

Reviewer comments:

I suggest acceptance after minor revisions regarding the following points:

- While it is understandable that the site codes are necessary and standardized, the use of solely the codes in the text makes the manuscript hard to read. Please include the site codes and city names in the text (e.g. "...with the exception of HEL\_UB (Helsinki)..."). Similarly, when "TR" or "IND" are used on their own, like in line 436, please add the full word for sake of readability.

**Response:** Thank you for this valuable suggestion. We agree that including both the site codes and city names will enhance the readability of the manuscript. We will revise the text accordingly by adding the city names alongside the site codes (e.g., "HEL\_UB (Helsinki)") throughout the manuscript. Similarly, we will ensure that abbreviations such as "TR" and "IND" are accompanied by their full terms (e.g., "Traffic" and "Industry") where they first appear to improve clarity for the readers.

- Section 2.2 (risk assessment): the values provided by the US EPA are being used here on a European dataset, which makes the reader wonder if there are no such standards (or limits) in the EU. For example, the EU has defined OEL limits. A discussion of why EPA values are used instead is missing (or instead a comparison between the two).

**Response:** Thank you for the reviewer's insightful comment. We would like to clarify our rationale for using U.S. EPA values and provide a comparison with the European Union's Occupational Exposure Limits (OEL).

In our study, we employed U.S. EPA values because the EPA's health risk assessment framework is globally recognized for its systematic and standardized approach to evaluating environmental health risks. The Lifetime Cancer Risk (LCR) values and Reference Concentration (RfC) values provided by the EPA are widely used in assessing health risks related to air pollutants. These values are based on extensive data and evaluations of human health, making them highly reliable for evaluating risk from environmental exposures.

The EU's Occupational Exposure Limits (OEL) are important regulatory standards focused primarily on limiting acute exposure risks in occupational settings. However, these standards are designed for workplace environments rather than long-term, low-level exposure encountered in ambient environments by the general population. Consequently, OEL values are not entirely suitable for assessing chronic exposure risks among the general public. In contrast, the EPA's LCR and RfC values are specifically intended to address the health risks associated with prolonged exposure to environmental pollutants, aligning more closely with the aims of our study.

Our choice to use EPA standards does not imply a dismissal of EU standards but rather reflects the need for values that align with the specific objectives of our study. To provide further clarity, we have added a discussion in the manuscript explaining the differences between the EPA and OEL standards (line 167-173).

*"Specially, in this study, we adopted U.S. EPA values as they provide a standardized framework specifically designed for environmental exposures (Phillips and Moya, 2013). The EPA's health risk assessment values (LCR and RfC) are widely utilized due to their systematic approach and extensive data basis for chronic exposure scenarios. While the EU's Occupational Exposure Limits (OEL) are established for workplace environments, they primarily address acute exposure risks in occupational settings (Högberg and Järnberg, 2023). Therefore, they are not entirely suitable for assessing chronic, low-level exposure risks among the general public."*

- Section 3.5 (health risk assessment): it should be mentioned that the EPA values used are based on the assumption of permanent exposure, which does not mostly happen outdoors. Most humans spend most of their time indoors, so that the contribution of outdoor air pollution does not necessarily determine health or cancer risks. This caveat (i.e. that indoor air concentrations of the BTEX compounds would be needed to make any health-related conclusions) should be discussed. Also, when mentioning health risks in the conclusions, please make clear that this is valid for outdoor exposure only. (E.g. “.the health index values of BTEX at monitoring sites were generally lower than the threshold limit value, suggesting a low non-carcinogenic risk from outdoor exposure to BTEX”). Similar adjustment is necessary when discussing cancer risk.

**Response:** Thank you to the reviewer for the thorough review of this section. We agree that the EPA's risk assessment method is indeed based on the assumption of continuous exposure, which does not entirely apply to outdoor environments. Most people spend more time indoors, so outdoor air pollution alone does not fully determine health or cancer risks. The indoor concentrations of BTEX compounds are also crucial for evaluating health-related conclusions. In light of this, we have clearly indicated in the revised manuscript that this assessment is specific to outdoor exposure and emphasized in the conclusion that our results pertain to outdoor environments.

Line 460-464

*It should be noted that the EPA values are based on the assumption of continuous exposure, which typically does not occur outdoors, where individuals spend less time compared to indoors. Thus, our findings apply primarily to outdoor exposure, and indoor air concentrations of BTEX compounds would need to be considered to draw comprehensive health-related conclusions.*

Line 472-475

*This indicates a generally low non-carcinogenic risk from outdoor exposure to BTEX in the region, with levels mostly within safe thresholds. Therefore, there is no immediate risk of developing non-cancer diseases due to the inhalation of BTEX at the observed levels outdoors.*

Line 489-490

*This would enable better-informed decision-making for public health interventions specifically focused on outdoor exposures.*

- You responded to the referee comment "Why are B/T ratio's higher at industrial sites" but did not make changes to the text that would provide that same information to the reader, at least I did not find it. (Recommendation for future revisions: it is helpful to color any text changes in the response document in a different color, so that it is easy to find out what changes to the text have been made in response to which comment.)

**Response:** Thank you for the helpful suggestion. We have marked the changes in the revised manuscript in blue to make it easier to locate updates corresponding to each comment. Specifically, the response to the B/T ratio question can be found on line 393-395 in the revised manuscript.

*“Notably, the B/T ratio is higher at industrial (IND) sites, which can be attributed to the different atmospheric lifetimes of toluene and benzene. Although toluene is commonly emitted in greater quantities from industrial sources, its atmospheric lifetime is much shorter than that of benzene (toluene: 2.1 days, benzene: 9.5 days). As a result, even though toluene emissions may be significant, the shorter lifetime of*

*toluene leads to its rapid degradation in the atmosphere compared to benzene. This allows benzene to accumulate relative to toluene, particularly near industrial sources, resulting in a higher B/T ratio despite toluene's greater initial emissions (Atkinson and Arey, 2003; Liu et al., 2008)”*

Based on the concerns of the reviewers regarding the novelty of the analysis, I suggest that the category of the manuscript will be changed from “Research Article” to “Measurement Report”. Nevertheless, the manuscript provides an important dataset with comparison of BTEX concentrations between many European locations and is as such a relevant addition to the literature.

**Response:** Thank you for your thoughtful suggestion. We agree with your recommendation and will change the manuscript category from "Research Article" to "Measurement Report" as per your advice. We believe this change better reflects the nature of the manuscript, which provides valuable data and a comparison of BTEX concentrations across multiple European locations. We appreciate your input and are confident that the manuscript will be a relevant contribution to the existing literature.