Review of: "Evaluating Hydrologic, Geomorphic, and Vegetation Parameters to Assess Natural, Living, and Hardened Shorelines along the Northern Gulf of Mexico"

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Potential competing interests: No potential competing interests to declare.

Reading and reviewing the work has proven to be engaging, with its clarity being notably noteworthy. In particular, I found it highly beneficial for future research works, since it is well inserted in the most recent field of “green infrastructure”, which are though to provide a natural alternative to ‘hard’ shoreline stabilization methods, like rip rap, seawalls, breakwaters etc.

The main basic purpose was to *“investigate the effects of three different shoreline types (natural marsh, living shoreline, and hardened shoreline) on hydrologic, geomorphic, and vegetation conditions by synthesizing data collected at six representative living shoreline study sites along the northern Gulf of Mexico*”. The study has effectively addressed its scope by thoroughly examining a substantial number of actual shorelines and incorporating a noteworthy volume of field data, which encompasses crucial parameters related to hydrologic, geomorphic, and vegetation conditions. The data has been carefully analysed and adequately compared.

Nonetheless, it should be important to emphasize within the text that this analysis represents only the initial stage of the study. This is due to the fact that the parameters accounted for the "hydrologic" conditions lack of a proper wave climate analysis. The impact of waves on shorelines is widely recognized and can be understood in terms of two distinct time scales: the short-term scale, which pertains to storm conditions, and the long-term scale, which relates to mean climate conditions. These two scales exert different effects on shoreline development: the short-term scale influences the cross-shore profile response, while the long-term scale affects the plan-form evolution over extended periods. It's important to note that the implementation of coastline protection measures can have varying effects, either positive or negative, depending on the dominant beach processes.

Consequently, it is imperative that future studies incorporate a more comprehensive investigation into wave climate and its impact on beach response across both short and long time scales. The analysis should be then integrated into the "conceptual model" to accurately evaluate the most effective locations for implementing living shoreline projects. By understanding the interplay between wave dynamics and coastal responses, we can make informed decisions about the feasibility and success of such initiatives.

I suggest the Dean and Darlymple’s book “Coastal Processes with Engineering Applications” for an insight. Moreover, for complex projects, sophisticated wave models can be used to provide a detailed analysis of the wave patterns in and around a site. For application to most living shorelines projects, shallow water wave models that can accurately represent

important processes, like shoaling, refraction, dissipation, diffraction, etc. should be used. Two of the more commonly used nearshore modeling packages which include waves are: Delft3D (http://oss.deltares.nl/web/delft3d) and Mike21 (http://www.mikepoweredbydhi.com/). Moreover, for modelling long term evolution of shoreline GENESIS model (Hanson and Kraus, 1989; https://www.veritechinc.com/products/cedas/cedas-details) can be considered.

In conclusion, considering that this critical evaluation is not of utmost importance at the current stage of the study, I recommend proceeding with the publication of this work after a minor revision. This will allow for the inclusion of any necessary updates or improvements, while ensuring that the overall findings and contributions remain intact. Specifically, please find below a few comments/suggestions, that the Authors might consider, for improving the work:

1. Within the paragraph “Hardened Shorelines”, I suggest citing other well sounded contributions from literature assessing the role of hard defence structures on shoreline evolution:
    a. Buccino, M.; di Paola, G.; Ciccaglione, M.C.; Del Giudice, G.; Rosskopf, C.M. (2020). A medium-term study of Molise coast evolution based on the one-line equation and “equivalent wave” concept. Water 2020, 12(10), 2831. https://doi.org/10.3390/w12102831
    b. Di Paola, G., Ciccaglione M.C., Buccino, M.; Rosskopf, C.M. (2020). Investigating the possible influence of hard defense structures on shoreline erosion along Molise coast (southern Italy): preliminary data. Rendiconti online: Società Geologica Italiana. 52, pp. 2-11
    c. Ciccaglione M.C.; Buccino, M.; Di Paola, G. Calabrese M. (2021). Trigno river mouth evolution via Littoral Drift Rose. Water 2021, 13(21), 2995. https://doi.org/10.3390/w13212995
2. Moreover, within the paragraph “Living Shorelines”, please consider the Reef Balls technique, which are concrete elements designed to attenuate wave energy and serve as the backbone of a natural reef. In this regard please cite:
    a. Barber, R.T., 2001. Reef Balls™: An Advanced Technique to Mimic Natural Reef System using Designed Artificial Reefs. www.artificialreefs.org/scientificreports/ReffBallProjectPlanning.htm.
    b. Buccino, M, Del Vita I, Calabres M. (2014) Engineering modeling of wave transmission of reef balls™. Journal of Waterway, Port, Coastal, and Ocean Engineering. 140(4):1-18. doi: 10.1061/(ASCE)WW.1943-5460.0000237
    c. Buccino, M., Del Vita, I., and Calabrese, M., 2013. Predicting wave transmission past Reef Ball™ submerged breakwaters In: Conley, D.C., Masselink, G., Russell, P.E. and O’Hare, T.J. (eds.), Proceedings 12th International Coastal Symposium (Plymouth, England), Journal of Coastal Research, Special Issue No. 65, pp. 171-176, ISSN 0749-0208. 10.2112/SI65-030.1
3. Figure 1 should be improved. Please insert the precise location of each of the six different sites along the Mississippi and Alabama coastline.
4. Are the solid lines in Figure 3 necessary? I suggest leaving only the “forms”.