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Sustainability Trends in Higher Education: An Analysis of the *International Journal of Sustainability in Higher Education*: 2010-2019

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Honors Thesis

Western Michigan University

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Abstract

Since the onset of the Industrial Revolution, human activities have substantially harmed the biosphere and, if continued, pose a substantial risk to life on Earth. Recognizing this, educated people have advocated widespread adoption of sustainable practices and, in particular, have increased the amount of sustainability efforts associated with higher education. The *International Journal of Sustainability in Higher Education*, established in 2000, is devoted to such practices. For my honors thesis, I examined articles published in the journal from 2010 through 2019 to determine the countries, and the institutions within those countries, that were the primary contributors to the journal. Results indicate that first authors came from 332 institutions and 59 countries. Multi-authored articles were common and reflected similar diversity. These results show a relatively broad interest in sustainability in higher education, but there is certainly more work that needs to be done to expand these efforts. Most contributions came from the United States of America and Europe, however, and there was relatively little representation of Latin American, Asian, and former Soviet bloc countries. This finding is unfortunate yet understandable given that the journal is published in English.

The Earth is roughly 4.5 billion years old. Life has existed on Earth for at least 3.5 billion years and our species, *homo sapiens*, has been around for about 200 thousand years (Ward & Kirschvink, 2016). Over the eons, Earth has supported a wide range of life forms and changed an incredible amount. Cataclysmic events and gradual changes have come and gone and have killed off a majority of the millions of species that have ever lived, but life has survived and continues to flourish. Throughout the past century, however, *homo sapiens* have changed the world around it in a way that poses a large and growing threat to itself and many other species. A majority of the damage can be attributed to climate change. As Davey (2017) notes, relative to the average rate of climate change that has occurred in the past, human activity has been accelerated to a rate of change nearly “170 times faster than [other] natural forces” (Davey), excluding humans as a natural force.

Since the onset of the Industrial Revolution, emission of greenhouse gasses, such as carbon dioxide, methane, nitrous oxide, and ozone, has increased at an unprecedented rate. For example, the atmospheric carbon dioxide level has passed 400 particles per million, the highest level in more than 3 million years. Greenhouse gasses absorb, then emit, radiant energy and thereby warm the planet. Earth’s average temperature has warmed by about 1 degree Centigrade since 1900; two-thirds of the warming has occurred since 1975 (Kolbert, 2016). One degree of warming may seem insignificant, but it has caused ice once widely viewed as permanent to melt and, in turn, caused the world’s sea levels to rise. In addition to rising, the pH of the oceans is getting lower, causing acidification that results in marine life death (Ward-Wallace, 2019).

As Kump et al. (2009) indicate, since the Industrial Revolution, the world’s oceans have absorbed about 25 million tons of carbon, approximately 25 percent of our total released carbon

emissions. This rapid absorption has increased the acidity of the oceans by over 30 percent since the early 1900s, and has caused dramatic and harmful effects to its inhabitants. Carbon emissions are increasing the temperature of the air and oceans, and making large portions of the oceans, which contain most of the world's water, unlivable for native species. For example, in many areas native corals have been bleached to a point in which they will not likely recover. The loss of a keystone species such as coral has an immense effect across all trophic levels and can quickly throw an ecosystem out of equilibrium. Climate change also has increased the frequency and severity of significant adverse weather events, such as floods, droughts, and extreme storms (Ward-Wallace, 2019). These changes have combined with human land use practices to increase the frequency of wildfires and, in some areas, to reduce agricultural productivity (Kolbert, 2016).

Human actions have led to the emission of greenhouse gasses and have clearly and significantly reduced the capacity of the Earth to support a diverse biosphere. Paul Crutzen, a Dutch Chemist who shared a 1995 Nobel Prize for discovering the harmful effects of ozone-depleting chemicals, summarized many of these actions and their unintended, dire consequences in an influential *Nature* article (Crutzen, 2002). He wrote that:

- Human activity has transformed between a third and a half of the land surface of the planet.
- Most of the world's major rivers have been damned or diverted.
- Fertilizer plants produce more nitrogen than is fixed naturally by all terrestrial ecosystems.
- Fisheries remove more than a third of the primary production of the oceans' coastal waters.

- Humans use more than half of the world's readily accessible freshwater runoff. (Kolbert, 2014, p. 108)

After studying the impact humans have on the important aspects of Earth's geology, Crutzen proposed that the term "Anthropocene" would be an appropriate description of a new geological epoch that began roughly when James Watt introduced the steam engine and continues to the present. Crutzen did not coin "Anthropocene" – it was used occasionally in the mid-1970s – but he has done much to popularize it (e.g., Crutzen et al., 2006). The term "Anthropocene" has not yet been formally adopted in the science community, however many scientists use the term regularly.

The Anthropocene is described in detail in the book "the Sixth Great Extinction." The book describes the five historical events that caused the relatively rapid extinction of many species, in some cases, most of Earth's life forms. In order of appearance, they are called the Ordovician Mass Extinction, Devonian Mass Extinction, Permian Mass Extinction, Triassic - Jurassic Mass Extinction, and Cretaceous-Tertiary (or the K-T) Mass Extinction. Most laypeople know that an asteroid that slammed into the Yucatan peninsula caused the K-T extinction, which famously "killed the dinosaurs" 66 million years ago. It is estimated that the eruption also killed about three-quarters of all other species (Hallam & Wignall, 1997). Other mass extinction events varied in size and causes, but there is no evidence that a single species was primarily responsible for mass extinction until now.

Solid data provide compelling evidence that human activities over the past 250 years, and especially in the past 50, have created environments very different from those in which many species evolved, one in which they cannot survive. Species loss is occurring quickly, and at an

accelerating rate (Kolbert, 2014). Consider the findings of an extensive research project conducted by Cebellos et al. (2015), which they summarized as follows:

Earlier estimates of extinction rates have been criticized for using assumptions that might overestimate the severity of the extinction crisis. We assess, using extremely conservative assumptions, whether human activities are causing a mass extinction...Even under our assumptions, which would tend to minimize evidence of an incipient mass extinction, the average rate of vertebrate species loss over the last century is 100 times higher than the background rate. Under the [highly conservative]2 mammal extinctions per 10,000 species per 100 years background rate, the number of species that have gone extinct in the last century would have taken, depending on the vertebrate taxon, between 800 and 10,000 years to disappear. These estimates reveal an exceptionally rapid loss of biodiversity over the last few centuries, indicating that a sixth mass extinction is already underway.

Pollution, such as the widespread dumping of plastics, introduction of invasive species, habitat fragmentation, deforestation, poaching, and proliferation of domestic animals contribute to the deleterious human activities previously mentioned to make Earth increasingly hostile for many species (Burdock, 2005; Cebellow et al., 2015; Davis, 2009; Kolbert, 2014). In addition to the anthropogenic changes in the world that have made life hard for other creatures, most notably, climate change, humans face serious challenges from antibiotic-resistant forms of old microbial adversaries and from novel zoonotic diseases, such covid-19 (Allen et al., 2017; MacFadden et al., 2017). These challenges arise from our activities, such as overprescribing antibiotics for humans and using them to help fatten livestock, eating meat, and destroying habitats that force animals away from their homes. As more people suffer, the risks of famine,

genocide, and war increase, and the quality of life on Earth declines. Books such as *The Uninhabitable Earth* (Wallace-Wells, 2019), *Falter: Has the human game begun to play itself out?* (McKibben, 2019), and *Learning to die in the Anthropocene: Reflections on the end of a civilization* (Scranton, 2015) call attention to the state of our ecosystem, and the grave risk this poses. And the time on the Doomsday Clock, a symbolic warning by members of the Bulletin of Atomic Scientists of the risk our technologies pose to our survival, is 100 seconds to midnight (Bulletin of Atomic Scientists, 2020).

Humans should be gravely concerned with the harm we have done and continue to do to the world. Environmentalism has a long history in the United States of America, and in many other countries (Elliott, 2019). The publication of *Silent Spring* (1962), in which Rachel Carsen called attention to the widespread and unintentional harm caused by widespread use of the pesticide, DDT, raised serious concerns regarding the state of the environment. Those concerns were voiced forcefully on April 22, 1970, at the first Earth Day event. At that event, championed by Senator Gaylord Nelson, “Millions of Americans, including students from thousands of colleges and universities, participated in rallies, marches and educational programs across the country” (history.com, 2020).

Students and other people involved with institutions of higher learning, including faculty and administrators, have continued to play an important role in the environmental movement and have done so as advocates, scientists, scholars, and political leaders (Elliott, 2019). These individuals are taking steps to ensure that practices at their institutions fulfill their purpose without significantly damaging the environment and are sustainable in nature.

In 2000, the first and only journal devoted entirely to sustainable practices in higher education, the *International Journal of Sustainability in Higher Education*, initially appeared.

According to the journal's website, it publishes articles concerned with:

1. Environmental management systems
2. Sustainable development
3. Sustainable development goals
4. Curricular innovations
5. Campus greening
6. Operational aspects of universities
7. Energy, water, recycling, waste management
8. Planning and Design of Campuses
9. Environmental reports
10. Environmental policies and action plans
11. Staff and student initiatives
12. Other environmental topics (*International Journal of Sustainable Education*, 2020)

To date, no analysis of the sources of its articles (i.e., the countries and institutions from which articles originate) or its topics has appeared. Sustainability is important to ensure the well-being of the Earth and its inhabitants, including humans. Unfortunately, the United States of America has not played a lead role in promoting sustainability in general (Elliott, 2019). I am earning a bachelor's degree in Global and International Studies and am tentatively planning to do graduate work, and work professionally, in a field that relates to educational policy. I am committed to fostering a sustainable lifestyle for myself and those around me. I have committed to a vegan lifestyle and continue to read about climate change's impact on our planet and do my

best and practicing sustainability in all aspects of my life. For these reasons, I am interested in determining how often authors from the U.S. contribute to the *International Journal of Sustainability in Higher Education*, the countries that contribute the most articles, and the contents of the articles.

For my thesis, I examined every article published in the *Journal of Sustainability in Higher Education* from 2010 through 2019 and determine the country listed for the first author. I also determined the number of articles that have contributors from two or more countries. Sustainability is an international issue and it may well be, but is by no means a given, that international collaboration is relatively common in articles published in the journal.

Attempting to analyze content, I also examined keywords, which appear with each article. After recording and analyzing keywords for all articles that appeared in 2019 and 2018, I abandoned this enterprise because the keywords were too general (e.g., curriculum, university students, sustainability) to be meaningful.

Method

I accessed on-line every article that appeared in *Journal of Sustainability in Higher Education* during the period of interest and, for each article, cut-and-pasted to an Excel file the institution listed for the first author and the country where that institution was located. The same information was also recorded for all other authors.

After the data were recorded, an Excel function was used to determine the institutions and countries that provided articles with first and other authors and the number of relevant articles. The raw data also were hand-searched to determine the number of articles with authors from two or more countries.

Results

A total of 437 articles were published over the 10 years of interest. A total of 332 different institutional affiliations were listed for first authors. Appendix 1 lists these institutions and the number of articles with a first author from each of them. Most institutions were listed only once. Table 1 shows the institutions listed as the first author's affiliation two or more times and the number of times it was so listed. The Royal Melbourne Institute of Technology (RMIT) leads the list with 8 articles, followed by Michigan State University and Arizona State University with 6 apiece, University of Hamburg and Chalmers University with 5 each.

First authors listed affiliations from 59 different countries. Appendix 2 lists those countries and the number of articles with a first author from each of them. Eleven countries supplied the first author of 5 or more articles. The United States of America leads the list, with 119 articles, followed by the United Kingdom with 43, Australia with 35, Canada with 28, Germany with 21, Brazil with 18, Spain with 16, South Africa with 12, the Netherlands with 11, and Sweden and Portugal, with 10 each.

Other (not first) authors came from 333 different institutions, listed in Appendix 1 with the number of articles to which they supplied such authors. Relatively few of these institutions contributed to more than one article. Table 2 shows the institutions that contributed other authors to two or more articles and the relevant number of articles. The schools with the most other-authored articles were the University of North Texas with 6, Michigan State University and Arizona State University with 5 apiece, and the University of Hamburg and Chalmers Institute of Technology with 5 each. A total of 53 articles had authors from two or more countries.

Table 1

Institutions with Two or More First-Authored Articles

Institution	Articles	Institution	Articles
Ball State University	2	Nagoya University	2
Lafayette College	2	University of Johannesburg	2
Bryant University	2	Clemson University	2
Manchester Metropolitan University	2	University of South Australia	2
Wageningen University	2	Asian Institute of Technology	2
Allegheny College	2	Griffith University	2
Emory University	2	Oklahoma State University	2
James Cook University	2	Cardiff Metropolitan University	2
Freie Universitat Berlin	2	Pennsylvania State University	2
University of Gloucestershire	2	University of Missouri	2
Tongji University	2	University of Coimbra	3
University of Hartford	2	James Madison University	3
United Nations University	2	University of Vermont	3
University of Melbourne	2	University of Toronto	3

Universidade de Passo Fundo	2	University of Calgary	3
University of New Haven	2	Plymouth University	3
Universitat Internacional de Catalunya	2	University of South Africa	3
University of Sao Paulo	2	De Montfort University	3
Universiti Kebangsaan Malaysia	2	Monash University	3
Leuphana University of Lüneburg	2	University of Tasmania	3
Universiti Sains Malaysia	2	National Taiwan Normal University	3
University of Sussex	2	Nelson Mandela University	3
University College Cork	2	Western Kentucky University	3
University of Technology	2	Delft University of Technology	4
		The Education University of Hong Kong	
University of Aveiro	2	Kong	4
University of the Sunshine Coast	2	Dalhousie University	4
University of British Columbia	2	University of Saskatchewan	4
Chiba University	2	University of Hamburg	5
University of Cadiz	2	Chalmers University of Technology	5

Swinburne University of Technology	2	Michigan State University	6
University of North Texas	2	Arizona State University	6
University of Florida	2	RMIT University	8
University of the Aegean	2		

Table 2

Institutions with Two or More Other-Authored Articles

Institution	Article	Institution	Article
Allegheny College	2	University College Cork	2
Asian Institute of Technology	2	University of Aveiro	2
Ball State University	2	University of Sao Paulo	2
Bryant University	2	University of South Australia	2
Cardiff Metropolitan University	2	University of Sussex	2
Chiba University	2	University of Technology	2
Clemson University	2	University of the Aegean	2
Emory University	2	University of the Sunshine Coast	2
Freie Universitat Berlin	2	Wageningen University	2
Griffith University	2	De Montfort University	3
James Cook University	2	James Madison University	3
Lafayette College	2	Monash University	3
Leuphana University of Lüneburg	2	National Taiwan Normal University	3

Manchester Metropolitan University	2	Nelson Mandela University	3
Nagoya University	2	Plymouth University	3
Oklahoma State University	2	University of Calgary	3
Pennsylvania State University	2	University of Coimbra	3
Swinburne University of Technology	2	University of South Africa	3
Tongji University	2	University of Tasmania	3
United Nations University	2	University of Toronto	3
Universidade de Passo Fundo	2	University of Vermont	3
Universitat Internacional de Catalunya	2	Western Kentucky University	3
Universiti Kebangsaan Malaysia	2	Dalhousie University	4
University of British Columbia	2	Delft University of Technology	4
University of Cadiz	2	The Education University of Hong Kong	4
University of Florida	2	University of Saskatchewan	4
University of Gloucestershire	2	Chalmers University of Technology	5

University of Hartford	2	University of Hamburg	5
University of Johannesburg	2	Michigan State University	6
University of Melbourne	2	Arizona State University	6
University of Missouri	2	University of North Texas	8
University of New Haven	2		

Discussion

Human activity has severely damaged the ecosphere and poses grave risks for all living species (Kolbert, 2016; McKibben, 2017; Scranton, 2015; Wallace-Ward, 2019). Human behavior can change and it is conceivable that our ingenuity and technology will allow us to avoid outright catastrophe in the coming centuries. For that to happen, however, humans need to move quickly and forcefully to adopt sustainable practices in every aspect of our lives.

This project focused on a single outlet for sharing information about sustainable practices in a single area of human endeavor, higher education, and examined only the contributors to that outlet. The results tell us nothing about sustainability in a broad sense, but they do indicate that over the past 10 years scholars and scientists from many institutions from around the world have produced peer-reviewed articles addressing sustainability in higher education. The *International Journal of Sustainability in Higher Education* is truly international. Although multiple first-authored articles came from several different universities, no institution contributed more than eight such articles, which suggests that there was no dominant voice. This appears to be a good thing because input from multiple institutions is likely to foster diverse strategies for increasing sustainable practices throughout higher education and the world. Collaboration across universities was relatively common in the articles I examined, which also is likely to foster diversity in ideas and approaches to sustainability. It is noteworthy that, as with first authors, no school produced other authors for a large number of articles. Three of the schools that produced a relatively large number of first-authored articles, Michigan State University, Arizona State University, and Hamburg University, also contributed a substantial number of other-authored articles.

The *International Journal of Sustainability in Higher Education* is an English-language journal, and it is unsurprising that many first authors were from English-language countries, notably the United Kingdom, the United States of America, and Canada. The United States of America was the leading producer of first-authored articles. This is an interesting finding because the government of the United States is not recognized as a leader in supporting sustainability (Elliott, 2019). I did not closely examine which years the United States published the most articles, however, so more articles could have been written before the election of Donald Trump.

Collaboration across countries was fairly common in the articles I reviewed; 12% of them had authors from two or more countries. Institutions from the United States, specifically Michigan State University, Arizona State University, and the University of North Texas were leaders in international collaboration. These schools appear to play especially important roles in sustainability in higher education.

Western Michigan University, where I am an actively engaged student, is committed to sustainable practices. For example, its Office of Sustainability (2020) list the following as goals and strategies:

- Make Western Michigan University a national higher education sustainability leader.
- Identify and help implement innovative and cost-effective strategies for reducing WMU's eco-cultural wake, which span all of our policies, programs and activities.
- Facilitate interdisciplinary and cross-college collaboration, research and inquiry around sustainability.
- Encourage and support weaving sustainability and climate change education into existing curriculum.

- Assist in the development and implementation of new undergraduate and graduate sustainability courses, certificates and degree programs.
- Support active learning and real-world problem solving through student sustainability research, internships and co-curricular activities.
- Graduate knowledgeable, open-minded, well-prepared and engaged planetary stewards.
- Serve as a resource and advocate for sustainability on campus and in the community, region and state.
- Collaborate with all offices and colleges across campus to secure resources for these efforts.
- Report regularly and transparently on both our achievements and shortcomings in these endeavors. (Western Michigan University Office of Sustainable Development, 2020).

The Office of Sustainability supports preparation of publications and reports and on its website lists 28 prepared from 2015-2019. The title of some of them suggests that they might be appropriate for publication in the *International Journal of Sustainability Research*, but none of the articles I examined lists an author from Western Michigan University. In 2019, the *International Journal of Higher Education* had an impact factor of 1.47 (Academic Accelerator, 2020), which is decent, and appears attract the interest of representatives of many institutions of higher learning. It appears to be a worthy outlet for future research and theorizing by WMU students, faculty, and administrators.

There are a number of viable outlets for conceptual and empirical work concerning sustainability in higher education. One limitation of my project is that I examined a single journal. Although the *International Journal of Sustainability in Higher Education* is the only international journal devoted to sustainability in higher education, there are other journals that

publish on the same topics. The schools and countries that contribute heavily to the *International Journal of Sustainability in Higher Education* may, or may not, contribute heavily elsewhere.

Another limitation of my project is that I was unable to fulfill one of my initial objectives, which was to determine themes from articles published in the journal. My initial plan was to record keywords and determine the keywords used most often, and on that basis determine popular topics. I recorded and analyzed key words for articles published in 2019 and determined the most-used words, which was straightforward. Unfortunately, those keywords were too general to be meaningful. I expected that I would be able to relate them to the areas of interest described in the Instructions to Authors (and described earlier in this document), but that was not possible. Commonly used keywords, such as “sustainable development goals,” “higher education,” “university,” “curricula,” “students,” and “sustainable,” provide no real information about the contents of an article. Determining areas of general interest would necessitate reading and scoring each individual article. Although worthwhile, taking this tack was beyond the scope of my project.

Despite its limitations, my analysis provides solid evidence that over the past decade the *International Journal of Sustainability in Higher Education* has provided a viable means of disseminating information provided by a large number of widely distributed scholars. In the coming years, I hope to see Western Michigan University, and all institutions across the world, contribute to this journal and adopt more sustainable practices and adhere to a plan of carbon neutrality. Universities are the mitochondria of education, so it is crucial that they dedicate themselves to decreasing humans detrimental impacts on the planet and creating systems and research that can be used to inform and educate the general public on best practices in order to reduce climate change’s rate of acceleration and, in turn, a rise in the global temperature.

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Appendix 1.**Institution Name
published # of articles**

RMIT University	8
Michigan State University	6
Arizona State University	6
University of Hamburg	5
Chalmers University of Technology	5
Delft University of Technology	4
The Education University of Hong Kong	4
Dalhousie University	4
University of Saskatchewan	4
University of Coimbra	3
James Madison University	3
University of Vermont	3
University of Toronto	3
University of Calgary	3
Plymouth University	3
University of South Africa	3
De Montfort University	3
Monash University	3
University of Tasmania	3
National Taiwan Normal University	3
Nelson Mandela University	3
Western Kentucky University	3
University of North Texas	2
University of Florida	2
University of the Aegean	2
Nagoya University	2
University of Johannesburg	2
Clemson University	2

University of South Australia	2
Asian Institute of Technology	2
Griffith University	2
Oklahoma State University	2
Cardiff Metropolitan University	2
Pennsylvania State University	2
University of Missouri	2
Ball State University	2
Lafayette College	2
Bryant University	2
Manchester Metropolitan University	2
Wageningen University	2
Allegheny College	2
Emory University	2
James Cook University	2
Freie Universitat Berlin	2
University of Gloucestershire	2
Tongji University	2
University of Hartford	2
United Nations University	2
University of Melbourne	2
Universidade de Passo Fundo	2
University of New Haven	2
Universitat Internacional de Catalunya	2
University of Sao Paulo	2
Universiti Kebangsaan Malaysia	2
Leuphana University of Lüneburg	2
Universiti Sains Malaysia	2
University of Sussex	2
University College Cork	2
University of Technology	2
University of Aveiro	2
University of the Sunshine Coast	2

University of British Columbia	2	University of Western Macedonia	1
Chiba University	2	Jahangirnagar University	1
University of Cadiz	2	Universidade Nova de Lisboa	1
Swinburne University of Technology	2	Colorado State University	1
Vienna University of Economics and Business	1	University of Bristol	1
University of Leeds	1	James Cook University Townsville	1
College of Charleston	1	University of Alberta	1
Appalachian State University	1	Arizona State University,	1
University of South Dakota	1	University of Botswana	1
Graduate Program in Civil and Environment Engineering	1	John von Neumann University	1
Chinese University of Hong Kong	1	University of California	1
Aristotle University of Thessaloniki	1	Jordan University of Science and Technology	1
University of Girona	1	University of Exeter	1
Hamburg University of Applied Sciences,	1	Kansas State University	1
University of New Hampshire	1	University of Graz	1
Harvard University	1	Katholieke Universiteit Leuven	1
Franklin College Switzerland	1	Alabama State University	1
Harvey Mudd College	1	Keele University	1
Universitat Politècnica de Catalunya – Barcelona Tech	1	University of Malaya	1
HAW Hamburg	1	Kent State University	1
University of Basel	1	Deakin University	1
Higher Institute of Administration and Economics	1	Kibbutzim College of Education, Technology and the Arts	1
Curtin University	1	University of Nottingham	1
Institut Futur	1	King Saud University	1
Davidson College	1	University of São Paulo	1
Institute for Ecological Economics/RCE Vienna	1	KTH Royal Institute of Technology	1
Dead Sea and Arava Science Center	1	University of Southern Santa Catarina (Unisul)	1
ISAE Brazilian Business School	1	Kumasi Polytechnic	1
University of Passo Fundo	1	University of the Basque Country UPV/EHU	1
Istanbul Technical University	1	Kyung Hee University	1
Federal University of Rio de Janeiro	1	University of Vienna	1
Ithaca College	1	Duke University	1

University of Zurich	1	East China University of Political Science and Law	1
Lahore College for Women University,	1	University of Lüneburg	1
Free University of Berlin	1	Nanjing University of Finance and Economics	1
Lake Forest College	1	University of Manitoba	1
Universität Bremen	1	National Cheng Kung University	1
Lancaster	1	University of Minho	1
Université de Sherbrooke	1	National Institute of Technology	1
Leuphana University Lüneburg	1	University of Nevada Las Vegas	1
Universiti Teknologi MARA Sarawak	1	National Sun Yat-sen University	1
Aston University	1	University of Nis	1
University Colleges Leuven-Limburg	1	Belgium and University Colleges Leuven-Limburg	1
Loyola University Chicago	1	University of Oregon	1
University of Athens	1	Bilkent University	1
Lund University	1	University of Santiago de Compostela	1
University of Bergamo	1	Newcastle University	1
Australia	1	Ernst-Moritz-Arndt Universität Greifswald	1
University of Brighton	1	Northern Arizona University	1
Massachusetts Institute of Technology	1	University of Southern California	1
COMSATS University	1	Northumbria University	1
McGill University	1	Faculty of Forestry/UBC Sustainability Initiative (USI) Teaching	1
University of Campinas	1	North-West University	1
Memorial University	1	University of Tennessee	1
University of Córdoba	1	Nottingham Trent University	1
Babeş-Bolyai University	1	Franklin & Marshall College	1
Curtin University Malaysia	1	NOVA University of Lisbon	1
Middlebury College	1	University of Valencia	1
University of Gothenburg	1	nstitute of Geography	1
Miriam College	1	University of Wales	1
University of Guelph	1	Bond University	1
Balearic Islands University	1	University of Wisconsin-River Falls	1
University of Hong Kong	1	Open Universiteit	1
Montana State University Bozeman	1	Utrecht University	1
University of Kansas	1		

Otago Polytechnic	1	University of British ColumbiaOkanagan	1
Virginia Tech	1	Royal Liverpool and Broadgreen University Hospitals NHS Trust	1
Oxford Brookes University	1	Cranfield University	1
Universidade Federal Fluminense	1	Royal Roads University	1
Pacific University	1	University of Cambridge	1
Università degli Studi di Padova	1	Ruppin Academic Center	1
Brock University	1	University of Central Missouri	1
Charles Sturt University	1	Rush University Medical Center	1
Philadelphia University	1	University of Colorado	1
Universitat Politècnica de Catalunya, Barcelona	1	Rutgers University	1
Natural Resources Institute Finland	1	University of Eastern Finland	1
Charles University	1	San Jose State University	1
Politecnico di Milano	1	University of Ferrara	1
Universiti Teknologi Malaysia	1	Santa Clara University	1
Politecnico di Torino	1	University of Ghana Business School	1
Universiti Teknologi PETRONAS	1	Shanghai Jiao Tong University	1
Pontifical Catholic University of Rio de Janeiro	1	Academia de Studii Economice din Bucuresti	1
University College London	1	Sheffield Hallam University	1
Pontificia Universidade Catolica do Parana	1	University of Granada	1
University Jaume I Castellón	1	Shinshu University	1
Princeton University	1	University of Groningen	1
University of Arizona	1	Smith College	1
Purdue University	1	Daugavpils University,	1
Aalborg University	1	South Dakota State University	1
Queen's University	1	University of Helsinki	1
University of Belgrade	1	Southern Illinois University	1
Radford University	1	University of Illinois at Urbana-Champaign	1
University of Bologna	1	St. Petersburg State University	1
Rhodes University	1	University of Johannesburg	1
University of Bradford	1	Stellenbosch University	1
Bucknell University	1	University of Lausanne	1
University of Bristol	1	Stockholm University	1
Roman Catholic University of Eichstaett-Ingolstadt	1		

University of Łódź	1	University of South Florida	1
Swedish University of Agricultural Sciences	1	Central Connecticut State University	1
University of Maine	1	University of Southern Maine	1
Cambridge University	1	TransWorld University	1
University of Manchester	1	University of Strathclyde	1
The Ohio State University	1	Tufts University	1
University of Maryland	1	University of Tampere	1
Western Sydney University	1	Uganda Martyrs University	1
University of Michigan	1	Federal University of Technology	1
Winters College	1	Unite Group PLC	1
University of Minnesota	1	Florida Gulf Coast University	1
Yale University	1	United Arab Emirates University	1
University of Natural Resources and Life Sciences	1	University of the South Pacific	1
Brazil Federal Univeristy of Rio Grande do Sul – UFRGS	1	Central University of Technology	1
University of New England	1	University of the West of England	1
The City College of the City University of New York	1	Universidad Camilo José Cela	1
Albright College	1	University of Utah	1
Cardiff University	1	Universidad de Chile	1
Eberswalde University for Sustainable Development	1	Franklin University Switzerland	1
The Hague University of Applied Science	1	Universidad de Ciencias Aplicadas y Ambientales	1
University of Oklahoma	1	University of Wageningen	1
The Ohio State University	1	Universidad Iberoamericana	1
University of Padova	1	University of Waterloo	1
The Open University	1	Universidad ICESI	1
University of Pennsylvania	1	University of Wisconsin-Madison	1
The Pennsylvania State University	1	Universidad Nacional Autónoma de México (UNAM)	1
Edith Cowan University	1	University of Worcester	1
The University of Manchester	1	Universidad Nacional del Comahue	1
California State University	1	US Environmental Protection Agency	1
Tohoku University	1	Universidad San Francisco de Quito	1
Ethiopian Graduate School of Theology	1	Victoria University of Wellington	1
Tokyo University of Marine Science and Technology	1	Universidade da Coruna	1
		Virginia Polytechnic Institute and State University	1

Universidade de Caxias do Sul	1
Virginia Tech University	1
Universitat Autònoma de Barcelona	1
Universidade Federal de Santa Maria	1

Appendix 2.

Institution Name	# of articles published		
Brazil Federal Univeristy of Rio Grande do Sul – UFRGS	1	Bond University	1
California State University	1	Brock University	1
Colorado State University	1	Bryant University	2
Duke University	1	Bucknell University	1
East China University of Political Science and Law	1	Cambridge University	1
Natural Resources Institute Finland	1	Cardiff Metropolitan University	2
The Ohio State University	1	Cardiff University	1
Universitat Autònoma de Barcelona	1	Central Connecticut State University	1
University of Bristol	1	Central University of Technology	1
Aalborg University	1	Chalmers University of Technology	5
Academia de Studii Economice din Bucuresti	1	Charles Sturt University	1
Alabama State University	1	Charles University	1
Albright College	1	Chiba University	2
Allegheny College	2	Chinese University of Hong Kong	1
Appalachian State University	1	Clemson University	2
Aristotle University of Thessaloniki	1	College of Charleston	1
Arizona State University	6	COMSATS University	1
Arizona State University,	1	Cranfield University	1
Asian Institute of Technology	2	Curtin University	1
Aston University	1	Curtin University Malaysia	1
Australia	1	Dalhousie University	4
Babeş-Bolyai University	1	Daugavpils University,	1
Balearic Islands University	1	Davidson College	1
Ball State University	2	De Montfort University	3
Belgium and University Colleges Leuven-Limburg	1	Dead Sea and Arava Science Center	1
Bilkent University	1	Deakin University	1
		Delft University of Technology	4
		Eberswalde University for Sustainable Development	1
		Edith Cowan University	1
		Emory University	2

Ernst-Moritz-Arndt Universität Greifswald	1	Kansas State University	1
Ethiopian Graduate School of Theology	1	Katholieke Universiteit Leuven	1
Faculty of Forestry/UBC Sustainability Initiative (USI) Teaching	1	Keele University	1
Federal University of Rio de Janeiro	1	Kent State University	1
Federal University of Technology	1	Kibbutzim College of Education, Technology and the Arts	1
Florida Gulf Coast University	1	King Saud University	1
Franklin & Marshall College	1	KTH Royal Institute of Technology	1
Franklin College Switzerland	1	Kumasi Polytechnic	1
Franklin University Switzerland	1	Kyung Hee University	1
Free University of Berlin	1	Lafayette College	2
Freie Universität Berlin	2	Lahore College for Women University,	1
Graduate Program in Civil and Environment Engineering	1	Lake Forest College	1
Griffith University	2	Lancaster	1
Hamburg University of Applied Sciences,	1	Leuphana University Lüneburg	1
Harvard University	1	Leuphana University of Lüneburg	2
Harvey Mudd College	1	Loyola University Chicago	1
HAW Hamburg	1	Lund University	1
Higher Institute of Administration and Economics	1	Manchester Metropolitan University	2
Institut Futur	1	Massachusetts Institute of Technology	1
Institute for Ecological Economics/RCE Vienna	1	McGill University	1
ISAE Brazilian Business School	1	Memorial University	1
Istanbul Technical University	1	Michigan State University	6
Ithaca College	1	Middlebury College	1
Jahangirnagar University	1	Miriam College	1
James Cook University	2	Monash University	3
James Cook University Townsville	1	Montana State University Bozeman	1
James Madison University	3	Nagoya University	2
John von Neumann University	1	Nanjing University of Finance and Economics	1
Jordan University of Science and Technology	1	National Cheng Kung University	1
		National Institute of Technology	1

National Sun Yat-sen University	1	Royal Roads University	1
National Taiwan Normal University	3	Ruppin Academic Center	1
Nelson Mandela University	3	Rush University Medical Center	1
Newcastle University	1	Rutgers University	1
Northern Arizona University	1	San Jose State University	1
Northumbria University	1	Santa Clara University	1
North-West University	1	Shanghai Jiao Tong University	1
Nottingham Trent University	1	Sheffield Hallam University	1
NOVA University of Lisbon	1	Shinshu University	1
nstitute of Geography	1	Smith College	1
Oklahoma State University	2	South Dakota State University	1
Open Universiteit	1	Southern Illinois University	1
Otago Polytechnic	1	St. Petersburg State University	1
Oxford Brookes University	1	Stellenbosch University	1
Pacific University	1	Stockholm University	1
Pennsylvania State University	2	Swedish University of Agricultural Sciences	1
Philadelphia University	1	Swinburne University of Technology	2
Plymouth University	3	Technion – Israel Institute of Technology	1
Politecnico di Milano	1	Teesside University	1
Politecnico di Torino	1	TERI University	1
Pontifical Catholic University of Rio de Janeiro	1	Texas A&M University	1
Pontificia Universidade Catolica do Parana	1	Texas State University at Round Rock	1
Princeton University	1	The City College of the City University of New York	1
Purdue University	1	The Education University of Hong Kong	4
Queen's University	1	The Hague University of Applied Science	1
Radford University	1	The Ohio State University	1
Rhodes University	1	The Open University	1
RMIT University	8	The Pennsylvania State University	1
Roman Catholic University of Eichstaett-Ingolstadt	1	The University of Manchester	1
Royal Liverpool and Broadgreen University Hospitals NHS Trust	1	Tohoku University	1

Tokyo University of Marine Science and Technology	1	Universiti Teknologi Malaysia	1
Tongji University	2	Universiti Teknologi MARA Sarawak	1
TransWorld University	1	Universiti Teknologi PETRONAS	1
Tufts University	1	University College Cork	2
Uganda Martyrs University	1	University College London	1
Unite Group PLC	1	University Colleges Leuven-Limburg	1
United Arab Emirates University	1	University Jaume I Castellón	1
United Nations University	2	University of Alberta	1
Universidad Camilo José Cela	1	University of Arizona	1
Universidad de Chile	1	University of Athens	1
Universidad de Ciencias Aplicadas y Ambientales	1	University of Aveiro	2
Universidad Iberoamericana	1	University of Basel	1
Universidad ICESI	1	University of Belgrade	1
Universidad Nacional Autónoma de México (UNAM)	1	University of Bergamo	1
Universidad Nacional del Comahue	1	University of Bologna	1
Universidad San Francisco de Quito	1	University of Botswana	1
Universidade da Coruna	1	University of Bradford	1
Universidade de Caxias do Sul	1	University of Brighton	1
Universidade de Passo Fundo	2	University of Bristol	1
Universidade Federal de Santa Maria	1	University of British Columbia	2
Universidade Federal Fluminense	1	University of British ColumbiaOkanagan	1
Universidade Nova de Lisboa	1	University of Cadiz	2
Università degli Studi di Padova	1	University of Calgary	3
Universität Bremen	1	University of California	1
Universitat Internacional de Catalunya	2	University of Cambridge	1
Universitat Politècnica de Catalunya – Barcelona Tech	1	University of Campinas	1
Universitat Politècnica de Catalunya, Barcelona	1	University of Central Missouri	1
Université de Sherbrooke	1	University of Coimbra	3
Universiti Kebangsaan Malaysia	2	University of Colorado	1
Universiti Sains Malaysia	2	University of Córdoba	1

University of Eastern Finland	1	University of Michigan	1
University of Exeter	1	University of Minho	1
University of Ferrara	1	University of Minnesota	1
University of Florida	2	University of Missouri	2
University of Ghana Business School	1	University of Natural Resources and Life Sciences	1
University of Girona	1	University of Nevada Las Vegas	1
University of Gloucestershire	2	University of New England	1
University of Gothenburg	1	University of New Hampshire	1
University of Granada	1	University of New Haven	2
University of Graz	1	University of Nis	1
University of Groningen	1	University of North Texas	2
University of Guelph	1	University of Nottingham	1
University of Hamburg	5	University of Oklahoma	1
University of Hartford	2	University of Oregon	1
University of Helsinki	1	University of Padova	1
University of Hong Kong	1	University of Passo Fundo	1
University of Illinois at Urbana-Champaign	1	University of Pennsylvania	1
University of Johannesburg	2	University of Santiago de Compostela	1
University of Johannesburg	1	University of Sao Paulo	2
University of Kansas	1	University of São Paulo	1
University of Lausanne	1	University of Saskatchewan	4
University of Leeds	1	University of South Africa	3
University of Łódź	1	University of South Australia	2
University of Lüneburg	1	University of South Dakota	1
University of Maine	1	University of South Florida	1
University of Malaya	1	University of Southern California	1
University of Manchester	1	University of Southern Maine	1
University of Manitoba	1	University of Southern Santa Catarina (Unisul)	1
University of Maryland	1	University of Strathclyde	1
University of Melbourne	2	University of Sussex	2

University of Tampere	1	University of Zurich	1
University of Tasmania	3	US Environmental Protection Agency	1
University of Technology	2	Utrecht University	1
University of Tennessee	1	Victoria University of Wellington	1
University of the Aegean	2	Vienna University of Economics and Business	1
University of the Basque Country UPV/EHU	1	Virginia Polytechnic Institute and State University	1
University of the South Pacific	1	Virginia Tech	1
University of the Sunshine Coast	2	Virginia Tech University	1
University of the West of England	1	Wageningen University	2
University of Toronto	3	Western Kentucky University	3
University of Utah	1	Western State Colorado University	1
University of Valencia	1	Western Sydney University	1
University of Vermont	3	Wilhelm Büchner Hochschule - Universität Bremen	1
University of Vienna	1	Winters College	1
University of Wageningen	1	Wuppertal Institute for Climate	1
University of Wales	1	Yale University	1
University of Waterloo	1	Yasar University	1
University of Western Macedonia	1		
University of Wisconsin-Madison	1		
University of Wisconsin-River Falls	1		
University of Worcester	1		

