This paper presents observations of plastic transport in relation to flow velocity and discharge in the tidal part of the Saigon river. It is an interesting, well-written paper with novel observations of plastic transport. I will refrain from the interesting points that Reviewer 1 mentioned and the follow-up response by the authors and focus more on the methods of this research.

Thank you very much for your constructive and critical comments which will improve the quality of our manuscript.

1. Regarding the monitoring of plastics, in line 115 and in Section 2.3 (and in other parts) you mention that the counting of the plastic particles was done visually. How exactly? From the top of the bridge that is 14 m above the water or the plastics were somehow collected and sampled? While reading, in the beginning I assumed the former (which would then lead to the obvious question how accurate this data monitoring is when observing plastics as small as 0.5 cm) but when you mentioned the mass of the plastics in Equation (2) I assumed that you collected the plastics to weigh them. Then, based on the lines 231-235, did you actually collect and classify the plastic samples or did you visually observe them from the bridge and used the distributions from van Emmerik et al. (2019)? This part (and the Section 3.3) is very confusing, please clarify how you sampled the plastics and what is the role of the data from van Emmerik et al. (2019). This part is also critical for the interpretation of Figure 4 and for the analysis related to the different categories of plastics.

Thank you very much for this comment. We will amend section 2.3 to clarify which method we used to monitor floating macroplastic. We used the visual counting method, a widely used measurement method in macroplastic research (González-Fernández et al. 2021; Castro-Jiménez et al., 2019; van Emmerik et al., 2022a; Sarminingsih et al., 2022). Trained observers stand on the bridge and count all visible items over a predefined time interval. Given the spatial heterogeneity in the distribution of floating macroplastics across the river width, this counting process is typically conducted at multiple locations across the bridge. The visual counting method does not necessitate the collection of macroplastics through means like nets. Determining the minimum detectable size of floating items is challenging, as it varies depending on observer sight and perception; ambient conditions and the bridge height. Nonetheless, it is generally accepted that floating items above 0.5 cm are observable (van Emmerik et al., 2018; Liro et al., 2020).

The visual counting method enables one to estimate item transport rate, quantified as number of items per unit of time. It is common in plastic research studies to also report transport rates in terms of plastic mass per unit of time. We thus converted our estimates of item transport rates into mass transport rates. This conversion was done using the dataset on plastic item mass as presented in the work of van Emmerik et al. (2019).

1. In my opinion, for an experimental study there are many assumptions when processing the data and many speculations when interpreting the results, which make the

conclusions a bit doubtful. One of the key findings of the paper, according to the authors, is that the net transport of plastics is higher than the net water discharge. However, the water discharge was estimated based solely on near-surface velocity measurements in a flow environment that can potentially be very complex. The authors multiplied the near-surface measurements with a coefficient 0.85 (please provide proper referencing for this), which I am assuming corresponds to a fully developed boundary layer that obeys the law of the wall. However, the measurements are done in the vicinity of a bridge (actually they included the effect of the bridge by measuring after the flow passed the bridge by changing measuring locations during ebb and flood – in line 109, what does "face the flow direction during measurements" imply?), where local flow accelerations may take place and/or local variations on the bed level may be present with the development of scour holes. In addition, the interactions of fresh and salt water are completely neglected and it is assumed that there is no stratification or mixing that could affect the law of the wall. Finally, by estimating the flow discharge with this method, the (limited time period of) tidal reversal cannot be properly taken into account. As a result, the calculation of the flow discharge is questionable; however, it is used to deduce one of the main findings of the paper: the fact that the net transport of plastics is higher than the net discharge.

Thank you for this comment. We provide clarifications to your comments on the following aspects:

1. **Use of a coefficient of 0.85 to compute averaged-depth flow velocity from near-surface flow velocity measurements**.

We indeed used a coefficient of 0.85 for converting near-surface flow velocity measurements to averaged-depth flow velocity. This coefficient assumes a logarithmic vertical velocity distribution and a typical bed roughness and is generally accepted in the hydrological community (Muste et al., 2008; Boiten, 2003). Haut et al. (2018) estimated averaged-depth flow velocity using gauging data at 176 sites, combining surface flow velocity measurements with water level data and found that most coefficient values fall between the range of 0.7 and 0.9. We will update our referencing to include this study and others regarding the use of a coefficient of 0.85.

Additional references that will be included in a revised version of the manuscript:

Boiten, W. (2003). *Hydrometry: IHE Delft lecture note series*. CRC press.

Hauet, A., Morlot, T., & Daubagnan, L. (2018). Velocity profile and depth-averaged to surface velocity in natural streams: A review over a large sample of rivers. In *E3s web of conferences* (Vol. 40, p. 06015). EDP Sciences.

Muste, M., Fujita, I., & Hauet, A. (2008). Large-scale particle image velocimetry for measurements in riverine environments. *Water resources research*, *44*(4).

Rantz, S. E. (1982). Measurement and computation of streamflow. USGS Water-Supply Paper 2175. *US Geological Survey, Reston, VA*.

2. Small-scale processes that might influence discharge estimates (scour holes, local variations in bed level, fresh and saltwater mixing)

We acknowledge that bathymetric data collected at the monitoring site could provide more accurate estimates of water depths and potentially reveal local scour holes and local variations in the riverbed. These data are however not available. Nevertheless, we measured water depths at five locations across the river width, taking into account contraction scour effects (Arneson, 2013). However, we did not directly measure water depths at the nose of the bridge piers, which could mean that we may have overlooked local scour holes.

To address this, we here estimate the impact of local scour holes on our cross-sectional area calculations and, consequently, on our discharge estimates. We have taken a conservative approach, assuming a worst-case scenario for our calculations. We estimated the maximum scour hole depths for the considered bridge piers. The methodology for estimating these depths can be found in Arneson's work (2013) in Chapter 7, specifically detailed in equations 7.3 and 7.4.

Local scour hole depth (y) [m] was calculated at each point i in front of bridge piers, using the following equation:

$$y_i = 2.0\, K_1 K_2 K_3 \left(\frac{h_i}{a}\right)^{0.35} Fr_i^{0.43}\, a$$

where:

y = Scour depth [m]
h = Flow depth directly upstream of the pier [m]
K_1 = Correction factor for pier nose shape
K_2 = Correction factor for angle of attack of flow
K_3 = Correction factor for bed condition
a = Pier width [m]
Fr = Froude number directly upstream of the pier = $\frac{v_i}{(h_i g)^{0.5}}$

v = Mean velocity of flow directly upstream of the pier [m/s]
g = Acceleration of gravity [9.81 m/s]

We calculated the Froude number (Fr), flow depth (h) and flow velocity (v) for each bridge pier i that we considered. Note that the bridge pier closest to the north-west riverbank was excluded from this analysis. This decision was based on its close proximity to the bank; in an area characterized by very low flow velocities and shallow water depths. These conditions make it unlikely for scour holes to form. Flow depths and flow velocities in front of bridge piers were estimated by averaging the flow depths and flow velocities measured at each observation point. We acknowledge that this is a simplification, as there were instances where the bridge piers were nearer to one of the two observation points.

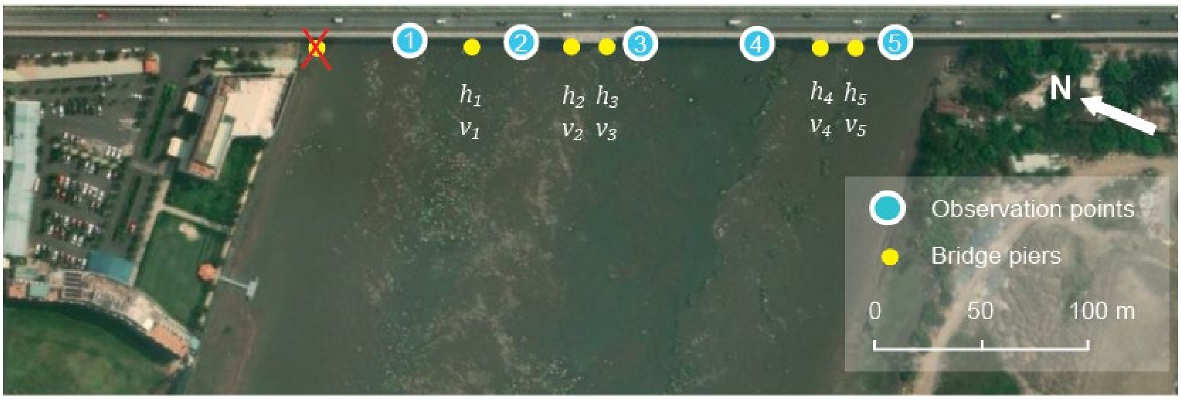

Figure R1. Bridge piers considered, and representation of flow velocity (v) and water depths (h) upstream of each pier i. The bridge pier marked with a red cross was not considered as likely to have scour holes. Copyright: Bing Maps.

The correction factor for angle of attack of flow (K_2) was calculated as follows:

$$K_2 = \left(\cos\theta + \frac{L}{a}\sin\theta\right)^{0.65}$$

θ = Angle of attack of the flow [degrees]
L = Length of the pier [m]

The bridge piers at the monitored location are cylinders of diameter of approximately 2.4 m ($L = a = 2.4\ m$). The angle of attack of the flow was estimated at 12 degrees, using aerial imagery. As a result, K_2 was estimated at 1.17. Additionally, we assigned a value of 1.0 to K_1, given the round nose of the piers. K_3 was set at 1.1, considering the possibility of a bed condition with small dunes (Arneson, 2013).

We found scour depths reaching maximum values between 3.6-2.7 m, depending on the bridge pier considered. To estimate the scour hole area around each bridge pier we use the following equation:

$$A_{s,i} = y_i\, b_i$$

where b indicates the topwidth [m] of the scour hole. Note that we consider the scour hole area around each pier to be comprised of two triangular areas on either side of the pier. Arneson (2013) recommends estimating the topwidth b as twice the scour depths (i.e., b = 2y).

In the end, the total scour area across the entire cross-section amounts to approximately 90 m^2. This results in an increase in river discharge estimates of 2%. Thus, we can reasonably assume that under such worst-case scenario, factors such as local scour holes have only a minimal impact on our discharge estimates.

In addition, it should be noted that precise quantification of discharge was outside the scope for our study. We estimated river discharge to enable comparisons between water flow and plastic transport dynamics. Furthermore, in our comparisons of water delivery ratios to that of plastics, we incorporate both flow velocity and discharge-based estimates. As you rightly noted in a further comment, using flow velocity estimates results in lower uncertainty.

3. The influence of the bridge

Thank you very much for mentioning the influence of the bridge. In the next sub-section ('Tidal reversal') we expand on the influence of the bridge with respect to tidal reversal and the flow direction. Here we focus on the influence of the bridge on the flow dynamics. The presence of the bridge piers indeed obstructs a portion of the flow and the transport of plastics. We conducted our measurements at observation points with minimal direct disturbance from the bridge piers (see Figure R2 below). Consequently, we assume that our measurements are representative for the natural undisturbed river cross-section.

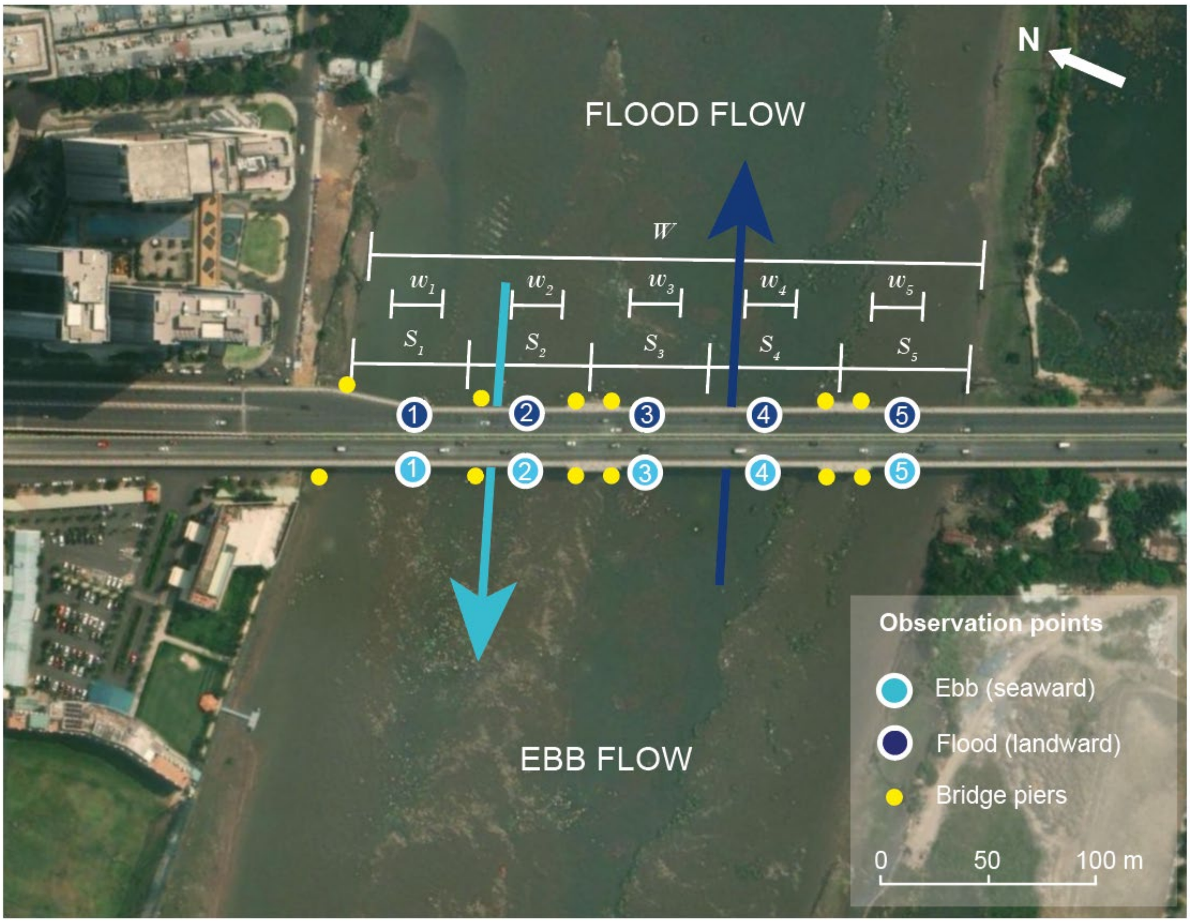

Figure R2. Measurement site (Thu Thiem bridge, 10.785984, 106.718332) and locations. The numbers 1, 2, 3... mark the observation points distributed across the bridge, with variations in their location depending on the flow direction. For floating plastic, we considered observational track width w_i (of 15 meters). For discharge calculations, we considered widths represented as S_i at each observation point. Copyright: Bing Maps.

4. Tidal reversal

Tidal reversal was taken into account in our estimates, as we measured continuously near-surface flow velocity and water depths throughout six tidal cycles. One measurement (including flow velocity, water depth and plastic transport rates) took an average of 9 minutes.

We indeed conducted our measurements facing the flow, so when water (and plastics) had already passed beneath the bridge (see Figure R2). This approach was necessary, particularly for the measurements of surface flow velocity and water depths, as it allowed us to handle the equipment with care. Conducting these measurements prior to water passing beneath the bridge would have led to a loss of visibility of the equipment, as it would have been positioned beneath the bridge due to the flow.

2. Moreover, the way Equation (4) is written, implies that it doesn't calculate the discharge of the whole cross section. In line 133 you mention that w_i=15 m (and W=298 m) and you only have 5 such widths. So, by summing these five areas, you estimate a partial discharge of the river. This is not necessarily a problem, but you relate this to the plastic transport, F, in Equation (1), which extrapolates the measured plastics transport from each width w_i to the whole river width W. By measuring so close to the bridge, it is expected that the bridge piers will induce a high variation in the flow velocities and the plastic concentration on the water surface across the river cross-section. Please clarify how these variables are connected.

   Thank you for this comment. We acknowledge that the equations used to estimate discharge imply a partial discharge calculation. For floating plastic, we considered an observational track width of 15 m (represented as w_i in the figure below). For discharge calculations, we considered widths represented as S_i at each observation point.

   We propose to amend equation 3 to explicitly indicate that we calculated the discharge over the entire cross-section, rather than partial discharge:

$$a_i = S_i \cdot d_i$$

   Furthermore, we have made revisions to Figure R2 to illustrate both " w_i " and " S_i " for improved visual representation. We will update Figure 1B of the manuscript as shown in Figure R2. Note that the bridge decks visible from the aerial imagery between observation points 2 and 3, and between 4 and 5, are much larger in size than the bridge piers.

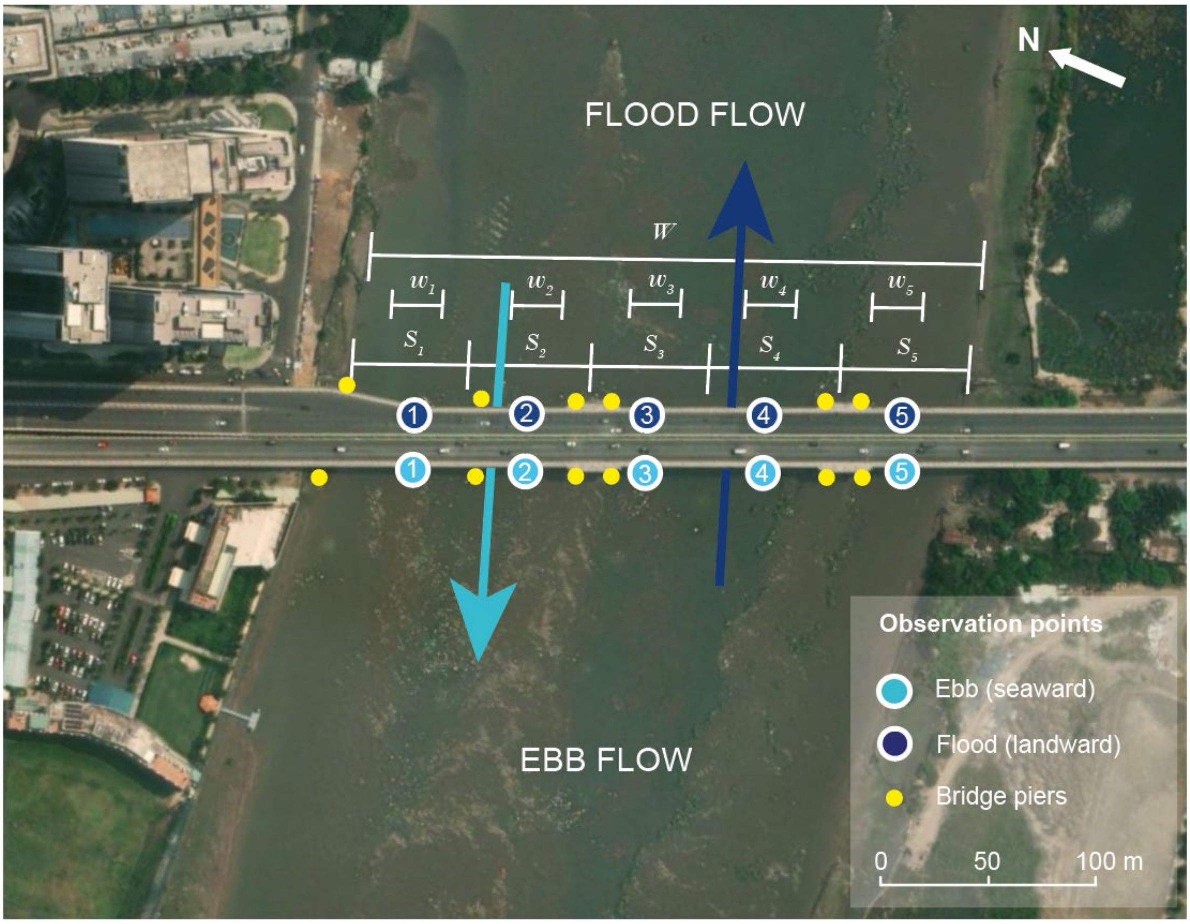

Figure R2. Measurement site (Thu Thiem bridge, 10.785984, 106.718332) and locations. The numbers 1, 2, 3... mark the observation points distributed across the bridge, with variations in their location depending on the flow direction. For floating plastic, we considered observational track width w_i (of 15 meters). For discharge calculations, we considered widths represented as S_i at each observation point. Copyright: Bing Maps.

Some other comments in order of appearance:

3. Lines 142-143: There is no justification about this assumption for the categories “Multilayer” and “Other plastic” and the choices seem rather arbitrary.

We understand your concern regarding the assumption made for the "Multilayer" and "Other plastic" categories. Indeed, there were no measurements of plastic mass available for these two categories. Considering that the 'Multilayer' items were previously categorized as 'PO soft' items in the study conducted by van Emmerik et al. in 2019, we suggest lumping together ‘Multilayer’ and ‘PO soft’ categories for the mass estimates. For ‘Other plastic’ we keep the overall mean of all found macroplastic items. In a revised version of the manuscript, we will update our results on mass transport estimates.

4. Lines 168-170: I agree with the authors that it's less uncertain discussing flow velocities that are directly measured instead of the calculated flow discharges; however, a large part of the analysis is still done based on water discharges and water volumes. How reliable are your conclusions then?

   We report both flow velocity and discharge values, and we base our conclusions on both. We obtained similar results using both flow velocity and discharge, which enhances the robustness and confidence in the study's conclusions.

5. Line 201: In the way that you defined the plastic transport (either items per hour in Equation 1 or mass per day in Equation 2), how can you get volume of plastic transport by integration?

   We acknowledge that the phrasing at l. 201 is unclear and propose to revise this paragraph accordingly:

   > "*The integral values for flow velocity and discharge correspond respectively to the total river surface length [m] and river volume [m^3] that passed by the measurement location per tidal phase. The integral values for plastic transport corresponds to the total amount and mass of plastic items passing by the measurement location.*"

6. Line 218: Why only higher net transport of plastics and not lower?

We appreciate your valuable input. The current wording of line 218 is indeed in need of revision. It's important to note that multiple factors can contribute to the observed differences in plastic and water delivery ratios, which could lead to either higher or lower net transport of plastics compared to water. We propose the following rephrased version:

> "*Over the six tidal cycles considered, we found a seaward mean net transport of approximately 3.1 · 10^3 items hour^{-1}, corresponding to 400-760 plastic kg day^{-1} (Table 1). This represents only about 27-32% of total plastic transport. This ratio is lower for river discharge and flow velocity (18%) (Table 1). In the Discussion, we explored potential explanations for the observed disparities between water and plastic delivery ratios*".

7. Line 224: Can you please clarify "with both higher peaks in flow velocity during the ebb than flood phase of the tidal cycles"

The current wording of line 224 needs rephrasing. We propose the following rephrased version:

> "*The maximum flow velocity during the ebb phase exceeds that observed during the flood phase (0.56 and -0.41 m s^{-1}, respectively)*".

8. Lines 278-279: What are the three values and how is this related to the next sentence and the median mass of items?

We agree that the current wording at l.278-9 needs rephrasing. We suggest the following:

> "*Overall, calculated plastic delivery ratios based on items transport and mass transport are in good agreement, with no more than ±5% of difference between the calculated values (item transport, mass transport based on median, and mean mass per item).*"

9. Lines 337 and 404: As a reader, a paper that is under review does not provide strong support for an argument.

We'd like to clarify that since the time of your review, the reference in line 337 has been published. We will update the reference accordingly to:

Tasseron, P., Begemann, F., Joosse, N., van der Ploeg, M., van Driel, J. and van Emmerik, T. (2023). Amsterdam Urban Water System as an Entry Point of River Plastic Pollution. *Environmental Science and Pollution Research* 30, 73590–73599.

Regarding the manuscript mentioned in line 404 (Lotcheris et al., 2023 in review), while it has not been published yet, it represents a field-based study focusing on the Saigon river and tidal dynamics. Given its relevance to our work, we believe it is appropriate to include a reference to this study in our manuscript.

Lotcheris, R., Schreyers, L., Bui, T. K. L., Thi, K., Nguyen, H. Q., Vermeulen, B., & van Emmerik, T. Plastic Does Not Simply Flow into the Sea: River Transport Dynamics Affected by Tides and Floating Plants. *Available at SSRN:* https://ssrn.com/abstract=4449742

10. Lines 356-357: Is this reference at the tidal part of the river? If not, how is it related to your study?

We greatly appreciate your observation on lines 356-357. We aim to reference studies that specifically address the tidal regions of rivers to maintain relevance to our research focus. We propose to amend lines 356-357 as follows:

> *"The large discrepancy between instantaneous and net plastic transport highlights the need to estimate transport rates based on longer observation periods than usually done in riverine transport studies. For example, González-Fernández et al. (2021) quantified plastic transport over 42 rivers, including 5 influenced by tides. Similarly, van Emmerik et al. (2022a) estimated plastic transport in Dutch rivers, encompassing 26 locations, 7 of which were influenced by tides. In both studies, data collection was limited to the ebb phase, which may have led to potential overestimations of plastic transport."*

11. Lines 392-394: This is a very vague and highly speculative sentence.

Thank you for this remark. We agree that the last two sentences of that paragraph are quite speculative, and thus suggest to remove them. We propose the following amended paragraph:

> *"Besides flow velocity and discharge, other factors could influence the velocity of plastics, such as wind, waves and lateral flows (Laxague et al., 2018; van der Mheen et al., 2020). These factors could generate accelerating or decelerating effects in the propagation of plastic in the river".*

Reference list from this reply:

Arneson, L. A. (2013). *Evaluating scour at bridges* (No. FHWA-HIF-12-003). United States. Federal Highway Administration.

Boiten, W. (2003). *Hydrometry: IHE Delft lecture note series*. CRC press.

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González-Fernández, D., Cózar, A., Hanke, G., Viejo, J., Morales-Caselles, C., Bakiu, R., ... & Tourgeli, M. (2021). Floating macrolitter leaked from Europe into the ocean. *Nature Sustainability*, *4*(6), 474-483.

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Laxague, N. J., Özgökmen, T. M., Haus, B. K., Novelli, G., Shcherbina, A., Sutherland, P., ... & Molemaker, J. (2018). Observations of near-surface current shear help describe oceanic oil and plastic transport. *Geophysical Research Letters*, *45*(1), 245-249.

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Sarminingsih, A., Andarani, P. and Nugraha, W.D. (2022). Developing a Visual Counting Method to Quantify Riverine Plastic Litter: A Case Study of Rivers in Semarang City, Indonesia. In *IOP Conference Series: Earth and Environmental Science* (Vol. 1098, No. 1, p. 012050). IOP Publishing.

Tasseron, P., Begemann, F., Joosse, N., van der Ploeg, M., van Driel, J. and van Emmerik, T. (2023). Amsterdam Urban Water System as an Entry Point of River Plastic Pollution. *Environmental Science and Pollution Research* 30, 73590–73599.

van der Mheen, M., Van Sebille, E., & Pattiaratchi, C. (2020). Beaching patterns of plastic debris along the Indian Ocean rim. *Ocean Science*, *16*(5), 1317-1336.

van Emmerik, T., Kieu-Le, T. C., Loozen, M., Van Oeveren, K., Strady, E., Bui, X. T., ... & Tassin, B. (2018). A methodology to characterize riverine macroplastic emission into the ocean. *Frontiers in Marine Science*, *5*, 372.

van Emmerik, T., Strady, E., Kieu-Le, T. C., Nguyen, L., & Gratiot, N. (2019). Seasonality of riverine macroplastic transport. *Scientific reports*, *9*(1), 13549.

van Emmerik, T., de Lange, S., Frings, R., Schreyers, L., Aalderink, H., Leusink, J., ... & Vriend, P. (2022). Hydrology as a driver of floating river plastic transport. *Earth's Future*, *10*(8), e2022EF002811.