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Air Pollution in South Korea

Public Discourse on a Controversial Issue

Znečistenie ovzdušia v Južnej Kórei

Olomouc 2022 Lenka Sirotnáková

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Annotation

The goal of this bachelor thesis is to introduce the reader to the contemporary problematic of air pollution in South Korea. It explores the causes, measures against air pollution and the effects it has on people and their daily lives. It was written by using many articles published by various Korean newspapers in English between 2017-2022.

Keywords

air pollution, fine dust, ultra-fine dust, particulate matter, health, China, coal, South Korea, government, covid-19

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Anotácia

Cieľom tejto práce je zoznámiť čitateľa s problematikou znečistenia ovzdušia v Južnej Kórei. Táto práca skúma príčiny, opatrenia proti znečisteniu ovzdušia a dôsledky, ktoré má znečistenie na ľudí a ich každodenný život. Bola napísaná s použitím anglických verzií článkov publikovaných rôznymi kórejskými novinami v období 2017-2022.

Kľúčové slová

znečistenie ovzdušia, jemný prach, ultra-jemný prach, častice, zdravie, Čína, uhlie, Južná Kórea, vláda, covid-19

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1. Introduction

Air pollution is considered a serious issue in South Korea that severely affects the daily lives of all its citizens. Pollution costs several thousand lives each year and even more hospital admissions. It is linked to many health and environmental problems. There are several external and internal causes of air pollution in South Korea. One of the internal causes is coal production and one of the external causes is China and its pollution which also affects the quality of air and quantity of fine dust in Korea. There are many steps taken by the government to prevent and minimize air pollution and to better the lives of citizens in South Korea.

Air pollution can be divided into two types: ambient air pollution as in outdoor air pollution and household air pollution. (WHO 2022) In the first part, I will briefly introduce uncontested facts about air pollution and main pollutants in South Korea, its causes and consequences on public health and environment using data from World Health Organization (WHO) and www.airkorea.or.kr, which is a website created by the Korean Ministry of Environment and Korea Environment Corporation(K-eco). In the main part I present my own research in which I try to get an answer to what are the topics of public interest and discourse regarding air pollution in South Korea, who or what do they blame for it and the effects that it has on them, their health and daily lives using published articles written between 2017-2022 and analyzing them.

2. Air Pollution in South Korea

2.1. Definition of Pollutants

Air pollution is defined as contamination of the indoor or outdoor environment by any chemical, physical, or biological agent that alters the natural properties of the atmosphere. Most common air pollutants that are considered a serious threat to health are particulate matter, ozone, nitrogen dioxide, carbon monoxide and sulfur dioxide. Air in South Korea contains all these dangerous pollutants in different concentrations, which change daily and are measured separately.¹ According to data from K-eco

¹ This and the following summary are based on Nathanson 2010, KECO 2018, WHO 2013, and WHO 2021

gathered between 1995 to 2019 particulate matter was annually highest in 1996 and since then being on decline but still within the dangerous concentrations and still being the biggest pollutant. Ozone concentration had been annually rising. The annual concentrations of nitrogen dioxide did not waver much but are a bit lower than in 90s. Carbon monoxide and sulfur dioxide concentrations have both been on a serious decline and do not pose as much threat as particulate matter or ozone.²

2.1.1. Particulate matter

Particulate matter is a common air pollutant made up of a combination of solid and liquid particles suspended in the atmosphere. Particulate matter is divided into two categories based on their diameters: PM_{2.5} and PM₁₀, meaning PM_{2.5} are particles that are less than 2.5 µm in diameter and PM₁₀ are particles that are less than 10 µm. The mixture of particulate matter is different in each location, but the typically found chemical constituents include nitrates, sulfates, inorganic ions, organic and elemental carbon, crustal material, particle-bound water, metals, and polycyclic aromatic hydrocarbons. Particulate matter also contains biological component, particularly allergens and microbial compounds. In Korea fine dust is created by fine particulates, which are emitted primarily by internal-combustion engines and industrial sites, and is especially prevalent during the winter, when it is exacerbated by yellow dust from the Mongolian desert. Particulate matter possesses risk for human health. Most dangerous are the particles that are less than 2.5 µm, because they get caught in the lower respiratory system after being inhaled deeply into the lungs. In this case, particulate matter can aggravate asthma, worsen lung function, or cause other respiratory illnesses. Particulate matter is a threat to environment as well. It contributes to creation of smog and acid rain, which alters the pH equilibrium of waterways and greenery. Moreover, it causes the corrosion of historic buildings and monuments.

2.1.2. Ozone(O₃)

Ozone is created during the photochemical reaction of nitrogen oxides and volatile organic compounds with the presence of sunlight. There are various sources including

² Korea Environment Corporation. "Annual Air Quality Trends." *AIRKOREA*. Accessed January 11, 2022.

industrial refineries, chemical plants, automobile emissions and electric utilities, however they can be also formed naturally. If people are exposed to ozone for a long time, they potentially suffer from chest pain, problems with lungs such as reduced lung capacity or its damage, throat irritation, cough, problems with heart, pulmonary emphysema, asthma, and many others. Those who suffer from asthma or any respiratory disease including children and elders should avoid spending long hours outside when there are higher levels of ozone, because they are especially at risk. It is also a threat to some plant life because it damages its leaves and therefore causes losses for farmers and in addition it damages forests as well.

2.1.3. Nitrogen dioxide (NO₂)

Nitrogen dioxide is a highly reactive gas that is created during oxidation of nitrogen oxides. It also occurs during the formation of ozone, where it serves as precursor which reacts with volatile organic compound. Industrial processes, high temperature combustion processes, automobile emissions and chemical production processes are mostly responsible for this gas, but it can also form naturally. In high concentrations it can cause mucosal diseases, chronic bronchitis, pneumonia, pulmonary hemorrhage, edema, and it also causes damage to plant cells. In addition, it also contributes to the formation of haze.

2.1.4. Carbon monoxide (CO)

Carbon monoxide is defined as a toxic gas that is created by the unfinished burning of carbon and it lacks any color or smell. The main source of this gas are automobile emissions, but there are also other emitters such as industrial processes, forest fires, smoking, cooking and others. It poses a great risk to human health causing symptoms of heart disease, visual difficulties and diminishing physical and mental skill even in healthy people. Exposure to a high levels of carbon monoxide may be lethal as interrupts the delivery of oxygen to the tissues.

2.1.5. Sulfur dioxide (SO₂)

Sulfur dioxide is a colorless gas that is part of sulfur oxide gas family (SO_x) and can be easily distinguished as it has particularly unique odor. It is able to form a sulfur in

reaction with hydrogen sulfide and that is why in natural environment it is mostly prevalent in volcanos. However, it is also formed by burning coal and oil and the main sources are power plants, industrial processes, electricity generation, fossil-fuel combustion, and automobile emissions. High concentrations of sulfur dioxide may also cause respiratory problems, weaken the function of lungs, and worsen cardiovascular diseases. Along with nitrogen oxides, sulfur dioxide is the principal cause of acid rain, and therefore contributes to soil acidification. Because sulfur oxide gas family can be carried long distances by the wind, problems related with it are not limited to places where it is emitted, but also to every place it is carried to. It causes damage to plants and especially plants veins. It also causes damage to structures and monuments, by accelerating corrosion and is a major cause of haze.

2.2. Assessing air quality

The Comprehensive Air-quality Index (CAI) is used in South Korea to describe current ambient air quality and gauges the risk that possesses air pollution to one's health. It attempts to make air pollution levels more understandable to the general public and to safeguard people's health from pollution. Four colors inform about the level of risk and the amount of particulate matter in the air. The higher the value, the more polluted the air is and therefore bigger threat to human health. Blue represents values between 0–50. The air quality is good, and the air pollution possesses no risk to human health. Green represents values between 51–100. Air quality is moderate and in the case of prolonged exposure, this level may have only a minor effect on patients suffering from diseases related to pollution in the air. Yellow represents values between 101–250. The air is unhealthy, and this may affect patients and members of vulnerable groups as well as elicit negative reactions from the general public. Red represents values between 251–350 and 351–500. Both values are considered very unhealthy. Values of 251–350 represent a level that, in the event of an acute exposure, could have a serious impact on patients and members of vulnerable groups as well as the general population. The CAI of 351–500 has a negative impact on a general public and the vulnerable groups may require an emergency measures. According to data from Korea Environment Corporation in 2021 PM 2.5 had the highest concentration during spring and winter season from November till May with 12 days being in the yellow level with values from

150–200. PM10 was also the worst from November till May. The days with highest levels had been in March, where there was a day with values of 206 and May where were two days which had values of 306 and 402. Ozone had slightly higher values during summer season, but it had generally quite small values through the year with the highest one being 106. Nitrogen dioxide had small increases during summer and winter but had largely also quite small values with the highest being 67 in March. Sulfur dioxide and carbon dioxide had very small values during the whole year and did not pose any potential danger in 2021.³

3. Public interest and discourse on Air Pollution

Air pollution is definitely a concern for general public. According to several recent polls it is one of the biggest worries for Koreans. Korea Environment Institute conducted a survey in 2019 and found out that almost half of South Koreans considered air pollution as the most urgent environmental issue. The survey was conducted on 3008 respondents from which 46.5 percent chose the option “improving air quality” as the most pressing issue that needed to be addressed first. The number rose from 46.1 percent in the annual survey conducted a year ago. The rise demonstrates broad unanimity on the importance of addressing those issues.⁴

Another poll conducted by the Ministry of the Environment shared the similar results. It was conducted in 2019 on 700 citizens and 510 experts. The goal of this survey was to gather participants perspectives on environmental policy priorities and assess their satisfaction with those policies. The highest percentage of citizens (37.9%) and experts (37.3%) prioritized creating a clean and safe atmosphere free of fine dust particles as the most urgent ministry's policy task among other tasks. In case of policy satisfaction, citizens were the least satisfied with ministry's fine dust policy with a satisfaction score of 57.1 points. Experts similarly rated fine dust policy among the lowest rated policies with satisfaction score of 61.5. When asked about why they were dissatisfied with the fine dust regulation in 2019, 37% of citizens claimed there were

³ Korea Environment Corporation. “Annual Air Quality Trends.” *AIRKOREA*. Accessed January 11, 2022.

⁴ Yonhap, “Air pollution No. 1 environmental concern for Koreans: survey,” *The Korea Times*, July 12, 2020.

inadequate tangible policy results and also 33 percent of them emphasized the importance of new legislation and legal modifications to improve the effects of fine dust policy. Ministry commented on the results stating that the overall interest in environmental policies increased because of problems associated with fine dust and harmful substances in the environment. They also promised to continue to promote and manage policies so that the public can better experience their effects.^{5 6}

3.1. Effects on people

Almost every Korean is affected either physically or mentally by the air pollution. In 2019 Korean recruiting website called Incruit conducted a survey on 731 adult Koreans and found out that for 97 percent of surveyed Koreans it was difficult to live in polluted air, 93.7 percent said the government should take better measures in response to the polluted air and 90 percent stated that the constantly polluted air had caused them some mental or physical issue. Two most mentioned issues by 16 percent of people were problems with eyes and “fear of ventilation”, respiratory diseases came in second chosen by 15 percent, followed by mental pressure to wear a mask (13%), anxiety to participate in an outdoor activity (9%), worsening of one’s overall health and headaches both chosen by 7 percent, reduction of vision (5%), lung illness (3%) and lastly also 3 percent of surveyed Korean considered immigration to another country, because of the air pollution. The poll also asked about the preemptive safety measures taken by the participants. The most common answer was wearing a dust filtering mask, which was chosen by 33 percent of people. Second was staying indoors mentioned by the 24 percent of people and followed by regularly using an app that informs about the current dust levels (21%). The last preemptive safety measure was the use of air purifier by the 17 percent.⁷

⁵ I could not find any polls from 2020-2021. It is possible that the annual surveys did not happen, because of Covid-19 pandemic.

⁶ Yonhap, “Polled citizens, experts prioritize fine dust in environmental policies,” *The Korea Times*, June 13, 2020.

⁷ Park, Si-soo, “97% of Koreans suffer 'physical or mental' distress due to fine dust: survey,” *The Korea Times*, January 15, 2019.

3.1.1. Deaths associated with air pollution

The Health Effects Institute issued a report called “State of Global Air 2019” which shows that about 17 300 people died in South Korea in 2017 because of the air pollution and PM 2.5 was responsible for the 90 percent of those deaths. The report also shows that the deaths from air pollution were higher every year as for example in 1995 there were 13,200 deaths.⁸

However, another article presented slightly higher numbers. In that article Rep. Kang Gi-yun of the People Power Party cited the data from the Korea Disease Control and Prevention Agency. He said that about 63 969 died from ultra-fine dust (PM 2.5) in South Korea during 2015-2017 period. According to the report, ultra-fine dust pollution claimed the lives of the most individuals in 2017, with 21,759 deaths. Then about 21,627 died in 2016 and 20,583 in 2015. Stroke was the leading cause of death from fine dust, accounting for 10,929 deaths over the three-year period. Heart disease and lung cancer claimed the lives of 8,701 and 7,678 people, respectively. The Rep. also views air pollution as an ongoing ecological disaster and something more dangerous to people than the coronavirus. And he stated that even though the Ministry of Health and Welfare is conducting some health project like giving masks to centers for elderly people he also stressed the need to come out with some extraordinary measures along with ministry of Environment to battle the external sources of pollution like China.⁹

Because of the high concentrations of fine dust in the air and it being the leading cause of cardiovascular deaths, Korean government had to issue an emergency measures like fine dust warnings. Those warnings became an everyday reality for most of the citizens, mainly those that live in close vicinity to the capital. Professor Park Yong-hwan of a cardiovascular medicine residing at Samsung Changwon Hospital stated that fine dust has the potential to cause recurrence of cardiovascular disease and when a fine dust warning is issued, individuals should avoid going outside and wear a mask. He also added that it is important that people take care of any pre-existing

⁸ Nam, Kyung-don, “[Graphic News] Air pollution causes 17,000 deaths in S. Korea in 2017,” *The Korea Herald*, April 8, 2019.

⁹ Park, Han-na, “More than 63,000 extra deaths caused by ultrafine dust: lawmaker,” *The Korea Herald*, October 21, 2020.

cardiovascular conditions and that is also critical for high-risk groups to seek professional advice and identify the best remedy. Also, The Korea Centers for Disease Control and Prevention issued a guideline which encourages people to take care of their preexisting conditions, to not open windows, to preemptively wear an approved mask, to limit long hours of physical activity, to minimize outdoor activities and to stay hydrated in order to prevent cardiovascular diseases caused by air pollution.¹⁰

However not only fine dust is responsible for air pollution. Kim Tae-jong, chairman of Climate Media Hub, a Seoul-based climate action advocacy organization stated that the fossil fuel pollution kills an average of 80,962 people per year, accounting for 30% of all deaths in South Korea. Citing from the Korea Times article he then expressed that: “Thirty percent is the fourth highest rate in the world, behind Bangladesh, China and India, and that is only natural when South Korea boasts the world's highest concentration rate of coal power plants (on land). The country must immediately reduce the use of coal-burning plants, which not only worsen particulate matter-bound air pollution, but also speed up the impact of climate change. We must hurry up with the transition to renewable energy, as it is safer.”^{11 12}

Future also sounds grim as a report from 2019 found out that as many as 2133 elderly people living in Seoul may die annually from the polluted air by 2030. The policy report was issued by the Seoul Institute and it was based on the assumption that the concentration of ultrafine dust present in the Seoul’s air in 2030 will be similar to that in 2015, when the annual average level was 23 micrograms per square meter, well over the World Health Organization's recommended maximum threshold of 10 micrograms. When the annual average level of ultrafine dust raises by 10 micrograms per square meter, the risk of death among elderly living in Seoul jumps by 13.9 percent, according to the study. Particularly men and those in lower income groups are more at risk than women and those from higher income brackets. Report also stated that elderly in comparison to younger people, are more vulnerable to environmental contamination.

¹⁰ Kim, Hyun-bin, “Fine dust: leading cause of cardiovascular deaths,” *The Korea Times*, January 20, 2019.

¹¹ Ko, Dong-hwan, “1 in 5 deaths caused by fossil fuel air pollution worldwide, new study says,” *The Korea Times*, Last modified February 17, 2021.

¹² This and all of the direct quotes said by public, experts or political figures in this work are all directly sourced from articles used in this bachelor thesis.

Furthermore, due to the aging society trend, the detrimental impact of ultrafine dust on the health of the elderly is expected to increase.¹³

3.1.2. Other health related problems

The Graduate School of Public Health and Seoul National University Bundang Hospital made combined research in which they found out that ultrafine dust may increase emergency hospitalization for mental health problems. The analysis was made in 2019 on 86 634 cases located in Seoul during 2003–2013 period and the result was that there is a link between ultrafine dust exposure and psychological illnesses like depression and schizophrenia. When PM_{2.5} reaches 10 micrograms per cubic meter for two days in a row, the rate of emergency mental health hospitalizations rises by 0.8 percent. The trend is also more prevalent in warm weather rather than in cold weather, when both air pollutants such as carbon monoxide and ultrafine dust levels are high in concentration. When contaminants from the air enter the body or the brain, they can either trigger inflammation or increase the risk of mental disease. However only those under the age of 65 were shown to be at danger from ultrafine dust effect on mental health. According to the research team it is because in comparison to the elderly, younger people tend to spend more time outside.¹⁴

A different article pointed to another problem related to fine dust and that is the slowly deteriorating students' physical fitness. Due to the air pollutions negative effects on health and concerns among parents and teachers, the Seoul Metropolitan Office of Education and other local education offices have decided to ban outdoor activities in schools, when fine dust is high in concentration and advisories have been issued. In reaction to the ban Park Hyun-wook, the father of two children in elementary school expressed his concern: "Whenever the fine dust concentration level is high, the schools my two children go to stop their outdoor physical education classes. Due to the absence of outdoor activity, I am very concerned about that their physical fitness which is poor compared with their physiques." For example, according to education offices in

¹³ Kim, Jae-heun. "Over 2,000 elderly Seoulites may die from air pollution annually by 2030," *The Korea Times*, Last modified November 26, 2019.

¹⁴ Lee, So-jeong, "Ultrafine dust increases No. of mental patients," *The Korea Herald*, February 11, 2019.

Gyeonggi Province the percentage of students with low physical fitness soared from 12.3% to 13% in only one year from 2016 to 2017. Some parents, however, believe that declining physical fitness is preferable to exposure to dangerous fine dust particles and resulting health problems. Kang, the mother of two elementary students is one of the people who think that way. She expressed that: “Although it is sad that children do not have the opportunity to go outside and exercise, it is much better than having a fine dust-related disease.” Another option is to have an indoor physical education, however not many schools have a gymnasium. Nevertheless, even indoor physical education is not optimal in every case as many of the school gyms lack ventilation systems, which also poses a health threat.¹⁵

One of the other problems mentioned in the media is the higher usage of ambulances by patients with respiratory issues when air pollution is high. In the first quarter of 2019, the number of cases in which emergency responders drove ambulances to transport patients with respiratory illnesses to hospitals reached a five-year high. According to data from the National Fire Agency the rescuers were dispatched to 21,849 patients from January to March. In contrast emergency responders were dispatched to 11, 387 patients in 2015, 10,727 in 2016, 11,375 in 2017 and lastly 20, 512 in 2018 during the same period.¹⁶

3.1.3. Daily lives

But air pollution does not only affect Koreans health. It affects their daily lives in many ways as well. Things such as masks or air purifiers has now become a necessity, which has led to an increased sales of these essentials, which can be seen in the data provided by E-mart. Amid rising air pollution, sales of air purifiers, clothes dryers, and steam closets rose up to 180 percent from January 1 to January 20, 2019, compared to the same time in 2018. An employee of E-mart stated that: “Air purifiers and clothes dryers were regarded as seasonal products, but these two appliances have now become

¹⁵ Kang, Seung-woo, “Fine dust worsens students' physical fitness,” *The Korea Times*, January 28, 2019.

¹⁶ Yonhap, “More patients with respiratory ailments use ambulances amid severe air pollution,” *The Korea Times*, October 4, 2019.

essentials at home. Fine dust has been changing the home appliance industry.”¹⁷

However not everyone can afford air purifier or masks. People with low income are suffering the most as the price for these essential can be relatively high. Office worker Kim Do-jin stated that: “I've been purchasing dust masks almost every day this month and I spent nearly 50,000 won just for myself. If I count the total cost of masks purchased for my wife and son, it goes up to nearly 150,000 won. And I am only talking about the masks here.” Salesman Cho Hyun-soo purchased an air purifier for his vehicle since he spends a lot of time in it, but he could not afford a good one due to the cost explaining that: “This was an expense that was out of my expectations and for sure 200,000 won is quite a high price. I heard a decent home air purifier costs an average 700,000 won to 1 million won these days. We are now living in a world where you can't breathe clean air if you don't have any money.” The salesman wraps up his misgivings by declaring himself frustrated and left in the lurch by the government. Because of the frustration, many citizens signed petitions and put them on Cheong Wa Dae's website, requesting a variety of solutions, ranging from affordable masks to free mask distribution. Some of the petitioners wrote posts like: “My family spent more on masks than food. Do poor people have to die because of expensive masks? The government should come up with countermeasures for masks, which are now a daily necessity, by setting up state-run mask factories.” Another one posted a comment saying: “As the government provides subsidies to those buying electric vehicles, it should provide subsidies for anti-fine dust products. They are directly related to health.”¹⁸ However, people are not the only ones that need to wear masks in order to protect themselves from pollution. Many pet owners are worried about their pets as well, as sales of pet masks has also increased according to company Dear Dog one dog owner stated that: “His breed requires regular walking, so I have no choice but to make him put on this mask. It's inconvenient but I think we'll have to keep living with that.”¹⁹ But the pollution does not only affect the people's needs for masks or purifiers, but also their routines. Choi Ju-yeon from Paju said that air pollution has affected his daily

¹⁷ Kim, Da-sol, “Fine dust pollution reshapes local home appliance market,” *The Korea Herald*, January 22, 2019.

¹⁸ Kim, Jae-heun, “Low-income group falls vulnerable to air pollution,” *The Korea Times*, March 7, 2019.

¹⁹ Choi, Won-suk, “South Koreans fight smog their own way: with pork,” *The Korea Times*, March 21, 2019.

routine too: “The first thing I do when I wake up is check the weather report for fine dust and plan the day accordingly. When levels are high, I try to stay indoors as much as possible. I also have air quality monitoring devices at home.” Koreans also made a playful adaptation of weather forecasting proverb that goes something along the lines that three cold days in winter are followed by four warm days and turned to into “Three cold (days), four (days of) fine dust.” Kim Sang-ho, who has three children said, that during winter he rarely goes out: “It’s quite irritating really. These days it’s either too cold or fine dust is too bad for me to take the kids out. There is all this talk about what causes fine dust, and its health effects. Although I don’t know what is true, I think the best I can do for my kids is to limit exposure as much as possible.” Because of fear associated air pollution there has been also an increasing number of natural remedies, which are supposed to help with helping the body get rid of fine dust particles, that are not scientifically proven. Various meals and drinks have been linked to fine dust protection; for example, some individuals believe that pork fat absorbs fine dust.²⁰ This is actually a long-held superstition in Korea that pork meat and especially the fat can help with protection against fine dust. It probably began with a belief that coal miners held, that the oil could help in the passage of the dust down their throats. Even though it is not scientifically proven many Koreans really believe this as the sales of pork tend to rise on highly polluted days, especially the pork belly. In the article on this issue many expressed their thoughts about this. Han Dong-jae said that: “My mom told me that pork helps - and pork belly is my favorite food - so I eat more pork when it's smoggy like today.” Kim Dong-wook said that: “It feels like oil from the meat washes away the dust in my throat.”²¹

However, this belief provides only temporary relief to already frustrated Koreans. In March 2019 due to peoples unsatisfaction with how government handled air pollution 500 petitions flooded on the Blue House website demanding better measures. The government has already come up with emergency measures such as banning old diesel vehicles from entering the cities, early closure of daycares and schools,

²⁰ Choi, He-suk, “[Weekender] Fine dust, a force changing society,” *The Korea Herald*, February 14, 2019.

²¹ Choi, Won-suk, “South Koreans fight smog their own way: with pork,” *The Korea Times*, March 21, 2019.

emergency text messages and other, however that did not seem enough to a lot of citizens. A lot of them also believe that the fine dust came mostly from China, thus asking the president to boycott China. Parents are also worried about their children as many schools did not have any air purifiers. One mother complained online that: “We have an air purifier at home but there are none at my daughter's school. She would be safer at home, and I wish I could keep her home from school, but I just can't.” Almost all of the kindergartens and most of the elementary school have air purifiers, however 74% of middle and high schools in 2019 did not have any at their disposal. However, after the complains Minister Yoo Eun-hae responded that the government will provide them within a year.²² Air pollution and it's risks and handling by the government took a toll on a view that people have about the future of the country. Many of them are pessimistic. During September 25-27 Global Research carried a poll for Hankyoreh Economy and Society Research Institute on 1000 Koreans asking them about their opinions on the sustainability considering politics, economy, society and environment of the country. Only 21,7% of the respondents had a positive view on the sustainability of Korea while 36.1% had a neutral view and most of the people exactly 42.1% view it negatively. The most pessimistic views had people young people in their twenties and older 60+ generation. One student expressed her worries by saying: “A lot of my friends and family are worried about whether Korean society is sustainable because of the low birth rate, the aging society, polarization, and particulate matter in the air. When you think about apartment prices, educational challenges, and unstable employment, it's gradually becoming harder to get married and raise kids.” From all categories in the poll the sustainability of environment had the least positive views off them all. Only 12.7 percent of respondents were positive about it. One of the respondents Park Mi-yeong, who is a mother commented that: “I have two daughters in elementary school, and we're pretty afraid of particulate matter. Things have gotten a little better recently, but it's scary when there's a lot of fine dust in the air. There's not going to be a dramatic improvement anytime soon, and I feel frustrated about factors that are outside of our control, like China. I always thought that environmental issues were an issue that didn't affect my life, but with particulate matter levels getting higher, it's starting to really hit

²² Kang, Seung-woo, “Citizens irked by poor anti-dust measures,” *The Korea Times*, Last modified March 7, 2019.

home.” The reason why Koreans are starting to take air pollution seriously may be because they are starting to realize how big effect it has on their lives in all aspects. Also, because the social media, newspaper, environmentalists, and many others have been trying for long to raise the awareness on the issue.²³

3.2. Causes

3.2.1. External factors (China)

China is one of the most mentioned causes of the air pollution in South Korea by media, politics and public. When searching for the relevant articles regarding air pollution one is bound to find a lot of articles mentioning China. However, it is not surprising given both countries history and complicated relationship.

Studies

Many articles blame China for Korea's pollution. But most of them are not just baseless speculations or prejudice, but they present real unbiased scientific research. For example, in 2019 NIER²⁴ did an analysis on meteorological observation records of ultrafine dust from January 11 to 15 and found out that on average 75% of fine dust in South Korea originated outside of South Korea. The NIER did not name a single country but given the direction of the winds during that particular period and the volume of pollution produced, China appeared to be the primary culprit. Official from the NIER later in the article said that they will deliver the study results to China and try to strengthen cooperation in research.²⁵ Another article presented a bit older analysis with similar findings. It was done by the NIRS.²⁶ From January 2015 to March 2018, they studied fine dust fluxes over the Incheon area and found out that when winds blew from the west, the particulate matter density rose in proportion to that of a China. Domestic factors also influenced the levels of particulate matter; however, the influence

²³ Kim, So-youn, “Majority of S. Koreans are pessimistic about future of their country,” *The Hankyoreh*, October 6, 2019.

²⁴ National Institute of Environmental Research

²⁵ Jung, Hae-myung, “‘75% of Korea's fine dust came from China’,” *The Korea Times*, February 7, 2019., Yonhap, “[Newsmaker] External sources account for 75% of Korea's fine dust pollution,” *The Korea Herald*, February 6, 2019.

²⁶ National Information Resources Service, which is an affiliate of the Ministry of the Interior and Safety

of the external factors was higher. According to the scientists, when the concentrations of particulate matter were very high in China²⁷ and the wind was blowing to the west, the fine dust pollution in Incheon was also high and labeled as not safe. This shows a connection between unsafe air in Incheon, westerly winds, and high concentrations of aerosols in Chinese regions. Data from another 20 fine dust agencies in Incheon area supported this. When they made a comparison of correlations for particulate matter predictions from these 20 observation sites, the scientist found out that the strongest connection for PM and nitrogen dioxide was in the area of Baengnyeong Island rather than in Incheon. The data were interpreted as indicating that the distribution of fine dust in the China is higher than in Incheon. Also, when the external factors were excluded from the analysis, the number of days with air quality rated as good increased by 50% from 20 to 30 in the first quarter of 2018. To accurately analyze domestic and external factors the NIRS constructed a fine dust forecasting model using data from the Ministry of Environment and NASA. The current accuracy of the model is 84.4% for PM10 and 77.8% for PM2.5 and in the future the scientist plan make the prediction model more accurate by using the data from South Korea 's Chollian-2A and 2B satellites. The head of the NIRS Kim Myung-hee also stated that: "This analysis is very significant both in terms of improving forecasting accuracy by actively applying a machine learning predictive model to fine dust forecasts, and in terms of being able to grasp the pathways through which fine dust arrives."²⁸

Before this study NASA and NIER conducted another study together in 2017, where they found out that about 48 percent of particulate matter comes from external sources and about 52 percent from domestic contribution. The measuring of PM2.5 was done at Olympic Park in Seoul during May and June of 2016. However, the result may have limited generalizability, because the study was conducted only in one place at one specific time of the year when the concentration of ultrafine particulate matter was not particularly high. But it lends weight to the findings of the Ministry of Environment's previously published foreign contribution rate of ultrafine particulate matter 30-50

²⁷ particularly in Beijing, Shandong Province, Hebei Province and Shaanxi Province

²⁸ Lee, Jung-ha, "Majority of fine-particle dust in S. Korea originates in China and overseas regions," *The Hankyoreh*, January 29, 2019.,

Yonhap, "South Korea again confirms influx of fine dust from China," *The Korea Herald*, January 28, 2019.

percent throughout the year, and 60-80 percent during periods of high concentration), because it fits within the range. Kim Jeong-su, the director of NIER's atmospheric and environmental research department commented on the study that: "One limitation of this joint study is that it took place at a time of the year when particulate matter from overseas does not have a major impact. But since it confirmed a large number of instances when even the domestic impact alone was raising the concentration of ultrafine particulate matter above the level recommended by the World Health Organization, it showed that a lot of effort needs to be made domestically in order to reduce the concentration of particulate matter."²⁹

In 2020 scientists from Korea-China Air Quality Joint Research Team found out that the PM2.5 in Seoul and Beijing had relatively similar components. In both capitals the ultrafine dust consisted of ammonium nitrate, ammonium sulfate, organic matter, and crustal materials in various ratios. However, the researcher from NIER explained that this joint research has nothing to do with the issue of cross-border ultrafine particle flows and its goal is to investigate the causes of ultrafine dust in the two cities and provide assistance to relevant policymakers.³⁰

Reactions on air pollution from China

Public as well as local environmental groups, are dissatisfied with Seoul's air quality and external Chinese causes. Around 90 citizens filed a lawsuit in May 2017 against the South Korean and Chinese governments, seeking compensation of 3 million won each plaintiff. Among this people were also some more known figures such as Choi Yeol (chief director of the Korea Green Foundation), Kim Sung-hoon (former agriculture minister), and lawyer Ahn Kyeong-jae. They charged Beijing with a failure to manage air pollution and Seoul with failure of identifying the source of fine dust and defending people's right to safety and happiness. However, the Seoul Central District Court dismissed the lawsuits. The court explained that even if the citizens suffered from air pollution, it is difficult to prove that the Korean government has broken laws

²⁹ Kim, Jeong-su, "NASA and NIER study finds that 48% of particulate matter comes from outside S. Korea," *The Hankyoreh*, July 20, 2017.

³⁰ Yonhap, "Ultrafine dust in Seoul, Beijing has similar ingredients: report," *The Korea Herald*, January 22, 2020.

intended to protect citizens and in regard to the China they stated that they do not have any legal authority over surrounding countries. Also, during the court hearings, the South Korean government stated that they made steps to determine the cause of pollution and develop solutions and argued that the plaintiff's allegations and proof of damages were vague.³¹

Additionally, because of these studies and reports blaming China for ultrafine dust many Korean experts asked the South Korean government to take tangible diplomatic steps to convince the Chinese government into curbing its fine dust emissions. After the Seoul Institute of Public Health and the Environment published the report on the influx of particulate matter from China³² after the Lantern festival that in combination with stagnant air resulted in high levels of ultra-fine dust in Korea, experts started to argue that in order to fix the air pollution in Korea, the issue with China and its pollution must be resolved first. One of the experts professor Cho Seok-yeon of environmental engineering at Inha University thinks that: “Reducing the density of fine dust in Beijing won’t have much of an effect on Korea. The important thing is the total output on the Chinese mainland.” However, experts’ opinions differ on potential solutions. Song Gi-ho, a lawyer and trade specialist, believes that Korea should renegotiate the current FTA (free trade agreement) with China and push China to take responsibility for reducing its emissions by adding a provision to the FTA that allows the South Korean government to request the investigation of violations of Chinese environmental legislation by Chinese enterprises, because China’s fine dust emissions may well be in breach of the country's own environmental standards. However other experts think this is unrealistic, because South Korea is at a disadvantage when dealing with China on a one-to-one diplomatic relation. Other expert Ji Hyeon-yeong from the Korea Green Foundation thinks that making a voluntary convention with other countries that are affected by Chinese pollution would be a much more effective in putting pressure on China. China, as Asia's leading power, would then have little choice but to implement the reduction. Kwon Se-jung head of the climate bureau at South Korea’s Ministry of Foreign Affairs however thinks that: “Even if China were placed under the

³¹ Yonhap, “Court dismisses fine dust-related compensation lawsuit against Seoul, Beijing,” *The Korea Times*, December 11, 2020.

³² particularly Beijing and Shenyang

obligation to reduce emissions, there's no practical way to force it to abide by that obligation. We need to be thinking about moving toward a multilateral voluntary consultative body under which China can voluntarily set and meet mandatory reduction goals in the manner of the National Determined Contributions in the Paris Agreement.”³³

Public is also not very satisfied with the pollution coming from China. In a survey on air pollution done by Inruit and DooitSurvey 74.5 percent of 3,086 participants stated that they think that the government should put more economic and diplomatic pressure on China regarding air pollution.³⁴

Politics

In January 2019 from 22 to 24 China and Korea held a meetings in Seoul, regarding both countries future cooperation in dealing with fine dust pollution issue. These meetings were held at a time when both China and Korea were experiencing a dangerously high levels of fine dust and general public in South Korea already perceived China as mainly responsible for bad air quality in South Korea. President Moon Jae-in urged for joint cooperation with China to deal with air pollution. He expressed in a meeting on Tuesday 22nd at Cheong Wa Dae³⁵ that: “There are concerns the China-originated fine dust is influencing public health. I want relevant ministries to step up diplomatic efforts to address the rising smog levels such as an establishment of an early smog-detection alarm system.” In response to the public concerns he also added that: “I am also well aware of the fact that our people have great concerns about fine dust coming from China. We need to strengthen our cooperation to significantly reduce fine dust, because China too is suffering from it.”³⁶

After another meeting on 23-24. January, they have announced that they not

³³ Seon, Dam-eun, “Experts call for diplomatic measures to pressure China to reduce fine dust pollution,” *The Hankyoreh*, March 8, 2019.

³⁴ Park, Su-jin, “[Photo] South Korean citizens demand government pressure China over PM2.5 pollution,” *The Hankyoreh*, Last modified April 9, 2018.

³⁵ Presidential residence and office also known as a Blue House

³⁶ Kim, Yoo-chul, “China asked to tackle fine dust in Korea,” *The Korea Times*, January 22, 2019., Ock, Hyun-ju, “S. Korea, China hold talks on fine dust amid dispute,” *The Korea Herald*, January 22, 2019.

only agreed on establishing a combined early warning system for fine dust, but also on another three projects and cooperation. The government will be able to prepare for fine dust approaching the peninsula and provide notifications for impacted areas thanks to the unified early warning system. Beijing has promised to offer real-time forecast data. And they also agreed to present a clear action plan to the trilateral discussions between South Korea's, China's, and Japan's environment ministers in the second half of 2019.³⁷

This was not the first time when Korea pointed to China as a perpetrator related to pollution. However, China has always denied these claims and in this case the official from Chinese Ministry of Ecology and Environment told South Korea to first take care of it's domestic pollution before shifting blame to Beijing. He said that: "Air quality in China has improved 40 percent, while that of South Korea remains the same or has worsened slightly."³⁸ However despite improvements in China's air quality, average ultrafine dust levels in Beijing in 2018 were more than double the level in Korea.³⁹

Moon stated again at the start of March 2019 that he will seek a joint action on fine dust pollution with China and directed the government to explore solutions with the Chinese government to reduce the impact of the fine dust. He also mentioned a discussion over creation of the artificial rain over Yellow Sea, which could also help the China since China previously mentioned that pollution from Korea is also carried to Shanghai. However, he did not only concentrate on external factors of pollution, but he urged for domestic efforts to minimize fine dust as well, including the permanent closure of fossil-fuel-burning power facilities older than 30 years. He also implemented some domestic measures like providing and air purifier for schools and creation of an emergency fund. But not everyone was happy with the measures as the opposition parties have intensified their criticism of the administration for pursuing ineffective and delayed efforts to combat fine dust pollution. Hwang Kyo-ahn, chairman of the Liberty

³⁷ Kim, Jae-heun, "Korea, China to establish early warning system for fine dust," *The Korea Times*, Last modified January 25, 2019.,

Yonhap, "South Korea, China to seek joint fine dust warning system," *The Korea Times*, January 24, 2019.

³⁸ In the same period of time as Korea.

³⁹ Kim, Yoo-chul, "Beijing denies responsibility for fine dust," *The Korea Times*, Last modified March 8, 2019.

Korea Party expressed that: “People online say it is not fine dust, but Moon's dust. What he did was get briefed on Monday and come up with meaningless measures.”⁴⁰

On 15th of February 2019, a special law has passed in which if the daily average level of PM 2.5 reaches 50 micrograms per cubic meter and is projected to surpass that threshold again the next day, local governments are required to take various emergency actions such as reducing the operating hours of power plants, construction sites and other facilities. Because of this special law South Korea plants to cut fine dust emissions by 35.8% by 2022. Before passing this special law Prime Minister Lee Nak-yeon at the special committee meeting along with experts and people from local governments also debated about comprehensive measures to limit ultrafine dust and as a result they opted to focus their policy priority on intense management of domestic fine dust emitters and tighter cooperation with China. PM expressed that: “It has already been proven that fine dust mainly originates from China. Fine particles cause Chinese people much greater pain. We repeat our call for China's responsible cooperation.”

About that time the National Institute of Environmental Research published the report mentioned few pages above, in which was reported that the overseas sources primarily from China, contributed for 75% of South Korea's ultrafine dust air pollution. Likewise, the study from NIRS and few others also mentioned above, which also reported that fine dust particles over the Korean Peninsula are mostly due to China were already out. Despite these studies the Chinese government denied any responsibility for fine dust concentrations over South Korea.⁴¹

In response to the growing accusations from Korea Chinese ministry spokesman Lu Kang during media briefing stated that: “I do not know if there's sufficient ground (to say) that fine dust in South Korea has come from China. It looks like that there has been no fine dust in Beijing over the last two days, when Seoul was blanketed by dense fine dust. The cause (of fine dust) is very complicated. Comprehensive handling should be based on a scientific attitude.” A day after the Chinese ministry spokesman remarks South Korean Foreign prime minister Kang Kyung-wha responded that there is in fact connection between China and the country's growing air pollution. She said that: “It's

⁴⁰ Park, Ji-won, “Moon vows joint action with China to tackle dust,” *The Korea Times*, March 6, 2019.

⁴¹ Yonhap, “Seoul to propose fine dust reduction treaty to China,” *The Korea Times*, Last modified February 16, 2019.

true that there's a cause (of fine dust) stemming from China.” She was asked for a response by reporters, when leaving National assembly from the meeting on North Korea. Chinese ministry spokesman comments came only hours after South Korean President Moon Jae-in urged for cooperative cooperation with China to address the issue. In addition, the ruling and opposition parties have agreed to enact a set of laws targeted at improving air quality and they included a provision declaring severe fine dust a “national calamity” and allocation of governmental funds to combat it. According to Kang, South Korea and China had talks between their environment ministries and discussed possible coordinated actions against fine dust.⁴²

Also in March 2019 Ban Ki-moon⁴³ was established as a head of at that time newly formed national committee for combating fine dust. The committee consisted of people from government, National Assembly, social and civil groups and its mission was to come up with recommendations to president in fighting the pollution. Ban Ki-moon at the press conference stated the Korea has declared worsening air pollution as catastrophe and again stressed the importance of talks with China: “South Korea designated the worsening air pollution as a national disaster. Record levels of fine dust have blanketed most of the country. Yes, this is a national disaster. We have to address it by developing relevant talks with countries in Northeast Asia including China.” South Korea has also agreed to work with NASA and to use NASA's satellite data to determine the exact source of air pollution. China however disliked and complained about this move and still continued to deny that it is a source of fine dust in Korea, defining air pollution as a regional issue.⁴⁴

Previously mentioned studies and government officials pointed on China as a source of fine dust in Korea, but foreign minister Kang Kyung-wha pointed out that pollution in South Korea could also affect China. She said that: “Depending on the season, fine dust that occurs in the country could fly over to China.” In reaction to the ministers’ words, experts pointed out that the amount of fine dust travelling to China is

⁴² Yonhap, “China linked with fine dust in South Korea: minister,” *The Korea Times*, March 7, 2019., Kim, Yoo-chul, “Beijing denies responsibility for fine dust,” *The Korea Times*, Last modified March 8, 2019.

⁴³ ex United Nations Secretary General

⁴⁴ Kim, Yoo-chul, “Seoul will discuss fine dust issue with Beijing’: Ex-UN chief,” *The Korea Times*, Last modified March 25, 2019.

negligible, saying that yearly only about 0.1 percent or less of ultra-fine dust blows to China from South Korea.⁴⁵ There was also a similar study done on this issue in 2017. From 2000 to 2017, the researchers from China, South Korea and Japan measured levels of various air contaminants in all three countries and how much of the pollution from one country affected another. They found out that China was responsible for 32 percent of ultra-fine dust in South Korea and in comparison, South Korea was only responsible for 2 percent of ultrafine dust in China in 2017.⁴⁶

On November 4th, 2019, South Korean and Chinese environment ministers Cho Myung-rae and Li Ganjie signed an action plan called “clear sky”, which includes cooperation policy implementation, collaborative research, technological and personnel exchanges between the two nations. The action plan was then to be implemented by the South Korea-China Environmental Cooperation Center, which was established in June 2019 in Beijing. This was the first annual meeting of the two ministers, which they agreed on back in February. After the meeting South Korean minister expressed that: “I have delivered to Li the Korean people’s concerns about fine dust that comes from China. I asked for close cooperation from China in sharing information about fine dust and strengthening joint efforts reduce it.”⁴⁷

A year later in November 2020 the Korean minister of environment Cho Myung-rae held the next annual meeting online with a new Chinese minister of environment Huang Runqiu. The result of the meeting was that they pledged to cooperate together more closely on their anti-fine dust programs, establishing a consultative organization to share policies and technology targeted at reaching carbon neutrality. Minister Cho expressed after the meeting that: “We must protect the blue sky for our people who are exhausted from COVID-19. We will continue practical cooperation with China in order to eliminate fine dust and overcome the climate crisis.” Month before the meeting, President Moon also declared that he has set South Korea becoming carbon neutral by 2050 as his last administration policy goal and Xi Jin Ping,

⁴⁵ Kim, Hyun-bin, “Korea's fine dust has meager effect on China',” *The Korea Times*, Last modified March 25, 2019.

⁴⁶ Kim, Bong-gyu, “[Photo] China accounts for 32% of S. Korea’s air pollution, joint study finds,” *The Hankyoreh*, November 20, 2019.

⁴⁷ Ock, Hyun-ju, “Korea, China sign ‘clear sky’ plan to fight fine dust,” *The Korea Herald*, November 4, 2019.

the president of China declared in September that year that he would like China to be carbon neutral by 2060.⁴⁸

Most of the articles in this chapter are from 2019-2020, due to limit of published articles on this issue in 2021. This is probably due to Covid-19 pandemic and lockdowns that affected both South Korea and China. Speaking of lockdowns, Rep. Jan Chul-min of the Democratic Party also saw a connection between Korean and Chinese pollution. He stated that air quality improved while China was in a lockdown. He referenced AirKorea data showing that nitrogen dioxide concentrations in the first five months of this year were 25.4 percent lower than the average for the previous three years during the same period. He attributed this result lockdown in China: “While China enforced lockdowns in high-risk areas during those months, Korea did not, but still saw positive changes in air quality due to the impact of China’s actions.”⁴⁹ During pandemic the attitude of the public towards China did not improve and maybe got even worse than previous years. It can be seen particularly among younger Koreans as shows this article from 2021. The reason why Koreans hold negative perception of China is because the Chinese government has not only constantly denied the influx of pollution from China to Korea, that often takes over Korea and causes various problems for Korean public, but also the belief that Covid-19 pandemic started in Wuhan and the Chinese government's handling of the virus in Beijing, human rights issues, Chinese fishers fishing illegally in Korea's territory and many other problems that left Korean's frustration grow. A 23-year-old student explained that: “I think that anti-China sentiment has intensified in Korea, particularly after the COVID-19 outbreak. From reading news articles, I personally came to believe that Wuhan is where the virus originated from. The fact that people's lives have changed completely due to the pandemic, and many are suffering the consequences, seem to be the source of the recent surge in such negative feelings.”⁵⁰

Lastly, the newly elected South Korean president Yoon Suk-yeol in 2022 called

⁴⁸ Yonhap, “S. Korea, China agree to seek joint measures in reducing fine dust,” *The Korea Herald*, November 11, 2020.

⁴⁹ Ko, Jun-tae, “Air quality improves in Korea during China lockdown: lawmaker,” *The Korea Herald*, October 14, 2020.

⁵⁰ Park, Han-sol, 2021. “Young Koreans lash out at heavy-handed China,” *The Korea Times*, Last modified August 29, 2021.

with Chinese president and they both agreed on continued cooperation on various issues such as public health, supply chains, culture, climate change and the environment including the fine dust issue. They also agreed on active communication and future meetings. Quoting Yoon from the article: “I hope to work with Xi for the growth of the relationship between the two countries in the spirit of mutual respect and cooperation.”⁵¹

3.2.2. Domestic factors (Coal, Cars)

Coal

Second most mentioned cause of air pollution by the number of articles is coal production. According to report by CoalSwarm, in 2018 Korea still invested into building coal plants in developing nations despite transitioning to renewable energy sources in Korea.⁵² However, on October 28, 2020, ex-president Moon Jae-in during introduced a policy in which they vowed to go completely carbon neutral by 2050. During the time of his presidency also many measures were taken. For example, in 2019 The National Council on Climate and Air Quality led by Ban Ki-moon introduced a season fine dust management policy according to which the operation of 9-14 coal plants would be stopped from December to February and 22-27 power plants would stop operating in March. They also banned old diesel cars from entering big cities with population over half a million during this period. The council estimated that the closures might result in a 1,200-won increase in a four-person household's monthly electricity expenditure throughout the period. But the measures are necessary to curb the pollution. Ban Ki-moon explained the reason for this policy as: “Some people would say the measures are excessive, but these measures are necessary to resolve the particulate pollution problem that is a social disaster.”⁵³ Day after passing the policy the National Council on Climate and Air Quality and the Ministry of Culture, Sports and Tourism

⁵¹ Im, Eun-byel, “Yoon, Xi discuss cooperation between two countries in phone call,” *The Korea Herald*, March 22, 2022.

⁵² Choi, Won-suk, “Asian countries expanding coal plants in other nations: report,” *The Korea Times*, Last modified January 3, 2019.

⁵³ Ock, Hyun-ju, “[Newsmaker] Up to 27 coal power plants to be shut down December to March to curb pollution,” *The Korea Herald*, September 30, 2019.

wanted to know the citizens views on it, so they requested a survey. It was done on 2000 Koreans. The results were mostly positive as 78.3 percent agreed with seasonal dust management, 73.5 percent agreed with banning old diesel car from cities, 69 percent agreed with stopping the operation of coal power plants and 56 percent would not mind with rise of prices for electricity due to suspension of coal plants. However around 39 percent were not satisfied how Korea handles international cooperation related to fine dust, which shows that Koreans still perceived China as main source of pollution and only 20.8 had positive views about Koreas international cooperation.⁵⁴ The policy later appeared to be effective as fine dust emissions from coal plants in 2019 decreased by 40 percent from 5,320 tons to 3,212 tons compared to the same period (December – February) in 2018.⁵⁵

In 2021 Korea had 53 coal power plants, five less than previous year and they managed to shut down the oldest one the Honam Coal Power Plant and have planned on transforming it into LNG plant, which is more environmentally friendly.⁵⁶ Even though the government made those steps against coal, public was still not satisfied with coal situation in Korea as there were a few protests led by activists. For example, young people protested in front of the Samsung offices in August 2020, urging Samsung C&T to withdraw from a coal plant development project in Vietnam. At that time Samsung C&T had also coal plan projects in other countries as well. One of the protesters named Nam Dae-hee a member of a Youth 4 Climate Action expressed that: “Coal is the biggest contributor to the world's greenhouse gas emissions. If humanity is wiped out from the Earth because of climate change what good would Samsung's quality goods and services be?” The members of Youth 4 Climate Action also created a website called wrongcalloncoal.com, which purpose was to encourage visitors to take action against Samsung. The people from this organization have been active before in Korea as in May 2020 they convinced the Seoul Metropolitan Office of Education to not put their funds

⁵⁴ Ock, Hyun-ju, “6 in 10 Koreans support hike in electricity prices to curb fine dust: survey,” *The Korea Herald*, November 17, 2019.

⁵⁵ Yonhap, “Fine dust emissions down 40% on coal plant cap,” *The Korea Times*, March 17, 2020.

⁵⁶ Yonhap, “Winter season operation curb on coal plants in store to cut dust emissions,” *The Korea Herald*, November 25, 2021.

Yonhap, “Korea's oldest coal-fired plant to shut down,” *The Korea Times*, December 28, 2021.

in banks that support coal projects.⁵⁷ But this was not the only protest against Samsung. In November 2020 the Korea Federation for Environmental Movements (KFEM) held a protest against Samsung in front of their headquarters and demanded to stop its investments into coal project stating that these projects have caused 33000 early deaths, because of the air pollution created by coal plants. The protesters backed these accusations with the data from the report on Korea coal investments by Center for Research on Energy and Clean Air (CREA). They also stated that: “Every year, up to 1,000 people die early from air pollution emitted from the 40 coal-fired power plants Samsung Life and Samsung Fire & Marine Insurance invested in. Adding up the deaths caused during the 31-year operation of the power plants, the figure comes to 33,000.”⁵⁸ A two days later after that protest, Samsung Life and Samsung Fire & Marine Insurance released a statement, in which they promised to stop investments related to coal and rather plan to invest more into environmentally friendly projects. Environmental groups appreciated the statement but expressed worries about other Samsung’s affiliates and their coal related investments and also how this promise will be put in action. Coordinator Lee Ji-eon from the KFEM reacted to this pledge saying that: “While the policy is a major step forward, the devil is in the details. What remains to be seen is how they implement the decision and close loopholes, namely with ongoing projects”⁵⁹ There is also an increasing number of government organizations, which have decided that when choosing bank to handle their funds they will prefer the banks that do not invest in coal related projects. For example, the Seoul Metropolitan Office of Education announced in September 2020 that they would add new criteria when selecting banks to handle their fund, which would include corporate social responsibility, their education contributions and lastly the anti-coal efforts. Banks would have been judged on whether they have abandoned coal investments and have developed any measures to cut carbon emissions. If they still invested into coal they would not be taken into consideration. In response to this situation many banks and financial companies have decided to reevaluate their investments and involvement in coal related projects. The

⁵⁷ Kim, Se-jeong, “Teens say no to Samsung's coal project,” *The Korea Times*, August 19, 2020.

⁵⁸ Kim, Bo-eun, “30,000 deaths caused by Samsung insurers' coal investments,” *The Korea Times*, Last modified November 11, 2020.

⁵⁹ Kim, Bo-eun, “Samsung's financial affiliates declare end to coal investments,” *The Korea Times*, Last modified November 13, 2020.

UN Environment Programme Finance Initiative Korea Representative Lim Dae-wong commented that: “The green initiative will be among their top priorities, not because they feel environmentally conscious or morally obliged, but because they are able to make money that way. Many Korean financial firms and state-run entities seeking to embrace anti-coal campaign is capitalism at its best.” However, some companies have already reduced their coal related investment. In July 2020 Samsung Securities and Hanwha Investment and Securities announced that they will no longer partake in coal related projects. In August same year Industrial Bank of Korea made similar announcement. KB Financial Group which previously handled the fund also stated that they would reduce investments into carbon-heavy projects and rather focus their investments on projects of more renewable sources of energy.⁶⁰ Later other banks followed. In December 2020 Woori Financial Group promised to become a carbon neutral corporation by 2050 and as a start they have stopped making new investments in coal-fired power plants. The anti-coal campaign was also joined by Hana Financial Group in March 2021, which has also pledged to become carbon neutral by 2050 and to stop any coal related investments, while also supporting the government's carbon-free programs. The Shinhan bank also joined and pledged to stop funding coal-fired power plants and the purchase of any coal-related bonds.⁶¹ Maybe because of Moon Jae in administration goal of carbon neutrality by 2050 or maybe because of environmental groups criticism Korea Electric Power Corp has also joined an anti-coal campaign with its “2020 report for sustainable management.” In the report they pledged that the coal-fired power generation will be reduced or phased out both domestically and internationally.⁶²

In order to achieve the goal of carbon neutrality by 2050 government plans to shut down all coal powered plants by 2050 and increase energy sources which are more renewable. In 2020 coal power plants generated 35.6 percent of all energy in South Korea. However, this closure may cause some problems, because along with coal energy, government also aims to phase out nuclear one as well. Yoo Seung-hoon, a

⁶⁰ Lee, Kyung-min, “[ANALYSIS] Anti-coal campaign gathering force,” *The Korea Times*, Last modified September 27, 2020

⁶¹ Kim, Hyun-bin, “Hana, Shinhan join anti-coal campaign,” *The Korea Times*, March 10, 2021.

Lee, Min-hyung, “Woori pledges to go carbon neutral by 2050,” *The Korea Times*, December 13, 2020.

⁶² KEPCO, “Coal-free pledge,” *The Korea Times*, November 10, 2020.

professor in the Department of Energy Policy at Seoul National University of Science and Technology pointed out that: “The point is securing enough backup power. Abolishing both coal and nuclear power will seriously undermine stability in the power supply and result in the eventual failure of the energy transition.”⁶³ But some people doubt that achieving carbon neutrality by 2050 is even possible. Climate advocacy group Solutions for Our Climate and Korea Advanced Institute of Science and Technology did a study together and they found out that if no other changes are made to existing policies, the carbon neutrality will not be possible. They came up with three scenarios and in the worst one the greenhouse gas emissions would be down only by 30%. The transport sector would still use crude oil as an energy source by 50 percent in 2050 and greenhouse gas reductions in this sector are projected to be limited unless the government would put a ban on the sale of internal combustion engines.⁶⁴ Also NGO Climate Transparency published a report in 2021 in which they reviewed G20 nations climate performances and found out that Korea’s actions towards climate are insufficient compared to other nations, because they still relied heavily on fossil fuels, government invested in coal projects and lacked behind in their carbon emission target. The organization believes that Korea should phase out coal power by 2030 rather than in 2050 and stop any new coal power plant projects, speed operating approval for renewable energy generators, and improve grid access.⁶⁵

Nevertheless, Korean government seems to have genuine intention to deal with coal, even if its a bit slower than the others would have wanted as in October 2021 South Korea has finalized the decision to cut emissions by 40 percent by 2030 from the levels in 2018 and also committed to being carbon neutral by 2050, indicating that the country has begun to address the dual challenges of responding to climate change and achieving long-term growth. At the annual UN conference on November 2021 Moon Jae-in addressed this in his speech: “Following the inauguration of our government, eight coal-fired power plants were shut down. By the end of this year, two additional

⁶³ Yoon, Ja-young, “Korea's nuclear phase-out plan raises net-zero dilemma,” *The Korea Times*, Last modified October 29, 2021.

⁶⁴ Lee, Kyung-min, “Gov't won't achieve carbon neutrality by 2050,” *The Korea Times*, Last modified May 14, 2021.

⁶⁵ Lee, Kyung-min, “Korea falls far behind in decarbonization: climate advocacy,” *The Korea Times*, October 18, 2021.

plants are scheduled to close. We will put a complete end to coal-fired power generation by 2050. Moreover, official financial support for the construction of new coal-fired power plants overseas has already been suspended.”⁶⁶

Cars

Usually, the coal emissions of China are perceived as a main culprit of pollution however in 2017 environmental group Green Korea United and 130 citizens did a study where they measured air quality in Seoul and found out that car emissions were mostly responsible for air pollution in Seoul. Professor Kim Seong-tae from Daejeon University explained this by saying: “Since Seoul doesn’t have many coal-fired power plants or factories, automobile exhaust has a dominant effect on nitrogen dioxide concentrations.” However, this study’s findings varied a bit with the official numbers from Seoul city measurements. But the difference was due to different positioning of measurements devices whilst citizens measured air quality in about one -2 meters from the ground city measured air with devices on tall buildings.⁶⁷ On January 2019 government introduced hydrogen economy strategy blueprint, which focused on promoting environmentally friendly transportation and power cells, with the potential to generate 43 trillion won (\$38.2 billion) in wealth by 2040. The plan is to produce around 6.2 million hydrogen vehicles by 2040, which would put South Korea on the first place of green car making. They also plan to increase the number of hydrogen power station to 1200 and they also predict the number of hydrogen-powered taxis in use to be 80,000, as well as 40,000 buses and 30,000 trucks by 2040.⁶⁸ On May 2021 in an environmentally friendly initiative supported by the government Lotte Global Logistics, CJ Logistics, SK Networks, and Hyundai Glovis, as well as 55 bus and taxi firms from throughout the country, have promised to convert all of their vehicles to electric or hydrogen cars by the year 2030 in an eco-friendly initiative led by the

⁶⁶ Yonhap, “Moon declares Korea's commitment to cut carbon emissions by 40% by 2030,” *The Korea Times*, November 2, 2021.

⁶⁷ Hwang, Keum-bi, “Independent measurements say cars are biggest culprit in Seoul’s air pollution,” *The Hankyoreh*, June 28, 2017.

⁶⁸ Yonhap, “South Korea seeks to produce 6.2 million hydrogen cars by 2040,” *The Korea Times*, January 17, 2019.

government.⁶⁹ Also, Big South Korean companies decided to invest in hydrogen sector in order to reduce greenhouse gas emissions and take advantage of new economic prospects. Hyundai Motor Group is at the lead of this industry, because it has more than twenty years of experience of creating the hydrogen fuel cell system, while SK Group has stated that it intends to create hydrogen and another company POSCO aims to produce about 5 million tons of hydrogen annually by 2050.⁷⁰

3.3. Covid-19 pandemic

During Covid-19 pandemic sky in South Korea became much clearer and healthier as air was not as polluted as before. Byun Jee-hyuk a resident in Seoul commented that: “Weather was so nice this spring that I totally forgot about fine dust problems. Pity that I couldn’t spend much time outside as I was scared of getting infected with the coronavirus.” Compared to same period last year government released much fewer emergency advisories and warnings about fine dust in the air. Many of the Koreans think this is due to China having closed its factories. The same thing thinks also Byun: “Factories in China stopped for some weeks early this year, and it seemed to me that’s what mainly accounted for our air quality to be so much better this year so far.” However seasonal management of pollution by the Korean government that was mentioned in previous chapter seems to have made an effect as well. But it may seem less relevant, since air quality got better globally in other countries too. Kim Jong-ho, an environmental engineering professor at Hanseo University thinks that: “Although it’s too early to say which one played a greater role, it looks clear to me that both external and internal factors deserve credit.” Many experts, however, are worried that after the pandemic many factories and companies will be having longer operating hours to try to compensate for the financial loss, they suffered during pandemic, which will again take a heavy toll on the quality of the air.⁷¹

Some experts during coronavirus pandemic came out with the idea that fine dust

⁶⁹ Ko, Dong-hwan, “59 taxi, bus, delivery operators in Korea vow full move to carbon-free vehicles by 2030,” *The Korea Times*, May 27, 2021.

⁷⁰ Yonhap. “Korean companies bet big on hydrogen for zero-emission goal,” *The Korea Times*, December 16, 2020.

⁷¹ Ko, Jun-tae, “[News Focus] Clear skies a silver lining of COVID-19?” *The Korea Herald*, June 3, 2020.

could potentially be correlated to coronavirus outbreaks or to increase a risk of death by covid-19, because both coronavirus and pollution have an effect on respiratory system. Lung specialist Dr. Chun Eun-mi said that: “There are a lot of possibilities, as they both damage people’s respiratory systems. People could suffer greater damage to their respiratory systems when they are exposed to both, and this could increase the incidence rate as well as the fatality rate of COVID-19. More studies must be done to verify the exact effects, but from what we know so far, it could be dangerous.” However, none of this has been proven by any research and is only a guess. Employee from KDCA said that: “There has been no study proving simultaneous damage from COVID-19 and fine dust, but there are possibilities of negative effects as both of them could cause respiratory diseases. We advise people to stay home as much as possible when fine dust levels are high, which is pretty much the same advice as what we give out for COVID-19.”⁷² In 2021 research institute that is a part of Statistics Korea published a report on quality of life in which was written that around 40 percent of Koreans said that air has improved in 2020 compared to 2018. This was a 28.6 percent rise from the same survey done in 2018 and quite a change since from 2012 people tended to perceive the air quality rather negatively, mostly because of rising fine dust pollution.⁷³ Also, in a recent poll created by the Seoul Research Institute of Public Health and Environment citizens considered infectious diseases as the most serious health threat, however fine dust still came in second showing great concern among Koreans. Around 1000 regular citizens and 321 experts in health and environment participated in the poll and diseases got on the first place with 4.21 and fine dust to second with 4.02. The results show that due to coronavirus crisis people understand how dangerous these diseases are, however, are still very concerned about the fine dust pollution, even if air got a little better during lockdown.⁷⁴

⁷² Ko, Jun-tae, “[News Focus] Could bad air worsen coronavirus crisis?” *The Korea Herald*, November 19, 2020.

⁷³ Yonhap, “Nearly 40% of S. Koreans think air quality improved last year amid pandemic,” *The Korea Herald*, March 11, 2021.

⁷⁴ Yonhap, “Seoul citizens pick infectious diseases as most dangerous health hazard: survey,” *The Korea Herald*, December 29, 2021.

4. Conclusion

The goal of my thesis was to find out what is the contemporary public discourse on air pollution in South Korea, meaning what are the main topics in regards to air pollution, what kind of effect it has on their lives, what are the causes and measures taken. This was done by first finding the right articles published by various Korean media during 2018-2022 by using critical words, continued by their classification, analysis and finally writing. But along the way I encountered some problems, which took a toll on quality of the thesis. One major would be the lack of debate or discussion in the articles as most of them presented rather factual information, which turned my thesis into more descriptive than I previously opted for. Luckily, I was able to find some polls and quotations by public, which provide a better insight on how Koreans perceive things related to air pollution.

The result of my thesis is that I was able to find out that air pollution is an unwanted part of Korean life. It takes a toll on their physical and mental health; it influences their daily schedules, plans and finances as it can be also expensive to breathe clean air. By the amount of articles Koreans seem to perceive China as the main source of air pollution in Korea, which studies show is true to some degree, however domestic pollution seems to be similarly responsible. Yet, China on the other hand dismisses those claims, leaving Koreans even more frustrated. Other causes that are mentioned by the articles seem to be coal power plants emissions and emissions created by the old diesel vehicles. As for the measures or changes a lot of them happened due to public dissatisfaction that led into protests or petitions. Many policies or goals were set under the Moon Jae In administration, starting from successful seasonal fine dust management to setting a goal of being a carbon neutral and coal free by 2050, while also starting an international cooperation on fine dust with China. Covid-19, while being a horrible pandemic with devastating effect on lives worldwide, resulted into one surprising beneficiary for Korea and that was clearer skies than usually. However, as life slowly came to normal, so came the factories and polluted air.

In 2022 a new president Yoon Seok-youl was elected and is yet to be seen what will the future of Koreans and Korean air be like under this new administration.

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