ABSTRACT

PAH transport via the atmosphere and runoff routes related to high density population and traffic in urban areas has been extensively studied for decades. In recent years, several studies focused on the use of specific PAH-containing materials, particularly pavement sealer products, as possible sources of ambient PAHs. The log-poor studies are advantageous for documenting patterns of PAH distribution actually established in the environment, but typically provide limited information about specific source inputs in a given urban area. We provide a method to provide an independent resolution to evaluate relative inputs from numerous sources in larger systems. And, the type of controlled monitoring programs that can provide empirical information on the interconnections between specific sources and environmental fate in an urban area are large, expensive, and time-consuming. As a study design to help optimize monitoring programs, we developed bounding estimates for inputs that affect relative mass loading from local traffic, pavement sealer and residential wood combustion sources of PAHs. Using U.S. Census Bureau data for 42 metropolitan areas, average rainfall patterns and relationships between population density and parking lot area, we developed estimates for the various sources considered in the model. The output shows that residential wood combustion is the dominant source of PAHs in most metropolitan areas and that pavement sealer products contribute an average less than 5% of PAH mass inputs. On a more local scale, critical factors likely include traffic density, rainfall washout patterns and the size of sealed parking lots relative to streams receiving uncontrolled runoff.

RESULTS

- Several studies and 68 measured values available to characterize loading via runoff from parking lots with tar-based sealers (CT-sealed) - median = 0.9 mg/m² per rain event.
- Median contribution from CT-sealer less than 4% of urban input, less than 1/3rd of input from vehicle exhaust, tire wear and motor oil.
- Roadway and pavement sources overall typically amount to less than 1/4th of PAH input.
- Airborne contributions (i.e., wood burning) expected to be majority source.

CONCLUSIONS

- Mass balance model and probabilistic results consistent with empirical study on NY/NJ Harbor (Valle et al., 2007)* and historical literature – airborne, especially wood burning, a dominant source.
- Loading contributions from CT-sealer small overall and small relative to vehicular inputs.
- *Given relatively high PAH concentrations in CT-sealer, contributions from parking lots are expected to be highly localized compared to other sources.
- Overall PAH reduction following restrictions/bans on CT-sealer expected to be small and difficult to discern.
- Monitoring programs will require high resolution, highly localized designs to find effects from reducing CT-sealer use.

REFERENCES

- USEPA (1998) and 15 to 35 daily VMT/person