

CHAPTER 5

CONCLUSIONS AND RECOMMENDATIONS

5.1 Conclusions

1. PFAS concentrations in indoor dust are significantly higher than in outdoor dust, indicating that enclosed microenvironments act as persistent traps for emissions from building materials and household products. Indoor dust is dominated by 6:2diPAP, 6:2FTS, and 8:2diPAP, whereas outdoor exposure is dominated by 6:2FTS, PFHxA, and PFPeA.
2. Principal Component Analysis (PCA) confirms that PFAS contamination is driven by structured anthropogenic activities. In indoor dust, 6 principal components explain 76.05% of the data variance (originating from textiles, electronics, and food packaging). In outdoor dust, 5 components explain 81.37% of the variance (reflecting mixed land-use dynamics such as transportation and commercial zones).
3. Positive Matrix Factorization (PMF) modeling validates the PCA findings. In indoor environments, PMF extracted 6 factors separating historical emissions from modern compounds (specifically paper coatings, commercial surfactants, and batteries/electronics). In outdoor environments, PMF consolidated the sources into 3 main factors (industrial surfactant runoff, transportation infrastructure abrasion, and the degradation of urban solid waste).
4. The Hazard Quotient (HQ) parameter reveals highly critical non-carcinogenic health threats ($HQ > 1$). Children (aged 6-11 years) bear the highest absolute risk due to extreme Estimated Daily Intake (EDI) levels indoors.

5.2 Recommendations

1. Educate the public, especially managers of children's facilities (schools/hospitals), to increase the frequency of indoor cleaning using HEPA-filtered vacuum cleaners as well as regular wet mopping to break the chain of dust ingestion exposure.
2. Recommend that the Iquitos city government implement stricter zoning regulations by adding green buffer zones (pollutant-filtering vegetation) between high-traffic roads/commercial centers and public/residential areas to minimize outdoor PFAS deposition.
3. Encourage the Peruvian government to adopt a class-based restriction policy framework for PFAS, starting with a ban on the import or use of PFAS in non-essential goods such as single-use food packaging and cosmetics also prioritize accessible Fluorine-Free Alternatives (FFAs), such as biopolymer packaging and hydrocarbon-based coatings.

4. Encourage healthcare facility managers and local industries to begin substituting their coating materials and cleaning agents with fluorine-free alternatives (such as those based on silicone or polyurethane) to prevent the accumulation of regrettable substitutes in the future.