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World Health Organization

Topic: Countering the exponential rise in respiratory and other health issues due to air pollution

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I. Committee Background

The World Health Organization (WHO) is responsible for all health-related issues that are tackled by the United Nations. The organization was inaugurated on April 7, 1948, a date that came to be known as World Health Day. The decision-making body for WHO is the Health Assembly, which mainly determines the policies of the organization and appoints the director-general. The Health Assembly usually convenes in the UN headquarters in Geneva each year during the month of May. The Health Assembly also instructs the Executive Board, “in regard to matters upon which further action, study, investigation or report may be required”. The Executive Board consists of thirty-four technically qualified experts in the field of public health, elected for three-year terms. Generally, the purpose of the Executive Board is to facilitate the work of the Health Assembly. The WHO also relies heavily on its Secretariat, a body consisting of around eight hundred people, which are stationed across the globe, in the institution’s headquarters, and in the regional offices of the organization.

The primary goals of the WHO include, “to improve equity in health, reduce health risks, promote healthy lifestyles and settings, and respond to the underlying determinants of health”. Resolutions passed by the WHO are non-binding and must be approved by both the Health Assembly and the Executive Board. The meeting in which resolutions are approved occurs annually in January. In this conference, resolutions which had been proposed by the WHO are approved by the Executive Board and passed on to the Health Assembly. There is a shorter meeting in May to address the details of these resolutions and put them into effect.

II. Introduction

Description and Definition of the Topic

The dispute of air pollution has become increasingly pressing over the past years, seeing as both developed and developing countries are experiencing a dramatic increase in health issues and countless premature deaths due to the universal decline of air quality. According to the World Health Organization (WHO), “Air Pollution is contamination of the indoor or outdoor environment by any chemical, physical, or biological agent that modified the natural characteristics of the atmosphere”. In 2014, it was declared as the world’s largest single environmental health risk, causing around 7 million annual deaths, which is 12.5% of total global deaths. Cancer and other cardiovascular diseases such as, asthma, chronic obstructive

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pulmonary disease, pneumonia, and even tuberculosis, are some of the respiratory and allergic diseases that are being caused by this rising problem.

Air pollution is commonly present in households and is produced by the use of solid fuels such as wood, charcoal, coal, dung, and crop wastes, which are often used as heat sources in order to cook or alter the household's temperature. Those who spend a great deal of time inside their homes are excessively exposed to harmful gases and are hurt the most. Outdoor air pollution is mainly caused by combustion processes from motor vehicles, fuel burning, and industries. Such processes instigate the emission of harmful gases including Trioxide, Nitrogen Trioxide, Carbon Monoxide, and Carbon Dioxide, among many others. Currently, air pollution has risen to the point where 92% of the world's population lives in places where air quality exceeds WHO limits— a 20 $\mu\text{g}/\text{m}^3$ annual mean of PM₁₀ (WHO, 2016).

There are many types of air pollution particles, usually classified as Particulate Matter (PM). They range from PM₁₀ to PM₁—particulate matter that is less than 2.5 microns in width being considered the fine particulate matter. Amongst environmentalists, this fine particulate matter is of paramount concern, seeing as it presents a greater threat to the human body because these fine particulates are the ones that are small enough to enter the bloodstream through the alveoli and cause coronary heart disease as well as other cardiovascular ailments. Furthermore, people with a preexisting condition such as diabetes or atherosclerosis and children are exponentially more vulnerable to the PM than regular adults (Mead, 2011). With these particles, there is no threshold at which health is not affected, meaning that no matter the concentration in the air, they will always negatively affect the wellbeing of the population. Countries whose citizens increasingly rely on individual means of transportation or whose main industries have to do with oil or other types of unsustainable energy are more susceptible to being infected with these minuscule particles, as they are primarily caused by the exploitation of coal, wood, oil and other energy sources, wildfires, waste burning, fine powder from construction and landfills or simply windblown dust. Within buildings or houses, these microscopic pollutants are usually caused by tobacco smoke or the burning of candles, wood or coal.

The Problem

As air pollution continues to haunt the world's urban populations, its connection to respiratory disease becomes ever-more important and harder to ignore. Even more worrisome, the daunting effects of air pollution seem to affect children more so than adults. Because their respiratory organs are still in a stage of development, children are extremely vulnerable to any disturbances in the air they breathe (World Health Organization). While particulate matter in the air can cause Asthma, Bronchitis and even cancer (Spare the Air), scientists are also worried about the side-effects of having harder-working lungs. With a decrease in the amount of oxygen per volume in air, our lungs must work harder to maintain oxygen levels in our body, leading to an accelerating aging of the lungs and a shortened lifespan (Spare the Air). One of the greatest challenges in fighting this issue is the fact that individuals can not do much to prevent their

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consumption of polluted air as they can of polluted water, for example. Additionally, governments are reluctant to placing regulations that limit the number of air pollutants because of the possible repercussions on the economy. With the exception of few notable extremely polluted cities (among these Delhi, Riyadh, and Beijing), the levels of air pollution are not “smellable”, meaning not many people are actually aware of the levels and the threats they impose on their health. Because the side-effects of breathing polluted air tend to manifest after years of exposure, it is usually deprioritized by the common population and the government, despite its oftentimes deadly consequences (Environmental Pollution Centers).

Although the most common side-effects of breathing polluted air (irritated eyes, headaches, and dizziness) may sound trivial at first, they become a gateway to much more serious conditions. Even though many detractors may argue that no respiratory disease may be attributed solely to air pollution, it is a fact that particulate matter and gas in the air weakens the immune system in general, causing an increase in the amount of infections in the lungs and in the rest of the body (Dr. Roizen, 2016). Asthma affects more than 7% of the U.S. population, the equivalent of more than 20 million people,

There are three main factors which affect the risk of a person’s adverse effects: one’s current health status, the pollutant type and concentration, and the length of the exposure to the polluted air. Even people who are considered healthy can experience issues with respiratory irritation and have breathing difficulties while doing exercise. The people who are most aggravated by the contamination of air are individuals with heart disease, coronary artery disease or congestive heart failure, lung diseases such as asthma, emphysema or chronic obstructive pulmonary disease. In some cases, healthy people are as affected as those with previous ailments. Pregnant women, outdoor workers, and athletes who exercise vigorously can be severely harmed despite their best efforts to remain healthy (Spare the Air).

While it is very important to acknowledge the effects that air pollutants have on human beings, it is also essential to consider the effects they have on the environment, as they create unbalance in ecosystems, resulting in disastrous consequences that affect humans. Some commonly known side effects are acid rain, which is precipitation containing harmful amounts of nitric and sulfuric acids, eutrophication, and haze, which affects the clarity, color, and texture of what people see due to sunlight encountering pollution particles (Department of Environmental Protection). Furthermore, air pollution has also affected wildlife, causing birth defects, reproductive failure, and disease. Unquestionably the most commonly known effect that air pollution has on the environment, however, is climate change. The earth’s atmosphere creates a “greenhouse effect,” a term used to describe the trapping of the sun’s heat inside the planet. Over the past years, there’s been excess heat that gets contained in the planet due to the number of air pollutants that have been affecting the atmosphere and causing it to decrease in density and thickness; this process is known as global warming. Many scientists believe that global warming can have a negative effect on agriculture, water resources, forests, wildlife, and coastal areas, all of which cause a severe impact on human life (Department of Environmental Protection).

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III. Historical of the Topic Chronological History of the Topic

The conventional belief that air pollution has only existed since the industrial revolution is misguided. There are three main time spans for air pollution, all of them revolving around the industrialization of the world: Pre-/Peri-/Post- Industrial Revolution. Before the spread of mechanization, air pollution was still a relatively urgent problem seeing as the burning of wood for heat, melting of copper (for coinage) and indoor chimneys were complained about excessively in early Roman texts. Additionally, upon finding mummified corpses from Peru, Egypt, and Britain, and after conducting several analyses and experiments, scientists discovered that the lung tissue of the remains suffered from anthracosis—the blackening of the lungs’ bronchial mucosa (Mirsadraee, 2014). The conclusion reached was that this sickness was brought on from continuous exposure to wood smoke and the inhalation of dust, which makes sense seeing as during these times citizens usually utilized indoor fumes to ward off pests. Moreover, numerous texts also described the poor air quality in cities such as Athens, and Seneca, among other philosophers, often times wrote about the “oppressive atmosphere of the city,” and the “reek of smoking cookers which pour out, along with clouds of ashes, all the poisonous fumes...” (Mosley, 2002). In the preindustrial era, the main concerning factors related to air contamination were workshops and indoor furnaces that were frequently used to cook. It is important to note that the latter is still utilized in developing communities to this day.

By the time industrialization began taking place, there were already dramatic differences in the local air quality of large cities. In London, the buying of fuelwood and charcoal became unaffordable to common citizens due to the deterioration of surrounding woodlands, eventually leading the citizenry to rely on coal as a substitute. London’s populace had increased threefold from 1600 to 1700, and the 10,000 tons of coal that sufficed the population in 1540 soared to 360,000 tonnes by 1640 (Mosley, 2002). The considerable increase in coal usage gave rise to societal outrage about the ever-worsening quality of air in the city. Although factories were present and causing pollution in the air, about 85% of all the air pollution was brought on by the indoor burning of this sulfurous coal -often with inadequate oxygenation (Healy, 2015). Well-known writers such as John Evelyn indignantly criticized the heavy smoke undulating from house doors and chimneys. Even in 1307 when coal was not common, a royal proclamation had been pronounced by Edward I which prohibited coal-fired kilns within the city, however, laws meant to control the pollution (despite it being tangible) were mostly inefficient and overlooked by the population. Modifications like these did not only occur in London, seeing as there was a widespread complaint in many cities inside Germany and the United States, both industrial powerhouses at the time.

The age after the industrial revolution, the present, is often referred to as the ‘Era of Invisible Threats.’ Since most of the air pollution in the past was the result of indoor coal fires and the industry was comparatively small-scaled (taking into account the one at the present day), the air pollution was mostly localized to cities. However, with affordable cars and the industrialization of everything from: producing goods to agriculture to providing energy,

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large-scale anthropogenic atmospheric pollution became an issue and brought with it many 'Invisible Threats' such as acid rain, photochemical smog, ozone depletion and climate change. A study of ice in central Greenland compared the ice of different time periods by analyzing and measuring the difference in the concentrations of metal pollutants such as lead, zinc, cadmium, and copper. They realized that there was no noticeable shift pre-industrial revolution but that by 1800, lead levels were already one magnitude above natural standards. Moreover, there was a massive rise in the levels of all four contaminants between 1960-1970 (Candelone, 2012). Despite many experiments such as this one, it took scientists and environmentalists far too many decades to begin explaining to the population about these threats.

Currently, many countries are attempting to deal with the ever-surging issue, focusing on renewable energy, limiting animal agriculture, and trying to stray from emission-heavy sources. This has been somewhat effective, and in many areas in which appropriate laws have been established and followed, air quality has increased. There are, of course, areas in which quality is at an exponential decrease. Places such as New Delhi and China are particularly affected, as solid fuels such as wood, cow dung or sugar cane are used inside the house, the industry is growing extensively and many people are making the switch to individual automobiles. Air pollution does not only affect the health of the millions of inhabitants in a country, but studies have shown that it also leads to a lack of productivity in society. Adults and children prone to asthma attacks are less inclined to exercise or attend work or school because of the contaminant levels outside their homes (Jerrett, 2017). Furthermore, besides affecting society, current air pollution is also interfering with natural systems, causing the unseasonable increase and decrease in temperature, chaotic weather patterns and the acidification of Earth's oceans. These issues are commonly known as "Climate Change", and are caused by long-lived greenhouse gases that are trapped in the atmosphere such as methane, nitrous oxide, and fluorinated gases as well as other common soil and water pollutants. This is a major issue, leading to the destruction of ecosystems which in turn create unsustainable weather conditions. The destruction of the oceans, in particular causes many repercussions. Rising ocean temperatures and the acidification of ocean waters have created uninhabitable circumstances for coral and fish alike. About $\frac{1}{3}$ of all carbon dioxide emissions are absorbed into the ocean, and the rising pH levels kill the living polyps that live over the stony reef, resulting in the "bleaching" of the coral. The Great Barrier Reef, for instance, is already 93% bleached because of the rising temperatures. In the past it had generated about 4 billion dollars from tourism and provided 70,000 jobs, yet the probability of the reef recovering is extremely slim.

Historical Case Studies

Bhopal Gas Tragedy

Known as the world's worst industrial disaster, the Bhopal Gas Tragedy is estimated to have caused over 15,000 deaths and is still bringing repercussions for the people of India. It occurred on the night of December 2, 1984, when a plant belonging to the American Union Carbide pesticide corporation released over thirty tons of methyl isocyanate, as well as other

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extremely poisonous gases. The pesticide plant was surrounded by small towns, which led to the exposure of over 600,000 people to these deadly gases, who experienced symptoms such as burning throats and eyes, nausea, and constant headaches. This tragedy caused 2,259 deaths in the immediate aftermath of the gas leak and three decades later, the death toll still continues rising.

The gases that polluted the air of remained close to the ground, but besides this, human rights groups affirm there are currently copious amounts of toxic waste buried underground. The Union Carbide Corporation has failed to clean up toxic waste inside the premises, which is still affecting the surrounding villages. Since this tragedy occurred, protests have been going on as survivors are constantly fighting for the site to be cleared. Out of 865 women who lived one kilometer from the site of the gas leak, 43% of the births resulted in stillbirths, far above the global average (Moxon, 2016). It is believed that no deaths will cease until the site is completely clear of any toxic residue (Taylor, 2014). This is a catastrophe that will never be forgotten by the Indian people, and its backlash continues to affect lives.

Great Smog of London

During a period of cold weather and little wind, a thick layer of smog formed over the city of London. This massive cloud lasted from December 5 to 9 of 1952 and was mainly caused by the burning of coal for the use of power plants and other means. It is estimated that during the first four days of the “Big Smoke” tragedy, at least 4,000 deaths and over 150,000 hospitalizations occurred. The massive smog cloud disappeared only after weather conditions changed. However more deaths continued to be reported reaching a grand total of over 12,000 by the year 2002 (Davis, 2002).

This event has been recorded as the worst air pollution tragedy in the United Kingdom and it led to the creation of the Clean Air Act in 1956. London is known to have a poor air quality since the Middle Ages due to the high concentration of coal stoves in the city and despite the aforementioned act being introduced, the air in the UK’s capital is still considered to have a moderate risk on human health.

Pennsylvania Smog of 1948:

In the Pennsylvanian town of Donora on October 27, 1948, residents woke to a cloud of yellow smoke permeating throughout the town. Although the nearby zinc and steel plant was only a few miles away and they were used to great amounts of pollutants sweeping through their town, there was something out of the ordinary that morning. The cloud of pollutants killed about 20 people in the first 5 days and sickened thousands more.

According to records, what caused this smog was cold air that was trapped in the valley of the town, making it impossible for the pollutants from factories to escape. The two main factories producing the smoke were Donora Zinc Works and American Steel and Wire, but even though many citizens demanded they move out of the city, these chose to stay despite the fact they had hospitalized over half of the population and had killed more than 20.

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This event was the first to spark new legislation in the United States regarding air pollution, in which they tried to prevent “pollution of the air by smokes, dust, fumes, gases, odors, mists, vapors, pollens and similar matter, or any combination thereof” (Guenther, 2011). They tried to limit the number of factories close to large populations and strategically position them to prevent smog from affecting people. Furthermore, this incident made President Richard Nixon create the Environmental Protection Agency which leads to the creation of the National Air Quality Standards, the Clean Air Act, and continues to provide grants in order to promote research on sustainable energy sources and root pollution causes that can be decreased and minimized.

Past UN Actions

In 2016, WHO created an air quality model that confirmed 92% of the world’s population live in places where air quality exceeds the World Health Organization limits. "The new WHO model shows countries where the air pollution danger spots are, and provides a baseline for monitoring progress in combating it," says Dr. Flavia Bustreo, Assistant Director-General of WHO. This model is also representative of the most detailed health data regarding air pollution within each country, which comes from satellite measurements, air transport models, and ground station monitors on thousands of locations. This was developed by WHO, with the help of the University of Bath, United Kingdom.

Also created by WHO, is an organization called BreatheLife: a global platform designated to raise awareness on the health risks pollution has on humans, led by the Climate and Clean Air Coalition and the Government of Norway. This campaign stresses the need of improving practical methods—such as better housing, transport waste, and energy systems—to be used in cities that have already implemented them and promote them to cities that haven’t.

The 2030 Agenda is a plan made by the General Assembly at the 2015 Sustainable Development Summit in New York. It presents one course of action that has been widely accepted by countries and people alike that focuses on the well-being of the planet. It is the world’s first ever global development plan and is seemingly long-term as it focuses on renewable energy, sustainably managing resources and production and urgently fighting against climate change.

Governments from around the world have brought several departments together, such as environment, climate, and health sectors, in order to take action to solve this issue. At the Conference of the Parties to the United Nations Framework Convention on Climate Change, in September of 2017, ministers of health and environment agreed to sign the Marrakesh Ministerial Declaration on Health, Environment and Climate Change, which states that “there is currently no global mechanism to bring the environment and health sectors together to work on saving lives and protecting the planet”, and it pressures the United Nations agencies to put a mechanism in order.

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IV. Key Players and Points of View:

United Kingdom:

Air pollution has been classified as a major contributor to sicknesses in the UK, but it is hard to define how much. While polluted air isn't directly a cause of death, it does shorten the lives of around 40,000 people per year, which government advisers claim is an underestimate and may actually be twice as big. Despite the overall fall of pollution levels throughout the country, large UK cities like London and Manchester have had great increases in NOx which are harmful particulates and oxides of nitrogen. This has led to the rise of air pollution-related deaths. United Kingdom's air pollution is a trending topic because the UK government has lost several court cases over levels of illegal dirty air (according to the WHO's guidelines) throughout the country, and also because carmakers were accused of cheating tests on car emissions.

The United Kingdom suggests implementing compressed hydrogen public buses instead of diesel using automobiles. This would reduce the levels of high air pollution in the country by reducing gas consuming cars. Another solution the country proposes is to insulate homes so they don't burn as much gas.

India

India's exponential growth in air pollution levels, having now surpassed China's, is causing the premature deaths of 1.1 million people yearly. India has issued an alarming report which states the increase of nearly 50 percent in premature deaths because of particulate matter from 1990 to 2015. As the country progresses towards industrialization, more factories are running daily, causing pollution levels to rise. Combined with China, these two countries account for 52 percent of all the air pollution in the world. As stated by Chief Minister, Arvind Kejriwal, India is filled with, "traffic-clogged cities like Delhi, where the streets resemble a gas chamber". The country has recently implemented norms in which once every few months constructions and demolitions are postponed to avoid reaching extreme levels of pollution. Unfortunately, India has even had to cancel school because of the inhumane conditions to which children can't be exposed.

China

With a demand for energy and its buoyant economy, China's air pollution has increased dramatically over the past years; mostly because of its new coal-fired power plants which provide around 60% of China's electricity. Since 2014, premature deaths and child asthma have been directly linked to China's growth in air pollution, for which the largest cause is coal burning in Beijing and its surrounding areas (Greenpeace, 2014). Switching from coal to greener, less polluting sources of energy such as wind or solar, would demonstrate an enormous improvement in air quality. Many NGOs, including Greenpeace and The Institute of Public and Environmental Affairs, are campaigning against the amount of air pollution that China is creating, and are pushing for the change in energy production from coal to wind or solar. China

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currently has the largest capacity of hydro, wind, and solar energy. However, having such high energy needs, these plants only provide for about 24% of the total energy used in the country. Most of its energy is still provided by coal.

United States of America

The United States has made great progress since 1971 in cleaning the country's air. One sign of the improvement in air quality is that visible air pollution is less frequent and widespread than it was in the 1970s (Environmental Protection Agency, 2016). Nevertheless, air pollution is still harmful even when it is not visible, and even if it is at very low levels. The EPA is working with states to limit common air pollutants, identifying the areas that are meeting the national air quality standards, and those who are not. For areas in the country that are not meeting the standards, states are required to adopt the necessary measures that are needed to reduce the air pollution. To accomplish this task, OAQPS establishes the National Ambient Air Quality Standard (NAAQS) Also, the EPA is taking into consideration the number of air vehicles, as they also pollute because of their high fuel consumption. Sulfur in gasoline impairs the efficiency of fuel in cars, as well as being an important factor in air pollution. The gasoline sulfur standards will enable more efficient vehicle emissions, which will lead to the minimization of harmful gases.

Greece

There are two main types of air pollution that have been recognized in Greece; the high concentrations of particles and photochemical smog, which is an excess of nitrogen oxides, hydrocarbons, carbon monoxide, ozone, and organic nitrates (European Environmental Agency, 2015). To solve this issue, the Greek government has implemented and is still implementing many solutions for the diminishing of air pollution in the country. Many of these ideas revolve around transportation and the air that many vehicles produce. An expansion of the subway system was implemented in the year 2000, reducing the number of trips taken by people by 250,000 a day. The retirement of old vehicles has also been implemented and resulted in 260,000 old cars to be retired in the whole country.

V. Possible Solutions:

One of the most straightforward solutions to air quality pollution is to reduce carbon emissions and move towards renewable energy. Although this long-term goal may seem far-fetched, governments can begin by subsidizing companies and encourage individuals to invest in renewable energy—such as solar, wind and geothermal energy—to reduce their emissions. Governments and companies could also work together to ensure that renewable energy is not only affordable but accessible to the largest possible proportion of citizens. Moving towards wind and solar energy is not only beneficial to the environment, but also makes economic sense, seeing as taking preemptive measures in order to avoid the dramatic rise in the cost of oil, gas, or coal as they dwindle and become harder to obtain will allow people and

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countries who rely on these products to maintain financial stability (William, 2016). Over the long run, renewable energy is cheaper than power from coal or natural gas (SMPS, 2017). The increase in renewable energy sources would also provide more jobs, lower consumer expense (so citizens are able to save on utility costs), and modern sources could even be implemented in developing countries which still use more traditional forms, such as biomass,

Another way to reduce carbon emissions is to promote the use of public transportation. In most of the world, public transportation is inefficient, costly and time-consuming, which causes an influx of automobiles and an increase in emissions of carbon. Investing in more efficient methods of public transportation will not only reduce these but also reduce traffic in congested cities.

One of the biggest problems of air pollution is the fact that power plants and energy-intensive industries are sometimes located near residential areas, which causes deadly particles to be carried into populated areas and cause a wide range of respiratory diseases. Regulating the location of these power plants and industries can greatly improve the air quality in populations across the globe.

VI. Current Status:

Climate Change:

As a trending topic, changes in climate will worsen in the coming years. This poses a direct threat to aggravating respiratory diseases such as asthma, rhinosinusitis, and chronic obstructive pulmonary disease. It has now been accepted widely that Earth's temperatures are rising by about 2.0 °F since the late 19th century, as seen by glaciers melting, rising sea levels, and the diminishing of the snow cover in the Northern Hemisphere. Furthermore, changes in the intensity of extreme weather events have risen in heat waves, hurricanes, floods and droughts. Gases being produced are the cause of the warm temperature and have caused more severe and prolonged heat waves, forest fires and heavy precipitation. The most contemplated issue has been the increase in anthropogenic greenhouse gases: Carbon Dioxide, Methane, and the Nitrous Oxides.

95% of the current warming threat is a result of human activity since the mid-20th century. Global Warming will worsen the air and water conditions, which will lead again to unhealthy respiratory conditions.

Recycling:

Even amongst many developed nations, landfills remain the largest method of garbage disposal. Often accompanied by incinerators, this procedure of discarding waste is less than ideal as it both destroys the ecosystem around it and, when incinerators are utilized, contaminates the air with the harmful particulate matter. There are, however, shining examples of viable recycling, and quasi-sustainability is attainable if certain laws are set in place. Germany, for instance, recycles about 65% of its total municipal waste, being the top recycler

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globally. The homeless often rummage through garbage, collecting plastic and glass bottles which pay between 7 and 25 cents when recycled (McCarthy, 2016). In 2012, out of Germany's 353 millions tons of waste, 152.8 million went to recycling, 34 to energy recovery, 11 to incineration and 63.8 (only about $\frac{1}{5}$ of the total waste) to landfills (McCarthy, 2016). Like Germany, other countries such as South Korea, Belgium, Denmark, Austria, Sweden and The Netherlands apply policies (such as the "Pay-as-you-throw" program), fees and restrictions which allow them to recycle more than half of their municipal waste. Moreover, in 2008 alone, the recycling industry generated a turnover of about 145 billion euros, providing jobs for millions of people, creating additional products from recycled material and even being broken down and used as compost (DW). As with many environmental topics, it is interconnected with the others. An increase in recycling will keep more garbage off of landfills and incinerators and create a better universal air quality. Besides this, it will inform citizens about pollution, provide attainable and measurable landmarks when it comes to managing waste and enforces green behavior in citizens, creating a society that works together in order to deal with the issue.

Developing Technologies:

There are many technologies that are being created in order to combat air pollution and reduce PM levels in urban areas. One of the leading ones is Studio Roosegaarde's "Smog Free Tower," which utilizes electrical charges that attract PM 2.5-10 in the air, leaving clean, filtered air as a byproduct and collecting the minuscule particles. It was first applied in Rotterdam, and after being successful was incorporated into Beijing and Tianjin with future plans to introduce it in India soon (Studio Roosegaarde). The massive towers, about 7 meters in height are able to clean an area of 30,000 cubic meters each hour - about a small neighborhood per day-, and run on only 1,400 watts of power, no more than a tea kettle. The Smog-Free Tower has already received international recognition and countless sustainability awards (Morlin, 2016). However, technologies such as that one only targets the effects of pollution, not the root causes. A major shift to the idea of continuously obtaining clean, renewable energy has taken place in the international committee. Needless to say, the prioritization of clean energy and perfection of the methods used to harvest it plays a crucial role in massively reducing crude carbon-based emissions. Pioneers are researching ways to obtain greener energy, from Stanford's search for the specifics of underwater hydrokinetic turbines (Zarubim, 2015) to Germany's search for clean, inexhaustible energy through the gargantuan nuclear-fusion stellarator labelled "The Black Horse Project," which took about 1.1 million construction hours and 1.1 billion dollars (Insider, 2015). These intricate new technologies, while certainly interesting and with high-potential, are not the only way to obtain energy efficiently. Scientists and engineers are still working in order to maximize the energy output and efficiency of the already-existing solar panel cells—as the world record for efficiency in 2014 was only 46% (Dimroth, 2014).

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