

Research Performance in South-East Asia

Biometric hand scanner



Executive Summary

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Foreign &
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Office



BRITISH
COUNCIL

ASEAN Research Output, Growth and Impact

This report was commissioned by the UK-South-East Asia Knowledge Partnership, an alliance between the British Council and the Foreign and Commonwealth Office to analyse and present the research performance of five South-East Asia countries: Indonesia, Malaysia, Philippines, Thailand, and Vietnam.

The bibliometric study undertaken by Elsevier Analytical Services, examined each country's research performance, identifying its strengths, its most prolific or impactful institutions, and its collaborators between 2009-2013. The five countries selected have the most prolific scholarly output in the region and are partner countries for the UK's Newton Fund, excluding Singapore due to its superior research performance.

“ASEAN countries collectively represent one of the most dynamic economies in the world. With a population of 600 million people (i.e. 9% of the world population), and a combined GDP of \$1.8 trillion, the ASEAN economy is ranked as the 9th largest economy in the world and the 3rd largest in Asia. The region has experienced continued economic growth in recent years, with average rate of growth being 5 to 6% per year during the past 20 years. In recent years, the ASEAN countries have increased investment in science and technology with the view of achieving an economy driven by knowledge.”

Nguyen, T. V. & Pham, L.T., 2011, “Scientific output and its relationship to knowledge economy: an analysis of ASEAN countries” *Scientometrics*, 89(1), pages 107–117.

ASEAN output share of world papers

2.2% of world scholarly output 2009-2013 (244,404 papers): the share of world papers published by ASEAN as a whole.

ASEAN output annual growth

13.7% 2009-2013 annual growth (CAGR): the output of ASEAN as a whole has been showing strong average annual growth.

ASEAN output citation impact

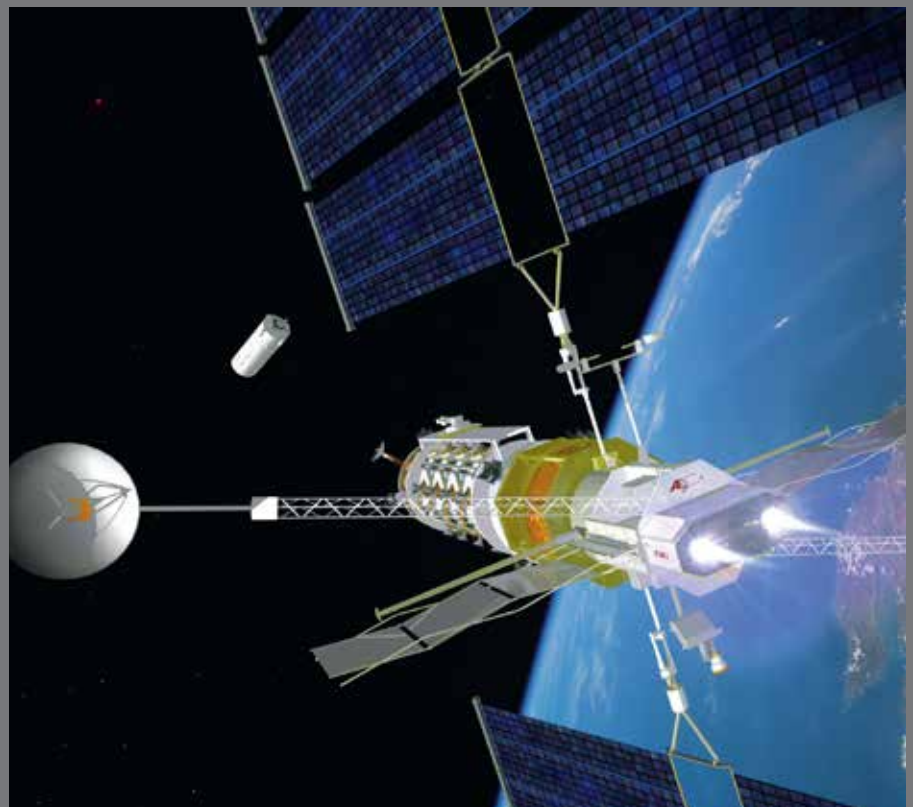
1.19 2013 field-weighted citation impact (FWCI): the citation impact of ASEAN as a whole is nearly 20% above world average.

ASEAN citation impact annual growth

0.5% 2009-2013 annual growth (CAGR): the citation impact of ASEAN as a whole has also been growing.

ASEAN most impactful subject area

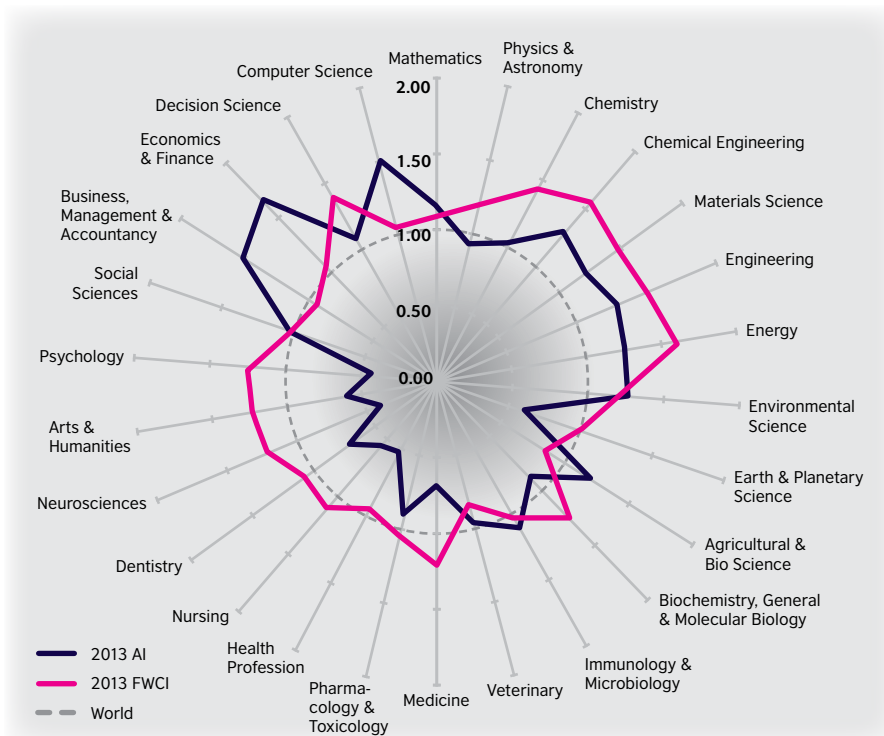
Energy Energy shows the highest relative impact (63% above world average) for ASEAN as a whole. It is a particularly vibrant area for ASEAN and for most selected ASEAN countries, also displaying high output and high growth 2009-2013.



ASEAN Output, Growth and Impact by Subject Area

Selected ASEAN Countries Research Output, Growth and Impact

Chart 1: 2013 ASEAN Activity Index and Field-Weighted Citation Impact



Source: Scopus

The ASEAN region as a whole is comparatively more active in the Physical Sciences, certain areas of the Social Sciences, a couple of Life Sciences fields, and Computer Sciences; it has relatively high output and impact levels in Chemical Engineering, Engineering, Materials Science, and Energy. However, UK collaborations with selected ASEAN countries show relatively more activity in the Life and Health Sciences.

To some extent this may be a reflection of the UK's own activity by subject area, which shows higher proportions of outputs in the Health, Life, and Social Sciences than the ASEAN region.

The data also shows high relative activity in high impact multidisciplinary journals. Energy and Economics, Econometrics, & Finance present the largest 2009-2013 gains in this indicator.

In terms of impact, Malaysia has strongly risen over time. The Philippines has constantly remained significantly above world average, albeit seeing some decreases through time. Vietnam and Thailand are roughly around world average after stability over the past few years, while Indonesia has experienced consistent decreases in impact, remaining under and distancing itself further from the world average.

Chart 2: Share of World Papers

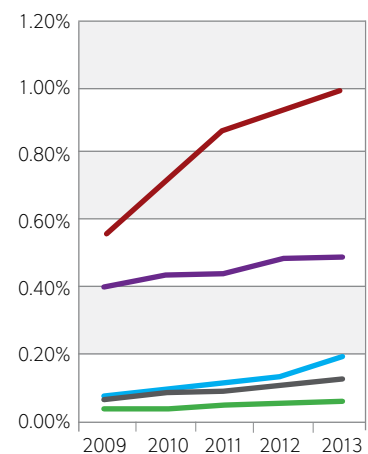
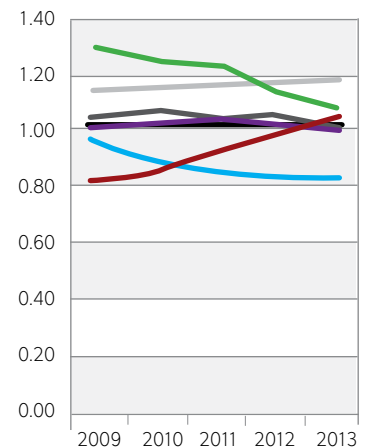


Chart 3: FWCI

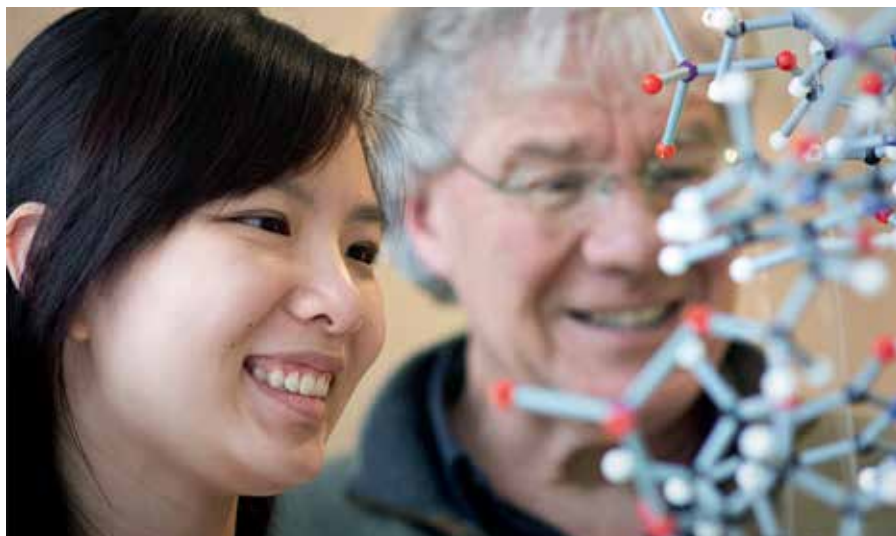


Source: Scopus

Legend:
 ASEAN (Grey), Malaysia (Red), Thailand (Purple)
 Indonesia (Blue), Vietnam (Dark Grey), Philippines (Green)
 World (Black)

Selected ASEAN Countries Output and Impact by Subject Area

South-East Asia Institutions



Each selected ASEAN country reveals different activity indices patterns, but all present relatively high activity in Agricultural & Biological Sciences. And while each comparator country has its own impact distribution by subject, Energy has a high impact for prolific Indonesia and Malaysia, as well as, to a lesser extent, for Thailand and Philippines. This high impact in Energy across four of the five selected countries contributes to the overall ASEAN high impact in this area.

Business, Management & Accounting is a high activity but low impact area for three of the five selected countries (Malaysia, Indonesia, Philippines). A similar pattern is observed for Agricultural & Biological Sciences and Immunology & Microbiology for Thailand and Vietnam, for Veterinary Sciences for Thailand and Vietnam, and for Computer Sciences for Indonesia and Vietnam.

- Malaysia shows high and growing activity (more than 50% than the world average) and impact (more than 60% than the world average) in Engineering and Energy, but high activity and average or low impact in Business, Management & Accounting and Economics, Econometrics & Finance.
- Thailand has high activity but low impact in Agricultural & Biological Sciences, Immunology & Microbiology, and Veterinary Sciences (more than twice the world average activity for these last two subject areas).
- Indonesia sees high activity (between 50% and 100% more than world average) but low impact in Agricultural & Biological Sciences, Business, Management & Accounting, and Computer Sciences.
- Vietnam presents high activity (more than twice the world average for the first two subject areas) but average or low impact in Mathematics, Computer Sciences, Agricultural & Biological Sciences, Immunology & Microbiology.
- Philippines displays high activity (more than twice the world average) and impact in Environmental Sciences and Agricultural & Biological Sciences, but high activity and low impact in Veterinary Sciences, Social Sciences, Business, Management & Accounting, and Economics, Econometrics & Finance.

30 institutions were selected across the five countries on the basis of their output and/or impact. Their strengths were defined as their top five subject areas in terms of FWCI, with at least 100 papers published in 2009-2013. The institutions were selected to ensure coverage of all five countries, and a range of institution types, including universities and research centres.

Malaysia

University of Malaya
Universiti Kebangsaan Malaysia
Universiti Teknologi Malaysia
Universiti Sains Malaysia
Universiti Teknologi MARA
Universiti Malaysia Perlis
Universiti Tun Hussein Onn Malaysia

Thailand

Mahidol University
Chulalongkorn University
Chiang Mai University
Khon Kaen University
Kasetsart University
Prince of Songkla University
King Mongkut's University of Technology Thonburi
National S & T Development Agency Thailand

Indonesia

Bandung Institute of Technology
University of Indonesia
Gadjah Mada University
Institut Teknologi Sepuluh Nopember
Institut Pertanian Bogor
Lembaga Ilmu Pengetahuan Indonesia
CIFOR, West Java

Vietnam

Vietnamese Academy of Science & Technology
Hanoi University of Technology
Vietnam National University
Can Tho University

Philippines

University of the Philippines
International Rice Research Institute
De La Salle University Manila
Ateneo de Manila University

Research Output, Growth and Impact: Institutional Level

- **Energy** is a star area for ASEAN as a whole, with high output, growth, and impact. It is an active and impactful area for several of the selected institutions (e.g. University of Malaya, Universiti Kebangsaan Malaysia, Universiti Teknologi Malaysia, Chulalongkorn University, King Mongkut's University of Technology Thonburi, Bandung Institute of Technology).
- **Engineering** is by far the most common strength, present for over two-thirds of the 30 selected institutions, in particular technologically-oriented ones. Chemical Engineering and Materials Science also stand out as common strengths for about one third of the institutes.
- **Environmental Sciences** is a strength for 12 of the 30 selected institutes, and is particularly impactful in institutes such as: Universiti Sains Malaysia, Khon Kaen University, Prince of Songkla University, Lembaga Ilmu Pengetahuan Indonesia and Center for International Forestry West Java.
- **Agricultural and Biological Sciences** is a high activity area for all five selected countries, and a research strength for nearly a third of institutions such as Center for International Forestry West Java, Lembaga Ilmu Pengetahuan Indonesia, International Rice Research Institute.
- Specific institutes show high impact in **Medicine**, such as Vietnamese Academy of Science & Technology or Mahidol University.

Chart 4: Number of institutions displaying a particular strength, by country and overall

Strength	Malaysia	Thailand	Indonesia	Vietnam	Philippines	Total number of institutes with each strength
Engineering	7	6	4	3	1	21
Environmental Sciences	1	6	3	1	1	12
Chemical Engineering	5	4	1	1		11
Agricultural and Biological Sciences		1	4	2	2	9
Materials Sciences	4	3	1	1		9
Social Sciences	1	3	2		3	9
Medicine		4	3	1		8
Physics and Astronomy	1	4	1	1	1	8
Biochemistry, Genetics and Molecular Biology		1	4		2	7
Computer Sciences	2		2	2	1	7
Energy	4	2	1			7
Mathematics	2	1	2	2		7
Chemistry	2	1	1			4
Decision Sciences	3					3
Arts and Humanities	2					2
Earth and Planetary Sciences			2			2
Dentistry		1				1
General		1				1
Nursing		1				1
Pharmacology, Toxicology and Pharmaceutics		1				1
Psychology	1					1
TOTAL NUMBER OF STRENGTHS BY COUNTRY	35	40	31	14	11	131

Source: Scopus

ASEAN and Selected Countries Collaboration with the UK

Selected institutions activity indices & relative impact

The study identifies the top five collaborator partners of each institution, both internationally and for the UK, in each of these strengths.

Selected institutions in each country tend to have less collaboration with the UK than with regional or international partners in their strength areas, but in most cases, these collaborations tend to be of similar or higher impact. Although the relative distribution of UK collaboration varies for each selected ASEAN country, most show some highly active collaboration areas in the Life, Health, and Social Sciences. Medicine and/or Immunology & Microbiology in particular emerge as highly active areas of collaboration for several of the selected countries.

Interestingly, ASEAN areas of high output and/or impact in the Physical Sciences tend to show low relative collaborative activity with the UK for most countries. This means that there is proportionally less output collaborated with the UK in these fields compared to the ASEAN overall output in these fields. To some extent this may be a reflection of the UK's own activity by subject area, which shows higher proportions of outputs in the Health, Life, and Social Sciences than ASEAN, which is more focused on the Physical Sciences.

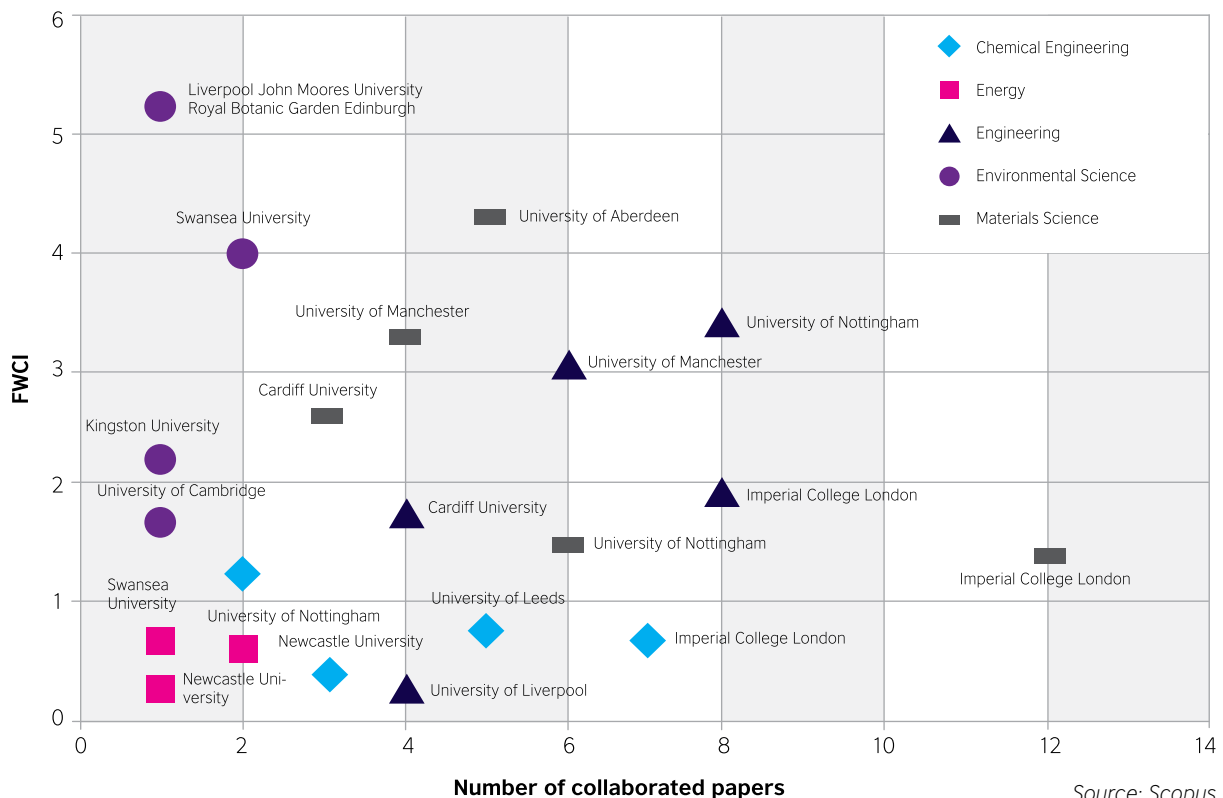
For each institute, the analysis identifies, in each strength, the five most prolific international and UK collaborators as in the below example for Universiti Sains Malaysia.

Most selected Malaysian institutions display high activity and/or impact in Physical Sciences. For most institutes, Energy and Engineering are particularly active and impactful but for other areas, high activity and impact usually do not go hand-in-hand.

Most selected Thai institutes tend to show high activity in Life and Health Sciences fields, but this is not always associated with high impact e.g. several institutes show high activity but low impact in areas such as Veterinary Sciences, Agricultural & Biological Sciences, and Immunology & Microbiology.

Selected Indonesian institutes have very varied activity indices. Generally, few show high activity and impact in the same subject areas. Selected Vietnamese institutions usually have low outputs, and again, most present a dichotomy whereby they are not highly impactful in their most active fields. Selected Philippines institutions also tend to have low outputs and average or low impact in their most prolific areas.

Chart 5: Universiti Sains Malaysia's most prolific UK collaboration partners in five research strengths, 2009-2013



Source: Scopus

Key Findings

ASEAN



2.2%
of world papers 2009-2013



13.7%
annual output growth
2009-2013 CAGR



1.19
Field-Weighted Citation
Impact (19% above
world average)



0.5%
annual FWCI growth

Energy shows the highest relative impact (63% above world average) and is a particularly vibrant area that also displays high output and high growth

Malaysia



Over
23,000
papers in 2013



0.68% of
world citations
in 2013



Citation impact
6% above
world average
in 2013

Malaysia displays high and growing activity and impact in Engineering and Energy, but high activity and average or low impact in Business, Management & Accounting and Economics, Econometrics & Finance

Thailand



Over
11,300
papers in 2013



0.42% of
world citations
in 2013



Citation impact
2% below
world average
in 2013

Thailand has high activity but low impact in Agricultural & Biological Sciences, Immunology & Microbiology, and Veterinary Sciences

Indonesia



Nearly
4,500
papers in 2013



0.19% of
world citations
in 2013



Citation impact
18% below
world average
in 2013

Indonesia sees high activity but low impact in Agricultural & Biological Sciences, Business, Management & Accounting, and Computer Sciences

Vietnam



Over
3,300
papers in 2013



0.14% of
world citations
in 2013



Citation impact
on par with
world average
in 2013

Vietnam presents high activity but average or low impact in Mathematics, Computer Sciences, Agricultural & Biological Sciences, Immunology & Microbiology

Philippines



Over
1,500
papers in 2013



0.07% of
world citations
in 2013



Citation impact
11% above
world average
in 2013

Philippines has high activity and impact in Environmental Sciences and Agricultural & Biological Sciences, but high activity and low impact in Veterinary Sciences and Economics, Econometrics & Finance

Article output for a country is the count of articles with at least one author from that country (according to the affiliation listed in the authorship byline). All analyses make use of 'whole' rather than 'fractional' counting: an article representing international collaboration (with at least two different countries listed in the authorship byline) is counted once each for every country listed.

CAGR (Compound Annual Growth Rate) is defined as the year-over-year constant growth rate over a specified period of time. Starting with the first value in any series and applying this rate for each of the time intervals yields the amount in the final value of the series.

FWCI (field-weighted citation impact) is an indicator of mean citation impact, and compares the actual number of citations received by an article with the expected number of citations for articles of the same document type (article, review or conference proceeding paper), publication year and subject field. The indicator is therefore always defined with reference to a global baseline of 1.0 and intrinsically accounts for differences in citation accrual over time, differences in citation rates for different document as well as subject-specific differences in citation frequencies overall and over time and document types.

Activity Index is defined as a country's share of its total article output across subject field(s) relative to the global share of articles in the same subject field(s). A value of 1.0 indicates that a country's research activity in a field corresponds exactly with the global activity in that field; higher than 1.0 implies a greater emphasis while lower than 1.0 suggests a lesser focus.



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