

THE EFFECTS OF ROUTE CHOICE ON PERSONAL EXPOSURE TO
BLACK CARBON – A CASE STUDY IN LONDON

Timea Felkl

Department of Civil and Environmental Engineering
Imperial College London

1. INTRODUCTION

Black carbon (BC) is a component of the particulate matter emitted by the incomplete combustion of carbonaceous fuels, unrelated to non-combustion sources (Cheng et al., 2014). BC has been associated with respiratory symptoms in children (Kim et al., 2004), cardiovascular health effects (Peters et al., 2000) and with increased ST-segment depression in elderly (Gold et al., 2005). The aim of this study was to see if an individual could reduce their black carbon exposure by changing the route they take to work for example.

2. METHODOLOGY

The study conducted entailed two independent fieldworks. The collection of BC data was carried out using two Micro-Aethalometers (Model AE51, AethLabs, United States).The instruments were carried in the top pocket of a small backpack. The cycle routes for the two field works were chosen using the mobile app, Citymapper (2016). An additional set of data was taken with GPS recordings by the mobile app Strava (2016). The data collected was analysed using MATLAB (The MathWorks, Inc., United States).

3. FIELD STUDY I: FIXED ROUTE

The first field study was conducted between Fulham and South Kensington, using Santander cycles. The trip was bordered by the stations Halford Road (West Kensington) and Queens Gate (Central). Samples were collected on weekdays, between 8am and 10pm. For differentiation between on and off peak times, the differentiation outline by TfL, as adapted for the oyster fare paid on the underground lines, was used; 6.30-9.30 Morning Peak and 16.00-19.00 Evening Peak (Transport for London, 2016).

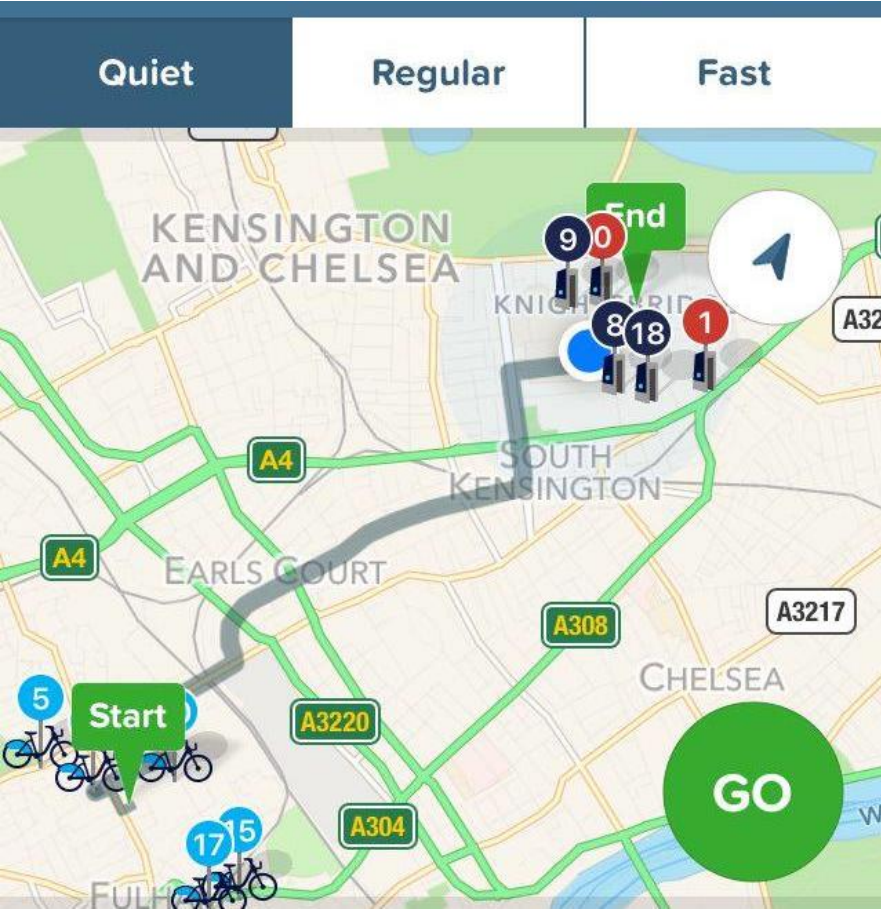


Figure 1: Fixed route between Fulham and SK

	Mean BC On Peak [µg/m³]	Mean BC Off Peak [µg/m³]
Instrument 1	3.39 ± 0.73	2.64 ± 0.48
Instrument 2	3.64 ± 0.69	2.90 ± 0.55
Average	3.52 ± 0.69	2.77 ± 0.50

Table 1: On-peak and off BC concentrations and 95% confidence intervals

ACKNOWLEDGEMENTS

I would like to express my gratitude to my supervisor Dr Marc Stettler for his guidance and assistance.

REFERENCES

Cheng, Y., Liao, C., Liu, Z., Tsai, C. & Hsi, H. (2014) A size-segregation method for monitoring the diurnal characteristics of atmospheric black carbon size distribution at urban traffic sites. Atmospheric Environment. 90 (1), 78-86.
Citymapper Ltd. (2016) City Mapper (6.6) [Mobile App]. Available from: <https://www.citymapper.com/> [Accessed 2nd June 2016].
Gold, D. R., Litonjua, A. A., Zanobetti, A., Coull, B. A., Schwartz, J., MacCallum, G., Verrier, R. L., Nearing, B. D., Canner, M. J., Suh, H. & Stone, P. H. (2005) Air pollution and ST-segment depression in elderly subjects. Environmental Health Perspectives EHP. 113 (7), 883-887.
Kim, J. J., Smorodinsky, S., Lipsett, M., Singer, B. C., Hodgson, A. T. & Ostro, B. (2004) Traffic-related air pollution near busy roads: the East Bay Children's Respiratory Health Study. American Journal of Respiratory and Critical Care Medicine. 170 (5), 520-526.
Peters, A., Liu, E., Verrier, R. L., Schwartz, J., Gold, D. R., Mittleman, M., Baliff, J., Oh, J. A., Allen, G., Monahan, K. & Dockery, D. W. (2000) Air pollution and incidence of cardiac arrhythmia. Epidemiology. 11 (1), 11-17.
Strava Inc. (2016) Strava (4.17.0) [Mobile App]. Available from: <https://www.strava.com/> [Accessed 2nd June 2016].
Transport for London. (2016) Adult rate prices: All Tube, DLR, London Overground and TfL Rail services and National Rail services in Z1-9. Available from:<http://content.tfl.gov.uk/adult-fares.pdf> [Accessed 2nd June 2016].

4. FIELD STUDY II: ROUTE COMPARISON

Three route types between South-Kensington and Putney Highstreet were compared. These were a quiet route and a fast route cycled using the Santander cycle stations Queens Gate (Central) and Montserrat Road Putney, and a public transport route, using busses 14, 430 and 74.

