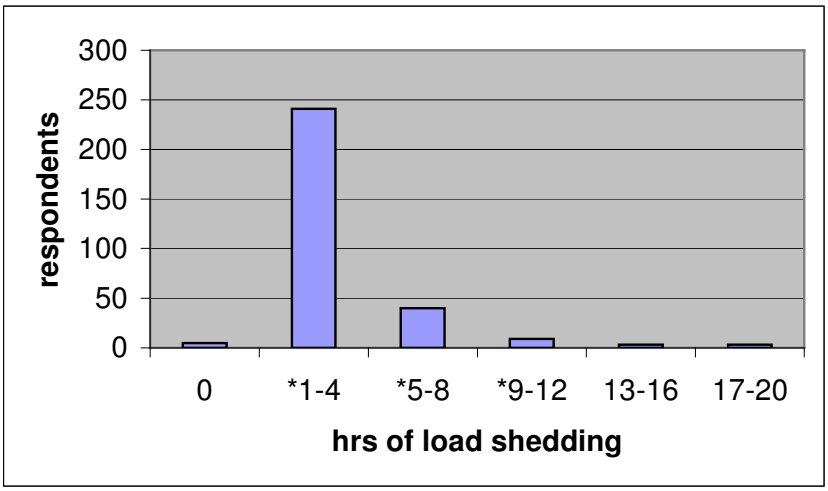


Figure **14.5** Pattern of Load Shedding

Table 14.8 Pattern of electricity use in households

Use of Electricity	*Number of respondents*	*Percent*
Yes	301	96.2
Total	**313**	**100**
Cause of not using electricity		
Option not provided	1	8.3
Financial reason	10	83.3
Other reason	1	8.3
Total	**12**	**100**
Average daily hours of load shedding		
0	5	1.7
1-4	241	80.1
5-8	40	13.2
9-12	9	3.0
13-16	3	1.0
17-20	3	1.0
Total	**301**	**100**
Use of electricity for various purpose *		
Commercial	29	9.63
Studying	206	68.44
Cooking	0.0	0.00
General lighting	301	100.00
Others	294	97.67

* Multiple responses

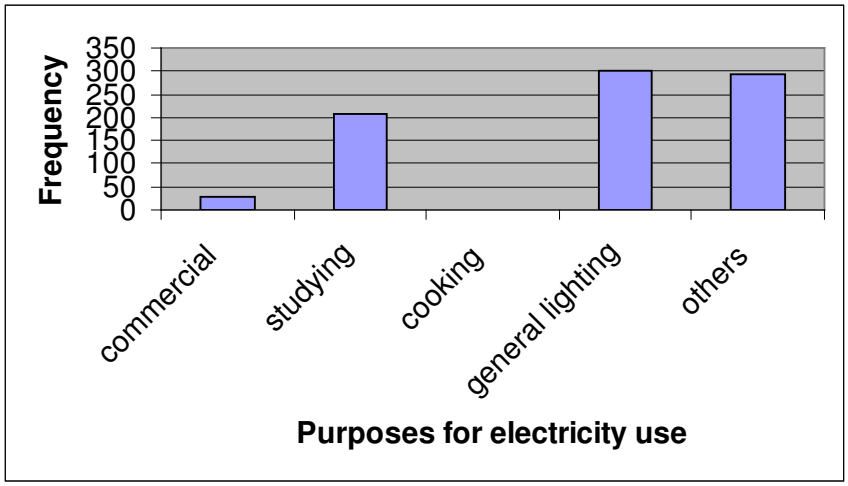


Figure **14.6** Pattern of Use of Electricity

Commercial use of electricity

Among the 313 respondents interviewed, 9.3 percent were using electricity for commercial purposes. Nearly 45 percent of the commercial users of electricity were using it for running general shops followed by those who were using it for running grocery shops (28%). About 7 percent were using it for running oil mills. The rest were using electricity for different kinds of shops like for selling clothes, jewellery, and watches and for STD booths (Table 14.9).

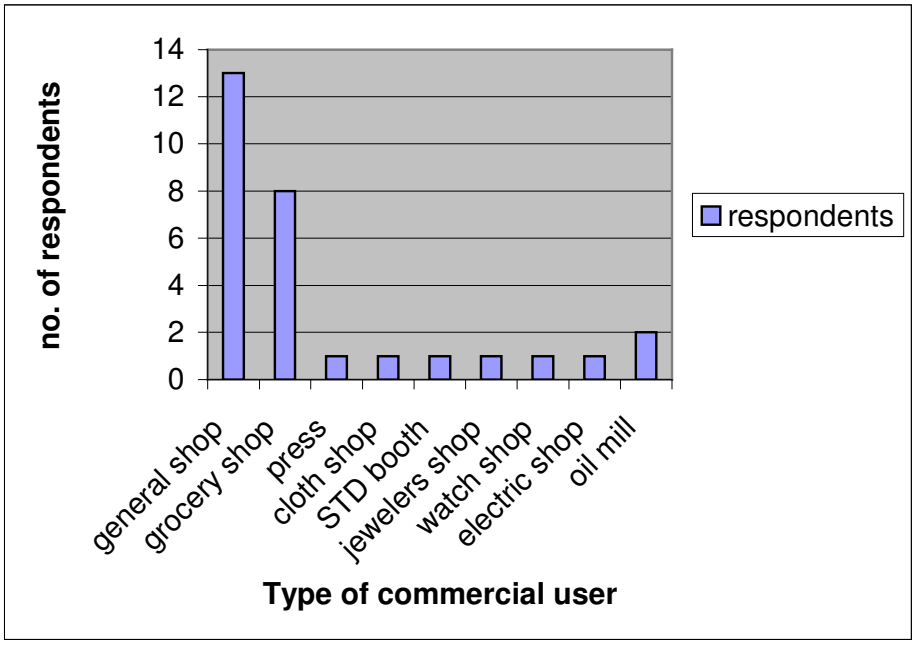


Figure **14.7** Pattern of Commercial Use of Electricity

Looking at the number of people in the household using electricity, it was observed that in more than four-fifth of the households, only one person was using electricity for commercial purpose. The daily hours of use of electricity commercial purpose of the respondents varied from 9-12 hours (51.72%) followed by 5-8 hours (24.14%). A total of 26 respondents out of 29, reported that they saved time by using electricity followed by 6 who preferred the use of electricity due to it being a clean fuel.

Table 14.9 Commercial use of electricity

Purpose of use of electricity	*Number of respondents*	*Percent*
Commercial	29	9.3
Household	284	90.7
Total	**313**	**100**
Type of commercial use of electricity		
General shop	13	44.8
Grocery shop	8	27.6
Press	1	3.4
Cloth shop	1	3.4
STD Booth	1	3.4
Jewelers shop	1	3.4
Watch shop	1	3.4
Electric shop	1	3.4
Oil mill	2	6.9
Number of people in the household using electricity for commercial purpose		
1	24	82.8
2	4	13.8
4	1	3.4
Number of hours of use of electricity for commercial purpose (In hrs.)		
1-4	2	6.9
5-8	7	24.14
9-12	15	51.72
13-16	5	17.24
Use of electricity in respect of productivity in commercial use (Multiple response)		
Saves time	26	89.7
Cleaner	6	20.7
Total	**29**	**100**

Electricity used for general lighting

As high as 301 respondents interviewed out of 313 were using electricity for general lighting (96.2%) followed by 12 who are using kerosene (3.8%). Majority of the respondents (97.8%) thought that electricity was more comfortable than other fuels for general lighting (Table 14.10).

Looking at the number of people in the household using electricity for general lighting, it was observed that in more than half the households, one to four members were using electricity for general lighting followed by five-eight members in 35.5 percent households. The daily hours of use of electricity for general lighting by the respondents varied from 5-8 hrs. (67.8%) followed by 1-4 hrs (25.9%).

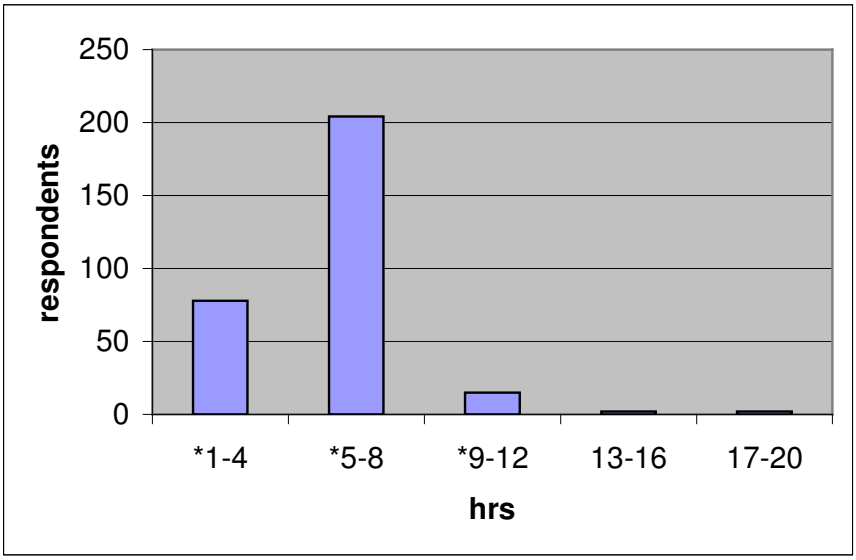


Figure 14.8 Number of hrs of use of electricity for general lighting

Table 14.10 Electricity used for general lighting

Sources of energy for lighting	N	%
Electricity	301	96.2
Kerosene	12	3.8
Total	**313**	**100**
Number of people in the household using electricity for general lighting		
1-4	167	55.5
5-8	107	35.5
9-12	18	6.0
13-16	7	2.3
17-20	2	0.7
Total	**301**	**100**
Number of hours of use of electricity for general lighting (In hrs.)		
1-4	78	25.9
5-8	204	67.8
9-12	15	4.9
13-16	2	0.7
17-20	2	0.7
Total	**301**	**100**
Use of electricity in respect of productivity in general lighting *		
More comfortable	306	97.8
Expensive	12	3.8
More light	3	1.0
Total	**313**	**100**

* Multiple responses

Other uses of electricity

Among the 294 users of electricity for 'other' purposes, a large number of respondents interviewed were using electricity for running fans (96.6%) and only 2.4 percent were using it for watching television. The daily hours of use of electricity for other uses varied from 9-12 hrs (29.6%) followed by 13-16 hrs (27.2%).

A total of 186 respondents out of the 294 reported that they saved time by using electricity for 'other purpose'. Some 29 percent felt that electricity was also cheaper than alternative options for 'other uses'.

Table 14.11 Other uses of electricity

Purpose of other use of electricity	*N*	%
Fan	284	96.7
Pump	3	1.0
Television	7	2.4
Number of people in the household using electricity for other purpose		
1-4	167	56.8
5-8	101	34.3
9-12	19	6.4
13-15	7	2.4
Number of hours of use of electricity for other purpose (In hrs.)		
1-4	12	4.1
5-8	62	21.1
9-12	87	29.6
13-16	80	27.2
17-20	51	17.3
21-24	2	0.7
Use of electricity in respect of productivity in other purpose *		
Saves time	186	63.3
Cleaner	23	7.8
Comfortable	56	19.0
Save Expense	86	29.3

* Multiple responses

Energy use patterns for different applications

Energy use for studying

Among the 219 respondents who were studying, 206 were using electricity for this purpose while 12 used kerosene (Table 14.12). In more than two-fifths of the households, only one member used electricity for studying, followed by about 37% of the household sin which two members were using electricity for study. The daily hours of use of electricity for studying varied from 1-4 hrs (for 60.2%) followed by 5-8 hrs (35.4%).

A total of 212 respondents out of 219, felt more comfortable using electricity for study purpose, though some felt that electricity was costly.

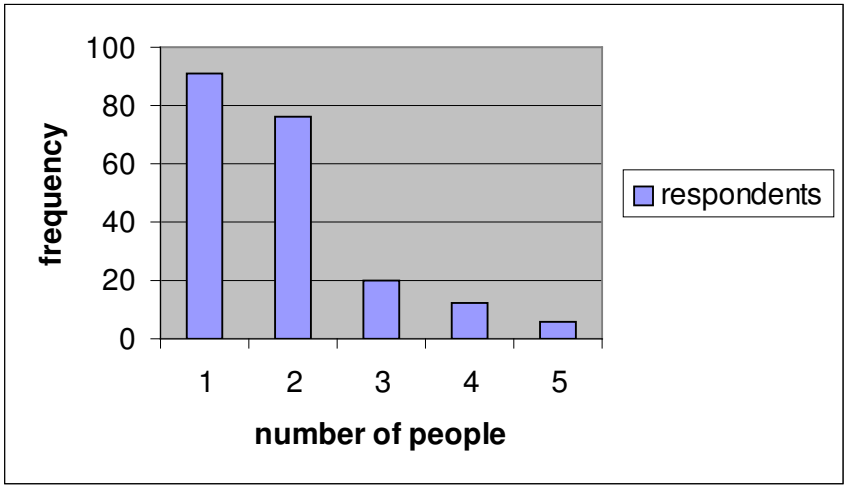


Figure **14.9** Number of people in the household using electricity

Table 14.12 Energy used for studying

Sources of energy for study	Number of respondents	Percent
Electricity	206	94.0
Kerosene	12	5.5
Chargeable Light	1	0.5
Total	**219**	**100**
Number of people in the household using electricity for Study		
1	91	44.2
2	76	36.9
4	20	9.7
5	12	5.8
6	6	2.9
Total	**206**	**100**
Number of hours of use of electricity for Study (In hrs.)		
1-4	124	60.2
5-8	73	35.4
9-12	7	3.4
13-16	2	1.0
Total	**206**	**100**
Use of electricity in respect of productivity in study (Multiple response)		
More comfortable	212	96.8
Expensive	10	4.6

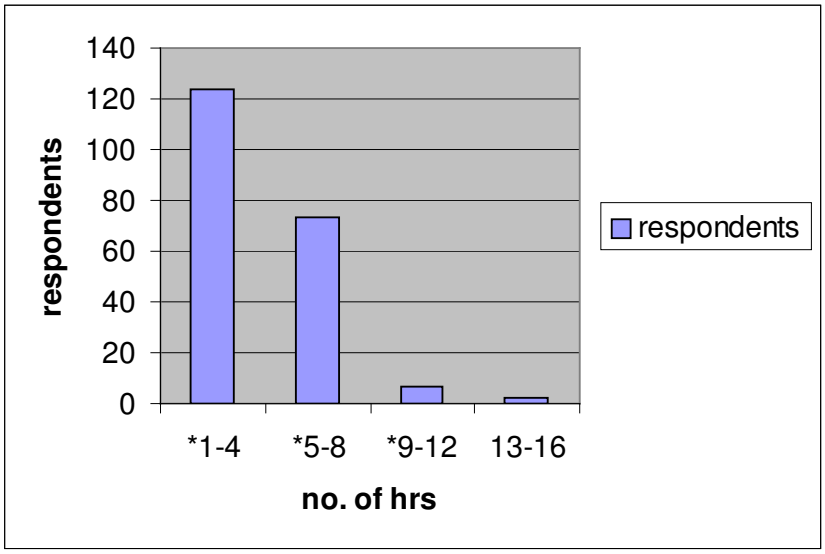


Figure **14.10** Distribution of people using electricity for study purpose

Energy use for cooking

Among the 313 respondents interviewed, 63 percent were using LPG gas for cooking followed by those who were using wood (28.4%). However, none of the respondents used electricity for cooking (Table 14.13). Interestingly, however, 73.5 percent of the respondents felt that they could save time by using electricity; about 43 percent felt that it would be less expensive and 34.5 percent thought it to be a cleaner means of cooking. In contrary, nearly 95 percent of respondents were not in favour of using electricity for cooking due to financial reasons.

Table 14.13 Energy used for cooking purpose

Sources of energy for cooking	*Number of respondents*	*Percent*
Kerosene	13	4.2
LPG gas	198	63.3
Wood	89	28.4
Cow dunk	5	1.6
Coal	8	2.6
Total	**313**	**100**
Use of electricity in respect of productivity in cooking*		
Saves time	230	73.5
Cleaner	108	34.5
Save expense	134	42.8
Total	**219**	**100**
Cause for not using electricity for cooking in spite of its availability*		
Unreliable supply	16	5.1
Financial reason	296	94.6
Other	5	1.6
Total	**313**	**100**

* Multiple responses

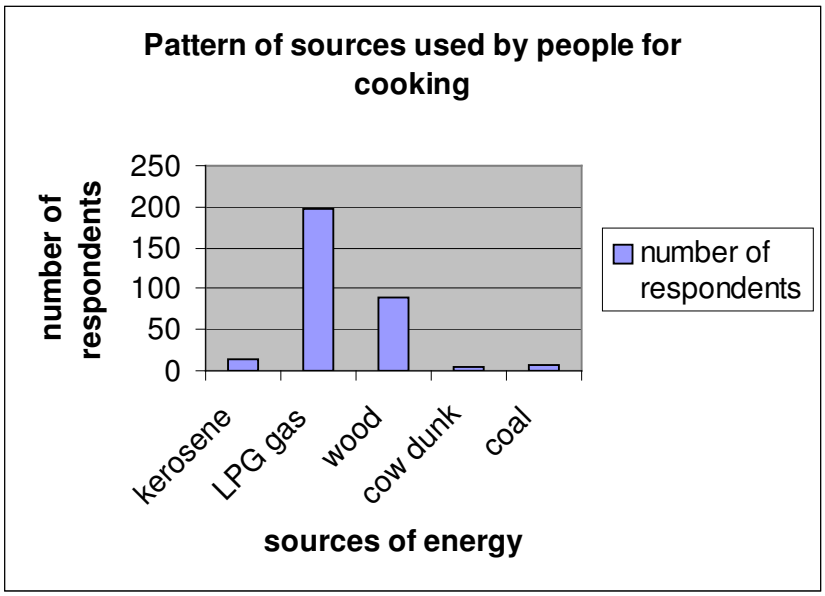


Figure **14.11** Pattern of sources used by people for cooking

Social and economic impact of the project

The study intended to find out the overall impact of the West Bengal Transmission System Project and the affordability of electricity.

The respondents were asked how much they paid for electricity per month. Nearly 36 percent of the respondents interviewed were paying Rs. 100-200 per month followed by 32 percent paying Rs. 200-500 per month.

The respondents were asked whether they thought electricity was affordable to different income groups. All respondents reported that electricity was affordable to the upper middle and rich income groups. However, about 43 percent felt that poor income group users would also be able to afford electricity.

Most respondents (81.8%). could not answer to whether they felt the project had made any impact on the economic condition of the residents. However, some 13 percent felt that it had. About 40 percent of them thought that this improvement was indicated by the advantage in education, followed by 30.0 percent who cited advantage in trade as an indicator.

Table 14.14 Affordability of electricity and social/economic impacts of the project: perceptions

		Number of respondents		*Percent*
Amount paid for electrification per month				
Below Rs.50		17		5.4
Rs. 50-100		47		15.0
Rs. 100-200		114		36.4
Rs. 200-500		100		31.9
More than Rs.500		35		11.2
Improvement in electrification condition				
Yes to some extent		72		23.0
Yes very much		47		15.0
Not much		14		4.5
Not at all		3		1.0
Have no idea		177		56.5
Affordability of electrification				
Poor class		134		42.8
Lower middle class		291		93.0
Upper middle class	313		100	
Rich	313		100	
Improvement in social and economic environment due to the project				
Yes		40		12.8
No		17		5.4
Don't know		256		81.8
Total		**313**		**100**
Indicators of social/economic environment of the locality *				
More electric supply		4		10.0
Continue running rice mill		2		5.0
High voltage		9		22.5
Increase of light on the road side		7		17.5
More advantage in education		16		40.0
Job satisfaction		3		7.5
More advantage in trade		12		30.0
Increase land value		1		2.5
Total		**40**		**100**

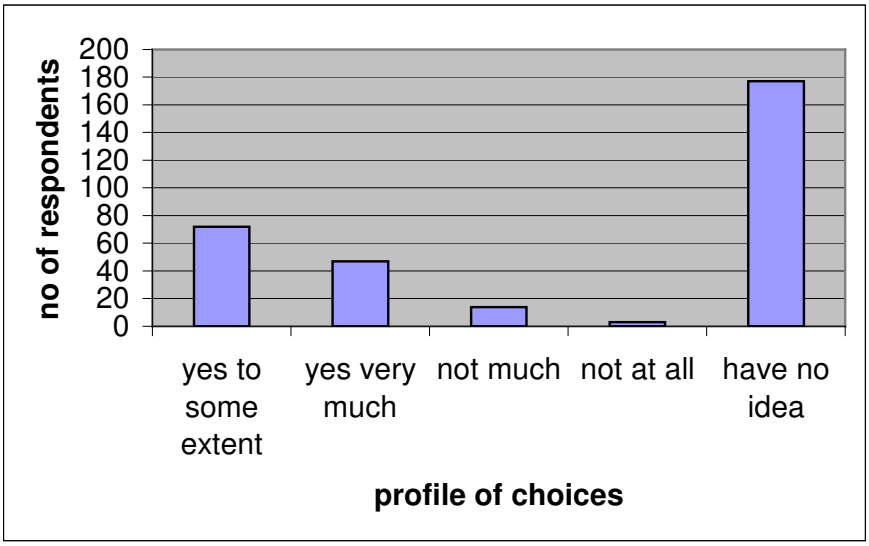


Figure **14.12** Improvement in electrification condition