

## **Effect of changes in emissions and climate on air pollution-**

*Peter Brimblecombe*

*School of Energy and Environment, City University HONG KONG*

The interaction between weather and air pollution is self-evident, but at times it can become easy to exaggerate the potential role of meteorology on air pollution. Changes in climate can be quite subtle, yet changes in air pollutant emissions, given that they are controlled by human activity can be large and rapid. On the other hand there is a question of variability. European emissions of PM<sub>2.5</sub> reduced by 25–35% compared to emissions from 2000 in 2010, but such changes can be obscured by the effect of meteorological variability, which is of the same order of magnitude, so improvements may not be readily observed. There is a huge volume of research on climate change and air pollution, but some suffer from the assumption of constant pollutant emission rates over the coming century. Although this allows us to explore climate change impacts, it of course neglects the likely changes in emission, both increases and decreases. It is further complicated because regional differences in economic growth can introduce a distinct heterogeneity in terms of future emissions.

This presentation explores the importance of the relative balance between pollutant emissions and climate which may all change, so we need to examine a complex pattern of change that can override earlier generalised claims that pollutants such as ozone or particulate matter will necessarily increase in future. There are even more challenging research problems when one tries to address issues, such as health or agriculture, under a changing future environment. Studies that examine the threats from a warmer climate and worsening air quality, often neglect the underlying social changes that can shift health outcomes or alter our agricultural activities in terms of farming practice or even the crop types that are grown.

We also need to consider the effect of changes in climate on emissions. Increased energy utilisation perhaps in warm climates can increase emissions, but these could decrease in cold climates. Increased evaporation in a warmer world could lead to enhanced VOCs both from anthropogenic and biological sources; the latter is not readily amenable to control. We will also explore the changes in sensitivity in terms of human health and crop damage. Food security

seems a key issue for many parts of the world, but its relation to air pollution has not always received the attention it deserves. I will argue that the situation is complex and doesn't always offer the easy answers favoured by decision makers. There are certainly a number of critical research challenges for the future. In particular we should note that the Asia Pacific Rim, with a prevalence of biomass burning, El Niño, monsoons and typhoons, will face some unique problems, not only as climate and pollutant emissions change, but through developing economic strength and a vibrant society.

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