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GREEN LOGISTICS IN E-COMMERCE INDUSTRY: A CASE STUDY ON DARAZ NEPAL PVT. LTD.

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ABSTRACT:

This thesis explores the important role of last-mile delivery in the logistics sector, with a particular focus on the e-commerce sector. Daraz, a leader in e-commerce, currently relies on two- and four-wheeled gasoline-powered vehicles for last-mile deliveries, using a hub-based model spread across nine locations across the Kathmandu valley. In line with its commitment to environmental sustainability, Daraz aims to convert its entire fleet of gasoline-powered vehicles to electric alternatives, thereby contributing to the global effort to reduce the carbon emissions. Our research yields compelling findings that highlight the significant benefits of transitioning from internal combustion engines (ICEs) to electric vehicles in the context of e-commerce last-mile delivery. These results highlight the financial and ecological benefits of adopting electric mobility in the logistics sector. We recommend that organizations involved in last-mile delivery, especially in e-commerce, carefully consider the use of electric vehicles as a financially prudent and environmentally friendly option. This conversion promises significant fuel savings, significantly improved fuel efficiency and an extremely short payback period of less than 5 years. In addition to these findings, our research also examines the transformative potential of energy consumption and emissions reduction in last-mile logistics. The energy consumption by EV is found to be less than 50% than that of petrol option. We reveal a stark disparity between petrol and electric vehicles, with petrol two- and four-wheelers showing significant energy consumption and emissions, especially in the area of carbon dioxide (CO2). In summary, our research makes a compelling case for a cleaner, more sustainable and more economically viable future in last-mile logistics through the adoption of electric vehicles and other innovations.

1. INTRODUCTION

In recent years, there has been growing concern about the consequences of human activity on the environment. This is why the issue is receiving increasing attention in the popular press, on government agendas, in the academic literature and in the general public. Stakeholders are increasingly pressuring companies to take responsibility for any negative impacts their business activities may cause. In general, logistics is considered a set of actions whose goal is to minimize costs and maximize profits. The term is mainly used in the purely commercial sector by exhibition companies and in financial reporting. However, for many years, the term logistics has been used in combination with the term "green" to create "Green Logistics" - a term that contains costs but does not appear in financial, environmental and financial reports. The term "green logistics" refers to supply chain management strategies and practices that aim to reduce the environmental and energy impact of goods distribution, with a focus on materials handling, waste management, packaging and shipping [1].

Petroleum-powered vehicles are the world's largest source of greenhouse gas emissions and the largest consumer of petroleum products, contributing to global fossil fuel depletion. It is believed that the solution to the problem of greenhouse gas emissions and the depletion of fossil resources lies in electric

cars. Electric vehicles (EVs) are powered by a motor, which is powered by battery cells, which serve as the drive source. It could be argued that the majority of Nepal's electricity comes from clean hydropower, which appears to be the case [2]. Therefore, the use of electric cars in Nepal reduces the country's dependence on foreign oil and significantly reduces greenhouse gas emissions. According to data from the Ministry of Commerce Customs, about Rs 155.43 billion diesel and gasoline were imported into Nepal in the 2018/2019 financial year, an increase of nearly Rs 30 billion compared to the previous financial year [3].

As it stands, the cost of imported oil is expected to nearly double compared to the 2018-2019 financial year and has recently increased significantly with planned price increases in the years 2022-2023. Kathmandu is one of the most polluted cities in the world as Nepal's carbon emissions increased 32-fold in the 15 years from 2000 to 2015 [4]. According to K. Zhang and S. Batterman, the increase in the number of vehicles in the valley was then considered to be the main cause of the increase in pollution, especially from private vehicles [5]. So, in the case of Nepal, finding a clean alternative is now necessary. More than 99% of vehicles in Nepal run on oil, increasing carbon emissions and causing pollution [6].

2. LITERATURE REVIEW

Typically, logistics is seen as the actions of which the objective is to minimize costs and maximize profits. The term was used mostly in purely business areas exhibiting companies and in financial reports. But, for many years, the term logistics was used in conjunction with the "green" by creating "Green Logistics" - the term containing costs, yet did not appear on financial reports and on the environment and society.

Due to the global economic growth and worldwide network of supply chains, the logistics network has become more complex and distantly located. Larger distances covered in the transportation tend to increase emissions, resulting in larger environmental problems. The term “Green logistics” is related to planning, controlling and implementing the flow of logistics by incorporating modern logistics techniques with an aim to minimize the environmental hazards [7]. This flow of logistics should also achieve the satisfaction of the customers as well as the organization goals along with the aim of reducing the effect of these activities on the environment [1]. From this perspective, green logistics is an organization's ability to deliver products and services in an environmentally friendly yet economically efficient manner. Green logistics also refers to an organization's ability to conserve resources, reduce waste, increase work efficiency, and meet societal requirements for ecological consolidation.
The best solution to reduce carbon emissions is to implement green logistics in last-mile transportation operations. Green Logistics aims to reduce the environmental impact caused by delivery procedures. By integrating green logistics into business operations and sustainability, organizations can improve both. A carbon footprint can bring many benefits, from saving money to attracting customers. Not only that, customer loyalty can also be achieved as more than 88% of consumers expressed that they would remain loyal to a company that values sustainability. Overall, with the ability to reduce carbon emissions, one can strengthen relationships with consumers by demonstrating exemplary sensitivity to the environment [8].

3. METHODOLOGY

This particular research took done inside a well-known e-commerce company located in Nepal, and the topic of study that this particular investigation fell under is the broad area of green logistics. The

Kathmandu Valley's urban areas came under close inspection, with Kathmandu, Lalitpur, and Bhaktapur being the three main targets. This study's main objective was a thorough analysis of every kind of vehicle, including both two- and four-wheelers, used in the last stage of cargo delivery for Daraz Nepal.

In essence, this study explored the vast field of green logistics but focused on a large Nepalese e-commerce company. It focused on Kathmandu Valley cities in particular, including Kathmandu, Lalitpur, and Bhaktapur, and examined the whole Daraz fleet of vehicles utilized for last-mile delivery.

A conceptual framework that captures the main focus and the breadth of factors considered has been constructed in accordance with the study's aims and findings from the literature review. Both primary and secondary data sources are used in this study. While secondary data includes information that has already been gathered in other research projects, primary data is information that is gathered directly from the e-commerce company. Aside from acquiring technical information about electric vehicles from businesses like NIU and Tata, primary data acquisition also included counting the number of vehicles used at Daraz Nepal.

The main areas of concentration and the variety of variables included have been clearly summarized by a conceptual framework that has been formed by the study's aims and previous research discoveries. The research technique combines primary data, obtained directly from the online retailer, with secondary data, which draws on knowledge gathered from earlier research investigations. Additionally, primary data collection involved gathering technical information about electric vehicles from manufacturers like NIU and Tata in addition to characterizing the vehicles now in use at Daraz Nepal.

Excel and other visualization tools were used to carefully process the primary and secondary data that had been gathered. After this data cleaning, a Python model was created to carry out an extensive analysis. With the use of this analytical method, the dataset was fine-tuned to enable the computation of important variables including the payback period and CO2 emissions.

After doing a data analysis, the study evaluated the financial and environmental benefits of using green logistics techniques. Using a Python model to determine the payback period, the financial viability of these activities was quantified and the findings were displayed graphically. Additionally, a bar graph was used to emphasize the differences between traditional diesel/petrol automobiles and electric vehicles when comparing their energy use.

Further, to assess the possible cost savings realized by carbon trading, the study calculated significant emissions, such as CO2, CO, HC, NOx, and PM10. The advantages of switching to green logistics are thoroughly covered in this complex analysis, which takes into account both economic and environmental factors.

4. RESULT AND DISCUSSION

Daraz's last-mile delivery operations, which use both two-wheeler and four-wheeler vehicles to carry products to customers' doorsteps, are an essential part of their logistics network. These trucks act as the last link in the supply chain, ensuring that goods purchased through Daraz are delivered effectively and on schedule to their intended customers. Daraz operates a network of distribution hubs that are placed both inside and outside the Kathmandu Valley strategically to help with this operation. These hubs act as key places from which products are delivered to their specific locations, whether those areas are inside the busy Kathmandu metropolitan area or farther afield throughout Nepal. Daraz also offers a flexible and customer-focused approach by making it convenient for individuals who choose to pick up

their packages to do so at any of the business' sites inside the Kathmandu Valley. This adaptability improves the overall customer experience by enabling people to select the delivery option that best suits their needs and schedules. Nine areas in the valley, including Kathmandu, Lalitpur, and Bhaktapur, are owned by Daraz. These places are used for doorstep deliveries called the last mile. Due to the fact that one site cannot service all regions, hubs are developed for specialized last-mile delivery. Additionally, customers can pick up their packages from any of these locations if it is more convenient for them to do so.

Figure 1 Heatmap of delivery location inside Kathmandu Valley

For last-mile deliveries of items to consumers, Daraz uses both two-wheelers (delivery bikes) and four-wheelers (delivery trucks). Two-wheelers (delivery bikes) are used to deliver small packages, while four-wheelers (delivery vans) are used to deliver larger packages. The delivery vans now in use all have internal combustion engines, however switching the entire fleet to electric vehicles is a possibility. The company now uses the following list of gasoline vehicles for logistics operations:

Table 1: Vehicle used with quantity

S.N.	Vehicle Type	Quantity
1	Two-Wheeler (Motorbike/Scooters)	221
2	Four-Wheeler	15

Additionally, the creation of elaborate cash flow diagrams and instructive graphs, both painstakingly built through the use of several Python packages, increased the analytical depth of this study. These visualization tools made it easier to understand the intricate financial dynamics as well as the financial and temporal considerations involved in the switch to electric vehicles. By using Python libraries to create these graphics, decision-makers can better understand the potential financial rewards and viability of adopting electric options in the e-commerce sector. This highlights the value of data-driven insights. The python-generated cash flow diagram and graph are as shown below which shows that the payback period for two-wheelers is 3.03 years and for four-wheeler option is 4.34 years.

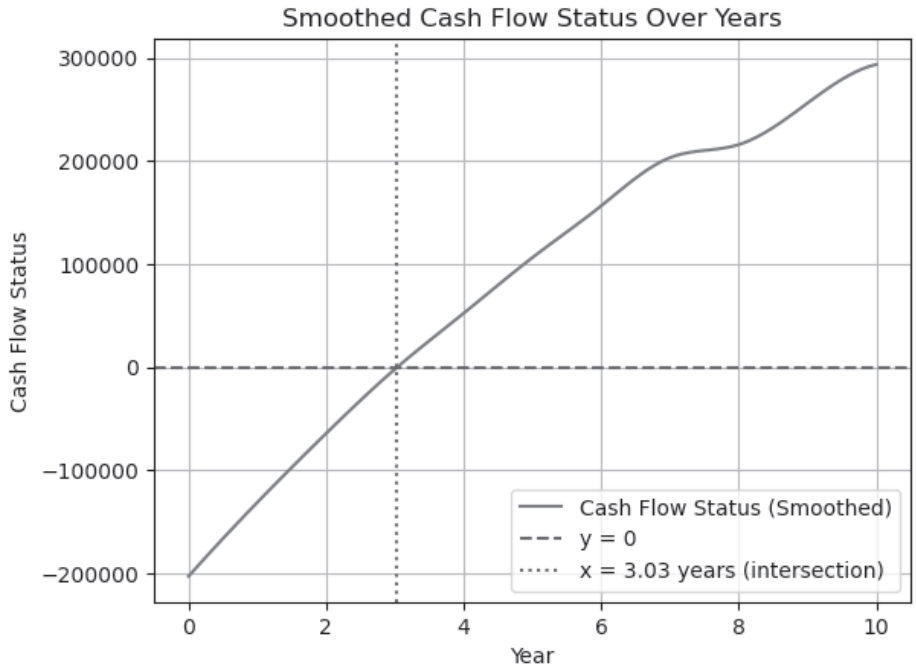

Figure 2 Cash flow diagram showing pay-back period of two-wheelers

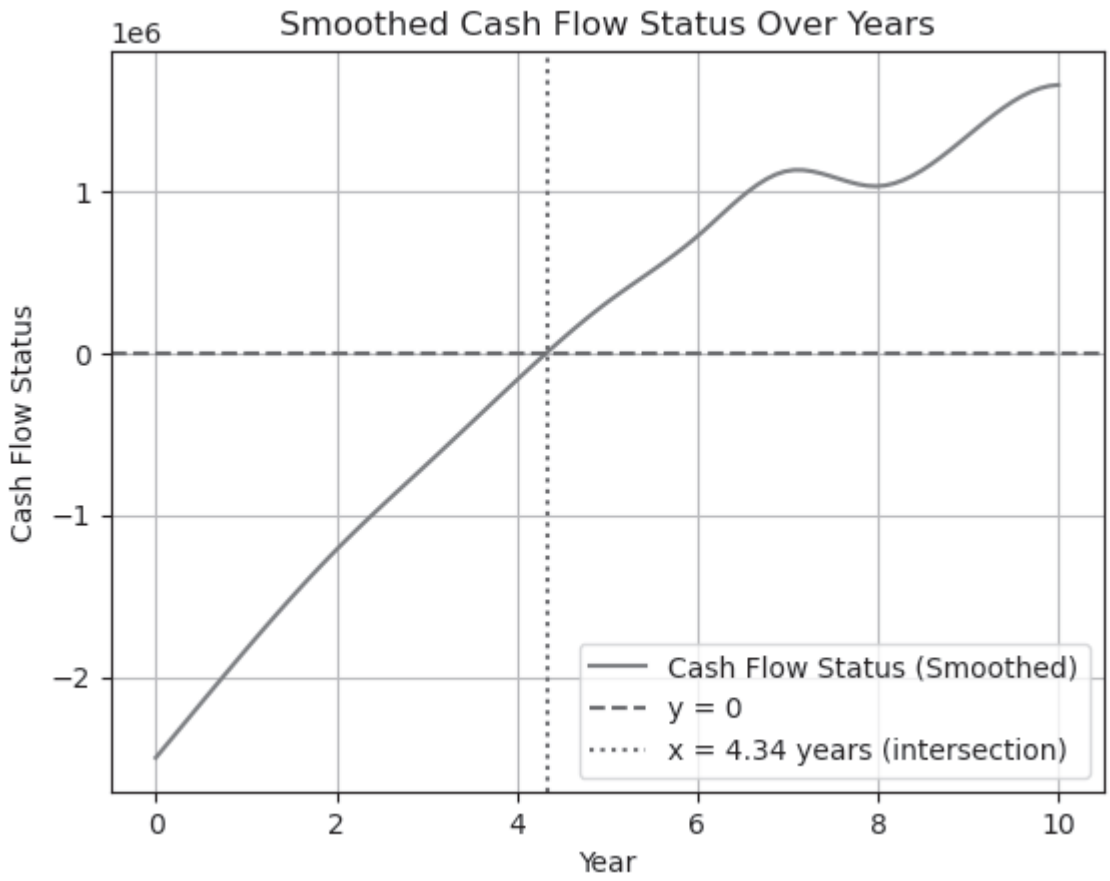

Figure 3 Cash flow diagram showing pay-back period of four-wheelers

The results of our research highlight a remarkable story of opposites. Gasoline-powered 2-wheelers are responsible for a significant amount of annual energy usage, coming in at 296,027.24 kWh. In stark contrast, the EVs used to supply 2-wheelers show an amazing break from tradition by using only 66,228.4 kWh. This astounding disparity highlights a significant decrease in energy use and highlights the revolutionary influence of electric 2-wheelers on energy efficiency. This considerable disparity is illustrated visually in the accompanying bar graph by visualizing the comparison.

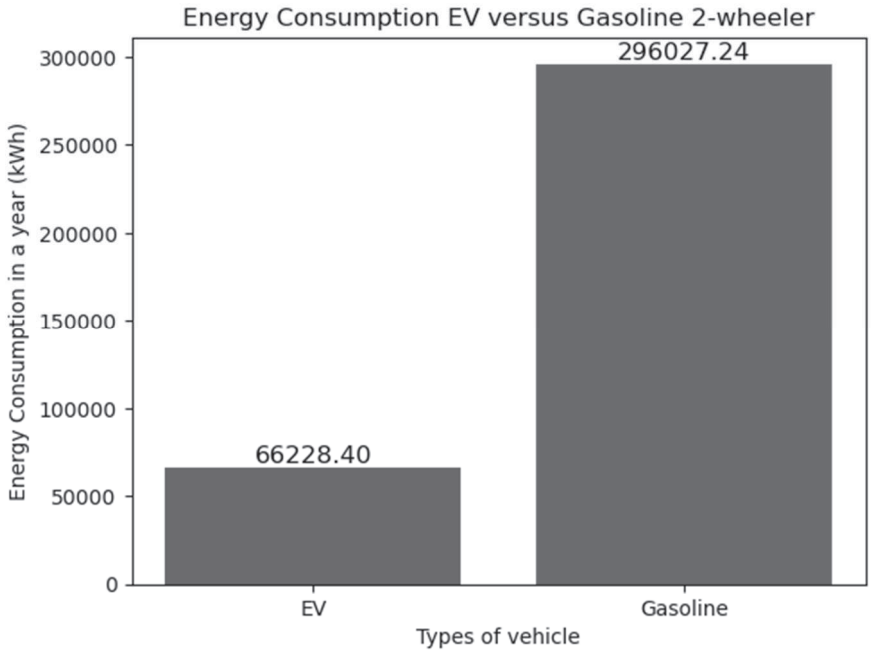

Figure 4 Energy Consumption of EV vs Gasoline (Two-Wheeler)

When we focus on 4-wheelers, a similar story of decreased energy use develops. An impressive number in itself, gasoline-powered 4-wheelers need 117,667.31 kWh of energy every year. The EVs in charge of the 4-wheeler delivery, however, accomplish a remarkable achievement by using only 58,968 kWh, which is a strong indication of their effectiveness. This discrepancy clearly highlights the significant decrease in energy consumption associated with electric 4-wheelers, as shown in the related bar graph.

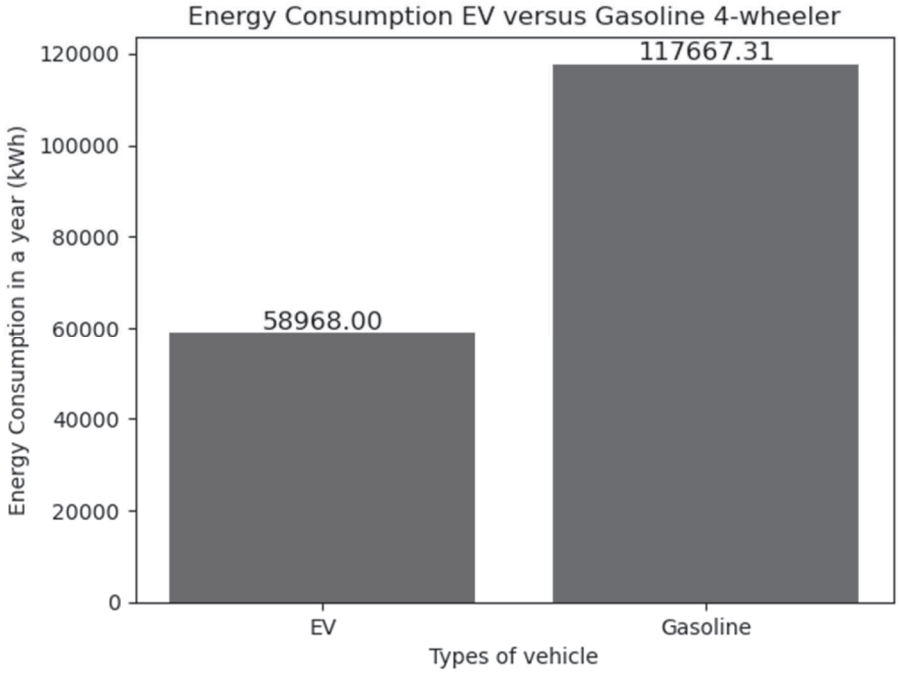

Figure 5 Energy Consumption of EV vs Gasoline (Four-Wheeler)

A striking discovery emerged from this visual exploration: Carbon dioxide (CO2) emissions reign supreme among all pollutants. These emissions are especially notable because they are the dominant greenhouse gas (GHG), responsible for a significant portion of global warming and climate change. When looking at emissions from 2- and 4-wheeled vehicles, a harsh reality becomes clear. The use of gasoline as the main fuel source for last-mile deliveries in the logistics sector leads to significant emissions of various gases. This revelation highlights the environmental impact of conventional logistics practices and emphasizes the need for change.

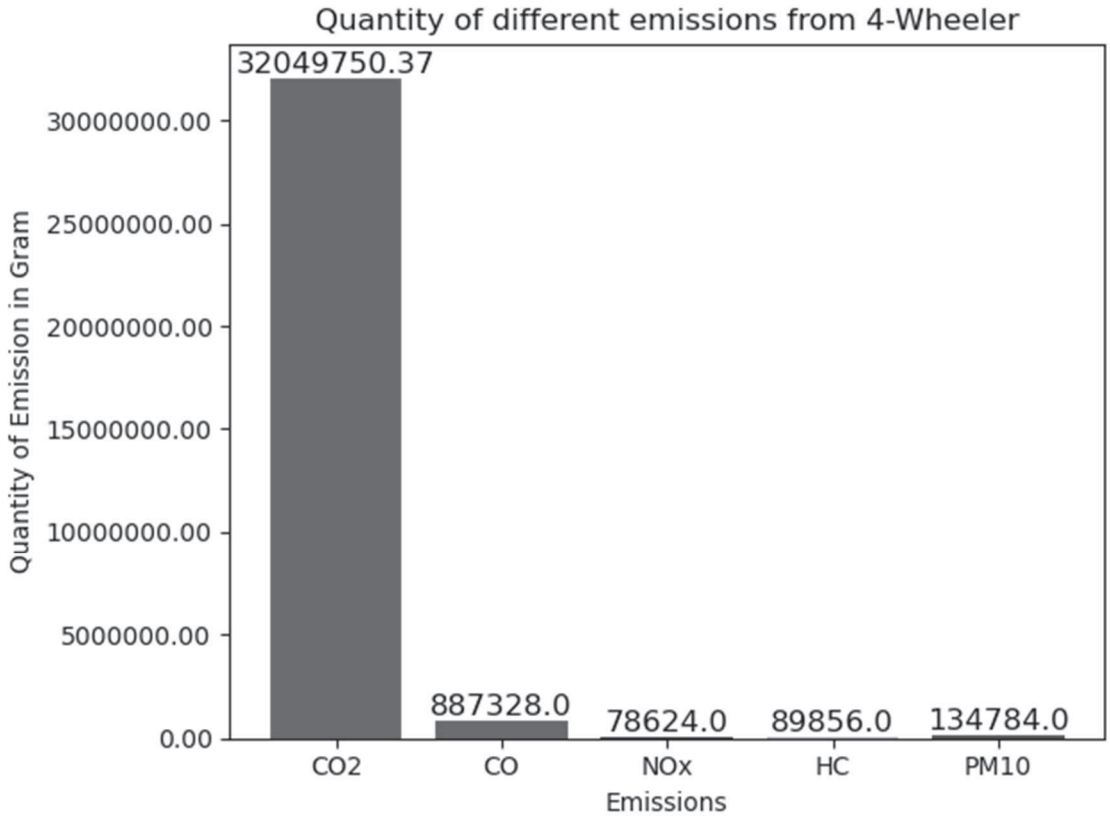

Figure 6 Quantity of Emission from different pollutants from four-wheeler

However, there is a glimmer of hope in these results. Data shows that these emissions can be reduced significantly, even reaching net zero emissions. Achieving this ambitious target depends on implementing strategies and practices designed to reduce Minimize or completely eliminate emissions. These steps towards greener logistics not only promise a more sustainable and environmentally friendly future, but are also in line with global efforts to combat climate change and reduce environmental impact.

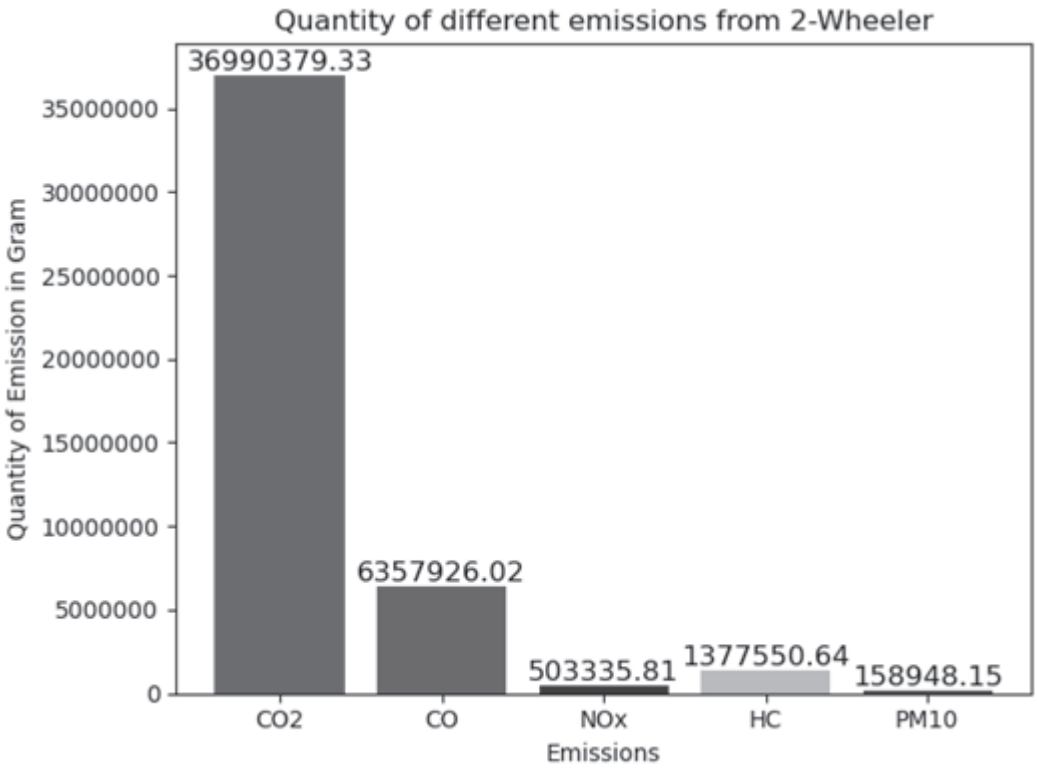

Figure 7 Quantity of Emission from different pollutants from two-wheeler

5. Conclusion

In this study, the essential role of last-mile delivery in logistics, especially in the e commerce sector, is emphasized. Daraz's use of gasoline-powered vehicles for last-mile deliveries at several locations in the Kathmandu Valley was examined. The study highlights Daraz's goals for environmental sustainability, which aims to transition from gasoline-powered vehicles to electric vehicles. The results demonstrate the significant benefits of adopting electric alternatives, including significant gas savings, improved energy efficiency and a quick payback period of less than 5 years, creating a solid basis There is certainty for the adoption of electric vehicles for last-mile delivery, especially in e-commerce. Additionally, the study highlights the value of data visualization tools and their role in supporting informed decisions in the logistics and transportation sector. Additionally, it highlights the potential to significantly reduce emissions, especially carbon dioxide emissions, and the economic feasibility of emissions reduction efforts, ultimately supporting a clean future more sustainable, more economically feasible emissions mitigation strategies.

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