

# Awareness of Carbon Emission and its Hazardous Effect Due to Food Waste and Food Supply Chain amongst Residents of Pune

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## Abstract

Climate change and its impact on human life or on nature is a big concern today. The World Economic forum has ranked global change and its risk as one of the top issues for governments, business, and people to act upon. The impact of this climate change is seen on the hotel industry, by way of the change in environment, supply of the raw material, increase in rates. According to Sustainability Hospitality Alliance, the hotel sector contributes 1% global carbon emission, hence like any other industry, the hospitality industry is shifting their focus on being environment friendly while preparing and serving food and beverages in the market. The increased attention towards environment has made sure that consumers are talking climate change to understand all the responsible factors affecting carbon emission. The study aims to understand the perception of household customers towards the carbon footprint.

**Keywords:** Carbon Footprints, Emissions, Environment, Food Waste, Economic

## INTRODUCTION

With the rapid growth in technology and the demand to want everything instantly, humans utilize every resource possible. As a result, a colossal number of companies are dependent on non-renewable sources of energy for their economies to sustain them and ensure growth, but on the other hand, they end up exploiting these reserves.

The World Health Organization has defined carbon footprint as “a measure of the impact your activities have on the amount of carbon dioxide (CO<sub>2</sub>) produced through

the burning of fossil fuels and expressed as a weight of CO<sub>2</sub> emissions produced in tons.” Right from the time a person wakes up and does their daily chores to traveling to work, consuming meals, purchasing various products, and much more, all this constitutes the production of carbon and other harmful gases in some way or another. Unfortunately, although people are conversant with the increase in greenhouse gases, carbon emissions, and how it increases the earth’s temperature, they are not aware of the infinite risks they cause and the consequences.

The 2011 FAO evaluation of worldwide food losses and waste assessed that 33% of all food created on the planet for human utilization never arrived at the purchaser’s table each year. This method is a botched chance for the economy and food security and misuse of the multitude of regular assets utilized for developing, handling, bundling, shipping, and showcasing food. Through a broad writing search, the 2011 evaluation of food wastage volumes assembled weight proportions of food misfortunes and wasted for various areas of the world, distinctive product gatherings, and various strides of the inventory system. These proportions applied to territorial food mass progressions of FAO’s Food Balance Sheets for the year 2007.

While a fair amount of people is aware of the term “carbon footprint,” not many are aware of its primary causes. In the initial stages, the focal point of several countries was to reduce the carbon emissions, and global warming caused due to burning of fossil fuels for energy, industrial pollution, and transportation, but only in the last few years has the food supply chain and food waste also become the center of attention.

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The food goes through several stages to reach the consumer and causes a significant amount of greenhouse gases. However, people do not cogitate about the additional production of greenhouse gases caused due to food waste of raw and cooked products and even its packaging. Furthermore, the food waste in several cases is not treated and ends up in landfills, where it further decays and releases gases that are even more harmful in the longer run. Therefore, Janet Ranganathan, vice-president for science and research at the World Resources Institute (WRI), said that consumers have to change how they produce and consume food for environmental reasons and existential issues for humanity.”

Food misfortune alludes to abatement in mass (dry matter) or healthy benefit (nature) of food initially expected for human consumption. Failures in the food supply chains bring about these misfortunes, for example, poor infrastructure and logistics, lack of technology, insufficient skills, knowledge and the executive’s limit of production network entertainers, and absence of admittance to business segments. In addition, natural debacles assume a part. Food squander alludes to food suitable for human utilization being disposed of, whether it is kept past its expiry date or left to ruin. Frequently, this is because food has been ruined, yet it may be very well for other reasons, such as oversupply because of business sectors or individual buyer shopping/dietary patterns. Food wastage alludes to any food lost by crumbling or waste. Subsequently, the expression “wastage” incorporates both food misfortune and food squander.

This paper focuses on how there is a necessity to increase awareness about the carbon footprint caused due to the food supply chain, from farm to fork as well as due to the excessive amounts of food waste and what steps consumers can take to help curb the increase in greenhouse gases and thus help in sustaining the environment.

## LITERATURE REVIEW

- A Swedish case study on the carbon footprint of food waste management options in the waste hierarchy - April 2015 (Eriksson, Strid & Hanss, 2015).

Food waste could have economic, environmental, and social implications, creating it each vital and complex. Previous studies have self-addressed waste management

choices at the less prioritized finish of the waste chain of command. However, data on many arranged levels are additionally needed once deciding on the market waste management options. Work the world warming potential of various waste management options offers a regional perspective but remains essential for verifying generations from the waste hierarchy in a native environment. This study contrasted the impact on the gas discharge of different food waste management conditions representing different levels within the waste order in Uppsala, Sweden. A life cycle assessment was performed for six waste management eventualities (landfill, incineration, composting, anaerobic digestion, animal feed, and donations), exploiting five food merchandise (bananas, grilled chicken, beef, and bread) as examples once treated as individual waste streams.

- Tonini, Albizzati and Astrup (2018).

Food waste is usually distinguished between unavoidable and avoidable, and the latter is intended because of the food (and eventually drinks) which was edible before being thrown out (Quested & Johnson, 2009). The unwarranted measure signifies a waste of sources, as food waste needs land use, energy, chemicals, and materials to be manufactured and supplied to the wide-ranging contributors involved within the food supply system. Loss of resources as anticipated converts into substantial environmental impacts that ideally could even be avoided by prevention or mitigated by enforcing best waste management practices. Some studies have assessed the impact of garbage using life cycle thinking approaches. More often than not, there are two main processes to perform this assessment: using top-down methodologies, using, for instance, input-output tables and corresponding figures for the impacts, or bottom-up approaches, using more detailed products databases. The advantages and drawbacks of the two methods are discussed elsewhere (Reutter et al., 2017)

- Pathak, Jain, Bhatia, Patel and Aggarwal (2010).

India, being diverse in climate and culture, has a wide diversity in the consumption of food. For the sample, rice is selected as a primary food in the eastern and southern areas, whereas wheat is the primary food in the northern area. However, because of more urbanization and increasing income, food habits are changing, and today’s cosmopolitan Indians consume various food items. This

research indicated that change in food habits offers possibilities for GHG mitigation. Food product selection that favors with lesser environmental consequences could be part of the attempts to reduce GHG emissions. Some options to reduce the GHG emissions of food consumption are consumption of locally produced foods, less mutton consumption, the substitution of meat and milk with other vegetable protein. However, besides the calorific value and GHG emission, the nutritional values (vitamins, proteins, and minerals) are fundamental in food product substitution. To efficiently exercise sessions “wise weather regimens,” more information is needed about the life cycle effect of single goods and links between diets and how the food chain is.

- Springmann described in Global Panel (2018) directly addresses the link between FLW reduction and nutrition.

Employing a global partial agricultural sector model (IMPACT), demand changes by 2030 are simulated and assessed in nutritional content. Halving Gus-tavsson et al. (FAO 2011) FLW changes has considerable nutritional benefits. However, while showing contributions to food security, no insight into environmental impacts is given, nor into the relative contributions of interventions in several sectors or at different stages of the availability group. The research also does not credit for income and economic feedback circles beyond the agricultural sector. They were using an equivalent IMPACT model, Springmann et al. (2018) place.

- Kумму et al. (2017)

FLW reduction alongside yield improvements and dietary change during a 2050 projection of environmental pressure. The contribution of FLW reduction is dominated by yield improvements, while dietary change is vital to scale back GHG emissions. Evaluations of modifications in nutrition are not provided. Again, the worldwide results do not allow comparisons regarding reductions by sector, supply chain stage, or regions.) Address variation across countries identifying three country groups regarding food production in response to diet change, FLW reduction, and yield improvements. Yield involvements control Eastern Europe, Central Asia, and Southeast Asia, while dietary changes control North America and Western Europe. In other regions, dietary change and yields have roughly an equivalent impact. Altogether regions FLW reduction features a minor impact on food availability. The research offers no

detail on food protection or environmental influences. A severe methodological drawback is that production and consumption do not interact, nor can trade flows adjust. These previous studies work around FLW data limitations through simulation models with varying complexity in capturing feedback loops within the food system. As a result, increasing food protection and environmental goals, trade-offs, and synergies of FLW reduction across these two domains cannot be determined. While the importance of variations across sectors, supply chain stages, and regions are often deduced by looking across studies, each study only reports aggregate results (being it at the global level or the combined effect of multiple FLW interventions within the food supply chain), hampering the identification of critical leverage points to succeed in food security and environmental objectives.

- Cattaneo, Federighi and Vaz (2021).

The framework provided during this paper features the significance of accounting for economic reporting, and particularly price conduction processes, when determining environmental outcomes linked to reductions in food loss and waste. By highlighting potential synergies and trade-offs between different environmental dimensions, the paper presents necessary policy implications of food loss and waste reduction schemes. The paper explains the link between food loss and waste decrease and environmental results and summarizes four propositions. The first proposition proves that when the price transmission mechanism is weak and the environmental damage occurs mostly downstream, a reduction in losses can produce environmental damage than good. Conversely, the second proposition concludes that reducing waste always results in an environmental improvement. The paper also exposes the false equivalence between resource use efficiency and environmental improvement. This takes us to our third proposition, which suggests that reducing FLW improves resource use efficiency and GHG emission intensity. Within the case of losses, this improvement increases with the share of injury occurring upstream but decreases if consumer waste is high. As for reducing waste, the potential for improvement in all dimensions is considerable despite decreasing losses.

## OBJECTIVES

- To understand the perception of consumers about the concept of carbon footprint due to food.

- To study the factors responsible for the increase in carbon footprint due to food waste generation at the household level.
- To create awareness about a sustainable environment with responsible behaviour related to food waste.

## RESEARCH METHODOLOGY

*Type of Research:* A descriptive research was used to study the awareness of carbon footprint in the environment due to food wastage and food supply chain of the residents of Pune and will include surveys and factual findings of the research.

## METHODS OF DATA COLLECTION

*Primary Data* - Primary data was collected through a survey.

*Questionnaires:* A questionnaire was circulated amongst the general public to survey to deduce awareness regarding the topic.

*Secondary Data* – Data was collected from published / unpublished literature on increased carbon footprints in the environment due to food wastage and food supply chain inclusions and its awareness from the latest references available from the journals, newspapers, research publications and magazines, records and training reports of the hotel, and additional appropriate sources.

*Questionnaire* – Design and implementation: The questionnaire was done with experts in statistical techniques and considering the measurement needs & research objectives. The questionnaire responded by the selected sample population

*Sampling Techniques:* For this study, 108 adults from different professions, age groups, and backgrounds were selected as residents of Pune.

## Sampling

*Sampling Criteria:* People may or may not be aware of the carbon footprint.

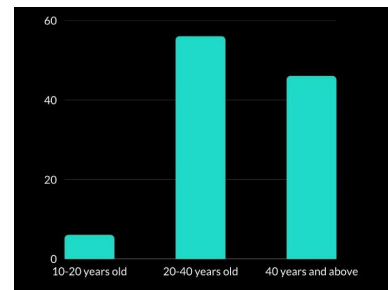
*Sampling Technique:* A probability Sampling Technique is used in this study.

*Sampling Element:* The sampling unit consists of sampling elements that are Professionals and able to decide their Diet.

*Sample Size:* A total of 130 questionnaires were distributed, out of which 108 responses were received.

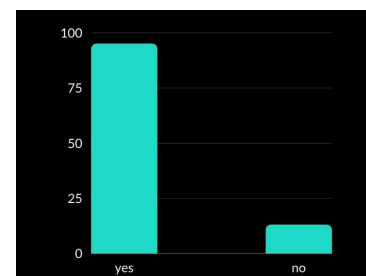
## DATA ANALYSIS

### Age



- The survey was conducted within all age groups ranging from 20-60 years of age. The varied age groups helped comprehend the awareness of carbon footprint as a concept and its repercussions on the environment. More than 50 % of the respondents were from 20-40, mostly the working class, followed by 42.6% of 40 years and above.

Question 1: Were you familiar with the term Carbon Footprint?



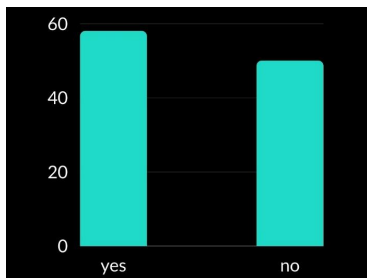
- Astonishingly, 88% of the respondents were familiar with the term carbon footprint. Therefore, understanding and learning about carbon footprint is quintessential for citizens because it generates the required awareness for conserving our resources.

Question 2: According to you, what contributes more to the increase in carbon footprint?



- The majority of the respondents think that food waste is a significant contributor to the increase in carbon footprint. Today, an anticipated one-third of the food manufactured in the world goes to waste. That amounts to about 1.3 billion tons of fruits, vegetables, meat, seafood, and cereals that either get spoiled at the source, get lost or spoils in delivery, or are thrown away in hotels, grocery stores, restaurants.

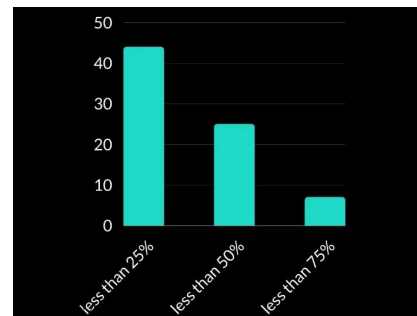
Question 3: Do you or your locality take any steps to process food waste?



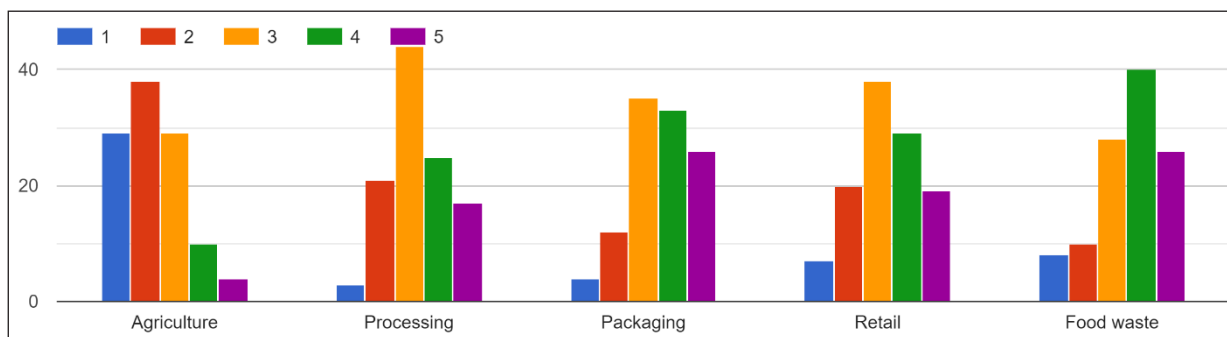
- Over 53% of the localities process their food waste. Fruits and vegetables have the high-

est wastage rates of any food product. The Food and Agriculture Organization of the United Nations estimates that 45 percent of fruits and vegetables are wasted globally along the supply chain. Nevertheless, with some chemistry, biology, and engineering know-how, the scrapped by-products can be reprocessed into functional and valuable products.

Question 4: If yes in above question, according to you how much percent of the waste is processed? (Waste processing includes for example: making manure, bio gas, etc.)

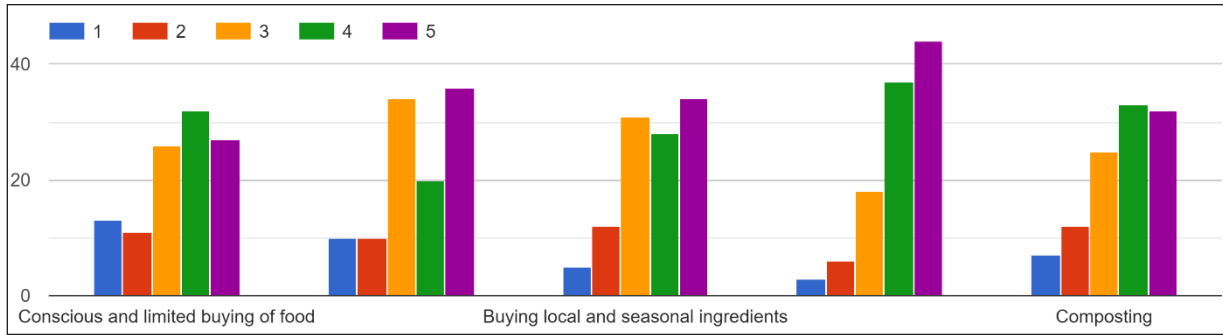


- From the above pie chart, we can understand that the percentage of food waste processing is meagre, as the majority of the people have stated that less than 25% of food waste is getting processed around the locality. Therefore, a critical component in any waste management program is public awareness and participation, in addition to appropriate legislation, strong technical support, and adequate investment.



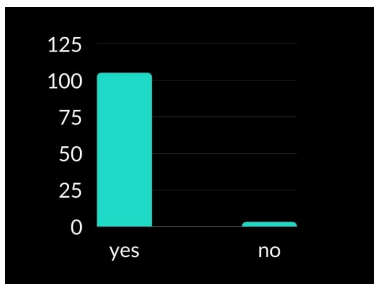
- The above bar graphs present the respondent’s opinions on sources contributing to the most carbon emissions. For example, food waste is a significant contributor to carbon emissions. Global food loss

and waste are generated annually in giant quantities or about 8% of total human-caused GHG discharges. The findings show that wastage emissions to global warming are aware.



- From the data collected through questionnaires, it is evident that the general public is ready to make a change and adopt better ways to reduce carbon footprint. It includes conscious and limited buying of food, items, and products with minimal packaging, proper disposal of food waste at the household level, composting.

Question 7: Do you think there is an environmental benefit because of the actions taken to reduce the carbon footprint?



- Over 97% of respondents stated that there is an environmental benefit because of reducing the carbon footprint. However, carbon emissions can be drastically reduced if preventive measures are practiced.

## FINDINGS AND OBSERVATIONS

- The majority of awareness present about carbon footprint is among people from 20-40 years old. The age group between 20 to 40 being the working class, the level of awareness is high, whereas the teenagers and the older generation lack the required amount of awareness, which needs to be created.
- Although the awareness is present, it still needs to grow to positively impact the betterment of the environment and reduce carbon emissions.
- Food waste and food supply chain management are amongst the leading causes of the production of carbon discharges. As the world's population continues

to grow, our challenge should not be growing more food but feeding more people while wasting less of what we already produce.

- There should be an increase in the processing of food waste at the individual house, locality level. However, there is also a need to develop a sense of responsibility at the consumer level. Fortunately, we can take a plethora of actions at the consumer level to make a significant difference, from delivering leftovers to those in need to freezing food, conscious buying, and composting to prevent unnecessary landfills, which will ultimately help us curb emissions.
- Some measures can be adopted, such as planning and buying what is needed, using freezing techniques, composting, buying local and seasonal ingredients, and buying products with negligible packing.

## CONCLUSION

The essential takeaways from this research were that,

- Even though millions of people consume food daily, food waste is still a significant contributor to landfills, thus increasing carbon emissions. However, due to awareness about climate change, people are willing to change their habits and make more environmentally conscious decisions.
- The government should implement and encourage more composting programs and food waste processing programs to send marginally lower amounts to landfills and, in turn, help create renewable resources such as biogas through these processes.
- Due to globalization and the increase in technology, today's food supply chain is exceptionally intricate and elaborate and thus must include innovative and modern ways to help reduce food loss and waste at each stage of the chain.

- Reducing food waste during the food supply chain can be considered an effective method to minimize the food waste caused and consequently help in sustainability for generations.

In conclusion, the truth is that only small, manageable changes need to be made for the consumers to create a big difference. Furthermore, as food is biodegradable, consumers can make conscious decisions during purchasing and disposal of their food waste even at the household level, thus helping to create a sustainable and safe atmosphere.

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