Management of Drinking Water and Sanitation Services; Accessibility and its Impact on Service Quality, Peru 2025

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Summary
The purpose of this research is to verify how the variables "Management of drinking water and sanitation services and Accessibility to drinking water and sanitation services", affect the dimensions of the variable "Quality of water and sanitation services Enel Peru 2025. The research has a quantitative, cross-sectional, non-experimental, basic and correlational descriptive approach. Among the main results, it can be mentioned that in Peru in 2025 there are 4.07 million inhabitants without access to safe water and 9.8 million inhabitants without quality sewerage or sanitation, deteriorating the quality of life and affecting the health and exposure to risk of this human group. On the other hand, economic and financial indicators show that there are deficiencies, which is why there are 19 providers intervened by OTASS. And in relation to quality, it can be seen that most of them are discontinuous systems, with excess water losses, and lack of effective metering, with infrastructure that already requires renovation, a high level of complaints and a low level of effective treatment of wastewater. Among the main recommendations is that the state should be concerned with generating new and trained personnel to take over the reins of companies and improving salary levels to attract trained and experienced professionals who can show results in the short term. In relation to accessibility, it is recommended to reformulate procedures to promote and expedite investment, given that billions are required to close gaps in accessibility and renovation of infrastructure, as well as institutional projects. In general, it is indicated that the main problem facing the drinking water and sanitation sector is the inability to execute investments with quality and efficiency.

Keywords: Management, Accessibility and Quality, Sanitation Services

Introduction

The search for background information reveals that relatively few researchers have ventured into issues of drinking water and sanitation; a reality that affects not only Peru, but all of Latin America, where the production of reports falls mostly on international organizations. For those of us who work in the sector, it is worrying to observe how, despite the passage of time and changes in government, inefficiencies in management persist. Access gaps continue to widen and the natural deterioration of infrastructure increasingly compromises the quality of service

According to data from PAHO (2024), it is estimated that in Latin America there are 166 million people without access to drinking water and 338 million without sanitation. This lack not only deteriorates the quality of life and pollutes the environment, but also generates serious public health problems, such as intestinal, parasitic and dermatological diseases, in addition to putting the physical integrity of children at risk. Given the importance of this problem, the United Nations has prioritized its attention through Sustainable Development Goal (SDG) No. 6.

The "Management of drinking water and sanitation services in Peru" and at the national level, are the political and administrative responsibility of the MVCS as the governing body, and it has operators for urban and rural areas distributed as follows: In urban areas with 52 companies and which have a mega-company that is SEDAPAL, it has large G1 companies that are 6 and large G2 that are 15, medium-sized companies M that are 15 and small companies P that are 15. In addition, there are 48 urban companies not yet recognized by the regulator. On the other hand, it has 580 small cities that are administered by the UGM and 73,864 rural communities that are assisted by the ATMs.

From the SUNASS Benchmarking for the period 2024-2025, published on the regulator's website. it is evident that the levels of accessibility in Peru are still far from reaching the universal coverage proposed by the United Nations in Sustainable Development Goal number six. The operational structure of the sector shows a deep fragmentation, where 74,542 operators coexist to serve a total population of 34.3 million inhabitants, of which the greatest benefit burden falls on the 50 Service Provider Companies and SEDAPAL, and that despite institutional efforts there is a stagnation in the closing of gaps. with approximately 4.17 million people who lack access to safe drinking water and a critical figure of 9.97 million inhabitants, equivalent to 29.1% of the national population, who still do not have sanitation or sewerage services.

Table 1. Population and service coverage

Number of operators and population covered at the country level 2025					
Operator Type	Quantity	Density	Population (Thousands of inhabitants)		
			Total	With water P.	With Sewerage

					Hab.	Cob.	Hab.	Cob.
SEDAPAL	EPS - S	1	3.75	11,039	10,351	93.8%	10,085	91.4%
LARGE EPS 1	EPS - G1	6	3.90	5,523	4,958	89.8%	4,560	82.6%
BIG EPS 2	EPS - G2	13	3.23	3,806	3,226	84.8%	2,760	72.5%
MEDIUM EPS	EPS - M	15	3.17	1,773	1,477	83.3%	1,293	72.9%
SMALL EPS	EPS - P	15	3.41	504	438	87.0%	416	82.6%
URBAN IN EPS	UGM	48	3.44	1,149	1,035	90.1%	662	57.6%
SMALL TOWNS	UGM	580	3.73	2,316	1,977	85.4%	1,324	57.2%
RURAL	OC	73,864	3.10	8,210	6,687	81.5%	3,249	39.6%
TOTAL		**74,542**	Hab/viv.	**34,319**	**30,149**	**87.8%**	**24,349**	**70.9%**

Fuente: Benchmarking SUNASS

As can be seen the disparities between the different management models. While in the area of SEDAPAL, sewerage coverage reaches 91.4%, in rural areas, managed by more than 73,000 community organizations, this indicator plummets to an alarming 39.6%, evidencing a disconnect between population growth, which is advancing at a rate of 2% per year, and the expansion of infrastructure. The inefficiency is not only in coverage, but also in budgetary and technical execution; Although resources are allocated for investment, the average execution barely reaches 55%. This operational inability translates into a worrying inventory of 547 paralyzed works that represent an investment of 6,100 million soles, which, when ending in arbitration or abandonment processes according to reports from the Comptroller's Office, a process that lasts many years in which the infrastructure is abandoned, and exposed to the weather without maintenance and that has been vandalized due to lack of surveillance, which is why most of the infrastructure is deteriorated and unusable. The economic and financial situation of the drinking water and sanitation sector in Peru reveals a particular and large-scale market structure that conditions its management. As it is a vital service for health and human development, its provision is organized under the figure of natural monopolies. This technical condition arises because it is not possible for two or more operators to coexist in the same locality, each with its own infrastructure as it is in the case of telephony, cable, it would be economically inefficient. This scenario of operational exclusivity and according to reports only from the 51 (EPS) it has been determined that together they serve 22.09 million inhabitants, generating annual income of 4,293 million soles, giving direct employment to more than 11,800 people, and thousands of indirect jobs through outsourcing, which is considered necessary to operate and maintain an infrastructure valued at more than 8,370 mlls.

The financial analysis of the sector is based on the Benchmarking and Regulatory Accounting reports of SUNASS, these financial statements will allow the economic health of the sector to be evaluated by calculating solvency, liquidity and profitability ratios.

Table 2. Balance sheet of the drinking water and sanitation sector

Balance Sheet of the 51 EPS				
		Year 2022	Year 2023	Year 2024
90	ACTIVE			
100	CURRENT ASSETS			
120	CASH AND CASH EQUIVALENT	1,894,682,704	1,992,980,308	2,019,079,097
140	TRADE RECEIVABLES	573,402,070	603,515,035	598,947,935
142	OTHER ACCOUNTS RECEIVABLE (NET)	218,143,589	283,993,649	184,886,250
150	RELATED PARTY RECEIVABLES	0	49,931	3,056,525
170	INVENTORIES (NET)	72,008,801	78,056,473	69,096,011
192	INCOME TAX ASSETS	10,054,729	14,219,696	20,885,200
200	DEFERRED EXPENSES	23,546,142	25,702,457	8,587,915
210	OTHER ASSETS	85,867,950	85,761,831	112,059,537
240	TOTAL, CURRENT ASSETS	2,877,705,985	3,084,279,380	3,016,598,470
260	NON-CURRENT ASSETS			
280	TRADE RECEIVABLES	60,346,539	37,080,600	53,169,015
282	OTHER ACCOUNTS RECEIVABLE	329,599,291	276,002,497	214,248,196
325	REAL ESTATE INVESTMENTS (NET)	0	0	342,267
330	INVESTMENT PROPERTIES	1,600,364,424	1,453,427,523	0
340	REAL ESTATE, MACHINERY AND EQUIPMENT	15,189,927,304	15,283,293,525	17,450,961,057
	PROPERTY, PLANT AND EQUIPMENT (NET)	9,555,276	24,505,667	0

350	INTANGIBLE ASSETS	73,399,885	80,768,431	88,887,654
360	TAX ASSETS, INCOME AND DEFERRED SHARES	14,008,977	14,209,120	12,588,437
380	OTHER ASSETS	356,549,522	367,988,354	377,923,401
390	TOTAL, NON-CURRENT ASSETS	17,633,751,218	17,537,275,717	18,198,120,027
400	TOTAL, ACTIVE	20,511,457,203	20,621,555,097	21,214,718,497
500	LIABILITIES AND EQUITY			
510	CURRENT LIABILITIES			
520	BANK OVERDRAFTS	770,701	808,828	524,719
530	FINANCIAL OBLIGATIONS	629,881,907	725,233,290	753,450,140
540	TRADE PAYABLES	474,621,421	329,047,586	410,726,029
542	OTHER ACCOUNTS PAYABLE	417,395,485	405,163,303	468,305,195
550	ACCOUNTS PAYABLE TO RELATED ENTITIES	81,073,875	209,365,166	162,285,162
580	PROVISIONS	175,405,507	186,199,647	220,311,105
592	INCOME TAX LIABILITIES	77,054,581	43,714,141	21,389,593
594	EMPLOYEE BENEFITS	177,665,735	165,885,463	164,153,089
600	OTHER LIABILITIES	10,201,055	8,567,821	3,399,582
603	TAXES, CONTRIBUTIONS AND OTHERS	76,725	183,299	0
604	REMUNERATION AND SOCIAL BENEFITS	882,923	906,281	0
610	TOTAL, CURRENT LIABILITIES	2,045,029,916	2,075,074,826	2,204,544,614
620	NON-CURRENT LIABILITIES			
630	FINANCIAL OBLIGATIONS	2,258,056,807	2,441,781,524	2,510,926,706
640	TRADE PAYABLES	26,127,369	29,815,305	35,427,142
642	OTHER ACCOUNTS PAYABLE	529,741,504	459,447,309	463,433,035
650	ACCOUNTS PAYABLE TO RELATED ENTITIES	1,047,809,930	1,038,222,339	993,527,938
660	LIABILITIES FOR TAX. TO THE INCOME AND PARTIC. DEFERRED	464,750,198	297,551,287	270,015,794
680	PROVISIONS	2,084,116,475	2,134,438,393	1,946,635,638
682	EMPLOYEE BENEFITS	31,856,716	29,855,007	27,474,705
684	OTHER LIABILITIES	2,012,491,528	2,017,601,893	1,850,946,539
690	DEFERRED REVENUE	2,323,522,397	2,439,137,176	2,533,657,165
720	TOTAL, NON-CURRENT LIABILITIES	10,778,472,924	10,887,850,233	10,632,044,662
740	HERITAGE			
750	CAPITAL	4,795,410,092	4,940,050,967	4,970,856,997
770	ADDITIONAL CAPITAL	2,324,514,202	2,277,394,398	2,215,129,703
790	LEGAL RESERVATIONS	34,113,669	50,290,565	51,496,693
810	CUMULATIVE RESULTS	143,325,053	29,500,300	773,893,031
830	OTHER HERITAGE RESERVES (*)	379,924,913	346,932,514	366,752,797
840	NATIONAL TREASURY	10,666,434	14,461,294	0
890	TOTAL, EQUITY	7,687,954,363	7,658,630,038	8,378,129,221
900	TOTAL, LIABILITIES AND EQUITY	20,511,457,203	20,621,555,097	21,214,718,497

Source: CR SUNASS

Table 3. Income statement of the drinking water and sanitation sector

Income statement of the 51 EPS				
		Year 2022	Year 2023	Year 2024
100	INCOME FROM ORDINARY ACTIVITIES			
130	TOTAL INCOME FROM ORDINARY ACTIVITIES	3,735,379,398	4,038,886,038	4,292,491,724
160	TOTAL, OPERATIONAL COSTS	-2,231,393,444	-2,384,289,160	-2,425,346,395
170	GROSS PROFIT (LOSS)	1,503,985,954	1,654,596,878	1,867,145,329
180	SALES AND DISTRIBUTION EXPENSES	-532,549,560	-582,952,101	-640,454,843
190	ADMINISTRATION COSTS	-610,113,692	-730,693,228	-628,986,776

210	OTHER OPERATING INCOME	464,563,720	640,528,832	686,806,993
230	OPERATING PROFIT (LOSS)	825,886,422	981,480,381	1,284,510,703
240	FINANCIAL INCOME	97,165,310	142,026,336	174,406,196
245	EXCHANGE DIFFERENCE (PROFITS)	463,743,129	216906018	152522655
250	FINANCIAL EXPENSES	-280,233,784	-303,495,302	-295,311,736
255	EXCHANGE DIFFERENCE (LOSSES)	-367,862,374	-196,018,495	-127,987,669
330	NET PROFIT (LOSS) FOR THE YEAR	738,698,703	840,898,938	1,188,140,149
292	INCOME TAX EXPENSE	-202,113,168	-235,867,156	-213,481,356
330	NET PROFIT (LOSS) FOR THE YEAR	536,585,535	605,031,782	974,658,793
380	OTHER RESULTS	-898174	0	359547
390	TOTAL COMPREHENSIVE PROFIT FOR THE YEAR, NET OF INCOME TAX	535,687,361	605,031,782	975,018,340

Source: CR SUNASS

The analysis of profitability on equity of the 51 EPS (ROE) for the period 2022-2024, shows a progressive improvement going from 6.97%, 7.9% and 11.64%. This increase reflects an improvement in the ability to generate value from equity. However, in a scenario without SEDAPAL, SEDALIB and SEDAPAR, the result drops to critical levels of 1.5%, 0.87% and 1.32%, respectively. This shows that the financial health of the sector depends drastically on a minority group of large companies, while the vast majority operate at levels close to the break-even point or with a marginal profitability that compromises their autonomous sustainability.
From the analysis of the Return on Assets of the 51 EPS (ROA), for the period 2022-2024, it shows an increasing trend of 2.61%, 2.93% and 4.60% which, although they are positive results, are significantly lower than ROE levels, which is explained by the high value of assets demanded by this type of service, and which by 2024 is estimated at more than 18,198 million as a capital base. On the other hand, when doing a simulation without the EPS (SEDAPAL, SEDALIB and SEDAPAR), profitability falls to marginal levels of 0.60%, 0.35% and 0.57%. These figures reveal that, for the vast majority of providers, it has only marginal capacity for profitability
The analysis of the Net Margin, on the 51 EPS, for the period 2022-2024, shows an increasing trend of 14.34%, 14.98% and 22.71%, showing a trend of strengthening in the operational and financial efficiency of the sanitation sector as a result of improved revenues and cost conservation. On the other hand, when doing a simulation without the EPS (SEDAPAL, SEDALIB and SEDAPAR), the results are 9.91%, 5.26% and 8.42%. This indicates that for the vast majority of operators, the room for maneuver in the event of unforeseen events is reduced, since they allocate more than 90% of their ordinary income to cover operating costs, administrative and sales expenses.
From the analysis of current liquidity, on the 51 EPS, for the period 2022-2024, it can be seen that there is an oscillating trend of 1.41, 1.48 and 1.37 and that it is related to the variations of current assets and current liabilities. On the other hand, when doing a simulation without the EPS (SEDAPAL, SEDALIB and SEDAPAR), the results are 1.16, 1.23 and 1.11. that although they are values that technically remain above unity, the margin for maneuver is extremely narrow. Any delay in collection or unexpected increase in operating costs could compromise the payment chain, severely limiting its ability to address technical emergencies or make critical operational purchases.
From the analysis of the acid test (or severe liquidity ratio) on the 51 EPS, for the period 2022-2024, it reinforces the immediate solidity given as the results 1.37, 1.45 and 1.34, confirming that there is minimal dependence on stocks in the warehouse. On the other hand, when doing a simulation without the EPS (SEDAPAL, SEDALIB and SEDAPAR), the results are from 1.37 in 2022 to an adjusted 1.09 in 2024, this constant decline should be a matter of priority control, a value of 1.09 indicates that companies barely have a margin of 9% of liquid assets on their short-term debts.
From the analysis of solvency or total debt ratio, on the 51 EPS for the period 2022-2024, the results have been 0.63, 0.63 and 0.61, this indicates that 61% of the assets are financed by third parties and is technically justified by the magnitude of the investments required, and by the long useful life of the assets. On the other hand, when doing a simulation without the EPS (SEDAPAL, SEDALIB and SEDAPAR), the results are 0.60, 0.60 and 0.53) are very similar to the previous ones, and even slightly lower than the sectoral average. This parity suggests that small and medium-sized companies have less capacity to access credit and leverage.
The analysis of investment management, on the 51 EPS for the period 2022-2024, reveals that this is the critical bottleneck that limits the possibility of closing gaps in the sector. According to consolidated data from 2022 to 2024, the level of sectoral execution has not exceeded 55% of what was programmed. On the other hand, when doing a simulation without the EPS (SEDAPAL, SEDALIB and SEDAPAR), the results were 33%, 31% and 31%, respectively. This means that medium and small companies are in an even more complicated condition, there are no expansion works, renovation or improvement, generating higher operating costs and losses.
The analysis of operational efficiency, on the 51 EPS for the period 2022-2024, reveals that there is a trend towards optimization, with ratios of 59.74%, 59.03% and 56.50%, which represents a sustained reduction in direct costs, achieving a better gross margin and an operational improvement that provides greater financial slack to cover administrative and financial expenses. On the other hand, when doing a simulation without the

EPS (SEDAPAL, SEDALIB and SEDAPAR), the results were 63.7%, 65.3% and 63.8%. Although this group has proportionally higher costs due to its lower volume of users, the result is still positive, maintaining an average gross margin of 36.2%.

Regarding the analysis of the working relationship on the 51 EPS for the period 2022-2024, it results 85.6%, 87.2% and 82.0%, which shows an extremely heavy cost structure; this value would be expected to be below 60%. On the other hand, when doing a simulation without the EPS (SEDAPAL, SEDALIB and SEDAPAR), the results were 102.6%, 105.2% and 106.7%, which means that their operating expenses systematically exceed their sales revenues. In financial terms, these 48 companies operate under a structural operating deficit

Finally, the analysis of the inventory turnover on the 51 EPS for the period 2022-2024, gives results of 30.99, 28.59 and 32.29, which reflects agile management, with an average renewal cycle of just 11.30 days in the last year, which suggests a constant flow of materials and a low immobilization of resources in warehouses. On the other hand, when doing a simulation without the EPS (SEDAPAL, SEDALIB and SEDAPAR), the results were 16.22, 15.61 and 16.63 times, doubling the renewal cycle to reach 21.95 days. This greater permanence of supplies in warehouses does not necessarily respond to administrative inefficiency, but to a risk management strategy imposed by the geography and social reality of Peru.

With regard to the variable **'Accessibility to drinking water and sanitation services in Peru'**, it is imperative to consider the heterogeneity of operating systems at the national level. This variability is conditioned by multiple critical factors, ranging from the physicochemical quality of the source and its geographical location, to the hydraulic capacity of the catchments and intakes. The technical configuration of each system depends on the need for specific pretreatments, the complexity of the pumping and repumping stations, and the efficiency of the conduction and storage lines. Likewise, in the sanitation component, accessibility is influenced by the complexity of the networks of collectors, interceptors and emitters, integrating a wide diversity of technological solutions for wastewater treatment adapted to each regional context. And no less important is the state of conservation and operability of the existing infrastructure.

To estimate the investment required to close accessibility gaps in the urban environment, we resort to the research developed by Perry (2025) in which he develops a methodology to obtain the unit costs of investment for both urban companies and small cities and for rural areas, his results are shown below

Table 5. Table N°2 Investment cost per user and by type of service (In soles with IGV).

Type of provider	Investment cost per user	
	Drinking Water	Sewerage
SEDAPAL	6,223	10,620
EPS Grandes G1	11,017	15,420
EPS Large G2	9,410	12,198
Medium EPS M	8,758	12,004
EPS Small P	10,409	15,129
Urban in EPS	10,409	15,129
Small Towns	9,774	9,121
Rural population centers	13,877	13,759

Source: Own elaboration

We consider it essential not only to close the access gaps in year zero, but also to guarantee the sustainability of this condition for the next 30 years. To this end, the population was projected according to the size of each provider and unit costs were applied, thus determining the annual investment requirement to close gaps in each service and category of provider for the next 30 years, reaching a global figure of 201,952 million soles.

Table 6. Projected investment to close gaps in Water and Sanitation at the country level

Operator Type		Quantity	Year 0	(1-5)	(6-10)	(11-15)	(16-20)	(21-25)	(25-30)
SEDAPAL	EPS - S	1	3,848	6,365	7,182	8,102	9,141	10,313	11,635
EPS Grandes G1	EPS - G1	6	5,403	4,584	5,135	5,754	6,447	7,223	8,093
EPS Large G2	EPS - G2	13	5,637	2,751	3,067	3,420	3,813	4,251	4,740
Medium EPS M	EPS - M	15	2,638	1,190	1,321	1,465	1,626	1,804	2,001
EPS Small P	EPS - P	15	589	281	303	326	351	378	408
Urban in EPS	UGM	48	2,482	506	538	571	606	643	682
Small Towns	UGM	580	3,315	597	628	660	694	729	766
Rural	OC	73,864	28,881	2,720	2,831	2,946	3,065	3,190	3,320
Investment per period			**52,793**	**18,995**	**21,003**	**23,243**	**25,742**	**28,531**	**31,645**
Total Investment in Drinking Water and Sanitation (Millions of soles)			**201,952**						

Source: Own elaboration

As all physical assets have a limited useful life cycle, it is possible to have a reference of the renovation needs, which marks the needs for investment in renovation and in some cases other reasons such as lack of capacity, obsolescence of technology, or others. According to Perry's (2025) study, it states that on average

the useful life of sanitation infrastructure is 50 years, that is, 2% of annual replacement. But it also specifies that there is an accumulated deficit in infrastructure renovation estimated at 30% of the value of the capital base, which totals 136,208 million soles, as shown in table No. 7.

Table 7. Projected investment in infrastructure renovation at the country level.

Operator Type		Quantity	Year 0	(1-5)	(6-10)	(11-15)	(16-20)	(21-25)	(25-30)
SEDAPAL	EPS - S	1	13,282	3,794	3,794	3,794	3,794	3,794	3,794
EPS Grandes G1	EPS - G1	6	9,280	2,705	2,705	2,705	2,705	2,705	2,705
EPS Large G2	EPS - G2	13	5,748	1,696	1,696	1,696	1,696	1,696	1,696
Medium EPS M	EPS - M	15	2,607	764	764	764	764	764	764
EPS Small P	EPS - P	15	923	268	268	268	268	268	268
Urban in EPS	UGM	48	1,751	524	524	524	524	524	524
Small Towns	UGM	580	2,443	753	753	753	753	753	753
Rural	OC	73,864	12,884	4,046	4,046	4,046	4,046	4,046	4,046
Investment per period			**52,793**	**18,995**	**48,918**	**14,548**	**14,548**	**14,548**	**14,548**
Total investment in Drinking Water and Sanitation (Millions of soles)			**136,208**						

Source: Own elaboration

Additionally, from the tariff studies prepared by the regulator, Perry (2025) determined the unit cost for Disaster Risk Management (DRM), for the Mechanisms of Remuneration for Ecosystem Services (MERESE) and various institutional strengthening projects. And that applied to the 30-year population projections, it obtained a cumulative value of 8,221 million soles, as shown in table No. 8.

Table 8. Projection of investment in projects: GRD – MIO – MERESE.

Operator Type		Quantity	Year 0	(1-5)	(6-10)	(11-15)	(16-20)	(21-25)	(25-30)
SEDAPAL	EPS - S	1	92.5	370.0	462.5	462.5	462.5	462.5	462.5
EPS Grandes G1	EPS - G1	6	103.9	415.5	519.4	519.4	519.4	519.4	519.4
EPS Large G2	EPS - G2	13	38.1	152.4	190.5	190.5	190.5	190.5	190.5
Medium EPS M	EPS - M	15	180.2	101.0	115.6	115.7	189.4	115.8	115.7
EPS Small P	EPS - P	15	4.7	18.7	23.4	23.4	23.4	23.4	23.4
Urban in EPS	UGM	48	8.9	0.3	0.7	0.8	0.8	0.8	0.9
Small Towns	UGM	580	17.1	1.7	1.2	1.2	1.3	1.4	1.4
Rural	OC	73,864	54.7	2.3	3.3	3.4	3.6	3.7	3.9
Investment per period			**52,793**	**18,995**	**500**	**1,062**	**1,316**	**1,317**	**1,391**
Total investment (Millions of soles)			**8,221**						

Source: Own elaboration

And finally, consolidating the results shown in tables No. 6, No. 7 and No. 8, table No. 9 has been prepared, which shows the need for investment in all respects is 346,380 million soles, as shown in table No. 9.

Table 9. Projection of investments for all concepts for Drinking Water and Sanitation

Operator Type		Quantity	Year 0	(1-5)	(6-10)	(11-15)	(16-20)	(21-25)	(25-30)
SEDAPAL	EPS - S	1	17,222	10,529	11,438	12,358	13,397	14,569	15,891
EPS Grandes G1	EPS - G1	6	14,787	7,704	8,360	8,978	9,671	10,447	11,317
EPS Large G2	EPS - G2	13	11,423	4,599	4,953	5,306	5,699	6,137	6,626
Medium EPS M	EPS - M	15	5,425	2,055	2,200	2,345	2,579	2,683	2,881
EPS Small P	EPS - P	15	1,517	567	594	617	642	669	698
Urban in EPS	UGM	48	4,242	1,030	1,062	1,095	1,130	1,167	1,207
Small Towns	UGM	580	5,776	1,352	1,382	1,414	1,448	1,484	1,521
Rural	OC	73,864	41,820	6,768	6,879	6,995	7,114	7,239	7,369
Investment per period			**52,793**	**18,995**	**102,211**	**34,605**	**36,868**	**39,108**	**41,681**
Total investment (Millions of soles)			**346,380**						

Source: Own elaboration

A determining factor in sectoral planning is the maturity cycle of projects. From the conception of the idea, through the preparation of the profile, feasibility, the technical file, the obtaining of permits, physical-legal sanitation of land, to the bidding phase, execution, liquidation and commissioning, the process can take

between 7 and 10 years, assuming optimal conditions.
However, any documentary deficiency or challenge in the selection processes makes this time horizon unpredictable. Under the current scenario, with an annual programming of resources of S/ 8,400 million and an execution efficiency of just 54%, closing accessibility gaps is mathematically unachievable. Even under a hypothetical scenario of 100% efficiency, current resources would still be insufficient.
To close the gaps, it is imperative to establish a medium- and long-term State policy. That it allocates greater annual resources, at least doubles the annual budget to 16,800 million and is 100% efficient in execution, in this way gaps could be closed in 20 years.
Regarding the variable **'Quality of the provision of drinking water and sanitation services in Peru'**, the analysis of the Regulatory Benchmarking 2024 reveals that the provider companies are still far from optimal efficiency levels. This performance gap is largely a direct consequence of the persistent inability to execute capital investments. A critical reflection of this situation can be seen in the operational management indicators (Group I). Currently, drinking water coverage reaches only 81.5%, which leaves 6.14 million inhabitants without direct access to the resource. In the case of sewerage, the gap is even more pronounced, with coverage of 72.3%, implying that 9.58 million people lack adequate sanitation services.

Table 10. Group I operational management indicators - at country level - 2025

Operator Type		Quantity	Density	Population (Thousands of inhabitants)				
				Total	With water P.		With Sewerage	
					Hab.	Cob.	Hab.	Cob.
SEDAPAL	EPS - S	1	3.75	10,519	9,863	9,610	93.77%	91.36%
LARGE EPS 1	EPS - G1	6	3.90	5,277	4,736	4,356	89.76%	82.55%
BIG EPS 2	EPS - G2	13	3.23	3,643	3,090	2,643	84.80%	72.54%
MEDIUM EPS	EPS - M	15	3.17	1,701	1,417	1,241	83.30%	72.94%
SMALL EPS	EPS - P	15	3.41	489	425	404	87.01%	82.58%
URBAN IN EPS	UGM	48	3.44	7,855	5,358	4,735	68.21%	60.28%
SMALL TOWNS	UGM	580	3.73	2,948	1,545	1,087	52.40%	36.88%
RURAL	OC	73,864	3.10	2,246	1,829	1,020	81.46%	45.41%
TOTAL		**74,542**	Hab/viv.	**34,677**	**28,264**	**25,095**	**81.50%**	**72.37%**

Fuente: Benchmarking SUNASS

These figures underscore that the operating deficit is not only a financial metric, but a structural barrier to human development in the country. On the other hand, it should be noted that sectoral indicators are usually presented as averages by groups of companies, which generates a bias that makes the precariousness of medium and small localities invisible. For example, according to data from Table 10, the average continuity is 18.61 h/d, however, there are localities with critical values such as Trujillo and Tumbes with less than 7 h/d, Nasca with less than 3.7 h/d or Pasco and Utcubamba with less than 2 h/d. The same happens with the water pressure in the network, which indicates an average of 20.12 m.c.a., however, localities such as Piura, Tumbes, Lambayeque and Juliaca, have less than 7 m.c.a. In the caseof wastewater treatment, it indicates an average of 83.38%, however there are 18 companies that do not have treatment, and on the other hand, the volume that enters the WWTPs should not be considered, but rather the nominal design capacity at most, and even consider that many of the WWTPs are overloaded. clogged and with lack of maintenance, a situation that reduces operational capacity. Another indicator is that of micro metering that indicates 75.08% when there are 10 companies with less than 40% and in some localities they have zero micro metering, and on the other hand that value that requires correction for operability considering that the useful life of a meter does not exceed 7 years, and a large part has already exceeded that age, and no longer indicate an effective measurement, the meters are under-registering.

Table 11. Operational management indicators at the urban level group II - 2025

Operator Type		Quantity	Indicator				
			Continuity Hours/day	Pressure m.c.a.	Non-Revenu Water	Treated wastewater	Miro Measurement in %
SEDAPAL	EPS - S	1	21.6	23.2	31%	97.0%	90.3%
LARGE EPS 1	EPS - G1	6	19.4	20.8	36%	91.1%	80.5%
BIG EPS 2	EPS - G2	13	18.8	19.9	36%	83.6%	75.2%
MEDIUM EPS	EPS - M	15	18.8	20.0	36%	85.6%	75.9%
SMALL EPS	EPS - P	15	18.8	19.9	36%	83.4%	75.1%
TOTAL		**74,542**	**18.61**	**20.12**	**36.74%**	**83.38%**	**75.08%**

Fuente: Benchmarking SUNASS
Continuing with the analysis, it can be seen that the age of the pipes, and the low level of preventive maintenance have caused 17,524 breaks, producing service cuts, waterlogging, deterioration of roads and damage to third parties. And this refers to visible cases, given that since all pipes are more than 1.2 meters deep, not all faults are detected. The same happens with the sewer pipes that apart from this we must consider

there are areas where users lift the lids of mailboxes to throw garbage. And we must also mention the earth that enters with the rains that finally sediment and reduce the capacity of the collectors. It is also necessary that the dissatisfaction of users is reflected in the large number of complaints, which to date are 443,673 complaints reported per year, however, this figure would be much higher if unreported complaints could be registered, a situation that generally occurs in the water administrations in provinces. Another major problem of companies is the inability to execute investments that, discarding Sedapal, the average execution at a general level is 30% on average. And finally, with regard to the employment relationship, which although it indicates an average of 67.8%, the truth is that more than half of the companies have this value close to 1 and in some cases even above, leaving little or no room for maneuver for investments.

Table 12. Group III Operational Management Indicators – at the Urban Level – 2025

Operator Type		Quantity	Indicator				
			Pipe breaks # / year	Blockages collectors # / year	Investment Execution %	Employment relationship %	Number Claims # / year
SEDAPAL	EPS - S	1	2,311	25,818	100%	64.7%	111,685
LARGE EPS 1	EPS - G	6	4,269	26,531	34%	68.4%	160,528
BIG EPS 2	EPS - G	13	6,281	20,692	24%	70.3%	108,665
MEDIUM EPS	EPS - M	15	3,393	7,080	24%	70.5%	51,744
SMALL EPS	EPS - P	15	1,270	1,904	28%	70.4%	11,051
TOTAL		**74,542**	**17,524**	**82,025**		**67.83%**	**443,673**

Fuente: Benchmarking SUNASS

As you can see, the quality of service provision has many deficiencies that, although it is impossible to eliminate them 100%, you should make an effort to reduce them.

Background

Muñoz et al. (2021) analyzed the quality of drinking water and sewerage services in Ecuador, noting that, despite the abundance of water resources, the country has not achieved universal coverage. This deficit is aggravated by population growth and, according to the authors, responds to a lack of political decision and investment capacity. On the other hand, Palacios (2020) examined access to water and sanitation in indigenous, Afro-descendant, and tribal communities in the Americas, evidencing the violation of human rights in these historically marginalized groups, his study proposes solutions that respect cultural and geographical particularities, demanding policies that guarantee true inclusion. Finally, Moreno (2020) used a qualitative-descriptive approach to explain the poor quality of services in Colombia, concluding that inefficiency is deeply linked to corruption and political interference

On the other hand, Lentini (2018) developed a qualitative-descriptive research to evaluate the model of provision and regulation of water and sanitation services in Argentina. The author concludes that, in addition to the problems of corruption and inefficiency, the sector lacks a unified regulatory methodology: while 50% of providers are governed by the price cap model, the rest use different methodologies. Likewise, Moroñas et al. (2020) conducted a similar study in Uruguay in order to explain the quality of service provision. Their findings reveal that companies are not self-sustainable because tariffs are low and only cover operating costs and expenses, which limits accessibility and delegates the responsibility for investment exclusively to the State.

Llamosas (2020) developed a qualitative-descriptive research with the purpose of explaining the quality of water and sanitation services in Paraguay. Its study concludes that the existence of more than 5,200 operators atomizes the sector, resulting in an inefficient system that prevents comprehensive planning and overwhelms the regulator's institutional capacity. On the other hand, Padilla (2019), through quantitative research of non-experimental and correlational design, evaluated the relationship between strategic planning and business management, confirming a significant correlation between both variables. Along the same lines, Molina (2021) used a cross-sectional quantitative approach to analyze the link between strategic planning and customer satisfaction, concluding that there is a direct and positive relationship between these dimensions.

On the other hand, Benites et al. (2021) developed a qualitative research of a basic and descriptive nature in order to evaluate the inefficiencies of the sanitation sector in Peru. Their findings indicate that municipal and regional governments, as the main responsible for the service providers, tend to politicize the sector by interfering in tariff and investment matters, which adds to marked regulatory deficiencies. In addition, Hernández (2022) analyzed the relationship between public policies and equity, concluding that the latter is essential to build just societies by focusing on closing gaps according to the specific needs of each population. Along these lines, Montañés (2018) evaluated the link between Social Responsibility and business management, determining that organizational success transcends economic benefit by integrating with social and environmental well-being. Finally, Dianderas (2022) investigated accessibility to water and sanitation according to regional water availability, concluding that, although economic development is an influential factor, coverage depends mostly on strategic government decisions on infrastructure and the strength of the regulatory framework to reach the most vulnerable areas.

For their part, Bonifaz et al. (2023) evaluated the relationship between investment and accessibility to public services in Peru. Their study highlights that the infrastructure gap is not limited to basic access, but integrates dimensions of quality, sustainability and mitigation of environmental risks. The authors conclude that investment planning should respond to tangible improvements in management, underscoring the need for strategic coordination between the public and private sectors. In line with this, Oblitas (2015) developed a qualitative-descriptive research to analyze the link between management and the quality of services, warning that the levels of investment of the different governments have been insufficient to achieve the expected results. To achieve universal coverage, Oblitas argues that financial capital is not enough; it requires training, a change in the cultural paradigm, the strengthening of organizational values and, fundamentally, the reduction of political interference and corruption.
For their part, Cairampoma et al. (2016) evaluated the relationship between public sanitation policies and accessibility to services. The authors conclude that there is a direct link, since the policies establish the macro guidelines that lead to plans and programs supported by a regulatory and legal framework. However, they point out that it is in the implementation phase, which is the responsibility of the Executive Branch in coordination with the private sector and the community, where the greatest non-compliances occur. In addition, Cava (2011) investigated various management models, defining this task as the art of efficiently combining resources to generate value for customers, employees, shareholders and society. Their study concludes that organizational success depends on the selection of the appropriate model, whether it is the traditional, behaviorist, or decision theory-based model.
Finally, Fernández (2014) investigated the dynamics of social groups cohesive by common identities or needs, who organize to defend political and cultural interests. The author warns that the orientation of these groups can be biased by the objectives of their leaders; Therefore, it concludes that understanding these motivations is crucial to analyze political processes and promote a more equitable society. In a more technical and recent field, Quiñones (2024) developed basic and correlational quantitative research on the relationship between investments and environmental risks. After analyzing data from 57 workers of a service provider, the study confirmed a very strong positive correlation (Spearman's Rho = 0.869), which led the author to recommend the mandatory inclusion of environmental risk analysis in all investment projects in the sector.

From the above, we can define the **general problem** as follows; How do the Management of drinking water and sanitation services and the Accessibility to drinking water and sanitation services affect the Quality of the Services offered by providers of drinking water and sanitation services in Peru? 2025?, and in the same sense, four **specific problems** were raised that relate the independent variables to the dimensions of the dependent variable of; How do the Management of drinking water and sanitation services, and Accessibility to drinking water and sanitation services, affect the dimensions of the variable quality of drinking water and sanitation services such as; "tangible elements", "reliability", "attention", "safety", and "empathy", which give drinking water and sanitation companies in Peru, 2025?.

Theoretical bases for the definition of variables; N°1 definition of the variable 'Public Services Management', is taken as a reference to Cava et al. (2011), who define it as the set of actions implemented to ensure the efficiency, effectiveness and quality of the service. This approach involves the development of strategies, programs and performance standards aimed at continuous improvement, in order to maximize benefits for creditors, customer satisfaction and the protection of personnel and the environment. This modern vision is nourished by historical foundations such as those of **Frederick Winslow Taylor**, considered by López (2022) the pioneer of scientific management at the beginning of the twentieth century. Taylor's theories, focused on task optimization and efficiency measurement, laid the foundation for mass production. Finally, the perspective of **Michael Porter** (Porter et al., 2018) is incorporated, who revolutionized operations management by proposing that every organization should evaluate its competitive environment and internal capabilities before making decisions, thus guaranteeing a strategic advantage.
For the definition of the variable **'Accessibility',** Martha Nussbaum (2020) **has been taken as a fundamental reference**. The author argues that accessibility to public services goes beyond mere investment in physical infrastructure; it necessarily implies evaluating the economic capacity of the population to access services that are vital for life and health. From this perspective, ensuring the material conditions for this access to be effective is an inescapable obligation of the State. In addition, the vision of **Walt Rostow is** incorporated, whose model of development by stages is analyzed by **Morazán (2021).** Rostow argues that societies evolve from a traditional phase to one of mass consumption, driven by industrialization and strategic investment. In this process, the State plays a decisive role as a facilitator of development, allowing basic services to become the support of a modern economy.
For the definition of the variable **'Quality of Service',** Parasuraman et al. (1988) **has been taken as the main reference**. The authors define quality as the degree of customer satisfaction when receiving a service, recognizing that perception is inherently relative between individuals. In contemporary terms, this quality translates into the organization's ability to exceed user expectations. Because evaluating a service is more complex than evaluating a physical product, they proposed the multidimensional **SERVQUAL** model, which allows measuring gaps between expectation and perception. In addition, the vision of **Edwards Deming is** incorporated, who, according to **Jeison (2021),** revolutionized the sector with the continuous improvement approach or **PDCA Cycle**. This model consists of four phases: planning, proposing solutions, executing with controls to correct failures, and finally, evaluating results to generate feedback in a cycle

Like all research, this one arises from the existence of problems, which in our case we have defined as **a General Problem**: How do the Management of drinking water and sanitation services and the Accessibility to drinking water and sanitation services, affect the Quality of the Services offered by providers of drinking water and sanitation services in Peru, 2025?, And secondly we have four **specific problems** defined as: How do the Management of drinking water and sanitation services, and Accessibility to drinking water and sanitation services, affect each of the dimensions of the variable quality of drinking water and sanitation services such as; "tangible elements", "reliability", "attention", "safety", and "empathy", which give drinking water and sanitation companies in Peru, 2025?.
it makes knowledge. It has a **methodological justification** that guarantees the good use of data and analysis techniques, guaranteeing a solid and well-founded analysis. It has an **epistemological justification**, which explains why it is worthwhile to carry out the research, being in our case of the positivist type, and finally it has a **practical justification**, because it is expected that the results will have an impact on the improvement of the quality of services in Peru.
In relation to the objectives, the **general objective** is to determine the impact between the variable "management of drinking water and sanitation services and accessibility to water and sanitation services" and the variable "quality of water and sanitation services". There are also 4 **specific objectives** defined as variables N°1 and N°2 (Management of drinking water and sanitation services and Accessibility to drinking water and sanitation services) affect the five dimensions of variable N°3 (quality of water and sanitation services in Peru 2025).

Methodology

To analyze the relationship between the variables **'Management'**, **'Accessibility'** and **'Quality'** in drinking water and sanitation services, the present research adopts a **quantitative approach** of cross-sectional and non-experimental design. According to Aristides (2020), this study is basic and correlational-descriptive, since it seeks to determine the degree of association between the variables at a given time, without delving into causal relationships. From the perspective of **Bunge (2001),** the research is based on solid scientific rigor by integrating dimensions of **ontology, epistemology, axiology and hermeneutics**. Likewise, it maintains a philosophical stance open to paradigm shifts, being willing to incorporate new experiences, interpretations and evidence that arise from the results obtained.
As it is a quantitative research, the opinion of specialists at the national level with recognized experience will be required, our tool in our case consisted of a questionnaire with 54 questions related to the variables and their dimensions, and which was submitted to the evaluation and opinion of 5 experts who validated it and then was subjected to a pilot test with a sample of 20 surveys to verify its reliability. With the help of the SPSS program, this previous analysis was developed obtaining very favorable results, Conbrach's alpha for the variables V1, V2, V3, and V1 with V2 were higher than 0. The Spearman Value was also calculated with results of 1.000 for the V1 variable, 0.952 for the V2 variable and 1.000 for the variable. As is known, the value of Cronbach's alpha must be between 0.7 and 1,000 to indicate reliability in the same way as the Spearman value.
In relation to the study population and sample size, we are guided by the idea of Arispe et al. (2020), who explain that it is the specific group of people who share the characteristics necessary to be studied. In our case, we focus on all workers in the water and sanitation sector in Peru. However, in order for the study to be viable and accurate, we applied two main filters. First, that they are professionals, that is, with a university degree, for this regulatory accounting information was taken from the regulator's website, estimating these at 7,000 between workers and officials. Then a restriction had to be taken, which being impossible to contact everyone since they are dispersed nationwide, it was estimated that we would only have effective access to 1.5% due to geographical distances and the difficulties of travel in the country. By crossing these criteria, and using Yamane's statistical formula with a margin of error of 5%, it was determined that the design population would be made up of 105 people, and considering that we expected the data collected to be representative at the national level and that in practice it would be impossible to do the surveys personally, The questionnaire was digitized and the structure or composition of the sample was defined.
For our analysis, the composition of the sample group was in proportion to the estimated number of specialists according to work centers. It was considered that 50% by workers of the provider companies and the other 50% by workers from the public and private sectors. The scheduled information collection period was two weeks. And that during the two weeks that the scheduled time lasted to burr the data. To do this, we contacted the specialists with video calls, the reason for the request for information was explained to them and the online questionnaire was sent to them so that they could answer it, it should be noted that on the first page of the questionnaire the Informed Consent Annex was inserted, and that if they agreed they would continue to answer the questions. Questionnaires were then sent to workers of the 52 companies, from which a response was received from workers of 21 companies and which, by the way, are the 21 most representative companies in the country, covering approximately 90% of users nationwide, in the same way the requests were sent to workers in the public and private sectors. It should be noted that 100 applications were sent at the EPS level, of which 52 were returned. And on the other hand, approximately 100 professional applications from the public and private sector were sent, returning 53 files duly completed, being in total the 105 foreseen in the sample, It should be noted that after the defined collection period, more duly filled questionnaires continued to arrive, but they were no longer taken into account because the expected sample had been completed. The composition of the sample was as follows:

Table 1 . Composition of the sample.

Origin	Quantity	Percentage
EPS Workers	52	50%
SUNASS Workers (Rates)	7	7%
SUNASS Workers (Studies)	7	7%
SUNASS Workers (Supervision)	4	4%
SUNASS Workers (Regulation)	6	6%
SUNASS Workers (Inspection)	2	2%
Consultants	11	10%
MVCS	4	4%
OTASS	7	7%
MEF	2	2%
ODS	3	3%
	105	100%

Then, tabulating responses and taking them to process in the SPSS to verify if the sample of 105 members obtains reliability with the estimation of Conbrach's alpha. The results were: For variable N°1 "Management" a value of 0.842, for variable N°2 "Accessibility" a value of 0.842 and for variable N°3 "Quality" a value of 0.849. For the combination of variables N°1 and N°2, it gave 0.890, in all cases with a bilateral contrast of 0.05. Given the four results and with the value of Cronbach's Alpha between 0.7 and 0.9 considered values of excellence, between
Since the variables are not parametric, it is necessary to calculate their multiple linear correlation in order to verify if there is an incidence between the independent variables in the dependent variable, in this case they are the demonstration of the hypotheses.

Regarding the general hypothesis, the independent variables "Management of water and sanitation companies in Peru 2015" and "Accessibility of water and sanitation services in Peru 2025" affect the dependent variable "Quality of water and sanitation services in Peru 2025".
R (Correlation Coefficient) of 0.605 which shows that there is a moderate and very solid joint linear relationship.
R2 (Coefficient of determination) of 0.366 which indicates that 36.6% of the V3 Variable is explained by the behavior of the V1 and V2 variables
R2 (adjusted) of 0.353 with real and very stable methodological fit, valid for predictive models.
Standard error of 6.205 indicating low dispersion of residues to the vicinity of the line
Line defined by; V3 = 42.668 + 0.587 * V1 – 0.301 * V2
There is an incidence of V1; positive and solid effect, with T-value of 3.646 being >1.96
There is an incidence of V2; inverse negative effect, with T-value of -1.996 being <-1.96
In conclusion, the Null hypothesis is discarded and the Original hypothesis is approved, confirming that the combination of variables V1 and V2 have an impact with mathematical certainty on the behavior of variable 3.

Regarding specific hypothesis N°1, the independent variables "Management of water and sanitation companies in Peru 2015" and "Accessibility of water and sanitation services in Peru 2025" affect dimension 1 (D1 = Tangible Elements) of variable V3.
R (Correlation Coefficient) of 0.559 which shows that there is a moderate and very solid joint linear relationship.
R2 (Coefficient of determination) of 0.312 which indicates that 31.2% of the V3 Variable is explained by the behavior of the V1 and V2 variables
R2 (adjusted) of 0.298 with real and very stable methodological fit, valid for predictive models.
Standard error of 1.637 indicating low dispersion of residues to the vicinity of the line
Line defined by; D1-V3 = 10.985 + 0.165 * V1 – 0.108 * V2
There is an incidence of V1; positive and solid effect, with T-value of 3.837 being >1.96
There is an incidence of V2; inverse negative effect, with T-value of -2.700 being <-1.96
In conclusion, the Null hypothesis is discarded and the Original hypothesis is approved, confirming that the combination of variables V1 and V2 have an impact with mathematical certainty on the behavior of dimension 1 of variable 3.

Regarding specific hypothesis N°2, the independent variables "Management of water and sanitation companies in Peru 2015" and "Accessibility of water and sanitation services in Peru 2025" affect dimension 2 (D2 = Reliability) of variable V3.
R (Correlation Coefficient) of 0.518, which shows that there is a moderate and very solid joint linear relationship.
R2 (Coefficient of determination) of 0.268 which indicates that 26.8% of the V3 Variable is explained by the behavior of the V1 and V2 variables

R2 (adjusted) of 0.253 with real and very stable methodological fit, valid for predictive models.
Standard error of 2.195 indicating low dispersion of residues to the vicinity of the line
Line defined by; D2-V3 = 9.940 + 0.178 * V1 – 0.121 * V2
There is an incidence of V1; positive and solid effect, with T-value of 3.136 being >1.96
There is an incidence of V2; inverse negative effect, with T-value of -2.770 being <-1.96
In conclusion, the Null hypothesis is discarded and the Original hypothesis is approved, confirming that the combination of variables V1 and V2 have an impact with mathematical certainty on the behavior of dimension 2 of variable 3.

Regarding specific hypothesis No. 3, the independent variables "Management of water and sanitation companies in Peru 2015" and "Accessibility of water and sanitation services in Peru 2025" affect dimension 3 (D3 = Attention) of variable V3.
R (Correlation Coefficient) of 0.509 which shows that there is a moderate and very solid joint linear relationship.
R2 (Coefficient of determination) of 0.259 which indicates that 25.9% of the V3 Variable is explained by the behavior of the V1 and V2 variables
R2 (adjusted) of 0.244 with real and very stable methodological fit, valid for predictive models.
Standard error of 1.699 indicating low dispersion of residues to the vicinity of the line
Line defined by; D3-V3 = 10.957 + 0.144 * V1 – 0.089 * V2
There is an incidence of V1; positive and solid effect, with T-value of 3.243 being >1.96
There is an incidence of V2; inverse negative effect, with T-value of -2.152 being <-1.96
In conclusion, the Null hypothesis is discarded and the Original hypothesis is approved, confirming that the combination of variables V1 and V2 have an impact with mathematical certainty on the behavior of dimension 3 of variable 3.

Regarding specific hypothesis No. 4, the independent variables "Management of water and sanitation companies in Peru 2015" and "Accessibility of water and sanitation services in Peru 2025" affect dimension 4 (D4 = Safety) of variable V3.
R (Correlation Coefficient) of 0.551, which shows that there is a moderate and very solid joint linear relationship.
R2 (Coefficient of Determination) of 0.304 which indicates that 30.4% of the V3 Variable is explained by the behavior of the V1 and V2 variables
R2 (adjusted) of 0.290 with real and very stable methodological fit, valid for predictive models.
Standard error of 2.457 indicating low dispersion of residues to the vicinity of the line
Line defined by; D4-V3 = 10.370 + 0.250 * V1 – 0.198 * V2
There is an incidence of V1; positive and solid effect, with T-value of 3.918 being >1.96
There is an incidence of V2; inverse negative effect, with T-value of -3.322 being <-1.96
In conclusion, the Null hypothesis is discarded and the Original hypothesis is approved, confirming that the combination of variables V1 and V2 have an impact with mathematical certainty on the behavior of dimension 4 of variable 3.

Regarding specific hypothesis No. 5, the independent variables "Management of water and sanitation companies in Peru 2015" and "Accessibility of water and sanitation services in Peru 2025" affect dimension 5 (D5 = Empathy) of variable V3.
R (Correlation Coefficient) of 0.559 which shows that there is a moderate and very solid joint linear relationship.
R2 (Coefficient of determination) of 0.312 which indicates that 31.2% of the V3 Variable is explained by the behavior of the V1 and V2 variables
R2 (adjusted) of 0.298 with real and very stable methodological fit, valid for predictive models.
Standard error of 1.637 indicating low dispersion of residues to the vicinity of the line
Line defined by; D5-V3 = 10.985 + 0.165 * V1 – 0.108 * V2
There is an incidence of V1; positive and solid effect, with T-value of 3.837 being >1.96
There is an incidence of V2; inverse negative effect, with T-value of -2.700 being <-1.96
In conclusion, the Null hypothesis is discarded and the Original hypothesis is approved, confirming that the combination of variables V1 and V2 have an impact with mathematical certainty on the behavior of dimension 5 of variable 3.

Conclusions

Having finished with the analysis of the indicators and ratios of companies in the water and sanitation sector, we can present some conclusions of the results with respect to the three variables of study.
Having concluded with the exhaustive analysis of the economic and financial ratios of the drinking water and sanitation sector, based on the financial statements of the regulatory accounting available to the regulatory entity, it can be said that there is evidence that the sanitation sector has achieved a positive transformation between 2022 and 2024, reversing historical loss trends and consolidating a robust cash generation. The current management stands out for its operational and collection efficiency, reaching an operating margin of 55% and logistical agility reflected in an inventory turnover of 32.29 times. This financial strengthening is

crowned with assets of 8,378 million soles and an 80% growth in its net results, standing at 975 million. However, this financial soundness contrasts critically with poor investment execution. The sector has an 'idle' liquidity of 2,019 million soles in cash that should be transformed into infrastructure to meet the Sustainable Development Goals (SDGs). Likewise, the existence of 53 million soles in long-term accounts receivable suggests the need for accounting honesty or fractionation campaigns that allow the balance sheet to be cleaned up and optimize capital recovery
As can be seen, the water coverage indicator reaches 87.8%, which indicates that there are 4.07 million inhabitants in Peru who consume unsafe water, and on the sanitation side, coverage is 70.5%, which indicates that there are 9.8 million inhabitants without sewerage or safe sanitation. This generates a deterioration in the quality of life of this large number of inhabitants, putting their health at risk, leaving them exposed to multiple gastro-intestinal and skin diseases.

In relation to the economic and financial management of drinking water and sanitation service providers in the urban area of Peru, the results of the analysis developed on the basis of the regulatory accounting information developed by SUNASS, show that the sanitation sector in Peru is today a profitable and solvent operating business. but a bad manager of efficient projects. If they manage to unblock this deficiency, the sector could close gaps in access and quality of services. What, if it is necessary to make clear, is that we are talking about information from 51 EPS consolidated as a whole, where the very large EPSs with good results pull up many small and medium-sized companies, many of them inefficient and with weaknesses that are hidden given that due to their size measured by the number of users they are not representative in the total sample. that is why 19 of the 51 companies are under the transitional administration regime by OTASS, and there are 9 companies that would be close to moving to OTASS but that to date do not have the capacity to manage more companies.

In relation to the accessibility of a public service, it is the responsibility of the state, but that it maintains the same inefficiency for decades, with an inability to execute investments, the executive should expand the number of executing units, strengthen and supervise them,

As can be seen in the analysis, billions are required today to close gaps in accessibility and renovation of infrastructure, as well as institutional projects. And if we take into account that the project cycle can be 8 years on average and that each year the population increases by 6,000 more inhabitants, the problem will become increasingly complicated and difficult to solve.

In relation to quality indicators, we can conclude that they are a reflection of poor business management. On the one hand, the infrastructure that has already passed more than half of its useful life, the low level of preventive maintenance, the lack of investment in expansion, the deficiencies of the personnel, is reflected in the levels of continuity and pressure, a sewage treatment plant in which the sewage enters but its current capacity is not capable of processing that volume. On the other hand, there is no effective micro-metering, the meters by age are in the under-registration stage.
And on the statistical side, the results show that, if there is reliability of the data of Variables V1, V2, V3, and V1-V2, which have been estimated with the help of the SPSS program determining in Conbrach's Alpha, with the following results: For variable N°1 "Management" a value of 0.842, for variable N°2 "Accessibility" a value of 0.797 and for variable N°3 "Quality" a value of 0.856. For the combination of variables N°1 and N°2, it gave 0.890, in all cases with a bilateral contrast of 0.05. In view of the four results and with the value of Cronbach's Alpha between 0.7 and 0.9 considered values of excellence. Then we proceeded with the demonstration of the hypotheses, for which the SPSS program was used through the multiple linear relationship option. obtaining the following results:
General Hypothesis; "The Management of Drinking Water and Sanitation Services and Accessibility to Drinking Water and Sanitation Services Affect the Quality of Drinking Water and Sanitation Services in Peru 2025. And that according to the model it was determined that:
That the incidence equation has a coefficient Bo = 10.480 that occurs when V1 and V2 are zero and has a T-value of 1.728, with significance of p=0.008, and with a confidence level of 99%. It also has an incidence coefficient of V1 in V3 given by B1 = 0.265, which has a T-value of 3.322, a significance of 0.009, with a positive and solid effect and with a confidence level of 99%. And it also has a coefficient of incidence of V2 in V3 given by B2 = 0.531, which has a T-value of 6.209, and a significance of 0.000, with a positive and solid effect, with a confidence level of 99%. The incidence equation is given by V3 = 9.389 + 0.036 * V1 + 0.060 * V2. On the other hand, the model as a whole has an F variance of 38.621, with a sig. of 0.000 and with alpha < 0.05. Another result is that its adjusted R2 is 0.423, which indicates that 42.3% of the V3 is explained by the variables V1 and V2, with a VIF multicollinearity level of 1.177. Confirming and validating the General Hypothesis.
Specific Hypothesis 1; "The Management of Drinking Water and Sanitation Services and Accessibility to Drinking Water and Sanitation Services have an impact on the D1-V3 dimension (Tangible Elements) of the Quality of Drinking Water and Sanitation Services variable. And that according to the model it was determined that:
That the incidence equation has a coefficient Bo = 9.389 that occurs when V1 and V2 are zero and has a T-value of 5.837, with significance of 0.000, and with a confidence level of 99%. It also has a coefficient of incidence of V1 in D1-V3 given by B1 = 0.036, which has a T-value of 1.605, a significance of 0.112, with

a statistically significant direct incidence and with a confidence level of 99%. And it also has a coefficient of incidence of V2 in D1-V3 given by B2 = 0.060, which has a T-value of 2.646, and a significance of 0.000, with a statistically significant direct incidence, with a confidence level of 99%. The incidence equation is given by **D1-V3 = 9.389 + 0.036 * V1 + 0.060 * V2.** On the other hand, the model as a whole has a variance F of 7.578, with a sig. of 0.001 and with alpha < 0.05. Another result is that its adjusted R2 is 0.129, which indicates that 12.9% of the D1-V3 is explained by the variables V1 and V2, with a VIF multicollinearity level of 1.177. Confirming and validating Specific Hypothesis 1.
Specific Hypothesis 2; "The Management of drinking water and sanitation services and the Accessibility to drinking water and sanitation services have an impact on the D2-V3 (Reliability) dimension of the Quality of drinking water and sanitation services variable. And that according to the model it was determined that:
That the incidence equation has a coefficient Bo = -0.021 that occurs when V1 and V2 are zero and has a T-value of -0.011 and with a confidence level of 99%. It also has a coefficient of incidence of V1 in D2-V3 given by B1 = 0.056, which has a T-value of 2.061, a significance of 0.042, with a statistically significant direct incidence and with a confidence level of 99%. And it also has a coefficient of incidence of V2 in D2-V3 given by B2 = 0.159, which has a T-value of 5.725, and a significance of 0.000, with a statistically significant direct incidence, with a confidence level of 99%. The incidence equation is given by **D2-V3 = -0.021 + 0.056 * V1 + 0.159 * V2.** On the other hand, the model as a whole has a variance F of 27.185, with a sig. of 0.000 and with alpha < 0.05. Another result is that its adjusted R2 is 0.335, which indicates that 33.5% of the D2-V3 is explained by the variables V1 and V2, with a VIF multicollinearity level of 1.177. Confirming and validating the Specific Hypothesis 2.

Specific Hypothesis 3; "The Management of drinking water and sanitation services and Accessibility to drinking water and sanitation services have an impact on the D3-V3 (Attention) dimension of the Quality of drinking water and sanitation services variable. And that according to the model it was determined that:
That the incidence equation has a coefficient Bo = 3.330 that occurs when V1 and V2 are zero and has a T-value of 2.354 and with a confidence level of 99%. It also has a coefficient of incidence of V1 in D3-V3 given by B1 = 0.034, which has a T-value of 1.728, a significance of 0.082, with a statistically significant direct incidence and with a confidence level of 99%. And it also has a coefficient of incidence of V2 in D3-V3 given by B2 = 0.081, which has a T-value of 4.064, and a significance of 0.000, with a statistically significant direct incidence, with a confidence level of 99%. The incidence equation is given by **D3-V3 = 3.330 + 0.034 * V1 + 0.081 * V2.** On the other hand, the model as a whole has a variance F of 14.690, with a sig. of 0.000 and with alpha < 0.05. Another result is that its adjusted R2 is 0.288, which indicates that 28.8% of the D3-V3 is explained by the variables V1 and V2, with a VIF multicollinearity level of 1.177. Confirming and validating the Specific Hypothesis 3.

Specific Hypothesis 4; "The Management of drinking water and sanitation services and Accessibility to drinking water and sanitation services have an impact on the D4-V3 (Safety) dimension of the Quality of Drinking Water and Sanitation Services variable. And that according to the model it was determined that:
That the incidence equation has a coefficient Bo = -2.081 that occurs when V1 and V2 are zero and has a T-value of -1.117 and with a confidence level of 99%. It also has a coefficient of incidence of V1 in D4-V3 given by B1 = 0.134, which has a T-value of 5.187, a significance of 0.000, with a statistically significant direct incidence and with a confidence level of 99%. And it also has a coefficient of incidence of V2 in D4-V3 given by B2 = 0.112, which has a T-value of 4.273, and a significance of 0.000, with a statistically significant direct incidence, with a confidence level of 99%. The incidence equation is given by **D4-V3 = -2.081 + 0.134 * V1 + 0.112 * V2.** On the other hand, the model as a whole has a variance F of 36.717, with a sig. of 0.000 and with alpha < 0.05. Another result is that its adjusted R2 is 0.407, which indicates that 40.7% of the D4-V3 is explained by the variables V1 and V2, with a VIF multicollinearity level of 1.177. Confirming and validating the Specific Hypothesis 4.

Specific Hypothesis 5; "The Management of Drinking Water and Sanitation Services and Accessibility to Drinking Water and Sanitation Services have an impact on the D5-V3 dimension of the Quality of Drinking Water and Sanitation Services variable. And that according to the model it was determined that:
That the incidence equation has a coefficient Bo = -0.130 that occurs when V1 and V2 are zero and has a T-value of -0.062 and with a confidence level of 99%. It also has an incidence coefficient of V1 in D5-V3 given by B1 = 0.020, which has a T-value of 0.678, a significance of 0.000, with a statistically significant direct incidence and with a confidence level of 99%. And it also has a coefficient of incidence of V2 in D5-V3 given by B2 = 0.119, which has a T-value of 0.393, and a significance of 0.000, with a statistically significant direct incidence, with a confidence level of 99%. The incidence equation is given by **D5-V3 = -0.130 + 0.020 * V1 + 0.119 * V2.** On the other hand, the model as a whole has a variance F of 11.121, with a sig. of 0.000 and with alpha < 0.05. Another result is that its adjusted R2 is 0.163, which indicates that 16.3% of the D5-V3 is explained by the variables V1 and V2, with a VIF multicollinearity level of 1.177. Confirming and validating the Specific Hypothesis 5.

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