

AN ASSESSMENT OF ENVIRONMENTAL AWARENESS AMONGST THE PASSENGER CAR USERS IN INDIA

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Abstract: Automobile sector is one of the major source of pollution. Though the consumptions of passenger cars in India is much less as compared to that of developed countries, the growth potential in India is very high. This increasing trend of buying passenger cars is associated with rise in pollution levels. In order to keep pollution under check Govt. is coming out with stricter regulations, however regulations alone will not be enough to curb the pollution, it has to be coupled with environmental awareness of people. Thus it had become necessary to find out the awareness level of consumers about the environment. The intent of this paper is to evaluate and analyse the awareness level with reference to demographic variations. To meet this objective, a survey was conducted in the metropolitan cities of India to get an insight on awareness levels.

Index Terms - Eco-friendly cars, consumer's awareness, Pollution, greenhouse gases.

1 INTRODUCTION

Air Pollution means “the presence of contaminant or polluting substances in the air, that do not disperse properly and that interfere with human health to produce other harmful environmental effects”. Air Pollution is a major problem in world leading to loss of human life as well as natural capital. There are two main sources of air pollution, namely, Anthropogenic Air Pollution (Increase in pollutants in air due to manmade sources) & Natural Air Pollution (Due to natural causes like Volcanic Activity)

Air pollution has seen a dramatic increase since 19th Century, as we know the industrial revolution led to setting up of carbon-intensive factories. These factories ran on fossil fuels and emitted huge greenhouse gases. These GHG gases are responsible for warming up of global mean temperature. Global temperatures have risen up by 0.8 °C in past century and if no intervention is taken, the temperatures rise will soon touch 2°C. Some of the greenhouse gases(GHG) like CO₂, N₂O, and CH₄ existed naturally but their respective concentrations have increased drastically in last three decades. Other GHGs like HFCs, N₂O, PFCs, and SF₆ came into existence due to human interventions.

Amongst all the sectors transportation sector is one of the major sources of environmental pollution. The environmental burden of transport is critical owing to its significant use of energy, and burning most of the world's petroleum. This leads to emissions of excess of nitrous oxides and particulates, and is a dominant contributor to global warming through emission of carbon dioxide. Subsector wise, road transport is the biggest contributor to global warming. Environmental regulations have tried to tackle and reduce the individual vehicles emission, however, this has been offset by an increase in the number of vehicles, and more use of each vehicle.

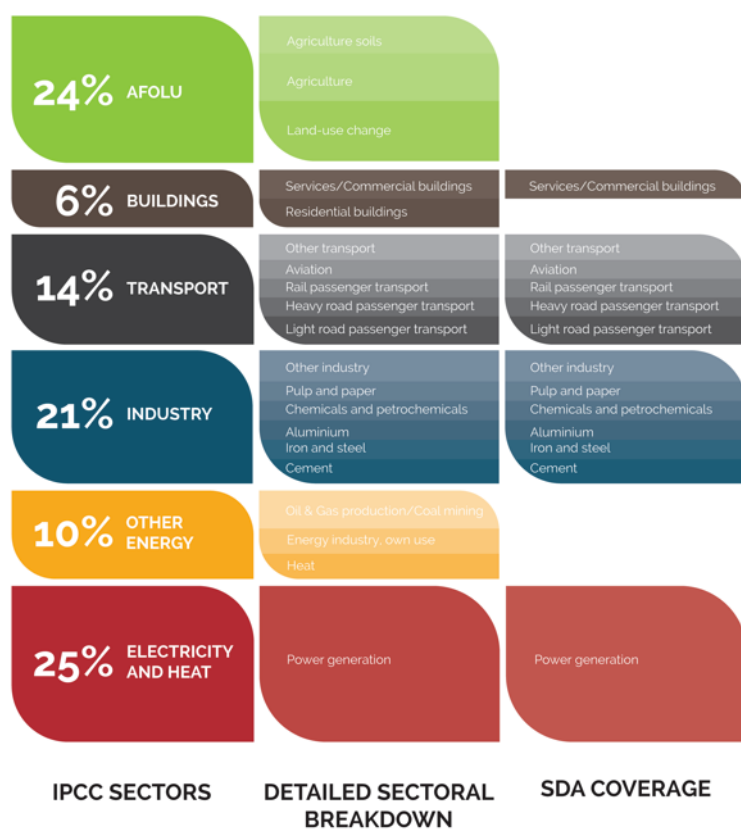
According to the recent economic survey conducted in India, an increase in available disposable income among citizens has created an upsurge in the purchase of vehicles and a decline in the adoption of public transport. Roads are the prominent travel medium in the country, and as of April 2019 there were 230 million vehicles on the road. With a sale of more than 3 million vehicles in 2018-19 in the four-wheeler segment alone, the total number of vehicles burning petrol and diesel, and emitting hazardous fumes into the air is above 230 million.

According to the newspaper Hindustan Times the pollution level in Delhi is as follows:

Pollutant	Pollution load (in ton/day)
Carbon Monoxide	217.7
Hydrocarbons	66.7
Nitrogen oxides	84.1
Particulate Matter	9.7
Sulphur Dioxide	0.72

Pollutant and their Corresponding Pollutant Load [\(HindustanTimes 2017\)](#)

Globally transport sector accounts for 14% of the GHG emissions.



As per IPCC 5th Assessment Report

1.1 Automobile Sector and Pollution in India

India faces challenges eternized by the trend towards privately owned vehicles, thereby emphasizing the urgent need of an alternative mobility future. Daily approximately 50,000 new motor vehicles including 2-, 3-, and 4-wheelers are registered in India, depicting a trend of nearly a 10% increase in vehicle registration annually for the past decade. Though the number of vehicles per capita in India is very low compared to the other countries in the world, traffic congestion and pollution are already serious matters in India. According to a study by World Health Organization (WHO) conducted in 2016 [\(WHO 2016\)](#), India has 10 of the world's 20 most polluted cities. In 2015, India imported more than 80% of its oil at a cost of Rs 4.2 lakh crore

In an effort to control the growing pollution levels in the major cities of the country and to provide clean, cost-effective, and efficient mobility services, the Indian Government is moving towards offering electric and hybrid cars in the domestic market. Initially, the Government had first laid out provisions to move to hybrids but in May 2017, the think-tank NITI Aayog and the US-based Rocky Mountain Institute which specialises in transportation solutions built up a roadmap for the 2030 switchover which is entitled as 'India Leaps Ahead: Transformative Mobility Solutions for All'. The report provides a blueprint for a "leapfrog" opportunity in India and has devised a "Three-phased approach" from 2017 to 2032 focussing on creating a shared, electric, and connected mobility future for all. This robust starting point would enable India to leapfrog towards ambitious goals of 6–7 million EVs that includes EVs, including hybrids, or HEVs, and plug-in hybrid electric vehicles, or PHEVs by 2020 and 175 GW of renewable energy by 2022.

Additionally, to promote the aim of eco-friendly vehicles, the Indian Government has also started Faster Adoption and Manufacturing of Hybrid and Electric vehicles (FAME) scheme which provides incentives for purchasing electric vehicles. This scheme was launched under the National Electric Mobility Mission Plan (NEMMP) has four focus areas namely 'Technology development', 'Demand Creation', 'Pilot Projects' and 'Charging Infrastructure'. The phase 1 of this scheme called as FAME-1 had begun in 2015 continuing for a period of approximately three years up-to 2018. Under this scheme Government is releasing tenders to increase charging infrastructure in the country and covers hybrid and electric technologies like a strong hybrid, plug-in hybrid and battery electric vehicles. The pronouncement of the NEMMP-2020 plan and perpetuation of the FAME scheme are crucial pointers for Original Equipment Manufacturers (OEMs) that play decisive roles in contributing more EV products to the Indian marketplace

All these efforts can prove to be a boon for the vision of becoming as a 40 percent EV nation by 2030. These transformations would thus in turn not only immensely reduce fossil-fuel costs and oil import dependency, but also help in cutting down of hazardous air and carbon emissions, fuel job production and home-grown innovation, and support the growth of India's economy. Preliminary estimates determine that shifting to a shared, electric, and connected passenger mobility paradigm may scale down as much as 1 gigatonne of carbon dioxide (1 GtCO₂) emissions between 2017 and 2030, and provide a saving of around \$60 billion in annual petrol/diesel costs in 2030.

The second most populous country in the world, India's potential to create a shared, electric, and connected mobility system could bring out extensive advantages both domestically and globally.

1.2 Need for Environmental Awareness

One of the major contributors to the environmental pollution is automobiles which emit oxides of nitrogen, carbon monoxide (CO), particulate matter (PM10 and PM2.5) and hydrocarbons (HCs). Additionally, inefficient combustion of fuel produces a mix of products of atmospheric transformation like ozone, sulphate particles as well as primary emissions such as diesel soot particles and lead. The Government has adopted various regulatory and other policy measures for controlling vehicular emissions like BS IV and BS VI emissions standards for both petrol and diesel vehicles. However, due to the tremendous increase in the number of vehicles on the road these regulatory standards do not prove to be fully effective in controlling pollution levels. It is necessary to have regulations coupled with consumer's awareness about the pollution caused by vehicles.

2 LITERATURE REVIEW

The literature on environmental awareness of consumers has grown substantially in the past decade considering the ever growing environmental issues, technological advancements and changing policies. This review focuses on understanding consumers' overall environmental awareness with respect to demographics that in turn affects their purchase decision, first through the study of consumers' awareness for low involvement and high involvement eco-friendly products. Later, the review studies the published work on eco-friendly cars concerning with market penetration, consumers' perceptions and apprehensions related to these vehicles and their willingness to pay and shift to such cars and then consequently understanding the gap left in previous studies.

2.1 Study of consumers' awareness for Eco-friendly Low Involvement Products

(Park and Ha 2012) reported that consumers with prior experience with or commitment to a pro-environmental practice can easily embrace other pro-environmental disciplines in comparison to consumers without such experiences and/or commitment. They also reported that whether or not consumers shop for green products is associated with their beliefs, attitudes, and behavioral intentions concerning other pro-environmental behaviors such as recycling.

For the Swiss Consumers (Tanner and Kast 2003), stated that the extent of consumers' environmentally friendly behaviors can be facilitated or inhibited by acts of marketers or other contextual barriers. Additionally, decision making process was improved when facilitated with adequate knowledge to distinguish between environmentally friendly and environmentally harmful products.

(Magnusson, et al. 2003), demonstrated from the survey of Sweden consumers that the effects of performing more Environmentally Friendly Behavior (EFBs) are mostly of a long term character and the individual may not even benefit from them during his/her lifetime. Further, egoistic (health) benefits can be achieved by the individual him/herself, whereas the goal of improving the environment presupposes a collective effort.

(Rahbar and Wahid 2011), asserted that Green marketing tools such as eco-label, eco-brand and environmental advertisement will make easier perception and awareness of green products attributes and characteristics, consequently, guiding consumers into purchasing environmentally-friendly products.

Similarly, (Jain and Kaur 2006), through their research concluded that there are significant differences present in environmental consciousness among consumers belonging to different socio-demographics which imply that the policy makers and marketers be sensitive to these differences and make use of such knowledge for evolving positioning and marketing-mix strategies as suitable to different green segments

(Datta and Ishaswini 2011), suggested that educated Indian consumers are concerned about the environment and such pro-environmental concerns influence their green buying behaviour to some extent, thereby leading to purchase of eco-friendly products.

3 RESEARCH OBJECTIVES, SCOPE AND HYPOTHESIS

3.1 Objectives:

- 1) To assess the environmental awareness with respect to vehicular pollution for different demographic characteristics of Indian vehicle users.
- 2) To find out if lifestyle is a major cause of pollution.
- 3) To find out what according to users is a solution to reduce vehicular pollution.

3.2 Scope of the Research

The aim of this study is to perceive the customers' awareness level about environmental friendly advanced passenger cars and their perceptions toward buying these green vehicles. The present study has been conducted encompassing respondents from the metropolitan cities of India. The study is confined to passenger cars only. The study may be beneficial to the Automobile OEMs, marketers and dealers to formulate enhanced marketing campaign and policies for modern cars, based on the comprehensive knowledge about the awareness level of consumers pertaining to such cars.

3.3 Hypothesis

H01: Environmental awareness with reference to vehicular pollution varies with literacy levels.

H02: Most highly educated people feel that change in lifestyle is a cause of environmental degradation.

H03- Literates feel that eco-friendly car can solve the pollution problem.

4 RESEARCH METHODOLOGY

4.1 Questionnaire Design

With reference to the study conducted in different countries and regions on consumers' awareness about environment friendly cars, the structured questionnaire was designed. This research primarily consists of assessment of variation in environmental awareness with regards to demographic characteristics and socio-economic parameters. Demographics and socio-economic parameters included age, education, gender, occupation and income groups. Questions on awareness level of environment comprised of statements that required respondents to determine on how strongly they agreed or disagreed with them. The respondents were provided with five alternatives to choose from for each question.

4.2 Data Collection

An internet based survey technique was used to collect data from the sample population. The survey was administered to people residing in metropolitan cities of India namely Mumbai, Delhi, Kolkata, Chennai and Bengaluru and nearby areas to get a representative sample of 61 individuals. Before deploying the actual survey a pilot test was conducted within a close group to ensure that the questions included were easy to comprehend and respond as well as to ensure the accuracy of the alternatives furnished in the questions.

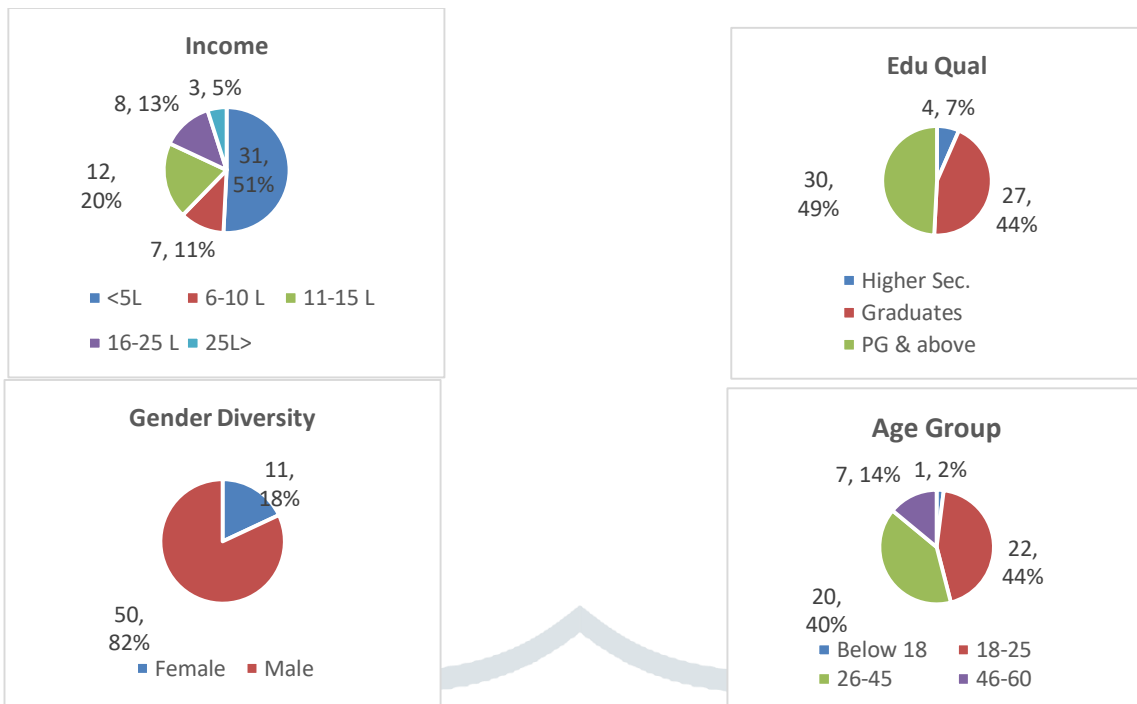
4.3 Data Analysis

The primary data collected by way of an internet based survey was then analyzed using SPSS tool and Excel. Chi Square Test was used to test the hypothesis.

5 RESULTS

5.1 Sample Description

The sample has a larger representation of males as compared to females. The overall sample is considerably young with respondents being majorly from the age groups of 18 to 45. The age of the respondents can be ascribed to the fact that majority of the respondents are graduated, post graduated and above. It may also be noteworthy to see that the sample collected may not necessarily be representative about the overall Indian population but majorly represent current and prospective car owners. Detailed demographic patterns of the sample are provided in following charts



5.2 Environmental Awareness

H01: Environmental awareness with reference to vehicular pollution varies with literacy levels

Educational Qualification * Are fossil fuel cars key contributor to climate change

Crosstab

Count

Are fossil fuel cars key contributor to climate change

		3	4	5	Total
EQ	3	0	3	1	4
	4	1	14	14	29
	5	1	9	18	28
Total		2	26	33	61

Symmetric Measures

		Value	Asymptotic Standard Error ^a	Approximate T ^b	Approximate Significance
Interval by Interval	Pearson's R	.183	.122	1.426	.159 ^c
Ordinal by Ordinal	Spearman Correlation	.197	.124	1.541	.129 ^c
N of Valid Cases		61			

a. Not assuming the null hypothesis.

b. Using the asymptotic standard error assuming the null hypothesis.

c. Based on normal approximation.

Respondents with different educational level were asked to answer on “Petrol/Diesel cars contribute significantly to increased air pollution in cities” with the degree of agreement to the statement on a 5-point Likert scale with score of 1 (Strongly Disagree) and 5 being the (Strongly Agreed) value. Above table shows that the Pearson’s R value is 0.183 which indicated weak positive correlation hence the null hypothesis is rejected. That means even respondents with lesser education believe that fossil fuel cars are key contributor to climate change.

5.3 Change in life style.

H02: Educated people feel that change in lifestyle is a cause of environmental degradation.

EQ * Change in Lifestyle

Crosstab

		Change in Lifestyle			Total
		3	4	5	
EQ	3	0	1	3	4
	4	1	13	15	29
	5	2	12	14	28
Total		3	26	32	61

Symmetric Measures

		Value	Asymptotic Standard Error ^a	Approximate T ^b	Approximate Significance
Interval by Interval	Pearson's R	-.110	.121	-.851	.398 ^c
Ordinal by Ordinal	Spearman Correlation	-.088	.126	-.676	.502 ^c
N of Valid Cases		61			

a. Not assuming the null hypothesis.

b. Using the asymptotic standard error assuming the null hypothesis.

c. Based on normal approximation.

Respondents with different educational level were asked to answer on “Petrol/Diesel cars contribute significantly to increased air pollution in cities” with the degree of agreement to the statement on a 5-point Likert scale with score of 1 (Strongly Disagree) and

5 being the (Strongly Agreed) value. Above table shows that the Pearson’s R value is -0.110 which indicated weak negative correlation hence the null hypothesis is rejected. That means even respondents with lesser education believe that change in lifestyle is responsible for environmental degradation.

5.4 Solution for the pollution problem

H03- Literates feel that eco-friendly cars will solve the pollution problem.

EQ * Would Eco friendly cars solve pollution problem

Crosstab
Count

		Would Eco friendly cars solve pollution problem				Total
		2	3	4	5	
EQ	3	0	0	1	3	4
	4	0	0	18	11	29
	5	2	3	13	10	28
Total		2	3	32	24	61

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	8.573 ^a	6	.199
Likelihood Ratio	10.315	6	.112
Linear-by-Linear Association	3.932	1	.047
N of Valid Cases	61		

a. 8 cells (66.7%) have expected count less than 5. The minimum expected count is .13.

The above test reveals that the significance value in Chi Square test is greater than 0.05, the null hypothesis is accepted, It can also be inferred from the above tables that educated population which accounts majorly for students and employed individuals show a greater consideration towards environmental problems and feels that eco-friendly cars would solve the pollution problem.

6 CONCLUSION

The purpose of this paper was to explore the environmental awareness of Indian consumers and with variation demographic characteristics. My analysis showed that there is no change in awareness levels of the consumers with the demographic variations. Even the less educated person is also now aware of ill effects of fossil fuel cars and lifestyle.

7 FUTURE RESEARCH

The current study was limited to the metropolitan cities of India. Further research is required to include consumer groups from all regions of India to see if the results from this study are replicable to the whole of India. Since eco-friendly cars yet to gain a substantial share in the automotive market, an in-depth study covering all regions would provide a substantial base to overcome the major shortcomings faced by consumers. In addition to an internet based survey further analysis could also consider direct face-to-face interviews to get a more enhanced perspective.

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