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# Modelling the impacts of renewables energies on health - Cases and costs on Europe due to fine particles under climate change scenarios

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Air pollution impacts human health, by the close relationship with climate change and because of the effects that pollution has on human health and welfare. Air pollution impacts health in a form that it also involves some associated external costs to society. This study is focused on particulate matter, especially fine particles (with a diameter of 2.5 $\mu$m or less, PM2.5). Exposure to PM2.5 is dangerous because they can reach lungs or even pulmonary alveoli, depending on particles size. PM2.5 impact on health is variable (from respiratory to until mortality) and all dwellers are under risk, especially children. Can be damage for our health both short- and long-term exposure to PM.
This study tries to assess the impacts of present (1991-2010) and future (2031-2050) air pollution by fine particles on several pathologies and to estimate the difference in the costs associated to those health impacts on European population. Two possibilities are considered for the future scenario: (1) business-as-usual energy production system and emissions, and (2) scenario where 80% of the energy is obtained from renewables.
Air quality model data from the REPAIR project is used in order to check the possible changes in pathologies and diseases between present and future scenarios of climate change. The simulations used for assessing air quality in this work span the periods 1991-2010, as a present reference period, and 2031-2050 under RCP8.5 climate change scenario. The differences between these two runs will provide the changes in future air quality. The regional chemistry/climate model used has been WRF-Chem, assuming unchanged anthropogenic emissions but varying natural emission (which depend on climate conditions, and therefore vary in present and future simulations). The emission factors for energy production (g/GJ) are obtained from EMEP/EEA air pollutant emission inventory guidebook – 2016. Health effects studied in this work caused by fine PM2.5 are Respiratory and Cerebrovascular Hospital Admissions, Chronic Bronchitis, Congestive heart failure, Lung Cancer, Asthma, Diabetes and Premature Deaths.
Overall, the most affected area by fine PM2.5 pollution is southern Europe, especially the Mediterranean Basin. All the pathologies included in this study will increase in the future period under climate change scenario if no mitigation policies for anthropogenic regulatory pollutants are implemented in Europe, which can be strongly compensated by the introduction of renewable energy policies over Europe.

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