

REVIEWER'S REPORT

Manuscript No.: IJAR-58858

Title: IMPACT OF THE PUMPING REGIME ON THE RECHARGE BALANCE OF THE CONTINENTAL TERMINAL AQUIFER OF THE ALLADA PLATEAU: CASE OF THE GODOMEY AND OUAËDO WELLFIELDS IN THE COMMUNE OF ABOMEY-CALAVI (SOUTH BENIN).

Recommendation:

Accept as it is

Accept after minor revision.....

Accept after **major revision**

Do not accept (*Reasons below*)

Rating	Excel.	Good	Fair	Poor
Originality		Good		
Techn. Quality		Good		
Clarity		Good		
Significance		Good		

Reviewer's ID: JPR- 115 Dr **Thirunahari Ugandhar**

Detailed Reviewer's Report

1. **The manuscript addresses an important and relevant groundwater-management problem**, particularly the increasing pressure on the Continental Terminal aquifer due to urbanisation and intensive pumping. However, the manuscript requires **major revision** before it can be considered for publication.
2. **The abstract contains several numerical inconsistencies and unclear statements.** For example, the reported annual withdrawal of **34 million m³/year** does not appear consistent with the stated average pumping rate of **47,000 m³/day**, which corresponds to approximately 17.2 million m³/year. These figures must be carefully checked and reconciled.
3. The statement that transmissivity decreased from **7.97×10^{-3} to 2.22×10^{-3} m²/s** is important, but the authors should clearly explain whether the two values were obtained from **comparable pumping tests, borehole conditions, pumping rates, and analytical methods**. Comparison of individual boreholes from different years may not necessarily represent regional aquifer deterioration.
4. The interpretation of the **storage coefficient** requires substantial clarification. A change from approximately **10^{-9} to 2.33×10^{-3}** is very large. The authors should explain the hydrogeological basis for this interpretation and verify the units, notation, and reliability of the estimates.

REVIEWER'S REPORT

5. The manuscript states that the aquifer changes from **confined to semi-confined/free conditions**, but the evidence supporting this conclusion is insufficient. Additional geological, piezometric, lithological, and hydraulic evidence should be presented.
6. The **Theis method assumptions** are not fully satisfied, as acknowledged by the authors. The manuscript should explain the limitations of applying the Theis solution to the investigated aquifer and discuss whether alternative methods or numerical modelling would provide more reliable estimates.
7. The recharge estimation methodology needs greater detail. The authors should provide the **actual equations, assumptions, input parameters, temporal resolution, and outputs** of the ESPERE calculations. In particular, the basis for selecting an effective porosity of **0.26** should be justified with appropriate references or field evidence.
8. The conclusion of a “**chronic imbalance**” and **depletion of non-renewable static reserves** should be supported by a clearly presented quantitative water-budget analysis. The authors should explicitly compare recharge, pumping, natural discharge, storage change, and other inflows/outflows.
9. The manuscript claims a **strict linear correlation between population growth and groundwater abstraction**, but no statistical indicators are presented. The authors should provide **R², correlation coefficients, significance levels, regression equations, confidence intervals, and residual analysis**.
10. The demographic projection to 2040 and the projected abstraction of **58.3 million m³/year** need methodological justification. A simple linear regression may not adequately represent future population growth or water demand. Consider alternative demographic and water-demand scenarios.
11. The relationship between **population growth and pumping volume is not necessarily causal**. Water consumption can also be affected by industrial demand, leakage, network expansion, per-capita consumption, climate variability, and changes in water-supply infrastructure. These factors should be discussed.
12. The manuscript should provide **complete tables and figures** for the pumping-test results, recharge estimates, groundwater-level trends, pumping volumes, and demographic projections. Several tables appear incomplete in the supplied manuscript, particularly Table 6.
13. The study would be significantly strengthened by presenting **long-term piezometric trends** from the Godomey and Ouèdo wellfields. Time-series graphs showing groundwater-level changes alongside pumping rates would provide stronger evidence for aquifer stress.
14. The discussion of **saline intrusion** appears speculative because no salinity, electrical conductivity, chloride, or groundwater-quality data are presented. The authors should either provide supporting evidence or clearly identify saline intrusion as a potential future risk rather than an established consequence.

REVIEWER'S REPORT

15. The proposed **artificial recharge** strategy is potentially useful, but its feasibility requires further discussion, including recharge-water quality, infiltration capacity, land availability, clogging, contamination risks, and hydrogeological suitability.
16. The manuscript should clearly distinguish between **Godomey and Ouèdo wellfields** rather than treating them collectively where their pumping rates, hydrogeological characteristics, and impacts may differ.
17. The terminology and English language require substantial revision. There are several awkward or technically unclear expressions, such as “**artificial discharge of the water table,**” “**widespread drying up,**” “**marked aquifer,**” and “**almost instantaneous discharge.**” The manuscript should be professionally edited by a fluent scientific English speaker.
18. The introduction contains extensive general information about global water availability that is not directly necessary for this study. It should be **shortened and focused on groundwater stress, recharge, aquifer exploitation, and the specific hydrogeological context of southern Benin.**
19. The literature review should be updated with **recent international and regional studies on groundwater overexploitation, recharge estimation, aquifer depletion, and groundwater management in West Africa**, particularly studies published during the last five years.
20. The authors should provide a clear **conceptual hydrogeological model** showing recharge areas, aquifer geometry, groundwater flow direction, pumping centres, natural discharge zones, and possible interaction with coastal systems.
21. The manuscript should clarify the exact **study period**. Different sections refer to **2011–2025, 2011–2026, 2001–2023, and projections to 2040**. These periods must be made consistent throughout the manuscript.
22. The methodology should include sufficient information to ensure **reproducibility**, including the number and locations of boreholes, pumping-test durations, pumping rates, observation-well distances, groundwater-level measurements, climatic datasets, and missing-data treatment.
23. The authors should carefully verify all **units, decimal points, scientific notation, and numerical values**. Some expressions appear corrupted or incomplete, particularly the storage coefficient and transmissivity values.
24. The manuscript should avoid making strong management recommendations solely from statistical projections. The recommendations should be directly linked to the **quantitative findings and uncertainty associated with the recharge and abstraction estimates**.

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REVIEWER'S REPORT

25. **Overall recommendation: Major Revision.** The study has scientific and practical relevance, but substantial improvements are required in data consistency, hydrogeological interpretation, recharge estimation, statistical analysis, presentation of results, discussion of uncertainty, and English language before the conclusions can be considered fully supported.