

Article

Carbon Footprint: CO₂ Emission In Industry

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How to cite this article:

Ashwita K, Aditi R. Carbon Footprint: CO₂ Emission In Industry. *J Adv Res Nanosci Nanotech* 2020; 2(1): 21-24.

Date of Submission: 2020-05-12

Date of Acceptance: 2020-05-20

A B S T R A C T

Carbon footprint has become an effective approach for evaluating carbon emission, aiming at tracking down total carbon emission across the life cycle to provide scientific bases for carbon lessening. This paper presents the research progress in carbon footprint analysis based on a comprehensive literature review, summarizing definitions, computational methods and application case histories of carbon footprint. As for computational methods, process analytic method and input-output analysis approach are highlighted. Case histories in this paper report the application of footprint analysis with respect to different scales and industrial sectors/infrastructure departments. Prospects for research trends in the area of carbon footprint are discussed as well. Climate change is unique of the greatest persistent encounters in the biosphere. Human emissions of greenhouse gases carbon dioxide (CO₂), nitrous oxide, methane, and others have augmented global temperatures by around 1 meanwhile pre-industrial time.

Keywords: Carbon Footprint, CO₂ Emission, Greenhouse Gas

Introduction

A carbon footprint is positive as the total greenhouse gas (GHG) emissions fashioned by a separate, organization, spoken as carbon dioxide equivalent. Greenhouse gases, counting the carbon- comprising gases carbon-dioxide and methane, can be fashioned finished the burning of fossil fuels, land clearance and the production and consumption of food, artificial goods, resources, buildings, conversion and other services.¹ Industrial emissions present a serious threat to natural ecosystems and human kind both at global and local levels.

Sub-Arctic regions beforehand measured to be one of the main unspoiled ecosystems in the world and are currently endangered to snowballing pressure from mining and producing activities in various regions. The raw materials industry has, underwritten to conservational damage and worsening.

In confident cities and states, it is the business carbon emissions and vehicle depletes that taken generate a havoc

somewhat than internal systems that make the extreme involvement to atmospheric pollution.²

Aim/ Objective

The impartial of this broadside is:

The term Carbon Footprint develops clear when you examine the binary confrontations "Carbon" and "Footprint". Carbon mentions to an extensive variety of greenhouse gases synonymous with global warming. Footprint on the supplementary hand is a universal situation to total impact produced by something. From this, we can decipher that Carbon Footprint refers to an approximation of the full influence of somewhat on climate change. We find this meaning by Cambridge Dictionary: A carbon footprint is a dimension of the amount of carbon dioxide that their happenings yield.

With growing apprehension about environmental protection all over the globe, carbon emission has developed an significant factor for global contractor assessment.³ Utmost of the preceding models take individual absorbed on

cost, quality, geographical position, cost-effective risk, etc., queries but not planned sufficient position to carbon emission for global supplier. Uncommon educations and definition have addressed sustainability but not prospered to compute carbon footprint that has been mounting day by day. This paper enumerates the carbon footprint that is used as detached meaning in multi-determinations. As a contribution in emission, different carbon management factors and outsourcing carbon cap are familiarized in the model. In multi-objective formulation, total cost, quality rejection, late elated item, carbon footprint, and total value of procuring (TVP) are ingenious as five determinations that have to be improved concurrently. Compassion examination is showed for the model.

Literature Review

Carbon emission investigation was introduced in 1981 with the first periodical focusing on volatile organic carbon emissions of cooling tower water. Subsequently several researchers travelled the domain deprived of important influences until the Kyoto protocol was signed in 1997. Though, carbon Sustainability 2019, 11, of 24 emission research converted a trending topic after 2007, consequential in a momentous increase in research publications. With the rising global temperatures, climate change has become a major global apprehension which is also measured as the most thoughtful subject global community has to address in the 21st century.

Investigation on global carbon emissions has significantly augmented after determining carbon emissions as the main reason of climate change. Snowballing carbon emissions have caused momentous concern between the countries such as China, United States, Russia, India, European Union, and Japan as the leading carbon emitters of the world. Carbon emission research increases over numerous investigation areas which contain ecological sciences, engineering, finances, energy, etc. Finances, energy fuels, ecology, and civil engineering are certain of the other prominent investigation areas which have been affected by carbon emission investigation.

A chief motive for carbon emission investigation to increase into the above-mentioned research areas is the goal of maintainable entactment which has turn out to be gradually prevalent among the worldwide community due to low carbon emission society perception Units.

Carbon Footprint Calculator

There are numerous carbon control values out there, but 99% of corporations will end up selecting the GHG Protocol. The Greenhouse Gas Protocol (GHG Protocol) is the utmost comprehensively castoff international secretarial tool for management and business privileged to follow, enumerate, and manage greenhouse gas emissions. The

GHG Protocol, a decade-long company amid the World Resources Institute and the World Business Council for Sustainable Enhancement World Business Council for Sustainable Enhancement, is remunerated with productions, supervisions, and conservational groups round the world to build a new compeers of credible and operative programs for beginning climate change.⁴

A carbon footprint is restrained in tons of carbon dioxide corresponding (CO_2e). The carbon dioxide corresponding (CO_2e) permits the different greenhouse gases to be associated on a like-for-like basis relative to one unit of CO_2 . CO_2e is designed by growing the emanations of both of the six greenhouse smokes by its 100 year global warming potential (GWP).

A carbon footprint contemplates all six of the Kyoto protocol Greenhouse gas: Carbon dioxide, Methane, Nitrous oxide, Hydro fluorocarbons, Perfluoro carbon and sulphur hexa-fluoride.⁵

Result and Discussion

The greatest influential industrilazed climate actions are: refrigerant management (90 billion tonnes of CO_2e 2017-2050, meanwhile refrigerants consume thousands of times the warming potential of CO_2); ground-based wind turbines for electricity (85 billion); reduced food waste (71 billion); and regenerating tropical forests by deduction usage of the land for other willpowers (61 billion). They compute welfares cumulatively to 2050, rather than per annum, since industrial actions have extended lead times.⁶

A products or company's carbon footprint can be pretentious by frequent as well as the following factors, but not unfinished to:

- Energy sources
- Offsite electricity generation
- Ingredients

These influences can also alteration with dissimilar industries. Though, here insufficient periods that can be taken to decrease carbon footprint on a large scale.

In 2016, the EIA reported that electricity is responsible for roughly 37% of Carbon Dioxide emissions, making it a potential target for reductions. Possibly the cheapest way to do this is through energy efficiency enactments. The ACEEE reported that energy efficiency has the potential to save over 800 billion kWh per year, based on 2015 data. Some options to increase energy competence are:

- Waste heat recovery system
- Protection for huge constructions and burning chambers
- Knowledge promotions, i.e. different light sources, lower ingesting machines

Carbon Footprints from energy depletion can be condensed from the enactment of a substitute energy enlargements,

such as solar and wind energy, which are renewable resources and which is used readily.

Replanting, the refilling of current forests or woodlands is an instance of Carbon Offsetting, the countering of carbon dioxide emissions with a corresponding reduction of carbon dioxide in the atmosphere. Carbon counterbalancing can reduce a company's inclusive carbon footprint by offering a carbon credit.

A life cycle or supply chain carbon footprint can deliver valuable data which will assistance the industrilazed to recognize precise and dangerous areas for enactment in each region. By manipulative or prediction of a carbon footprint high releases areas can be recognized and phases can be taken to decrease in those expanses.

TIAC can also be combined with Thermal Energy Storage (TES). Thermal energy storage is a technology that allows facilities to shift the power for the chillers to off-peak hours when the power is at the lowest value and least in mandate. This incomes that more power will be available during on-peak hours, leading to improved monetary presentation for the facility. When TIAC and TES combine, the system is mentioned to as TESTIAC. Turbine Inlet Air Cooling (TIAC) has had a wonderful effect in the electricity generation sector, precisely in gas turbines. While the main purposes of the knowledge is to augment power, it does diminish carbon footprint. TIAC diminishes the amount of fuel used by the power plant, consequently plummeting the quantity of GHGs and pollutants unconfined to the atmosphere. The greatest ill- famed GHGs are carbon dioxide, methane and surface level ozone.

Figures and Tables

The industrialized sector is fashionable of the third main source of man-made carbon dioxide emissions. This subdivision shaped 20% of fossil fuel related carbon dioxide emissions in 2015. The industrial sector involves of industrialized, construction, mining, and agriculture. Industrialized is fourth prevalent and can be broken down into five categories: paper, food, petroleum, chemicals and metal/mineral products. All These categories account for majority of the fossil fuel use and CO₂ emissions by this sector.

Production and industrial developments are one of the majorly yield large expanses of each type of greenhouse gas but specifically large amounts of CO₂. This is since many industrialized sector uses fossil fuels to create heat and steam needed at various stages of production. For example the cement industry, have to heat up limestone to 1360°C to turn it into cement, it is done by burning fossil fuels to create the required heat.⁷

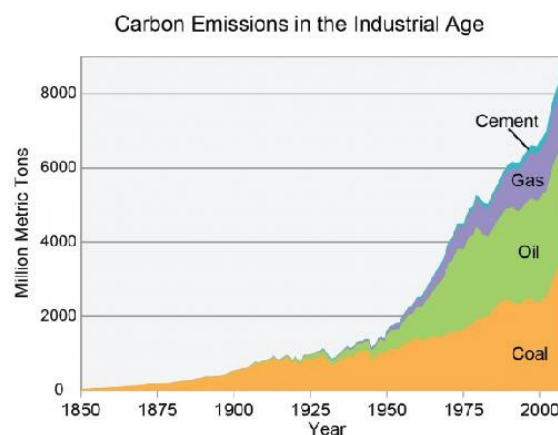


Figure 1. Carbon Emission in industry till 2000⁷

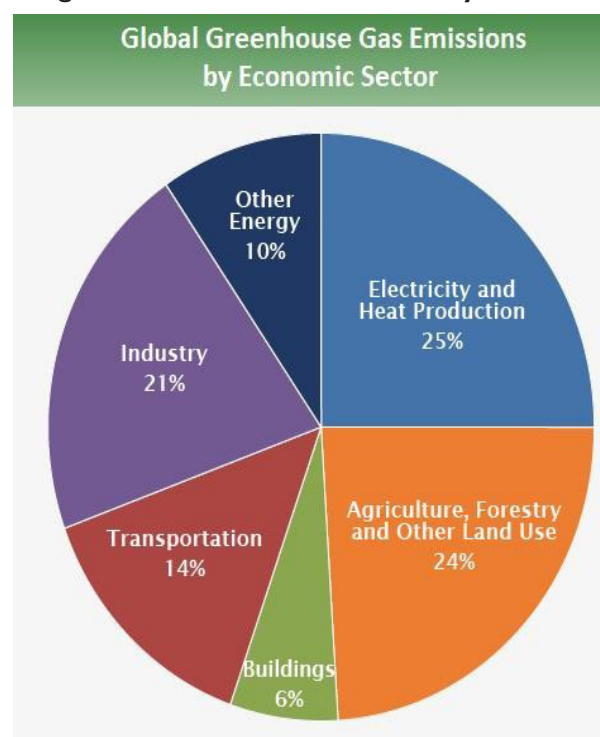


Figure 1. Carbon Emission in industry till 2000⁷

Conclusion

If the engineering makes an effort to comprehend, compute and shrink carbon footprint, will no doubt be interested to take additional climate action. Also realize that individual emission decreases are only part of the bigger picture. The scale of emissions discounts obligatory globally require that governments, companies and other organizations must play their part in as long as climate solutions.

Secondary government action and driving business origination. With the right knowledge and inspiration one will be able to inspire climate action that has an effect far beyond your own footprint.

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