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### Electric Car: A Research Impact BY Means OF Scientometric Analysis

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# ELECTRIC CAR: A RESEARCH IMPACT BY MEANS OF SCIENTOMETRIC ANALYSIS

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**Key words:** Electric Car - Scientometric – Regression – Doubling Time – Lotka’s Law – Bradford’s Law

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## Abstract

*The day-to-day increasing costs of petrol and diesel and to control the air pollution makes an impact to do a scientometric analysis on the research output on “Electric Car”. Therefore, the research publications indexed in Web of Science for 28 years have been downloaded from 1991 to 2018 for the analysis. The research reveals that a total of 2424 publications is published during the above-mentioned year. The regression test proves that the deviation among the data is low and has possibility to calculate the doubling time on the basis the last 14 years. The doubling time proves that the growth of publications increased from year after year. Journal articles played a dominant role among other type of publications. The language “English” played prominent role than the other language publications on “Electric Car”. Tang T.Q. published 15 publications and ranked first among the other authors. The Lotka’s Law does not fit the author productivity of the publications published on “Electric Car”. Eventhough, the research publications are increasing from year after year, the number of publications published in the past is not up to remarkable. At the same time, only a very few countries have been implemented the “Electric Car” throughout the world. It is therefore, suggested that the funding agencies, sponsoring bodies and global research and development ministries to encourage the researchers to do many more research on “Electric Car”, to enhance the control of air pollution by means of reducing the consumption of Petrol and Diesel, which will also support the cost control for better economy of the global countries.*

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## 1.1 Introduction about Electric Car

The cost of the petrol and diesel are increasing from day-to-day. The society is struggling to maintain a fuel engine car due to the threat of the increasing trend of the price of the fuel. Electric Cars are emerging to replace the petrol engine or diesel engine cars to initiate an economic reformation in the management of cars. A comparative on-line statement for the electric cars and fuel cars published by “Data Quest” reveals that an approximate amount of more than INR 5000/- can be saved every month by an individual through utilizing electric car.<sup>1</sup> It was proved through the assessment of the last four years in five countries viz., UK, Germany, France, Netherlands and Norway that the electric cars are cheaper than the petrol and diesel engine cars. Further, a research report of the International Council for Clean Transportation (ICCT) declares that the air pollution can be controlled through electric cars.<sup>2</sup> If there are possible chances to control the air pollution to safe guard the lungs of the people living all over the world, it would be the best alternate to go for the electric cars instead of fuel based cars.

## 1.2. Introduction about Scientometric Analysis

Scientometric is a powerful metric to measure any research publications on various aspects such as author productivity, year-wise research publications, language-wise publications, type of documents involved in research, country-wise publications, number of research literatures referred by the authors towards the productivity, to ascertain the doubling time of the records, Degree of Collaboration between the authors, application and testing of theories formulated by the bibliometricians Alfred Lotka, and Bradford. Scientometric plays vital role

towards the assessment of the quantity and quality of research publications, researchers and publishers.

## **2.1. Need for the Study**

“Electric Car” is an emerging concept, which is supposed to make a dynamic reformation in the car manufacturing industry. Human health can be enhanced through the control of air pollution by means of the implementation of “Electric Car” in the society is the prime factor for this research of scientometric study.

## **2.2. Limitation**

The data collected for the scientometric study are limited to the database “Web of Science – Core Collection”. The selected years are limited for only 28 years of publications.

## **2.3. Methodology**

The research method adopted is descriptive in nature. Data for 28 years from 1991 to 2018 have been downloaded from “Web of Science”. “American Psychological Association” style manual has been utilized towards reference citation. Open source software “Hiscite” software has been utilized to segregate the data. Microsoft Excel has been further utilised to tabulate the data and for statistical application.

## **2.4. Hypotheses**

1. “H0: There is no significant relationship between the research publications published from 1991 to 2018”
2. “H0: There is no significant relationship between the research publications published from 2005 to 2018”
3. “H0: There is no significant relationship between the author productivity and the prediction of Lotka’s Law”.

## **3. Review of Literatures**

**Gao, Y., Ge, L., Shi, S., Sun, Y., Liu, M., Wang, B., ... & Tian, J. (2019)** have revealed in 38 years of global trends on bibliometric analysis of e-waste research using Web of Science database and CiteSpace V, Histcite, and VOSviewer are used to get literature information. 2800 literatures outputs get during the study period 1981-2018, seventy percent of authors were published single publication among 6583 authors. Chinese Academy of Sciences and China are the top most publications on e-waste research than other countries. First e-waste research article published in 1981 and it was slowly growing upto 2003. The awareness of electronic waste may be due to after meeting on WHO at Geneva (2013), the publications have high in the year of 2013 onwards. Ninety percent of the research publications emerged after 2019; its increasing awareness of environmental safety, more countries and scholars have carried out e-waste research.<sup>3</sup> **Gubta, B. M. et.al.,(2018)** have studied the electronic waste research publications in ten years from 2007 to 2016 using Scopus database and get 3468 global publications. Across the globe, 87 countries were registered and the top ten countries global publications share between three percent and around forty percent. China has occupied the first

place followed by USA, India and UK. Environmental Science, Engineering and Chemistry are the top three subject areas in e-waste research, 14 organizations from China were mainly productive than others from Hong Kong, Sweden, France, Italy and Nigeria in top twenty countries and 12 most productive authors from china in top twenty authors. During the study period, China is only country to concentrate more importance of e-waste research publications than other countries. <sup>4</sup> **Li, N., Han, R., & Lu, X. (2018)** have analysed the reuse and recycling of solid waste in twenty five-years. In the recent years, the contribution of developing countries have momentous development the issue of reuse and recycling though developed countries continued trivial growth relatively. Since 2007 to 2011, China has exceeded the USA as the most productive country, and had a significant improve in eminence and influence. The journal Bioresource Technology from Finland, had published an article, Biodegradation of lignin in a compost environment: a review by Tuomela et al., in 2000 has got 425 citations as the highest during the study period.<sup>5</sup> **Borthakur, A., & Singh, P. (2012)** have reviewed the research activities on environmental health and toxicology in global. Hirsch index is the quality indicator based on the publications output from Nations, USA has got the highest in h-index got 267 during the study period. It is noted that the country more concentrate on environmental health and toxicology research and studies. The journals of this topic have evidenced a considerable growth in terms of its publications from 1996 -2016. Since the year 2016, China has reinstated the United States of America in the most research producing countries on both ‘environmental science’ and ‘health, toxicology and mutagenesis’. India placed on the first five countries continually in the current decade has been hopeful.<sup>6</sup>

#### 4. Analysis and Interpretation

##### 4.1. Year wise Publications

Sl. No.	Year of Publication	No. of Records	Percentage Analysis	LCS	GCS
1	1991	15	0.62%	5	129
2	1992	24	0.99%	4	213
3	1993	22	0.91%	1	133
4	1994	19	0.78%	2	82
5	1995	46	1.90%	27	789
6	1996	50	2.06%	36	583
7	1997	38	1.57%	24	477
8	1998	30	1.24%	34	455
9	1999	36	1.49%	41	503
10	2000	21	0.87%	19	995
11	2001	22	0.91%	13	306
12	2002	22	0.91%	19	760
13	2003	30	1.24%	22	812
14	2004	38	1.57%	29	1509
15	2005	34	1.40%	32	1744
16	2006	43	1.77%	63	2204

Sl. No.	Year of Publication	No. of Records	Percentage Analysis	LCS	GCS
17	2007	58	2.39%	42	1760
18	2008	42	1.73%	27	903
19	2009	69	2.85%	131	2891
20	2010	94	3.88%	229	4455
21	2011	143	5.90%	325	3886
22	2012	115	4.74%	390	5105
23	2013	138	5.69%	434	6189
24	2014	181	7.47%	453	3944
25	2015	195	8.04%	373	3973
26	2016	249	10.27%	277	3456
27	2017	306	12.62%	177	2392
28	2018	344	14.19%	35	1006
<b>Total</b>		<b>2424</b>	<b>100.00%</b>	<b>3264</b>	<b>51654</b>

**Table No.4.1. Yearwise Research Publications on “Electric Car”**

The table number 4.1 shows the year wise percentage analysis of the research publications on “Electric Car” for 28 years from 1991 to 2018. The total count of the research publications is 2424, for which the publications received 3264 numbers of Local Citation Score and 51654 numbers of Global Citation Score.

#### **4.2. 1. Regression Test 1**

The regression test has been conducted to assess the relationship between the averages of the research publications, in order to ascertain the doubling time of the records. The total years of twenty-eight has been divided into two segments i.e., from 1991 to 2004 and from 2005 to 2018. The regression test has been done through Microsoft Excel. The result reveals that the P-value of X Variable 1 is 0.65, which is not lesser than the critical value of 0.05. Therefore, the null hypothesis is accepted and concluded that there is a significant relationship between the averages of the number of publications published from 1991 to 2004 and from 2005 to 2018. Therefore, it is not possible to calculate the doubling time on the basis of the whole records published from 1991 to 2018.

	Coefficients	Standard Error	t Stat	P-value
<b>Intercept</b>	<b>27.47</b>	<b>5.26</b>	<b>5.22</b>	<b>0.00</b>
<b>X Variable 1</b>	<b>0.01</b>	<b>0.03</b>	<b>0.46</b>	<b>0.65</b>

**Table No.4.2.1. Regression Test 1**

#### **4.2.2. Regression Test 2**

As per the first Regression Test, the result reveals that the whole data from 1991 to 2018 is not fit towards the calculation of the doubling time. Therefore, the second Regression Test

has been conducted for the research publications published from 2005 to 2011 and from 2012 to 2018. It is also fine and reasonable to calculate the doubling time on the basis of the last few years. The result of the second regression test reveals that the P-value of 0.002 is lesser than the critical value 0.05 and the second null hypothesis of “There is no significant relationship between the publications published from 2005 to 2011 and 2012 to 2018” is rejected and the alternate hypothesis of H1: “There is a significant relationship between the publications published from 2005 to 2011 and 2012 to 2018” is accepted. Therefore, the possibility of calculating the doubling time is very high on the basis of the research publication published from 2005 to 2018.

Coefficients		Standard Error	t Stat	P-value
Intercept	-22.541	17.270	-1.305	0.249
X Variable 1	0.419	0.074	5.635	0.002

**Table No.4.2.2. Regression Test 2**

### 4.3. Doubling Time of Records

Sl. No.	Year of Publication	No. of Records	Cumulative Records	W1	W2	R(P)	DT=0.693/RP	Average Doubling Time	Doubling Time
1	2005	34	34	3.53	3.53	0.00		0.69	8 Months
2	2006	43	77	3.76	4.34	0.58	1.19		
3	2007	58	135	4.06	4.91	0.84	0.82		
4	2008	42	177	3.74	5.18	1.44	0.48		8 Days
5	2009	69	246	4.23	5.51	1.27	0.55		
6	2010	94	340	4.54	5.83	1.29	0.54		
7	2011	143	483	4.96	6.18	1.22	0.57		
8	2012	115	598	4.74	6.39	1.65	0.42	0.41	4 Months
9	2013	138	736	4.93	6.60	1.67	0.41		
10	2014	181	917	5.20	6.82	1.62	0.43		
11	2015	195	1112	5.27	7.01	1.74	0.40		28 days
12	2016	249	1361	5.52	7.22	1.70	0.41		
13	2017	306	1667	5.72	7.42	1.70	0.41		
14	2018	344	2011	5.84	7.61	1.77	0.39		

**Table 4.3. Doubling Time of Publications**

The table number 4.3 is the calculation of the doubling time of the publications on “Electric Car”. The data taken for the doubling time assessment are on the basis of the results of the Regression Test 2, which is tabulated in Table No.4.2.2. The year taken as data is from 2005 to 2018. The years have been segregated into two segments i.e., 2005 to 2011 and 2012 to 2018. It is possible to take 8 months and 8 days for the doubling of 2011 publications on the basis of the number publication published from 2005 to 2011. It is possible to take 4 months and 28 days for the doubling of 2011 publications on the basis of the number of publications published from 2012 to 2018. High clarity is available through the calculation of the doubling time to

understand that the impact of the growth of publications on “Electric Car” increases from year to year.

#### 4.4. Document wise Publications

Sl. No.	Document Type	No. of Records	Percentage Analysis	LCS	GCS
1	Article	1922	79.29%	3038	42965
2	Article; Proceedings Paper	184	7.59%	109	3743
3	Review	83	3.42%	81	4361
4	Letter	70	2.89%	10	56
5	News Item	67	2.76%	3	11
6	Editorial Material	61	2.52%	20	449
7	Book Review	15	0.62%	0	48
8	Note	11	0.45%	1	11
9	Correction	5	0.21%	0	0
10	Film Review	2	0.08%	1	1
11	Biographical-Item	1	0.04%	0	0
12	Item About an Individual	1	0.04%	0	0
13	Meeting Abstract	1	0.04%	0	1
14	Review; Book Chapter	1	0.04%	1	8
<b>Total</b>		<b>2424</b>	<b>100.00%</b>	<b>3264</b>	<b>51654</b>

**Table 4.4. Percentage Analysis of the Document wise Publications**

The document wise publications are displayed in table number 4.4, which is crystal clear that the “Articles” leads the table with a publication count of 1922(79.29%). The “Articles” received 3038 numbers as Local Citation Score and 42965 numbers as Global Citation Score. The “Articles” received a Local Citation Score of 3038 and a Global Citation Score of 42965. Papers published in the proceedings are placed in the second place with a publication count of 184(7.59%) and received 109 numbers as Local Citation Score and 3743 numbers as Global Citation Score. The third place has been occupied by the document “Reviews” with a publication count of 83(3.42%) and the “reviews” received 81 numbers as Local Citation Score; 4361 numbers as Global Citation Score. The fourth place has been occupied by the “Letters” with 70 publications followed by “News Items” with 67 publications; “Editorial Material” with 61 publications; “Book Review” with 15 publications; “Note” with 11 publications; “Correction” with 5 publications; “Film Review” with 2 publications; “ 1 publication to the credit of Bibliographical-Item”, “Item About an Individual”, “Meeting Abstract” and “Book Chapter Reviews”.

#### 4.5. Language wise Publications

The number 4.5 reveals that the language “English” played a pre-dominant role towards the production of research publications on “Electric Car” with a records count of 2363(97.48%). The research out on “English” language received 3259 numbers as Local Citation Score and 51535 as Global Citation Score. “German” language placed in the second place with a publication count of 16(0.66%) and secured one as Local Citation Score and 38 as Global

Citation Score. The third place has been shared by two languages viz., “French” and “Spanish” with a publication count of nine. The language “French” gained 17 as Global Citation Score and “Spanish” gained seven as Global Citation Score. The fourth place has been occupied by the language “Polish” with a publication count of eight numbers and gained five Global Citation Score followed by Chinese with six; Japanese with three; Portuguese with two; Russian with two; Slovene with two; Czech, Hungarian, Italian, Turkish with only one publication. Totally fourteen languages involved towards publishing 2424 research publications on “Electric Car”.

Sl. No.	Language	No. of Records	Percentage Analysis	LCS	GCS
1	English	2363	97.48%	3259	51535
2	German	16	0.66%	1	38
3	French	9	0.37%	0	17
4	Spanish	9	0.37%	0	7
5	Polish	8	0.33%	0	5
6	Chinese	6	0.25%	0	21
7	Japanese	3	0.12%	0	3
8	Portuguese	2	0.08%	1	2
9	Russian	2	0.08%	3	26
10	Slovene	2	0.08%	0	0
11	Czech	1	0.04%	0	0
12	Hungarian	1	0.04%	0	0
13	Italian	1	0.04%	0	0
14	Turkish	1	0.04%	0	0
<b>Total</b>		<b>2424</b>	<b>100.00%</b>	<b>3264</b>	<b>51654</b>

**Table No.4.5 Percentage Analysis of the Language wise Publications**

#### **4.6. Top Ten Country wise Publications**

The table number 4.6 shows that United States of America is placed in the first place with 432(17.8%) research publications on “Electric Car”. USA gained 847 numbers as Local Citation Score and 15426 numbers as Global Citation Score. Peoples of Republic China published 294(12.1%) research publications on “Electric Car” and placed in the second place. Peoples Republic China gained 257 numbers of Local Citation Score and 5102 numbers as Global Citation Score. Germany placed in the third place with 251(10.4%) research publications and gained 426 as Local Citation Score; 4427 as Global Citation Score. UK placed in the fourth place with 207(8.5%) research publications and gained 426 as Local Citation Score; 4223 as Global Citation Score. Italy placed in the fifth place with 145(6%) research publications and gained 205 as Local Citation Score; 4736 as Global Citation Score. Japan and the Netherlands shared the sixth place with 122 research publications, but Japan gained 99 numbers as Local Citation Score and 2178 numbers as Global Citation Score, whereas the Netherlands gained 373 numbers as Local Citation Score and 3431 numbers as Global Citation Score. France placed in the seventh place with 103(4.2%) research publications for which France gained 57 numbers as Local Citation Score and 1688 numbers as Global Citation Score. South Korea placed in the



eighth place with 85(3.5%) research publications and gained 37 numbers as Local Citation Score; 2990 numbers as Global Citation Score. Canada placed in the ninth place with 74(3.1%) research publications and gained 209 numbers as Local Citation Score; 2022 as Global Citation Score. Sweden placed in the tenth place with 67(2.8%) research publications and gained 116 numbers as Local Citation Score; 1442 as Global Citation Score.

Rank	Country	Records	Percent Analysis	LCS	GCS
1	USA	432	17.8%	847	15426
2	Peoples R China	294	12.1%	257	5102
3	Germany	251	10.4%	426	4427
4	UK	207	8.5%	426	4223
5	Italy	145	6%	205	4736
6	Japan	122	5%	99	2178
6	Netherlands	122	5%	373	3431
7	France	103	4.2%	57	1688
8	South Korea	85	3.5%	37	2990
9	Canada	74	3.1%	209	2022
10	Sweden	67	2.8%	116	1442

**Table No.4.6. Top Ten Country wise Publications**

#### 4.7. Publication wise Ranking of Authors

Rank	Author	No. of Records	No. of Authors Collaborated	Cited References	LCS	LCS h Index	GCS	GCS h Index
1	Tang TQ	15	22	339	26	3	212	8
2	Axsen J	13	15	530	104	7	381	10
2	Kim J	13	34	364	17	1	167	6
3	Kurani KS	11	10	246	127	8	410	10
3	Sovacool BK	11	16	826	49	3	339	7
4	Plotz P	10	39	509	83	5	257	7
5	Cherry CR	9	20	309	81	5	416	8
5	Sperling D	9	10	241	45	3	161	5
5	Thiel C	9	19	410	92	5	380	8
5	Wu Y	9	36	389	23	2	217	6
5	Yang SC	9	13	203	24	3	149	7

**Table No.4.7. Publication wise Ranking of Authors**

The table number 4.7 reveals the ranking of top five authors on the basis of the number of publications published on “Electric Car”. Tang T.Q. leads the table with 15 publications, for which he secured 26 as Local Citation Score with an h-Index of 3 and 212 Global Citation Score with 8 as h-Index. Tang T.Q. referred 339 numbers of publications towards publishing 15 research contributions. Two authors viz., Axsen J and Kim J, shared the second place with 13

publications. Axsen J referred 530 research publications to contribute 13 publications and secured 104 as Local Citation Score and gained an h-Index of 7 Axsen J received 381 as Global Citation Score for which he gained 10 as h-Index. Kim J referred 364 research publications to publish 13 publications, for which he secured 17 as Local Citation Score and gained one as h-Index. Kim J secured 167 Global Citation Score and an h-Index of six. Kurani K.S. and Sovacool B.K., both of them shared the third rank with eleven publications. The author, Plotz.P is ranked in the 4<sup>th</sup> place with 10 research publications. The fifth place has been shared by five authors viz., Cherry .C.R., Sperling .D., Thiel .C., Wu.Y., Yang .S.C., . for nine research publications.

#### 4.8. Application and Testing of Lotka's Law

x (No. of Works)	Observed No. of Authors			Application and Testing of Lotka's Power Law							Difference: Observed Value and Lotka's Law	
	y (No. of Authors)	Average of y	Cumulative Average of y	X	Y	XY	X <sup>2</sup>	1/xn	fe	cum fe		
1	515	0.21	0.21	0.00	2.71	0.00	0.00	1.00	0.05	0.05	0.16	
2	467	0.19	0.41	0.30	2.67	0.80	0.09	1.00	0.05	0.10	0.30	
3	586	0.24	0.65	0.48	2.77	1.32	0.23	1.00	0.05	0.15	0.50	
4	395	0.16	0.81	0.60	2.60	1.56	0.36	1.00	0.05	0.20	0.61	
5	218	0.09	0.90	0.70	2.34	1.63	0.49	1.00	0.05	0.25	0.65	
6	122	0.05	0.95	0.78	2.09	1.62	0.61	1.00	0.05	0.30	0.65	
7	57	0.02	0.97	0.85	1.76	1.48	0.71	1.00	0.05	0.35	0.62	
8	23	0.01	0.98	0.90	1.36	1.23	0.82	1.00	0.05	0.40	0.58	
9	14	0.01	0.99	0.95	1.15	1.09	0.91	1.00	0.05	0.45	0.54	
10	9	0.00	0.99	1.00	0.95	0.95	1.00	1.00	0.05	0.50	0.49	
11	3	0.00	0.99	1.04	0.48	0.50	1.08	1.00	0.05	0.55	0.44	
12	6	0.00	1.00	1.08	0.78	0.84	1.16	1.00	0.05	0.60	0.40	
13	1	0.00	1.00	1.11	0.00	0.00	1.24	1.00	0.05	0.65	0.35	
14	2	0.00	1.00	1.15	0.30	0.35	1.31	1.00	0.05	0.70	0.30	
16	2	0.00	1.00	1.20	0.30	0.36	1.45	1.00	0.05	0.75	0.25	
26	1	0.00	1.00	1.41	0.00	0.00	2.00	0.99	0.05	0.80	0.20	
27	1	0.00	1.00	1.43	0.00	0.00	2.05	0.99	0.05	0.85	0.15	
51	1	0.00	1.00	1.71	0.00	0.00	2.92	0.99	0.05	0.90	0.10	
65	1	0.00	1.00	1.81	0.00	0.00	3.29	0.99	0.05	0.95	0.05	
290	2424	1.00		18.51	22.25	13.75	21.72	0.99	0.05	1.00	-1.00	
									c value= 19.91			
									n value = 0.0018			
									Maximum Deviation		0.65	
									Threshold Value		0.10	

**Table No.4.8. Application and Testing of Lotka's Law with Kolmogorov Smirnov Test**

The actual author productivity for the research publications published on “electric car” is the “Actual number of Authors” and the same has been designated as “y”. The number of works done by those authors is designated as “x”. The cumulative count of the average number of actual authors is considered as “Observed number of Authors”. The Logarithm and the Lotka’s Power Law have been applied to find out the prediction of the Alfred Lotka and this value is the “Expected number of Authors”. Kolmogorov Smirnov Test has been applied to find out the maximum deviation between the “Observed number of Authors” and the “Expected number of Authors” to test the hypothesis “H0: There is no significant relationship between the author productivity and the prediction of Lotka’s Law”. During the process of testing the hypothesis, the ‘n’s value’ is assessed as 0.0018 and ‘c’s value’ (absolute value) is 19.91. The deviation between the Observed value and Expected Value (Lotka’s Law) has been compared to arrive the value of ‘f’ (deviation). Out of the value of ‘f’, the maximum deviation ( $D_{max}$ ) has been observed as 0.65. The Threshold value (critical value) is 0.10. As the  $D_{max}$  value of 0.65 is greater than the critical value of 0.10, the null hypothesis of “H0: There is no significant relationship between the author productivity and the prediction of Lotka’s Law” is accepted. In simple term, we can interpret that the Lotka’s law does not fit for the author productivity of the research publication published on “Electric Car” from 1991 to 2018.

## **5. Findings, Suggestion and Conclusion**

The importance of the usability of “Electric Car” and the value of scientometric study has been depicted in the introduction. It was also mentioned that a few developed countries such as UK, Germany, France, the Netherlands and Norway are utilizing the electric cars for the past four years. In an intention to control the costs and the consumption of petrol and diesel to control the air pollution is the primary concept of this scientometric study. The study reveals that 2424 research publications are from 1991 to 2018. The first regression test proves that it is not possible to calculate the doubling time of the records on the basis of the number of publications published for the whole year from 1991 to 2018, as the deviation among the number of publications varies a lot. The second regression test proves that there is a possibility to calculate doubling time of the records from the year 2005 to 2018. It is possible to taken 8 months and 8 days for the doubling of 2011 publications on the basis of the number publication published from 2005 to 2011. It is possible to take 4 months and 28 days for the doubling of 2011 publications on the basis of the number of publications published from 2012 to 2018. The document wise publications are displayed in table number 4.4, which is crystal clear that the “Articles” leads the table with a publication count of 1922(79.29%). The language “English” played a pre-dominant role towards the production of research publications on “Electric Car” with a records count of 2363(97.48%). United States of America is placed in the first place among the other countries with 432(17.8%) research publications on “Electric Car”. Tang T.Q. leads the table with 15 publications, for which he secured 26 as Local Citation Score with an h-Index of 3 and 212 Global Citation Score with 8 as h-Index. Tang T.Q. referred 339 numbers of publications towards publishing 15 research contributions. The Kolmogorov Smirnov Test proves that the Lotka’s law does not fit the author productivity of the research publications published on “Electric Car” from 1991 to 2018. By means of this scientometric research, it is suggested that the funding agencies, sponsoring bodies and global research and development ministries to encourage the researchers to do many more research on “Electric Car”, to enhance the control of air pollution by means of reducing the consumption of Petrol and Diesel, which will also support the cost control for better economy of the global countries.

## References:

1. <https://www.dqindia.com/electric-vs-petrol-cars-cost-comparison-era-rising-petrol-prices/>
2. <https://www.theguardian.com/environment/2019/feb/12/electric-cars-already-cheaper-own-run-study>
3. **Gupta, B. M., Dhawan, S. M., Kumar, A., & Visakhi, P. (2018).** E-Waste Research: A Scientometric Assessment of Global Publications Output during 2007-16. *International Journal of Information Dissemination and Technology*, 8(1), 31-36.
4. **Gao, Y., Ge, L., Shi, S., Sun, Y., Liu, M., Wang, B., ... & Tian, J. (2019).** Global trends and future prospects of e-waste research: a bibliometric analysis. *Environmental Science and Pollution Research*, 26(17), 17809-17820.
5. **Li, N., Han, R., & Lu, X. (2018).** Bibliometric analysis of research trends on solid waste reuse and recycling during 1992–2016. *Resources, Conservation and Recycling*, 130, 109-117.
6. **Borthakur, A., & Singh, P. (2012).** Electronic waste in India: Problems and policies. *International Journal of Environmental Sciences*, 3(1), 353-362.
7. **Sivasekaran, K. and Ragavan, S.S. (2014).** Journal of Astrophysics and Astronomy: A Bibliometric Study. *Library Science Research Journal*, 2(6).
8. **Gao, Y., Ge, L., Shi, S., Sun, Y., Liu, M., Wang, B., & Tian, J. (2019).** Global trends and future prospects of e-waste research: a bibliometric analysis. *Environmental Science and Pollution Research*, 26(17), 17809-17820.
9. **Sivasekaran K. (2015).** India's Contribution on Renewable Energy Research Output: A Scientometric Study. *Journal of Advances in Library and Information Science*, 4(4), pp. 311-316.
10. **Cujba, R., & Turcan, N. (2019).** Bibliometric Assessment of Research on Energy in the World, in the Eastern Europe and in the Republic of Moldova, *Problemele Energeticii Regionale* 1 (39), .pp 112-127.