

Committee: Special Conference on the preservation of cultural heritage and art

Issue: Protecting historic and cultural monuments from acid rain and air pollution

Student Officer: Fotis Giannousas

Position: President

PERSONAL INTRODUCTION

Dear Delegates,

My name is Fotis Giannousas and I am a student on my second year of A Levels at Byron College. This year I have the great honor of serving as this year's President of the Special Conference on the preservation of cultural heritage and art, and look incredibly forward to getting to know as well as working with each and every one of you. I believe this topic to be one of incredible importance in the modern age, one that has been brewing since the Industrial Revolution. This study guide will provide you with important information on the aforementioned topic, however I strongly advise you to not base your entire research on it, and use other sources of information as well when conducting independent research.

Do not hesitate to contact me at fotis.giannousas1@gmail.com if you have any questions. I look forward to meeting you and hearing your debate, which I have no doubt will be a fruitful one!

Kind Regards,

Fotis Giannousas

TOPIC INTRODUCTION

Ever since the Industrial Revolution, air pollution has been on the rise and consequently, so has the presence of acidic chemicals within rain. The Industrial Revolution triggered a period of industrialization and technological advancement that while undoubtedly possessing numerous positive characteristics, takes a significantly negative toll on the environment. Such advancement has started to be replaced by more environmentally-friendly alternatives, although such replacement isn't extensive or being conducted at an adequate rate for the impact on cultural heritage to be sufficiently hindered. Innumerable forms of cultural heritage as will later be described in further detail are suffering great damage due to air pollution and acid rain, being corroded immensely and thus wiping out a great deal of many countries'

culture. Action needs to be taken to address the wide range of reasons behind concerning amounts of air pollution and acid rain, as well as to promote effective salvation and restoration efforts of forms of cultural heritage slowly falling victim to these phenomena.

DEFINITION OF KEY TERMS

Cultural Heritage

The means through the ways of living of a community are expressed, with these means being passed on from generation to generation. There are three types of tangible cultural heritage, movable cultural heritage such as paintings, immovable cultural heritage such as monuments, and underwater cultural heritage such as shipwrecks.

Acid Rain

Precipitation that has high levels of sulfuric as well as nitric acids, most often with a pH between 4.2 and 4.4.

Air Pollution

The release and consequent presence of harmful chemicals, pollutants detrimental to people and the environment, in the air.

Corrosion

The breaking down of a material and the loss of its significant properties as a result of chemical reactions.

Fossil Fuels

Sources of energy formed from the decomposing remains of organisms, decomposing in the earth's crust. These have contents of carbon as well as hydrogen, which allows fossil fuels to release energy upon combustion.

Monuments

A structure or building built to commemorate a certain person or event, which is of great importance to a country's history.

Low-Emissions Zone

A geographically defined area in which vehicles greatly contributing to pollution through high emissions are restricted or discouraged from being used within the area, with the intent of improving air quality.

Renewable Energy

Energy that comes from natural sources that are incessantly replenished, such as wind and solar power.

Particulate Matter

A mixture of solid particles with liquid droplets that are found in air, can sometimes be large enough to be seen with the naked eye and can be travelled by the air over large distances.

Sorbent Injection

Refers to the injection of a dry alkaline mineral into a flue gas stream with the purpose of reducing the emission of sulfur oxide, but also of other acid gases.

Fluidized Bed Combustion Technology

A method of combustion of fossil fuels that reduces the corrosive effects of it due to the low temperatures of it. The possibility of adding limestone or dolomite to the fluidized bed where the combustion occurs allows for the control of sulfur oxides that are normally emitted as part of the combustion process.

BACKGROUND INFORMATION

We live in an increasingly developing world, one that has nurtured not only a plethora of technological and social advancements; as the world develops this has even reaped changes within our climate and weather systems, as can be seen clearly by acid rain and air pollution, weather phenomena that have become increasingly common and damaging with the Industrial Revolution.

Acid Rain is the product of a chemical reaction, forming when different harmful chemicals such as sulfur dioxide as well as nitrogen oxides are released into the air. They then react with water in the atmosphere, oxygen as well as other chemicals present and form sulfuric and nitric acids. The aforementioned acids dissolve in rainwater and are present again in the form of acid rain. They get trapped in the system and reach the ground through rain, essentially integrating themselves into, staining the water cycle.

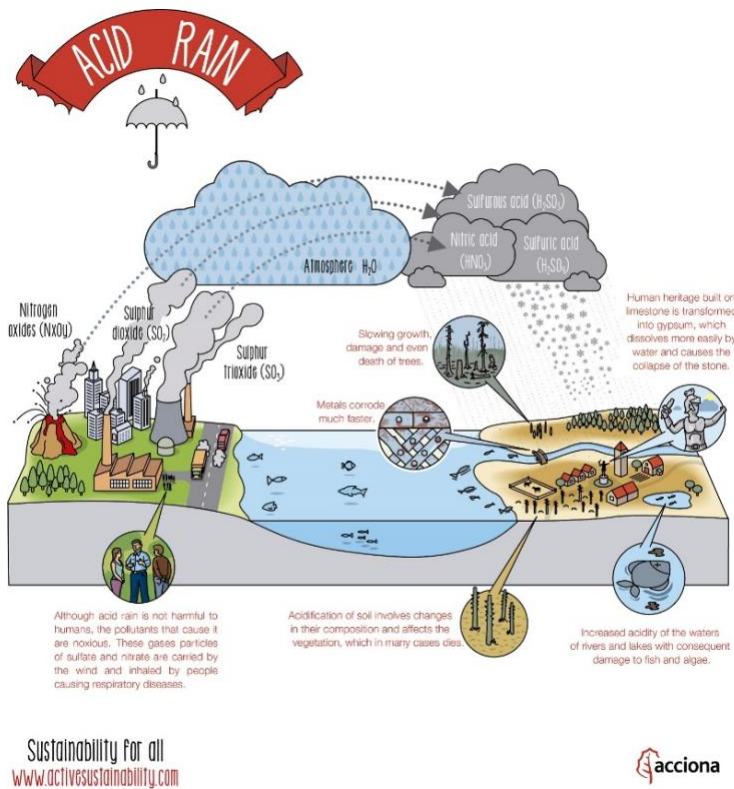
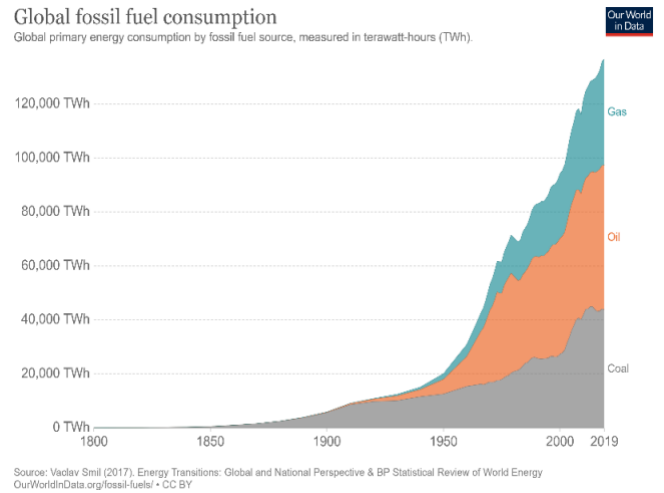
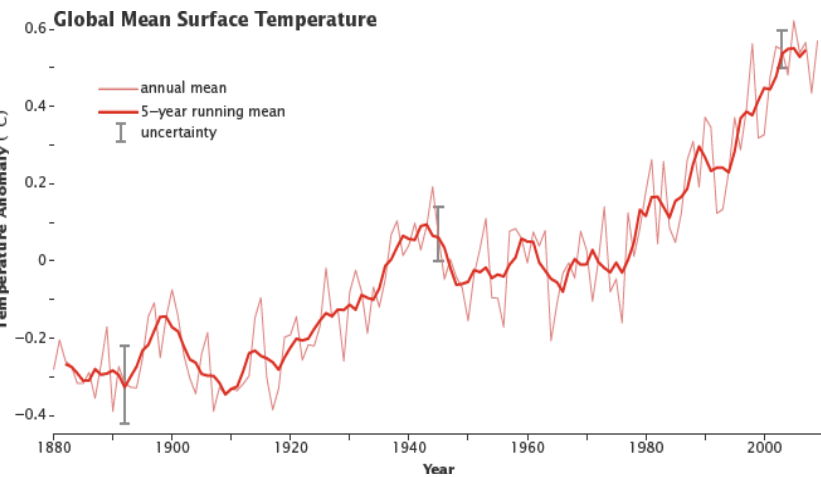


Figure 1: A diagram showing how acid rain is formed, as well as the effect it has on nature and man-made structures, such as monuments and other buildings, which it ruins due to its corrosive qualities.

Air pollution thus feeds the creation of acid rain, and air pollution in turn is sadly an incredibly prominent problem worldwide. The burning of fossil fuels for electricity, to fuel vehicles, etc. have nurtured a dependency on fossil fuels in society, one worsened by factors such as the fact that the majority of people continue to use their own cars incessantly rather than opting for more environmentally-friendly public transport. Fossil fuels are incredibly detrimental to the environment; over 65% of sulfur dioxide comes from electricity generators that run on fossil fuels, as do 25% of nitrogen oxides in the atmosphere.

The problems of acid rain and air pollution became problems of much greater severity with the Industrial Revolution, where new manufacturing processes took over in Europe, and gradually worldwide. This transition to the secondary sector dominating society from the former primary sector meant industrial processes became much more common and widespread, which in turn meant so did the emissions of fossil fuels that release pollutants into the air. As more pollutants were released into the air, air quality worsened, and the chemicals responsible for this dissolved in rain, with their corrosive qualities then coming back onto the ground through acid rain which thus became increasingly prevalent. The prevalence of such problems is of great concern as they are incessantly destroying parts of the world's history and culture; victims of acid rain and pollution include the Parthenon, the cultural, historical value of which is undeniably evident. The monument came after Ancient Greece's victory over Persia, and came to fruition from a group of architects including Iktinos, who constructed the monument that is widely perceived as the birthplace of democracy, theatre, numerous freedoms including that of speech and expression, and philosophy, all of which have contributively molded modern society and the values effervescent within

it. Monuments such as the aforementioned one have prevailed through numerous calamities including earthquakes and bombardments, and it is regrettable that such great constructions are under a very preventable, controllable threat that is the product of optional human actions.



Figures 2&3: Graphs showing the Global Mean Surface Temperature and the Global Fossil Fuel Consumption since the 1800's; there's a clear positive correlation, showing that as fossil fuel consumption has been increasing, majorly due to the industrial revolution, so has the earth's temperature, indicative of the fact that an increase in fossil fuel consumption, and thus air pollution, is driving climate change.

So how do air pollution and acid rain cause such a grave problem when it comes to their damage on historical and cultural monuments?

Acid rain is full of chemicals with high acidity and corrosiveness, such as the aforementioned nitrogen oxides and sulfur dioxide. The high corrosive qualities of rain thus damage monuments, this being as they are made of limestone or marble, both of which dissolve in the presence of such acidic chemicals the rain carries.

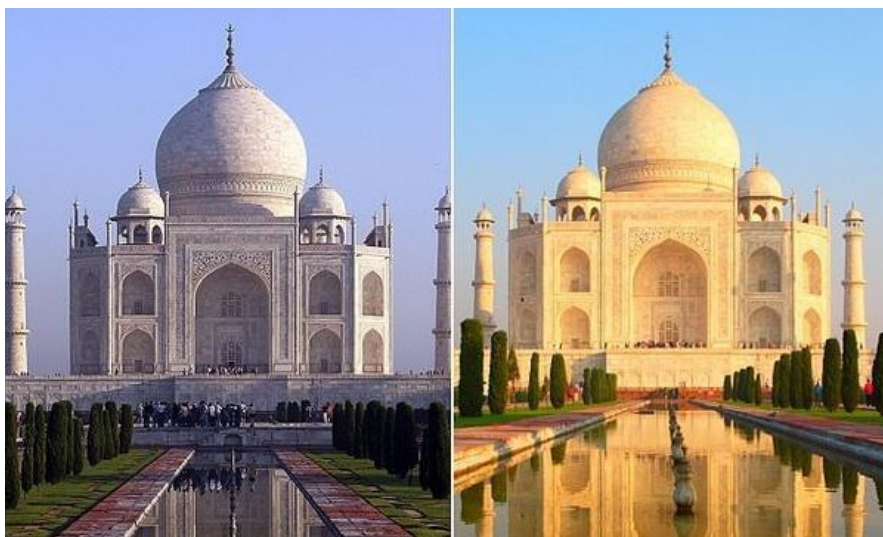


Figure 4, a side-to-side comparison of the Taj Mahal prior to (left) and after the effects of acid rain (right). It has lost its color, turning into an unappealing yellow color.

MAJOR COUNTRIES AND ORGANIZATIONS INVOLVED

India

India has received criticism for its handling of the issue of the Taj Mahal turning yellow, both from the global community and from the authorities in India; the Supreme Court of India has released an ultimatum, calling for the Taj Mahal to either be properly restored or demolished. It ordered the state of Uttar Pradesh to seek help from experts outside India in restoring it, given that local efforts have proven inadequate. The cremation of those deceased in India using chopped wood due to tradition means that there is an incredible level of emissions from this alone that contributes to the Taj Mahal turning yellow; a wood-burning crematorium is located near the Taj Mahal, contributing to the release of pollutants that have stained the Taj Mahal as part of emissions, as well as contributing to acid rain, totaling at 50 to 60 million trees being burned for cremations annually in India. The establishment of a protective zone around the Taj Mahal where emissions are controlled carefully in this 4,000 square mile zone, the establishment of this has been insufficient in tackling the impacts of acid rain and air pollution on the monument.

Greece

Greece, while coping with the effects of acid rain on its many archeological monuments, has devised ways to curb such effects, which primarily involve discoloration but also some patterns, details on the marble structures dissolving. A notable restoration technique is the use of laser beams, where the simultaneous combination of infrared and ultraviolet rays clean ancient marble, with each cancelling out the effects of potent discoloration their individual use entailed. In addition, work is being done in the archeological site of Delos; emergency meetings take place two or three times a year, between the French School there and the Cyclades Antiquities Ephorate, and out of these has come the establishment of an internet data system that accumulates information on issues arising, as well as of a 3D model which allows for a more comprehensive protection of the monuments at the site.

Italy

In Rome alone, 3600 forms of cultural heritage made of limestone and 60 made of bronze face the risk of sustaining deterioration. Due to air pollution annually, about

5.6 microns of marble are lost from cultural heritage items, and 0.33 microns for bronze. Due to the evident involvement Italy has in the issue at hand, Italy has been actively involved in the development of strategies to preserve historical monuments.

China

In 1996, the Leshan Buddha was named a UNESCO Cultural Heritage Site. The statue has been great victim of acid rain, with parts of it dissolving due to the acidity of rain. During the same period of the 1990s, China began imposing fines on certain polluters, and in 2001, Beijing introduced a target for reducing emissions of sulfur oxides between 2001 and 2005. From 2006 to 2009, despite formerly futile efforts, emissions of sulfur dioxide reduced by over 13%. In terms from pollution from transport, China has also taken notable action. The introduction of Electromobility and New Energy Vehicles is an important step; To promote their further use, the government has introduced subsidies for the purchase as well as operation of New Energy Buses, and tax cuts for decommissioning buses with older engines that aren't of great environmental sustainability. By the start of 2020, over 400,000 New Energy buses were being used across China, forming 55% of the bus market compared to just 1% in 2013. It is estimated that over 1 million fuel cell vehicles running on electricity will be operating in China by the next decade.

TIMELINE OF EVENTS

Date	Description of event
1975	First International Acid Rain Conference held.
1979	Convention on Long-range Transboundary Air Pollution signed
1992	General Assembly confers for its 19th Special Session on the Implementation of Agenda 21, Sustainable transport
1997	Adoption of the Kyoto Protocol.
2007	The Fourth Assessment Report was published, which highlighted the need for and ways of preparation for another agreement to succeed the Kyoto Agreement.

2008	First Commitment period for the Kyoto Protocol begins.
2009	The European Commission's development of the Fuel Quality Directive
2012	First Commitment period for the Kyoto Protocol ends.
August 2014	Sustainable Goals' High-Level Advisory Group on Sustainable Transport confers.
2015	International Acid Rain Conference held in Rochester.
2016	Global Sustainable Transport Conference held in Turkmenistan, aiming to confine greenhouse gas emissions from transport, a major contributor to greenhouse gases that create acid rain and the air pollution that are ruining monuments.
2016	Paris Agreement is signed, aiming to reduce greenhouse gas emissions for all signatories, thus contributing to limiting the scale of the problem of acid rain due to less pollutants including sulfur oxides being present in the air, thus consequentially limiting the damage done to monuments from acidic rain.
2018	Estonia makes public transport free.
2019	Climate Action Summit held, the goal of which was to take more action to reduce greenhouse gas emissions and prevent the global temperature from increasing by over 1.5°C above pre-industrial levels
December 2019	First commercial flight with an electricity-powered airplane takes off in Vancouver, an unprecedented step in the aviation industry towards sustainable flights in the future.
2020	Second Commitment Period for Kyoto Protocol Ends. In this period, European

	Union members, Iceland and Australia pledged to make further reductions in their emissions, so to reach a 20% reduction compared to levels in 1990.
April 2020	2nd Global Conference on Strengthening Synergies between the Paris Agreement and the 2030 Agenda held in Geneva.
November 2020	The USA formally withdraws from the Paris Agreement.
February 2021	The USA rejoins the Paris Agreement.

RELEVANT RESOLUTIONS, TREATIES AND EVENTS

Global Sustainable Transport Conference of 2016, Turkmenistan

The Global Conference included representatives from the UN, governments of member states, and similar international organizations. It addressed every mode of transport, whether rail, road, waterborne, air and emphasized attention to the concerns of developing countries, particularly those of Africa. In the “Ashgabat Statement on Commitments and Policy Recommendations”, participants reiterated the commitment to intensifying the role of sustainable transport in connecting people and communities to education, healthcare and work in both urban and rural landscapes, providing equality in sustainable transport infrastructure.

European Green Deal

The European Green Deal aims to make the economy of Europe a sustainable one. It mentions integral measures to be taken as part of this deal, with many addressing the issue of sustainable transport. The Deal calls for the decarbonization of the energy industry, investment in technologies that aren't harmful to the environment, and introducing more environmentally-friendly, healthy and less costly mediums of public and private transport. The EU members, as part of this deal, signed a commitment to be climate-neutral by 2050.

A/RES/72/212, Strengthening the link between all modes of transport to achieve the Sustainable Development Goals, 29th January 2018

Emphasizes the importance of sustainable modes of transport with low carbon and efficient energy usage to ameliorate the present situation regarding climate change. The resolution also mentions the need for multi-stakeholder partnerships so for the aforementioned sustainable modes of transport to be created.

PREVIOUS ATTEMPTS TO SOLVE THE ISSUE

Actions on St. Paul's Cathedral

A 30-year research showed that sulfur dioxide levels have fallen by 95% in the last thirty years. This has been said to be the result of a decrease of industry in Central London, as well as the more widespread of cleaner sources of energy. Acid rain is now responsible for less than 1% of damage done to the building's limestone.

Taj Mahal action

In India, restorers have been relying on a clay mineral to clear the marble of impurities, as it makes them able to simply be washed off with water. Nevertheless, the government has faced constant criticism due to its lack of adequate action and engagement in dealing with the issue, including numerous environmentalists taking the government to court for this negligence, suggesting there's more to be done on the side of the government.

The European Commission's development of the Fuel Quality Directive

The Fuel Quality Directive, introduced in April 2009, demands a depletion of greenhouse gas intensity of fuels used for transport by at least 6% by 2020. It demanded a mandatory reduction of Sulphur levels in fuels, with levels then being below 10 ppm as a result. Additionally, the directive called for an increase in the use of biofuels, with those having to have 60% lower emissions than their alternative fossil fuels, and a reduction in upstream emissions, examples of such being flaring

Nordea limiting the fossil fuel industry within Nordic countries

Nordea introduced a guideline for Nordic countries, with the aim of this being to limit these countries' fossil fuel usage as an energy source. The effectiveness of this guideline is evident from the fact that Nordic countries rank amongst the cleanest countries in terms of air pollution in the world, indicating greenhouse gas emissions from the burning of fossil fuels are of small amount.

Estonia's actions in public transport

In 2018, Estonia made public transport free of charge. The impact of this is evident after it was reported that a year and a half after this was implemented, passenger rides with public transport increased by 15%, and an additional 2 million rides were taken on its public transport fleet of buses, trams and trolleys between 2018 and 2019.

Volvo's actions towards sustainable transportation

Volvo has set a target for its vehicles to be 100% fossil fuel free by 2040. It focuses on the electrification of its vehicles as well as using biofuels that are sustainable and hydrogen to power its vehicles. It has released many electric car models that are widely used globally, with them having an expectation of 50% of their car models sold to be fully electric by 2025.

Nordea's actions regarding fossil fuel guidelines

Nordea has developed a guideline regarding the usage of fossil fuels within the Nordic countries, to limit their use of fossil fuels to an aforementioned level. It additionally aims to diversify countries and businesses away from coal by not investing in companies of which more than 30% of their profits come from the sale of coal. It does not finance projects regarding the extraction of unconventional oil or gas.

POSSIBLE SOLUTIONS

Addressing the problem of the production of air pollution and acid rain

Firstly, the reason behind the damage being done to the monuments needs to be dealt with, this being the production of air pollution and consequently of acid rain. Factors leading to their production include a plethora of one's everyday activities, such as that of transport; this raises the need for more sustainable transport methods being introduced in public and private transport.

The public must be sensitized on the severity of this issue, which could occur through widespread campaigns on various media forms about the issue at hand and how one can do their part in tackling it, whether this being through individual efforts at lowering air pollution, e.g. using public transport rather than your own car, or signing petitions, writing letters to authorities calling for more action to be taken.

Non-motorized transport should be improved so to become more appealing to the public, such as adding or improving bicycle and pedestrian lanes, this also doing its part in tackling traffic congestion, another major pollutant of greenhouse gases that reap acid rain.

Stricter legislation must be imposed regarding the proximity of factories and other industries with high gas emissions to historic and cultural monuments under threat from acid rain, so to reduce the prevalence of air pollution and acid rain on monuments vulnerable to such, and to localize the damage caused by acid rain.

Another important factor is filtering pollutants from their source, as can be done by in situ sulfur removal, e.g. using sorbent injection or fluidized bed combustion technology that reduces the sulfur oxides entering the atmosphere, and thus the potential for acid rain. Such technology must become more affordable and accessible, and its importance made known to all governments and industries on a global scale.

Restoring monuments already damaged by acid rain and air pollution

In addition to curbing further damage on historical and cultural monuments, it is important to try restore the damage already done to monuments, including their change in color, parts of them dissolving, amongst others. For example, the technology of laser beams used in Delos, Greece should be made available to other countries for their monuments at an affordable, accessible level. Methods already used such as adding a water-resistant coating to limestone monuments should be invested into so to conduct research increasing its efficacy and availability for all monuments worldwide.

BIBLIOGRAPHY

"What is Cultural Heritage - Culture in Development."
http://www.cultureindevelopment.nl/Cultural_Heritage/What_is_Cultural_Heritage.

Accessed 10 Jun. 2021.

"Definition of the cultural heritage | United Nations ... - UNESCO."
<http://www.unesco.org/new/en/culture/themes/illicit-trafficking-of-cultural-property/unesco-database-of-national-cultural-heritage-laws/frequently-asked-questions/definition-of-the-cultural-heritage/>. Accessed 10 Jun. 2021.

"Acid rain facts and information - National Geographic." 28 Feb. 2019,
<https://www.nationalgeographic.com/environment/article/acid-rain>. Accessed 11 Jun. 2021.

"Dry Sorbent Injection (DSI)."
https://cdn.ymaws.com/www.icac.com/resource/resmgr/white_papers/ICAC_Industrial_DSI_Ancillar.pdf. Accessed 2 Jul. 2021.

"What is Acid Rain? | Acid Rain | US EPA." 12 May. 2020,
<https://www.epa.gov/acidrain/what-acid-rain>. Accessed 30 Jun. 2021

"What is acid rain and how is it formed? - Sustainability for all."
<https://www.activesustainability.com/climate-change/what-is-acid-rain/>. Accessed 30 Jun. 2021.

"Air Pollution: Everything You Need to Know - NRDC." 1 Nov. 2016,
<https://www.nrdc.org/stories/air-pollution-everything-you-need-know>. Accessed 11 Jun. 2021.

"Corrosion | Definition of Corrosion at Dictionary.com."
<https://www.dictionary.com/browse/corrosion>. Accessed 11 Jun. 2021.

"Fossil Fuels | National Geographic Society." 31 May. 2019,
<https://www.nationalgeographic.org/encyclopedia/fossil-fuels/>. Accessed 11 Jun. 2021.

"Fossil Fuels - Our World in Data." <https://ourworldindata.org/fossil-fuels>. Accessed 30 Jun. 2021.

"Global Warming - NASA Earth Observatory." 3 Jun. 2010,
<https://earthobservatory.nasa.gov/features/GlobalWarming/page2.php>. Accessed 30 Jun. 2021.

"MONUMENT | meaning in the Cambridge English Dictionary."
<https://dictionary.cambridge.org/dictionary/english/monument>. Accessed 11 Jun. 2021

"Low-emission zone - Wikipedia." https://en.wikipedia.org/wiki/Low-emission_zone. Accessed 11 Jun. 2021.

"Acropolis, Athens - UNESCO World" <https://whc.unesco.org/en/list/404/>. Accessed 22 Jul. 2021.

"The Taj Mahal is turning yellow – and time's ticking to restore it | The" 13 Aug. 2018, <https://www.independent.co.uk/arts-entertainment/architecture/taj-mahal-yellow-brown-air-pollution-acid-rain-restoration-india-architecture-a8489486.html>. Accessed 30 Jun. 2021.

"Electric Cremation vs The Traditional Funeral Pyre - India - India Map." 16 Oct. 2014, <https://www.mapsofindia.com/my-india/society/electric-cremation-vs-the-traditional-funeral-pyre>. Accessed 30 Jun. 2021.

"Indian Supreme Court Orders Government to Restore the Taj Mahal" 17 Jul. 2018, <https://www.smithsonianmag.com/smart-news/indian-supreme-court-restore-taj-mahal-or-demolish-it-180969668/>. Accessed 30 Jun. 2021.

"Ancient Greek Monuments, Including Acropolis, Threatened by" 26 Jun. 2019, <https://greekreporter.com/2019/06/26/ancient-greek-monuments-including-acropolis-threatened-by-climate-change/>. Accessed 30 Jun. 2021.

"Greek scientists use lasers to clean Acropolis | Reuters." 17 Oct. 2008, <https://www.reuters.com/article/us-greece-acropolis-idUSTRE49G45E20081017>. Accessed 30 Jun. 2021.

"Pollution turns India's white marble Taj Mahal yellow and ... - Reuters." 21 May. 2018, <https://www.reuters.com/article/us-health-pollution-india-tajmahal-idUSKCN1IN01S>. Accessed 2 Jul. 2021.

"Is free public transport everything it is cracked up to be? | Euronews." 10 Mar. 2020, <https://www.euronews.com/2020/03/10/is-free-public-transport-everything-it-is-cracked-up-to-be>. Accessed 2 Jul. 2021.

"St Paul's Cathedral pollution damage 'lowest ever' - BBC News." 10 Oct. 2012, <https://www.bbc.com/news/uk-england-london-19896401>. Accessed 2 Jul. 2021.

"Fluidized-bed combustion - ScienceDirect." <https://www.sciencedirect.com/science/article/pii/B9780408012508500143>. Accessed 2 Jul. 2021

"Electrification | Volvo Car Group - Volvo Cars." <https://group.volvocars.com/company/innovation/electrification>. Accessed 2 Jul. 2021.

"Renewable Energy: The Clean Facts - NRDC." 15 Jun. 2018, <https://www.nrdc.org/stories/renewable-energy-clean-facts>. Accessed 11 Jun. 2021.

"Basics | Particulate Matter (PM) Pollution" <https://www.epa.gov/pm-pollution/particulate-matter-pm-basics>. Accessed 11 Jun. 2021.

"Responsible Investment Policy - Nordea Bank." 8 Mar. 2021, <https://www.nordea.com/en/doc/namripolicy2021260521.pdf>. Accessed 2 Jul. 2021.

"Programs to Control Air Pollution and Acid Rain--SARATH K" <https://www.nap.edu/read/11192/chapter/7>. Accessed 11 Jun. 2021.

"New way to protect historic limestone buildings -- ScienceDaily." 4 Dec. 2012, <https://www.sciencedaily.com/releases/2012/12/121204145922.htm>. Accessed 2 Jul. 2021.