

Harm Of Discharging Fireworks and Harm Reduction Measures

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Abstract. In recent years, there has been greater awareness and concern about the impact of pollution from fireworks on the environment. The main research objective of this paper is the impact of fireworks on the earth environment. This paper will talk about the advantages and disadvantages of setting of the fireworks during holidays. Besides, this study will analysis that do people still encourage people to emit the pollution by fireworks under this bad condition of earth. The result shows in two different way. One the one way, fireworks burn produce a lot of harmful substances, including chemicals, particulate matter and heavy metals, which can negatively affect air and soil quality. And sulfide in fireworks can easily lead to acid rain. Secondly, particulate matter emitted by fireworks directly effects atmospheric quality and body health. When particles enter the respiratory tract, they can cause respiratory problems such as asthma, bronchitis, and other respiratory diseases. In addition, fireworks emissions also cause noise pollution. On the one side, human have to admit that setting of the firework give us a vibe that everybody immersed themselves in that merry and people get power from it. In this essay, a lot of research were studied to solve the problem of general effect of fire setting of fireworks to the plant, to human life, to the air, to the physical and mental health of human body, and to the waste of the natural resources. Everyone look forward to find a better way to solve this big issue ,everyone should have a deep thinking to create a feasible solution together in order to avoid environmental crisis that might happen in the future.

Keywords: Air pollution; fireworks; environment; residents.

1. Introduction

Data and reports that posted by researchers and environmental protectors showed that during new year time the mission of the firework becomes more and more severe for global environment. Therefore, it becomes a issue that some people believe that it does not play an significant role in human life, but others reckon that everybody should aware of it because everyone get advantage of good air.

It is true that are some academic and news reports about the impact of fireworks on the environment, it most of articles are reported on time of the Chinese New Year. Most residents will only observe in certain situations, but therefore will not take action. Therefore, this article would like to let the audience feel the harm caused by pollution emitted by fireworks from every aspect of life. It is worth mentioning that some countries and regions have taken measures to restrict or ban the use of fireworks in order to reduce their negative impact on the environment. At the same time, people have also begun to pay attention to the development and use of environmentally friendly fireworks to decrease the number of pollutants they emit. In recent years, the German government and citizens have increased their awareness of environmental protection, and people's concern about fireworks emissions has also increased. As a result, over the past few years, many German cities have begun to restrict or reduce the use of New Year fireworks. Some cities have taken measures to ban fireworks to reduce air pollution and the risk of explosions. In addition, some people are starting to choose environmentally friendly fireworks, which can reduce the impact on air quality. However, there are many places that maintain the tradition and continue to set off large numbers of fireworks. They believe that set off fireworks bring happiness to people it's a emotional and conventional way to make people fun and enjoy the holiday by this way. It is respectful because from this point of view, it points out that some leaders are focus on their citizens' idea and mind, they respect their residents and give an attitude that supports the good things for people. They believe that the fireworks kill nervous and the anxiety of the specific people. Due to increased environmental awareness, Germans are also more

careful about when and where they use fireworks. For example, only set off fireworks in certain locations and limit them to a fixed period of time. Germany's New Year fireworks emissions are expected to continue to decrease in the coming years due to increasing environmental awareness and emphasis on sustainability. If people all work together, the power is great, and human beings can make great changes to protect the earth on which human live. Overall, there is growing awareness of the environmental impact of pollution from fireworks, and efforts are being made to find more environmentally friendly solutions to minimize the harm it causes to body health and environment. Germany has been working hard over the past few years to reduce emissions from festive fireworks. There is no precise data directly, but the information provides some general trends and observations.

This study mainly talks about the general idea of the mission of the firework around the word, not only the bad effects, but also the good way it shows us. Therefore, the paper concludes the general influence of firework emission in this report.

2. Benefits of Setting Off Fireworks

2.1. Vibe of Holiday Section Headings

When people talk about the firework, it occurs them with good memories and festivals. In special days, the governor in each country let off the fireworks in order to increase happiness for everyone. Fireworks are synonymous with celebration in the twenty-first century [1]. In Sydney, Australia, Jan. 1, 2020, in the purpose of celebrating the new year day, Fireworks explode over the Sydney Harbour Bridge and the Sydney Opera House. Fireworks are let off in the night sky near the Eiffel Tower to celebrate Bastille Day in Paris, France, July 14, 2021. Typically, people were obsessed with setting off the fireworks for fun and pray for better year in China. There is also a legend about the origin of new year in china. It is said that our ancestors were threatened by one of the dangerous beasts in ancient times. This beast is called "Nian", when the mountain food shortage in winter, it will break into the village, hunting people and livestock, people are terrified. It is known that once the ancestors found that "Nian" was afraid of loud things, so fireworks were invented to drive away the beast. Therefore, fireworks become the symbol of new year festival, after people come together and enjoy the dinner, the youngster and children will play with fireworks. This has always been a custom in China, people believe that it drives away bad luck and evil things, and everything will be smooth and peaceful in the following year. Nevertheless, in recent years, due to the ban on urban fireworks in China, people have not had a lively New Year for a long time. There is a lack of "New year flavor", a cheerful atmosphere of the New Year. Until early December 2022, the fully open of Covid-19 made fireworks have become an indispensable atmosphere of celebration. Instead of allowing us to set off fireworks in the city, the administrators and governor use their own strategy to bring festive vibe and joy. For instance, Nanchang city held fireworks show around a lake during the Chinese New Year In 2022. The colorful fireworks are the brightest at night, making the entire lake sparkle and allowing local residents to enjoy the lively festive atmosphere.

2.2. Kill the Nervous and Anxiety for Human, Stimulate the Active Emotion

Fireworks create fascinating visual displays with their bright colors, patterns and shapes. Watching mesmerizing light can divert attention from worrying or anxious thoughts, providing a brief escape and relaxation. Fireworks are often associated with festivals, celebrations and joyous events. The festive atmosphere and shared experience of watching fireworks with others can help create a sense of unity, happiness and excitement, easing tension. Fireworks displays evoke a sense of awe and wonder. Witnessing controlled explosions and impressive effects can inspire a sense of wonder, stimulate positive emotions and reduce tension. Many people have positive childhood memories associated with fireworks, such as watching fireworks on special occasions, holidays or family gatherings. These nostalgic memories can evoke feelings of comfort, happiness, and nostalgia, helping to counteract tension. It's important to remember that the effect of fireworks on tension varies

from person to person. While fireworks are enjoyable for many people, some may still find them overwhelming or triggered due to sensitivity to noise, bright lights, or past negative experiences.

2.3. Rise Employment Rate

Fireworks are traditionally associated with Hunan Province in China, especially in Liuyang City, which is famous for the “fireworks Capital of the world”. Hunan's fireworks industry has indeed created a large number of jobs for the region. The production of fireworks requires skilled labor to handle a variety of tasks, including assembling fireworks, packaging, quality control, and storage. The growth of the industry and the demand for fireworks has led to the establishment of many fireworks manufacturing factories in Hunan, employing a large number of workers. And fireworks production involves the extraction and processing of several raw materials, such as gunpowder, chemicals, metals and paper. These materials need to be sourced locally or imported, creating jobs in mining, refining and transportation. Sometimes research and development activities are necessary to improve the quality, safety and visual effects of fireworks. Fireworks manufacturers employ scientists, engineers, and technicians to develop new formulations, test products, and innovate in design, color, and effect. Sales and Marketing: Fireworks companies need sales teams to promote and distribute their products to retailers, wholesalers and international markets. These teams often include sales representatives, marketing specialists, and logistics personnel. In addition, the rise of e-commerce platforms has provided more job opportunities for online sales and marketing. Not to mention promoting job opportunities during fireworks displays in celebration of festivals and events, careers include event planners, technicians, pyrotechnic technicians, security personnel and assisting organizations. Meanwhile, Hunan's reputation as a fireworks center has attracted tourists from all over the world. The growth in tourism has created jobs in hotels, restaurants, transportation, travel agencies and other hotel-related industries.

3. Disadvantage of Setting Off the Fireworks

3.1. Air Pollution

The pollutants released from fireworks may seriously deteriorate air quality and adversely impact human health [2]. For example, particulate matter, fireworks produce a lot of particulate matter, including metal salts, sulfur compounds and carbon particles. These particles are very small and be able to stay suspended in the air for a while. When inhaled, they could adversely affect respiratory health and cause air pollution. Unusually high levels of a number of trace elements, have been measured in outdoor ambient fine particles following both day-long celebrations and after short-term displays [3]. Fireworks also emit a lot of metal, because fireworks contain metal compounds, so when lit to produce bright colors. However, these metals, such as copper, strontium and barium, also emit toxic fumes and cause serious air pollution. Especially heavy metals such as lead and cadmium. Ambient particulate matter (PM) continues to be among the top environmental health concerns globally [4]. Fireworks usually contain sulfur-based compounds that give them a distinctive smell and color. When these compounds burn, they release sulfur dioxide, a gas that causes air pollution and causes problems in the human respiratory system. The daytime net ozone (O_3) formation rates during the Spring Festival and Lantern Festival increased by 11.4% and 15.2%, respectively, on average due to firework emissions [5]. When fireworks burn, they produce nitric oxide (NO) and nitrogen dioxide (NO_2). The gas contributes to the formation of ground-level ozone and smog, which are harmful to human health and the environment. Even, some fireworks contain chlorinated or brominated compounds, such as chlorine or bromine salts, that can be released into the atmosphere. These chemicals have the potential to damage the ozone layer, which protects the Earth from detrimental ultraviolet.

Fig. 1 shows a source allocation-based approach that estimates the amount of black carbon, polycyclic aromatic hydrocarbons and metals released into the city by fireworks during New Year's Day fireworks from 2010 to 2021. Metals, namely Ba, Cu, K, Mg, and Sr. Nigh teen percents of waste

gas contributions come from fireworks, Other metals were attributed to fireworks by variable proportions averaging 67%, 77%, 44%, 59%, 64%, 75%, and 33%, respectively [6]. All in all, these findings are a complement for future monitoring and a regulation of fireworks emissions. However, many countries have taken steps to reduce the environmental impact of fireworks. For example, the United Kingdom also has special rules on where and when fireworks can be set off. According to UK law, people are not allowed to set off fireworks (including fairy sticks) in the street or other public places. Some other countries restrict the use of certain chemicals and heavy metals in fireworks, promoting the use of less toxic alternatives. In addition, advances in fireworks technology have led to the development of “green fireworks” designed to minimize environmental impact by reducing the release of pollutants.

Firework Emission

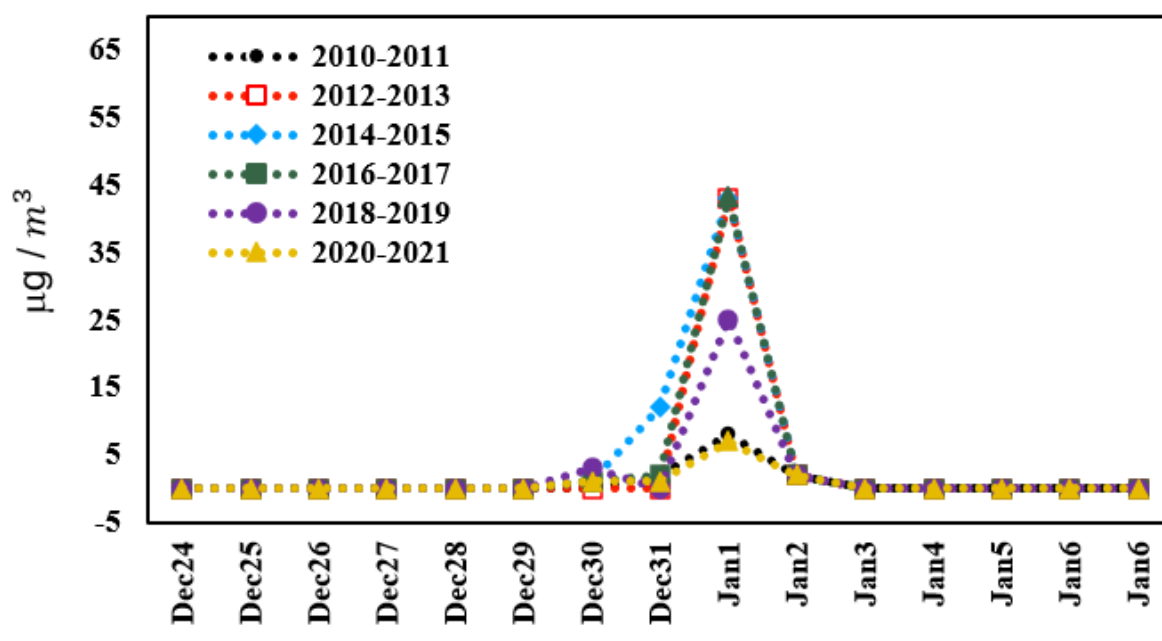


Fig. 1 Firework emission during six New Year's Day (2010-2021). (Picture credit: Original)

3.2. Soil Pollution

Setting off fireworks will cause soil pollution. After fireworks explode in the air, residues, including unburned or partially burned particles, chemical residues and heavy metals, can settle on the ground. Over time, these substances can seep into the soil and pollute it. Fireworks often contain metals such as copper, strontium, barium and aluminum, which have bright colors, and when the fireworks explode, these metal particles fall to the surface of the soil. The accumulation of metals in soil can have long-term effects on soil health and may affect plant growth and soil microbial communities. Second, perchlorate, a common component of fireworks, can persist in the environment and has the potential to migrate into the soil. These compounds can interfere with the function of certain enzymes in plants and may pose a risk to human and ecosystem health. Also, some fireworks show often take place near bodies of water, such as lakes or rivers. The purpose is to facilitate cleanup and reduce hazards, which is fine, but if the fireworks are set off on or near the water, chemicals and residues may be washed into the water by rain or other runoff events and, therefore, seep and contaminate nearby soil. For the sake of minimizing the environmental influence of fireworks to soil and other ecosystems, regulatory measures, proper waste management and clean-up efforts are essential. Proper handling of fireworks debris and compliance with guidelines and regulations governing the use of fireworks can help mitigate the risk of soil contamination.

3.3. Sound Pollution

Fireworks will produce a loud explosion and high intensity sound, creating a huge noise. According to the survey, fireworks can produce sound levels in excess of 120 decibels (dB) when they explode, which is considered within the range of discomfort and potential damage to human hearing. The high levels of noise produced by fireworks can have harmful effects on human health. It has a certain likelihood of causing temporary hearing loss, or even deaf, no one can imagine the hurts it causes, so prevention is better than cure. Loud noises from fireworks can also cause stress, anxiety and sleep disturbances, especially in people who are sensitive to noise or those with pre-existing medical conditions. Fireworks noise can also affect wildlife, especially animals that are sensitive to loud sounds, such as birds, small mammals, and pets. Sudden bursts of noise can frighten and disorient animals, affecting their behavior, feeding patterns and nesting activities. Many animals have a keen sense of hearing and are very sensitive to loud noises. Fireworks can cause fear, anxiety and panic in pets, leading to a racing heart, tremors, attempts to escape, and even injury. Many of the most beautiful fireworks displays take place at night, when the colors are more vivid, but this can disturb the peace and tranquility of the community. Loud noises can cause discomfort, annoyance and disruption to residents, especially the elderly, those with sensitive senses, and those trying to sleep or concentrate, which can cause irreversible harm.

3.4. Damage and Waste of Existing Natural Resources

The reason why the production of fireworks is considered a waste and destruction of natural resources is because a large number of natural resources are required in the production process. Materials used in fireworks, such as metals, chemicals and paper, often need to be mined, extracted and processed. These activities deplete non-renewable resources and thus contribute to environmental degradation.

4. Measures to Reduce Environmental Pollution Caused by Fireworks

The government should make people have an awareness of the environmental pollution caused by fireworks. People are encouraged to consider reducing or celebrating the festival in other ways instead of fireworks. You can choose to set off with fountains, lights and water mist to reduce the number of fireworks or replace them with light shows or laser shows. The government can educate people to support environmentally friendly alternatives and explore and promote environmentally friendly alternatives to traditional fireworks. These alternatives can include laser display, projection mapping or other visually attractive displays that do not depend on chemical combustion. The implementation of global strategies to control the use of fireworks and hence improve air quality could possibly reduce their likely detrimental effect on human respiratory health in exposed individuals, but clearly more targeted research is needed [7]. It means that the laws of reduction of fireworks emission works.

Nevertheless, citizens excessively emit harmful gases due to environmentally friendly fireworks, resulting in the impact of environmentally friendly fireworks on the environment, which is basically the same as that of traditional fireworks [8]. For factories, they can use low-pollution fireworks to find labels, such as “low smoke” or “low residue” fireworks, that is, fireworks specially designed to reduce the level of pollutants, so as to release fewer toxic chemicals and particulate matter to reduce air and water pollution. For example, the new small fireworks are a kind of urban fireworks that release less gas and show cold light. The sonic effect produced by the fireworks mainly depends upon the chemical composition of the mixtures and the particle size [9]. Using nano-sized powder, it is environmentally friendly in nature, produces less pollution, and ensures a cleaner environment. Mandatory legislative laws pertaining to the manufacture, sale, and use of fireworks and creating public awareness can reduce the incidence of this preventable cause of blindness in the society [10]. For governments, they should strictly implement local regulations and restrictions, and can set up designated fireworks collection points to encourage participants to handle fireworks correctly. Dispose of the residues of fireworks and firecrackers, such as shells and packaging, in appropriate

waste bins or recycling facilities. These regulations can include restrictions on the types of fireworks allowed to be set off, the designated area where fireworks are set off, and the specific time frame for fireworks to be set off. These measures help to control and manage environmental impacts more effectively.

5. Conclusion

People need to take action to avoid the damage occurred, people have to do something to change it is due to our responsibility, everybody achieve whatsoever the target. On the one hand, fireworks actually bring us a lot of happiness, everyone likes it beautiful and charming. Also, for some people who have suffered a lot of sadness shortly, the visual effects of fireworks can heal the pain and forget the hatred. Apart from that, firework can attract a lot of people around the world, so the growth in tourism has created jobs in hotels, restaurants, transportation, travel agencies and other hotel-related industries. On the other hand, the gas released by fireworks can cause too much damage. Fireworks cause soil pollution, sound pollution, waste of limited resources and the destruction of human beings. Luckily, some countries restrict the use of certain chemicals and heavy metals in fireworks, promoting the use of less toxic alternatives. In addition, advances in fireworks technology have led to the development of “green fireworks” designed to minimize environmental impact by reducing the release of pollutants. Strict regulations and safety measures are necessary to ensure the well-being of workers and surrounding communities. People should be aware of their importance. To protect our planet as much as possible through small changes and collective solidarity.

References

- [1] Simon W., Fireworks: pyrotechnic arts and sciences in European history. University of Chicago Press. 2010.
- [2] Cao X., Zhang X., Tong D.Q., Chen W., et al., Review on physicochemical properties of pollutants released from fireworks: environmental and health effects and prevention. Canadian Science Publishing. Environmental Reviews. 2018, 26(2): 133-155.
- [3] Alexandre J., Audrey S., Tom K., Michel F., et al., Characterisation of particulate exposure during fireworks displays. 2010, 4325-4329.
- [4] Ajit S., Pallavi P., Francis D.P., Air quality during and after festivals: Aerosol concentrations, composition and health effects. Atmospheric Research. 2019, 227: 220-232.
- [5] Liu Y., Ma W., Yin S., et al., Quantification of enhanced VOC emissions from fireworks. Environmental Pollution. 2022, 315: 120389.
- [6] Mohamed K., Xiansheng L., Hadiatullah H., et al., (March) Influence of New Year's fireworks on air quality-A case study from 2010 to 2021 in Augsburg, Germany. Science Firect. Atmospheric Pollution Research. 2022, 13(3): 101341.
- [7] Caroline G., Stephen M., Potential impact of fireworks on respiratory health. Lung India: official organ of Indian Chest Society. 2014, 31(4): 375.
- [8] Fan S., Li Y., Liu C., Are environmentally friendly fireworks really “green” for air quality? A study from the 2019 National Day fireworks display in Shenzhen. Environmental Science and Technology. 2021, 55(6): 3520-3529.
- [9] Azhagurajan A., Selvakumar N., Impact of nano particles on safety and environment for fireworks chemicals. Science Direct. Process Safety and Environmental Protection. 2014, 92(6): 732-738.
- [10] Ramesh V., Prachi G., Shailja T., et al., Indian journal of ophthalmology. 2017, 65(2): 140.