

Table 2 Fit statistics of simulated data by WEAP and observed stream flow data for validation

Fit Statistic	Range	Acceptable Range	Value
Mean Observed Flow (m ³ /s)			9.111
Mean Simulated Flow (m ³ /s)			8.621
Median Observed Flow (m ³ /s)			9.010
Median Simulated Flow (m ³ /s)			8.345
Standard Deviation (Observed) (m ³ /s)			4.786
Standard Deviation (Simulated) (m ³ /s)			3.767
Mean Absolute Error (MAE) (m ³ /s)	0 to ∞	Lower is better	5.886
Root Mean Square Error (RMSE) (m ³ /s)	0 to ∞	Lower is better	11.991
Nash-Sutcliffe Efficiency (NSE)	—∞ to 1	> 0.5	0.807
Index of Agreement (IA)	0 to 1	Closer to 1	0.819
Coefficient of Determination (R ²)	0 to 1	> 0.6	0.821

Source: Researcher (2025)

4.3 Scenario analysis and projected water demand (2022-2052)

4.3.1 Sectorial trends in water demand

Domestic water use follows a gradual upward trajectory, driven primarily by population growth. Demand increases from 11.6×10^6 m³ annual in 2022 to nearly 36.8×10^6 m³ annual by the year 2052, necessitating infrastructure upgrades. Industrial demand use, though Higher than domestic demand is expected to rise steadily, increasing from 14.9×10^6 m³ annual in 2022 to 30.2×10^6 m³ annual by the year 2052. The table below summarizes the projection of the demands from base flow year to projected year 2052 (Table 3).

Table 3 Overrow base year demand 2022 and projected year 2052

SUMMARY OF WATER DEMAND PROJECTION					
No.		Supplied demand 2019	Base year 2022	2032	2052
1	Domestic Water Demand	11,039,060	11,648,610	16,753,865	36,871,205
2	Commercial Demand	7,212,035	7,653,320	8,791,390	3,063,350
3	Agricultural Demand	7,943,860	8,430,040	9,683,450	14,389,395
4	School Demand	5,818,100	6,173,975	7,091,950	10,538,280
5	Health Facility Demand	2,813,055	2,968,180	3,590,140	5,993,665
6	Industrial Demand	14,162,000	14,943,465	18,074,070	30,175,280
	TOTAL WATER DEMAND	48,988,110	51,817,955	63,985,230	111,031,175

Total water demand across all sectors is projected to 111×10^6 m³ annual, underscoring the importance of sustainable practices such as rainwater harvesting, wastewater recycling, and efficient irrigation. Policy actions must focus on seasonal conservation, infrastructure resilience, and equitable distribution to meet growing demand.

4.3.2 Comparison with 2022 baseline water demand

The 2022 baseline water demand under the current accounts scenario serves as a reference for assessing sectoral changes and planning needs. Total annual demand in 2022 was approximately 51.8×10^6 m³ annual. Industrial use accounted for the largest share (14.9×10^6 m³ annual) around 29%, followed by domestic (11.6×10^6 m³ annual) agriculture (28.4×10^6 m³ annual), commercial (7.6×10^6 m³ annual), school (6.2×10^6 m³ annual), and health sectors (2.9×10^6 m³ annual) (Figure 6).

Two datasets are compared were: Base year (blue color); Projected year (orange color)

The figure above compares total water demand from the 2022 baseline to projections for 2052. Demand is expected to rise from 51.8×10^6 m³ annual in 2022 to over 111×10^6 m³ annual in 2052 with a 53% demand increment. This is driven by population growth, urbanization, agricultural expansion, and industrial development. These trends highlight the need for adaptive management strategies, including wastewater recycling, rainwater harvesting, and improvements in irrigation and industrial efficiency. Infrastructure investment and policy interventions are essential to ensure sustainable water allocation.