

Pollution or Solution: Choice is in our hands

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ABSTRACT: From the list of current environmental issues, all across globe, pollution is one the most dangerous and deadly issue. Researchers trying to find out new techniques to design such products that controls air pollution but, every year the air quality index (AQI) is increasing day by day. The problematic issue is that air pollution not only degrade the quality of air we inhale but also, it can cause dangerous diseases as well and harm human health. In this research work, a discussion is done about air pollution, its causes and effect on human health. A comparison is done between traditional fire crackers and green fire crackers which ultimately gives good impact towards pollution reduction. From future perspective this research work can help researchers to design some new techniques that is capable of controlling and reducing air pollution and help to improve AQI level for better environment.

KEYWORDS: Air pollution, causes of air pollution, diseases caused by air pollution, effect of air pollution, remedies.

1. INTRODUCTION

The process of any kind of contamination of impurity or harmful substances in the pure form of air, land, water, soil etc. is known as pollution. Among all type of pollutions, air pollution and water pollution are two examples that directly affect the human health. Air pollution is one in which the quality of air degrades due to presence of smog, low oxygen levels, existence of harmful particulates and pollutant substances present in air. Urban development is one of the biggest reason that causes different types of pollution. In Figure 1 some common types of pollutions have been illustrated in pictorial form. It is very important to pay attention towards these pollutions reduction of pollution in a healthy way because due to these pollutions human health is badly affected. It can cause diseases like breathing pollution, cardiovascular disease, lung infection etc. therefore the main focus of this research work is on the brief study of air pollution and its causes [1].

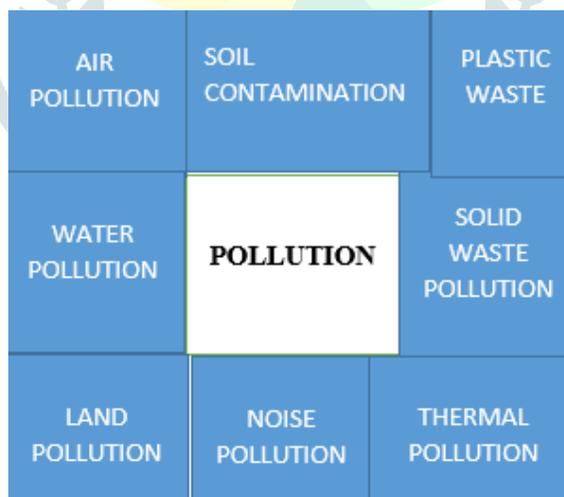


Figure 1: Some Common Types of Pollution

These are most common type of pollutions that are found everywhere and lot of attention should be given toward them in order to reduce for better environment. However, some other examples of pollutions are radioactive pollution, medical and medical & surgical waste, light pollution.

1.1 Causes of Air Pollution

There are many reasons due to which air pollution is caused. Although, pollution is an unwanted destruction of resources present on earth that are given by nature for free of cost but, human's consumption of resources is increasing day by day which may result in scarcity of resources for future generations. Not only human's

health but wild life, environment, natural things and many more factors are there that are badly effected by air pollution. There are some common causes of air pollutions discussed as:

- (a) Industrial emission waste
- (b) Carbon monoxide (CO)
- (c) Sulphur dioxide(SO₂)
- (d) Particulate matter (PM)
- (e) Ozone O₃
- (f) Nitrogen dioxide (NO₂)

These factors fall in chemical categories that are exhausted by industries and factories. Most of the production factories of rubber, fabric, shoes, plastic products, household items where plastic is first melted and reshaped in some molds shapes and specified designs. These type of industries are the major source of production of CO & NO₂. Pollution caused by chimneys of factories and production house mixed with air and pollute it. Particulate matter and SO₂ are majorly produced by vehicular pollution. As the no. of vehicle per person ratio is increasing day by day, the amount of pollution is also increasing due to which adverse effect is found in air quality. In comparison of last decade, the no. of vehicles per person capita is increased by a large number.

1.2 Case study for vehicle per capita: New Delhi (India)

According to economic survey (2017-2018), survey table reported in Delhi assembly, on every 1000 people there are motor available. There are records that tells us, the total no of vehicles on road was 103 crores. Thus, as per data given in survey is analyzed and results in growth of 6.99 % if compared from 2016-2017.this survey differentiated between car/jeep and two wheelers, there are total 30% of car jeep where as two wheelers contributes 64 % of total vehicles. Rest may include auto rickshaw and other vehicles.

Except these causes, some other factors are also there that cause air pollution such as burning of coal/fuel, microbial decaying waste, demolition of buildings and construction of new buildings, pollution by transport vehicles, use of products that cause ozone depletion such as deodorants, chlorofluorocarbon (CFCs), refrigerants. These are the factors that causes air pollution. Therefore, the overall use of such products in daily life routine should be reduced up to an extent so that, environmental pollution could be controlled. Agricultural chemicals and fertilizers also produce air pollution as fertilizers are sprinkled on crops under open sky which sometimes mixed with air and some of the particulates stimulates the air molecules and mixed up with, local environment. In this scenario, the local residents get its effect in terms of breathing problems and many other diseases.

1.3 Pollutants of Air Pollution

The particles that causes pollutions are called as pollutants. There are various pollutants that are responsible for air pollution. These pollutants have been differentiated into sub sections explained as:

1.3.1. Primary Pollutants

Primary pollutants are such particles of pollutants that are emitted in environment directly is called as primary pollutants. These pollutants have a direct contact with atmosphere. Some examples of primary pollutants are carbon monoxide, Sulphur dioxide, nitrogen monoxides, particulate matter etc.

1.3.2. Secondary pollutants

Secondary pollutants are those components that are formed due to chemical reactions between already present compounds of pollutants of gases. Some examples of secondary pollutants are ozone depleting particles.

1.3.3. Indoor-outdoor pollutants

Indoor outdoor pollutants are those pollutants that are generated due to human usage of resources and their combustion. For example, cooking combustion, smoking, heating of fuel, incomplete combustion in winters, non-degradable bio waste etc. except this, outdoor pollutants are those, which is caused by external factors like transportation, vehicles, urban development, manmade non-recyclable products etc. are considered to be external pollutants.

1.3.4. Liquid and gaseous pollutants

Liquid and gaseous pollutants are those that are present in atmosphere in the form of either liquid or gas particles. All the chemical components that has hazardous nature and pollute the air are called as gaseous pollutants. It is difficult to control the gaseous pollutants as compared to control other pollutants such as solid waste. Some examples of gaseous pollutants are CO, NO₂, SO₂, Benzene, dioxins, aldehydes [2].

1.3.5. Particulate matters

Particulate matters are also one the major factor among different pollutants. There are such categories in which these particulates have been classified such as particulates in range of 2.5-10mm are regulatory standardized and named as PM10 fine whereas, from 0.1-2.5mm are regulatory standard are named as ultrafine and not being regulated.

1.4 Diseases caused by Air Pollution

There is a direct link between air pollution and human health and environment. Due to air pollution environment is directly affected in terms of AQI and bad human health. There are various pollutants that targets specific organs in human body and hamper its functioning. Some of the pollutants and related diseases/ target organs are discussed here. Carbon monoxide (CO) is one of the major pollutant that harms overall environment and when it is consumed by humans in the form of breath, pollutants mixed with oxygen enters human body and cause cardiovascular diseases and affect badly the central nervous system of human beings. Its effect is observed when pollutants are consumed for a long period of time. The main sources of emission of CO are vehicular pollution, incomplete combustion of oil and woods. Industrial wastes are also one of the major cause in production of CO. Its standard level is 35mg/m³. Due to consumption of CO by pregnant lady, the infant may affect in terms of being handicapped and loss of organs. Researchers have found that carbon monoxide inhalation can kill a human being instantly [3].

Ground level ozone is the reason of air pollution due to which the respiratory system is badly affected along with improper functioning of cardiovascular functioning. Sometimes, eye irritation is also observed caused by this type of pollution. The major source of ground level ozone is industrial exhausted material and pollution caused by vehicles. Its standardized level is only 0.12mg/m³. The pollution caused due to Sulphur dioxide can affect breathing exercises such as less oxygen level, lung infection, weak liver and eye irritation as well. This SO₂ is so harmful which can affect not only human's health but also monuments. For ex: acid rain, when Sulphur components are mixed with rain, their chemical reaction forms Sulphur acid which affect the rocks and marbles of Taj Mahal and converts it into yellowish color. From this example, we can get the idea how harmful these pollutants are. Its standardized level is 75µg/m³. Nitrogen oxide is one the most hazardous pollutant among all that causes a range of diseases and affects human health much badly. Serious lung injury and respiration problems can be caused if nitrogen oxide is inhaled by someone. Color of nitrogen oxide is reddish brown. If a human being is exposed to highly concentrated nitrogen oxide, it leads to instant death. Its standardized level is 100µg/m³. It can cause lung damage, liver spleen, and even bleeding [4].

2. LITERATURE REVIEW

Xu-Qin Jiang et al. presented a research paper in which there is a discussion on air pollution and its effect on human health. According to author, there are various chronic disorders that are caused by air pollution. Burden of air pollution is discussed in this paper in context of how badly air pollution affects human health. Various types of air pollutants and health damaging compounds are explained by author like indoor and

outdoor pollutants along with their major sources. Some adverse health related issues have been highlighted by author. The main focus is on respiratory system as it is first carrier of inhalation of polluted air/oxygen in body. Some of the remedies has been suggested by author such as wearing a mask, consuming sufficient nutrients [5].

Bidhubhusan Mahapatra et al. presented a paper in which a discussion has been done on effect of exposure to PM10 and its effect on children health. There are some of the evidences that are based on a large scale done from a no. of cities in India. In this research work author had given a brief introduction of air pollution and air quality. According to author, air pollution will continue reflect its effect on the health of children and adults as well. Some of the methods has been used to analysis the effect of air pollution such as data collection from two sources one of them is national family health survey-4 and second source is air quality data. A brief table has been given consist of characteristics of women household with no. of births in 5 years in terms of n, where n is the birth data. An analysis of statistical data has been shared by author in this research work.

Pier Mannuccio Mannucci et al. explained health effects of ambient air pollution in various developing countries in research work. A brief introduction has been given about air pollution, and effect on health in adults from total population is discussed. Author also discussed, health effects in particularly some vulnerable population. Author gave strong conclusion stated as women and children lives in slum areas are at front line to be affected by indoor pollution, and solid waste pollution and fuel combustion which can cause respiratory problems when used at nearby stoves [6].

Douglas W. Dockery discussed about health effects of particulate air pollutants in research work. Author explained about what are air particulates means and reviewed about EPA particle standards. When these particulates are exposed to human beings for a long period of time, it can cause hazardous health issues. According to author discussion about EPA forced to ACT, every 5 years, the clean air act has to be reviewed so that, the particular review can draw attention towards the issues and new solutions can be drawn in order to reduce the amount of pollution and some techniques to control the pollution for better health of citizens [7].

3. METHODOLOGY

The problematic issue about air pollution is transportation and vehicular pollution and fire crackers usually found on festive occasion in India has been observed from many years. Therefore, the purposed methodology has been suggested to replace the ordinary fire crackers with green fire crackers that are ecofriendly and causes almost no pollution. In case of transportation, petrol and diesel fuel should be replaced by compressed natural gas (CNG) based vehicles and even electric vehicles as well that causes very less or no pollution. This idea will definitely help to improve the AQI.

The concept of green fire crackers uses very less raw material that causes pollution and their formulation of chemicals is also considered less harmful while manufacturing. In comparison of regular highly chemical based fire crackers causes, around 160 decibels of noise pollution, there is a reduction in noise pollution as well in case of green fire crackers that is in the range of (110-125decibels). CSIR is the signing authority that gives the permission of manufacturing of green fire crackers. Therefore, the manufacturers have to take permission for this with legal documentations.

There are majorly three types of green fire crackers that are found in India as illustrated in Figure 2 that are good choice over traditional fire cracker which is based on high chemical formulation and cause a lot of smog and pollution. This pollution can cause eye irritation and many other serious health problems as well.

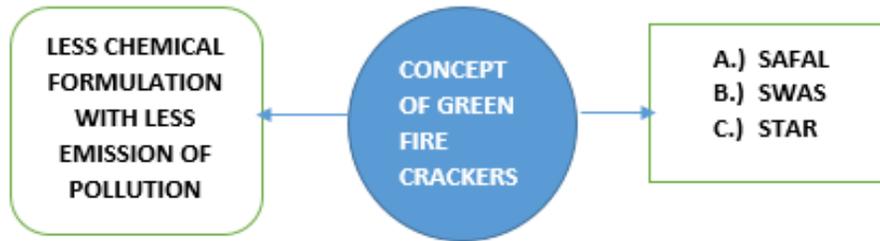


Figure 2: Three main green crackers approved by CSIR in India.

These are green fire crackers that are purely based on phenomenon of less chemical formulation in order to produces less pollution in air. By using these fire crackers, health issues caused by air pollutions can be controlled. Table 1 shows data on comparison between traditional fire crackers with green fire crackers

- **SWAS** stands for safe water releaser
- **SAFAL** stands for safe minimal aluminum
- **STAR** stands for safe thermite cracker



Table 1: Comparison between traditional fire crackers with green fire crackers.

Sr No.	TRADITIONAL FIRE CRACKERS	GREEN FIRE CRACKERS
1	Can be formulated by local cracker manufacturers in factories.	Formulated by CSIR-NEERI*
2	Contains gun powder and other combustible chemical compounds which ignite and explode.	No combustible compound
3	Chemical compounds used are SO. Nitrogen, carbon oxides that produce, CO NO ₂ , SO ₂ after combustion.	Compounds generally used are aluminum, potassium nitrate.
4	Carbon is widely used, along with it chromium, zinc oxide, nitrates, carbon oxides, manganese are also used.	Carbon compounds are removed and sharply reduced in order to control emission of pollution.
5	Produce high pollution	Emit less pollution by 30 %
6	Release only pollutant and smog fumes	Release water vapors or air which act as dust suppressant that dilute the emission of gaseous material.
7	Can be sold anywhere by local shopkeepers, even without license	Green crackers can be sold only when a unique logo on box is used for authentication.
8	Noise pollution is around 150-180 decibels.	In comparison lesser amount of noise pollution is done. Specifically in the range of (110-115 dB A).
9	Serious health problems like visual defects in eyes, deafness, eardrum failure, respiratory and breathing issues can be major issues by use of traditional crackers.	Very less health issues or almost no health issues are there with use of green fire crackers as they do not produce or very less pollution is produced.

* **NEERI** – National Environmental and engineering Research Institute.

* **CSIR**- Council of Scientific and Industrial Research.

In SAFAL, the main focus is on use of aluminum. Lesser amount of Al is used and this is the main theme of green crackers to use minimal and only adequate amount of chemical compounds that emit lesser pollution. In some cases, green fire crackers also emit pollution but its chemical formulation is very less as compared to traditional fire crackers. With the use of less chemical formulation, the overall pollution could be lowered up to 30 %. Even Supreme Court has modified its already issued order about crackers on 23 October considering that fire crackers bursting time should be limited up to only 2 hours, that is from 8 pm to 10pm only. In southern states, of India court allowed to decide people when they can burst fire crackers and that also should not exceed more than two hours timing. So this is a smart step taken by Indian government towards the reduction of pollution.

However, if comparison is done generally, the pollution in general days and in normal days without festivals, there is not much difference in between amount of pollution. This means that not only fire crackers but also, transportation and vehicular pollution, industrial pollution are also major factors that causes air

pollution and day by day it will increase if the sources that causes air pollution are not replaced by smart choices such as electric vehicles. A kind suggestion is purposed through this methodology to pat attention towards environment and to take such steps like replacing vehicles with bicycles if destination is within 2-5KM, or use of electric vehicles, use of solar energy panel in homes, changing petrol diesel engines with CNG engines, replacement of traditional fire crackers with green crackers that produce very less amount of pollution are some steps that can be implemented by many of us. Government should also take some pillar steps towards environment by considering these steps. Fire crackers factories should be banned for the production of traditional fire crackers in which high chemical formulation is used. And not only on occasion of Deewali but without occasion as well, the use of such chemical based products should be taken under control in order to reduce environmental air pollution.

DISCUSSION

Long term emission of pollution from various sources whether it is transport or vehicles or fire crackers, industries and urbanization by rapid rate, can definitely cause health issues, and these health issues are not limited to a specific society or country because, pollution can spread everywhere with the flow of air/wind. Thus not only a country or society but all of us, including government, societies, social coworkers, and environmental scientists should pay attention towards the betterment of environment by replacing smart choices over polluting sources to save environment and air. By doing so, health issues caused by air pollution such as cough and breathing problems, less oxygen levels and many more.

CONCLUSION AND FUTURE PERSPECTIVE

From above studies it can be concluded that use of green fire crackers and replacing petrol diesel vehicles with electric and CNG vehicles will definitely reduce the amount of pollution and may prove a smart step towards betterment of environment. The amount of emission of pollution content like NO₂, SO₂, CO, can be reduced by this idea of replacement. Even in upcoming time, more and more advance technologies are supposed to be developed as, natural resources can be getting drained and soon there will be scarcity of natural resources. In next 20 or 40 years, the whole scenario of fuel refining industries, and manufacturing of vehicles, electric engines will be changed.

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