Report of the Comptroller and Auditor General of India

for the year ended March 2004

Government of National Capital Territory of Delhi (Volume-II)

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PREFACE

This Report for the financial year ended March 2004 has been prepared for submission to the Lieutenant Governor under Article 151(2) of the Constitution of India. It covers matters arising from audit of the accounts of the Government of the National Capital Territory of Delhi.

The audit observations on the Finance Accounts and Appropriation Accounts of the Government of National Capital Territory of Delhi for the financial year 2003-04 and the matters arising from test audit of the financial transactions of Government of National Capital Territory of Delhi have been included in Volume-I of the Report.

The present Report contains results of a performance appraisal on measures to control water pollution in River Yamuna in Delhi. The appraisal was conducted through test check of the records of the Department of Urban Development of the Government of the NCT of Delhi and its implementing agencies viz. the Delhi Jal Board and Delhi State Industrial Development Corporation.

OVERVIEW

The water of Yamuna continues to be relentlessly polluted by the domestic and industrial sewage generated in the National Capital Territory of Delhi.

While the water quality of the river at the point of its entry into Delhi at Palla is adequate to sustain aquatic life and conforms to water quality of "bathing" standards in terms of Dissolved Oxygen (DO) and Bio-chemical Oxygen Demand (BOD), the water quality is rendered unfit for any purpose by the time it exits Delhi at Okhla, with a drastic decline in the parameters of both DO and BOD as well as in total coli form count.

Performance audit of the sewage treatment programme undertaken by the Delhi Government through its implementing agencies viz. the Delhi Jal Board and the Delhi State Industrial Development Corporation disclosed glaring mismatch between the sewage generated and the treatment capacity created, as also between the treatment capacity created and the conveyance systems, resulting in discharge of untreated sewage into the river.

Thus, very little value for Rs. 872 crore spent on treatment of domestic sewage over the last decade has been realized in terms of impact on preventing the pollution of Yamuna by the sewage generated in Delhi.

Out of the estimated 719 MGD of domestic sewage generated in the National Capital Territory, 384 MGD was being discharged untreated into the river. Besides, even the treated effluent from seven treatment plants did not meet the pollution control standards, while harmful gases were being discharged into the atmosphere due to non-functional sludge digesters and gasholders at five treatment plants.

Most of the industrial sewage of 42 MGD continued to be discharged untreated into the river despite an expenditure of Rs. 123 crore on the construction of 10 Common Effluent Treatment Plants. Most of them were either non-functional or were operating at sub-optimal levels.

Measures to Control Water Pollution in River Yamuna in Delhi

This performance audit is the third in the series of reviews carried out by audit on issues relating to sewage management and treatment aimed at controlling water pollution in the National Capital Territory (NCT) of Delhi. The earlier two reviews printed in the reports of the Comptroller and Auditor General of India relating to the Government of NCT of Delhi presented to the Legislature during 2000 and 2004 highlighted *inter alia* the slow progress of construction of sewage treatment plants (STPs) and sewage pumping stations (SPSs), rehabilitation of sewer lines, tardy progress of construction and utilisation of common effluent treatment plants (CETPs) to treat industrial effluents and continuing flow of large quantities of domestic and industrial sewage into the Yamuna without treatment resulting in pollution of the river water during its passage through the NCT of Delhi. Highlights of each of the earlier reviews are at Annex I.

In view of the significant environmental risks associated with under-performance of sewage treatment projects, this performance audit was carried out with a view to assessing the cumulative status of the performance of STPs, SPSs and the connecting sewer lines as well as the actual treatment of domestic and industrial sewage, the quality of treatment and finally the impact on control of pollution in the river Yamuna as at the end of March 2004.

Highlights

Domestic and industrial sewage generated within the NCT of Delhi is the main source of pollution of the river Yamuna during its passage through the NCT. Despite over ten years of efforts and expenditure of Rs. 872 crore since 1994[1] on establishment of sewage treatment infrastructure for treatment of domestic and industrial sewage before its release into the river, the quality of water at the point where the river leaves Delhi has deteriorated drastically with large amounts of untreated sewage still falling into the river.

[1] *Expenditure prior to 1994 not reckoned.*

The water quality of the river at the point of its entry into Delhi at Palla is adequate to sustain aquatic life and conforms to water quality of "bathing" standards in terms of Dissolved Oxygen (DO) and Bio-chemical Oxygen Demand (BOD). However, at the point of its exit from Delhi at Okhla, the water quality of the river is unfit for any purpose with the BOD being 40 mg per litre against the norm of not more than 3 mg per litre while the DO deteriorates to almost nil against the norm of not less than 5 mg per litre. The coli form pollution which is already sub-standard at 217 times the norm when the river enters Delhi also deteriorates further to 1.39 lakh times the norm at the time of its exit from the NCT.

Against the estimated domestic sewage generation of 719 Million Gallons per Day (MGD) in Delhi, the Government has created capacity for treatment of only 512[2] MGD until March 2004. Even the created capacities of the STPs are not utilised optimally on account of construction of STPs in areas without adequate sewage load and non-synchronisation of construction of trunk sewer lines and sewage pumping stations. The progress of rehabilitation of the 28 trunk sewers of total length of 130 kms which is crucial for conveyance of the sewage has been tardy.

Only 335 MGD out of the estimated domestic sewage of 719 MGD is being treated before discharge into the river. The balance 384 MGD outfalls into the river untreated. Even the figures for actual treatment of sewage are arrived at through normative calculation on the basis of rated capacity of the STPs rather than through a robust system of measurement of the inflows and outflows.

The quality of treated effluent did not meet the stipulated specifications implying that even the treated effluent is contributing to the deterioration in water quality.

[2] *including 12 MGD capacity of one plant that is non-functional since 1999.*

Of the 15 CETPs required for treatment of 42 MGD industrial sewage, only 10 are complete at an expenditure of Rs. 123 crore of which only four were commissioned as of March 2004. The utilisation of even the commissioned plants is questionable. The construction and maintenance of the CETPs are plagued by various constraints; viz. under-estimation of the cost leading to shortage of funds, cost escalation due to delay, delay in construction of conveyance systems, delay in formation of CETP societies, etc. Consequently, almost the entire industrial sewage was out falling into the river without treatment.

The untreated sewage from the unsewered areas continues to fall into the river through open drains and nallahs in the absence of trapping of the sewage from such areas for treatment. This further contributed to the pollution load in the river.

While the physical progress of construction of sewage treatment and disposal works indicated under-performance, the Delhi Jal Board, which is entrusted with execution of such works, failed to utilise Rs. 159 crore out of Rs. 599 crore provided for the purpose by the Government during 1999-2004.

List of recommendations

- *Government of Delhi and the executing agency may put in place a system of efficient project management and utilisation of funds with CPM/PERT chart of all measurable activities which can be foreseen. The systems and procedures for formulation of plans and processing of tenders need to be streamlined so as to ensure optimum utilisation of funds placed at the disposal of DJB.*
- *Institutional mechanisms need to be established for timely co-ordination with other concerned civic and land owning agencies so as to minimize delay and hindrances in execution of works.*
- *Proposals for creation of treatment capacity must be based and prioritized with reference to the estimated sewage generation in the relevant catchment areas which should be estimated after taking all factors into account including population trends and availability/supply of water.*
- *Government of Delhi and DJB should put in place a system to ensure simultaneous execution and completion of all related infrastructure*

and establish reporting and accountability systems for under-performance. They should also monitor completion of all conveyance and other inter-dependent work and establish accountability for failure to complete them within the prescribed time.

- *DJB should ensure the optimum functioning of every component of a STP so as to obviate the possibility of release of harmful gases into the atmosphere. It should also explore the possibility of utilizing the gases generated by the STPs for generating electricity to meet their own requirement of power which would significantly offset operating costs.*

- *Systems and procedures need to be strengthened to ensure accurate measurement of both the quantity of treated sewage being discharged as well as its quality with reference to the prescribed parameters.*

- *The Government of Delhi should resolve outstanding issues related to the payment of share by the Government of India and the CETP societies.*

- *Government and DSIDC should ensure completion of the remaining CETPs in a time bound manner ensuring compliance with the stipulated environmental standards.*

- *Government of Delhi should pay prompt attention to trapping and treatment of all sewage presently flowing through these drains/nallahs in line with its assurances given to the Supreme Court in December 1993 and prepare a comprehensive plan to complete the works in a time bound manner.*

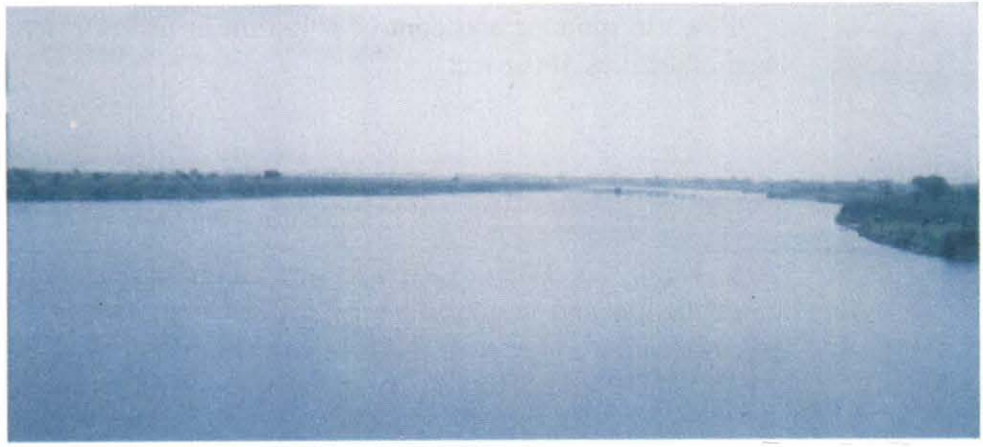
1. Introduction

Yamuna is one of the major rivers of India and has social, economic and religious significance for vast sections of the population. The total length of the Yamuna from its origin in the Yamunotri Glacier in the Himalayan ranges of Uttaranchal to its confluence with the river Ganga at Allahabad in Uttar Pradesh is 1376 kms of which 22 kms pass through the National Capital Territory (NCT) of Delhi. It enters Delhi at Palla near Wazirabad Barrage and leaves Delhi at the Okhla Barrage.

Water quality of a river is assessed and categorised with reference to its use, viz: (a) raw water fit for drinking purposes, (b) raw water fit for bathing purposes, and (c) raw water fit for agricultural use. The categorisation of water for its different uses is based primarily on parameters of Dissolved Oxygen

(DO), Bio-Chemical Oxygen Demand (BOD) and Total Coli form (TC).The water quality of river Yamuna at the point of its entry into Delhi is adequate to sustain aquatic life and conforms to water quality of bathing standards.

Figure-1: River Yamuna at Wazirabad Barrage (up stream)



The main source of pollution of water in Yamuna in Delhi is domestic sewage which constitutes 94 *percent* of the total sewage generated in the NCT of Delhi while the balance is contributed by industrial sewage. The Union Ministry of Environment and Forests released a white paper in December 1997 along with a broad action plan on "Pollution in Delhi" which aimed inter alia at achieving water quality of "bathing standards" in Yamuna. The parameters prescribed to achieve this standard were as follows:

Figure-2: Parameter of water quality for bathing standard

Parameter	Prescribed standard
Dissolved Oxygen (DO)	Not less than 5 mg per litre
Bio Chemical Oxygen Demand (BOD)	Not more than 3 mg per litre
Total Coli form (TC)	Not more than 500 per 100 ml

The action plan envisaged a strategy for conservation of water, full utilisation of sewage treatment plants and regular maintenance of sewers and pumps by the Delhi Government and its executing agencies.

2. The legal mandate

The Water (Prevention and Control of Pollution) Act, 1974, provides for the prevention and control of water pollution and the maintenance or restoration of the wholesomeness of water. For this purpose, the Act provides for the establishment of Boards and conferring them with suitable powers for prevention and control of water pollution. Under the provisions of this Act, the Central Government constituted the Central Pollution Control Board

(CPCB) while each State Government was to constitute similar State Pollution Control Boards to implement the provisions of the Act. In so far as Union Territories are concerned, the CPCB delegated its functions to the Governments of the Union Territory. In pursuance of the above provisions, Government of Delhi constituted the Delhi Pollution Control Committee (DPCC) to monitor and control pollution in Delhi in terms of the provisions and objectives of the Act.

3. Implementing agencies

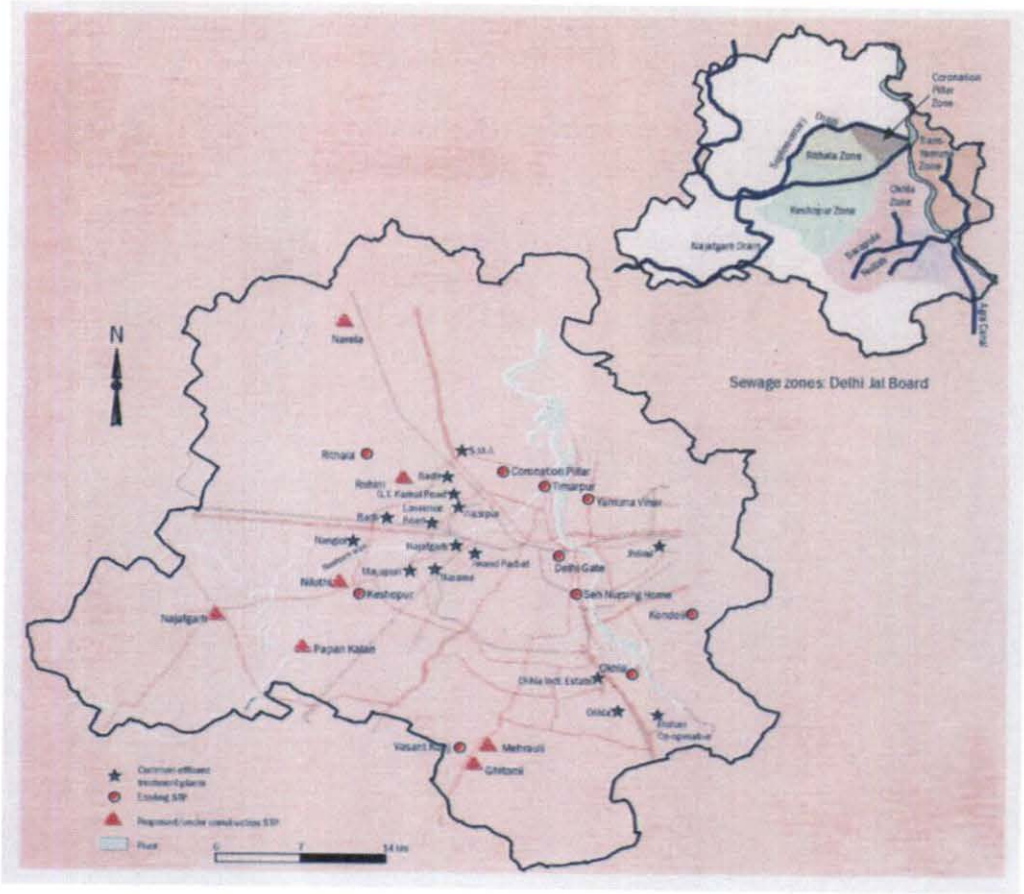
The Delhi Jal Board (DJB) is the executing agency entrusted with the construction and maintenance of sewage treatment plants, sewage pumping stations and trunk sewers and for treatment of domestic sewage in the NCT of Delhi. The Board functions under the administrative control of the Department of Urban Development of the Government of Delhi. It also provides sewerage facilities in areas under the jurisdiction of the Municipal Corporation of Delhi (MCD). The New Delhi Municipal Council (NDMC), the Delhi Cantonment Board (DCB) and the Delhi Development Authority (DDA) are responsible for construction of branch sewers and out fall into trunk sewers in the areas under their respective jurisdictions. The Delhi State Industrial Development Corporation (DSIDC) is entrusted with the task of constructing CETPs in identified industrial estates. Monitoring of pollution and enforcement of pollution standards is the responsibility of the DPCC along with the CPCB.

4. Existing sewage system in Delhi

The DJB has 30 STPs at 17 locations in the NCT of Delhi along with SPSs. The sewerage network comprises of 5600 kms of sewerage lines including trunk sewers and branch sewers (peripheral/internal sewers). This includes 28 main trunk sewers of a total length of 130 kms. For sewage management, Delhi is divided into five drainage zones of Okhla, Keshopur, Rithala-Rohini, Coronation and Shahdara. In addition, there are newly sewered areas of

Pappan Kalan (Dwarka), Vasant Kunj, Sarita Vihar and Narela. The location of STPs and the five drainage zones is depicted in Figure-3.

Figure-3 : Locations of STPs and five Drainage Zones of Delhi



5. Audit objectives

The performance audit of measures to control water pollution in Yamuna was conducted with a view to assessing whether:

- the programmes and schemes for control of pollution were being holistically conceived and systematically planned so as to effectively control water pollution;

- the funds available for control of water pollution were being optimally utilised;

- the projects and structures involved in effective sewage disposal i.e. trapping, conveying and treatment of waste water were properly matched and co-ordinated so as to achieve the intended purpose;
- the facilities created were effectively functioning in accordance with the stipulated performance standards;
- there was effective monitoring of the water quality of the river so as to enable timely corrective action; and
- the measures undertaken had an impact in terms of improving the quality of the river water to "bathing" standards as envisaged in the White paper issued by the Union Ministry of Environment & Forests.

6. Audit criteria

The fundamental criteria used for assessment was whether the pollution control schemes and projects undertaken had resulted in reduction in the pollution levels and improvement in the quality of the river water and whether the infrastructure created was functioning optimally. This was sub-defined as follows:

- projects should be based on a proper assessment of the quantum of sewage generation taking into account area-wise trends of population growth;
- optimal utilisation of allocated funds for pollution control measures;
- existence of systems and procedures for efficient implementation of pollution control projects and for monitoring of pollution levels;
- coordinated construction and performance of projects for sewage treatment;
- performance of the system to the designed/stipulated capacity and specified quality of output;
- adverse side effects in terms of air pollution, soil pollution, etc.; and
- the ultimate objective of release of treated sewage in the river so as to improve the quality of river water in terms of the parameters of dissolved oxygen, bio-chemical oxygen demand and total coli form content.

7. Scope of audit and methodology

The performance audit with reference to the progressive status of the measures taken to control pollution of Yamuna as at the end of March 2004 was conducted by test check of records of the DJB, DSIDC and DPCC. The audit team made field visits to 16 STPs located at five sites along with the connected sewage pumping stations and to the CETPs in the Wazirpur and Mayapuri industrial estates. The methodology adopted was:

- formulation and finalisation of the audit objectives taking into account the views of the Chief Executive Officer of DJB and Managing Director of DSIDC and their officers at a meeting held in December 2003.
- scrutiny and check of records of DJB, DSIDC and DPCC alongwith study of their five year plans/annual plans;
- scrutiny and test check of the plant records maintained at the STPs/CETPs and their physical inspection in association with the concerned officials of DJB/DSIDC; and
- study of assessment reports of outside agencies like Indian Agricultural Research Institute and CPCB to assess the overall impact of the measures undertaken for treatment of domestic and industrial sewage/effluent.

8. Utilisation of funds

The Department of Urban Development, Government of NCT of Delhi, provides loans/grants to the DJB for implementation of the scheme for controlling pollution in Yamuna. It was brought out in the report of the Comptroller and Auditor General relating to the Government of Delhi for the year ended March 1999 that Government had spent Rs. 284.98 crore during 1994-99 on creation of sewage treatment facilities. During April 1999 to February 2004, the Government released Rs. 598.84 crore of which DJB utilised only Rs. 439.60 crore as under:

Figure-4: Year-wise budget allocation and actual expenditure

(Rupees in crore)

Year	Release by Government to DJB	Actual expenditure by DJB	Unspent amount/excess (-/+)
1999-00	68.80	64.29	(-) 4.51
2000-01	115.12	78.27	(-) 36.85
2001-02	130.60	108.03	(-) 22.57
2002-03	132.72	87.05	(-) 45.67
2003-04	151.60*	101.96*	(-) 49.64*
Total	598.84	439.60	(-) 159.24

**Provisional figures*

DJB failed to utilise 27 per cent of the funds during 1999-2004.

While DJB did not utilise 27 *percent* of allotted funds during the five years under review, there were also unspent balances in each of the five years ranging from 6.56 to 34.41 *percent*. There were also unspent balances under each of the separate schemes ranging from eight percent to 43 percent as depicted in Annex-II.

DJB attributed the under-utilisation in July 2004 to delays due to non-finalisation of tenders for construction of pumping stations and treatment plants, change in effluent standards prescribed by the DPCC in January 2001 and lack of technical expertise for rehabilitation of trunk sewers. Government added in October 2004 that in addition to the above factors, under-utilisation of resources was also attributable to the multiplicity of agencies from which permissions were required for execution of works, unforeseen hindrances due to the service plans of other underground utilities and introduction of new technologies.

The reasons advanced are not tenable as the requirement of permission from other agencies, the time required for the tender processes and requisite technical expertise are foreseeable factors common to all such works, which should have been planned and catered for while change of standard was a one time matter. Further, trunk sewers, under which Rs. 68 crore remained unspent out of the total provision of Rs. 157.88 crore, had been lying silted for periods ranging from one to 15 years and the reasons advanced for non-utilisation of the funds are not applicable to rehabilitation of trunk sewers.

9. Plan targets of treatment capacity and achievements

In IX Plan period, DJB created additional capacity of only 202 MGD against target of 321 MGD.

At the beginning of the IX five year Plan (1997-2002), the DJB had existing total sewage treatment capacity of 280 Million Gallons per day. DJB assessed the total sewage generation as 756[3] MGD by the end of the IX Plan. Of this, DJB planned to tackle 601 MGD of sewage generated from the sewered areas. Against these projections, DJB could create additional sewage treatment capacity of only 202 MGD during the IX Plan period taking the cumulative treatment capacity to 482 MGD.

For the X five year Plan (2002-2007), DJB revised the estimated total domestic sewage generation by March 2007 to 720 MGD and targeted creation of additional treatment capacity of 263 MGD by the end of the X Plan period increasing the total sewage treatment capacity to 745 MGD. In addition, to tackle sewage from the unsewered areas, DJB planned to trap the

[3] *Normative figure assessed on the basis of likely water supply by the corresponding period assuming that 80 percent of water supply would convert into sewage.*

Until 2004, DJB has created treatment capacity of only 500 MGD.

drains which were carrying sewage of these areas and convey it to the STPs. Against these projections, DJB created additional sewage treatment capacity of only 30 MGD during the first two years (2002-04) of the X Plan resulting in total treatment capacity of only 512 MGD of which an STP of 12 MGD capacity was non-functional since 1999.

9.1 Analysis of achievements

Analysis of the projections made in the five year Plans and the achievements revealed the following:

DJB is yet to trap sewage generated from unsewered areas.

- DJB had not created treatment capacity to match the actual sewage generation in the NCT of Delhi. The IX five year Plan did not incorporate any provision to trap the sewage from the unsewered areas covering about 40 percent of the population. Even during the first two years of the X Plan, no action had been initiated in this regard.

- The total treatment capacity set up by the end of the IX Plan (March 2002) was only 482 MGD which was 274 MGD short of the estimated sewage of 756 MGD.

- An STP of 12 MGD capacity at Keshopur remained non-functional for about five years as of March 2004.

- The planning and actual construction of STPs during the first three years of the X Plan fails to inspire confidence about achievement of the target at the end of the plan period. While during the first two years additional capacity of only 30 MGD was added, the work in hand is of 70 MGD capacity.

9.2 Under performance in execution of specific projects

Against 143 works planned for execution, only 34 were actually completed.

There were also shortfalls in execution of specific projects. During 1999-2004, DJB identified 51, 26 and one work of construction of pumping stations, construction of new rising mains and rehabilitation of an existing rising main respectively for execution. However, DJB could execute only 29 of these 78 works though there was unspent allotment during each of these years. Similarly, DJB projected 65 works of construction/rehabilitation/de-silting of trunk sewers during 1999-2004 of which only five were completed.

Audit examination further disclosed that there was no evidence to suggest whether any prioritisation was done in planning and construction of the systems linking with the growth of the city. Moreover, proposals for

construction of a particular STP did not include details/status of the supporting pumping stations and trunk sewers etc. Consequently, the works were not synchronised and the intended objective could not be achieved as brought out in subsequent paragraphs. Further, DJB did not prepare detailed project reports or pre-feasibility study reports except for the two STPs which were executed under the Ganga Action Plan.

Government stated in October 2004 that DJB relied on the projections of population and city development made by the Delhi Development Authority in the Master Plan and the availability of water for its planning and strategy. Due to migration of large population from other States, the actual population growth in the city exceeded the projections made. It added that due to multiple agencies involved in the clearance and the execution of the projects, the progress was slow.

The reply relating to population projections going wrong is not relevant in the context of under performance with reference to the projects planned for execution.

Recommendations

- *Government of Delhi and the executing agency may put in place a system of efficient project management and utilisation of funds with CPM/PERT chart of all measurable activities which can be foreseen. The systems and procedures for formulation of plans and processing of tenders need to be streamlined so as to ensure optimum utilisation of funds placed at the disposal of DJB.*

- *Institutional mechanisms need to be established for timely co-ordination with other concerned civic and land owning agencies so as to minimize delay and hindrances in execution of works.*

10. Adverse consequences of poor planning and prioritisation

One of the consequences of inadequate planning and prioritisation was mismatch between the treatment capacity created and the actual sewage generated in the relevant catchment areas resulting in untreated sewage continuing to outfall into the Yamuna. DJB spent large amounts in creating treatment capacity in sparsely populated areas while it failed to create necessary treatment facilities and conveyance systems in areas where sewage was presently being generated.

10.1 Sewage treatment capacity significantly below sewage generation

In the following cases, the treatment capacity created was significantly less than the sewage actually generated:

Figure-5: Sewage treatment capacity and actual generation

[Figures are in MGD]

	Keshopur Zone	Okhla Zone	Shahdara Zone	Total
Effective capacity	60*	140	65	265
Estimated sewage generation	145	220	126	491
Sewage actually treated	59	132	41	232
Sewage being bypassed	86	88	85	259

** one STP of 12 MGD capacity non-functional since 1999.*

Treatment capacity created in three zones was only 277 MGD against sewage generation of 491 MGD.

Thus, the total sewage treatment capacity created in the three zones was 277 MGD against the estimated sewage generation of 491 MGD. Sewage of 259 MGD was out falling untreated into the river. Scrutiny revealed the following:

- Rehabilitation work of the trunk sewers in **Okhla zone** was in progress at a cost of Rs. 88.76 crore and was expected to be completed by June 2005. Rs.33.46 crore had been spent as of March 2004. Once completed, these trunk sewers were expected to convey the entire sewage of 220 MGD generated in the catchment areas to the STPs. However, since the STPs had a treatment capacity of only 140 MGD, untreated sewage of 80 MGD would continue to outfall into the river.

Figure-6: A view of Okhla STP

- In **Shahdara zone,** DJB had created sewage treatment capacity of 65 MGD. However, a High Powered Committee constituted by the Supreme Court and the CPCB assessed the sewage generation in the relevant catchment areas as 110 and 126 MGD in 1998 and 1999 respectively. In pursuance of the recommendations of the High

Powered Committee, DJB prepared an action plan to enhance the total treatment capacity to 110 MGD by March 2000. In September 2003, DJB further revised its action plan for treatment of 135 MGD sewage by March 2005. However, DJB stated in January 2004 that total treatment capacity of 65 MGD was adequate for the targeted catchment area. The difference in the estimated quantity of sewage between the DJB and CPCB has not yet been resolved.

10.2 Construction of treatment plants in low sewage load areas

DJB incurred an expenditure of Rs. 51.34 crore on creation of sewage treatment facilities in areas where sewage generation was low as under:

Figure-7: STPs in low sewage load areas

	Ghitorni	Rohini	Narela	Pappankalan	Total
Treatment capacity created [MGD]	5	15	10	20	50
Sewage actually generated/treated [MGD]	Nil	0.5 – 0.7	0.5	12	13.10
Unutilised treatment capacity [MGD]	5	14.03	9.5	8	36.53
Capital cost of STPs (Rupees in crore)	6.28	14.15	13.67	17.24	51.34

Treatment plants constructed at cost of Rs. 51.34 crore remained under-utilised due to lack of sewage.

The treatment capacity of 36.53 MGD remained unutilised while the Board continued to incur a recurring expenditure on maintenance, operation and watch and ward of the treatment plants at places where hardly any sewage was generated. Examination of documents further disclosed the following:

- The plant at **Ghitorni** was lying idle for over seven years from the time of its completion in 1997 till July 2004. In addition to the expenditure on operation and maintenance, DJB spent Rs. 38.54 lakh towards watch and ward up to March 2001 and upkeep of equipment. In addition, DJB was liable to pay an amount of Rs. 6.48 lakh as of March 2004 to the contractor for watch and ward @ Rs. 18,000 per month from April 2001 to March 2004 as well as the actual expenditure which would be incurred for making electrical and mechanical equipment operational at the time of commissioning of the plant.

- Though DJB reported sewage treatment of 0.5 to 0.7 MGD at the **Rohini** STP commissioned in October 2002, a CPCB report of January 2004 indicated that the plant was actually not in operation.

- The capacity utilisation of the plant at Narela commissioned in May 2001 was only five per cent.

- Sewage to the plant at Pappam Kalam commissioned in April 2002 was being conveyed by trapping of a nearby nallah/drain and not through the conveyance system.

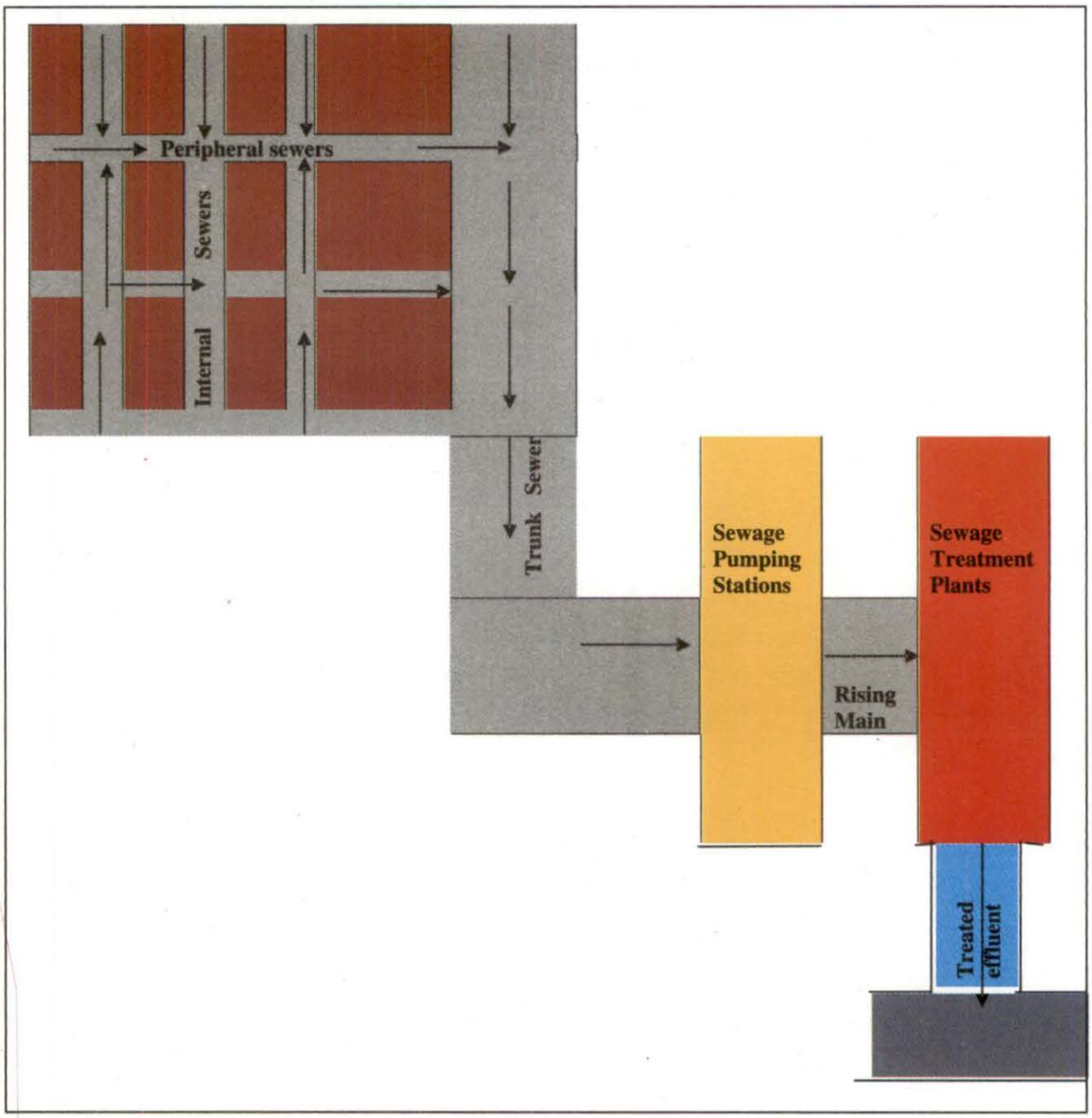
Recommendation

- *Proposals for creation of treatment capacity must be based and prioritised with reference to the estimated sewage generation in the relevant catchment areas which should be estimated after taking all factors into account including population trends and availability/supply of water.*

11. Non-synchronisation in execution of projects resulting in sub-optimal utilisation of treatment capacities

Disposal of sewage involves its collection through branch sewers and trunk sewers by gravity which is then pumped by the various pumping stations to the treatment plants for treatment as depicted in Figure 8 below:

Figure- 8: Flow of Sewage for Treatment



The objective of treatment of sewage generated is not achieved if any of the above components or links is missing or not functioning to its intended capacity. DJB did not ensure synchronisation and co-ordination in execution of the various works which resulted in under-utilisation of the created treatment capacity. Out of total treatment capacity of 512 MGD for domestic sewage, only 335 MGD of domestic sewage was actually being treated.

11.1 Failure to rehabilitate sewage conveyance systems to match sewage treatment capacities

There were a total of 28 trunk sewers of 130 kms length in the NCT of Delhi. DJB identified 18 trunk sewers of 91 kms length in January 2000 that needed immediate rehabilitation or de-silting. This work was to be completed by March 2002. Although DJB revised the target date of completion of the work first to December 2003 and again to June 2004, it could complete rehabilitation/de-silting work of only 20 kms as of July 2004.

Sample analysis disclosed that about 65 per cent of the sewage generated found its way into the river untreated.

Twenty three trunk sewers of 106 kms length required rehabilitation/de-silting as of March 2004. Analysis of sewage treatment for catchments of nine of these 23 these trunk sewers disclosed that 165 MGD domestic sewage out of the estimated 258 MGD domestic sewage was falling into the river untreated due mainly to the blocked and collapsed conveyance system.

Audit scrutiny further disclosed that:

- six treatment plants of total capacity of 85 MGD at **Coronation Pillar and Kondli** were actually treating sewage of only 60 MGD representing 71 percent capacity utilisation. Due to partially operating conveyance system, two trunk sewers of plants at Coronation Pillar and six trunk sewers of plants at Kondli were not conveying adequate quantity of sewage for periods ranging from one and half year to seven years as they had either collapsed or silted up and required rehabilitation/de-silting.

- sewage of only 46.65 MGD was being treated at **Rithala** STP against a treatment capacity of 80 MGD. A new 40 MGD plant was constructed at Rithala in 2001 at a cost of Rs. 42.21 crore in addition to the existing STP of equal capacity. However, though DJB was aware of the status of the trunk sewers leading to under-utilisation of the plants, it did not take action to rehabilitate the trunk sewers to ensure capacity utilisation of the second plant. Consequently, both the plants were under-utilised and untreated sewage of 39 MGD was being discharged into the river.

- four trunk sewers in **Keshopur zone** had settled or silted up and were not carrying the entire sewage being generated in the relevant catchment areas. No action had been taken for rehabilitation of these trunk sewers.

- four trunk sewers in **Okhla zone**, viz. at Ring Road, Pragati Vihar, Indian Express and Sita Ram Bazar were not functioning optimally due to siltation and settlement. As against an estimated sewage generation

of 138 MGD from the catchment area of these trunk sewers, only 50 MGD of sewage was actually being conveyed to the STPs.

Government stated in October 2004 that the delay in re-furbishing of the entire trunk system was due to lack of expertise and experience amongst the contractors who could be entrusted with such work, congestion in the areas and heavy traffic conditions.

11.2 Under-utilisation due to non-synchronisation of works

The quantum of actual sewage treated at five STPs was only 12 MGD against the total treatment capacity of 70 MGD due to failure of DJB to synchronise the works as under:

Figure-9: Details of under-utilisation of plants

Sl. No.	Name of the Plant	Capacity	Year of Commissioning	Actual Treatment	Percent Capacity utilisation
1.	Yamuna Vihar	10 MGD 10 MGD	1999 2003	7.00 MGD	35
2.	Najafgarh	5 MGD	2002	0.20 MGD	4
3.	Nilothi	40 MGD	2002	4.94 MGD	12
4.	Mehrauli	5 MGD	2003	Nil	Nil
	Total	70 MGD		12.14 MGD	

- A 10 MGD plant commissioned in Yamuna Vihar in 1999 at a cost of Rs. 8.58 crore remained under utilised from the very beginning with only 2.45 MGD sewage being treated. However, without ensuring optimum utilisation of the plant by providing an effective and matching conveyance system, DJB constructed another plant of equal capacity in 2003 at a cost of Rs. 11.44 crore to cater to the same catchment area. The second STP required one main pumping station with two intermediate pumping stations for its optimal functioning. While the main SPS at Ghonda-II was commissioned in 2002 at a cost of Rs. 6.02 crore, one of the intermediate SPS at Ghonda–I was not completed even as of March 2004 despite an expenditure of Rs. 4.76 crore. Due to non-commissioning of the SPS, its trunk sewer which was laid at a cost of Rs. 65.64 lakh in June 1999 could not also be commissioned. Consequently, sewage generated from the catchment area of SPS Ghonda-I was still out falling in the river without treatment. DJB also failed to provide internal sewers in many of the

unauthorised-regularised colonies in the catchment area of the STP. Thus, in spite of expenditure of Rs. 31.46 crore in creating infrastructure (STP/SPS/ trunk sewers), the intended objective of treatment of sewage generated in the area remained substantially unachieved.

Figure-10: A view of sludge treatment at a sewage treatment plant

- A five MGD treatment plant and a 12.5 MGD pumping station were commissioned in **Najafgarh** in June 2001 and July 2002 respectively at a total cost of Rs. 11.51 crore. The work of its connected trunk sewers was subsequently completed in April 2003 at a cost of Rs. 4.40 crore. However as of December 2003, the actual sewage treatment was of only 0.2 MGD as the conveyance system had not been commissioned. The Executive Engineer stated in May 2004 that notification regarding connections to individual dwellers was under process. Thus, failure to synchronise the commissioning of the conveyance system with the construction of the STP resulted in untreated sewage from the catchment area being discharged into Yamuna.

- A 40 MGD treatment plant was commissioned in 2002 at **Nilothi** at a cost of Rs. 58.65 crore. However, sewage of only 5 MGD being trapped at Kirari drain by temporary installation of a pump house was actually being treated at the plant. The under-utilisation was attributable to the failure of the Board to implement/execute the allied works of rising main and connected SPS.

- A five MGD STP along with a 12.5 MGD pumping station was commissioned in May 2003 at Mehrauli at a total cost of Rs. 10.19 crore. To make it functional, 1.5 MGD sewage was shown as treated by trapping a nallah. However, no sewage was being treated at the plant as of December 2003 as sewage could not be conveyed to the STP.

- Rampura SPS of three MGD capacity was constructed in July 2002 at a cost of Rs. 1.85 crore but the DJB did not provide rising main through which sewage was required to be pumped to Bharat Nagar SPS for onward pumping to the Rithala STP. The work of rising main was yet to be approved by the competent authority as of May 2004. Thus, an amount of Rs. 1.85 crore spent on the SPS was not only unfruitful but untreated sewage from the catchment area continued to outfall into the Yamuna.

Thus, despite an expenditure of Rs. 118.06 crore on creation of infrastructure for treatment of sewage, the intended objective of treatment of sewage remained unachieved due to non-synchronisation in execution and completion of various works.

Recommendations

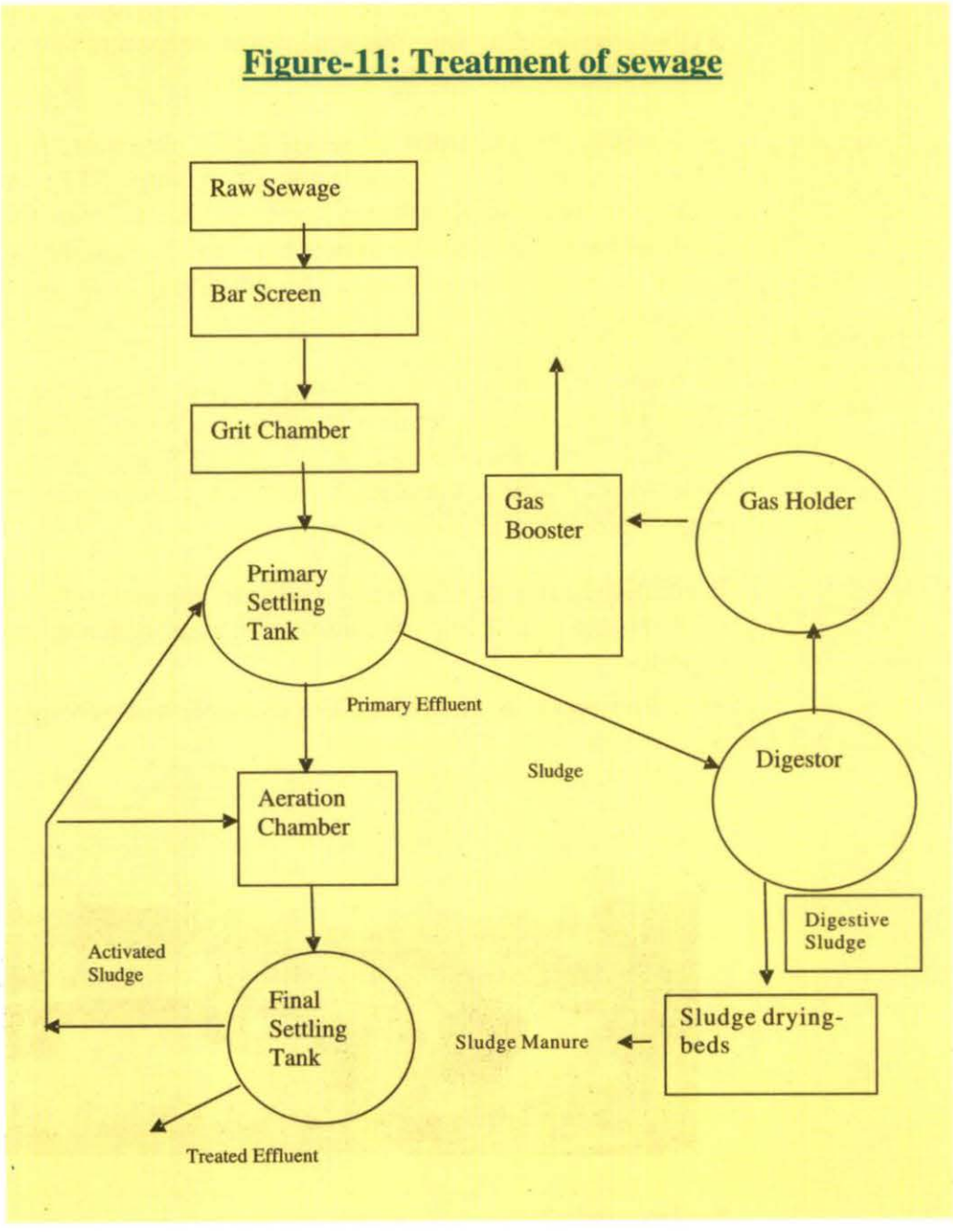
- *Government of Delhi and DJB should put in place a system to ensure simultaneous execution and completion of all related infrastructure and establish reporting and accountability system for under performance.*

- *They should also address completion of all conveyance and other inter-dependent works on priority and monitor its execution on monthly basis and establish accountability for failure to complete them within the prescribed time.*

12. Unintended side effects – release of harmful gases

The process of treatment of sewage in a treatment plant is depicted in the flow chart in Figure-11 below:

Figure-11: Treatment of sewage



The main function of a sludge digester is to digest the sludge in the absence of oxygen. During this process, poisonous gases like methane, hydrogen sulphide and carbon dioxide are produced which are collected in the dome of the sludge digester and thereafter transferred to gas holders for onward disposal.

About 15,572 cubic meters of harmful gases produced at Kondli and Keshopur STPs were escaping into the atmosphere every day due to malfunctioning of sludge digesters and gas holders.

At **Kondli,** the functions of seven sludge digesters, a gas holder, two gas burners and two filter pumps in two of the three STPs were impaired due to leakage in its dome. Resultantly, gases produced during the process of sewage treatment escaped into the atmosphere and the gas holders and gas burners could not be put to use. In addition, 40 drying beds for sludge had not been commissioned till now.

At **Keshopur,** none of the 14 sludge digesters were functioning properly since 1989. Further, one gas holder out of the two was dismantled in 1987-88. Thus, the sludge digesters instead of curing the sludge were merely working as tanks/store. As the gas holders, burners etc. were not put to use, the gases were escaping into the atmosphere.

In addition to release of harmful gases into the atmosphere, improper digestion of the sludge produced poor quality of manure which might affect the porosity of soil.

Figure-12: A view of the gas chamber and sewage settling plant

Recommendation

- *DJB should ensure the optimum functioning of each of its components so as to stop the release of harmful gases into the atmosphere and establish a system of ensuring designed utilisation of all facilities set up for sewage treatment. It should also explore the possibility of utilizing the gases generated by the STPs for generating electricity to meet their own requirement of power which would significantly offset operating costs.*

13. Lack of monitoring of effluents discharged into river

The STPs lacked not only a reliable mechanism to measure the quantity of the effluents being discharged into the river but they also failed to ensure adherence to the stipulated quality parameters.

13.1 Measurement of quantity of sewage

Just as the sewage generated was estimated on the basis of population in the catchment area rather than on the basis of water supplied or used or any other reliable method, the sewage shown as treated was not verifiable as the flow meters meant to measure the incoming raw sewage and outgoing treated effluent were either non-functional or non-existent at the plants test checked in audit except in the STP at Rithala Phase-II. The quantum of sewage being depicted as treated at the STPs was based on the design capacity of the pumps with reference to the number of hours it actually ran. Thus, the quantum of sewage being depicted as treated was a normative assessment rather than by actual measurement with proper calibration.

13.2 Quality of treated sewage

Most of the treatment plants were equipped with in-house laboratories to analyse the samples of effluent collected from different units of the STP to ensure their conformity with the standards prescribed by the DPCC under the provisions of the Water (Prevention and Control of Pollution) Act, 1974:

Figure-13: Prescribed standards of treated sewage

Sl. No.	Parameters	Prescribed limit
1.	pH	5.5-9.00
2.	Total suspended solids (TSS)	Not to exceed 50 mg/litre
3.	Oil and grease	Not to exceed 10 mg/litre
4.	BOD	Not to exceed 30 mg/litre
5.	COD*	Not to exceed 250 mg/litre

**Chemical Oxygen Demand*

CPCB also conducts analysis of dissolved oxygen, total coli form and faecal coli form while monitoring the water quality of river Yamuna and the treated sewage being discharged from the STPs.

DPCC revised the standards of BOD and TSS to 10 mg/l and 15 mg/l from 30 mg/l and 50 mg/l respectively in January 2000 and asked DJB to address the problem of coli form pollution. DJB requested the Environment Pollution (Prevention and Control) Authority in August 2003 to retain the earlier standards because of difficulty in obtaining the technology required to meet

the revised standards as well as its prohibitive cost. DJB assured that its treatment plants would be fully utilised to ensure adherence to the stipulated standards and that no untreated sewage would find its way into the river through open drains/nallahs. However, DJB failed to live up to its assurances. Test check of the records for the period from April 2003 to December 2003 revealed as under:

The quality of treatment was deficient leading to discharge of polluted effluent into the river.

- As per the tests conducted by DJB, treated effluent from three STPs of total capacity 90 MGD did not meet even the earlier prescribed standards. Further, as per the report of DPCC and CPCB during July to December 2003, another four STPs with total treatment capacity of 61 MGD were also not meeting the prescribed standards. The details of the STPs and quality of treated effluent are depicted in Annex-III.

- DJB had no arrangement to analyse the standard of total coli form and faecal coli form at any of its plants except at the Okhla STP where it was started in May 2003. DJB attributed this to lack of bacteriologists who are required to conduct the analysis.

- While the STPs were functional round the clock, tests conducted by DJB were limited to only eight hours. Moreover, the extant instructions stipulate that test samples should be taken at regular intervals during the course of a day and the average test results then arrived at so as to depict a true picture of the quality of the treated sewage. However, DJB was basing its results on only one sample collected once every day. Hence, the tests conducted by DJB do not provide a credible assurance of the quality of the treated sewage throughout the day. DJB stated in January 2004 that regular tests could not be conducted due to inadequate manpower.

Recommendation

- *Systems and procedures need to be strengthened to ensure accurate measurement of both the quantity of treated sewage being discharged as well as its quality with reference to the prescribed parameters.*

14. Industrial sewage

As per the Delhi Master Plan 2001, there are 28 approved industrial estates in Delhi. The Supreme Court directed the Government of Delhi in February 1996 to construct CETPs in these industrial estates to treat industrial sewage and reuse the noxious effluents to reduce the toxic effect on the river. In pursuance of these directions, DPCC appointed the National Environmental Engineering

Out of 15 CETPs which were to be completed by 1998, only 10 had been completed as of March 2004 of which only four were actually functional.

Research Institute (NEERI) in March 1996 to prepare detailed project reports including design and specification of the CETPs. Under the Delhi Common Effluent Treatment Plants Act 2000, CETP societies were to be formed which were to be entrusted with the maintenance and operation of the plants after their construction. DSIDC was to undertake construction of the CETPs as per technical know how provided by NEERI. The project cost was to be apportioned between the Government of India, the Government of Delhi and the CETP societies in the ratio of 25:25:50. NEERI recommended construction of 15 CETPs in 21 industrial estates with a total treatment capacity of 191.4 Million Litres Per day (MLD) i.e. 42 MGD at a total cost of Rs. 90 crore. The remaining seven industrial estates had either non-polluting industries or their own treatment arrangements.

All the 15 CETPs were to be completed by 1998. DSIDC could take up construction of only 12 CETPs during October 1999 to July 2002. Only 10 CETPs were completed as of March 2004 at a total expenditure of Rs. 123.12 crore. The work of one CETP at Naraina industrial area was in progress while the local residents had stopped the work of another CETP at Najafgarh Road. Construction of the remaining three CEPTs was yet to be taken up due to paucity of funds, non-approval by the Plant Level Committee, etc. Even out of the 10 CETPs which were completed, only four were commissioned. The remaining six CETPs were yet to be commissioned though they had been completed 11 to 15 months ago as reflected in Annex – IV.

Against the total commissioned capacity of 12 MGD in the four operational CETPs, the actual sewage being treated was only five MGD.

Audit scrutiny of the records relating to the construction of the CETPs by DSIDC revealed mismanagement which delayed their construction as well as subsequent operation as summarized below:

Gross under estimation of cost resulted in shortage of funds hampering construction.

- The detailed project report failed to take into account essential aspects like cost of land, development of site, construction of boundary wall, revamping of conveyance system, electric sub-stations/HT cables, etc. Consequently, the total project cost was grossly under-estimated and it had to be enhanced from Rs. 90 crore in June 1996 to Rs. 256.40 crore (excluding cost escalation of Rs. 20.14 crore attributable to delay) in March 2004. This resulted in shortage of funds which had not been initially planned for. Government of India and the CETP societies released only Rs. 22.5 crore and Rs. 28.77 crore respectively to the Government of Delhi against their revised matching contribution of Rs. 59.47 crore and Rs. 101.99 crore respectively. This hampered the progress of construction of the CETPs.

- Incorrect assessment of actual quantum of sewage generation resulted in creation of excess treatment capacity by two and half times in Mayapuri industrial estate. Against actual sewage generation of one MGD, a CETP of three MGD capacity was constructed at a cost of Rs. 13.88 crore.

- Deficiencies in the design parameters relating primarily to the use of chemicals required for treatment of toxic sewage required installation of additional units and improvement of designs involving both delays as well as additional costs.

Delay in implementation of the project resulted in cost escalation of Rs. 20.14 crore.

- Delay in implementation/completion of the project resulted in cost escalation of Rs. 20.14 crore. The delay was attributable to delay in handing over the land by the DDA (26 months), delay in obtaining permission from the Railways (six months) for laying rising mains and paucity of funds.

- Poor coordination between DJB and DSIDC resulted in non-commissioning of a sewage conveyance system in the industrial estates at Wazirpur and Philomel. Consequently, the CETPs constructed in these industrial estates remained under-utilised.

- The CETP societies were to take over the operation and maintenance of the plants after a trial run to ensure that the discharge met the standards prescribed by law duly certified by the DPCC. Lack of certification of standards of the discharge coupled with increase in the costs resulted in the CETP societies declining to take over the operation of the completed plants.

Surprise checks disclosed non-functional status of most of the plants.

The Environment Pollution (Prevention and Control) Authority for the NCT of Delhi and the National Capital Region conducted a surprise visit of the CETPs including the four commissioned plants in December 2003. It found that most of the plants were non-functional. In case of the CETP at Mayapuri, the waste received by the plants was being discharged into the drains without any treatment while the waste was simply bypassed directly into the drains in Mangolpuri and Wazirpur CETPs. The Authority observed that not only was there a complete and total waste of public funds but the purpose for which these plants had been ordered by the Supreme Court had also been negated.

Recommendations

- *The Government of Delhi should resolve outstanding issues related to the payment of share by the Government of India and the CETP societies.*

- *Government and DSIDC should ensure completion of the remaining CETPs in a time bound manner ensuring compliance with the stipulated environmental standards.*

- *Government of Delhi should ensure the proper operation and maintenance of all the completed CETPs and the monitoring of the quantity and quality of treated effluent.*

15. Sewage in drains/nallahs

Failure of the DJB to trap sewage of unsewered areas and provide effective sewerage system resulted in untreated sewage out falling in the river through open drains/nallahs.

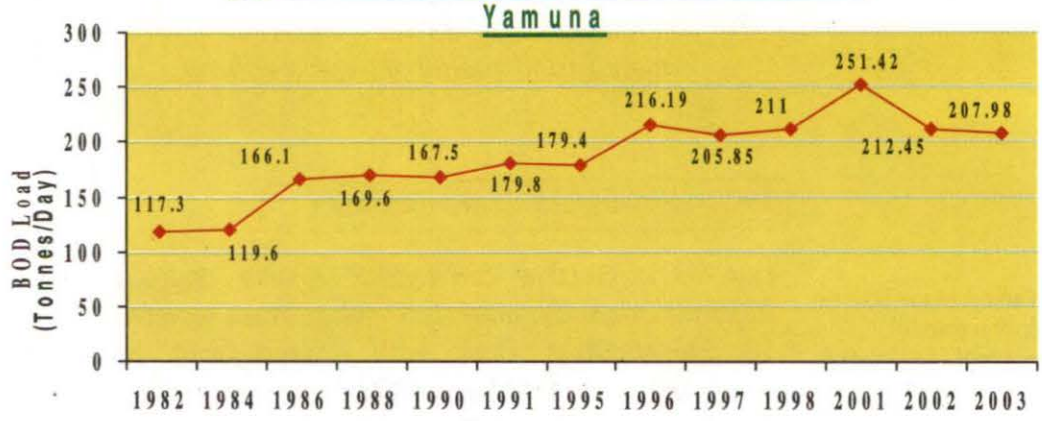
Due to ineffective conveyance system coupled with inadequate sewage treatment capacity, untreated sewage from sewered areas was flowing into the 18 drains/nallahs along with sewage from the unsewered areas. These drains/nallahs were meant to carry only storm water and outfall directly into Yamuna. A study conducted by RITES had highlighted in January 2004 that 711 MGD of sewage on an average was out falling in the river through these drains as detailed in Annex - V. In terms of quantum of sewage, Najafgarh drain was carrying the maximum discharge followed by Shahadara drain and Barapulla nallah.

Figure-14: Flow of untreated sewage in Najafgarh drain

Free ammonia and heavy metals like lead, copper, nickel, zinc, etc. were present in the sewage flowing through the open drains much above the standards prescribed in the Environment Protection Act as detailed in Annex-VI. The trend in pollution load contribution of the sewage flowing through the open drains/nallahs from 1982 to 2003 in terms of BOD load is presented in

Figure-15 below:

Figure-15: Yearwise trend of BOD input in Yamuna



The BOD load contributed to the river by the sewage from open drains/nallahs out falling into the river increased from 117.3 tonnes/day in 1982 to 207.98 tonnes/day in 2003. No steps had been initiated to effectively trap and treat the pollutants being discharged through the drains.

Recommendation

- *Government of Delhi should pay prompt attention to trapping and treatment of all sewage presently flowing through these drains/nallahs in line with its assurances given to the Supreme Court in December 1993 and prepare a comprehensive plan to complete the works in a time bound manner.*

16. Impact of pollution control measures through sewage treatment

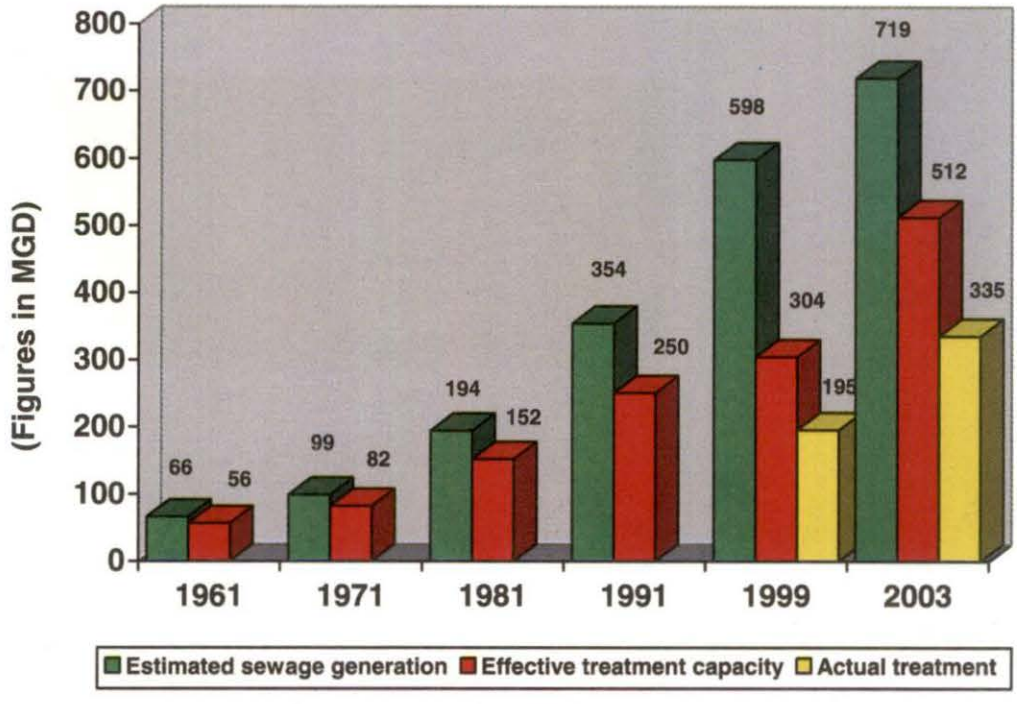
16.1 Quantity of domestic sewage treated

53 percent of total sewage generation was being discharged untreated into river.

Against an estimated sewage generation of 719 MGD by March 2004, Government of Delhi provided sewage treatment capacity of only 512 MGD (including the 12 MGD STP which was non-functional) while actual sewage being treated was only 335 MGD which represented only 47 per cent of the total estimated sewage generation. The treatment capacity created and growth

in waste water generation during the last four decades is presented in Figure-16.

Figure-16: Increased discharge of untreated sewage



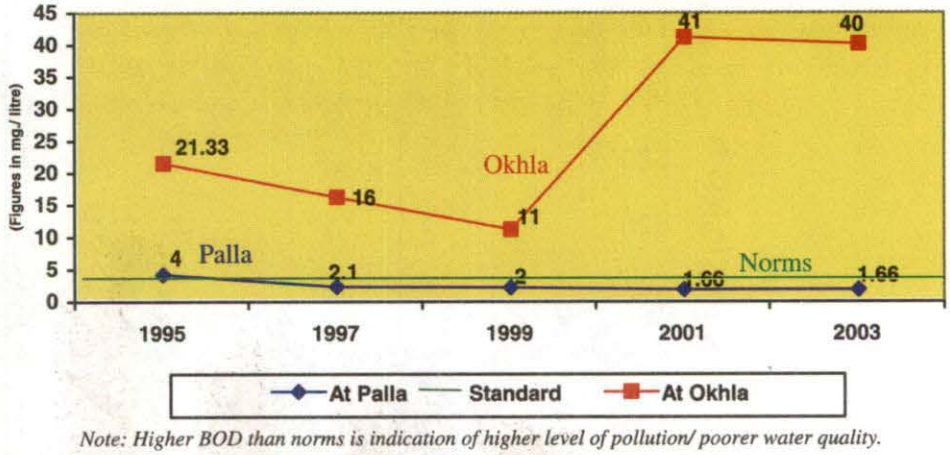
(Figures of actual sewage treatment not available prior to 1999)

16.2 Water quality in Yamuna: the impact

The water quality of Yamuna instead of improving deteriorated over the period 1999-04 despite expenditure of Rs. 871.67 crore since 1994 (Rs. 284.98 crore until 1998-99 and Rs. 586.69 crore during 1999-2004 Rs. 439.60 by DJB and Rs. 147.09 crore by DSIDC). The BOD and DO parameters indicated a sharp deterioration in the position at the point of the river leaving Delhi as is depicted in Figures 17 and 18. While BOD at Palla when the river enters Delhi was within the norms, the load of untreated sewage of Delhi polluted the river to the extent that bio-chemical oxygen demand reached 13 times in excess of the norm at Okhla. The presence of

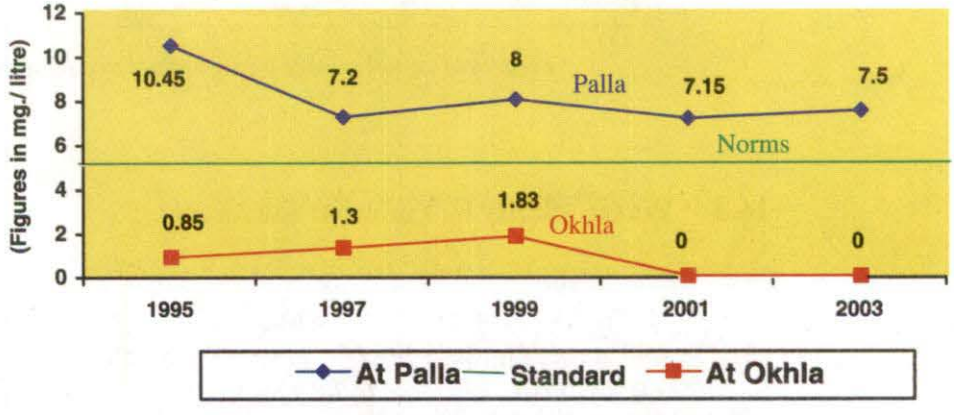
dissolved oxygen deteriorated from an acceptable one and a half times above the stipulated minimum norm at Palla to almost nil at Okhla. Coli form count also deteriorated exponentially from about 217 times at Palla to about 1.39 lakh times above the stipulated norm at Okhla.

Figure-17 : BOD Trends Year wise at Palla and Okhla in River Yamuna (Delhi Stretch)



Note: Higher BOD than norms is indication of higher level of pollution/ poorer water quality.

Figure-18: DO Trends Year wise at Palla and Okhla in River Yamuna (Delhi Stretch)



Note: Lower levels of DO suggest higher pollution/ poorer water quality.

The position of total coli form also indicated a sharp increase as depicted in table below:

Figure-19: Trend of Total coli form at Palla and Okhla Barrage

Location	Bathing Standards	1995	1997	1999	2001	2003
Palla	Not more than-500/ 100 ml	950.00	8,967.00	5,199.00	7,500.00	1,08,666.66
Okhla Barrage	-do-	5,72,500.00	32,9,312.00	2,57,667.00	92,33,333.00	693,33,333.00

RITES in its report of January 2004 had reported that:

- Dissolved Oxygen (DO) which is the most important parameter for sustaining a healthy riverine eco-system was not present in the Delhi stretch of the river during any part of the year;

- free ammonia which is toxic to fish and micro-organisms was present far above the acceptable levels; in the range of 1.47 mg/l to 6.73 mg/l as against the acceptable level of 0.02 mg/l;

- there was concentration of heavy metals like copper, lead, nickel, zinc and mercury far in excess of the limits prescribed by the Environment Pollution Act. Zinc particularly was present in very high concentrations in the river;

Figure-20: Water quality of Yamuna at Wazirabad Barrage (down stream)

The adverse impacts of untreated sewage were as under:

- While the water at Palla conforms to the bathing standards in terms of DO and BOD, by the time Yammuna leaves Delhi at Okhla, the water deteriorates to far below the `bathing standards` and is, in fact,unfit for any use.

- The capacity of the soil to retain oxygen required for biological decomposition of partially decomposed or un-decomposed organic matter contained in sewage is reduced hindering decomposition of organic matter resulting in "sickness of soil."

- Sewage is a potential carrier of various pathogenic fungi, bacteria and parasites which pose serious community health hazards like cholera, typhoid, jaundice, etc. The health hazards from water contaminated with sewage arise from both consumption of sewage grown plant products without cooking or processing as well as from direct contact with sewage. According to a study conducted by the Environmental Sciences Division of the Indian Agriculture and Research Institute New Delhi in 2002, vegetables grown in areas like Yamuna Pushta, Okhla, Najafgarh, Alipur and Ballabgarh were found to have a significantly higher level of contamination of zinc, lead and cadmium.

17. Acknowledgement

The audit findings as well as the recommendations were discussed with the Principal Secretary (Urban Development) and the Chief Executive Officer of the DJB on 15 September 2004. Their views as expressed at the meeting as well as formally communicated subsequently in October 2004 have been taken into account and reflected in the review.

R. K. Ghose

New Delhi
Dated: 21 मार्च MAR 2005

(R. K. GHOSE)
Accountant General (Audit), Delhi

Countersigned

New Delhi
Dated: 22 मार्च MAR 2005

(VIJAYENDRA N. KAUL)
Comptroller and Auditor General of India

Annex - I

Highlights of review on control of pollution of river Yamuna in Delhi published in the C&AG's report for the year ended March 1999.

The water quality of river Yamuna continues to be polluted by the domestic sewage and industrial effluent from Delhi while the water quality at the point where the river enters Delhi is of acceptable quality. Pollution load from Delhi renders it severely polluted downstream.

The management of sewage treatment by NCT Government of Delhi through the executing agency, i.e. Delhi Jal Board has been tardy. During the seven years 1992-99, the Government has been able to increase the sewage treatment capacity by only 112 MLD[4].

Of the total estimated quantity of 2852 MLD sewage generated in Delhi, the Government is able to treat only 886 MLD. 1966 MLD untreated sewage is being discharged in river Yamuna causing serious pollution to the water.

Even the STPs constructed are not being utilised optimally due to failure of the NCT Government to ensure completion of attendant sewerage lines and proper interception and diversion. In two cases, STP has been constructed in an area which does not have the sewage load rendering the capacity for sewage treatment of 114 MLD unused while in other areas untreated sewage is polluting Yamuna due to absence of STPs.

The existing pumping stations and STPs were functioning much below their capacity. Problems in functioning of aerators used in the STPs and sludge digester and gas holders led to incomplete removal of the organic matters from the sewage and release of toxic gases in the atmosphere.

Industrial pollution also remains to be tackled. 348 out of 428 grossly polluting industries had not put up effluent treatment plants. In addition, construction of none of the 15 common effluent treatment plants to tackle the pollution from other polluting industrial units has been taken up.

In one of the STPs sample checked, the sewage even after treatment was found to be grossly polluted.

[4] *Million litre per day*

Highlights of review on Sewerage system in Delhi published in the C&AGs report for the year ended March 2003.

Out of the loans and grants of Rs. 326.40 crore released during 1998-99 to 2002-03 by the Government of NCT Delhi, the Board could utilise only Rs. 185.94 crore.

Board failed to trap the sewage generated from unsewered areas. Sewerage system of sewered areas was also not functioning properly as 18 out of 28 main trunk sewers were either not functioning at all or were functioning only partially during the last five to ten years due to collapsed/ silted sewers. Fifty urban villages and 154 unauthorized regularized colonies out of 135 urban villages and 567 unauthorized regularized colonies either had no sewerage system or the sewerage system was not functioning.

The Board failed to implement the works due to deficient planning and physical achievements fell short by 57 per cent.

Thirty sewer lines which were taken up for construction/ completed during the period 1998–99 to 2002-03 could not be made functional due to non-completion/non-functioning of connected systems.

Ring Road trunk sewer was not functioning for more than five years despite incurring of an expenditure of Rs. 13.12 crore. In three cases, the Board incurred excess expenditure of Rs. 7.90 crore due to execution of works at higher rates. In another case, an amount of Rs. 1.19 crore was paid to the contractor in excess of actual execution of work.
Failure of the Board to finalize tenders within their validity period or even by the extended dates necessitated re-invitation of these tenders and resultant additional expenditure of Rs. 20.77 lakh.

Deficient planning and failure to provide clear site to the contractor in time resulted in cost overrun of Rs. 4.13 crore besides time overrun of more than nine years.

Poor utilisation of departmental resources resulted in loss of Rs. 1.58 crore.

Against sewage generation of 652 million gallons per day (MGD), the Board had a sewage treatment capacity of 512.60 MGD. Out of this, 296.24 MGD sewage was flowing into the river Yamuna untreated.

The water quality of the river Yamuna in Delhi stretch was poor. While the water quality at its entry point in Delhi was fit for bathing purposes, it was not fit for any purpose at the point it left Delhi.

Annex-II

(Referred to in paragraph 8)

Year-wise and Scheme-wise Budget Allocation and Actual Expenditure during 1999-2000 to 2003-2004

(Rupees in crore)

Sl. No.	Name of the Scheme	1999-2000		2000-01		2001-02		2002-03		2003-04		Total		Savings (-)/ Excess (+)
		Budget Allocation	Actual Expe-nditure by DJB	Budget Allocation	Actual Expend-iture by DJB	Budget Allocation	Actual Expend-iture by DJB	Budget Allocation	Actual Expend-iture by DJB	Budget Allocation	Actual Expend-iture by DJB	Budget Allocation	Actual Expend-iture by DJB	
1.	Trunk Sewers	17.50	12.02	29.80	14.74	21.23	14.24	41.35	10.52	48.00	38.32	157.88	89.84	(-) 68.04
2.	STP	30.00	35.58	31.60	31.88	41.60	34.97	55.13	33.14	37.00	33.70	195.33	169.27	(-) 26.06
3.	Branch Sewers	5.50	2.52	33.50	14.19	48.15	39.97	22.02	32.12	49.60	19.52	158.77	108.32	(-) 50.45
4.	Renovation of Existing Plants	1.75	2.08	4.50	3.40	7.68	6.86	6.43	4.93	5.00	1.54	25.36	18.81	(-) 6.55
5.	Sewerage & Drainage in Trans Yamuna	9.70	9.40	10.00	9.53	9.94	9.74	6.43	5.72	8.00	6.07	44.07	40.47	(-) 3.60
6.	Prevention of Pollution of River Yamuna	0.35	0.02	0.72	0.23	0.45	0.52	0.00	0.14	0.00	0.00	1.52	0.91	(-) 0.61
7.	Anti Flood works	4.00	2.67	5.00	4.30	1.55	1.73	1.36	0.48	4.00	2.81	15.91	11.99	(-) 3.92
Total		**68.80**	**64.29**	**115.12**	**78.27**	**130.60**	**108.03**	**132.72**	**87.05**	**151.60**	**101.96**	**598.84**	**439.60**	**(-) 159.24**

Annex–III

(Referred to in paragraph 13.2)

Quality of Treated Effluent as per DJB lab reports

S. No.	Name of the Plants	BOD	TSS	T.C.	Remarks
1.	Okhla STPs – (I) 30 MGD	35 to 48 mg/l	54 to 81 mg/l	17 per cent to 87.75 per cent	
	(ii) 16 MGD	Meeting prescribed standard			As per CPCB Report of November-December 2003 not meeting the BOD and TSS standards.
2.	Keshopur STP - (i) 20 MGD	38 to 92 mg/l	57 to 138 mg/l	Not analysed	
	(ii) 40 MGD	33 to 40 mg/l	50 to 65 mg/l	-do-	
3.	Kondli STP - (i) 10 MGD (Ph.I)	Meeting the prescribed standard		-do-	As per CPCB Report of November-December 2003 not meeting the standards of TSS .
	(ii) 25 MGD (Ph. II)	-do-		-do-	As per DPCC Report July to Dec. 2003 not meeting the standards in respect of BOD and TSS.
	(iii) 10 MGD (Ph. III)	-do-		-do-	As per DPCC Report October-December 2003 not meeting the standards of BOD and TSS.

Annex–IV

(Referred to in paragraph 14)

Status of CETPs in Delhi as of December 2003

(Rupees in crore)

Sl. No.	Name of CETP	Capacity of plant (in MLD)	Cost of Plant	Actual Expenditure incurred	Status of the CETPs	Remarks
1.	Wazirpur	24	19.85	20.85	Commissioned in October 2001	CETP is not functional since 9th July 2003 as it was closed due to flooding. Further, due to non-existence of conveyance system, flow is taken from open drain.
2.	Mangolpuri	2.4	6.29	6.80	Commissioned in November 2001	CETP is not functional since August 2003 due to paucity of funds. Rising main yet to be laid.
3.	Mayapuri	12	12.18	13.88	Commissioned in July 2002	Only primary treatment due to non availability of Chemicals because of paucity of funds.
4.	Jhilmil	16.8	13.15	8.59	Commissioned in June 2003	Railway permission pending to lay line. Conveyance system not completed.
5.	Lawrence Road	12	10.92	7.21	Completed in March 2003	Plant not working due to action pending with DJB, MCD etc. Disposal line of treated effluent is yet to be laid under Ring Road.
6.	Badli	12	9.24	9.79	Completed in March 2003	Commissioning held up because DJB had not given connection to individual units.

Sl. No.	Name of CETP	Capacity of plant (in MLD)	Cost of Plant	Actual Expenditure incurred	Status of the CETPs	Remarks
7.	Okhla Industrial Area	24	23.69	21.56	Completed in April 2003	Plant completed but rising main of REPs yet to be laid, permission from Railways delayed the work.
8.	G.T.K. Road	6	8.29	8.12	Completed in December 2002	Commissioning delayed due to non availability of power as there was paucity of funds.
9.	S.M.A. Industrial Area	12	13.54	12.92	Completed in May 2003	Commissioning held up as DJB had not laid the internal conveyance system and paucity of funds
10.	Nangloi	12	14.56	13.38	Completed in May 2003	Commissioning held up because of power and MCD permission for road cutting for laying of rising main.
11.	Najafgarh Road	9.6	10.98	1.81	Work in progress	Delay in allotment of land and thereafter hindrance by local residents.
12.	Naraina	21.6	16.70	1.21	-do-	Progress of work slow due to repeated litigation for site besides paucity of funds.
13.	Mohan Co-op	1.8	4.64	0.46	Work not taken up so far	Work had not been taken up due to uncertainty of funds.
14.	Okhla Industrial Estate	1.2	4.36	0.07	-do-	Award of work not approved by Plant Level Committee (PLC)
15.	Anand Parbat	24	16.87	0.38	-do-	Due to demolition of existing structures at site.

Annex-V

(Referred to in paragraph 15)

Discharge of drains/nallahs out falling in the river Yamuna and BOD input during March 2002 to June 2003

Sl. No.	Name of the drains/nallahs	Quantum of discharge (Avg.) in MGD	BOD (mg/litre)	
			Min.	Max.
1.	Najafgarh	441.599	40	100
2.	Magazine Road	0.801	400	450
3.	Sweeper Colony	1.292	90	450
4.	Khyber pass	2.135	60	280
5.	Matcalf	3.194	50	130
6.	Qudasia Bagh/Mori Gate	12.523	30	530
7.	Tonga stand	2.265	50	350
8.	Moat Nallah	0.316	40	130
9.	Civil Mill	11.243	40	230
10.	Delhi Gate	24.559	30	150
11.	Dr.Sen Nursing Home	21.266	60	90
12.	Nalla No.12A	2.211	50	470
13.	Nalla No.14	12.843	50	280
14.	Barapulla	24.869	40	150
15.	Maharani Bagh	2.984	100	160
16.	Kalkaji	7.417	50	230
17.	Tuglaquabad	0.762	20	130
18.	Shahdra	138.580	50	180
	Total	710.859		

Annex-VI

(Referred to in paragraph 15)

Detail of Heavy Metal Pollution in drains/nallahs

Sl. No.	Metal	Standard as per EPA	Actually Measured from Drains
(i)	Copper	9	28 to 770
(ii)	Lead	2.5	40 to 454
(iii)	Nickel	52	20 to 153
(iv)	Zinc	120	138 to 12600
(v)	Mercury	0.77	17.4 to 462

Besides, presence of free ammonia was ranged between 1.64 to 6.73 mg/l against the prescribed standard of 0.02 mg/l and below

GLOSSARY

Bio-chemical Oxygen Demand (BOD): is used to assess the water quality by determining how much oxygen is being used by aerobic microorganisms in the water to decompose organic matter. Elevated levels of BOD is a risk to diversity of life, affects the useful aquatic life and promotes growth of pollutant tolerant harmful organisms.

Chemical Oxygen Demand (COD): It indicates the measure of the oxygen required for chemical oxidation. In situations where the presence of toxic materials is likely to interfere with the BOD, this test is very useful.

CPM/PERT: 'Critical Path Method' is a tool to analyze project and determine duration, based on identification of "critical path" through an activity network. Knowledge of the critical path can permit management of the project to change duration. In 'Program Evaluation and Review Technique', activities are represented by arrowed lines between the nodes or circles and multiple time estimates are used for each activity allowing variation in activity times.

Dissolved Oxygen (DO): Refers to the amount of oxygen dissolved in water. This is the most important parameter, determines the ecological health of water. Fish kills, noxious taste, odours and low biological diversity are indication of low DO.

Internal sewer: Small dia sewer pipe line which collects sewage from individual residential colonies and conveys the sewage to peripheral/trunk sewers.

Million Gallon per Day (MGD): Million Gallons per Day (standard unit of measurement of water/sewage i.e. 10,00,000 x 4.53 litre per day.

Million Litre per Day (MLD): Million Litres per Day (standard unit of measurement of water/sewage i.e. 10,00,000 litre per day).

Peripheral sewer: Medium dia sewer pipe line which collects sewer water from different internal sewers and conveys to trunk sewers.

pH: It is measure of hydrogen ion concentration and is an indicator of relative acidity or alkalinity of water. Water values of 9.5 and above indicate high alkalinity while water value of 3 and below indicates acidity.

Rising Main: It is a big dia pipe which is connected between SPS and STP for conveyance of waste water from the level of SPS to that STP.

Sewage Pumping System (SPS): It is a installation of electrical and mechanical equipment to pump sewage water to STP through rising main.

Sewage Treatment Plant (STP): It is a installation of electrical and mechanical equipments meant to treat the domestic sewage.

Sewer: Means any conduit pipe or channel, open or closed, carrying sewage or trade effluents.

Total coliform and Faecal coliform: The presence of faecal coli form bacteria indicates contamination with faecal material of humans or other animals. Contaminated water contains pathogens, which are responsible for the spread of many contagious diseases.

Total Suspended Solids (TSS): are the third most significant conventional pollutant because it aggravates a dissolved oxygen deficiency by sedimentation and forming an oxygen-demanding sludge deposit. These cause turbidity in the receiving water and may alter the habitat of aquatic biota; and, perhaps most importantly, they can harbor pathogens (disease-causing microorganisms).

Trunk sewer: Big dia sewer pipe lines which collects sewage from peripheral/internal sewer lines and convey it to SPS/STP.

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