



Afforesting as a Way to Eliminate Haze and to Fertilize Plants

Jiayi Zhang*

Theoretical physics class 3, School of Physical Science and Technology South Tian shui Street#222, Lanzhou, Gansu, China

Abstract

Haze problem causes serious health risk and troubles to the human being. Traditional manners such as reducing vehicle uses and biomass burning etc. don't work well as was expected. More effective ways to address haze problem are urgently in need. From literatures, haze contains many vital elements of plants growth, such as nitrogen, phosphorus and sulfur, such that absorbing them as the fertilizers for forests or other ecological systems would be a more effective way to tackle the haze problem. In fact, the components in haze are suitable for fertilizing plants because they come from burning oil and coals which are dead plants and animals long time ago. Since soils with water in them are feasible to dissolve the ions in haze, combined with ecological functions of forests such as water transparency, harmful gases absorption, forests and other ecological systems can effectively absorb the haze and turn them into the fertilizers for plants continuously; therefore, the haze would be eliminated with infinite capacity. In summary, haze would be eaten by these ecological systems and turn them into life again. Utilizing afforesting, haze can be eliminated in an environment friendly and constructive way, they would become the nutrition in living things and circulate in the biosphere. In this way, not only haze can be absorbed, but also the plants are fertilized, more over such process is infinite.

Keywords: Haze, Soil, Dissolve, Fertilizer, Circulation, Biosphere, Afforesting

Introduction

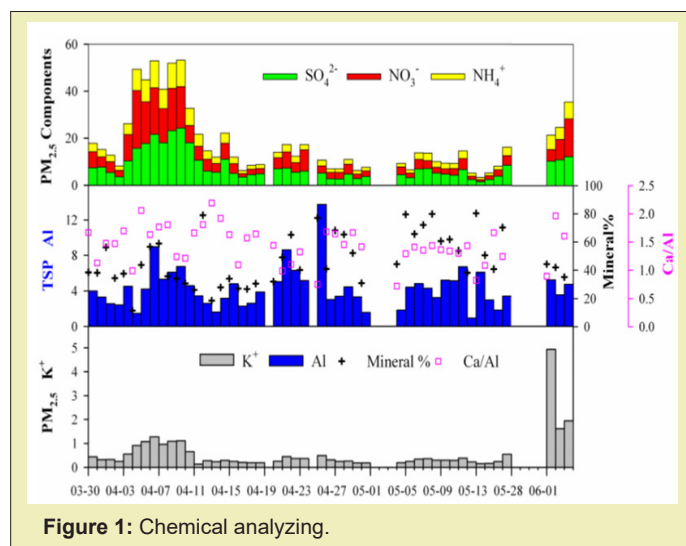


Figure 1: Chemical analyzing.

Haze problem is a significant health risk factor in megacities today. There are different types of haze constituents in terms of the particle diameters, i.e., PM_{10} , $PM_{2.5}$ and PM_1 etc. Amongst these kinds of particles, $PM_{2.5}$ is relatively more stable to suspend in the air, they are hard to agglomerate due to their surface energy. $PM_{2.5}$ mainly comes from anthropogenic sources, such as coal burning, vehicle emission, etc. By chemical analyzing,¹ as shown in Figure 1, 77% of $PM_{2.5}$ mass consists of SO_4^{2-} , NO_3^- , and NH_4^+ , and there is also remarkable amount of K^+ in total $PM_{2.5}$. Besides, the total haze also contains CO , As , other mineral particles, dust and biomass burning products etc.

Table 1 Time series of (a) SO_4^{2-} , NO_3^- , and NH_4^+ concentration ($\mu g m^{-3}$) in $PM_{2.5}$ (b) Al concentration ($\mu g m^{-3}$), the fraction of mineral aerosol, and the elemental ratio of Ca/Al in the total suspended particles (TSP) (c) K^+ in $PM_{2.5}$, during the whole study period. (This figure is cited from²)

Quick Response Code:



*Corresponding author: Jiayi Zhang, Theoretical physics class 3, School of Physical Science and Technology South Tian shui Street#222, Lanzhou, Gansu, China

Received: 06 January, 2021

Published: 17 February, 2021

Citation: Jiayi Zhang. Afforesting as a Way to Eliminate Haze and to Fertilize Plants. *Glob Sci-ent Res Env Sci.* 2021;1(2):1–5. DOI: [10.53902/GSRES.2021.01.000507](https://doi.org/10.53902/GSRES.2021.01.000507)

Table 1: The concentrations of ions in Urumqi (μgm^{-3})

	SO_4^{2-}		NO_3^-		Cl^-		NO_2^-		F^-	
	$PM_{2.5}$	TSP	$PM_{2.5}$	TSP	$PM_{2.5}$	TSP	$PM_{2.5}$	TSP	$PM_{2.5}$	TSP
Spring	6.61	9.56	2.98	3.51	4.07	4.95	0.98	1.59	0.32	0.59
Summer	2.37	5.61	1.76	1.85	1.08	2.99	0.29	0.59	0.16	0.18
Fall	23.04	25.72	8.89	5.62	12.06	10.86	0.58	5.22	0.11	0.50
Winter	80.88	135.53	10.23	16.88	17.42	23.83	0.12	0.21		
Mean	28.23	41.22	5.97	6.65	9.13	9.49	0.55	1.54	0.20	0.55
Heating	37.14	52.73	7.34	8.22	11.16	12.58	0.57	0.57	-	-
H/N*	15.65	9.39	4.16	4.44	10.35	4.20	1.97	1.47	0.00	0.00
	NH_4^+		Na^+		Ca^{2+}		K^+		Mg^{2+}	
	$PM_{2.5}$	TSP	$PM_{2.5}$	TSP	$PM_{2.5}$	TSP	$PM_{2.5}$	TSP	$PM_{2.5}$	TSP
Spring	3.57	3.29	1.52	2.47	3.11	7.27	0.56	0.83	0.26	0.47
Summer	1.26	2.88	0.48	0.56	1.72	5.55	0.21	0.37	0.13	0.16
Fall	13.02	12.31	4.09	4.27	2.69	8.31	1.81	2.04	0.24	0.50
Winter	19.64	22.73	8.50	9.43	1.03	6.52	1.40	1.86	0.21	0.62
Mean	9.92	10.61	5.71	4.32	2.14	6.55	1.03	1.31	0.21	0.45
Heating	12.20	13.11	4.75	5.37	2.27	7.36	1.25	1.61	0.24	0.55
H/N	9.68	4.55	9.90	9.59	1.32	2.05	5.94	4.56	1.85	3.44

H/N: Heating periods/Non-heating periods.

As shown by Table 2,³ the $PM_{2.5}$ compositions in Urumqi are various kind of ions of inorganic salts. Their major compositions are $SO_4^{2-}, NO_3^-, NH_4^+, Cl^-$ and NH_4^+ , and the concentrations of them is obviously higher in heating period than that in non-heating period.

Table 2: The concentrations and the ratios to particles of five major ions ($SO_4^{2-}, NO_3^-, Cl^-, NH_4^+, Na^+$) and three major anions (SO_4^{2-}, NO_3^-, Cl^-) in four seasons and in heating period.

	Concentrations particles (μgm^{-3})		The total concentrations of five major ions (μgm^{-3})		ratio* of (%)		The total concentrations of three major anions (μgm^{-3})		Ratio* of (%)	
	$PM_{2.5}$	TSP	$PM_{2.5}$	TSP	$PM_{2.5}$	TSP	$PM_{2.5}$	TSP	$PM_{2.5}$	TSP
Spring	69.2	174.0	19.20	24.34	28	14	13.99	18.45	20	11
Summer	58.8	91.3	6.96	13.90	12	15	5.21	10.46	8.9	11
Fall	164.8	263.6	61.05	58.15	37	22	43.99	42.19	27	16
Winter	259.7	428.5	137.25	213.63	53	50	108.53	176.24	42	41
Mean	139.5	239.7	57.13	73.46	41	31	43.76	58.43	31	24
Heating	165.5	289.0	73.32	92.76	44	32	56.2	73.98	34	26

*Ratio: The sum of these ions to the mass concentrations of $PM_{2.5}$ and TSP.

Moreover, since these ions of $PM_{2.5}$, i.e., $SO_4^{2-}, NO_3^-, NH_4^+, Cl^-$ and NH_4^+ are all highly hygroscopic, the water or vapor in the air would be easily adsorbed/absorbed onto these aerosol particles and hence forms the haze-fog. These particles part as the condensation nuclei for haze-fog. The health risk effects of haze have been well recognized, there are plenty of studies about it. Haze is hard to be filtered because of their small magnitudes near to atoms. Immunity is unable to expel them out of the body. Besides, haze also causes low visibility which increases traffic accident ratio, facilitates the spreads of harmful matters such as virus which are extremely easy to cling onto haze particles and hence diffuse themselves further in the air. The low visibility brought by them means less sunlight onto the earth, lowering the solar energy reception and virus is also

The fact that the concentration of SO_4^{2-} is remarkably positive related to the haze concentration implies that coal burning should be a major source of the haze in Urumqi, and coal burning would therefore lead to haze in other cities.

easier to live under less ultraviolet. The undispersed haze makes a lot of trouble to the human being.

In the past, people never consumed such amounts of coals, oils and other fossil resources. They contain those elements out of the circulation in the biosphere for a long period. As the exploitation of them, they were released and become many contents in the air, such as $SO_4^{2-}, NO_3^-, NH_4^+, Cl^-$ and NH_4^+ ions. These contents then form haze.

The circulation of the matters on the earth makes everything in harmony, nothing like haze accumulates. For example, the decomposition of corpses circulates those elements into the biosphere again, this balances the generation of the creatures, i.e., the con-

sumption of their nutrition matters. The generation of the haze is also a kind of consumption of these nutritious matters of industry, for this reason, people should seek ways to make them circulate into the biosphere again to eliminate it.

The Ecological Effects of Forests and Soils

Researchers have shown many ecological benefits of forest. Forest consists of various kinds of plants and animals. And there are a lot of air pollution removal effects of these lives. Plants themselves have purification effects to the air. The carbon fixation of plants via photosynthesis has been well known, more CO_2 can be fixed from this process and the global warming can therefore be modified. However, plants can also absorb many gaseous pollutants such as NO_x ; Conferta and Ivy have significant absorption effects to NO_x ; Kaffir lily has some sterilization functions; Areca palm can remove toluene and xylene. The bamboo palm and Rubber Plant both have abilities to remove formaldehyde; Dracaena can remove trichloroethylene; in similar fashions, plants can remove many types of air pollutants by adsorption and absorption.⁴ In fact, plants themselves absorb fertilizers not only via their roots from the soil, but also from other parts of them, such as leaves, and stems.²

Soils, in some extent, may also purify the air. Soils consist of mineral materials, organic materials, air and water. Soils are mixtures with liquid, solid and gas.⁵ The solids come from the weathering of minerals, including physical and chemical ones. The elements of soil come from the parent material of weathering as well as volcanic burst atmosphere. They form electrolytes and the elements exist in forms of ions, this facilitates their transportation into and out of the plants. When plants live in, these electrolytes provide a variety of elements that is nutritious for plants, such as $K, Ca, N, C, P, Fe, Al, S$, etc. The elements that are needed for plants are usually absorbed in forms of ions,¹ such as NO_3^- for nitrogen, SO_4^{2-} for sulfur, K^+ for potassium, Ca^{2+} for calcium, Mg^{2+} for magnesium and Cl^- for chlorine etc. Ammonium is also available since they are usually used in chemical fertilizers.

As we see before, the better of $PM_{2.5}$ are just these kinds of ions, i.e., $SO_4^{2-}, NO_3^-, NH_4^+, K^+, Ca^{2+}, Cl^-$ and NH_4^+ etc.³ When these ions dissipate and are absorbed by the plants as their fertilizers, and after some other economical processes, soil would have more capacity to dissolve more such kinds of ions from the air. Soils are porous when the humidity is moderate and the composition is appropriate, and gas from the atmosphere is easy to contact with water and other contents in it under this state. In this way, soils can decrease the haze in the air and convert them into nutrition for plants. In general, the haze comes from the consumption of oil and coals, which are actually generated from the corpses of plants and animals long time ago. They keep suspending in the air because they cannot become coals and oils again. In this view, the only way to eliminate haze is to make them circulate into the biosphere again, and absorbing them by soil as fertilizers for plants is a feasible way.

In another respect, forest also has a good function to the environment. Water is the essence of all lives on the earth. However, inland area is far away from the sea and it is hard for the water to

travel from the sea into the inland via evaporation alone. If this is always the case, there would be no life far away from the sea. In contrary, lives are abundant in the inland, rains come regularly and forests expanded continuously without human's over development. Why is this? There must be some links between forests and rainfall. In fact, forests are not only consumers of water, but also promoters of water.⁶ When they drink the water from the sea, the transpiration effects would send parts of the water they've absorbed up to the sky. As these streams accumulate and cool down at high altitudes, clouds formed consequently and then travel further into the inland. This mechanism makes water spread into the inland and animate those areas.

It is worth mentioning that the increases of rainfalls in Lanzhou recent years verified this: Lanzhou was a dry place nearly twenty years ago and sand storms were coming frequently. Now, as the enhancement of afforestation these years in Lanzhou, the rainfalls are becoming more and more frequently and there is much less sand storm. Today Lanzhou has become a city with green mountains and yellow river, and yellow river takes more nutritious soils for the plants.

In summary, forests can make the water distribution on the earth more balanced and increase the rainfalls around. Like a fountain, forest drink throw the water into adjacent areas. And soils are also able to absorb the content in the atmosphere, including haze. And the component ions in haze is just similar to the components in plants because haze in fact is from the corpses of the plants and animals long time ago. For this reason, if the ground was not too much hardened, the forests would expand the rainfalls and the haze would be quickly absorbed by the soils being accelerated by the increasing rainfall brought by the forests. Forests are vital to our environment balance and habitability, and soils can absorb the haze as their fertilizers.

Afforesting as a Way to Convert Haze into Produce Fertilizer

As the forests make the environment more alive, haze can be absorbed by them at the same time. What's more, the component of haze is similar to the plants, and the absorbed haze can be turned to fertilizer for the plants. Specifically speaking, haze can be eliminated in several ways below:

Firstly, plants can absorb many harmful gases and aerosols, such as Ivy and Conferta which can absorb NO_x , they can absorb part of the harmful haze naturally.⁷ And plants also absorb their fertilizer matters from the air, this process is called foliage fertilization. The ions in haze contains $SO_4^{2-}, NO_3^-, NH_4^+, K^+, Ca^{2+}, Cl^-$ and NH_4^+ etc, they are nutritious for plants and plants would also absorb them in this way.

Secondly, soil consists of minerals and other contents from the volcanic and atmosphere. The structures of soils allow them to exchange matters with the atmosphere. When the gas from the atmosphere contacts with the soils, dissipation and dissolution effects would dissolve haze into the soils. As mentioned before, the haze-content contains multifarious elements that is suitable to nourish plants, such as $SO_4^{2-}, NO_3^-, K^+, Ca^{2+}, Cl^-$ and NH_4^+ , and their forms of ions

is just how these elements that are needed by the plants are absorbed by them. The absorbed haze can be consumed by the plants as their fertilizers and therefore haze can be absorbed into the soil and become fertilizers continuously. In this way, haze would be converted into the nutrition for plants and eliminated with infinite capacity.

Besides, forests produce more food using the energy from the sun. In these processes, such as photosynthesis etc., the energy from the sun would be fixed as different kinds of foods. Since the energy can't be created or be annihilated naturally, the temperature would simultaneously be cooling down by the forests through their photosynthesis so that people would not need air conditioners anymore which produce more heats in whole as they reduce temperature locally (this can be detected from thermodynamics). The forests make the environment where people live in more comfortably.

Moreover, forests make homes for various kinds of animals, including bats, pangolin, masked civet, various insects, and birds etc. When forests bloom, these animals would live into forests and no longer have to survive in cities where they are hard to live. This not only benefits those animals, but also keeps their viruses away from the human. If these animals live in cities, the viruses inside them would be readily to attack human. And when they go back into the forests, the interactions between thousands of kinds of lives in the forests may also prevent the emergency of novel viruses, because the complexity of the environment and the natural selection may rule them out.

In addition, soils also save waters from rainfalls or snows and the seeds in the remnant of human foods. In metropolises, water from the snow and rainfall always forms flood because the hardened ground doesn't allow water to go down, and there are no plants that can buffer or absorb them; however, such water is environment for the growth of plants, including corps for food supplying. More soils would prevent the formation of floods and make them into more use. And more soils also allow the growth of seeds after people eating something, such as pitaya, grapes and watermelon etc.

Since the haze mainly comes from the burning of coal and biomass etc., and these actually things are corpses of living creatures after all. In the perspective of ecology, haze is the jam in the circulation of the elements from coals and oils. They are from the corpses of plants and animals of an ancient period; therefore, the best way to eliminate them is to decompose them into the nutrition of plants and animals or other living things again, it is hard to lock them down. For this reason, using soils as well as the plants on them to absorb the haze as their fertilizers is just what is needed to do. Then the elements in haze would be converted into the circulation of biosphere and there would be no haze anymore.

In addition, this way of eliminating haze also reduces the needs to constrain the using of vehicles, and people would have higher quality of lives. Generally, forests as well as soils contained have remarkable effects to purify the air. Haze can be absorbed by the soil as the fertilizer for plants. They also make homes for various kinds of animals, lower the environment temperature, prevent the forma-

tion of floods and waste of seeds. Afforesting is an environmentally friendly and healthy way to eliminate haze, and haze is converted into nutrition for plants.

Conclusion

The source of haze is well-known today, i.e., coal burning, biomass burning and vehicle emission etc. Unfortunately, a majority of them is necessary for the development of our human right now. On the other hand, it is not effective to eliminate haze by cutting down their emissions only. Just like the cases in many areas of China today, the haze is still remaining while all cars, factories and biomass burning etc. are stopped. Stopping emission alone doesn't work well as expected; hence, it is necessary to find new ways to eliminate those haze to solve this haze problem.

According to the discussions above, afforesting can not only make the environment more habitable, but also convert the haze into nutrition in the biosphere. Plants themselves can absorb some part of the haze. Soil is a mixture of gas, liquid and solid. The gas is mostly from the atmosphere and contacts with the water in it easily if the soil has appropriate humidity and composition, since soils become porous at this time. In this way, the ions in haze would dissolve into the soil continuously. Since the haze has finely similar element composition with plants, the haze absorbed into the soil would become good fertilizers for the plants, and more rainfalls or snows brought by the forest would wash the haze from the air. In a word, forests as well as the soil can eat the haze and turn them into nutrition for the lives in it.

In this way, haze, which is the jam in the matter circulation of the biosphere consist of dead animals and plants long time ago, would be turned into lives again. They would be absorbed by the soils and converted into the nutrition for the lives in forests continuously. Then people can use vehicle freely again, and haze is eliminated environmentally friendly. The forests may also prevent the formation of floods, high temperature, aridity and the creation of novel diseases.

Nowadays haze problem is a serious health risk factor to people, it does harm to people directly. It also causes low visibility and facilitates the spreading of virus; the virion is easy to attached onto those PM particles. Afforesting, as an environmentally friendly measurement, would convert the haze into fertilizers for the plants in it so that the elements would go back to circulations in the biosphere continuously. As a result, the haze would be eaten by the forests and people can use those fossil resources in a less limited way.

Haze essentially comes from dead creatures from a long time ago. Those burning fossils put elements from those dead animals and plants etc. radically into the air; however, in metropolis where there is only cements ground and constructions they are cooped up having nowhere to go; thus, they become colloids in the air which is called haze. In this sense, increasing soils when afforesting provides something that can dissolve these colloids and the absorbed ions and other contents are suitable to fertilize plants. Haze is eliminated because they come into the matter circulation in the biosphere

again. And such manners allow more usage of fossils because haze is able to become fertilizer for the plants continuously.⁹⁻¹³

Acknowledgments

Thanks to the professors in my journal team, it is their acceptance of me that gave me chance to continue study in the academic community. Thanks to all my professors and teachers, they gave me great help in learning. Thanks to my professor WU-Jingshan, he taught me good philosophy and this paper was for answering his query that why the science had made it clear that how our universe is, i.e., where are we from, how our world comes and where would we go, while we have nothing to do with the haze problem? Actually, we haven't understood them and knowing is unlimited. Science is what we use to understand the nature and solve problems for the human being. Thanks to PENGZhiwei, a friend of mine who majored in chemistry, he taught me that haze is a kind of aerosol, it has properties of colloid; therefore, I think haze should be dissolved into the matter circulation of the biosphere again rather than stopping its generation, we need to outlet them for our production and living. Thank my friends worldwide who I know via the Tik Tok, they are really good and like China, including my girlfriend, I really like her and she speaks excellent Chinese, she dreamed to come to China and I wish she can realize her dream so that we can establish our company together to do things we like to earn money and to be the best friends forever, absolutely never sell our love.

Funding

None.

Conflicts of interest

Author declares that there is no conflict of interest.

References

1. Huang K, Zhuang G, Lin Y, et al. Typical types and formation mechanisms of haze in an Eastern Asia megacity, Shanghai. *Atmos Chem Phys*. 2012;12:105-124.
2. Weihua WU. *Plant Physiology*. Science Press, Beijing; p. 100-105.
3. Tingna LIU, Guoshun ZHUANG, Kan HUANG, et al. A Typical Formation Mechanism of Heavy Haze-Fog Induced by Coal Combustion in an Inland City in North-Western China. *Aerosol and Air Quality Research*. 2016;17:98-107.
4. <https://learn.eartheasy.com/articles/the-top-10-plants-for-removing-indoor-toxins>
5. Liguang SUN, Zhouqing XIE, Xiaoyong Yang, et al. Introduction to earthly environmental science. China Science and Technology Press: Anhui, Hefei; 204-207.
6. <http://www.permaculture-and-sanity.com/pcarticles/trees-and-the-water-cycle.php>
7. Shuji Fujiia, Hiun Chaa, Naoki Kagib, et al. Effects on air pollutant removal by plant absorption and adsorption. *Building and Environment*. 2005;40(2005):105-112.
8. Lubomír Adamec. Leaf absorption of mineral nutrients in carnivorous plants stimulates root nutrient uptake. *New Phytologist*. 2002;155:89-100.
9. <https://www.physicscentral.com/explore/plus/trees-make-rain.cfm>
10. PIRTLE EC, BERAN GW. Virus survival in the environment. *Rev sci tech Off int Epiz*. 1991;10(3):733-748.
11. Wenxiang JIA, Jingying CHENG, Lifang JIANG. *Medical microbiology*. Beijing: People's Health Press; p. 323-325.
12. Cuijuan NIU, Anru LOU, Ruyong SUN, et al. *Foundations in Ecology*. Beijing: Higher Education Press; p. 230-238.
13. Ralph A. Burns. *Fundamentals of Chemistry*. Beijing: Higher Education Press; p. 408-410.