Principle review criteria

Scientific significance: 2 – Good

Scientific quality: 2 – Good

Presentation quality: 3 - Fair

**Review:**

The study provides a comprehensive analysis of the aftermath of Hurricane Dorian's impact on Grand Bahama Island, specifically addressing the extensive flooding and saltwater intrusion into aquifers, which significantly affected the island's water supply. Through an exploration of Managed Aquifer Recharge (MAR) and reforestation as potential nature-based solutions, the study conducts a thorough technical assessment of MAR, identifying plausible implementation sites. Additionally, it offers insightful financial and cost-benefit analyses, integrating ecosystem services, for both MAR and reforestation strategies.

The study's approach is noteworthy for its emphasis on holistic consideration and sustainability. While not exhaustive, it offers relevant implications for addressing urgent environmental challenges and enhancing the resilience of ecosystems and local communities in Grand Bahama.

**Comments**

- The abstract effectively outlines the problem, methodology, and results. However, to enhance clarity, it would be beneficial for the authors to explicitly state the purpose of the study and its specific objectives. Additionally, while the exploration of Managed Aquifer Recharge (MAR) is well-presented, the findings on reforestation could be given equal prominence to provide a comprehensive overview of the conservation practices studied.
- Line 51 contains an important fact that warrants citation.
- Line 58 highlights that the RO system fails to reach potable levels in certain households according to WHO standards. It would strengthen the discussion to specify the extent of this shortfall and explore potential reasons behind it, such as technological limitations or system deterioration. Providing a citation to the potability level guidelines would enable readers to verify this information.
- Line 60 mentions corroded pipes in Bahamian households, likely due to high water salinity. Is this linked to GB's RO system? Clarification is needed to understand its impact on system performance.
- In line 65, the authors could expand on whether RO systems have been previously utilized in the area and investigate evidence of hurricane damage leading to energy supply disruption in the study area or similar regions.
- Line 67 presents an important aspect regarding the benefits of Natural Based Solutions. It would be beneficial for the authors to support this assertion with recent references
- Lines 75 to 77 contain significant facts. It is recommended to accompany these facts with recent evidence and publications to strengthen the argument.
- In natural conditions, when rainfall occurs, the initial portion often infiltrates into the soil. When the soil becomes saturated, or if the rainfall intensity exceeds the infiltration capacity of the soil, excess water will indeed flow over the land surface as runoff, and occasionally causing flooding (Smith, R., & Goodrich, D, 2005. https://www.tucson.ars.ag.gov/unit/publications/PDFfiles/1696.pdf). In line 139, the paper suggests that excess rainfall can be infiltrated, contradicting or suggesting otherwise of what is stated above. Could you clarify this?

- The last paragraph of section 2.4 (Starting from line 132) is not clearly explained. Since the subsequent analysis relies on the identification of feasible MARs, this paragraph should be sufficiently elucidated. For instance, it is not clearly indicated how the water demand and suitable aquifers were determined. The article should be self-explanatory, and the supplementary material should be used as a complement. However, in this case, many fundamental criteria of the different steps of the methodology were placed in the supplementary material. It is recommended to rewrite this paragraph providing more detail of the methodology.
- The equation presented in Equation 2 exhibits a technical flaw: the absence of an opening bracket and the omission of summation limits. These oversights compromise the clarity and accuracy of mathematical expressions.
- Equation 3 introduces a subscript for the variable NPV, which is absent in Equation 2. It would be helpful to clarify the significance of these subscripts for NPV to ensure consistency and understanding throughout the equations.
- Line 197 mentions that the costs of RO were based on global reference costs from 2021, while operational costs were derived from literature predating 2018. To improve accuracy, consider incorporating more recent operational costs for a more precise assessment.
- The information provided in section 2.5 is limited and not well organized. For example, the five ecosystem services indicated are not addressed with the same proportion or depth, nor do they follow the indicated sequence. For instance, habitat provisioning (ecosystem service 4) is discussed after Timber provisioning (ecosystem service 5). Tourism (ecosystem service 2) is addressed at the end of the section.
- Navigating through the article proves challenging as it requires frequent backtracking to previous sections or referring to supplementary material to grasp the primary configurations that the article evaluates. Therefore, it is suggested to rewrite the text.
- On line 252, Figure 2 is cited, which supposedly involves six steps. However, it appears that this reference is incorrect, as the corresponding figure should be Figure 3.
- In line 252, the water demand is estimated to be 30% of the current supplied on the island. Shouldn't this demand be calculated based on the population instead?

  Furthermore, it would be valuable to discuss the correlation between the aquifer's recovery dynamics and the water demand necessary to fulfill a portion of the water supply. For instance, if it is anticipated that the aquifer will fully replenish in 20 years, it raises questions about the interplay between this recovery timeline and the water demand. If non-natural interventions are projected over a 30-year evaluation period but the aquifer recuperates within 20 years, there is a possibility that the populace might require less water treated through osmosis. Nevertheless, it's essential to consider that the population size might have increased by the 20-year mark as well.
- In line 263, it is indicated that a major part of wastewater is treated locally in pit latrines and already recharges the aquifer. Could the authors comment on whether this treatment is sufficient to avoid compromising the water quality of the aquifer? If these latrines are located near the proposed or existing extraction wells, could they compromise the water quality of the aquifer, thus requiring additional costs for treatment for drinking water purposes?
- Figure 3 could be improved for better information transfer. For example, the arrows do not clearly indicate the direction of the flow chart.
- In line 267, the article mentions "via drain tranches". It is important to clarify if this refers to drain trenches.

- Figure 4 is not self-explanatory. For instance, it is not possible to identify where this is located on the general map of Grand Bahama. What does the prominent rectangle signify? Is it the area of analysis? Where is the "<3m (no suitable)" area shown in the figure? The figure indicates that the blue dots represent groundwater level data. To what level does it refer? Distinguished values of the level are not apparent.
- In line 292, volumes of recharge are indicated in m3/yr, whereas in previous paragraphs, demand is indicated in m3/d. It is suggested to standardize the units for better communication of results to the readers.
- The final paragraph of section 3.1 appears to be somewhat confusing. Initially, it suggests that the implementation of RRWH would be technically feasible. However, it then mentions that the construction of schemes would be a time-consuming task, and that public acceptance would be a prerequisite. Could you please provide clarification on this matter?
- In line 336, the text highlights reforestation as the least effective measure for water supply. However, the correlation between reforestation and water supply is not explicitly addressed in the article. If this relationship is not defined, in this article reforestation serves no other purpose than ecosystem services. Therefore, its inclusion/comparison in CBA is questioned. Referring to what is mentioned in the article "The worst performing measure in terms of water provisioning is reforestation," could the author include the relationship between reforestation and water provisioning?
- The content of Section 3.4.2 provides valuable information on the criteria/methods used to estimate/assess the benefits of ecosystem services, as well as those services not addressed by the study, among others. Incorporating this information into the introduction could enhance the clarity of the article in understanding the general parameters of the study. It is suggested to include relevant details from this section in the introduction to illustrate to the reader why the study focuses on the applied methodology and the natural measures addressed.
- In line 440, the article references " Positive impacts on groundwater quantity and quality by forests were identified in that area…" However, it was not possible to verify/contrast the amounts of improvements in the quantity and quality of groundwater attributed to reforestation. It would be beneficial to present these results/findings in tables to provide a more detailed overview of the benefits of reforestation.
- The article considers various assumptions due to lack of data, such as using habitat provisioning data from Rio Grande Basin - Texas (Wang et al. (2021)), data based on communication with experts, and not having groundwater modeling, among others. The results and discussion should include an extended analysis of uncertainties associated with these sources.
- The article addresses an important topic of assessing Nature-based solutions to mitigate the impacts of Hurricane Dorian in Grand Bahama. However, it is suggested to reformulate the discussion and conclusions based on the comments and feedback provided.