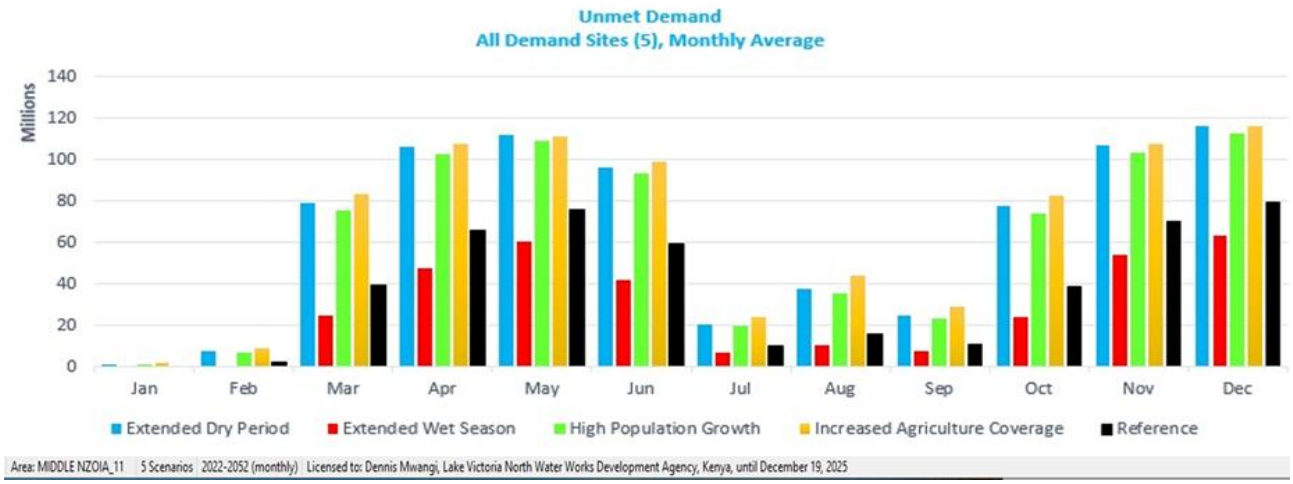

Figure 16 Unmet demand in all demand sites (Source: Researcher (2025))

5 Conclusion

Scenario simulations for the period 2023-2052 under varying assumptions (high population growth, extended dry season, extended wet season, and increased agricultural coverage) indicate a substantial rise in water demand, with projections exceeding 260 × 10^6 m³ annual by the year 2052. Scenarios combining population growth and climate stress the unmet demand, the volume of water required but not supplied started at approximately 20 × 10^6 m³ in 2022 and was projected to climb to about 180 × 10^6 m³ by the year 2052, marking a 28% increase over the study period. During extreme dry seasons and high-growth scenarios, unmet demand reaches to 31% of total demand. This underscores the vulnerability of the catchment to both demographic and climatic drivers, and highlights the need for integrated planning and water-efficient technologies.

The total water demand, which was projected to rise steadily from about 52 × 10^6 m³ in 2022 to nearly 260 × 10^6 m³ by the year 2052. This increase reflects growing population pressure, industrial expansion, and agricultural intensification.

The catchment has an estimated allocable surface water potential of 240 × 10^6 m³ annual, factoring in ecological flow requirements and infrastructure limitations. However, this potential is unevenly distributed and seasonally variable. Current allocation patterns disproportionately favor industrial and agricultural sectors, while essential domestic and institutional uses are under-prioritized. Without reforms, projected future demand will exceed sustainable supply. Therefore, equitable allocation mechanisms, demand management strategies, and resilience-building measures are critical for long-term sustainability.

The study advocates for the adoption of Integrated Water Resources Management (IWRM) to harmonize water allocation across domestic, agricultural, and industrial sectors. Emphasis should be placed on prioritizing essential water uses, particularly domestic and institutional demands, to ensure equitable access.

Enhancement of water storage capacity through construction and rehabilitation of reservoirs and small-scale storage systems is critical to buffer seasonal variability and drought periods. Additionally, promoting water-efficient irrigation techniques can significantly reduce agricultural water consumption while maintaining productivity.

Ecosystem-based management approaches, including catchment reforestation and wetland restoration, are recommended to improve natural water retention and baseflow sustainability. These interventions support both water availability and ecological resilience.