

Counteraction of Trioxygen inside the Tropopause for Protection of Human Health

¹Mr.Samiran Rana, ²Mr.Sudipta Jana, ²Ms.Sudipa Das, ²Ms.Sanchita Maity, ²Ms.Ranju Samanta, ³Ms.Mouli Bhakat, ³Mr.Sumantra Bid

¹Ph.D. Scholar, Department of Physiology, Shri JJTU, Jhunjhunu, Rajasthan, India

²Under Graduate Scholar, Department of Human Physiology, Midnapore College (Autonomous), West Bengal, India

³Post Graduate Scholar, Department of Human Physiology, Vidyasagar University, West Bengal, India

Abstract: *The trioxygen inside the tropopause, quite possibly the most dirtying of right now, is incredibly famous for its impacts on people just as creatures and the climate. So, this is a matter of concern. This is the reason why individuals are unwittingly influencing their health, particularly the lungs. In this age of industrialization, every big and small city around the world is emitting huge amounts of VOC, NOX, CO and many other pollutants. The public should be aware to avoid all these obstacles and moreover, the government has a central role to play in limiting all these emissions and conducting vehicle inspection programs. Although it is very difficult to completely eliminate trioxygen from the environment, people can keep their bodies fit with regular exercise, if possible, internal breathing exercises.*

Keywords:- Air pollution, Air pollutants (VOCs, NO_x), Trioxygen (O₃), Source and Formation of Trioxygen, Tropospheric trioxygen, Human health effects, Double trouble-flu boost effect of trioxygen, Prevention tricks.

I INTRODUCTION

Everything in nature is like a storehouse that we have to exist in this world, but unfortunately, the people of the world consciously destroy the whole nature which causes a lot of pollution and indirectly also destroys their own lives. Air pollution has become the most dangerous cause of health diseases like lung infections, heart diseases etc. [1]. WHO states that 1/8 of total worldwide death happens because of air pollution [1]. OECD (Organization for Economic Cooperation and development) Says that the cost of the air pollution to the society in 2010 was approximately at US\$ 0.5 trillion [1].

The most common and harmful air pollutant is Trioxygen Or Ozone. It is a faded blue coloured gas consists of three oxygen atoms [2]. It is divided into two types, Stratospheric trioxygen or ozone layer and trioxygen inside the tropopause or simply, ground level ozone. Stratospheric trioxygen or ozone layer (6-30 miles above the earth ground) has a great contribution in our life, it helps to protect the earth from the UV rays. However, trioxygen inside the tropopause or ground level ozone (2 miles above the earth ground) is very harmful for human health but sometimes it is used as a bleaching which is strong germicide in the chemical industry [2]. According to NIOSH 5 ppm trioxygen is dangerous for human health. The negative effects of trioxygen on human lives are such as, breathing problem, asthma, lung problems and infections and many chronic diseases e.g. chest pain, coughing. Trioxygen is not directly put out into the environment but created by a chemical process (NO_x + VOC + heat and sunlight = trioxygen or ozone) [3]. 95% of NO_x is increased in environment as a result of human activity such as burning of gasoline, oils in the car, industries and power plants. VOCs (Volatile Organic Compound) is released due to the production of gas and upstream oils and fossil fuels. Global rise in burning of fossil fuels is enhancing tropospheric trioxygen 32 percent per year [1]. Besides trioxygen amount is also influenced by solar radiation, relative humidity and air speed. Trioxygen level becomes higher when the atmosphere is hot or warm with low humidity. The trioxygen amount in valley, mountain is regulated by peripheral winds [4]. This trioxygen is also called bad trioxygen or ozone because of its adverse effect on human health. It has become a big issue for the people in the urban area, not only in summer days but also in winter days because of large amount of NO_x and VOCs in the air. The rural people are also facing the problem because of long transport of trioxygen. Aloft winds are responsible for the conduction of O₃ to a long route [1]. The mean natural amount of trioxygen is about 30 to 100 microgram/m³. Short term mean circumambient amount of O₃ in urban area may increase to 300-800 microgram/m³[1]. That top concentration of O₃ is taken in afternoon because in the morning the cars emit NO_x and VOCs and in noon, the NO₂ convert into NO₃ and in afternoon, the trioxygen is formed. The amount remains unchanged until 3 or 4 hours [5]. The ground level trioxygen present in the air as a part of photochemical smog binds to other gases and pollutant particles. This dangerous gas concentration has to be controlled by reduce vehicle use, prevent industrial pollutants emission, otherwise it will ruin all the lives in the planet.

II Research Methodology

In this paper we endeavour to centre the dominating counteraction of trioxygen inside the tropopause for protection of human health. In this work, extremely basic exploration procedure is utilized as secondary data sources like news, articles, environmental science books, webpages, Government act and regulations of air pollution, sources, human health effects and control.

III Source

Both natural and anthropogenic source have an important contribution to the release of ground level trioxygen inside the tropopause [3].

- **Natural Source:** NO_x occurring naturally due to natural fires such as volcanic activity, lighting & burning of biomass [3][6][9]. It is the main natural contributors to increase atmospheric NO_x [3]. On the other hand, volatile organic compound release from natural wild fires & due to vegetation & fossil fuel deposition [6].
- **Anthropogenic Source:** It is also called man made source. Huge amounts of nitrogen oxide (NO_x) produce from the combustion of fossil fuels in power station, other industry, cars & refiners [6][9]. A significant quantity of NO_x originates from home heaters also [3]. VOCs are propagated from some mobile sources, which employ with the A) On road source and B) Non road source [7].

A. On Road source

Comprise any mobile source of VOCs such as motor vehicles, buses, trucks and cars [7].

B. Non road source

Non road pollutants are releases from airplanes, agricultural equipment and lawn, combustion engines on farm, and also from commercial marine vessels, recreational watercraft [7]. VOCs also released from paint, gasoline vapours, cleaning supplies, pesticides and adhesive materials [9]. VOCs & NO_x are chief pollutants that transforms into secondary pollutants i.e. trioxxygen (O_3) by ultraviolet rays and heat [7]. Being an air pollutant trioxxygen is considered as poisonous for all kind of living organism including human in the troposphere.

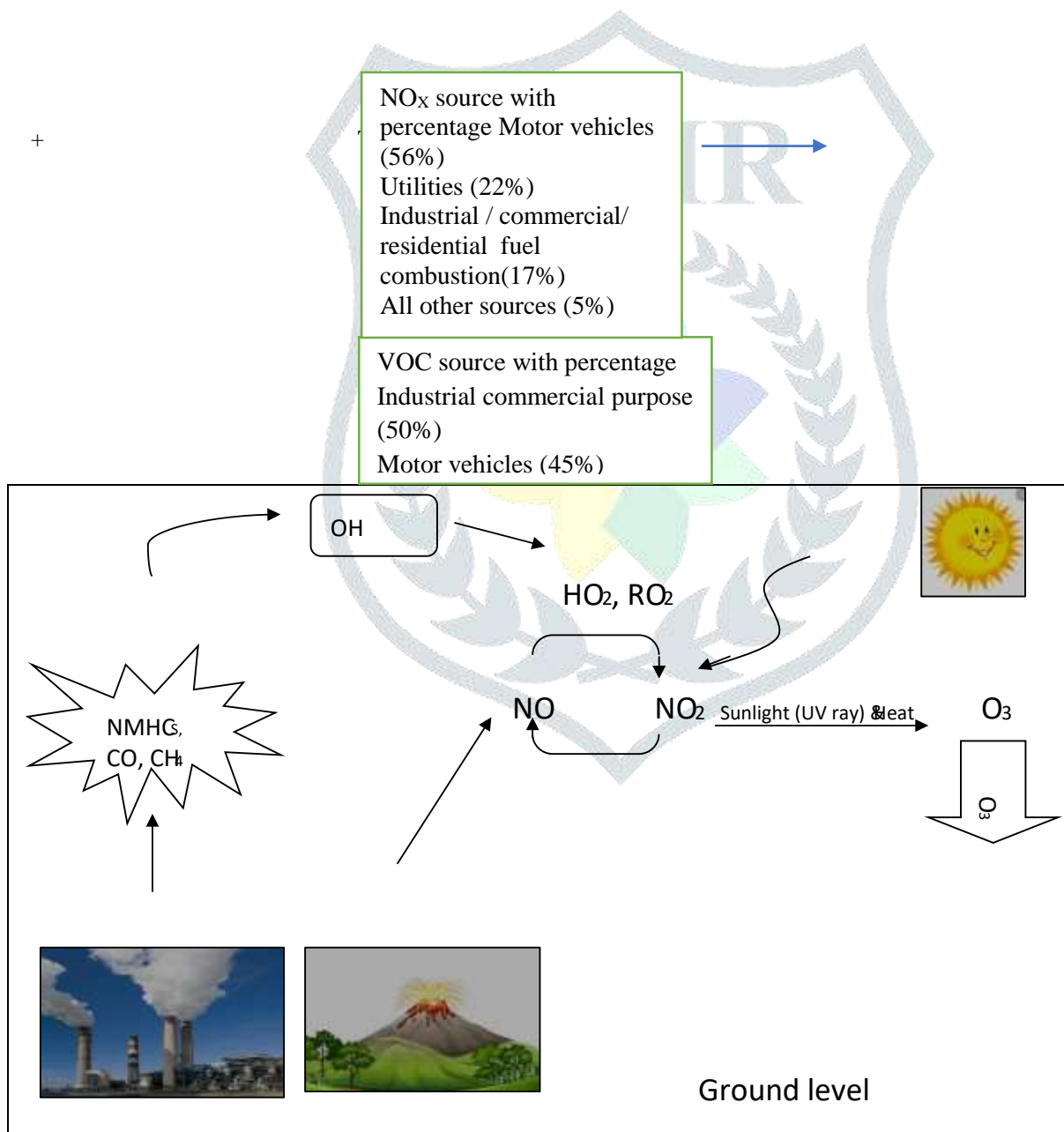


Fig: depicted view of production of trioxxygen (O_3) in troposphere.

Trioxxygen formation:

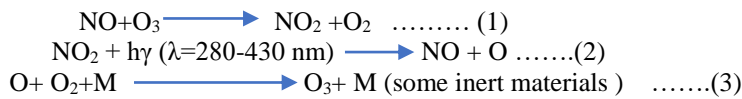
Trioxxygen is present widely all over the troposphere and at the Earth's surface (ground level O_3) [4]. Ozone formation occur through a chemical process in presence of sunlight (Ultra violet rays) and heat, when VOCs react with NO_x .

Nitrogen oxide (NO_x) also form solid nitrate particles, this solid nitrate particles pass through various chemical reaction in the atmosphere layer^[10].

Photochemical formation of trioxygen:

Photochemical reaction is a process by which trioxygen is produced in the atmosphere depend on ultraviolet rays and heat^[7].

In the troposphere trioxygen formation occur due to photolysis of NO₂ at < 424 nm wavelength of light, when sufficient solar energy is consumed by NO₃. Initiation of photo dissociate process occur as following-



Above these constructive responses is only the time of day [12]. The secondary pollutants trioxygen concentration is closely related to the NO₂ / NO concentration ratio [7]. A number of emissions in north-western Europe that were identified as the most polluted areas [5]. NO_x hydrocarbons are two essential precursors [11]. The emission of NO_x and hydrocarbons in European cities increased significantly during the period covered by trioxygen [6]. It has been observed that ground level concentrations of trioxygen are constantly increasing, especially in rural sites. [8]

Effect of trioxygen(O3) on human health

Researchers of University of North Carolina at Chapel Hill School of Medicine and Environmental Protection Agency did an experiment with low level of ozone[12]. Exposure to the Ozone for long time even in the lower level of ozone can be a cause of lung dysfunction in healthy young adults. It can also increase the inflammation of pulmonary airway. Current standard level of ozone is 0.075ppm, but for researchers identified that the ozone level was 0.06 ppm. Researchers recruited health care workers for the test and at first, they were given clean filtered air(Placebo) and they then gave the 0.06 ppm Ozone and tested their lung functioning. The researchers were worried whether that level of ozone can cause irritation. Next morning people came back and they give their sputum sample, the cough was analysed if there were any increased inflammation in the airways after the Ozone exposure. The result was that, at the 0.06 ppm Ozone level, researchers found little changes in the lung function after the exposure. The information was just like the asthma patients.

Who are affected most by trioxygen(o3)?[13]

It has been proved that children asthmatics and elderly population are more prone to affected by trioxygen. The Other important factors are -

- Degree of exposure: Adverse effects of trioxygen depends on how much and how long the person remain in the outdoor and also respiratory rate.
- Pre-existing heart and lung disease: Pre-existing heart and lung disease patients are more prone to affected by trioxygen.
- Age: There are strong association between mortality and acute trioxygen exposure; elderly populations are affected most[14].
- Building construction workers: In summer season, unfortunately, after prolonged exposure of trioxygen, people are at higher risk of being affected by trioxygen. So, these people are much more prone to pulmonary disorders than the people living sedentary life in jail.
- Exercise: Especially during outdoor exercise people are exposed to ground level trioxygen and the increased breathing rate allow to inhale larger amount of trioxygen present in the atmosphere cause various health hazards.
- Effect Seasonal effects: Climate variability is observed as a priority at the trioxygen level in the troposphere than NO_x. Trioxygen shows maximum in summer and minimum in winter. In many cases wind speed primarily affects the levels of NO₂ and O₃ in the atmosphere. [15]

Should people limit to go out in the afternoon for exercise in fear of trioxygen exposure?^[16]

Although exercise is one of the keys to a healthy lifestyle. Air pollution and exercise can be a deadly combination together, especially in patients with asthma, diabetes, heart and lung disease. Many researchers personally believe that everyone should practice more and more.

Effects: The effects can be short-term (acute) or long term (chronic).

(A) Short term effects -

➤ Effects on lung function:

There are enough experiments which describes acute lowering of lung function but there may be differences at the level of responsiveness from person to person. Repeated exposure to trioxygen may worsen the physical condition. Although body develops tolerance over repeated exposure on subsequent days.

➤ **Inflammation of pulmonary airways:**

Several studies have proved that trioxygen can irritate the upper and lower airways, as a result there can be damage of epithelial tissues, increased absorptive power of both endothelium and epithelium cells and becomes more prone to infected because the host-defence mechanism of the lungs become change. [17] Exposure of trioxygen at 0.08 ppm levels can enhance the number of neutrophils, monocytes, dendritic cells and increased expression of CD14, HLA-DR, CD80, CD86 on monocyte within several hours. As a result, increased the release of cytokines and various tissue factors like albumin[18]. Within one day of trioxygen exposure, eosinophil release which causes hyperactivity and hamper M2 muscarinic receptor activity. Loss of neural M2 receptor results airway hyperactivity (Costello ET Al 1999). Within 3 days of trioxygen exposure IL-1β comes into action, not the eosinophils but its mechanism is yet to be discovered. IL-1β increases the nerve growth factors and Tachykinin Substance P which are associated with neural plasticity[19].

Daily mortality: There are some association between trioxygen exposure and daily mortality which was conducted by WHO. The data obtained from over 400 cities from 20 countries across the world, clearly showed that over 6000 could be avoided just by implementation of strict air quality standard. Ground level trioxygen are very reactive and formed by the reaction of pollutants and sunlight in urban and suburban locality. Current air quality threshold (in microgram per metre cube of air) are listed below-

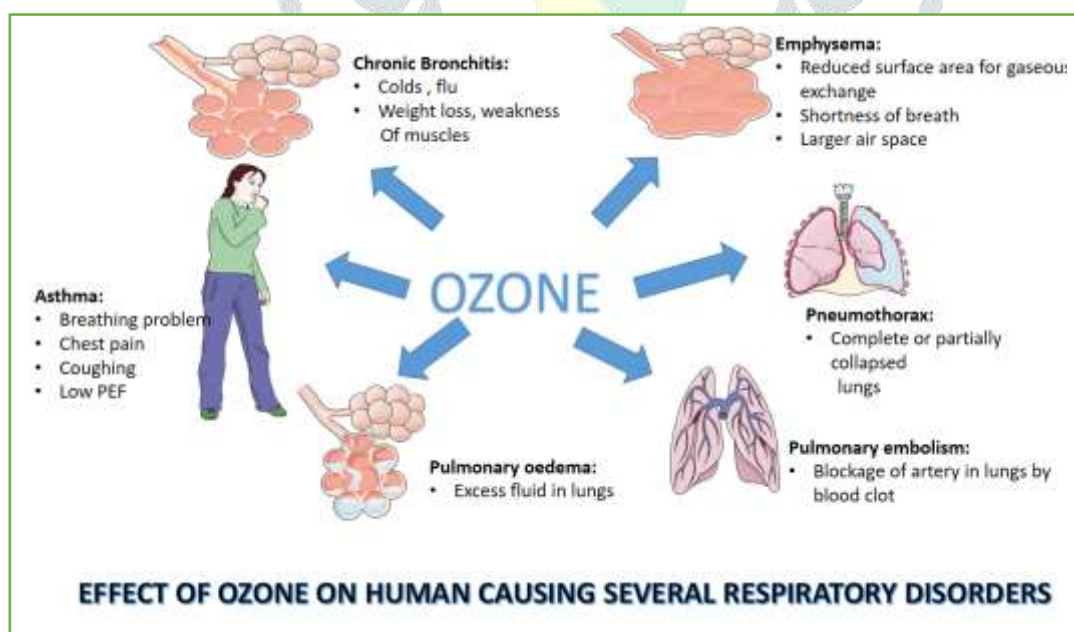
| Organisation name | Air quality threshold |
|--|------------------------------|
| World Health Organisation | 100 microgram per metre cube |
| European Union directive | 120 microgram per metre cube |
| US national ambient air quality standard | 140 microgram per metre cube |
| Chinese ambient air quality standard | 160 microgram per metre cube |

Based on the data from multi city and multi-country collaborative research network, a total of 45165170 deaths were analysed in 406 cities. If there is an increasing 10 microgram per meter cube of trioxygen, there is 0.18% increased death risk from the previous day(i.e. extra 6262 people are dying per year). All these data help Government and Scientist to take initiative against this pollutant for the better future and healthier life of the people.

Recent studies suggest that 80% of death in urban area are due to polluted air having threshold given by WHO

(B) long term effects

Chronic exposure to trioxygen can lead to the structural changes in respiratory tract showed by animal toxicological studies.



1. **Long term effects of trioxygen on lung function and growth:**

Long term exposure to trioxygen is associated with decreased airway measurements (less than 2 millimetre). There was a study on 12 Southern California Community Children to detect trioxygen effect. The school kids were regularly checked and it was observed that respiratory illness was high for those who are living in the house with pets, pests, mildew and those whose parents were asthmatics or the parents who were smokers^[21].

2. Trioxygen effects on bronchus:

Asthma is one of the chronic diseases in children and old ones and one of its cause is environmental air pollution. Although there is not sufficient evidence, it may play a small role in this disease (WHO 2005). Depending on the level of trioxygen exposure it can worsen lung diseases like asthma, emphysema, chronic bronchitis and pneumothorax etc. & it also increase frequency of asthma attack. This effect has also been found in healthy people.

Decrease of life span:

Decrease of the lifespan is the most important effect of trioxygen on human health. Different cohort studies revealed that subject with different chronic trioxygen concentration are associated with cardiovascular mortality and many other disorders usually in the 45-50 years of age[22]. Now a days, it is seemed that there is some positive effect of ozone in body as it can activate immune system. Many celebrities having ozone therapy without knowing its risk factors but ozone become a pollutant, its therapy is against the law[23].

Double trouble-flu boost effect of trioxygen:

Scientists have hypothesized that influenza virus could strengthen the effect of air pollutant on lungs and vice versa. These two are interrelated in light of the fact that air pollutants (e.g. - trioxygen, VOCs) may debilitate our protection from viral infections or this might be methods for transport of infections during inward breath. There was a research at the University of Hong Kong and the study of this interaction between air pollutants and pathogens was that mortality of people significantly goes up when trioxygen level arise during flu[24]. The researchers reported that numbers of hospitalization and deaths were increased with increase in trioxygen levels and the effects are preferably common in females than in males. In the Sunny months of September - December when UV radiation reacting with nitrogen oxides and VOCs to produce trioxygen, flu is followed by this increased trioxygen level. That's why two flu seasons are often seen in Hong Kong in January-February and May-July[25].

Prevention tricks of trioxygen level in tropopause:

A half of million premature death worldwide, in 2017 happened only for the reasons of trioxygen level inside the tropopause [26]. Ground level trioxygen or tropospheric trioxygen is a great threat to us as it rising global temperatures, damages crop production by reducing plant's ability to turn sunlight into growth. According WHO a safe ground level ozone concentration is 50 parts per billion (ppb) over an 8 hrs. approx. but so many countries set the threshold with a high range than normal range of WHO.[27] For controlling tropospheric trioxygen in every countries should set a standard value of concentration if it may not effect on human health & ecosystem.

Tropospheric trioxygen is formed by photochemical reaction with the help of NO₂, VOCs and sunlight & some other harmful pollutants, so we should focus about the concentration of NO_x and VOCs mainly, i.e. if NO_x concentration are higher than VOCs then VOCs reduce the tropospheric trioxygen, while NO_x reduction may increase it. On the other hand, if VOCs concentration are higher than NO_x, then NO_x reduction gives better result than VOCs smallness.[28](OTA 1989). So, if the pollutants (VOCs, NO_x) ratio is balanced, then tropospheric trioxygen may be controlled.

Most valuable tricks to control tropospheric trioxygen are:

- For decreasing refuelling emissions needs vapor recovery nozzles at the gasoline pumps.
- To reduce VOCs, NO_x and other air pollutants, we must use reformulated cleaner burning gasoline.
- Every power plants and industrial sources of air pollutants must limit for strict NO_x emissions.
- In every States must increase vehicle inspection programs.
- Strict restrictions on the solvent usages in factories and industries.
- Avoid cooler in car.
- Avoid excessive automobile for our laziness.
- As much as possible we must share single ride to work and use public transportation.
- Eliminate wood stove uses and fireplaces.

Meeting this high level of ground ozone will require management/maintenance tricks that improve governance and its precursor by announcing some Acts,

1. Better monitoring of ground level ozone.
2. Tricks of co-ordinate & trans boundary
3. Appointment with civil society and citizens action.[26]

Environment Protection Agency(EPA), New England's "Air Quality Planning Unit" works ceaselessly to protect our health and environment from certain harmful air pollutants like O₃, carbon monoxide(CO), particulate matter etc. To arrange our National Standards Air Quality, they work simultaneously with communities' states, arrangements for stopping air pollution from various sources such as--- vehicles, chimney, factories, thermal plants, and paints[31].

EPA and NAAQS'S (National Ambient Air Quality Standards) for their ceaseless work, in England now 80-90% fuel combustion from mobile sources and 10-20% from CO emissions. EPA will continue to work with engine and fuel manufacturers to keep CO levels low.[32]

The Diesel Emissions Reduction Act (DERA) program funds also work for reducing harmful emission from diesel engines and to give protection human health and improve air quality.

NO_x is one of the harmful air pollutant releases from various sources and plays a vital role in the atmospheric reactions with VOCs that helps to produce trioxxygen on mainly hot summer days^[33]. As new England, if we have adopted regulation, we will be able to prevent tropospheric trioxxygen to reduce NO_x emissions for that reason require some air pollution prevent equipment such as, SNCR (Selective non catalytic reduction) , SCR(Selective catalytic reduction) . The ozone transport commission(OTC) in the New England states have actively engage in OTC's development of a regional NO_x Cap.

Now a days tropospheric trioxxygen pollution become a greater air pollution problem around all over world as well as Beijing .On a cost-effective basis it is difficult for policy makers to identify optimal control options because ozone is formed in a complex way. The researchers at Beijing founds that stage II gasoline vapor recovery system that would be the most cost-effective option which reduce trioxxygen pollution by cutting vehicular emissions are much more cost-effective than to 'clean up' coal fixed thermal plant.^[34]

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