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### Green Entrepreneurship: A Bibliometric Study

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**Abstract:** Entrepreneurship, in general, and green entrepreneurship, in particular, has become a dynamic field of research in the last few decades. It seems therefore important to present a quantitative survey of the literature in this area, aimed at identifying the most important sub-topics, contributors and their geographical distribution, major subject areas, highly cited articles as well as the most frequently studied countries. This paper presents a bibliometric study in green entrepreneurship using scientific literature. The study was conducted using data from the Scopus database over the time period of 2005–2016. This study comprises 88 articles with 181 authors.

The paper attempts to investigate the research landscape in green entrepreneurship at country level and at institute level. The results indicate that institutes from USA and UK are high productive in the area of green entrepreneurship research. It is also noted that USA and UK published maximum number of papers. The information produced in this study can be useful for research scholars in the field of green entrepreneurship. Future research scopes with limitations of this study were also presented in the end.

**Keywords:** Bibliometrics study, Green entrepreneurship, Sustainable entrepreneurship, Ecopreneurship

#### 1. INTRODUCTION

Despite the high growth in economy and increases in the quality of life over the years still the main concern is that the industrialization has had impacted negatively to the natural environment and that these effects reduce the vitality and sustainability of our economic systems (United Nations, 1987; World Resources Institute, 2004). There are different kinds of pollution as water pollution, air pollution etc present at local level and every nation is facing it and its affect can be seen in the form of climate change, depletion of ozone layer and destruction of fisheries in oceans (World Resources Institute, 2004; United Nations, 1999, 2004, Volery, 2002). The long-term economic impacts of these effects may be quite big because major portion of the world's economic output depends upon the esprit of natural systems (Costanza et al., 1997).

The activities carried out by business organisations are the main reasons for environmental degradation. In present time the economy of the most of the countries are based on demand and supply pattern thus the role of entrepreneurs become important to adopt the green business practices. Green entrepreneurship has potential and major force in changing the business dimensions as well as providing new opportunities to those who adopt it ahead of its competitors. In this way, Green entrepreneurship work as a full factor through demonstrating the economic benefits that obtain from being greener. Thus, the green practices help in environment and bring new business opportunities (Schaper, 2002) and suggested that green business should be made part of basic business to add value to the organisations as well as stakeholders (Banerjee et. al. 2003; Menon & Menon, 1997). There can be two dimensions of Green entrepreneurship first is product based while second one is process based. In product based, Green entrepreneurs enter into the business with the objective of providing green and environmentally friendly products and services while in Process based, green entrepreneur focused on environmentally friendly process i.e. eco-labels, eco-packaging, etc. Thus the overall objective of green entrepreneur is to safe the environment from hazardous impact and includes both dimensions together in business operations. Thus the term green entrepreneurs can be defined “as the persons who target the opportunities in the market at their best and successfully introduce their innovative products and services accordingly” (Dixon and Clifford, 2007).

The most of studies in green entrepreneurship are either case studies or conceptual studies focusing on innovation and concern for the environment and there are rarely found studies and analyses of larger-scale quantitative studies focusing on the research trends on this field and it is this gap in the literature that this paper addresses.

The contribution of this work is twofold. First, we offer a quantitative-based dimension showing the current trends in the field. Second, our analysis provides a new perspective for future researchers looking toward green entrepreneurship as an area of study for extending their own research. Thus, this study is beneficial for green entrepreneurship researchers as well as those based in other disciplines who may find their investigation into the entrepreneurship field (Venkataraman, 1997).

The article is organised as in section 2 Literature review is presented. Next in section 3 research methodology is presented. Next in section 4 analyses is presented. Next in section 5 Lotka’s is tested. Next in section 6 conclusions is presented and in the last section7 limitations and future research scope of the study presented.

## **2. OBJECTIVES**

This study has been undertaken with the objective to find out:

- Keyword analysis
- Academic Disciplines
- Contributing countries
- Top 10 Publication sources
- Authorship pattern
- Authors Productivity

- Institute/Organisation Productivity
- Language wise distribution pattern
- Year-wise publication pattern
- Citation analysis

### **3. LITERATURE REVIEW**

The concept of green entrepreneurship emerged recently, which links sustainable development to entrepreneurship (Schaltegger & Wagner, 2008). Over the years, it has been given different names by various scholars as “ecopreneurship” (Gerlach, 2003), “environmental entrepreneurship” (Dixon & Clifford, 2007) or “green entrepreneurship” (Chick, 2009).

There are lots of studies conducted in the past and examined the scientific structure of entrepreneurship research but the research on green entrepreneurship is very limited. Gregoire et al. (2006) conducted content analysis on the co-citations of papers published from 1981 to 2004. Their network analysis suggests that there is some convergence around conceptual themes. Another study conducted by Teixeira (2011), who examined seven entrepreneurship journals, from 2005 to 2010 and found a number of emerging subject areas. The study conducted by Schildt et al. (2006) based on SSCI data from 2000 to 2004 and identified several emerging topics for research in the field of entrepreneurship. Petersen (2002), found that out of 64 new ventures, 46 are having an ecological concern because of the environment friendly movement. Gerald D. O’Neill, Jr et al.(2009) conducted the study by taking cultural context of sustainability entrepreneurship and presented that holistic value proposition (HVP) developed by a sustainability venture can create the value for multiple stakeholders across the multiple dimensions of sustainability.

Cohen and Winn (2007), conducted study by taking organizations and the natural environment together and focused on incremental innovation through improvement of waste management practices. They concluded that corporate greening makes financial sense and simultaneously contributes to improved environmental performance.

Dean and McMullen (2007), conducted study to explain how entrepreneurship can help resolve the environmental problems of global socio-economic systems, and found that Environmental entrepreneurs can alleviate environmentally relevant market failures through the discovery, evaluation, and exploitation of opportunities present in market failure.

Ndubisi and Nair (2009), developed the conceptual framework named GVA and concluded that for the success of GVA (green value added), an innovative, flexible, risk-taking and persistent entrepreneur required.

Koe, W.L. et al (2014) conducted a study and found that owners-managers of SMEs are having a positive and moderate relationship with propensity to sustainable entrepreneurship. Which is also supported by previous studies (Liñán et al. (2005); Segal et al. (2005)).

From the above discussion it is concluded that the field of green entrepreneurship is having multidimensional aspects for research and very few researchers have conducted the research quantitatively to see the trends and productivity of the field.

## **4. RESEARCH METHODOLOGY**

Bibliometric analysis is used to examine the bibliographic information through the quantitative way to make it useful and organised for a particular field of study (Merigó et al., 2015). Bibliometric analysis is used to analysis the scientific publication to examine the addition in existing knowledge of a particular field of study and assesses the quality of scientific work and its impact (Daim et. al., 2006, Bouyssou & Marchant, 2011). To perform the current bibliometric analysis of research on green entrepreneurs, this study analysed the most prolific authors in terms of publications, most productive countries in terms of publications, the journals with most publications, most productive institutes/universities and the preferred languages for research work. There are certain steps which need to be followed in bibliometric analysis and described as follow.

### **4.1. Database selection**

The first task is the identification of the databases which best fulfil the study's requirements. In this study SCOPUS was used as the database because it is available online, provide articles from scientific journals, books, and other academic documents in all fields of study. For this study we analyzes articles from 2005 to 2016(May) because the regular scientific publications on green entrepreneurship were available since 2005 in Scopus database. The reason for selecting the SCOPUS is that it is one of the best source for bibliometric studies and evaluations of scientific production (Pinto et al., 2013). The quantity and quality indicators were used for analysis purpose because the study is an attempt to measure how interest in green entrepreneurship has grown in past 12 years.

### **4.2. Define Search criteria**

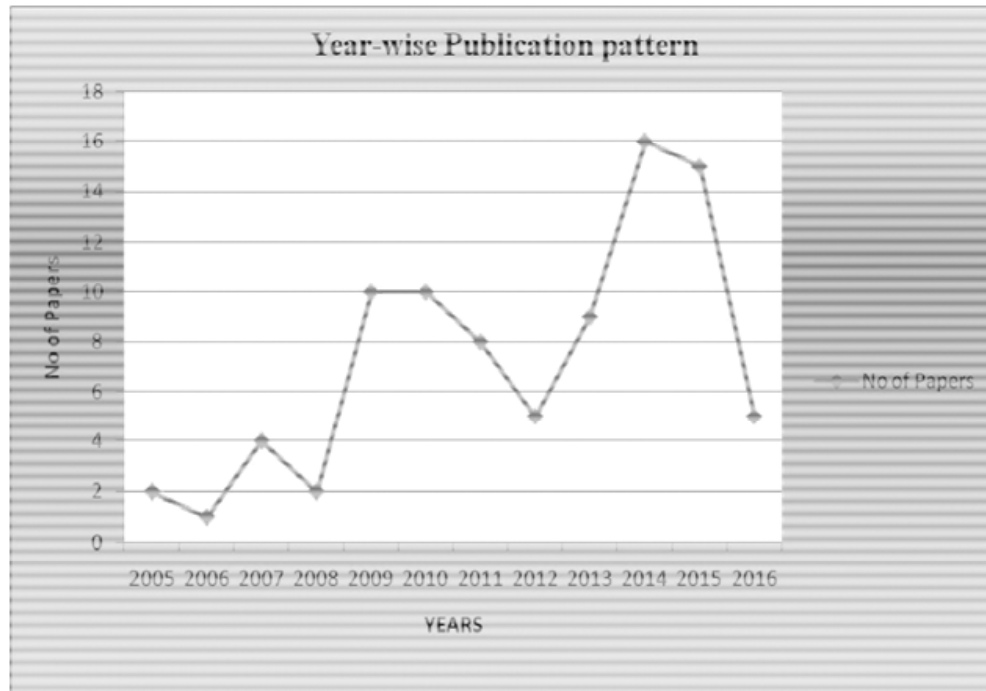
In this study, the following query keywords were used: Green entrepreneurship and Ecopreneurship. Using these keywords, different combinations were made to obtain the articles. While selecting keywords, we tried to be sure that the aspects of green entrepreneurship were completely captured.

### **4.3. Initial search results**

The articles were collected using the Scopus database because it is the largest abstract and citation database and includes over 20,000 peer-reviewed journals in the fields of science, technology, medicine, social sciences, and arts and humanities (Fahimnia et al., 2015). The above keywords were searched in "title, abstract, keywords" of articles belonging to Scopus database. The initial search resulted in 97 articles. These results were then saved, which contained the necessary information related to the paper such as title, authors' names and affiliations, abstract, keywords, references and citations.

### **4.4. Refine the search results**

For the refinement of the search results, duplicates were removed because few papers were present in more than one combination of keywords. On eliminating such duplications, we were left with 88 papers. This is depicted in figure 1.



**Figure 1: Publication pattern since 2005-16**

Figure1. Publication pattern since 2005-16 Figure 1 shows the changing pattern of publications in each year, starting from 2005 until the beginning of 2016. It can be clearly seen from the figure that the number of publications on Green entrepreneurship has fluctuations. There is sudden rise in 2009 and 2010 then it decrease in 2011 to 2013 than again sudden rise 2014 and 2015. This indicates that research in green entrepreneurship has no stability and people are not interested in this field.

#### **4.5. Codification of the information**

The retrieve information has been codified based on several variables such as top keywords, top subject areas, Top publication sources, top authors, top countries, top institutes/universities with highest productivity, highly cited articles and language. Following this process, the study produced an excel data file for the later analysis.

### **5. RESULTS**

This study covers only articles to maintain the standard of this study and is to gain an overall perspective of developments in research on green entrepreneurship. The time frame for this study has been taken since 2005 to 2016. The starting year is 2005 because we found regular articles in the Scopus database.

The results of this study were produced by taking several parameters. These parameters are Keyword analysis, academic discipline, highly productive countries, institutes, journal authorship pattern and author's productivity etc. This analysis will help to understand the research trends in this field of study as well as it will open new scope for further research.

### 5.1. Keyword analysis

A keyword analysis was conducted to obtain information about important topics, current trends, and relationships between topics reflected by keywords. This helps in better understanding of research activities in the field of green entrepreneurship. By aggregating the occurrence of keywords in consecutive time periods, it is possible to identify research trends. Keywords analysis from the table 1 shows very interesting results. The word entrepreneurship is at the top of the list which shows that there is sufficient research in the field of entrepreneurship while the word green entrepreneurship is at fifth place in number of counts which is an indicator that still there is less research in the field of green entrepreneurship. Thus it is the need of the hour to increase the research particularly in green entrepreneurship.

**Table 1**  
**Top 20 keywords**

<i>Keywords</i>	<i>No of counts</i>
Entrepreneurship	19
Entrepreneur	18
Sustainability	15
Sustainable development	12
Green entrepreneurship	6
Sustainable entrepreneurship	6
Innovation	5
Environmental economics	4
Green jobs	4
India	4
Climate change	3
Economic growth	3
Green business	3
Environmental entrepreneurship	3
Green economy	3
Netherlands	3
Resource management	3
United States	3
Ecopreneur	2
Ecopreneurship	2

### 5.2. Academic Disciplines

Here authors try to analyze the distribution of main contributing academic disciplines for better understanding the green entrepreneurship research and drawing the implications on dominant disciplines in general. The results in Table 2 reveal some interesting patterns. While it is not surprising that most of the research activities come from social sciences and Business, Management and Accounting, the high percentage of Environmental Science-related research demonstrates the importance of environmental factors in green entrepreneurship nowadays. Further, the environmental impact of green entrepreneurship increasingly is being investigated, leading to research on eco-friendly business enterprises and businesses for reducing pollution. This requires more research on the interface between green entrepreneurship and other disciplines,

such as energy and environmental science. The excess number of papers shows that some of the papers fall more than one subject areas.

**Table 2**  
**Top 10 subject areas**

<i>Subject areas</i>	<i>No of papers</i>
Social Sciences	42
Business, Management and Accounting	34
Environmental Science	28
Economics, Econometrics and Finance	15
Energy	7
Engineering	7
Agricultural and Biological Sciences	6
Arts and Humanities	3
Computer Science	3
Decision Sciences	3

### 5.3. Contributing countries

In this section, we analyzed the distribution of contributing countries. To consider the impact of contributions, we separately investigated the main contributing countries and sort list them according to the number of papers. Table 3 lists the top 10 contributing countries according to the number of papers contributed. The numbers indicate that most of the publications are published by scholars from United States (19.54%), followed by a large portion of publications from the United Kingdom (16.09%). The numbers demonstrate that most research contributions are from developed countries with a relatively high focus on environmental issues. It must be note down here that some countries, such as the United States and United Kingdom are generally top research contributors in almost all type of research for their development due to their leading role in the global economy and technological progress which is also supported by previous bibliometric studies (Kumar & Kushwaha, 2015).

**Table 3**  
**Top 10 contributing countries**

<i>Country</i>	<i>No of papers</i>
United States	17
United Kingdom	14
Malaysia	7
Netherlands	6
India	5
Australia	4
Greece	4
Canada	4
New Zealand	3
Romania	3
Spain	3
Sweden	3



#### 5.4. Authorship pattern

In this section the authorship pattern analysis showed that the number of co-authors per publication lies between 1 and 3 for almost 90 percent of all publications, as shown in the Table 4. A relatively high percentage 35.22% of publications is published by dual authors while single author publication is just slight low (34.09%). This is an indication that collaboration in research may be beneficial over research by an individual researcher and the high percentage of dual-authored works supports these findings

#### 5.5. Top 10 Publication sources

From the table 5 it is clear that top ten journals are contributing more than one fourth of the included articles in this study. From the table it is clear that Advances in the Study of Entrepreneurship, Innovation, and Economic Growth journal published maximum no of Indexed in Scopus database and considered to be the good quality journals.

**Table 5**  
**Top 10 Publication sources**

<i>Journal</i>	<i>No of Papers</i>
Advances in the Study of Entrepreneurship, Innovation, and Economic Growth	4
International Journal of Sustainable Development and World Ecology	2
Corporate Social Responsibility and Environmental Management	2
Environmental Engineering and Management Journal	2
International Journal of Business and Globalisation	2
Bulletin of the Atomic Scientists	2
International Journal of Entrepreneurship and Small Business	2
Journal of Cleaner Production	2
Journal of Environmental Planning and Management	2
Journal of Technology Management and Innovation	2
Sustainability Switzerland	2

Papers while rest of the journals are producing same no of articles.

#### 5.6. Authors Productivity

The authors productivity is measured in terms of the number of publications. In Table 6, a ranking of top authors based on their individual publications is provided. The top four authors are Walton S. (Centre for Entrepreneurship, Department of Management, University of Otago, Dunedin, New Zealand), Kirkwood J. (Centre for Entrepreneurship, Department of Management, University of Otago, Dunedin, New Zealand), Holt D (Queen's University Management School, Queen's University, Belfast Northern Ireland, United Kingdom) and Mars M.M. (University of Arizona, McGuire Center for Entrepreneurship, United States). We further observed that all these authors contributed an equal number of papers. Only these four authors contributed 2-2 papers while rest of the authors have only single contribution.



**Table 6**  
**Top Authors**

<i>Author</i>	<i>No of Papers</i>
Walton S.	2
Kirkwood J.	2
Holt D	2
Mars M.M.	2

### 5.7. Institute/Organisation Productivity

The institute productivity is measured in terms of no of publications and evaluated from the data file. From the table 7 it is clear that out of top 10 institutes 5 are from USA and UK. We see that the Manchester Metropolitan University United Kingdom is the leading research institutions in the field of green entrepreneurship while rests of the institutes are contributing equal number of publications. Since Most of the institutes /universities are from the United States and United Kingdom which supports our results provided in an earlier section.

**Table 7**  
**Institute /organisation productivity**

<i>Institute/Organisation</i>	<i>No of Papers</i>	<i>Location</i>
Manchester Metropolitan University	3	United Kingdom
University of Colorado at Boulder	2	United States
Pennsylvania State University	2	United States
University of Waterloo	2	Canada
University of Otago	2	New Zealand
Macquarie University	2	Australia
UC Berkeley	2	United States
Queen's University Belfast	2	United Kingdom

### 5.8. Language wise distribution pattern

From the table 8 it is clear that most of the articles included in this dataset have original Language English while single – single articles have been from Croatian, French, Slovene, Japanese and Spanish. This demonstrate

**Table 8**  
**Language wise distribution of articles**

<i>Language</i>	<i>No of Articles</i>
English	83
Croatian	1
French	1
Japanese	1
Slovene	1
Spanish	1

that most of the researchers in the field of green entrepreneurship like to write in English and in local languages either researcher don't like to write or there is less research in non-English speaking countries.

### 5.9. Year-wise publication pattern

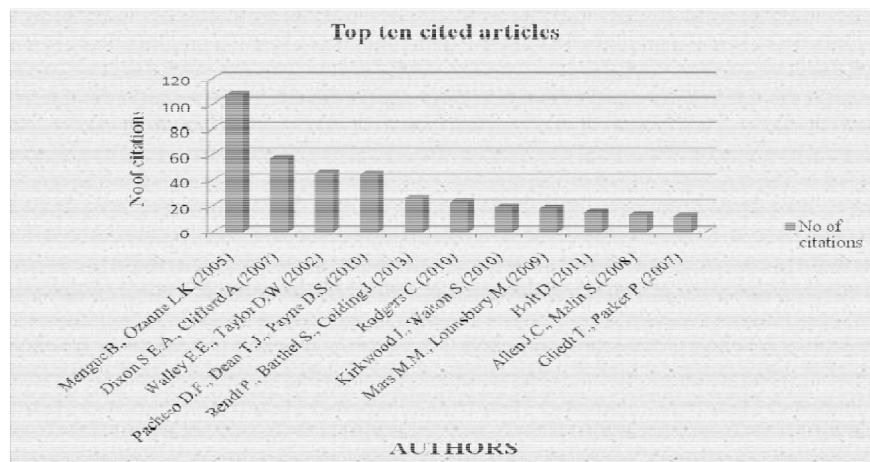
Table 9 depicts the changing pattern of publications in each year, starting from 2005 until the beginning of 2016. It can be clearly seen from the table that the number of publications on green entrepreneurship is not having any set pattern. The highest no of publications observed in year 2014 and 2015. This shows the research in this area is not stable. Since green entrepreneurship is new field thus sometimes it attracts researchers and sometimes researchers do not like to contribute in this field though there is much scope for researchers in this field.

**Table 9**  
**Year-wise publication**

Year	No of Papers
2005	2
2006	1
2007	4
2008	2
2009	10
2010	11
2011	8
2012	5
2013	9
2014	16
2015	15
2016	5

### 5.10. Citation analysis

Citation analysis is one of the best methods used to evaluate the impact of an author/ institute or article in given field of research.



**Figure 2: Top 10 highly cited article**

According to Garfield (1972), the total number of citations on a scientific journal indicates its significance in that area of research. Past study also supported this that the impact of heavily cited articles on scientific research is greater than that of less cited articles (Sharplin and Marby, 1985). Although there are lots of critics regarding citation analysis though it is still regarded as one of the most commonly used methods for analysing literature and identifying the most influential author, journal, or work in that particular area of research (Mac Roberts and Mac Roberts 1989, 2010). Figure 2 and table 10 shows the top 10 highly cited articles.

From the figure2 and table 10 it is clear that the top ten influential works published between 2005 and 2016. The most influential article during this period, having received 107 citations, is the work published by Menguc B., Ozanne L.K.(2005). The authors test a model of the impact of the higher order construct of natural environmental orientation (NEO) on firm performance and found that the higher order construct of NEO is positively and significantly related to profit after tax and market share while, it is negatively related to sales growth. Another important contribution was made by Dixon S.E.A., Clifford A.(2007), who established the link between economically viable business created by ecopreneurs and retaining their core environmental and social values by using exploratory approach in UK. This work received 57 citations which reflect the significance of the article in this field. Furthermore, the article by Walley & Taylor (2002), which has been cited 46 times, propose a framework for investigating the influences on, and motives of, green entrepreneurs. The results of this study produced four ‘ideal types’ of green entrepreneurs’ namely innovative opportunists, visionary champions, ethical mavericks and ad hoc enviropreneurs. Table10.

**Table 10**  
**Top 10 highly cited articles**

<i>Author</i>	<i>Title of the Paper</i>	<i>Journal name</i>	<i>No of citations</i>
Menguc B., Ozanne L.K.(2005)	Challenges of the “green imperative”: A natural resource-based approach to the environmental orientation- business performance relationship	Journal of Business Research	107
Dixon S.E.A., Clifford A.(2007)	Ecopreneurship - A new approach to managing the triple bottom line	Journal of Organizational Change Management	57
Walley E.E., Taylor D.W.(2002)	Opportunists, champions, Mavericks A typology of green entrepreneurs	Greener Management International	46
Pacheco D.F., Dean T.J., Payne D.S.(2010)	Escaping the green prison: Entrepreneurship and the creation of opportunities for sustainable Development	Journal of Business Venturing	45
Bendt P, Barthel S., Colding J.(2013)	Civic greening and environmental learning in public-access community gardens in Berlin	Landscape and Urban Planning	26
Rodgers C.(2010)	Sustainable entrepreneurship in SMEs: A case study analysis	Corporate Social Responsibility and Environmental Management	23

*contd. table 10*

<i>Author</i>	<i>Title of the Paper</i>	<i>Journal name</i>	<i>No of citations</i>
Kirkwood J, Walton S.(2010)	What motivates ecopreneurs to start businesses?	International Journal of Entrepreneurial Behaviour and Research	19
Mars M.M., Lounsbury M.(2009)	Raging against or with the private marketplace?: Logic hybridity and eco-entrepreneurship	Journal of Management Inquiry	18
Holt D.(2011)	Where are they now? tracking the longitudinal evolution of environmental businesses from the 1990s	Business Strategy and the Environment	15
Allen J.C., Malin S.(2008)	Green entrepreneurship: A method for managing natural resources?	Society and Natural Resources	13

## 6. CONCLUSION

Entrepreneurship is very important for sustainable development in any country (Dana, L.P, 2000). In this study we present the bibliometric study of green entrepreneurship publications between 2005 to early 2016 (May) available in the SCOPUS database. The results provide an overview of all the existing information regarding research on green entrepreneurship. This study provides a review of the literature and summarizes research available so far. First, the study analyzes the trend in academic publications on green entrepreneurship. The study analyzes productivity by countries, observing that the country with the largest number of publications is the United States. English is the most common language when publishing research. English is unofficially the international language and provides enormous opportunities for publication than any other language does. The authors with the largest number of publications on green entrepreneurship are Walton S., Kirkwood J., Holt D and Mars M.M. while in terms of citations Menguc, B. and Ozanne, L.K. are more productive. The findings of this study show that the number of Publications pattern was up and down. This may be because research on green entrepreneurship is in nascent stage.

## 7. LIMITATIONS AND FURTHER RESEARCH SCOPE

The basic problem with bibliometric analysis lies in the indicators to measure quantity, quality, and relationship between publications. Generally the citation index or the number of publications measures quality or quantity, regardless of the actual quality of the article. Another limitation of the study is that many more articles on green entrepreneurship may exist in non-indexed journals unavailable in the Scopus database. For further research, researchers should consider conducting a bibliometric analysis using other databases. Future research could also be used to compare the results from other databases with these results.

Future research could also be done using different parameters (e.g. h index).

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