Forum: Environmental Commission

Issue: Promoting Sustainable Lifestyles in Carbon-Intensive Countries

Student Officer: Abrar Yusuf

Position: Deputy President

Introduction

Ever since the start of the Industrial Revolution, global carbon dioxide emissions have been rising at a dramatic rate. While emissions may have stabilized in recent years from a multitude of countries, they are still projected to rise in the future. However, carbon intensity on the other hand has decreased overall from 1990 to 2014, dropping from 0.77 kg per PPP $ of GDP to 0.326 kg per PPP $ of GDP, according to the World Bank.

With that being said, there are numerous countries around the world that are still relatively carbon-intensive (with a majority of them being in Asia). Fossil fuels are carbon-intensive resources while renewable resources such as hydroelectricity, ocean power, wind and nuclear are not. Therefore, economies that rely heavily on industrial production and manufacturing (such as China and the United Arab Emirates) tend to have a higher carbon-intensity than those which rely more on their service sectors to generate revenue (such as Sweden and Denmark), as the use of fossil fuels are less prominent there. In addition to that, countries that rely on trade to import carbon-intensive goods will have a lower carbon intensity than those countries that manufacture the same goods for export.

Carbon-intensive activities indicate that large amounts of carbon dioxide are being produced annually and consequently, this can have devastating effects on our world. Increasing overall greenhouse gas emissions contribute to the greenhouse effect and global warming, the effects of which range from severe changes in weather patterns to the melting of the polar ice caps. Furthermore, ocean acidification as well as the depletion of the ozone layer can result from the presence of more carbon dioxide in the atmosphere.

Therefore, in order to alleviate these issues and avoid causing permanent damage to our planet, sustainable lifestyles need to be promoted in carbon-intensive countries. Nations need to find a way to utilise resources effectively to minimise carbon dioxide emissions whilst maintaining their economic growth and output. Currently, measures such as the 2005 Kyoto Protocol and the 1992 United Nations Framework Convention on Climate Change are in place to stabilize carbon dioxide emissions. However, more effective strategies are still in demand and tackling this issue would require a holistic approach. The need to come to a global solution has become more urgent than ever and the absence of further

action will mean that pollution and environmental destruction will continue, rendering the future of the human race to be grim.

Definition of Key Terms

Carbon-Intensity

This can be defined as the average emission rate of carbon dioxide from a given source relative to the intensity of a specific activity. Carbon-intensity is primarily measured in two ways: grams of carbon dioxide released per megajoule of energy produced or the ratio of carbon dioxide emissions produced to gross domestic product.

Gross Domestic Product

This is the total value of all production of goods and services in an economy in a given period of time. GDP is a measure of aggregate economic output and generally indicates how strong a country's economy is.

Sustainability

It refers to meeting the needs of the present without compromising the ability of future generations to meet their needs. The whole concept of sustainability is comprised of three pillars: economic, environmental and social. Sustainability presumes that resources are finite and therefore should be used conservatively and wisely, taking the long-term consequences of the ways in which resources are used into account.

Sustainable Living

It is the application of the concept of sustainability to lifestyle choice and decisions. Sustainable living is a lifestyle that aims to reduce an individual's or society's use of earth's natural resources. It normally involves reducing one's carbon footprint, and this is done by altering methods of transportation, energy consumption and diet.

Carbon Dioxide Emissions

Carbon dioxide is a colourless, odourless and non-poisonous gas formed by the combustion of carbon (e.g. burning fossil fuels) and the respiration of living organisms. Carbon dioxide emissions refer to the release of this gas into the atmosphere over a specified area and period of time.

Global Warming

It is the increase in average temperature of Earth's near-surface air and oceans likely caused as a result of increasing greenhouse gas emissions (as these gases contribute to the greenhouse effect). These emissions result from human activity such as deforestation and fossil fuel burning.

Greenhouse Effect

It is when greenhouse gases in the atmosphere such as carbon dioxide and methane trap heat from the Sun. The Sun's heat reaches the planet in the form of infra-red waves, some of which are absorbed by the greenhouse gases and are re-emitted back to Earth. The greenhouse effect leads to a gradual rise in the Earth's atmosphere as greenhouse gas emissions increase.

Background Information

History of fossil fuel usage

Fossil fuels, such as coal, oil and natural gas, are considered to be carbon-intensive resources, with coal being the most carbon-intensive out of the three. There is evidence suggesting that surface mining and household usage of coal in China dated back to 3490 BC. During the Middle Ages, in order to supply forges, smithies and breweries, small mining operations took place with the goal of extracting and utilizing coal. The British used coal to fire bricks in the 1400s as this made chimneys cheap to build.

These resources played a significant role during the Industrial Revolution in the 18th century, as they were used to primarily power steam locomotives. England, Germany, Belgium and the United States of America (USA) are examples of nations in which the Industrial Revolution took place. The operation of the steam locomotives is what boosted the economies of countries that utilized it. Coal was generally used as fuel to compensate for a lack of firewood and charcoal. It was widely coveted due to its abundance, ease of accessibility and the fact that it could be used in its natural form.

From the mid-19th century, the oil industry experienced a significant growth as petroleum rose to global prominence. It initially saw use in the form of kerosene, (a product derived from petroleum) which was used for lighting and heating. Once drilling technology for oil wells in mid-19th century America were developed, petroleum started to be consumed in massive quantities. It was used as fuel for vehicles such as automobiles and ships, applied in power plants to generate electricity, used for heating and to provide hot water supplies.

During the Great Depression in the 1930s, a time during which the world economy faced a decline, the use of fossil fuels continued to increase. This can be attributed to the fact that oil-fuel aviation had begun as the Wright Brothers invented and flew the world's first successful airplane. At that time, fertilizer and oil-powered tractors were invented too and in addition to that, coal, tar and oil were being turned into industrial chemicals for other uses.

However, the use of fossil fuels and carbon-intensive lifestyles come at a cost. Not only do they contribute to global warming, but they also cause air pollution and damage public health. Chronic asthma, low lung functioning, chronic bronchitis and cardiovascular diseases are some health complications that can arise due to greenhouse gas emissions. The Great Smog of 1952 in England served as an example of this; on 5 December, the city of London was covered by a dense blanket of toxic smog as a veil of fog mixed with the tons of soot, smoke and other toxic pollutants that were being emitted by factories and vehicles. The smog remained for five days, drastically reducing visibility and harming the public (particularly the elderly, children and those with respiratory problems). Deaths caused by pneumonia and bronchitis skyrocketed and it is estimated that at least 8000 people died as a result of this disaster. Afterwards, the Parliament passed the Clean Air act of 1956 to ensure that an event of this scale does not occur again.

Nowadays, fossil fuels are still an integral part of society. Global consumption of fossil fuels has increased from 3.8 billion tons in 1965 to 11.1 billion tons of oil equivalent in 2017. Humans have become dependent on them to heat their homes, run vehicles, power industry and manufacturing and provide electricity. They tend to be used in manufacturing industries and therefore, countries that rely heavily on the secondary sector are likely to be carbon-intensive.

Consequences of carbon-intensity

As mentioned previously, should global carbon emissions not decline, and carbon-intensive countries continue as they are, the world will be under the threat of global warming. As temperatures around the world rise due to rising greenhouse gas emissions, particularly carbon dioxide emissions, there will be a number of effects on the world; glaciers would melt, causing sea levels to rise. As a result, low-lying coastal countries, such as Bangladesh, would be in danger of flooding. Several animal species may go extinct as they fail to adapt on time to the changing climate. Evidence for this could be seen by the Adélie penguins in Antarctica, whose numbers have fallen from 32,000 breeding pairs to 11,000 in the last 30 years. Global warming would change weather patterns and precipitation would increase overall since the warmer air would hold more moisture. However, there will be different effects in different parts of the world; the tropics would receive less precipitation while the Polar Regions will receive more. Warmer air would also mean that water would evaporate from surfaces at a faster rate, leading to certain areas facing little to no precipitation to dry out more quickly. This would lead to places such as southern Africa, southern Asia, the Mediterranean and the US Southwest facing more frequent and longer-lasting droughts. Furthermore, invasive species would have the opportunity to thrive in warmer temperatures (such as the spruce bark beetles of Alaska, which have so far chewed 4 million acres of trees) and this can become an obstacle in food production.

Due to climate change, water supplies around the world would be severely affected. The Environmental Protection Agency (EPA) predicts that climate change will cause the demand for water to increase while the supply of water shrinks. An increase in precipitation would lead to an increase in

sediment and pollutants that are washed into sources of water. Rising sea levels would cause saltwater to infiltrate freshwater systems, which would increase the need for desalination and drinking water treatment. These all indicate that accessing clean drinking water would become a more difficult and expensive task, meaning that less economically developed nations, as well as the citizens within them, will struggle and suffer.

Carbon dioxide emissions can also acidify water supplies. In fact, since the Industrial Revolution, the world's oceans have become 30% more acidic. Because the ocean serves as a sink for carbon dioxide and absorbs some of it, the gas is then able to react with seawater to produce carbonic acid. Models suggest that, if carbon dioxide is emitted on current trends, the ocean average pH will reach 7.8 by the end of the 21st century, which is 0.5 units below pre-industrial level. As a result of this, several marine species may go extinct as they may not be fast enough to adapt to these changes and ocean ecosystems may be destroyed.

Fair use of resources

Due to the Industrial Revolution, many countries underwent drastic economic development and saw a growth in their secondary (manufacturing) sector. These nations were able to utilise fossil fuels to their maximum potential and reap the benefits of it. Through continued development, the service sector of these nations grew while the manufacturing sector lost preeminence. However, this was not the case everywhere around the world; many nations such as Uzbekistan did not industrialise in that time period, at least not to a great extent, and so they lagged behind on economic development. Their economies were mainly comprised of agriculture and only recently have many made the move to manufacturing and saw a growth in their secondary sector.

Therefore, these nations may deem it unfair if they were forced to cut back on fossil fuels, resources that allow them to make progress in economic development. If sustainable practices are to be adopted to reduce carbon-intensity and pave the way for a greener future, a compromise needs to be found in order to satisfy all parties involved; while sustainable methods should be implemented across all nations, their economic growth should not be jeopardised.

Case study: Wyke Farms

Aside from governments and NGOs, businesses have also been pushing for sustainability, as is the case with Wyke Farms, a dairy business located in southwest England. Wyke Farms exports around 14,000 tonnes of cheddar a year to more than 160 countries and generates its electricity, gas and heat from renewable sources. While solar panels are used in this business, cow dung is another resource which is utilized effectively. Microorganisms are used to break down the dung into biogas, which is then burned to generate electricity and heat. In addition to that, the use of cow dung significantly reduces the emissions of methane (which is a greenhouse gas) since dung releases this gas during decomposition. Wyke Farms also converts some of the biogas into biomethane, which is then primarily sold to

businesses. Richard Clothier, the managing director of Wyke Farms, claims that the adoption of these sustainable practices saves approximately US $131,000 per month in energy bills.

Wyke Farms is currently putting in place software to monitor electricity generation and wastewater recycling, so that adjustments can be made to the amount of electricity generated according to the needs of the business. The company has also invested around US $6.5 million in biomethane generation and plans to turn that into a business too. It has borrowed US $14 million for its alternative energy operation and has put in US $2.6 million of its own money to cover the cost of planning, equipment, wiring and electric grid upgrades. Wyke farms also plans on improving its solar energy generation and hopes to inspire other farmers to adopt alternative energy.

Major Countries and Organizations Involved

Ukraine

Ukraine is currently one of the most carbon-intensive countries in the world, having produced around 3.21 metric tons of carbon dioxide per thousand year 2005 US dollars in 2011. While Ukraine's emissions decreased by a significant amount between 1990 and 2012, its GDP also decreased (by approximately 30%). Currently, the carbon intensity of Ukraine's economy is almost 5 times the world average. In 2012, Ukraine emitted 366 million metric tons of carbon dioxide equivalent. The nation's energy sector accounted for 92% of the emissions (with electricity and heating making up 41% of those emissions and manufacturing and construction making up 21%).

With that being said, Ukraine has taken action to address its carbon-intensity. It has committed to reduce its greenhouse gas emission levels by 20% below 1990 levels by 2020. The Intended Nationally Determined Contribution (INDC) in the nation set a target to cap emissions at 60% of 1990 levels in 2030. In addition to that, Ukraine developed and adopted the 2020 National Renewable Energy Action Plan (NREAP) in 2014, which sets a target to increase Ukraine's share of renewable energy resources to 11% of total energy consumption by 2020.

With regards to sustainability, Ukraine receives support from the United Nations Development Programme (UNDP) to address climate change mitigation at a policy level and through practical initiatives. The UNDP aims to develop the energy efficient lighting market and support local energy efficiency initiatives and community organisations working in the energy and environment area. As a result of their involvement, the market share of energy efficient lighting products in Ukraine increased by 11% and 2500 schools received education materials and interactive training on energy efficiency.

Sweden

Sweden was ranked as the most sustainable country in the world in 2015 according to the Country Sustainability Ranking study. In 2011, it produced around 0.13 metric tons of carbon dioxide per thousand year 2005 US dollars in 2011. Sweden's air pollution is currently at 10.2 micrograms per cubic

metre, compared with the Organisation for Economic Cooperation and Development (OECD) average of 20.1.

Sweden's success in sustainability can be attributed to various reasons, one of them being the fact that it combines citizen engagement, high ambition levels and international solidarity. A study by the European Commission found that 40% of its citizens have purchased eco-labelled food and consumer products in one month, which was higher than the European average. In addition to that, recycling plays an important role in its society, with 88% of all aluminium cans and PET bottles being in the recycling system (out of a targeted 90%). The government intends to become the world's first fossil fuel free nation and seeks to have a vehicle fleet completely rid of fossil fuels by 2030. The nation planned to also invest US $633 million of its 2016 budget in solar and wind energy, smart grids and eco-friendly transportation. Moreover, 52% of Sweden's energy sector is comprised of renewable energy resources (the highest percentage in the EU).

The country as also implemented a carbon tax in 1995, which has largely been successful. This is an excise tax which is placed on carbon-intensive fuels such as oil and natural gas. The carbon tax has allowed Sweden to cut down its dependency on fossil fuels.

China

Being one of the world's largest emitters of carbon dioxide, China produced around 0.86 metric tons of carbon dioxide per year 2005 US dollars in 2011, a value higher than the world average. Between 1990 and 2012, there was reduction in carbon-intensity by 51% as China adopted more efficient technology and improved industrial processes. The primary reason why China is still such a large emitter of carbon dioxide is due to the fact that a significant part of China's emissions come from electricity and direct fuel burning to manufacture goods for export. China has a massive manufacturing industry, which accounted for 44% of China's GDP in 2013.

In 2016, China released a plan that set a target to reduce its carbon intensity by 18% by 2020. The plan also stated that energy use per GDP would be reduced by 15%, from 2015 levels between 2016 and 2020 and that energy consumption would be capped at 5 billion tonnes of standard coal equivalent by 2020. At the UN climate conference in Paris in December 2015, China committed to reducing its carbon intensity by 60-65% below 2005 levels.

China is taking part in a collaborative project with the Singaporean government to build the Tianjin Eco-city, a city designed to house 350,000 people in a low-carbon, green environment by 2020. The city is being built on polluted land that has been cleaned up and is implementing technology to remove toxic heavy metals from its polluted reservoir. Each district within the city is planned to have amenities and jobs located close by, with local and centralised facilities serving the needs of the residents in each neighbourhood. In terms of transport, the aim of the project is to increase the use of public transport and non-motorised modes of transport. Therefore, non-motorised and motorised

networks would be separated to minimise conflict between pedestrians, cyclists and vehicles. In addition to that, the city is also being planned with extensive vegetation and water networks in order to enhance the ecology.

United States of America (USA)

The USA is another large emitter of carbon dioxide, but its carbon intensity levels are relatively low when compared to the world average. It produced around 0.41 metric tons of carbon dioxide per year 2005 US dollars in 2011. The carbon-intensity of USA's electric power sector faced a reduction recently since electricity generation shifted away from coal towards natural gas and renewable energy resources such as wind and solar power.

The USA has been taking action towards reducing its carbon footprint. The nation established the Greenhouse Gas Reporting Program, which collects and publishes data about emissions from individual facilities that emit greenhouse gases in large quantities. Having an effective way to collect emission data can prove to be useful as it helps policy makers and businesses to track trends and identify opportunities for increasing efficiency and reducing emissions. The United States Environmental Protection Agency (EPA) is currently creating a Clean Power Plan which, when fully in place in 2030, will reduce carbon dioxide emissions by 32% below 2005 levels. The EPA has partnered with the private sector and through voluntary energy and climate programs, its partners have managed to reduce greenhouse gas emissions by 345 million metric tons in 2010.

Multiple initiatives have been launched to promote sustainable living within the nation. In Portland, new bike routes are being added to increase the use of alternative transportation while maintaining current routes. In Denver, a type of landscaping known as xeriscaping is being used to conserve water. Denver created a program to make it easier for residents to xeriscape around their homes, with the city's water board having developed downloadable plans and resources to ensure that every resident can remodel their yards. In New York, one of the world's largest landfills is now being turned into a park with advanced landfill engineering techniques. Landfill mounds in this site have been capped through a process that alleviates toxic fumes and the soil has been treated to ensure proper drainage. However, because a lot more development is required, the park is not scheduled for completion until 2037.

World Wildlife Fund (WWF)

The World Wildlife Fund (WWF) is a non-governmental organisation whose mission is to create a world where people and wildlife can thrive together. The organisation is currently involved in six main areas: restoring and preserving wildlife; sustaining forests; reducing global carbon dioxide emissions; ensuring that food systems are sustainable and maintain food security; maintaining freshwater ecosystems and flow regimes so that people and nature are provided with water; and ensuring that fisheries and ocean ecosystems are productive, resilient and remain biodiverse.

They are currently working with the UK government to bring forward policies to reduce carbon dioxide emissions in line with international targets. They also work with businesses to reduce their impact and emissions. The WWF seeks to also increase the use of renewable energy resources in the UK, with the most notable one being the offshore wind farms located around the Scottish coast. The organisation is also working to create an international policy to limit emissions from the aviation industry.

In 2009, the WWF launched the One in Five Challenge, which was a guided programme and award scheme that helped businesses reduce the number of flights they take over a period of five years. Companies such as Microsoft UK, BT and Lloyds TSB, as well as the WWF itself, took part in the challenge. As a result of this, the companies involved managed to cut their flights back by 38% on average, saving around US $ 2.6 million and 3000 tonnes of carbon dioxide.

Relevant UN Treaties and Events

- United Nations Framework Convention on Climate Change, 1992
- Kyoto Protocol, 2005
- Paris Agreement, 2016
- 17 Sustainable Development Goals, 2016

Previous Attempts to solve the Issue

The Kyoto Protocol, an international agreement linked to the United Nations Framework Convention on Climate Change (UNFCCC), was adopted as the first international treaty on controlling and reducing greenhouse gases in 1997. It commits its parties by setting internationally binding emission reduction targets. 192 parties have ratified the protocol, which mandated that 37 industrialized nations, as well as the European Community, cut their greenhouse gas emissions. Developing nations were asked to voluntarily comply with the protocol, with more than 100 of them being exempted from the treaty. Signatories of the treaty agreed to reduce their emissions to 5% below 1990 levels between 2008 and 2012. The Kyoto protocol also established an international trading system in which countries could earn credits towards their emission target by investing in emission cleanups outside of their own country. It could not enter into full force until 2005 as it required at least 55 nations to ratify it. Under the protocol, a monitoring system was established to keep track of emission reductions from each country. Parties have had to submit annual emission inventories and national reports at regular intervals and a compliance system ensured that Parties were meeting their commitments and helped them meet them if they had problems doing so. By 2012, all Kyoto protocol members saw an average reduction in carbon dioxide emissions by 12.5%. However, the main reason behind this result was the collapse of the Soviet Union in 1991. After the collapse, there was a decline in heavy manufacturing industries across Russia and the newly independent states. If Russia and Ukraine were to be not accounted for when looking at

the average reduction in carbon dioxide emissions, the results would show that the Kyoto Protocol Parties have only reduced their emissions by 2.7%, which is well below the target of 5%. Therefore, the apparent success of the Protocol can be said to be attributed to a handful of countries. Moreover, major emitters such as USA and China were not a part of the Protocol either. Thus, it can be argued that the treaty has overall been relatively ineffective.

The Paris Agreement is a pact sponsored by the United Nations to bring the world's countries together to combat climate change. It builds upon the UNFCCC and the overall mission of it is to limit global average temperature increases to no more than 2 degrees Celsius above the levels from the years 1850 to 1900. Participating nations have decided to adopt green energy resources, cut down on greenhouse gas emissions and limit the rise of global temperatures. As of October 2017, 195 UNFCCC members have signed the agreement and 169 of them have become a party to it. The Paris Agreement entered into force in 2016. While greenhouse gas emissions are projected to rise in the future, the agreement assumes that greener technology, conservation efforts and efforts to remove greenhouse gases from the atmosphere will eventually slow down emissions and cause them to decline. The strategies laid out by countries in the agreement and financing are set to start in 2020. The deal is designed to evolve over time and every five years, each nation's targets will be reevaluated so that the 2-degree target can be achieved.

The 10YFP Programme on Sustainable Lifestyles and Education is an international step that has been taken to promote sustainable living around the world. It was launched at the UNESCO World Conference on Education for Sustainable Development in Japan on 11 November 2014, with the United Nations Environment Programme as the Secretariat of the 10YFP. The objectives of the programme are as follows: to build a shared vision of sustainable lifestyles; to integrate the principles and practices of sustainable living across society; to develop tools and incentives, provide capacity-building for sustainable lifestyles and spread good practices; to empower individuals to adopt sustainable lifestyles through education, awareness-raising and participation; and to measure and track the benefits of actions revolving around sustainable living. The work areas of the program include developing and replicating sustainable lifestyles, educating about sustainable living and transforming current lifestyles and shaping those of future generations. The programme is co-led by the Ministry of Environment of Japan, the Government of Sweden represented by the Stockholm Environment Institute (SEI) and the World Wide Fund for Nature (WWF). So far, 16 initiatives have been launched under the Sustainable Lifestyles and Education (SLE) programme, with notable examples being the 'Love Food Hate Waste' campaign (a campaign that aims to help consumers waste less food by providing targeted tips, advice and guidance) and an initiative which aims to promote the use of energy-efficient technologies among the public in Zambia.

Possible Solutions

Sustainable living can be promoted and carbon intensity can be reduced through numerous ways. One method of doing so would be though the development of infrastructure within countries; governments should increase expenditure on building new roads, railways, ports, airports etc., as well as improving existing ones. Doing so would reduce transport costs and the time taken to move goods within and across countries. Not only would this boost economic growth, but it would also reduce total carbon dioxide emissions, leading to a decrease in a country's overall carbon intensity.

Carbon taxes should also be imposed in countries worldwide, particularly in those that are carbon-intensive. Simply put, this would be a fee on the production, distribution or use of fossil fuels based on how much carbon their combustion emits. Governments would put a price per ton on carbon, which would then be translated into a tax on electricity, natural gas or oil. Implementing carbon taxes would prove to be useful because if they are high enough, it would serve as a monetary disincentive for fossil fuel use, motivating people to switch to cleaner energy. It can drastically reduce carbon dioxide emissions and governments can use the tax revenue to invest in renewable energy resources and sustainable development.

Moreover, because the carbon-intensity of a specific activity depends on the fuel used, all nations should gradually move away from coal and switch to oil and natural gas in their energy sectors, as these resources are not as carbon-intensive. An alternative would be to reduce fossil fuel usage and implement more renewable energy resources, such as solar power, wind power, hydroelectricity and geothermal power. Electricity generation through renewable resources or less carbon-intensive fuels could be subsidised by governments so that there is an incentive to utilise these resources.

Energy efficiency plays a significant role in the concept of sustainability and carbon-intensity, and so should be taken into account when devising solutions. The use of fuel efficient and electric cars should be encouraged through public awareness and subsidies. There should also be more investment in research and development of sustainable technologies by the government, as emerging technologies such as the hydrogen fuel cell and betavoltaic devices could play a crucial role in creating a greener future.

Bibliography

"The History of Carbon Dioxide Emissions." *The History of Carbon Dioxide Emissions | World Resources Institute*, www.wri.org/blog/2014/05/history-carbon-dioxide-emissions.

"Historical Global CO2 Emissions." *Historical Global CO2 Emissions | Center for Climate and Energy Solutions*, www.c2es.org/facts-figures/international-emissions/historical.

"Effects of Increased Greenhouse Gas Emissions." *What's Your Impact*, 8 July 2017, www.whatsyourimpact.org/effects-increased-greenhouse-gas-emissions.

INDUSTRIES, LTD. MITSUBISHI HEAVY. "History of Fossil Fuel Usage since the Industrial Revolution." *MITSUBISHI HEAVY INDUSTRIES, LTD.*, www.mhi.com/discover/earth/issue/history/history.html.

"The History of Fossil Fuels." *Just Energy Solar*, www.justenergysolar.com/blog/the-history-of-fossil-fuels/.

What Is Ocean Acidification?, www.epoca-project.eu/index.php/what-is-ocean-acidification.html.

(E3/GCC), Amy Daniels. "Global Climate Change." *Greenhouse Gas Emissions Factsheet: Ukraine | Global Climate Change*, 1 Oct. 2016, www.climatelinks.org/resources/greenhouse-gas-emissions-factsheet-ukraine.

"WELCOME TO THE ADEC INNOVATIONS BLOG." *How Sweden Became the World's Most Sustainable Country: Top 5 Reasons*, info.esg.adec-innovations.com/blog/how-sweden-became-the-worlds-most-sustainable-country-top-5-reasons.

"China Sets 18% Carbon Intensity Reduction Target by 2020 « Carbon Pulse." *Carbon Pulse*, carbon-pulse.com/16618/.

(ICFAI), Prableen Bajpai CFA. "China's GDP Examined: A Service-Sector Surge."*Investopedia*, 31 Oct. 2014, www.investopedia.com/articles/investing/103114/chinas-gdp-examined-servicesector-surge.asp.

"U.S. Energy Information Administration - EIA - Independent Statistics and Analysis." *Carbon Intensity of Energy Use Is Lowest in U.S. Industrial and Electric Power Sectors - Today in Energy - U.S. Energy Information Administration (EIA)*, www.eia.gov/todayinenergy/detail.php?id=31012.

Watson, Caroline. "Green Travel: How NGOs Can Reduce Their Carbon Footprint." *The Guardian*, Guardian News and Media, 22 May 2014, www.theguardian.com/global-development-professionals-network/2014/may/22/green-travel-ngo-carboon-footprint.

"The Kyoto Protocol: Climate Change Success or Global Warming Failure?" *Circular Ecology*, www.circularecology.com/news/the-kyoto-protocol-climate-change-success-or-global-warming-failure.

"Kyoto Protocol Fast Facts." *CNN*, Cable News Network, 24 Mar. 2017, edition.cnn.com/2013/07/26/world/kyoto-protocol-fast-facts/index.html.

United Nations Framework Convention on Climate Change. *Kyoto Protocol*, 30 May 2013, unfccc.int/kyoto_protocol/items/2830.php.

Domonoske, Camila. "So What Exactly Is In The Paris Climate Accord?" *NPR*, NPR, 1 June 2017, www.npr.org/sections/thetwo-way/2017/06/01/531048986/so-what-exactly-is-in-the-paris-climate-accord.

"Georgia Institute of Technology." *Georgia Tech's Research Horizons Magazine*, 11 Oct. 2017, www.rh.gatech.edu/features/12-emerging-technologies-may-help-power-future.

"Our Global Goals." *WWF International*, wwf.panda.org/what_we_do/how_we_work/our_global_goals/index.cfm.

"Global Warming Effects on Drought." *Climate Hot Map*, www.climatehotmap.org/global-warming-effects/drought.html.

Clark, Duncan. "How Will Climate Change Affect Rainfall?" *The Guardian*, Guardian News and Media, 15 Dec. 2011, www.theguardian.com/environment/2011/dec/15/climate-change-rainfall.

"Global Warming : Feature Articles." *NASA*, NASA, earthobservatory.nasa.gov/Features/GlobalWarming/page6.php.

Klein, Christopher. "The Great Smog of 1952." *History.com*, A&E Television Networks, 6 Dec. 2012, www.history.com/news/the-killer-fog-that-blanketed-london-60-years-ago.

"Various Disadvantages of Fossil Fuels." *Conserve Energy Future*, 21 May 2017, www.conserve-energy-future.com/disadvantages_fossilfuels.php.

10YFP. *Sustainable Lifestyles and Education Programme*, staging.unep.org/10yfp/Programmes/ProgrammeConsultationandCurrentStatus/Sustainablelifestylesandeducation/tabid/106266/Default.aspx.

Wang, Ucilia. "The West Country Cheddar Maker Powered by Solar and Cow Dung." *The Guardian*, Guardian News and Media, 27 May 2016, www.theguardian.com/sustainable-business/2016/may/27/green-energy-industrial-scale-wyke-farms-cheddar.

"In-Depth." *UNDP in Ukraine*, www.ua.undp.org/content/ukraine/en/home/ourwork/environmentandenergy/in_depth/.

Vince, Gaia. "Future - China's Eco-Cities: Sustainable Urban Living in Tianjin." *BBC*, BBC, 3 May 2012, www.bbc.com/future/story/20120503-sustainable-cities-on-the-rise.

brandon_baker. "The 10 Most Inspirational Sustainability Initiatives in the U.S." *EcoWatch*, EcoWatch, 27 June 2016, www.ecowatch.com/the-10-most-inspirational-sustainability-initiatives-in-the-u-s-1881933006.html.