Reviewer 2: Thank you for recognizing the relevance of this study and for your thorough evaluation. Your comments offer important perspectives that will enhance the quality of our revised manuscript. Below, we provide our responses (in blue font) following each reviewer comment (in black font).

The manuscript studies the resistance of estuaries to changes in dissolved oxygen following rainfall events. The study made a number of counterintuitive findings such as that resistance to change was higher in urbanised estuaries.

I thought the study was well presented in terms of the organisation and coherence of the text and the quality of the figures. I think the study is potentially important because it uses large datasets across many estuaries to make generalisation about how estuaries response to anthropogenic changes. I note I am not an expert on the statistics, but reviewer 1 has covered this point.

Thank you for the encouraging remarks.

My interest is really in the biogeochemistry of estuaries and what the term resistance to change really means. To my mind this was not a useful metric of estuarine function. As the authors themselves acknowledge, if an estuary is in an unhealthy state (ie low DO) before an event, and quickly returns to this, then it would be classified as resistant to change, which isn't really meaningful. I suggest, %DO saturation un-untransformed for resistance would be more useful as a response variable.

Fundamentally, the resistance index is a normalized value that generally describes the concept of a system's shift from a baseline in response to a perturbation, and one of its strengths is that it is not a system-specific index. We provide the definition of the resistance index (lines 188-189). The resistance index is a common and widely-used framework in various fields of ecosystem science for assessing the ability of an ecosystem to maintain its structure and function in response to a disturbance.

We reiterate that the resistance index can not convey information about the overall state of the system (i.e., healthy or not healthy), it can only indicate if a process variable– indicative of ecosystem function– had shifted relative to the baseline as a result of a disturbance. In the manuscript, we frame the resistance index as a tool for: 1) comparing ecosystems' stability responding to precipitation events; and 2) investigate factors that associate with stability. We state the limitations associated with the resistance index (lines 202-207), and reflect on the dependency of the resistance index on the baseline and on the subjectivity in establishing a baseline (line 248). We also present Figure 2 a–e containing information about DO at each site before and after precipitation, which elucidates ambient DO levels, direction of change in DO, and the absolute magnitude of the change. This figure

complements the resistance index to reveal possible implications of each estuaries' response to precipitation (Figure 2 f–j).

We also thank the reviewer for suggesting to use DO (%-sat.) instead of concentration (mg L^{-1}). We previously performed the calculation and checked the resistance index calculated with DO measured in %-sat. against calculations that use DO in mg L^{-1} (please see Figure S5). The resulting resistance indexes are virtually identical, with slightest differences possibly arising due to flagging/not-flagging of some data points during the QA/QC process, or missing values of variables used for internal conversion from %-sat. to mg L^{-1}. We state that the resulting resistance index calculated using DO (%-sat) and (mg L^{-1}) yielded equivalent results on lines 224-225.

In addition to events, I would also have undertaken the analysis to look at how catchment variable such as tree cover, built area etc influenced estuarine response variables such as chlorophyll a, turbidity and nutrient concentrations and how some of the response variable relate to each other. There are other studies of this nature and I think the biogeochemical and ecological implications of this potentially interesting study would be much more straight forward and higher impact than using what I regard as a rather abstract and inappropriate metric for a study of this nature.

We echo the reviewer's suggestions about the importance of including the analysis showing the relationships among variables and draw their attention to Figures S8 and S13. Particularly, Figure S8 shows a correlation matrix with Pearson's correlation coefficients of all variables (resistance index, physicochemical parameters, and LULC). Figure S13 shows the relationships between estuarine response variables (i.e., DIN, Chl-*a*, and turbidity) and LULC (i.e., catchment variables).

We also acknowledge the significance of catchment characteristics on the response variables and their joint implication on estuarine ecology. We address these implications by discussing the effects of these variables (i.e., DIN, turbidity, Chl-*a*) on the directionality of DO change following storms and their influence on DO baseline (see section 4.1, lines 406-436).

To address the reviewer's suggestion, in the revised manuscript we will expand the discussion to include the relationships between population density with turbidity, and between percent trees with PO_4^{-3} that had some of the highest Pearson's correlation coefficients shown in Figure S8.