Reducing Carbon Emission from Various Industries using Artificial Intellignce

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Abstract— *Basically the aim of the title is Reducing carbon emissions from various industries using Artificial intelligence. General ways where carbon are emitted from the different industries like refrigeration industries, automobile industries, food industries and cafeteria, thermal power plant, electric power plant, textile industries, manufacturing industries, construction sector (cement industries). This emissions may be direct or indirect. We have discussed about the various ways of carbon emission in different kinds of industries, ways of reducing carbon emission, measuring carbon footprints, technologies used in the industries to reduce carbon emission their advantages and disadvantages. Effect of carbon emission in the atmosphere and climate change. Finally we have found some new ways and technology to reduce carbon emission in automobile sector, food industries/restaurants.*

Keywords— Carbon Emission, Carbon footprint, Artificial Intelligence, climate change, GHG Emission, Economic growth, Energy consumption, Carbon dioxide emission, Management.

I. INTRODUCTION

1.1 Carbon Footprints

A carbon footprint is the total greenhouse gas (GHG)emissions caused by an individual, event, organization, service, place or product, expressed as carbon dioxide equivalent. Greenhouse gases, including the carbon-containing gases carbon dioxide and methane, can be emitted through the burning of fossil fuels, land clearance and the production and consumption of food, manufactured goods, materials, wood, roads, buildings, transportation and other services.[2] The term was popularized by a $250 million advertising campaign by the oil and gas company BP in an attempt to move public attention away from restricting the activities of fossil fuel companies and onto individual responsibility for solving climate change.

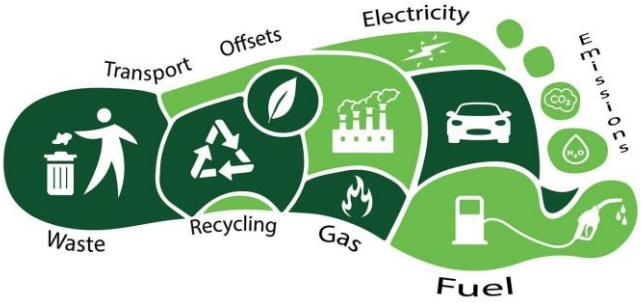

FIGURE 1: Carbon Footprints

In most cases, the total carbon footprint cannot be calculated exactly because of inadequate knowledge of and data about the complex interactions between contributing processes, including the influence of natural processes that store or release carbon dioxide. For this reason, Wright, Kemp, and Williams proposed the following definition of a carbon footprint: A measure of the total amount of carbon dioxide (CO2) and methane (CH4) emissions of a defined population, system or activity, considering all relevant sources, sinks and storage within the spatial and temporal boundary of the population, system or activity of interest.

Calculated as carbon dioxide equivalent using the relevant 100-year global warming potential (GWP100). CARBON STRATEGY Carbon strategy is a term that refers to a systematic plan of action for managing carbon consumption and emissions related to food manufacturing and distribution activities. The impetus for carbon management strategy is rooted in several driving forces (Holcomb, 2010; Park, 2010):

1. Global climate change issues
2. Stakeholder and investor demand
3. Environmentally and socially conscious consumers
4. Government regulations and policies
5. Return on investment

II. MEASURING CARBON FOOTPRINTS

Calculating the carbon footprint of industry, product, or service is a complex task. One tool industry uses Life-cycle assessment (LCA), where carbon footprint may be one of many factors taken into consideration when assessing a product or service. The International Organization for Standardization has a

standard called ISO 14040:2006 that has the framework for conducting an LCA study .ISO 14060 family of standards provides further sophisticated tools for quantifying, monitoring, reporting and validating or verifying of GHG emissions and removals.[29] Another method is through the Greenhouse Gas Protocol ,a set of standards for tracking greenhouse gas emissions (GHG) across scope 1, 2 and 3 emissions within the value chain.

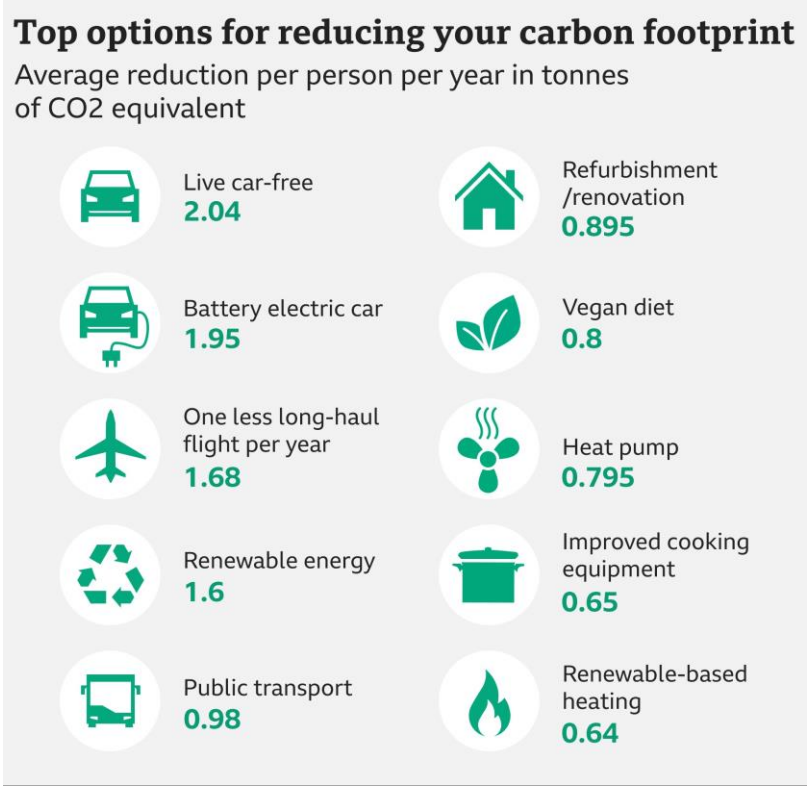

FIGURE 2: Process to measure Carbon Footprint

Predicting the carbon footprint of a process is also possible through estimations using the above standards. By using Emission intensities/Carbon intensities and the estimated annual use of fuel, chemical, or other inputs, the carbon footprint can be determined while a process is being planned/designed.

III. VARIOUS WAYS OF CARBON EMISSIONS

There are two ways of Carbon Emissions-

I) Direct Carbon Emission

II) Indirect Carbon Emissions

3.1 Direct Carbon Emissions

Direct or 'scope 1' carbon emissions come from sources that are directly from the site that is producing a product or delivering a service. An example for industry would be the emissions related to burning a fuel on site. On the individual level, emissions from personal vehicles or gas burning stoves would fall under scope 1. Indirect Carbon Emissions Indirect carbon emissions are emissions from sources upstream or downstream from the process being studied, also known as scope 2 or scope 3 emissions. Examples of upstream, indirect carbon emissions may include:

- Transportation of materials/fuels
- Any energy used outside of the production facility
- Wastes produced outside of the production facility

Examples of downstream, indirect carbon emissions may include:

- Any end-of-life process or treatments
- Product and waste transportation
- Emissions associated with selling the product.

3.2 Indirect Carbon Emissions

Scope 2 emissions are the other indirect related to purchased electricity, heat, and/or steam used on site. Scope 3 emissions are all other indirect emissions derived from the activities of an organisation but from sources which they do not own or control. Role of Artificial Intelligence (AI) in reducing Carbon Emissions in Various Industries. The great strength of AI lies in its ability to learn by experience, collecting massive amounts of data from its environment, intuiting connections that humans fail to notice, and recommending appropriate actions on the basis of its conclusions. Companies looking to reduce their carbon footprint should turn the AI spotlight on all three components of the effort:

3.3 Monitoring Emissions

Companies can use AI-powered data engineering to automatically track emissions throughout their carbon footprint. They can arrange to collect data from operations, from activities such as corporate travel and IT equipment, and from every part of the value chain, including materials and components suppliers, transporters, and even downstream users of their products. AI can exploit data from new sources such as satellites. And by layering intelligence onto the data, AI can generate approximations of missing data and estimate the level of certainty of the results. Predicting Emissions. Predictive AI can forecast future emissions across a company's carbon footprint, in relation to current reduction efforts, new carbon reduction methodologies, and future demand. As a result, they can set, adjust, and achieve reduction targets more accurately. Reducing Emissions. By providing detailed insight into every aspect of the value chain, prescriptive AI and optimization can improve efficiency in production, transportation, and elsewhere, thereby reducing carbon emissions and cutting costs. Carbon Emission from Automobile Sector

There is both way of Carbon Emission in Automobile sector.ie-Direct & Indirect Carbon Emissions.

Direct Carbon Emission- Exhaust gases are removed from exhaust pipes. CO2 emissions per passenger-kilometre (pkm) for all road travel for 2011 in Europe as provided by the European Environment Agency *109 g/kmCO2 For vehicles, average figures for CO2 emissions per kilometer for road travel for 2013 in Europe, normalized to the NEDC test cycle, are provided by the International Council on Clean Transportation:

- Newly registered passenger cars: 127 gCO2/km
- *Hybrid-electric vehicles: 92 gCO2/km
- *Light commercial vehicles (LCV): 175 gCO2/km Average figures for the United States are provided by the US Environmental Protection Agency, based on the EPA Federal Test Procedure, for the following categories:
- Passenger cars: 200 gCO2/km (322 g/mi)
- Trucks: 280 gCO2/km (450 g/mi)
- Combined: 229 gCO2/km (369 g/mi)

These are directly affecting atmosphere ,contributes in green house gases which leads to green house effect and then global warming. To reduce these engineers have invented technologies to reduce carbon emission. Like-catalytic converter, EGR.

IV. IMPROVEMENT REQUIRED IN THE CURRENT TECHNOLOGIES

These technologies are not AI controlled, which are making them less efficient and less towards smart tech.

AI Controlled Lithium Peroxide coated chamber:

Lithium peroxide readily absorbs carbon dioxide. which is solid in nature. A lithium peroxide coated chamber can be built where exhaust gases from exhaust manifold comes out and gets into the lithium peroxide chamber where at the inlet of the chamber gas meter will be installed which will measure the volume of air entering into the chamber which will be monitered using sensors where coding will be feed so that machine keeps a record of different conditions (Machine Learning) where engine produces more exhaust gases and in which condition the engine produces less exhaust gases, during excess throttling condition, when the vehicle is at still position etc . so that it will keep the records and all the data will be visible at the display where the driver can see and be aware of exhaust conditions which can be minimized somewhat in that way.

Parts used are:

- Sensors
- Lithium peroxide chamber
- Gas meter
- Sealant

Advantages

- Reduced parts in the vehicle which indirectly reduces indirect carbon emission.
- Efficiency increases
- cost effective

V. CARBON EMISSION FROM FOOD INDUSTRIES

In a 2014 study by Scarborough, the real-life diets of British people were surveyed and their dietary greenhouse gas footprints estimated. Average dietary greenhouse-gas emissions per day (in kilograms of carbon dioxide equivalent) were:

- 7.19 for high meat-eaters
- 5.63 for medium meat-eaters
- 4.67 for low meat-eaters
- 3.91 for fish-eaters
- 3.81 for vegetarians
- 2.89 for vegans

Lots of food is wasted in the food industries and restaurants. Which in return produces excess of carbon to the atmosphere. Three important terms are at the center of carbon consumption and emission issues for food processors:

- Green house gas (GHG)
- Carbon footprint
- Life cycle assessment (LCA)

Green house gasses (GHGs) absorb infrared radiation in the atmosphere. GHGs common in food processing activities. Most of the GHGs emitted from food processing plants are a result of the use of electricity, natural gas, coal, diesel, gasoline or other energy sources. For example, the combustion of natural gas results in the emission of carbon dioxide according to the following chemical formula:

$$CH4 + 2O2 => CO2 + 2H2O + heat$$

5.1 Some Direct & Indirect Carbon Emissions in Food Industry

- *Direct emissions – sources owned or controlled by the food processor (e.g., boiler, heater, cooker, vehicle fleet, waste water treatment). NOTE: GHGs not covered in the Kyoto Protocol (CFCs, NOx, etc.) are not included here.
- *Electricity indirect emissions – those created by the use of purchased electricity.
- *Other indirect emissions – those emissions that occur as a result of food processing activities but from sources not owned or controlled by the manufacturer (e.g., ingredients, freight, equipment manufacture, solid waste disposal, contractor, employee business travel). NOTE: This is an optional reporting category. WAYS OF REDUCING CARBON EMISSIONS ARE AS FOLLOWS:

5.2 Inventory GHG emissions to establish a baseline

Footprint

- Overall facility
- Individual products

5.3 Consider GHG emissions in core business strategy

- Product development (low or zero carbon products)
- Advertising and marketing
- Capital expenses
- Planning
- Product development and design

5.4 Assess internal opportunities to reduce GHG emissions

- Capital improvements
- High efficiency equipment
- Waste heat recovery
- Insulation
- Alternative energy sources
- Logistics improvements
- Packaging reduction and recycling

Disadvantages

Six Sigma is extremely costly for many small businesses to implement. Employees must obtain training from certified Six Sigma institutes in order for an enterprise to receive Six Sigma certification. Which is not possible for small and very small scale food industries and restaurants.

VI. PROPOSED TECHNOLOGY

6.1 *Smart Artificial Intelligence (Ai) Controlled Dustbin or Container:

A device is designed for reducing carbon emission, also certified from HCL Technologies.

PARTS USED:

- CONTAINER
- WEIGHING PLATE

- WIRING
- SENSORS
- BEEPER
- DISPLAY MONITOR
- Electrical circuit unit
- chip

WORKING

It is a kind of smart dustbin or a container having weighing plate at its base which will be connected with wires to the display screen. This device will work in this way when the food products are thrown inside the container it will weigh the mass of food inside and simultaneously keep the record in the chip coding will be fed where the different data will be provided before that for making (ex: 10g of food , 2g of fuel is burnt) and likewise many more values will be fed which will after the whole day it will calculate the amount of fuel burnt in excess by getting the value from the weighing plate and as machine learning is there the device will automatically fed the data and detect when the carbon emission per day exceeds as per given minimum limit, which will in result beep a warning bell and show the amount of carbon emissions to the food management authorities and chefs as well using **if else condition in C++**, which will apparently help in reducing the carbon emission.

ADVANTAGES

This is a simple and affordable device which can be used by every food industry and restaurants etc

*There are many more industries where carbon emissions can be reduced like-

- Textile Industries
- Thermal Power Plants
- Electric Power Plants
- Manufacturing Industry

VII. CONCLUSION

This study reviews current knowledge about greenhouse warming and examines a wide variety of potential responses. I have found that, even given the considerable uncertainties in our knowledge of the relevant phenomena, greenhouse warming poses a potential threat sufficient to merit prompt responses. People in this country could probably adapt to the likely changes associated with greenhouse warming. The costs, however, could be substantial. Investment in mitigation measures acts as insurance protection against the great uncertainties and the possibility of dramatic surprises. In addition, I believes that substantial mitigation can be accomplished at modest cost. In other words, insurance is cheap. These responses, however, must be based on consideration of the uncertainties, costs of actions and inaction, and other factors. Actions that would help people reducing carbon emission in automobile sector is described. Actions that would help people reducing carbon emission in food industries/restaurants is described.

The author has found some ways of reducing carbon emission by tracing carbon footprints in various industries using Artificial Intelligence (AI).

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