UNEARTHING THE ENVIROMENTAL IMPACT OF HUMAN ACTIVITY : A GLOBAL CO2 EMISSIONS ANALYSICS

1 INTRODUCTION

1.1 OVERVIEW

The increasing average atmospheric temperature has led to global warming, which drives a set of changes to the Earth's climate and weather systems. These swifT changes are happening as humans continue to emit heat-trapping greenhouse gases (GHG) to the atmosphere. Among these emissions, carbon dioxide (CO2) is the critical anthropogenic greenhouse gas due to its abundance and its ability to remain in the atmosphere for thousands of years.

Carbon Dioxide and other greenhouse gases are responsible for the warming of the planet by almost 1°C since the late 19th century.

The subject of greenhouse gases, their link to climate change, and sustainability initiatives have been in the news almost constantly over the last few years, and there has been a push to recognise climate change as a national and global emergency within Parliament.

In 2019, vans registered in the EU, Iceland, Norway, and the UK emitted an average of 158.4g of CO2 for every kilometre driven, according to the European Environment Agency. When you consider that each van in Great Britain travels an average of 13,000 miles — or approximately 20,921km — per year, this means each vehicle emits around 3.3 tonnes of CO2 every year. With 14.1 million vans on the UK's roads

CO2 emissions can be from natural and human sources. One of these sources originates from the urbanization process. Urbanization is a dynamic process that changes rural areas into urban areas with an increasing number of people and the expansion of the built environment horizontally and vertically. The built environment is the anthropogenic surroundings that provide infrastructure and facilities for human activities, and they are the fundamental components of the economy and social development of a nation. Thus, the acceleration of urbanization played a considerable role in rising CO2 emissions in the building sector.

In general, the building sector ranges from construction to operation, which can be further divided into residential and non-residential buildings. These include the processes of adding structures to areas of land and the operation, service, and maintenance of the building. With the building sector facing a resurgence in growth, a massive direct and indirect impact on the environment has been reported. It is considered as one of the significantly consuming and waste generating sectors of the economy . The environmental impact of this sector can be categorized into ecosystem impacts, natural resource impacts, and public impacts . This sector is also responsible for significant energy consumption and emission production, such as GHG emissions,

particulate matter, sulfur dioxide, carbon monoxide, and nitrogen oxide . As a result of the energy consumption from this sector, the ambient CO2 level has increased, which generates

enormous proportions of CO2 emissions . Sources of CO2 emissions in this sector can be from the energy utilization required for the manufacturing and transportation of the building materials to the processing of resources, construction waste disposal, and the demands of construction equipment .

1.2 PURPOSE

Survival used to mean repopulating. That, however, is quickly becoming true for the opposite as we reach the maximum carrying capacity that our planet can sustain, so some experts claim. Overpopulation has become an epidemic since mortality rates have decreased,

medicine has improved, and industrial farming methods were introduced, thus

Keeping humans alive for much longer and increasing the total population.

Another issue is our dependency on coal and fossil fuels for energy; the larger the population,the more fossil fuels will be used. Using fossil fuels (such as oil and coal) results in copiousamounts of carbon dioxide in the air- threatening the extinction of thousands of species, which adds to the effect that forest depletion already has.

The effects of overpopulation are thought to be severe, with one of the most powerful being the degradation of the **environment**. Humans require lots of space, whether for farmland or industries, which also takes up tons of space. An increased population results in more clear-cutting, resulting in severely damaged ecosystems. Without enough trees to filter the air, CO_2 levels increase, potentially damaging every single organism on Earth.

Humanity continuously requires more space, which devastates ecosystems and increases CO_2 levels, further devastating the delicate **environment**.

4 ADVANTAGES

Reducing Greenhouse Gas Emissions

Reducing global greenhouse gas emissions to slow climate change could prevent millions of premature deaths due to air pollution over the next century, strengthens the case for mitigating global greenhouse gas emissions by highlighting additional benefits to air quality and human health. The study is the first use of a global model and realistic future scenarios to estimate benefits for air quality and human health.

Exposure to outdoor air pollution has been linked to heart and respiratory diseases and was recently classified as a human carcinogen by the International Agency for Research on Cancer. Because air pollution and greenhouse gases are often released from the same sources, cutting greenhouse gas emissions in an effort to slow climate change also reduces air pollutants, such as fine particulate matter (PM2.5). Reducing these co-emitted air pollutants improves air quality and benefits human health.

Crucial to reduce greenhouse gas emissions

1. Clearer Air & Skies – reducing our carbon emissions helps reverse the impact of global warming overall, but more specifically, benefits the overall air quality. Plus, it makes for clearer Skies.
2. Save Money – the simple reduction of energy shrinks your carbon footprint and operating expenses.
3. Healthier Water Supply – Greenhouse gas emissions raise air temperatures, directly impacting the oxygen concentration in rainwater and contributing to lower rainfall levels.
4. Overall Health - With healthier air, water, and food, we can significantly reduce many climate-related health issues seen today.

Reducing Greenhouse Gas Emissions - Impacts on the World

Consciously reducing the emission of greenhouse gases during standard business processes impacts our global environment in multiple ways, including:

1) Air Quality

As temperatures rise and emissions increase both in volume and density, the Paris Agreement notes air quality is certain to worsen. With the degradation of air quality comes decreased accessibility of outdoor spaces, consequential damage to clean land and water, and we will be facing unprecedented challenges in trying to continue with personal and professional routines that have become our norm. With greenhouse gas emission reduction, air quality will improve and result in an across-the-board increase in the health of our entire planet – from our bodies of water to our own internal bodily systems.

2) Economic Growth

In conjunction with the improvement of public health, the global economy will also benefit from a cleaner environment through a reduction in GHG emissions. Clean, green energy is more appealing from an economic standpoint than ever before, with a 19-44% difference in price between new natural gas generation as opposed to new coal generation in the US. The reduction of electrical use within homes and businesses, longer-lasting electric and fuel-vehicles and reduced waste from natural gas are only a few of the factors that will push the economy towards more tangible success than it has seen in recent years. Corporations will see significant ROI on investment into clean energy, and with more time and funding to dedicate towards product development and improvement, as well as increased organizational credibility through openness with stakeholders around their sustainability efforts, both sales and consumer satisfaction will rise.

3) Slowed Climate Change

Finally, and arguably the most impactful aspect of greenhouse gas emission reduction is the overall slowed climate change and environmentally beneficial practices that will be implemented. Climate change is the central cause of increased droughts, sea-level rise, drastic weather events, such as forest fires, and all the subsequent devastating effects of these events on humanity and our development in every sense. Reducing GHG emissions is the number one key to working towards a cleaner, greener, safer, and healthier society around the globe.In addition to these tangible global, large-scale benefits, organizations can also benefit from the positive impacts of greenhouse gas emission reduction. The biggest benefits of effective emission management include:

4) Cost Savings

When it comes to cost savings, the simple reduction of energy usage both shrinks your organizational carbon footprint and your operating expenses themselves. In 2016, Energy Star released a report – when Intelligent Energy Optimizers LLC (IEO) supplied LED lighting to replace the existing fluorescents and HIDs at Kimberly–, Clark Berkley Mill, an investment of $350,000 by the owner resulted in annual savings of $160,000 with full ROI in just over one and a half years.

5) Improved External Relations

The spending power of consumer populations holds immense sway in the process of influencing organizational action. The process of commitment to accountability in the arenas of broader sustainability as well as greenhouse gas emission reduction is a huge credibility boost in the eyes of the public. When your organization takes direct actions towards reducing carbon dioxide and greenhouse gas output, the causal increase in quality and depth of relationships with potential partners and external business connections is invaluable.

6) Improved Stakeholder Relations

Alongside the deepened relationship with the public, the impact of transparent sustainability metrics and performance holds immense potential to deepen invaluable relationships with stakeholders. More investors than ever before are diverting capital away from carbon-heavy, secretive companies, and turning towards those who chose to be open, proactive, and honest with their management of greenhouse gas emissions within the sustainability world, and beyond.

7) Regulatory Compliance

With a 20-fold increase in the amount of global climate change laws since 1997, ensuring proactive regulatory compliance is more prevalent in the minds of organizational leadership, public spheres, and stakeholders than ever before – and it's only rising in importance. Implementing an effective greenhouse gas emission reduction strategy, as well as documenting and reporting on progress in that area, is a vital action for organizations to take in order to continue operations and reduce fines.

Ways to Reduce Greenhouse Gas Emissions

When it comes to the act of actually reducing these GHG emissions, there are several paths you can take – and the more angles you approach while working to solve the issue of effective greenhouse gas emission reduction, the more effective your final efforts will be.

- Cut initial consumption of energy
- Replace fossil fuels with cleaner, greener alternatives
- Work towards higher energy efficiency rates
- Purchase carbon offsets

Cut Consumption

Simply trying to decrease the amount of energy and supplies your organization is using during its daily operations can have a huge impact on the effectiveness of greenhouse gas emission reduction programs.

Clean Fuel Alternatives

With electric vehicles, innovations in solar energy, and countless more options available within the scope of moving away from fossil fuels and coal as primary sources of energy – as well as huge subsequent benefits when it comes to ROI and environmental protection – there's really no downside to working towards using only clean fuel.

Energy Efficiency

When the reduction of operating costs, as well as emission reduction, hinges on the simple act of investing in more energy-efficient equipment, the decision is simple. Committing to the installation of more energy-efficient systems throughout a company's functioning areas, whether retail, production, warehouse or something entirely different, is the way to go.

Carbon Offsets

A carbon offset is a reduction in emissions of greenhouse gases made in order to compensate for emissions made by your company. The money used to purchase these offsets is used to finance projects – forest preservation, energy efficiency efforts, and landfill methane capture – that would not have been built without that investment and funding. Read more about carbon offsets and how to purchase them.With these strategies under your belt, supporting the environment we live in as well as pushing towards the next level of excellence within your organization is more accessible than

ever before. Don’t let the opportunity pass you by – invest in energy-efficiency and sustainability efforts for your business and join the march towards universal greenhouse gas emission reduction today.

DISADVANTAGES

Air pollutants are substances that adversely affect the environment by interfering with the physiology of plants, animal species, and entire ecosystems, with human property in the form of agricultural crops or man-made structures, and with climate. As global climate change has been considered among the key environmental challenges faced by humanity, certain climate forcing agents that otherwise cause no harm to living ecosystems—most importantly carbon dioxide—have been re-classified as air pollutants, along with such compounds as oxides of nitrogen or sulfur. On the other hand, climate research has linked certain compounds long recognized as air pollutants (for instance black carbon) to the warming of climate, thus providing one more reason for their control.Air pollutants canoriginate from natural or anthropogenic (man-made) sources, or both. Examples of natural sources of pollution include volcanic eruptions or wind erosion. Emissions from internal combustion engines are an exemplary source of anthropogenic pollution. Some sources of pollution, such as forest fires, can be related to both natural phenomena and human activities.Atmospheric reactions can transform primary pollutants into different chemical species. These reactions can produce both harmless compounds and secondary air pollutants that may be more harmful than their precursors.

Criteria Air Pollutants.

Governments and international organizations have been taking action to protect the quality of air, as well as—in more recent years—to control emissions of climate forcing agents. Ambient air quality standards and guidelines, issued by environmental protection authorities, are instrumental in achieving air quality objectives.

An example of such legislation is the US National Ambient Air Quality Standards (NAAQS) program by the Environmental Protection Agency (EPA). The NAAQS address both

human health (primary standard) and public welfare (secondary standard) concerns. Primary standards protect sensitive members of the human population from adverse health effects of criteria air pollutants. Secondary standards protect the public welfare from any known or anticipated adverse effects associated with the presence of a pollutant in the ambient air. Welfare effects include effects on soils, water, crops, vegetation, manmade materials, animals, wildlife, weather, visibility, climate, damage to and deterioration of property, hazards to transportation, as well as effects on economic values and personal comfort and well-being.

Under the US Clean Air Act of 1990, the NAAQS standards set maximum ambient concentration limits for six criteria pollutants including:

i. Ozone, O3
ii. Carbon monoxide, CO
iii. Nitrogen dioxide, NO2
iv. Lead, Pb
v. Particulate matter below 10 μm, PM10
vi. Oxides of sulfur, SOx

Hurricanes and fires

And of course, the larger-scale planetary changes caused by accumulating atmospheric CO2 are also expected to affect human health. As CO2 warms the planet, ice sheets are melting and seas are expanding, making cities more vulnerable to storms.

Higher temperatures are expected to lead to more intense storms with more rainfall, and as the past year demonstrated, that can have a huge effect on people. Last summer, the Caribbean and US Gulf Coast were hit by devastatingly strong hurricanes, one of which dumped an unprecedented amount of rain on Houston. Flooding caused by heavy monsoons in South Asia killed 1,200 people.

Wildfires are also getting worse as CO2 concentrations increase - something experts link to warmer temperatures. Thousands of buildings were razed by record-breaking wildfires in California last year. The amount of land burned in the US since 1984 is double what would

have been expected without the effects of climate change in that period, according to one study. And the average wildfire season in the west now lasts at least two and a half months longerthan it did in the early 1970s, according to WXshift, a project of Climate Central.

Decomposition and Respiration

Respiration and decomposition are naturally occurring processes involving the exchange

of carbon dioxide and oxygen between animals' blood and the environment. Respiration

occurs at a cellular level, with carbon dioxide released into the atmosphere by animals

and plants.

Every living cell must respire to produce the energy needed for survival, in a process commonly known as cellular respiration. This process creates the much-needed energy for organisms' growth by combining atmospheric oxygen with glucose. However, when glucose and CO2 are brought together, they form energy and carbon. That translates into more carbon

dioxide concentration in the air.

Respiration is also the same process by which organic organisms decompose. This

process results in both the release of water and carbon dioxide in the air. That's because

the decomposing bacteria breaks down both plants and other living organisms to release

Co2 in the atmosphere, where it's available to green plants for photosynthesis.

Weathering of Carbonate Rocks

With geologic time, limestone becomes exposed to the atmosphere because of rain. That's because carbonic acid is formed when CO2 dissolves in water. It dissolves carbonate rocks and ads more carbon dioxide into the atmosphere.

Burning Of Forests And Fossils Fuels

Human activities like deforestation, burning coal, gasoline, and gas contribute to at least 87% of the CO2 gas released into the air. During the combustion process, the carbon present in fossil fuel combines atmospheric oxygen to produce water and carbon dioxide. That's because the naturally occurring hydrocarbon fuels release water and Co2 when burning.

Besides releasing more carbon dioxide into the atmosphere by burning coal and trees, deforestation affects the Co2 levels in the atmosphere in more profound ways. That's because trees consume atmospheric carbon dioxide levels through photosynthesis. That means the fewer the trees, the more carbon dioxide is left lingering in the atmosphere.

Carbon Dioxide Intensive Industries

According to the United States Environmental Protection Agency (EPA), carbon dioxide is the most significant greenhouse gas emitted through fossil fuel usage and the humans' impact on forestry. Studies show that human activities contribute to as much as 110.5 million tons of atmospheric CO2 daily. NASA has also noted that human industrial activities have increased atmospheric CO2 levels from 280 to 400 parts per million over the last one and a half centuries.

While many countries acknowledge that climate change is a major issue, most are still struggling to reduce their carbon emissions even after signing the 2016 Paris Agreement. That's all because of these top five carbon-intensive industries.

Energy Production

Burning fossil fuel to produce energy is the biggest source of Co2 emissions in the atmosphere. According to UNEP (United National Environment Programme), fossil fuels account for three-quarters of human CO2 emissions. However, the energy created from burning fossil fuels is essential for the production of heat, electricity, and power used in manufacturing, construction, homes, and offices.

The main type of fossil fuel involved in energy production includes oil, coal and natural gas. These fossil fuels account for 20%, 43%, and 36% of carbon emissions respectively. In 2017, China experienced an expected surge of carbon emissions because coal-burning after a drought drained most of their rivers and affected their hydropower generation.

Forestry, Agriculture and Other Use of Land

Deforestation, agriculture, livestock rearing, and conversion of forest land contribute to major carbon emissions. However, their impact on carbon emission levels is two-fold. For instance, clearing forests to convert them into agricultural land reduces the number of trees that can significantly reduce the atmosphere's carbon dioxide. Additionally, animal agriculture releases carbon dioxide and other gasses into the air.

Transport

The transportation sector is another major culprit of carbon emission in the atmosphere. According to a 2010 report, transporting people and goods produces about 22% of carbon emissions by burning fossil fuel. That's because this sector is energy-intensive and uses petroleum-based fuels like diesel, gasoline, and Kerosene. That explains why transport-related carbon emissions have increased rapidly since the 1990s, growing by 45% over the last two decades.

Road transport accounts for about 72% of the carbon dioxide emissions related to the transport industry, with significant emitters being freight, automobiles, and light-duty trucks. Besides road vehicles, global aviation and marine shipping also contribute to carbon dioxide emissions in the atmosphere. Marine shipping contributes to 14% of carbon dioxide emissions from transport, while global aviation produces about 11%.

Industrial Sector

Industrial processes contribute to about 20% of Co2 emissions related to fossil fuel. These processes include construction, agriculture, mining, lithium extraction, agriculture, and manufacturing. However, manufacturing is the most significant contributor among the four.

How Carbon Dioxide Emissions Affect Our Planet

While Co2 exposure has several benefits to plants and human life, too much carbon dioxide can affect your health negatively. That includes dizziness, headaches, restlessness, difficulty breathing, tiredness, convulsion, elevate

blood pressure, and increased heart rate. An increase in the atmospheric carbon dioxide levels can also result in more devastating effects to the environment, including:

Climate Change

The more Co2 is trapped in the atmosphere, the more heat will be trapped in the environment. That contributes to the rise in global temperatures and influences climate change. That results in extreme weather events like wildfires, tropical storms, heat waves, and severe drought, negatively affecting crop production and disrupting the animals' natural habits.

Cause respiratory diseases to humans

Carbon emissions affect human life directly by causing more respiratory complications due to the increase in air pollution. Even worse, carbon emissions kill some animal species and destroy food, which highly affects humans.

5 APPLICATIONS

Multi-Industry Uses for Carbon Dioxide (CO_2):

Carbon dioxide in solid and in liquid form is used for refrigeration and cooling. It is used as an

inert gas in chemical processes, in the storage of carbon powder and in fire extinguishers.

Metals Industry:

Carbon dioxide is used in the manufacture of casting molds to enhance their hardness.

Manufacturing and Construction Uses:

Carbon dioxide is used on a large scale as a shield gas in MIG/MAG welding, where the gas protects the weld puddle against oxidation by the surrounding air. A mixture of argon and carbon dioxide is commonly used today to achieve a higher welding rate and reduce the need for post weld treatment.

Dry ice pellets are used to replace sandblasting when removing paint from surfaces. It aids in reducing the cost of disposal and cleanup.

Chemicals, Pharmaceuticals and Petroleum Industry Uses:

Large quantities are used as a raw material in the chemical process industry, especially for methanol and urea production.

Carbon dioxide is used in oil wells for oil extraction and to maintain pressure within a formation.. When CO_2 is pumped into an oil well, it is partially dissolved into the oil, rendering it less viscous, allowing the oil to be extracted more easily from the bedrock. Considerably more oil can be extracted from through this process.

Rubber and Plastics Industry Uses:

Flash is removed from rubber objects by tumbling them with crushed dry ice in a rotating drum.

Food and Beverages Uses for Carbon Dioxide:

Liquid or solid carbon dioxide is used for quick freezing, surface freezing, chilling and refrigeration in the transport of foods. In cryogenic tunnel and spiral freezers, high pressure liquid CO_2 is injected through nozzles that convert it to a mixture of CO_2 gas and dry ice "snow" that covers the surface of the food product. As it sublimates (goes directly from solid to gas

states) refrigeration is transferred to the product.

Carbon dioxide gas is used to carbonate soft drinks, beers and wine and to prevent fungal and

bacterial growth.

Liquid carbon dioxide is a good solvent for many organic compounds. It is used to

de-caffeinate coffee.

It is used as an inert “blanket”, as a product-dispensing propellant and an extraction agent. It can also be used to displace air during canning.

Supercritical CO_2 extraction coupled with a fractional separation technique is used by producers of flavors and fragrances to separate and purify volatile flavor and fragrances concentrates.

Cold sterilization can be carried out with a mixture of 90% carbon dioxide and 10% ethylene oxide, the carbon dioxide has a stabilizing effect on the ethylene oxide and reduces the risk of explosion.

6 Conclusion

It is clear from the material presented in this report that the modern rise in the air's CO_2 content is providing a tremendous economic benefit to global crop production. As Sylvan Wittwer, the father of agricultural research on this topic, so eloquently put it nearly two decades ago:

"The rising level of atmospheric CO_2 could be the one global natural resource that is progressively increasing food production and total biological output, in a world of otherwise diminishing natural resources of land, water, energy, minerals, and fertilizer. It is a means of inadvertently increasing the productivity of farming systems and other photosynthetically active

ecosystems. The effects know no boundaries and both developing and developed countries are,

and will be, sharing equally," for "the rising level of atmospheric CO_2 is a universally free premium, gaining in magnitude with time, on which we all can reckon for the foreseeable future" (Wittwer, 1995).

The relationship described above by Wittwer is illustrated below in Figure 8, where data pertaining to atmospheric CO_2 emissions, food production, and human population are plotted. Standardized to a value of unity in 1961, each of these datasets has experienced rapid and interlinked growth over the past five decades. Rising global population has led to rising CO_2 emissions and rising CO_2 emissions have benefited food production.

7 Future scope

The UK power generation sector contains opportunities for the commercial deployment of a wide range of CCS technologies. The scenarios shown in Table 1 include an option in which significant coal generation capability is retained. This would probably involve some existing power plants being upgraded from sub-critical to supercritical steam conditions and having postcombustion CO2 'scrubbers' added. It is also likely, however, that some new Integrated Gasifier Combined Cycle (IGCC) plants, with the carbon monoxide in the gas shifted to hydrogen and carbon dioxide for capture, would also be built – several such schemes are already being planned. In the longer term, further existing coal power plants may be upgraded to oxyfuel operation or be repowered with gasifiers. Natural gas combined cycle (NGCC) plant may also have CO2 capture fitted. In the first instance this would probably be post-combustion capture technology. This is likely to offer relatively low-cost CO2 capture so long as gas prices remain low, particularly for new NGCC plant that is designed for capture from the outset. The last column in Table 1 shows this option - the amount of NGCC plant capacity with capture corresponds approximately to new plant that would need to be built between now and 2020 to meet demand in a high-gas scenario. In any case it is important that all new UK power plant is built to be 'capture ready', even if capture equipment is not installed when it is built. Depending on future natural gas supply conditions, some existing NGCC plant may be modified to operat