

What is the growth and scientific impact of global warming research, 2008-2010?

Dennis N Ocholla, Omwoyo Bosire Onyancha, Lyudmila Ocholla

docholla@pan.uzulu.ac.za

University of Zululand, Department of Information Studies, Private Bag x1001 Kwadlangezwa 3886

onyanob@unisa.ac.za

University of South Africa, Department of Information Science, PO Box 392 UNISA 0003²

locholla@pan.uzulu.ac.za

University of Zululand, The Library, Private Bag x1001 Kwadlangezwa 3886

Introduction

This paper (2008-2010) builds on previous study (Ocholla and Ocholla 2008) - covering the research domain between 1980 and 2007- that considered global warming by using both descriptive and evaluative informetric techniques to analyse research in the domain through published literature as indexed and reflected in three key bibliographic databases in the Web of Science(SCI,SSCI and A&HCI). In the 1980 -2007 study we noted that global warming is increasingly becoming a major area of multidisciplinary research because of growing concerns about its causes and consequences and the alarming tragedy to occur if less is done about and cited several studies for validation. There have been significant developments and dimensions of research in the domain for the last three years with varying degree of surprises. The 1980 -2007 study- no comparison with global science is done at this stage - found that a total of 116 countries produced one or more publications on global warming, with the USA (2572; 35.7%), England (834; 11.6%) and Japan (546; 7.6%) leading the pack with 3952 (54.85%) publications. The contribution of non-English [first] language speaking countries – in English language - such as Japan, Germany, France, China, the Netherlands and Sweden was, however, found to be significant, as these six countries were in the list of the world's top ten contributors suggesting that more researchers in those countries publish their research results in English. The multidisciplinary nature of global warming research is confirmed by the variety of journals found in the domain. The subject coverage was largely in the pure sciences, followed by applied sciences. It was further noted that a large part of global warming research was taking place within Higher Education Institutions (HEIs) and universities, and that the growth of research publications in the domain since 1990 had increased by over 300% by 2007. Also, there was a

correlation between total cites, average cites per item and per year and the h-index. However there was no correlation ($p=0.315$) between average cite per item and the item counts.

Methodology

This paper uses both descriptive and evaluative informetric techniques to analyse global warming research using published literature as indexed and reflected in three key bibliographic databases selected from the Web of Science, namely the Science Citation Index, the Social Sciences Citation Index and the Arts and Humanities Citation Index. The study covers publications published on global warming between 2008 and 2010 and appeared in the selected databases. The search included all the different types of documents in which the publications appeared. Preliminary searches using different search queries captured fairly limited records and most of the records were duplicated in the global warming search term, a situation that led us to settle on **Global Warming** as a search term. The search was conducted within the title, abstract and subject fields. Data was analysed using the ISI's in-built facility for analysing records and obtaining citation data.

Results

This section presents and discusses the findings.

Table 1: Publication output by country (N=4186)

Country	Records	%
USA	1280	30.6
Peoples R China	365	8.7
England	347	8.3
Germany	345	8.2
Japan	314	7.5

Distribution of records by country

Table 1 reveals that the USA came top, with a total of 1280(30.6%) publications. It was noted that majority of the countries that appeared among the top 20 belong to the developed world. Indeed of the 117 countries that produced at least 1 publication, the five countries' production accounted for about two-thirds (i.e. 63.3%) of the world's total research output in this area that is also worth comparing with their global science research output.

Distribution of records by sources

The term sources refer to the periodicals in which GWR was published. The most productive sources were: *Geophysical Research Letters* which published a total of 106 publications accounting for 2.5% of world GWR output followed by *Global Change Biology* (101, 2.4%), *Proceedings of the National Academy of Science* (72, 1.7%), *Journal of Climate* (70, 1.7%), and the *International Journal of Life Cycle Assessment* (68, 1.6%). Apparently, majority of the GWR is most commonly published in subject-specific journal as most of the journals focus on the subjects of environmental sciences and meteorology and atmospheric sciences. This aspect is also reflected in the analysis of subject categories.

Language of publication of GWR

Majority of the publications were published in the English language (i.e. 4082) accounting for 97.5% of the world's total publications in 2008-2010 time period. German language was placed in

second position with 21 (0.5%) publications followed by Chinese, French and Spanish languages which yielded a total of 14 (0.3%) each.

Subject categories

The broad subject categories within which GWR is conducted are presented in Table 2 which reveals that most research emanates from or falls under *Environmental Sciences* (913, 21.8%) followed by *Meteorology Atmospheric Sciences* (495(11.8%), *Ecology* (464 (11.1%), *Multidisciplinary Geosciences* (381, 9.1%) and *Environmental Engineering* (278, 6.6%).

Table 2: Subject categories of GWR (N=4186)

Subject	Records	%
Environmental Sciences	913	21.8
Meteorology & Atmospheric Sciences	495	11.8
Ecology	464	11.1
Geophysics, Multidisciplinary	381	9.1
Engineering, Environmental	278	6.6

Most prolific institutions

The authors' institutional affiliations were examined in order to find out the most productive institutions. A total of 4204 institutions participated (either individually or in cooperation) to publish 4186 publications between 2008 and 2010. They include the following, in descending order of the number of publications: Chinese Academy of Science which produced a total of 162 (3.9%) publications, the University of Tokyo (50, 1.2%), University of California Berkeley (48, 1.2%), Russian Academy of Science (45, 1.1%) and University of Washington (44, 1.1%). Although the WoS data was used for institutional comparisons, we take note that academy of sciences are not necessarily comparable to universities because of their large size in some countries but also note that weighting is rarely used for enabling accurate /fair comparisons in different circumstances.

Most productive authors

The study revealed that a large number of authors (i.e. 11679) were engaged in GWR between 2008 and 2010. The top authors were: Christensen, TH who published a total of 25 (0.6%) papers followed by Kerr, RA (15, 0.4%), Feijoo, G (14, 0.3%), Moreira, MT (13, 0.3%) and Gonzalez-Garcia, S (11, 0.3%). We take note of the low counts by author and low variations between authors suggesting that ranking of authors has to be considered very cautiously.

Scientific impact of GWR

Scientific impact was measured in terms of the total number of citations, average citations per publication and the h-index (Table 3)

Table 3: Scientific impact of GWR 2008-2010 compared to 2002-2007

Year	Records	Citations	Av cites
2002	431	11,239	26.08
2003	492	11,899	24.18
2004	553	11,097	20.07
2002-2004	1,453	33,871	23.31
2005	663	11,274	17
2006	701	11,364	16.21
2007	970	9,684	9.98
2005-2007	2,260	32,922	14.57
2008	1,235	8,785	7.11
2009	1,434	4,602	3.21
2010	1,415	1,036	0.73
2008-2010	4,186	15,193	3.63

Conclusions and recommendations

We note (table 3) that there has been significant growth of GW research between 2008 and 2010 when compared to the previous six years. This study has also noted insignificant variations between top GW journals from 1980 – 2007 as compared to 2008 -2010. Only two of the

top journals from 1980 – 2007 have retained their top five positions. In addition, top authors in previous years have been replaced by previously low ranked authors. Compared to previous years, the most productive countries have retained their positions with USA still leading, universities are dominant research centres and China is emerging strongly as a GW research country. Ongoing work has been enriched by useful (three) reviewers comments for the poster that we received with much appreciation and incorporated in the full length paper.

References

- Ocholla, D.N., Onyancha, O.B., and Ocholla, L. (2010) An Overview of Collaboration in Global Warming Research in Africa, 1990-2008. In B.Larsen, J.W, Schneider and F.Astrom (Eds), *The Janus Faced Scholar. A Festschrift in Honor of Pater Ingwersen*. Copenhagen, Det Informationsvidenskabelige, 159-166
- Ocholla, Dennis N. and Ocholla, Lyudmila (2008) Research output and scientific impact of global warming research productivity and literature from 1980 - 2007. An informetric analysis .Fifteenth Jubilee Crimea Conference 2008, Crimea, Sudak, Ukrain, 7th - 15th June.[Online]
<http://www.gpntb.ru/win/inter-events/crimea2008/eng/cd/157.pdf>