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Towards a Healthy Urban Route Planner for cyclists and pedestrians in Amsterdam

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Cities are hotspots of air pollution and heat stress, resulting in nuisance, health risks, cost of medication, reduced labour productivity and sick leave for citizens. Yet the air pollution and heat stress are spatially and temporally unevenly distributed over the city, depending on pollutant emissions, street design and atmospheric turbulent mixing and radiation. This spatiotemporal variation allows pedestrians and bikers to choose alternative routes to minimize their exposure, if the distribution is known.

In this project, we develop a route planner for bicyclists and pedestrians for Amsterdam (NL), that proposes routes and departure times based on model simulations of weather and air quality. We use the WRF-Chem atmosphere and air quality model at unprecedented grid spacing of 100-m (Ronda et al, 2015), with an underlying urban canopy model and NO_x and PM10 emissions. The emissions by traffic are calculated based on observed traffic intensities and emission factors. An urban land use map will characterize urban density and street configuration to estimate urban heat storage (Attema et al, 2015). WRF-Chem runs will be issued daily for a lead time of 48 hours, resulting in forecast maps of temperature and pollutant concentrations that will be uniquely expressed in a metric that combines both treats The hourly fields of this metric are provided to the route planner based on the open source routing library pgRouting to identify more healthy routes on the route network of Amsterdam.

The objectives of the healthy urban route planner are to raise awareness of heat and air quality issues in Amsterdam, to provide an innovative adaptation tool for citizens and tourists, to locate the most important bottlenecks in (the exposure to) air pollution and heat stress, and ultimately to test the readiness of the travellers to use the information and adapt the route.