

Figure 2: Using alternative forms of energy such as wind-generated power has benefits for air quality and climate change. Image: Wikimedia Commons



# Air quality: its impact on climate change

Air quality and climate change are among the most challenging environmental problems facing mankind. By **Tirusha Tambrian**.

**T**he combustion or burning of fossil fuels such as petroleum and coal emits pollutants such as sulphur dioxide ( $\text{SO}_2$ ), carbon monoxide (CO), particulate matter (PM) and carbon dioxide ( $\text{CO}_2$ ). Even though these emissions can originate from the same sources we find that  $\text{SO}_2$ , CO, PM are traditionally classified as air pollutants, whereas  $\text{CO}_2$  is classified as a greenhouse gas. Air pollutants and greenhouse gas emissions are often studied, monitored and managed separately.

There are various reasons for this. The first is that the lifetimes of

these pollutants in the atmosphere differ greatly. For example,  $\text{SO}_2$  can remain in the atmosphere for a few days whereas  $\text{CO}_2$  can remain in the atmosphere for a hundred years. Secondly, air pollutants have more immediate and local impacts on human health and ecosystems, whereas the effects of the greenhouse gases are more long-term, as they are able to absorb sunlight and thus contribute toward long-term changes in surface temperatures and have impacts on the global climate.

As a result of these differences, the policies to deal with air quality

and climate change issues have also been developed at different scales. Policy to deal with air pollution is generally developed at a national level, with opportunities for regional and local policies, where the ultimate goal is the protection of human health and ecosystems through air quality management. Climate change policy has, however, developed at an international level, where the main aims are to mitigate or slow down climate change through a reduction of greenhouse gas emissions, and to adapt to the consequent damage that could occur as a result of climatic changes. >>

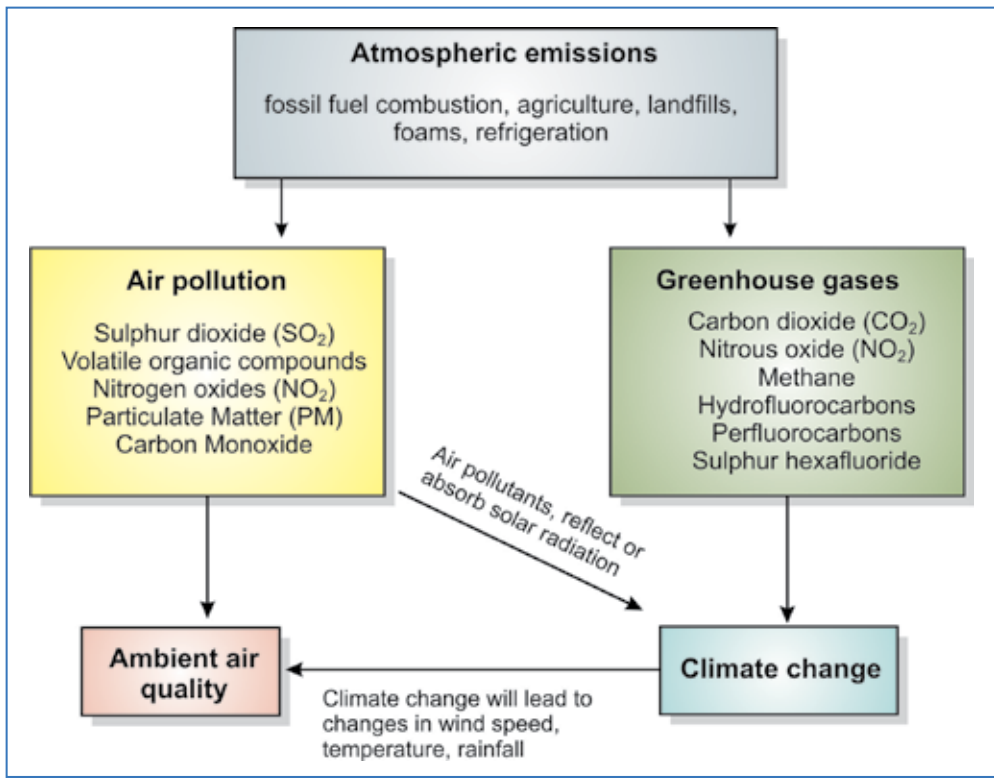


Figure 1: Summary of the key linkages and interactions between climate change and air quality.

### Air quality and climate change have complex linkages and interactions

In the last decade significant progress has been made towards improving our scientific understanding of how the issues of climate change and air quality are related, revealing that the linkages between these issues extend beyond a commonality of sources of emissions.

Specifically, air pollutants have the ability to absorb or reflect solar radiation, and thus can have warming or cooling effects on the climate. Sulphate particles, for example, can contribute to cooling the Earth by reflecting sunlight back into space and preventing it from reaching the Earth's surface, whereas other particles such as those of black carbon are able to absorb sunlight and contribute to climate warming. Thus, air pollutants can sometimes be referred to as 'short-lived' greenhouse gases – because of their atmospheric lifetimes they only have an impact on surface temperatures and the climate in the short term.

Climate change is also likely to have impacts on air quality. Poor air quality generally results from a combination of air pollution and weather conditions that are unfavourable for the removal of these pollutants from the atmosphere. Climate change is expected to result in progressive changes to weather patterns. These include changes

to the distribution and amount of precipitation, change to temperature, changes to wind speed, wind direction and to large-scale weather-producing systems. These are key factors responsible for the dispersion of pollutants. Furthermore, climate change could lead to changes in fossil fuel consumption patterns as well as changes to natural sources of emissions. Thus, climate change is expected to impact on air pollution and ambient air quality by affecting the sources of emissions of air pollutants, as well as the ability of pollutants to be dispersed in the atmosphere. These changes are likely to have an impact on the number, duration and intensity of air pollution events.

### Linking air quality and climate change interventions

Because air quality and climate change have many complex linkages and interactions as shown in Figure 1, there is growing recognition of the need to tackle both these issues together. One opportunity to do this is by implementing interventions within the key polluting sectors that will simultaneously reduce or avoid the release of both air pollutants and greenhouse gases. As fossil fuel combustion is a major source of emissions, one option is to move towards greater use of renewable sources of energy, such as wind generated power (see Figure 2),

that do not emit air pollutants or greenhouse gases and thus avoid the release of further emissions.

However, if we continue to use fossil fuel-derived energy we must ensure that we use it more efficiently. Furthermore, by taking a more holistic approach to how we manage atmospheric emissions, there are opportunities for countries to be more cost-effective in the ways in which they reduce air pollution and greenhouse gas emissions.

The concept of dealing with air quality and climate change issues together may be of particular relevance to developing countries that are still grappling with air quality issues and do not prioritise climate change mitigation. Using a holistic approach to air quality management, where climate change linkages and interactions are considered, may allow these countries to more effectively meet their existing goals for air quality improvements and also make contributions toward climate change mitigation.

Behavioural changes in society are likely to be key factors in determining how successful nations are in simultaneously tackling air quality and climate change challenges. We all have a role to play, and every person needs to be made aware of how their actions and decisions contribute toward air pollution and greenhouse gas emissions. Taking the appropriate actions now to reduce atmospheric emissions will allow current generations to experience air quality improvements, whilst also creating the prospect of long-term climate and air quality benefits for future generations.

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