

An In-Depth Analysis of Electric Bikes and Petrol Bikes in Modern Transportation

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Abstract

Since the Electric Era is Booming across the world, so many major Electric Vehicle manufacturers are launching their all-electric bikes in India, due to marketing strategies and technological skills. Sales and demand for Electric Bikes is rapidly increasing in Maharashtra as well as in Palghar City. The research problem statement is can this affect sales and demand of Petroleum Bikes? As Marketing Strategies are diversely affecting the mindset of humans. While concluding which one is More Affordable by comparing its price, range, running Cost and analyzing public opinion from Palghar city with the help of Statistical tools, found a result that there is not much difference in-between these two as per our survey parameters. Moreover, Petroleum bikes made noticeable sense over electric bikes. Although Commercial Advertisement mainly centralize that Electrical bikes are ecofriendly and supports the green movement as they don't emit exhaust fumes but they do use batteries which can emit toxic fumes. In India 65-70% electricity is used to power electric vehicles, which is generated from non-renewable energy sources and the fossil fuels, which can indirectly have a negative impact on both our health and the environment.

Keywords: Technology, Electric bikes, Petrol bikes, Green Marketing and Advertisement.

Introduction

The pollution emitted by the automobiles is increasing rapidly nearly about 73% of total pollution due to the usage of internal combustion engines. The future of automobile is going to be electric. But, if we go for newly launched electric bikes, they are highly priced compare to conventional petrol bikes. Battery used by these electric bikes are costlier, they use lithium-ion batteries which prices around thousands. The papers aims to study the green marketing strategies and measure the gap between pollution caused by petrol vehicles against electric vehicles.

Literature Review

1. Bing tu, hui wang, yin wang, rui li, liuzhang ouyang, renheng tang, (2022), in contrast to lithium-ion reserves, hydrogen may be found virtually anywhere. If you have the technology, it is an unlimited resource that is not subject to governmental resource centralization like fossil fuel. Concepts for hydrogen-powered scooters, like the mob-ion AM1, have demonstrated that two stacks of hydrogen cells the size of a coke can can power a 3kw motor, negating the need for bulky battery packs

2. Ali, saqlain, (2021), electric vehicles have a significant deal of promise to increase efficiency in the transportation sector. Helps to decrease accidents, boost productivity, and lessen environmental impact. They have encountered opposition from many groups, who contend that they are hazardous, provide a security risk, endanger jobs, and worsen environmental pollution due to more driving as a result of their convenience. Given the greater knowledge of how the policymaker's decisions today may affect the future development and use of developing technologies

3. B. Patil, P. Kansara, P. Ambre, H. Prajapati, and W. Khan (2019) disassemble the regular petrol bike and convert it into a hybrid bike by adding a lithium-ion battery, an electric hub motor, a regenerative controller, an electric throttle, etc. We then take the hybrid bike on numerous trails in accordance with local requirements and review the performance of each component to determine that it runs properly on both the engine and the electric motor.

Research Problem

1. Since the introduction of Electric Bikes in the market, they have not been proved to be cost-effective for use especially as a result of their high demand for an intense bike as well as the time taken for recharging them.

2. As per the study people believe in cost cutting of variable, cost of vehicles. Competing fairly with electric bikes has been a bigger challenge since people prefer what will be convenient for them and cost short distances are co-effective

3. The study focuses on future scope of bikes keeping in mind easy availability and affordability

Objectives

1. To study and analyze which bike is more affordable, electric bike or petrol bike

2. To study the genuine impact of green marketing on pollution keeping electric bikes as focus area

3. To compare future scope of electric bikes and petrol bikes

4. To measure and interpret the difference between electric bike and petrol bikes

Hypothesis

1. H_0 : There is no significant difference while illustrating the characteristics such as reliability, safety, easy refueling, efficiency and purchasing cost.

H_1 : There is significant difference while illustrating the characteristics such as reliability, safety, easy refueling, efficiency and purchasing cost.

2. H_0 : There is no significant relationship between the acidification impact on health and the environment.

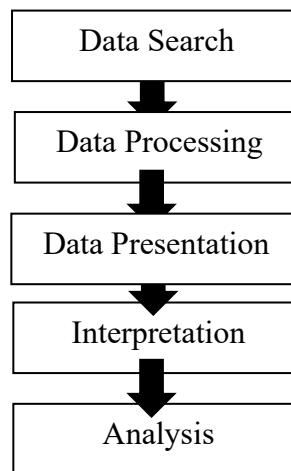
H_1 : There is significant relationship between the acidification impact on health and the environment.

3. H_0 : There is no significant difference between samples.

H_1 : There is significant differentiating between samples.

Methodology

1. Primary information collected in the form of survey through Questionnaires
2. Secondary data collected through Google scholar and Research papers
3. Statistical analysis was done using one-way ANOVA



Analysis and Interpretation

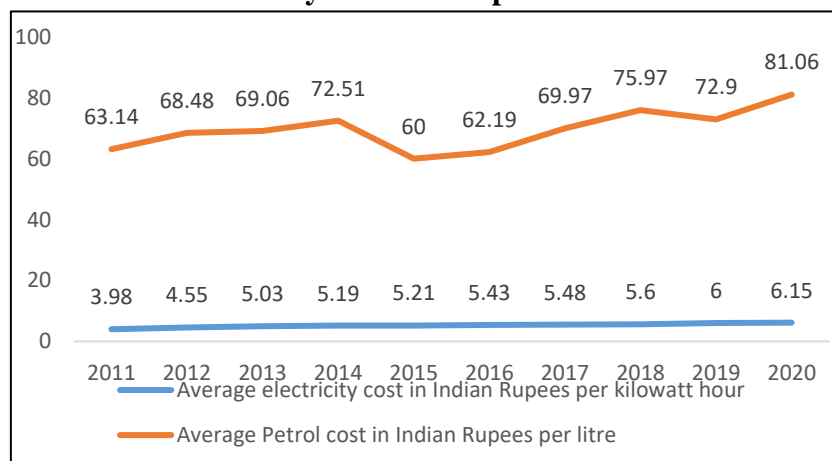


Fig No.01 Comparison of Electricity Cost and Petrol Cost of India

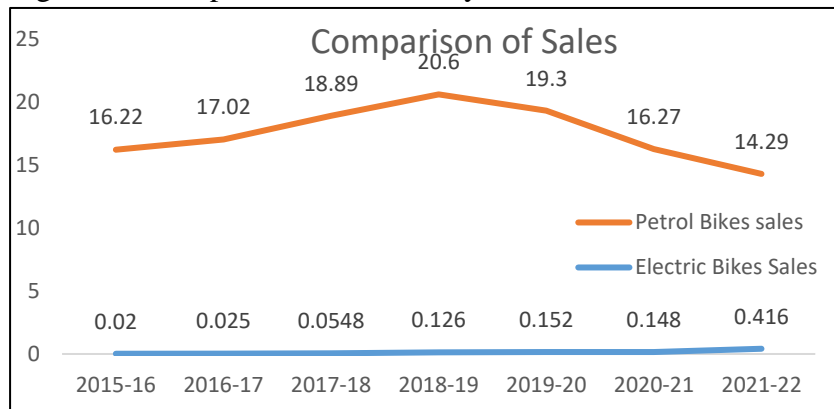


Fig No.02 Comparison of Petrol Bikes Sales and Electric Bikes Sales

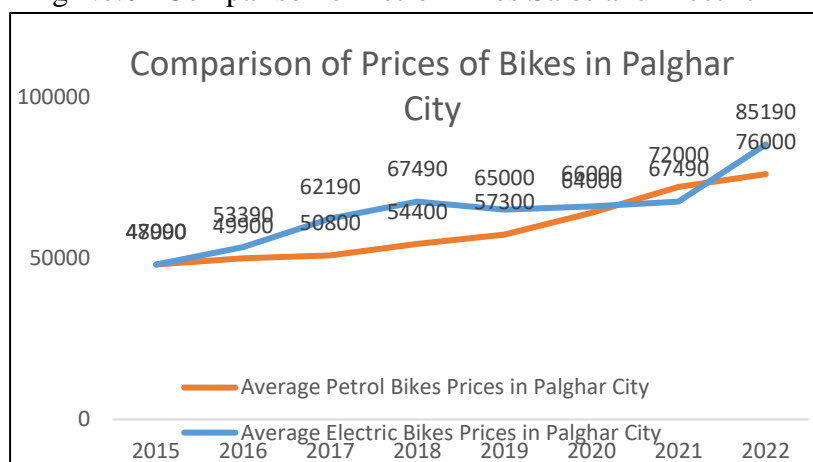
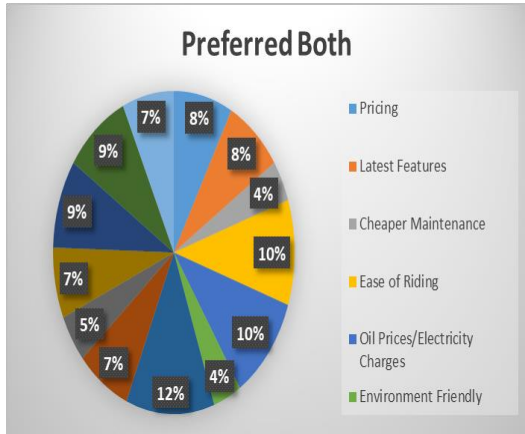
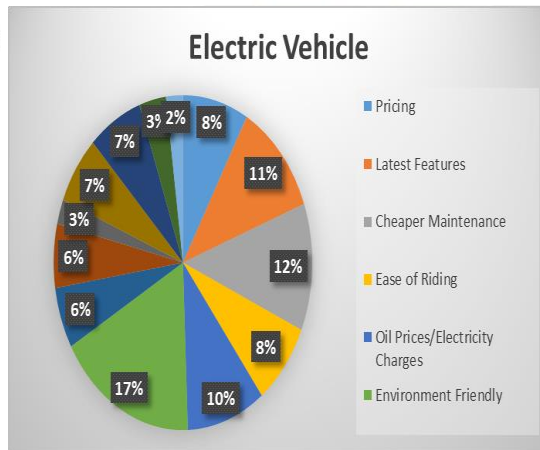
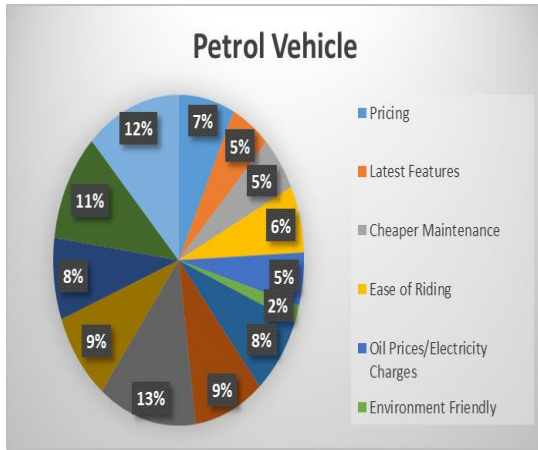


Fig No.03 Comparison of Prices of Petrol Bikes and Electric Bikes in Palghar City

Data Interpretation

Sr. No.	Parameters	Electric Bikes	Petrol Bikes	Preferred Both
1	Pricing	117	136	48
2	Latest Features	158	96	47
3	Cheaper Maintenance	175	101	25
4	Ease of Riding	114	123	64
5	Oil Prices/Electricity Charges	140	97	64
6	Environment Friendly	246	32	23
7	More Comfortable and Pleasant	84	145	72
8	Weight Capacity of Vehicle	88	169	44
9	Long Distance Travel	34	238	29
10	Refilling/Charging Time	94	164	43



Preference	Mean	P value
Electric	109.6154	0.000045
Petrol	144.6154	
Both	46.76923	

11	Battery Pack/Servicing	97	150	54
12	Availability of Charging Station/Petrol Pump	48	200	53
13	Speed	30	229	42

Sampling Technique

ANOVA table

Source of Variation	Sums of Squares SS	Degrees of freedom DF	Mean Squares MS	F
Between samples	SSB = 63910.2051	$k - 1 = 2$	MSB = 31955.1026	13.3796
Within samples	SSW = 85980.4615	$n - k = 36$	MSW = 2388.3462	
Total	SST = 149890.6667	$n - 1 = 38$		

STEP1 : H_0 : There is no significant difference between samples.

H_1 : There is significant differentiating between samples.

STEP2: $F(2, 36)$ at 0.05 level of significance $F_{Table} = 3.2594$

STEP3: $F_{Calculated} = 13.3796$

STEP4: Since $F_{Calculated} > F_{Table}$

So, H_0 is rejected

Hence there is significant difference between samples.

Result using P-value:

The p -value is 0.000045.

Since $p\text{-value} < 0.05$. So, H_0 is rejected.

Price Comparison of Petrol Bikes and Electric Bikes

Sr. No.	Particulars	Petrol Bikes	Electric Bikes
1	Price	85000	126000
2	Savings	41000	0
3	Maintenance Cost (4 years)	10000	40000
4	Petrol / Electricity Cost(40000km)	80000	10000
5	Interest on Savings	10000	0
6	Total Savings(4 years)	51000	0
7	Final Cost (after 4 years)	175000- 51000=124000	176000

For 4 years petrol bikes cost is still lower than electric bikes

Future Scope of Petrol Bikes and Electric Bikes

	Petrol Bikes					Particulars	Electric Bikes				
	1st Year	2nd Year	3rd Year	4th Year	5th Year		1st Year	2nd Year	3rd Year	4th Year	5th Year
Particulars	2022-23	2023-24	2024-25	2025-26	2026-27		2022-23	2023-24	2024-25	2025-26	2026-27
Price of Bike	90,000	94,000	98,500	1,03,500	1,09,500	Price of Bike	1,26,000	1,38,600	1,52,460	1,67,710	1,84,410
Cost of Petrol (20000km per year)	50,000	52,000	53,000	54,000	55,500	Cost Electricity (20000km per hour)	5,500	6,350	7,150	7,800	9,800
Interest on Loan	11,200	10,800	9,800	9,500	9,000	Interest on Loan	17,200	16,600	16,100	15,600	15,000
Cost of Repairs & Maintenance	4,000	4,000	4,000	4,000	4,000	Cost of Repairs & Maintenance	10,000	10,000	10,000	10,000	10,000
Battery	-	-	-	-	-		-	-	-	-	65,000

Cost												0
Total Cost	1,55,200	1,60,800	1,65,300	1,71,000	1,78,000	Total Cost	1,58,700	1,71,550	1,85,710	2,01,110	2,84,210	
Savings(Electric Bike – Petrol Bike)	3,500	10,750	20,410	30,110	1,06,210							

After 5 years petrol bikes cost is still lower than electric bikes

Limitations of Lithium Ion Batteries

1. In India, over 50,000 tones of lithium ion battery waste is produced every year amongst which only 2% are recycled. Currently India have only 9 lithium ion recycling plants. India is investing 300 crore rupees in expanding lithium ion recycling capacity from 1,000 tones to 11,000 tones per annum by the end of this year

2. According to reports only china will produce 500000 metric tons of lithium ion batteries and global index of production will reach to 2 million metric tons per year by 2030. In Australia 2-3% and European union and less than 5% lithium ion batteries are recycled

Suggestions

1. Some research claims that Hydrogen powered scooter are 2.5x more efficient than conventional engines and takes only a few minutes unlike EVs which take hours to charge. Hydrogen can be produced using electrolysis, steam methane reforming (extracting hydrogen from natural gas) and gasification, a process producing hydrogen from steaming coal which can be done locally, we can generate the fuel at the fuel station itself
2. We can adopt a hybrid system, where while running a bike the mechanical energy will be converted to electrical energy and can be stored in a battery, which will help to drive a vehicle. And thus fossil fuels can be conserved to certain extent. A hybrid electric vehicle that relies not only on batteries but also on an internal combustion engine, which drives a generator to provide the electricity and may also drive a wheel. This vehicle is powered by both battery and petrol, the combination of both the powers makes the vehicle dynamic in nature

Conclusion

Overall, petrol bikes are much better than electric bikes. Producing batteries and electric motors requires a lot of toxic minerals such as nickel, copper and aluminum. Hence, the acidification impact is much greater than that of conventional petrol bikes production. Batteries are gradually getting better, which could result in electric bikes being used for longer, however, as petrol engines are also improving, the relationships between the different types of vehicles are not constant. While studying genuine impact of green marketing on pollution electric bike proved hazardous.

References

1. Bing tu , hui Wang, yin Wang, rui li, liuzhang ouyang, renheng tang, optimizing ti–zr–cr–mn–ni–v alloys for hybrid hydrogen storage tank of fuel cell bicycle, international journal of hydrogen energy, volume 47, issue 33, 2022, pages 14952-14960, ISSN 0360-3199, <https://doi.org/10.1016/j.ijhydene.2022.03.018>
2. Ali, saqlain, "an overview on why electric cars are the future of transportation" (2021). Electronic theses, projects, and dissertations. 1372
3. B. Patil , P. Kansara , P. Ambre , H. Prajapati, and W. Khan, automobile department, "regenerative hybrid bike" international journal of engineering research & technology (IJERT), ISSN: 2278-0181, vol. 8 issue 11, november-2019
4. Wanger, T.C. (2011), the lithium future—resources, recycling, and the environment. Conservation letters, 4: 202-206. <https://doi.org/10.1111/j.1755-263x.2011.00166.x>
5. Pražanová A, Knap V, Stroe, D, literature review, recycling of lithium-ion batteries from electric vehicles, part ii: environmental and economic perspective. Energies 2022, 15, 7356
6. N. Omar, Y. Firouz, H. Gualous, J. Salminen, T. Kallio, J.M. Timmermans, Th. Coosemans, P. Van den Bossche, J. Van Mierlo, "Aging and degradation of lithium-ion batteries" Editor(s): Alejandro A. Franco, In Woodhead Publishing Series in Energy, Rechargeable Lithium Batteries, Woodhead
7. Sharada Prasad N and K R Nataraj, Design and development of hybrid electric two-wheeler suitable for Indian road conditions, International Journal of Electrical, Electronics and Data Communication, ISSN: 2320-2084, Volume-2, Issue-9, Sept.-2014.
8. Dr. S. Charles, Fredrick. C, Gopinath. K and Manoj Prabakar. D, Design and development of an extended range electric hybrid scooter, IRACST- Engineering Science and Technology: An International Journal (ESTIJ), ISSN: 2250-3498, Vol.2, No. 2, April 2012.
9. Dhobale, Mayur Ishwardas. "Future of Hydrogen Fuel—A Potential Contribution in India." *Natural Gas* 42.81 (2016): 45.
10. Shepherd, Simon, Peter Bonsall, and Gillian Harrison. "Factors affecting future demand for electric vehicles: A model based study." *Transport Policy* 20 (2012): 62-74.
11. Gärling, Anita, and John Thøgersen. "Marketing of electric vehicles." *Business Strategy and the Environment* 10.1 (2001): 53-65