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O 26. AIR POLLUTION AND PUBLIC HEALTH IMPACTS DURING THE COVID-19 PANDEMIC

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ABSTRACT: Industrial success often results in relatively high population densities and causes concomitant and sometimes synergistic air, water and soil pollution problems. Petrochemical plants, motor vehicles, metal processing industries and household heaters are just a few of the pollution sources that pollute the environment. Altogether, these problems are widely thought to be associated with high cancer deaths. Although many studies in the literature have examined the issue of changes in air pollutant levels during quarantine in different countries, few have focused on the impact of these changes on health risks. The study compared the 2020 period, which included quarantine (partial closure between March 16 - May 10 and October 30 - December 15), with previous years and the pandemic period to determine how these government-mandated quarantines affected concentrations. NO2, O3, PM2.5 and PM10 and how it affects human health factors including low birth weight, lung cancer, mortality, asthma, non-accidental mortality, respiratory and cardiovascular diseases have been determined. Air quality is important for health, although there are changes in the relative risks of health outcomes based on epidemiology. It was found that the relative changes in pollutant levels during the 2020 restriction period were as follows. Reductions in short-term risks were associated with reductions in PM2.5 (in pediatric emergency department visits for asthma during the second lockdown) and NO2 (in hospital admissions for respiratory causes). Long-term risk reductions related to PM2.5 include low birth weight, mortality rate and lung cancer, and NO2 has also been stated to be effective in mortality rate. WHO also stated that air pollution poses a major risk to the environment and health. Even more harmful to health is indoor air pollution in large urban areas. It is important to have correct ventilation systems in indoor environments, as particulate matter in aerosols can also harbor pathogens such as viruses and bacteria and therefore be easily transmitted. Air pollution is also one of the biggest challenges of our millennium, and some early studies have highlighted a positive correlation between air pollution and the spread of the virus. Therefore, it is crucial to define what role atmospheric particulate plays in the spread, morbidity, and mortality of the virus.

Keywords: Pollution, COVID-19, Pandemic, Air pollution, Public health

1. INTRODUCTION

Air pollution emissions are released from both natural and anthropogenic sources. Human-driven activities aimed at providing necessary goods and services to society are responsible for the anthropogenic share of air pollution. Air pollution emissions occur at many stages in the life cycles of products and services, that is, from raw material extraction, energy acquisition, production and manufacturing, use, reuse, recycling, through to ultimate disposal. Effects of pollutants is direct bearing on the health of animals & man, & planetary biodiversity. Toxic gases & substances present in the atmosphere cause: Retardation of growth, promote ageing, Bleaching of leaves, Necrosis in plants. The degree of damage: Dose of pollutant & Duration of exposure, Loss of valuable plant materials especially around industrial areas damage to physical structures, monuments, and buildings. Microbial pollution of air: A variety of microbes are carried by air, Meteorological conditions (temperature, humidity, solar radiation), Amount of particulate & gaseous pollutants contribute immensely to the variation in the load and type of microbes, Most of the atmospheric microflora emanates from the soil or due to stirring action induced by animal/human activity within the animal houses, The microbes are adsorbed on the dust particles, Carried over long distances under favourable weather conditions (high wind velocity) especially during outbreaks of diseases, A large numbers of organisms (many of them pathogens) can

be transmitted through air in an area, Animals suffering from respiratory diseases discharge the microorganisms during sneezing & coughing.

For human being: Sneeze can release up to 10,000-10,00,000 droplets, Microbes released by animal & human sources survive in the environment for varying lengths of time, Some organisms may not survive for more than few minutes (Leptospira in dry atmosphere), Can resist the adverse environmental conditions for as long as 28 years (spores of Bacillus anthracis in soil), Brucellae can survive in soil for about one month, Exposure to sunlight causes destruction of many environmental microorganisms (*Mycobacterium* spp.), In soil: mycobacteria can survive for up to 6 months.

COVID-19: The virus that causes COVID-19 is known as SARS-CoV-2, It appears to have first emerged in Wuhan, China, in late 2019 (Fig. 1). The outbreak has since spread across China to other countries around the world. By the end of January 2020, the new coronavirus had been declared a public health emergency of international concern by the WHO. The most reported symptoms include a fever, dry cough, and tiredness, and in mild cases people may get just a runny nose or a sore throat. In the most severe cases, people with the virus can develop difficulty breathing, and may ultimately experience organ failure. Some cases are fatal.

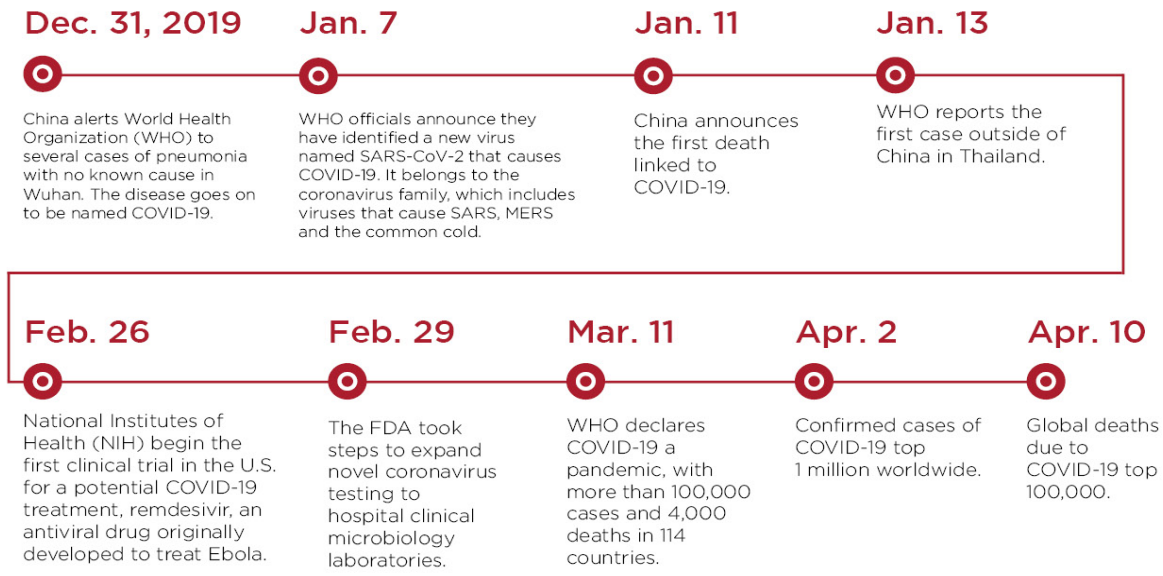

Figure 1. Action schedule for beginning of COVID-19 pandemic period.

Although the amount of infection is low in the group over the age of 20 and over the age of 80, who are not allowed to go out due to the measures taken due to the Covid-19 pandemic, it is seen that the survival rate of those infected with the disease is more difficult, that is, the death rate is higher (Fig. 2). The disease recovery rate is quite high in patients between the ages of 20 and 40. Looking at the death rates from Covid-19 in Asian, European and African countries in Figure 3, it is seen that the highest death rates after the USA are in China and India.

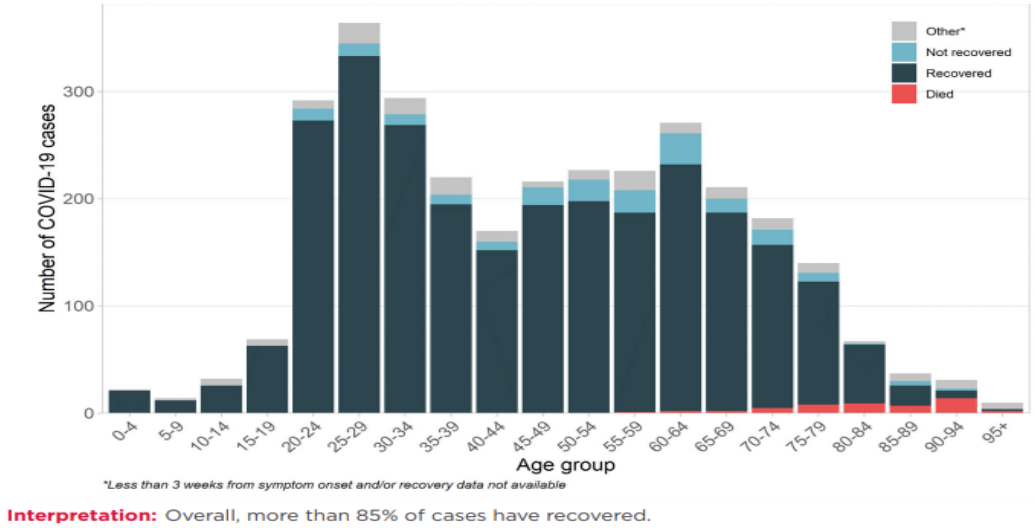

Figure 2. Total number of COVID-19 cases by age group and health status.

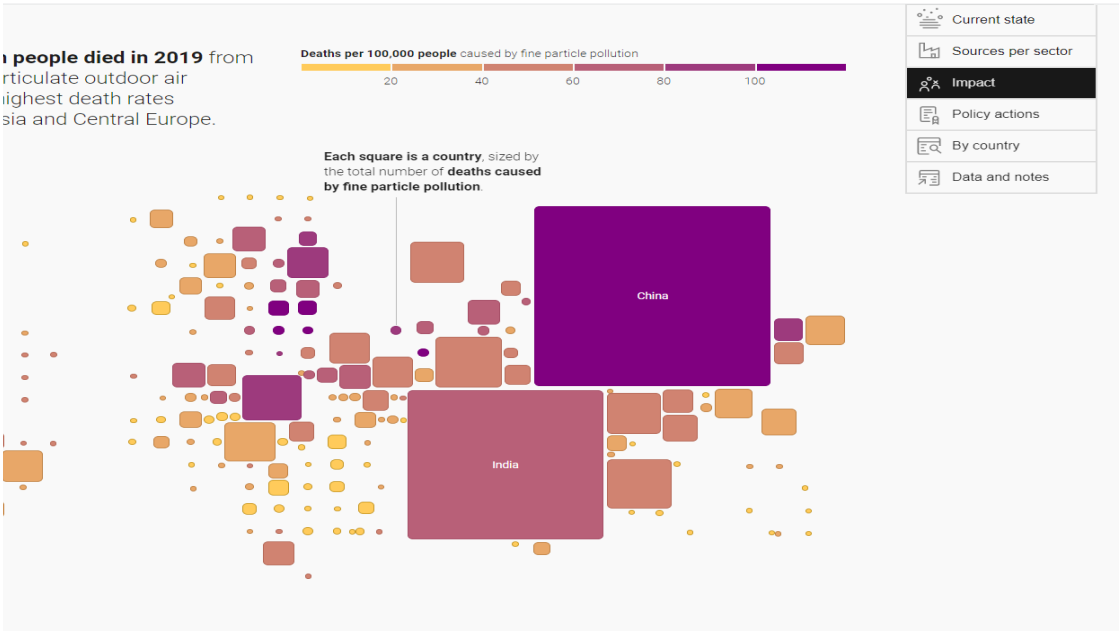

Figure 3. Death rates from Covid-19 infection in European-Asian and African countries.

The amount, size, sources and effects of PM in the atmospheric environment are quite complex. Figure 4' The effects of PM pollution on the human body are shown in Figure 5. Of these organs, the highest impact rate is on the respiratory system. In addition to the high chance of these organs coming into contact with particulate matter, PM properties are also an important factor.

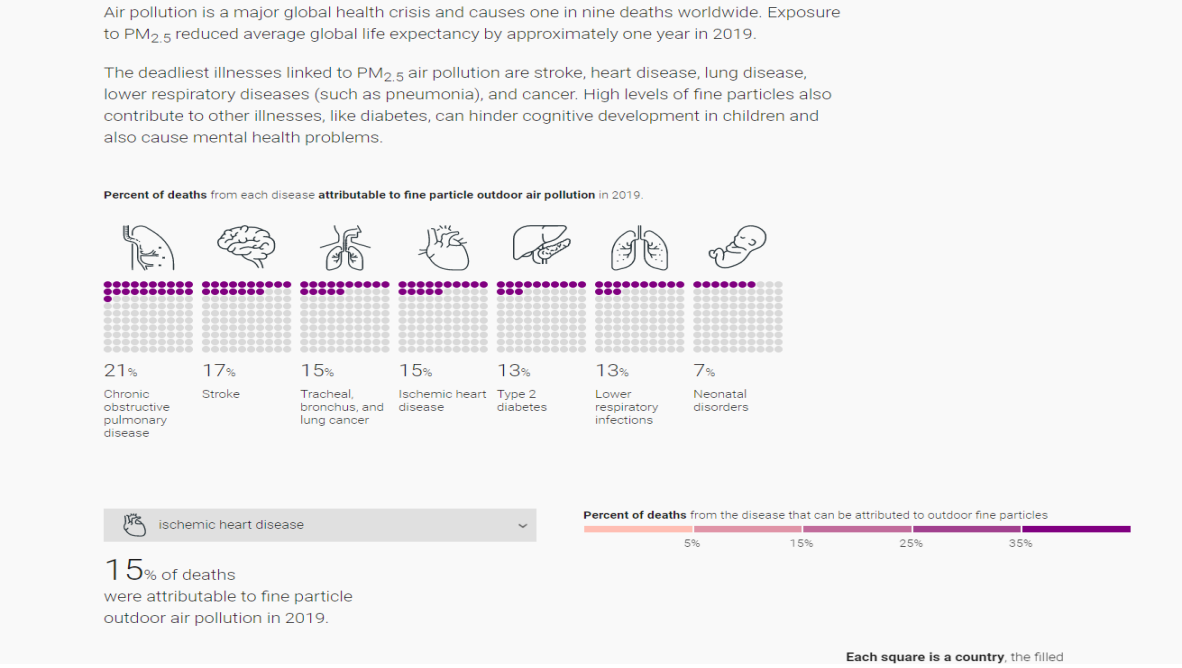

Figure 4. Rates of PM pollution affecting organs in the human body.

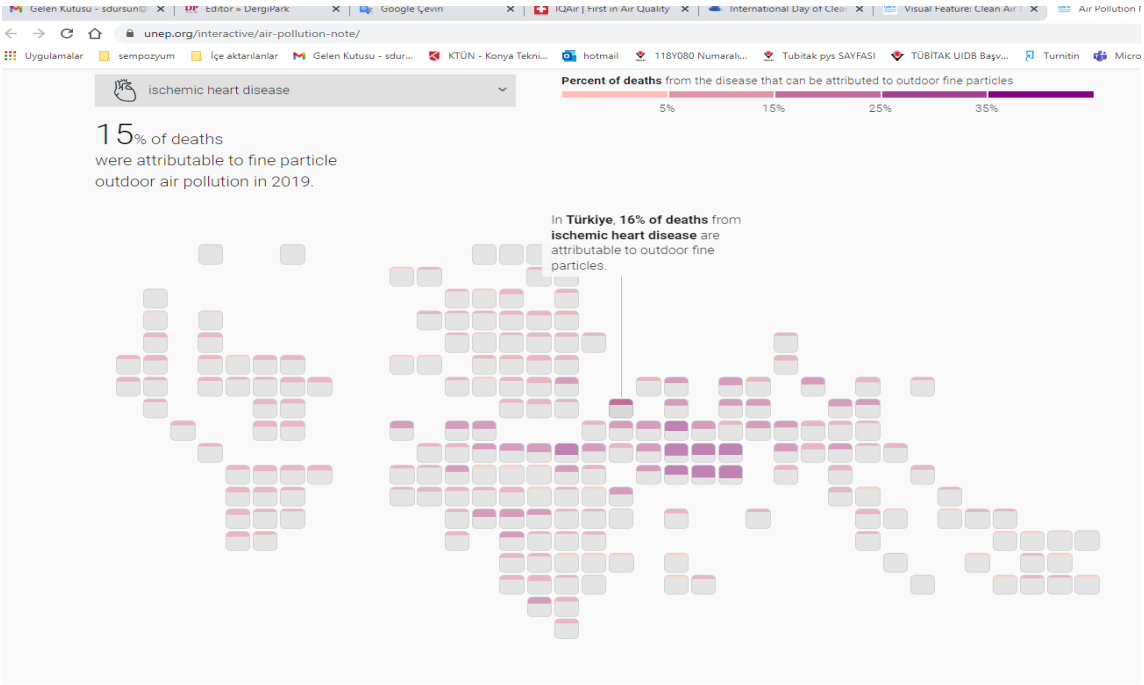

Figure 5. 15% of deaths in Turkiye were attributable to fine particle outdoor air pollution in 2019.

When European-Asian countries are examined in African countries, it is seen that there are high rates of Covid-19 rates and deaths in the Middle-Far East countries and the northern part of Africa (Figure 5). Figure 6 shows instantaneous PM10 concentrations in the world. Figure 7 shows current PM10 values in Türkiye and its surroundings. Although many factors affect PM values, it appears to be quite high in certain regions. These values are relatively close to the intensity of Covid-19.

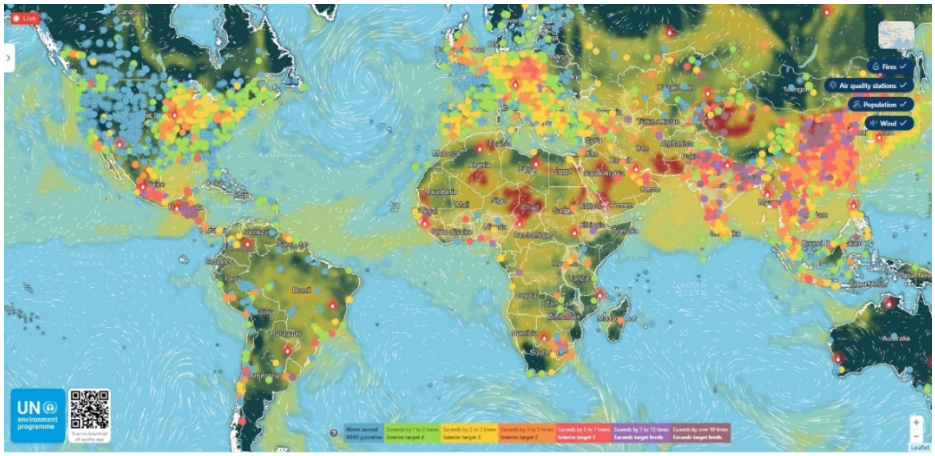

Figure 6. Worldwide PM_{10} pollution, https://www.iqair.com/unep

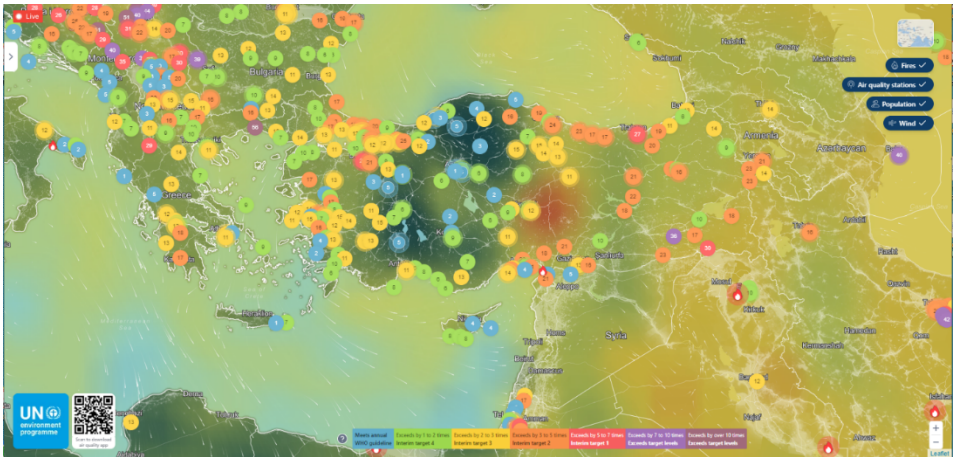

Figure 7. Turkiye PM_{10} concentration distribution.

Many measures are taken to reduce PM10 Concentrations in the majority of countries in the world (Figure 8). The rates of measures taken in European countries and the USA are higher. Rates in African countries are lower. Of the 9 different methods of taking measures determined in Turkey, success has been achieved in 8 of them, and measures are being developed in one of them (Figure 9).

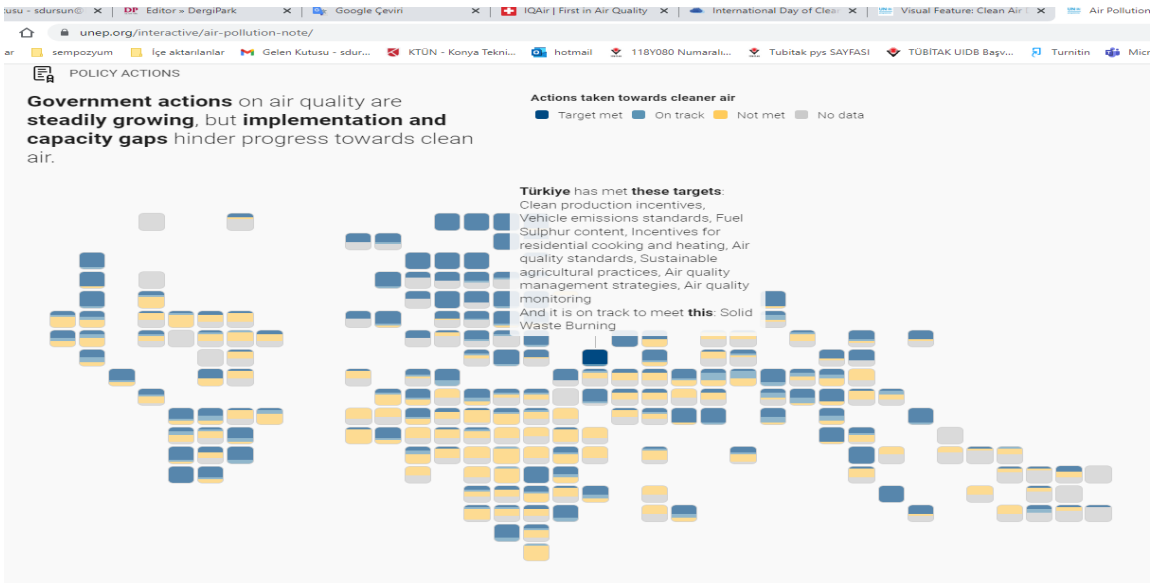

Figure 8. Government actions on air quality are steadily growing, but implementation and capacity gaps hinder progress towards clean air.

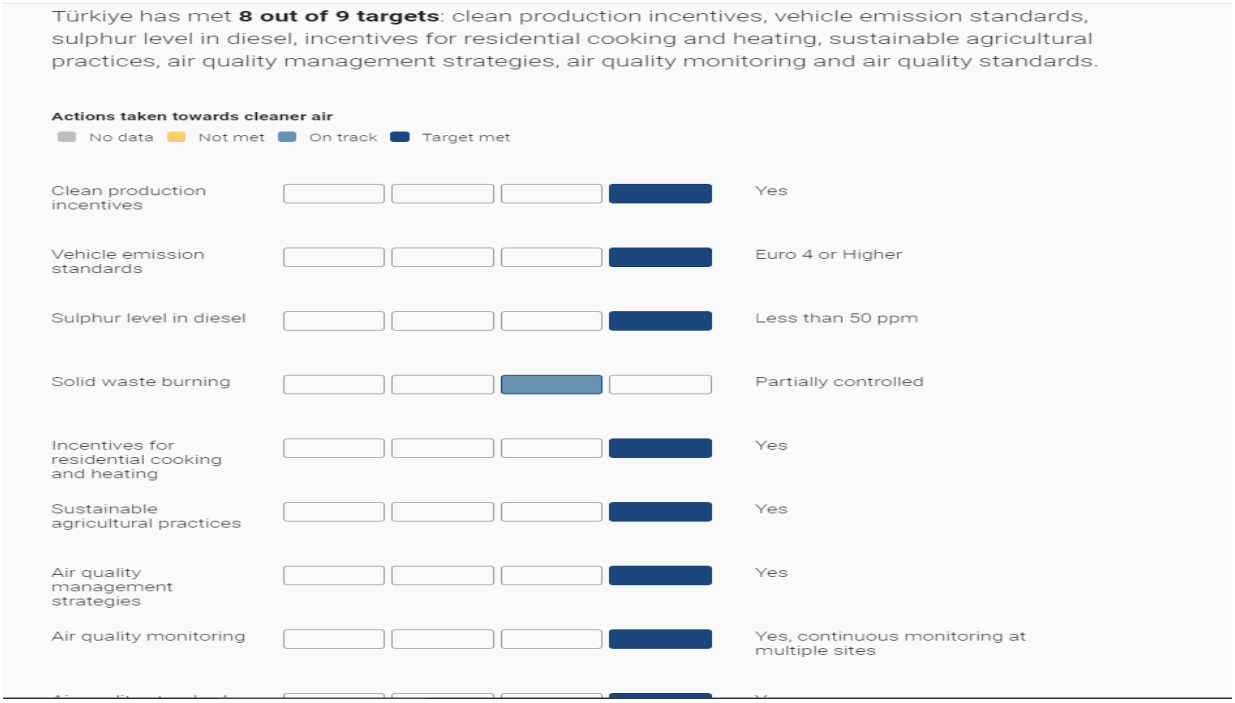

Figure 9. Türkiye has met **8 out of 9 targets**: clean production incentives, vehicle emission standards, Sulphur level in diesel, incentives for residential cooking and heating, sustainable agricultural practices, air quality management strategies, air quality monitoring and air quality standards.

Control of air pollution: Minimize the production & release of pollutants near the animal or human dwellings, Control of dust particles: by improving sanitary conditions within the houses, Frequent washings of floor & equipment: controlling the dust within the buildings, Vacuum cleaners: used effectively, Proper ventilation: a prompt clearance of foul gases & particulate pollutants. Filters can be installed to check the entry of external contaminants, Use of laminar air flow systems for closed compartments/ cabins, Allows unidirectional passage of air through cellulose acetate filters.

2. CONCLUSION

The goal of any clean air policy is to develop strategies to reduce the risk of adverse effects on human health and the environment as a whole caused by ambient air pollution. With the existence of very susceptible populations and the ability to detect effects even if they are infrequent, we may be confronted with situations when the concept of thresholds is no longer useful in setting standards to protect public health. The principle of eliminating adverse effects with an adequate margin of safety even for the most susceptible groups may not be realistic. However, risk reduction strategies are and will continue to be powerful tools in promoting public health. The development of such strategies requires not only qualitative, but also quantitative knowledge on the most relevant adverse effects. PM2.5 pollutant was investigated; it is primarily the pollution that occurs due to the fuels burned for transport purposes. In addition, due to the low air temperature values, people prefer to use public transport, walk or bike, etc. The use of private vehicles instead of using them also increases the pollutant values. In EU countries and Turkey, the limit value of PM10 (Particulate Matter) has been determined as 50 µg/m3 as a result of 24-hour measurement. As a result of the annual measurement, the limit value has been determined as 40 µg/m3. The working group noted that the recommendation to use PM2.5 as indicator for PM related health effects does not imply that PM2.5 is the only relevant parameter to characterize PM pollution. Therefore, it was recommended to set up a more comprehensive monitoring program in different European cities (possibly including PM10, PM2.5, composition, gases), which, in combination with properly designed health studies, could lead to an additional gain in knowledge on the health effects of ambient air pollution in the coming years.

3. RECOMMENDATIONS

Ensuring energy efficiency and ensuring the use of renewable energy sources (wind, geothermal, solar energy) are among the most important reduction activities in reducing air pollution. On the other hand, government should make the necessary legal arrangements and carry out inspections. It should review the legislation according to the conditions of the day and make the necessary improvements. The public should be informed by preparing trainings on the importance and protection of the environment. As a solution proposal as a result of research and analysis; Attention should be paid to the fuels used during industrial activities and the flue filters in the facilities. To reduce the exhaust and gases from motor vehicles, we can ensure less pollution by using public transportation, at least in an environmentally friendly way such as cycling or walking.

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