BIBLIOMETRICS AS A TOOL FOR ENVIRONMENTAL MANAGEMENT AT THE UNIVERSITY OF HAVANA

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Abstract

Within the framework of the University of Havana Environment Network (Red MA-UH), much environmental research is carried out, but most of it is never implemented or applied due to poor visibility and a lack of efficient strategic alliances. Today, the results of much of this research become either grey literature or Cuban publications with poor visibility, and therefore they can't be used for solving environmental problems affecting society. Nevertheless, this research could be used to help solve socio-environmental problems if decision-makers and international organizations were made aware of the results and provided funding to put them into practice. Research results are increasingly being disseminated on an international scale, so their visibility can be enhanced and funding and scientific collaboration can be gotten more easily, allowing the University of Havana Environment Network's research to have the desired social effects. The present work is aimed at examining high-impact publications included in the Scimago Journal & Country Rank (SJCR) portal, specifically in the field of environmental sciences. Metrical indicators were used to show the University of Havana Environment Network how to make its research results more visible by identifying international high-impact publications in the environmental sciences, to enhance the visibility of research carried out at the University of Havana, which contributes, in turn, to implementation in environmental management, rational use and equitable distribution of resources, and the promotion of local development by means of environmental management strategies, guaranteeing a harmonious relationship between society and nature.

Keywords: Bibliometrics, environmental networks, University of Havana, environmental sciences.

Introduction

Within the framework of the University of Havana Environmental Network (Red MA-UH), many pieces of research into the environment are carried out, but most of them are never implemented or applied to the environmental management due to poor exposure and a lack of efficient strategic alliances. Today, the results of many of these pieces of research just become either grey literatures or Cuban poorly visible publications, and therefore they can't be used for solving environmental problems affecting society.

On an international scale, research results have increasingly been disseminated widely. Visibility and funding could be enhanced and scientific collaboration could be established more easily to allow the University of Havana Environmental Network's research to have the desired social effects.

Research Question

What subject categories and international serials in the environmental sciences are the most effective to allow the University of Havana Environmental Network's research to be spread and given high impact and greater visibility? Our main objective was to identify international high-impact publications in the environmental sciences in order to enhance the visibility of the research carried out at the University of Havana, which contributes in turn to implementation of environmental management. Specifically, we wanted to identify subject categories in the University of Havana Environmental Network and their correspondence with similar international subject categories related to the environment. We examined the classification of international subject categories included in the Scopus database for the environmental sciences to determine if there is a correspondence between them and the University of Havana Environmental Network's lines of work in the year 2013.

Methods and Techniques of Research

Literature review: in order to identify theoretical foundations for the research.
Descriptive method: Data on the total number of publications according to subject categories indexed in Scopus in the environmental sciences were collected in order to identify journals with high impact as measured by the SCImago Journal Rank (SJR indicator) in the year 2013. Interviews were conducted with the University of Havana Environment Network's managers in order to obtain information on the Network's functioning. Journals included in the Scimago Journal & Country Rank (SJCR) portal, specifically the ones included in the first quartile in the environmental sciences domain in the year 2013, were compiled and their impact was measured by the SCImago Journal Rank (SJR indicator) according to subject categories. The year 2013 was the major year presented in the Portal.

Microsoft Excel was used to import data about journals included in the SJRC containing the entire bibliometric information from the Scopus Database. Excel was also used for data tabulation. SJR data were analyzed using the Statistica software package in order to calculate the average Scimago Journal Rank according to observed categories (± 95% confidence intervals).

A research tool allows determination through the application of quantitative indicators and mathematical models of the state of knowledge production, description, evaluation, and interpretation phenomena of informational scientific activity and their interrelation with society. It is used for adding value to information and improving decision-making in the organization. SCImago Journal Rank (SJR indicator) is a measure of the scientific prestige of scholarly journals. It was developed by Dr. Felix Moya de Anegon from SCImago Research Group. The prestige of every journal depends on a minimum value

achieved by a journal after being selected for processing by the Scopus database. Included are how many articles in a journal are included in the Scopus database, the number of citations received by a journal, and the importance of the journals from which such citations come. Citations are not equal because some citations have more value than others. For instance, a journal is considered more prestigious if it is cited by highly important journals.

University of Havana Environmental Network

- Mission: Coordinate and facilitate research into environmental issues by potentiating synergy between projects and university departments.
- Vision: A University of Havana research project network sharing information, human resources and materials in order to potentiate research results and their impact on the environment.
- Structure: A coordinating core and several nodes. The core comprises two persons and every university department dealing with environmental issues has a representative in the Network. At the same time people undertaking research projects both as managers and members share and manage resources and information.
- Functioning: Projects undertaken in every university department are the source of identifying common and possible synergies. These projects are divided into four subject categories: (1) biodiversity and conservation; (2) natural resources – water and soils; (3) climate change; and (4) management and territorial organization. The Network core manages working meetings and activities between departments and with actors external to the University of Havana.

Results

As shown in Table I, there is a correspondence between some subject categories, by which journals are grouped in the SCImago Journal & Country Rank (SJCR) portal, and the University of Havana Environment Network's lines of work. According to data supplied by the Network's coordinating core, the Network was found to have four lines of work connected with six out of twelve international subject categories in the field of environmental sciences. Nine hundred thirteen records from the identified categories were downloaded. The number of records per subject category was not homogenous.

University of Havana Environment Network's Lines of Work	**International Subject Categories**
Biodiversity and Conservation	Ecology
Climate Change	Global Planetary Change
Management and Territorial Organization	Management, Monitoring Policy and Law Waste Management and Disposal
Natural Resources: Water and Soils	Nature and Landscape Conservation
Pollution	Pollution

Table I. Correspondence between the University of Havana Environment Network's lines of work and subject categories in the field of environmental sciences included in Scopus.

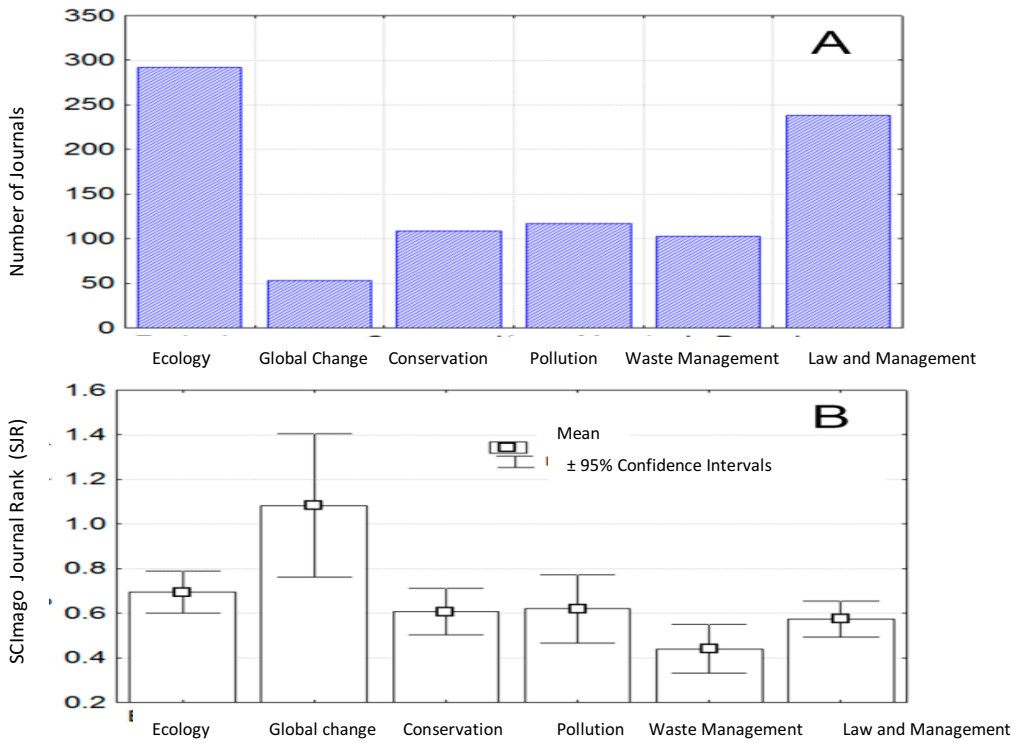

Figure 1. Number of journals per subject category in the environmental sciences domain on which they are focused (A), and the SCImago Journal Rank (SJR indicator) measuring scientific influence and prestige of scholarly journals included in the SCImago Journal & Country Rank (SJCR) portal in the year 2013, and subject categories in the environmental sciences domain, on which such journals are focused (B).

As it can be seen in Figure 1 (A), journals focused on ecology as a subject category in the environmental sciences are the most numerous, with 292 of them. Journals dealing with law and management issues come next (238), followed by the ones focused on pollution (117) and conservation (109). There are 103 journals focusing on Waste Management, and while there are only 53 journals dealing with the Global Change category, these are the most influential and prestigious ones (highest SJR indicator) (see Figure 1 B).

Table 2 shows the six most visible journals per subject category, and also their scientific influence and prestige measured by the SCImago Journal Rank (SJR indicator). The journals are arranged according to their SJR indicators, starting with the ones with the highest. The countries where they are published are shown as well. All the journals are published in English and peer-reviewed to ensure their scientific quality. The journals most visible in the year 2013 are *Annual Review of Ecology, Evolution, and Systematics*, focused on ecology; *Global change biology*, on global change; *Conservation Letters*, conservation; *Energy and environmental sciences*, pollution; *Water research*, waste management; and *Economic policy, law and management*. Articles published in the journals deal with issues that have a connection with the University of Havana Environment Network's lines of work.

A-Category: Ecology	**Country**	**SJR**
Annual Review of Ecology, Evolution, and Systematics	USA	6,226
Global Change Biology	United Kingdom	4,596
Frontiers in Ecology and the Environment	USA	4,156
Global Ecology and Biogeography	United Kingdom	4,118
Journal of Ecology	United Kingdom	3,481
Global Environmental Change	United Kingdom	3,461
B-Category: Global Change	**Country**	**SJR**
Global Change Biology	United Kingdom	4,596
Global Ecology and Biogeography	United Kingdom	4,118
Global Environmental Change	United Kingdom	3,461
Global Biogeochemical Cycles	USA	3,239
Quaternary Science Reviews	United Kingdom	3,124
Issues in Ecology	USA	2,901
C-Category: Conservation	**Country**	**SJR**
Conservation Letters	USA	2,862
Conservation Biology	United Kingdom	2,705
Biological Conservation	Holland	2,552
Wildlife Monographs	USA	1,968
Forest Ecology and Management	Holland	1,742
Landscape Ecology	Holland	1,644
D-Category: Pollution	**Country**	**SJR**
Energy and Environmental Sciences	United Kingdom	6,451
Water Research	United Kingdom	3,026
Issues in Ecology	USA	2,901
Energy	United Kingdom	2,692
Green Chemistry	United Kingdom	2,368
Environmental Pollution	United Kingdom	1,974

E-Category: Waste Management	**Country**	**SJR**
Water Research	United Kingdom	3,026
Bioresource Technology	United Kingdom	2,476
Waste Management	United Kingdom	1,88
Journal of Hazardous Materials	Holland	1,868
Critical Reviews in Environmental Science and Technology	United Kingdom	1,716
Biomass and Bioenergy	United Kingdom	1,703
F-Category: Law and Management	**Country**	**SJR**
Economic Policy	United Kingdom	5,212
Global Environmental Change	United Kingdom	3,461
Fish and Fisheries	United Kingdom	3,42
Review of Environmental Economics and Policy	USA	3,175
Journal of Environmental Economics and Management	USA	2,802
Biotechnology for Biofuels	United Kingdom	2,177

Table 2. The six most visible journals per subject category, included in the first quartile, and their scientific influence and prestige measured by the SCImago Journal Rank (SJR indicator); countries where they are published.

Discussion

Scientific and strategic policies adopted by the University of Havana and, more recently, the University of Havana Environment Network, have been directed at searching for more universal communication channels, safer and more reliable sources of funding for projects, and international research teams, all of which allow knowledge to be shared fairly and the scientific rigor of research to be enhanced.

The University of Havana has already designed an environmental strategy that awaits adoption across university departments. The University of Havana Environment Network's lines of work are grouped similarly to the way subject categories are in Scopus, so that they are up to international standards. The present work is *multidisciplinary*, *transdisciplinary*, and *interdisciplinary* in accordance with approaches adopted in scientific research since the second half of the 20th century (Arencibia-Jorge, 2007).

The SCImago Journal & Country Rank portal includes 1344 journals in the environmental sciences. This work identifies the 36 most influential and prestigious journals in English that focus on the environment, because they are the ones best able to contribute to an internationally enhanced visibility of the research into the environment carried out in Cuba. Additionally, results of scientific research are validated by publication in mainstream journals that are regarded as publishing the most relevant articles on the subjects involved. The increased number of publications in English shows the tendency,

described in great detail in the specialized literature, for scientists and scholars to use this language for global information sharing and dissemination. However, we know that most visible and prestigious journals are very competitive, and publishing research results therein is very difficult. Researchers have been always concerned about result visibility because it is not only the way of making the national and international scientific community aware of their contributions, but also ensures that they are acknowledged. At the same time, it is necessary to assess results to establish research dynamics and apply criteria on which political and public research management may be based in order to get financial support.

Scientific production is, however, decreasing at the University of Havana, despite the fact that there are a great many researchers who could potentially conduct research into the environment. Some reasons for this decrease include the fact that many researchers either do not know how to get their scientific articles published, or to write them properly, or to master the foreign language - mostly English - in which they need to write; sometimes they have too many teaching hours at the University as well. Hostile policies on Cuba adopted by third countries, such as the then U. S. President George W. Bush administration's attempt to prevent articles written by Cuban researchers being published in U. S. journals, are another reason, to mention just one example. Additionally, the age composition of the teaching staff has also changed, with most of them younger nowadays. This fact is of importance because the more experienced the staff is, the more scientific articles they produce.

This work presents 36 journals included in the first quartile (the most visible and influential and prestigious ones), which focus on environmental sciences, even though we acknowledge that they are very competitive publications because articles are rigorously peer-reviewed by at least two reviewers before publication. Even so, Cuban researchers must succeed in publishing their research results in these journals, because this gives them more opportunities to find sources of funding which make possible international collaborations on important issues such as the environment. The journals focusing on the subject categories global change, ecology, and pollution are the most influential and prestigious because these are environmental topics of major importance worldwide. Global climate change is of the utmost importance due to its disastrous effect on life on earth. Ecology is a highly topical scientific field dealing with studying interactions of organisms with each other and their environments; its results contribute to a better insight into biodiversity. Ecology is mostly aimed at establishing a harmonious relationship between development and the environment, and therein lies the social and historical importance of this field to mankind. Pollution is another environmental problem affecting the human race on a global, regional, and local level.

Nowadays, scientists are facing the challenge of finding sources of funding for meeting the increasing demands for research into the environment, which contribute to sustainable social development. But these contributions must be made visible to the international scientific community, by being published in very influential and prestigious scholarly journals whose articles are peer-reviewed by other scientists and experts. The present work has highlighted some of these journals, with the aim of helping scientists succeed in making their research efforts attain their desired goals.

Conclusions

Bibliometrics has contributed to enhanced environmental management at the University of Havana

because it has increased the understanding of environmental issues and given effective information for decision-making as the result of scientific activity in this field of science. There is a correspondence between the University of Havana Environmental Network's working policies and international standards that is favorable to scientific collaboration and application of results on different scales and in different contexts, and places an emphasis on sustainable social development.

Ecology, global change and pollution are high impact subject categories because they are the most important for the scientific community to be able to guarantee a sustainable development. The journals *Annual Review of Ecology Evolution and Systematics, Global Change Biology, Conservation Letters, Energy and Environmental Sciences, Water Research*, and *Economic Policy* have the greatest visibility (high impact) in the six analyzed subject categories internationally.

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