

## Publication

### Ambient air quality standards and policies in eastern mediterranean countries: a review

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**Author(s)** Faridi, S.; Krzyzanowski, M.; Cohen, A. J.; Malkawi, M.; Moh'd Safi, H. A.; Yousefian, F.; Azimi, F.; Naddafi, K.; Momeniha, F.; Niazi, S.; Amini, H.; Künzli, N.; Shamsipour, M.; Mokammel, A.; Roostaei, V.; Hassanvand, M. S.

**Author(s) at UniBasel** [Künzli, Nino](#) ;

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Objectives: National ambient air quality standards (NAAQS) are critical tools for controlling air pollution and protecting public health. We designed this study to 1) gather the NAAQS for six classical air pollutants: PM(2.5), PM(10), O(3), NO(2), SO(2), and CO in the Eastern Mediterranean Region (EMR) countries, 2) compare those with the updated World Health Organizations Air Quality Guidelines (WHO AQGs 2021), 3) estimate the potential health benefits of achieving annual PM(2.5) NAAQS and WHO AQGs per country, and 4) gather the information on air quality policies and action plans in the EMR countries. Methods: To gather information on the NAAQS, we searched several bibliographic databases, hand-searched the relevant papers and reports, and analysed unpublished data on NAAQS in the EMR countries reported from these countries to the WHO/Regional office of the Eastern Mediterranean/Climate Change, Health and Environment Unit (WHO/EMR/CHE). To estimate the potential health benefits of reaching the NAAQS and AQG levels for PM(2.5), we used the average of ambient PM(2.5) exposures in the 22 EMR countries in 2019 from the Global Burden of Disease (GBD) dataset and AirQ+ software. Results: Almost all of the EMR countries have national ambient air quality standards for the critical air pollutants except Djibouti, Somalia, and Yemen. However, the current standards for PM(2.5) are up to 10 times higher than the current health-based WHO AQGs. The standards for other considered pollutants exceed AQGs as well. We estimated that the reduction of annual mean PM(2.5) exposure level to the AQG level (5  $\mu\text{g m}^{-3}$ ) would be associated with a decrease of all natural-cause mortality in adults (age 30+) by 16.9%-42.1% in various EMR countries. All countries would even benefit from the achievement of the Interim Target-2 (25  $\mu\text{g m}^{-3}$ ) for annual mean PM(2.5): it would reduce all-cause mortality by 3%-37.5%. Less than half of the countries in the Region reported having policies relevant to air quality management, in particular addressing pollution related to sand and desert storms (SDS) such as enhancing the implementation of sustainable land management practices, taking measures to prevent and control the main factors of SDS, and developing early warning systems as tools to combat SDS. Few countries conduct studies on the health effects of air pollution or on a contribution of SDS to pollution levels. Information from air quality monitoring is available for 13 out of the 22 EMR countries. Conclusion: Improvement of air quality management, including international collaboration and prioritization of SDS, supported by an update (or establishment) of NAAQSs and enhanced air quality monitoring are essential elements for reduction of air pollution and its health effects in the EMR.

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