

## CHAPTER- II

### PUBLIC WORKS DEPARTMENT

#### 2.1 PERFORMANCE AUDIT ON WATER SUPPLY SCHEMES IN THE STATE

##### *Executive Summary*

*The water supply demand in the State is met through seven regional water supply schemes being implemented by the Public Health Engineering Wing of the State Public Works Department (PWD). A performance audit of the water supply schemes in the State was conducted with the objective to assess the effectiveness of the planning process; the implementation of schemes with due consideration to economy and efficiency; the promptness and effectiveness of revenue generation; the adequacy of asset management and effectiveness of monitoring and internal control mechanism. The Audit covered a period of five years 2008-13 and more than 50 per cent of the sub-divisions and divisions under the Public Health Engineering wing of the PWD. Some of the significant audit findings of the performance audit are as follows.*

- The Capital expenditure of ₹ 329.01 crore incurred under the Japan International Co-operation Agency (JICA) project during the period 2009-13 was not shown in the accounts of the State Government. The gap between the cost of operation of water supply schemes and the revenue generated was ₹ 480.50 crore over the period 2008-13.

*(Paragraphs 2.7.2 and 2.7.3)*

- Delay in tendering of works under JICA project resulted in additional burden of ₹ 166.37 crore to the State Government. Delays in acceptance of tender had resulted in additional liability of ₹ 69.02 crore on account of price escalation. Failure to capitalise on the forest approval given earlier resulted in a delay in start of work and consequent liability of ₹ 16.65 crore.

*(Paragraphs 2.9.2, 2.9.3 and 2.9.4)*

- Improper planning and lack of co-ordination within the PWD resulted in idle investment of ₹ 2.50 crore. Replacement of water meters with automatic meter reading component led to an unreasonable extra burden of ₹ 21.89 crore. Lack of planned preventive maintenance works led to irregularities in tendering of maintenance works costing ₹ 65.99 crore.

*(Paragraphs 2.9.5, 2.9.6 and 2.10.1)*

- Unaccounted water constitutes 35 per cent of the water produced resulting in short collection of revenue of ₹ 77.37 crore per annum. The percentage of replacement of damaged water meters over the last five years ranged from three per cent to 21 per cent only.

*(Paragraphs 2.11.3 and 2.11.4)*

- **Supervisory Control and Data Acquisition (SCADA) network installed at a cost of ₹ 1.52 crore is only partly functional due to delayed payment of utility bills and delayed repairs of circuit failures.**

*(Paragraph 2.12.2)*

- **Manganese detected in the treated water of Salaulim water treatment plant was higher than the acceptable limit prescribed in the water supply manual. The mining dumps and waste dumping in Khandepar river affected the functioning of the Opa water treatment plant.**

*(Paragraphs 2.13.1 and 2.13.2)*

- **The internal control mechanism on outsourced billing operations are compromised due to lack of input, processing and output controls.**

*(Paragraph 2.14.1)*

## **2.2 Introduction**

Goa has an area of 3,702 sq. kms. with two districts (North Goa and South Goa) and a population of about 14.59 lakh as per 2011 census data. The decadal growth rate (2001-11) of population was 8.17 *per cent*. The State has 347 villages and 14 towns with the urban and rural population in the ratio of 62:38. All the habitations in the State have access to safe drinking water. The demand for water in the State is met mainly through seven regional water supply schemes with a total capacity of 529 MLD (Million Litre per Day) as on March 2013. The average water supply levels in rural areas was 82 litre per capita per day (lpcd) and in urban areas 143 lpcd against the Government of India (GoI) norms of 40 lpcd and 135 lpcd respectively.

## **2.3 Organisation**

The Principal Secretary, PWD, Government of Goa is the Administrative Head of the Department. The Principal Chief Engineer (PCE) is executive Head of PWD who is also Ex-Officio Additional Secretary to the State Government. He is assisted by Chief Engineer I (CE-I) (Public Health Engineering, Roads and Bridges) and Chief Engineer II (CE-II) (Buildings). The Water Supply Sector is included in Public Health Engineering under the control of CE-I. The organisational set-up of the Water Supply Sector in the State is shown in *Appendix 2.1*.

## **2.4 Audit objectives**

The objective of the performance audit was to assess whether:

- planning for water supply schemes was effective;
- water supply schemes were implemented economically and efficiently;

- fixation of water tariff and collection of water charges were correct and prompt;
- asset/inventory management was adequate; and
- an efficient monitoring mechanism and internal control was in place.

## 2.5 Audit criteria

The audit findings were benchmarked against the following criteria:

- Annual plan, five year plan and master plan;
- Project feasibility reports, work estimates and tendering procedures;
- Central Public Works Accounts (CPWA) Code, CPWD Works Manual, General Financial Rules (GFR) and Circulars issued by the Government;
- Water supply Act, Tariff rules, Water Bye-laws;
- Manual of Water Supply by CPHEEO<sup>1</sup>.

## 2.6 Scope of audit and methodology

The present performance audit was conducted during April 2013 to September 2013 covering the period of 2008-09 to 2012-13. An entry conference was held (May 2013) with the Principal Secretary (PWD), PCE, CE-I and other officers of the Department. Out of seven water supply divisions, we had selected and test checked the records in the five divisions (Division IX, XII, XVII, XX and XXIV), the offices of the PCE, CE-I, Superintending Engineer (Monitoring and Evaluation), three circle offices (SE-V, SE-VI and SE-VIII) and Japan International Co-operation Agency (JICA) cell<sup>2</sup>. The operation and maintenance records maintained by the six<sup>3</sup> sub-divisions out of 12 sub-divisions and records of revenue collection maintained in seven<sup>4</sup> sub-divisions out of 13 sub-divisions were also test-checked by audit.

The draft performance audit report was discussed (November 2013) in the exit conference with the Principal Secretary (PWD), PCE and CE-I. The preliminary replies received from the Department have been incorporated at appropriate places. The reply of the Government was awaited (January 2014).

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<sup>1</sup> Central Public Health and Environmental Engineering Organisation, Government of India

<sup>2</sup> The project implementation unit for executing works with the help of loan sanctioned by the Japan Bank for International Co-operation.

<sup>3</sup> Sub-divisions 3 and 4 of division XII, 4 and 5 of division XVII, 4 of division XX and 6 of division XXIV

<sup>4</sup> Sub-divisions 2 of division IX, 2 and 4 of division XVII, 2,3 and 4 of division XX and 1 of division XXIV

## 2.7 Finance

### 2.7.1 Budget provision and expenditure

The budget provisions of receipts and expenditure and actuals under the water supply sector in the State during the period 2008-13 are given in **Table 1:**

**Table 1: Budget provision and actual expenditure and revenue**

(₹ in crore)

Year	Budget provision			Actual expenditure			Receipts	
	Revenue	Capital	Total	Revenue	Capital	Total	Budget	Actual
2008-09	161.43	83.54	244.97	161.55	82.75	244.30	83.06	62.72
2009-10	176.86	106.11	282.97	178.55	72.23	250.78	70.20	69.48
2010-11	176.64	119.66	296.28	189.97	45.34	235.31	70.95	68.51
2011-12	246.17	123.98	370.15	240.03	81.47	321.50	74.45	84.30
2012-13	236.70	84.51	321.21	216.13	36.27	252.40	89.09	96.59
<b>Total</b>	<b>997.80</b>	<b>517.80</b>	<b>1515.58</b>	<b>986.23</b>	<b>318.06</b>	<b>1304.29</b>	<b>387.75</b>	<b>381.60</b>

(Source: Finance and Appropriation Accounts of respective years)

We observed that there was huge variation between the budget provision (₹ 517.80 crore) and actual expenditure (₹ 318.06 crore) on capital heads mainly due to:

- delays in land acquisition, obtaining of forest licenses and re-tendering of works during the period 2009-10 to 2012-13 which resulted in non-utilisation of funds provided for Opa (₹ 35.33 crore), Assanora (₹ 6.25 crore) and other water supply schemes (₹ 22.37 crore);
- non-formulation of schemes under tribal area sub-plan (₹ 30.30 crore) during the period from 2010-11 to 2012-13; and
- non-settlement of bills of contractors due to insufficient funds (₹ 46.35 crore) during 2012-13.

### 2.7.2 Non-accountal of capital expenditure in the Government accounts

The State Government executed (September 2007) a loan agreement with Japan Bank for International Co-operation (JBIC) for execution of water supply and sewerage projects in the State. The project involved expansion and rehabilitation of Salaulim Water Supply Scheme, improvement of operation and maintenance of existing Water Supply Schemes (WSS) and creation of additional sewerage networks in the State.

As per Agreement, the release of loan was made by the JBIC directly to the contractors against the invoices for work carried out by them duly certified by the Consultants<sup>5</sup> and Project Implementation Unit (PIU). The JBIC released a total loan amount of ₹ 329.01 crore<sup>6</sup> to the contractors during the period 2009-13 against the bills certified and submitted through Controller of

<sup>5</sup> The consultants comprise of a Consortium of four companies namely M/s Nihon Suido Consultants Co. Ltd. NJS Consultants Co. Ltd. Luis Berger Group Inc. and Shah Technical Consultants.

<sup>6</sup> ₹ 19.88 crore in the year 2009-10, ₹ 25.50 crore in the year 2010-11, ₹ 152.96 crore in the year 2011-12 and ₹ 130.67 crore in the year 2012-13.

Aid Accounts and Audit, GoI, Ministry of Finance. Out of this, ₹ 282.89 crore and ₹ 46.12 crore were released for water supply sector and sewerage sector respectively. The State Government, however, did not include these transactions in their accounts during the corresponding years resulting in understatement of capital expenditure of ₹ 329.01 crore in the Finance Accounts of the State. The Department has intimated (August 2013) that the matter has been referred to the Finance Department.

### 2.7.3 Short recovery of ₹480.50 crore

The component wise revenue expenditure incurred and the water charges recovered during the period 2008-13 is given below;

**Table 2: Operation and maintenance expenditure and water charges recovered**

(₹ in crore)						
Year	Operation and maintenance expenditure—minor works	Electricity charges	Raw water charges	Total direct revenue expenditure	Water charges recovered	Short recovery
2008-09	79.17	38.00	24.00	141.17	60.20	80.97
2009-10	100.98	33.95	15.00	149.93	67.32	82.61
2010-11	104.25	39.01	20.04	163.30	66.42	96.88
2011-12	142.62	48.58	19.97	211.17	81.95	129.22
2012-13	109.33	55.71	20.00	185.04	94.22	90.82
<b>Total</b>	<b>536.35</b>	<b>215.25</b>	<b>99.01</b>	<b>850.61</b>	<b>370.11</b>	<b>480.50</b>

(Source: Expenditure as per Appropriation Accounts. Water charges received as furnished by the Department)

It may be observed that the total expenditure incurred for running and maintenance of the water supply schemes for the period 2008-13 was ₹ 850.61 crore (excluding salaries ₹ 116.40 crore). The water supply manual stipulated that the revenue earned should be capable of sustaining the cost of operating the amenity and also to provide for a reserve for meeting the capital expenses for future improvement. The recovery of water charges during the period 2008-13 which was ₹ 370.11 crore was insufficient to even cover total direct revenue expenditure. The audit findings on this issue are discussed in **Paragraph 2.11**.

## 2.8 Planning

### 2.8.1 Planning of water requirement

The urban and rural population in Goa was 62 per cent and 38 per cent respectively as per the Census-2011. The Central Public Health and Environmental Engineering Organisation (CPHEEO), GoI's Manual of Water Supply and Treatment set the maximum consumption of water for the population with facilities of flushing sewerage system as 135 litre per capita per day (lpcd) and without sewerage system the consumption recommended was 70 lpcd.

The State had achieved the service level of 82 lpcd in rural areas and 143 lpcd in urban areas at the end of the Tenth Five Year Plan. It was proposed to increase the supply level to 100 lpcd in rural areas and 150 lpcd in urban areas with the emphasis on 24x7 water supply.

The water supply demand in the State is met mainly through seven Regional Water Supply Schemes (RWSS) with a total capacity of 529 MLD (Million Litres per Day) as on March 2013. The additional treatment capacity created during 2008-13 was 135 MLD as given below:-

**Table 3: Capacity and coverage of Regional Water Supply Schemes (RWSS)**

Name of the Scheme	Capacity in MLD		Talukas covered
	Existing	Created during 2008-13	
Opa W.S.S.	115	25**	Ponda, Tiswadi
Assonora W.S.S.	42	50*	Bardez
Sanquelim W.S.S.	52	0	Bicholim
Salaulim W.S.S.	160	40**	Sanguem, Quepem, Salcete, Mormugao
Chandel W.S.S.	15	0	Pernem
Canacona W.S.S.	5	10*	Canacona
Dabose W.S.S.	5	10*	Sattari
<b>Total</b>	<b>394</b>	<b>135</b>	

(Source: Furnished by the Department)

\*New water treatment plants, \*\*by construction of additional filter beds and increasing the pumping capacity of existing water treatment plants

These RWSS covers the 92 per cent of urban and rural population in 11 talukas of the State. Those areas which are not served by these RWSS are served by rural water supply schemes with their sources being ground water or springs.

The year wise details of water consumption under various categories are as given in **Appendix 2.2**.

The total water supplied from the existing RWSS was 529 MLD. Considering the per capita requirement of water as prescribed in the manual of CPHEEO, the total domestic water requirement worked out to 161.09 MLD<sup>7</sup>. Even to achieve the targeted per capita water supply of 100 lpcd in rural and 150 lpcd in urban areas set for the eleventh five year plan (2007-12), the total treated water requirement worked out to 191.25 MLD<sup>8</sup>. Against these requirements the actual water consumption was 228<sup>9</sup> MLD during the year 2012-13. Thus the targets set for the 11 Five Year Plan had been achieved and excess water supply capacity had been created. This can

<sup>7</sup> Urban population= say 9.07 lakh x 135 lpcd = 1,224.45 lakh lpcd = 122.45 MLD + Rural population= say 5.52 lakh x 70 lpcd= 386.40 lakh lpcd = 38.64 MLD.

<sup>8</sup> Urban = 9.07 lakh x 150 lpcd = 1,360.50 lakh lpcd = 136.05 MLD + Rural = 5.52 lakh x 100 lpcd= 552 lakh lpcd = 55.20 MLD

<sup>9</sup> Domestic consumption was 8,33,56,655m<sup>3</sup>/(365 days x 1000m<sup>3</sup>)= 228 MLD

encourage wastage and diversion of critical drinking water for other purposes, which Department needs to guard against.

## **2.9 Implementation of schemes**

### **2.9.1 Implementation of JICA project**

GoI requested (2002) assistance of the Government of Japan (GoJ) for augmentation of water supply and sanitation in Goa. Accordingly the GoJ entrusted (March 2005) the work to undertake feasibility study to Japan International Co-operation Agency (JICA). Based on study report, the JBIC sanctioned (September 2007), a loan of 22,806 Million Japanese Yen (₹ 847.50 crore as per prevailing exchange rate) against the total project cost of ₹ 1,031.90 crore. The total loan including interest was repayable over a period of 20 years commencing from September 2017. The tripartite loan agreement between the GoG, GoI and JBIC was signed in September 2007.

The GoG constituted (August 2008) Project Implementation Unit (PIU) for project implementation, supervision and monitoring and necessary co-ordination activities.

The JICA identified following priority projects which were to be completed by the year 2012:-

#### **1. Expansion works for Salaulim Water Supply Scheme**

- a. Construction of 100 MLD Water Treatment Plant at Salaulim
- b. Laying of 73.65 kilometre of 150 mm to 1,400 mm transmission mains
- c. Construction of 20,000 cubic metre (m<sup>3</sup>) Master Balancing Reservoir at Sirvoi and construction of 6 reservoirs with capacities of 100 m<sup>3</sup> to 800 m<sup>3</sup>
- d. Pumping stations at five locations

#### **2. Rehabilitation of existing Salaulim Water Supply Scheme**

- a. Rehabilitation of 160 MLD Water Treatment Plant (WTP)
- b. Rehabilitation of 1,200 mm transmission mains from Margao to Verna (13.8 km)
- c. Four units of pumping equipment at Verna pumping station .

#### **3. Improvement of operation and maintenance (for all seven RWSSs)**

- a. Installation of flow meters at WTPs, flow meters and float valves at reservoirs and flow meters and flow control valves at transmission mains
- b. Establishment of safety standards for WTPs
- c. Establishment of Central Laboratory at Tonca, Panaji with adequate testing equipment which can measure all the required parameters.

State Government conveyed (March 2008) Administrative approval to the total project cost of ₹ 1,031.90 crore which comprised water supply sector component of ₹ 763.10 crore and sanitation sector component of ₹ 268.80 crore. The PIU took up the priority projects 1a to 1d under 'Expansion of Salaulim WSS' and 'Establishment of Central Laboratory' (3c). Other priority projects under Rehabilitation of existing Salaulim WSS and

installation of flow meters and establishment of safety standards for WTP had not been taken up till date (January 2014).

**2.9.2 Additional burden of ₹ 166.37 crore to State due to delay in implementation of the projects**

The JICA project implementation was to be carried out in 22 packages (12 packages for water supply sector, 6 packages for sanitation sector and 4 common packages). The estimated cost as per the loan agreement, the estimated cost put to tender, the accepted tender cost and expenditure incurred up to January 2014 on each package and physical progress under the water supply sector are given below;

**Table 4: Details of progress of works under JICA project**

*(₹ in crore)*

Priority project number	Package numbers	Name of works	Estimated cost as per loan agreement	Estimated cost put to tender	Accepted tender cost	Expenditure incurred up to January 2014	Physical progress achieved (in percentage)	
1 (a)	1	Expansion of 100 MLD WTP at Salaulim	73.79	111.92	138.50	47.53	60	
1 (b)	2	Transmission lines from Salaulim to Margao	177.66	192.98	246.50	195.08	75	
1 (c)	3	Master balancing reservoir at Sirvoi	10.19	9.05	10.10	4.96	80	
1 (b)	4+8+10b (3 packages)	Transmission lines, distribution lines and reservoirs at various places	81.45	108.52	104.51	17.97	25	
1 (b)	5	Distribution mains	54.64	52.06	44.96	11.22	25	
1 (d)	6	Transmission reservoirs, pumping stations in Sanguem taluka	11.11	19.03	12.77	8.64	70	
1 (d)	7	Transmission reservoirs, pumping stations in Quepem taluka	3.27	5.67	4.03	2.83	40	
2 (a and c)	9	Rehabilitation of SWTP <sup>10</sup> and Verna pumping station	(41.75)	Yet to be tendered				
3 (c)	10(a)	Central water testing laboratory	1.75	2.42	2.44	1.77	100	
*	11	Water meters and automatic reading component	35.58	59.55	53.73	11.16	15	
*	12	Power supply to SWTP and Verna pumping station	10.41	11.69	8.68	4.63	80	
		<b>Total</b>	<b>459.85</b>	<b>572.89</b>	<b>626.22</b>	<b>305.79</b>		

*(Source: Furnished by the Department)*

*\*In addition to the priority projects mentioned in the JICA report*

<sup>10</sup> Salaulim Water Treatment Plant



As against the estimated cost of ₹ 459.85 crore assessed in the loan agreement for 11 out of the 12 packages, the accepted tender cost of these packages was ₹ 626.22 crore. As the loan amount was limited to ₹ 459.85 crore on these packages, the remaining amount of ₹ 166.37 crore will be met from the state budget.

### 2.9.3 Inordinate delay in acceptance of tenders resulting in escalation of ₹ 69.02 crore

The commencement of the project, as detailed in **Appendix 2.3**, was delayed due to time taken for acceptance of tenders by one to 16 months from the date of tendering. It was observed that the stipulated dates of completion of six packages (1, 2, 3, 6, 7 and 12) were already over but the physical progress made ranged from 40 per cent to 80 per cent only.

According to the provisions of para 19.3.1 and Appendix 23 of the CPWD manual, maximum 45 days from receipt of tenders was allowed for scrutiny at various levels to decide the award of work, where tenders had been accepted by Works Board. The Department except in one package (10a) took more than 45 days in finalising the tenders and issue of work orders and overall delays ranged from 4 months to 16 months.

The GSWB<sup>11</sup> also took time ranging from seven months to 11 months in three<sup>12</sup> works for its approval after receipt of the proposal from Bid Evaluation Committee (BEC)

The contract agreement provided for price variation payment according to the change in indices of labour, material and POL (Petrol, Oil and Lubricants) components of the contract value. The scrutiny of work files on execution of package-2 (Transmission lines from Salaulim to Margao) revealed that the Department took 13 months for issue of work order subsequent to opening of the tenders. The Department had already paid ₹ 25.56 crore (June 2012) as escalation on the total value of work done (₹ 124.24 crore). As per the price indices applied for escalation payment of ₹ 25.56 crore the average monthly increase in cost was 0.95 per cent<sup>13</sup>.

The element of escalation cost makes the timely processing of tenders most essential. The delay in finalising the tenders would lead to an additional financial burden of ₹ 69.02 crore **Appendix 2.3** for the State Government. Almost 36 per cent **Appendix 2.3** of the additional cost was attributable to time taken by the GSWB in accepting the lowest offers recommended by the BEC in respect of seven works.

<sup>11</sup> Goa State Works Board

<sup>12</sup> Packages 2,3 and 11

<sup>13</sup> During the period from January 2010 to January 2012, the average increase of labour, wholesale price indices (WPI) for steel, other commodities and POL components per month were to the extent of 0.57 per cent, 1.01 per cent, 0.72 per cent and 1.50 per cent respectively (as per the escalation bill) making an average monthly increase of 0.95 per cent  $(0.57+1.01+0.72+1.50=3.8/4=0.95)$ .

**2.9.4 Failure to capitalise the earlier forest approval resulted in delay in start of work and consequent liability of ₹16.65 crore**

The progress of priority project of Salaulim water supply scheme which involved construction of 100 MLD Water Treatment Plant (WTP) and intake well, construction of 20,000m<sup>3</sup> capacity reservoir at Sirvoi and laying of transmission lines parallel to the existing transmission lines up to Vern a sump was very slow and not synchronised to allow the scheme to be commissioned as per the target date of April 2013 refer *Appendix 2.3*.

The works of WTP and reservoir required approval from the Forest Department for diversion of forest land. The Forest Department approved (January 2004) the proposal of the PWD to execute the project under BOOT<sup>14</sup> basis subject to compliance of the stipulated conditions. The approval was valid for five years and was subject to payment of compensatory afforestation charges of ₹ 1.27 crore. The Department paid (December 2008) the charges and submitted compliance report to the Ministry of Environment and Forest in March 2009. Since the compliance report was received after five years, the Ministry revoked (May 2009) the earlier approval of January 2004. Consequently the State had to process for fresh clearance from the Ministry of Environment and this was received only in November 2011 affecting the timely execution of the project.

Though the work orders of the reservoir at Sirvoi and WTP were issued in February 2011 and April 2011 respectively, the works could not commence till November 2011. The work of WTP commenced in April 2012 and only 60 per cent was completed till January 2014. The work of reservoir at Sirvoi commenced in December 2011 only and 80 per cent of the work could be completed as on January 2014.

Thus the Department's failure to capitalise on the forest approval received in January 2004 resulted in delay in start of work and consequential additional liability of ₹ 16.65 crore<sup>15</sup> towards escalation.

**2.9.5 Improper planning and lack of co-ordination resulted in idle investment of ₹ 2.50 crore**

The work of 'construction of transmission reservoirs and pumping stations at three places viz. 800 m<sup>3</sup> in Quepem town area, 300 m<sup>3</sup> in Padi village and 100 m<sup>3</sup> at Cupwada in Quepem Taluka' (package-7) was awarded (August 2010) to M/s Saisudhir Infrastructure Ltd. for ₹ 4.03 crore. The work was to commence in August 2010 and scheduled to be completed by August 2011. After making payment of ₹ 2.50 crore (February 2011) the work could not proceed further as clearances from various authorities were pending till January 2014.

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<sup>14</sup> Built Own Operate and Transfer

<sup>15</sup> Accepted cost of WTP = ₹ 138.50 crore. Escalation liability for delay of 12 months (April 2011 to March 2012) @ 0.95 per cent per month = ₹ 138.50 crore x 0.95/100 x 12 = ₹ 15.79 crore.  
Accepted cost of Reservoir = ₹ 10.10 crore. Escalation liability for delay of 9 months (February 2011 to November 2011) @ 0.95 per cent per month = ₹ 10.10 crore x 0.95/100 x 9 = ₹ 0.86 crore.  
Total = ₹ 15.79 crore + ₹ 0.86 crore = ₹ 16.65 crore.

Audit scrutiny revealed that:

- The work of laying pipelines from Balli to Barcem (10.5 km) was to be carried out along the NH 17. The Roads division-XIV demanded (June 2011) ₹ 5.25 lakh for use of National Highway land. The payment was made in October 2011 but the demand draft was returned due to incorrect payee's name. The demand draft was however, revalidated only in November 2012 and the NOC was issued (November 2012) by National Highway Authorities. This inordinate delay impacted the timely completion of the project. The physical progress of the project was 40 per cent till January 2014.
- NOCs were pending (January 2014) from Forest Department, Balli Comunidade, Rivona Comunidade and from a private party for the works of GLR Padi, sump Padi, GLR Cupwada and sump at Cupwada respectively. This showed lack of proper planning by project authorities.

The stipulated date of completion of this work was in August 2011, but only 40 per cent of the work has been completed by January 2014. Improper planning and lack of co-ordination resulted in non-completion of the work and idle investment of ₹ 2.50 crore for three years.

#### **2.9.6 Replacement of water meters with automatic meter reading component - extra cost of ₹ 21.89 crore**

Reduction of Non-Revenue Water (NRW)<sup>16</sup> was one of the objectives of JICA project.

Under package 11 of the JICA project the PIU proposed the work of supply, installation and maintenance of 93,459 multi jet water meters with Automatic Meter Reading (AMR)<sup>17</sup> for Salaulim water supply scheme. The work was awarded (January 2013) to M/s Unity-Chetas at total cost of ₹ 53.73 crore as detailed in Table below:

**Table 5: Details of items of work awarded**

(₹ in crore)

Sl. No.	Items	Amount
1	Plant equipment machinery and spare parts supplied from within the country	38.26
2	Transportation, insurance and other incidental services	0.63
3	Installation services component	12.74
4	Provisional sum	2.10
	<b>Total</b>	<b>53.73</b>

The item No 1 above 'plant equipment machinery and spare parts supplied from within the country (₹ 38.26 crore)' included supply of 93,330 multi jet domestic water meters costing ₹ 29.95 crore, supply of 129 non-domestic water meters costing ₹ 0.38 crore, providing AMR components costing

<sup>16</sup> NRW = Unaccounted for water + free water supply.

<sup>17</sup> AMR solution consist of 'the meter interface unit located at each meter which automatically transmits the meter reading to a hand held data receiving terminal carried by the meter reader'. The data from the data receiving terminal can be downloaded to central server facility/data management and billing system for generation of water bills.

₹ 2.91 crore and supplying pipes, valves and other fittings costing ₹ 5.02 crore.

The contract provided for replacement of 84,970 multi-jet domestic water meters of different sizes with AMR and providing additional 8,489 multi-jet meters for new connection with AMR.

Audit scrutiny revealed that:

- The PWD procures water meters as per the DGS&D<sup>18</sup> rate contracts. The multi-jet type domestic water meters were available at the rates of ₹ 525 for 15mm, ₹ 660 for 20mm and ₹ 873 for 25 mm as per rate contract available in the year 2010. The accepted basic rates of multi-jet domestic type water meters (without AMR component) in the contract were ₹ 2,950 for 15 mm, ₹ 3,490 for 20 mm and ₹ 7,500 for 25 mm. Even after considering a 10 per cent increase every year over the DGS&D rates, the rates accepted were exorbitantly higher. For 93,330 domestic water meters to be procured under the contract the total excess amount has been worked out at ₹ 21.89 crore as detailed in Table 6.

**Table 6: Calculation of extra cost incurred on water meters**

<i>(Amount in ₹)</i>				
Sl. No	Particulars	15mm meter	20mm meter	25mm meter
1	Rate as per contract (basic rate)	2950	3490	7500
2	Rate as per DGS&D rate contract (2010)	525	660	873
3	Rate contract after adding 30 % (Row 2+30%)	685	860	1135
4	Difference (Row 1-3)	2265	2630	6365
5	Number of meters	80830	11720	780
6	Excess amount (Row 4x5)	183079950	30823600	4964700
<b>7</b>	<b>Total excess amount</b>	<b>218868250</b>		

*(Source: Schedule of quantities and DGS&D rate contracts)*

- The contract provided replacement of 84,970 domestic water meters with new meters. An analysis in seven out of 13 revenue collection sub-divisions revealed that almost 84 per cent of the water meters were in working condition (discussed in **paragraph 2.11.4**). Thus the decision of Department to replace all the meters was injudicious. Further the replacement of water meters with AMR was not in the priority projects identified in the JICA report.
- The procurement of 93,459<sup>19</sup> number of water meters constitutes nearly 35 per cent of the total water connections (2.67 lakh) in the State. The Department had neither conducted any pilot study nor analysed the cost benefit ratio before procurement of such a large

<sup>18</sup> Director General of Supplies and Disposal

<sup>19</sup> 93,330(Domestic)+129(Non-domestic)

quantity of water meters with AMR at a cost of ₹ 53.73 crore. The analysis done by audit on 300 consumers (selected by statistical sampling) revealed that nearly 46 per cent of the consumers pay less than ₹ 50 and another 33 per cent of the consumers pay between ₹ 50 and ₹ 100 as monthly water charges. Considering the huge capital expenditure and expensive maintenance required for water meters with AMR component the Department should have ensured replacement of meters of high paying consumers at the first instance before going for an outright replacement of all the water meters with AMR.

## 2.10 Operation and maintenance

### 2.10.1 Irregularities in tendering of maintenance works costing ₹ 65.99 crore

The Department has not prepared a maintenance manual for maintenance of its assets such as plant and machinery, pipe lines, reservoirs etc. As per the JICA report, the design life for the water treatment plant is 50 years and 15 years for mechanical and electrical equipment which are to be rehabilitated/replaced accordingly. The house connections are to be rehabilitated/replaced after 10 years. The details of total quantities of various assets with the Department and their year-wise repairs and replacements carried out by the Department were not furnished to audit (January 2014). We observed that the Department had spent ₹ 536.35 crore during the period 2008-13 on various repairs and maintenance works. There was no planned preventive maintenance work and repair works were carried out in ad-hoc manner by the divisions in the event of any breakage or leakage.

We also observed that the divisions were not observing the codal provisions while executing the repair and maintenance works on the grounds of urgency of repairs. As per para 16.1 of the CPWD manual, wide publicity should be given to the notice inviting tenders. Tenders with estimated cost of more than ₹ 5 lakh, should be advertised in press and should be sent for publication on website.

We observed that divisions XVII and XXIV had executed 1,321 and 331 repair and maintenance works during the period from July 2009 to November 2011 incurring expenditure of ₹ 52.59 crore and ₹ 13.40 crore respectively without publishing tenders in news papers. Works in 285 cases were more than ₹ 5 lakh each. A test check of 50 works in division XXIV revealed that 11 works had been broken in phases and awarded to the same agencies by issue of short tender notices, thus enabling the divisions to circumvent codal provisions as detailed in *Appendix 2.4*.

The EE (Division-XVII) stated (February 2012) that: (i) the tender notices were not published in newspapers as nobody other than local contractors were expected to come forward for these works, (ii) there were public agitations every day due to poor water supply scenario in North Goa in 2009 and (iii) as the delay in taking approvals of estimates resulted in delay in taking up of works, the Minister, PWD announced publically to take up all maintenance works costing up to ₹ 10 lakh without publishing in news

papers to save time. He however confirmed that this practice has now been discontinued and all the works costing above ₹ 5 lakh were being advertised in news papers.

#### ***2.10.2 Payment of penalty due to low power factor ₹ 58.72 lakh***

The power factor is a measurement of how effectively electrical power is being used. As per para 12 (c) of the notification applicable for High Tension (HT) consumers for public water supply schemes, the power factor shall not in any case fall below 0.85 lagging (revised to 0.90 lagging with effect from July 2012). In case the power factor is found to be lower, penal charges at the rate of 0.5 *per cent* of the monthly bill corresponding to demand charges and energy charges shall be levied. In case the power factor is less than 0.70 lagging, the installation is liable for disconnection. However, all HT and Extra High Tension (EHT) installations where the power factor is maintained at above 0.95 lagging shall be eligible for a rebate @ one *per cent* of the energy charges for every one *per cent* improvement in the power factor.

We observed that the electricity bills of eight installations under five water supply schemes had low power factor ranging from 0.15 to 0.51 and paid penal charges of ₹ 58.72 lakh for the period March 2010 to May 2013 as detailed in **Appendix 2.5**.

The Electricity Department recommended (December 2012) to PWD replacement of capacitors suitable for different machinery for maintaining good power factor. This indicated that the Department was not checking and replacing the capacitors periodically and properly maintaining its plant and machinery. This has not only resulted in payment of penal charges on the above installations but also would affect the functioning of the machinery.

Electricity charge is one of the major components of expenditure on running of the water treatment plants. During the period 2008-13 the Department had incurred a total amount of ₹ 215 crore as electricity charges. Considering the huge expenditure on electricity charges and maintenance of poor power factor, the Department should have conducted an energy audit of all its plant and machineries and also other installations maintained by the Department.

## **2.11 Revenue**

### ***2.11.1 Reduction in share of revenue from non-domestic consumers***

The Department collects water charges from nearly 2.67 lakh consumers. The category wise number of consumers over the last five year period is given in **Appendix 2.6**.

During the period 2008-13, ₹ 370.11 crore was collected as water charges. The year wise details of consumption and the water charges collected from domestic and non-domestic consumers during the period 2008-13 are given in **Table 7**.

Table 7: Water consumption and water charges collected

Year	Quantity consumed in 1,000 cubic meter (million litre)			Revenue collected (₹ in crore)		
	Domestic	Non-domestic	Total	Domestic	Non-domestic	Total
2008-09	61407	42383	103790	24.90	35.30	60.20
2009-10	73572	32428	106000	30.03	37.29	67.32
2010-11	66517	32004	98521	29.01	37.41	66.42
2011-12	81187	39509	120696	38.82	43.13	81.95
2012-13	83357	42167	125524	49.11	45.11	94.22
<b>Total</b>				<b>171.87</b>	<b>198.24</b>	<b>370.11</b>

(Source: Furnished by the Department)

While analysing the pattern of growth in consumption, domestic consumption had increased to 66 per cent in 2012-13 as compared to 59 per cent in 2008-09. Similarly, the water consumption in respect of non-domestic consumers reduced to 34 per cent in 2012-13 from 41 per cent in 2008-09. The domestic consumers' share in revenue grew from 41.36 per cent in 2008-09 to 52.12 per cent in 2012-13 but during the same period the share from the non-domestic sector reduced by 11 per cent. We observed that while the domestic tariff has been increased three-fold during the last five years, there was only marginal increase in non-domestic tariff over the same period as detailed in the succeeding paragraph.

### 2.11.2 Revision of water tariffs

As per paragraph 17.4.2 of the water supply manual of CPHEEO, the revenue earned on sale of water was to be utilised to meet the annual recurring cost of operation and maintenance and to provide for a reserve for meeting the capital expenses. The quantity actually billed was invariably less than the quantity produced and was thus unaccounted for water. The revenue recovered was inadequate to meet the operation and maintenance expenditure and in the tariff the cost of water which was not accounted for should have been factored in.

The total direct revenue expenditure for running the water supply schemes stood at ₹ 185.04 crore during 2012-13. Based on the present production of 529 MLD<sup>20</sup>, the unit cost for production of water was ₹ 9.58<sup>21</sup> per cubic meter during the year 2012-13. Due to the high percentage of unaccounted water, the Department could collect water charges for only 343.90 MLD<sup>22</sup>. Thus the unaccounted water constitutes 35 per cent. Receipts for 67,561.50 MLD<sup>23</sup> during 2012-13 were lost as the same was unaccounted for.

During the period from April 2008 to April 2013 the Department revised the tariff structure twice (March 2011 and April 2013) as detailed in Appendix 2.7. The increase in domestic tariffs in the maximum slabs was 200 per cent and those of public taps increased by 66 per cent during the period 2008-13. In respect of non-domestic tariffs the increase ranged from

<sup>20</sup> One MLD = 1,000 cum per day.

<sup>21</sup> Expenditure in 2012-13 ₹ 185.04 crore. Production per day = 5,29,000 m<sup>3</sup>. Production per year 5,29,000 x 365 = 19,30,85,000 m<sup>3</sup>. Unit cost = ₹ 185,04,00,000/19,30,85,000 = ₹ 9.58 per m<sup>3</sup>

<sup>22</sup> Total metered consumption 12,55,24,162 m<sup>3</sup> in 2012-13 (Appendix-2.2). 12,55,24,162/365 days = 3,43,901 m<sup>3</sup> equivalent to 343.90 million litre.

<sup>23</sup> (529 MLD-343.90 MLD)x365 days = 67,561.5 MLD

16 per cent to 46 per cent only during the same period. The increase in the domestic water tariff during the last five year period indicated a healthy trend in achieving sustainability in operation of the water supply schemes in the State. The tariff should periodically be revised to ensure that the recurring cost of operation and maintenance at least, are realised.

### **2.11.3 High percentage of unaccounted water resulting in short collection of revenue of ₹ 77.37 crore per annum**

The Unaccounted Water (UW) represents the difference between the quantities of water supplied from the water treatment plants and that of the quantity supplied and measured at consumer point. The major factors leading to UW are leakage of water from the transmission lines, distribution lines, underground reservoirs, valves, connections *etc.* illegal connections; unmetered supply and non-working/faulty water meters.

As per the CPHEEO manual, Ministry of Urban Development, GoI the unaccounted water should be limited to 15 per cent.

The Department aims for 24×7 supplies in future. This brings with it the challenges of ensuring that leakage control measures are put in place to keep leakage 'in-check', as potentially, increasing the hours of supply could increase the level of water loss. The Department stated that all the connections were metered, reasons for the huge percentage of UW could be attributed to faulty meters, leakages in water pipelines and other causes.

#### **2.11.3.1 Salaulim Water Supply Scheme**

The Salaulim Water Treatment Plant (SWTP) supplies an average of 200 MLD water and the total output of the plant was being measured at the flow meters installed at Xelpem. After covering a length of 24 kilometre the 1,400 mm conveying mains reaches the Bifurcation Point at Margao (BPM) where another flow meter was installed. The flow meter at BPM measures the flow of water at an average of 113 MLD. The total water released through 21 tapping points from the conveying main between these two flow meters was 87 MLD<sup>24</sup>.

We obtained the total billed quantity of all the consumers who received water through these 21 tapping points during the period from January 2013 to March 2013. The monthly (30 days) average quantity of water released at SWTP and received at BPM was 5,979 Million Litre (ML) and 3,411 ML respectively. The difference in quantity of 2,568 ML per month represents the quantity of water supplied through the above 21 tapping points. However, the actual monthly water consumption metered and billed at the consumer points (covering 34 villages) which receives water from the above 21 tapping points was 1,562 ML. Thus 1,006 ML<sup>25</sup> of water was unaccounted for which was 39 per cent of total water supply.

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<sup>24</sup>200 MLD-113 MLD =87 MLD

<sup>25</sup> 2,568-1,562 = 1,006



### 2.11.3.2 Opa Water Supply Scheme

From the 40 MLD WTP of Opa water supply scheme the water is supplied through main pipe line to Taleigao and Altinho reservoirs at Panaji and five tapping points lie on route of supply. Flow meters have been installed only at the Panaji and Taleigao tapping points. Due to non-availability of flow meters at the other three tapping points, audit worked out the water released through Panaji and Taleigao tapping points and the total billed quantity on the consumers from these tapping points.

The water consumption metered and billed at the consumer points of Panaji and Taleigao during the period from March 2013 to April 2013 and the water released as per the flow meter readings in these tapping points was as shown in **Table 8**.

**Table 8: Calculation of unaccounted water of Opa WSS**

Sl. No.	Particulars	Quantity
1	Flow meter reading for Altinho reservoir in MLD	14.86
2	Flow meter reading for Taleigao reservoir in MLD	7.94
3	Water fed in to system from Opa water treatment plant for supply to the consumers of above zones in MLD (1+ 2)	22.80
4	Total water metered and billed per day in MLD	14.85
5	Unaccounted water ( 3-4)	7.95
6	Percentage of unaccounted water (5/ 3x100)	35

(Source: Compiled by audit from the information furnished by the Department)

Thus the percentage of unaccounted water from these two tapping points was 35 per cent.

### 2.11.3.3 Chandel Water Supply Scheme

Chandel water supply scheme supplying water to the Pernem taluka in North Goa district has a total installed capacity of 15 MLD. As per the information furnished by sub-division 2 of division XVII, Pernem, the average daily water consumption for two latest billing cycle (ranging from 98 to 151 days) was to the tune of 9,764 m<sup>3</sup> (9.76 MLD). Thus the unaccounted water constituted 5.24 MLD<sup>26</sup> which worked out to 35 per cent.

### 2.11.3.4 Dabose Water Supply Scheme

The Dabose water supply scheme (DWSS) which supplies water to the Sattari taluka in North Goa district has a total installed capacity of 15 MLD. Due to hydraulic constraints of the conveyance grid, the actual production of the plant was only 12.50 MLD equivalent to 12,500 m<sup>3</sup> per day and the actual billed quantity as furnished by concerned sub-divisions<sup>27</sup> was only to the extent of 7,138 m<sup>3</sup>. Thus the unaccounted water in the scheme was 5,362 m<sup>3</sup> which constitutes 43 per cent.

<sup>26</sup> 15 MLD – 9.76 MLD = 5.24 MLD

<sup>27</sup> sub-division 3 of division XXIV, Valpoi

The overall unaccounted water of 35 per cent<sup>28</sup> under all the seven WSS was above the permissible limit of 15 per cent. The PWD was recovering water charges at the rate between ₹ 15 to ₹ 35 per m<sup>3</sup> for the consumption of above 50 m<sup>3</sup> per month for domestic and the actual quantity measured in respect of non-domestic consumers. Considering the rates applicable to various categories of consumers, the revenue lost for unaccounted water excluding the permissible limit of 15 per cent worked out to ₹ 77.37 crore during the year 2012-13 as detailed in *Appendix 2.8*.

#### **2.11.4 Non-replacement of faulty/damaged water meters**

We observed from the test check of seven<sup>29</sup> sub-divisions which have a total number of 89,575 connections that the percentage of damaged meters constitutes 12 to 16 per cent and out of these damaged meters only three to 21 per cent were replaced during the period 2008-13 as given in **Table 9**.

**Table 9: Details of damaged meters and its replacement**

Year	Number of connections	Number of damaged/ non- working meters reported	Percentage of non- working meters	Number of damaged/ non-working meters replaced	Percentage of replaced meters to damaged/ non-working meters
2008-09	80308	10532	13	758	7
2009-10	84186	12317	15	2477	20
2010-11	86481	11476	13	2437	21
2011-12	87097	10888	12	1473	14
2012-13	89575	14000	16	454	3

(Source: Furnished by the Department)

The low replacement level of faulty meters would hamper the Department's initiatives to check unaccounted water and then lead to non-recovery of water charges.

#### **2.11.5 Arrears of water charges**

Arrears of water charges increased from ₹ 16.41 crore at the end of 2008-09 to ₹ 23.49 crore at the end of 2012-13. Almost 30 per cent of the arrears pertained to three consumers namely Western India Shipyard, Mormugao (₹ 1.33 crore), Mandovi Hotels, Panaji (₹ 4.21 crore) and M/s Dalmia Resorts, Mobor (₹ 1.66 crore).

The arrears of M/s Western India Shipyard were due from the year 2005. The consumer paid six lump sum amounts up to August 2009. Thereafter, some part payments up to December 2012 were made leaving an arrear of ₹ 1.33 crore as on March 2013. The Department disconnected the water connection only in April 2013 and the matter had been passed on to the revenue

<sup>28</sup> 529 MLD (total water supplied)-343.90 MLD = 185.10 MLD which is 35 per cent (185.10/539 x 100)

<sup>29</sup> Sub-division 2 of division IX, sub-division 2 & 5 of division XVII, sub-division 1 of division XXIV and sub-divisions 2, 3 and 4 of division XX.

recovery court. The Department did not renew the bank guarantee of ₹ 2.34 lakh submitted (January 2001) by the customer while renewing the water connection and thus the same could not be encashed.

M/s Mandovi Hotels disputed the sewerage charges which were levied from February 1995 along with the water charges. Their contention was that they consume water from sources other than PWD and thus sewerage charge for water from other sources was not payable by them. The Department has neither disconnected the water connection nor taken any action to recover the dues through recovery court during the past 18 years and the arrears mounted to ₹ 4.21 crore as of March 2013.

The arrears of M/s Dalmia Resorts were due from June 1996 when the water connection was disconnected. The revenue recovery of ₹ 5.67 lakh could not be made as the customer discontinued business. When the consumer restarted business in 2007, the Department demanded a sum of ₹ 1.66 crore which included delayed payment charges applicable from time to time. An appeal by the consumer was dismissed (September 2010) by the Hon'ble High Court of Bombay at Goa but the Department has not taken any action on the basis of the Court's order so far to recover the amount (January 2014).

## **2.12 Monitoring**

### ***2.12.1 Non-working flow meters resulting in poor monitoring of water supply***

Installation of flow meters is essential for ascertaining quantity of water supplied. We observed during a joint visit (June 2013) to the Salaulim WTP with the Assistant Engineer of Sub-division 4 that both the flow meters installed (June 2011) on two 1,000 mm raising mains to the WTP at a cost of ₹ 13.68 lakh were not working. The Assistant Engineer informed (June 2013) that both the flow meters were not working since June 2012 due to damage caused during maintenance activity to underground cables. He further informed that the flow meters would be repaired on completion of ongoing replacement work of rising mains to WTP and the contractor had agreed (June 2013) to carry out the repair work without extra cost and his security deposit of ₹ 1.39 lakh was kept on hold.

### ***2.12.2 Non-functioning of SCADA network installed at a cost of ₹1.52 crore***

Supervisory Control and Data Acquisition (SCADA) is a management information system helpful in management of operation and maintenance of a water supply scheme. The data collected from the monitoring devices installed in remote areas are fed into a software (SCADA software) which act as a tool to generate various reports such as daily flow charts, hourly flow charts *etc.* The analysis of SCADA reports would enable the Department to ascertain how much water was fed into the system and that reached at various tapping points *etc.* to locate areas of leakages.

The Opa water supply scheme was connected with a SCADA network in the year 2010 at a cost of ₹ 1.52 crore. It was observed that the SCADA system

was non-operational from May 2011 onwards due to the failure of segment coupler circuit which was short circuited by lightning. The same was repaired and the SCADA started getting the data from local stations from September 2011 onwards with intermittent failures. The SCADA system became partly non-operational from March 2012 as the modem required for internet connection had gone out of order. Though a new modem was procured (July 2012), 6 Airtel sim-cards and 2 Idea sim-cards acquired for data acquisition from remote locations were disconnected (July 2012) by the service providers due to non-payment of dues in time. The BSNL land lines and internet connections were also disconnected due to non-payment of dues. Hence the SCADA network had been non-functional since March 2012 till date (January 2014).

Thus, despite incurring ₹ 1.52 crore on installation of the SCADA the Department has failed to get the full benefits of the system for a period of over two years.

### **2.13 Environmental degradation affecting drinking water sources**

#### **2.13.1 Mining activities in the catchment area resulted in high manganese deposits in the Salaulim dam water**

We observed that the manganese deposits in the Salaulim dam water has been one of the major constraints faced by the Department in the Salaulim water treatment plant. The details of manganese contents reported by Division XII during last five years in the raw water and treated water are shown below:-

**Table 10: Details of manganese contents detected in Salaulim WSS**

Year	Number of months during the year when manganese was reported in		Quantity of manganese reported in milligram per litre	
	Raw water	Treated water	Raw water	Treated water
2008-09	8	2	0.17 to 3	0.05 to 0.09
2009-10	9	5	0.05 to 1.7	0.05 to 0.5
2010-11	10	4	0.05 to 3	0.02 to 0.1
2011-12	9	7	0.13 to 1.8	0.03 to 0.1
2012-13	12	10	0.05 to 2.9	0.06 to 0.1

*(Source : Furnished by the Department)*

The Division reported (July 2012) that manganese deposit in the dam water was due to concentration of many mining activities in the surrounding catchment areas of the dam as the mining dumps percolate to the dam water during monsoon and remains in the water in soluble condition. In order to have effective control of manganese pollution problem at Salaulim dam the division proposed (July 2012) a detail study in collaboration with Director of

Industries and Mines. In this regard, the Directorate of Mines and Geology proposed a joint inspection in August 2012, but the results of the inspection/study have not been furnished to audit by the Department (January 2014).

An analysis of manganese deposit levels recorded during the last five years (2008-13) revealed increasing trend. As per the Manual of Water Supply the acceptable level of manganese in treated water was only 0.05 milligram per litre. However, the manganese detected in the treated water ranged from 0.09 mg to 0.5 mg per litre which was ten times higher than the acceptable limit. Action needs to be immediately taken to ensure that the treated water conforms to the standard laid down.

### ***2.13.2 Waste dumping to Khandepar river and mining activities in the upstream of the river affecting Opa WSS***

The Assistant Engineer of sub-division-V, Opa WTP reported (October 2012) that the lower inlet holes of jackwell was blocked by plastics and other rubbish materials. He further reported (July 2013) that plastic cans, bottles, pieces of cloth *etc.* are flowing in the Khandepar river, thereby choking the intakes and suction lines of the pumps at Opa water works necessitating frequent shut down of the plant.

Mining in the upstream area of the Khandepar river also resulted in increase in the turbidity of the water causing choking of the sand filter beds. This increases the treatment time due to frequent back washing, excess pumping of raw water and thereby decreases the efficiency of the treatment plant.

Action may be taken to ensure that the waste is not dumped in Khandepar river and mining rejects do not affect the working of the Opa plant.

## **2.14 Internal control**

### ***2.14.1 Mechanism for measurement and collection of water charges***

Printing of water bills was outsourced to two vendors *viz.* M/s Megasoftware systems, Margao and M/s Cybercad Technologies, Ponda. For every billing cycle, the meter reader notes the quantity of water consumed for onward submission to the vendor. The vendor works out the water charges leviable and generates printed bills, monthly consumer ledger, daily/monthly revenue collection statements, revenue summary, category wise revenue *etc.*

We selected bills of 50 consumers in each of six sub-divisions for checking by statistical sampling using Idea Software. A random sample of 15 bulk consumers was also included. The observations were:

**2.14.1.1** Barring bulk consumers, no ledgers were maintained at sub-division II of Division IX, Margao with 21,752 consumers. M/s Megasoftware reported that no previous records were maintained. Therefore audit was unable to carry out checks in the sub-division office.

**2.14.1.2** Sub-division II of Division XX with 4,951 consumers maintained manual ledgers with details of payments by consumers. Complaints

about non-recording of receipts by the vendor were received from consumers who received inflated bills. The sub-division had to subsequently make corrections in the bills after checking with the ledgers maintained by it. The position of arrears as recorded in the Megasoft's records and as per the sub-divisional ledgers for the last five years are shown in **Table 11**.

**Table 11: Difference in arrears between Departmental ledger and billing agency**

*(Amount in ₹)*

Year	Arrears as per Megasoft ledger	Arrears as per sub-divisional ledger	Difference
2008-09	691609	387009	304600
2009-10	524851	478636	46215
2010-11	757924	547415	210509
2011-12	875670	749108	126562
2012-13	859088	676698	182390
<b>Total difference</b>			<b>870276</b>

*(Source: Furnished by the Department)*

**2.14.1.3** The audit team along with the sub-divisional staff visited the vendor M/s Megasoft systems to ascertain the various security, input, processing and output controls existing in the computerised billing system. We observed that:

- Megasoft had 10 dedicated data entry operators (DEOs) for PWD work. They were working on a data base management system developed through Foxpro. The DEOs were allotted a fixed set of zones for data entry and each DEO was responsible for his/her zone. The DEOs did not have a unique access user identification or user password that authorised them to enter or modify data.
- In case of corrections in a bill, ideally, the sub-division was to send the corrected bill authorised by the Assistant Engineer to Megasoft so that they could enter the changes in the system. File modifications however, were also carried out on instructions or authorisation for the same over the telephone from a Junior Engineer or an Assistant Engineer.
- There was no system in place at the sub-divisional level to cross check the arrear figures calculated by Megasoft.
- When asked to furnish the soft copy of all the ledgers for the last five years, Megasoft stated it was unable to do so because as a practice it maintained the ledger dated only upto the last billing cycle and deleted the previous one. It supported its action by saying that there was no clause in the tender schedule which binds them to preserve past ledgers.

The system of billing and maintenance of records by the Department was compromised by lack of internal controls with regards to the operations carried out by the vendor. As the Department adopted the arrears position as provided by the vendors, the figures of revenue shown in the accounts records are susceptible to inaccuracies. The contract agreement with the vendors may be reviewed to ensure security of data and safe keeping of past data through suitable back up.

### **2.15 Conclusion**

The Department could not recover its operation and maintenance cost to the extent of ₹ 480.50 crore over the last five years. The implementation of works under JICA project was tardy resulting in cost overrun. Inordinate delay in acceptance of tenders resulted in avoidable escalation payment of ₹ 69.02 crore. There was unjustified extra expenditure of ₹ 21.89 crore on replacement of water meters. Lack of periodic maintenance of plant and machineries resulted in high power consumption and payment of penalty on low power factor. Lack of planned preventive maintenance works resulted in maintenance works being executed in adhoc and irregular manner. While there was three-fold increase in domestic tariffs over the period 2008-13 the increase in non-domestic tariffs was only marginal. The prevailing percentage of unaccounted water was 35 *per cent* against the permissible limit of 15 *per cent* prescribed in the water supply manual. The Department has not installed flow meters to measure water supply on all water supply schemes and those installed are not functioning resulting in poor monitoring. The SCADA installed was only partly functional due to delayed payment of utility bills and delayed repairs to circuit failures. The mining dumps and waste dumping in raw water sources hampered functioning of water treatment plants. The internal control mechanism on outsourced billing operations are compromised by lack of input, processing and output controls.

### **2.16 Recommendations**

- The Department should revise the water tariffs applicable to non-domestic consumers in line with the revision of domestic tariffs.
- The Department should introduce planned periodic maintenance for its plant, machinery, pipe lines and fittings.
- An annual survey to identify areas of leakages should be conducted and plan its maintenance works to check unaccounted water.
- The Department should conduct a mid-term review on implementation of JICA project and ascertain the additional funding requirements for completion of the projects.