Lessons learned from emission fluctuation of greenhouse gases and air pollutants due to restrictions associated with the COVID-19 pandemic

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The decrease in the concentration of air pollutants due to the limitation of socio-economic activities associated with the COVID-19 pandemic has been detected by ground-based and satellite observations. Since most of the air pollutants originate from fossil fuels, it is thought that the emission of carbon dioxide, which is a greenhouse gas, has also been reduced. However, as behavior restrictions have been lifted, air pollutant concentrations have returned to their original levels. Although it was a very short period of time, it is a fact that there was a rapid global reduction in their emissions that could not have been normal situations. What should we learn from this experience toward mitigating future climate change and air pollution? I will provide a few perspectives based on my public articles posted to Yahoo Japan News (sorry, but only in Japanese) (https://news.yahoo.co.jp/byline/takemuratoshihiko/) for discussion.

<Mitigating global warming by reducing carbon dioxide vs. Accelerating global warming by reducing air pollutants>
Both carbon dioxide and air pollutant emissions were reduced globally in the first few months of this year. Carbon dioxide reduction works to mitigate global warming, of course. On the other hand, climate change caused by aerosols is quantitatively large among the air pollutants, and its reduction brings about positive radiative forcing, and therefore accelerates global warming. Most of the air pollutants have short lifetimes in the atmosphere, then as soon as the amount of emission changes, the concentration also changes significantly. In the case of carbon dioxide, even if the amount of emission changes temporarily, the concentration in the atmosphere does not immediately change. Therefore, temporary reductions in fossil fuel consumption may have resulted in temperature increases of the order of months in some regions. An international project with climate models is underway to analyze how the climate change caused by the COVID-19 pandemic was. Regarding the long-term relationship between air pollution and climate change, developed countries that have continued to increase greenhouse gas emissions by only reducing particulate matter that cools the
atmosphere to mitigate air pollution have accelerated global warming. Air pollution control and global warming mitigation had to proceed simultaneously.

<Sustainable behavior change is effective in mitigating global warming>
Improving the atmospheric environment and reducing carbon dioxide emissions associated with the COVID-19 pandemic is only temporary. Although it was only temporary, we were able to experience that if the consumption of fossil fuels is reduced, the carbon dioxide emissions will decrease and the atmospheric environment will improve. It was analyzed that the largest reduction in carbon dioxide emissions due to this behavior change was in the transportation sector. It was proved that individual commuting by foot or bicycle, and reduction of going to office and business trips by remote work were effective. We tend to have the impression that we have to put up with something to mitigating global

warming (especially Japanese people). “Patience” of behavior restriction does not become an essential solution to global warming and air pollution, but we have experienced that sustainable behavioral change by each person is effective in achieving a decarbonized society. I think that what we have done is of great significance.

Keywords: COVID-19 pandemic, Climate change, Air pollution, Carbon dioxide, Aerosols, Behavior change

