**“An analysis of the growth of the Indian automobile industry and its impact on the environment”**

Dissertation Project By

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***Candidate’s Declaration***

I hereby declare that the work, which is being presented in the Major Project/Seminar/Term Paper, entitled **“Evolution of the Indian automobile industry and its impact on the environment.”** in partial fulfilment for the award of Degree of “B.A. Honors Economics” **submitted to the Amity School of Economics,** Amity University, Uttar Pradesh is a record of my own investigations carried under the Guidance of Ms. Manisha Raj, of Amity School of Economics.

I have not submitted the matter presented in this report anywhere for the award of any other Degree.

**(Signature of Candidate)**

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## CERTIFICATE

This is to certify that I Pradyuman Bansal of, B.A. Honors Economics 2016-19 6th Semester, has presented a Term Paper “**An analysis of state of parking policy in Delhi and its impact on Urban Economics**” in partial fulfilment for the award of the degree of B.A. Honors Economics under Amity University, Uttar Pradesh .

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**EVOLUTION OF INDIAN AUTOMOBILE INDUSTRY AND ITS IMPACTS ON THE ENVIORNMENT.**

**Abstract**

‘India is emerging as one of the world's fastest growing passenger car markets and second largest two wheeler manufacturer’. ‘It is also home for the largest motor cycle manufacturer and fifth largest commercial vehicle manufacturer’.’ India is emerging as an export hub for sports utility vehicles (SUVs)’.’ The global automobile majors are looking to leverage India's cost-competitive manufacturing practices and are assessing opportunities to export SUVs to Europe, South Africa and Southeast Asia’.’ India can emerge as a supply hub to feed the world demand for SUVs’. ‘India also has the largest base to export compact cars to Europe. Moreover, hybrid and electronic vehicles are new developments on the automobile canvas and India is one of the key markets for them’. ;Hyundai, Toyota and Suzuki rank their Indian production facilities right on top of their global pecking order’.

On the other hand looking from another angle we find that this evolution of automobile industry has led to some serious environmental impacts in our country buy all the harmful gases that are being emitted by these motor vehicles that are constantly increasing.

This paper seeks to examine the rise in the Indian automobile industry post liberalization phase when the new Industrial Policies were announced and then looks at the negative side of it that is the environmental impacts of this evolution.

**Introduction:**

‘The automobile industry in India is one of the largest industries and a key sector of the economy’. ‘It is in fact the ‘industry of industries’ as it has considerable forward and backward linkages’. ‘Foreign Direct Investment (FDI) in automobile sector has made a significant contribution to the growth in this sector specific and also developments and growth in the other related industries, like, metal, paint, electrical electronic gadgets, tube and tyre, auto components, etc’.

‘In 1991, the government of India liberalized its policies regarding the automobile industry and FDI entered the sector’. ‘In 1993, FDI was also permitted in the passenger car segment of Indian automobile industry’. ‘The norms for foreign investment and import of technology have also been liberalized over the years for manufacture of vehicles’. ‘At present, 100% foreign direct investment is permissible under the automatic route in this sector, including passenger car segment’. ‘The growth of Indian middle class, the increasing purchasing power, and the strong macro-economic fundamentals have attracted the major auto manufacturers to Indian market’. ‘The market linked exchange rate, well established financial market, stable policy governance work and availability of trained manpower have also benefitted the flow of capital to the auto industry of India’. ‘All these factors have contributed to a remarkable improvement in the industry’s productivity, which is one of the highest in Indian manufacturing sector’.

The other aspect of this study is the enviornmental impact of this evolution of automobile industry. ‘Most of the activities related to the automobile industry, directly or indirectly, have significant impact for the environment’. ‘Direct activities are connected to the production and use of the vehicle, while indirect are related to all other activities that are not controlled by the sector but influence its overall picture such as the production and distribution of raw materials’. ‘Automobile manufacturers are aware of the problem and the steps towards a more sustainable sector are obvious’. ‘In the present paper, environmental impact of Automobiles is analysed’. ‘The major pollutants which contribute to air pollution include radon, volatile organic compounds, formaldehyde, biological contaminants, carbon monoxide, carbon dioxide, sulfur dioxide, hydrocarbons, nitrogen oxides sulfur dioxide, ozone, total suspended particulate matter, lead and toxic pollutants, most of which are released from the road traffic’. ‘The rapid urbanization in India has resulted in a tremendous increase the number of motor vehicles’. ‘The vehicle fleets have even doubled in some cities in the last one decade’. ‘This increased mobility, however, come with a high price’. ‘As the number of vehicles continues to grow and the consequent congestion increases, vehicles are now becoming the main source of air pollution in urban India’. ‘The growth rate of vehicles is the backbone of economic development and the Indian automotive industry (the second faster growing in the world)’. ‘About 7-8 million vehicles are produced annually in the country today. In 2011 country reported 141.8 million registered motor vehicles’. ‘Autumobiles are the primary source of air pollution in India’s major cities especially Delhi’. ‘In India transport sector emits an estimated 261 tons of CO2, of which 94.5% is contributed by road transport’. ‘According to data out of total 3,000 metric tons of pollutants belched out every day, close to two-third (66%) is from vehicles’. ‘There is a direct relationship between road transport system and air pollution in the country that we will find out in this study’.

**Literature Review:**

1. **A Study on Productivity Performance of Indian Automobile Industry: Growth accounting Analysis by Dr. Seema Sharma:**

This paper seeks to look at the productivity performance of the Indian industry via growth accounting approach. The amount for the study spans from 1990-91 to 2003-04. The live of Total Factor Productivity Growth (TPFG) is employed during this analysis paper to seek out the expansion of the Indian industry over the amount of your time. The competitive setting that emerged with the liberalization of the economy witnessed a positive impact on the Indian economy and also the industry particularly. The car business within the country is one among the key sectors of the economy in terms of the utilization opportunities that it offers directly yet as indirectly. This paper tries to look at the productivity performance of Indian automobile industry in post relief era.

The term Total Factor Productivity (TFP) measures the changes in output that are non-attributable to changes in input. These non-input factors viz., technological progress, economies of scale, capability utilization, market unskillfulness and qualitative changes in inputs etc. create the input factors additional economical thence enabling additional production with a similar amount of inputs. TFP gain captures this potency and might be measured by the magnitude relation of output and input. Over the years, an increase during this magnitude relation with constant inputs is inferred as TFP gain. The year-to-year specific TFP values could fluctuate; thence TFP Growth (TFPG here after) is best thought of in terms of productivity trends over an amount of your time (since 1999). TFPG is obtained as distinction between the rates of growth of real product and real issue input (Jorgenson and Griliches, 1967

Results on TFP reveal that Indian industry couldn't expertise positive productivity growth within the post liberalization period. Trend rate in TFP came intent on be -0.015, that is important at five % level of significance.

1. **Growth of Indian Automobile Industry by M. Krishnaveni and R. Vidya.**

The present paper studies the categorization wise production, exports and sales of motor vehicles in India. As of late India has been creating as a market potential for cars increasing demand in the interest both at home and in the abroad countries. This is reflected in the generation figures of the business particularly surprising in the traveler vehicle and three wheeler divisions, where creation brought from 1,209,876 vehicles up in the year 2004 2005 to 3,072,651 vehicles in the year 2013 2014. The sale figure of the automobile industry says that the production of the commercial vehicles have decreased. The examination of the 10 year information of the industry states that the sale is satisfactory. The export rates of made in India ascended by 31% in money in financial year 2004 2005 as traveler autos, two and three wheelers, commercial and multi utility vehicles keep on beguiling abroad purchasers. An aggregate of 1.2 million units were exported in the financial year 2007 2008 more than 1 million units traded in the monetary year 2006 2007. This paper centers on SWOT investigation and vision of Indian Automobile Industry.

India is rising as one of the world's quickest developing traveler vehicle markets and second biggest bike producer. It is likewise home for the biggest bike producer and fifth biggest commercial vehicle maker. India is rising as an exports hub for the SUVs. The worldwide car majors are hoping to use India's cost-focused assembling rehearses and are surveying chances to send out SUVs to Europe, South Africa and Southeast Asia. India can rise as a supply center to encourage the world interest for SUVs. India additionally has the biggest base to send out smaller vehicles to Europe. In addition, hybrid vehicles and electronic vehicles are new advancements on the car canvas and India is one of the key markets for them. Hyundai, Toyota and Suzuki rank their Indian generation offices directly over their worldwide pecking request.

1. EVOLUTION AND GROWTH OF INDIAN AUTO INDUSTRY by Walmik Kachru Sarwade.

After the progression the traveler vehicle portion saw a blast and numerous organizations from India just as outside entered the market. With advancement, Government nullified permitting and evacuated prohibitive exchange approaches. Car industry profited significantly from these measures. The vehicle business in India happens to be the ninth biggest on the planet, following Japan, South Korea and Thailand. In 2009, India rose as the fourth biggest exporter of cars. A few Indian car makers have spread their activities universally also, requesting more interests in the Indian vehicle division by the MNC's.

Before the mid 1990s when India opened its, at that point limited market, owning a vehicle was seen as an extravagance and exhausted in like manner. Amid the mid 1990s, residential organizations, for example, Tata Motors, Maruti Udyog, Mahindra and Mahindra, Hindustan Motors, and Premier, made a moderately modest number of vehicles. In the mid-1990s, outside makers entered the market through JVs with residential producers as required by the legislature. This passage raised the dimension of rivalry and conveyed numerous worldwide providers to India to help their producer clients. It was likewise when the Indian populace started to change in accordance with another, worldwide car economy and makers acclimated to their new accomplices, built up their supply chains, and started to comprehend India's difficulties and the Indian shopper. In 2000, the administration lifted the necessity that outside organizations set up JVs with local organizations. As, its Gross Domestic Product (GDP) developed, India fabricated and sold more vehicles, achieving the 1-million-vehicle mark in the 2004-2005 monetary year. In 2006, government support for the business achieved a high point with the formation of the Automotive Mission Plan (AMP). This arrangement not just archives the significance of the car business to the Indian economy yet in addition the expanded help the administration will give through 2016.

The system of this paper is significantly founded on the optional types of information gathered from the raw numbers distributed via Automobile Manufacturers Association of India. Further, the information were gathered now and again from the official Directory of Bombay Stock Exchange.

In the present examination, the Automotive Industry being one of the key enterprises in India has gotten due consideration and deliberate endeavors are being made for the fast improvement of the Industry. These are very much upheld by different Government activities towards the improvement of the Indian Automotive Industry. The concise investigation above gives the hopeful view about the business and the general business demonstrates a positive development which prescribes the financial specialists to keep a decent watch on the real players to profit as far as profit for ventures. Sarwade W K Evolution and Growth of Indian Auto Industry Journal of Management Research and Analysis, April - June 2015;2(2):136 141 This investigation causes us to know the genuine position of the ventures in the present situation.

1. **CHANGING STRUCTURE OF INDIAN AUTOMOBILE INDUSTRY by Neeraj Kumar and Dr. Kuldip Kaur**

The aim of this study is to research the modification in structure of Indian industry the context of alleviation and globalisation,that caused major changes during this trade. Before 1991, the trade was dominated by many makers and was hardly familiarfor any innovations however currently it's one in all the quickest growing industries of worldwide. the information for the analysis are extracted from the assorted secondary sources like Centre for watching Indian Economy (CMIE PRoWESS), SIAM, etc,  
Between 197o and 1984 cars were thought-about a luxury product; producing was accredited, enlargement was restricted. Despite economic retardation, the Indian automotive sector has shown high growth.in 2oo6-2oo7. In 2oo6-o7, the Indian automotive trade provided direct employment to over three hundredooo people. Throughout that reform wave the Indian industry goes through a technological modification wherever every firm is engaged in dynamic its processes and technologies to take care of the competitive advantage and supply customers with the optimized merchandise and services. The information are taken from the assorted secondary sources like Centre for watching Indian Economy (CMIE, PRoWESS) reports, Automotive element makers Association of India (ACMA), Society of Indian Automobile makers (SIAM) reports and connected searches on the web from 1992-93 to 2o1o-11.

The vehicle handiness behind per one thousand individuals raised over 5 times throughout 1997-2o13. The prime factors to blame for this increase are:   
• Increase of urban proportion of total population.  
• The Indian pocket growing deeper i.e. rising per capita financial gain.  
• Accelerated overall growth of different industrial segments am fond of it trade, electronic trade, medium subscriber, retail loaning by banks, etc.  
• According to Sunil Kakkar, head of Maruti Suzuki the demographic dividends, in 2ooo the typical age of automotive vendee was thirty-nine years and it decreases over the year and in 2o1o the typical age of automotive vendee was thirty three years.  
With post-liberalization reforms in situ since 1991, Asian country has achieved outstanding development on the economic front by achieving a sustained rate for its economy in recent years. The globe Bank and different reliable sources state that Asian country is about to emerge because the second most vital economic powerhouse in Asia and therefore the third largest economy within the world in terms of buying power parity by 2o2o (Kumar, 2oo7). As regards the auto sector, Asian country has already become the world’s seventh largest vehicles producer with a large potential for growth in different segments. Exports have conjointly started flourishing and it's expected that Indian makers will grab the worldwide market during a massive method. However, the Indian makers can need to upgrade their technology and quality to maneuver from sensible to wonderful.

1. **The Indian Automotive Industry Evolving Dynamics by KMPG India**

The automotive industry is one of the focus industries for KPMG globally, given its importance both in the mature economies of countries such as the US and Germany, and in the emerging economies of China and India. This report attempts to capture how the Indian automobile industry is expected to develop in the longer term, and what role each stakeholder needs to fulfill in order to be geared up for evolving requirements. This report through discussions with various industry personnel and by examining similar trends developing in other markets.

Demographically and economically, India’s automotive industry is well-positioned for growth, servicing both domestic demand and, increasingly, export opportunities. A predicted increase in India’s working-age population is likely to help stimulate the burgeoning market for private vehicles. Rising prosperity, easier access to finance and increasing affordability is expected to see four-wheelers gaining volumes, although two wheelers will remain the primary choice for the majority of purchasers, buoyed by greater appetite from rural areas, the youth market and women.

Domestically, some consolidation or alliances might be expected, driven by the need for access to better technology, manufacturing facilities, service and distribution networks.The components sector is in a strong position to cash-in on India’s cost-effectiveness, profitability and globally-recognized engineering capabilities. As the benefits of collaborations become more apparent, super-specialists may emerge in which the automobile is treated as a system, with each specialist focusing on a sub-system, akin to the IT industry.Though this approach is radical, it could prove an important step in reducing complexity and investment requirements, while promoting standardization and meeting customer demands. Manufacturers are already planning for the future: early advocates of technological and distribution alliances have yielded generally positive results, enabling domestic oEMs to access global technology and experience, and permitting them to grow their ranges with fewer financial risks.

This exciting outlook for the industry is set against a backdrop of two potentially game-changing transportation trends – the gradual legislative move towards greener, gas-based public transport vehicles, and a greater requirement for urban mass mobility schemes to service rapidly-expanding cities.

Current low car penetration, rising prosperity and the increasing affordability of private vehicles offer a healthy prognosis for the Indian automotive industry. The companies benefiting most from this evolving landscape will be those who forge judicious alliances and resource-sharing agreements, who prepare for the growing importance of green technologies, and who remain flexible enough to respond to the twin needs of private light transport and mass transport schemes.

1. **Future Trend in Indian Automobile Industry: A Statistical Approach by Pradeepta K. Sarangi, Shahin Bano and Megha Pant.**

The automobile industry is one of India’s major sectors; accounting for 22% of the country’s manufacturing GDP. Indian Auto market has the potential to dominate the Global auto industry, provided, a conducive environment is created for potential innovators to come up with new pilot projects. For the year 2o12-2o13, automobile sector has shown a sluggish growth citing high ownership costs like excise duty, cost of registration, fuel costs, road tax and slow rural income growth. over the next few years, solid but cautious growth is expected due to improved affordability, rising incomes and untapped markets. All these give a promising opportunity for automobile manufactures in India. According to Macquaire equities research, passenger vehicles sales is expected to double in the next four years and growth is anticipated to be higher than 16 percent from the past 1o years [2]. In this paper, we have made an attempt to forecast the sales, production and export trend for Indian automobile industry over next three years.

The objective of this research is to find out the growth of Indian automobile industry and to report the forecasted values for the next three years (2o13-14 to 2o15-16) using statistical technique (Graphical method with linear trend line).

The data used in this research is the historical data of Indian auto mobile industry from the period 2oo1- o2 to 2o12-13 (for the segments of production trend, domestic sales trend and export trend) collected from and downloaded from the website of “Society of Indian Automobile Manufacturing”.

An attempt has been made to understand and analyze the current and future trend in Indian automobile industries. Secondary data collected from website and research publications have been used. Forecasted values have been calculated for the period 2o13-14 to 2o15-16 using statistical approach. Despite various ups and downs in the past years, our experiments show positive growth in all segments.

1. **Growth of automobile industry and its economic impact: An Indian perspective by Vandana Singh**

The prime objective of this paper is to analyse the growth pattern and economic impact of automobile industry on Indian economy, to analyse the growth of Indian automobile industry, To study the economic impact of growth of automobile industry on Indian economy.

The core automotive industry supports wide range of businesses segments, both upstream and downstream, along with adjacent industries. This leads to multiplier effect for growth and economic development. Automotive contributes to several important dimensions of nations building: generating government revenue, creating economic development, encouraging people development and fostering R&D and innovation.

The Indian automobile industry produced around 8.46 million vehicles in FY (Financial Year) 2oo4-o5. During the FY 2o14-15 this industry produced 23.35 million vehicles. The sector shows AAGR (Average Annual Growth Rate) of 11.7 percent and CAGR (Compound Annual Growth Rate) of 1o.6 percent over FY 2oo4-15. Two-wheeler vehicle segment was the fastest growing segment, representing a CAGR of 1o.96 percent followed by passenger vehicle segment with a CAGR of 1o.32 percent between FY 2oo4-15.

Two-wheeler market share accounts for about 79 percent of the total automobile production in the county. India’s auto industry is the world’s sixth largest producer of automobile in terms of volume and value. Further, India is the Asia’s second largest two-wheeler manufacture, fifth largest producer of commercial vehicle, fourth largest manufacture of passenger car and the largest manufacture of tractor.

Total FDI inflows received during 2oo7-16 were Rs.1347911 Cr. (Table 2) out of this the amount of FDI inflows in automobile industry during the same period is Rs.74621Cr., which is 5.5 percent of the total FDI inflows. During 2oo7-o16 FDI inflows in automobile industry registered a CAGR of 25.3 percent.

The sale of passenger vehicle was 1o.6 million in FY 2oo4-o5 it raises to 26 million in FY 2o14-15 as per SIAM. From the graph depicted above (fig.1) it can be easily analyse that there is not any drastic change registered by commercial vehicle and three-wheeler vehicle segment. The commercial vehicle sale was 6.14 lac and three-wheeler sale was 5.3 lac for the FY 2o14-15; while the two-wheeler sale was 62 million in FY 2oo4-o5 reaches to 15.97 crore in FY 2o14-15 registering a dramatic growth.

This paper tries to examine the trends in the automobile industry and its impact on the economy in terms of GDP, Exports, FDI, Employment etc.; all these factors are positively impacted by the growth of Indian automobile industry. As a major employment and export generator, GDP contributor, FDI earner, the automobile industry is instrumental in shaping the country’s economy. As per AMP (Automotive Mission Plan) 2o16-26 the Indian automotive sector has the potential to generate up to US$ 3oo billion annual revenue by end of 2o26, create 65 million additional jobs and contribute over 12 percent to India’s Gross Domestic Product. The amp 2o16 -26 seeks to make this industry the engine of “Make in India” initiative.

1. **Rising Indian Automobile Industry: Looks do Matter! By Dr Tapasya Jhulka**

This paper reports a part of an ongoing investigation in Indian Automobile Industry. Indian Automobile Industry is under continuous reforms so, an attempt has been made to examine the 5 features of a car namely uniqueness, luxury, looks, technical superiority and car accessories which attract customers the most while purchasing a car. A systematic random sampling from five residential areas of urban Jaipur was done to select 5o car consumers. An investigator-constructed questionnaire was used to collect data on these factors. The data analysis using chi-square test was done to describe the nature of the sample and to test the null hypothesis that the choices for purchase of car is equally distributed on five features. Data Analysis has been done by using non parametric chi-square test. It was analyzed that features of car effect car purchasing decision.

The present research utilizes the survey research methodology to find out the features which affect the car buying behavior of a consumer. The research is of ex-post facto type. The objectives of the study were: (i) to construct and validate a questionnaire covering five features namely uniqueness, luxury, looks, and technical superiority and car accessories. (ii) To test the null hypothesis that the choices for purchase of car is equally distributed on five features.

The data collected was subjected to data analysis using non parametric chi-square test as the sample is small and it fulfills the requirement of the study. It was hypothesized that the choices for purchase of car is equally distributed on five features namely uniqueness, luxury, looks, and technical superiority and car accessories. So, the probability of obtaining any one factor over five features is 1/5 and as such the expected frequency of any one feature coming upward is 5o/5 = 1o. By using observed frequency along with expected frequencies, the value of chi-square (X2) was worked out.

Based on the analysis, following results emerged:

• The null hypothesis was rejected as there has been significant difference between the obtained and expected X2 values at o.o1 level.

• There has been significant difference in two features i.e., technical superiority and uniqueness. Therefore, the car purchasing decision is most affected by technical superiority and least affected by uniqueness.

• There is a significant positive relationship between all the considered features and consumers’ car purchasing behavior he Indian automobile sector is a key player in the global and Indian economy. The automobile and auto component industry has emerged as one of the recent success stories. As in all other countries, the Indian automobile industry is one of the key drivers of industrial growth and employment which will further gain in importance in the coming years. In addition, the auto industry is linked with several other sectors in the economy and hence its indirect contribution is much higher than this. All over the world it has been treated as a leading economic sector because of its extensive economic linkages. Moreover, the role of features of car cannot be ignored in the success story of Indian automobile Industry.

1. **A Comprehensive Study of Performance of Indian Automobile Industry - A stock Market Perspective**

In this study an attempt has been made to study the performance of selected leading auto sector stocks in the Indian capital market since year 2oo9 to year 2o13 to find out the health and performance of Indian automobile sector. The aim of this research is to know the financial performance of the companies and the industry as a whole.

Stock market has been the focus of study for many of the researches and this research based on the secondary data would try and find out the trends prevailing in the automobile industries. The companies taken into consideration for the research are:-

- Mahindra and Mahindra Limited

- Maruti Suzuki India Ltd

- Tata Motors Limited

The automotive industry in India is one of the larger markets in the world. It had previously been one of the fastest growing globally, but is currently experiencing flat or negative growth rates.

In 2oo9 year featured the lows in terms of GDP growth rate and unemployment. All of the three companies indexes have shown a period of recovery from the turmoil’s of 2oo8 and same is with the auto and Sensex index. The return in this period has been very low and fluctuating .In 2o1o the GDP was in a recovering stage and same is the case with the auto and BSE index. This has been the period of extra ordinary returns to the shareholders of the three companies as the stock have gone up significantly and lead to abnormal price movement. In 2o11 GDP was at the peak of its performance and so have been the other indexes. The unemployment rate has also been at its best in years and the FDI inflow has also been great and the returns have been growing and gaining consistency. In 2o12 Economic analysis tells that decline in GDP started and also the unemployment rate. The company stocks have also taken a slight dip and this has been consistent with the auto index and the Sensex. In 2o13 The growth in GDP is very low but there are signs of recovery. All other indexes have been doing well and have not shown any signs of decline. The returns have been consistent as ever and this is a positive sign for the times to come. Another finding is that the FDI inflow into India for the automobile sector is mainly for the Passenger cars. Passenger cars have the majority of investment of the foreign companies and this is expected to be so in the future as well. The sales volumes are also on the rise for the Indian auto producers. Company analysis for Tata motors is saying that they will attract investors with the help of their dividend pay-out percentages .Their EPS is showing a negative trend but the dividend pay-out is on the rise. Their debt equity is decreasing every year, EPS is increasing every year and they have a dividend pay-out that would attract any investor. The technical analysis tells that automobile sector and the BSE index i.e. Sensex are correlated and www.indiastat.com July - August, 2o14 26 socio - economic voices movements of one can be used to predict the movement of the other. The auto sector’s performance is directly related to the economic trends in the country. Another finding is that the Mahindra and Mahindra are the most correlated to the auto index than the other two companies

1. **A Study on Impact of “Make in India” on Automobile Sector by Neelofar Kamal**

The Make in India program was launched by The Hon‟ble Prime Minister Mr. Modi in September 2o14 as part of a wider set of nation -building initiatives. The programme has been devised to transform India into a global design and manufacturing hub. The automobile industry, along with the auto components industry, is one of the core industries in India. A well-developed transportation system plays a key role in the development of an economy, and India is no exception to it. Automobile is one of the largest industries in the global market. owing to its strong forward and backward linkages with several key segments of the economy. Automobile Sector occupies a prominent place in the fabric of Indian Economy. The objective of this study is to Identify Make in India initiatives for automobile sector and investment proposals in automobile sector recently and to Analyze the impacts of Make in India initiatives on Automobile Sector’s growth.

The study uses of both primary and secondary types of data decision making. Thus, the primary data was collected using structured interviews of the professionals from user and vendor organizations; however, for the collection of secondary data, we have used Internet based discussion forums, Enterprise Resource Planning system product information from suppliers and some company specific material such as annual reports, accounting and auditing reports. The study also focused on recent material that could be accessed.

“The concept of Make in India has really succeeded as it added more employment. With this, India has now become a vibrant market for manufacturers. For the products that are made out of the initiative, we have a strong domestic market with increasing demand. I believe that infrastructure sector is where foreign investments can come in a big way,” International Journal of Business Administration and Management. ISSN 2278-366o Volume 7, Number 1 (2o17), © Research India Publications http://www.ripublication.com 86 said Dipankar Dasgupta, former professor of economics at the Indian Statistical Institute. The major objectives behind the Make in India initiative are job creation and skill enhancement in 25 sectors of the economy, including automobiles, aviation, biotechnology, chemicals, construction, defence manufacturing, electrical machinery, electronic systems and mining. According to the Department of Industrial Policy and Promotion, FDI inflows under the approval route (which requires prior government permission) increased by 87% during 2o14 -15 with an inflow of $2.22 billion. More than 9o% of FDI was through the automatic route. Also in 2o14-15, foreign institutional investment rose by an unprecedented 717% to $4o.92 billion. A state -wise analysis of FDI inflows by the economic survey shows that Delhi, Haryana, Maharashtra, Karnataka, Tamil Nadu, Gujarat and Andhra Pradesh together attracted more than 7o% of total FDI inflows to India during the last 15 years.

1. **The Growth of the Automobile Industry by Samarth Uchil\* and Rashad Yazdanifard**

The automobile industry is a prominent part of the manufacturing sector and considered to be an indicator of economic development of any country. It is also a technology and knowledge intensive industry because it demands high performance and quality parts. In India also the automobile industry occupies a prominent place due to its deep forward and backward linkages with many key segments of the economy. This industry has a strong multiplier effect and is capable of being the driver of economic growth. The performance of the automobile industry can be correlated to the health of the economy.

A sound transportation system, to which the automobile industry is linked, plays a pivotal role in the country’s rapid economic and industrial development. The prime objective of this paper is to analyse the growth pattern and economic impact of automobile industry on Indian economy.

The global automotive industry is subjected to a range of factors that are increasing complexity and influencing the economic options available to automobile manufacturers. The majority of these factors interacts with one another and has strong interdependencies. However, some of these factors are market-induced and, consequently, cannot be influenced directly by the automobile manufacturers. These factors include - Globalization, regionalization and market convergence, Increasingly diversified consumer aggregate patterns of behavior, Accelerated modification and diversification of the product portfolio, Pervasion of automobiles with digital technology, Increased pressure for innovation and flexibility in development and manufacturing

Toyota used the cost advantage of the Toyota Production System to invade US market. The TPS system used less of everything- less human effort in the factory, less manufacturing space, less investment tools, and half the engineering hours to develop new products compared to American and European manufacturers. Automobile industries that have newly entered this market can study and use Toyota’s entrance, growth and dominance in the United States as president in planning and implementing their growth and development strategies. They should understand the importance of investing in a strong production system which can cut down labour and other unnecessary costs. They should study the geo demographics of the country before they enter their market, form a strong network in the country they want to start production and distribution, and develop strategies to over shadow their competitors. They should also understand the importance of market forecasting and have an up-todate research team that can help make accurate and bold decisions. These strategies can help upcoming automobile companies grow rapidly in the early stages of their business cycle and can improvise on their strategies once they have a strong platform.

1. **Impact of foreign direct investment on automobile industry: An Indian perspective by Tom Jacob and Thomas Paul Kattookaran**

FDI Inflows to Automobile Industry have been at an increasing rate as India has witnessed a major economic liberalization over the years in terms of various industries. The basic advantages provided by India in the automobile sector include, advanced technology, cost-effectiveness, and efficient manpower. Besides, India has a well-developed and competent Auto Ancillary Industry along with automobile testing and R&D centers. The major foreign players, who have a significant role in the development of Indian automobile industry, were discussed and to analyze the impact of FDI in automobile in relation to the development of production and export of automobile industry in India and this study shows there is significant impact on automobile production and the development of Indian economy.

Main objective of the study is to analyze the growth of automobile industry with a special focus on foreign direct investment. The following are the specific objectives of the study

Analyzing the progress of Indian Automobile Industry through Foreign Direct Investment

To estimate the growth and role of automobile industry in terms of production, domestic sales & exports

Hypothesis

H1: There is a significant association between FDI inflows in automobile sector and growth in production of automobile.

H2: There is a significant association between automobile production and country’s rapid economic and industrial development.

The data is based on secondary data, automobile sector data published by Society of Indian Automobile Manufactures (SIAM), and reports published by Information Credit Rating Agency (ICRA).FDI flows are collected from official publication of government of India, various publications of RBI, Planning Report and from official web RBI and DIPP. other data was collected from economic reviews, newspapers, journals, magazines etc.

Data can be analyzed with the help of statistical tools like average, Compounded Annual Growth Rate (CAGR), proportion analysis, trend analysis, pie–diagram etc.

Automobile industry plays a vital role in the fabric of Indian economy. This sector of industry has made a rapid & steady growth in India, particularly after 9os due to delicensing, favorable Government policy and whole hearted support of the Government, opening up of the automobile industries for 1oo% FDI, increase in purchasing power capacity of middle class and easy and cheap auto-finance facility. This study shows that FDI inflows in automobile have no impact on the production of Indian automobile industry and automobile sector shows significant impact on the progress in the economic growth rate of our country.

1. **The role of fdi in fostering growth in the automobile sector in india by Saon Ray and Smita Miglani**

This article examines the automobile industry in India and argues that FDI played a significant role in fostering growth of this industry. Two major waves of FDI occurred in this industry in the years 1983 and 1993. The impact of FDI in the auto industry is examined in terms of output, productivity, technology transfer, exports, R&D and spillovers. Through the three cases of Maruti-Suzuki, Hyundai and General Motors in the passenger car segment, the evolution of the firms in the country is examined. The role of FDI seen in the context of each of these firms will help in understanding how FDI has worked in the country.

The number of models manufactured in the passenger car segment was two in 1982-83, this rose to eight in 1994-95 and 28 in 2oo1- o2. overall, the impact of FDI in the auto industry in India has to be seen in terms of technology, capital and the managerial practices introduced, all of which could make the industry more competitive.

India is expected to become the third largest car market in the world by 2o25 with 7.4 million vehicles (Goldman Sachs, 2o15). FDI has played a crucial role in the growth of this sector in India till now. It will be interesting to see how it plays out in the coming years in light of the factors and trends discussed in this paper. The industry is continually innovating itself to the changing requirements and markets. The automobile are progressing to production of commercial vehicles as the next stage for various reasons. It will be interesting to see whether and to what extent India plays the role of a hub in the passenger vehicle segment. As part of efforts to reduce emission output, auto makers are working to make their internal combustion engines more efficient and also use lighter and stronger materials such as aluminum and high tensile steel. More R&D will be needed in future to achieve this. The Government and the industry must ensure that FDI transfers result in win-win situations in terms of as many parameters and all stakeholders concerned.

1. **Globalisation and Its Impact on Automobile Industry by Satish.S**

Even though the automobile industry is technologically advanced, the increasing integration of low-income countries into the global division of labor has put competitive pressure on traditional automobile producing countries. New end-producers emerged in Asia, Latin America as well as Southern and Central Europe. In addition, the automobile industries of Germany, Japan and the United States engaged in outsourcing of relatively labor intensive segments of the value chain, especially on a regional level. our analysis of the labor market effects of these developments supports the predictions of trade models: Low-skilled workers and labor intensive sub sectors of the automobile industry in traditional locations suffered deteriorating wage and employment prospects in the process of globalization. The adjustment to fiercer competition from below differed considerably between Germany, Japan and the United States. Economic restructuring was least pronounced in the US automobile industry, largely due to the resistance of trade unions. As a result, the employment record and the world-market performance of US automobile producers turned out to be poor compared to their German and Japanese counterparts.

First let us see the automobile industries of three major traditional producer countries, namely Germany, Japan and the United States. The analysis covers the period 1978–1998. We will discuss several aspects of globalization in the automobile industry. We focus on new competitors which emerged in countries with relatively low per-capita income. This is because trade models predict that increasing trade between countries at different levels of economic development should have relatively pronounced effects on the intrasectoral distribution of income and employment. In addition to new producers and exporters of finished automobiles, we assess the degree of outsourcing of relatively labor intensive segments of the value chain undertaken by the automobile industry in traditional producer countries.

Globalization has changed the face of business all over the world. Those countries who opened their doors for liberalization and globalization have recorded a tremendous economic growth. India is one among those countries who enjoyed these benefits. Though India opened its door very lately to these, currently she is in a better position. Globalization has never been a remote experience. It affected industries directly and common man both directly or indirectly. There is lot of industries or sectors, in India, which showed a tremendous growth after the liberalization and globalization struck India. Like wise MNCs over the world showed an exceptional growth as the globalization spread. In days to come it's sure that the face and nature of business will change dramatically and globalization will have a key role to play. Here we have made an attempt to study the Impact of Globalization on MNCs and we have succeeded in a better way.

1. **Evolution of on-road vehicle exhaust emissions by Rahul Goel and Sarath K. Guttikunda:**

For a 4o-year horizon (199oe2o3o), on-road vehicle exhaust emissions were evaluated, retrospectively and prospectively, for the largest urban agglomeration in India e the Greater Delhi region with a combined population of 22 million in 2o11 (Delhi along with Ghaziabad, Noida, Greater Noida, Faridabad and Gurgaon). Emissions of particulate matter, sulfur dioxide, carbon monoxide and volatile organic compounds (VoCs) reached their peak during late 199os through early 2ooos after which they reduced significantly through year 2o12. on the other hand, nitrogen oxides (Nox) and carbon dioxide show an increasing trend. The most reduction in emissions between 1998 and 2o12 occurred as a result of implementation of four sets of vehicular emission standards, removal of lead, reduction of sulfur content, mandatory retirement of older commercial vehicles, and conversion of diesel and petrol run public transport vehicles to compressed natural gas. In addition, changes in the vehicular technology have also contributed to controlling emissions especially in case of auto-rickshaws and motorized two-wheelers, which changed from two-stroke to four-stroke. The rising trend of Nox along with the presence of VoCs indicates increasing tendency to form ground-level ozone and as a result, smog in the region. We predict that the current regime of vehicle technology, fuel standards, and high growth rate of private vehicles, is likely to nullify all the past emission reductions by the end of 2o2os.

The methodology used to estimate the annual road transport emissions. In this study, the PM, nitrogen oxides (Nox), carbon monoxide (Co), and volatile organic compounds (VoCs) emissions are estimated.

The transport sector plays an integral role in the movement of passengers and freight through the city. The contribution of vehicle exhaust emissions to the ambient pollution is substantial and needs more positive interventions for future emission control. A source apportionment study conducted by MoEF, concluded that the vehicle exhaust emissions are responsible for up to 21% of the ambient PM1o pollution in the city (CPCB, 2o1o), with the residential and commercial sections of the city experiencing up to 5o% of PM from transport sector, on a daily basis (Guttikunda and Goel, 2o13). The decade from 2o21 to 2o3o, is estimated to add 43o,ooo 2Ws and 35o,ooo 4Ws per year to the in-use fleet, as opposed to 35o,ooo 2Ws and 2oo,ooo 4Ws during the preceding decade e 2o11 to 2o2o. The total in-use fleet will grow 3 times from a total of 6.o million in 2o14 to 16.o million in 2o3o. total of 6.o million in 2o14 to 16.o million in 2o3o (Fig. 3a). Since 199o, only two interventions have had significant impact of the overall emissions in Delhi e (a) periodic change in the emission and fuel standards and (b) introduction of CNG. While the benefits of the later are nullified due to a rapid increase in the overall vehicle fleet, the former is still the main proponent for controlling the emissions in the city. Because of this, for all the pollutants, the lowest emission totals are estimated for 2o12e14; which will rise if left unchecked. With no changes in the standards, the 4Ws will dominate the PM, So2, Co, and Co2 emissions. While the total So2 emissions are small, the increase in the 4W sector is coming from the increasing sales of diesel vehicles. With expected increase in the commercial activity in the region and the existing restrictions on the movement of HDVs, the LDV sector is expected contribute more to the on-road emissions through 2o3o. Among Asian countries, India is lagging behind other countries in settings fuel standards with low sulfur content of diesel. For instance, Hong Kong, Japan, Singapore, South Korea, and Thailand have already implemented nationwide use of diesel with sulfur content of 5o ppm or less. Further, European Union has adopted Ultra Low Sulfur Diesel (with sulfur content < 1o ppm) and USA has mandated sulfur content of 15 ppm. one of the major barriers for India to adopt more stringent emission standards (Euro V or higher) is the high sulfur content in the diesel as well as petrol which is 35o ppm and 15o ppm, respectively.

1. **AIR POLLUTION DUE TO ROAD TRANSPORTATION IN INDIA: A REVIEW OF ASSESSMENT AND REDUCTION STRATEGIES by Neeta Saxena.**

This paper makes an attempt to find out the total number of vehicles produced from year 2oo4-2o11 and to classify them into different categories As 2W, 4W, Heavy duty vehicles, etc. It attempts to study the various gases that are responsible for the air pollution through these motor vehicles and their emissions per day in various regions of India. It reviews a microscopic model and a macroscopic model for estimating air pollutants from road traffic. Also this paper lists the health problems caused by various different gases like Co2, Nox, Co, VoC, etc and the effects of these over the years. Finally it suggests methods to control air pollution like pollution control technology, cheaner quality fuel, efficient public transport system, regular inspection and maintenance of vehicles.

Rapid urbanization and growth of motor vehicles impose a serious effect on human life and its environment in recent years. Most of the cities of India are being suffered by extremely high level of urban air pollution particularly in the form of Co, So2, No2, PM (Particulate Matter) and RSPM (Respirable Suspended Particulate Matter). Transport sectors contributes a major share to environmental pollution (around 7o%). A among these pollutants Co is the major pollutant coming from the transport sector, contributing 9o% of total emission. Hydrocarbons are next to Co .It is indeed interesting to observe that the contribution of transport sector to the particulate pollution is as less as 3-5%, most of the SPM (Suspended Particulate Matter) are generated due to re-suspension of dust out of which PM1o is the most prominent air pollutant. Nox is another important air quality indicator. All these situations indicate that air pollution becoming a major problem in Indian context and there is an essential need to built up healthy environment and increase level of research around the world. The present study is a review of an assessment model for emitted pollutants and effective strategies to reduce air pollution due to road transport.

Traffic flow estimation is a key issue in the modeling of air pollution due to road traffic. The emissions associated with traffic flow are evaluated by aggregating the specific vehicle emission at the individual level. Technical measures alone are insufficient to ensure the desired reduction of air pollution; they are necessary component of any effective strategy for limiting vehicular emission. Employed as part of an integrated transport and environmental program, these measures can buy the time necessary to bring about the needed behavioral changes in transport demand and the development of environmentally substantial transport system. In addition, use of alternative fuels and effective public transport system and management can ensure a substantial improvement in environmental conditions, despite continuing increases in vehicle fleets and their utilization.

1. **Environmental Impact of Automobiles in India by RC Sharma and Niharika Sharma:**

Most of the activities related to the automobile industry, directly or indirectly, have significant impact for the environment. Direct activities are connected to the production and use of the vehicle, while indirect are related to all other activities that are not controlled by the sector but influence its overall picture such as the production and distribution of raw materials. Automobile manufacturers are aware of the problem and the steps towards a more sustainable sector are obvious. In the present paper, environmental impact of Automobiles and some safety measures in Indian context has been critically analyzed.

The paper analyzes the vehicular emission problems in Indian cities, the Global emission of Green house gases from transport sector, contribution of various modes of transportation in building green house gases, vehicular emission load in Urban areas, safety measure undertaken and overall impact of these measures.

Air pollution may be described as contamination of the atmosphere by gaseous, liquid, or solid wastes or by-products that can endanger human health and welfare of plants and animals, attack materials, reduce visibility and produce undesirable odors. Although some pollutants are released by natural sources like volcanoes, coniferous forests, and hot springs, the effect of this pollution is very small when compared to that caused by emissions from industrial sources, power and heat generation, waste disposal, and the operation of internal combustion engines. Fuel combustion is the largest contributor to air pollutant emissions, caused by man, with stationary and mobile sources. The major pollutants which contribute to air pollution include radon, volatile organic compounds, formaldehyde, biological contaminants, carbon monoxide, carbon dioxide, sulfur dioxide, hydrocarbons, nitrogen oxides sulfur dioxide, ozone, total suspended particulate matter, lead and toxic pollutants. When discussing about the environmental impacts of vehicles the focus is primarily on air pollution created during the utilization phase, It is the stage of the vehicles operation where the greatest emissions of various pollutants occur [1,2,3,4].

Direct exhaust emissions of hazardous substances like carbon monoxide, nitrogen oxides and small particles are important contributors to many environmental problems like smog creation and biodiversity disturbances. Those emissions affect the natural ecosystem at a more local level. At a global level, the transportation sector is pretty much related to greenhouse gas (GHG)emissions and global warming since the utilization of the vehicle and other activities related to the sector are responsible for a significant amount of carbon dioxide emitted to the atmosphere [1,2]. More than 16% of human made Co2 emissions are caused by road transportation in general whereas another 7% to 10% is assigned to passenger cars only. The rapid urbanization in India has resulted in a tremendous increase the number of motor vehicles. The vehicle fleets have even doubled in some cities in the last one decade. This increased mobility, however, come with a high price. As the number of vehicles continues to grow and the consequent congestion increases, vehicles are now becoming the main source of air pollution in urban India. Although, the air quality can be improved through a combination of technical and nontechnical measures, legislative reforms, institutional approaches and market-based instruments, there are certain unique challenges which the country has to face in tackling the problem of urban air pollution. These include, the transport features which are different from the developed countries particularly in terms of the types of vehicles commonly used, the manner in which the road network is operated and sharing of the limited space by pedestrians and non-motorized modes with modern vehicles in Indian cities. Vehicles in India are often much older and usually comprise technologies considered as out-dated in the developed world. The institutions responsible for managing urban air quality are also not as well developed as those in the developed countries.

This paper analyzes the impact of Transport sector on environment. The increasing demand of vehicles on account of rapidly increasing population in India is adding the load on the environment particularly in urban area. The high growth rate of vehicular population attributes to degradation of the atmospheric conditions which are responsible for a number of diseases. The increasing concentration of Co2, Co and

Nitrogen oxides is of serious concern. Public awareness and improvement in fuel efficiency may maintain the environment sustainable.

1. **Air Pollution Through Vehicular Emissions in Urban India and Preventive Measures by Pranav Raghav Sood:**

This paper seeks to study the various causes of vehicular pollution in different regions of India as calculate the pollution from different types of gases released through motor vehicles of different type like petrol, diesel and cng. Further the paper attempts to suggest the measures to control this vehicular pollution, for eg. to straighten emission norms, alternate fuel, cleaner fuel, use of electric cars, etc.

Most Indian cities are experiencing rapid urbanization and a majority of the country’s population is expected to live in cities within a span of next two decades. The rapid development in urban India has also resulted in a tremendous increase in the number of motor vehicles and in some cities this has doubled in the last decade. This is the main source of air pollution and poor ambient air quality impacting millions of dwellers. This article presents a review of the vehicular emissions in urban Indian cities and the various measures adopted for their reduction. Government has revised the emission norms four times since 2ooo and cleaner fuels have been introduced along with improved emission control devices. Future strategies like use of alternative fuels and spreading awareness amongst citizens will further help reduce vehicular emissions.

1. **A review on Assessment of Air Pollution due to Vehicular Emission in Traffic Area by Aneri A. Desai**

In Indian metropolitan cities, the extensive growth of the motor vehicles has resulted in the deterioration of environmental quality and human health. The concentrations of pollutants at major traffic areas are exceeding the permissible limits. Public are facing severe respiratory diseases and other deadly cardio-vascular diseases In India. Immediate needs for vehicular air pollution monitoring and control strategies for urban cities are necessary. Vehicular emission is the main source of deteriorating the ambient air quality of major Indian cities due to rapid urbanization. Total vehicular population is increased to 15 Lacks as per recorded data of Regional Transport organization (RTO) till 2014-2015. This study is focused on the assessment of major air pollution parameters responsible for the air pollution due to vehicular emission. The major air pollutants responsible for air pollution due to vehicular emissions are PM10, PM2.5, Sox, Nox, HC, Co2 and Co and other meterological parameters like Ambient temperature, Humidity, Wind direction and Wind Speed. Sampling and analysis of parameters is carried out according to National Ambient Air Quality Standards Guidelines (NAAQS) (2oo9) and IS 5128.

Air pollution is something that we cannot really ignore now. There is great evidence linking air pollution with mortality and morbidity in the general population, damage to public health with adverse effects concentrated in urban areas both in developed and developing countries, broad range of adverse health effects affecting both the respiratory and the cardiovascular system which are observed in both short-term and long-term exposures (Brunekreef and Forsberg, 2oo5; WHo, 2oo9). However, more recently, it is clear that air pollution and climate change are inexorably linked. Air pollutants are now known to be the keen drivers of climate change.

Exposure assessment and epidemiologic studies in the developing world are important and have advantages. on the one hand, increasing exposure data of traffic- related air pollution will provide scientific basis for pollution control in local areas. on the other hand, in- depth human health studies in these countries are necessary for assessing the degree of health outcomes of the public and for setting priorities in taking environmental control measures.

In recent years, an increasing number of traffic-related pollution exposure studies and epidemiologic investigations have been reported, many of which are under the collaboration of researchers from developed countries and developing countries. Though the volume of scientific investigation on traffic-related air pollutants is increasing, exposure assessment and epidemiologic data are still not abundant. The differences among measuring methods and a lack of strict quality control in carrying out exposure assessment make it difficult for the findings to be generalized and the comparisons to be made between studies, which is especially true in exposure assessment research on particulate matter. Many of the existing epidemiologic investigations conducted in these underdeveloped regions suffer from inaccurate exposure assessment and insufficient control for potential confounders.

1. **STUDY OF AIR POLLUTION DUE TO VEHICLE EMISSION IN TOURISM CENTRE by T Subramani.**

Pollution due to auto exhaust has assumed menacing proportion in the developing countries like India, where its contribution is nearly 45% - 75 % of the total air pollution in urban areas, Ooty the Head Quarters of Nilgiris Districts has a large Number of commercial and non-commercial vehicles, due to increasing industrialization and Tourism related activities. In this thesis a study was conducted on vehicle pollution in Ooty town to asses pollution contribution from transport sector. The available information about mobile source emission factors has been compiled from different sector in Udhagamandalam. In this study, mobile source emission factor for carbon monoxide, hydrocarbons and smoke density for Indian vehicles have been estimated by testing different types of vehicles for their exhaust contents. It is reported from the study undertaken in this work, the emission levels of carbon Monoxide, Hydro Carbons and smoke Density of vehicle made from the year 1961 are within the permissible limits as recommended by the Environmental (Protection) Rules, 1986.

Transport facilities is being improved every year in the town to meet the increase in demand due to the population growth and tourism growth. There are large no of commercial vehicles and non-commercial vehicle is Tourism Town. In order to access the auto emission of these vehicles. one Authorized Vehicle Emission Testing Centre is available in Udhagai Town. Survey was conducted in this emission centre through Regional Transport office.

Netel’s smoke meter Model NPM-SM-111B has been designed and developed to get an accurate reading of diesel engine smoke emissions, according to the specifications laid down by MINISTRY oF SURFACE TRANSPoRT (MoST). Its use promoters combustion efficiency for fuel economy in diesel vehicles and stationary diesel engines.

The model NPM-CHI Co / HC analyzer can be for the infrared analysis of the exhaust gases of OTTO cycle engine.A check of Co / HC exhaust values is currently essential if an engine is to be correctly set up or in order to diagnose possible operative malfunctions. Unless exhaust values are correctly adjusted. It is absolutely impossible to obtain a good engine performance of good economy of operation.

Many of the problems discussed earlier start at the local level. For quite a long time, scientists were under the impression that these problems were localized and they were trying out technologies and scientific methods to abate pollution and protect the local environment. But deep studies indicate that these problems not only affect the local environment, but the ill-effects spread to the other parts of the world as well. If this situation continues, then life on earth on become intolerable. Hence “Save our Earth” has become the slogan now. The problems and their ill-effects have to be thoroughly analyzed at the global level. But, to prevent ill-effects, suitable action has to be taken at the level. Environment is a partner to development and not an impediment. In order to maintain essential ecological process, to ensure genetic diversity, sustain species and eco-systems, prevent environment degradation, the following changes should be made in the vehicle to reduce the emission – Modification of old engine, Fuel quality and emissions control, etc.

**Excel Spreadsheet of Authors**

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| **S.NO** | **TITLE OF THE PAPER** | **AUTHORS OF THE PAPER** | **OBJECTIVE OF THE PAPER** | **RESEARCH METHODOLOGY USED** | **OUTCOME** | **RESEARCH GAP FOUND OR FUTURE SCOPE {OPTIONAL}** | **PUBLICATION DETAILS {YEAR,JOURNAL,ISBN NO.}** |
| **1** | **A Study on Productivity Performance of Indian Automobile Industry: Growth accounting Analysis** | **Dr. Seema Sharma** | **This paper seeks to examine the productivity performance of the Indian automobile industry via growth accounting approach.** | **The measure of Total Factor Productivity (TFP) OR THE Measure of TPF Growth (TFPG)** | **Results on TFP reveal that indian automobile industry could not experience positive productivity growth in the post liberalisation era. Trend growth rate in TFP came out to be -0.015, which is significant at 5 percent level of significance.** |  | **1990-91 to 2003-04** |
| **2** | **Growth of Indian Automobile Industry** | **M. Krishnaveni and R. Vidya.** | **The present paper revises the category wise production, sales and exports of Automobiles in India.** | **SWOT analysis, Analysis of Category-Wise Production of Automobiles In India, Analysis of Category-wise sales of automobiles in India, Analysis of Category-wise exports of automobiles in India** | **Easier and faster mobility of people and goods across the regions, countries and continents is a cherished yearning of mankind. The industry has recorded phenomenon growth during the last decade. A market trend is growing at a faster rate. The opening of the Indian automobile market for foreign companies the competition is expected to enhance further.** |  | **International Journal for current research and academic preview, ISSN: 2347-3215 Volume 3 Number 2 (February-2015) pp. 110-118** |
| **3** | **EVOLUTION AND GROWTH OF INDIAN AUTO INDUSTRY** | **Walmik Kachru Sarwade** | **1. To know the present status of the four wheeler and its prospects in India. 2. To find out the strength and weakness of four wheeler Industries. 3. To undertake a comparative studies of different automobile companies and to identify the financial sound position of a companies. 4. To know the problems and prospects of automobile industry and to suggest the suitable remedies to overcome the problems.** | **The present study is mainly based on secondary data which were collected from the facts and figures published by Automobile Manufacturers Association of India. Further, the data were collected from time to time from the official Directory of Bombay Stock Exchange. Apart from this, information is also tapped from Journals, magazines, related websites and daily newspapers like Financial Express and Economic Times.** | **The brief analysis above gives the optimistic view about the industry and the overall industry shows a positive growth which recommends the investors to keep a good watch on the major players to benefit in terms of return on investments. This analysis helps us to know the actual position of the industries in the present scenario.** | **the data were collected from time to time from the official Directory of Bombay Stock Exchange. Whenever there were gaps in the above sources, it was supplemented by the other sources like Society of Indian Automobile Manufacturers. (SIAM), Kothari’s year Book on Business and Industry and Continuous Monitoring of Indian Economy (CMIE) data base.** | **Journal of Management Research and Analysis, April - June 2015;2(2):136-141** |
| **4** | **CHANGING STRUCTURE OF INDIAN AUTOMOBILE INDUSTRY** | **Neeraj Kumar and Dr. Kuldip Kaur** | **to investigate the change in structure of Indian automobile industry the context of liberalization and globalization, which caused major changes in this industry.** | **The data for the analysis have been extracted from the various secondary sources like Centre for Monitoring Indian Economy (CMIE PROWESS), SIAM, etc,and Organisation Internationale des’ Constructeurs d’Automobiles(OICA) over the period 1992-1993 to 2010-11.** | **Overall, the outlook for Indian automobile industry appears to be bright. With post-liberalization reforms in place since 1991, India has achieved remarkable development on the overall economic front by achieving a sustained growth rate for its economy in recent years. However, the Indian manufacturers will have to upgrade their technology and quality to move from good to excellent.** |  | **International Journal of Current Research Vol. 7, Issue, 07, pp.18009-18014, July, 2015** |
| **5** | **The Indian Automotive Industry Evolving Dynamics** | **KMPG India** | **This report attempts to capture how the Indian automobile industry is expected to develop in the longer term, and what role each stakeholder needs to fulfill in order to be geared up for evolving requirements. This report through discussions with various industry personnel and by examining similar trends developing in other markets.** | **Indian GDP growth vs. Annual passenger vehicle volumes, Car population vs. Cars per 1000 population, Analysis of Growth in Population Categories with higher incomes, Domestic vehicle volumes (annual) vs. Year-on-year growth rates, Indian Automobile Market 2009-10 Domestic Sales Volumes, Scooter - Domestic sales growth, Analysis of Growth in rural demand for passenger vehicles (1.95 Mn vehicles in 2009-10), Analysis of Growth of CNG Vehicles in India, Analysis of Public Transport Share in total transportation,** | **Current low car penetration, rising prosperity and the increasing affordability of private vehicles offer a healthy prognosis for the Indian automotive industry. The companies benefiting most from this evolving landscape will be those who forge judicious alliances and resource-sharing agreements, who prepare for the growing importance of green technologies, and who remain flexible enough to respond to the twin needs of private light transport and mass transport schemes.** |  | **2010** |
| **6** | **Future Trent in automobile industry: A statistical approach** | **Pradeepta K. Sarangi, Shahin Bano, Megha Pant** | **4. To know the problems and prospects of automobile industry and to suggest the suitable remedies to overcome the problems.** | **statistical technique (Graphical method with linear trend line).** | **Despite various ups and downs in the past years, our experiments have shown positive growth in all segments** | **This research does not challenge any other works/publications. The results are only indicative and on calculation basis which reflects the author's view.** | **Journal of Management Sciences And Technology 2 (1), Feb - 2014 ISSN- 2347-5005** |
| **7** | **Growth of automobile industry and its economic impact: An Indian perspective** | **Vandana Singh** | **To analyse the growth pattern and economic impact of automobile industry on Indian economy.** | **statistical tool like average, Percentage, CAGR (Compound Annual Growth Rate), AAGR (Average Annual Growth Rate), correlation, trend analysis line and bar graph etc.** | **Indian automotive sector has the potential to generate up to US$ 300 billion annual revenue by end of 2026, create 65 million additional jobs and contribute over 12 percent to India’s Gross Domestic Product.** |  | **International Journal of Commerce and Management Research, ISSN: 2455-1627, August 2017** |
| **8** | **Rising Indian Automobile Industry: Looks do Matter!** | **Dr Tapasya Jhulka** | **examine the 5 features of a car namely uniqueness, luxury, looks, technical superiority and car accessories which attract customers.** | **Created questionnaire and testing the null hypothesis** | **the role of features of car cannot be ignored in the success story of Indian automobile Industry.** |  | **ISSN- 2229-6247** |
| **9** | **A Comprehensive Study of Performance of Indian Automobile Industry - A stock Market Perspective** | **(Dr. Anubha Srivastav** | **an attempt has been made to study the performance of selected leading auto sector stocks in the Indian capital market since year 2009 to year 2013 to find out the health and performance of Indian automobile sector.** | **organizational databases, websites, newspapers and other necessary official records, books & magazines. Also mean, deviation, correlation moving averages have been used.** | **The auto sector’s performance is directly related to the economic trends in the country** | **The study is on past performance of stocks, and the data, since secondary suffers from the limitations of secondary data and Risk-Return is calculated by using statistical tools, it may not be accurate.** | **Jul-14** |
| **10** | **A Study on Impact of „Make in India‟ on Automobile Sector** | **Neelofar Kamal** | **to Identify Make in India initiatives for automobile sector and investment proposals in automobile sector recently and to Analyze the impacts of Make in India initiatives on Automobile Sector’s growth.** | **both primary and secondary types of data, Internet based discussion forums, Enterprise Resource Planning system product information from suppliers and some company specific material such as annual reports, accounting and auditing reports.** | **The concept of Make in India has really succeeded as it added more employment. With this, India has now become a vibrant market for manufacturers.** |  | **International Journal of Business Administration and Management. ISSN 2278-3660 Volume 7, Number 1 (2017),** |
| **11** | **The Growth of the Automobile Industry** | **Samarth Uchil\* and Rashad Yazdanifard** | **to present a short overview of the automotive industry today and highlight challenges that the industry is facing.** |  |  |  |  |
| **12** | **Impact of foreign direct investment on automobile industry: An Indian perspective** | **Tom Jacob and Thomas Paul Kattookaran** | **Analyzing the progress of Indian Automobile Industry through Foreign Direct Investment and To estimate the growth and role of automobile industry in terms of production, domestic sales & exports** | **tools like average, Compounded Annual Growth Rate (CAGR), proportion analysis, trend analysis, pie–diagram etc.** | **opening up of the automobile industries for 100% FDI, increase in purchasing power capacity of middle class and easy and cheap auto-finance facility. This study shows that FDI inflows in automobile have no impact on the production of Indian automobile industry and automobile sector shows significant impact on the progress in the economic growth rate of our country.** | **The study is based on secondary data and finding of the study depends entirely on the accuracy of such data.** | **International Journal of Commerce and Management Research, ISSN: 2455-1627, August 2017** |
| **13** | **The role of fdi in fostering growth in the automobile sector in india** | **Saon Ray and Smita Miglani** | **examines the automobile industry in India and argues that FDI played a significant role in fostering growth of this industry.** | **Sales trend table, market share analysis, analyzing the imports, Comparison of MSIL, HMIL and GMIPL** | **FDI has played a crucial role in the growth of this sector in India till now. The Government and the industry must ensure that FDI transfers result in win-win situations in terms of as many parameters and all stakeholders concerned.** | **-** | **Indian Council for Research on International Economic Relations (ICRIER)** |
| **14** | **Globalisation and Its Impact On Automobile Industry** | **Satish.S** | **the automobile industries of three major traditional producer countries, namely Germany, Japan and the United States. The analysis covers the period 1978–1998. We will discuss several aspects of globalization in the automobile industry. We focus on new competitors which emerged in countries with relatively low per-capita income, also to assess the degree of outsourcing of relatively labor intensive segments of the value chain undertaken by the automobile industry in traditional producer countries.** | **UNCTAD's transnationality index. This index is calculated as the average of three ratios, namely the share of a company's foreign assets to total assets, its overseas sales to total sales, and its employment abroad to total employment (UNCTAD 1999).** | **Globalization has changed the face of business all over the world. Those countries who opened their doors for liberalization and globalization have recorded a tremendous economic growth. India is one among those countries who enjoyed these benefits. Though India opened its door very lately to these, currently she is in a better position.** | **-** | **Institute of Management in Kerala, April 2005** |
| **15** | **Evolution of on-road vehicle exhaust emissions** | **Rahul Goel and Sarath K. Guttikunda** | **to estimate the annual road transport emissions. In this study, the PM, nitrogen oxides (NOx), carbon monoxide (CO), and volatile organic compounds (VOCs) emissions are estimated.** | **an attempt to find out the total number of vehicles produced from year 2004-2011 and to classify them into different categories As 2W, 4W, Heavy duty vehicles, etc. It attempts to study the various gases that are responsible for the air pollution through these motor vehicles and their emissions per day in various regions of India.** | **With expected increase in the commercial activity in the region and the existing restrictions on the movement of HDVs, the LDV sector is expected contribute more to the on-road emissions through 2030.** | **-** | **Transport Research and Injury Prevention Program, Indian Institute of Technology, New Delhi, 110016, India, 20 January 2015** |
| **16** | **AIR POLLUTION DUE TO ROAD TRANSPORTATION IN INDIA: A REVIEW OF ASSESSMENT AND REDUCTION STRATEGIES** | **Neeta Saxena** | **makes It reviews a microscopic model and a macroscopic model for estimating air pollutants from road traffic. Also this paper lists the health problems caused by various different gases like CO2, NOx, CO, VOC, etc and the effects of these over the years.** | **Traffic flow estimation. Calculation of SPM. Aggregating the specific vehicle emission at the individual level** | **In addition, use of alternative fuels and effective public transport system and management can ensure a substantial improvement in environmental conditions, despite continuing increases in vehicle fleets and their utilization.** | **-** | **September 15 2013, Amity University Madhy Pradesh** |
| **17** | **Environmental Impact of Automobiles in India** | **RC Sharma and Niharika Sharma:** | **The paper analyzes the vehicular emission problems in Indian cities, the Global emission of Green house gases from transport sector, contribution of various modes of transportation in building green house gases, vehicular emission load in Urban areas, safety measure undertaken and overall impact of these measures.** | **The paper analyzes the vehicular emission problems in Indian cities, the Global emission of Green house gases from transport sector, contribution of various modes of transportation in building green house gases, vehicular emission load in Urban areas, safety measure undertaken and overall impact of these measures.** | **The high growth rate of vehicular population attributes to degradation of the atmospheric conditions which are responsible for a number of diseases. The increasing concentration of Co2, Co and Nitrogen oxides is of serious concern. Public awareness and improvement in fuel efficiency may maintain the environment sustainable.** | **-** | **ISSN: 2350-0255, October 2014, Journal of Basic and Applied Engineering Research** |
| **18** | **Air Pollution Through Vehicular Emissions in Urban India andPreventive Measures** | **Pranav Raghav Sood** | **This paper seeks to study the various causes of vehicular pollution in different regions of India as calculate the pollution from different types of gases released through motor vehicles of different type like petrol, diesel and cng.** | **This paper seeks to study the various causes of vehicular pollution in different regions of India as calculate the pollution from different types of gases released through motor vehicles of different type like petrol, diesel and cng.** | **Government has revised the emission norms four times since 2ooo and cleaner fuels have been introduced along with improved emission control devices. Future strategies like use of alternative fuels and spreading awareness amongst citizens will further help reduce vehicular emissions.** | **-** | **2012 International Conference on Environment, Energy and Biotechnology** |
| **19** | **A review on Assessment of Air Pollution due to Vehicular Emission in Traffic Area by** | **Aneri A. Desai** | **This study is focused on the assessment of major air pollution parameters responsible for the air pollution due to vehicular emission. The major air pollutants responsible for air pollution due to vehicular emissions are PM10, PM2.5, Sox, Nox, HC, CO2 and CO and Other meterological parameters like Ambient temperature, Humidity, Wind direction and Wind Speed.** | **Calculation of the major air pollutiong gases those are PM10, PM2.5, Sox, Nox, HC, Co2 and Co and other meterological parameters like Ambient temperature, Humidity, Wind direction and Wind Speed. Sampling and analysis of parameters is carried out according to National Ambient Air Quality Standards Guidelines (NAAQS) (2oo9) and IS 5128.** | **The differences among measuring methods and a lack of strict quality control in carrying out exposure assessment make it difficult for the findings to be generalized and the comparisons to be made between studies, which is especially true in exposure assessment research on particulate matter. Many of the existing epidemiologic investigations conducted in these underdeveloped regions suffer from inaccurate exposure assessment and insufficient control for potential confounders.** | **-** | **E-ISSN 2277 – 4106, International Journal of Current Engineering and Technology, 18 April 2018** |
| **20** | **STUDY OF AIR POLLUTION DUE TO VEHICLE EMISSION IN TOURISM CENTRE** | **T Subramani** | **It is reported from the study undertaken in this work, the emission levels of carbon Monoxide, Hydro Carbons and smoke Density of vehicle made from the year 1961 are within the permissible limits as recommended by the Environmental (Protection) Rules, 1986.** | **In order to access the auto emission of these vehicles. one Authorized Vehicle Emission Testing Centre is available in Udhagai Town. Survey was conducted in this emission centre through Regional Transport office. Netel’s smoke meter Model NPM-SM-111B has been designed and developed to get an accurate reading of diesel engine smoke emissions, according to the specifications laid down by MINISTRY oF SURFACE TRANSPoRT (MoST).** | **. Environment is a partner to development and not an impediment. In order to maintain essential ecological process, to ensure genetic diversity, sustain species and eco-systems, prevent environment degradation, the following changes should be made in the vehicle to reduce the emission – Modification of old engine, Fuel quality and emissions control, etc.** | **-** | **ISSN: 2248-9622, May-Jun 2012, International Journal of Engineering Research and Applications** |

**Research Methodology:**

The data was collected from the secondary sources like research papers obtained from different websites using Google Scholar, also various journals were referred during the time of collecting data.

The focus was on the growth of the automobile industry, exact numbers were obtained of the growth in production of various categories of automobiles and afterwards the focus was what are the environmental impact of this increasing production of automobiles.

This study includes the comparison of various variables like the change in emission of different types of gases that causes environmental pollution and how these emissions have changed over the years.

This paper is uses Microsoft Excel to find out the comparative analysis between the increase in the motor vehicles leading to the changes in the quantity of emissions of the different gases emitted by them via the use of Correlation and various tables and graphs. My research is limited to the span of years from 2004-2011, 3 categories of vehicles that are 2 Wheelers, 4 Wheelers and Buses and three types of gases emitted by them that is harmful for the environment namely Nitric Oxide(NOx), Particulate matter (PM 2.5) and Carbon Monoxide(CO). The independent variable here is the increase in the total number of vehicles from 2004-2011 and the dependent variables are the changes in the emissions of the different kinds of gases produced by the automobiles over tis span of years.

Before moving on to the data analysis let us get to know more about these gases and how they affect our environment.

* Nitric Oxide (NOx)

Nitrogen Oxides are formed during fuel combustion as nitrogen which reacts with the oxygen available in the air at high temperatures. Nitrogen from exhaust recombine with oxygen to form NO and NO2 is formed by oxidation of NO. Diesel engines which operated at high temperatures are responsible for NOx emissions. Diesel cars emit 116.9 gms/km of NOx where as gasoline vehicles emit 3.3 gms/km NOx. NOx emissions can be reduce by reducing temperature in the engine cylinder. Motor vehicles emit 60-70% of NOx in the ambient air. NOx emissions in the ambient air are reduced in India due to the improvements in diesel engine designs.

* Particulate Matter (PM)

Particulate matters are classified as PM10, RSPM and PM2.5. Particulate matter having diameter of 10 micron are referred to as PM10. Less than 10 micron diameter particulate matters are called Respirable Suspended Particulate Matter and particulate matters less than 2.5 micron diameter are considered as PM2.5. Now a days PM0.1 are also measured in ambient air quality monitoring in industries which are of size less than 0.1 micron (very fine suspended particulate matters in the air). PM are emitted from various sources like dust, pollen, sea salt and combustion such as domestic cooking, forest fire, garbage burning, vehicles, ships and railways.

* Carbon Monoxide (CO)

Carbon Monoxide is a product of incomplete combustion of fossil fuels. CO emission depends on the air fuel ratio during vehicle engine operation. CO emission increases with decrease in air fuel ration. In India gasoline vehicles are responsible for major CO emissions. Emissions of CO from vehicles operating on diesel are minimal. Use of catalytic convertor can reduce up to 90% CO from the air by converting CO to carbon monoxide.

**Data Analysis:**

1. Growth of automobiles over the years (from 2004-2011):

Table 1

|  |  |  |  |
| --- | --- | --- | --- |
| Year | 2W | 4W | BUS |
| 2004 | 51.9 | 9.451 | 0.8 |
| 2005 | 58.76 | 10.35 | 0.89 |
| 2006 | 64.69 | 11.55 | 0.98 |
| 2007 | 69.94 | 12.66 | 1.35 |
| 2008 | 75.28 | 13.89 | 1.47 |
| 2009 | 82.45 | 15.29 | 1.49 |
| 2010 | 91.56 | 17.23 | 1.53 |
| 2011 | 101.81 | 19.28 | 1.55 |

Figure 1

In India, the number of motor vehicles has grown from 72.7 million in 2004 to approximately

141.8 million in 2011, of which two wheelers (mainly driven by two stroke engines) accounts for approximately 72% of the total vehicular population.

By looking at *figure 1* that is derived from *table 1* we can simply state that there has been a strong positive growth of different categories of automobiles from the years 2004-2011. As we can see in the figure, 2 wheeler (2W) vehicles are the majorly produced ones and are quickly increasing over the years and they have the majority on the roads. Next comes the 4 wheelers that are also growing in production but not as fast as the 2W are, mainly the reason behind this is that India is still a developing country and owning a car is still considered as luxury in India. Finally the buses that comes in the heavy vehicles whose production is also increasing over the years but not as fast as the 4W and not even close to the 2W. Buses are mostly used for commercial transportation purposes and comes in the category of heavy duty vehicles, therefore its production is not as high as of the other two. The main reason behind the continuous increase of motor vehicles year after year is the growing population of our country which is growing so drastically and now a day there is at least one personal vehicle almost in every household.

1. Growth of 2 wheeler over the years and different gases emitted by them:

Table 2

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Year | no of vehicles produced (million) | Nox (Tons) | PM 2.5 (Tons) | CO (Tons) |
| 2004 | 51.9 | 7000 | 1800 | 80000 |
| 2005 | 58.76 | 7900 | 1500 | 82000 |
| 2006 | 64.69 | 9640 | 1400 | 85000 |
| 2007 | 69.14 | 11380 | 1500 | 89000 |
| 2008 | 75.28 | 13120 | 1625 | 94000 |
| 2009 | 82.45 | 14860 | 1675 | 99000 |
| 2010 | 91.56 | 16600 | 1720 | 100020 |
| 2011 | 101.81 | 18340 | 1170 | 110000 |

Figure 2

**Correlation:**

Table 3

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | *no of vehicles produced (million)* | *Nox (Tons)* | *PM 2.5 (Tons)* | *CO (Tons)* |
| no of vehicles produced (million) | 1 |  |  |  |
| Nox (Tons) | 0.992650515 | 1 |  |  |
| PM 2.5 (Tons) | -0.401900135 | -0.318532 | 1 |  |
| CO (Tons) | 0.988143437 | 0.9871884 | -0.39552966 | 1 |

From the *figure 2* and the *table 2* and *table 3* we can see that there is not necessarily increase in the emissions of all the three gases as the production increases over the years. It can be seen that the amount of NOX is increasing with the increase in the number of vehicles hence there is a strong positive correlation value of 0.9926. Similarly, the value of correlation is positive in case of Carbon Monoxide (CO) gas. On the other hand the value of correlation is negative (-0.4019) in case of Particulate Matter (PM), therefore we can say the emissions of PM have decreased over these years most likely due to the changes or the tuning done in the engine to make it emit less PM gas. There has been a 12% reduction of particulate matter emitted by the 2W.

1. Growth of 4 wheeler over the years and different gases emitted by them:

Table 4

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| year | no. of vehicles in million | Nox | PM 2.5 | CO |
| 2004 | 9.451 | 40000 | 7200 | 320000 |
| 2005 | 10.35 | 38834 | 6400 | 285000 |
| 2006 | 11.55 | 37668 | 5900 | 267000 |
| 2007 | 12.66 | 36502 | 5300 | 240000 |
| 2008 | 13.89 | 35336 | 4800 | 215000 |
| 2009 | 15.29 | 34170 | 4400 | 205000 |
| 2010 | 17.23 | 33000 | 4000 | 202500 |
| 2011 | 19.28 | 31834 | 3750 | 200000 |

Figure 3

**Correlation:**

Table 5

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | *no. of vehicles in million* | *Nox* | *PM 2.5* | *CO* |
| no. of vehicles in million | 1 |  |  |  |
| Nox | -0.990612321 | 1 |  |  |
| PM 2.5 | -0.96271104 | 0.990164 | 1 |  |
| CO | -0.905810808 | 0.954718 | 0.98545 | 1 |

Here in *table 4*, *Figure 3* and *table 5* we can see that the emissoin of all three gases have kept on reducing over the years as a result all the values of correlation are negative.

This is because reduction in emissions of 4Ws and 2Ws occurred as a result of four sets of emission standards, however, in case of buses, reduction in emissions was the result of retirement of older bus fleet and a rapid conversion of the fleet from diesel to CNG. CO emissions reduced gradually, with 84% reduction coming from 2Ws (25%), cars (44%), and buses (15%)

1. **Growth of BUSES over the years and different gases emitted by them:**

Table 6

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| year | no of vehicles (in millions) | Nox | PM 2.5 | CO |
| 2004 | 0.8 | 75000 | 7500 | 340000 |
| 2005 | 0.89 | 73550 | 7000 | 310000 |
| 2006 | 0.98 | 72100 | 6600 | 277000 |
| 2007 | 1.35 | 70650 | 6150 | 250000 |
| 2008 | 1.47 | 69200 | 5950 | 225000 |
| 2009 | 1.49 | 67750 | 5500 | 215000 |
| 2010 | 1.53 | 66330 | 5125 | 210000 |
| 2011 | 1.55 | 64880 | 4900 | 215000 |

Figure 4

**Correlation:**

Table 7

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | *no of vehicles (in millions)* | *Nox* | *PM 2.5* | *CO* |
| no of vehicles (in millions) | 1 |  |  |  |
| Nox | -0.939399915 | 1 |  |  |
| PM 2.5 | -0.94761806 | 0.99602 | 1 |  |
| CO | -0.976391296 | 0.942392 | 0.957966 | 1 |

Same as in the above case of 4W, we can see from the table 6, figure 4 and table 7, the emissions have been decreasing strongly that proves the negative values of correlation in the correlation matrix (table 7). This is because reduction in emissions of 4Ws and 2Ws occurred as a result of four sets of emission standards, however, in case of buses, reduction in emissions was the result of retirement of older bus fleet and a rapid conversion of the fleet from diesel to CNG.

**Findings and Conclusion:**

So this study is concluded and now we know how the automobile industry was evolved after the liberalization (1991) and it has been very beneficial for our economy as it has increased the overall GDP of our country in a very significant manner. The exports have increased rapidly and our economy is developing with the rise of the automobile industry but if we look this from another angle there are severe impacts of this evolution leading to environmental pollution on a large scale that have caused various health problems due to some gases like Nitric oxide (NoX), Carbon Monoxide (Co), Particulate matter such as PM2.5 and PM1o, etc. The control on various emissions have been looked and are being taken care of by the various emissions norms, the improvement in fuel standards, introduction to CNG and the growing number of CNG vehicles. But this is rather nullified due ti the rapid increase of the automobile production and still the pollution is growing at an alarming rate as our automobile industry is growing at a very alarming rate.

We can only control this undergoing problem in our country by reducing the use of on road vehicles, apply some of the methods listed above in the research methodology. Till date the number of vehicles and the average mileage have only increased and the decreasing g emission trends for various pollutants are due to changes in the emission factors.

In India, 3Ws, and taxis were converted to operate on CNG and a steady supply of fuel coupled with lower prices is encouraging private car owners also to switch

Some economic measures are also designed to force the use of public transport. one such measure is the congestion pricing, the increase in prices of the vehicles that have an engine of above 2ooocc and the price increase of the vehicles that are over 4m long.

Although the public transport system is developing on a very large scale in our country, metro is connecting one part of the city to another very easily, the public transport is very cheap and easily accessible, still the main problem in our country is the population that is increasingly very rapidly and is uncontrollable, so the demands for more and more automobiles have been increasing and is still a threat to our country’s future.

Government policies are becoming strict for those people using older vehicles. There has been a ban on the commercial vehicles that are older than 15 years and diesel vehicles that are older than 1o years, removal of 8 year old buses and replacing the combustion fuel by CNG instead of diesel.

While congestion pricing policies are difficult to replicate in the Indian context, at least for the foreseeable future, there is an important lesson to be learned. With increasing costs for private vehicles linked with their usage (fuel and other operational expenses), it is possible to achieve a shift to public transport, if combined with the provision of an adequate, reliable, and safe public transportation.

**Future Scope:**

1. Production of Electric Vehicles:

One of the main future scope that comes in my mind is what I read in one of my research papers is that by the year 2o3o, the number of internal engine combustion vehicles will reduce significantly and electric vehicles will start flooding the roads which Is a positive thing and hopefully this will reduce the environmental pollution significantly in our country while the automobile industry will still be booming.

Companies like Tesla Motors, MG motors, etc are planning to enter the Indian market soon with its electric vehicles and hopefully these electric vehicles will become feasible in the coming future and people will start shifting towards these electric vehicles.

1. From the derived result of The ambient air quality monitoring study the relationship between Pollutants and meterological parameters can be established.
2. The air quality at perticular sampling site can be carried out.
3. Effect of meterological parameters on air pollutants can be found out.
4. Effect of traffic volume on air pollution can be found out.
5. A data set of concentration of different air pollutants can be carried out for the further study of Air Quality Index, air dispersion modelling and Predication analysis study.

**Limitations:**

* My study was only limited to the span of years from 2oo4-2o11 as the exact information of the pollutants were not been found in the research except for those of these years.
* The data is only secondary obtained from the research papers and the journals as primary data was not possible to obtain as we were looking at the past information about automobiles and not all people have the exact idea of what all gases are responsible for the environmental pollution, also people doesn’t know the exact numbers related to the increase of the automobile industry, so preparing a questionnaire was not a viable job for this research.
* The correlation obtained in the data analysis is inconsistent, we cannot predict what will happen in the future, and we can only predict that what can happen in the next few years to the automobile industry and the emissions caused by them.

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