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Mapping Street Level CH₄ Emissions in the Urban Area of Heidelberg (Southwest Germany)

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Estimating the contribution of cities and urban areas to the regional and global methane budget is challenging due to their complex infrastructure. The use of mobile measurement devices provides a well-suited way to detect methane sources via real-time ambient air measurements. Surveys with mobile CH₄ measurements were conducted from May 2020 to January 2021 in the city area of Heidelberg. This made it possible to cover a third of Heidelberg's entire road network via real-time ambient air measurements. Leak indications for methane were observed and recorded with an excess of 100 to 4600 ppb CH₄ above the background concentration. A minor portion of leaks was attributed to the sewer system while most of them originate from natural gas leaks in the urban gas distribution system with 2.1 covered km per leak indication.

To assign an emission rate to all of the leak indications a method, developed by Weller et al. (2019)² based on release experiments and mobile measurements, was used and adapted to Heidelberg. We tested this method with additional CH₄ release experiments and modified it to the smaller street widths in Heidelberg resulting in shorter distances from the source to the measurement device. The total annual CH₄ emission rate calculated for Heidelberg, up-scaled to the entire road network, is 42 tCH₄ yr⁻¹. This results in an emission rate of 0.26 kgCH₄ yr⁻¹ per capita.

²Weller, Z. D., Yang, D. K., & von Fischer, J. C. (2019). An open source algorithm to detect natural gas leaks from mobile methane survey data. *Plos One*, 14(2), e0212287. doi:10.1371/journal.pone.0212287