Aim: This paper is a result of the WOW project (Wind power On Wikipedia) which forms part of the SAPIENS (Scientometric Analyses of the Productivity and Impact of Eco-economy of Spain) Project (Sanz-Casado et al., 2013). WOW is designed to observe the relationship between scholarly publications and societal impact or visibility through the mentions of scholarly papers (journal articles, books and conference proceedings papers) in the Wikipedia, English version. We determine 1) the share of scientific papers from a specific set defined by Wind Power research in Web of Science (WoS) 2006-2015 that are included in Wikipedia entries, named data set A; 2) the distribution of scientific papers in Wikipedia entries on Wind Power, named data set B, captured via the three categories for the topic Wind Power in the Wikipedia Portal: Wind Power, Wind turbines and Wind farms; 3) the distributions of document types in the two wiki entry data sets’ reference lists. In parallel the paper aims at designing and test indicators that measure societal impact and R&D properties of the Wikipedia, such as, a wiki reference focus measure; and a density measure of those types in wiki entries.

Methods: The study is based on Web mining techniques and a developed software that extracts a range of different types of Wikipedia references from the data sets A and B. Results: Findings show that in data set A 25.4% of the wiki references are academic, with a density of 17.62 academic records detected per wiki entry. However, only 0.62% of the original WoS records on Wind Power are also found as wiki references, implying that the direct societal impact through the Wikipedia is extremely small for Wind Power research. In the second Wikipedia set on Wind Power (data set B), the presence of scientific papers is even more insignificant (10.6%; density: 3.08; WoS paper percentage: 0.26%). Notwithstanding, the Wikipedia can be used as a tool informing about the transfer from scholarly publications to popular and non-peer.
reviewed publications, such as Web pages (news, blogs), popular magazines (science/technology) and research reports. Non-scholarly wiki reference types stand for 74.6% of the wiki references (data set A) and almost 90% in data set B. Interestingly, the few WoS articles in wiki entries on Wind Power present on average 34.3 citations received during the same period (2006-2015) as WoS Wind Power publications not mentioned in wiki entries only receives on average 5.9 citations.

Conclusions: Owing to the scarcity of Wind Power research papers in the Wikipedia, it cannot be applied as a direct source in evaluation of Wind Power research. This is in line with other recent studies regarding other subject areas. However, our analysis presents and discusses six supplementary indirect indicators for research evaluation, based on publication types found in the wiki entry reference lists: Share of (WoS) records; Density; and Reference Focus, plus Popular Science Knowledge Export, Non-Scholarly Knowledge Export and Academic Knowledge Export. The same indicators are direct measures of the Wikipedia reference properties.

### Response to Reviewers:

Review remarks to Submission SCIM-D-17-00020R1

Reviewer #1: The authors have responded to my comments with "Review 1 has no particular remarks" which is unsatisfactory and even somewhat rude. The paper would not be acceptable for publication unless the authors spend more time on the literature review.

RESPONSE: WE ARE VERY SORRY ABOUT THIS ISSUE AND WE WISH TO APPLOGIZE TO Reviewer 1, since our way of responding to his/her remarks were not appropriate: We should have stressed from the start that we did not pursue the Altmetrics/Webometrics perspective in the new version of the submission. Consequently we did not use some of the references suggested by Reviewer 1. However, we included two of his/her proposed and relevant references (after reading) on the Wikipedia coverage (Samoilenko; Teplitskiy). That was mentioned under point 10, unfortunately under Reviewer 2 comments. They should have been taken up under the Review 1 comments. We apologize for this structural error and are thankful for the Reviewer’s contribution.

Reviewer #2: Dear authors,

Thank you for the improved version of the manuscript. I think it is now acceptable for publication.

I would like to make some clarifications:

Firstly, I apology for the confusion related to the statement "The manuscript is partially an original contribution". Clearly, this expression was not appropiate. After this phrase in my first review, I added the following text: "it is the first study focused on this topic (wind power), although previous published studies have made similar work on other topics and some of them might be taken into account in the Introduction section and when discussing the results". Therefore, as authors said, I meant the manuscript was not the first one addressing the issue of scientific knowledge provided by the Wikipedia, but it is an original contribution. Anyway, I apology if authors felt offended.

Regarding my suggestion related to the exclusion of the formulas in the 'Three simplistic research evaluation indicators', it was just my opinion as a reader and it was not an important issue. Therefore, either the inclusion or the exclusion was a valid way.

Finally, when I recommended some publications related to altmetrics, I was not asking authors to include all of them in the manuscript, I was just suggesting to READ them (and include them in the manuscript if it was relevant), as I perceived a simplistic overview of webometric and altmetrics. I am not in favour of forcing authors of a given research to cite studies that they do not consider relevant to their research.

Congratulations for this interesting research.

WE APPRICIATE THE REVIEWER’S COMMENTS!

WE ARE CONSEQUENTLY ONE MORE TIME CHECKING THE SCIM-D-17-00020R1 VERSION PRIOR TO SENDING IT TO THE SYSTEM AS THE FINAL SUBMITTED
Wind power research in Wikipedia: Does Wikipedia demonstrate direct influence of research publications and can it be used as adequate source in research evaluation?

Antonio Eleazar Serrano-López², Peter Ingwersen¹, Elias Sanz-Casado²

¹Royal School of Library and Information Science, University of Copenhagen, Denmark
²Carlos III University Madrid, Spain

Aim: This paper is a result of the WOW project (Wind power On Wikipedia) which forms part of the SAPIENS (Scientometric Analyses of the Productivity and Impact of Eco-economy of Spain) Project (Sanz-Casado et al., 2013). WOW is designed to observe the relationship between scholarly publications and societal impact or visibility through the mentions of scholarly papers (journal articles, books and conference proceedings papers) in the Wikipedia, English version. We determine 1) the share of scientific papers from a specific set defined by Wind Power research in Web of Science (WoS) 2006-2015 that are included in Wikipedia entries, named data set A; 2) the distribution of scientific papers in Wikipedia entries on Wind Power, named data set B, captured via the three categories for the topic Wind Power in the Wikipedia Portal: Wind Power, Wind turbines and Wind farms; 3) the distributions of document types in the two wiki entry data sets’ reference lists. In parallel the paper aims at designing and test indicators that measure societal impact and R&D properties of the Wikipedia, such as, a wiki reference focus measure; and a density measure of those types in wiki entries.

Methods: The study is based on Web mining techniques and a developed software that extracts a range of different types of Wikipedia references from the data sets A and B.

Results: Findings show that in data set A 25.4% of the wiki references are academic, with a density of 17.62 academic records detected per wiki entry. However, only 0.62% of the original WoS records on Wind Power are also found as wiki references, implying that the direct societal impact through the Wikipedia is extremely small for Wind Power research. In the second Wikipedia set on Wind Power (data set B), the presence of scientific papers is even more insignificant (10.6%; density: 3.08; WoS paper percentage: 0.26%). Notwithstanding, the Wikipedia can be used as a tool informing about the transfer from scholarly publications to popular and non-peer reviewed publications, such as Web pages (news, blogs), popular magazines (science/technology) and research reports. Non-scholarly wiki reference types stand for 74.6% of the wiki references (data set A) and almost 90% in data set B.

Interestingly, the few WoS articles in wiki entries on Wind Power present on average 34.3 citations received during the same period (2006-2015) as WoS Wind Power publications not mentioned in wiki entries only receives on average 5.9 citations.

Conclusions: Owing to the scarcity of Wind Power research papers in the Wikipedia, it cannot be applied as a direct source in evaluation of Wind Power research. This is in line with other recent studies regarding other subject areas. However, our analysis presents and discusses six supplementary indirect indicators for research evaluation, based on publication types found in the wiki entry reference lists: Share of (WoS) records; Density; and Reference Focus, plus Popular Science Knowledge Export, Non-Scholarly Knowledge Export and Academic Knowledge Export. The same indicators are direct measures of the Wikipedia reference properties.

Introduction

The main goal of the WOW (Wind Power on Wikipedia) project is to measure the relationship between scientific publications and societal interest or impact on common citizens through the mentions of scholarly papers in Wikipedia, including co-referenced publications. The Wikipedia system is a crowdsourcing developed information system on the Web. As a «free encyclopedia» it is completely free in many ways: It is free to access; anyone with a device connected to the Internet can access to all contents of Wikipedia in many different languages. In addition, everyone can add, modify or delete entries, and no registration is required. The Wikipedia has some tools in order to prevent vandalism and fake information, as the «librarians» (users with watchdog permissions to revert changes, ban users, etc.) or bots, which are looking constantly for bad words, errors or fakes to correct these (Henderson, 2010;
Wikipedia, 2016). We are interested in the Wikipedia entries that 1) are associated with given scholarly publications, e.g. publications under research evaluation, and 2) contain references of scholarly and non-scholarly nature to be included in scientometric measurements of societal influence. Hence, since we deal with references and mention of scholarly records in the Wikipedia, we regard the measurements and indicators as belonging to Scientometric publication and citation analysis rather than to Webometrics as defined by Björneborn & Ingwersen (2004) or Altmetrics (Thelwall, 2016), even though the Wikipedia form part of the Web.

Wikipedia mentions are in general considered as an useful indicator to measure the diffusion and social divulgation of Science (Allen et al., 2013; Trueger et al., 2015). Added to classic scientometric indicators, Wikipedia mentions of given departmental publications and their distributions in wiki entries may serve as potentially valid indicators. The distribution pattern of WoS records over wiki entries is, like mentions, regarded as an direct research assessment approach. Co-reference patterns of a variety of (non-)scholar publication types, associated to given WoS records in wiki entries, are regarded indirect assessments of the original units to be evaluated, but seen as direct assessments of the Wikipedia itself.

Although everybody can edit Wikipedia entries, some studies demonstrate that it is possible to find academic experts and scholars contributing to Wikipedia in many different fields (Stein & Hess, 2007). Other works have analyzed the presence of Wikipedia in the general scholarly and scientific systems (Park, 2011). They looked at the impact of the Wikipedia on science by analyzing the Web of Science and Scopus systems for citations to Wikipedia entries.

More in line with the present study Teplitzkiy, Lu & Duede (2016) identified the 250 most highly cited journals in each of 26 research fields (4,721 journals, 19.4M articles) indexed by the Scopus database, and tested whether topic, academic status, and accessibility make articles from these journals more or less likely to be referenced on the Wikipedia (English version). They found that a journal’s academic status (impact factor) and accessibility (open access policy) both strongly increase the probability of it being referenced on the Wikipedia. However, Teplitzkiy, Lu & Duede demonstrate (2016, Table 4) that in their large-scale sample the English-language Wikipedia’s coverage of academic research varies immensely across the 26 academic fields and, most importantly, the coverage measured in mentions is scarce, between 0.04% (Dentistry) and 0.5% (Social Sciences). The Energy field has a Wikipedia coverage of 0.05% in their study.

Very recently, Kousha & Thelwall (2016) counted Wikipedia citations to 302,328 articles and 18,735 monographs in English indexed by Scopus from multiple subject areas in the period 2005 to 2012. On average 5% of the articles are cited (mentioned) by the English Wikipedia, with Environmental Science only reaching 3.4%. Energy Science does not take part in their study.

Earlier analyses have similar scarcity of Wikipedia citations in topically limited subject areas. Luyt & Tan (2010) analyzed 50 History Wikipedia entries for the types of wiki references they presented. 62% of the 480 wiki references detected were Web-based with 17.1% of all references originating from various governmental sources, 11.9 % from news media and 11.9% from internet sources. The most cited type among the non-Internet Wikipedia references were books, with 34.9% of all the 480 wiki references. Almost no journal articles were cited. Given the History subject this is not surprising. In a later investigation Koppen, Phillips &
Papageorgiou (2015) found that based on 21 drugs they extracted 601 references from corresponding Drug entries in the English Wikipedia. Like in the case of Luyt & Tan (2010) they were interested in the distribution of types of the references. 50% of all 601 references were journal articles, but only 20.4% of the same set belonged to crucial Core Clinical Journals, as defined by National Library of Medicine. Commercial Websites (11.1%), news media (10.5%) and government Websites (9.2%) were the most frequent types of wiki references observed. Further, in their study books ranked 5th with 6.5% of the distribution. Central meta-analyses and guidelines only counted for 2.2% and 0.8%, respectively.

However, among these studies only Teplitskiy, Lu & Duede (2016) and Kousha & Thelwall (2016) have investigated the amount of a given set of scholarly documents that Wikipedia mentions concerning a topic or institution, and their characteristics. It is our opinion that in order to use scholarly references from Web of Science or Scopus found in Wikipedia entries (from now on named ‘scholarly wiki references’) to form part of research evaluation or capture of societal impact, it is vital that the amount of such references in these entries is statistically fitting. According to Kousha & Thelwall (2016) the scarcity of academic references prohibits such analyses. An overall view of the analyses presented above indicates strongly that the distribution of types of wiki references is non-systematic and depends on the subject area in question. A trend seems to be that open access (OA) and free Web-based sources are more likely to be part of Wikipedia references (Teplitskiy, Lu & Duede (2016)), as books in humanistic subject areas (Luyt & Tan (2010); Kousha & Thelwall (2016)). The investigations, including the present one, can in addition bring answers to the question of how the information transfer between a scholarly and non-scholarly environments takes place, and what kind of information is used and useful to common citizens through the Wikipedia.

Following the Introduction this article describes the Methodology, followed by the Findings and Discussion sections. They are divided into results and indicators concerning the set of Wikipedia entries defined by references to WoS publications on Wind Power and the complementary findings in relation to the set of Wikipedia entries defined by the topic ‘Wind Power’. Where relevant we compare and discuss outcome patterns and usability of the two data sets. A concluding section ends the article.

Methodology
The SAPIENS project (Sanz-Casado et al., 2013; Ingwersen et al., 2013; 2014) demonstrated interesting scientometric results concerning the development of Wind Power research 1995-2009, in particular the extensive use of conference proceeding papers in the scientific communication process (approx. 60 % of all research publications) and the very low citation impact of this document type. In the present analysis we apply the same retrieval profile as used in the SAPIENS Project, see Appendix I, to isolate a basic set of WoS records on Wind Power.

The present study makes use of two different methods when collecting data from the Wikipedia: Data set A: first to isolate Wind Power publications of all types in WoS and then detecting their occurrence together with other kinds of references in Wikipedia entries; Data set B: searching directly and isolating Wind Power entries in Wikipedia and detecting the occurrence of scholarly and other types of publications in this set of wiki entries. The reason for applying data set A is to ensure that the same research entities are evaluated in WoS and in Wikipedia, for instance a topic (as in the present study), a department or country output or an
author’s research publications. Data set B illustrates a ‘quick and dirty’ way of collecting data directly in the Wikipedia on a topic.

For data set A we developed a script to extract scientific (and other types of) references from Wikipedia. The script was written in Python language (including urllib library), which includes many kinds of search patterns to find WoS records mentioned in Wikipedia entries: paper title (for long titles), paper title and source title, paper title and author, DOI, etc. This script returned a CSV file with one line for each WoS record and how often is it mentioned. Thus, we first isolated and downloaded a set of Wind Power records captured from WoS (25,540 records; publication window: 2006-2015), using the search strategy from the SAPIENS Project, Appendix I. Then the set of WoS records was cross-checked against the English Wikipedia version by means of the script. Each mention in Wikipedia entries, e.g. in the wiki Reference List, of record elements from the WoS set (title, title + authors, doi...) was detected and checked. Duplicates were removed. The script retrieved reliable elements pointing to 159 WoS records, representing 0.62 % of the original set of WoS Wind Power records, and defining the set of 159 unique Wikipedia entries holding 258 mentions of the WoS records. Since each wiki entry does not repeat the same reference twice on its Reference List, some of the WoS records are co-occurring in the set of wiki entries, together with other kinds of wiki references, in total 11,027 wiki references. We may regard the 159 WoS records found in the Wikipedia as an (extremely small) sample drawn from the original 25,540 WoS records, seen as the population.

Data set B was generated by searching and isolating all Wikipedia entries directly on ‘Wind Power’ and then detecting the kind of references to publications found in this topic-defined set of Wikipedia entries. In praxis we used the Wikipedia Web portal related to Renewable Energy (http://en.wikipedia.org/wiki/Portal:Renewable_energy). From this portal we extracted (using web mining techniques) all wiki entries related to Wind Power (67 entries, Appendix II) and all their references to publications, including scholarly and non-scholarly articles and papers (in total 2,387 wiki references). A script similar to that above programmed in Python language was used for the wiki reference extraction. This script used the Wikipedia API to retrieve the information of each entry in JSON format. In this format, the script runs over the Wikipedia entries, goes to the reference list and extracts every reference to a CSV document containing each full reference, like item type, author, and publication year, title of the document referenced, URL, addition date and title of the Wikipedia entry. Also, the script takes into account the variety of ways which Wikipedia allows to use for references, and looks for these patterns in source code (using HTMLParser library), for example: <ref>, {{cite}}, {{citation}}, {{doi}}, {{ISBN}}, etc.

The problem is that not all of these fields are complete, for example, the information on publication year or authorship are often incomplete when Web pages are referenced.

The main difference between the two data sets is that WoS publications in set A on Wind Power can be mentioned in Wikipedia entries also dealing with other topics than the chosen topic. Also notice that most of the 67 Wikipedia entries from Data set B are included in the 159 wiki entries defined by the WoS records on Wind Power (Data set A). Other characteristics of the two data sets are discussed in the Findings sections.
Three simplistic research evaluation indicators

We have designed three indicators associated with the data sets A and B that determines how much scholarly information transfer occurs from traditional sources (peer reviewed journals, conferences, etc.) to the Wikipedia, and thus assumingly further transferred to common citizens.

One indicator deals with the Share \((R)\) of WoS records found in Wiki entries \((p_{\text{WoS}})\) over a set of WoS records retrieved on a given topic, author, institution or country \((P_{\text{WoS}})\). Essentially, the indicator measures the amount of knowledge export or direct societal influence of WoS research publications onto Wikipedia entries – measured as ratio \((R)\) in %:

\[
R = 100 \ast (p_{\text{WoS}} / P_{\text{WoS}})
\]

This indicator is a direct measure and a consequence of data set A, and is in line with the Kousha & Thelwall measure (2016, Table 1, p. 667). At \(R = 95\text{-}100\%\) almost all original WoS records (the population) are also found in Wikipedia entries and common knowledge export, influence or impact is almost total. Using the set of Wikipedia entries in alternative research evaluation is thus statistically sound. In the case of a very low ratio (< 1.5%) too few scholarly records associated with the object to be evaluated exist in wiki entries. In that case, any alternative direct measure that involves that data set, including its use as societal impact indicator, cannot be statistically valid. Consequently, Ratio \(R\) may rather act as a predictor of probability of utility in research evaluation and should be calculated prior to other indicators (see discussion in Findings sections).

The second indicator concerns the Density \((D)\) of number of wiki references \((n)\), regardless publication type, or mentions \((m)\) of WoS publications on the topic, in a given set of Wikipedia entries \((N)\):

\[
D = n / N \quad \text{or} \quad D = m / N
\]

The Density indicator is an indirect evaluation measure and can be applied to data sets A or B described above. In the case of data set A, by logic its scholarly output can never go below 1.0. Various versions of the Density indicator are available. For instance, by applying data set A the WoS Density \((D_{\text{WoS-A}})\) – or average mention – concerns the number of WoS record mentions \((m_{\text{WoS-A}})\) in the set of wiki entries that is defined by retrieved WoS records on a given topic, author, institution of country, etc. \((N_{\text{WoS-A}})\):

\[
D_{\text{WoS-A}} = m_{\text{WoS-A}} / N_{\text{WoS-A}}
\]

For instance, as shown above the number of WoS record mentions found in the WoS defined wiki entries is 258 \((m_{\text{WoS-A}})\) and the number of wiki entries is 159 \((N_{\text{WoS-A}})\); thus the Density \(D_{\text{WoS-A}} = 1.6\).

By applying both data sets A and B it is possible to compare the density of the individual publication types, or their sum, thereby comparing the data capture methods. We define scholarly publication types found in WoS and Wikipedia as peer reviewed ‘journal articles’, ‘review articles’ and ‘proceedings papers’. Other publication types referred to in Wikipedia entries on their List of References are, for instance, Web page, Popular Magazine article, R&D Report, News article. The categorization of wiki references is carried out semi-automatically. The density \((D_{\text{pop-B}})\) of Popular Magazine articles \((n_{\text{pop-B}})\) in a set of wiki entries on Wind Power \((N_B)\):

\[
D_{\text{pop-B}} = n_{\text{pop-B}} / N_B
\]

can be compared to the similar formula applied to data set A. The Density indicator is a good predictor for the usefulness of applying indirect alternative
assessments in a Wikipedia setting, such as the amount of non-scholarly publications co-
occuring with original scholarly publications to be evaluated.

The third indicator, named Wiki Reference Focus ($F$), is indirect and is the normalized
Density of a particular (group of) wiki reference type(s). By this normalization it is possible to
compare the Density indicator values across data sets and academic fields:

$$F = \frac{D_{\text{type-B}}}{\sum D_B}$$

where $\sum D_B$ signifies the sum of all document type densities in a given set (here Data set B) of
wiki references. The value span of the Wiki Reference Focus is 0.0 – 1.0. The indicator displays
the ranking of wiki reference types in a given set of wiki entries.

All three indicators are direct measures of properties of the Wikipedia and can be used
for evaluation purposes of this particular source.

Findings and discussion
Below we discuss the central properties of the two Wikipedia data sets if they might be useful
elements of assessments. This could be the distribution pattern of the 258 WoS publication
mentions over the 159 wiki entries (Table 1), the co-occurrence of WoS records found in
Wikipedia entries (Table 2), distributions of Document Types, Data Density and Wiki Reference
Focus (Table 3), leading to knowledge transfer indications, indirect research assessments (co-
referencing of original WoS records) and citation distributions (Figure 2). When relevant we
compare to the original WoS set of records on Wind Power, because that is the set 1) to be
observed for societal influence and 2) that forms the object of a research evaluation. Initially
we apply the filter, ratio $R$, to the two data sets A and B to observe the societal impact of the
original WoS set through Wikipedia.

Wikipedia data sets A and B – applying the ratio filter
With respect to data set A, based on the population of WoS records (25,540) on Wind Power
and retrieved in the English Wikipedia (159 entries), one notices that this share (ratio $R$) of
WoS records in the Wikipedia on the topic Wind Power is extremely low:

$$R = 100 \left( \frac{p_{\text{WoS-A}}}{p_{\text{WoS}}} \right) = 100 \times \frac{159}{25,540} = 0.62\%$$

The Wikipedia data set A on Wind Power demonstrates small influence of the original
set of WoS records. Further, in line with the findings by Kousha & Thellwall (2016) it does not
possess sufficient statistical certainty to be applied as basis for alternative direct evaluation of
Wind Power research through the Wikipedia. Statistically, with a standard confidence interval
of 0.95 and an estimated error of 0.5 (5 %), the minimum sample size for a population of
25,540 records would be 379 records. With a sample size of 159 records the estimated error
increases to 7.6 % - still keeping the confidence interval at 0.95. Keeping this insufficiency in
mind we demonstrate below selected characteristics of Wikipedia data that eventually can be
used as alternative indirect research evaluation tools. The $R$-value for 379 records is 1.5 % and
thus serves as a borderline case. This implies that the 258 mentions of original WoS records in
the 159 wiki entries also is below the threshold with a share of $R = 1.01\%$. Note that in the case
of Kousha & Thellwall (2016) their Environmental Science subject field, close to sustainable
energy research, reaches 3.4%. The Energy field in the analysis by Teplitskiy, Lu & Duede (2016,
Fig. 4, p. 5) demonstrates an 12 times lower $R$-value: 0.05%. Why this is the case may be
because Teplitskiy, Lu & Duede (2016) rely on the 250 most high impact journals in each field
indexed by Scopus, where Kousha & Thelwall and we apply all articles in the selected subject fields.

Using the smaller data set B on Wind Power the R value is correspondingly extremely low: 0.26%. Wikipedia data set B shows even less influence from the original scholarly WoS records, compared to data set A. It demonstrates hardly any societal influence and should not be applied as an alternative in direct research evaluation, e.g. using the amount of ‘mention’ as indicator. Nevertheless, certain other reference elements of selected wiki entries might prove useful as alternative indirect measures (Table 3), e.g. the amount of non-scholar co-references, Table 3.

Distribution of Web of Science records mentioned in Wikipedia entries

Only 11 original WoS documents are mentioned 3 or more times (Table 1) in the Wikipedia data set A. Notice that the Wikipedia entries in the set (Table 2) may not be mainly about Wind Power but rather on other related generic issues, e.g. Renewable Energy; Energy Storage; Sensory Ecology; Climate Change Mitigation, in which Wind Power plays an aspectual role, as determined by the wiki entry authors in the set. The percentage of wiki entries (109 entries) in Data set A not dealing mainly with the topic at hand (Wind Power) indicates the degree of transfer, spreading or association of the topic to other fields or specialties in the Wikipedia: 100 * 109 / 159 = 68 %. This measure is on normalized set level and can be compared to the captured set by Method B (Appendix II). In set B all the 67 wiki entries are directly on the topic at hand. So although set B is much smaller than set A the former is far more focused on Wind Power.

Since only 3 documents have 10 or more mentions across the set of Wiki entries (Table 1), it is very probable that the English Wikipedia follows a power law distribution like the Bradford or Lotka laws, with a few WoS documents accumulating a lot of mentions, while the long tail of documents obtains one-time-mentions of scholarly WoS publications. The same pattern can be observed for data set B with respect to the original WoS records mentioned. In data set A the total number of mentions of original WoS records is 258 (Table 1). On average each wiki entry in data set A contains 258 / 159 = 1.6 WoS records from the original set of 25,540 records. This small Density figure makes their application insufficient as a direct measure of scholarly references in Wikipedia associated with elements of academic records. Likewise, Table 3 demonstrates the distribution of wiki entry references from the two data sets, the density and the wiki reference focus. It is obvious that scholarly wiki references, including the original WoS records, constitute a quite small proportion of all wiki references.

Table 1. WoS titles mentioned in Wikipedia entries (>=3) – data set A. (Spring, 2016)

<table>
<thead>
<tr>
<th>WoS Title (N=159)</th>
<th>Times mentioned (n=258)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wind energy</td>
<td>25</td>
</tr>
<tr>
<td>Providing all global energy with wind, water, and solar power, Part I: Technologies, energy resources, quantities and areas of infrastructure, and materials</td>
<td>15</td>
</tr>
<tr>
<td>Providing all global energy with wind, water, and solar power, Part II: Reliability, system and transmission costs, and policies</td>
<td>10</td>
</tr>
<tr>
<td>Advances in solar thermal electricity technology</td>
<td>6</td>
</tr>
</tbody>
</table>
Further, rather few Wikipedia entries mention several of the original WoS documents. In data set A only seven entries include four or more co-occurring references to documents in Web of Science as such (Table 2). They are often entries by authors about themselves, like Roy Billinton, Henrik Lund, Benjamin K. Sovacool, Mark Z. Jacobson or Martin J. Pasqualetti.

Table 2. Mentions of WoS records by Wikipedia entries, Data set A (>=3 mentions)

<table>
<thead>
<tr>
<th>Wikipedia Entry Title (N=159)</th>
<th>Times Mentioned of WoS records (n=258)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Environmental impact wind power</td>
<td>8</td>
</tr>
<tr>
<td>Roy Billinton</td>
<td>8</td>
</tr>
<tr>
<td>Henrik Lund (academic)</td>
<td>6</td>
</tr>
<tr>
<td>Intermittent energy source</td>
<td>6</td>
</tr>
<tr>
<td>Wind power</td>
<td>5</td>
</tr>
<tr>
<td>Wind turbine design</td>
<td>5</td>
</tr>
<tr>
<td>Benjamin K. Sovacool bibliography</td>
<td>4</td>
</tr>
<tr>
<td>Feed- tariff</td>
<td>3</td>
</tr>
<tr>
<td>Life-cycle greenhouse-gas emissions energy sources</td>
<td>3</td>
</tr>
<tr>
<td>Mark Z. Jacobson</td>
<td>3</td>
</tr>
<tr>
<td>Martin J. Pasqualetti</td>
<td>3</td>
</tr>
<tr>
<td>Renewable energy</td>
<td>3</td>
</tr>
<tr>
<td>Renewable energy debate</td>
<td>3</td>
</tr>
<tr>
<td>Sensory ecology</td>
<td>3</td>
</tr>
<tr>
<td>Solar updraft tower</td>
<td>3</td>
</tr>
<tr>
<td>Sustainable energy</td>
<td>3</td>
</tr>
<tr>
<td>Wind farm</td>
<td>3</td>
</tr>
<tr>
<td>Wind turbine</td>
<td>3</td>
</tr>
</tbody>
</table>

Figure 1 demonstrates extracts from the reference list of the Wikipedia entry for “Wind Farm” – found in set A as well as set B. A glance demonstrates that most often the co-references to a Wind Power WoS record (Ref. no. 42, Figure 1) consists of press releases, newspaper articles, web pages, governmental or institutional reports, etc., i.e., non-scholarly
publications. See Table 3 for breakdown into document types of the sets A and B. As demonstrated in Figure 1 other scholarly WoS records (no. 6 and no. 132) also co-occur with the original WoS Wind Power record. These concurrent reference types can probably be applied as alternative (indirect) measures of scientometric nature associated with the scholarly objects of evaluation, e.g., author or institutional name, journal titles, a country, a topic or single or a set of WoS records. These kinds of measures, and foremost the ones based on non-scholarly wiki references, such as the share, density and focus of Popular Magazines, are probably the most valuable indirect research evaluation indicators provided by the Wikipedia in relation to scholarly output. Simultaneously, they provide direct indicators of the Wikipedia’s mode of influencing its readers.

Fig. 1. Reference list (extract) from the Wikipedia entry ‘Wind Farm’, data sets A+B (Spring 2016). Legend: entries in *italics* : scholarly publ.; entries in **bold+italics** : WoS record from original WoS set on Wind Power.

### Document types in the two data sets

Table 3 demonstrates the division of wiki references into document types for both data sets. In set A the share of scholarly references, including original WoS records, is 25.4%. The density of the original WoS records (1.62) is very low but that of scholarly references (17.63) is substantial compared to the average density for data set A (69.35) and also compared to the

### References

2. Terra-Gen Press Release, 17 April 2012
5. IEC61400-1 site assessment
corresponding lower density of data set B (35.63). In this comparison the *wiki reference focus* should be used (Focus, scholarly wiki references: Set A: 0.25; Set B: 0.11), as this indicator is set-normalized. The three predominant non-scholarly types of wiki references: Web pages; Popular/News magazines; Research reports constitute foci of 0.75 and 0.89, respectively for sets A and B. These types illustrate indirect indicators in two ways: 1) each concurrent *individual* type signifies a specific replacement of scholarly information (WoS records and books) into popular scientific magazines or factual information in the form of non-scholarly web pages and reports from institutions; 2) the three types *together* constitute a non-scholarly, non-peer reviewed *profile of information visibility* in (or potential popular influence on) society by the Wikipedia associated with the original academic WoS publication elements. Unfortunately neither the Kousha & Thelwall or the Teplitskiy, Lu & Duede (2016) study address the proportion of all scholarly as well as non-scholarly references that are used alongside the original set of selected scholarly references detected in the wiki entries. However, Koppen, Phillips & Papageorgiou (2015, Table 1, p. 142) demonstrate that in their analysis of Drug associated wiki entries the share of scholarly references reaches 58.8%, with journal articles amounting to 50.1%. In our study journal articles reach 16% in data set A and 6.1% in set B. The distributions within the non-scholarly wiki references are rather alike, with Web pages as the strongest type in both data sets (Table 3: set A: 42.2%; set B: 53.2%), followed by Magazine/News articles (set A: 20.9%; set B: 22.6%). When comparing the various study findings, the subject area seems to be the determining factor in the distribution of Wikipedia reference types.

**Table 3.** Document types for Wikipedia References on Wind Power, Data sets A & B

| Document types          | Data set     | Data set     |
|-------------------------|--------------|--------------|----------------|--------------|--------------|----------------|--------------|--------------|--------------|--------------|
|                         | N = 159      | % Density    | N = 67; n = 645 | % Density    | N = 159      | % Density    | N = 67; n = 645 | % Density    |
| Book                    | 688          | 6.2          | 4.33 0.06      | 82           | 3.4          | 1.22 0.03      |
| Conference Paper       | 196          | 1.8          | 1.23 0.02      | 14           | 0.6          | 0.20 0.006     |
| Conf. Paper in journal issue | 90       | 0.8          | 0.57 0.008     | 2            | 8.4-4        | 0.03 0.0008    |
| Journal Article         | 1764         | 16.00        | 11.09 0.16     | 147          | 6.1          | 2.19 0.06      |
| Magazine/News Article   | 2300         | 20.90        | 14.47 0.21     | 539          | 22.6         | 8.04 0.23      |
| Patent                  | 39           | 0.4          | 0.25 0.004     | 2            | 8.4-4        | 0.03 0.0008    |
| Report                  | 824          | 7.5          | 5.18 0.07      | 217          | 9.1          | 3.24 0.09      |
| Web page                | 4650         | 42.20        | 29.25 0.42     | 1271         | 53.2         | 19.00 0.53     |
| Other, *                | 476          | 4.3          | 2.99 0.04      | 111          | 4.7          | 1.66 0.05      |
| **Total/avg. wiki references (n):** | **11027** | **100** | **69.35 1.0** | **2387** | **100** | **35.63 1.0** |

No. of entries with no refs.: 0 0
Max. number of refs. in entry: 264 264
Scholarly wiki references: 2801 25.4 17.62 0.25 254 10.6 3.8 0.11
Non-scholarly wiki references: 8226 74.6 51.73 0.75 2133 89.4 31.83 0.89
No. of WoS records mentioned in set: 258 1.62 64 0.96

* Other, method A: citation needed (196); review article (63), etc.
* Other, method B: citation needed (65); review article (9), etc.

In addition, the distribution of wiki references is quite different in the two data sets on Wind power, mainly owing to the proportions of scholarly references in the two sets. The extraction method may thus also influence the distribution. Since data set A is defined by the occurrence of the scholarly WoS records in Wikipedia, we find it very likely that such a set...
contains additional scholarly references as well. In data set A journal articles constitute the
dominant academic reference type (16%; density 11.09; focus: 0.16); but in set B, defined by
direct searching in the Wikipedia, the proportion of that type is only 6.1% (density 2.19; focus:
0.06). These figures should be compared to the distribution of document types in the original
Wind Power set in WoS, where conf. proceeding papers, incl. papers published in journal
issues, constitute approx. 60% of all publications (Sanz-Casado et al., 2013). In the Wikipedia
the focus indicator for the same document type is extremely low (set A: 0.008; set B: 0.0008).
The data set figures stress that the authors of the Wikipedia entries on Wind Power have made
a conscious and dedicated selection of references to be displayed, targeting their presentation
towards common users.

An example of alternative measures applying reference co-occurrence could be that a
subset of data set A signifies a set on Wind Power, e.g. generated by a given university
department under evaluation. Aside from use of traditional scientometric indicators, such as
citations normalized for field and journals, such alternative indirect measures of Wikipedia
references could be (scores from Table 3):

- **Popular science knowledge export/influence:** Share of Magazine articles: 20.9%, set A;
  the bigger the share the more potential influence.
- **Non-scholarly knowledge export/influence:** Share of all non-scholarly references:
  74.6%, set A; the bigger the share the more potential influence of non-peer reviewed
  knowledge.
- **Academic knowledge export/influence:** Share of all scholarly references (types in
  *Italics*, Table 3): 25.4%, set A; the bigger the share the more potential export and
direct influence of scholarly knowledge on Wikipedia readers.
- **Wiki reference focus:** the density figure of a publication type (or group of types)
  normalized by the overall average density of the set to which the type(s) belong: e.g.
  Web page, set A: 29.25 / 69.35 = 0.53 (max. value: 1.0). The score can be compared to
  a different set of wiki entries’ references, e.g. the Web page wiki reference focus
  calculated from the data set provided by the Koppen, Phillips & Papageorgiou analysis
  (2015, Table 1, p. 141-142): (24.7/100 share * 601 wiki references) / 21 Drug wiki
  entries = 7.07 (density) / 28.5 (total density in set) = 0.25 (Wiki Ref. Focus).

These four indicators rely on the degree to which the document type algorithm can
detect correctly the variety of publication types presented in wiki entries. In dubious cases the
correct classification is done manually by the researcher team. Typically, the categories of
‘Other’, ‘Journal articles’ and ‘Conf. paper in journal issue’ are difficult to separate by the
algorithm. ‘Citation needed’ is a category signifying that the wiki entry author still wishes to
add a reference to the list.

Figure 2 demonstrates the distribution of wiki references from data set B over their
publication years and document types. The two large reference types, Web pages and Popular
magazine/news articles, are mainly from 2008 to the present, while reports are of more recent
nature.
The few journal articles are much more spread out, like books from 2000. This pattern demonstrates that the Wikipedia in Wind Power presents up to date references in the topical entries. Figure 3 shows the general distribution of wiki reference publication years, regardless document type versus Wikipedia entry publication year. The immediacy characteristics of the distribution is very clear for the topic ‘Wind Power’.

Fig. 2. Distribution of wiki references over publication year and document type from data set B (N=2387 wiki references).

Fig. 3. Distribution of wiki reference publication years over Wikipedia entry publication years (mention years) from data set B (N=2387 wiki references).
Citations as indirect measure of Wikipedia entry impact

Instead of applying the number of mentions of the original WoS records (258) in data set A (or 64 in set B) we propose to use the citations to those records as an *indirect indicator of impact* guided by the Wikipedia entries holding those Wos Records.

![Graph showing WoS citations vs Wikipedia mentions](image)

**Fig. 4. WoS citations (boxplots) vs Wikipedia mentions of WoS records (dots ; N=258) in 159 Wikipedia entries by WoS document types, data set A.**

To understand the relationship between WoS citations and Wikipedia mentions of WoS records additional analyses were made. The comparison of WoS citations given to WoS records on Wind Power in data set A, and Wikipedia mentions of WoS publications in that set shows a distinct kind of distribution (Figure 4). Most mentioned documents (dots) receive few citations, while more highly cited documents only get one mention in the Wikipedia. The Spearman correlation coefficient shows similarly a very low correlation between both variables (0.06). The main difference occurs on review (articles) and proceeding papers published as articles in journals on Wind Power. They are highly cited in WoS but scarcely mentioned in Wikipedia.

**Table 4. Citation average associated with the presence in Wikipedia, data set A.**

<table>
<thead>
<tr>
<th>Average of citations to WoS records per wiki entry, data set A</th>
<th>Mentioned in Wikipedia</th>
<th>Not mentioned in Wikipedia</th>
</tr>
</thead>
<tbody>
<tr>
<td>34.28 CITATIONS</td>
<td>5.89 CITATIONS</td>
<td></td>
</tr>
</tbody>
</table>

Nevertheless, Table 4 demonstrates that WoS documents on Wind Power mentioned in the Wikipedia obtain proportionally far more citations in WoS than documents not mentioned in the Wikipedia (5.8 times more). This might seem to be contradictory to the distribution of WoS publications in the Wikipedia, but, on the other hand, only 30 of the WoS records with at
least one mention in the Wikipedia have no citations in WoS. This could mean that documents mentioned in the Wikipedia obtain a higher visibility and sharing and thus receives more citations or, on the other hand, documents cited in WoS have a higher probability of being mentioned in Wikipedia, as shown by the t test, with a p-value lower than 8.137e-11. The latter explanation echoes the findings by Teplitskiy, Lu & Duede (2016) and the immediacy pattern, Figure 3. Citations to scholarly publications mentioned as wiki references (on the topic Wind Power) are thus feasible as basis for indirect research evaluation indicators using the Wikipedia.

Conclusions

Along this work some phenomena were observed relating to the flow of scientific information from the scientific sources to the Wikipedia:

The main conclusion is that the share of scholarly papers which are mentioned in Wikipedia entry references on Wind Power is not substantial (25.4% (set A); 10.4% (set B)). And if we look just at the mention of the 25,540 original WoS records on Wind Power only 0.66% is found in the Wikipedia (set A) and even less (0.26%) in set B, according to the present study. The Wikipedia entry authors in general prefer non-scholarly sources (like magazines, news, web pages, etc.) and non-peer reviewed research reports to support factual statements in the entries. However, observations from the other studies of the Wikipedia with respect to scholarly impact mentioned above strongly indicate that the subject area is a determining factor in the distribution of types of wiki references. In Drug related wiki entries the journal article is the dominant reference type (Koppen, Phillips & Papageorgiou, 2015, p. 142) whereas in History wiki entries (Luyt & Tan, 2010, p. 717-718), not surpricing books is the dominant type (34.4% of all wiki references) followed by news site items (11.9%). Only 2% are journal articles. In Teplitskiy, Lu & Duede (2016) this share is even below 1%. For humanistic fields Kousha & Thelwall (2016, p. 771) also point to books as an important wiki reference type. Due to this strong variation we must conclude that no generalization is possible about the Wikipedia reference distribution from findings based alone on a subject area analysis.

In addition, we cannot recommend the use Wikipedia for direct evaluation of scholarly work, e.g. by observing the amount of mentions of research publications or names detected in Wikipedia entries. This negative outcome of our analyses is also echoed by Kousha & Thelwall for most non-humanistic subject areas in their large scale analysis (2016, p. 770). Further, our analysis indicates that the method applied to isolate or extract wiki entries on a topic (here Wind Power) does influence the overall distribution of wiki reference types (Table 3). Our study is the only one that has addressed this issue.

On the other hand, the substantial amount of non-scholarly publications found on the wiki reference lists in all Wikipedia studies makes it possible to apply such publication types as indirect research evaluation measures that supplement traditional scientometric indicators. The three predominant non-scholarly types of wiki references: Web Pages; Popular Magazines/News; and Research Report constitute wiki reference foci of 0.70 and 0.85, respectively for sets A and B. These types illustrate indirect indicators in two ways: 1) each concurrent individual type signifies a specific replacement of (or supplement to) scholarly information (WoS records) by popular scientific magazines/news or factual information in the form of non-scholarly web pages and reports from institutions; 2) the three types together
constitute a non-scholarly, non-peer reviewed profile of information visibility in society through the Wikipedia associated with the original academic WoS publications. This leads to four indirect indicators of influence on readers through the Wikipedia references:

- **Popular science knowledge export/influence**, i.e. the share of Magazine/News articles.
- **Non-scholarly knowledge export/influence**, i.e. the share of all non-scholarly references.
- **Academic knowledge export/influence**, i.e. the share of all scholarly references.
- **Wiki reference focus**, i.e. the density of a publication type (or group of types) normalized by the overall average density of the set to which the type(s) belong.

These indirect indicators and the Density metric can indeed be regarded as supplementary to common Scientometric indicators, since they are constituted by publication references captured from a specific database (Wikipedia on the Web).

The same four indicators as well as Density are direct measures of the Wikipedia itself. Indirectly, citations may play a role in the Wikipedia assessment by being citations to 1) the Wikipedia entries themselves or 2) to individual wiki entry references. As concerns the latter kind our analysis strongly indicates that the WoS papers mentioned in Wikipedia on Wind Power do obtain proportionally (5.8 times) more citations in Web of Science than papers on Wind Power not mentioned in the Wikipedia. Highly cited publications seem to be preferred by wiki authors in Wind Power, in line with findings by Teplitskiy, Lu & Duede (2016). We did not investigate the former kind of citations to entire wiki entries.

The study presented here is limited to the topic Wind Power. Like for other topical investigations the findings are not of general nature regarding the Wikipedia and scholarly publications. Further investigations of the Wikipedia in other topical areas may not contribute more generalized knowledge, but may contribute to emphasize the variation of wiki reference types in play. We have studied two overlapping but differently constructed data sets. We are aware that the smaller and topically focused set (B) is the most likely to be used by evaluators, since it is easy to operate in the Wikipedia and is directly centered on the topic in question. The larger and broader set (A) is much more cumbersome to capture since it involves the application of a second scientific information system (Web of Science or Scopus or a domain-specific database) and a software to match the retrieved records with wiki references. However, it is only through the data set A methodology that one may target an evaluation to, for instance, university or departmental research output, or to specific author profiles. Data set B may only satisfy topical investigations in the Wikipedia.

Based on the findings above and findings by Kousha & Thelwall (2016) and others, we can say that the Wikipedia, English version, is not a very comprehensive dissemination channel for scholarly information, because not many scientific papers (e.g. on Wind Power) reach the Wikipedia. As research evaluation tool the Wikipedia is consequently insufficient. But it is a useful channel, because those few papers that occur in Wikipedia co-occur with other relevant non-scholarly publication types, which help transform scholarly information into more common knowledge.

**Acknowledgments:** This research was funded by the Spanish Ministry of Economy and Competitiveness under the project CSO 2014-51916-C2-1-R. Titled “La investigacion en eficiencia energetica y transporte sostenibles en el medio urbano: analisis del desarrollo
científico y la percepción social del tema desde la perspectiva de los estudios métricos de la información” “(Research on energy efficiency and sustainable transport in the urban environment: analysis of the scientific development and the social perception of the topic from the perspective of the metric studies of information)”. 

APPENDIX I: Wind Power search strategy in Web of Science

TS=("wind power" OR "wind turbine*" OR "wind energy*" OR "wind farm*" OR "wind generation" OR "wind systems")

  Refined by: [excluding] Web of Science Categories={ASTRONOMY ASTROPHYSICS}
  Databases=SCI-EXPANDED, SSCI, CPCI-S, CPCI-SSH
  Time window: 2006-2015
  Lemmatization=On
### APPENDIX II: Wind Power entries from Wikipedia collected in Data set B

<table>
<thead>
<tr>
<th>No.</th>
<th>Wikipedia Entry</th>
<th>No.</th>
<th>Wikipedia Entry</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Airborne wind turbine</td>
<td>35</td>
<td>Wind power in India</td>
</tr>
<tr>
<td>2</td>
<td>Community wind energy</td>
<td>36</td>
<td>Wind power in Iran</td>
</tr>
<tr>
<td>3</td>
<td>Darrieus wind turbine</td>
<td>37</td>
<td>Wind power in Italy</td>
</tr>
<tr>
<td>4</td>
<td>Environmental effects of wind power</td>
<td>38</td>
<td>Wind power in Japan</td>
</tr>
<tr>
<td>5</td>
<td>Floating wind turbine</td>
<td>39</td>
<td>Wind power in Kenya</td>
</tr>
<tr>
<td>6</td>
<td>History of wind power</td>
<td>40</td>
<td>Wind power in Lithuania</td>
</tr>
<tr>
<td>7</td>
<td>List of offshore wind farms</td>
<td>41</td>
<td>Wind power in Malta</td>
</tr>
<tr>
<td>8</td>
<td>List of onshore wind farms</td>
<td>42</td>
<td>Wind power in Mexico</td>
</tr>
<tr>
<td>9</td>
<td>List of wind turbine manufacturers</td>
<td>43</td>
<td>Wind power in Morocco</td>
</tr>
<tr>
<td>10</td>
<td>Savonius wind turbine</td>
<td>44</td>
<td>Wind power in New Zealand</td>
</tr>
<tr>
<td>11</td>
<td>Small wind turbine</td>
<td>45</td>
<td>Wind power in Pakistan</td>
</tr>
<tr>
<td>12</td>
<td>Unconventional wind turbines</td>
<td>46</td>
<td>Wind power in Poland</td>
</tr>
<tr>
<td>13</td>
<td>Vertical axis wind turbine</td>
<td>47</td>
<td>Wind power in Portugal</td>
</tr>
<tr>
<td>14</td>
<td>Wind energy software</td>
<td>48</td>
<td>Wind power in Romania</td>
</tr>
<tr>
<td>15</td>
<td>Wind farm management</td>
<td>49</td>
<td>Wind power in Russia</td>
</tr>
<tr>
<td>16</td>
<td>Wind farms</td>
<td>50</td>
<td>Wind power in Serbia</td>
</tr>
<tr>
<td>17</td>
<td>Wind power</td>
<td>51</td>
<td>Wind power in Spain</td>
</tr>
<tr>
<td>18</td>
<td>Wind power consulting companies</td>
<td>52</td>
<td>Wind power in Sweden</td>
</tr>
<tr>
<td>19</td>
<td>Wind power forecasting</td>
<td>53</td>
<td>Wind power in Thailand</td>
</tr>
<tr>
<td>20</td>
<td>Wind power in Asia</td>
<td>54</td>
<td>Wind power in the European Union</td>
</tr>
<tr>
<td>21</td>
<td>Wind power in Australia</td>
<td>55</td>
<td>Wind power in the Netherlands</td>
</tr>
<tr>
<td>22</td>
<td>Wind power in Austria</td>
<td>56</td>
<td>Wind power in the Philippines</td>
</tr>
<tr>
<td>23</td>
<td>Wind power in Belgium</td>
<td>57</td>
<td>Wind power in the Republic of Ireland</td>
</tr>
<tr>
<td>24</td>
<td>Wind power in Brazil</td>
<td>58</td>
<td>Wind power in the United Kingdom</td>
</tr>
<tr>
<td>25</td>
<td>Wind power in Canada</td>
<td>59</td>
<td>Wind power in the United States</td>
</tr>
<tr>
<td>26</td>
<td>Wind power in China</td>
<td>60</td>
<td>Wind power in Turkey</td>
</tr>
<tr>
<td>27</td>
<td>Wind power in Croatia</td>
<td>61</td>
<td>Wind power industry</td>
</tr>
<tr>
<td>28</td>
<td>Wind power in Denmark</td>
<td>62</td>
<td>Wind resource assessment</td>
</tr>
<tr>
<td>29</td>
<td>Wind power in Estonia</td>
<td>63</td>
<td>Wind turbine aerodynamics</td>
</tr>
<tr>
<td>30</td>
<td>Wind power in Finland</td>
<td>64</td>
<td>Wind turbine design</td>
</tr>
<tr>
<td>31</td>
<td>Wind power in France</td>
<td>65</td>
<td>Wind turbines</td>
</tr>
<tr>
<td>32</td>
<td>Wind power in Germany</td>
<td>66</td>
<td>Wind-powered land vehicle</td>
</tr>
<tr>
<td>33</td>
<td>Wind power in Greece</td>
<td>67</td>
<td>Windmill</td>
</tr>
</tbody>
</table>

### References


Wind power research in Wikipedia: Does Wikipedia demonstrate direct influence of research publications and can it be used as adequate source in research evaluation?

January 9, 2017, Malmo, Sweden

Copyright Statement Form

Copyright Transfer Statement

Publisher: Akadémiai Kiadó Zrt., Budapest, Hungary

Author
Name: Peter Ingwersen
Address: Royal School of Library and Information Science, University of Copenhagen, Sondre Campus, Bygn. 4, Njalsgade 76, Copenhagen 2300 S, Denmark
E-mail address: peter.ingwersen@hum.ku.dk

Article information
Title: Wind power research in Wikipedia: Does Wikipedia demonstrate direct influence of research publications and can it be used as adequate source in research evaluation?
Journal title: Scientometrics
Co-authors: Antonio E. Serrano-Lopez; Elias Sanz-Casado

I. Transfer of copyright
By execution of the present Statement Author transfers copyright and assigns exclusively to Publisher all rights, title and interest that Author may have (for the extent transferable) in and to the Article and any revisions or versions thereof, including but not limited to the sole right to print, publish and sell the Article worldwide in all languages and media. Transfer of the above rights is referred to as those of the final and published version of the Article but does not restrict Author to self-archive the preprint version of his/her paper (see Section III).

II. Rights and obligations of Publisher
The Publisher’s rights to the Article shall especially include, but shall not be limited to:
- ability to publish an electronic version of the Article via the website of the publisher Akademiai Kiado, www.akademiai.com (in Hungary), as well as the co-publisher’s website, www.Springerlink.com (outside of Hungary) or any other electronic format or means of electronic distribution provided by or through Akademiai Kiado or Springer from time to time, selling the Article world-wide (through subscriptions, Pay-per-View, single archive sale, etc.),
- transforming to and selling the Article through any electronic format
- publishing the Article in the printed Journals as listed on the official Website of Publisher
- transferring the copyright and the right of use of the Article onto any third party
- translating the Article
- taking measures on behalf of the Author against infringement, inappropriate use of the Article, libel or plagiarism.

Publisher agrees to send the text of the Article to the e-mail address of Author indicated in the present Statement for preview before the first publishing either in paper and/or electronic format (Proof). Author shall return the corrected text of the Article within 2 days to the Publisher. Author shall, however, not make any change to the content of the Article during the First Proof preview.

III. Rights and obligations of Author
The Author declares and warrants that he/she is the exclusive author of the Article – or has the right to represent all co-authors of the Article (see Section IV) – and has not granted any exclusive or non-exclusive right to the Article to any third party prior to the execution of the present Statement and has the right therefore to enter into the present Statement and entitle the Publisher the use of the Article subject to the present Statement. By executing the present Statement Author confirms that the Article is free of plagiarism, and that Author has exercised reasonable care to ensure that it is accurate and, to the best of Author’s knowledge, does not contain anything which is libelous, or obscene, or infringes on anyone’s copyright, right of privacy, or other rights. The Author expressly acknowledges and accepts that he/she shall be entitled to no royalty (or any other fee) related to any use of the Article subject to the present Statement. The Author further accepts that he/she will not be entitled to dispose of the copyright of the final, published version of the Article or make use of this version of the Article in any manner after the execution of the present Statement. The Author is entitled, however, to self-archive the preprint version of his/her manuscript. The preprint version is the Author’s manuscript or the galley proof or the Author’s manuscript along with the corrections made in the course of the peer review process. The Author’s right to self-archive is irrespective of the format of the preprint (.doc,.tex,.pdf) version and self-archiving includes the free circulation of this file via e-mail or publication of this preprint on the Author’s webpage or on the Author’s institutional repository with open or restricted access. When self-archiving a paper the Author should clearly declare that the archived file is not the final published version of the paper, he/she should quote the correct citation and enclose a link to the published paper (http://dx.doi.org/[DOI of the Article without brackets]).

IV. Use of third party content as part of the Article
When not indicating any co-authors in the present Statement Author confirms that he/she is the exclusive author of the Article. When indicating co-authors in the present Statement Author declares and warrants that all co-authors have been listed and Author has the exclusive and unlimited right to represent all the co-authors of the Article and to enter into the present Statement on their behalf and as a consequence all declarations made by Author in the present Statement are made in the name of the co-authors as well. Author also confirms that he/she shall hold Publisher harmless of all third-party claims in connection to non-authorized use of the Article by Publisher. Should Author wish to reuse material sourced from third parties such as other copyright holders, publishers, authors, etc. as part of the Article, Author bears responsibility for acquiring and clearing of the third party permissions for such use before submitting the Article to the Publisher for acceptance. Author shall hold Publisher harmless from all third party claims in connection to the unauthorized use of any material under legal protection forming a part of the Article.

V. Other provisions
Subject to the present Statement the Article shall be deemed as first published within the Area of the Hungarian Republic. Therefore the provisions of the Hungarian law, especially the provisions of Act LXXVI of 1999 on Copy Rights shall apply to the rights of the Parties with respect to the Article. For any disputes arising from or in connection with the present Statement Parties agree in the exclusive competence of the Central District Court of Pest or the Capital Court of Budapest respectively.

January 9, 2017, Malmo, Sweden

Peter Ingwersen

Date and place of signature