

Trip Motive in Time and Space: The Impact on Black Carbon Exposure

Philip Temmerman, *Hasselt University, Belgium*

Evi Dons, *VITO / Hasselt University, Belgium*

Martine Van Poppel, *VITO, Belgium*

Tom Bellemans, *Hasselt University, Belgium*

Geert Wets, *Hasselt University, Belgium*

Luc Int Panis, *VITO / Hasselt University, Belgium*

Background: Exposure in transport contributes to almost a quarter of accumulated exposure over a day, however in Flanders individuals travel for only 6% of the time. Evidence is emerging that high concentration peaks, for example in transport, are responsible for important health effects.

Objectives: We evaluate trips with different motives, and try to discover spatial and temporal characteristics typical for trips with a specific motive. The effect on in-traffic exposure to Black Carbon (BC) is assessed.

Methods: In 2010, 62 people volunteered to participate in a Flemish study examining personal exposure to the air pollutant BC using portable μ -aethalometers. The participants were also equipped with an electronic diary to register activities and trips. A Global Positioning System was built in the handheld computer and tracked the trips of volunteers.

Results: Over 1500 trips were registered, and assigned by the participants to 6 modes of transport. Trip motive was defined as one of 10 activities performed at the destination side of a trip (only if this was a home-based activity, the diary entry at the origin was defined as trip motive). 61% of all trips with motive work were on weekday peak hours. Half of social and leisure trips are in the weekend and another third is on off-peak hours. Transport modes are distributed quite evenly over trips with different motives. More than 50% of all non-rail commute trips are on highways or on other major roads, daily shopping trips are mainly driven on local roads. As a result, average exposure during commute trips is highest ($5.7 \mu\text{g}/\text{m}^3$). Exposure during daily shopping trips is much lower ($4.0 \mu\text{g}/\text{m}^3$). In addition, commute trips have almost twice the duration of daily shopping trips.

Conclusions: Average concentrations encountered during trips with different motives, are mainly driven by the timing of those trips and road choice. Exposure to BC is highest during car commute trips.

Key words: Black Carbon, GPS, traffic, mobile monitoring, trip motive