

Forensics Junior Group Discussion

Study Guide: Air Pollution

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Dear Delegates,

My name is Ainta Marinaki and I am more than excited to be serving as the President of the Forensics Junior Group Discussion in the 5th Campion School MUN Conference. I took part in last year's CSMUN Conference as a Judge in the International Court of Justice and I feel honored that I am given the opportunity to serve as a Student Officer in this year's Conference.

I believe that the Forensics Junior Group Discussion is a really unique Committee and it is a challenge -and a privilege at the same time- for a Student Officer to chair a Committee with young delegates, have the chance to make them understand the value of MUN Conferences and inspire them to continue participating in them. My role during the session will be to explain to you how the work in our Committee will be conducted, assist you, give you advice and guidelines and coordinate the discussions that will take place to make sure that you all get involved and participate in them and the procedural rules are followed. Having chaired before I am confident that I will do my best to ensure that you will make the most out of your participation in the Conference.

My advice to you is to do as much research as you can prior to the Conference. Preparation is the key for you to be able to contribute creatively and make the discussions fruitful, constructive and interesting. I hope that you find my study guide helpful. If you have any questions do not hesitate to ask me.

I look forward to meeting you and cooperating with you!

Regards,
Ainta Marinaki

TOPIC INTRODUCTION

Air pollution is a phenomenon that can be generated both by human activity and natural processes. It poses a major threat since it can harm any living organism by causing allergies, diseases or even death and can have adverse effects on food crops that are consumed by humans and animals. Hence, it is a main source of damage to the natural and built environment. A lot of noticeable attempts have been made to control and regulate the emission of air pollutants and to develop and spread the

use of effective alternatives to the main causes of air pollution, but still a lot can be done in order to improve the current situation.

DEFINITION OF KEY TERMS

Air pollution

Air Pollution is a phenomenon that occurs when harmful substances including particulates and biological molecules are introduced into Earth's atmosphere.

Air pollutant

An air pollutant is a substance in the air that can have a damaging impact in humans and the ecosystem. They are either of natural origin or caused by human activities and can have the form of solid particles, liquid droplets, or gases. They are divided in two categories; primary and secondary. Primary pollutants are usually the outcome of a process and are emitted directly, such as ash from a volcanic eruption. When primary pollutants react or interact secondary pollutants are produced in the air. An example of a secondary pollutant is ground level ozone. Some pollutants may belong to both categories. Carbon dioxide has been characterized as "the leading pollutant"¹ because of its role as a greenhouse gas.

Emission Factors

Air pollutant emission factors are reported representative values used to estimate the emissions from sources of air pollution and attempt to combine all available credible data to relate an activity associated with the release of a pollutant to the quantity of that pollutant released to the surrounding air.

Exposure to Air Pollution

Air pollution exposure can refer to individuals, certain groups or entire populations and is indicated by the air pollutant concentration in each micro-activity/micro-environmental setting. A function of the danger of a pollutant and the exposure to that pollutant measures the air pollution risk.

Air Quality Index (AQI)

Government agencies use a number called air quality index to commute to the public how polluted the air is or is forecast to become. As this figure increases a greater percentage of the population is likely to encounter health problems. There are different types of indices to show the level of the pollution of the air. Some example are the Air Quality Health Index (Canada), the Pollutant Standards Index (Singapore) and the Air Pollution Index (Malaysia).

Air Pollution Hotspots

Areas where air pollution emissions have an alarmingly negative impact on the health of individuals (such as respiratory diseases, childhood asthma and cancer) are called air pollution hotspots. They are usually densely populated urban areas, where stationary and mobile sources of pollution are located.

¹ <http://www.nationalgeographic.com/environment/global-warming/pollution/>

Sources of air pollution

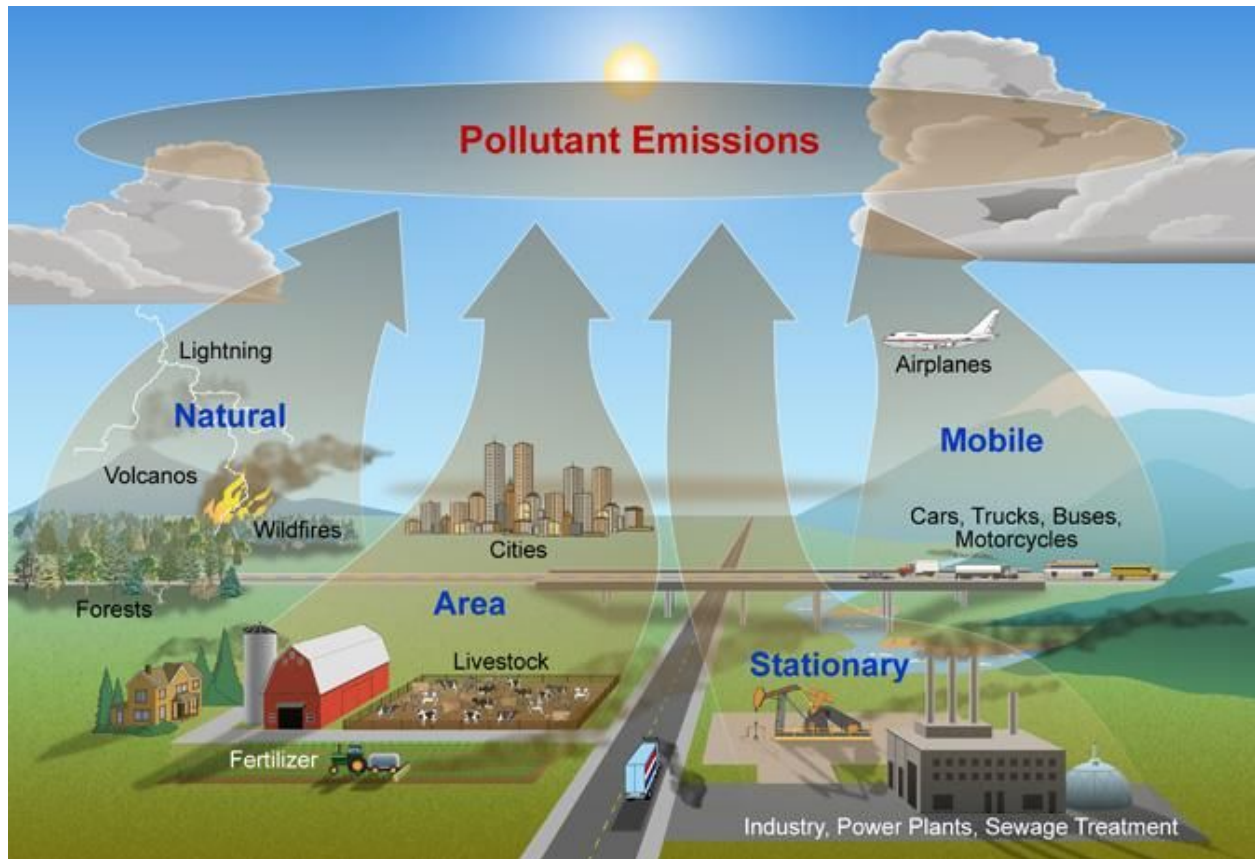
Air pollutants are released into the atmosphere in various locations as a result of a combination of different factors. The sources of air pollution can be classified in two main categories: anthropogenic (man-made) and natural.

Anthropogenic sources are mostly related to the burning of multiple types of fuel and include:

- Stationary sources: smokestacks of power plants, manufacturing facilities (factories), waste incinerators and fuel-burning heating devices such as furnaces. Stationary sources, like power plants, are also known as point sources of pollution as they emit large amounts of pollutants from a single location
- Area sources are made up of lots of smaller pollution sources and include agricultural areas, cities, and wood burning fireplaces
- Mobile sources: various types of vehicles and means of transportation such as cars, buses, planes, trucks, and trains
- The burning of traditional biomass created by wood and crop waste is the main cause of air pollution in developing and poor countries
- Controlled burn practices in agriculture and forest management
- Fumes produced by various sources such as paint, hair spray, varnish, aerosol sprays and other solvents
- Waste deposition in landfills. This practice generates Methane, which is a highly flammable chemical compound that can form explosive mixtures with the air
- Military resources, such as nuclear weapons, toxic gases, germ warfare and rocketry

Unlike anthropogenic sources, natural sources have not been the cause of ongoing air pollution problems in many cases. They include:

- Smoke and carbon monoxide as a result of wildfires
- Dust from natural sources, usually large areas of land with little or no vegetation
- Sulfur, chlorine, and ash particulates produced by volcanic activity
- Seasonal haze of secondary air pollutants caused by the reaction of volatile organic compounds (VOCs) emitted by vegetation (such as black gum, poplar, oak and willow) in some regions under particular temperature conditions with anthropogenic organic carbon compounds and anthropogenic pollutants
- The decay of radium within the Earth's crust is responsible for the formation of a colorless, odorless, naturally occurring, radioactive noble gas that is called radon. This gas can accumulate in confined areas and buildings and affect the health of people severely causing health problems such as lung cancer.



TIMELINE OF EVENTS

1948- In Donora, Pennsylvania 20 people died and over 7,000 were injured after an incident of air pollution.

1952- The Great Smog of 1952 formed over London. Around 4,000 people died and more recent estimates put the figure at nearer 12,000.

1979- An accidental leak of anthrax spores from a biological warfare laboratory in the former USSR near Sverdlovsk is believed to have caused at least 64 deaths.

1984- The world's worst short-term civilian pollution crisis -the Bhopal Disaster- took place in India; at least 3787 people were killed and 150,000 - 600,000 were injured.

1990- The latest Amendments were made to the Clean Air Act in a United States which is a federal law designed to control air pollution on a national level.

1996- Council Directive 96/62/EC of the European Union on ambient air quality assessment and management provides a common strategy against which member states can "set objectives for ambient air quality in order to avoid, prevent or reduce harmful effects on human health and the environment . . . and improve air quality where it is unsatisfactory".

2002- The latest revision of the "Technical Instructions on Air Quality Control" (TA Luft), which is Germany's air pollution control regulation, took place.

2005- The Air Quality Health Index or “AQHI” (which is currently implemented in 103 communities across Canada) was launched as a pilot project in the British Columbia Interior and Nova Scotia.

2005- A scientific study for the British Columbia Lung Association showed that a small improvement in air quality would produce \$29 million in annual savings in the Metro Vancouver region in 2010.

2008- Blacksmith Institute World's Worst Polluted Places published a report according to which indoor air pollution and poor urban air quality are listed as two of the world's worst toxic pollution problems.

2008- The European Court of Justice ruled that under the Directive 96/62/EC citizens have the right to require national authorities to implement a short term action plan that aims to maintain or achieve compliance to air quality limit values².

2011- The latest assessment of the Environmental Protection Agency of the US that characterizes nationwide chronic cancer risk estimates and non-cancer hazards from inhaling air toxics was published.

2014- In India it was reported that air pollution by black carbon and ground level ozone had cut crop yields in the most affected areas by almost half in 2010 when compared to 1980 levels.

2014- The World Health Organization reported that around 7 million deaths annually are linked to the impact of air pollution.³

2016- "The Cost of Air Pollution: Strengthening the Economic Case for Action" report was published by The World Bank and the Institute for Health Metrics and Evaluation at the University of Washington

BACKGROUND INFORMATION

Most polluted cities by PM ^[110]	
Particulate matter, $\mu\text{g}/\text{m}^3$ (2004)	City
168	Cairo, Egypt
150	Delhi, India
128	Kolkata, India (Calcutta)
125	Tianjin, China
123	Chongqing, China
109	Kanpur, India
109	Lucknow, India
104	Jakarta, Indonesia
101	Shenyang, China

According to the “World Bank Statistics” data⁴

² <https://curia.europa.eu/en/actu/communiqués/cp08/aff/cp080058en.pdf>

³ <http://www.who.int/mediacentre/news/releases/2014/air-pollution/en/>

⁴ http://siteresources.worldbank.org/DATASTATISTICS/Resources/table3_13.pdf

Indoor air pollution (IAP)⁵ in developing nations

Biomass in the form of wood, charcoal and crop residue is used by approximately three billion people in developing nations as their domestic cooking fuel. Although dependence on biomass has started declining, the use of this fuel has exposed millions of people to serious health risks since much of the cooking takes place in indoor spaces without proper ventilation. It was estimated that in 2012 IAP was responsible for around 4.3 million deaths mainly in developing low and middle income countries. More specifically, 1.69 million deaths occurred in the South East Asia, 1.62 million in Western Pacific regions, 600,000 in Africa, 200,000 in the Eastern Mediterranean, 99,000 in Europe, 81,000 in America and 19,000 in high income countries globally.

The impact of air pollution on developed countries

Developing countries, where no strict environmental regulations are enacted, are more likely to face increased levels of air pollution especially in densely populated urban areas. However, air pollution can also be concentrated in populated areas of developed countries, such as Los Angeles, Rome and Beijing. China is a country vastly affected by air pollution. The incidents of lung cancer in Beijing were nearly doubled between 2002 and 2011, although the number of smokers is falling.

The C40

The C40 is a public 'non-state' network of megacities focused on tackling climate change, reducing greenhouse gas emissions and climate risks and improving urban air quality through measurable and sustainable actions. It has been characterized as 'governance from the middle' and as an alternative to intergovernmental policy as its actions are based on the collaboration and the exchange of knowledge between cities and are independent from national government decisions. The C40 Cities Climate Leadership Group connects more than 80 cities around the world and represents over 600 million people and one quarter of the global economy.

Economic effects

According to the findings of a joint study by the World Bank and the Institute for Health Metrics and Evaluation (IHME) at the University of Washington⁶ with the title "The Cost of Air Pollution: Strengthening the Economic Case for Action" productivity losses and degrading living conditions attributed to diseases caused by air pollution cost the global economy approximately \$5 trillion annually. However, the actual costs exceed this figure since health costs, the adverse impact on agriculture and other additional costs were not taken into consideration in the report. In 2013 it was estimated that one

⁵ <http://www.who.int/heli/risks/indoorair/indoorair/en/>

⁶ <http://documents.worldbank.org/curated/en/781521473177013155/pdf/108141-REVISED-Cost-of-PollutionWebCORRECTEDfile.pdf>

out of ten deaths that occurred was linked to the effects of air pollution. The number of people affected by the air pollution differs noticeably between developed and developing countries. The fact that "children under age 5 in lower-income countries are more than 60 times as likely to die from exposure to air pollution as children in high-income countries.", as reported in the study, depicts characteristically the prevailing situation.

Health effects

The health effects caused by air pollution may include respiratory infections, heart diseases, COPD, stroke and lung cancer. Difficulty in breathing, wheezing, coughing, asthma, worsening of existing respiratory and cardiac conditions and other health conditions are also related to air pollution and a recent study in Europe has found that exposure to ultrafine particles (a kind of air pollutant) can increase blood pressure in children. Therefore, air pollution is the main or a supplementary cause of a constantly increasing number of deaths every year. Urban outdoor air pollution is estimated to cause 1.3 million deaths worldwide per year and in 2014 the World Health Organization estimated that air pollution is responsible for the premature death of around 7 million people annually. Children are particularly at risk due to the immaturity of their respiratory organ systems⁷. The differences regarding the rate of the exposure of people to air pollutants and the health facilities offered in each state mean that the effects of air pollution on the health of people varies significantly between different areas and depends on a wide range of factors.

- India has the highest death rate due to air pollution and more deaths from asthma than any other nation according to the World Health Organization. On account of these conditions protective measures to ensure the health of people -and especially children- have started being implemented in New Delhi and other cities, where buses now use compressed natural gas to help eliminate the "pea-soup" smog.
- In 2013 annual deaths in China caused by air pollution were estimated at 500,000.
- Air pollution is estimated to be responsible for around 430,000 premature deaths in Europe every year and has reduced life expectancy in the European Union by almost nine months⁸. Nitrogen dioxide and other nitrogen oxides emitted by road vehicles are one of the main causes of those deaths. The UK government disclosed in a 2015 consultation document that nitrogen dioxide is responsible for 23,500 premature UK deaths each year.
- In the United States in 2002 at least 146 million Americans were living in non-attainment areas. Non-attainment areas are regions in which the concentration of certain air pollutants -known as criteria pollutants (ozone, particulate matter, sulfur dioxide, nitrogen dioxide, carbon monoxide and lead)- exceed federal standards.

POSSIBLE SOLUTIONS

Proposed alternatives to some causes of air pollution are listed below.

⁷ <http://www.who.int/ceh/risks/cehair/en/>

⁸ <http://news.bbc.co.uk/2/hi/health/4283295.stm>

Alternatives aiming to reduce pollution from means of transportation and other mobile sources:

- Regulations related to the reduction of air pollution from mobile sources can be expanded to new sources (including cruise and transport ships, farm equipment, and small gas-powered equipment) or introduced in areas -especially developing countries- where such regulations are very permissive or do not exist yet.
- Emission-free electric vehicles can replace motor vehicles that depend on fossil fuels and the use of clean public transit such as electric trains can be widened and promoted
- Cleaner fuels such as natural gas can be used for the propulsion and idling of ships.
- The use of hybrid vehicles can increase the efficiency of already existing fuels.
- Pollutants that can be emitted by airport-related sources of emissions contribute to the degradation of the quality of the air of areas downwind (over 20 miles) of major airports. According to a NASA led 2017 study aviation biofuel mixed in with jet fuel at a 50/50 ratio can reduce jet derived particulate emissions by 50-70%.

Alternative sources of energy:

- The combustion of fossil fuels such as coal and oil consists a major cause of air pollution. Therefore, the reduction of the use of such fuels and the switch to sustainable energy (energy that is consumed at insignificant rates compared to its supply and with manageable collateral effects, especially environmental effects) through the replacement of fossil fuels by clean power sources such as wind power, solar power and hydro power can reduce air pollution drastically. A study published in Energy and Environmental Science in 2015 showed that the transition to 100% renewable energy in the United States would prevent approximately 62,000 premature mortalities per year and about 42,000 in 2050. As a result a lot of medical conditions linked to air pollution would be eliminated and annual health costs in 2050 could be cut down by about \$600 billion (or about 3.6% of the 2014 U.S. gross domestic product)
- Power generation from nuclear and renewables can replace electric power generation from burning fossil fuels, whereas in poor countries a much cleaner fossil fuel like natural gas can replace heating and home stoves.
- The use of ground source heat pumps and seasonal thermal energy storage can replace the combustion of fossil fuels for space heating.

Land-use planning:

Land-use planning refers to a branch of urban planning followed by governments in order to manage the development of a specific area, safeguard natural resources and cover the needs of the community. Achieving an ethical and efficient regulation of the use of land requires taking into consideration various different disciplines. Land-use planning may involve zoning, transport infrastructure planning and a wide range of air pollution control technologies and strategies.

Pollution control devices:

Air pollution control devices are used in industry and transportation to prevent gaseous and solid pollutants from entering the atmosphere by either destroying contaminants or removing them from an exhaust stream before it is emitted into the atmosphere. They are classified into two broad categories:

devices that control acidic and gas emissions and devices that control the amount of particulate matter that escape into the environment. The use of pollution control devices has proven to be effective in the past.

United Nations involvement

The United Nations Environment Assembly (UNEA) of the United Nations Environment Programme (UNEP) is the recently constituted UN high-level platform for decision-making on environmental issues and it stems from work conducted at and following the Rio+20 Conference on 20-22 June 2012. The first UNEA was held at the UNEP headquarters in Nairobi, Kenya, from 23-27 June 2014. One of the 14 resolutions that were adopted refers to the quality of the air. The title of this resolution is “Strengthening the role of the United Nations Environment Programme in promoting air quality”⁹.

In November 2016 the United Nations Environment Programme published the Emissions Gap Report 2016¹⁰ in which efforts that have been made at a global level so as to achieve the emissions reductions required to meet the long-term goal of the United Nations Framework Convention on Climate Change (UNFCCC) are assessed by scientists.

The Climate & Clean Air Coalition (CCAC) was launched by the United Nations Environment Programme in 2012. Its main objective is to unite governments, civil society and the private sector to achieve the improvement of air quality and the protection of the climate through reducing short-lived climate pollutants.

Main Regulations in place

Air quality standards can be classified into two types:

- Air quality standards that set maximum atmospheric concentrations for specific pollutants (some examples are the EU Air Quality Directive and the US National Ambient Air Quality Standards)
- Air quality standards used to communicate to the public the relative risk of outdoor activity in the form of a scale with various thresholds (an example is the North American Air Quality Index)

Canada

The Air Quality Health Index (AQHI) is a federal program jointly coordinated by Health Canada and Environment Canada and supported by provinces, municipalities and NGOs that measures air pollution and associated health risks and demonstrates a local air quality current value as well as a local air quality maximums forecast. The index has been developed as a continuum: The higher the number, the greater

⁹ The aforementioned resolution as well as the rest of the resolutions and decisions adopted by the United Nations Environment Assembly of the United Nations Environment Programme at its first session on 27 June 2014 can be found at: <http://www.cepal.org/sites/default/files/pages/files/k1402364.pdf>

¹⁰ The text of the report can be accessed at:

file:///F:/Users/Pc-User/Downloads/emission_gap_report_2016.pdf

the health risk and need to take precautions. The purpose of this program is to adjust activity levels of citizens and reduce short-term exposure to air pollution through health risk communication and community engagement in accordance with the level of health risk associated with local air quality. This health protection and air quality monitoring tool provides a number from 1 to 10+ to indicate the health risks posed by air pollution. In some occasions when the amount of air pollution is abnormally high, the number may exceed 10.



- 1-3: Low health risk
- 4-6: Moderate health risk
- 7-10: High health risk
- 10 +: Very high health risk

United States

The first United States federal legislation that was related to air pollution, as it referred to the provision of funds for federal government research of air pollution, was the 1955 Air Pollution Control Act. The Clean Air Act of 1963, which is administered by the United States Environmental Protection Agency (EPA) in coordination with state, local and tribal governments, is the first federal law designed to monitor and control air pollution on a national level through the establishment of a federal program within the United States Public Health Service and it has proven to be a very comprehensive environmental law. The 1967 Air Quality Act authorized the federal government to expand its investigations and studies of air pollutant emission inventories and interstate air pollution transport (pollution from upwind emission sources that impact air quality in a given location downwind), apply ambient monitoring and control techniques and perform stationary source inspections.

The United States Environmental Protection Agency under authority of the Clean Air Act has established the US National Ambient Air Quality Standards (NAAQS) which are standards that apply for outdoor air throughout the country.

In addition, the US EPA has furnished four national-scaled air toxics assessments (NATA) to evaluate the impact inhaling air toxics has on the health of people by measuring and characterizing the chronic cancer and noncancer hazards risk posed by air toxics. The latest assessment was made publicly available in 2011.

Europe

To improve the air quality through legislating¹¹ the European Union sets legally binding and non-binding national annual emission limits for specific pollutants (particulate matter - PM of certain sizes, ozone, sulphur dioxide, nitrogen oxides, lead and other pollutants that may have a detrimental effect on human health or ecosystems) dispersed in the air for the whole Union. The 2008 Directive on ambient air

¹¹ <http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=URISERV:l28031a>

quality and cleaner air for Europe (2008/50/EC) and the 1996 Framework Directive on ambient air quality assessment and management (96/62/EC) are significant pieces of legislation that set pollutant limits across Europe. Each country has the responsibility to implement all necessary measures at a national level so as to ensure that the emissions of certain pollutants remain below the ceiling set for them.

Germany: The "Technical Instructions on Air Quality Control"- commonly referred to as the TA Luft (Technische Anleitung zur Reinhaltung der Luft)- is an air pollution control regulation adopted by many countries. It was established in Germany in 1964 and has subsequently been revised in 1974, 1983, 1988 and 2002.

United Kingdom: The Atmospheric Dispersion Modelling Liaison Committee (ADMLC) is a Committee of representatives from government departments, agencies and private consultancies aiming understanding the atmospheric dispersion and relevant phenomena in order to regulate efficiently the authorization or licensing of pollutant emissions to the atmosphere from industrial, commercial or institutional sites and to evaluate atmospheric pollutant discharges from regulated emission sites and other fixed sources.

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