

Chapter-IV
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Flow meters were installed at 32 locations against the requirement of 58 locations. Out of these 32 locations, water supply in terms of LPCD found less than the norms at 23 locations. It was observed that in 72 out of 604 test-checked cases, the discharge of raw water by Irrigation and Water Resources Department was lesser than actual requirement whereas the storage capacity of Storage and Sedimentation tanks in 63 out of 604 cases was found to be less than the actual requirement. In urban area, 48 per cent of 3.16 lakh connections were unmetered. Records related to history of pumping machinery were not found maintained.

4.1 Assessment of quantity of water supplied

Assessment of quantity of water being supplied was one of the objectives of this Performance Audit. During audit, it was observed that elaborate data regarding operational hours of water motors/tubewells and machinery details viz. Brake Horse Power (BHP), Litre per minute (LPM) etc. was not available in divisions.

Hence, to determine actual quantity of water supplied, 58 locations were selected where the concerned departments (i.e. PHED, HSVP, ULBs) agreed to install flow meters at water works. The details are given in **Table 4.1** below:

Table 4.1: Status of installation of flow meter

Name of department	No. of locations where flow meter was to be installed	No. of locations where either flow meter was not installed/related record not provided to audit	No. of locations where water supplied was found less than the prescribed norms
PHED	15	3	8
HSVP	31	11	15
ULB	12	12	--
Total	58	26	23 out of 32

From the above, it can be assessed that out of 12 locations of PHED, water supply in respect of 8 locations and out of 20 locations of HSVP, water supply in respect of 15 locations was below the prescribed norms. The details are given in **Appendix 9**. Thus, the departments failed to provide water supply to the inhabitants as per prescribed norms.

Beneficiary survey: 95 out of 608 beneficiaries (16 per cent) stated that water supply was available after gap of one or more than one day whereas 125 out of 608 beneficiaries (21 per cent) stated that there was shortage of water supply in summer season. However, people met their needs through tankers (either departmental or private).

4.2 Status of Water supply to consumers in PHED

PHED has adopted norms of water supply for the Rural as 55 LPCD in Non-DDP areas and 70 LPCD for Desert Development Programme (DDP) areas. As per the CPHEEO manual published in May 1999, the project components viz. water treatment units and clear water reservoirs and balancing tanks are designed by taking design period of 15 years. Components viz. raw water and clear water conveying mains and distribution systems are designed by taking design period of 30 years. The data dump related to water supply and its related components available on departmental website was provided by the Office of the EIC, PHED, Haryana. The dump data of eight selected districts was analysed as per methodology detailed in *Appendix 10*.

The results of analysis revealed the following:

4.2.1 Sanctioned discharge for water works less than required discharge

In surface water supply schemes, Irrigation department sanctions outlet at any particular location. Raw water is taken from Irrigation department from sanctioned outlet and is stored in Storage and Sedimentation tank for fulfilling the water requirement/demand during canal closure. While sanctioning size of outlet, several components are taken in consideration like futuristic prospective population considering two *per cent* increase per year, canal closure, canal running period. The sanctioned discharge may be revised by Irrigation and Water Resources Department due to change in canal running and closure period.

To calculate the required discharge¹ of raw water from Irrigation department, audit worked out the actual status by taking prospective population for the year 2021, canal running days, canal closure days, 55 LPCD requirement for Non DDP areas and 70 LPCD requirement for DDP areas (*Appendices 11 and 12*). It was noticed that in 12 *per cent* cases² (72 out of 604 cases) in selected districts, actual sanctioned discharge was much lesser than the required discharge, with maximum number of cases having a shortage in discharge of 26 *per cent* to 50 *per cent* as given in *Table 4.2 (a)* and *4.2 (b)*.

¹ Total requirement of water in litre: Total Population * LPCD (55/70) + 15 *per cent* evaporation losses.

² There were 58 cases in DDP areas and 14 cases in non-DDP areas where discharge sanction was less than required sanction.

Table 4.2 (a): District-wise number of water works/cases where sanctioned discharge was less than the requirement

Name of District	Hisar	Fatehabad	Karnal	Rewari	Rohtak
Total water works for which outlet sanctioned by Irrigation department	259	120	1	86	138
Cases where sanctioned discharge was less than the required discharge	53	4	0	1	14
Cases in terms of percentage	20	3	--	--	10

Table 4.2 (b): Bifurcation of water works/cases on the basis of shortage in terms of percentage

District/Range	0-10 per cent	11-25 per cent	26-50 per cent	51-75 per cent	76-100 per cent
Hisar	5	7	20	14	7
Fatehabad	0	1	1	2	0
Rewari	0	0	0	0	1
Rohtak	3	4	6	1	0
Total cases	8	12	27	17	8

Thus, it is assessed that Litre Per Capita per Day (LPCD) as per norms is unlikely to be achieved due to lesser sanctioned discharge than the required discharge.

4.2.2 Less Storage capacity of Storage and Sedimentation (S&S) tank

For the required capacity of S&S tank during the closure period of canal, audit worked (*Appendix 10*) out the requirement by taking prospective population for the year 2021, canal running days, canal closure days, S&S tank capacity, evaporation losses @ 15 per cent, 55 LPCD requirement for Non DDP areas and 70 LPCD requirement for DDP areas.

It was observed that in selected districts where water is supplied through canal water supply, the storage capacity of S&S tanks in 11 per cent cases³ (63 out of 604 cases) was found to be less than the actual requirement of population during closure period of canal as indicated in *Table 4.3 (a) & 4.3 (b)*. The details can be seen in *Appendices 13 and 14*.

Table 4.3 (a): District wise cases where storage capacity of S&S tank was less as per requirement

Name of District	Hisar	Fatehabad	Karnal	Rewari	Rohtak
Total storage & sedimentation tanks	259	120	1	86	138
Cases where storage capacity was less than the required	47	12	0	2	2
Cases in terms of percentage	18	10	--	--	--

Table 4.3 (b): Bifurcation of cases on the basis of shortage in terms of percentage

District/Range	0-10 per cent	11-25 per cent	26-50 per cent	51-75 per cent	76-100 per cent
Hisar	15	15	5	8	4
Fatehabad	2	2	3	3	2
Rewari	0	1	0	1	0
Rohtak	0	0	1	1	0
Total cases	17	18	9	13	6

³ In DDP area, 61 cases where water requirement is 70 LPCD whereas in non-DDP areas where water requirement is 55 LPCD, two cases were detected.

Thus, it is assessed that in the absence of full storage capacity of water during canal closure period, department is unlikely to provide 55/70 LPCD for the habitants.

4.3 Case study of Rewari town

A case study of Rewari town was carried out to assess the performance towards supply of water in the town against the requirement and efficiency in revenue collection of water charges. The result of the case study is as under:

In Rewari town, the main source of water supply is canal based (JLN Feeder) and tube wells have also been installed to meet the requirement during canal closure period. The following agencies are responsible for providing and up-gradation of structures related to water supply in Rewari town:

Sr. No.	Name of agency	Population served (till 2021)	Jurisdiction/Area	Actual water supply against 135 LPCD	Capacity of Water Treatment Plant (WTP) under the jurisdiction
1.	PHED	1,79,001	Entire town area (except HSVP sectors)	111	30 MLD (168 LPCD)
2.	HSVP	43,966	Sector areas of HSVP	86	7 MLD (159 LPCD)

As is evident from the above, adequate capacity of water treatment plants were available to treat the drinking water in Rewari Town.

The status of water supply under the jurisdiction of the agencies is as under:

- Areas under the jurisdiction of PHED:** There are two canal based water-works (one is situated at Kalaka and another at Lisana) to provide water supply to the inhabitants residing in Rewari town under the jurisdiction of PHED. Apart from these, there are two tube-wells which are installed to meet the requirement. The storage capacity of sedimentation tanks (636.87 million litres) was found less than the requirement (1,039.10 million litres). Due to insufficient storage capacity, as against the requirement of water supply of 135 LPCD, PHED could supply only 111 LPCD.

To provide water supply as per norms, the work of construction of additional storage tank and other allied works was administratively approved in June 2019. Till March 2021, an amount of ₹ 20.62 crore (2019-20: ₹ 7.94 crore, ₹ 2020-21: ₹ 12.68 crore) had been allocated for execution of the above said project. Due to delay in finalization of land, the construction work of additional storage tank could not be started. Thus, despite availability of funds and raw water, construction work of additional storage tank was not started thereby depriving the citizens to intended benefit of the facility.

- **Areas under the jurisdiction of HSVP:** As per information provided by Divisional Office, HSVP, it was noticed that people were getting 86 LPCD water as against the requirement of 135 LPCD.
- **Areas under the jurisdiction of MC:** The main objective of the AMRUT scheme to provide household tap connection to every citizen in town area remained unachieved as nearly 11.14 *per cent* households were not considered for providing tap connection even in approved Detailed Project Report of Rewari town under AMRUT. The details are as follows:

Total households	Households covered before execution of project	Households proposed to be covered in this project	Total no. Households covered after project implementation	Remaining households with no tap connection after project completion	Percentage of households remaining
(a)	(b)	(c)	(d) = (b) + (c)	(e) = (a) – (d)	(f) = (e)*100/(a)
28,702	23,597	1,909	25,506	3,196	11.14

Other issues regarding water supply in Rewari Town

- During scrutiny of records for the period 2016-21, it was noticed that PHED assess the total requirement for domestic consumers of Urban Areas on the basis of prospective population for next 30 years by taking into consideration the water allowance of 135 LPCD as per CPHEEO Manual. However, while assessing the total water requirement for Rewari town, the institutional⁴ requirements were not considered by the PHED.
- No record was maintained by PHED for maintenance of pumps and motors to ascertain the efficiency of machinery.
- Log-books were not maintained in PHED where O&M was done by outsourcing staff.

Efficiency in Revenue collection

During the period 2016-21, an amount of ₹ 20.70 crore (PHED: ₹ 17.55 crore + HSVP: ₹ 3.15 crore) was to be collected from the consumers of Rewari Town as water charges. Out of this, ₹ 6.50 crore (PHED: ₹ 5.71 crore + HSVP: ₹ 0.79 crore) was pending from consumers as on 31 March 2021. However, an expenditure of ₹ 47.93 crore (PHED: ₹ 32.02 crore + HSVP: ₹ 15.91 crore) had been incurred by both these departments on Operation & Maintenance of water supply component during 2016-21. Thus, revenue generated was not adequate to cover the O&M expenditure of the water supply system.

⁴ For hospitals: 340 to 450 LPCD (per bed), hostels and boarding schools/colleges: 135 LPCD, day schools/colleges: 45 LPCD, restaurants: 70 LPCD (per seat) and for cinema and theatre: 15 LPCD.

4.4 Some specific systemic issues

For the canal based water supply, the running and closure period is modified by the Irrigation and Water Resources Department based on the availability of water in the canals. Audit observed delays in works planned/undertaken by the PHED for providing water supply during the closure period due to improper planning, the details are as under:

4.4.1 Lack of planning leading to delay in construction of additional storage tank

Scrutiny of records⁵ revealed that the work “Augmentation of raw water storage capacity by construction pumping station and new S&S tanks at Pataudi Road and Lisana (W/W) Renovation and updating of structures of Lisana (W/W) for Rewari Town District Rewari” was given administrative approval (June 2019) by Water Supply and Sanitation Board for the year 2019-20 under “**Augmentation Urban Water Supply**”. The estimate amounting to ₹ 50.58 crore was framed to cover the cost of Construction of new S&S tanks at Pataudi Road & Lisana WW, renovation & updating of structures of existing WW Lisana for Rewari town.

Scrutiny revealed that despite administrative approval, detailed estimate of the project had not been approved till date. Till date, an amount of ₹ 20.62 crore (2019-20: ₹ 7.94 crore; 2020-21: ₹ 12.68 crore) had been allocated for execution of the said project but divisional office failed to commence the project. Storage capacity of both the tanks was 636.87 million litres and tube wells were installed to meet out the balance requirement, which on an average ran 8 hours daily per day as per information furnished by divisional office. Audit worked out the quantity of net water provided (LPCD) during the canal closure of 24 days as given in **Table 4.4**.

Table 4.4: Quantity of water provided during canal closure

1.	Capacity of raw water tanks	636.87 million litre
2.	Water available from tube wells (considering 100 per cent efficiency factor)	2.3 million litre ⁶
3.	Total water available	639.17 million litre
4.	Deducting 25 per cent evaporation loss	159.79 million litre
5.	Net water available for distribution for 24 days	479.38 million litre
6.	Population of Rewari town as per 2011 census	1,43,201
7.	Considering 2.5 per cent increase per year (2021)	1,79,001
8.	Net water provided per day per person	479.38 million litre/(1,79,001 ⁷ x24) = 111 LPCD

From the above, it was assessed that department was providing 111 LPCD to the inhabitants of Rewari town as against the norms of 135 LPCD. Thus, despite availability of funds and availability of raw water, divisional office was not able

⁵ EE, PHED-1, Rewari.

⁶ 8 hours x 60 x 200 LPM x 24 days.

⁷ Population of the town as per 2011 census plus 2.5 per cent increase per year till 2021 (1,43,201+35,800=1,79,001).

to start the work (delay in constructing additional storage tank) due to lack of planning (delay in finalization of land) thereby depriving the citizens to access to required quantity of potable water.

4.4.2 Planning failure leading to non-provision of water supply as per norms

Para 6.5.5 of Haryana Public Works Department code provides that the divisional officer shall keep on record complete plans of works (i.e. plans of roads, canals, distributaries, drains, sewers, water supply lines etc.) under his charge as actually constructed, with any subsequent alteration.

Scrutiny of records of Executive Engineer, Public Health Engineering Division, Fatehabad, it was seen that work of Augmentation of Canal based WW in Bhuna could not be made operational as the work of Inlet channel could not be completed on time, the details are given in **Table 4.5**.

Table 4.5: Status of work Augmentation of canal based water works in Bhuna town

Sr. No	Name of work	Name of agency	Date of start of work	Scheduled completion of work	Status of work as on May 2022	Remarks
1.	Augmentation of canal based WW in Bhuna	Maha Laxmi Construction Company	19 December 2017	18 March 2019	In progress	Two different agreements (mains and inlet channel) were made to complete work. The work of Inlet Channel could not be completed due to non-availability of land.
		Sunder Lal Sharma Contractor	19 December 2017	18 December 2018	Completed	

The department was lifting raw water from minor⁸ through Syphon for storing water in Storage tanks as a temporary arrangement. Despite availability of sanctioned raw water (5.33 cusec) for this project and even after incurring an expenditure of ₹ 21.09 crore against the estimated cost of ₹ 24.76 crore on this work, required LPCD water supply to the inhabitants could not be possible. Further, possibility of water losses due to the temporary arrangement cannot be ruled out.

During exit conference (November 2022), PHED stated that reply would be conveyed after verification of the details. Reply is awaited as of December 2022.

4.5. Provision of metered connection

Haryana State Rural Water Policy 2012 emphasizes on providing individual household metered connections to 50 *per cent* rural populations by the end of 12th Five Year Plan (2012-17) i.e. up to year 2017.

⁸ Channel taking off from the main canal or distributary with head discharge of less than one cumec.

During scrutiny of records⁹, it was observed that department is collecting water charges on flat rate basis (by following the notification¹⁰ dated 03 April 2017 according to which tariff charges for General category beneficiaries and SC category beneficiaries is ₹ 40 per and ₹ 20 per month respectively in villages which are not falling under any MC areas instead of billing as per meter reading. Thus, the department failed to achieve desired target of covering 50 per cent rural population under metered connections.

4.5.1 Haryana Shehri Vikas Pradhikaran

HUDA (now renamed as HSVP) vide notification (19 April 2017) has clearly indicated that no water supply services will be provided to Institutional, Industrial, Commercial etc. consumers having no metered connection.

During scrutiny, audit observed that amongst domestic beneficiaries, 37 per cent unmetered and 0.7 per cent illegal connections were found. Similarly, in case of other than domestic beneficiaries 32 per cent unmetered and 1.4 per cent illegal connections were found (*Appendix 15*).

Till date, no action has been taken (nor any penalty imposed) by the HSVP authorities on these unmetered as well as illegal connection holders.

4.5.2 Urban Local Bodies Department

Urban Local Bodies Department notified (August 2018) that if the water meter is not working then it will be treated as unmetered connection and the users will be charged on flat rate basis depending upon the size of the plot. However, no unmetered water supply connections shall be allowed in the Institutional/Commercial/Industrial establishment in future. Even for the existing water supply, unmetered connections shall be converted to metered ones by the occupants in a period of three months from the date of order otherwise rate of bill charges shall be minimum ₹ 2,000 per month.

Amongst domestic beneficiaries in MC divisions¹¹, 53 per cent unmetered and 22 per cent illegal connections were found. Similarly, in case of other than domestic beneficiaries 41 per cent unmetered and 18 per cent illegal connections were found as detailed in *Table 4.6*.

⁹ Public Health Engineering Department

¹⁰ The notification provides details of water tariff to be collected from each category of consumers along with rate per Kilolitre for metered supply and flat rate for unmetered supply.

¹¹ MC-Faridabad & Karnal. The figures are provided by concerned MCs and there are mismatch in the data provided by both MCs as number of total consumers is not matching with the total number of connections (domestic as well as other than domestic beneficiary).

Table 4.6: Details of water connection in MCs

Name of District	Total Consumer	Domestic Beneficiary				Other than Domestic Beneficiary			
		No. of Connections	Metered Connections	Unmetered Connections	Illegal Connections	No. of Connections	Metered Connections	Unmetered Connections	Illegal Connections
Faridabad	1,91,711	1,34,625	27,598	1,07,027	49,932	5,629	2,277	3,352	1,525
Karnal	38,671	37,516	27,070	10,446	0	1,155	1,064	91	0
Total	2,30,382	1,72,141	54,668	1,17,473	49,932	6,784	3,341	3,443	1,525

Till date, no action has been taken (nor any penalty imposed) by the MC authorities on these unmetered as well as illegal connections holders.

4.5.3 Public Health Engineering Department

The information related to unmetered connection in other than domestic (Institutional, Commercial, Industrial, etc.) beneficiaries was not furnished.

4.6 Conduct of Water Audit

As per Central Public Health & Environmental Engineering Organisation (CPHEEO) Operation & Maintenance Manual (Chapter-15), water audit of Water Supply Schemes is defined as the assessment of the capacity of total water produced by the authority and the actual quantity of water distributed throughout the area of service of the authority, thus leading to an estimation of the losses.

During scrutiny of records, it was noticed that both the departments viz. Haryana Shehri Vikas Pradhikaran and Urban Local Bodies had not conducted any water audit as ibid in the manual. No such exercise to detect estimated water losses by calculating water availability and further distribution to consumers had ever been conducted by these departments. In the absence of water audit, estimation of water losses is not possible, which is a cause of concern.

4.7 Leakage in distribution system leading to generation of non-revenue water

Chapter-15 of O&M Manual for Rural Water Supply defines Non-Revenue Water/ Un-accounted for Water (NRW/UFW) as the expression used for the difference between the quantity of water produced and the quantity of water billed or accounted for.

$$\text{NRW/ UFW} = \text{Quantity of water produced} - \text{Quantity of water billed/ accounted for}$$

In surface water supply schemes, Irrigation department sanctions outlet at any particular location. From this outlet, raw water is carried through Inlet channel and ultimately the water gets stored in storage & sedimentation tank for further supply to inhabitants. Scrutiny of records in EIC, PHED for the period 2016-21, it was seen that the bulk flow meters were not installed at production points to quantify the raw water availability from Irrigation department. In rural areas also, the water meters did not exist. In absence of the metering systems,

department was not having the data regarding total availability of raw water and total water distributed to consumers.

Similarly, in tube well based supply, no such metering mechanism was available to know the exact quantity of water extracted from tube wells (for further supply to inhabitants). In absence of proper metering of the water supplied, audit could not ascertain the actual loss of water in the distribution system.

In response to audit query, the department stated (December 2021) that size of the outlet was used as measuring tool to quantify the raw water supplied. Similarly, in case of tube well based supply, the quantity of water extracted was measured by considering the actual pumping hours and capacity of pumping set.

The reply of the department is not acceptable as the facts as stated were not supported by any documentary evidence. It was also noticed that log books of the installed pumping sets were not maintained at places where contractual staff was hired for the purpose.

Thus, department had no sound mechanism to assess the quantity of water available with department for supply (either received from I&WRD¹² or by pumping out ground water from tube wells) vis-à-vis quantity of water actually being supplied to the consumer.

The department (June 2022) while agreeing to the audit observation stated that a detailed action plan would be unveiled and posed to the Government for additional financial support so that an in-built mechanism of measurement of flow is maintained for each scheme which would be beneficial in effective water management.

Beneficiary survey: 118 out of 564 beneficiaries (21 per cent) complained about leakage of water whereas 211 out of 564 beneficiaries (37 per cent) complained about low pressure of water.

4.8 Non-maintenance of records related to history sheets of pumping machinery

Para 11.3 of O&M Manual for Rural Water Supplies published by Ministry of Drinking Water & Sanitation, Government of India (May 2013) provides details regarding pumping machinery maintenance. As per Para 11.3.2, a history sheet of pump and motor should be maintained indicating its specifications, date of installation/commissioning, records of periodical maintenance, repairs, inspections and tests.

Scrutiny of records¹³ revealed that no such record was maintained by divisional offices related to pumps and motors. In the absence of the record related to

¹² Irrigation & Water Resources Department.

¹³ PHED: Rewari, Fatehabad, Kosli, Tohana, Bawal, Faridabad, No.1 & 2: Rohtak.

maintenance of the pumps and motors, audit could not ascertain the efficiency of the operation and maintenance of the machinery.

Conclusion

At 23 locations, where quantity of water supply was checked using flow meters, water supply in terms of LPCD was found less than the norms. It was observed that in 72 out of 604 test-checked cases, the discharge of raw water by Irrigation department was lesser than actual requirement whereas the storage capacity of Storage and Sedimentation tanks in 63 out of 604 cases was found to be less than the actual requirement. Department is collecting water charges on flat rate basis in rural areas which was against the provisions of Haryana State Rural Water Policy 2012. In urban areas, 48 *per cent* of 3.16 lakh connections were unmetered. Records related to history of pumping machinery were not found maintained

Recommendations

In view of the above audit observations:

- 4 *Periodic assessment for upgrading water supply infrastructure must be done by preparation of half-yearly/yearly returns.*
- 5 *Metering should be made mandatory for effective water management so that leakage/wastage of precious water could be avoided and fines be imposed on consumers having unmetered and illegal connections.*
- 6 *To assess total water availability for distribution, the department should explore option of capturing realtime based data/IoT (Internet of Things) based data at source/water works so that proper monitoring may be done at any time and at any level.*

