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Report No: 29311

IMPLEMENTATION COMPLETION REPORT
(CPL-39230 SCL-3923A IDA-27630)

ON A

LOAN IN THE AMOUNT OF US\$167.0 MILLION

AND A CREDIT

IN THE AMOUNT OF SDR 15.9 MILLION (US\$25.0 MILLION)

TO

INDIA

FOR

THE BOMBAY SEWAGE DISPOSAL PROJECT

June 15, 2004

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CURRENCY EQUIVALENTS

(Exchange Rate Effective December 2003)

Currency Unit = Rupees (Rs.)
Rs. 1.00 = US\$ 0.02146
US\$ 1.00 = Rs. 46.60

FISCAL YEAR

April 1 March 31

ABBREVIATIONS AND ACRONYMS

Bombay	All references to “Bombay” should be replaced by “Mumbai”
BOD	Biochemical Oxygen Demand
BSDP	Bombay Sewage Disposal Project
CBO	Community Based Organization
EA	Environmental Assessment
FY	Fiscal Year
GIS	Geographical Information System
GOI	Government of India
GOM	Government of the State of Maharashtra
ICB	International Competitive Bidding
ICR	Implementation Completion Report
IDI	Institutional Development Impact
Lcd	Liters per capita and day
MCBM	Municipal Corporation of Brihan Mumbai (Greater Mumbai)
MDGs	Millennium Development Goals
MMR	Mumbai Metropolitan Region
NA	Not Available
NCB	National Competitive Bidding
NEERI	National Environmental Engineering Research Institute
NGO	Non Governmental Organization
PPM	Parts Per Million
QAG	Quality Assurance Group
SAR	Staff Appraisal Report
SCADA	Supervisory Control and Data Acquisition
SS	Suspended Solids
SSP	Slum Sanitation Program
SUMC	Sewerage Utility Management Center
WSSD	Water Supply and Sewerage Department

Vice President:	Mr. Praful C. Patel
Country Director	Mr. Michael F. Carter
Sector Manager	Ms. Sonia Hammam
Task Team Leader/Task Manager:	Mr. Shyamal Sarkar

INDIA
BOMBAY SEWAGE DISPOSAL PROJECT

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<i>Project ID:</i> P010480	<i>Project Name:</i> BOMBAY SEWAGE DISPOSAL
<i>Team Leader:</i> Shyamal Sarkar	<i>TL Unit:</i> SASEI
<i>ICR Type:</i> Core ICR	<i>Report Date:</i> June 15, 2004

1. Project Data

Name: BOMBAY SEWAGE DISPOSAL

L/C/TF Number: CPL-39230; SCL-3923A;
IDA-27630

Country/Department: INDIA

Region: South Asia Regional
Office

Sector/subsector: Sewerage (95%); Sanitation (5%)

Theme: Municipal governance and institution building (P); Pollution management and environmental health (P); Access to urban services for the poor (P); Other urban development (P); Municipal finance (P)

KEY DATES

	<i>Original</i>	<i>Revised/Actual</i>
<i>PCD:</i> 05/15/1990	<i>Effective:</i> 10/06/1995	03/22/1996
<i>Appraisal:</i> 03/06/1995	<i>MTR:</i> 09/01/1999	12/18/1999
<i>Approval:</i> 07/06/1995	<i>Closing:</i> 12/31/2002	12/31/2003

Borrower/Implementing Agency: GOVT OF INDIA/MUNICIPAL CORPORATION OF BRIHAN MUMBAI (MCBM)

Other Partners: NA

STAFF	Current	At Appraisal
<i>Vice President:</i>	Praful C. Patel	Joseph Wood
<i>Country Director:</i>	Michael F. Carter	Heinz Vergin
<i>Sector Manager:</i>	Sonia Hammam	Robert Panfil
<i>Team Leader at ICR:</i>	Shyamal Sarkar	William Roach
<i>ICR Primary Author:</i>	Klas B. Ringskog	

2. Principal Performance Ratings

(HS=Highly Satisfactory, S=Satisfactory, U=Unsatisfactory, HL=Highly Likely, L=Likely, UN=Unlikely, HUN=Highly Unlikely, HU=Highly Unsatisfactory, H=High, SU=Substantial, M=Modest, N=Negligible)

Outcome: S
Sustainability: L
Institutional Development Impact: SU
Bank Performance: S
Borrower Performance: S

QAG (if available)

ICR

Quality at Entry:

U

Project at Risk at Any Time: No

Quality at Entry was rated by QAG as 'Marginally Satisfactory'.

3. Assessment of Development Objective and Design, and of Quality at Entry

3.1 Original Objective:

The Staff Appraisal Report (SAR), dated June 12, 1995, lists the original project objectives as:

- (a) Strengthening the capacity of MCBM's Water Supply and Sewerage Department (WSSD) in all aspects of the management of the provision of sewerage services including planning, design, construction supervision including material and construction quality management, operation and maintenance;
- (b) Sustaining the financial viability of the provision of water supply and sewerage services in Brihan Mumbai through direct charges to beneficiaries at appropriate levels;
- (c) Improving the health and environmental conditions in Brihan Mumbai through the construction of sewerage works improvements so designed and constructed as to conveniently and economically permit a further level of such improvements in the future; and
- (d) Improving the health and environmental conditions for a significant portion of the slum dwellers of Mumbai through the construction of sustainable sanitation improvement facilities, mainly for safe excreta disposal, of a kind and nature determined in consultation with the prospective beneficiaries.

The Credit Agreement (2763 IN) lists three project objectives. These are:

- (i) Strengthen the Corporation's capacity in all aspects of the management of the provision of sewerage services;
- (ii) Sustain the financial viability of the provision of water supply and sewerage services in the jurisdiction of the Corporation, and
- (iii) Improve the health and environmental conditions in the jurisdiction of the Corporation, including the slum dwellers.

Assessment: The objectives were clear and responded to the needs to satisfy the project *institutional* feasibility (first objective), its *financial* feasibility (second objective); and its *economic and environmental* feasibility (third and fourth objective). The *technical* feasibility was unknown in the early stages of the project and prompted the Bank to carefully study the optimal outfall solution for the project. The *political* feasibility of an early project design was tested at public hearings on the project's environmental impact. Segments of Mumbai's civic society vigorously criticized the original project that focused primarily on pumping stations, aerated lagoons and the construction of submarine outfalls to dispose of sewage from already sewerred neighborhoods. The critics demanded that some attention be given to Mumbai's 5.5 million slum dwellers who largely lacked adequate and sustainable sanitation, i.e. sanitary excreta disposal. As a result of the criticism the fourth objective was added with corresponding activities in project components which vastly improved the project's political feasibility and socio-economic design. The Slum Sanitation Program (SSP) arguably responded to the highest priority socio-economic needs in Mumbai.

3.2 Revised Objective:

The objectives were not revised.

3.3 Original Components:

The original components as described both in the SAR and in the Loan Agreement comprised:

Part A: Physical Components

- (1) The construction of about 3 km long and about 3.5 meter in diameter marine outfall in submarine tunnel at Worli and a similar outfall at Bandra.
- (2) The construction of a pumping station at Bandra.
- (3) The construction of aerated lagoons at Ghatkopar and Bhandup.
- (4) The construction of facilities to prevent siltation of the influent tunnel at Ghatkopar.
- (5) The rehabilitation of the existing Ghatkopar tunnel.
- (6) The implementation of slum sanitation schemes.
- (7) The construction of additional structural features to improve the stability of five existing sewage pumping stations.
- (8) The implementation of a program of improvement to the existing conveyance system.

Part B: Technical Assistance and Training

Provision of technical assistance and training for:

- (1) Supervision of construction of the works to be carried out under Parts A (1) through (5) and (7);
- (2) Upgrading the operation and maintenance practices and facilities for the Corporation's sewerage system to acceptable levels;
- (3) Implementing topographic and condition surveys for the Corporation's conveyance system and formulating a program of improvements to said system;
- (4) Carrying out of social and physical surveys, the formulation of investment proposals, implementation and management, and for independent monitoring and evaluation in respect of the slum sanitation schemes; and
- (5) Carrying out of feasibility studies for the second stage sewage treatment and disposal facilities in the service areas of Malad, Versova, Bhandup, Ghatkopar, Bandra, Worli and Colaba and completing detailed engineering designs for sewage treatment and disposal facilities in said service areas.

3.4 Revised Components:

Part A was revised to include rehabilitation of a tunnel to collect sewage and transport it to the Bandra pumping station; and the rehabilitation of the existing Ghatkopar tunnel was replaced by the construction of a higher-level tunnel because a new and higher-level tunnel proved to be less costly than the contemplated rehabilitation of the existing Ghatkopar tunnel. Part B was revised to include a training component; and carrying out detailed engineering designs for the second stage sewage treatment and disposal was deferred to be taken-up separately on confirmation of funding.

3.5 Quality at Entry:

At the time of appraisal of the project the Bank's Quality Assurance Group (QAG) did not exist. However, subsequently QAG assessed the project on two occasions. The first was in 1998 where, as part of a post-approval quality-at-entry/quality of supervision assessment, the project was assessed along with another three water supply and sanitation projects in the South Asia region. Subsequently in the year 2000, QAG assessed yet again the project with respect to quality of supervision. The QAG assessment for the quality-at-entry concluded "the Bank has not given enough attention to the water supply sector in Mumbai since the first project in the early 70s, particularly on the institutional aspects. The result today is that we still have the same legal and institutional framework with limited autonomy and we have been unable to assist MCBM to evolve in the right direction. We have missed the opportunity of using MCBM's important financial base to transform WSSD into a world class water utility. For these reasons I suggest that Quality at Entry be rated Marginally Satisfactory. "

It should be remembered that the Bombay Sewage Disposal Project (BSDP) followed three earlier Bank water supply and sewerage projects to Mumbai, and as a consequence of the relative failures of the preceding three projects, the BSDP, attempted to complete the sewerage components that had not been implemented under the previous projects. The Bank preparation seems to have proceeded in a fairly deterministic fashion with a narrow technical focus. However, in order to safeguard against larger-than-expected project cost increases, loan negotiations were conditioned on a completed bid evaluation and proposed award of the major component, the two submarine outfall tunnels, and loan effectiveness was conditioned on contract award. The technical project preparation was focused mostly on the outfalls and other major physical components. The project preparation failed to focus on such essential aspects as controlling cross connections (sanitary sewage disposed through the storm water drainage), making an inventory of sewage outfalls via the storm water drainage system; and ensuring that connection rates would increase to guarantee the necessary sewage flow to the treatment and disposal systems. In a similar vein, the project design did not address the need to improve the management of the water supply system.

A number of NGOs argued during the public hearings on the proposed project in mid-1994 that the project, as initially designed, would do little to assist the slum population with resolving their serious deficiency of sanitation. As a result, the Bank agreed to include a SSP "to be implemented for about one million slum dwellers living on MCBM land." This project was notional and as late as one month before negotiations a Bank preparatory mission for this component was sent out. The lack of preparation of the socio-economically most important component is

illustrated by the fact that little tangible progress was made on its implementation during the first four years of project implementation.

Project preparation appears to have been heavily weighted towards the project's technical aspects. Yet, only one of the four project objectives was predominantly technical. The objectives of strengthening the managerial capacity of the WSSD, and of ensuring its financial sustainability, received less attention. In particular, there is a whiff of complacency in the assurance that the WSSD financial viability was guaranteed by relying mostly on tariff increases. A more balanced approach would have been to demand greater efficiency improvements, better incentives and institutional reforms.

Because of the noted deficiencies, the ICR rates the project *Quality at Entry as unsatisfactory*.

4. Achievement of Objective and Outputs

4.1 Outcome/achievement of objective:

The project objectives were as follows:

Objective (a): “Strengthening the capacity of MCBM’s WSSD in all aspects of the management of the provision of sewerage services including planning, design, construction supervision including materials and construction quality management, operation and maintenance.”

The ICR rates that this objective was achieved as the present project did strengthen substantially WSSD's management capacity in the provision of sewerage services. First, the *planning* capacity has been helped by the establishment of a Sewerage Utility Management Center (SUMC) with the task of preparing and updating digitized maps of the sewerage system. As part of the project, the entire sewerage system was mapped in Geographical Information System (GIS), including all the manholes. Second, the condition of 150 km of the entire 1,400 km sewerage system was inspected and was rated in GIS on a five-point scale ranging from “1” denoting being in excellent condition to “5” denoting collapsed sections. The category “5” sections were subsequently all rehabilitated. Third, by working closely with supervision consultants, the *supervision and construction quality management* capacity have significantly improved. Fourth, the *operational* capacity was improved with the procurement of laboratory and safety equipment, of sewer cleaning equipment and through training courses. A training center was established at the Love Grove pumping station and total of 36 training courses were organized, reaching about 4,000 sewerage staff, usually in short-term courses. Fifth, the *maintenance* capacity was enhanced through the procurement of safety and sewer-cleaning equipment that was put to use and through stepped-up pace of rehabilitation of existing sewers.

On the water supply side, although not being part of the original project, Bank supervision missions were successful in promoting reform in order to enhance the financial sustainability. Effective 2001 all billings were computerized and decentralized to the 24 wards of the distribution system. The improved commercial systems were backed up by expanded metering and by the establishment of a customer facilitation center. The accounting system was similarly computerized. Finally, although the BSDP did not finance it, the Supervisory Control and Data Acquisition (SCADA) operations center that had been designed under the Third Bombay Water Supply and Sewerage Project became fully operational during the course of the present project.

Further strengthening of WSSD's capacity will depend on organizational reforms where the present compartmentalized thinking is replaced by integrated planning, investments and operations. In particular, there seems to be a disconnect between the provision of water supply and sewerage services. Similarly, objectives seem to be centered around the construction of individual components of the water supply and sewerage systems rather than ensuring that these components be developed along an integrated plan and be put to optimal use. The target must be to make WSSD fully accountable for the quality and coverage of service to its clients. Such accountability is only meaningful if it is matched by incentives and autonomy for the WSSD to improve service. This is not contemplated at the present time. WSSD still operates as a risk-averse government agency, where staff is promoted on the basis of seniority and where the political power is retained by the elected political representatives. Performance targets are seldom explicit and do not seem to be used to reward superior performance or sanction

inferior performance. In this respect, WSSD, although arguably premier among water supply and sewerage agencies in India, continues to lag modern utilities in developed countries and in the leading edge developing countries.

Objective (b): “Sustaining the financial viability of the provision of water supply and sewerage services in Greater Mumbai through direct charges to beneficiaries at appropriate levels.”

The ICR rates that this objective was achieved in a narrow sense of stated improvements such as full coverage of operating expenditures, improved collection efficiency (from 85% current demand in 1997-98 to 96.4% in 2002-03), some capacity to invest through internal cash generation (Rs. 483 million in 1996-97 to 2,568 million in 2002-03), regular tariff increases, reduction of cross subsidies from commercial to domestic consumers (the ratio was reduced to 6.3 in 2002-03 from 36 existed in 1996-97). The financial working ratio of WSSD has consistently remained around 0.5, i.e. cash operating expenditures (excluding depreciation) have been half that of cash operating revenue. However, this margin has been maintained primarily through regular tariff increases. The most common measurement of efficient commercial management is the unaccounted water that measures the proportion of produced water that is metered and subsequently generates revenue. According to the monitoring indicators unaccounted water decreased from 29% in 1996 to 23% in 2003. However, the decrease is deceptive since a large share of the water meters are non-operational. In 2003 about 58% of domestic water meters and about 47% of non-domestic meters were non-operational. As a consequence, “metered” consumption for these connections were estimated on the basis of historical consumption levels. However, the situation did arguably improve since 91% of domestic meters and 68% of non-domestic meters were non-operational in 1996. The collections percentage (actual collections/billings) dropped during the early part of the project, but subsequently rose to over 96% as a result of the measures instituted under the project.

Objective (c): “Improving the health and environmental conditions in Greater Mumbai through the construction of sewerage works improvements so designed and constructed as to conveniently and economically permit a further level of such improvements in the future”; and

The ICR rates that this objective was mainly achieved. The project was expected to improve environmental conditions in two ways: first through completing the works that had been commenced under the earlier projects to collect sewage, provide preliminary treatment and then dispose of the degrittied sewage three kilometers off-shore; and second through transporting sewage to lagoons to be constructed at Bhandup and Ghatkopar. The investments were all concluded and the individual schemes are operating. The effect from the Bhandup and Ghatkopar lagoons is clear with reductions of the Biochemical Oxygen Demand (BOD) of 75% and 70%, respectively. These reductions are lower than what those in the Versova lagoon (89%). The explanation for the low reduction is likely due to relatively diluted strength of the incoming sewage, a consequence of the lag in connecting sewer houses to the interceptor tunnels leading to the lagoons. However, both Bhandup and Ghatkopar effluent standards comply with the standards of the Maharashtra state that are 100 PPM for BOD and 100 PPM for suspended solids (SS). It is estimated that only about 61% of the population living in formal housing are actually connected. In the slums only 1% of the population is connected to sanitary sewerage.

From the operation of the Worli outfall, the near-shore water has improved from the aesthetic point of view. The levels of dissolved oxygen, bacteriological contamination, and of BOD in parallel lines near-shore, 1 km, 3 km and 5 km away from the west coast of Mumbai were studied. The findings are that only along the 1 km line there is a noticeable improvement. Significantly, there is no near-shore bacteriological improvement which is explained by the presence of seven major storm water outfalls from large areas where the population dispose of their sanitary sewage via the storm-water drainage. Work has belatedly started to intercept these outfalls that have prevented the large investments in marine outfall tunnels to produce the full benefits. The project did enhance the effectiveness of the sanitary sewerage system through rehabilitation of major trunk sewers and through providing sewer missing links using micro-tunneling technology.

Objective (d): “Improving the health and environmental conditions for a significant portion of the slum dwellers in Mumbai through the construction of sustainable sanitation improvement facilities, mainly for excreta disposal, of a kind and nature determined in consultation with the prospective beneficiaries.”

The ICR rates that this objective is achieved. The SAR objective does not quantify the target population but the SAR does refer in an annex to a target of about one million slum dwellers living on MCBM land. This target was subsequently revised at the mid-term review to aim at providing half a million slum dwellers with adequate and sustainable sanitation. On March 31, 2004 it was estimated that about 368,000 slum dwellers were using 219 toilet centers managed by Community Based Organizations (CBO) and when all the 333 toilet centers initiated under the Project are completed (expected by September 2004) a total of about 560,000 will have access to toilets. This is a significant accomplishment and has ignited a drive for other slum dwellers to organize and request similar toilet centers. The CBO-based toilet centers combine sanitary excreta disposal with the provision of continuous water supply for hygiene and at times health education to achieve an impact on the health of the slum populations. The SSP has been adopted by the MCBM as their standard procedure for providing sanitation in the slums in Mumbai. But more important achievement has been that the GOM has also adopted the demand-led participatory approach for the provision of sanitation facilities in slums in the Maharashtra state.

Considering that the four objectives were achieved *the ICR rates the project outcome as “satisfactory”*.

4.2 Outputs by components:

The following sections discuss the output. Annex 8 provided an overview of the project's scope and implementation results.

Component 1: Physical Works. This component included construction of a 3 km long and 3.5 meter diameter marine outfall in submarine tunnel at Worli and a similar outfall in Bandra; a major sewage pumping station at Bandra, aerated lagoons at Ghatkopar and Bhandup; facilities to overcome siltation in an influent tunnel at Ghatkopar, rehabilitation of an existing tunnel at Ghatkopar; implementation of Slum Sanitation Schemes; improving stability of five sewage pumping stations and conveyance system improvements. During implementation, the works of silt mitigation measures for the influent tunnel and rehabilitation of the existing tunnel at Ghatkopar were dropped and replaced by a new tunnel which was a cheaper and efficient option. Rehabilitation of a tunnel at Bandra which had been built under an earlier project was included for conveyance of sewage from Bandra zone to influent pumping station. The scope of slum sanitation schemes was revised at Mid-Term to cover about 500,000 slum dwellers. Of the 333 schemes taken-up for implementation, 219 were completed and are operated by CBOs benefiting an estimated 368,000 people as of March 31, 2004. All the investments were satisfactorily concluded within the project costs and the individual schemes are operating. All applicable Bank safeguard policies were fulfilled, except for bringing back the families affected by shaft 2 of influent tunnel at Ghatkopar from the temporary site to the original site.

Component 2: Technical services for Component 1. This component of the project included several consulting services and achieved highly satisfactory results. It enabled MCBM to install an operation and management system for the sewerage, establish SUMC supported by a GIS for sewerage system, determine technology for rehabilitation of old trunk sewers, provide missing links for sewerage coverage, identify the weak appurtenances in the sewerage system, and develop an implementation action plan for slums sanitation schemes. Consulting services in the design and supervision (in varying degree from 'Engineer's Representative' to 'Advisory') of the complex works such as marine outfalls, pumping stations, aerated lagoons, rehabilitation/construction of tunnel, and supervision of the use of trenchless technology produced highly satisfactory quality of construction and equipped MCBM engineers with the knowledge of supervision and quality management. Through these services several new technology were introduced in India, such as, segmental lining for tunnel, microtunneling and pipe-jacking for sewer installation, pipe bursting for sewer replacement, and sewer rehabilitation by lining.

Component 3: Preparation of Stage 2 Sewerage Investments. The scope of this component was revised during implementation to include in one single study the feasibility of second stage sewerage improvement in the entire city. This has been satisfactorily completed. However, the study of detailed engineering designs has been deferred by MCBM and is to be undertaken when the investment funding will be available. Looking to the complexity involved in the detailed engineering study and the prudence of including supervision and project management along with detailed engineering under one contract, the decision appeared right.

It is instructive to analyze the actual project expenditure of each group of components as they relate to the achievement of each of the four project objectives as shown in Table 1 below:

Table 1 Shares of Total Project Cost by Component and by Objectives

Objective	Relevant Components	Total Cost (Rs. Millions)	Share of Cost	Socioeconomic Cost Effectiveness
“Build WSSD Sewerage Management Capacity”	B 2 and 3	2,330	20%	High
“Sustain the financial viability”	None at appraisal	NA	NA	High
“Improve health and environmental conditions”	A 1-5, 7-8 and B 1 and 5	8,830	74%	Medium
“Improve health and environmental conditions of slum dwellers”	A 6 and B 4	700	6%	Very high
Total		11,860	100%	Medium

4.3 Net Present Value/Economic rate of return:

No economic rate-of-return has been calculated because none was calculated at appraisal. However, Table 1 above does provide a rough estimate of the relative cost-effectiveness of each of the four groups of components. The socio-economic cost effectiveness of the SSP is very high, and is followed by the high cost effectiveness of the “sewerage management capacity” and “financial viability” components. The immediate impact of the very large component to complete the outfall tunnels must be rated as medium, given the modest improvement of the near-shore waters. The simple analysis underlines the unsatisfactory quality-at-entry of the project. It also indicates that more funding for the second objective of sustaining the financial viability of WSSD would be justified. The Bank project provided none, however. It was only during supervision that paid more attention to better metering, and to the decentralization of billings and collections to the ward level.

4.4 Financial rate of return:

No financial rate-of-return has been calculated because none was calculated at appraisal.

4.5 Institutional development impact:

The institutional development impact (IDI) of the entire project is rated as “substantial”. The IDI stands for the extent to which the project has improved WSSD’s and India’s ability to make effective use of its human and financial resources. On the positive side the project supervision did result in changed commercial procedures where billings and collections are handled at the ward level which should favor the financial viability of the WSSD. The considerable reductions in WSSD staffing levels from 22,500 on March 31, 1997 to 15,600 on March 31, 2003 should have produced a better use of human resources but they cannot be attributed to the project. Rather the staff reductions were the result of a nationwide hiring freeze in the public sector. The staff numbers do not seem to have been accompanied by reorganizations, more vigorous training programs or changed incentives for staff to perform. It is significant that the project design did not address the issue of institutional improvements on the water supply side. Similarly, the SAR also failed to provide funds for the training programs that would be needed to underpin the strengthening of WSSD’s capacity to manage its sewerage system. However, active supervision remedied these design flaws. All the components aimed at strengthening the management capacity of the sewerage system were implemented with the result that the WSSD sewerage department has gained precise and up-to-date knowledge of the physical facilities and their condition. Further, the policies sustaining the SSP do imply a radically better use of both human and financial resources. Rather than rely on the MCBM to manage and maintain the community toilet blocks, the SSP set up CBO that manage and maintain the SSP toilet blocks. The IDI under the SSP must be rated as very high. Concluding, *the average IDI for the project is rated as “substantial”*.

5. Major Factors Affecting Implementation and Outcome

5.1 Factors outside the control of government or implementing agency:

There were no significant macroeconomic factors that affected the project implementation or outcome. The Mumbai regional economy, like the overall Indian economy, improved over the project period but the changes did not materially influence the project. Bank performance during supervision contributed positively to efficient and effective project implementation.

5.2 Factors generally subject to government control:

The financing of the project investments came from two sources, the proceeds of the IDA credit and Bank loan, and from WSSD's internal cash generation. The Bank/IDA financing was to the Government of India (GOI) which then onlent the funds to the State Government of Maharashtra (GOM) which in turn onlent the funds to the MCBM. The Bank group financing was on standard terms to India (a term of 20 years for the Bank loan and 35 years for the IDA credit) whereas the GOI applied its standard financing terms. At the time, these were 11% annual interest rate and a term of 20 years plus five years grace, applied to 70% of the loan/credit proceeds. The GOM added a margin of 200 basis points to the central government lending rate which resulted in an annual interest rate of 13% to the MCBM. Further, the GOM did not pass on the 30% grant element to the MCBM. During much of the project the GOM was late in passing on the disbursements from the GOI although the delays do not seem to have slowed project execution. The internal cash generation seems to have been dependable throughout the project and underpinned by annual tariff increases. In addition there was an effort made to reduce the high cross-subsidies from industrial and commercial consumers in favor of domestic consumers.

5.3 Factors generally subject to implementing agency control:

The implementing agency, MCBM, performed well. Project implementation was fairly close to what had been planned and the one-year extension of the loan closing date was caused by minor delays in procurement of components necessary to commission the Bandra outfall and the Ghatkopar sewage treatment lagoons and to advance further in the implementation of the SSP.

5.4 Costs and financing:

The costs and financing of the project are detailed in Annex 2. The project costs were US\$ 273.2 million of which the Bank financed US\$ 155.7 million (57%) and the remainder US\$ 117.5 million (43%) was financed by the WSSD from internal cash generation. However, if the costs of those non-Bank funded elements of the project are included, the WSSD financing share is likely to rise to about 50%. There were some cost savings as compared to the original estimate. The dollar was stronger than expected against the Indian Rupee during most of the project implementation period which made the Bank and IDA dollar financing go further. Some contract costs resulted somewhat lower than appraised and it did not prove necessary to use the entire physical contingencies of 16% that had been provided for the civil, mechanical and electrical works. As a result of the cost savings, it was possible to cancel US\$ 10.0 million of the Bank loan in June 2000, and another US\$ 12.0 million in September 2002. The undisbursed balance of US\$ 4.2 million at the end of the loan closing will be canceled.

6. Sustainability

6.1 Rationale for sustainability rating:

The WSSD is known and stable and its financial working ratio of 0.50 guarantees that the project facilities will have sufficient funding to pay for operations and maintenance. When including the costs of works for which MCBM did not request Bank disbursements it is estimated that WSSD financed about 50% of the entire capital expenditure program from its internal cash generation. The water supply and sewerage tariff was increased regularly during project implementation and the latest financial projections for WSSD indicate financial sustainability during the foreseeable future unless major new investment projects are undertaken (and the sustainability of which must be analyzed and safeguarded individually). The sustainability of the toilet centers financed under the SSP is also rated as "likely". As of March 31, 2004 all of the some 219 toilet centers commissioned were being operated and maintained successfully by the CBOs. This represents a significant accomplishment and attests to the soundness of the design of the SSP. Nevertheless, for long-term sustainability focus on accountability for service and performance, greater focus on efficiency improvements, better incentives

and institutional reforms will be required. Concluding, *the sustainability of the project is rated as “likely”*.

6.2 Transition arrangement to regular operations:

There are no special transition arrangements necessary. The WSSD has already commissioned the physical works financed under the project and is operating them successfully.

7. Bank and Borrower Performance

Bank

7.1 Lending:

Bank performance during preparation is rated as “unsatisfactory”. As detailed in the section on quality-at-entry the project, as appraised included four objectives. However, it failed to provide loan components for such important categories as “training” to strengthen the management capacity of the WSSD sewerage system (first project objective) and to provide any components at all to sustain the financial viability of the water supply and sewerage operations (second objective). The components associated with improving the environmental condition of the Arabian sea (third objective) failed to analyze in a systematic way from where and how the polluting sewage flows reached the sea. Finally, the improvement of the environmental condition and state of health in the slums (the fourth objective) was added just prior to negotiations. The design of this component is best described as notional. It is not surprising that only four years into the project implementation period were the first toilet centers commissioned. Good project preparation requires that there is a congruence between objectives, components, and conditionality (if needed.). This did not hold true for the project and justifies the “unsatisfactory” rating of Bank performance during preparation. In total, the Bank expended US\$ 543,200 for project preparation, corresponding to 0.2% of the appraised project cost.

7.2 Supervision:

The “unsatisfactory” Bank performance during lending was compensated for by Bank supervision that is rated as “highly satisfactory”. A total twenty Bank supervision missions were made (see Annex 4). The missions would usually represent up to five different professionals and in particular sociologists who were crucial to prepare and help launch the SSP. The Bank supervision was greatly facilitated by continuity in the task management and in the sociological aspects. The continuity created credibility of Bank staff in the eyes of the Borrower. As a result of the trust built up it proved possible for the Bank supervision missions to redress most of the design flaws (for example, no project resources devoted to achieve the financial objective) of the project. In particular, training components were added, substantial reforms were made in the commercial routines of WSSD, a dialogue was started to explore a pilot scheme to engage a private operator for one of the wards (K-East with one million inhabitants), the rehabilitation of the Ghatkopar tunnel was replaced by a cheaper higher-level tunnel, and the SSP was prepared and implemented. The environmental category “A” project was the subject of a satisfactory environmental assessment done by MCBM’s consultants NEERI who also first established the baseline conditions for the seawater quality prior to the commissioning of the project, and then evaluated the environmental impact from the commissioning of the Worli outfall. MCBM may contract with NEERI yet again to evaluate the environmental impact of the commissioning of the Bandra outfall and to establish a baseline along the urbanized areas north of Bandra. The baseline would be useful to prepare for future projects that will collect, pre-treat and dispose of the sewage from the Versova and Malad sections of Mumbai. Procurement followed Bank procurement procedures and there was no instance of misprocurement. (Annex 2 provides further details on project procurement). Finally, the financial management safeguards were adequately supervised. In total, the Bank expended US\$ 673,800 for project supervision, or 0.25% of the actual project cost.

QAG assessed quality of supervision twice. The first was in 1998 when post-approval quality-at-entry/quality of supervision was assessed. Subsequently in the year 2000, QAG assessed yet again the quality of supervision. In both the assessment the quality of supervision was rated as satisfactory.

7.3 Overall Bank performance:

Overall **Bank performance is rated as “satisfactory”**. The “unsatisfactory” performance during lending was offset by the energetic and timely supervision that is rated as “highly satisfactory”.

Borrower

7.4 Preparation:

Borrower performance during preparation is rated as “satisfactory”. WSSD and MCBM had experience from three previous Bank projects which facilitated their involvement in project preparation.

7.5 Government implementation performance:

The government implementation performance was satisfactory with the exception of the GOM that was late on a number of occasions to transfer the proceeds of the IDA credit and Bank loan to the ultimate borrower, the MCBM. The latter’s performance was good to sustain the project and the water supply and sewerage tariff was increased regularly to sustain the finances of WSSD and to provide the necessary counterpart funding. Duly audited financial statements were submitted on time.

7.6 Implementing Agency:

The performance of the implementation agency, WSSD, is rated as “satisfactory”. However, commitment to bring back the families affected by shaft 2 of influent tunnel at Ghatkopar from the temporary site to the original site remained outstanding. Design changes made to the influent tunnel at Ghatkopar necessitated temporary resettlement of 135 squatter families to an adjoining site which was reserved in the Development Plan for future road widening program. In accordance with a resettlement plan prepared by MCBM for these affected families, they were to be brought back to the original site after the construction was over by providing improved housing and access to basic amenities. During the period of construction, 108 families moved out voluntarily. MCBM informed the Bank recently that they would not bring back the remaining 27 families to the original site due to safety considerations as fatal accident had occurred due to accidental ignition and explosion of accumulated inflammable gas in another tunnel shaft during commissioning, and would allow them to continue to stay at the place where they were temporarily relocated by providing them with all required facilities. The Bank team is following up with MCBM to ensure that these families receive all facilities which were assured for their return to the original site, and in the event of displacement on account of road widening they receive the benefits of resettlement.

The sewerage section in particular performed well and updated its data base, operating procedures and professional qualifications as a result of the project. WSSD produced its quarterly progress reports on time that, among other things, tracked and evaluated the monitoring indicators that had been agreed upon with the Bank.

7.7 Overall Borrower performance:

The Borrower performance is rated as “satisfactory”.

8. Lessons Learned

The project offers four lessons for possible follow-up projects in Mumbai, in India or elsewhere:

Lesson One: Water supply and sewerage projects play a central role in reaching the Millennium Development Goals (MDGs). The targets specify that the present share of the world population lacking safe water supply and adequate sanitation should be halved by the target year 2015. In order to reach the targets the number of people benefiting from each water supply and sanitation project should be monitored. In contrast, the BSDP should have been more precise in identifying the number of people who would benefit from the project. Instead the project focused more on the implementation of the large capital investment program than on the ultimate objectives of the project: to improve the environmental and health situation in Mumbai. The project would have been more effective in providing benefits to the population had it considered how the Mumbai population would receive water service; how the wastewater would be collected, how it would be transported to treatment works, and finally disposed of. This was not done. Even today Mumbai lacks precise data on the population connected to its water supply system, and on the population actually connected to its sewerage system. Water service is provided only three hours on average per day and affects the poor most of all since they lack the means to pay for the costs in coping with such an unsatisfactory service. Refocusing the project in the suggested fashion would likely have resulted in a different project that would have included an effort to manage water demand in order to minimize the quantity of wastewater produced, and in a project that would have devoted larger resources to actually connecting the

population to its sewerage system.

Lesson Two: Successive Bank projects to the same borrower should make an effort to advance in parallel between capital investment financing and in policy reform. The BSDP was the fourth project to Mumbai and its design could have promoted a closer integration between the water supply and sewerage sections of the Water Supply and Sewerage Department and concerning measures to raise the autonomy and accountability of its activities. As it happened, the BSDP design did not make an effort to reform the WSSD organization, to update its tariff policies, to set performance standards, and to provide incentives for its staff for reaching targets and sanctions for failure to perform to the prevailing standards.

Lesson Three: The success of the SSP confirms yet again the necessary ingredients in programs to improve the health and well-being of the poorest segments of the population: a sanitary excreta disposal together with the provision of a good water supply and of health education. The SSP has demonstrated that slum communities are willing to organize and pay sufficient fees to guarantee the sustainable operations and maintenance of community toilets provided that they are involved from the very beginning and are given the responsibility for managing the community toilets. The SSP also teaches that adequate sanitation must be matched by the provision of a water supply to meet the hygiene needs of the communities and by health education programs that focus foremost on the children's hygiene habits. When organized in such a demand driven fashion where the community will have the responsibility of managing and maintaining the toilet facilities, slum sanitation program can be expected to be sustainable. Further, they can be expected to yield important demonstration effects as evidenced by the fact the GOI has now adopted a National Sanitation Program that reflects the design and lessons learned in the SSP in Mumbai.

Lesson Four: The importance of quality at entry to achieving objectives and sustainability, and limitations of fully turning around a poorly prepared project during supervision--despite the fact that supervision in this instance even without formal restructuring managed to get some firsts in Indian context by paying attention during implementation to issues that had been neglected in preparation.

9. Partner Comments

(a) Borrower/implementing agency:

A copy of the draft ICR was sent to the MCBM with copy to the Government of India Departments of Economic Affairs and Urban Development and Government of Maharashtra Water Supply and Sanitation Department on April 17, 2004 for review and comments by the Borrower and implementing agency. A response was received from the MCBM commenting on the assessment of objectives (a) and (c) and on lessons one and two, as follows:

Objective (a): MCBM is presently focussing on implementing the physical works, improving the infrastructure and providing services. On achieving this goal, MCBM will concentrate on providing more satisfactory services to the citizens.

Objective (c): It is a fact that more than 50% population of Mumbai is staying in slums and not actually connected to sewerage. MCBM has, therefore, started the implementation of diversion of dry weather flow from open storm water drains to sewerage with an intention to derive the benefit of marine outfall, from environment point of view. In addition to this, program of eliminating illegal connections has already started and will be continued further. Ongoing works under SSP and future works will help to improve the situation further.

Lesson One: Though MCBM lack precise data, MCBM has gathered substantial data by doing Topographical Survey of sewerage network and mapped in GIS in digitized format. The same is being updated through MCBM's Sewerage Utility Management Center. Similar type of efforts will be taken on water supply system.

Lesson Two: MCBM, being a quasi-government organization, has to operate within the constitutional provisions, state laws, MMC Act, directives from Government from time to time including reservation policies and therefore, performance based promotions/policies can not be applied. However, the promotions are on seniority-cum-merit basis

(b) Cofinanciers:

NA

(c) Other partners (NGOs/private sector):

NA

10. Additional Information

Annex 1. Key Performance Indicators/Log Frame Matrix

The project included the obligation of the ultimate borrower, the MCBM, to monitor quarterly 63 indicators of project implementation and operations. This number is too large to permit focused analysis and the monitoring and reporting seems to have been formal in nature. The fact that neither the SAR, nor the Credit and Loan Agreements fixed any targets and benchmarks seems to have reduced the impact of the monitoring indicators and their trends and levels. The amended monitoring indicators below represent those that relate to the project's objectives of improving the environmental conditions in Mumbai and of ensuring the financial and institutional sustainability of the operations.

Monitoring Indicator	March 31, 1997	March 31, 2003 *
Service Coverage and Quality		
Formal population, million	5.0	6.5
Slum population, million	5.5	6.1
Total population, million	10.5	12.6
Water connections	192,000	346,000
Formal population per water connection	26	14
Sewerage connections	Not available (NA)	275,000
Formal population per sewerage connection	NA	18
Hours of water distribution service/day	3	3
Bacteriological quality of water at production	Safe	Safe
Population covered by Slum Sanitation Program	0	130,000
Service Efficiency		
Metered water production, million m3	963	1,133
Metered and estimated water consumption, million m3	685	876 (Year 2001-02)
Production/formal population, m3/year	193 (530 lcd)	227 (620 lcd)
Consumption/formal population, m3/year	137 (380 lcd)	175 (480 lcd)
Unaccounted water (Metered water production-metered and estimated water consumption) /Metered water production	29%	23%
Employees/thousand water connections	117	45
Service Sustainability		
Collection efficiency (Current demand), Percent	85	96.4
Ratio of non-domestic tariff (av.) and doestic tariff (av.)	36	6.3
Working ratio (Cash operating costs/cash operating revenue)	0.48	0.56
Share of water consumption treated in wastewater treatment plants	0	14% (Bhandup, Ghatkopar, Versova @ 110,000 m3/day)

* Note: WSSD's performance is measured on annual basis and is available at the end of September of the following year when audit is completed.

Annex 2. Project Costs and Financing

Project Cost by Component (in US\$ million equivalent)

Component	Appraisal Estimate US\$ million	Actual/Latest Estimate US\$ million	Percentage of Appraisal
Component 1: Physical Works	207.40	242.50	115.2
Component 2: Technical Services to Component 1	17.80	25.00	140.4
Component 3: Preparation of Stage 2 Investments	19.90	5.70	28.6
Total Baseline Cost	245.10	273.20	
Physical Contingencies	48.70		
Price Contingencies	1.80		
Total Project Costs	295.60	273.20	
Total Financing Required	295.60	273.20	

Appraisal estimate included tax and duty.

Project Costs by Procurement Arrangements (Appraisal Estimate) (US\$ million equivalent)

Expenditure Category	Procurement Method ¹			N.B.F.	Total Cost
	ICB	NCB	Other ²		
1. Works	179.70 (107.90)	55.40 (32.70)	0.00 (0.00)	0.00 (0.00)	235.10 (140.60)
2. Goods	17.70 (14.20)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	17.70 (14.20)
3. Services	0.00 (0.00)	0.00 (0.00)	42.80 (37.20)	0.00 (0.00)	42.80 (37.20)
Total	197.40 (122.10)	55.40 (32.70)	42.80 (37.20)	0.00 (0.00)	295.60 (192.00)

Project Costs by Procurement Arrangements (Actual/Latest Estimate) (US\$ million equivalent)

Expenditure Category	Procurement Method ¹			N.B.F.	Total Cost
	ICB	NCB	Other ²		
1. Works	200.00 (110.00)	25.40 (9.86)	0.00 (0.00)	0.00 (0.00)	225.40 (119.86)
2. Goods	16.80 (11.93)	0.30 (0.25)	0.00 (0.00)	0.00 (0.00)	17.10 (12.18)
3. Services	0.00 (0.00)	0.00 (0.00)	30.70 (23.66)	0.00 (0.00)	30.70 (23.66)
Total	216.80 (121.93)	25.70 (10.11)	30.70 (23.66)	0.00 (0.00)	273.20 (155.70)

^{1/} Figures in parenthesis are the amounts to be financed by the Bank Loan. All costs include contingencies.

^{2/} Includes civil works and goods to be procured through national shopping, consulting services, services of contracted staff of the project management office, training, technical assistance services, and incremental operating costs related to (i) managing the project, and (ii) re-lending project funds to local government units.

Project Financing by Component (in US\$ million equivalent)

Component	Appraisal Estimate			Actual/Latest Estimate			Percentage of Appraisal		
	Bank	Govt.	CoF.	Bank	Govt.	CoF.	Bank	Govt.	CoF.
Component 1: Physical Works	163.30	89.50	0.00	131.28	111.22	0.00	80.4	124.3	0.0
Component 2: Technical Services for Component 1	13.60	6.20	0.00	18.00	7.00	0.00	132.4	112.9	0.0
Component 3: Preparation of Stage 2 Investments	15.10	7.90	0.00	5.43	0.27	0.00	36.0	3.4	0.0

Annex 3. Economic Costs and Benefits

No economic rate-of-return was calculated because none was calculated at appraisal.

Annex 4. Bank Inputs

(a) Missions:

Stage of Project Cycle	No. of Persons and Specialty (e.g. 2 Economists, 1 FMS, etc.)		Performance Rating		
	Month/Year	Count	Specialty	Implementation Progress	Development Objective
Identification/Preparation					
	05/92	2	FIN. ANALYST (1); ENG. (1)		
	10/92	1	FIN. ANALYST (1)		
	03/93	2	FIN. ANALYST (1); ENG. (1)		
	10/93	2	FIN. ANALYST (1); ENG. (1)		
	02/94	2	FIN. ANALYST (1); ENG.(1)		
	06/94	2	FIN. ANALYST (1); ENG. (1)		
	11/94	2	FIN. ANALYST (1); ENG. (1)		
Appraisal/Negotiation					
	02/95	5	FIN. ANALYST (1); SAN. ENG. (3); ENV. (1)		
	05/95	6	MUNI. ENG. (1); SAN. SPL. (1); SAN. ENG. (1); ENV. ENG. (1) SOCIAL SCIENCE (1); URBAN DEV. (1)		
Supervision					
	10/07/1995	7	SAN. ENG. (2); FIN. ANALYST (1); DISB. SPL. (1); SOCIOLOGIST (1); PROCUREMENT (1); ENG. (SLUM SAN.) (1)	S	S
	06/24/1996	5	SAN. ENG. (2); SOCIOLOGIST (1); ENG. (SLUM SAN.) (1); FIN. ANALYST (1)	S	S
	10/31/1996	6	ENV. ENG. (1); SAN. ENG. (2); ENG. (SLUM SAN.) (1); FIN. ANALYST (1); SOC. SCIENTIST (1)	S	S
	07/04/1997	5	ENV. ENG. (1); SAN. ENG. (1); ENG. (SLUM SAN.) (1); FIN. ANALYST (1); SOC. SCIENTIST (1)	S	S
	12/10/1997	7	ENV. ENG. (1); SAN. ENG. (1); ENG. (SLUM SAN) (1); FIN. ANALYST (1); SOC. SCIENTIST (1); PROCUREMENT (1); OPERATIONS ADVISER (1)	S	S
	06/27/1998	3	SAN. ENG. (1); SOC. SCIENTIST (1); ENV. SPL. (1)	S	S
	09/11/1998	3	SAN. ENG. (1); SOC. SCIENTIST (1); ENG. (SLUM SAN.) (1)	S	S
	12/18/1998	6	SAN. ENG. (1); ENV. SPL. (1); SOC. SCIENTIST (1); FIN.	S	S

	04/29/1999	2	ANALYST (1); ENG. (SLUM SAN.) (1); PROCUREMENT (1)		
	12/18/1999	10	SAN. ENG. (1); ENG. (SLUM SAN.) (1) TTL/SAN. ENG. (1); WAT&SAN SPL. (1); ENV. (1); ENV. (SLUM SAN.) (1); FMS (1); WATER UTILITY SPL. (1); SOC. DEV. (2); MUNI. ENG. (1); PROCUREMENT (1)	S	S
	06/16/2000	2	TTL/SAN. ENG. (1); SOC. DEV. (1)	S	S
	12/01/2000	5	TTL/SAN. ENG. (1); SOC. DEV. (1); PROCUREMENT (1); ENV. (1); FMS (1)	S	S
	06/20/2001	5	TTL/SAN. ENG. (1); MUNI. ENG. (1); SOCIOLOGIST (1); FMS (1); ENV. (1)	S	S
	12/12/2001	2	TTL/SAN. ENG. (1); SOC. DEV. (1)	S	S
	05/24/2002	5	SOC. DEV. (1); ENV. (1); PROCUREMENT (1); TTL/SAN. ENG. (1); FMS (1)	S	S
	10/10/2002	6	TTL/SAN. ENG. (1); URBAN DEV. (1); ENV. SPL. (1); MUNI. ENG. (1); SOC. DEV. (1); FMS (1)	S	S
	03/03/2003	7	TTL/SAN. ENG. (1); SOC. DEV. (1); MUNI. ENG. (1); ENV. (1); FMS (1); URBAN DEV. (1); ECONOMIST (1)	S	S
	10/17/2003	5	TTL/SAN. ENG. (1); SOC. DEV. (1); WAT&SAN. SPL. (1); ENV. (1); FMS (1)	S	S
ICR	12/10/2003	4	TTL/SAN. ENG. (1); SOC. DEV. (1); ENV. (1); WATSAN ECONOMIST	S	S

(b) Staff:

Stage of Project Cycle	Actual/Latest Estimate	
	No. Staff weeks	US\$ ('000)
Identification/Preparation	136	419
Appraisal/Negotiation	41	124
Supervision	243	639
ICR	8	35
Total	428	1217

Annex 5. Ratings for Achievement of Objectives/Outputs of Components

(H=High, SU=Substantial, M=Modest, N=Negligible, NA=Not Applicable)

	<u>Rating</u>				
<input type="checkbox"/> <i>Macro policies</i>	<input type="radio"/> H	<input type="radio"/> SU	<input type="radio"/> M	<input type="radio"/> N	<input checked="" type="radio"/> NA
<input type="checkbox"/> <i>Sector Policies</i>	<input type="radio"/> H	<input type="radio"/> SU	<input type="radio"/> M	<input type="radio"/> N	<input checked="" type="radio"/> NA
<input type="checkbox"/> <i>Physical</i>	<input type="radio"/> H	<input checked="" type="radio"/> SU	<input type="radio"/> M	<input type="radio"/> N	<input type="radio"/> NA
<input type="checkbox"/> <i>Financial</i>	<input type="radio"/> H	<input checked="" type="radio"/> SU	<input type="radio"/> M	<input type="radio"/> N	<input type="radio"/> NA
<input type="checkbox"/> <i>Institutional Development</i>	<input type="radio"/> H	<input checked="" type="radio"/> SU	<input type="radio"/> M	<input type="radio"/> N	<input type="radio"/> NA
<input type="checkbox"/> <i>Environmental</i>	<input checked="" type="radio"/> H	<input type="radio"/> SU	<input type="radio"/> M	<input type="radio"/> N	<input type="radio"/> NA
 <i>Social</i>					
<input type="checkbox"/> <i>Poverty Reduction</i>	<input type="radio"/> H	<input checked="" type="radio"/> SU	<input type="radio"/> M	<input type="radio"/> N	<input type="radio"/> NA
<input type="checkbox"/> <i>Gender</i>	<input type="radio"/> H	<input type="radio"/> SU	<input type="radio"/> M	<input type="radio"/> N	<input checked="" type="radio"/> NA
<input type="checkbox"/> <i>Other (Please specify)</i>	<input type="radio"/> H	<input type="radio"/> SU	<input type="radio"/> M	<input type="radio"/> N	<input type="radio"/> NA
<input type="checkbox"/> <i>Private sector development</i>	<input type="radio"/> H	<input type="radio"/> SU	<input type="radio"/> M	<input type="radio"/> N	<input checked="" type="radio"/> NA
<input type="checkbox"/> <i>Public sector management</i>	<input type="radio"/> H	<input checked="" type="radio"/> SU	<input type="radio"/> M	<input type="radio"/> N	<input type="radio"/> NA
<input type="checkbox"/> <i>Other (Please specify)</i>	<input type="radio"/> H	<input type="radio"/> SU	<input type="radio"/> M	<input type="radio"/> N	<input type="radio"/> NA

Annex 6. Ratings of Bank and Borrower Performance

(HS=Highly Satisfactory, S=Satisfactory, U=Unsatisfactory, HU=Highly Unsatisfactory)

6.1 Bank performance

Rating

- | | | | | |
|--------------------------------------|-------------------------------------|------------------------------------|------------------------------------|--------------------------|
| <input type="checkbox"/> Lending | <input type="radio"/> HS | <input type="radio"/> S | <input checked="" type="radio"/> U | <input type="radio"/> HU |
| <input type="checkbox"/> Supervision | <input checked="" type="radio"/> HS | <input type="radio"/> S | <input type="radio"/> U | <input type="radio"/> HU |
| <input type="checkbox"/> Overall | <input type="radio"/> HS | <input checked="" type="radio"/> S | <input type="radio"/> U | <input type="radio"/> HU |

6.2 Borrower performance

Rating

- | | | | | |
|--|--------------------------|------------------------------------|-------------------------|--------------------------|
| <input type="checkbox"/> Preparation | <input type="radio"/> HS | <input checked="" type="radio"/> S | <input type="radio"/> U | <input type="radio"/> HU |
| <input type="checkbox"/> Government implementation performance | <input type="radio"/> HS | <input checked="" type="radio"/> S | <input type="radio"/> U | <input type="radio"/> HU |
| <input type="checkbox"/> Implementation agency performance | <input type="radio"/> HS | <input checked="" type="radio"/> S | <input type="radio"/> U | <input type="radio"/> HU |
| <input type="checkbox"/> Overall | <input type="radio"/> HS | <input checked="" type="radio"/> S | <input type="radio"/> U | <input type="radio"/> HU |

Annex 7. List of Supporting Documents

Relevant information of supporting Bank and external project documents have been incorporated in the main text and in annexes. However, the following documents were also analyzed:

1. Mission aide-memoires.
2. Office Memo dated August 15, 1998 from Mr. Prem Garg, Director, Quality Assurance Group on Post-Approval Quality at Entry/Quality of Supervision Assessment: South Asia Water and Sanitation Projects.
3. Marine Sewage Outfalls at Mumbai - A Case Study, June 2000, Ambuja Technical Literature Series 53, Ambuja Cement, Mumbai.
4. Memo dated December 2, 2000 from Mr. Prem Garg, Director, Quality Assurance Group on Quality of Supervision Assessment (QSA4): Final Assessment.
5. Urban Notes - Thematic Group on Services to the Urban Poor, The World Bank: Reaching the Urban Poor through Sustainable Partnerships: The Slum Sanitation Program in Mumbai, India by Rosanna Nitti and Shyamal Sarkar, January 2003.
6. Various reports and coverage in the Newspapers in Mumbai.

Additional Annex 8. [Overview of Project's Scope and Results

Sl. No.	Item Description	Status	Output
COMPONENT 1 - PHYSICAL WORKS			
	Pumping Stations, Treatment and Disposal		
A.1	Worli and Bandra Outfalls	Completed	<p>Worli outfall: It is designed for carrying 760 Mld dry weather flow. It is in use since June 15, 1999 and currently conveying 360 Mld sewage. Sewage volume will substantially increase when the ongoing works of intercepting and diverting dry weather flow from 7 storm drains are completed (due January 2005).</p> <p>Bandra outfall: Its designed for carrying 796 Mld dry weather flow. It is in use since May 27, 2003 and currently conveying 400 Mld sewage. Works of connecting local sewers are in progress.</p>
A.2	Bandra Pumping Station (Civil, Mechanical and Electrical works)	Completed	Installation for pumping raw sewage to Waste Water Treatment Facility on way to marine disposal through outfall at Bandra.
NEW	Rehabilitation of Bandra Collector Tunnel	Completed	Commissioned in stages during May 27 – September 18, 2003. It is an essential link to convey sewage to pumping station and then to Bandra outfall.
A.3.1	Bhandup Lagoons (Civil, Mechanical and Electrical works)	Completed	280 Mld capacity lagoon was commissioned on June 3, 2002. Currently, 140 Ml sewage is treated per day.
A.3.2	Ghatkopar Lagoons (Civil, Mechanical and Electrical works)	Completed	300 Mld capacity lagoon was commissioned on May 23, 2003. Currently, 110 Ml sewage is treated per day.
A.4;A.5	Ghatkopar influent tunnel repair	Deleted	
NEW	Ghatkopar High Level Tunnel (This work was taken in lieu of repair of the influent tunnel which was dropped)	Completed	Commissioned on May 23, 2003. It is an essential link to convey sewage to pumping station and then to lagoons.
Slum Sanitation Implementation			
A.6.1	Schemes – Lot 1	Completed	3 toilet blocks with 60 seats completed as pilot. The first toilet block is operated and maintained by CBO since June 2000. All are operated and maintained by CBOs.
A.6.2	Schemes – Lot 2	Completed	2 schemes of local sewer to connect private latrines completed and commissioned in early 2001.
A.6.3	Schemes – Lot 3	Completed	5 toilet blocks completed. CBOs operate and maintain them since early 2002.
A.6.4	Schemes – Lot 4	Completed	One toilet block operated and maintained by CBO.
A.6.5	Schemes – Lot 5	Completed	3 toilet blocks retrofitted in 2002 as pilot.

			CBOs operate and maintain them.
A.6.6	Schemes – Lot 6	Partly completed	75 toilet blocks handed over to the CBOs for operation and maintenance. Ongoing works for 36 toilet blocks are to be completed by September 2004.
A.6.7	Schemes – Lot 7	Partly completed	120 toilet blocks handed over to the CBOs for operation and maintenance. Ongoing works for 78 toilet blocks are to be completed by September 2004.
A.6.8	Rehabilitation of Bandra Collector Tunnel (toilet blocks provided to slum community near the work site)	Completed	6 toilet blocks with 20 seats in each constructed. These are operated and maintained by CBOs since December 2001.
A.6.9	Mobile/shiftable toilets	Completed	2 mobile toilets and 2 shiftable toilets provided as pilot.
A.6.10	Sewer laying to improve slum connectivity	Completed	5,256 meter sewers laid in Eastern suburb and 3,823 meter sewers laid in Western suburb to provide connectivity to slums.
A.6.11	Segregation of sewage flow from storm water drains in Worli zone	Due to be completed by January 2005	7 outfalls in Worli zone will be intercepted. This will diminish the untreated sewage flow to near shore.
A.7	Stability Restoration – 5 Pumping Stations	Completed	Functional efficiency improved. In use since February 1998.
	Conveyance System Remedial Works		
A.8.1	Works: Providing missing links by microtunneling	Completed	15 missing links provided with aggregate length of 4,871 meters.
A.8.2	Works: Manholes - Reconstruction, repair and replacement of frames and covers	Completed	170 manholes reconstructed, 529 manholes repaired and 3,210 manholes provided with frames and covers.
A.8.3	Works: Providing vent shaft and improvement in drop connections	Completed	48 vent shafts and 817 drop connections provided.
A.8.4	Works: Replacement of sewers by open excavation	Completed	1,495 meter sewers replaced.
A.8.5	Works: Sewer rehabilitation by lining	Completed	16,957 meter large trunk sewers lined.
A.8.6	Works: Sewer rehabilitation by pipe bursting/pipe jacking	Completed	3,794 meter sewer length rehabilitated.
A.8.7	Works: Modification of grit chambers and air diffusers	Completed	Grit removal efficiency improved in Love Grove pumping station.
A.8.8	Equipment: Safety equipment	Completed	Gas monitor, Escape unit and Safety harness and Oil-free air compressors procured. Safety officers have been appointed to train the workers.
A.8.9	Equipment: Sewer Cleaning equipment	Completed	Vehicle mounted - 3 suction-cum-jetting (combination unit without recycling), 1 jetting/suction unit (with recycling), 7 suction unit (Gully emptier), 5 high velocity cleaner (Jetting machines); and 15 power bucket sewer cleaning machine procured. All of them have been put to effective use.
A.8.10	Equipment: Laboratory equipment	Completed	Sewage quality monitoring laboratory capacity enhanced and a routine for sample collection, analysis and reporting established.

A.8.11	Equipment: Check valves and Duck-bill valves	Partly completed	21 check valves have been installed. Duck-bill valves procured, installation awaited.
COMPONENT 2 - TECHNICAL SERVICES FOR COMPONENT 1			
B.1	Engineering services for BSDP	Completed	Provided design, supervision and project management services for marine outfalls, pumping stations, aerobic lagoons, construction/rehabilitation of tunnels.
B.2	Studies – Upgrade (Operation & Maintenance Services) Sewerage	Completed	Recommended modification to various installations in pumping stations, laboratory set-up, maintenance workshops, staff training, and safety of workers.
B.3.1	Studies – Sewerage topographical surveys	Completed	Identified system deficiency and in establishment of SUMC supported by GIS.
B.3.2	Studies – Sewerage condition assessment	Completed	Identified vulnerable sections of the sewerage system and recommended feasibility of diversion of dry weather flow in Worli zone.
B.4.1	Slum sanitation – Program publicity	Completed	Enabled dissemination of the demand-led participatory approach among sections of slum community.
B.4.2	Slum sanitation – Concurrent monitoring	Completed	Findings helped in redesigning the slum sanitation program.
B.4.3	Slum Sanitation Sanitation surveys of slums	Completed	Map of slum areas with existing sanitation facilities made available through this study. Enabled MCBM to relaunch SSP with modification in approach.
B.4.4	Slum sanitation – Preparation of comprehensive plan for Cheeta Camp	Completed	Comprehensive sanitation plan for about 200,000 slum dwellers prepared.
NEW	Sewerage: Services for trenchless technology (microtunneling and sewer rehabilitation)	Completed	Technical services including advisory support provided.
NEW	Studies - Operation and Maintenance of Water Supply System	Completed	Key aspects studied are water audit, hydraulic modelling, energy efficiency, adequacy of maintenance, condition assessment of treatment plants, transmission and distribution system, and establishment of Customer Facilitation Center.
COMPONENT 3 - PREPARATION OF STAGE 2 INVESTMENTS			
B.5.1	Stage 2 Feasibility Studies for Sewerage	Completed	Sewerage Master Plan for Mumbai for year 2025 prepared identifying the priority works and intervention
B.5.2	Stage 2 Detailed Engineering Studies	Deleted	

Note: Serial number follows the number indicated under section 3.3 (Original Components)

Additional Annex 9. [Borrower's Evaluation Report

**S.J.Kunte(I.A.S.)
Addl Municipal Commissioner**

Municipal Corporation of Brihanmumbai

No. AMC/P/2754

Date: 24.5.2004

Sub :- Mumbai (Bombay) Sewage Disposal Project.
(Ln/Cr. 3923/2763-IN)
- Draft Implementation Completion Report (ICR).
- Borrower's Evaluation Report.

Dear Mr. Rajamani,

I am enclosing herewith the Borrower's Evaluation Report in respect of World Bank aided Mumbai Sewage Project (Loan/Credit 3923/2763-IN). You are requested to forward the Report to the World Bank, through the Department of Economic Affairs, Ministry of Finance, Government of India.

With regards,

Yours faithfully,

Sd/-

(S.J.Kunte)

Encl: As above.

Mr.M.Rajamani
Jt. Secretary,
Ministry of Urban Development
& Poverty Alleviation,
Government of India,
Nirman Bhavan,
New Delhi – 110 011.

c.c. Shyamal Sarkar,
Sr.Sanitary Engineer & Task Team Leader,
The World Bank,
70, Lodi Estate, New Delhi – 110003, India.

c.c. Mr. Sunil Bhargava,
Director,
Department of Economic Affairs,
Ministry of Finance, Govt. of India,
North Block, New Delhi – 110 001.

c.c. Mr. B.C.Khatua,
Principal Secretary,
Water Supply & Sanitation Department
Govt. of Maharashtra, Mantralaya,
Mumbai – 400 032.

MUNICIPAL CORPORATION OF BRIHAN MUMBAI

**WORLD BANK AIDED MUMBAI SEWAGE DISPOSAL PROJECT
(LOAN / CREDIT 3923 / 2763 – IN)**

BORROWER'S EVALUATION

1. INTRODUCTION

The Municipal Corporation of Brihan Mumbai (MCBM) has been implementing Integrated Water Supply and Sewerage Schemes with the assistance from International Development Association / International Bank for Reconstruction and Development, since 1974. Since then, MCBM has implemented Bombay I, Bombay II and Bombay III Water Supply and Sewerage Projects. The Mumbai Sewage Disposal Project (MSDP) was approved by the World Bank (WB) on July 6, 1995, for a total loan / credit amount of US\$192 million. The original loan closing date of December 31, 2002 was extended by one year to December 31, 2003.

The Mid Term Review of the project was carried out in December 1999. The project was restructured and certain works were added to the project, to utilise the savings. The saving was mainly due to appreciation of US\$ with respect to Indian Rupee and actual expenditure being less than the basic cost for some of the major works. Loan amount of US\$10 million was cancelled in June 2000. The expenditure forecasts were reviewed from time to time. Accordingly, work-wise targets were revised and project was monitored. A further Loan amount of US\$12 million was cancelled in September 2002.

2. PROJECT OBJECTIVES:

In brief, the objectives of MSDP were to :

- i) Strengthen the Corporation's capacity in all aspects of provision and management of sewerage services.
- ii) Sustain the financial viability of provision of water supply and sewerage services in the jurisdiction of the Corporation.
- iii) Improve the health and environmental conditions in the jurisdiction of Corporation including the slums.

3. THE PROJECT:

Original Components: The original components as described both in the Staff Appraisal Report (SAR) and in the Loan Agreement comprised of:

Part A - Physical Components:

- 1) Construction of about 3.7 km. Long, 3.5 metre diameter marine outfall at Worli and Bandra.
- 2) Construction of a Pumping station at Bandra.
- 3) Construction of aerated lagoons at Bhandup and Ghatkopar.
- 4) Construction of facilities to prevent siltation of the influent tunnel at Ghatkopar.
- 5) Rehabilitation of the existing Ghatkopar tunnel.
- 6) Implementation of Slum Sanitation schemes.
- 7) Construction of additional structural features to improve the stability of five existing sewage pumping stations.
- 8) Implementation of a programme of improvement to the existing conveyance system.

Part B - Technical Assistance and Training:

Provision of technical assistance and training for:

- 1) Supervision of construction of the works to be carried out under Parts A (1) through (5) and (7).
- 2) Upgrading the operation and maintenance practices and facilities for the Corporation's sewerage system to acceptable levels.
- 3) Implementing topographic and condition surveys for the Corporation's conveyance system and formulating a program of improvements to said system;

- 4) Carrying out social and physical surveys, the formulation of investment proposals, implementation and management, independent monitoring and evaluation in respect of the slum sanitation schemes; and
- 5) Carrying out feasibility studies for the second stage sewage treatment and disposal facilities in the service areas of Malad, Versova, Bhandup, Ghatkopar, Bandra, Worli and completing detailed engineering designs for sewage treatment and disposal facilities in said service areas.

Revised Components:

At the mid-term, the project was restructured to include the following:

- 1) The rehabilitation of the existing Ghatkopar tunnel was replaced by the construction of a higher-level tunnel because a new and higher-level tunnel proved to be less costly than the contemplated rehabilitation of the existing Ghatkopar tunnel
- 2) A training component was added after the Mid-Term Review
- 3) The rehabilitation of a tunnel was added to collect sewage and transport it to the Bandra pumping station.
- 4) Study of O&M of water supply system of Mumbai.
- 5) The work of segregation of sewage from storm water drains was also included to enhance environmental benefits.

4. ACHIEVEMENT OF PROJECT OBJECTIVES:

4.1 Strengthen the Corporation's capacity in all aspects of provision and management of sewerage services.

This objective has been substantially achieved.

(a) Service coverage:

- i) The work of laying new sewer lines at various places by Micro-tunneling method has brought more area under sewerage network. Sewer lines at various locations, totalling to about 4.9 km., were laid using micro tunneling. The work consisted of laying long-standing missing links, laying sewer lines of larger sizes i.e. augmentation and also extension of sewer network, bringing hitherto un-sewered population under sewerage service umbrella. The work has benefited about 1.8 million population on nearly 2000 Ha. area.
- ii) Laying of new sewer lines of about 9.1 km. (by trenching method) has enhanced the area under sewerage network, resulting in increase in the sewerage connections.
- iii) The High Level Tunnel at Ghatkopar has been commissioned in May 2003. This has improved the collection and conveyance of sewage in Zone VII i.e. Ghatkopar Zone.
- iv) 100% of formal dwellers have the sanitation facility out of which 80% is covered under sewerage , whereas 65% slum dwellers have the sanitation facilities out of which 1.4% is covered under the sewerage

(b) Operation and Maintenance (O.&M.) improvement :

- i) Study to up-grade Sewerage Operation and Maintenance Services was carried out under the Project. Based on the Reports submitted, areas requiring improvements were identified.
- ii) The Sewer-cleaning equipment procured under the project has enabled the department to carry out systematic cleaning of sewer lines. The machines have proved to be efficient in removing chronic & difficult chokes as well as useful in attending to intricate problems in sewer lines. This has improved maintenance capacity of the sewerage services.
- iii) The safety equipments procured under MSDP are being used and has raised the morale of the field staff and has increased safety awareness.
- iv) The management of Sewerage Treatment Facilities has become more effective because of sophisticated and user-friendly laboratory equipments procured under the Project.
- v) The modification in grit chamber and providing air diffusers has given encouraging results for effective control over grit removal to cope up with Pollution Control Norms.
- vi) The Customer Facilitation Centers (CFCs) have been set up in some of the wards.
- vii) There is reduction in the no. of sewer related complaints.

- c) **Sewage treatment capacity:** The sewage treatment capacity, which was 1155 MLD before M.S.D.P., has enhanced to 2530 MLD as on 31.12.2003.

Treatment Facility	Capacity (MLD)	Treatment Process	Remarks
BEFORE MSDP			
Colaba	125	Preliminary treatment & 1.2 km. long marine outfall	
Love Grove, Worli	760	Preliminary treatment & 3.7 km. long marine outfall	Outfall under MSDP
Versova	90	3 stage aerated lagoons	
Malad	180	Preliminary treatment	
Subtotal	1155		
AFTER MSDP			
Bhandup	280	Single stage aerated lagoons	Aerated Lagoons under MSDP
Ghatkopar	300	Single stage aerated lagoons	Aerated Lagoons and High level tunnel under MSDP
Bandra	795	Preliminary treatment & 3.7 km. long marine outfall	Bandra IPS, repairs and rehabilitation of EPS,WWTF & Force-main, rehabilitation of Bandra Collector Tunnel system and Outfall under MSDP
Subtotal	1375		
TOTAL	2530		

- d) **Disposal in environmentally acceptable manner :**

Considering the present water supply, 2600 MLD sewage is generated. Out of this, at present, 1500 MLD sewage is collected and disposed off in environmentally acceptable manner against 790 MLD disposed off without treatment prior to M.S.D.P.

By implementation of the plan prepared after Stage-II Studies, it is expected to collect 90% sewage (at present 60% sewage is collected) and dispose it off in an environmentally acceptable manner, to meet the improved standards likely to be prescribed by Maharashtra Pollution Control Board (MPCB) / Central Pollution Control Board (CPCB). The priority works, including expansion of Slum Sanitation Programme (SSP) have been identified, under Stage-II plan.

- e) **Improved infrastructure:**

- i) Structural stability of 5 pumping stations has been improved.
- ii) Condition assessment of sewers for 150 km. length of sewer out of 1400 km. was carried out. The lines identified as Category '5' i.e. collapsed sections have been rehabilitated under this project.
- iii) The work of Repairs and Reconstruction of Manholes has resulted in the improvement in structural conditions and operational conditions.
- iv) The work of Replacement of Manhole Frames & Covers has achieved the advancement towards standardization of MH frame & cover and has improved operational conditions.
- v) The work of Providing Vent Shafts & Improvement in Drop Connections has improved ventilation in the system and avoided scouring of manhole base.
- vi) Rehabilitation of sewers by different trench-less methods i.e. 3.8 km. by pipe bursting/ pipe jacking method and 17 km. by lining method has improved structural condition and operational condition.
- vii) Replacement of sewer lines of about 1.5 km. (by open-cut method) has improved sewage conveyance.

f) Maps :

Topographical Survey and improvement in sewage conveyance system was carried out under MSDP.

MCBM has established a Sewerage Utility Management Center (SUMC) to maintain and update the digitized maps of sewerage system. This has resulted in achieving sophistication in data management, improved planning capacity and increased awareness among the staff.

g) Training :

- i) A training center has been established at Love Grove Pumping Station, Worli and sewerage department staff is being trained there for enhancement of technical knowledge and various skills. The courses are held on various subjects such as Maintenance, Management, Health, Safety and Public relations etc. So far about 36 courses were organised, reaching about 4000 sewerage staff. Due to the training, the staff has understood their respective roles and responsibilities better.
- ii) While carrying out the work of laying sewers by micro-tunneling, through close interaction with the Consultants, Contractors, Operators, Manufacturers and Technology providers, the MCBM staff has developed the confidence for supervising such works without any external assistance, thus resulting in skill development & capacity building.

h) Preparation of future plans:

The study for identifying sewerage works for Stage II of MSDP has been completed under this Project and Final report, including futuristic plan for enhancing the infrastructure and considering the population growth from 2002 to 2025, was received by MCBM in August, 2002. By implementation of the plan, it is expected to collect 90% sewage (against 60% at present) and dispose it off in an environmentally acceptable manner, to meet the improved standards likely to be prescribed by MPCB / CPCB. The priority works, including expansion of SSP have been identified.

4.2 Sustain the financial viability of provision of water supply and sewerage services in the jurisdiction of the Corporation.

Water Supply and Sewage Disposal Department of MCBM revised water and sewerage tariffs and also tariff structure from time to time and it met with the stiff investment finance covenant without fail. Billing and collection efficiency has significantly improved because of the proactive measures taken and its financial performance improved over the years.

This objective has been achieved as detailed below:

- i) MCBM maintains a specific cash account to cover the planned annual cost of asset replacement and rehabilitation costs after meeting 35% of the capital expenditure required under the agreement.
- ii) Revision of Water and Sewerage tariffs: MCBM had revised water and sewerage tariffs, effective from 01/02/2001. The main aspect of the tariff rise is introduction of 60% Sewerage Charges in respect of water connections granted in slum areas (Stand-post water connections). Further, minimum charges against bill and scheduled charges are revised. The penal clause has been introduced to improve the collection. Water tariffs have been further revised with effect from 01/08/2002. The revenue collection for both water and sewerage has increased during financial year 2002-03. Also, the ratio Total Collection / Total Billing has markedly improved.
- iii) Computerized decentralized water and sewerage billing system in the wards : MCBM has introduced new Decentralized Aqua Billing System at Ward level to improve the collection efficiency and to enhance recovery of annual revenue. The system started functioning in April 2001 in all wards and in April, 2002 in K/East ward. The Water Charges Bills are now generated at ward level monthly and staggered thrice in a month on prescribed dates of 5th, 15th and 25th day of every month. Since the preparation of bills takes place within 8 to 10 days of meter reading, the demand is progressive for each month. To discourage delay in payment of water bills, an additional charge of 2% per month or part thereof is introduced, which automatically gets added in the next bill. This system enables Assistant Engineers in the wards to generate list of Top 100 defaulters, so as to take prompt disconnection action. The introduction of Computerized Billing System has helped in production of bills in time, their issuance

through post, collection of revenue and providing the accurate account to the connection holders.

iv) Efforts are also being made to reduce operating cost. Study of operation and maintenance of water supply system of Mumbai, is in progress, with the objective of optimizing the operating costs. Draft Final Report has been received on December 31, 2003. The report is under scrutiny.

v) Recovery including Past and Previous years, for both water and sewerage, continues to be improved during financial year 2002-03.

4.3 Improve the health and environmental conditions in the jurisdiction of Corporation, including the slums.

All measures to improve the health and environmental conditions that have been provided in the project have been completed and the objective has been substantially achieved.

The quality of near shore water has improved significantly from aesthetic point of view since commissioning of the marine outfalls and the lagoons. Nevertheless, from an assessment of the impact of the various measures implemented, MCBM initiated a program to intercept the sewage flowing into coastal water through the storm water drains to enhance the environmental conditions near shore. MCBM will continue to study the quality of marine water near shore and 3 to 5 km from shore and take measures as required to enhance the health and environmental conditions.

Details are given below:

- i) Marine outfall at Worli has been commissioned and is working satisfactorily. About 500 MLD sewage is being disposed through the said outfall. National Environmental Engineering and Research Institute (NEERI) carried out studies known as Mumbai Coastal Water Quality Modeling Studies. Evaluation of environmental impact (post-commissioning) of the Worli outfall was completed by NEERI and Final Report was received in November-2001. The near-shore water has improved from aesthetic point of view. The water quality at 1 km. line from shore shows some improvement. However, there is no improvement near-shore and at 3 km. & 5 km. from the shore. This is due to non-point discharges from storm water drains (SWDs). Hence, the works for segregation of sewage from SWDs have been taken up.
- ii) Marine outfall at Bandra has been commissioned in May 2003. The post-commissioning study will be taken up to assess the environmental benefits. The preliminary inspection has shown aesthetic improvement at Mahim Creek and the local fishermen have reported increase in the fish yield.
- iii) Aerated Lagoons at Bhandup have been commissioned in June 2002 and those at Ghatkopar in May 2003. Due to this, the discharge water quality standards prescribed by the MPCB have been achieved. This has helped reduce the pollution of Thane Creek.
- iv) Sewage collection was improved and 20 sq. km. area (with about 1.8 million inhabitants) has been brought under sewerage coverage.
- v) Sewage treatment and disposal capacity was improved from 1155 MLD to 2530 MLD.
- vi) The SSP is being implemented as the demand-based project with participation of local residents.

The sanitation surveys of slums in all the wards carried out under MSDP have quantified the required no. of community toilets. As on 31.12.2003, 193 toilet blocks have been completed and handed over to Community Based Organisations (CBOs). No. of beneficiaries has substantially increased to 1,97,000.

The SSP carried out under MSDP has brought about improvement in the cleanliness in the slum pockets, particularly around the toilets, elimination of open defecation, reduction in waiting time to use the toilet, protection of self esteem and better social relationships.

Government of Maharashtra (GoM) announced policy reform for converging all programs in Mumbai to adopt demand-led participatory approach where the community takes over the responsibility for operation and maintenance of the sanitation schemes, for achieving longer-term health and environmental benefits in the slums. About five million slum-dwellers will have improved access to toilet facilities and will help in improving the health and environmental conditions in the slums they reside and in the neighboring areas which are also impacted by the degraded conditions. Water Supply & Sanitation Department of GoM has issued Government Resolution (GR) in March 2002, for adhering to the SSP policy followed in this Project,

for the construction of community toilet blocks.

- vii) The construction works under MSDP were carried out with Environment Impact Mitigation and Monitoring Action Plan (EIMMP), based on the conditions laid down in the environmental clearance issued by Ministry of Environment & Forests (MOEF), Government of India (GoI). The activities were plantation of mangroves, appointment of Citizens Advisory Committee (CAC) and monitoring of air and noise at construction sites.
- viii) The replantation of mangrove in 40 ha. area in the East Coast also helped protection of ecology.
- ix) NEERI completed Thane Creek water quality study and modeling for its assimilative capacity. The finding of the study was discussed in the workshop in Jan.2002, attended by stakeholders Thane Municipal Corporation (TMC), MPCB, New Mumbai Municipal Corporation (NMMC) and Thane-Belapur Industries Association (TBIA). NEERI submitted the modified report considering the quantity and quality of flow for the years 2001, 2015 and 2025. The findings of both, Mumbai Coastal Water Quality Modeling Studies and Thane Creek Water Quality Study have been used by Stage II Consultants in preparing the Master Plan.
- x) A Sewage Quality Monitoring Laboratory is set up at Dadar Pumping Station. The laboratory conducts various physical and chemical tests to assess the quality of sewage and also quality of effluent discharged into water body after the treatment. The effluent quality is compared with the norms set by MPCB.

5. BANK'S PERFORMANCE:

Bank's overall performance was satisfactory.

The Bank closely supervised the project by deputing Supervision Missions, once in every six months. This helped in completing the Project smoothly. Visits by Bank officials from various disciplines, as part of supervision missions, were beneficial in sorting out major issues such as method of Rehabilitation of Bandra Collector tunnel, construction of High level tunnel at Ghatkopar, environmental issues, contractual issues and issues regarding implementation of SSP. Wide experience of experts has helped improve the quality of works and the MCBM staff got first-hand training under their guidance. Many a times Missions conveyed concurrence on several issues in the field, which saved a lot of time. Bank team for supervision was by and large continued and this was extremely helpful in continuing development dialogue. Further, the availability of the team in Delhi also helped MCBM to reach out them for any consultation that was needed for implementation of such a large and complex project. MCBM rates the Bank's supervision performance highly satisfactory.

Technical guidance received from the Bank not only helped MCBM to implement the project well and deploy the most cost effective technology, but also in saving costs in (a) Ghatkopar tunnel, (b) micro-tunneling works, (c) Mechanical and electrical works for Bandra pumping station, (d) sewer rehabilitation, (e) floating aerators for lagoons. Bank guidance on introduction of the decentralized and computerized Water Supply and Sewerage (WSS) billing system and computerized accounting system is also highly appreciated.

Project cost estimate did not take account of costs associated with the project implementation like, water & sewerage charges, overheads, taxes and duties for equipments and consultancies, as a result MCBM had to finance Rs. 3440.202 million, for which no disbursement was claimed.

6. BORROWER'S PERFORMANCE:

MCBM's performance was satisfactory:

- i) As on 31/12/2003, the Expenditure of Rs.10028.682 millions has been incurred and an amount of Rs.6571.005 millions. (US \$ 151.537 millions) have been claimed. Bank has disbursed Rs. 6445.948 millions (US\$ 148.802 millions) and including Special Account, it works out to US\$158.62 millions). GoM has released Rs.4135.3 millions. Due from GoM is Rs.2310.624 millions.
- ii) MCBM's positive outlook and commitment to the Project helped in smooth completion of the Project. All the physical works and studies have been completed before the extended Loan Closing Date, except that the implementation of the SSP is in progress and draft Final Report of Study of O&M of water supply system has been received on 31.12.2003. The project has been completed with the cost saving.
- iii) The major and complex works viz. Worli and Bandra Marine Outfalls, Civil, Mech. & Elect. Works at Bandra IPS, rehabilitation of Bandra Collector Tunnel System, High Level Tunnel at Ghatkopar, Aerated Lagoons at Bhandup & Ghatkopar, Sewer laying by micro-tunneling and rehabilitation of sewers by Lining

were closely monitored and successfully completed & commissioned by MCBM.

- iv) The Contracts were administered efficiently by MCBM with the help of in-house expertise and skills, including timely payments to the Contractors ensuring smooth cash flow to the contractors. MCBM resolved the contractual disputes speedily, with the help of Dispute Review Boards (DRBs).
- v) The demand-led Slum Sanitation Programme is being successfully implemented by MCBM, with participation of slum-dwellers.
- vi) The tariff adequacy in the context of forecast of W.S.S.D. was reviewed every year and the tariffs were periodically revised to meet the investment requirements.
- vii) Asset replacement fund was created as annual contribution in W.S.S.D. budget.
- viii) Funds earmarked for Training remained un-utilised for want of clearance from Government of India (GoI) for overseas training.

7. LESSONS LEARNT:

- i) Rehabilitation of sewer lines should be planned considering the condition of up-stream and down-stream portions.
- ii) GIS maps of all the underground utilities should be available for proper planning of the works and for avoiding missing links and un-attended stretches.
- iii) Difficult works can be completed by benchmarking of technology options as MCBM has done for outfall by tunnel boring, sewer laying by micro tunneling, sewer rehabilitation by lining and pipe bursting .
- iv) Geo-technical aspects should be thoroughly assessed and interpreted before taking up the works.
- v) While inviting International Competitive Bidding (ICB) tenders, joint ventures with Indian Contractors are advisable for ensuring Technology Transfer.
- vi) Award of contracts within the original bid validity period is essential for timely implementation of the project.
- vii) The scope of work for Consultancies for studies needs to be more elaborately specified. e.g. The contract document of Consultancy work for study of O.&M. of water supply, prepared as per the Bank guidelines, included only the Request For Proposal (RFP) document. It is now felt that the technical proposal submitted by the Consultants should have been part of the Contract document. The objectives in the RFP, within which key parameters were specified, were needed to be elaborated in detail, so as to pinpoint the work to be done by the Consultants.
- viii) The participation of community at planning and design stage and thereafter in operation and maintenance of local sanitation facilities is essential for sustainable improvement of health and environmental conditions in slums.
- ix) MCBM has spent about 10% and 5% of the Contract Cost for major works and minor works respectively towards consultancy services for design, bid preparation, bid evaluation and supervision over the contract. By now, MCBM has acquired substantial know-how to carry out small & mid-size works. The help of Consultants should be insisted only for major and complex nature works.
- x) MCBM being the implementing agency, 30% loan component (grant) shall be passed on to MCBM, which will reduce overall interest from 13% to competitive rate.
- xi) MCBM shall be allowed to make early re-payment without any penalty so as to reduce burden of interest.
- xii) Disbursement received from the World Bank/ Government of India shall be passed on to MCBM by Government of Maharashtra within 15 days so as to maintain the cash flow and the same shall not be adjusted against any dues.

8. FUTURE OPERATION:

All the sewerage works completed under the Project have been integrated in the existing sewerage system of Brihan Mumbai. Sustainability is certain. MCBM has the capacity to operate and maintain the sewerage plants and networks completed under MSDP. MCBM would redeploy the personnel such that the new facilities are operated and maintained along-with the existing facilities.

The Financial performance has been good in the past and will continue to be good, so finance for O&M is not likely to present problems.

The operational indicators for WSSD as a whole, including physical, financial, environmental and institutional, have been agreed with the Bank.

There is reduction by 4.7% in the complaint received and 3% reduction in the staff, in the year 2003 with respect to 2002 and staff for 1000 sewer connections is observed to be 54.75

The SSP implementation started under M.S.D.P. is being further continued through MCBM's funds which will provide additional facility to about 1,63,000 slum dwellers.

Under stage II priority works, it is proposed to construct 35,000 community toilet blocks and individual toilets for 6 lakhs slum dwellers till 2010. The estimated cost including design, project management and contingencies, over the period from 2004 to 2010 is Rs.4,800/- millions.

9. CONCLUSION:

To maintain the momentum gained from M.S.D.P., MCBM has proposed to carry out the Stage-II priority works identified by the stage-II feasibility studies and SSP.

MCBM thanks the World Bank for its financial assistance, the constant encouragement, technical advice and support given during the implementation of M.S.D.P.

