Levels of soot in Kermanshah, Iran

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Over 3 million people die prematurely each year due to outdoor airborne particles globally[1]. Measurements at street level in Kermanshah, Iran, has shown soot concentrations of 0.6 µg/m^3 and 0.1 µg/m^3 which is low compared to other cities.

The Middle East is today a white spot in the mapping of air pollution and airborne particles in the world. Few measurements have been performed there before, and no measurements of airborne particles have been conducted in Iran prior. To remedy this, a longterm measurement station is being set up in Kermanshah, Iran, in a collaboration between Razi University and Lund University.

Airborne particle are hazardous to inhale, since they deposit inside the lungs, and are causing more than 3 million premature deaths globally each year[1]. They can cause cancer, cardiovascular diseases, asthma and decreased lung function in people exposed to them. They also have a noticeable impact on the climate. Some particles, like soot, contribute to the global warming while others, like dust, have a cooling effect on the climate. In total, though, particles cool down the climate. Therefore mapping the particles are of importance.

Cars and industries, using combustion, are big sources of airborne soot particles, which are formed in incomplete combustion processes. Soot particles from cars are additionally emitted at ground level. This means they are more likely to be inhaled and cause health problems, for the inhabitants of the area, than soot being emitted higher up in the atmosphere.

Kermanshah has about 850,000 inhabitants, making it a fairly large city. The measurement site in Kermanshah represents the exposure to particles in a typical Iranian urban area. Measurements of the soot concentration were performed both at street level in the middle of Kermanshah, and at an urban background site just north of the city.

The urban background had a soot concentration of about 0 µg/m^3 for all measurements, and the street level measurements gave 0.6 µg/m^3 for the first measurement and 0.1 µg/m^3 for the second. This can be compared to measurements from Helsinki, the capitol of Finland with 630,000 inhabitants. In downtown Helsinki a soot concentration of 1.38 µg/m^3 has been measured[2]. The measured value of 0.6 µg/m^3 and 0.1 µg/m^3 at street level in Kermanshah is low compared to Helsinkii. One explanation for this can be that the measurements in Kermanshah are taken during a time with low traffic intensity, which should result in lower soot concnetrations. Direct comparisons, though, are difficult to make, since the measurements in Kermanshah is only over a few hours while the measurements in Helsinki are over a far longer time.

[1] J. Lelieveld et al. "The contribution of outdoor air pollution sources to premature mortality on a global scale". In: *Nature* 525 (2015), pp. 367–371. DOI: 10.1038/nature15371

[2] T. A. Pakkanena et al. "Atmospheric black carbon in Helsinki". In: *Atmospheric Environment* 34 (9 2000), pp. 1497–1506. DOI: https://doi.org/10.1016/S1352-2310(99)00344-1.