Research Trends

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Identifying expertise in water management

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The value of bibliometric measures

Identifying expertise in water management

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Although approximately two-thirds of the Earth is covered in water, just 2.5 percent of this is fresh, 70 percent of which is frozen. This means that all creatures living outside the sea have to share 0.75 percent of the world's water. As consumption increases, governments, economists and researchers around the world are paying greater attention to the world's supply of fresh water.

Painting an accurate picture of how universities and countries are performing on water research is critical for identifying the potential solutions emerging from this science. Without proper insight, academic and government bodies cannot make appropriate funding decisions or develop strategic blueprints that will lead them to the scientific breakthroughs crucial to long-term solutions and economic success.

Recently, a study was conducted on academic research on the topic of "water resources" using Scopus data and SciVal Spotlight, a performance-measurement tool based on a detailed model of the current structure of science. This study was presented at the Government-University-Industry Research Roundtable in July 2010 in Washington. Here, we present some of the characterizations of the field.

The study clearly illustrates a marked increase in research output in this area over the past decade, reflecting rising global concerns (see Figure 1).

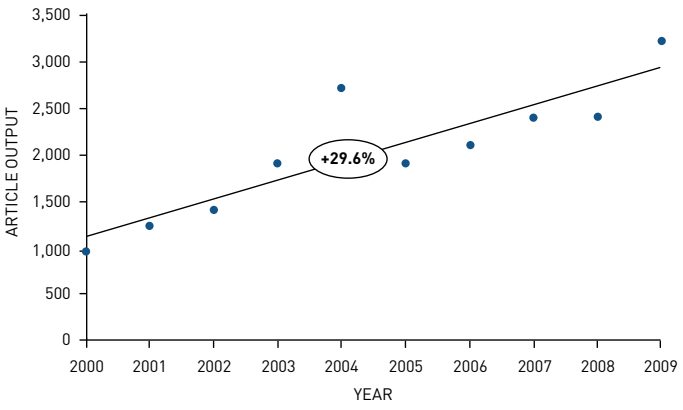

Figure 1 – Article output in water resources increased almost 30 percent between 2000 and 2009. For comparison, over the same timeframe, the average growth rate for academic research was just 3 percent while the keyword "nano-", indicating another current hot topic, rose 20 percent.
Source: Scopus.

Deluge from the US and China

Publications originate from a wide range of countries, reflecting international interest. The US and China are leading the field (see Figure 2), with several other countries picking up pace. Research output in Iran, Mexico and Denmark is rising sharply. Iran, for instance, produced 96 papers on water resources in 2009, compared with just 12 papers between 1970 and 2000

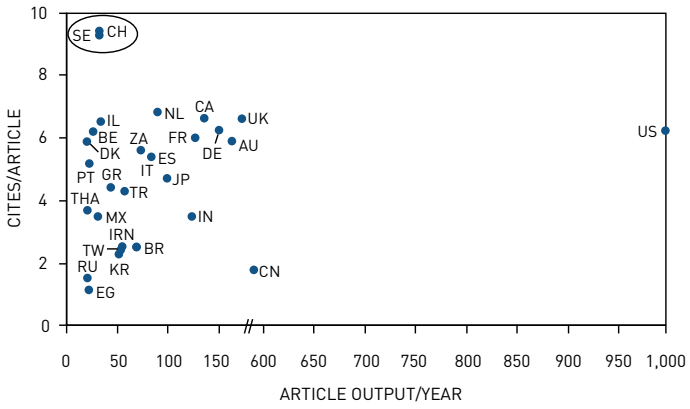

Figure 2 – Output and citations per paper, per country (2005–2008).
Source: Scopus.

SciVal Spotlight also allows us to take a closer look at the research landscape at a country level. Taking China as a test case, we can see that it is especially strong in many applied scientific subject areas, including the computer sciences, chemistry and engineering (see Figure 3). However, they also have a significant cluster of strengths around biology and biotechnology. In fact, 28 of China's 463 competencies (6.04 percent) are in water research, with the highest concentration in water treatment and waste water. This is perhaps not surprising given its local challenges with water pollution.

In contrast, the US has 81 competencies (of a total 1,635, 4.95 percent) in water research, with relative strengths in wastewater, water resources and freshwater biology. In the UK, 16 of its 361 competencies are related to water research (4.43 percent), with a distribution similar to that of the US.

Global focus increases impact

The type of research varies by country, too. China is highly focused on solutions to local challenges while research carried out in the US is more concerned with global issues.

Continued on page 4

Continued from page 3

As for impact, Sweden and Switzerland are leading the field, with the highest citations per paper (see Figure 2). Sweden has published four papers with more than 50 citations, totaling 217. Its top articles were published in Nature and Science. Switzerland has published three papers with more than 50 citations, totaling 161. The top paper was published in the *Lancet*.

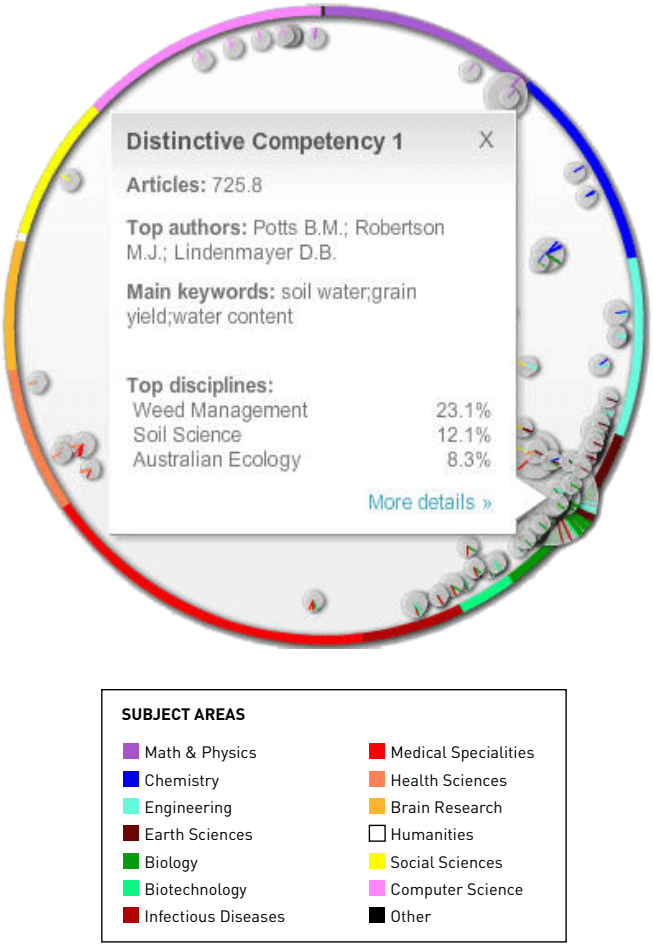

Figure 3 – The Scival Spotlight country map for China shows where its core competencies lie (2008 data).
Source: Scopus.

If we look at the institutes that are particularly strong in the field of water resources (see Figure 4), some stand out. Tel Aviv produced less than 25 papers, but one of those received more than 150 citations, more than half of Tel Aviv's total citations. The Chinese Academy of Sciences, at the other extreme, produced more than 250 papers with fewer than 2.6 citations per article, due to the local focus of their papers. In the **webinar version of this study**, institutional maps are shown for the Australian Commonwealth Scientific Research Organization, Princeton and USDA.

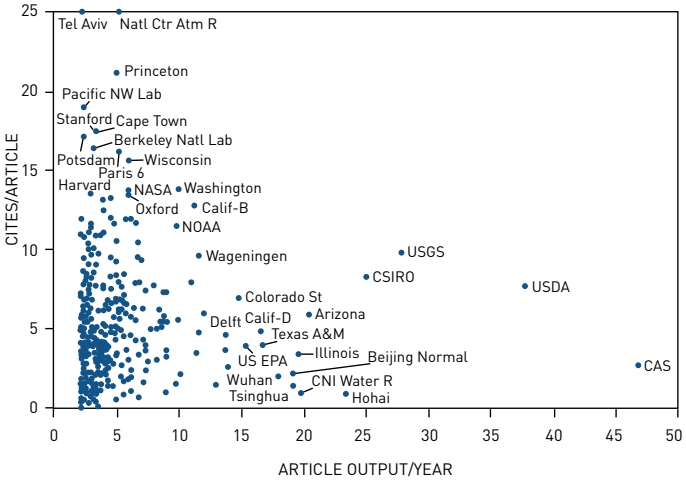

Figure 4 – While some institutes are producing few, highly cited papers, like Tel Aviv, others are publishing numerous studies on local issues, like the Chinese Academy of Sciences (CAS), which attract fewer citations.
Source: Scopus.

Multidisciplinary approach

It is also apparent that water research is becoming more multidisciplinary in nature (see Figure 5). Mathematicians, economists and computer scientists are increasingly contributing to research into solutions for our water challenges. This multidisciplinary approach to our most urgent environmental challenges is not limited to water resources. Research Trends has noted this trend in several past issues, such as **alternative energy research** and other **environmental challenges**.

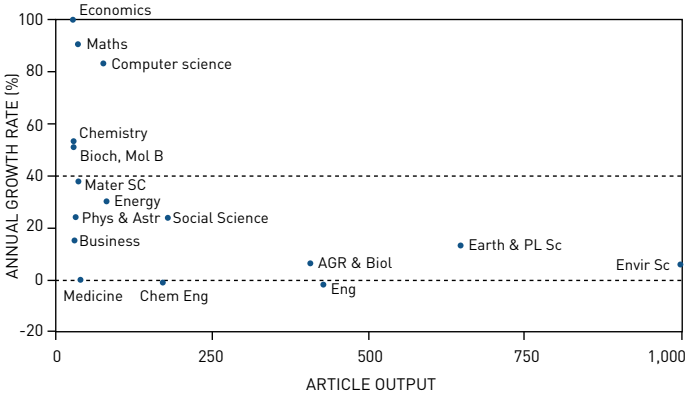

Figure 5 – Annual growth rate of water resources output per subject area (2005–2008).
Source: Scopus.

This multidisciplinary approach is presenting bibliometricians with their own set of challenges. In particular, it is getting more difficult to fully comprehend a research area by simply looking at the output within journal categories, as many important papers cross the traditional subject classifications. Fortunately, technological solutions are helping us understand many emerging and multidisciplinary fields. Identifying hot spots in water

Continued on page 5

Continued from page 4

research helps us know where it is moving and where we might want to offer incentives to drive it.

For all our most pressing challenges, research is needed more than ever. We desperately need solutions to alleviate the suffering that badly managed water resources cause millions around the world. Getting an accurate picture of where the best research is being carried out can only help governments better allocate another scarce resource – funding.

Useful links

SciVal webinar on water resources