Reply Reviewer #3

Not being a modeller myself, i have reviewed this article to the best of my abilities.

I think this paper is very well-written, clear and concise. The quality of the analysis, figures and data interpretation is very high and the scientific quality, rigour and significance seem to be excellent. I, therefore, congratulate the authors on such an excellent manuscript. Really, no issues were found during my review, and i think the approach and the results presented here, represent a very promising development in the field of plastic pollution. Besides, the real-world applications to the selection of the best clean-up locations are really concrete (although field validation of this modeling exercise is currently missing, but strongly envisaged).

We thank the reviewer for going through our manuscript and the positive feedback.

Maybe, i just have a minor comment for the author's consideration:

Given that as you say at lines 293-294 "locations with a high Retention Rate (Figure 7a), SSIsink (Figure 7d), betweenness centrality (Figure 7h) and PRin centrality (Figure 7i) are the most effective cleanup locations", why not combining all these 4 centralities in a single index to further restrict potential the list of potential clean-up locations to the "very" best ones? Assuming that clean-up capabilities of the Galapagos local municipality are restricted, this could be an effective way of further restricting/prioritising the best locations? (i.e. the ones having the best ranks in all 4 centralities). This index, could be potentially also added as a last panel to Fig. 7.

One can indeed combine different centrality rankings to create an even higher impact as done for example in Pata et al. (2021). As suggested by the reviewer, we've combined the 4 most optimal centralities mentioned in our manuscript and compared the combined ranking to the individual rankings (see Fig. 1 in this document). For limited cleanup effort (<10% of coastline), this leads to a slightly higher benefit (Fig. 1a), but it needs more iterations to reach steady state as quickly as when using the individual Retention Rate centrality ranking (Fig. 1c). Combining different centrality rankings is not straightforward, as choosing *which* centrality rankings to combine and *how* depends on the impact objectives and available cleanup resources (e.g. the example of Fig.1 shows that the combined centrality ranking performs worse than some of the individual rankings when the cleanup effort > 10%). Furthermore, the intention of this paper was to introduce the network methodology for plastic pollution mitigation measures in a way that it could be reproduced in other regions. As it is not yet known whether the same centrality rankings score best when applied elsewhere, extending the analysis with combinations of the various centrality rankings is outside the scope of this paper, but worth mentioning as a recommendation for future work. The addition to the discussion can be found in the revised manuscript.

References

Pata, P. R., & Yñiguez, A. T. (2021). Spatial Planning Insights for Philippine Coral Reef Conservation Using Larval Connectivity Networks. *Frontiers in Marine Science*, *8*. https://www.frontiersin.org/article/10.3389/fmars.2021.719691

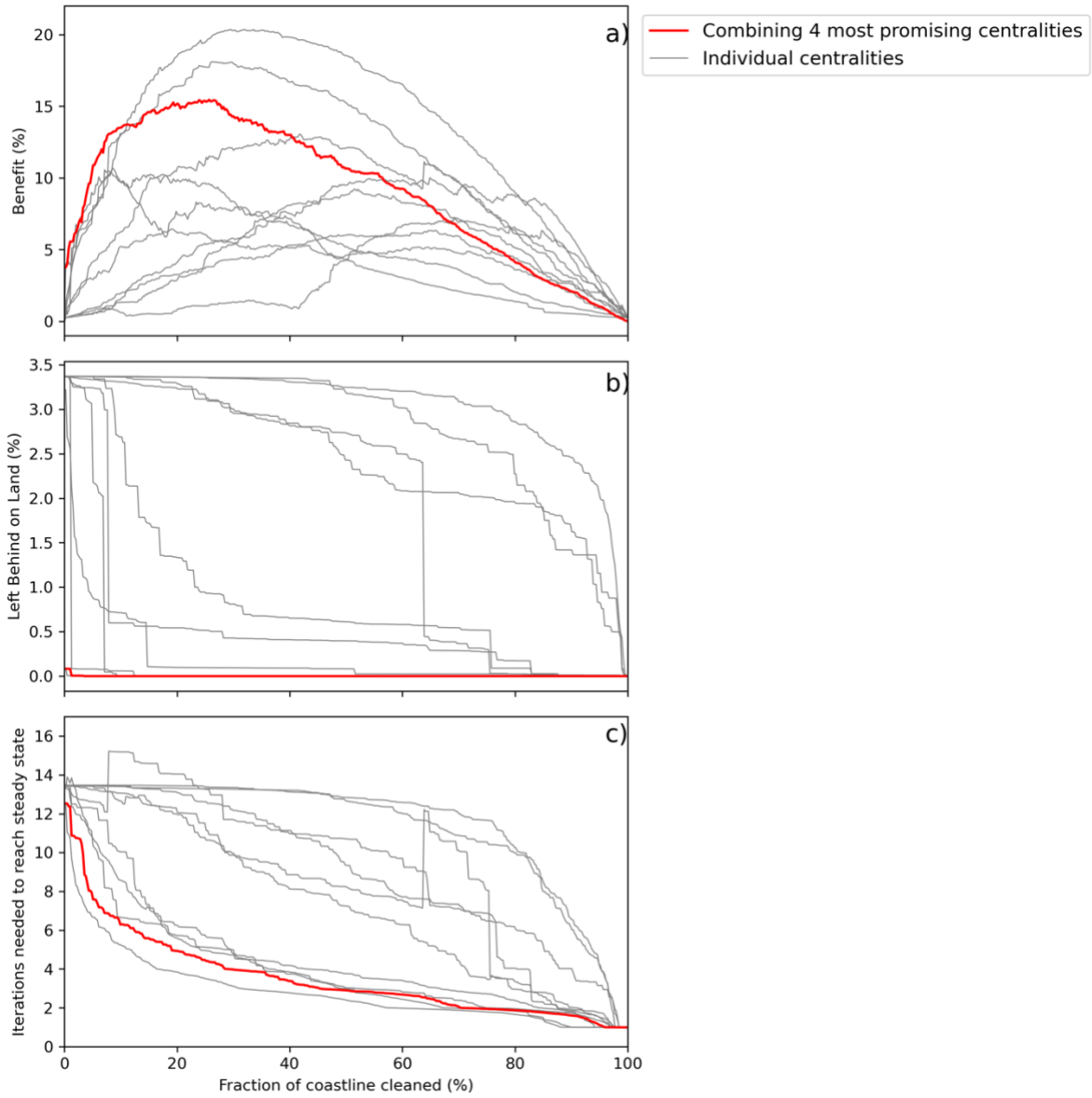

Figure 1: Adjustment from Fig.4 in the manuscript: A comparison of the impact metrics described in section 2.5 of the manuscript as a function of the fraction of coastline nodes cleaned for ***all individual centrality rankings (grey lines)*** *and for* ***the combined ranking*** *of the Retention Rate-, SSIsink-, betweenness centrality-, and PRin-rankings* ***(red line)*** *. The benefit metric (a) measures the difference (in %) between the total number of particles removed and the number of particles removed if there would have been zero connectivity between the different nodes. The Left Behind on Land metric (b) indicates how many particles are still on land after steady state is reached. The Iterations metric (c) shows how many iterations where needed to reach steady state and provides an indication for how often one should clean.*